ACTION

	DATE
COMMITTEE	
M.A.P.C.	
B.C.C./B. CO. C.	

DR 74-16 - Subdivision Policy
Requirements for Road Improvements
Major Developments

April 25, 1974

Jack H. Galbraith, Chief Planner

Robert A. Lakin, Director of Planning

DR 74-16 - Subdivision Policy Requirements for Road Improvements - Major Developments

The Board of City Commissioners has asked that the general policy of when and where improvements beyond the normal 52-foot arterial section are to be required, be considered by the MAPD and MAPC. Specifically, the "difference" in action on Cedar Lake Village Third Addition and Westlink 11th should be compared. I, too, am concerned about the apparent inconsistencies. From now on, do we require full accel-decel on all 6 acres, plus Light Commercials and Commercials? On apartment projects over X size with Y density?

I would suggest a meeting with Public Works to develop specific guidelines. These should probably result in amendments to the Subdivision Regulations. This would provide some legal authority for the acts now being taken.

RAL:ber

cc: Robert Finch, Assistant City Manager
Ray Bruggeman, Director of Public Works
Dick Linn, City Engineer
Paul Graves, City Traffic Engineer

Met on 5/13/74 with McKinley
Galbraith, Young, & Laken

dated (big devel) strip map.
(show takings on all major
developments)
single lot cuts.
total access control except city streets
accel-decel lanes.
service roads.

the more cuts, the more conflict points,
the more accidents (theoretically)

accident rates correlated to cuts (S. Seneca Study)

(West Street case)?

may need to use some of the info
in the data files & cross reference with
accident records.

on strip outs - 60 foot ½ st. R.O.W. with a
third moving lanes

Center 5th lane for movement both ways and
turn in each direction.

What size & type ~~facilities~~ developments
justify the wider (60) ½ ROW taking,
10 trips/day - higher density apartments. Kingston Cove
ave peak.

40 to 80 trips/1000 □' Commercial centers / day

50 to 100 " " " " Discount centers.

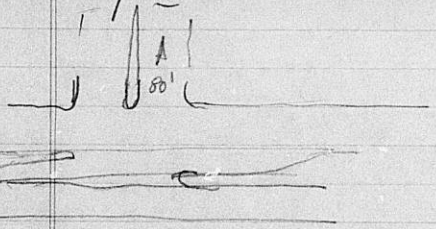
50 to 150 " " " " fast food centers.

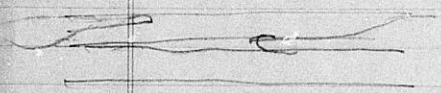
(Bill M. has some info on this Weatherwit Sand)

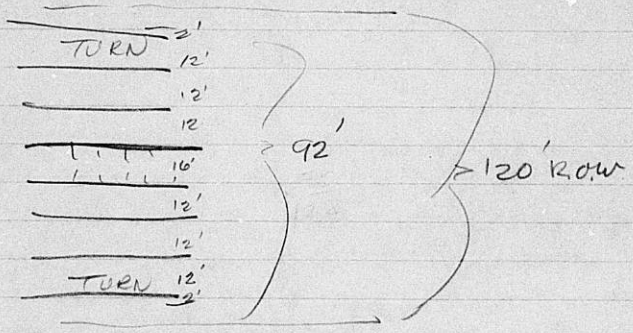
6.68 trips/day single family

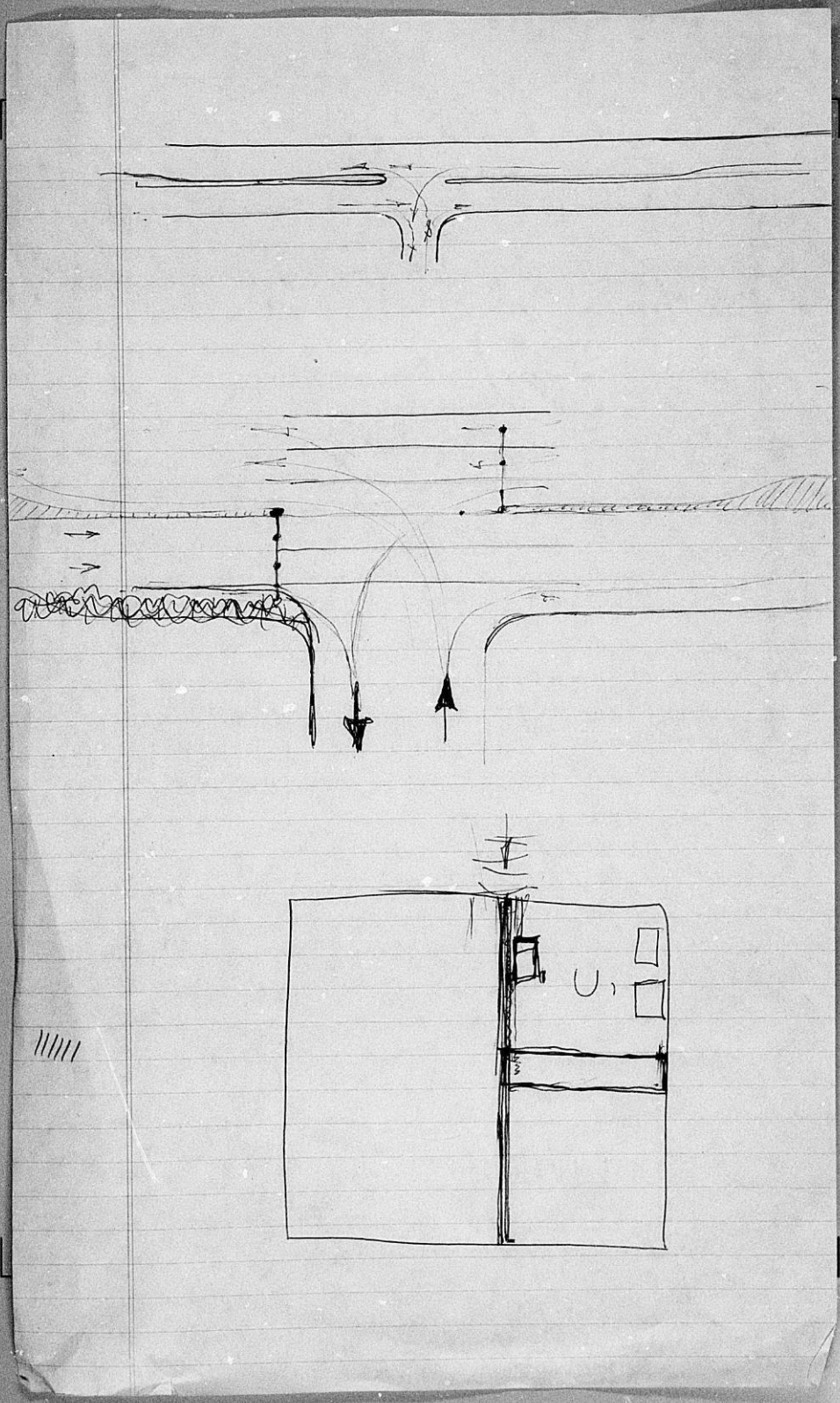
curbs are not considered a problem (by TE) if the third lane is present.

Major street entrance – 80' medial into property before any turns.









Tentative ITE Recommended Practice

Guidelines for driveway design and location*

by ITE Committee 5N-S

Foreword: This report was approved as a Tentative Recommended Practice by the ITE Board of Direction on November 28, 1972. Following a period of time sufficient for the submittal of comments on its provisions, the report will be reconsidered by the Technical Council and the Board for final action.

The report was developed by Project Committee 5N-S in Department 5 of the ITE Technical Council. Members of the committee were: Paul C. Box (Chairman), David S. Plummer, R. Clarke Bennett, Robert R. Canfield, Sam Fisher, David V. Konsa, Harry Parker, J.O. Litchford, Donald C. Morgan, Alexander T. Morris, H. Wayne Sherrell, and Earl C. Williams, Jr. Special thanks also goes to William R. McConochie for his help in the final preparation of this report.

CONTENTS

Part I
objectives

The primary objective of this Recommended Practice is to establish guidelines for location and design of driveways providing access from public streets and highways to developments on abutting property. In order for the guidelines to be of maximum value, it is necessary that wide flexibility be retained in their application. Engineering judgment should override recommended dimensions if warranted by specific traffic conditions. A secondary objective of this Recommended Practice, therefore, is to provide material from prior studies to aid engineers at the municipal, county and state levels in evaluating actual traffic needs and granting variations in issuing driveway permits.

classifications and definitions

The following definitions and classifications apply to this Recommended Practice. They deal with various types of roadways and areas, between streets of high pedestrian activity and those of lower importance to pedestrians.

Areas: An area is defined as Urban if the abutting street has a speed limit of 40 MPH (miles per hour) or less, or if at least 50 percent of the frontage on one side of the route within one half mile of the proposed driveway location has been developed with residences, business and/or industry. It is also intended that the term Urban generally include developed areas within incorporated limits of municipalities and urbanized townships or counties.

All locations not included under the Urban definition should be considered as Rural.

Streets: The term Major Route includes all marked county, state or federal routes and all urban streets: (a) having continuity; (b) carrying substantial amounts of through traffic; and (c) on which traffic is assigned the right-of-way by Stop signs facing cross streets.

Land Uses: Most Urban residential neighborhood business and industrial streets are of Low Pedestrian Activity. Areas of High Pedestrian Activity include streets through or abutting central business districts as well as those in the same block with auditoriums, schools, libraries and secondary (community type) business districts. Under certain conditions, streets and highways adjacent to public parks and rapid transit stations may also fall into this category.

Driveway Types:

1. A Residential Driveway is one providing access to a single family residence, to a duplex, or to an apartment building containing five or fewer dwelling units.
2. A Commercial Driveway is one providing access to an office, retail, or institutional building or to an apartment building having more than five dwelling units. Such buildings are customarily serviced by trucks or an incidental rather than a principal driveway use. Industrial plant driveways whose principal function is to serve administrative or employee parking lots are considered Commercial Driveways.
3. An Industrial Driveway is one directly serving substantial numbers of truck movements to and from loading docks of an industrial facility, warehouse or truck terminal. A centralized retail development, such as a community or regional shopping center, may have one or more driveways specially designed, signed and located to provide access for trucks. These are classified as Industrial Driveways.

Methods of Measurements:

1. All dimensions in this report refer to distances from (or along) *face of curb*. In the absence of a curb the measurement is considered to be from (or along) the edge of pavement.
2. Driveway angles are measured between the driveway centerline and one edge of the roadway.

*** Due to its length, this report will be printed in three parts in consecutive issues of "Traffic Engineering." Following its appearance in the magazine, reprints of the entire report will be made available from ITE**

Part II
design considerations

The efficiency and safety of a street or highway depends largely on the amount and character of interferences affecting vehicles moving along it. Major interferences are caused on most streets by vehicles entering, leaving, or crossing the road at intersecting streets and driveways. In order to minimize accidents and to assure best overall use of the facility by the general public, it is necessary to regulate vehicle movements in and out of abutting developments and cross streets.

With respect to driveways, road users have certain rights of access to abutting property as well as the right to travel on the highway with relative safety and freedom from interference. Since these various rights sometimes conflict, cities, counties and states having jurisdiction over public thoroughfares are generally given the responsibility for reconciling and, to the extent feasible, for satisfying the needs and rights of *all* road users in respect to driveway location, design and operation. When conflicts cannot be fully resolved, preference should be given to the safe and efficient use of the highway.

A number of design considerations have been established on which findings and recommendations of this report are based. These are listed below. When documents supporting specific principles are available for reference, they are identified.

1. Direct driveway access to abutting property represents a service to the traveling public; driveways are *not* special concessions to landowners.

2. The conflict effect of driveways is a function of traffic flow along the street and at the driveway. Traffic from adjacent driveways and from driveways on the opposite side of the roadway, may also be in conflict.

3. A low volume driveway causes relatively little conflict on a major route, and a high volume driveway causes little conflict on a minor route. The relationships, however, are not necessarily linear.[21]

4. Driveways are essentially "T" intersections. High activity land uses produce driveway volumes greater than those of most intersections of local streets with major routes.[19]

5. The design elements of each high volume driveway (location, spacing, sight distance, throat width, radii angles, deceleration and acceleration lanes and grades) should be based on expected volumes by directions of arrival and by vehicle characteristics.[37, 47]

6. In the absence of a separate left turn lane, the left turn *entry* movement generally produces the greatest hazard and congestion on the street.[19, 20, 47]

7. The left turn *exit* movement is the most sensitive to spacing of the driveway relative to the nearest point of street traffic control (especially a signal). Such movements are also relatively hazardous.[19]

8. The right turn entry into a driveway is the second most sensitive movement in respect to spacing from the location of street traffic control. Such movements also impede through traffic.[26]

9. Driveways along major and collector routes should be designed for curb lane access and with minimal encroachment on travel lanes disregarding present parking practices.[23]

10. In order to preclude encroachment on travel lanes, radii for right turn entry and exit should be consistent with the design vehicle's swept path requirements.[19]

11. If the radius is inadequate, encroachment will occur unless the entering or leaving vehicle temporarily occupies a substantial width of the driveway throat.[19, 47]

12. For low volume or one-way drives, it is acceptable for vehicles to sweep across the entire throat.

13. Two-way drives represent the most practical design for many conditions; for high volume operations, such a driveway may be considered as two adjacent one-way driveways separated by a center line.

14. If 30 feet of linear curb opening is needed for right turn entry (or exit) from a curb lane of given width and by a specific design vehicle, the access may be provided by:

(a) Separate in and out drives, each with a 30-foot curb cut and a curb return of zero radius.

(b) Two separate drives, each with a 30-foot curb cut, but with a 15-foot throat and a 15-foot radius on the curb return on one side.

(c) A single two-way drive, with a 60-foot total curb cut, 30-foot throat, and 15-foot radii on both sides.

15. In most areas, pedestrian accidents involving cars entering or leaving driveways are infrequent compared with the number of vehicular collisions involving the driveways.[20]

16. Where pedestrian safety is a major factor, design 14a above is the poorest since a total of 60 feet of driveway crosses the walk in contrast to a total of 30 feet of throat for either the 14b or 14c designs. However, the degree of difference is also a function of the placement of the sidewalk within the area between the curb and the property line.

17. In areas of high pedestrian activity, designs for low speed vehicular entry and exit may be based on radii of intermediate dimensions and restricted total widths. Such designs, however may increase vehicle/vehicle conflicts and increase the number and length of delays to vehicles.

18. The differing problems indicate that two *separate* design standards are needed in urban areas: one to minimize pedestrian/vehicle driveway conflicts, and the other to minimize vehicle/vehicle conflicts.[19]

19. The lesser problems on low

volume routes also suggest less stringent design requirements on secondary streets.

20. Because of the much higher speeds on rural highways, they require a higher level of design than urban streets.[47]

21. Most driveway design elements are directly related to the layout of the parking area, amount of reservoir space (for drive-in service facilities) type of loading facility, circulation pattern, and building placement *within* the site.[37]

22. The relationship of site plan to driveway design is so critical that review and approval of both building and driveway permits should be concurrent. This should be done even if it requires the collaboration of two separate departments.[37]

23. Land use is strongly related to traffic volume, which in turn affects driveway design; therefore *zoning* changes should not be made without considering driveway access elements.[37]

24. No one set of regulations can be expected to apply to all access requirements (even for a single type of land use). Therefore, "controls" should be expressed as guidelines, subject to administrative variations based on engineering judgment.

Part III
Importance of traffic generation data

The potential traffic generation of specific land uses is important to highway planners and designers, zoning boards and driveway permit engineers. If generation rates are known, volumes can be calculated for use in designing access streets to service residential areas with various sizes and types of dwelling units as well as industrial, office and commercial generators. Volume data are needed particularly in calculating the number of lanes required on approaches to critical intersections.

Driveways serving commercial, industrial and high density residential developments represent an important element in the highway system. About 12 percent of the accidents on major urban routes are related directly or indirectly to vehicles entering or leaving commercial driveways. Many commercial driveways have much more traffic than the typical local street at its intersection with a major traffic route. At very high volume driveways such as those serving regional shopping centers and major industrial developments, high type driveway design—including left turn bays and signalization—may be warranted. To effectively plan and design such facilities in advance of development of the generator, however, estimates are needed of future traffic volumes and turning movements.

Traffic generation rates can be used to project total number of vehicles entering and leaving a given driveway or access street in a certain period. The turning movements that will be associated with these volumes must then be estimated separately. They are a function of the percentage of driveway traffic expected to arrive from and depart to the various sectors of the tributary area. In the case of retail operations, percentages can often be based on previous market studies of the developer. Alternatively, the engineer may use maps showing the distribution of population within the trade area, with suitable adjustments for competing retail centers along various approach routes.

If the facility is industrial or an office building, direct use of population distributions is appropriate. In these cases, the availability of mass transportation facilities and the number of persons expected to use buses or rapid transit also must be considered.

generation units

There are a number of units by which generation may be estimated. Some are more applicable to certain land uses than others. For example, studies have shown that automobile trips to an industrial plant relate poorly to either land or building area, and are best related to number of employees. Employment data are usually available from management, but secondary consideration must be given to class of employee and the prevalence of car pools. Thus a new suburban industry might have a very high proportion of cars as related to employees (the peak parking needs might be 0.8 space per employee) while a steel mill with considerable car pooling might need only half as much parking space per employee. Traffic generation of an office building is also related to employees and their travel modes. The needs may vary widely, however, due to major differences in floor area per employee.

Floor area is a known and more constant element than employment, and when possible generation is usually estimated directly from it. In shopping centers, GLA (Gross Leasable Area) is often a better generation unit than the number of employees or the gross square footage of the buildings.

Traffic generation of hospitals has been successfully related both to employees and to number of beds. At a medical clinic, the appropriate generation unit is the "doctor." For all schools above grade schools, the "student" is the preferred unit rather than the number of faculty members or the number of classrooms.

Certain land uses have such widely varying building sizes that they can usually best be considered as special cases. These include service stations, car washes, and drive-in banks.

Residential traffic generation is directly related to number of dwelling units. Studies have found that traffic volumes vary with number of bedrooms. In apartment developments, separate identification of the number of efficiency, one-bedroom, two-bedroom, and three-bedroom apartments may be desirable. Other

The total In plus Out traffic generation of the units expressed on a floor area basis is lowest for a regional shopping center. . . . a neighborhood shopping center has six times the flow rate of a regional shopping center.

parameters such as dollar income, age of residents, and location with respect to the CBD and public transportation also affect traffic generation rates.

Various units of measurement result from a review of alternatives. For example, traffic volumes at a sit-down restaurant could be estimated on the basis of number of seats, but a more reliable index would be floor area because the latter would be harder to change operationally. This logic extends to drive-in restaurants; although the number of parking spaces might seem to be a very realistic indicator of volume, parking area is not as fixed as floor area and may not be directly related to volume.

The traffic generation potential of vacant tracts must sometimes be estimated for undeveloped areas. Such calculations are also necessary in zoning for certain classifications in the absence of specific development plans. As a general rule, however, projection of traffic volumes from land areas alone is the least accurate method for both industrial and retail uses. If developments are to be residential in nature and the number of anticipated units per acre can be estimated with reasonable confidence, it is possible to calculate volumes on the basis of estimated number of dwelling units.

methods of making traffic generation studies

There is great variety in the type and sophistication of traffic generation studies. They range from simple counts of traffic entering and leaving driveways at anticipated peak periods of a particular facility to week-long or month-long automatic machine counts supplemented by hourly, daily and seasonal information. The more refined data are preferable, but the land use predictions may be so inaccurate that they do not justify precise calculations.

In their simplest form, peak hour traffic generation studies involve establishing relationships between vehicular volumes and number of generation units in the facility under study. For example, an office building with 100,000 square feet of gross floor area might have 160 vehicles entering during the morning peak hour and 20 vehicles leaving. These volumes would correspond to generation rates of 1.6 per 1,000 square feet inbound and 0.2 per 1,000 square feet outbound during this peak hour. Sampling of the same hour on the various days of the week might show slight differences. Similarly, sampling during various seasons of the year might show differences due principally to summer vacation travel or seasonal hiring practices of certain offices. Obviously, abnormally severe weather, strikes, and extensive vacancies in the building under study could produce major variations in the counts.

At a facility such as a drive-in restaurant, information on number of cash register transactions or dollar sales on an hourly, daily, monthly or annual basis might be used to project traffic at various hours. However, the dollar value of sales per car at a drive-in restaurant varies with time of day. Selective sampling and development of proper factors is essential, therefore, to make realistic projections of daily traffic volumes.

In practice, most traffic design for driveways should be based on both movements during the hours of peak highway traffic and also on the hours of peak traffic to and from the proposed development. Hourly volume counts are practical at driveways of commercial, industrial and residential developments where ADT (Average Daily Traffic) counts would be impractical. Selection of seasonal peaks is largely a matter of judgment, supplemented by interviews with people knowledgeable in the operation of the particular facilities being studied.

findings from past studies

The California Division of Highways[6-10] and the Maryland State Roads Commission[4] have performed major studies of traffic generation in relation to specific kinds of facilities. The Western Section of ITE made a Trip Generation Study in 1967[11] and a report was prepared in 1970 by the Illinois Section.[5] Empirical data from over 300 generators checked in such studies are given in Table 1. While complete counts are not available for most studies, items are presented to the extent the data permitted. These include the type of area, the trip generation unit employed, and traffic volumes during street peak hours (the typical morning and evening rush hours). Also, the highest hourly volumes counted at specific facilities are given where known. They were sometimes higher than the volumes during the hours of peak traffic in the access street. Some studies yielded 24-hour data for weekdays, Saturdays and Sundays. Since information on In and Out volumes during peak hours is also desirable for traffic design purposes, rates for these movements have been separately calculated wherever possible.

When several samples for a given type of development were available, averages were calculated as shown in the table.

Retail developments, offices and restaurants have rates calculated on the basis of 1,000 square feet of GFA (Gross Floor Area). The most critical traffic design period is usually the PM peak hour, but the AM peak and the closing hour of retail facilities may also warrant checking. The total In plus Out traffic generation of the units expressed on a floor area basis is *lowest* for a regional shopping center. The next higher value is for office buildings, followed by community-size shopping centers, grocery stores, neighborhood shopping centers, sit-down restaurants, and drive-in restaurants. It is interesting to note that a neighborhood shopping center has six times the flow rate of a regional center. A drive-in restau-

Table 1: Traffic generation rates

Source Ref.	Type of Development	Type of Area	Trip Generation Unit	Number Units in Facility Studied	VOLUME PER UNIT: During Street Peak Hours AM IN	AM OUT	AM TOTAL	PM IN	PM OUT	PM TOTAL	Highest Hourly Volumes Counted at Facility IN	OUT	TOTAL	24-HOUR WEEK DAY	SAT.	SUN.
2	Motel	CBD	Room	low limit*	.01	.03	.04	.04	--	--	.05	.06	--			
2	"	"	"	top limit*	.08	.26	.34	.14	--	--	.14	.26	--			
3	"	suburb	"	500	.44	.28	.72	.24	.24	.48	.46	.28	--			
3	"	"	"	150	.20	.20	.40	.34	.14	.48	.34	.27	.48			
3	"	"	"	96	.40	.45	.85	.57	.27	.84	.57	.58	1.07			
5	"	"	"	260	--	--	.55	--	--	.48	--	--	.73			
				AVERAGE			.60			.60			.80			
1	Medical Clinic	suburb	doctor	10	--	--	--	--	--	6.0	4.0	4.0	8.0	--	--	--
7	" " # 42	"	"	7	--	--	--	--	--	7.1	--	--	--	53	--	--
8	" " # 43	"	"	56	--	--	2.3	--	--	5.7	--	--	5.7	46	--	--
10	" " #105	"	"	20	--	--	--	--	--	--	2.5	5.0	7.5	52	45	--
10	" " #112	"	"	14	--	--	--	--	--	--	--	--	5.0	31	15	--
				AVERAGE						6.4			6.1	46		
6	Hospital # 5	suburb	bed	87	--	--	--	--	--	--	.92	1.26	2.2	13	--	9
4	" --	"	"	107	--	--	--	--	--	--	--	--	--	19	--	--
10	" #103	"	"	142	.70	.35	1.05	--	--	--	.70	1.20	1.9	17	11	11
7	" # 30	"	"	243	--	--	0.82	--	--	--	--	--	1.2	10	--	--
6	" # 18	"	"	246	--	--	0.77	--	--	1.3	--	--	1.3	13	11	--
6	" # 22	"	"	319	--	--	--	--	--	1.2	--	--	1.2	9	--	--
6	" # 18	rural	"	500	--	--	0.54	--	--	0.8	--	--	0.8	3	--	--
5	" --	--	"	184	--	--	--	--	--	0.7	--	--	1.0	--	--	--
5	" --	suburb	"	316	--	--	--	--	--	0.8	--	--	1.0	--	--	--
5	" --	"	"	437	--	--	--	--	--	0.7	--	--	0.9	--	--	--
				AVERAGE			0.80			0.9			1.3	12		
	Shopping Centers		1000 GFA(1)													
4	Regional B	--	"	500	--	--	--	--	--	--	--	--	--	44	--	--
4	" F	--	"	530	--	--	--	--	--	--	--	--	--	50	--	--
6	" #26	suburb	"	528	--	--	--	--	--	--	--	--	6.5	39	55	24
11	" A	--	"	500	--	--	--	--	--	--	--	--	--	27	33	--
11	" B	--	"	503	.40	--	--	1.40	--	--	2.30	--	--	37	53	--
11	" C	--	"	541	.26	.12	.38	0.59	0.86	1.5	0.86	.74	1.5	18	--	--
11	" D	--	"	560	.29	.19	.48	0.68	0.88	1.6	0.88	.73	1.6	20	--	--
11	" E	--	"	569	.54	.38	.92	1.45	1.47	2.9	2.30	1.80	4.1	43	--	--
11	" F	--	"	755	.53	.16	.69	0.85	1.15	2.0	1.50	1.00	2.5	28	--	--
11	" G	--	"	811	.50	.19	.69	0.93	1.16	2.1	1.50	1.00	2.5	28	--	--
				AVERAGE	0.40	0.20	0.60	1.00	1.10	2.1	1.50	1.00	3.1	33	47	
	Shopping Centers		1000 GFA													
4	Community A	--	"	295										61		
4	" C	--	"	157										81		
4	" D	--	"	189										40		
4	" E	--	"	366										53		
4	" G	--	"	87										71		
4	" H	--	"	341										58		
4	" I	--	"	325										44		
3	" --	suburb	"	127				3.1	3.3	6.4	4.4	4.2	8.6	--		
3	" --	"	"	295				2.0	2.2	4.2	2.0	2.2	4.2	--		
3	" --	"	"	165				2.1	2.2	4.3	2.9	2.5	5.4	--		
3	" --	"	"	127				2.5	2.8	5.3	3.8	3.7	7.5	--		
3	" --	"	"	106				2.4	2.3	4.7	--	--	--	--		
3	" --	"	"	72				4.9	3.3	8.2	4.7	4.7	9.4	--		
				AVERAGE				2.8	2.1	4.9	3.5	3.5	7.0	58		
	Shopping Centers															
6	Neighborhood #3	suburb	1000 GFA	83										84		
5	"	"	"	33	1.4	1.2	2.6	8.0	6.8	14.8	8.0	7.3	15.3			
5	"	"	"	26	0.4	0.3	0.7	1.4	1.7	3.1	1.7	2.0	3.7			
5	"	"	"	15	1.9	1.6	3.5	7.7	6.5	14.2	7.7	6.5	14.2			
5	"	"	"	7	0.3	0.3	0.6	11.6	11.6	23.2	12.7	12.7	25.4			
				AVERAGE	1.0	0.8	1.8	7.2	6.6	14.0	7.5	7.1	14.5			
5	Grocery Stores	suburb	1000 GFA	10	0.5	0.5	1.0	4.0	4.0	8.0	4.5	4.5	9.0			
5	" "	outlying	"	3	--	--	--	--	--	20.0	--	--	20.0			
5	" "	"	"	14	--	--	--	6.3	6.7	13.0	6.3	6.7	13.0			
5	" "	suburb	"	12	0.8	0.2	1.0	3.7	4.3	8.0	5.5	5.5	11.0			
5	" "	outlying	"	28	--	--	--	--	--	--	--	--	16.0			
				AVERAGE	0.6	0.4	1.0	4.7	5.0	12.0	5.4	5.5	13.8			

(1)per 1000 Square Feet Gross Floor Area.

*Volumes for lower and upper limits of range found for several facilities.

Table 1 continued

Source Ref.	Type of Development	Type of Area	Trip Generation Unit	Number Units in Facility Studied	VOLUME PER UNIT: During Street Peak Hours AM IN	AM OUT	AM TOTAL	PM IN	PM OUT	PM TOTAL	Highest Hourly Volumes Counted at Facility IN	OUT	TOTAL	24-HOUR WEEK DAY	SAT.	SUN.
5	Restaurant Sit down	urban	1000 GFA	1	--	--	--	--	--	--	--	--	56.0			
5	" "	"	"	7	--	--	--	--	--	--	--	--	9.0			
3	" "	suburb	"	3	--	--	--	11.9	7.5	19.4	13.5	10.3	23.8			
3	" "	"	"	3	--	--	--	10.4	9.6	20.0	10.4	9.6	20.0			
3	" "	"	"	1	--	--	--	19.2	20.0	39.2	36.0	28.0	64.0			
3	" "	"	"	3	33.0	38.0	71.0	12.0	9.0	21.0	33.0	38.0	71.0			
				AVERAGE				13.0	12.0	25.0	23.0	21.0	44.0			
5	Restaurant Drive-in	Urban	1000 GFA	1									241			
5	" " "	"	"	1									156			
5	" " "	"	"	2									94			
5	" " "	"	"	2									71			
5	" " "	"	"	3									60			
3	" " "	suburb	"	1	--	--	--	--	--	--	260	287	547			
3	" " "	"	"	1	--	--	--	55	45	100	156	104	260			
3	" " "	"	"	1	--	--	--	24	24	48	69	63	132	1160	1140	720
3	" " "	"	"	1	--	--	--	--	--	256	--	--	424	3260	3460	2300
				AVERAGE						134			220			
3	Car wash	suburb	each	1				36	36	72	57	57	114			
3	" "	"	"	1									47			
3	" "	"	"	1									58			
3	" "	"	"	1									48			
3	" "	"	"	1	--	--	--	--	--	60	--	--	60			
				AVERAGE						66			65			
3	Bank, drive-in	suburb	each	1				130	140	270	150	160	310			
3	" " "	"	"	1				200	200	400	200	200	400			
3	" " "	"	"	1				180	180	360	190	190	380			
				AVERAGE				170	170	340	180	180	360			
5	Service Stations	suburb	each	13(2)	--	--	22	--	--	--	--	--	--			
5	" "	"	"	16(2)	--	--	--	--	--	23	--	--	--			
5	" "	"	"	5(2)	--	--	--	--	--	--	--	--	28			
				AVERAGE			22			23			28			
3	Auto dealers	suburb	each	1	23	10	33	33	34	67	--	--	--			
3	" "	"	"	1	39	33	72	41	48	89	49	53	102			
3	" center	"	"	1	--	--	19	--	--	126	--	--	126			
				AVERAGE						94			114			
5	Offices	suburb	1000 GFA	157	--	--	--	--	--	2.7						
3	"	"	"	117	1.6	0.2	1.8	0.4	1.6	2.0						
				AVERAGE						2.3						
12	Industrial " Mixed	suburb	employee	22(3)	0.27	0.05	0.3	.06	.28	0.3						
4	" Park	"	"	1000	--	--	--	--	--	--	--	--	--	4.4		
4	" "	"	"	2200	--	--	--	--	--	--	--	--	--	2.2		
7	" "	"	"	30	--	--	1.3	--	--	--	--	--	2.0	7.5		
10	" "	"	"	570	--	--	0.7	--	--	0.8	--	--	--	7.1	3.3	1.3
10	" "	"	"	280	--	--	0.6	--	--	0.5	--	--	--	3.9	1.3	--
10	" "	"	"	140	--	--	0.5	--	--	0.4	--	--	--	3.7	--	2.1
10	" "	"	"	550	--	--	0.6	--	--	0.5	--	--	--	2.2	1.2	1.0
10	" "	"	"	120	--	--	0.9	--	--	--	--	--	--	4.3	--	--
10	" "	"	"	410	--	--	0.5	--	--	0.7	--	--	--	2.9	0.7	--
10	" "	"	"	100	--	--	0.5	--	--	0.8	--	--	--	4.4	--	--
7	" "	"	"	960	0.53	0.19	0.7	--	--	--	0.18	0.49	0.7	4.7	--	--
7	" "	"	"	290	--	--	1.0	--	--	0.9	--	--	--	4.5	--	--
7	" "	"	"	300	0.93	0.16	1.1	0.36	0.59	0.9	--	--	--	4.0	--	--
9	" "	"	"	5170	--	--	--	--	--	0.3	--	--	0.4	1.9	--	--
9	" "	"	"	130	--	--	--	--	--	--	--	--	0.6	2.9	--	--
9	" "	"	"	150	0.19	0.19	0.4	0.13	0.38	0.5	--	--	--	4.1	--	--
9	" "	"	"	200	0.39	0.07	0.5	0.12	0.43	0.5	--	--	--	2.2	--	--
10	" "	"	"	370	--	--	0.5	--	--	0.6	--	--	--	2.4	1.5	--
				AVERAGE	0.31	0.06	0.5	0.08	0.30	0.4	--	--	0.9	3.9	1.6	1.5

(2)number of different stations sampled for time shown.
(3)number of different facilities studied.

(*Continues*)

Table 1 continued

Source Ref.	Type of Development	Type of Area	Trip Generation Unit	Number Units in Facility Studied	VOLUME PER UNIT: During Street Peak Hours AM IN	AM OUT	AM TOTAL	PM IN	PM OUT	PM TOTAL	Highest Hourly Volumes Counted at Facility IN	OUT	TOTAL	24-HOUR WEEK DAY	SAT.	SUN.
6	Warehouse	suburb	employee	50	--	--	1.5	--	--	1.2	--	--	--	10.5		
6	"	"	"	250	--	--	0.8	--	--	0.7	--	--	--	6.4		
6	"	"	"	30	--	--	2.1	--	--	--	--	--	--	15.7		
				AVERAGE			1.5			1.0				10.1		
9	Adm,Research	suburb	employee	60	--	--	0.5	--	--	1.0	--	--	--	3.5		
9	" "	"	"	180	--	--	0.4	--	--	0.5	--	--	--	2.4		
9	" "	"	"	40	--	--	1.4	--	--	0.8	--	--	--	5.3		
				AVERAGE			0.8			0.8				3.7		
7	High Schools	suburb	student	690	--	--	0.5	--	--	--	--	--	--	1.7	--	--
7	" "	"	"	1290	0.14	.05	0.2	--	--	--	--	--	--	1.1	--	--
7	" "	"	"	2050	--	--	0.3	--	--	--	--	--	--	1.1	--	--
10	" "	"	"	1200	0.27	.09	0.4	--	--	--	--	--	--	2.1	1.2	0.4
10	" "	"	"	2850	0.21	.08	0.3	--	--	--	--	--	--	1.1	0.6	0.2
				AVERAGE	0.21	.07	0.3							1.4	0.9	0.3
4	Colleges	suburb	student	1350										2.7		
4	"	"	"	1850										2.9		
4	"	"	"	3310										1.9		
7	"	"	"	12000	--	--	.13	--	--	--	--	--	--	1.4		
8	"	"	"	5300	0.14	.02	.16	.02	.06	.09	--	--	--	1.4		
8	"	"	"	900	0.15	.05	.20	.10	.20	.30	.19	.25	.44	2.7		
8	"	"	"	5370	0.19	.03	.22	.06	.16	.22	--	--	--	2.6		
8	"	"	"	14300	0.13	.01	.14	.03	.02	.05	--	--	--	1.1		
8	"	"	"	2150	0.19	.02	.21	.01	.06	.07	--	--	--	1.6		
9	"	"	"	700	0.19	.06	.25	.09	.18	.27	--	--	--	2.6		
10	"	urban	"	11000	0.18	.03	.21	.04	.17	.21	--	--	--	1.9		
				AVERAGE	0.17	.03	.20	.05	.12	.17				2.1		
4	Apartments	suburb	D.U.(4)	13(3)										7.7		
5	"	"	"	7	0.08	.49	.57	.46	.23	.69						
6	"	urban	"	190	--	--	.31	--	--	.37	--	--	--	3.0		
9	"	suburb	"	990	--	--	--	.35	.21	.56	--	--	--	5.4		
9	"	"	"	120	--	--	.67	--	--	.83	--	--	--	3.4		
10	"	"	"	300	--	--	.70	--	--	1.10	--	--	--	7.9	8.4	7.1
10	"	"	"	180	--	--	.77	--	--	.93	--	--	--	7.0	7.6	6.2
10	"	"	"	150	--	--	.55	--	--	.96	--	--	--	6.9	4.4	4.3
10	"	"	"	140	--	--	.57	--	--	.57	--	--	--	5.1	5.3	4.9
10	"	"	"	220	--	--	1.00	--	--	1.64	--	--	--	5.9	8.1	5.8
10	"	"	"	100	--	--	.69	--	--	.79	--	--	--	6.5	6.7	6.6
10	"	"	"	70	--	--	.42	--	--	.71	--	--	--	4.8	5.8	--
10	"	"	"	130	--	--	.63	--	--	.79	--	--	--	7.1	7.5	6.9
10	"	"	"	100	--	--	.63	--	--	1.05	--	--	--	6.9	7.3	6.2
11	"	urban	"	590	0.11	.33	.44	.35	.13	.48	--	--	--	5.1	--	--
				AVERAGE			.60			.78				6.7	6.8	6.0
11	Apartments	high rise	D.U.	560	.03	.16	.19	.17	.08	.25	--	--	--	3.0		
11	"	" "	"	50	.10	.35	.45	.31	.19	.50	--	--	--	4.2		
2	"	CBD	"	low limit*	.02	.18	.20	.12	.03	.15						
2	"	"	"	top limit*	.05	.25	.30	.24	.14	.38						
				AVERAGE	.05	.24	.30	.21	.11	.32						
4	Single Family	suburb	D.U.	84(3)	--	--	.90	--	--	1.00	--	--	--	8.6		
5	" "	"	"	5(3)	.23	.58	.81	.60	.40	1.00						
11	" "	"	"	19(3)	.18	.63	.81	.68	.45	1.13	--	--	--	9.7	10.0	8.7
11	" "	"	"	15(3)	--	--	--	--	--	--	--	--	--	8.3	--	--
				AVERAGE	.19	.62	.80	.67	.44	1.00				8.7	10.0	8.7

(3) number of different facilities studied.

(4) Dwelling Unit.

*Volumes for lower and upper limits of range found for several facilities.

rant has more than 60 times the generation rate of a regional shopping center.

Judgment should be applied in using the average and summarized data shown in Table 1. For example, "highest hour" traffic volumes at the various drive-in restaurants ranged from 60 to 547. The "average" of 220 vehicles per hour is substantially different from either the highest or the lowest. Such variations exist partially because of differences in the generation rates of various drive-in restaurants and also because peak conditions were probably not observed at all of the facilities studied. Substantial data were available for two drive-in restaurants, but the ratio of their peak traffic is more than three-to-one when expressed on a floor area basis. A more meaningful relationship might be found by comparing land areas. Even this yields substantial differences, however, due to landscaped setbacks and differences in the efficiency of parking layouts.

It is interesting to compare service station traffic with that of neighborhood shopping centers. If expressed on the basis of land area, a neighborhood shopping center generates about five times as much traffic as a typical service station. Ironically, many zoning codes would permit a neighborhood shopping center at a given site but would prohibit a service station or require a Special Use Permit because of anticipated "traffic problems."

Generation factors for community and regional shopping centers should also be modified on the basis of engineering judgment. The factors shown in Table 1 are related primarily to weekday traffic. Heavy weekend traffic at shopping centers should be considered in estimating the peak volume likely to use a driveway.

Despite their limitations, the data in Table 1 are considered reliable enough to enable an engineer to estimate typical volumes or to check the calculations of other engineers.

Based on Table 1 various land uses may be classified as being low, medium, or high traffic generators, as follows:

Low
Farms
Homes for the Elderly
Single family, duplex and small apartments (five units or less)

Medium
Apartments (over five units in a single building)
Automobile dealers
Drug stores
Libraries
Medical clinics
Motels
Office buildings
Restaurants, sit-down
Schools, elementary and junior high
Service stations

High
Apartments, multi-building projects
Banks, drive-in
Car washes
Colleges and universities
Factories
High schools
Hospitals
Office buildings, over 50,000 square feet
Restaurants, drive-in
Shopping centers, all sizes
Theaters, auditoriums

Studies of the hourly variations of driveway traffic were made in North Carolina at 87 commercial developments along state highways. The hourly percentages of total traffic counted during a 10-hour business day are shown in Table 2 for several types of commercial use. It may be noted that some of the land uses had their highest hourly traffic volume during the evening rush hour.

There are also month-to-month variations depending on whether the traffic generator is seasonal or recreational as may be the case with a motel or restaurant, or part-year as is the case with most high schools and colleges. Industrial plants and office buildings are affected by vacations, their volumes dipping during summer months. A car wash generates higher volumes during winter months than in the summer. Shopping centers peak in December and just before Easter.

The term "generation" as used in this manual and in most studies of the relationship of traffic volumes to land use is a misnomer in many cases. The traffic using driveways and streets connected with residential and industrial developments is actually generated and added to the highway system. Part of the traffic entering and leaving driveways of retail and service facilities, however, was *already* on the street system. In studies of service stations, less than 50 percent of the traffic using the driveways during rush hours was actually generated; i.e., went toward its point of origin when it left the station.[19] Weekday studies of community shopping centers by the same researcher resulted in similar findings.

Studies in which direction of approach and departure of each shopper is traced have limitations. The return route may differ from the route used to the facility, but the trip may actually have been generated nonetheless. In any case, the data of Tables 1 and 2 relate to *driveway volume* estimates, and these are of primary interest to the engineer responsible for issuing or approving driveway permits.

traffic at successive entrances

Large facilities are sometimes served by several successive driveways along a major traffic route. With this condition, even after general directions of arrival and departure have been carefully estimated, and total daily traffic has been allocated to in and out movements by hours of the day, the volumes expected to use each access point will still be unknown. If accessibility is equal (both right and left turns permitted to both inbound and outbound vehicles at all driveways), and complete and convenient internal circulation is possible, most drivers entering from a given direction will tend to use the closest driveway. At one large community shopping center in Wisconsin, for example, 62 percent of the vehicles from one direction were found to enter at the first driveway while 88 percent of the arrivals from the opposite direction entered at their closest driveway. In a study at a regional shopping center in New York, 36 percent of entering drivers used the heaviest driveway. Studies at other regional shopping centers have found examples of near-equality in entering volumes at some driveways and extreme differences at others. The data show clearly that as congestion increases on certain days and in the busier hours, users shift to less congested access points. Thus, in making peak hour estimates for design purposes, it may be appropriate to load the first contact point with somewhat more than its proportionate share and distribute the balance downstream to successive driveways. A suggested distribution is 50-60 percent at the first driveway; 20-30 percent at the second; and 10-20 percent at the third.

estimating driveway traffic

The Shirlington House apartment complex in a Virginia suburb of Washington, D.C. may be used to illustrate the application of traffic generation data. The development

Table 2: Frequency distributions of commercial driveway volumes along North Carolina State highways

Hour Beginning	Percentage of 10-Hour Total Volume						
	Service Stations	Grocery and Grocery Service Station Comb.	Super-Markets	Restaurants	Cafes and Drive-ins	Furniture and Equipment	Misc.
0700	7.1%	4.2%	6.7%	5.7%	4.4%	4.4%	3.4%
0800	8.7	7.2	8.7	7.4	6.1	8.5	7.0
0900	9.2	7.4	4.8	8.6	7.2	9.7	8.7
1000	10.9	12.9	7.2	8.9	8.7	11.3	13.4
1100	9.7	9.9	10.6	10.9	10.9	11.1	11.5
1200	11.5	13.9	15.0	18.1	18.0	11.0	10.9
1300	10.4	11.4	8.8	14.2	12.6	11.4	11.3
1400	9.9	10.8	11.9	9.8	11.0	8.5	8.6
1500	10.6	10.8	9.5	9.0	11.5	15.0	11.9
1600	12.0	11.5	16.8	7.4	9.6	9.1	13.3
TOTAL	- - - - - - -			100%	- - - - - - - - - - - -		
Number Sampled	20	22	7	6	12	9	11

Source: Adapted from Table 13, "The Effect of Commercial Roadside Development on Traffic Operations," North Carolina State College, Project ERD-110B.

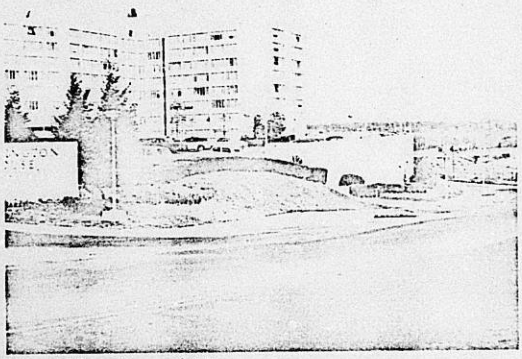


Figure 1: View of access points to Shirlington House garages and surface lot

has 436 dwelling units, 85 percent of which have one bedroom. This characteristic of the development would indicate few school-age children and little trip orientation toward schools. Bus service is available and car pooling is prevalent. Figure 1 is a view looking north toward Washington. The nearest freeway interchange connecting directly to Washington is also in this direction. The nearest community and neighborhood shopping centers are in the vicinity of the interchange.

Given such conditions during the zoning, design and planning stages, a local municipal traffic engineer might logically postulate that 80 percent of PM peak hour traffic would be southbound. Furthermore, should the actual directional split be 70 or 90 percent southbound, rather than 80 percent, it would not make any significant difference.

Due to the one-bedroom nature of the development, together with the bus service and car pool potentials, the traffic generation rate should be lower than average for apartment buildings. The study of 990 suburban apartments referenced in Table 1 found a rate of 0.35 cars inbound per dwelling unit, and 0.21 cars outbound during the PM rush hour. If these factors were multiplied by the number of dwelling units at Shirlington House, estimated PM peak hour volume for the development would be 150 vehicles inbound and 90 vehicles outbound. If 80 percent of total traffic was from the north, about 120 vehicles would be expected to come from that direction; these would represent the total peak hour right turn entry.

During site design, the developers planned approximately 360 parking spaces in two garages, each with a single entry-exit driveway, and a 240-space open parking lot also serviced by a single driveway (to the extreme left in Figure 1). If arrival volumes were distributed in proportion to the capacity of each parking facility, the estimated volume of inbound right turns would be 36 vehicles per hour at each garage driveway and 48 vehicles at the driveway to the open lot.

The site could also be considered in terms of a higher traffic generation rate. If the average for all apartment complexes studied were used (0.78 per dwelling unit) and a higher proportion of entering-to-leaving, such as two-to-one, were also used, the peak inbound flow would be estimated at 230 vehicles per hour. With an 80-20 directional

split, 180 southbound cars would enter the driveways, with 54 arriving for entry by right turns at each garage drive and 72 at the open lot drive. However, these differences in estimated volumes would have little effect on design.

As actually developed, Shirlington House illustrates unusually good driveway design. Deceleration lanes are provided at each entrance, together with channelizing islands and adequate radii at entrance and exit drives (Figure 2).

Typical steps in making volume projections for individual access points of a proposed development were shown by the foregoing example. These are summarized below:

1. Identify the important characteristics of the development as related to traffic during the critical hour (or hours).
2. Make counts of turning movements at an existing project with similar characteristics, and calculate the generation rate in terms of an appropriate unit.
3. If a similar development is not available for study, use data from appropriate studies of other projects such as those in Table 1.
4. Calculate peak hour inbound and outbound flows for the proposed land use.
5. Estimate directional splits and calculate turning movements.
6. Assign appropriate volumes to individual access points.
7. Evaluate the potential conflicts with street traffic, particularly as related to left turn entering and leaving movements, and assess need for roadway improvements adjacent to the site.
8. Visualize "downstream" traffic impacts at critical intersections, and assess need for improvements.

With such data in hand, the traffic engineer can give his planning board an appraisal of the traffic effect of a new development. Right-of-way dedications and payment for street improvements are best negotiated before rezoning or granting a building permit. Even where a zoning change is not involved, knowledge of probable traffic volumes is very useful in chosing driveway locations and in preparing designs. In planning and designing major thoroughfares, it is usually desirable to consolidate access points. Turning volumes may need to be projected for undeveloped parcels of land. Need for detailed knowledge of traffic generation rates exists, therefore, in all phases of engineering.

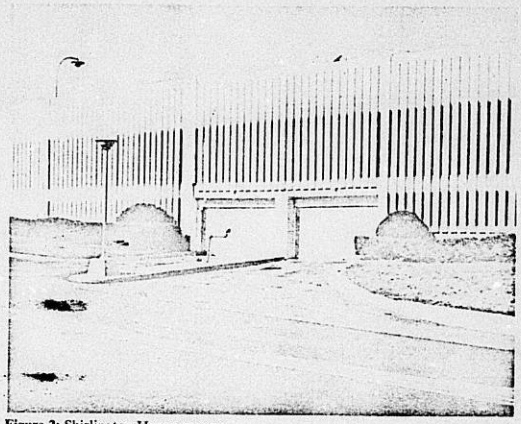


Figure 2: Shirlington House garage access channelization

Tentative ITE Recommended Practice

Guidelines for driveway design and location*

by ITE Committee 5N-S

Foreword: This report was approved as a Tentative Recommended Practice by the ITE Board of Direction on November 28, 1972. Following a period of time sufficient for the submittal of comments on its provisions, the report will be reconsidered by the Technical Council and the Board for final action.

The report was developed by Project Committee 5N-S in Department 5 of the ITE Technical Council. Members of the committee were: Paul C. Box (Chairman), David S. Plummer, R. Clarke Bennett, Robert R. Canfield, Sam Fisher, David V. Konsa, Harry Parker, J.O. Litchford, Donald C. Morgan, Alexander T. Morris, II, Wayne Sherrell, and Earl C. Williams, Jr. Special thanks also goes to William R. McConochie for his help in the final preparation of this report.

CONTENTS

Part I objectives

The primary objective of this Recommended Practice is to establish guidelines for location and design of driveways providing access from public streets and highways to developments on abutting property. In order for the guidelines to be of maximum value, it is necessary that wide flexibility be retained in their application. Engineering judgment should override recommended dimensions if warranted by specific traffic conditions. A secondary objective of this Recommended Practice, therefore, is to provide material from prior studies to aid engineers at the municipal, county and state levels in evaluating actual traffic needs and granting variations in issuing driveway permits.

classifications and definitions

The following definitions and classifications apply to this Recommended Practice. They deal with various types of roadways and areas, between streets of high pedestrian activity and those of lower importance to pedestrians.

Areas: An area is defined as Urban if the abutting street has a speed limit of 40 MPH (miles per hour) or less, or if at least 50 percent of the frontage on one side of the route within one half mile of the proposed driveway location has been developed with residences, business and/or industry. It is also intended that the term Urban generally include developed areas within incorporated limits of municipalities and urbanized townships or counties.

All locations not included under the Urban definition should be considered as Rural.

Streets: The term Major Route includes all marked county, state or federal routes and all urban streets: (a) having continuity; (b) carrying substantial amounts of through traffic; and (c) on which traffic is assigned the right-of-way by Stop signs facing cross streets.

Land Uses: Most Urban residential neighborhood business and industrial streets are of Low Pedestrian Activity. Areas of High Pedestrian Activity include streets through or abutting central business districts as well as those in the same block with auditoriums, schools, libraries and secondary (community type) business districts. Under certain conditions, streets and highways adjacent to public parks and rapid transit stations may also fall into this category.

Driveway Types:

1. A Residential Driveway is one providing access to a single family residence, to a duplex, or to an apartment building containing five or fewer dwelling units.
2. A Commercial Driveway is one providing access to an office, retail, or institutional building or to an apartment building having more than five dwelling units. Such buildings are customarily serviced by trucks or an incidental rather than a principal driveway use. Industrial plant driveways whose principal function is to serve administrative or employee parking lots are considered Commercial Driveways.
3. An Industrial Driveway is one directly serving substantial numbers of truck movements to and from loading docks of an industrial facility, warehouse or truck terminal. A centralized retail development, such as a community or regional shopping center, may have one or more driveways specially designed, signed and located to provide access for trucks. These are classified as Industrial Driveways.

Methods of Measurements:

1. All dimensions in this report refer to distances from (or along) *face of curb*. In the absence of a curb the measurement is considered to be from (or along) the edge of pavement.
2. Driveway angles are measured between the driveway centerline and one edge of the roadway.

*This is the second part of a three-part recommended practice. The last part will appear next month, after which the entire report will be made available from ITE headquarters.

radii and width

A critical element of driveway design is the radius of the curb return or amount of flare of the curbing connecting the edge or throat of a driveway with the edge of the nearest travel lane. The radius should be related to the swept path of a vehicle making a right turn in or out considering the width of the adjacent street lane and the width of the driveway. Figure 3 shows the path of a passenger car entering driveways of two different designs, both with 30-foot throats, measured at a point 15 feet from the curbing. A 12-foot roadway lane has been assumed, with the vehicle beginning its turn from the outer edge of the lane. In the upper portion of this figure, a flare of only two feet has been used. Obviously, a vehicle would occupy a substantial portion of the throat in entering the driveway, and a vehicle exiting from the driveway would be in direct conflict with an entering vehicle. If an exiting vehicle were waiting in the driveway, the entering vehicle would have to stop in the traveled lane until the other vehicle was able to leave. The potentials for congestion and accidents might be serious, depending on general traffic conditions.

Operation at a two-way driveway with a 30-foot throat is greatly improved if the radii of the curb returns on both sides of the driveway are adequate, as illustrated in the lower part of Figure 3. In this case, a vehicle is able to enter or leave by a right turn without lane encroachment at a speed which minimizes interference with through vehicles, and without conflicting with other vehicles entering or leaving the driveway.

The swept path diagram shows that a 15-foot flare would give operational results equally as effective as a curb return with a 15-foot radius. For single-family residential driveways, flares are probably just as good as the five- to seven-foot radii normally used. On the larger swept path radii needed for commercial and industrial driveways, however, the curved area of paving reduces the total cost of a driveway and looks better. It may also facilitate turning movements.

In Part V, Recommended Guidelines, of this Recommended Practice, the minimum radii range is from five to 25 feet, depending on type of area and land use served. The maximum radii range is from 15 to 50 feet. A three-centered curve may be used for industrial driveways.

These values apply on the side of the driveway used for entry or exit by right-turning vehicles. For a one-way driveway, the proper radius for the side *not* used for right turn entry (or exit) is established by the swept path needs of a vehicle entering by a left turn from the far side of the street (or exiting by a left turn onto the far side). Except for very narrow streets or for large vehicles, the "off-side" radii may be small.

Since parking may be prohibited in the future along any major thoroughfare, and a curb lane adjacent to a given driveway may be clear at times on *any* street, it is good practice to design driveways (other than single-family residential driveways on local streets or low-volume collectors) for entry from the curb lane without encroachment onto adjacent lanes or beyond the centerline.

The radius used at a given driveway is meaningful only when related to the width of throat. This throat is basically a point of narrowest controlled width. When the distance between curb line and right-of-way is equal to or greater than the design radius, the throat width may conveniently be measured along either the property line or the end of the radius. In many cases—especially in urban areas—the proper radius will be greater than the distance between curb line and property line. In such cases, if a raised barrier curbing extends into private property, the throat width may appropriately be measured at the end of the radius even though this may be on private property.

It is recommended that, as a general rule, the widths of two-way driveways be measured parallel to the roadway. One-way driveways may be measured at right angles to the driveway if it is constructed on a skew. When a center channelizing island is used in a two-way driveway to restrict entries to right turns in and right turns out, it is also appropriate to measure the width separately and at right angles between the curbing of the channelizing island and the driveway curb return. In this type of design, radii and total width of driveway at the throat are necessarily somewhat greater than for a two-way driveway without a channelizing island due to the need for lateral clearance between faces of the barrier curbs.

The Design Guidelines for the minimum width of driveways, measured at the throat or at another control point range from 10 to 20 feet. For commercial driveways the minimum width is based on two-way operation. Maximum widths range from 30 to 40 feet, depending on type of area, land use served, and degree of pedestrian activity. These widths assume two-way operation. The use of channelizing islands in any of these driveways, however, should automatically produce variations for such additional widths as necessary to assure efficient and safe traffic movements.

Where public sidewalks abut the curb in an urban area, it may be difficult to make the edge of the driveway visually apparent if the sidewalk is warped down into the driveway rather than using a step-down curb along the edge of the drive. While most driveways will function satisfactorily with warped sidewalks, thus avoiding pedestrian inconvenience, use of step-down curbs warrants consideration for special circumstances, since curbs have the important secondary advantage of notifying the pedestrian that he is in a *zone of conflict*.

If step-down curbs are used, sidewalk ramps for use by persons in wheelchairs and other physically handicapped persons should be considered. In areas where there are many pedestrians (e.g., central business districts; in the vicinity of high-rise apartments; or near places of public assembly) curb ramps should be considered. Ramps may be needed in the vicinity of major office buildings especially those housing medical services. Ramps should be designed to fit the needs at each particular location. Usually they should be about four feet wide with rounding near the curb. They should have a non-slip surface and a slope not steeper than about 12:1. They should be designed so as not to interfere with storm drainage. Other helpful details can be found in USASI Standard A117.1-1961, "American Standard Specifications for Making Buildings Accessible to, and Usable by, the Physically Handicapped."

angles

As with other geometric design elements of driveways, the angle between the driveway centerline and roadway edge should be based primarily on safety requirements. The speed at which a vehicle can enter or leave a public roadway is affected by the angle of approach or departure. If a desirable angle cannot be used because of lot size, physical obstructions or other limi-

tations, the design speed can be increased by altering radii, width or grade of the driveway. Also, the main roadway may be modified by adding acceleration or deceleration lanes designed in accordance with AASHO standards.

The choice between 90-degree ("T" driveways) and angled driveways is most often dictated by direction of travel and ease of turning into or out of the public street. Angled or one-way driveways are appropriate on one-way streets or streets divided by medians which limit movements to right turns in and out. A pair of such driveways may be widely separated or consist merely of two one-way driveways separated by a triangular island. Figure 4 shows examples of both types. Their use is *not* recommended for two-way driveways on two-way streets since both entering and exiting drivers might presume that the driveways were one-way. Since an angled driveway permits both entering and leaving vehicles to move at greater speeds, this presumption might create an unusually hazardous condition.

Alternative designs for 90-degree driveways are shown in Figure 5. These allow relatively high entering and exiting speeds. The use of a prominent Keep Right sign in the center median of the driveway is strongly recommended with the fully channelized driveway shown at the top of Figure 5. This should minimize the possibility of motorist confusion when entering by a left turn.

A special twin-drive arrangement suitable to serve a development with a high traffic generation rate is shown in the lower part of Figure 5. The possibility of left turn movements conflicting with each other has been precluded.

Angled driveways are not recommended for single-throat driveways with movements to and from both directions of traffic. Acute-angle turns must be made more slowly and thus cause greater interference with through traffic. If physical obstructions make use of an angled driveway unavoidable, the angle should be as near 90 degrees as possible.

Due to the relationship between driveway angle and operating speeds, angles of 70 degrees or greater are recommended in areas of high pedestrian activity along major traffic routes. For secondary routes, angles as flat as 60 degrees should not be hazardous, even where pedestrians are numerous.

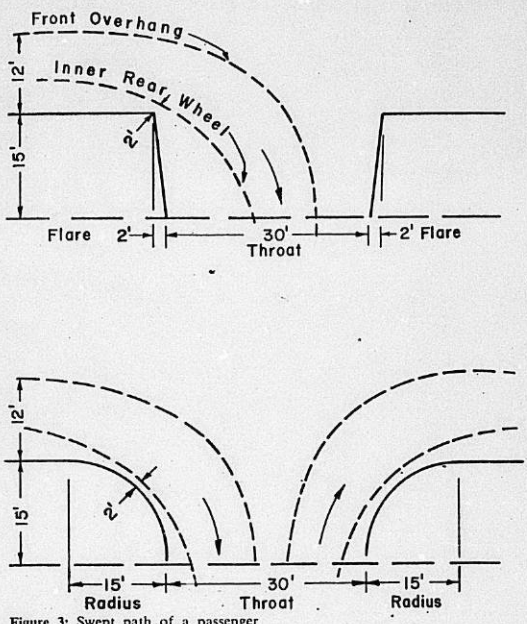


Figure 3: Swept path of a passenger car entering driveway from 12-foot curb lane

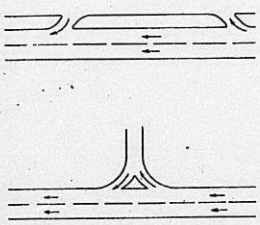


Figure 4: One-way angle driveways; left turns prohibited

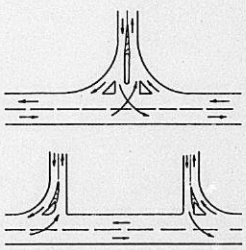


Figure 5: Ninety-degree driveway design allowing good entry and exit speeds; not for use in high pedestrian activity areas

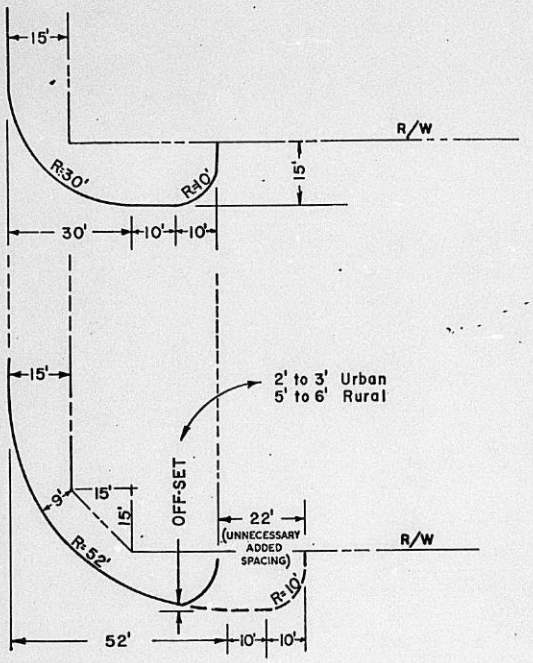


Figure 6: Application of off-set corner radius allowance for driveway at intersection of two major routes with large radius

For all other conditions on major and secondary routes in both urban and rural areas, a minimum angle of 45 degrees is suggested, with one-way operation preferred at these flatter angles.

With the general limitations described above, the following driveway angles are recommended for the principal categories of land use and roadway speeds:

1. Single-family residential—Rural and other high-speed roadways: Where through traffic normally travels faster than 50 MPH, it is desirable that vehicles entering and leaving driveways make their turns at speeds in excess of 15 MPH except on very low volume roads. Even in rural areas, however, frontage developments often limit driveways to the "T" design.

2. Commercial (including multiple-unit residential developments of more than five units)—Similar relationships of highway speeds and entering/exiting driveway maneuvers are pertinent to driveways serving commercial and multiple-unit residential complexes. A one-way driveway should not be less than 45 degrees unless an on-site deceleration lane can be provided. A two-way driveway should not be less than 70 degrees except on a low-speed, low-volume street.

3. Industrial—Driveways that must accommodate large volumes of truck traffic should be designed for their particular situation. Turning templates should be used to test movements to and from both directions of travel. Large trucks usually do not enter and leave driveways at high speeds so driveways at flat angles will seldom be hazardous. Facilitating the movement of trucks on and off traveled ways without impeding through traffic can best be accomplished by using angled driveways. For these reasons, flat angles and one-way drives should be encouraged. No minimum angle should be specified for entrances to one-way truck driveways, but exits should be at an angle of not less than 30 degrees to assure that drivers will have a good view when merging with through traffic.

spacing

The spacing of driveways should be related to adjacent driveways and nearby street intersections. The spacing and number of driveways serving a single piece of property is also a consideration.

Spacing criteria seek to achieve several objectives. One is to leave a

usable island between driveways for utility poles and traffic control devices. Since this aspect of spacing relates to a section of tangent curb, it is appropriate to measure the distance between the points of tangency rather than across driveway throats. Where curb returns are adequate, a single item such as a pole, a fire hydrant or a sign usually can be placed safely at the junction point where one driveway radius ends and the next begins. In areas of high pedestrian activity, however, it may be desirable to leave a larger island which also can serve as a refuge for pedestrians. Where curb parking is allowed, care should be taken to avoid setting up substandard length parking stalls between driveways. A tangent curb 10 to 15 feet long, measured between ends of curb returns, will constitute an inviting but inadequate parking space. Special "no parking" signs would be needed to prevent parking in such places.

Driveways should be at least 5 to 20 feet from the point of tangency of curb radii at street intersections, especially at major cross streets. Parking usually is not allowed in such sections as a matter of policy, and keeping a driveway away from an intersection, even by such small distances, reduces conflicts. When large corner radii are used at intersections, however, adhering to this criteria may place the driveway an unreasonable distance away from the intersection. Figure 6 shows a typical corner of the intersection of two major routes.

The American Association of State Highway Officials recommends 12 to 16 feet as a desirable border width; (Table E-2, page 16, 1957 Urban Policy). The same text recommends a 30-foot radius for the curb at this type of intersection. If ten feet of tangent curb is left between the end of the intersection curb radius and the beginning of the driveway radius, and a minimum radius of ten feet is used for the driveway, then the edge of the throat is 50 feet back from the curbline of the intersecting major route. If the stop line is placed at the end of the intersection curb radius, the edge of the driveway is 20 feet back which should be sufficient in most instances.

The lower part of Figure 6 shows the same intersection corner except that an added 15 × 15-foot leg corner triangle of right-of-way has been used to permit a curb return with a 52-foot radius. This results in the same distance from the narrowest point of right-of-way line to the face of curb as in the upper drawing. Application of the same guidelines for driveway placement, however, would move the driveway 22 feet farther away from the intersection. Since the stop line for the intersection would not usually be back this far, there appears to be little justification for changing the location of the driveway.

Many agencies have handled this problem by allowing the driveway radius to compound with the corner radius. These agencies have established a maximum offset dimension as shown in the lower part of Figure 6. Opinions differ as to what the allowable dimension should be, but two or three feet in urban areas and five or six feet in rural areas have been applied satisfactorily.

As a general rule, driveways should be far enough from an interior property line to permit the curb radius to fall entirely in front of the subject property. At some locations, particularly where frontages are narrow, however, it is impossible to design satisfactory driveways within this limitation. In this situation, it should be recognized that roadways are usually centered in the public right-of-way, and the area between the edge of roadway and the right-of-way line is public property. If this is the case, it should be permissable for a driveway curb radius to swing in front of an adjacent lot. The engineer should be given latitude to make variations from basic criterion and to permit construction of driveways close to property lines.

For agencies which strive to minimize the occasions where driveway curb radii extend in front of adjacent lots, the Design Guidelines recommend a zero spacing (the curb radius starting at the projection of the interior property line) *except* in the case of industrial driveways. The larger turning radii that must be accommodated at the latter makes a curb radius in front of adjacent property almost unavoidable.

Much of the concern over permitting a driveway near an interior lot line has to do with the possibility of a property line driveway being built on the adjacent property, thus creating an extremely wide driveway. While this sometimes occurs, unrealistic restraints to prevent it may result in inefficient driveway layouts. The permit engineer may suggest a common driveway for two abutting property owners in such cases.

There is ample precedent for zero spacing of radii from interior property lines: Michigan's Standard and Procedures for Driveways, 1960; Georgia's Rules and Regulations for the Control and Protection of State Highway Rights of Way, 1953; Arkansas' Regulations for Access Driveways to State Highways, 1962; and Virginia's Entrance Standards, 1958. Some states also permit "encroachment" of the driveway radius in front of adjacent property. Except in the few cases where highway right-of-way has not been acquired, and private ownership still extends to the edge of the road or even to the centerline of the highway, this "border area" between right-of-way line and roadway edge is available for public use. The portion of any driveway within this border area is intended for public use. Functionally, it may be appropriate to have a driveway curb radius in front of adjacent interior property, just as an intersection curb return may be in front of the corner property (Figure 6).

The second element of spacing concerns the number of driveways to be permitted to serve a single property. Research by three engineers has resulted in conflicting findings on this element. Head's study of more than 186 miles of urban highways found that the number of either commercial or residential driveways was a relatively *unimportant* factor in predicting accident rates.[28] He found that the number of commercial *units* was a much greater factor. This implies that there is little if any rationale in terms of traffic safety for restricting the number of driveways serving a given piece of property. Schoppert concluded that the frequency of driveways was a major factor per se,[36] but Petersen found the number of establishments per mile was not an important variable.[32] While these studies are not entirely definitive, they suggest a flexible approach to the number of driveways permitted to serve a piece of land.

An additional factor concerns the spacing of high-volume driveways where deceleration or acceleration lanes are required. Examples would include driveways into community and regional shopping centers as well as those into major industrial, commercial and apartment complexes. At least several hundred feet between major driveways is desirable. Factors to be considered include the volumes of entering and leaving traffic and the resultant merging movements upstream and downstream.

Table 3: Safe sight distance for passenger cars exiting from driveways onto two-lane roads[a]

OPERATING SPEED	SAFE SIGHT DISTANCE--LEFT[b]	SAFE SIGHT DISTANCE--RIGHT[b]
20 MPH	150'	130'
30	350	260
40	530	440
50	740	700
60	950	1050

[a] Values are for urban conditions. On rural highways, distances should be increased by 10 percent to allow for longer driver reaction time.

[b] Measured from a vehicle ten feet back of the pavement edge.

Table 4: Safe sight distance for passenger cars exiting from driveways onto four- and six-lane roads[a]

OPERATING SPEED	SAFE SIGHT DISTANCE--LEFT[b]	SAFE SIGHT DISTANCE--RIGHT[c]
20 MPH	130'	130'
30	220	260
40	380	440
50	620	700
60	950	1050

[a] Values are for urban conditions. On rural highways, distances should be increased by 10 percent for slower driver reaction.

[b] Measured from a vehicle ten feet back of the pavement edge to a vehicle in the outside lane.

[c] Measured from a vehicle ten feet back of the pavement edge to a vehicle approaching in the median lane.

Table 5: Safe sight distances for semi-trailers exiting from driveways onto two-lane roads[a]

OPERATING SPEED	SAFE SIGHT DISTANCE--LEFT[b]	SAFE SIGHT DISTANCE--RIGHT[b]
20 MPH	300'	200'
30	500	400
40	850	850
50	1600	1600
60	2500	2500

[a] Values are for urban conditions. On rural highways, distances should be increased by 10 percent to allow for slower driver reaction.

[b] Measured from a vehicle ten feet back of the pavement edge.

Table 6: Safe sight distances for semi-trailers exiting from driveways onto four- and six-lane roads[a]

OPERATING SPEED	SAFE SIGHT DISTANCE--LEFT[b]	SAFE SIGHT DISTANCE--RIGHT[c]
20 MPH	200'	200'
30	400	400
40	850	850
50	1600	1600
60	2500	2500

[a] Values are for urban conditions. On rural highways, distances should be increased 10 percent to allow for slower driver reaction.

[b] Measured from a vehicle ten feet back of the pavement edge to a vehicle in the outside lane.

[c] Measured from a vehicle ten feet back of the pavement edge to a vehicle approaching in the median lane.

In some cases, a long deceleration lane may result in low volume driveways (particularly into abutting properties upstream from the development) connecting into the deceleration lane. If the low volume driveways are of relatively little importance, no basic problems should result. Public agencies should not be prevented from requiring acceleration lanes extending in front of adjacent properties by the driveway needs of those properties. The same policy should apply to acceleration lanes.

median cuts

Conditions justifying breaks in medians are much too complex for detailed discussion in this Recommended Practice. General guidelines are suggested, however.

On a major urban street with frequent intersections and parallel streets or service roads, it is usually possible to prohibit left turns into driveways without causing undue hardships for motorists. Under such conditions, breaks in barrier medians may not be warranted. In fact, it may be desirable to extend barrier medians across intersecting local streets. Courts have generally upheld the rights of governmental agencies to block left turn access and/or egress by left turn prohibitions or physical barriers.

Studies have shown that the most prevalent type of driveway accident involves left turning vehicles.[10 24] As many as half of all driveway accidents may involve left turns and a very high percentage of accidents reported as rear-end collisions are thought to involve cars attempting to turn left into driveways. The number of such accidents can be greatly reduced by a median area of sufficient width to accommodate a recessed left turn bay. Thus, at high-volume driveways, well designed breaks in the median may be preferable to the alternative of diverting relatively high turning volumes to downstream intersections. The added intersection turns, together with the attendant circuitous routing may be more hazardous than the turns into driveways, from left turn bay that has been properly designed.

Other factors affecting median openings include:

1. Potential number of left turns into driveways.
2. Length of frontage along the street right-of-way line of the property proposed to be served.
3. Distance of proposed opening

from adjacent intersections or other openings.

4. Length and width of the left turn storage lane as functions of the estimated maximum number of vehicles to be in the lane during peak hours.

5. Traffic control, including signalization, that will be necessary at the median cut. If a traffic signal at a median cut is within 1500 feet of another traffic signal, the two usually should be coordinated.

sight distance

Before issuing a permit for egress from a parcel of land, the responsible agency should ensure that vehicles can exit from the proposed development with minimum hazard and disruption of traffic. The sight distances shown in Tables 3 to 6 are designed to enable exiting vehicles:

1. Upon turning left or right, to accelerate to the operating speed of the street without causing approaching vehicles to reduce speed by more than ten miles per hour; and

2. Upon turning left, to clear the near half of the street without conflicting with vehicles approaching from the left.

The sight distance criteria shown in Tables 3 to 6 should be considered essential in designing commercial and industrial driveways and desirable in connection with residential driveways.

The sight distance requirements for passenger cars are based on a 3.5′ height of eye and 4.5′ height of object. The distances for semi-trailers are based on a 6.0′ height of eye and 4.5′ height of object.

The operating speed on each approach is assumed to be, in order of desirability, (a) the 85th percentile speed, (b) the speed limit if based on an engineering study, or (c) in the case of a new facility, 80 percent of the design speed. (Source: Table II-6, p. 97, ref. No. 43).

Vehicles slowing down and turning left to enter a *two-way* driveway will have adequate sight distance ahead of them if the distances shown in Tables 3 to 6 have been provided to allow safe exit from the drive itself. The sight distances shown in Table 7 are needed by vehicles turning left and entering a one-way driveway to allow them to clear oncoming through vehicles safely.

On low volume four- and six-lane roadways, there is adequate space to maneuver into adjacent lanes. Therefore, when projected peak hour volumes on the heaviest approach are less than 400 VPH and 600 VPH respectively, the sight distances shown in Tables 4 and 6 may be replaced by the safe stopping sight distances shown in Table 8. On two-lane roads, however, the sight distance requirements shown in Tables 3 and 5 apply regardless of approach volumes.

One of the assumptions used in calculating the sight distances shown in Tables 3 through 6 was that through traffic would be amenable to a reduction in speed of ten miles per hour. When the engineer believes that through traffic on the highway would accept a 20 MPH reduction in speed, values in these tables should be reduced by one-third.

The sight distances shown in Tables 3 through 8 are for urban conditions. In order to convert these to rural conditions, where driver reaction times are longer, the sight distances should be increased by ten percent.

The sight distances in Tables 3 through 6 apply when highway grades are zero to 3.0 percent (either up or down). When an upgrade is steeper than 3.0 percent, adjustments should be made to compensate for the longer time required to reach the speed of highway traffic. The time is less than shown when the highway is descending. Adjustment factors below apply to grades only in that portion of the road between the driveway and the downstream point at which a vehicle emerging from the driveway has been able to accelerate to within ten miles per hour of the route speed.

When the highway, in the section to be used for acceleration after leaving the driveway, ascends at 3 to 4 percent, then sight distance in the direction of approaching ascending traffic should be increased by a factor of 1.4. When the driveway ascends at 5 to 6 percent, sight distance should be increased by a factor of 1.7.

When the road in the section to be used for acceleration after leaving the driveway descends at 3 to 4 percent, sight distance in the direction of approaching descending highway traffic should be reduced by a factor of 0.6. If the road descends at 5 to 6 percent, sight distance should be reduced by a factor of 0.5.

When the criteria for sight distances to the right cannot be met,

Table 7: Safe sight disitances for passenger cars entering driveways by left turns[a]

OPERATING SPEED	SAFE SIGHT DISTANCE IN FEET[b] 2-LANE	4-LANE	6-LANE
20 MPH	150	160	170
30	230	250	270
40	370	390	420
50	520	550	580
60	700	740	780

[a] Values are for urban conditions. On rural highways, distances should be increased by 10 percent to allow for slower driver reaction.

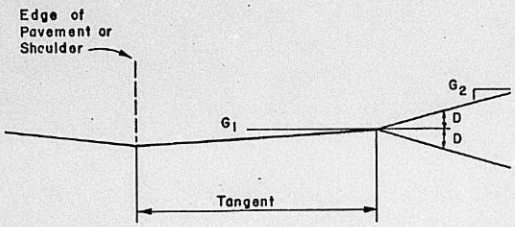
[b] Measured from the point where a left-turning vehicle stops to a vehicle in the outside lane.

Table 8: Safe sight distances for semi-trailers entering driveways by left turns[a]

OPERATING SPEED	SAFE SIGHT DISTANCE IN FEET[b] 2-LANE	4-LANE	6-LANE
20 MPH	260	280	300
30	400	440	480
40	570	620	670
50	810	880	950
60	1000	1100	1200

[a] Values are for urban conditions. On rural highways, distances should be increased by 10 percent to allow for slower driver reaction.

[b] Measured from the point where a left-turning vehicle stops to a vehicle in the outside lane.



	Suggested Maximum Grade Change (D)	
	Desirable	Maximum
High Volume Driveway	0%	± 3%
Low Volume Driveway on Major or Collector Streets	± 3%	± 6%
Low Volume Driveway on Local Streets	± 6%	Controlled by Vehicle Clearance

Figure 7: Suggested driveway profile

the need can be eliminated by prohibiting left turns by exiting vehicles.

Restriction of turning movements to right turns in and out of a driveway, together with provision of a right turn acceleration lane designed in accordance with AASHO standards, eliminates the need for the sight distances shown in Tables 3 through 6.

Direct access to a parcel should be denied when the sight distances shown cannot be attained and when restrictions on turning movements to and from a proposed development would not be practical. When a responsible agency denies access, it may be faced with the following alternatives:

1. Paying compensation to adjacent property owners to acquire access to the subject parcel through easements.
2. Constructing a frontage road serving the subject property and connecting with a highway where safe access can be provided.
3. Compensating the denied owner for loss of access.

In order to minimize the costs associated with such alternatives, access sight distance elements should be made a part of local standards. Zoning controls can be used to restrict certain types of developments on parcels where it would be impossible to provide proper sight distances for the types of vehicles generated by such developments.

driveway grades

Vehicles entering and leaving driveways which have abrupt changes in grade must travel at extremely low speeds. For those entering, the possibility of rear-end collisions on the public street is greatly increased. Exiting vehicles must wait for larger gaps in traffic, and thus hazards may become greater. The driveway profile is also an important design element with respect to comfort of vehicle occupants and as it affects potential damage to the undersides of vehicles.

Underside clearances of automobiles have not changed appreciably since 1955. During that time, several agencies have developed satisfactory driveway design standards. Most of the criteria produce similar results although they consist of various combinations of tangent slopes, tangent lengths and vertical curves.

Acceptable vertical profiles of driveways are generally governed

by the operating characteristics of vehicles. Maximum grades are established by the physical dimensions of vehicles (principally wheelbase) and braking capabilities, primarily of trucks. Designs must then be further refined as to (a) curb and shoulder cross-section within the right-of-way, and (b) whether a sag or a crest curve is required to complete the driveway beyond the right-of-way.

Figure 7 shows desirable and suggested maximum grade changes for three classes of driveways. For the values shown, no vertical curve connecting the tangents is necessary. The value of G_1 is limited by shoulder slope or by the presence of a sidewalk within the right-of-way.

For grade changes more abrupt than those shown in Figure 7, vertical curves at least ten feet long should be used to connect tangents. A template is helpful in checking clearances for more critical conditions. A design vehicle drawn to a scale of $1'' = 20'\text{-}0''$ is useful in checking grade limitations. Adjustable templates combining grades and a design vehicle are helpful in explaining clearance limitations to persons concerned with driveway design. Dimensions and break-over angles of new vehicles are published annually by the Automobile Manufacturing Association.[10]

Maximum grades (G_2) generally should be limited to 15 percent for residential driveways and to 5.0 to 8.0 percent for commercial and industrial driveways. If possible, driveways that must be steeper than these recommended limits should have longer tangent sections (at G_1 grade) than those discussed below.

Within the right-of-way limits, the driveway grade should be limited to 6.0 percent when possible. Preferably, the maximum difference between the downward cross slope of the traveled way (usually 2.0 percent or less) and the upward slope of the driveway to the sidewalk should not exceed 8.0 percent. If possible, it is desirable for the driveway crossing of the sidewalk to be made with little or no change in the sidewalk grade or cross-section. However, if the provision of adequate curb return radii precludes meeting this objective, the sidewalk should be warped into the driveway grade. Alternatively, for special circumstances as previously discussed in this Recommended Practice, step-down curbs may be used for the driveway. When possible, it is desirable that the driveway slope upward from the gutter line on a straight slope (no vertical curve) at least ten feet long for residential driveways and 40 feet long for commercial and industrial driveways. This relatively flat area permits vehicles to turn off a roadway without immediately climbing or descending, and exiting vehicles have a waiting area at approximately roadway level.

Mountable curbs are used along local streets in many areas, and often the curb is not modified when a driveway is installed. Such a design has the obvious advantage of costing the developer less to construct. However, they result in considerable "bounce" for occupants in vehicles riding over the curb. Due to this discomfort and the accident hazard when such driveways are entered at relatively high speeds, it is recommended that such driveways have the curb lowered to approximately the elevation of the gutter.

The same physical limitations apply to roadways with shoulders except that the driveway grade across the shoulder should be that of the shoulder. The grade between the outer edge of the shoulder and the property line should be appropriate for the type of drainage provided. If the roadway is in a cut, a driveway sloped to the low point of the ditch line would often result in a break-over angle that would be too sharp for satisfactory driveway speed, especially on uncurbed high-speed rural highways. As an alternative, a flat driveway with a culvert under it is recommended.

If the roadway is in a hilly area, the driveway may have to have a sufficient rise above shoulder level to prevent excessive run-off from the roadway onto adjacent property.

paving

Unless a driveway is paved and well maintained, pot holes and other surface imperfections are likely to develop. This may cause vehicles using the driveway to come almost to a stop before entering or leaving the traffic stream, causing excessive interference with through traffic. Furthermore, if the pavement is allowed to become badly deteriorated, circulation paths in any adjoining parking area may be adversely affected. Other undesirable characteristics of nonpermanent driveway surfacing include the difficulty of maintaining the desired surface profile, higher maintenance expenses, reduced skid resistance, tracking of loose material onto sidewalks, streets and highways, possible damage to the pavement if pot holes develop at the edge of the pavement, and problems of snow removal in northern climates.

Permanent types of paving include surfacing with portland cement concrete or asphaltic concrete and bituminous surface treatment. Gravel and other materials without a permanent surface are not considered satisfactory. Portland cement concrete has been identified as better than asphaltic concrete or bituminous surface treatment where fuel may be spilled such as around pump islands of service stations and where heavy wheel loads have to be sustained for long periods such as at truck loading docks.

Driveways should be well maintained to ensure that the original profile is retained, that operational speeds are not reduced by rough surfaces, and that no damage to or deterioration of the public roadway pavement is caused by condition of a driveway. The quality of maintenance also should be adequate to ensure that drivers will not deviate from logical circulation patterns to avoid driveways in poor condition.

In general, permanent pavement should extend at least to the end of the driveway curb radii to the sidewalk, or to any other portion of the driveway within the public right-of-way. In the case of commercial and industrial driveways, permanent pavement is desirable for at least 50 feet from the edge of the highway pavement.

If a driveway connects with an unpaved street or road, stabilized material of at least as high a standard as the roadway should be required to the right-of-way line. It is desirable to carry such stabilized material well back into private property—at least 50 feet from the edge of the public roadway.

When separate turn lanes and/or tapers are built along a paved street or road to serve a driveway, the permanent paving should be of the same type as that used on the public roadway or of contrasting surface material. The pavement should be designed to have at least the same structural strength as the public road. Separate turn lanes and tapers along unpaved streets and roads generally are not recommended. If they are installed, stabilized material of at least the same standard as the roadway should be specified.

Tentative ITE Recommended Practice

Guidelines for driveway design and location*

by ITE Committee 5N-S

Foreword: This report was approved as a Tentative Recommended Practice by the ITE Board of Direction on November 28, 1972. Following a period of time sufficient for the submittal of comments on its provisions, the report will be reconsidered by the Technical Council and the Board for final action.

The report was developed by Project Committee 5N-S in Department 5 of the ITE Technical Council. Members of the committee were: Paul C. Box (Chairman), David S. Plummer, R. Clarke Bennett, Robert R. Canfield, Sam Fisher, David V. Konsa, Harry Parker, J.O. Litchford, Donald C. Morgan, Alexander T. Morris, II. Wayne Sherrell, and Earl C. Williams, Jr. Special thanks also goes to William R. McConochie for his help in the final preparation of this report.

CONTENTS

Part I objectives

The primary objective of this Recommended Practice is to establish guidelines for location and design of driveways providing access from public streets and highways to developments on abutting property. In order for the guidelines to be of maximum value, it is necessary that wide flexibility be retained in their application. Engineering judgment should override recommended dimensions if warranted by specific traffic conditions. A secondary objective of this Recommended Practice, therefore, is to provide material from prior studies to aid engineers at the municipal, county and state levels in evaluating actual traffic needs and granting variations in issuing driveway permits.

classifications and definitions

The following definitions and classifications apply to this Recommended Practice. They deal with various types of roadways and areas, between streets of high pedestrian activity and those of lower importance to pedestrians.

Areas: An area is defined as Urban if the abutting street has a speed limit of 40 MPH (miles per hour) or less, or if at least 50 percent of the frontage on one side of the route within one half mile of the proposed driveway location has been developed with residences, business and/or industry. It is also intended that the term Urban generally include developed areas within incorporated limits of municipalities and urbanized townships or counties.

All locations not included under the Urban definition should be considered as Rural.

Streets: The term Major Route includes all marked county, state or federal routes and all urban streets: (a) having continuity; (b) carrying substantial amounts of through traffic; and (c) on which traffic is assigned the right-of-way by Stop signs facing cross streets.

Land Uses: Most Urban residential neighborhood business and industrial streets are of Low Pedestrian Activity. Areas of High Pedestrian Activity include streets through or abutting central business districts as well as those in the same block with auditoriums, schools, libraries and secondary (community type) business districts. Under certain conditions, streets and highways adjacent to public parks and rapid transit stations may also fall into this category.

Driveway Types:

1. A Residential Driveway is one providing access to a single family residence, to a duplex, or to an apartment building containing five or fewer dwelling units.

2. A Commercial Driveway is one providing access to an office, retail, or institutional building or to an apartment building having more than five dwelling units. Such buildings are customarily serviced by trucks or an incidental rather than a principal driveway use. Industrial plant driveways whose principal function is to serve administrative or employee parking lots are considered Commercial Driveways.

3. An Industrial Driveway is one directly serving substantial numbers of truck movements to and from loading docks of an industrial facility, warehouse or truck terminal. A centralized retail development, such as a community or regional shopping center, may have one or more driveways specially designed, signed and located to provide access for trucks. These are classified as Industrial Driveways.

Methods of Measurements:

1. All dimensions in this report refer to distances from (or along) *face of curb*. In the absence of a curb the measurement is considered to be from (or along) the edge of pavement.

2. Driveway angles are measured between the driveway centerline and one edge of the roadway.

This is the third part of a three-part recommended practice. The entire report will soon be available from ITE headquarters.

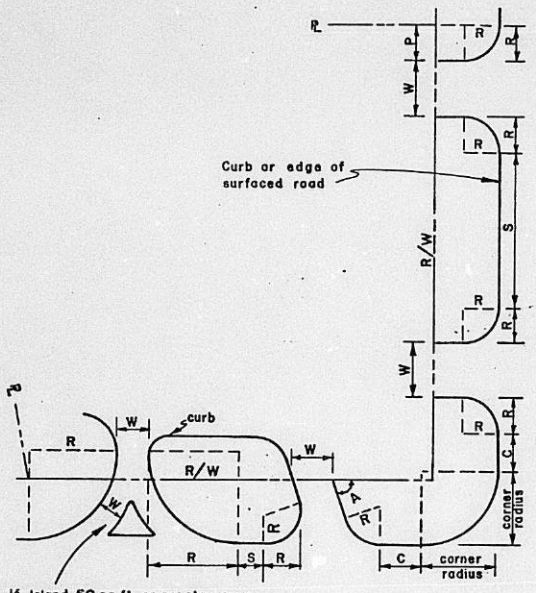


Figure 8: Driveway dimensions
measurements: see Table 9, opposite.

Part V
recommended guidelines

Basic Driveways: Basic widths, curb spacing, radii, and angles of driveways suggested for various land uses in urban and rural areas are given in Table 9. Methods of measurement and portions of previous text are footnoted below the table, and are illustrated in Figure 8.

In some driveway permit regulations, the term "curb cut" is used. The word "driveway" is preferred, since "curb cut" has little relation to the practical function of a driveway, and may be confusing when applied to roadways without curbs. If used, "curb cut" should be clearly defined as representing the effective driveway width together with the curb radii on both sides. Control dimensions should be adjusted accordingly. Thus, a 30-foot driveway with a 15-foot radius on each side becomes a 60-foot "curb cut".

It should be stressed that these design values are *guidelines*. The dimensions should be adjusted by the driveway permit engineer as required to handle expected traffic conditions.

major driveway design factors

Special care should be taken in designing driveways serving very high generation uses such as community and regional shopping centers, large industrial plants, major office building complexes, and huge density apartment developments. Specific elements have been discussed in this Recommended Practice under sections on Volumes, Successive Entrances, Angles, Spacing, Median Cuts, Sight Distances, and Paving. Shaw found that left turn bays could be justified on the basis of reductions in accidents and delays at typical major intersections having medians, and that the cost could be amortized by the savings in as short a period as five years.[11] Presumably, similar findings would apply to major driveways with heavy volumes of left turning vehicles. In fact, it is common practice at high generation developments to require medians of adequate width to accommodate left turn bays.

An interesting treatment of a left turn access problem in Alexandria, Virginia is shown in Figure 9. An overpass was constructed in the median of Duke Street, an otherwise at-grade, four-lane major route.

An unsignalized major driveway at grade may be considered to be

similar to an unsignalized intersection as studied by Harmelink.[12] He found left turn storage lanes to be justified for extremely low volumes. As shown in Figure 10, a left turn volume of 50 vehicles per hour from a four-lane highway facing an opposing volume of 300 vehicles per hour for example, would justify a left turn bay 50 feet in length. If the opposing volume was 1,100 vehicles per hour, a bay length of 100 feet would be needed. Harmelink also analyzed needs for left turn bays on two-lane highways as a function of speed and percentage of left turns as related to approaching and opposing volumes. His data are given in Figures 2 through 19 of his report.[42] While too extensive to be incorporated in these Guidelines, Harmelink's findings may be considered for inclusion in the operating practices or design guidelines of local agencies.

When left turn bays are to be provided at major driveways, a minimum spacing is automatically established for successive driveways that are to have left turn entry or exit. The basic factors are the distance required for the median taper (customarily with at least a 10:1 ratio) and the length of the storage bay. If a driveway on a major route is opposite a local street, a left turn bay for the local street also should be incorporated in the median. This will further increase the required distance between major driveways.

The distance of a major driveway with left turn channelization from a nearby major intersection which also has left turn bays will vary depending on whether the driveway is on the approach or departure side of the intersection with respect to the left turn lane. This may be illustrated by two examples. Assume a north/south route and a requirement for a northbound left turn bay to a major driveway. Assume that a bay 100 feet long is needed. If the major intersection is north of the driveway and requires a left turn bay 200 feet long with a 120-foot taper, the closest permissible location for a driveway would be 320 feet from the intersection. If the major driveway were on the north side of the intersection however, the required distance would be equal to the length of the left turn storage bay for southbound traffic at the intersection (again assume 200 feet), the taper of 120 feet, and the 100-foot left turn bay for the major driveway. These dimensions add up to a minimum

Table 3. Recommended basic driveway dimension guidelines

	Dimension Reference (See Fig. 8)	Urban			Rural		
		Residential	Commercial	Industrial	Residential	Commercial	Industrial
Width[1]	W						
Minimum		10	15	20	10	15	20
Maximum		30	35	40	30	40	40
Right Turn Radius[2]	R						
Minimum		5	10	15	10	15	25
Maximum		15	20	25	25	50	50
Spacing[3]							
From property line	P	0	0	-R	0	0	-R
From street corner	C	5	10	10	10	15	20
Between driveways	S	0	0	0	0	0	0
Angle[4]	A	45%	45%	45%	45%	45%	45%

[1]The minimum width of commercial driveways is intended to apply to one-way operation. In high pedestrian activity areas such as in a central business district or in the same block with auditorium, school or library, the maximum basic width should be 30 feet. The width shown applies to rural routes and most city streets including neighborhood business, residential, and industrial streets. The width is intended to be measured along the right-of-way line, in most instances, at the inner limit of a curbed radius or between the line of the radius and the near edge of a curbed island at least 50 feet square in area. For exceptions see Figure 6.

[2]On the side of a driveway exposed to entry or exit by right turning vehicles. In high pedestrian activity areas, the radii should be half the values shown.

[3]Measured along the curb or edge of pavement from the roadway end of the curb radius, except for conditions noted in Figure 6. In high pedestrian activity areas, the minimum spacing between driveways should be five feet.

[4]Minimum acute angle measured from edge of pavement, and generally based on one-way operation. For two-way driveways, and in high pedestrian activity areas, the minimum angle should be 70 degrees.

Figure 9: Left turn lane overpass to Landmark Regional Shopping Center in Alexandria, Virginia

distance from the intersection of 420 feet for a driveway.

These examples show the absurdity of attempting to specify the distances, consistent with all actual traffic needs, that driveways should be from intersections. It is important that driveways be designed for the particular traffic characteristics anticipated and that upstream and downstream factors affecting a driveway location should be considered in each instance.

As discussed under Successive Entrances, the entry movement to a series of driveways serving interconnected or common parking areas tends to be heavily concentrated at the first driveway in the series. Thus, deceleration lanes for right turns may be needed only at the first one or two driveways serving a given approach to a major facility. Conversely, acceleration lanes (if used they should be designed according to AASHO standards) may be needed at all the driveways. The value in a deceleration lane and the length of lane required is a function of the right turning volume into the driveway, the volume in the curb lane, and the speed of entry allowable by the driveway's geometric design. Driveways with relatively high speed entries, such as the one shown in Figure 5, may require no deceleration lane.

Traffic signal control of high volume driveways is commonly accepted in most jurisdictions. The control is needed primarily to facilitate outbound left turn movements, and heavy volumes of through traffic can be accommodated simultaneously. If the outbound left turn movement is low, the two-way flow on the major route must be stopped by the signal for only a short period. However, efficient signal operation under such conditions requires *separate sensing* of the driveway's right turn and left turn traffic lanes. Unless these lanes are separated and are of sufficient width, this may not be feasible. If separate sensing is not used, excessive green time will be required for the driveway to the detriment of through traffic flow on the major route.

As noted under Median Cuts, criteria used by one agency requires that driveway traffic signals within 800 feet of another signalized intersection shall be coordinated. As a general rule, this requires interconnection. Some agencies may insist on such interconnection when signalized locations are 1,200 or over 1,500 feet apart.

Because of the complexities and costs (both public and private) of providing access to major traffic generators, competent traffic studies should precede issuance of access permits. The intimate relationship between driveway locations and interior traffic circulation make it highly desirable that site plans also be prepared on the basis of traffic analyses. In this Recommended Practice, the value of this procedure is emphasized in Design Considerations 22 and 23 which call for consideration of driveway access elements in both site layout and zoning.

reservoir space

In designing driveways, attention should be given those situations where on-site geometrics affect safe and efficient movement of traffic on public rights-of-way. This problem is most evident with the drive-in service developments which generate high volumes and require drivers to remain in their vehicles while being served or until service begins. Examples of this type of development are drive-in banks, automatic car washes, drive-in theaters, and attendant-park lots and garages. In such cases, the design should provide adequate off-street reservoir space for waiting vehicles. Extreme care must be taken to minimize the probability that a queue of waiting vehicles will extend into the roadway.

In designing these site improvements, peaking within the design hourly volume is critical. Therefore, in addition to using the conventional critical *hourly* volume to measure the peak demand, the 5-minute, 15-minute or 30-minute demand may also warrant consideration.

Another important element in reservoir space design is the estimated accommodation or service time for vehicles using the facility. In connection with a proposed improvement, the service times can be measured at existing facilities with similar functions and similar geometrics. Knowing the short-term demand volume and service time, the needed reservoir area will be a function of that demand volume, the number of service facilities, and the service time per facility.

When determining design information it is important that facilities with similar geometrics be studied. Total service time includes not only the time for a vehicle to obtain service once within the service area, but also the time for the vehicle to maneuver into the service area after the driver has been directed to enter. This latter period is a function of the geometrics of the facility, particularly the width of the lanes, travel pattern, and the radius of the final approach turn. Wide lanes and flat approaches shorten the entering time. Good design calls for 11- to 12-foot approach lanes which are as straight as possible. For tight turns, a 30-foot outside radius is the practical minimum. When a turn exceeds 60 degrees, lanes within the turning area should be 13 feet wide. Following those criteria reduces total service time which in turn reduces storage requirements. The lanes adjacent to drive-in bank windows and ticket dispensing ma-

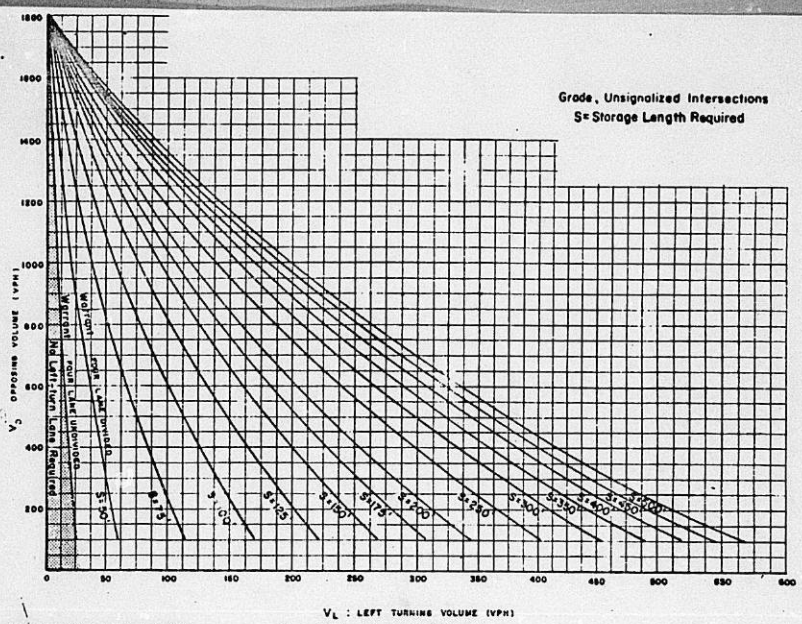


Figure 10: Warrants for left turn storage lanes on four-lane, at-grade, unsignalized highways. The section on graph lying between "undivided" and "divided" (VL = 25 to 55 VPH for a VO level of 200 VPH) relates to a warrant for a one-space length as provided by an ordinary opening in a median about 20 feet wide.
Source: Reference 42, Figure 1.

chines, of course, must be narrowed to 8.5 or 9.0 feet.

Care should always be taken to maximize reservoir areas no matter what the estimates indicate. One practical method is to place a service facility so that exiting vehicles have no more distance than needed to maneuver to the most convenient driveway. This maximizes the amount of storage space. Long exit lanes contribute nothing to the operation of a drive-in facility unless vehicles may have to wait before they can enter the street. Under such circumstances, sufficient space is needed between the curb lane and the service facility to preclude backups blocking the operation. Usually two or three spaces beyond each window will suffice.

If the potential reservoir area on the site would not be adequate, alternative uses of the land should be considered.

Based on the queuing calculations contained in the Woods and Messer study of drive-in banks, it was found that such facilities could serve an average of 40 VPH per window.[15] Unpublished studies by Paul C. Box and Associates empirically determined that such facilities could handle 36 to 44 VPH per window. Woods and Messer also found that lengths of queues were predictable as long as demand was less than 35 VPH per window. Based on these observations and calculations, the following guidelines should be used in determining reservoir space:

1. Estimate demand for the site in question from counts of similar facilities in the same area.

2. Calculate the number of windows required, based on a rate of 30 vehicles per hour per window.

When cars can be served at a rate of 40 VPH or more, and the average demand in the peak hour does not exceed 35 VPH per window, a waiting area for approximately 20 vehicles will not overflow more than five percent of the time. If the margin between service rate and demand is estimated to be narrower, it becomes difficult to predict the amount of reservoir space required. It will certainly need to be more than 20.

For all types of reservoirs, a length of 22 feet is suggested for each car space.[45]

Observations of queue lengths at automatic car washes of various types have resulted in recommendations of 30- to 50-foot reservoirs.[16] The amount of space required varies inversely with the

wash rate per hour and the number of bays or lines operated. Since car washes usually are built on restricted areas of land, most reservoirs do not have more than 10 to 20 spaces in each lane. The use of an attendant to direct motorists as they arrive is an important factor to be considered in design.

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T9105

Section technical report

Trip generation study provides useful preliminary data

By Ohio Section, ITE

As multi-family developments and high intensity commercial land use continues to grow rapidly, it is vital that criteria be available to gauge their impact on traffic.

The process of establishing such criteria began in Ohio more than a year ago, using as a guide the *Trip Generation Study of Selected Commercial and Residential Development*, published by the Institute's Illinois section in June, 1969.

Two basic traffic engineering terms, *trip* and *generation*, defined in that report were adopted.

The term *trip* refers to a single, one-way vehicular movement having either an origin or destination within the study area or site.

The term *generation* refers to the total number of trips crossing a counting station within a given time period. These trips can have either an origin or destination in the study area or site. Trip generation is expressed as a rate, i.e., trips per unit of building area, trips per dwelling unit, trips per motel room.

The *gross floor area* of an establishment expressed in 1,000's of square feet, is the best characteristic for identifying a commercial development and it provides a base for use in the trip generation rate.

Additional terms are *peak hour of operation* and *peak street hour*. The *peak hour of operation* is the hour of the day when the highest combined in and out traffic movement is observed at the site studied. The *peak street hour* is the hour during the day, usually the evening rush hour, when the highest traffic movements occur on streets adjacent to the development studied.

Study procedures

In Columbus, week day 24 hour non-directional mechanical traffic counts were made at each site. Sites selected had driveways long enough to get 90 degree crossings of the road tubes to eliminate double counting.

In Mansfield, this double-counting was eliminated by basing the machine counts on manual peak hour counts. In addition, Mansfield made 24 hour machine counts on two successive week days.

Springfield did not collect 24 hour data. Its trip generation rates were obtained from peak hour manual counts.

Manual peak hour counts were not made in Columbus except for single-family and multi-family residential cases where car occupancy and in vs. out volumes were obtained. In other cases, machine counts were used to determine peak hour trips.

In Columbus and Mansfield, residential sites were selected to eliminate through trips and occupany counts were included for the 7-9 a.m. and 3-6 p.m. periods. Apartment vacancy rates were less than five per cent and no adjustment was made for this in developing trip generation factors per dwelling unit.

Contributing to this report were William C. Habig, coordinator, Mid-Ohio Regional Planning Commission; Gerald Wilcox and David A. Younger, Columbus Division, Traffic Engineering and Parking; Walter Szczesney, Clark County-Springfield Comprehensive Transportation Study and Raymond G. Helmer. It was approved by Ohio section directors in December, 1972 and revised in November, 1973.

TABLE 1

	No. of samples	No. of uses	Ave. samples/use
Columbus	26	5	5
Sprinfield	6	6	1
Mansfield	11	11	1
Total	43	22	

TABLE 2

Land use	Sample size	Peak site hour	Daily
Fast-food restaurants	7[1]	73 trips/1,000 sq. ft. GFA[2]	561 trips/1,000 sq. ft. GFA
Sit-down restaurants	8[1]	33 trips/1,000 sq. ft. GFA	237 trips/1,000 sq. ft. GFA
Discount stores	7[1]	6.7 trips/1,000 sq ft. GFA	69 trips/1,000 sq ft. GFA
Community shopping center	1	4.2 trips/1,000 sq. ft. GFA	n.a.
Regional shopping center	1	1.5 trips/1,000 sq. ft. GFA	20 trips/1,000 sq. ft. GFA
Food store	1	16.6 trips/1000 sq ft. GFA	n.a.
Auto supply store	1	10.0 trips/1,000 sq. ft. GFA	137 trips/1,000 sq ft. GFA
Motel	1	0.6 trips/room	9 trips/room
Hospital	1	1.0 trips/bed	9 trips/bed
Suburban office	1	2.5 trips/1,000 sq. ft. GFA	17 trips/1,000 sq. ft. GFA
Service stations	2[1]	622 trips/1,000 sq. ft. GFA	43 trips/1,000 sq. ft. GFA
Single-family	6	0.91 trips/du	10.5 trips/du
Multi-family	6	0.85 trips/du	8.1 trips/du

[1] 24 hour data not available from one city.
[2] GFA = Gross Floor Area of building.

Data from three cities

All three cities provided data on developed site acreage and gross floor area of commercial buildings. Mansfield collected the number of entrances and exits, employment, number of parking spaces and car occupancy for each site.

Springfield collected the number of parking spaces, employment and operating hours for each site in addition to the two basic variables obtained by Columbus.

With proper site selection, studies of this type can be done by mechanical counters without the need for expensive manual counts. This assumes that a machine count crew normally is operated in the field by the agency collecting data.

Traffic generation studies of commercial and residential development conducted in Columbus, Springfield and Mansfield, Ohio provided 43 samples illustrating 12 different land uses, shown in Table 1.

Table 2 summarizes average vehicle generation factors during the site peak hour and on a daily basis.

Peak periods of generation for restaurants, discount stores and shopping centers differ from the normal evening peak hours on streets serving such developments. Average peak hour traffic generation rates per dwelling unit were more than 20 per cent higher for single family than multi-family units in the evening peak.

The study developed data on two basic types of land use. The first set of tables, (2 through 6), shows commercial developments including fast food restaurants, sit down restaurants, discount stores, community shopping centers, regional shopping center, food stores, auto supply stores, motels, hospitals, suburban office buildings and service stations.

TABLE 3 Fast-food restaurants

Columbus site number	Site area (developed acres)	Building area (sq. ft.)	24 hour data: Volume (2-way)	24 hour data: Trips 1000 sq. ft.	24 hour data: Trips acre	Peak hour data: Peak hour	Peak hour data: Volume (2-way)	Peak hour data: Trips 1000 sq. ft.	Peak hour data: Trips acre	ADT's (thousands)[1]
1	0.63	2800	2322	828	3670	12-1 PM	336	120	534	Site 1 30-35
2	0.67	2250	1322	589	1990	12-1 PM	211	94	318	Site 2 15-16
3	0.66	3240	1640	506	2410	11-12 AM	218	68	329	Site 3 20-25
4	1.17	3072	1278	417	1100	12-1 PM	143	47	122	Site 4 25-30
5	0.87	3072	1154	376	1331	12-1 PM	165	54	191	Site 5 20-25
Average	0.80	2887	1543	543	2100	12-1 PM	215	77	299	
#6 Springfield Burger Chef	0.66	2424	n.a.	n.a.	n.a.	12-1-PM	150	62	227	
#7 Mansfield McDonald's	0.88	1666	1188	713	1485	11:30-12:30	129	77	161	
AVE. OF TOTALS	0.79	2646	1484 (n=6)	571 (n=6)	1998 (n=6)	12-1 PM	193	75	269	

[1] (access of service road, ADT is mainline)
(major street-access off service road), 4000 (minor street)

TABLE 4 Sit-down restaurants

Columbus site number	Site area (developed acres)	Building area (sq. ft.)	24 Hour data: Volume (2-way)	Trips 1000 sq. ft.	Trips acre	Peak hour data: Peak hour	Volume (2-way)	Trips 1000 sq. ft.	Trips acre	ADT's (thousands) [1]
1	0.95	3721	2051	551	2170	8-9 AM	236	63.5	250	Site 1 25-30
2	1.49	3900	1910	490	1278	12-1 PM	200	51.3	134	Site 2 5-6
3	0.53	3000	583	193	1100	11-12 AM	95	31.6	180	Site 3 10-15
4	0.43	2500	573	219	1325	8-9 AM	60	24.0	139	Site 4 20-25
5	0.55	2900	514	178	929	12-1 PM	115	20.7	108	Site 5 15-20
6	1.99	11466	1091	96	550	7-8 PM	135	10.0	53	Site 6 35-40
Average	0.99	4581	1120	288	1225	Varies	140	33.5	144	
#7 Springfield Perkins	0.48	3200	n.a.	n.a.	n.a.	12-1 PM	240	75.0	500	
#8 Mansfield Perkins	0.70	4507	564	125	806	11:30-12:30	66	14.6	94	
AVE. OF TOTALS	0.89	4399	1041	265	1165	Varies	143	36.3	182	

[1] (major street), 6-8000 (minor street) (All access off service road)
(site within 500 ft. of 25-30 ADT street)
(access off service road, ADT is main line)

TABLE 5 Discount stores

Columbus site number	Site area	Building area (1000 sq. ft.)	24 Hour data: Volume (2-way)	Trips 1000 sq. ft.	Trips acre	Peak hour data: Peak hour (P.M.)	Volume (2-way)	Trips 1000 sq. ft.	Trips acre	ADT's (thousands)
1	9.20	73.4	6368	87.3	692	7-8	571	7.80	62.2	Site 1 10-15
2	11.00	90.0	6313	70.2	574	8-9	594	6.59	54.0	Site 2 20-25
3	12.22	117.8	8252	70.1	675	7-8	854	7.25	69.6	Site 3 20-25
4	13.50	123.3	7872	63.7	583	7-8	818	6.62	60.5	Site 4 30-35
5	8.21	86.0	3587	41.7	436	7-8	381	4.43	46.4	Site 5 15-20
Average	10.83	98.0	6478	66.6	592	7-8	643	6.57	58.5	
#6 Springfield Welles	12.63	66.3	n.a.	n.a.	n.a.	7-8	498	7.51	39.4	
#7 Mansfield Five Cousins	4.00	32.0	2424	75.8	606	1:30-2:30	208	6.50	52.0	
AVE. OF TOTALS	10.11	84.1	5803	68.1	594	Varies	561	6.67	54.9	

TABLE 6 Miscellaneous uses

City	Land use	Site area (developed acres)	Building area (1000 sq. ft.)	24 Hour data: Volume (2-way)	Trips 1000 sq. ft.	Trips acre	Peak hour data: Peak hour	Volume (2-way)	Trips 1000 sq ft.	Trips acre
Springfield	Community shopping center	57.39	180.0	n.a.	—	—	7-8 PM	758	4.21	13.2
Mansfield	Regular shopping center	61.33	690.8	13,824	20.0	225	2-3 PM	1041	1.51	17.0
Springfield	Food store	4.22	21.6	n.a.	—	—	5-6 PM	358	16.57	84.8
Mansfield	Auto supply	0.50	2.4	328	136.7	656	11-12 AM	24	10.00	48.0
Mansfield	Motel	105 units	29.2	923	31.6	9*	4-5 PM	68	2.33	0.6*
Mansfield	Hospital	105 beds	12.3	943	76.7	9*	3-4 PM	104	8.46	1.0*
Mansfield	Suburban office	10.50	82.0	1,422	17.3	135	4-5 PM	201	2.45	19.0
Mansfield	Service station	0.60	1.3	809	622.3	1348	6-7 AM	60	46.15	100.0
Springfield	Service station	0.27	1.3	n.a.	—	—	5-6 PM	52	40.00	192.6

* Ratios are per bed

Commercial developments

Fast-food restaurants

Columbus site selection was based on the availability of driveways long enough to direct the cars straight across the road tubes to prevent double actuations (Table 3). Even so, there are small errors in the counts due to double actuations. Because of the need to use long driveways, the sites selected were relatively new and located on major arterials.

These data are not available for Mansfield or Springfield.

In all cases, the peak hour trips occurred at noon. Peak hour trips per thousand square feet of floor area (gross) ranged from 54 to 120 vph with an average of 73 vph. Street volumes and location in the urban areas seemed unimportant. Both the highest and the lowest trip generators were located on the same street, less than a mile apart.

Sit down restaurants

As was the case for fast food restaurants, the main consideration in Columbus site selection for sit down restaurants, (Table 4), was driveway configuration. All locations studied were constructed recently and represent a new trend in sit down restaurants. The high trip generation rates indicate a high turnover. The variation in trip rates points up the difficulty of grouping sites within this general land use category. Commercial competition is intense and stage of development of the market area seems to be a major factor.

Discount stores

Columbus discount stores studied, (Table 5), tend to be older than the fast food or sit down restaurants surveyed. They also tended to be located farther into the city than the fast food or sit down restaurants.

Miscellaneous users

Columbus concentrated on obtaining five or six samples for each of five land uses while Mansfield and Springfield obtained one sample for each of 11 and six sites respectively.

Table 6 shows results for eight land uses outside the basic set. While they have no statistical validity, they indicate the scale of trip generation for such uses and provide guidance for further study.

Single family developments

As shown in Table 7, six residential subdivisions with home prices from $15,000 to $60,000 were surveyed. Only trips into and out of the subdivision were counted. In most cases, there were no through trips and where through trips were possible, they were minimal. Occupancy counts and in vs. out volumes were taken only during the peak hours of 7 a.m. to 9 a.m. and from 3 p.m. to 6 p.m. on weekdays.

Table 7A shows the split between in and out traffic during the subdivision's morning and evening peak hours. Although counts were not taken to determine the peak hour for adjacent streets, observations indicated the street peak hour generally coincided with the subdivision peak.

The peak hour splits at the Columbus locations were 76 per cent in and 24 per cent out in the morning and 64 per cent in and 36 per cent out in the evening. Evening peak direction rates averaged only about 18 per cent higher than the a.m. peak direction due to the higher peak direction split in the morning.

There appears to be no relationship between the cost of the house, trip generation or auto occupancy.

Evening hour generation rates on the average were, 40 per cent higher than for the morning period. This indicates a much greater concentration during the evening rush hour.

Average daily traffic counts, (ADT), to measure trip generation characteristics on adjacent streets for this type of land use should be used with caution and should account for all exits and entrances and exclude through traffic.

Multi-family developments

Table 8 shows six multi-family developments with rentals from $125 a month for a one bedroom apartment to $310 a month for a three bedroom apartment. Sites were selected to eliminate through trips.

Weekday occupancy counts and in vs. out volumes were taken only during the 7 a.m. to 9 a.m. peak and in the 3 p.m. to 6 p.m. peak. Vehicle occupancy and in vs. out volumes were not measured at all entrances and exits at sites one and two.

In all cases the apartment vacancy rate was no more than five per cent so no adjustments were made for the vacancies.

TABLE 7 Single family developments

Columbus subdivision number	Number of dwelling units	24 Hour data		Peak hour data							
				Volumes		Vehicle trips/du		Peak Hour		Auto occupancy	Price range
		Volumes	Trips/du	(am	pm)	(am	pm)	(am	pm)		
1	210	2391	11.39	117	208	.56	1.00	7:45-8:45	3:45-4:45	1.64	$15,000 $20,000
2	279	3682	9.49	210	242	.75	.87	7:15-8:15	5:00-6:00	1.60	$50,000
3	112	1604	14.35	100	101	.89	.90	7:45-8:45	5:00-6:00	1.55	$50,000 $60,000
4	436	3613	8.36	259	335	.59	.55	7:15-8:15	4:45-5:45	1.48	$25,000
5	246	2250	9.15	152	260	.62	1.06	7:00-8:00	4:45-5:45	1.59	$20,000
Average	256	2708	10.55	162	229	.68	.88	7:15-8:15	5:00-6:00	1.57	Varies
#6 Mansfield	50	482	9.64	32	62	.64	1.24	7:00-8:00	4:15-5:15	1.60	$20,000 $25,000
AVE. OF TOTALS	222	2337	10.40	145	201	.67	.94	7:00-8:00	5:00-6:00	1.58	Varies

Table 8 Single family developments—in vs. out traffic volumes

Columbus subdivision number	Morning peak hours				Evening peak hours			
	Time	Trips in	Trips out	% Peak direction	Time	Trips in	Trips out	% Peak direction
1	7:45-8:45	43	74	63%	3:45-4:45	130	78	63%
2	7:15-8:15	36	174	83%	5:00-6:00	168	74	69%
3	7:45-8:45	22	78	78%	5:00-6:00	76	25	75%
4	7:15-8:15	74	185	71%	4:45-5:45	215	120	64%
5	7:00-8:00	26	126	83%	4:45-5:45	144	116	55%
Average	—	40	127	76%	—	733	413	64%

TABLE 9 Multi-family developments

Columbus development number	No. dwelling units	24 hour data		Peak hour data							
		Volume	Vehicle trips/du	Volume am	Volume pm	Veh. trips/du am	Veh. trips/du pm	Peak hour am	Peak hour pm	Auto occupancy	Price Range
1	197	1387	7.05	147	150	.75	.76	7:30-8:30	4:45-5:45	1.23	$155-$310
2	157	1467	9.33	103	146	.71	.93	7:30-8:30	3:30-4:30	1.37	$132-$217
3	150	1259	8.39	74	73	.49	.49	7:00-8:00	5:00-6:00	1.53	$145-$230
4	458	4137	9.03	325	355	.71	.78	7:30-8:30	5:00-6:00	1.52	$135-$210
5	308	2095	6.80	181	241	.58	.78	7:15-8:15	5:00-6:00	1.33	$125-$135
Average	254	2069	8.12	166	193	.65	.75	7:15-8:15	5:00-6:00	1.40	Varies
#6 Mansfield	72	490	6.81	29	40	.40	.77	7:30-8:30	4:30-5:30	1.30	n.a.
AVE. OF TOTALS	224	1806	7.90	143	168	.61	.75	7:30-8:30	5:00-6:00	1.38	Varies

Table 8A presents the split between in and out traffic during morning and evening peak hours. Counts were not taken to determine the peak hour for the adjacent streets, but observations indicated the street peak hour generally coincided with the site peak.

Using the peak hour counts, splits at the Columbus locations were 85 per cent in and 15 per cent out in the morning and 72 per cent in and 28 per cent out in the evening. Multi-family developments had higher peak direction movements than single family developments in morning and evening hours.

As was the case with single family subdivisions, there were no clear correlation between rental price, trip generation or auto occupancy.

Car occupancy ratios for multi-family units were 13 per cent lower, reflecting the lower occupancy of such units compared with single-family homes.

Caveats

Based on customary statistical method, this study is seriously inadequate in terms of sample size. A maximum of seven or eight data points per category is by no means a sufficient statistical sample. It would have been desirable to make directional traffic counts for each site, but available resources limited data collection to Columbus.

The report does provide a detailed summary of 43 samples illustrating 12 land uses from data collected in Columbus, Springfield and Mansfield, Ohio.

This voluntary effort was hampered severely by the lack of time available in the agencies conducting the field studies. The authors are indebted to the Illinois section for its initial work in this field.

At first glance it may appear that this study is of little value because of the small sample size, but the data have some use, even if only to indicate the magnitude of such land uses.

The study provides a worthwhile framework for additional data collection as resources become available and a good indication of the magnitude of trip generation of the uses studied.

As an interim tool, used in conjunction with the Illinois section study and others, the data provide insight about and procedures for evaluating the impact of new land development on major traffic generators.

TABLE 10 Multi-family developments—in vs. out traffic volumes

Columbus development number	Morning peak hour				Evening peak hour			
	Time	Trips in	Trips out	% Peak direction	Time	Trips in	Trips out	% Peak direction
1	7:30 8:30	n.a.		n.a.	4:45 5:45	n.a.	n.a.	n.a.
2	7:30-8:30	n.a.	n.a.	n.a.	3:30-4:30	n.a.	n.a.	n.a.
3	7:00-8:00	12	62	84%	5:00-6:00	51	22	70%
4	7:30-8:30	62	263	81%	5:00-6:00	263	92	74%
5	7:15-8:15	12	169	93%	5:00-6:00	171	70	71%
Average	—	86	494	85%	—	485	184	72%

SUPPLEMENT TO

FIRST AND SECOND STREET IMPROVEMENTS

Traffic Engineering Division
Department of Public Works
City of Wichita

December 1971

SUPPLEMENT TO FIRST AND SECOND STREET IMPROVEMENTS

PURPOSE

The purpose of this supplemental report is to present Commissioner Garry Porter's proposal for improving First and Second Streets as proposed by him at the City Commission meeting on December 14, 1971. Commissioner Porter's proposal will be discussed herein as Proposal No. 7.

PROPOSAL NO. 7

First & Second Streets Improved to Provide 34' Roadways

Proposal No. 7 is similar to Proposal No. 1; however, it reflects a reduced street width. The roadways would be widened to 34 feet between the canal and Hillside, thus giving three 10-foot lanes plus two feet of gutter on each side.

Nine points should be considered when evaluating this proposal:

1. Tree Removal - The following list is the estimated extent of tree removal required for a 34-foot curb-to-curb roadway on First and Second Streets between I-35W and Hillside Avenue.

First Street	
Total trees on street right-of-way	95
Trees which must be removed	27
Trees clear of construction	28
Trees in question (excavating limits and root structure will determine whether tree will be removed or not)	40
Second Street	
Total trees on street right-of-way	88
Trees which must be removed	9
Trees clear of construction	47
Trees in question	32

2. Lane Widths - Three 10-foot lanes are proposed with two-foot curb sections on each side. The proposed 34-foot roadways could be constructed within the existing right-of-way.

Questions have arisen regarding the desirability of 10-foot lanes on First and Second Streets. The following information is provided to document the capacities of various lane widths. A number of technical sources are cited which contain pertinent information. The capacities that will be required on the subject streets can only be based on traffic projections which must be analyzed independently of actual lane capacities.

The Highway Capacity Manual is the latest available source of information regarding the capacities of urban streets and intersections. The analytical procedures contained in that document used to calculate capacities have been reduced to nomograph form by Jack E. Leisch, Vice-President and Chief Highway Engineer, DeLeuw, Cather & Co. of Canada Ltd. and were published in the August 1967 issue of Public Roads. Chart 8[1] in that publication pertains to one-way streets with no parking in fringe areas and outlying business districts. Chart 8 has been reproduced and is contained in Appendix A of this report. Capacities for First or Second Street with three 10', 11', or 12' lanes are 1300, 1450, or 1700 VPH, respectively, taken from the chart, assuming no trucks, 20% right turns, 20% left turns, and 50% green time. The Highway Capacity Manual also states the following regarding lane widths:[2]

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[1] J. E. Leisch, Chart 8, Public Roads, August 1967, Vol. 34, No. 9, page 189

[2] "Factors Affecting Capacity and Service Volumes," Highway Capacity Manual 1965, March 1966, page 88

"Narrower lanes have a lower capacity under uninterrupted** flow conditions than the 12-ft. lanes which the Committee has accepted as the defined ideal."

In conjunction with that statement, the Highway Capacity Manual contains a table which indicates the effect of lane widths on capacity for uninterrupted flow conditions. That table is reproduced below:

Effect of Lane Width on Capacity
For Uninterrupted Flow Conditions[3]

Lane Width (ft.)	Capacity (% of 12-ft. Lane Cap.) 2-Lane Highways	Multilane Highways
12	100	100
11	88	97
10	81	91
9	76	81

A number of other technical documents discuss lane widths as they relate to traffic volumes. A Policy on Arterial Highways in Urban Areas states the following:

"In the interest of safety, efficiency, and ease of operation, lane widths of 11 to 13 feet are desirable on any arterial highway*, the larger values providing the additional freedom and ease of operation consistent with high traffic volumes. On expressways and freeways, traffic lanes should be 12 feet wide as in summary. On major streets the stringent controls of

**Uninterrupted flow is a condition in which a vehicle traversing a section of a lane or a roadway is not required to stop by any cause external to the traffic stream although vehicles may be stopped by causes internal to the traffic stream.
*A highway or street is defined in Kansas Statutes Annotated as the entire width between property lines of every way publicly maintained when any part thereof is open to the use of the public for purposes of vehicular traffic; and shall also include turnpike projects as the same are defined by subsection (b) of K.S.A. 68-2001, or any acts amendatory thereof.

[3]Table 5.1, Highway Capacity Manual 1965, March 1966, page 89

right-of-way and existing development force use of 10-foot lanes. Substantial lane flow is accommodated on 10-foot lanes but driving is accomplished only with hazard and undesirable tension and strain, particularly on multi-lane streets. Barrier curbs are further restrictive to traffic."[4]

The Traffic Engineering Handbook has the following information:

"Lanes should be 12 feet wide for free flow, particularly where trucks and buses are included in the traffic demand. Lesser widths will restrict the amount of traffic carried."[5]

The above information documents the fact that wider lanes have greater traffic carrying capacities. One other relationship that should be considered is speed vs capacities. It is known that maximum capacities on highway facilities are attained in the range of 25 to 35 mph. Between 25 and 35 mph, the gaps between vehicles are relatively short, thus densities are greater with the end result of greater flow rates. Figure 2 in Appendix A contains two graphs which show typical speed-volume relationships.

It should be pointed out that the reference material presented in this section is based primarily on empirical data that has been accummulated from extensive field surveys and is not purely theoretical.

3. Special Assessments - Listed below is the estimated cost of improving First and Second Streets between I-35W and Hillside with a 34-foot width roadway.

First Street		Second Street	
Pavement -	$282,700	Pavement -	$309,800
Drainage -	153,100	Drainage -	74,300
Total	$435,800	Total	$384,100

[4] "General Design Elements", A Policy on Arterial Highways in Urban Areas, 1957, page 153

[5] "Factors Affecting Capacity and Service Volumes", Traffic Engineering Handbook, 1965, Third Edition, pp. 314-315

4. Notice to Citizen - The City Commission, if it approves First and Second Street improvements from I-35W to Hillside, should give an indication that similar improvements will be considered for scheduling from Hillside east at the time the Capital Improvements Program is considered by the governing body. At that time, if the CIP retains such additional improvements, the Public Information Office should attempt to have articles placed in the Eagle or Beacon and in neighborhood papers such as the Easterner.

5. Zoning - The BCC and the MAPC should pass a motion to the effect that zoning for non-residential uses will not be looked on with favor east of I-35W on either First or Second Streets. This is consistent with past staff recommendations and should assist (with good code enforcement) in maintaining the character of residential neighborhoods. A similar recommendation has been made by the Zoning Subcommittee of the Physical Development Task Force of Coalition Planning Goals Program. Also, the Commission should be aware that requests by the South Council of Model Cities have been made to revert the LC established on the east side of I-35W, to a residential classification.

6. Drainage - The drainage systems are proposed to be located within the limits of street construction. Due to the scope of drainage improvements, it is recommended that drainage improvements be coordinated with street reconstruction.

7. Tree Program - A tree replacement program has been proposed by the City Manager. After the project is completed, those trees lost in future years will have to be replaced by either property owner or be funded by the City's forestry program.

8. Commercial Traffic - It is proposed that all trucks and buses be prohibited on First and Second Streets from I-35W to Edgemoor. It should be realized that delivery trucks and school buses will be permitted to use the subject streets even though truck prohibition signs are posted.

9. On-Street Parking - It is proposed that all on-street parking be prohibited on First and Second Streets from I-35W to Edgemoor. (Consideration should be given to expanding the parking restricted area west to Washington.)

A primary point of discussion with this proposal is the 10-foot lane widths. Projections indicate that traffic volumes will exceed the capacities of 10-foot lanes at some point in time after I-35W is completed. The capacity of these 10-foot lanes is approximately 1300 vph and it is projected that peak hour volumes will exceed 1500 vph by 1986.

One additional point to be considered is the fact that First and Second Streets from I-35W west to Hydraulic have been designed for 12-foot lanes and are proposed for improvement under the TOPICS program. Utilizing 10-foot lanes from I-35W east will require a transition from the 40-foot to the 34-foot roadway.

SUMMARY

This report restates Commissioner Porter's proposal for improving First and Second Streets. His proposal includes the following:

1. Thirty-four foot (34') roadways, curb to curb
2. No additional acquisition of right-of-way
3. A tree replacement program

4. "Freeze" commercial zoning on subject streets
5. Advising citizens in east Wichita that the area at Oliver and perhaps onto Edgemoor is considered part of the Capital Improvements Program at the present time and will be coming up shortly.
6. Adequate drainage facilities to be placed beneath the new streets
7. Commercial traffic to be prohibited on First and Second Streets from I-35W to Edgemoor
8. All on-street parking on First from the canal to Edgemoor be removed

APPENDIX

A

TABLE A — ADJUSTMENT FACTOR (I) FOR LEVEL OF SERVICE

LEVEL OF SERVICE	LOAD FACTOR	W_A — WIDTH OF APPROACH — feet								
		10	15	20	25	30	35	40	50	'60
A No Backlog	0·0	—	—	0·95	0·95	0·95	0·94	0·94	0·94	0·93
B	0·1	—	—	0·97	0·97	0·97	0·96	0·96	0·96	0·95
C Design Capacity	0·3	—	—	1·00	1·00	1·00	1·00	1·00	1·00	1·00
D	0·7	—	—	1·12	1·09	1·07	1·07	1·08	1·11	1·13
E Possible Capacity	0·85	—	—	1·15	1·13	1·12	1·12	1·13	1·15	1·17

*NOTE:
Condition where volume of left turning vehicles can be handled without a separate signal indication; before using chart, the capacity of left-turn movement should be checked as per Special Conditions, Item 5.

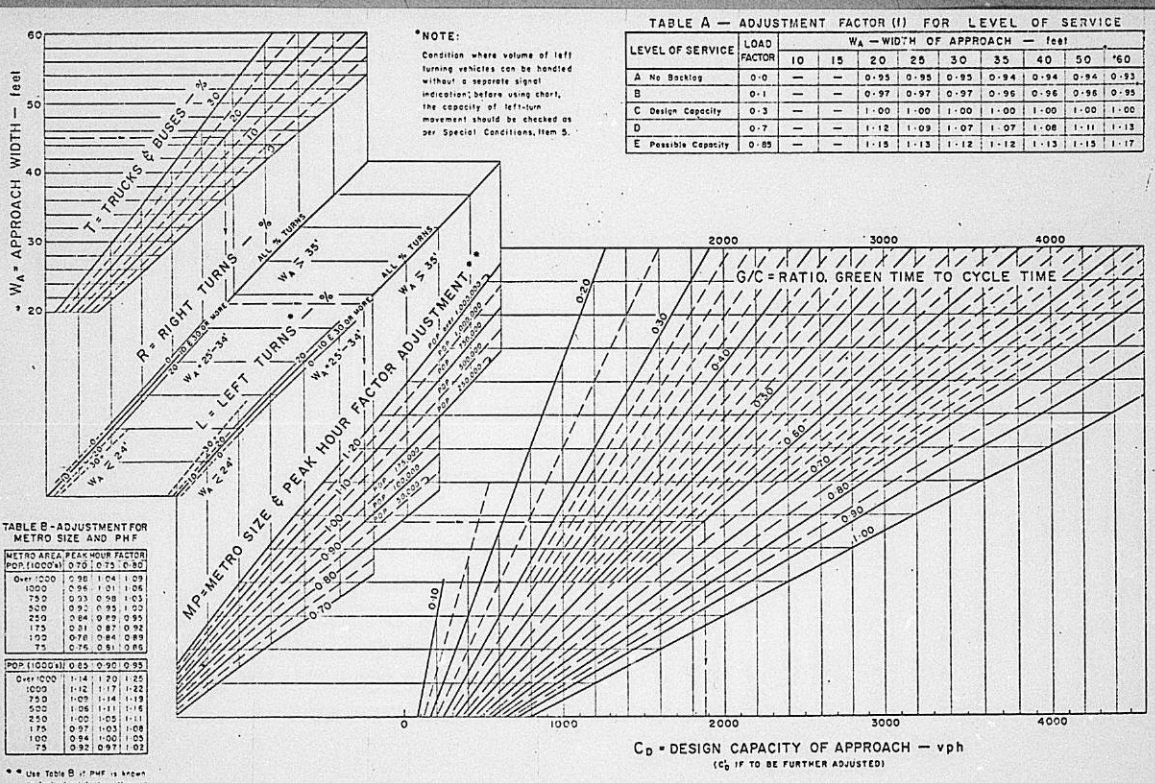


TABLE B - ADJUSTMENT FOR METRO SIZE AND PHF

METRO AREA POP.('000's)	PEAK HOUR FACTOR 0·70	0·75	0·80
Over 1200	0·98	1·04	1·09
1000	0·96	1·01	1·06
750	0·93	0·98	1·03
500	0·92	0·95	1·00
250	0·84	0·89	0·95
175	0·81	0·87	0·92
100	0·78	0·84	0·89
75	0·76	0·81	0·86

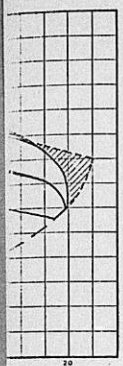
POP.('000's)‡	0·85	0·90	0·95
Over 1200	1·14	1·20	1·25
1000	1·12	1·17	1·22
750	1·09	1·14	1·19
500	1·06	1·11	1·16
250	1·00	1·05	1·11
175	0·97	1·03	1·08
100	0·94	1·00	1·05
75	0·92	0·97	1·03

** Use Table B if PHF is known to find adjust. factor; otherwise use Population directly.

FIGURE 1

DESIGN CAPACITY OF SIGNALIZED INTERSECTIONS
ONE-WAY STREET — NO PARKING — FRINGE AREA & O.B.D.
CHART 8

FRNG. O.B.D. 8



peed in one direction
expressways.

olume, given ideal
:, ordinary multi-
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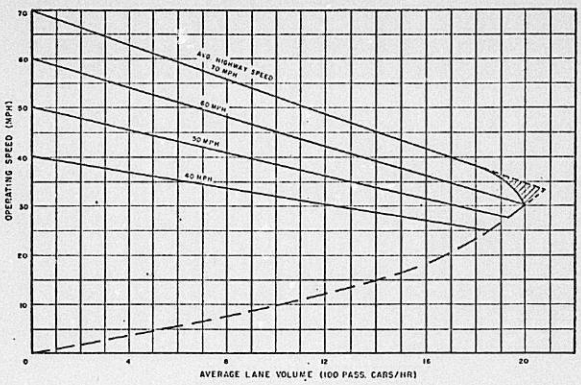


Figure 3.39. Typical relationships between volume per lane and operating speed in one direction of travel under ideal uninterrupted flow conditions on multilane rural highways.
(Source: BPR, combined data from various studies)

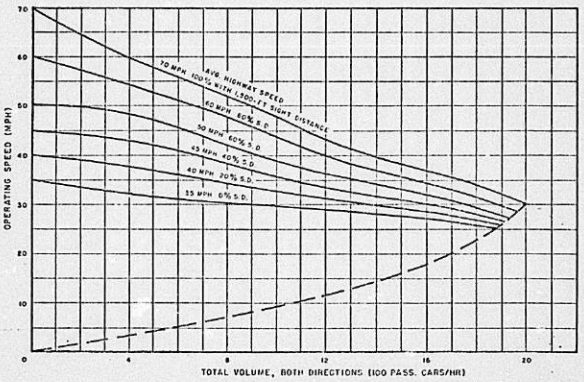


Figure 3.40. Typical relationships between total volume for both directions of travel and operating speed under ideal uninterrupted flow conditions on two-lane rural highways.
(Source: BPR, combined data from various studies)

FIGURE 2

RIGHT-OF-WAY USE AT MAJOR STREET (ARTERIAL) INTERSECTIONS

Prepared by

The Wichita-Sedgwick County Metropolitan
Area Planning Department

With Assistance From

The Department of Public Works
of
The City of Wichita

104 South Main Street
Wichita, Kansas

October 11, 1966

EXISTING RIGHT-OF-WAY USE AT MOST MAJOR STREET (ARTERIAL) INTERSECTIONS

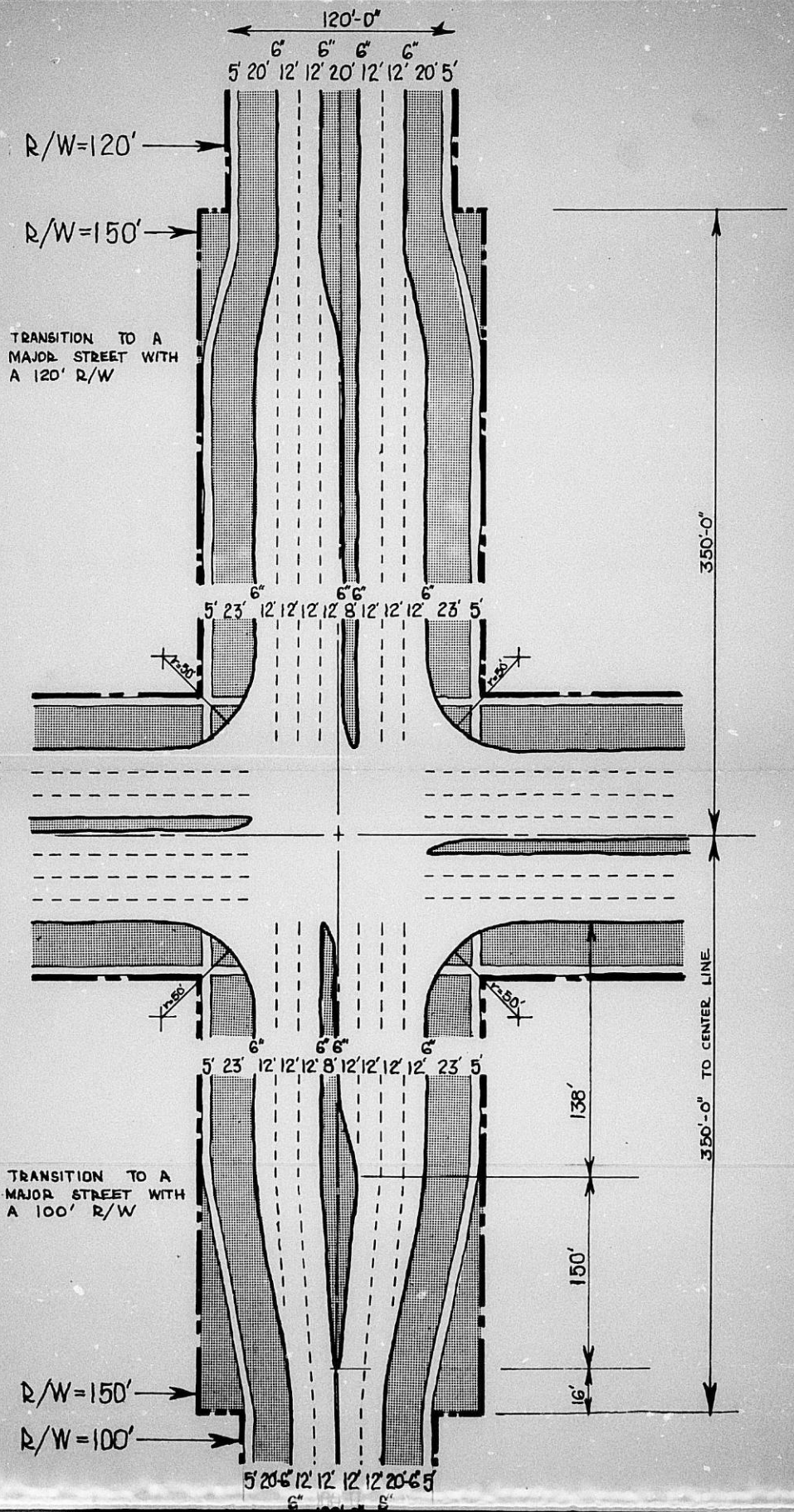
100 FEET OF RIGHT-OF-WAY

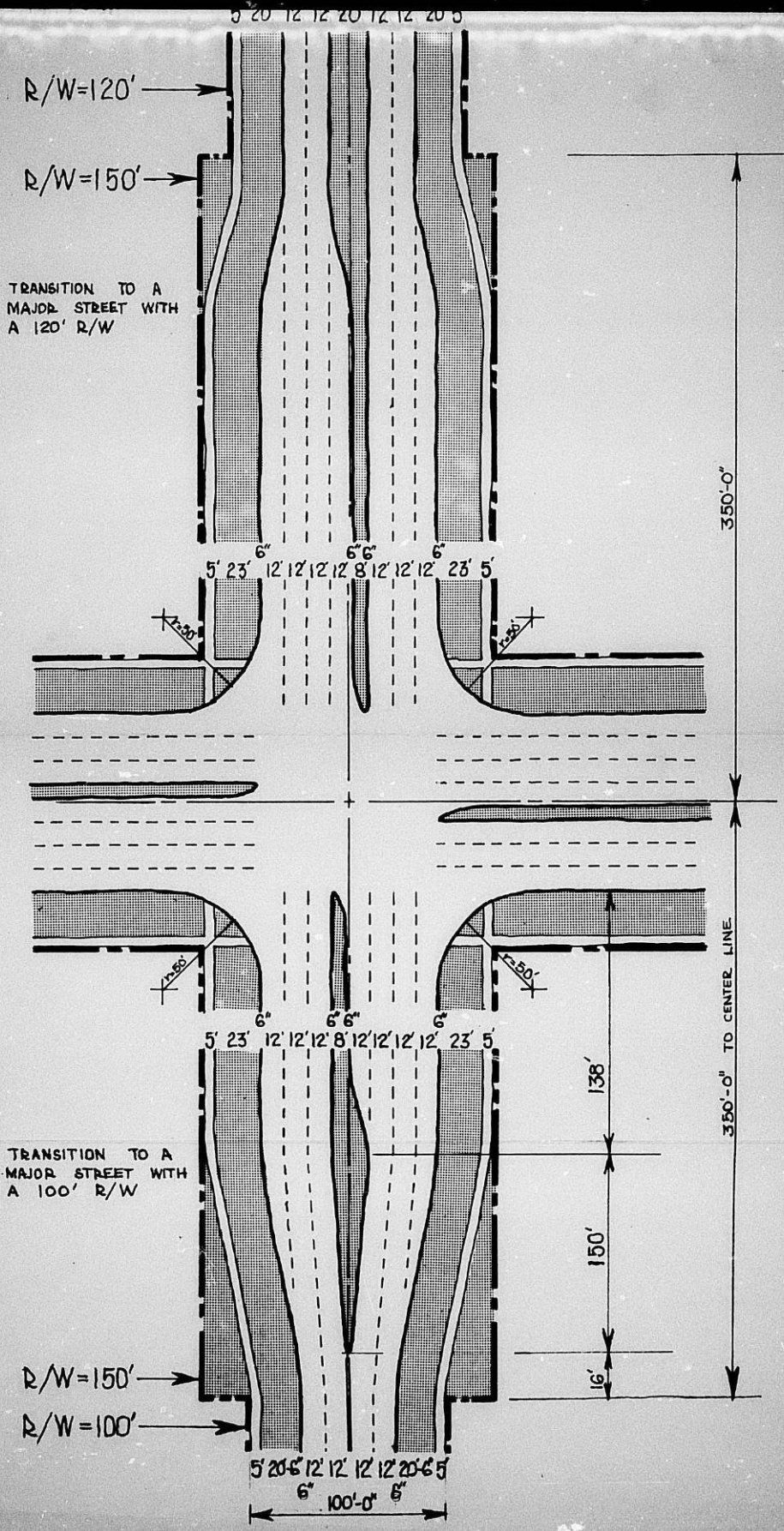
Location	Item	Dimension in Feet	
Structures Above Grade	Four lanes of traffic	48.0	
	Two curbs no provisions for turning vehicles no acceleration lane no sidewalks	1.0	
	Total		49.0
	---	---	
Structures Above Grade and/or Below Grade	Sanitary sewer Storm sewer Gas lines Electric lines Traffic signs Traffic detector conduits and junction boxes Traffic signals	25.5	
	Water lines Telephone lines Television cables (possible) Fire and Police Alarm Systems (possible) Traffic signs Traffic detector conduits and junction boxes Traffic signals	25.5	
	Total		51.0
	Grand Total		100.0

ADOPTED RIGHT-OF-WAY USE POLICY FOR MAJOR STREET (ARTERIAL) INTERSECTIONS

150 FEET OF RIGHT-OF-WAY

Location	Item	Dimension in Feet	
Structures Above Grade	Four through lanes of traffic each 12 feet in width	48.0	
	One median providing: a. left hand turns b. a pedestrian haven c. a location for traffic control devices	20.0	
	One right turn lane	12.0	
	One acceleration lane	12.0	
	Four curbs	2.0	
	Two sidewalks, 5 feet each	10.0	
	Total		104.0
	---	---	
Structures Above Grade and/or Below Grade	Sanitary sewer Storm sewer Gas lines Electric lines Traffic signs Traffic detector conduits and junction boxes Traffic signals	23.0	
	Water lines Telephone lines Television cables (possible) Fire and Police Alarm Systems (possible) Traffic signs Traffic detector conduits and junction boxes Traffic signals	23.0	
	Total		46.0
	Grand Total		150.0


120'-0"
6" 6" 6" 6"
5' 20' 12' 12' 20' 12' 12' 20' 5'
R/W=120'
R/W=150'
TRANSITION TO A MAJOR STREET WITH A 120' R/W
6" 6" 6" 6"
5' 23' 12' 12' 12' 12' 8' 12' 12' 12' 12' 23' 5'
R=30'
R=30'
R=50'
R=50'
350'-0"
350'-0" TO CENTER LINE
138'
150'
16'
TRANSITION TO A MAJOR STREET WITH A 100' R/W
R/W=150'
R/W=100'
5' 20' 6" 12' 12' 12' 12' 20' 6" 5'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6" 6"
138'
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16'
350'-0" TO CENTER LINE.
TRANSITION TO A MAJOR STREET WITH A 100' R/W
R/W=150'
R/W=100'
5' 20-6" 12' 12' 12' 12' 20-6" 5'
6" 6"
100'-0"

CONTROLLING LAND USE TO PROTECT TRANSPORTATION SYSTEM INVESTMENT

by

Roger L. Creighton
Creighton, Hamburg, Inc.

Presented at the Annual Meeting of the
Institute of Traffic Engineers - New York City, N.Y.

September 25, 1972

For many years, transportation planners have been working on the assumption that a steady stream of new investment in roadways — mainly expressways but with new arterials — would add new roadway capacity to urban areas at a rate faster than the increase in travel demand. Actually, this assumption has been borne out in practise in a number of medium and large metropolitan areas, although not in others.

Now, however, assuming steady increases in new roadway capacity is no longer valid. Construction of expressways in a number of metropolitan areas has been halted. In others, plans have been cut back to the bare minimum by official action. The reasons for this change in policy include concern over air and noise pollution, increasing sensitivy of residents to the disruption caused by construction of new facilities, and rapidly rising costs.

Because roadway capacity in urban areas is not growing rapidly, and may, in fact, not increase at all, the urban road system will become more sensitive than formerly to the impact of increased trip generation.

Increased trip generation -- that is, vehicle trip generation -- may be the result of three forces. First is increased density of land use, coming about as the result of tearing down smaller structures and building larger ones, or as the result of building upon land hitherto vacant. Second, people may generate more vehicle trips from the same amount of land use or floor area, as when car ownership rises. Third, people may stop using transit, resulting in increased use of automobiles.

Actually, any combination of the three preceding factors may give rise to increased trip generation. However, in this paper we are mainly concerned with increases in the density of land use and secondarily with the transit factor. Changes in trip generation resulting from higher vehicle ownership are considered here to be a problem of estimation, and not of planning.

If the density of land use rises, and if it is not accompained by an off-setting increases in transit utilization, then increased congestion on the streets will result. The amount of increased congestion can be calculated. Greater congestion will produce more air pollution and more noise (other things being equal) and will result in increased accidents, increased time in travel, and increased operating costs. All these things will result from the change in the density of land use.

Let me illustrate this conclusion with two examples.

Example 1

A Northeastern City

This city is an incorporated community of approximately 40,000 persons lying midway between the metropolitan central business district and the perimeter of the urbanized area. Within it, three tracts totalling some 68 acres came on the market last year.

It was proposed to the local government that this land should be developed with over 3600 dwelling units, 160,000 square feet of light industrial floor space, 500,000 square feet of office space, and 1,000,000 square feet of shopping center floor space. This is, in toto, intense level of development. Altogether, a floor area ratio of more than 1.5 would have been achieved, not counting parking structures. This would have been more than twice the density of the community around it.

Analysis of the traffic impact of this proposed development was illuminating. The projected development would have produced over 60,000 average daily vehicle trips (two directions) between 6 a.m. and 10 p.m. The peak hour travel, again in two directions, would have been 5 and 6 p.m. and a lesser peak of nearly 5500 between 7 and 8 p.m.

All this traffic would have been imposed upon an arterial street system that is currently operating at level of service C[1], with certain links already at service levels D and E. In general, the increased traffic caused by the new development would have downgraded traffic substantially; the majority of links would have been put down to service level D and E.

Studies of transit service and potential transit usage indicated that only a small fraction of trips to and from the new development could be expected to use transit.

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1. As defined in the Highway Capacity Manual, Highway Research Board, Washington, D.C., 1965.

The estimate of the traffic impact of the proposed development was one of the important factors leading the local government to disapprove of the project. Disapproval was made easier by the fact that the local government, through its redevelopment agency, owned the land. Hopefully new proposals will be forthcoming with lesser traffic impacts.

Example 2

An Eastern Community

This community is an unincorporated part of a major eastern central city. An expressway link was being planned directly adjoining the community, but without connections to the community; however, the expressway required the re-planning of certain community streets. The traffic study was a small part of a larger impact study whose purpose was to examine alternative expressway designs and to minimize adverse aesthetic, environmental, land use and traffic impacts.

In the course of this study it became apparent that land adjoining the expressway, but served by local arterial streets, might be redeveloped at much higher than present density. The local arterial streets were already operating at capacity. Currently, in the "study area" there are 1.5 million square feet of floor space. Market analysis suggested that another 1.8 million square feet of floor space could be built and would be marketable.

If total development reached 3.3 million, traffic service on all local streets and arterials would be at level of service E. Traffic would be extremely congested, even with the most optimistic estimates of 30% transit usage.

Factors and Issues

The two preceding examples are sufficiently typical of other cases, many of which can be brought to mind by the reader, that it is safe to use these examples to identify some of the factors which are at issue in problems of land development as related to transportation.

First, there is the factor of profit motive for maximizing the utilization of land within current zoning limitations. The landowner or developer may even try to have zoning limitations removed or modified so that he can further increase his profit, even if it means that the public will have to go to considerable expense to improve transportation facilities or will have to suffer increased congestion and air pollution as a result.

Second, there is the factor of the increased productivity of new, denser development. Large office buildings, major shopping centers, hotels, and to an extent apartment buildings appear to be efficient and profit-generating from the viewpoint of lessor. If this productivity inherent in leasing space in these new buildings did not exist, people would not rent the space.

Third, there is the factor of the municipal tax base. Increased taxes coming from new development are very attractive to municipal officials.

Fourth, there is the factor of inability to improve surface street systems substantially. In both the preceding cases, the existing street systems were of limited capacity and were so configured that it would have been extremely expensive to widen or otherwise improve them. This is often the case because of the high cost of property takings.

Fifth, there is the factor of increasing travel costs resulting from the new development.

Sixth, there is the factor of increased environmental impact caused by growing traffic within confined street space.

What Should Be Done?

The types of problems that I have described are going to recur with sufficient regularity so that something positive should be done about them. That "something" should be a four-part program involving traffic engineers, city planners, and transportation planners. The following kinds of work should be undertaken

1. Continuing Monitoring of Transportation Costs

Each metropolitan area -- each municipality, actually -- should have a continuing, biennial or annual, program of monitoring the condition of transportation within its borders. Monitoring should be based upon regular programs of traffic counting, but with this difference: that the traffic counts should be converted, for each link of the area's arterial and collector network, into (a) level of service and (b) unit and total costs of travel broken down into the components of accident, time, operating, air pollution, and noise costs. Link totals should then be added up into traffic zones and districts, so that the travel costs of parts of the region can be compared with one another and as they change over time. Two results will be obtained. First, the traffic engineer and planner will be able to demonstrate whether transportation costs are rising over time or not, and, second, they will have background data to use when special studies are required for proposed changes in land use.

2. Special Studies

Whenever a new large development is being proposed, or whenever it is suspected that a series of increases in building density are having an accumulative adverse effect upon the level of traffic service in an area, then a special study should be made.

The purpose of this study would be to estimate the probable future change in travel costs resulting from the proposed new development or other estimated changes. Such studies are not difficult to make and can be completed fairly rapidly. The critical aspects of such a study are to make reliable estimates of trip generation by hour of the day, to estimate transit usage, to have good measures of capacity and present traffic volumes, again by hour of the day, and to be able to estimate the directional tendencies of traffic reasonably well, at least within two to three miles of the project. Such studies can then produce estimates of the traffic impact of the new development, in terms that can be understood easily by the layman.

3. Publicity

Given background data from monitoring studies, and given the estimates prepared by special studies, it should be the responsibility of traffic engineers and city planners to make the public aware of the traffic impact of new high density users.

At the present time, the prevailing opinion being voiced in the media is that traffic is the result of a conspiracy between engineers and Detroit, each supposedly working to their mutual benefit. The idea that land use generates traffic, and that controls or incentives should be applied to land development to the mutual advantage of land use and transportation facilities, deserves a great deal of publicity. Very little publicity is given to the fact that land use generates trips, and that it is when land use density is out of balance with transportation capacity that congestion occurs.

It is curious that the potential of establishing some kind or control or incentives for the guidance of land development is not brought forward as a means for supporting transit improvements. We have known for a long time that transit is dependent upon high density land use for successful operation. If one could force development into certain patterns (putting aside for the moment the question of whether or not high density land use is desirable from a social viewpoint) then one could do a great deal to make transit work more efficiently. But this idea is so contrary to current prevailing opinion that there is little talk about it.

4. Controls and Incentives

Give a public awareness of the facts, it is possible that controls and incentives might be authorized by legislatures in the common interest. After all, legislatures are bargaining groups, and administrators should be pretty shrewd about their municipal balance sheets and competitive positions with respect to the rest of the world. Further, the environmentalists may be potent allies of the engineers and

planners in this situation. Noise and particularly air pollution have a relationship with health, and health is one of the prime reasons for instituting police-power actions such as zoning.

The following controls and incentives could be applied:

a. Zoning.

b. Redevelopment controls, applied whether public funds or powers have been used to redevelop land.

c. Changes in tax write-off laws to favor builders who locate their structures close to transit stations.

CONCLUSION

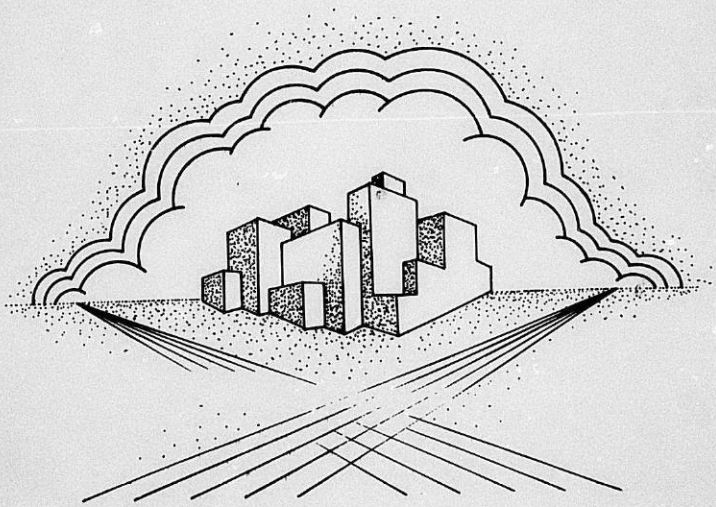
In the past, both transportation planners and traffic engineers have worked with the assumption that nothing could be done about land use. The growth of land use, it was reasoned, could be forecasted, but not controlled. This assumption was not critical ten or fifteen years ago because of the then-prevailing optimism about our ability to provide new roadway capacity.

Now, with decreased ability to provide capacity, traffic service has become a direct function of land use. Unless development is carefully guided, the street system will suffer. The same line of reasoning applies to transit.

For these reasons, traffic engineers and transportation planners are going to have to expand the subject areas with which they are concerned.

They will have to attempt to influence the future use of land in order to protect investment in transportation. If they do not, transportation facilities will become more congested, and they will be blamed for it.

Kellogg Mall Traffic Study



Traffic Engineering
Division
City of Wichita
— Jan 1973 —

KELLOGG MALL TRAFFIC STUDY

PURPOSE

It is the purpose of this report to analyze a report entitled, "Traffic Report - Proposed Commercial Development, Wichita, Kansas." This report was prepared by Raymond Keyes Engineers, Inc., Consulting Site Engineers based at Elmsford, New York.

SCOPE

This study analyzes the impact of a regional shopping center on the existing street network surrounding the proposed site. Included in this report will be a recommended roadway design to accommodate the anticipated shopping center traffic for the year 1980. A capacity analysis of all key intersections associated with this project will be evaluated.

THE SITE

The proposed location of this regional shopping center is at the northwest corner of Kellogg and Rock Road. In general, the area is bounded on the north by Douglas, on the east by Rock Road, on the south by Kellogg and on the west by Armour Drive. Included within this area are approximately 64 acres of land available to the proposed Kellogg Mall Shopping Center.

EXISTING AND FORECASTED TRAFFIC

The Traffic Engineering Division conducts biyearly 24-hour traffic volume counts at key intersections throughout the city of Wichita. These counts are then factored to represent an annual average daily traffic volume. The Raymond Keyes Report bases its highway and arterial street traffic upon the 1970 traffic flow map. The following table entitled, "Existing and Forecasted AADT" lists the existing and forecasted traffic volumes at key locations.

EXISTING AND FORECASTED AADT*

	Actual	Projected		
	1970	1974	1975	1980
Rock Road				
north of Douglas	8,926	10,400	10,730	12,550
south of Douglas	8,529	9,880	10,220	11,930
north of Kellogg	10,151	11,780	12,200	14,200
south of Kellogg	10,373	12,050	12,450	14,520
Douglas				
east of Rock Road	2,306	2,665	2,760	3,220
west of Rock Road	3,340	3,880	4,010	4,680
Kellogg				
east of Rock Road	19,602	22,750	23,550	27,400
west of Rock Road	20,824	24,200	25,000	29,200

*Source: Traffic Report - Proposed Commercial Development, Wichita, Kansas by Raymond Keyes Engineers, Inc.

TABLE 1

The figures in the above table were projected upon a 4% growth rate per year. The following table indicates our projection of the existing 1970 volumes based upon a 4% growth rate per year.

EXISTING AND FORECASTED AADT

	Actual	Projected		
	1970	1974	1975	1980
Rock Road				
north of Douglas	8,926	10,442	10,860	13,213
south of Douglas	8,529	9,978	10,377	12,625
north of Kellogg	10,151	11,875	12,350	15,026
south of Kellogg	10,373	12,135	12,620	15,355
Douglas				
east of Rock Road	2,306	2,698	2,806	3,413
west of Rock Road	3,340	3,907	4,064	4,944
Kellogg				
east of Rock Road	19,602	22,932	23,848	29,016
west of Rock Road	20,824	24,361	25,336	30,825

TABLE 2

The difference between the two tables is the result of the compounding effect of a 4% growth rate per year. The first table actually reveals a 40% increase in traffic volumes at each of the key locations which would be somewhat less than a 4% growth rate per year, while the second table reveals a 4% growth rate per year compounded for the ten-year period for a total growth rate of approximately 148%.

FORECASTED KELLOGG MALL TRAFFIC

The forecasted Kellogg traffic generated by the proposed site must be divided into two major segments. They are (1) shopping center traffic and (2) office and motel traffic.

The shopping center traffic in the Raymond Keyes Report was projected at a generation rate of 18 vehicles per thousand square feet of gross leasable area. This represents only the trips generated to the site. In addition to these trips, of course, you would have the return trip which would be generated from the site. Therefore, the 18 vehicles per thousand square feet trip generation rate actually accounts for 36 trips to and from the proposed site per thousand square feet of gross leasable area.

The office and motel traffic generation rate was computed at eight vehicles per thousand square feet. Again, this actually represents 16 vehicles to and from the site per thousand square feet of gross leasable area.

In forecasting the total anticipated site generated traffic in the Raymond Keyes Report, some basic assumptions were used. They were revealed in a table entitled, "Total Anticipated Site Generation Traffic." The following table is reproduced from that report.

TOTAL ANTICIPATED SITE GENERATION TRAFFIC

	Stage I	Stage II
Year of Completion	1974	1975
Year of Ultimate Traffic	1979	1980
Gross Leasable Area (retail) (s.f.)	700,000	1,135,000
Office and Motel Area (s.f.)	--	296,950
Parking Available (spaces)	7,768	7,768
Parking Index (space/1,000 s.f.)		
Retail	18	18
Office and Motel	8	8
Estimated Daily Vehicles		
Retail	12,600	20,430
Office and Motel	--	2,372

TABLE 3

Of special interest to us in the analysis of the anticipated generated traffic are the two major factors in determining the forecasted traffic: (1) gross leasable area and (2) daily trip generation rate per thousand square feet. All forecasted volumes were based upon a gross leasable area for retail of 1,135,000 square feet, while the office and motel area was based upon 296,950 square feet. The daily trip generation rate per thousand square feet for retail was based upon 18 trips per thousand square feet while the office and motel was based upon eight trips per thousand square feet. By multiplying the gross leasable area retail times the daily trip generation per thousand square feet retail, one arrives at the estimated daily vehicles per retail as revealed in the next to the last line of Table 3. The table reveals 20,430 trips generated to this retail site on an average day. In addition to this count, we must also add on the volume of traffic generated for office and motel use. Again this figure is arrived at by multiplying the office and motel area of square feet times the total traffic generation rate per thousand square feet of office and motel. This will result in an additional 2,372 trips generated to the site.

For comparison of daily generation rates which are forecast by the consultant to the actual daily generation rates which we have experienced in the city of Wichita, the following table is included:

DAILY GENERATION RATES

Date	Location	Generation Rate
August 27, 1971 (Friday)	Harry Street Mall	15
August 28, 1971 (Saturday)	Harry Street Mall	24
March 10, 1972 (Friday)	Twin Lakes	18
March 11, 1972 (Saturday)	Twin Lakes	25
April 22 & 29, 1971 (Thursday)	Metcalf South (Overland Park, Kansas)	18
April 24 & May 1, 1971 (Saturday)	Metcalf South (Overland Park, Kansas)	25
December 17, 1971 (Friday)	Twin Lakes	31
December 18, 1971 (Saturday)	Twin Lakes	42

TABLE 4

The preceding daily generation rates are based upon shopping centers of a magnitude considerably smaller than the one proposed as the Kellogg Mall. Both the Harry Street Mall and the Twin Lakes Center are approximately 300,000 square feet of gross leasable area, while the Metcalf South Shopping Center in Overland Park is approximately 800,000 square feet. Of special concern to the Traffic Engineering Division is the actual trip generation rate applied to this proposed shopping center. Presently, the city of Wichita is experiencing a daily generation rate of between 15 and 42 trips per thousand square feet. It should be further clarified that the lower generation rates experienced in the city of Wichita occur during off-retail sale days as compared to the higher generation rates which occur during the Christmas shopping rush. We realize that it is impossible to design a facility to handle the maximum anticipated forecasted traffic, but we do believe that this facility should be designed to handle approximately 85% of the maximum forecasted traffic.

Assuming that the December 18, 1971 Twin Lakes generation rate of 42 actually becomes a reality at this shopping center, the proposed shopping center will be designed to handle only approximately 43% of its traffic; or stating this another way, the 18 trips generated per thousand square feet of retail area will actually become 42 trips generated per thousand square feet of retail area. This will result in a peak day vehicular demand of approximately 47,670 trips generated to this site compared to the projected generation rate of 20,430 trips.

In summary, we feel that the consultant has picked a trip generation rate which he believes is realistic from his studies of various shopping centers throughout the United States of equal magnitude to the Kellogg Mall Shopping Center. He has indicated to us that several of the centers which he has studied are actually generating more traffic than which he is forecasting for this center, while the opposite has occurred in other centers where they have actually experienced less traffic generation rates than he is forecasting for this center.

It is our concern, substantiated by the daily generation rate table and the impact of the vehicle on Wichita citizens that the generation rate which he has chosen may be somewhat lower than what will actually occur. From our somewhat limited studies, we would anticipate a generation rate to the shopping center of from 22 to 25 vehicles per one thousand square feet of retail area on an average day. This would result in a traffic increase to the site of from 122% to 139%, depending upon whether you use the 22 or 25 generation rate.

DISTRIBUTION OF SHOPPING CENTER TRAFFIC

The actual origin and distribution of shopping center traffic to this site could be debated for many years to come. Each forecaster would probably have somewhat of a different opinion as to the actual distribution, although the overall effect would be much the same. It is for this reason that the Traffic Engineering Division will agree with the proposed distribution presented in the Keyes Report.

ANTICIPATED SHOPPER DISTRIBUTION*

From	Percent
Douglas Avenue (westbound)	2
Douglas Avenue (eastbound)	15
Kellogg Street (westbound)	3
Kellogg Street (eastbound)	45
Rock Road (northbound)	20
Rock Road (southbound)	15
Total --	100

*Source: Traffic Report - Proposed Commercial Development, Wichita, Kansas. Raymond Keyes Engineers, Inc.

TABLE 5

The actual distribution of this traffic into the site is illustrated on Figures 2, 3 and 4 of the Raymond Keyes Engineers Report. These figures are attached in the appendix of this report.

TOTAL FORECASTED TRAFFIC

The design of the roadway network for handling the traffic at this location must be based upon the following elements:

1. Forecasted Arterial or Highway Traffic - For the purpose of this study, this is all the traffic which is presently existing on Kellogg, Rock Road and Douglas. The existing volumes used in this study were based upon the 1970 volumes which were shown in Table 1. Mr. Keyes, the consulting engineer on this study, indicates that historically, these volumes can be expected to increase by approximately 4% to 5% per year. His study was based upon a lower rate of 4% a year and these projections were made by himself and this Division as indicated in Tables 1 and 2, respectively of this report.

2. Forecasted Shopping Center Traffic - In order for us to make a comparative analysis of the Keyes Report, we have assumed a trip generation rate of 18 vehicles per one thousand square feet of gross leasable area for the design year.
3. Office and Motel Traffic - Again, for comparison figures, the Traffic Engineering Division has used an average trip generation rate of eight vehicles per thousand square feet to analyze the traffic generated by office and motel users.

The forecasted traffic volumes by various years are reproduced from the Raymond Keyes Report (Table No. 6) which are denoted on page 8 of this report. Using the same assumptions that Mr. Keyes uses in developing his traffic volumes for years 1974, 1975 and 1980, we have arrived at Table 7 (page 9) of this report. This table reveals that our figures are from 3% to 4% higher at all locations except the Kellogg count, west of Rock Road. At this point, our figures are approximately 1% lower than the forecasted figures in the Keyes report. A portion of the errors between the two tables may be due to rounding, especially with the columns entitled, "Retail" and "Office". In almost all cases, the column entitled, "Highway", the error is due to the 4% per year compounded compared to the 4% for ten years equaling 40% growth rate; in other words, comparing 40% to the actual compounded 4% of 48%.

The actual distribution of the traffic into and around this shopping center is illustrated on Exhibit 1. This exhibit reveals the forecasted traffic volume on the major street during the peak highway hour. The volumes forecasted for Kellogg are in excess of any volumes which are presently being recorded within the city of Wichita during any peak hour.

RECOMMENDED IMPROVEMENTS

Kellogg (U. S. 54)

The traffic volumes which are forecasted along Kellogg in the vicinity of this shopping center are in excess of those which can be handled by an expressway facility. This analysis was based upon level of service C, which in layman terms would accommodate all traffic waiting at a signal during each signal cycle. Theoretically, this facility could be designed to handle service level F or maximum capacity. In reality, the theoretical capacity has very seldom been reached

	1974				1975				1980			
	Highway	Retail	Office	Total	Highway	Retail	Office	Total	Highway	Retail	Office	Total
Kellogg, west of Rock Road	24,200	2,520	-	26,720	25,000	4,075	107	29,182	29,200	8,150	107	37,457
Kellogg, east of Rock Road	22,750	380	-	23,130	23,550	615	142	24,307	27,400	1,230	142	28,772
Rock Road, north of Kellogg	11,780	4,790	-	17,570	12,200	7,750	1,020	20,970	14,200	15,500	1,020	30,720
Rock Road, south of Kellogg	12,050	2,520	-	14,570	12,450	4,075	950	17,475	14,520	8,150	950	23,620
Rock Road north of Douglas	10,400	1,880	-	12,280	10,730	2,050	710	14,490	11,550	6,100	710	19,360
Rock Road south of Douglas	9,880	1,700	-	11,580	10,220	2,750	808	13,778	11,930	5,500	808	18,238
Douglas, west of Rock Road	3,880	442	-	4,322	4,010	715	0	4,725	4,680	1,430	0	6,110
Douglas, east of Rock Road	2,665	252	-	2,917	2,760	407	95	3,262	3,220	817	95	4,130
Kellogg, west of Armour	24,200	5,650	-	29,850	25,000	9,175	2,140	36,315	29,200	18,350	2,140	49,690
Douglas, west of Armour	3,880	1,880	-	5,760	4,010	3,050	710	7,770	4,680	6,100	710	11,490

Source: Traffic Report - Proposed Commercial Development, Wichita, Kansas. Raymond Keyes Engineers, Inc.

TABLE 6

	1974				1975				1980			
	Highway	Retail	Office	Total	Highway	Retail	Office	Total	Highway	Retail	Office	Total
Kellogg west of Rock Road	24,361	1,894	-	26,255	25,336	3,065	71	28,472	30,825	6,129	71	36,925
Kellogg, east of Rock Road	22,932	379	-	23,311	23,848	613	142	24,603	29,016	1,226	142	30,384
Rock Road north of Kellogg	11,875	4,799	-	16,674	12,350	7,764	1,020	21,134	15,026	15,527	1,020	31,573
Rock Road south of Kellogg	12,135	2,526	-	14,661	12,620	4,086	950	17,656	15,355	8,172	950	24,477
Rock Road north of Douglas	10,442	1,894	-	12,336	10,860	3,065	710	14,635	13,213	6,129	710	20,062
Rock Road south of Douglas	9,978	1,705	-	11,683	10,377	2,758	808	13,943	12,625	5,516	808	18,949
Douglas, west of Rock Road	3,907	442	-	4,349	4,064	715	0	4,779	4,944	1,430	0	6,374
Douglas, east of Rock Road	2,698	253	-	2,951	2,806	409	95	3,310	3,413	817	95	4,325
Kellogg, west of Armour	24,361	5,683	-	30,044	25,336	9,194	2,135	36,665	30,825	18,387	2,135	51,347
Douglas, west of Armour	3,907	1,894	-	5,801	4,064	3,065	710	7,839	4,944	6,129	710	11,783

TABLE 7

on existing conditions as other factors cause a breakdown in its ultimate occurrence. The theoretical capacity does represent a jammed condition where, during all signal cycles during the peak hour, it would be completely jammed and there would always be cars waiting, and these cars would be waiting for four, five, six and more cycles before they were able to proceed on through the intersection. Assuming one was able to accept theoretical capacity for this segment of Kellogg, Kellogg would require six lanes plus dual left and right turn lanes where they are needed. In order to help you visualize this facility, we will follow eastbound Kellogg as it proceeds through the project. Approximately one-quarter to one-half mile west of Armour Drive, the present two-lane Kellogg facility for eastbound traffic would be widened to three lanes. Then as we approach the Kellogg and Armour intersection, a dual left turn lane for eastbound Kellogg traffic to turn north into Armour Drive would be required. Therefore, the eastbound approach at Kellogg and Armour Drive would be composed of three lanes of through traffic with an optional right turn in the outside lane plus a dual left turn lane. This requires a five lane approach.

Proceeding east of the Kellogg and Armour intersection, we would continue the three lanes of eastbound traffic until we approach the intersection of Kellogg and Rock Road. As we approach this intersection, it becomes necessary to widen Kellogg to accommodate a dual left turn for eastbound Kellogg to go north on Rock Road and also to develop a right turn lane which is really a free right turn lane for eastbound traffic to go south on Rock Road. This would require a sixth lane approach for eastbound traffic at Kellogg and Rock Road. As you continue east, beyond the intersection of Kellogg and Rock Road, three through lanes for eastbound Kellogg traffic would be required for several hundred feet until they could be combined into two through lanes, approximately one-quarter to one-half mile west of Kellogg and Rock Road.

Following westbound Kellogg traffic through the project, we will begin our trip at approximately one-quarter to one-half mile east of Rock Road. At this point, we will make a transition from a two-lane roadway for westbound traffic into a three-lane roadway. As we approach the Kellogg and Rock Road intersection, it will become necessary to develop a left turn lane and a right turn lane in addition to the three through lanes. Therefore, the actual approach for westbound traffic at Kellogg and Rock Road will be composed of a left turn lane, three through lanes, and a right turn lane for a total of five

lanes. As we proceed west from the Kellogg and Rock Road intersection, it will be necessary to maintain the three through lanes plus an additional deceleration/acceleration lane as required for the slip-off ramp and slip-on ramp. As westbound traffic approaches the intersection of Kellogg and Armour, it will become necessary to develop a left turn lane for westbound traffic wishing to turn south on Armour Drive. At this point, the westbound approach is composed of three through lanes and a left turn lane for a total of four lanes.

Proceeding on west from the intersection of Kellogg and Armour Drive, it is necessary to maintain three through lanes for several hundred feet. Then it will be necessary to make a transition of the three through lanes into two through lanes, approximately one quarter to one-half mile west of the Kellogg and Armour intersection. The alignment of this proposed roadway is illustrated on Exhibit 2.

The forecasted traffic volumes at the intersection of Kellogg and Armour Drive will require signalization. It is our recommendation that the signalization be a fully actuated dual left turn controller.

Up to this point, we have been talking only about the mainline Kellogg traffic. In addition to this roadway, it will also be necessary to reconstruct the existing service roads, both north and south of Kellogg. A proposed alignment for this frontage road is also illustrated on Exhibit 2. The right-of-way required to accomplish this widening project will vary from 220 to 345 feet.

Rock Road

Alternate No. 1 -

Based upon the assumption set forth in the Raymond Keyes Report, Rock Road could be designed to accommodate the anticipated traffic for 1980. In general, this roadway would be three lanes southbound for through traffic and two lanes northbound for through traffic with additional left turn lanes where required. To help you visualize the proposed Rock Road improvements, we will follow Rock Road south of Douglas to Kellogg. Just beyond the intersection of Douglas and Rock Road, it will be necessary to construct a third lane for southbound traffic for the entire length of this project. This southbound lane will serve a dual purpose as a through lane for southbound traffic and also to serve traffic wishing to enter and exit the shopping center at entrances labeled C, D and E. As we approach the intersection of Kellogg and Rock Road, it will be necessary to

widen Rock Road for an additional two lanes. One of these lanes will be for a left turn lane for southbound Rock Road traffic to turn east onto Kellogg and an additional right turn lane so that we can form a dual right turn lane for southbound traffic wishing to turn west on Kellogg. The actual approach on Rock Road for southbound traffic at Kellogg will be composed of a left turn lane, two through lanes, and a dual right turn lane for a total of five lanes approaching the intersection.

As you proceed south of the Kellogg and Rock Road intersection, it will be necessary to reconstruct Rock Road to accommodate two lanes of through traffic plus an acceleration lane for cars wishing to turn right off Kellogg onto Rock Road.

Starting at a point several hundred feet south of the intersection of Kellogg and Rock Road, we will follow northbound traffic as it proceeds along Rock Road. At this point, it is necessary to reconstruct Rock Road to a minimum of two lanes of through traffic northbound. As we approach the intersection of Kellogg and Rock Road, it will be necessary to widen the Rock Road approach to accommodate a left turn lane and a right turn lane for a total of four lanes for the northbound approach. As you proceed on north through the intersection of Kellogg and Rock Road, it will be necessary to continue a three lane, northbound Rock Road to the intersection of Rock Road at Entrance C. At this point, the outside through lane will be transitioned into the middle lane for northbound traffic. As we continue on north through the length of this project, it will be necessary to maintain two lanes of through traffic plus a left turn lane at each major intersection (shown on Exhibit 3).

Three new signals will be required along Rock Road at the three major entrances to the Kellogg Mall Shopping Center. These intersections would require fully actuated traffic signals. Analysis indicates that signal progression cannot be accomplished along Rock Road. Since Rock Road is classified as a major arterial street, we believe the primary function of Rock Road should be to handle through traffic. Without signal progression between Douglas and Kellogg on Rock Road, through traffic will be penalized for the benefit of the shopping center.

Alternate No. 2

This alternate was designed for the primary function of accommodating through traffic along Rock Road and local traffic into the shopping center. Instead of the three signals proposed under Alternate #1, this alternate would provide for only one signal at the main entrance labeled D.

Following southbound Rock Road traffic through the project, we will begin our trip south of Douglas Avenue. As we proceed south from Douglas on Rock Road, the existing two-lane facility will have to be widened into three through lanes for southbound traffic as we approach Entrance E. The outside lane of these three through lanes is an optional through and right turn acceleration/deceleration lane. These three through lanes continue south between Entrances E and D. As we proceed on south at Entrance D, an additional lane for southbound traffic must be developed. This lane is a combination acceleration/deceleration lane for right turn lanes, exiting Entrance D and right turn lanes entering Entrance C. In other words, between Entrance C and D, southbound Rock Road will be composed of four moving lanes.

Continuing on south at Entrance C, four moving lanes of traffic will be required as we approach the intersection of Kellogg and Rock Road. The outside lane again will be used for acceleration/deceleration lanes for through movement. Just prior to Kellogg, an additional left turn lane for traffic wishing to turn left off Rock Road southbound onto Kellogg eastbound will be required. The total approach southbound at Kellogg on Rock Road will be composed of five lanes (left turn lane, two through lanes and a dual right turn). As you proceed south of the Kellogg and Rock Road intersection, it will be necessary to reconstruct Rock Road to accommodate two lanes of through traffic plus an acceleration lane for cars wishing to turn right off Kellogg onto Rock Road. Several hundred feet south of Kellogg and Rock Road, southbound Kellogg traffic will make a transition from three lanes to two lanes.

Starting at a point several hundred feet south of the intersection of Kellogg and Rock Road, we will follow northbound traffic as it proceeds along Rock Road. At this point, it is necessary to reconstruct Rock Road to a minimum of two lanes of through traffic northbound. As we approach the intersection of Kellogg and Rock Road, it will be necessary to widen the Rock Road approach to accommodate a left turn lane and a right turn lane for a total of four lanes on the approach. As you proceed on north through the intersection of Kellogg and Rock Road, it will be necessary to continue a three lane northbound Rock Road.

Also, as you approach Entrance C, a left turn lane must be developed. Continuing on north from Entrance C, Rock Road will be composed of three through lanes through the intersection of Rock Road and Entrance D. Prior to the intersection of Rock Road and Entrance D, a dual left turn lane for northbound traffic wishing to enter the shopping center must be constructed. Therefore,

the northbound approach at Entrance D will be composed of dual left turn lanes plus three through lanes.

Proceeding on north, beyond the intersection of Kellogg and Entrance D, we will make a transition of the three lanes of through traffic into two lanes northbound just south of Linwood. As we approach the intersection of Rock Road and Entrance E, northbound traffic will be composed of a left turn lane and two through lanes. North of Entrance E, Rock Road northbound will follow the existing alignment (shown on Exhibit 4).

Douglas Avenue

Based upon the forecasted traffic volumes which will be using Douglas, we do not see any capacity deficiencies in the existing Douglas Avenue. The volumes forecasted on Douglas at Armour and the other entrances to the shopping center do not require signalization. We believe a word of caution is due here: Douglas is the only main roadway into the shopping center with excess capacity. As the other two main roadways become saturated with vehicular traffic, the attractiveness of Douglas will be an influential factor.

Armour Drive

Based on the assumptions of this report, it will be necessary to construct Armour Drive from Douglas south to the existing Armour Drive. This construction will be limited to a proposed two-lane facility on the east bank of the drainage ditch. The existing two-lane facility just north of Kellogg will have to be re-designed to accommodate three moving lanes northbound and two moving lanes southbound. The three lanes northbound are necessary to accommodate the dual left turn movement from Kellogg eastbound to Armour Drive northbound. One of the moving southbound lanes will be a free right turn lane.

SITE CIRCULATION

Special consideration must be given to the interior circulation route and its relationship to the major entrances along Rock Road. The actual storage requirement at each of the major intersections of Rock Road will dictate the proper location for the interior circulation route. Exhibit 4 , which is a plan view of Alternate #2, reveals the required storage for each of the major entrances along Rock Road and the proposed location of the interior circulation route.

CONCLUSIONS

This report has been based on three of the assumptions used in the Raymond Keyes Report. They are as follows:

1. Forecasted arterial/highway traffic was projected at a 4% growth rate per year
2. The gross leasable area retail was based upon 1,135,000 square feet while the office and motel area was based upon 296,950 square feet
3. The daily trip generation rates per 1,000 swuare feet of retail and office/motel were based upon 18 and 8, respectively

If the total net results of the above assumptions exceed the forecasted values, the validity of this study will be negated.

The improvements of Kellogg are beyond feasibility as an expressway. Therefore, no improvements to the existing Kellogg should be proposed under anything less than freeway standards. NOTE: Freeway requirements in the way of design standards and right-of-way have not been analyzed.

Rock Road should be improved to the minimum geometrics as shown on Exhibit 4, which is Alternate #2 of the report.

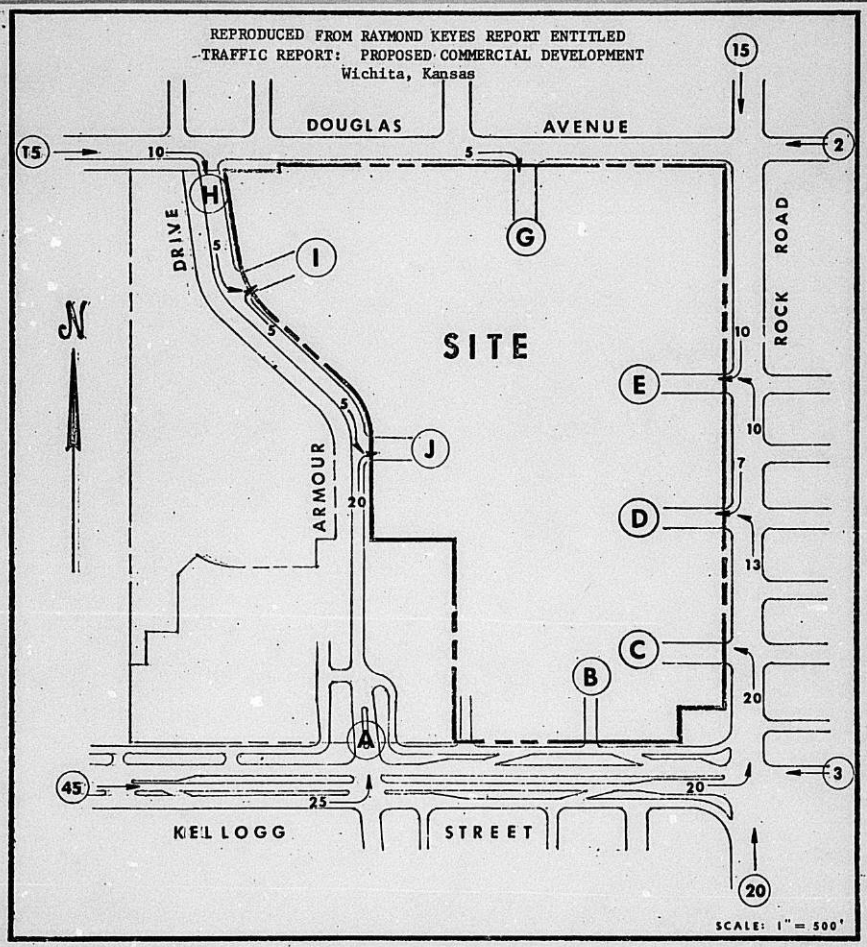
The signalization for this project shall be based upon recommendations from the Traffic Engineering Division. Any proposed signals will be at the expense of the developer.

The major entrances shall be redesigned to accommodate the peak highway traffic demand.

Neither the Raymond Keyes Report nor this report analyzes a proposed medial cut on Kellogg between Armour and Rock Road for eastbound traffic to enter the shopping center. This proposed cut has been illustrated on several site plans shown by the developer. This Division cannot support a medial cut at this location due to the existing openings at Armour and Rock Road.

APPENDIX

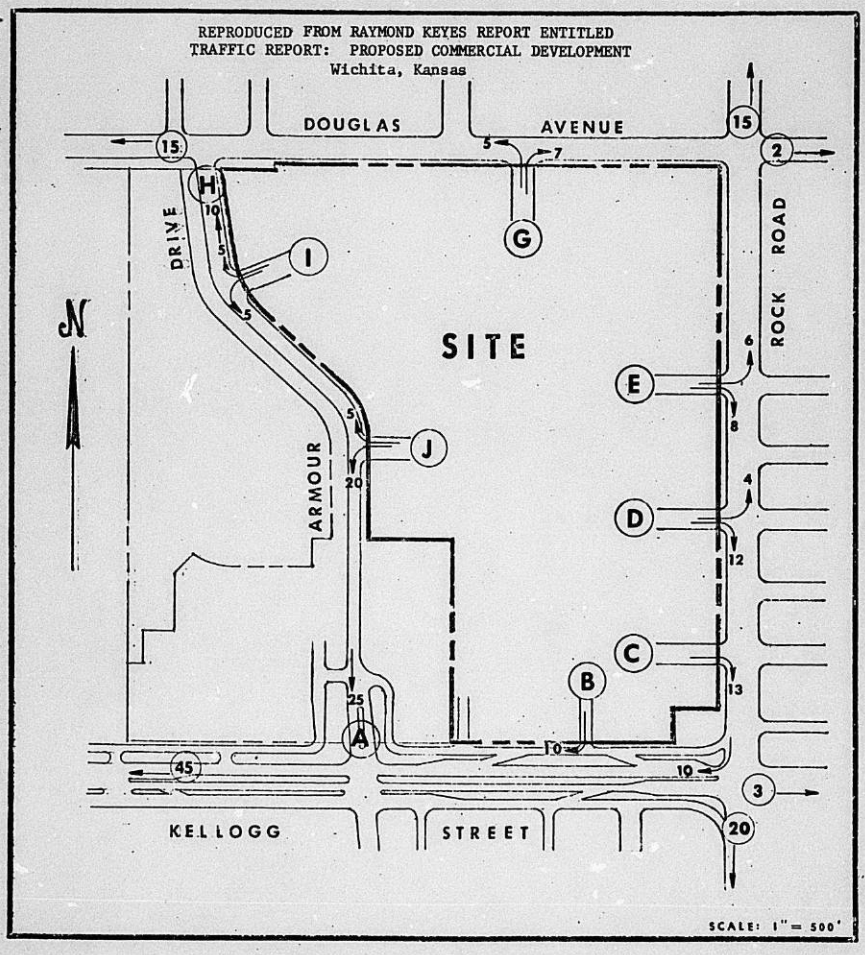
REPRODUCED FROM RAYMOND KEYES REPORT ENTITLED
TRAFFIC REPORT: PROPOSED COMMERCIAL DEVELOPMENT
Wichita, Kansas



SHOPPING CENTER
DISTRIBUTION OF ENTERING TRAFFIC
IN PERCENT
PROPOSED DEVELOPMENT
WICHITA KANSAS

DATE: 3-7-72 RAYMOND KEYES ENGINEERS, P.C. FIGURE " 2 "

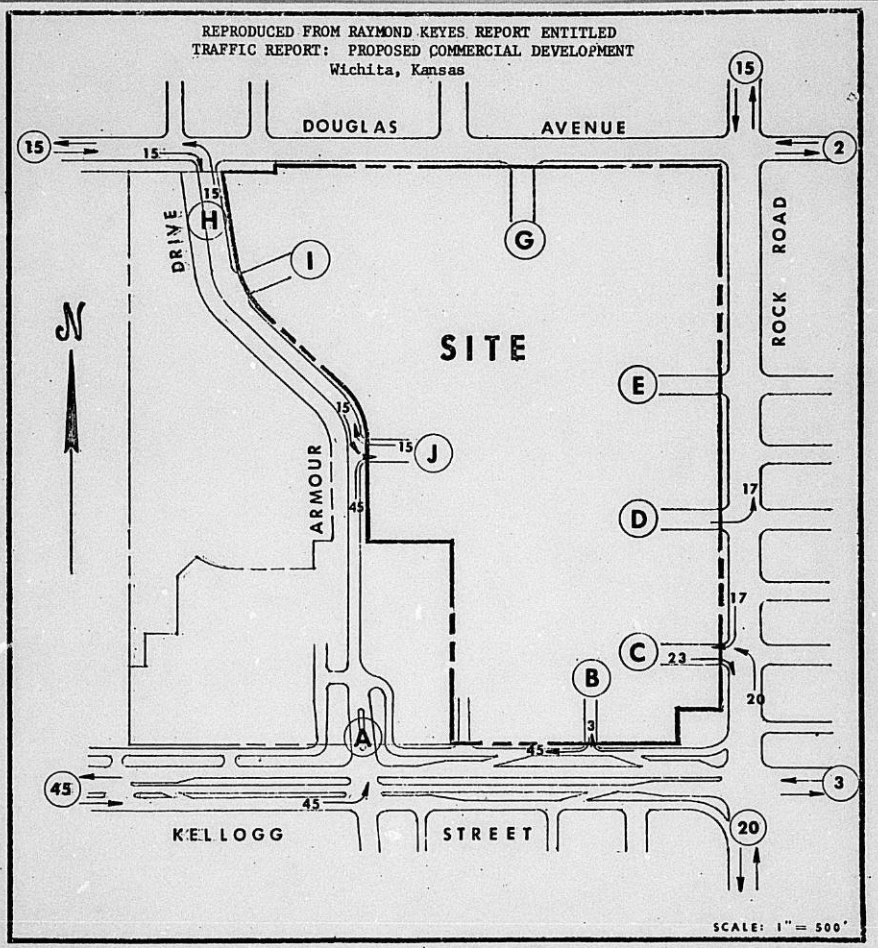
REPRODUCED FROM RAYMOND KEYES REPORT ENTITLED
TRAFFIC REPORT: PROPOSED COMMERCIAL DEVELOPMENT
Wichita, Kansas



SHOPPING CENTER
DISTRIBUTION OF EXITING TRAFFIC
IN PERCENT
PROPOSED DEVELOPMENT
WICHITA KANSAS

DATE: 3-7-72 RAYMOND KEYES ENGINEERS, P.C. FIGURE " 3 "

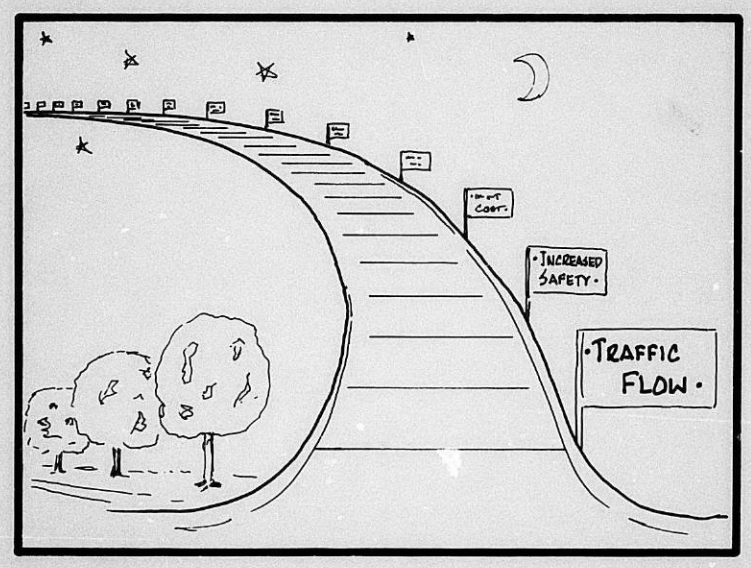
REPRODUCED FROM RAYMOND KEYES REPORT ENTITLED
TRAFFIC REPORT: PROPOSED COMMERCIAL DEVELOPMENT
Wichita, Kansas



OFFICE AND MOTEL
DISTRIBUTION OF ENTERING AND EXITING TRAFFIC
IN PERCENT
PROPOSED DEVELOPMENT
WICHITA KANSAS

DATE: 3-7-72 RAYMOND KEYES ENGINEERS, P.C. FIGURE " 4 "

FIRST and SECOND STREET IMPROVEMENTS



CITY of WICHITA

DEC. 1971

FIRST AND SECOND STREET IMPROVEMENTS

INTRODUCTION

First and Second Streets, generally from Hydraulic to Hillside, have been programmed for reconstruction a number of times in the past. The roadways on both streets are substandard for arterial street loads and are inadequate to carry existing and expected traffic volumes. Neighborhood opposition has arisen to oppose programmed improvements primarily from concern for the neighborhoods which are adjacent to both First and Second Streets. Many concerned citizens are of the opinion that reconstructing the subject streets will result in a deterioration of their neighborhoods due to increased traffic volumes and the loss of approximately 200 trees.

It appears at this time that the First and Second Street dilemma is approaching a critical stage with the construction of I-35W from English to 21st Street in progress. Prior planning efforts determined that First and Second Streets would be the most desirable locations for an interchange. This interchange will be constructed and will transfer large volumes of freeway traffic onto and off of the arterial street network at this location. For that reason, it is important that immediate action be taken to insure adequate arterial capacity to handle the freeway generated trips in addition to the existing high volumes.

PURPOSE

The purpose of this report is to provide information regarding the proposed First and Second Street improvements. Four (4) alternates to the reconstruction of First and Second Streets are discussed. Items considered

include traffic volumes, circulation requirements, traffic signalization, right-of-way requirements, and the existing condition of the streets involved.

BACKGROUND

For the purposes of this report, reference to First and Second Streets refers to the segment of those streets from the proposed I-35W interchanges east to Hillside. First and Second Streets within the limits, as stated above, each have 30-foot pavements constructed more than 40 years ago on 60 feet of right-of-way. Those streets were converted to one-way operation more than 20 years ago. Second Street is one-way westbound from Edgemoor to Waco and First Street is one-way eastbound from Waco to Edgemoor. First and Second Streets presently function as arterial streets, connecting the CBD to the eastern section of the city.

The existing physical condition of First and Second Streets is not good. Due to the age of both streets, base and sub-base failure can be expected, which result in high maintenance costs. In the opinion of the Superintendent of Public Works Maintenance, the subject streets could be maintained up to ten years without reconstruction; however, past that time period, it would be more economical to reconstruct the streets than to provide major maintenance that would be required.

First Street currently carries an average daily traffic (ADT) from approximately 11,000 vehicles per day (VPD) west of Hillside to approximately 12,500 VPD west of Hydraulic. Second Street volumes range from approximately 8,250 VPD west of Hillside to approximately 10,500 VPD west of Hydraulic.

Traffic volumes projected for the year 1986 indicate a demand on First and Second Streets of approximately 15,000 vehicles just to the west of I-35W and a demand of approximately 11,500 vehicles per day just to the east of I-35W. This projection is based on I-35W, the innerloop and the Kellogg freeway from Hillside to the Big Arkansas River being completed. The projection was supplied to the Traffic Engineering Division by the Kansas State Highway Commission.

PROPOSED IMPROVEMENTS

It has been determined that First and Second Streets do not have adequate capacity to accommodate the traffic volumes expected when the I-35W interchanges on the subject streets are operational due to additional signalization. Six (6) proposals are discussed here, five of which could be implemented to provide the capacity required for the traffic volumes expected.

Estimated costs of construction and/or right-of-way acquisition were not available at the time this report was written. Estimates will be supplied to the Commission at the time this item appears on the agenda.

PROPOSAL NO. 1

Reconstruction of First and Second Streets within Existing Right-of-Way

The reconstruction of First and Second Streets within existing right-of-way is a very real proposal. A three-lane, 40-foot street could be constructed without additional right-of-way acquisition on both First and Second Streets which would provide the required capacity to accommodate the expected traffic volumes. Figure 1 in Appendix A (page 16) shows a typical section of the proposed First Street between Grove and Hillside.

It is known that the reconstruction of First and Second to a 40-foot width would require the removal of approximately 200 trees. For that reason, a tree planting program is proposed to replace the trees that would be removed. The program would include planting trees of a desirable species and size on private property as near as possible to the locations of the original trees.

First and Second Streets were designated arterial streets in the 1964 Transportation Study and function effectively as a one-way couple. Four primary factors contribute to the attractiveness of the subject streets as major traffic carriers. First, it is possible to maintain a good traffic signal progression on both streets since both carry traffic in only one direction. The second factor is the limited commercial development east of Washington Street which results in less side friction encountered by the driver. A third attractive feature of First and Second Streets is that both are one-way streets. This permits drivers to turn onto and from them with greater ease and safety than two-way streets. The fourth consideration is the fact that a number of arterial streets in the vicinity of First and Second Streets are operated and have been improved under the assumption that First and Second Streets would remain arterials; thus deleting them from the arterial system would place excessive loads on the adjacent streets, particularly at major intersections.

The fact that First and Second Streets should be reconstructed within the next ten years cannot be overlooked. It is known that reconstructing the subject streets to the existing 30-foot width would damage or

cause removal of approximately half of the trees that would be involved if the streets were widened to a width of 40 feet. In addition, storm water sewers are needed along both First and Second Streets; however, they will not be constructed until such time as the streets are reconstructed.

It must be understood that a given demand for eastbound and westbound vehicular traffic exists in a corridor from Douglas to Central. It has been determined that generally speaking, seven lanes of adequate width will be required in each direction to accommodate the expected demand. If First and Second Streets are taken out of the arterial network, six lanes of traffic must be provided at alternate locations. The following four proposals contain provisions whereby the arterial functions of First and Second Streets could conceivably be replaced.

PROPOSAL NO. 2

Reconstruction of First and Second Streets with Additional Right-of-Way

Proposal No. 2 is a variation of Proposal No. 1 whereby additional right-of-way would be acquired on one side of First Street and also on one side of Second Street. A tentative proposal would be to obtain enough right-of-way along both streets so that the required pavement width could be constructed without disturbing the existing trees on one side of the street. By obtaining the additional right-of-way, it would be possible to provide greater lateral separation between the roadways and the homes than exists now or would exist under Proposal No. 1. The additional "parking" area (space between the curb and property line) could be landscaped to enhance the area and provide a sight and/or sound barrier.

Figure 2 in Appendix A (page 17) shows a typical section of First Street between Grove and Hillside.

The additional right-of-way required would displace approximately 90 structures. Table 1 in Appendix B (page 24) summarizes the number of displaced structures by type.

The primary advantage of this proposal is the fact that it would decrease, if not eliminate, opposition from those concerned about their trees. Trees on the one side would remain and those on the other side would be acquired with the additional right-of-way.

PROPOSAL NO. 3

Douglas and Central - One Way

The third proposal is a conversion of Douglas and Central to one-way operation. This proposal would appear to be most desirable in light of the advantages that can be derived from one-way operation; however, the geometrics of this particular application would create some definite problems.

One-way streets are usually designed in pairs and actually function similar to a divided roadway with a median one block wide. The theory is that every vehicle traveling on one roadway will, at a later time, desire to make the same trip in the opposite direction. It is also known that most motorists take the shortest time route (not necessarily the shortest distance) when selecting a route to a given destination. For that reason, it becomes apparent that caution must be exercised when attempting to pair up two streets to make a one-way couple. Douglas and Central, being one-half mile apart, could not, therefore, function effectively as a one-way couple.

As indicated above, considering the shortest time paths between given locations becomes extremely important when evaluating the potential success or failure of a proposed change such as converting Douglas and Central to one-way operation. For example, consider Douglas one-way eastbound and Central one-way westbound. It is very possible that Second Street would remain a faster route inbound for all traffic generated from points to the east and south of Second Street, thus actually creating a one-way couple between Douglas and Second Street rather than the intended Douglas-Central couple. The potential for a similar situation would exist between Central and First Street.

Attampting to form a one-way couple utilizing two arterials with a one-half mile separation would also tend to increase traffic volumes on the residential streets adjacent to them. Motorists desiring to make relatively short trips, say 2 to 8 blocks in a direction opposite to the one-way street, would probably find it more convenient to utilize the nearest residential street rather than travel one-half mile to and one-half mile from the appropriate one-way street. Encouraging any through traffic to use a residential street would be defeating the purpose of the proposed "improvement".

The implementation of this proposal could be undertaken utilizing any one of three possible treatments of First and Second Streets. The three sub-proposals are: (a) complete closure of First and Second Streets to through traffic by physical barrier or other means at a location just to the west of Grove; (b) limited access to First and Second Streets at

a location just to the west of Grove; (c) First and Second Streets left open and in their existing condition.

Considering the first case, sub-proposal (a), where First and Second are closed to through trips, a connecting link would be required from Central to Second and from First to Douglas to provide access to and from the I-35W interchange.

Douglas and Central would be one-way eastbound and westbound respectively from Hydraulic to Hillside. Douglas and Central would each have to be improved to provide seven one-way lanes of traffic from Hydraulic to or from Hillside, as the case may be, and provide a minimum of four one-way lanes from Hydraulic to the connecting link. Figure 3 in Appendix A (page 18) shows a typical section of Douglas between Grove and Hillside. Improvements on Douglas and Central west of Hydraulic would also be required to provide a minimum of five lanes (2 lanes in each direction and a center lane for channelization). Right-of-way would have to be acquired to implement sub-proposal A and would displace approximately 150 structures. Table 1 in Appendix B (page 24) summarizes the number of displaced structures by type.

Sub-proposal (b), with limited access to First and Second Streets, would be implemented basically the same as sub-proposal (a), with the exception that one through lane would be provided on both First and Second Streets. The intent of the one through lane would be to accommodate the residents in the area bounded by Hillside, Grove, Douglas and Central. The right-of-way and lane requirements would be the same as for sub-proposal (a).

Sub-proposal (c) is a proposal whereby First and Second Streets remain in their present state which is the most feasible option under Proposal 3 as a connecting link would not be required. Utilizing this option would not, however, decrease the arterial function of either First or Second Streets.

Douglas and Central, in this sub-proposal, would each be five lane, one-way streets from Hillside to St. Francis. This could be accomplished within the existing right-of-way, though Central would have to be widened and Douglas resurfaced.

Figure 4 in Appendix A (page 19) shows a typical section of Douglas between Grove and Hillside.

All three sub-proposals have the east terminal of the one-way sections of Douglas and Central at Hillside which would create some unique channelization and signalization problems. In addition, Hillside would not have adequate capacity to accommodate the existing Hillside traffic plus function as a connector for a one-way couple. Thus, reconstruction of Hillside from Douglas to Central could be expected if this proposal were implemented.

PROPOSAL NO. 4

Douglas and Central Improved But Remaining Two-Way Streets

The fourth proposal is a plan whereby Douglas and Central would both be improved two-way streets. This proposal could be implemented with any one of three possible treatments of First and Second Streets as was the case with the third proposal. The three sub-proposals of Proposal No. 4

are: (a) First and Second Streets closed to through traffic by physical barricades or other means at Grove; (b) limited access to First and Second Streets at Grove; and (c) First and Second Streets left in their existing condition.

The first case, sub-proposal (a), with First and Second closed to through trips, would require that a connecting link be constructed to transfer the First and Second Street traffic to and from Douglas and Central. The Grove Street alignment is proposed for this connecting link which would require a minimum of 150 feet of additional right-of-way. The link (Grove Street) would require signalization at Douglas, First, Second and Central. It would be difficult to provide adequate capacity at these locations due to the turning movements that could be expected. The link intersections with First and Second Streets would be "T" intersections with no provisions for through movements.

A frontage road is proposed on the east side of the connecting link to provide access to the adjacent properties. Figure 5 of Appendix A (page 20) shows a typical section of the proposed connecting link and frontage road.

To implement sub-proposal (a), Douglas would have to be reconstructed to provide nine lanes (4 lanes in each direction and a center lane for channelization) from Grove to Hillside, and reconstructed to provide five lanes (2 lanes in each direction and a center lane for channelization) from Hydraulic to Grove. Figure 6 in Appendix A (page 21) shows a typical section of the nine-lane facility. Central would have to be reconstructed

to provide seven lanes (3 lanes in each direction and a center lane for channelization) from Grove to Hillside, and reconstructed to provide five lanes (2 lanes in each direction and a center lane for channelization) from Washington to Grove. Figure 7 in Appendix A (page 22) shows a typical section of the seven-lane facility.

Problems would develop at the terminal locations of the improved section of Douglas and Central, particularly at the Grove and Hillside intersections. Serious alignment problems would be present at the Douglas-Hillside intersection where the nine-lane facility on Douglas would meet the existing four-lane section of Douglas. Similar problems would develop at Hillside and Central. Additional right-of-way required for sub-proposal (a) would displace approximately 139 structures. Table 1 in Appendix B (page 24) summarizes the number of displaced structures by type.

The second case to be considered, sub-proposal (b), is the partial closing of First and Second Streets to through trips. This case is very similar to the first case, with the difference being provisions for one lane of traffic proceeding east of First Street at the connecting link and one lane of traffic permitted to proceed westbound on Second Street at the link. The principal advantage of this option over the first case is the improved access to residents living within the area bounded by Hillside, Grove, Douglas and Central. The disadvantage is the intrusion of the through trips into the residential neighborhood. The right-of-way and lane requirements would be same as for sub-proposal (a).

The third option, sub-proposal (c), is improving Douglas and Central but not restricting flow on First or Second Streets. This could be accomplished by improving Douglas to provide seven lanes (3 lanes in each direction and a center lane for channelization) from St. Francis to Hillside. It would not be necessary to improve Central to implement this sub-proposal. The required additional right-of-way along Douglas would displace approximately 96 structures. Table 1 in Appendix B (page 24) summarizes the number of displaced structures by type.

The terminal and signalization problems would not be as great with this option as with the first two cases and a connecting link would not be required. The primary disadvantage is that through traffic would remain at its present level or higher on First and Second Streets.

PROPOSAL NO. 5

Construction of a New Facility to Replace the Arterial Functions of First and Second Streets

Proposal No. 5 is the construction of a new facility to replace the arterial functions of First and Second Streets. An alignment immediately south of the existing First Street is proposed. The new street would be constructed from I-35W to Hillside. The right-of-way required would be a strip 150 feet wide, adjacent to and south of the existing First Street right-of-way. Figure 8 shows a typical section of the new facility between Grove and Hillside. In addition, right-of-way would be required to provide a connector from the existing Second Street to the new alignment. A total of approximately 115 structures would be displaced to implement

Proposal No. 5. Table 1 in Appendix B (page 24) summarizes the number of displaced structures by type.

From an operational standpoint, there would be signalization and channelization problems at the eastern limit of the improvement. Obtaining adequate capacity at the intersection of the new alignment at Hillside would be particularly difficult; thus, excessive delays could be expected at that location.

Proposal No. 5 should not receive opposition from those concerned about the trees since Second Street would not be reconstructed and the trees along First Street would be acquired with the additional right-of-way. Although this proposal requires the acquisition of a number of residential properties, the remaining properties to the north of the new facility and south of Central would be left as a unit rather than a number of isolated neighborhoods divided by arterial streets.

PROPOSAL NO. 6

Do Nothing

The sixth proposal, do nothing, must be considered since it is easier to implement and less expensive, at least in the short range, than any of the other proposals. Although it is less expensive and easier to implement, it certainly would not be in the best interest of the citizens of this city to jeopardize the benefits that can be derived from freeway construction by not providing adequate arterial street capacities to get motorists to and from the freeway facilities. The city of Wichita is

fortunate to have federal and state funds spent here on I-35W and should do its part to assure that maximum benefits are derived. Accepting Proposal No. 6 would not meet that obligation.

SUMMARY

This report contains six (6) proposals regarding improvements on an arterial street system in an east-west corridor, generally from the CBD to Hillside between Douglas and Central. The six proposals are:

1. Reconstruction of First and Second Streets Within Existing Right-of-Way
2. Reconstruction of First and Second Streets with Additional Right-of-Way
3. Douglas and Central - One-Way
4. Douglas and Central Improved, But Remaining Two-Way Streets
5. Construction of a New Facility to Replace the Arterial Functions of First and Second Streets
6. Do Nothing

Any one of the first five proposals could be accepted and will probably provide adequate capacity for the east-west demand in the above-described corridor. The right-of-way requirements for Proposals 2 through 5 make them economically less attractive than the other proposals.

It should be understood that the descriptions of each proposal contained herein are only general in nature and a more detailed study would have to be undertaken before serious consideration could be given to implementing Proposals 2, 3, 4 or 5.

RECOMMENDATIONS

The Department of Public Works and the Planning Department have, in the past, recommended that First and Second Streets be improved within the existing right-of-way from I-35W to Hillside, as indicated in Proposal No. 1 contained herein. A number of alternate proposals are contained in this report which warrant consideration; however, any proposal which deletes First and/or Second Street from the arterial street system requires extensive right-of-way acquisition and in all probability, would not function as effectively as Proposal No. 1. It is unfortunate that First and Second Streets are arterials in residential neighborhoods, but it appears that a situation exists which cannot be economically altered.

APPENDIX

A

PROPOSAL NO. 1

Typical Section 1st Street between Grove & Hillside

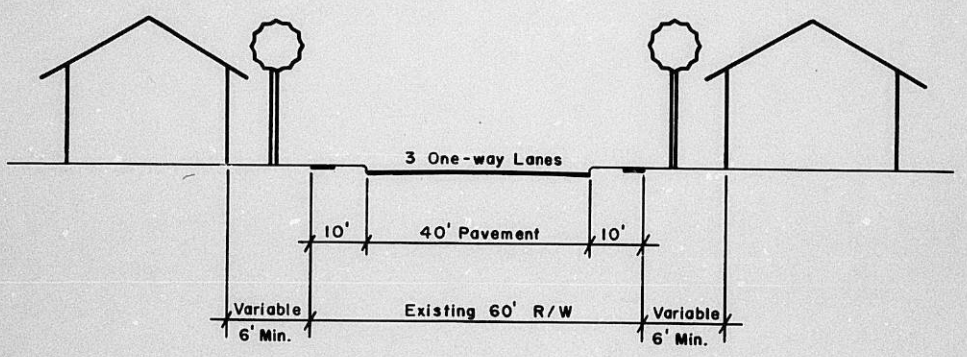


FIGURE 1

PROPSAL NO. 2

Typical Section 1st Street between Grove & Hillside

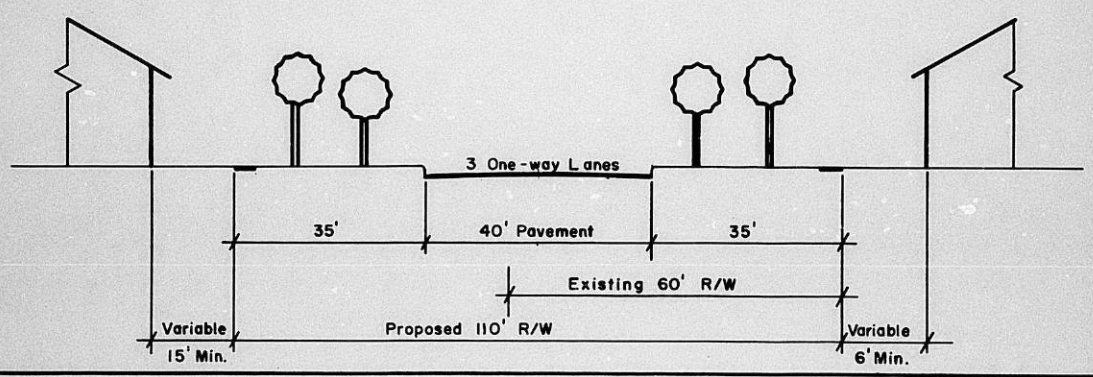


FIGURE 2

PROPOSAL NO. 3
Subproposal A & B

Typical Section Douglas between Grove & Hillside

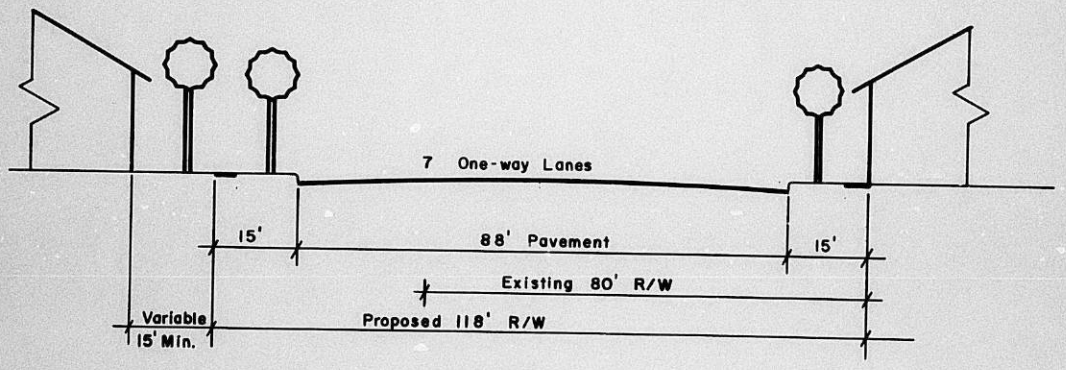


FIGURE 3

PROPOSAL NO. 3
Subproposal C

Typical Section Douglas between Grove & Hillside

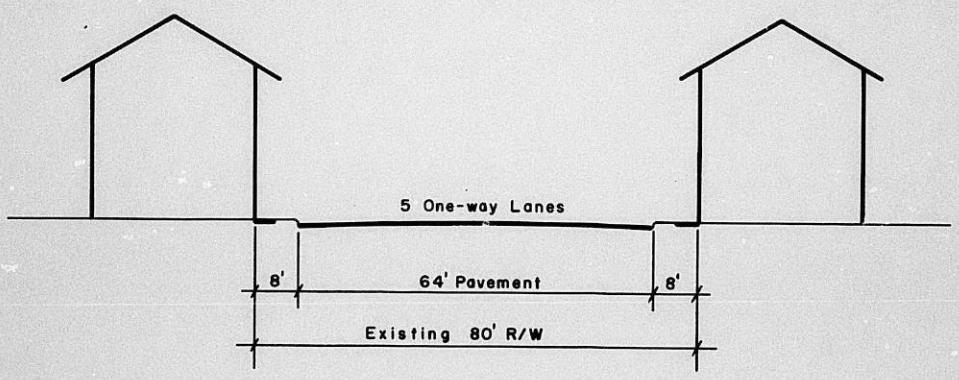


FIGURE 4

PROPOSAL NO. 4
Subproposal A & B

Typical Section Connecting Link
(Grove Alignment)

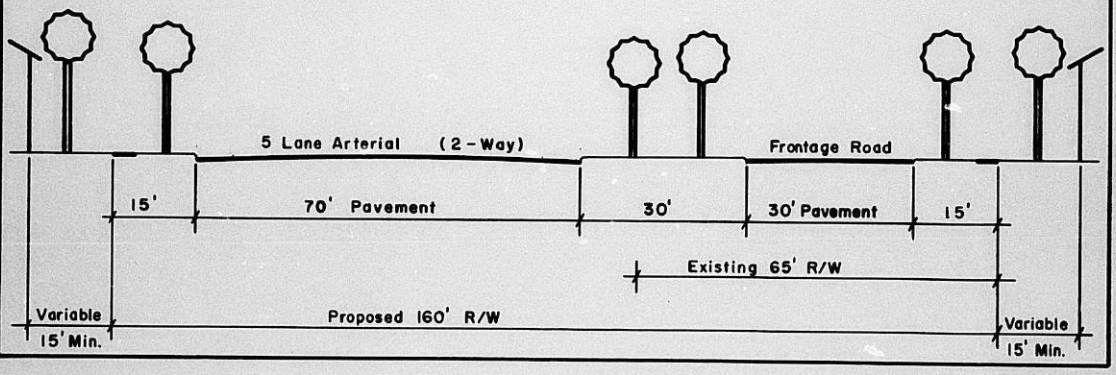


FIGURE 5

PROPOSAL NO. 4
Subproposal A & B

Typical Section Douglas between Grove & Hillside

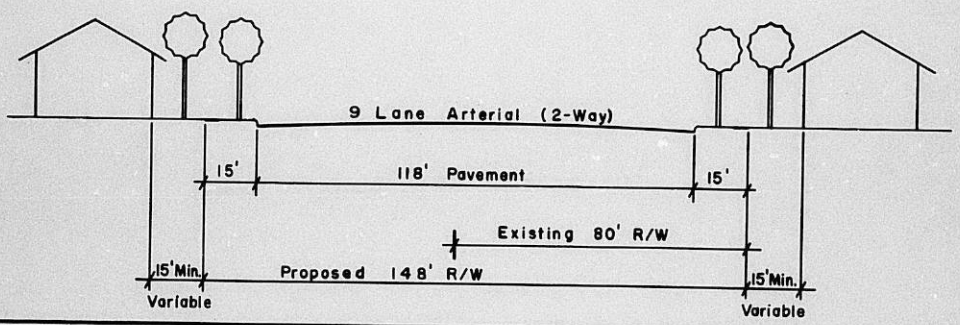


FIGURE 6

PROPOSAL NO. 5
Subproposal A & B

Typical Section Central between Grove & Hillside

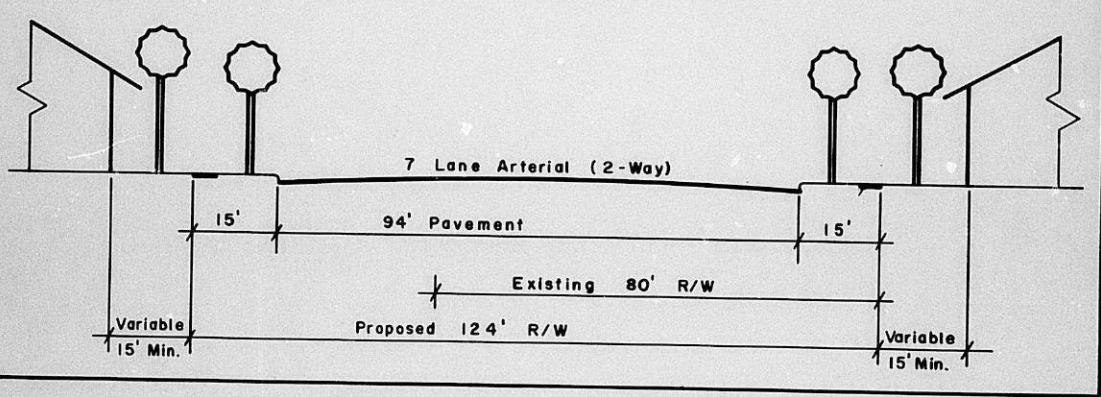


FIGURE 7

PROPOSAL NO. 5

Typical Section New Facility between Grove & Hillside

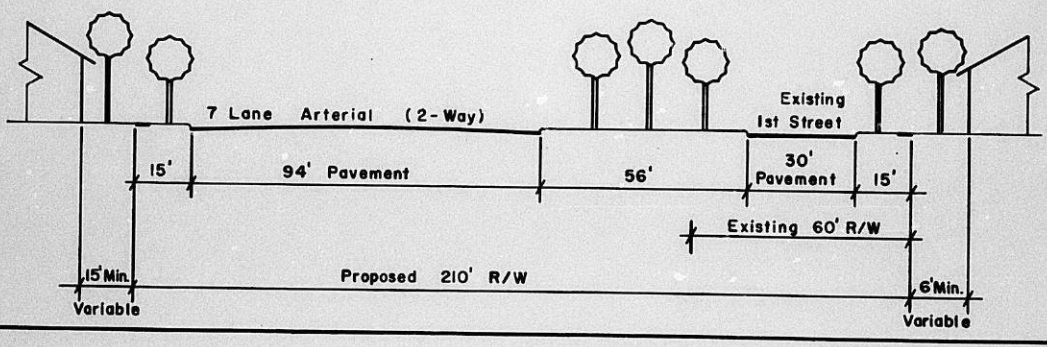


FIGURE 8

APPENDIX

B

SUMMARY OF DISPLACED STRUCTURES

Proposal	No. of Structures by Type						
	Resident	Apartment	Commercial	Church	School	Other	Total
No. 1	0	0	0	0	0	0	0
No. 2	70	16	5	1	0	1	93
No. 3							
A	51	15	88	0	0	0	154
B	51	15	88	0	0	0	154
C	0	0	0	0	0	0	0
No. 4							
A	49	14	74	0	0	0	139
B	49	14	74	0	0	0	139
C	5	9	81	0	0	1	96
No. 5	80	25	7	3	0	0	115
No. 6	0	0	0	0	0	0	0

TABLE 1

FIRST AND SECOND STREET REPORT

Traffic Engineering Division
City of Wichita
November 1971

FIRST AND SECOND STREET REPORT

INTRODUCTION

Consideration has been given to rebuilding First and Second Streets several times in the past due to the deteriorated condition of the roadways. Neighborhood opposition has appeared to oppose the projects primarily from concern for the residential neighborhoods which are adjacent to both First and Second Streets. Many concerned citizens are of the opinion that reconstructing the subject streets will result in a deterioration of their neighborhoods due to increased traffic volumes and the loss of approximately 200 trees.

It appears at this time that the First and Second Street dilemma is approaching a critical stage with the construction of I-35W from English to 21st Street in progress. Prior planning efforts determined that First and Second Streets were the most desirable locations for interchanges. Those interchanges will be constructed and will transfer large volumes of freeway traffic onto and from the arterial street network at those locations. For that reason, it is important that immediate action be taken to insure adequate arterial capacity to handle the freeway generated trips in addition to the existing high volumes.

PURPOSE

The purpose of this report is to evaluate the function of First and Second Streets in the arterial street system and to provide alternates to the reconstruction of subject streets. Particular consideration is given to the possibility of operating Douglas and Central as one-way streets. Items considered include traffic volumes, circulation requirements, traffic signalization, and capacity requirements. Recommendations of the Traffic Engineering Division are contained herein.

FIRST AND SECOND STREETS

For the purpose of this report, reference to First and Second Streets refers to the segment of said streets from Hydraulic to Hillside. Both streets currently serve as arterials, connecting the east part of the city to the Central Business District.

First Street currently carries an average daily traffic (ADT) from approximately 11,000 vehicles per day (VPD) west of Hillside to approximately 12,500 VPD west of Hydraulic. Second Street volumes range from approximately 8,250 VPD west of Hillside to approximately 10,500 VPD west of Hydraulic.

The relatively high volumes on First and Second Streets, as indicated above, can be attributed to a number of factors. First, it is possible to maintain good traffic signal progression on both streets since both carry traffic in only one direction. A second factor is the limited commercial development east of Washington which results in less side friction encountered by the driver. A third attractive feature of First and Second Streets is the fact that both are one-way streets. This permits drivers to turn onto and from them with greater ease and safety than two-way streets.

It is true that First and Second Streets have a number of characteristics which are favorable for arterial streets. However, due to neighborhood opposition, the Traffic Engineering Division was directed to seek alternate routes for the increasing traffic volumes which now depend on those two streets for access to and from the CBD.

DOUGLAS AND CENTRAL - ONE WAY?

One alternative to the reconstruction of First and Second Streets is the conversion of Douglas and Central to one-way operation. This proposal would appear to be most desirable in light of the advantages that can be derived from one-way operation; however, the geometrics of this particular application would create some definite problems.

One-way streets are usually designed in pairs and actually function similar to a divided roadway with a median one block wide. The theory is that every vehicle traveling on one roadway will, at a later time, desire to make the same trip in the opposite direction. It is also known that most motorists take the shortest time route (not necessarily the shortest distance) when selecting a route to a given destination. For that reason, it becomes apparent that caution must be exercised when attempting to pair up two streets to make a one-way couple. Douglas and Central, being one-half mile apart, could not, therefore, function effectively as a one-way couple.

As indicated above, considering the shortest time paths between given locations becomes extremely important when evaluating the potential success or failure of a proposed change such as converting Douglas and Central to one-way operation. For example, consider Douglas one-way eastbound and Central one-way westbound. It is very possible that Second Street would remain a faster route inbound for all traffic generated from points to the east and south of Second, thus actually creating a one-way couple between Douglas and Second Street rather than the intended Douglas-Central couple. The potential for a similar situation would exist between Central and First Street.

Attempting to form a one-way couple utilizing two arterials with a one-half mile separation would also tend to increase traffic volumes on the residential streets adjacent to them. Motorists desiring to make relatively short trips, say 2 to 8 blocks, in a direction opposite to the one-way street, would probably find it more convenient to utilize the nearest residential street rather than travel one-half mile to and one-half mile from the appropriate one-way street. Encouraging any through traffic to use a residential street would be defeating the purpose of the proposed "improvement".

PROPOSAL

Having determined that Central and Douglas would not function effectively as a one-way couple, the following proposal is submitted as an alternate to the reconstruction of First and Second Streets east of I-35W.

It is proposed that Douglas and Central be redesigned to provide additional capacity, utilizing an unbalanced directional split concept. This would involve providing six lanes on each street - Douglas, three through lanes eastbound plus left turn channelization and two lanes westbound; Central, three lanes westbound plus left turn channelization and two lanes eastbound (see Figure 1). A system of this type could be operated to favor eastbound traffic on Douglas and westbound traffic on Central, thus hopefully attracting some of the through trips which currently find First and Second more convenient. It is believed that a system as described above would have adequate capacity to relieve First and Second of some of the through trips, thus eliminating the urgency of reconstructing said streets east of I-35W. First and Second Streets would have to be reconstructed west of

I-35W to accommodate freeway traffic desiring to go to and from the CBD.

The redeisgn of Douglas and Central as proposed herein is not without disadvantages. The proposed roadways would have to be 80 feet wide to provide adequate lane widths to achieve the desired capacities. This would require obtaining considerable additional rights-of-way at a number of locations, including a number of commercial properties. All on-street parking would have to be removed on both streets to accommodate the 80 foot street width. In addition, this proposal does not replace the arterial functions of First and Second Streets, but would just tend to reduce the significance of the subject streets within the system.

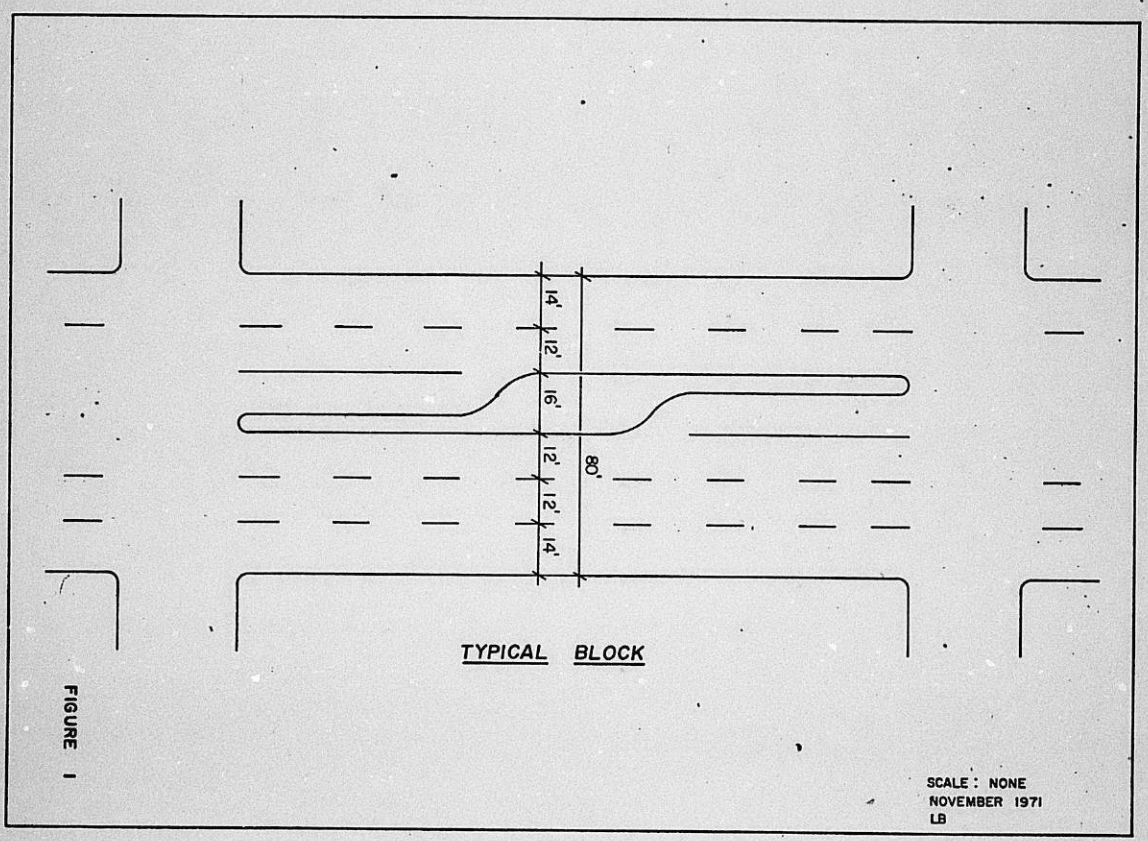
CONCLUSIONS

It can be concluded from evaluating the arterial street network in the vicinity of First and Second Streets that Douglas and Central cannot be converted to one-way operation and effectively replace First and Second. It can further be concluded that First and Second Streets must remain arterial streets to provide access to and from the proposed I-35W interchanges.

RECOMMENDATIONS

It is the recommendation of the Traffic Engineering Division that First and Second Streets be reconstructed to a 40 foot width from Hydraulic to Hillside. The subject streets are currently being redesigned for a width of 40 feet from Washington to Hydraulic.

It would appear that any feasible alternates to this recommendation would be unreasonably expensive and would probably not offer a satisfactory solution. The proposal as set forth herein would offer relief to First and Second Streets, but is not recommended as the ultimate solution to the problem.



TYPICAL BLOCK

FIGURE 1

SCALE : NONE
NOVEMBER 1971
LB

PROPOSAL NUMBERS 8 AND 9

Traffic Engineering Division
City of Wichita
March 1972

PROPOSAL NUMBERS 8 AND 9

INTRODUCTION

The First and Second Street dilemma has been reviewed and evaluated a number of times by both the public at large and the City staff in the past year and a half. The most recent formal review of the situation was on March 1, 1972, when a special Traffic Commission hearing was held. As a result of that hearing, two new proposals have been formulated and are identified as Proposal No. 8 and Proposal No. 9. The first seven proposals for First and Second are discussed in two prior reports entitled, "First and Second Street Improvements" and "Supplement to First and Second Street Improvements."

At the March 1, 1972 Traffic Commission hearing, detailed presentations were made concerning the project history, transportation planning considerations, condition and maintenance problems, traffic flow patterns and volumes, design and construction consideration, and a review of the tree situation.

The minutes of that hearing will serve as a source of background information.

PURPOSE

The purpose of this report is to present two additional proposals for solving traffic problems which are expected when I-35W is completed in Wichita. Proposal No. 8 was presented to the staff at the March 1, 1972 Traffic Commission hearing by Monty Robson; it is a proposed redesign of the First and Second Street split-diamond interchange. Proposal No. 9 has been developed by City staff following the March 1, 1972 Traffic Commission hearing; it is a plan to divert traffic from First and Second onto Douglas and Central without altering the existing plans for I-35W.

PROPOSAL NO. 8

SPLIT-DIAMOND REDESIGN AS SUBMITTED BY ROBSON

Proposal No. 8 is a plan whereby the split-diamond interchange proposed for First and Second Streets would be redesigned to discourage or prohibit

traffic from using First or Second Streets east of I-35W when interchanging with the freeway. Figure 1 shows the proposed redesigned interchange. The proposal does not include any reconstruction of First and SEcond Streets east of I-35W in the immediate future.

A preliminary evaluation of the redesigned split-diamond interchange revealed four general areas where special consideration and additional evaluation should be made. A discussion of each of those are contained in the report entitled "Evaluation of Proposed Changes to I-35W Interchanges".

PROPOSAL NO. 9

PLAN TO DIVERT TRAFFIC TO DOUGLAS AND CENTRAL

Proposal No. 9 is a plan to provide additional traffic carrying capacity on alternate facilities in an attempt to divert trips from First and Second Streets. The alternate facilities considered in this proposal are Douglas, Central, and Grove.

It is proposed that Douglas and Central be improved from Washington to Hillside to provide two through lanes in each direction, and a fifth center lane for left turn movements. This could be accomplished within the existing right-of-way if parking were prohibited on both sides of each street. Major reconstruction would be required on Central from Washington to Hydraulic; however, resurfacing would suffice on the remaining section of Central, and on Douglas. It is anticipated that the necessary improvements on Douglas and Central could be programmed for 1973 and/or 1974.

To provide adequate access from Douglas and Central to First and Second Streets, it is imperative that Grove be improved to major street standards from Kellogg to a point just north of Central. This project has been scheduled in the 1972-1977 CIP and has been approved by the Board of City Commissioners for construction in 1976. Consideration should be given to coordinating this improvement with the improvements on Douglas and Central.

This proposal contains no provisions for improving First or Second east of I-35W within the next three years, which complies with a prior City Commission vote to do nothing toward improving First and Second until at least 1975, as reflected in the 1972-1977 CIP. In addition, it is proposed that

First and Second be reclassified to residential status from Hillside to Edgemoor. The proposed operation is to retain the existing one-way flow from Hillside to Oliver, and to return both streets to two-way flow from Oliver to Edgemoor.

If Proposal No. 9 is approved, the following four points should be considered for First and Second between Grove and Hillside after the construction of I-35W is complete in 1976:

(1) Consider reconstruction for two lanes of travel one-way operation on a roadway of 28 feet. (This would require that No Parking Anytime restrictions be installed on both sides of the street.)

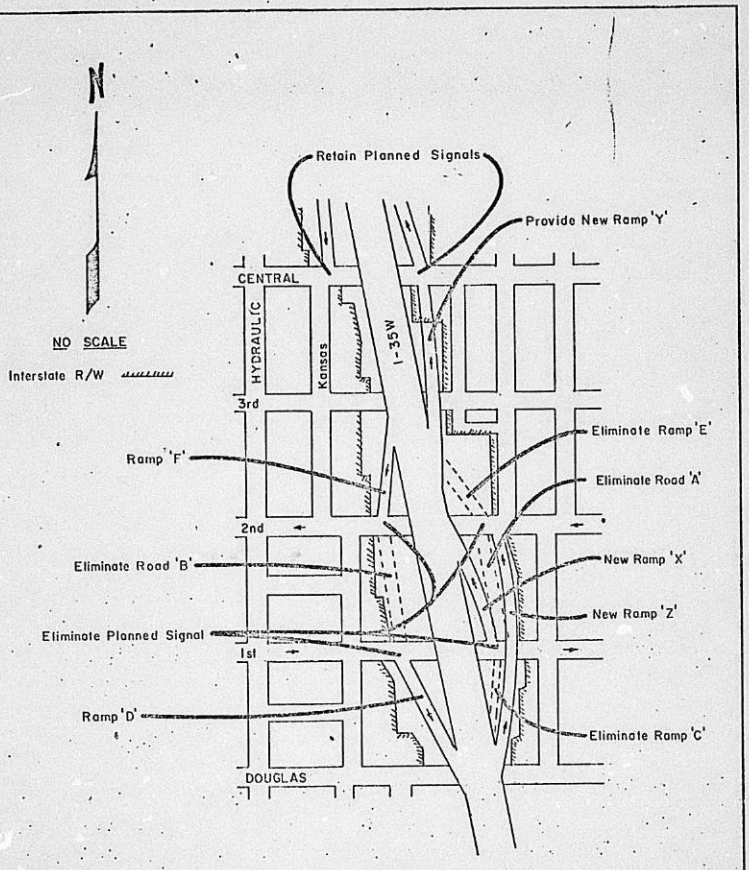
(2) Consideration of reconstruction for three lanes of traffic one-way operation at a width of 34 feet. (This would also necessitate the installation of No Parking Anytime restrictions on both sides of the street.)

(3) Consider reconstruction for three lanes of traffic one-way operation at a width of 40 feet. (This would also require provisions of No Parking Anytime on both sides of the street.)

(4) Consider the possibility of discontinuation of one-way traffic at Grove Street and return First and Second streets to two residential street operations.

RECOMMENDATION

It is the recommendation of the Traffic Engineering Division that Proposal No. 9 be approved.



PROPOSED INTERCHANGE REDESIGN

Submitted by Area Residents

Fig. No. I

EVALUATION OF PROPOSED CHANGES

TO I-35W INTERCHANGES

INTRODUCTION

The construction of Interstate 35W within the city limits of Wichita is continuing with the segment from English Street to 21st Street currently under construction. This segment includes a half-diamond interchange at Central Avenue, and a split-diamond at First and Second Streets. The City of Wichita originally planned to reconstruct First and Second Streets from Hydraulic (one-quarter mile west of I-35W) to Hillside (three-quarter mile east of I-35W) at the same time the canal bridges were constructed. Approval to initiate those projects from I-35W to Hillside has not been granted to date by the governing body in Wichita due to strong public opposition. The opposition originates from residents along those streets who believe that reconstruction and widening of the streets would lead to a deterioration of their neighborhoods.

A public hearing was held on March 1, 1972 before the Wichita Traffic Commission to discuss the advantages and disadvantages of reconstructing First and Second Streets from I-35W to Hillside. Approximately 300 well organized citizens attended that meeting to oppose not only the First and Second Street improvements, but also the construction of a split-diamond interchange on First and Second Streets. Their representatives prepared a proposal with the First and Second Street ramps relocated which they believe would provide adequate access to the interstate route, and would not adversely affect their neighborhoods. They indicated that they would pursue their proposal directly with the State and/or Federal Highway personnel. A preliminary evaluation has been made by City staff and is contained herein.

PROPOSED PLAN

The existing I-35W plans call for a split-diamond interchange at First and Second Streets as shown in Figure 1. The proposed plan provides the following modifications: (1) elimination of Ramps C and E; (2) elimination of Roads A & B; and (3) addition of two off-ramps and one on-ramp. The proposed plan is shown in Figure II.

PLAN EVALUATION

Years of planning, designing and redesign of the Canal Route (I-35W) had passed before a construction contract was let. During those years, many alternates were studied by several professional highway engineers until the final route and interchange locations were decided upon. The Traffic Engineering profession supplied its expertise in traffic flow, principles and practices as a portion of the data required for the total design. The evaluation presented here will only concern itself with fundamental facts related to traffic flow. Before any major expressway is actually built, numerous alternate designs are proposed and tested with regard to their traffic-carrying capacity and ability to serve the driver in a safe and efficient capacity.

In reviewing the proposal, four areas were identified for detailed traffic engineering review. The following points were analyzed: (1) intersection of Central and Ramp G, with the addition of an off-ramp at this location; (2) signalization requirements on First and Second Streets; (3) length of the weaving area between Ramp X and Ramp Y on I-35W; and (4) general roadway design and right-of-way required to accommodate the traffic.

1. An interchange configuration varies according to the traffic demand. Some of the more common types of interchanges are the diamond, cloverleaf and full directional interchange. The diamond interchange is the simplest form of grade-separated interchange between two roadways. The interchange

configuration at Central and I-35W would be classified as a half-diamond. A diamond interchange requires a minimum amount of land and is fairly economical to construct. However, due to signal timing problems which occur with a cross street, many times the capacity may not be adequate for the traffic demand. In this case, a capacity analysis of the intersection of Ramp G and Central Avenue indicate that in 1986, this intersection will operate at a low level of service. The addition of another off-ramp at this same location will present an intolerable operating deficiency.

Interchanges experiencing traffic volumes of a magnitude which would be introduced under this proposal are normally handled by higher type design configurations, such as a cloverleaf or a partial cloverleaf design. A cloverleaf interchange eliminates all crossing movement conflicts, thereby requiring no signalization. The disadvantage of a cloverleaf design at this location, of course, would be the great additional right-of-way costs needed to accommodate this type of configuration.

Contained in the appendix of this report are capacity analysis, Ramp Y traffic assignments and phasing diagrams for this intersection.

2. The proposed interchange configuration on First and Second Streets does divert a portion of the traffic volumes which were forecast to use the planned ramps. Based upon traffic engineering warrants for signalization as presented in the Manual on Uniform Traffic Control Devices for Streets and Highways, 1971 edition, the intersection of Second Street with Ramp F and the proposed Ramp Z would require signalization. It is impossible to merge the forecasted right turn volumes at both of these locations with the forecasted through trips. It should be noted that even under present traffic volumes on Second Street, and design according to this plan, the ramp volumes would require signalization.

It is extremely difficult to state what effect the elimination of the connecting link between Ramp F and Ramp D, or Roadway B, would have on the interchange configuration. It is the opinion of the Traffic Engineering Division that Kansas Avenue would function almost identically as the original Roadway B. That is, traffic exiting on Ramp F wishing to proceed easterly toward Hillside would exit off Ramp F, make a right turn onto Second, and then a left turn onto Kansas Avenue; continue on Kansas Avenue to First Street, then make a left turn on First Street and continue easterly to his destination. Also, trips proceeding westerly on Second Street wishing to go south on I-35W could proceed west to Kansas Avenue, turn right at Kansas Avenue, proceed south to First Street, turn left at First Street and then turn right onto Ramp D for southbound interstate traffic. Assuming that our assumption is correct, the intersection of Kansas Avenue and First Street would also have to be signalized to accommodate this traffic flow.

3. A weaving section of a roadway is the crossing of traffic streams moving in the same general direction. This occurs between successive merging and diverging points, or ramp entrances or exits. The distance allowed for weaving between proposed Ramp X at First Street and proposed Ramp Y at Central was analyzed for its capacity and safety. The physical distance separating the entrance onto the freeway at Ramp X and the exit from the freeway at Ramp Y is approximately 700 feet. An analysis of this weaving section with regard to capacity indicates that it is adequate in length, based upon the forecasted traffic volumes. The latest design criteria recommend a minimum of 1,200 feet between successive ramp entrances and exits for safety reasons. Freeways with successive entrance and exit ramps spaced closer than 1,200 feet are presently encountering higher-than-average accident rates.

4. In the overall design of a freeway, the operational characteristics of adjacent interchanges are considered. All proposed interchanges on I-35W from 29th Street to First Street are diamond interchanges which provide access in either the east or west directions. The proposed interchange redesign for First and Second Street does not provide the direct east-west access. In fact, northbound traffic exiting by way of Ramp Z is required to turn west on Second Street while the present plan gives the driver a choice of either direction. The same set of circumstances exist for southbound I-35W traffic.

All right-of-way acquisition has been acquired for this segment of the interstate route; that is, between English Street and 18th Street. This right-of-way acquisition was purchased to accommodate a split-diamond interchange for First and Second Street, and a half-diamond interchange for Central Avenue. The proposed plan would require additional right-of-way solely at the expense of the City of Wichita for the added ramp at Central Avenue, and the extension of Ramp C to Second Street with the addition of Ramp X from First Street. A cost estimate for this right-of-way acquisition is beyond the scope of a traffic engineering review.

SUMMARY

Our analysis indicates that the proposed modifications to the First and Second Street interchange and the Central Avenue interchange are not feasible.

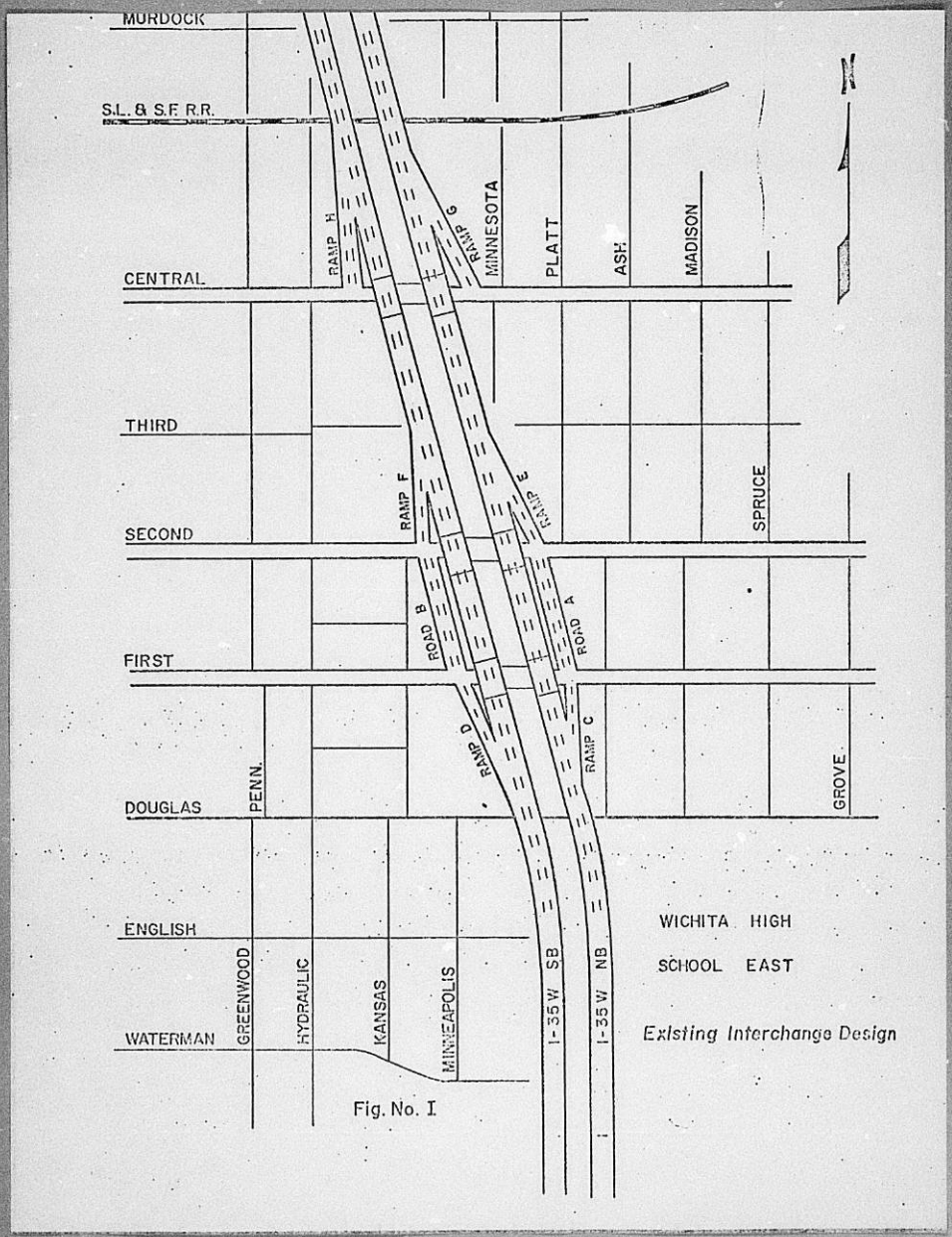
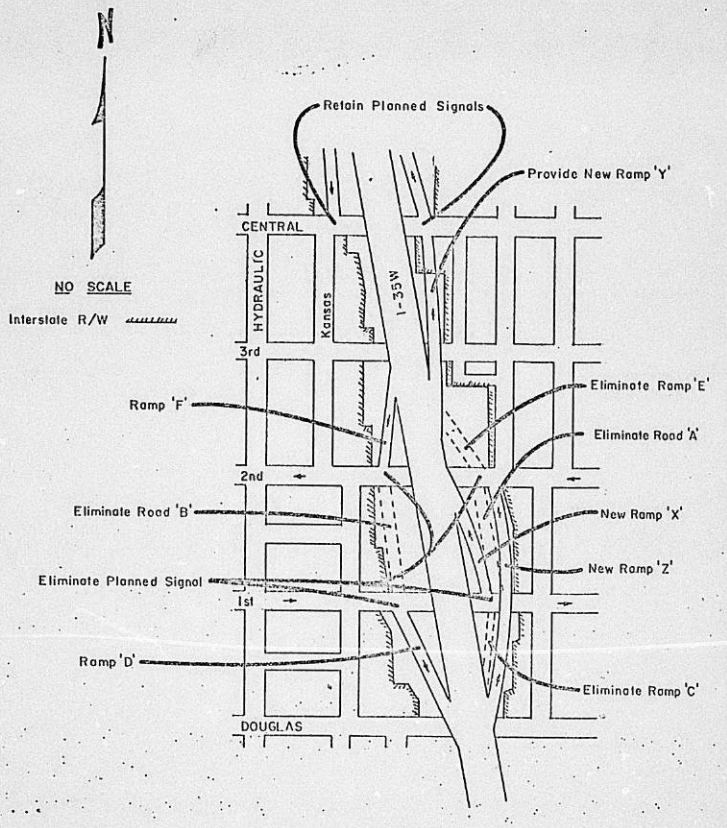

MURDOCK
S.L. & S.F. R.R.
CENTRAL
THIRD
SECOND
FIRST
DOUGLAS
ENGLISH
WATERMAN
RAMP H
RAMP G
MINNESOTA
PLATT
ASH
MADISON
RAMP F
RAMP E
SPRUCE
ROAD B
ROAD A
RAMP D
RAMP C
PENN.
GROVE
GREENWOOD
HYDRAULIC
KANSAS
MINNEAPOLIS
I-35 W SB
I-35 W NB
WICHITA HIGH SCHOOL EAST
Existing Interchange Design

Fig. No. I



PROPOSED INTERCHANGE REDESIGN

Submitted by Area Residents

Fig. No. II

APPENDIX

INTERSECTION CAPACITY WORKSHEET

INTERSECTION Central and Ramps G and Y BY W. G. M. DATE March 12, 197

GENERAL DESCRIPTION:							
	STREET	Central	Central	Central		Ramp Y	
	DIRECTION	WB	EB	EB		NB	
	MOVEMENT(S)	All	LT	Thru		RT only	
	VOLUME	1,537	681	1,537		239	
PHYSICAL CONDITIONS:							
W_A	WIDTH OF APPROACH	24	24	24		12	
Pkg	PARKING WITHIN 250'	NP	NP	NP		NP	
	ONE-WAY OR TWO-WAY	2W	2W	2W		1W	
ENVIRONMENTAL CONDITIONS:							
Area	TYPE OF LOCATION						
f_A	AREA FACTOR	1.25	1.25	1.25		1.25	
P	METRO AREA POPULATION (in 1,000's)	500	500	500		500	
PHF	PEAK HOUR FACTOR	.85	.85	.85		.85	
f_{PPHF}	COMBINED ADJUSTMENT FACTOR	1.06	1.06	1.06		1.06	
TRAFFIC CHARACTERISTICS:							
T	PERCENT TRUCKS	5	5	5		5	
f_T	TRUCK FACTOR	1.00	1.00	1.00		1.00	
R	PERCENT RIGHT TURNS	.31					
f_R	RIGHT-TURN FACTOR						
L	PERCENT LEFT TURNS	0					
f_L	LEFT-TURN FACTOR						
B	TYPE BUS STOP & NUMBER / Hr.	--	--	--		--	
f_{LB}	LOCAL BUS FACTOR						
CONTROL MEASURES:							
G	GREEN INTERVAL-Sec.						
C	SIGNAL CYCLE-Sec.						
G/C	RATIO	0.69	0.40	0.59		0.25	
LEVEL OF SERVICE:							
LF	LOAD FACTOR						
CALCULATIONS:							
	CHARTS AND TABLES USED	4	18B 22	4		8	
f_I	INTERMEDIATE FACTOR (all but G/C)						
f_c	COMPOSITE FACTOR ($f_I \cdot G/C$)						
SV_c	CHART SERVICE VOL.						
SV_a	ACTUAL SERVICE VOL. ($f_c \cdot SV_c$)						
	Phase A, Central - EB, LT	0.40					
	Phase B, Central - Thru	0.69					
	Phase C, Ramp Y - RT	0.25					
	Total Green Time	1.34					
	Amber Time	.15					
	Total Cycle Time	1.40					
	Operational Level of Service (F)						

431-(40) TRAFFIC ENGINEERING DIVISION, — A-67-43
CITY OF WICHITA. -9-

INTERSECTION CAPACITY WORKSHEET

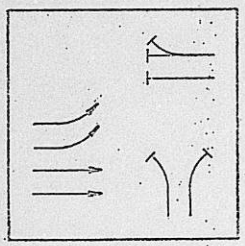
INTERSECTION Central and Ramps G and Y BY W.G.M. DATE March 12, 19

GENERAL DESCRIPTION:							
	STREET	Central	Central	Central		Ramp Y	
	DIRECTION	WB	EB	EB		NB	
	MOVEMENT(S)	All	LT	Thru		All	
	VOLUME	1,537	681	1,537		389	
PHYSICAL CONDITIONS:							
W_A	WIDTH OF APPROACH	24	24	24		24	
Pkg	PARKING WITHIN 250'	NP	NP	NP		NP	
	ONE-WAY OR TWO-WAY	2W	2W	2W		1W	
ENVIRONMENTAL CONDITIONS:							
Area	TYPE OF LOCATION						
f_A	AREA FACTOR	1.25	1.25	1.25		1.25	
P	METRO AREA POPULATION (in 1,000's)	500	500	500		500	
PHF	PEAK HOUR FACTOR	.85	.85	.85		.85	
f_{PPHF}	COMBINED ADJUSTMENT FACTOR	1.06	1.06	1.06		1.06	
TRAFFIC CHARACTERISTICS:							
T	PERCENT TRUCKS	5	5	5		5	
f_T	TRUCK FACTOR	1.00	1.00	1.00		1.00	
R	PERCENT RIGHT TURNS	.31				.72	
f_R	RIGHT-TURN FACTOR						
L	PERCENT LEFT TURNS	0				.28	
f_L	LEFT-TURN FACTOR						
B	TYPE BUS STOP & NUMBER/Hr.	--	--	--		--	
f_{LB}	LOCAL BUS FACTOR						
CONTROL MEASURES:							
G	GREEN INTERVAL-Sec.						
C	SIGNAL CYCLE-Sec.						
G/C	RATIO	0.69	0.40	0.59		0.28	
LEVEL OF SERVICE:							
LF	LOAD FACTOR						
CALCULATIONS:							
	CHARTS AND TABLES USED						
f_I	INTERMEDIATE FACTOR (all but G/C)						
f_c	COMPOSITE FACTOR ($f_I \cdot G/C$)						
SV_c	CHART SERVICE VOL.						
SV_a	ACTUAL SERVICE VOL. ($f_c \cdot SV_c$)						
	Phase A, Central - EB, LT	0.40					
	Phase B, Central - Thru	0.69					
	Phase C, Ramp Y - RT	0.28					
	Total Green Time	1.37					
	Amber Time	.15					
	Total Cycle Time	1.52					

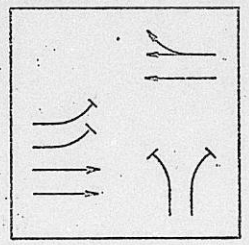
431-6M6 TRAFFIC ENGINEERING DIVISION, CITY OF WICHITA — A-67-43

PHASE DIAGRAMS

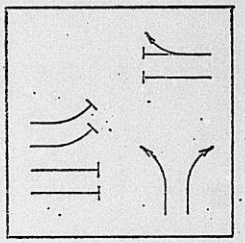
CENTRAL - RAMPS G & Y



PHASE "A"

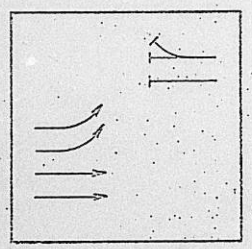


PHASE "B"

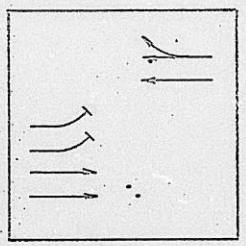


PHASE "C"

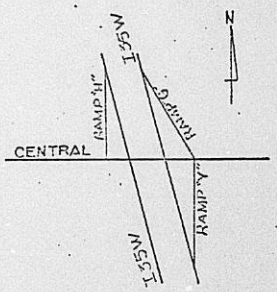
CENTRAL - RAMP G

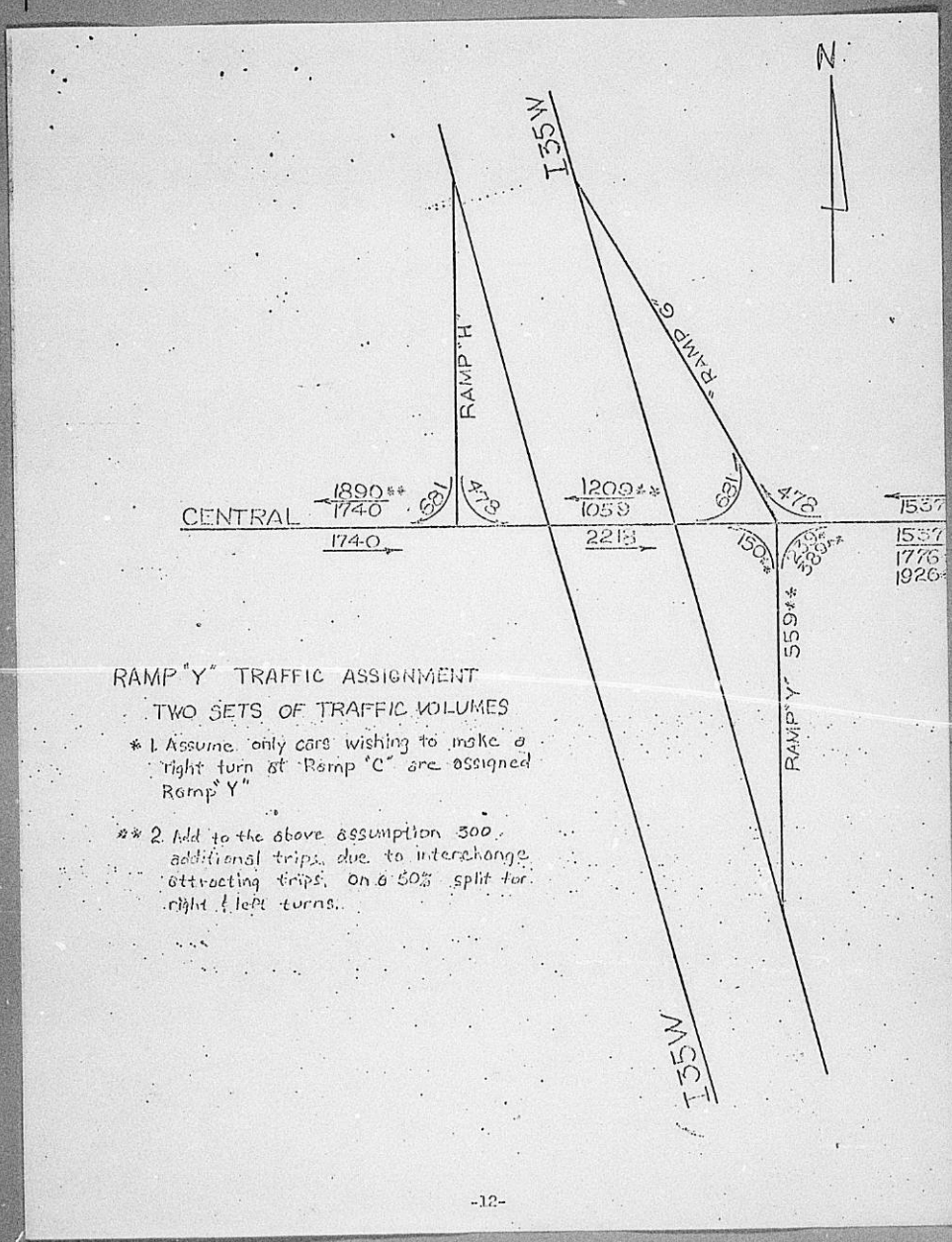


PHASE "A"



PHASE "B"





RAMP "Y" TRAFFIC ASSIGNMENT

TWO SETS OF TRAFFIC VOLUMES

* 1. Assume only cars wishing to make a right turn at Ramp "C" are assigned Ramp "Y"

** 2. Add to the above assumption 300 additional trips due to interchange attracting trips, on a 50% split for right & left turns.

For ZAC Subcommittee #4

HOSPITALS

		Wesley	St. Francis	St. Joseph	Osteopathic
No. Exist. Off St. Prkg. Spcs.		947	881	665	170
No. Parking Spaces Required By	Exist. Ord. 1 ea. 5 bed 1 ea. 5 Empl.	345	377	180	53
	Prototype 1 ea. 2 bed 1 ea. 2 Empl.	1192	944	625	150
	Dallas Tulsa 1 ea. bed	674	888	450	150
	Topeka 1½ ea. bed	1011	1332	675	225
	1¼ ea. bed	841	1110	562	188

10-12-70

WESLEY
MEDICAL
CENTER
550 N. HILLSIDE • WICHITA, KANSAS 67214 • MU 5-2151

April 24, 1970

Mr. Kenneth P. Stewart
Boyer, Donaldson and Stewart
Wichita Federal Savings Building
340 South Broadway
Wichita, Kansas 67202

Re: Revision of Zoning Ordinances

Dear Ken:

You recently forwarded to me an inquiry pertaining to some proposed off-street parking requirements for hospitals. You stated that you were working on the ZAC of the MAPC in relation to these proposed requirements.

You related that it is proposed to have at least one parking space for each two hospital beds, plus one parking space for each two employees (other than doctors), plus one parking space for each doctor assigned to the Staff.

It would seem that possibly these requirements are a little high in that at the present time we have a total of 750 parking spaces (off-street) and we are satisfying the need to some degree. It is acknowledged that additional off-street parking is needed during certain periods of the day but I would like to compare the 750 with the proposed requirement. The proposed requirement would mean that we would have 337 spaces (one space for each two hospital beds), 800 spaces (one space for each two employees), 330 spaces (one parking space for each doctor assigned to the staff) or a total of 1,467 parking spaces. This, as can be seen, is close to twice the number of parking spaces currently in use.

I would question the necessity of one parking space for each doctor assigned to the Staff - I do not know what is meant but I do not think it proper to have one parking space for each physician on any hospital's medical staff since it is not realistic to assume more than 25 to 30 percent of the total members on a medical staff would be at any particular hospital at any particular time.

It can also be seen that with 337 parking spaces, based upon hospital beds, and 800 parking spaces, based upon number of employees, that we would have the necessity of having 1,137 parking spaces which far exceeds our current number.

It is hoped that the above comments will be of assistance during your deliberation in revising the off-street parking requirements for hospitals. If you have additional questions, please let me know.

Sincerely,

O. C. Estes
Assistant Administrator

OCE:pw

THE CITY OF WICHITA

OFFICE OF Director of Public Works

DATE September 25, 1968

THE ROAD TO SAFETY — U.S. MISSION SAFETY 70

TO Ralph Wulz, City Manager

FROM R. W. Bruggeman, Director of Public Works

SUBJECT Off-Street Parking Requirements for the Wichita Clinic

This is with reference to a letter from W. Burdell Baker, Clinic Administrator for the Wichita Clinic to the Deputy City Manager dated September 10, 1968. Reference is also made to a letter to me from the Planning Director dated September 20, 1968, a copy of which you received.

As you undoubtedly noted in Mr. Foster's memorandum of September 20, Mr. Baker and the Clinic's architect were in contact some time ago with the Planning Department relative to off-street parking requirements and an addition to the clinic's present facility. Mr. Galbraith of the Planning staff explained at that time the normal procedure in procuring a zoning variance and stated his belief that Mr. Baker seemingly had sufficient evidence necessary to win the variance from the Board of Zoning Appeals.

I would suggest, as does Mr. Foster in his memo, that the Wichita Clinic pursue their remedy through the established means; namely, the Board of Zoning Appeals. The Board's function is to handle just such unique circumstances. To revise the text of the parking requirements of the zoning ordinance for all medical clinics based on studies of just the Wichita Clinic would be to re-create the situation to which Mr. Baker objects. If the clinic's situation is unique among medical clinics - and apparently it is - - the fairest avenue of approach at this time is through the Board.

Off-street parking requirements and specifically those involving medical clinics can most efficiently be analyzed during the complete revision of the zoning ordinance. Work is now being carried out, as you know, along these lines by Mr. Glen Lytle of the Planning staff. If, during revision, new parking requirements are deemed necessary for medical clinics based on their size, location, etc., then it seems to me that would be the more appropriate time and method for the text revision. We will see that this entire case is transmitted to Mr. Lytle.

RWB

R. W. Bruggeman
Director of Public Works

RWB:jh

cc: C. Bickley Foster, Director of Planning
Paul B. Graves, City Traffic Engineer
Glen Lytle, Planning Department

RECEIVED
SEP 25 1968
METROPOLITAN PLANNING

ANESTHESIOLOGY
DALE U. LOYD, M.D.
ROBERT H. ROBINSON, M.D.

DENTISTRY
DELMAR A. RENSNER, D.D.S.
THOMAS D. ELLIS, D.D.S.
ALBERT E. HALL, D.D.S.

DERMATOLOGY
F. H. CHARD, M.D.
HENRY T. GRAY, M.D.

INTERNAL MEDICINE
HENRY N. TIHEN, M.D.
FRED J. McEWEN, M.D.
PHILIP W. RUSSELL, M.D.
LLOYD M. HUMMER, M.D.
JAMES P. RHOADS, M.D.
RALPH W. BUBECK, M.D.

ALLERGY
HARVEY J. MEULBROEK, M.D.

ALLERGY AND PULMONARY DISEASES
CURTIS C. DREVETS, M.D.

CARDIOVASCULAR DISEASES
CHARLES L. WILLIAMS, M.D.
ROGER J. CUNNINGHAM, M.D.

DIABETES AND ENDOCRINOLOGY
EDWARD N. TIHEN, M.D.

ENDOCRINOLOGY AND RENAL DISEASES
THOMAS J. LUELLEN, M.D.

GASTROENTEROLOGY
JAMES B. FISHER, M.D.
J. WALKER BUTIN, M.D.

HEMATOLOGY
ROBERT P. NORRIS, M.D.

RHEUMATOLOGY
HARRY J. WISNER, M.D.

NEUROLOGICAL SURGERY
ARTHUR H. BACON, M.D.

NEUROLOGY
FRANK M. TILTON, M.D.

OBSTETRICS AND GYNECOLOGY
RAY A. WEST, M.D., Emeritus
LAWRENCE E. WOODARD, M.D.
WILLIAM T. WEST, M.D.
L. E. LUEKEN, M.D.

OCCUPATIONAL MEDICINE
CLAYTON E. BUHL, M.D.

OPHTHALMOLOGY
GEO. F. GSELL, M.D.
W. EVERETT THOMPSON, M.D.

ORTHOPEDICS
CHAS. ROMBOLD, M.D.
HARRY O. ANDERSON, M.D.
H. O. MARSH, M.D.
JOHN F. LANCE, M.D.
CLINE D. HENSLEY, M.D.
ROBERT A. RADCLIFFE, M.D.
JAMES M. BAEHR, M.D.

OTOLARYNGOLOGY
D. J. CRONIN, M.D.
R. T. FIRKINS, M.D.

PEDIATRICS
R. C. KNAPPENBERGER, M.D.
H. J. MENEHAN, M.D.
PAUL J. UHLIG, M.D.
LEONARD L. SULLIVAN, M.D.
ROBERT K. NORTON, M.D.

PSYCHIATRY
A. DALE GULLEDGE, M.D.

RADIOLOGY
DIAGNOSTIC X-RAY, COBALT THERAPY AND RADIOACTIVE ISOTOPES
CHARLES M. WHITE, M.D.
JAMES R. STARK, M.D.

SURGERY
WAYNE C. BARTLETT, M.D.
JOHN G. SHELLITO, M.D.
J. W. GRAVES, M.D.

UROLOGY
JOHN W. WARREN, JR., M.D.
KENNETH E. STANLEY, JR., M.D.

CLINIC ADMINISTRATOR
W. BURDELL BAKER

THE WICHITA CLINIC
TELEPHONE 683-8551
3244 EAST DOUGLAS
WICHITA, KANSAS 67208

ROUTING:
☒ REM
☒ RW
SEP 16 1968
☐ RGF
☐ File

September 10, 1968

Mr. Russell McClure, Deputy Manager
City Building
204 South Main
Wichita, Kansas 67202

Dear Mr. McClure:

You will recall the discussions we had together, a few weeks ago, concerning the deadening effect the current provisions of the off-street parking code have (will have) on the projected expansion of our (i.e., The Wichita Clinic's) facilities unless the interpretation and applications of those provisions to medical clinics is not materially and substantially ameliorated.

At that time we reported to you that we had been conducting a survey of our parking lot uses and this letter is written in response to your suggestion that we make the results of that factual survey -- and our suggested amendments to the present ordinance insofar as it applies to "medical clinics" -- available to you and your staff -- and such is the purpose of this letter.

First. In order that you may understand that our urging for the amelioration of the present off-street parking requirements (criteria) is not being made for argumentative or academic reasons we point out these solid facts.

(a) If the present regulations and criteria are applied to us, i.e., one stall for each 500 square feet of floor space plus one stall for each doctor and one stall for each employee, our presently planned facility-expansion will require these parking stalls:

213 to meet the footage criteria
256 to meet the employee criteria
66 to meet the doctor criteria

535 in order for us to "comply"

We now have 379 parking stalls which would mean that 156 additional stalls will have to be added if we are to be in "compliance".

(b) Under the City's current ruling this would (will) require us to purchase 13 additional 25-foot lots which at the current "going" rate at $22,000.00 per 50-foot lot, and providing we could find this many lots in our neighborhood to buy at this price, means that it would cost us $143,000.00 to purchase the land and an additional $24,375.00 for surfacing the same (based on the last price we paid), bringing a total of $167,375.00 for parking facilities alone.

(c) As pointed out to you in our conference, this cash outlay for this purpose reaches the prohibitive and our Executive Committee has directed that every reasonable effort be made to change it before proceeding further with our expansion plans.

Second. Our first study was to ascertain from an actual and positive "use-survey" as to whether or not the requirements of the present ordinance are fairly and reasonably applicable to "medical clinics" such as ours. Attached hereto is a "survey" of the empty stalls which were available and not in use for each day commencing with April 1, 1968, through August 31, 1968, during our "busy" hours, i.e., from 9:00 A.M. to 4:00 P.M., which survey made by the off-duty police officer whom we employ for the sole purpose of patrolling and policing these parking losts, is complete, accurate and wholly reliable.

Third. Now remembering that, we have purchased, equipped and have available 379 parking stalls. The "use-charts" show that we have never at any hour during the five months -- April through August -- had need for (i.e., use) more than 299 stalls. This seems to us to be incontrovertible proof that the criteria of the present ordinance is unreasonable insofar as its approach to "medical clinics" are concerned.

Fourth. On the affirmative side, the "use-chart" shows something else; it furnishes an accurate and reliable criteria which is meaningful to us -- who are conceivably more interested in our patients' parking convenience than anyone else could be -- and to the promulgators and administrators of this ordinance: It shows that if the number of our parking stalls had been proportioned to the number of our doctors -- 5.64 stalls for each of our 53 doctors would have been sufficient, and that 299 used-stalls would have covered our maximum need instead of the partially used 379 stalls.

Fifth. There are other actual figures which show the inappropriateness of the present ordinance criteria . For instance, our survey shows that only 75% of our employees drive to work and many of these drive together. And, of course, the square footage criteria is wholly untenable; it penalizes our modern up-to-date facility -- with the long, broad, well lighted passages, the spacious uncrowded waiting rooms, public rooms, restrooms, etc., by equating them footage-wise to the old, dark, crowded, uncomfortable chloroform - smelling dispensaries of the past.

In conclusion we have carefully studied and critically analyzed these "use-charts" and now believe -- that the off-street parking requirements applicable to "medical clinics" be changed so as to require 5.64 parking stalls per clinic doctor.

We sincerely trust that you and your staff will (do) appreciate the fact that the doctor-owners of The Wichita Clinic are not solely concerned with the cutting-down of the required capital outlay for completing its expansion plans; they are, as you all undoubtedly know, civic minded individuals who are intensely interested in the betterment of Wichita, and its continued growth; they sincerely believe that the criteria of the present owners as applied to "medical clinics" is wholly inappropriate, untenable and unfair and should be duly and early amended so as to relieve the conscientious administrators therof from the embarrassment and burden of its enforcement.

If we can be of any further service to you either in furnishing additional facts and figures or further explaining those furnished, or in urging the ordinance's amendment we would appreciate your asking us to do so.

Yours very truly,

W. Burdell Baker

W. Burdell Baker
Clinic Administrator

WBB:lh

enclosure

PARKING SURVEY
(EMPTY STALLS)

April, 1968	9:00 A.M.	10:00 A.M.	11:00 A.M.	12:00 NOON	1:00 P.M.	2:00 P.M.	3:00 P.M.	4:00 P.M.
1.	197	172	154	179	149	87	91	111
2.	186	163	151	181	107	88	87	107
3.	191	171	147	176	121	89	102	117
4.	187	178	151	172	147	98	91	112
5.	192	171	162	191	171	112	81	97
8.	186	168	131	184	163	106	89	116
9.	201	181	167	181	152	114	89	109
10.	179	158	133	196	145	108	93	117
11.	186	172	142	172	157	117	88	115
12.	192	167	130	187	161	113	121	106
15.	189	132	119	194	172	143	118	115
16.	202	163	145	172	189	120	112	121
17.	187	152	132	181	162	88	94	114
18.	175	170	141	192	134	85	89	110
19.	181	191	132	183	145	115	102	92
22.	197	132	145	172	120	110	121	111
23.	201	128	137	160	108	123	108	117
24.	179	168	130	193	177	142	144	119
25.	186	170	173	185	189	123	118	116
26.	179	165	147	177	152	121	111	118
29.	175	136	117	184	166	114	89	89
30.	169	144	149	202	191	132	130	151

May, 1968	9:00 A.M.	10:00 A.M.	11:00 A.M.	12:00 NOON	1:00 P.M.	2:00 P.M.	3:00 P.M.	4:00 P.M.
1.	176	140	98	167	130	90	80	104
2.	187	171	137	188	185	135	81	89
3.	179	174	144	186	187	120	124	147
6.	181	160	140	170	185	127	118	128
7.	179	155	125	205	174	115	98	108
8.	185	157	121	191	165	120	91	97
9.	161	152	117	195	189	121	96	93
10.	180	167	121	187	165	114	114	105
13.	178	161	112	154	166	87	81	86
14.	174	136	108	179	168	104	89	96
15.	179	155	109	173	168	113	89	90
16	163	144	128	173	177	96	95	90
17.	173	148	131	204	186	134	111	122
20.	174	153	129	157	166	81	92	101
21.	170	164	136	181	188	111	88	91
22.	181	154	112	172	165	132	116	122
23.	169	175	181	197	182	131	99	117
24.	158	130	117	206	175	104	107	126
27.	156	137	127	191	187	167	172	157
28.	190	147	117	170	159	101	99	88
29.	187	165	112	155	160	141	105	122
31.	171	161	131	147	156	131	106	87

PARKING SURVEY
(EMPTY STALLS)

June, 1968	9:00 A.M.	10:00 A.M.	11:00 A.M.	12:00 NOON	1:00 P.M	2:00 P.M.	3:00 P.M.	4:00 P.M.
3.	177	158	127	132	147	102	86	97
4.	175	133	125	179	170	97	90	85
5.	222	151	136	181	198	124	126	134
6.	191	180	140	200	172	143	130	117
7.	182	165	157	197	193	92	89	121
10.	189	178	151	194	185	89	91	97
11.	216	134	144	183	189	110	99	85
12.	187	169	177	185	172	93	127	134
13.	168	153	139	179	190	109	113	130
14.	187	168	154	214	203	147	149	155
17.	183	162	125	202	173	114	86	101
18.	188	167	133	192	177	99	88	97
19.	197	174	137	191	179	122	95	105
20.	181	169	144	177	181	123	131	141
21.	176	157	141	169	170	147	126	96
24.	188	142	125	177	163	137	118	103
25.	185	141	120	181	175	86	87	100
26.	192	164	149	187	222	163	143	130
27.	190	184	136	182	178	121	88	111
28.	187	178	139	178	161	130	111	92

July, 1968	9:00 A.M.	10:00 A.M.	11:00 A.M.	12:00 NOON	1:00 P.M.	2:00 P.M.	3:00 P.M.	4:00 P.M.
1.	179	123	90	194	168	132	105	99
2.	226	183	140	191	165	92	91	88
3.	179	167	117	161	152	144	125	112
5.	191	172	151	147	182	175	121	132
8.	187	176	147	133	182	165	109	121
9.	188	168	127	175	166	97	83	88
10.	167	141	114	167	155	149	120	99
11.	171	139	125	165	177	89	89	82
12.	105	161	125	180	164	178	89	84
15.	171	154	119	147	170	166	90	83
16.	174	167	150	162	181	177	105	106
17.	181	172	131	165	146	122	115	129
18.	183	165	147	190	186	120	102	111
19.	179	162	136	152	199	164	114	103
22.	178	158	120	188	185	117	89	82
23.	185	150	134	154	162	131	97	112
24.	173	147	114	162	140	129	117	132
25.	196	171	153	172	169	155	102	122
26.	176	164	150	197	186	112	100	102
29.	188	144	131	160	192	120	92	90
30.	177	151	140	151	170	181	111	90
31.	179	166	135	150	131	97	93	81

PARKING SURVEY
(EMPTY STALLS)

August, 1968	9:00 A.M.	10:00 A.M.	11:00 A.M.	12:00 NOON	1:00 P.M.	2:00 P.M.	3:00 P.M.	4:00 P.M.
1.	175	160	178	163	98	87	82	88
2.	182	157	143	151	198	175	103	119
5.	186	161	154	201	190	94	95	81
6.	181	157	151	181	189	121	105	113
7.	178	170	149	190	184	135	124	117
8.	198	172	154	161	206	142	103	122
9.	178	154	139	189	189	143	117	126
12.	187	164	153	181	187	113	89	103
13.	179	156	139	189	191	117	105	115
14.	187	163	142	188	182	124	124	134
15.	185	168	143	205	182	116	111	114
16.	180	158	150	208	187	129	123	130
19.	199	148	132	176	197	130	102	117
20.	185	170	135	181	156	122	71	75
21.	187	178	145	178	194	129	122	142
22.	182	168	151	176	188	142	119	127
23.	191	152	147	157	176	131	102	122
26.	184	162	143	158	208	173	108	72
27.	193	171	137	149	142	133	101	83
28.	185	181	155	192	157	109	111	106
29.	186	175	153	209	187	93	87	99
30.	188	169	149	206	190	117	108	97

10-1-68

Off-street Parking Reqmts. Med. Clinic

Wichita — Pres

1 ea. Dr.	66
1 ea Emp.	256
1 ea 500 ft	213
TOTAL	* 535

*based on B. Baker letter

Prototype
1 ea 400 ft = 266

Dallas —
1 ea 150 ft = 709

Topeka
6 ea doctor = 396

Portland, Ore.
1 ea 300 ft = 354
+ 1 ea emp. = 322
TOTAL = 676

Miami, Okla
1 ea 100 ft = 1065

ROUTE SLIP
(PLEASE CIRCLE DESTINATION)

City Manager	Dir. of Adm.	Planning Dept
City Clerk	Auditing	Police Dept.
Community Dev.	Budget	Motor Pool
Housing	Data Proc.	Dir. of Public Works
Human Res. Dev.	Industrial Dev.	Administration
Model Cities	Man. Coord. Center	Central Insp.
Community Facilities	Personnel	Project Betty
Credit Union	P.S. Careers	Engineering
Fire Department	Public Info.	Traffic Engr.
Health Department	Purchasing	Maintenance
Director of Law	Duplicating	Flood Control
Prosecutor's Office	Ret. & Group Ins.	Sanitation
Municipal Court	Treasury	Urban Renewal
Transit Authority	Library	Water Department
	Park Department	Water Pol. Control

For: Robin R. Young

____For your information ____ Reply sending me____ copies
____For your comments ____ Prepare reply for my signature
____Note and return ____ You handle. No report required.

MESSAGE:

Note Page 6
author simplicity

Signed TED Date 5/30

000-013

Published in the Topeka State Journal 2-16-70

ORDINANCE NO. 12875

AN ORDINANCE relating to the construction of driveways, curbs and gutters, amending Sections 25-219 through 25-229, inclusive, of the Code of the City of Topeka, 1968; setting forth regulations, rules of construction, standard plans and specifications for such construction; providing penalties for violation of provisions hereof; and expressly repealing said original sections.

BE IT ORDAINED BY THE GOVERNING BODY OF THE CITY OF TOPEKA, KANSAS:

Section 1. That Section 25-219 of the Code of the City of Topeka, 1968, be, and the same is hereby, amended to read as follows:

25-219. TERMS DEFINED. For the purpose of this ordinance, the following terms shall have the meaning ascribed to them as hereinafter defined, unless otherwise expressly stated or the context clearly defines a different meaning.

(a) Driveway. A place on private property for the operation of automobiles and other vehicles.

(b) Driveway Approach. An area between the roadway of the public street and private property intended to provide access for vehicles from the public street to private property.

(c) Roadway. That portion of any public right-of-way improved, designed or ordinarily used for vehicular travel.

(d) Property line. A line dividing two adjacent properties, either both private properties or one private and the other public, or both public properties.

(e) Parking. That portion of any public right-of-way between the curb or lateral lines of a roadway and the adjacent property lines not occupied by a sidewalk.

(f) Corner. The point of intersection of the outside lines of the roadway extended into the intersection of roadways.

(g) Curb Return. That portion of the curbing along the edge of any driveway approach which includes the radius of curvature or ramp type lug and which connects the driveway approach to the edge of the roadway.

(h) Curb Opening. A space provided in a non-mountable curb to permit the entry or departure of a vehicle from the roadway to the driveway approach.

(i) Private Driveway Approach. (Residential District) and (Along Major Traffic Thoroughfares) Includes classifications of "A" Single Family Dwelling, "B" Single Family Dwelling and "C" Two Family Dwelling use.

(j) Commercial Driveway Approach. Includes classifications of "D" Multiple Family Dwelling, "E" Multiple Dwelling, "E-1" High-Rise Multiple Dwelling, "F" Neighborhood Shopping, "G" Commercial, "H" Business, "I" Light Industrial; "J" Heavy Industrial, "H-P" Planned Central Business, "I-P" Industrial park use.

(k) Safety Island. That area along the curb line that is between two (2) commercial driveway approaches.

Section 2. That Section 25-220 of the Code of the City of Topeka, 1968, be, and the same is hereby, amended to read as follows:

25-220. Crossing, Cutting or Breaking Curbs; Unlawful Acts. It shall be unlawful for any person, firm or corporation willfully to drive or cause or permit to be driven, any vehicle or machinery over or across any curb or sidewalk in any street or avenue of the city, or to damage, break or cut any curb, gutter or sidewalk, except as may be authorized under a permit from the City Engineer issued in accordance with ordinances of the city relating to street parkings, curbs and gutters, and as hereinafter provided for the construction of driveway entrances.

Section 3. That Section 25-221 of the Code of the City of Topeka, 1968, be, and the same is hereby, amended to read as follows:

25-221. Bridging Curbs; Interference with Gutters; Exceptions. It shall be unlawful for any person, firm or corporation to bridge across any curb and gutter or fill any gutter with concrete, asphalt or other material for purpose of gaining access to or egress from any driveway or private property, or to obstruct or interfere with the drainage of any gutter or drain at the edge of a roadway by placing therein any concrete, asphalt, planks, stones, earth or other material or substance for such purpose except by written permit of the City Engineer: Provided, that building materials may be stored in or alongside of any curb and gutter or any street parking in accordance with a permit issued by the Building Inspector as provided by ordinance relating to the encumbering of streets for certain purposes: Provided further, that the Street Department may remove any existing material or any material hereafter placed across any curb or in any gutter or drain in violation of this section.

Section 4. That Section 25-222 of the Code of the City of Topeka, 1968, be, and the same is hereby, amended to read as follows:

25-222. Driveway Approaches; Unlawful to Extend. It shall be unlawful for any person, firm or corporation to construct, alter or extend, or permit or cause to be constructed, altered

or extended any driveway approach which can be used only as a parking space or area between the curb and adjacent property line, except in connection with a resolution by the Board of Commissioners.

Section 5. That Section 25-223 of the Code of the City of Topeka, 1968, be, and the same is hereby, amended to read as follows:

25-223. Conditions of Permits; Rule of Construction. All permits granted for the use of public property under the provisions of this ordinance shall be granted on condition that the same are revocable at the discretion of the Board of Commissioners and no such permit shall be deemed to permit or authorize any violation of other provisions of this code or other ordinances of the city. Any permit issued hereunder shall be granted on the further condition that the permittee or his successors in title will, upon the abandonment of any driveway approach, restore and reconstruct the curb and gutter to its original condition upon notice from the Commissioner of Streets and Public Improvements, and the City reserves the right to close and charge the cost thereof against the owner: Provided, that this ordinance shall not be construed to deny or abridge the right of egress and ingress of property owners.

Section 6. That Section 25-224 of the Code of the City of Topeka, 1968, be, and the same is hereby, amended to read as follows:

25-224. Disqualification for Permits. Any person, firm, association, or corporation who has previously violated any provision of this ordinance shall not be granted any permit hereunder unless and until the conditions causing said prior violations have been remedied.

Section 7. That Section 25-225 of the Code of the City of Topeka, 1968, be, and the same is hereby, amended to read as follows:

25-225. Building Permits; Driveway Approaches. All applications submitted to the Building Inspector for a permit which includes or involves unusual driveway approaches or problems shall be referred by the Building Inspector to the City Engineer and Traffic Engineer for their approval before a building permit is issued. Any existing driveway approach built for a purpose other than its present intended use shall be closed and the parking, curb, and gutter restored to its original conditions.

Section 8. That Section 25-226 of the Code of the City of Topeka, 1968, be, and the same is hereby, amended to read as follows:

25-226. Construction of Driveway Approaches; Regulations. The construction or reconstruction of driveway approaches including the cutting and/or removal of curbs or gutters shall be authorized upon application in accordance with the following requirements:

(a) A driveway or approach must provide access to private property adjacent to the city street for some definite purpose such as a driveway, a parking area, or a door at least seven (7) feet wide intended and used for the entrance of vehicles, and not for the parking or servicing of vehicles on street right-of-way.

(b) No driveway approach shall be constructed which will interfere with public facilities including street light poles, traffic signal standards, signs, catch basins, hydrants, crosswalks, loading zones, utility poles, fire alarm supports, underground pipes or ducts, or other necessary street structures without the concurrence in writing of the agency involved with the facility.

(c) Not more than one (1) driveway approach may be constructed for access to one (1) parcel of residential land less than eighty (80) feet in width, except that driveway approaches may be permitted from each roadway adjacent to a corner lot. Not more than one (1) driveway approach may be constructed along commercial property with frontage less than one hundred and fifteen (115) feet. Not more than two (2) driveway approaches may be constructed along commercial property with frontage less than one hundred and seventy-five (175) feet.

(d) To prevent encroachment on adjacent property, the entire driveway approach, including the flared portions for turning purposes, must be constructed on the petitioner's property frontage extended, exception may be allowed by written consent of the adjacent affected property owners. Extension of property frontage is to be determined by projecting lines at right angles from the street center line to the intersection of the abutting property lines with the street right-of-way.

(e) Adequate drainage structures, as approved by the City Engineer, shall be provided at entrances by the petitioner.

(f) Restricted area, on-street right-of-way. The placement of unauthorized signs, parked vehicles, or any sight obstruction will not be permitted on street right-of-way. Landscaping is permissible if shrubs are 30 inches or less in height from top of street pavement and all trees are properly trimmed so that sight distance is not restricted.

(g) Restricted area, not on street right-of-way, as covered by Section 20-414 of the Code of the City of Topeka, 1968. Parked vehicles, sidewalk-type signs, or any sight obstructions are prohibited for sight distance and safety reasons. Landscaping is permissible if shrubs are 30 inches or less in height from top of street pavement and all trees are properly trimmed so that sight distance is not restricted.

(h) Safety. Every effort shall be made to select driveway approach locations so that maximum sight distance is possible. Existing medians will not be opened to accommodate abutting property other than crossovers placed by the city as a part of the design plans. No vehicle parking areas will be permitted on the right-of-way, and only those signs approved by the City of Topeka shall be erected on the right-of-way.

(i) Where a driveway approach is serving more than a driveway or door on the private property, a non-mountable barrier curb shall be constructed and maintained on private property to prevent encroachment of vehicles or equipment upon public property except at the driveway approach.

(j) No driveway approach shall be constructed across any sidewalk unless such sidewalk be constructed or reconstructed in accordance with specifications pertaining to the construction of sidewalks to be used as driveway approaches.

(k) Where no sidewalk exists, that portion of the driveway approach adjacent the property line shall be constructed as though a sidewalk did exist.

(l) No driveway approach shall be constructed in a manner to change or interfere with the gutter flow line or sidewalk grade where such driveway approach crosses any such gutter or sidewalk.

(m) The sidewalk and curb shall, insofar as possible, be cut and removed at the nearest joint. Upon replacement and reconstruction of a sidewalk as a driveway approach, the construction of the curb return and any pavement in connection with a driveway approach, suitable joints shall be provided and all such spaces shall be filled with a bituminous fiberous compound in accordance with the specifications of the City of Topeka. When it is not possible to cut and remove at an existing joint, such cutting shall be performed by using a concrete saw.

(n) The cost of construction of all driveway approaches and necessary appurtenances thereto shall be borne by the permittee.

Section 9. That there shall be added to the Code of the City of Topeka, 1968, the following section.

25-227. DESIGN

1. Width of Driveway Approach.

(a) Private driveway approach (residential district) - the width of a driveway approach in residential districts shall not be less than ten (10) feet nor more than twenty (20) feet measured parallel to the center line of the street at the property line.

(b) Private driveway approach (along major traffic thoroughfares) - the width of driveway along major traffic thoroughfares shall not be less than twelve (12) feet nor more than twenty-four (24) feet measured parallel to the center line of the street at the property lines.

(c) Commercial driveway approach (not on major traffic thoroughfares) - the width of driveway approaches on non-major traffic thoroughfares shall not exceed thirty (30) feet or be less than twenty-five (25) feet measured parallel to center line of the street at the property lines of two-way driveway approaches and sixteen (16) feet if one-way, except in those instances involving a substantial volume of large trucks.

(d) Commercial Driveway Approach (along major traffic thoroughfares) - the width of driveway approaches on major traffic thoroughfares shall not exceed forty (40) feet or be less than thirty (30) feet measured parallel to the center line of the street at the property lines of two-way driveway approaches, and twenty (20) feet maximum if one-way.

2. Angle of Entrance.

(a) The angular placement of driveway approaches in both residential and commercial areas may vary from forty-five (45) degrees to ninety (90) degrees inclusive. This limitation includes the entire length of the driveway approach. The angle shall be that made by the center line of the driveway approach with the center line of the street or the tangent to the center line at the point of intersection if located on a curve.

3. Corner and Adjacent Property Line Offset.

(a) Private driveway approach (residential districts) - When residential driveway approaches are located at or near an intersection, in no case shall the distance from the intersection of adjacent street curb lines or roadway at a corner be less than twenty (20) feet to the near line of the driveway approach, extended to the street curb or pavement edge.

(b) Commercial driveway approach (not on major traffic thoroughfares) - When commercial driveway approaches are located at or near a street intersection, in no case shall the distance from the intersection property corner be less than thirty (30)

feet to the near line of the nearest driveway approach, as extended to the street curb or pavement edge.

(c) Commercial driveway approach (on major traffic thoroughfares) - When commercial driveway approaches are located at or near a street intersection, in no case shall the distance from the intersection property corner be less than sixty (60) feet to the near line of the nearest driveway approach for primary thoroughfares, or 50 feet to the near line of the nearest driveway approach for secondary thoroughfares, depending upon whether they are primary or secondary major traffic thoroughfares.

(d) No commercial driveway approach shall be constructed having a tangent length, between the curb return and the property line extended, of less than five (5) feet.

4. Safety Islands

(a) The minimum lengths of safety islands between entrances shall be 25 feet. Lengths of safety islands is the tangent distance between the turning radii as measured along the surface edge or curb line, measured parallel to the center line of the street.

5. Turning Radii

(a) Private driveway approaches (residential district) - Turning radii shall not exceed two and one half (2.5) feet.

(b) Private driveway approaches (along major traffic thoroughfares) - Turning radii shall not exceed five (5) feet.

(c) Commercial driveway approaches (not on major traffic thoroughfares)

(1) Safety island radii shall be five (5) feet.
(2) Approach radii shall not exceed twenty (20) feet on a ninety (90) degree driveway nor be less than five (5) feet.
(3) Approach radii shall not exceed fifteen (15) feet on driveway approaches less than ninety (90) degrees nor be less than five (5) feet.

(d) Commercial driveway approaches (on major traffic thoroughfares)

(1) Safety island radii shall not exceed ten (10) feet nor be less than five (5) feet.
(2) Approach radii shall not exceed twenty (20) feet

on a ninety (90) degree driveway approach nor be less than ten (10) feet.

(3) Approach radii shall not exceed twenty (20) feet on driveway approaches less than 90 degrees nor be less than ten (10) feet.

6. Curb Openings

(a) Private driveway approaches (residential district) - Curb openings for driveway approaches in residential districts shall not exceed twenty-five (25) feet.

(b) Private driveway approaches (along major traffic thoroughfares) - Curb openings for driveway approaches on major traffic thoroughfares shall not exceed thirty-four (34) feet.

(c) Commercial driveway approaches (not on major traffic thoroughfares) - Curb openings for commercial driveway approaches not on major traffic thoroughfares shall not exceed sixty-five (65) feet.

(d) Commercial driveway approaches (on major traffic thoroughfares) - Curb openings for commercial driveway approaches on major traffic thoroughfares shall not exceed seventy (70) feet.

Section 10. That Section 25-227 of the Code of the City of Topeka, 1968, be, and the same is hereby, amended to read as follows:

25-228. Standard Plans and Specifications; City Engineer. The City Engineer is authorized to prepare standard plans and specifications for the construction of driveway approaches, sidewalk crossings, and interior curbs which shall be furnished to any permittee upon application. It shall be the duty of the City Engineer to enforce the provisions of this ordinance and to supervise all work authorized by a permit. Upon completion of any such work, his approval shall be entered on the permit and he shall preserve a permanent file of his permits issued and agreements

entered into under the provisions of this ordinance.

Section 11. That Section 25-228 of the Code of the City of Topeka, 1968, be, and the same is hereby, amended to read as follows:

25-229. Variance From Strict Application of Provisions of this Ordinance. It is hereby recognized that variance from strict application of this ordinance may be necessary or desirable to better fit existing physical conditions, traffic conditions, or land uses. The City Engineer, with the concurrence of other applicable agencies, is hereby authorized to grant, in writing, as a part of any permit issued by him, variances from the strict application of the provisions of this ordinance, upon determining that any or all of the following conditions are present:

(a) Exception or variance desired arises from peculiar physical conditions not ordinarily existing in similar districts in the city or is due to the nature of business and operations on the abutting property.

(b) Exception or variance desired is not against the public interest, safety, convenience and general welfare.

(c) The granting of the permit for the exception or variance will not adversely affect the right of adjacent property owners or tenants.

(d) The strict application of the provisions of this ordinance will work unnecessary hardship on the property owner or tenant.

Section 12. That Section 25-229 of the Code of the City of Topeka, 1968, be, and the same is hereby, amended to read as

follows:

25-230. Penalty. Any person, firm or corporation convicted of violating any of the provisions of this ordinance shall be punished by a fine in any sum not exceeding two hundred dollars ($200.00). Each day that any violation continues or is permitted to exist shall constitute a separate offense.

Section 13. That Sections 25-219 through 25-229 of the Code of the City of Topeka, 1968, be, and the same are each of them, expressly repealed.

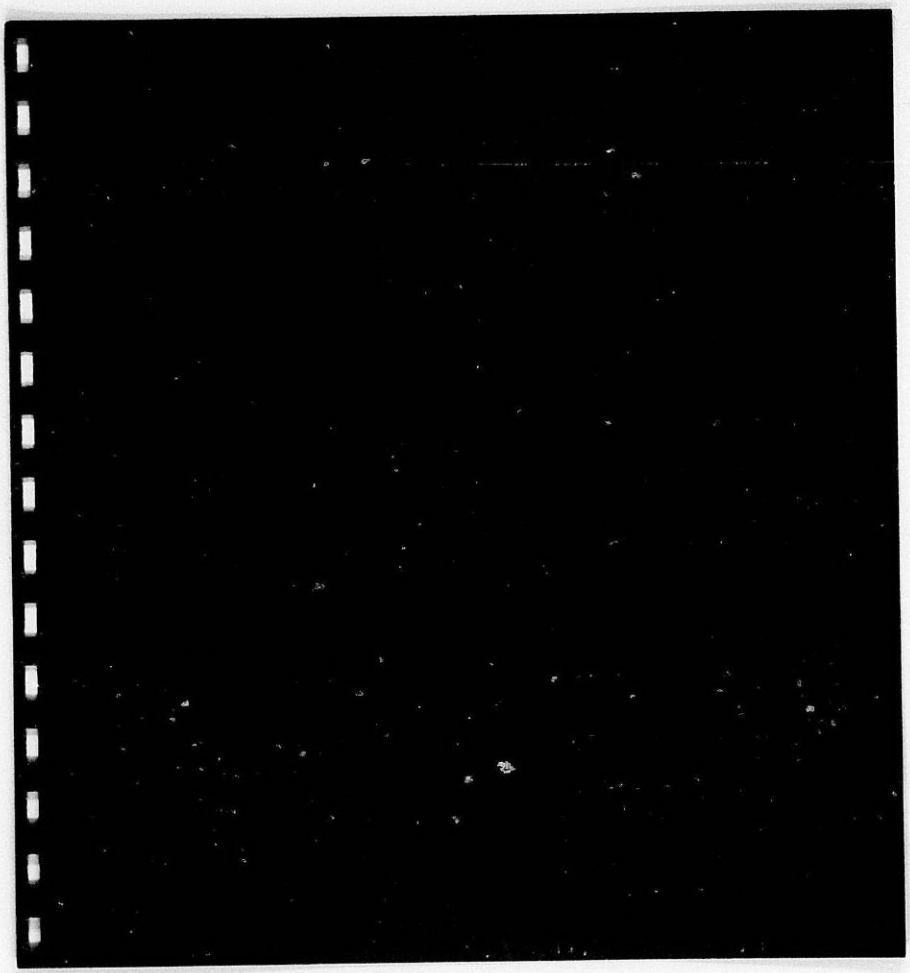
Section 14. That this ordinance shall take effect and be in force from and after its passage, approval and publication in the official city newspaper.

PASSED and APPROVED by the Board of Commissioners_____

_____
Gene C. Martin, Mayor

ATTEST:

_____
William M. Douglass, City Clerk



Introduction: Goals & Trends

This is the second in a series of reports on criteria and guidelines for the development of a better environment for all phases of life in St. Louis County, Missouri. The report was prepared by the St. Louis County Department of Planning based generally upon policies adopted by the St. Louis County Planning Commission in November, 1968.

Published: December, 1970

$4.50/copy

1

The environment of tomorrow is being determined today in St. Louis County. It is being shaped to some extent by external forces we cannot control, but more importantly, it is being shaped by decisions we, the citizens of St. Louis County, make or do not make. We can intervene in this process to create a better living environment. Thus, it becomes increasingly important that public officials and private citizens address themselves to every facet of the future environment and how we might best shape it.

Commercial facilities are a very important aspect of our environment. Development of such facilities has usually received an "all or nothing" approach from citizens and local governments. Neither approach yields positive results. Commercial services are necessary, but, they must be carefully controlled and integrated into the total living environment. The end result of the "all or nothing" approach to commercialization can be seen in any metropolitan area, including St. Louis. Some communities have steadfastly, at least for a few years, tried to keep out all or nearly all commercial uses believing that such uses will ultimately lead to a deterioration of the residential environment and to lowered property values. Yet, the people who live in these communities must have a place to shop, to buy gas, to get their car repaired. Result: the pressure mounts to satisfy public needs. Without planned commercial development, the market usually finds its outlet in some nearby community. Often these communities accept commercial development for its tax benefits and exercise little control over its planning and development. The environment created by default of its citizens results in hazardous traffic conditions, a visually unpleasant environment for shoppers and motorists, and deterioration of the surrounding area for other uses. (See Ill. I.) While one community has kept its residential environment intact, the environmental result in the total area is deleterious. In a large area, such as a metropolitan center city or adjacent unincorporated county, the "all or nothing" approach is clearly unacceptable. Services are needed and must be provided. However, the manner of provision is quite another matter!

This publication addresses itself to two important questions:

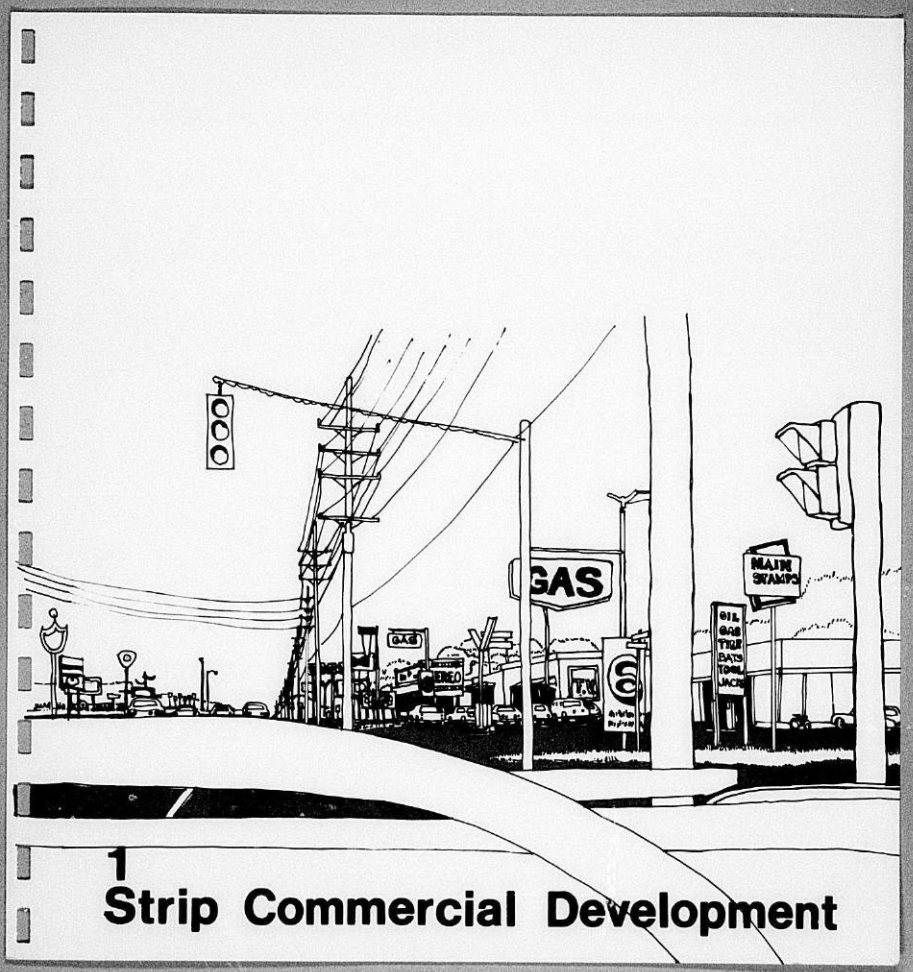
1. How can the existing, poorly planned commercial facilities in St. Louis be improved.

2. How can future commercial facilities be planned to co-exist with the predominantly residential character of St. Louis County.

Suggestions for improving the entire range of commercial facilities will be treated here, from the single commercial facility such as an auto service station on a single lot to a large scale commercial development which may include a mixture of compatible uses. The policies outlined in this publication represent a deliberate effort of the St. Louis County Planning Commission to control, coordinate and improve those commercial uses which are needed in St. Louis County. These policies have been formally tested and improved over a year and a half period. Further revisions will be necessary as new concepts are introduced and tested.

This publication is intended to fulfill two important functions: the first is to inform interested citizens of the current policies concerning commercial development; the second, and more important function, is to stimulate better proposals from private investors and thus to create a better environment.

The Planning Commission, in its first report in this series formally communicated its guidelines and criteria for future residential environment. The present report reaffirms the general goals stated in the residential report. Environmental improvement guidelines will continue to be released for other key environmental factors as part of this series of special reports.



1
Strip Commercial Development

4

To plan for the future, a clear understanding of the goals which will benefit all must be formulated. These goals must be consistent with existing trends and those projected for the future.

From a sensitive analysis of these goals and trends, specific objectives may be formulated which can be used as guidelines for both public agencies and private developers.

It must be recognized that the discussion of goals and trends which follows is subject to alterations and additions as new factors become evident.

A. Goals

A functional and efficient social, economic and physical environment for all residents.

A physically and psychologically healthy environment that maximizes individual and group well-being.

An environment that facilitates individual choice and achievement.

A progressive and viable economy that encourages growth along with optimum provision of public facilities and services.

An aesthetic and coherent environment that results in agreeable living and working conditions for all residents.

A vibrant social environment that facilitates "neighborliness."

B. Trends

A favorable long-term national economic pattern:
A continued rise in productivity per worker and in gross production,
A continued rise in the rate of technological advancement, and
A continued increase in the standard of living, including an increase in wages and salaries, leading to an increase in net disposable income for all persons and families.

A shorter work week:
An increase in leisure time,
Extra time spent in increased use of all types of recreational facilities, and
An increase in time spent for education.

A continued trend towards urbanization, especially in the metropolitan region, primarily from natural increase.

A continued rise in population within the metropolitan area.

A growing demand for a more sophisticated and wider variety of specialized commercial goods and services, which will tend to increase the number and type of commercial establishments.

A continuing contribution by the Federal and State governments to local development efforts.

Greater equalization of local tax rates and new state laws for improving the financing of schools and other services and facilities.

Increased public interest in air, water and noise pollution abatement and a more effective solution to solid waste disposal.

6

A desire for a variety of residential densities and dwelling types, and a concomitant demand for increased amenities with every type of residential development.

Different forms of development taking place as population increases, transportation facilities improve, public tastes diversify, and individual life styles change.

Use of the automobile as the primary means of transportation, despite a rise in public and mass transportation relative to population increase and density.

Continued increased citizen support for the financing of needed municipal and county services and facilities.

Development Guidelines

The development guidelines listed below are a synthesis of goals and trends. The guidelines are perceived as general concepts which suggest ways in which the total environment may be improved but are specifically related to our concern here, commercial facilities.

A. Physical Appearance and Efficiency

Objective: the highest degree of design excellence possible within the parameters of efficiency and economy.

Guidelines:

1. Commercial facilities should be arranged in compact architectural groupings to produce visual harmony and to facilitate pedestrian and vehicular movement.

2. The development plan for a commercial facility must incorporate measures both to safeguard surrounding areas from any potentially offensive conditions emanating from commercial uses or related traffic conditions, and also to safeguard the commercial facility from offensive conditions emanating from the surrounding area. Thus, large scale plantings around the entire perimeter of the site are to be encouraged for both their beauty and their utilitarian value as shades, windbreaks, noise barriers, and visual screens. All mechanical and electrical service installations should be grouped and screened. (See III.2)

3. Open and/or covered sidewalks should be used as additional design elements for aesthetic purposes and pedestrian safety and convenience, as well as an effective means for regulating traffic in parking lots and other areas.

4. Landscaping should be closely coordinated with site planning and architectural design. Existing natural features of the site such as trees, rock formations and water bodies should be preserved and taken advantage of in the site design. Large parking areas should be divided by walkways and landscaping. (See III.3)

5. Signs should be regarded as positive elements of the overall architectural composition, and should be closely regulated and integrated with the architectural plans, building elevations, and topography to reduce visual clutter. Signs and markings should be simple and standardized in order to prevent confusion, reduce accidents, and increase parking efficiency. Unique pictorial symbols or letters should be used to identify areas within large parking lots.

6. Lighting in automobile and parking areas must be engineered to fulfill utilitarian and safety functions, yet aesthetic expression should be achieved through careful design and proper selection of equipment.

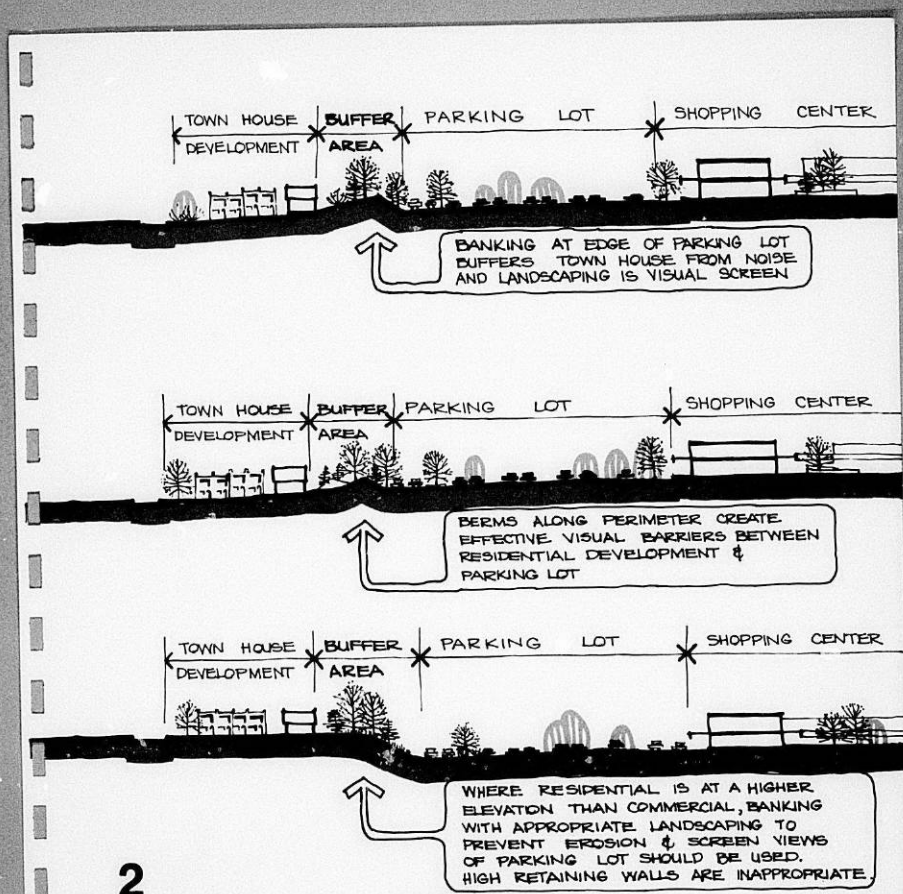
7. A tract of land to be utilized as a shopping center should be free of intervening roadways, rights-of-way, or easements which could prevent the integrated design of a unified center.

B. Compatibility with Surrounding Area

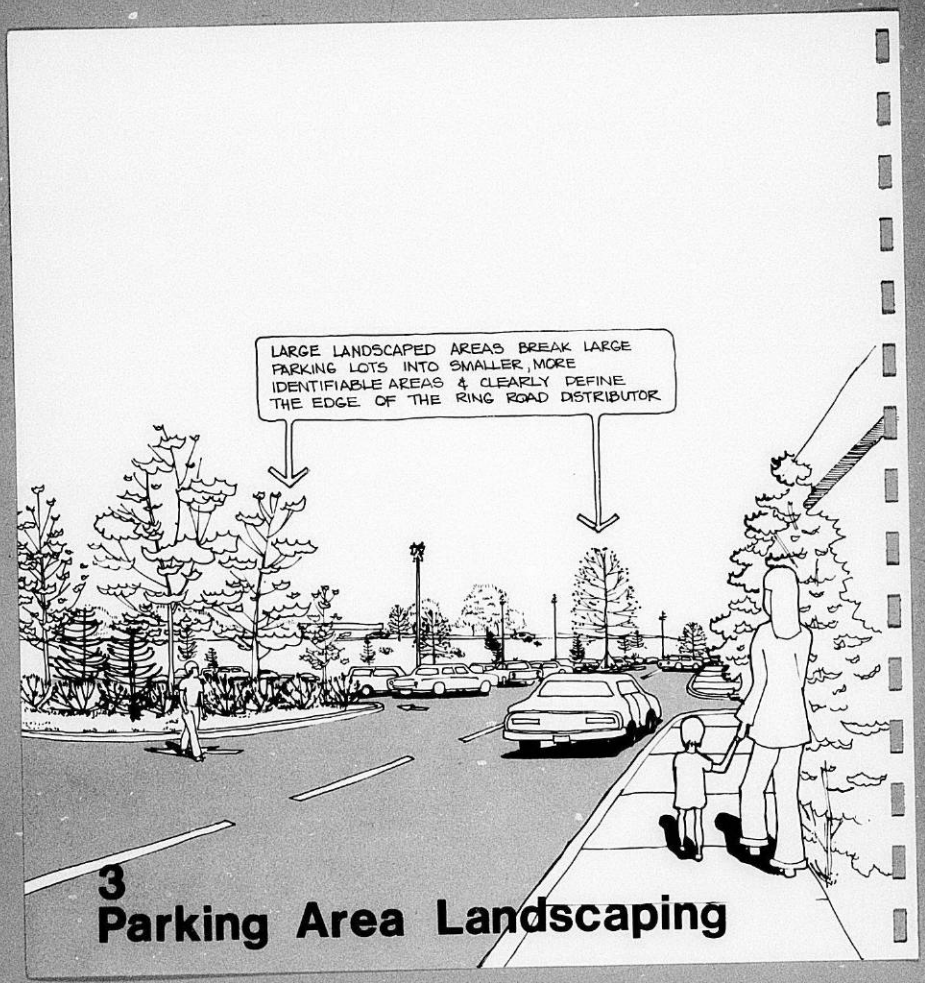
Objective: Assurance that all new developments will not exert an unfavorable influence on adjacent properties and the surrounding area.

Guidelines:

1. New commercial uses should be in scale with the characteristics of adjacent land uses.



2
Landscape Buffering



3
Parking Area Landscaping

2. A master plan for each large commercial center (neighborhood size or larger) or area should be developed which would protect or enhance the economic and aesthetic character of the surrounding area, as well as guide the improvement of the commercial district. (See Ill. 4)

3. Commercial areas should not be located directly adjacent to residential areas unless adequately buffered by landscaping or other means. If possible, adjacent uses should serve as a gradual transition between high-intensity commercial uses and nearby single family residences. The presence of both natural and man-made buffers or boundaries such as water bodies, slopes, large institutionally owned lands, or major highways should be considerations in the location and design of commercial areas.

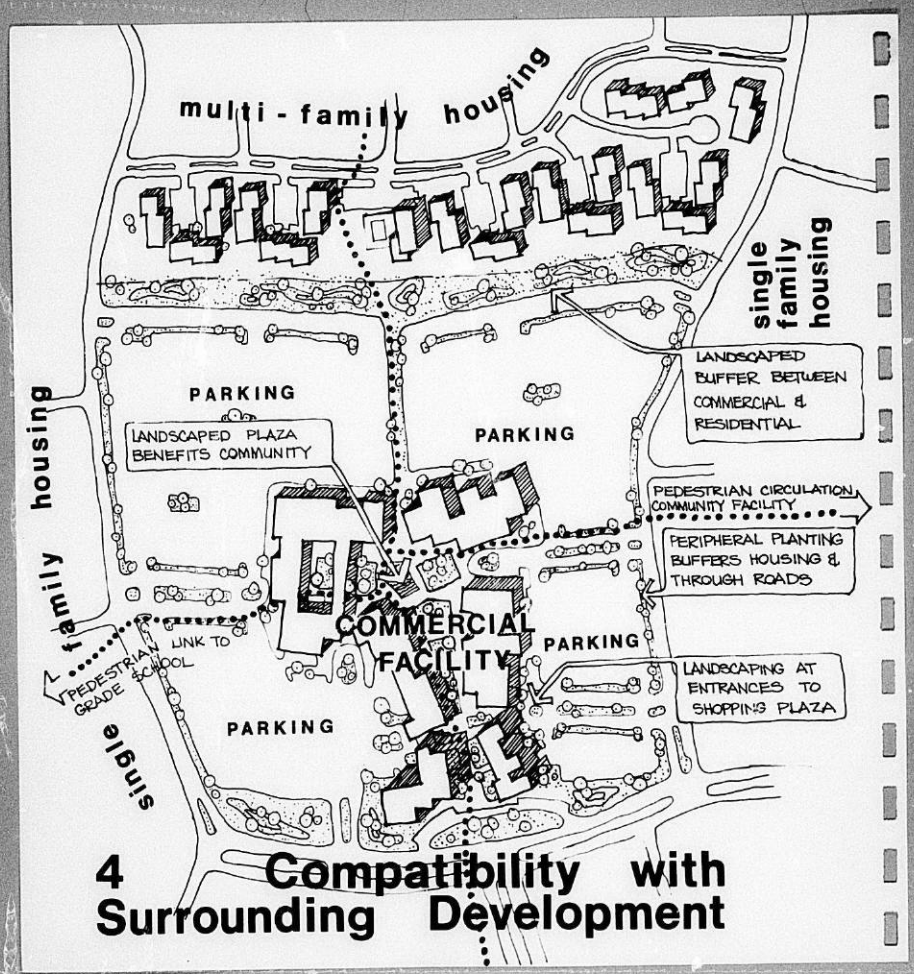
4. All lighting, both decorative and utilitarian, should be oriented internally to the commercial site and away from adjoining developments, particularly residential. Light should not constitute a traffic hazard.

5. Convenient pedestrian walkways should be provided as needed through and around commercial sites so that surrounding residents have access to schools, parks and other community facilities in the area. (See Ill. 4)

6. Commercially generated traffic should not be channeled on local access streets in residential areas.

7. Urban commercial development should not add unreasonably to the storm water problems of the watershed. Therefore, the runoff volume and rate in larger developments should not be increased above the rate and volume generated if the site were to be developed in a manner equivalent to nearby urban areas. No additional sediments from grading or construction should leave the site during development or occupancy.

8. The design of storm retention and erosion control systems should include:



4 Compatibility with Surrounding Development

a. A separate retention basin at perimeter or within property to assure temporary retention in accordance with the principles previously outlined.

b. A parking lot vertical configuration which provides for ponding.

c. Building design should provide for controlled runoff from large roof areas so that surrounding landscape is not damaged.

d. Underground piping or other appropriate facilities to carry storm water to major streams, as designated by the county.

C. Necessary Services

Objective: In general, commercial development which fosters long-term growth and market stability, and enhances the tax base of the community.

Sufficient area must be provided for all types of commercial activity and to serve all the commercial needs of the community. Such commercial development must include shopping centers (varying in size, service area, and function), central business districts, intermediate shopping areas, and certain types of highly specialized service areas as, for example, airport and highway commercial districts. Such developments must be appropriately located for accessibility and must be oriented to the residential or work area being served.

Guidelines:

1. The table which follows collates information about commercial services required by the community, site selection for best marketability and environmental improvement, and what specific types of commercial establishments might be grouped to provide the best and most efficient service to the public.

GENERAL GUIDELINES FOR SITE SELECTION AND TENANT SELECTION FOR VARIOUS TYPES OF COMMERCIAL SERVICE

TYPE OF MERCHANDISE OR SERVICE

*Impulse Buying

*Non-impulse Buying (large investment purchases or necessities)

Travelling Public

Medical Facilities

Non-warehouse Wholesaling

Business Repair Service

Auto Repair, Service and Auto Sales

Entertainment
A. Indoor

B. Outdoor

*The table on Standards for Location, Land & Facility Requirements for commercial shopping centers deals with facilities for these two types of merchandise in greater detail.

BEST LOCATION	COMMERCIAL FACILITIES
1. Area of high auto and pedestrian traffic 2. Within a large complex of commercial establishments 3. Where easy auto access and egress is available 4. Corner location	1. Variety stores 2. Gift shops 3. Specialty shops 4. Small clothing shops
1. Major arterials close to major highways 2. Right side of road from heavily populated areas 3. Visually prominent sites	1. Department stores 2. Discount stores 3. Auto showrooms 4. Hardware stores 5. Appliance stores
1. Major radial arterials near circumferentials or interstate highways 2. Visually prominent sites	1. Sleeping accommodations as motels, hotels 2. Restaurants and night clubs 3. Auto service centers 4. Gas stations
1. On major arterials	1. Hospitals 2. Medical & Dental offices 3. Pharmacies
1. Adjacent to or within office complex	1. Office Supply Stores 2. Art supply stores 3. Printing & copying 4. Computer services 5. Interior design showrooms
1. Adjacent to or within office complex	1. Business machine repair 2. Sign maintenance 3. Restaurant equipment & repair
1. On major arterials 2. Sites not immediately adjacent to residential development 3. Within other major commercial developments	1. Auto parts stores 2. Auto repair shops 3. Auto sales (new & used)
A. 1. On major arterials 2. Within larger commercial/entertainment developments B. 1. Major arterials or circumferential highways 2. Sites adequately buffered by physical barriers or higher commercial uses from residential uses	A. 1. Bowling alleys 2. Movie & legitimate theater 3. Night clubs, teen clubs B. 1. Amusement parks 2. Driving ranges 3. Miniature golf courses 4. Drive-in theaters

2. The location of major commercial developments should be contingent upon objective proof of the public economic demand for the particular type of facility at the proposed site.

3. Delineation of the general location, function and extent of commercial development wherever possible should conform to the general plan, special land use plans where applicable, and to the general guidelines established in the reports on residential and commercial development.

4. Commercial developments should be located within convenient driving and/or walking distances from the projected market area.

5. Commercial activities which cannot logically be included in other groupings for reasons of economics or compatibility should be located on an individual basis; for example, animal hospitals, greenhouses, retail lumber yards, monument sales and mortuaries.

6. Estimates of the nature and size of the service area and of existing commercial development should affect such design aspects as site size, land uses, and parking ratios. For example, a lower parking ratio can be used for neighborhood stores that depend primarily on pedestrian access, or for specialized uses where lower parking ratios are justified.

7. Tenant stores in given types of shopping centers should be carefully selected, with attention given to the size, type and location of tenants, in order to create a balanced retail area, allow for the greatest diversity, and minimize substantial overlapping or duplication of retail facilities beyond the point necessary to achieve competition.

D. Traffic Circulation

Objective: Assurance that all new commercial developments are planned with sufficient off-street parking and public and private traffic facilities to provide for safe and efficient movement of automobile, pedestrian and service traffic, both within and adjacent to the development. Also, sufficient flexible traffic facilities to accommodate commercial growth must be provided.

Guidelines:

1. The number of entrances to commercial areas should be minimized consistent with expected peak hour traffic movements to and from the site. Separately owned adjacent commercial establishments should be encouraged to or even required to combine to minimize the number of entrance and exit points to the larger traffic system.

2. Sufficient improvements to the road system surrounding a shopping center or other large commercial district should be made to allow traffic to flow safely and efficiently.

3. Proper ingress and egress points including acceleration and deceleration lanes accompanied by stacking areas if necessary should be provided to allow traffic to transfer smoothly and conveniently from the external road system to the commercial site. Entrance and exit points to and from the internal road system of a shopping center should be located away from major intersections except where the intersection is a "T" (See III. 5)

4. Vertical and horizontal sight lines should be sufficient to ensure safe vehicular movement at planned speeds. Unobstructed vision at entrance and exit points on commercial sites should ensure safe vehicular movement.

5. The design of a commercial site should facilitate traffic movement which is evenly distributed and flows with a minimum of conflict. The circulation plan for a large planned commercial development must provide wide circulation roads and a clearly marked traffic pattern. Circulatory roads should be arranged near the outer edges of the commercial site, but sufficiently removed from the property line to allow easy access to and from public roadways, or they should coincide with external signaled intersections. (See Ill. 6)

6. Angle parking space arrangements are better for drivers, are used more efficiently, and should be encouraged. Parking rows should be arranged at right angles to buildings, reducing walking distances and giving pedestrians safer access.

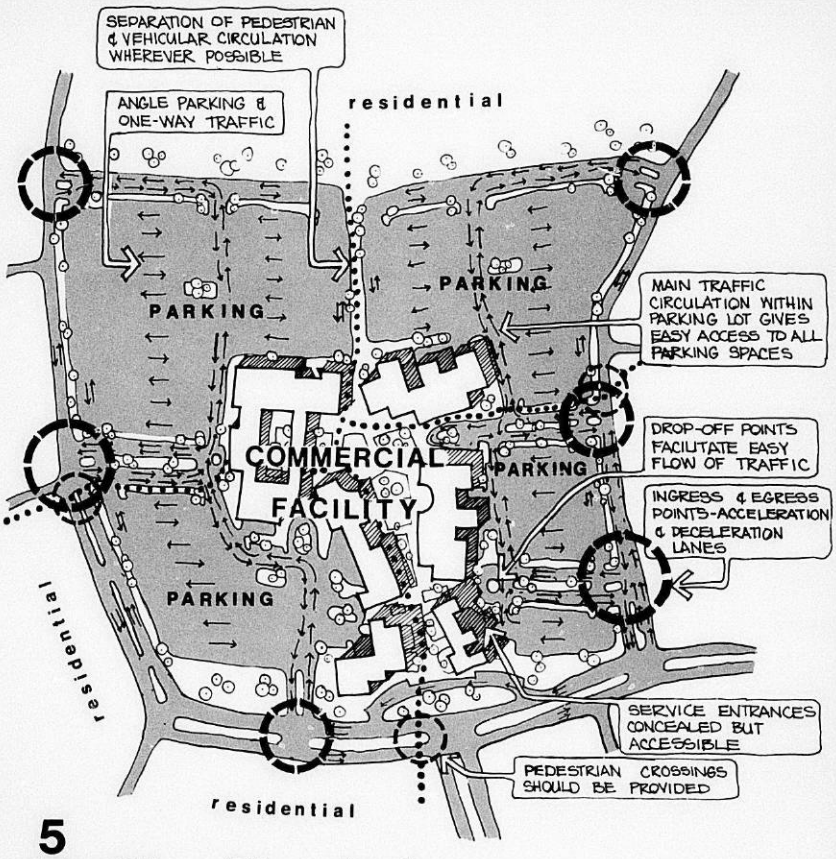
7. The degree of separation and methods of separating pedestrian from vehicular and service traffic depend on the size of the development and other conditions. Sidewalks should be provided around, as well as through, commercial sites, for the use of residents of the area. (See Ill. 5 & 6)

8. High quality surfacing which will not buckle or crack because of changes in weather should be used on all paved areas, both for vehicles and pedestrians to increase safety and efficiency and reduce maintenance costs.

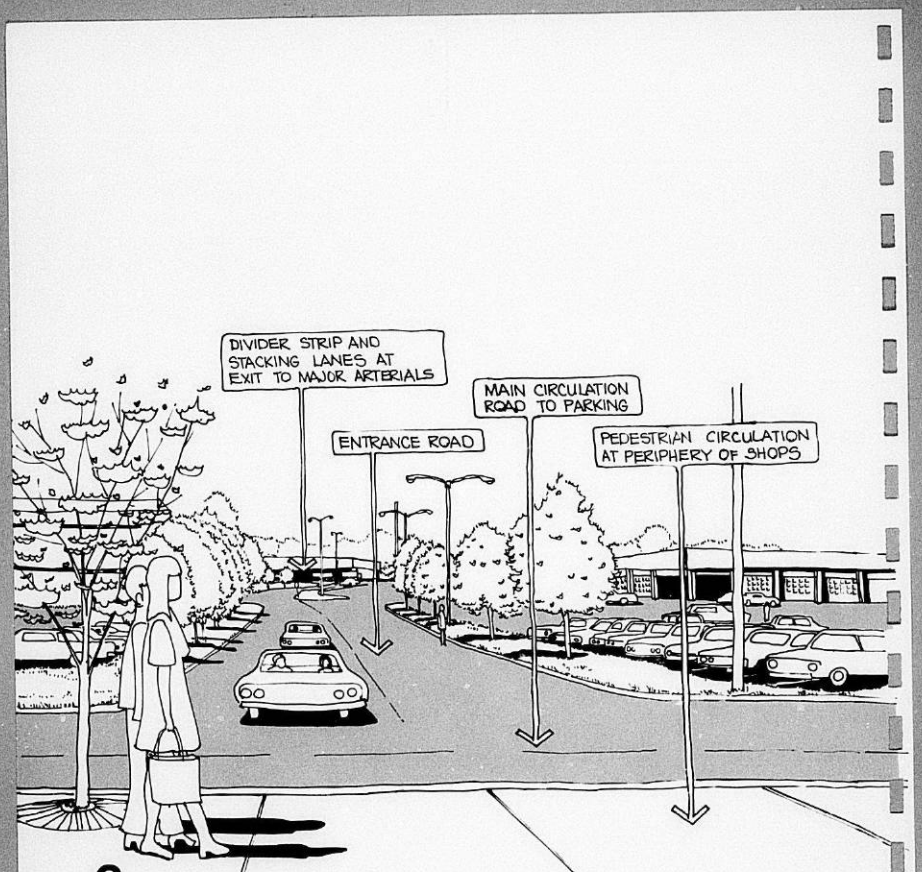
9. Accessibility by public transportation systems should be considered in site selection for major commercial centers, or such service should be made available.

E. Redevelopment

Objective: Existing poorly designed, inappropriate or obsolete commercial development should be upgraded to be more compact, efficient, accessible for both motorists and pedestrians, and more aesthetically appealing commercial areas.



5
Traffic Circulation



6 Traffic Circulation Elements

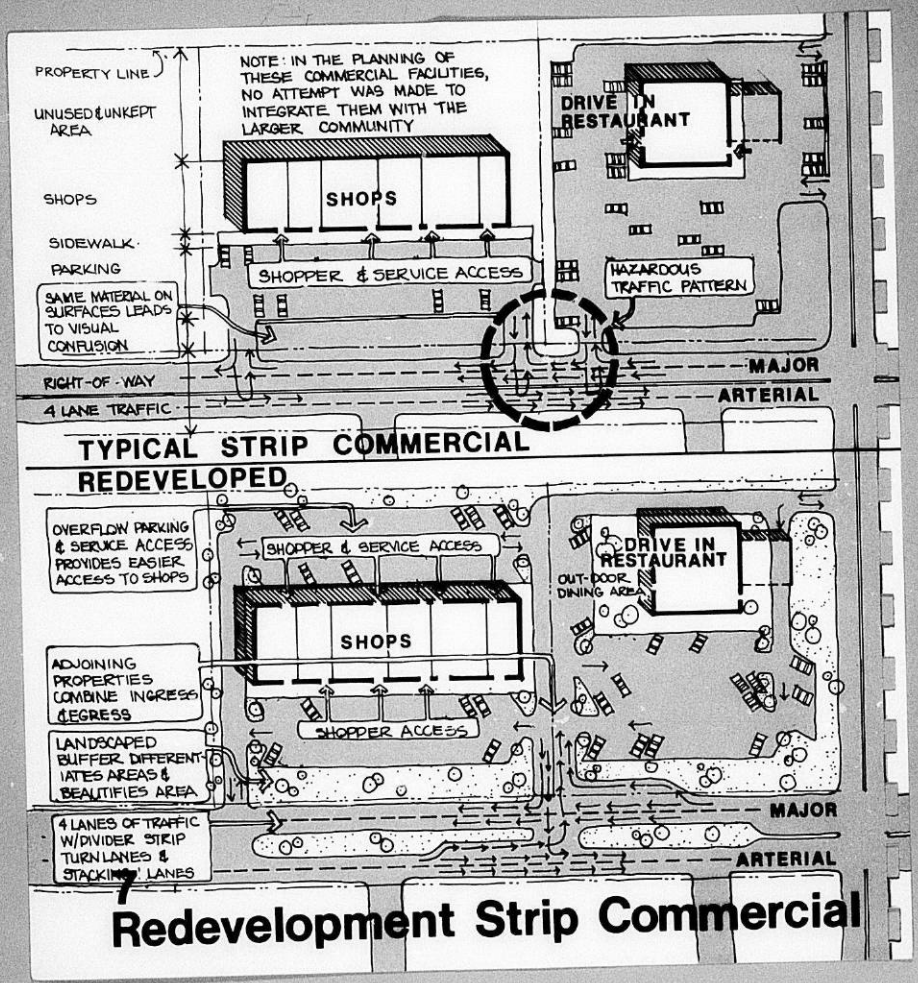
Guidelines:

1. Well located and functional commercial strips should be continually upgraded in safety, appearance and efficiency. (See Ill. 7 & 8) Excessive commercial strip development which contributes to inefficient space utilization and traffic conflicts should be discouraged. Because of these conditions, business often declines, leading to a deteriorating physical environment. When such conditions exist, redevelopment should take place which would eliminate obsolete and deteriorating buildings or non-conforming uses, and replace these with more compact and efficient shopping facilities, or other appropriate uses.

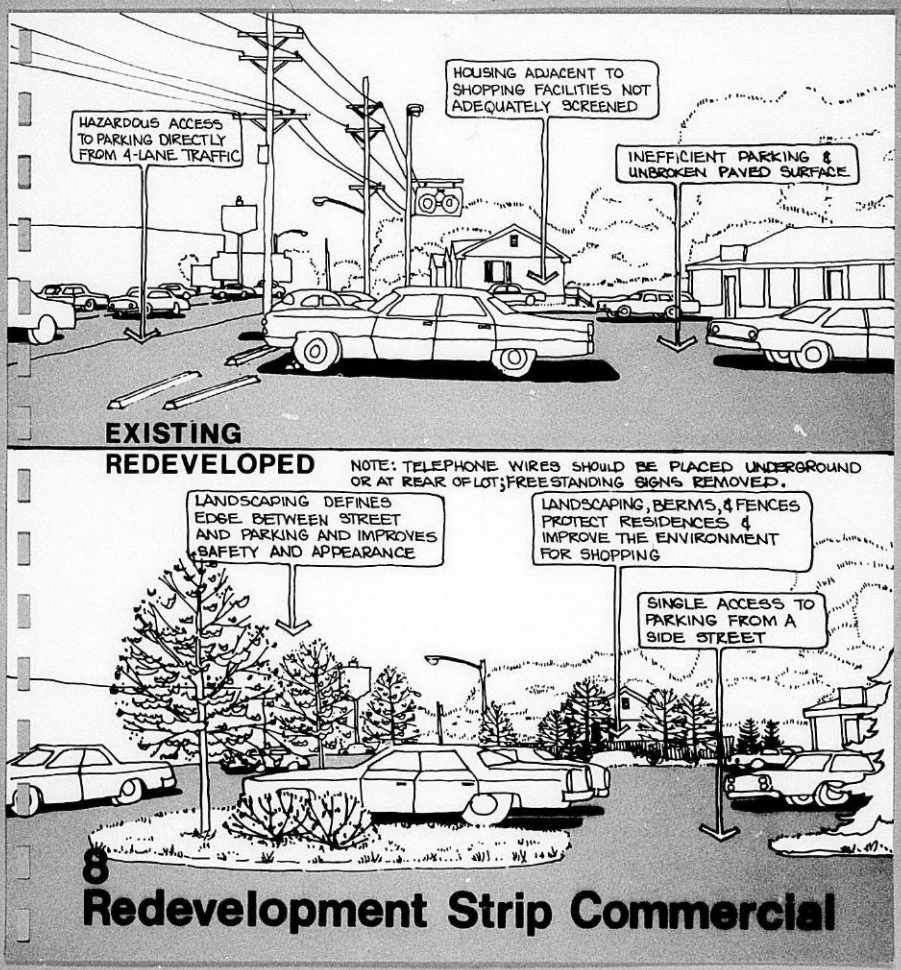
2. Additional parking and service areas should be required when redeveloping commercial strips and encouraged generally in all older commercial areas.

3. Pedestrian safety in existing commercial areas should be improved by re-routing vehicular traffic, by the proper design of parking areas, by the provision of exclusive pedestrian ways or sidewalks, and by installation of vertical barriers, separation structures, and the like.

4. Service stations and other similar commercial uses commonly found in strip commercial developments perform essential services; however, when located near residences, they represent one of the most controversial and potentially deleterious areas. More rigid controls must be placed on lighting, hours of operation, outdoor storage, signs and other accessory activities. Careful site planning, (including building location and landscaping) and building design which does not conflict with the residential scale and aesthetics should be used in such cases.



Redevelopment Strip Commercial



8

Redevelopment Strip Commercial

F. Relation to Community Life

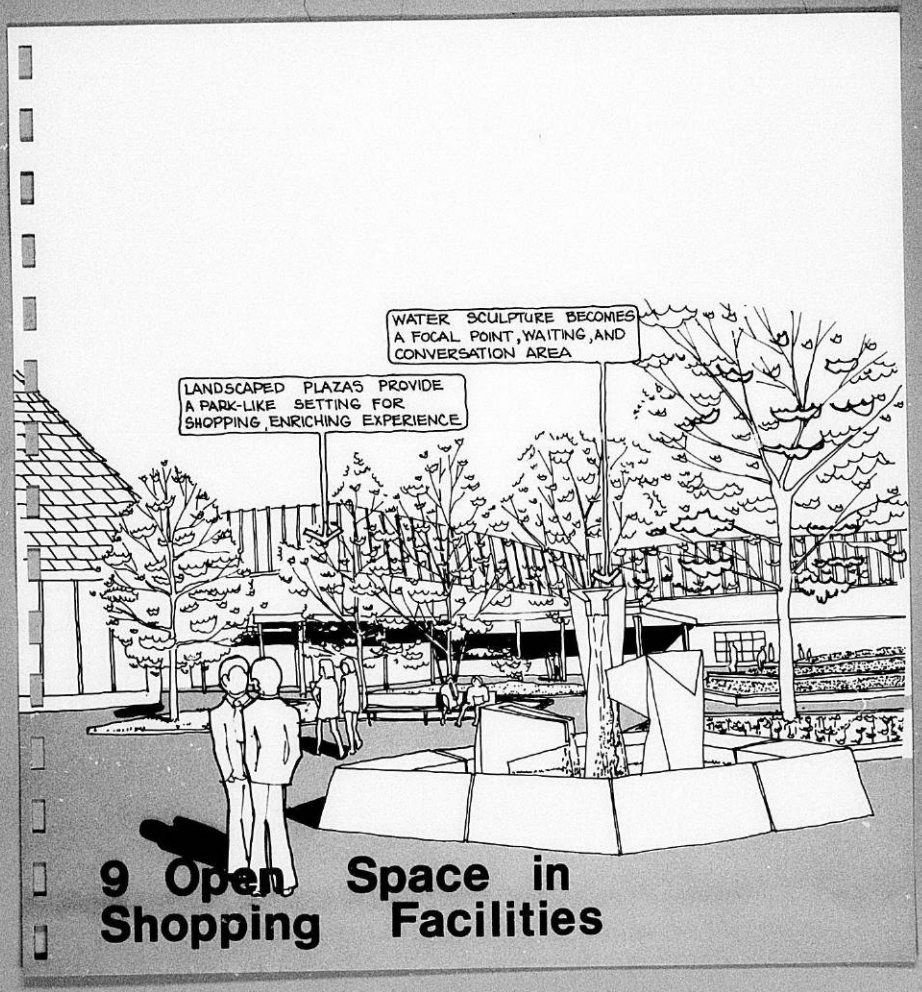
Objective: Commercial development which by design will also serve as focal points for the area's social, cultural and civic life.

Guidelines:

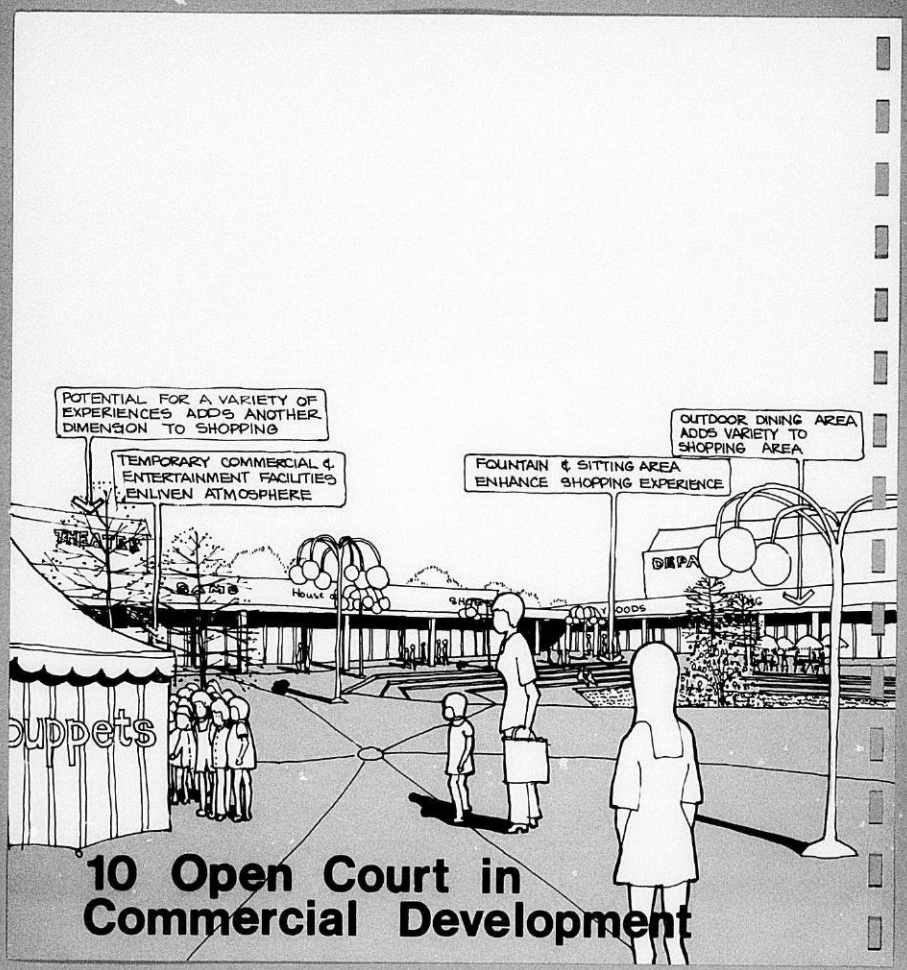
1. The primary function to which each sizable commercial center is devoted should be supplemented by appropriate complementary civic, social, and leisure activities. Areas for special events should be designed to establish and continually augment the position of the planned commercial development as a real community center.

2. The creation of a pedestrian environment within commercial areas is extremely desirable and requires careful control of traffic and the establishment of exclusive pedestrian areas. (See III. 9)

3. To create a livable varied, and exciting urban environment, landscaped open space should be provided which enriches every experience related to shopping activities and further attempts to create possibilities for other types of human activities, such as outdoor concerts and meeting places, outdoor eating areas, quiet sitting and conversation areas, places which are created simply as aesthetic experiences, places for puppet shows for children and other educational and play activities. (See III. 10)



9 Open Space in Shopping Facilities



10 Open Court in Commercial Development

Standards

The standards presented in the following section quantify the guidelines; that is, they give specific measurements which define character and size so that the guidelines may become physical realities. The use of standards for reference by businessmen and public officials permits more rapid decisions without detailed calculations and extensive research.

The standards for commercial facilities presented here were derived from research in the general fields of economics and applied technology. Information about buying habits, disposable income patterns, and consumption were used to formulate ranges of size requirements including total site area, floor area for selling goods, parking areas required, and the like, for various types of shopping facilities.

The information available is derived from studies of past trends and therefore, we believe, not totally indicative, when projected, of the revolution now underway in commercial development.

To better evaluate and project changing economic, social, physical and environmental factors that will affect these commercial policies, the Advance Planning Division of the Department has undertaken a new and innovative research project that attempts to objectively predict or anticipate changes in the 1970's – but without reliance on projection of past trends. This study is scheduled to be completed by early 1971. As information develops, it may be necessary to make major changes in these standards and the guidelines preceding them.

A. Location, Land, and Facility Requirements

The following is a table of standards in common use for various types of shopping facilities.

	CHARACTERISTIC	CLUSTER OF SMALL STORES
STANDARDS FOR LOCATION, LAND, AND FACILITY REQUIREMENTS FOR SHOPPING CENTERS	Typical Service Area (Diameter of Trade Area)	Less than one mile
	Maximum driving time to center	3 to 5 minutes, with a substantial walk-in trade
	*Population needed to support center	Varies with income, size and number of stories
	Location in proximity to:	Intersection of collector streets or in medium to high density residential areas or adjacent to other non-residential areas
	Site area (Gross land area)	Varies (often included in apartment complex)
	Major function	Provides limited convenience goods and personal services
	Typical stores	4-10
	Leading tenants	Varies
	**Average Gross Leasible Area (A.G.L.A.)	Varies
	Range of Gross Leasible Area	Varies
	Parking requirements	3/store

*May include existing population in service area and the projected population where area is undeveloped.

**Figures for Average Gross Leasible area are used because they avoid the variables of design, topography and site area which greatly affect figures for Gross Floor Area.

***This figures covers all but the 10 highest peak hours of demand. Cost of building and maintaining additional parking spaces and the negative psychological effect of an empty parking lot all moderate the need to meet this peak hour demand. Significant numbers of walk-in and transit customers would reduce this figure.

NEIGHBORHOOD CENTER	COMMUNITY CENTER	REGIONAL CENTER
One mile	2 to 4 miles	10 to 15 miles
6 minutes	10 to 20 minutes	30 minutes
7,000 to 20,000 people	20,000 to 100,000 people	100,000 or more people
Intersection of collector streets and/or secondary roads	Intersection of secondary roads and/or major roads and/or expressways	Intersection of expressways and/or freeways
4 to 10 acres	10 to 40 acres	30 to 100 + acres
Provide a wider range of convenience goods and personal services	Provides a competitive offering of shopping goods with some space for professional services	Offers a highly competitive and varied range of personal goods, professional services and specialty items
5-15	15-40	40-150
Supermarket and drug store	Jr. department store, major variety store, or major department store	Two or more major department stores
50,000 sq. ft.	150,000 sq. ft.	400,000 sq. ft.
30,000 sq. ft. to 100,000 sq. ft.	100,000 sq. ft. to 300,000 sq. ft.	300,000 sq. ft. to 1,000,000 sq. ft.
***5.5 spaces/1,000 sq. ft. G.L.A.	5.5 spaces/1,000 sq. ft. G.L.A.	5.5 spaces/1,000 sq. ft. G.L.A.

B. Parking and Circulation Standards

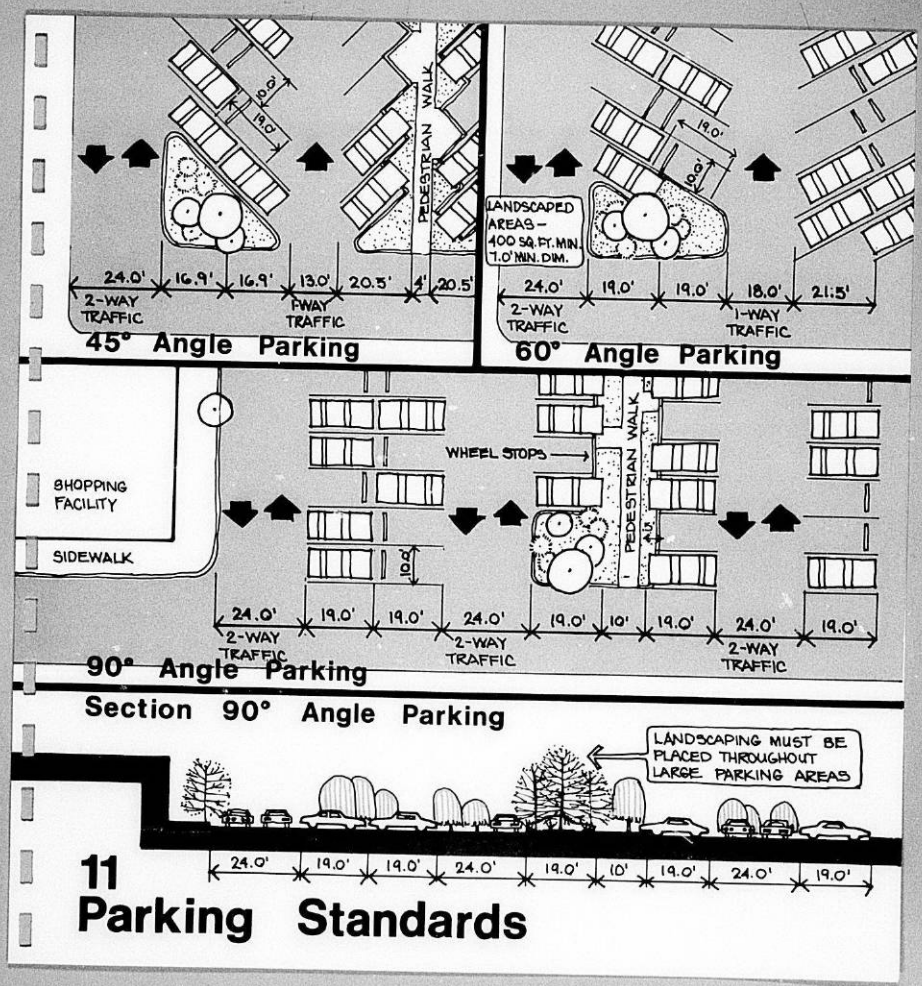
1. The total parking area required should conform with the standards previously stated for commercial shopping centers. This section outlines some details beyond those standards.

2. In planning the overall size of parking areas, 350 sq. ft. for each car is the minimum that can be considered satisfactory. Not more than 200 square feet need be devoted to the parking stall itself. The remainder is needed for aisles and access roads, exits and entrances and additional landscaping. Individual stalls should be at least 10 feet in width to ease the act of parking, avoid straddling, and allow doors to be opened easily without damaging adjacent cars.

3. Parking areas in excess of 10,000 sq. ft. should have at least five, 2" to 2 1/2" caliper hardwood trees for every additional 10,000 sq. ft. of parking space. Planting areas within a parking lot should not be less than 7' in diameter. There should not be less than 400 sq. ft. of planting area in each landscaped area within a parking lot; 400 sq. ft. is also the minimum area which can support 2 hardwood trees. (See Ill. 11) Each planting area must have water available through underground pipe and be protected from automobiles by non-mountable curbing. Solid curbs should be used around planting areas to keep out de-icing salt. The appearance of large parking lots, and thus the total environment of large shopping facilities can be improved by locating plant materials in the best possible environment for plants to survive and grow.

4. Where 90-degree parking is used, the central aisle should always be wide enough to permit two cars to pass as well as to enter and leave the parking space in one operation. The ideal width is 62 feet for the entire unit, including a 24-foot center aisle with stalls a minimum of 19 feet deep on either side. (See Ill. 11)

5. Where 45-degree angle parking is used, the minimum aisle width for one-way traffic should be 13' 0"; for 60-degree angle parking 18' 0". With two-way movement within the aisle, the width should be increased to 24 feet. (See Ill. 11)



11 Parking Standards

6. Raised walkways running through or between parking stalls should be 4 feet wide with an additional 2.5 feet for 90-degree angle parking on each side to allow for car bumper overhang, unless wheel stops are provided to restrain automobiles.

7. In a linear commercial development, employee parking can be taken care of by a band of parking along a rear service drive. The best minimum width for a combination buffer strip, rear service and parking area is 62 feet.

8. Within shopping areas, the buildings should be placed so that maximum walking distance from the parking area is not excessive and not greater than 400 feet in neighborhood and community size centers and 600 to 800 feet for regional centers.

9. Where possible, parking levels should be depressed below the surrounding area to bring the car tops below eye level, to increase the feeling of openness and to permit vision across to the store fronts. Visual barriers are sometimes desirable to screen the cars from roadways and abutting properties.

10. Underground tunnel or rear access is necessary for loading and unloading purposes, the former is usually required in regional shopping centers and the latter may be used in all other cases. (See Ill. 12) Tunnels and alleys should be at least 20 feet wide and be paved for the full width. Curb radii should be 30-40 feet at corners, vertical clearances should be at least 14 feet, loading docks should be 10-12 feet wide per truck, and set at truckbed height (about 4 feet from the pavement.) A 50-foot parking and maneuvering apron is needed in front of the dock. The floor area of the dock should be equal to or greater than the floor area of the beds of all the trucks that could be brought up to the dock at one time to allow room for unloading and temporary stacking.

12
Service Access

11. In regional centers, a circumferential or ring road should be provided completely on the property, separate from public roads and connecting parking with points of ingress and egress, thereby distributing traffic to all parking areas and equalizing the accessibility of all sides of the center. This road should be built to collector standards.

12. Entrance and exit points leading to and from the internal road system of a shopping center should be located a minimum of 300 feet from major intersections unless they can be aligned directly into a "T" intersection of two major roads or at a signalized intersection.

C. Building Configurations

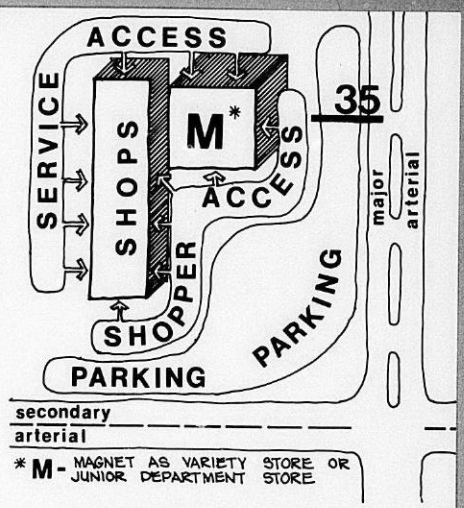
The diagrams which follow show several generic types of shopping centers and suggest their most logical uses.

Linear Development:

Best suited to the neighborhood center or for redevelopment of ribbon commercial, but its simplicity makes it adaptable to many site conditions. Length should commonly be no more than 600 feet. Depth should be adequate for setback, parking, landscaping, safe access and service.

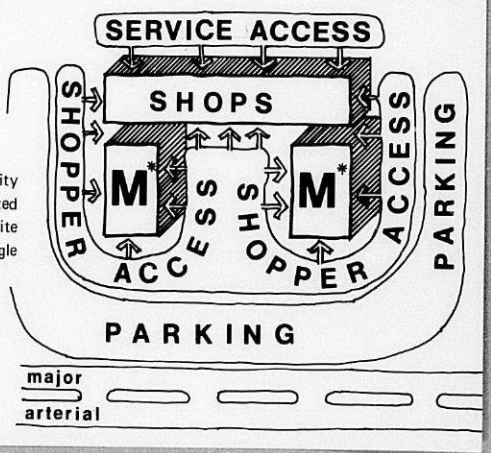
The "L"

Suitable for both neighborhood and community type shopping centers, but also useful in redevelopment. This is an adaptation of the strip which shortens frontage length and offers variability in terms of tenant locations. It is particularly adaptable for a site located at the intersection of two important roads.



The "U"

Suitable for neighborhood and community type shopping centers, and some specialized redevelopment. It adapts to nearly any site with adequate depth and to sites having single road frontages only.



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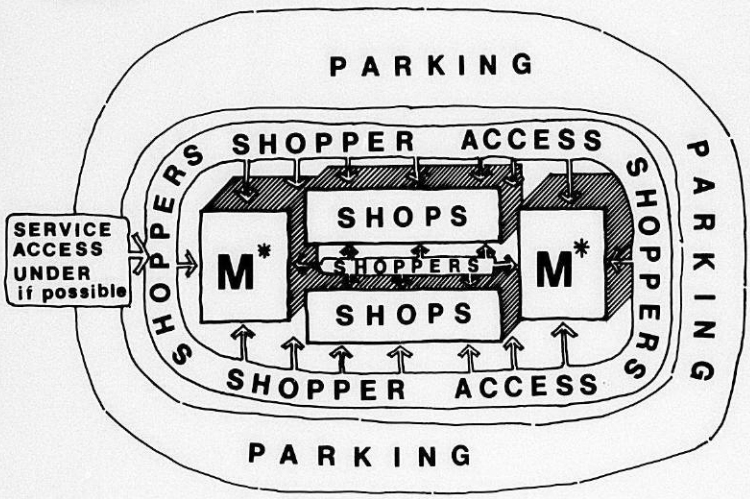
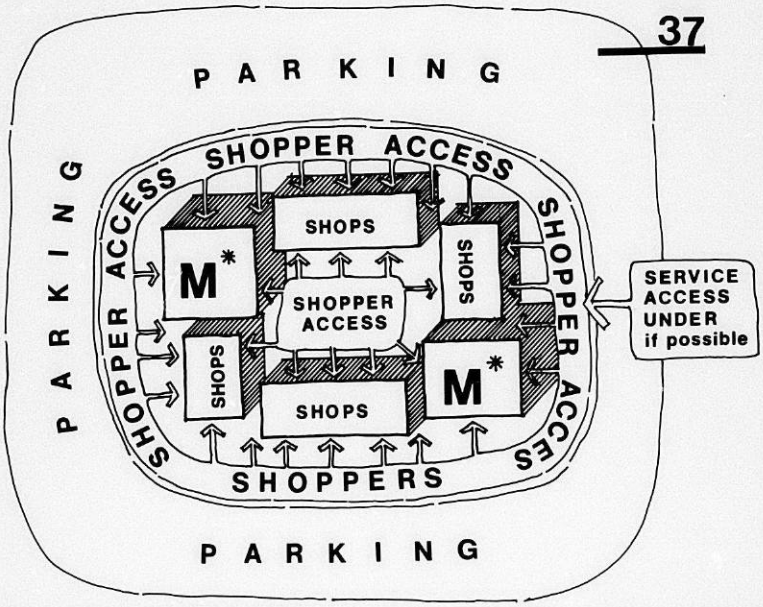


*M - MAGNET AS DEPARTMENT STORE OR JUNIOR DEPARTMENT STORE

The Mall

Commonly used in centers of over 100,000 square feet of floor area not utilizing the cluster or group pattern. Malls offer great appeal by offering places for outdoor display and special events, statuary, landscaping and floral displays. Malls usually require underground servicing through truck tunnels or service courts which must be effectively screened from customer approaches and parking areas. Some malls are covered for year-round environmental control.



*M - MAGNET AS DEPARTMENT STORE OR JUNIOR DEPARTMENT STORE.

The Cluster

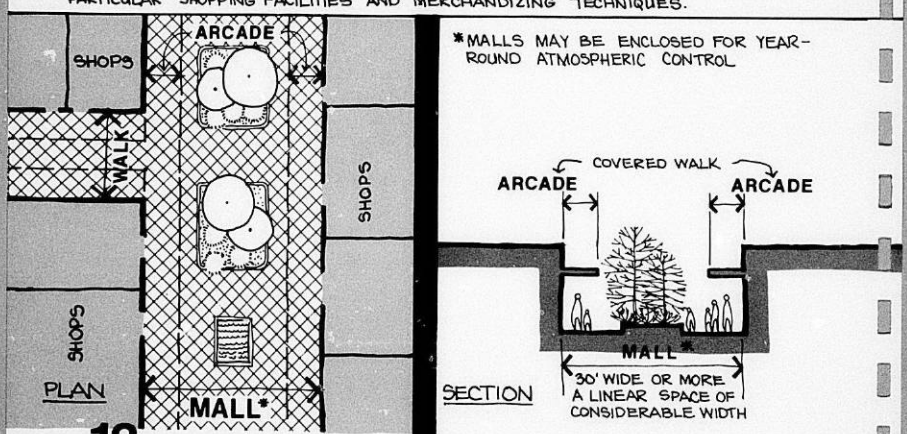
Most suitable for large regional centers where parking surrounds the buildings. This arrangement minimizes walking distances between outlying parking spaces and the building group. Service access may be difficult unless it is underground.

D. Open Space Standards

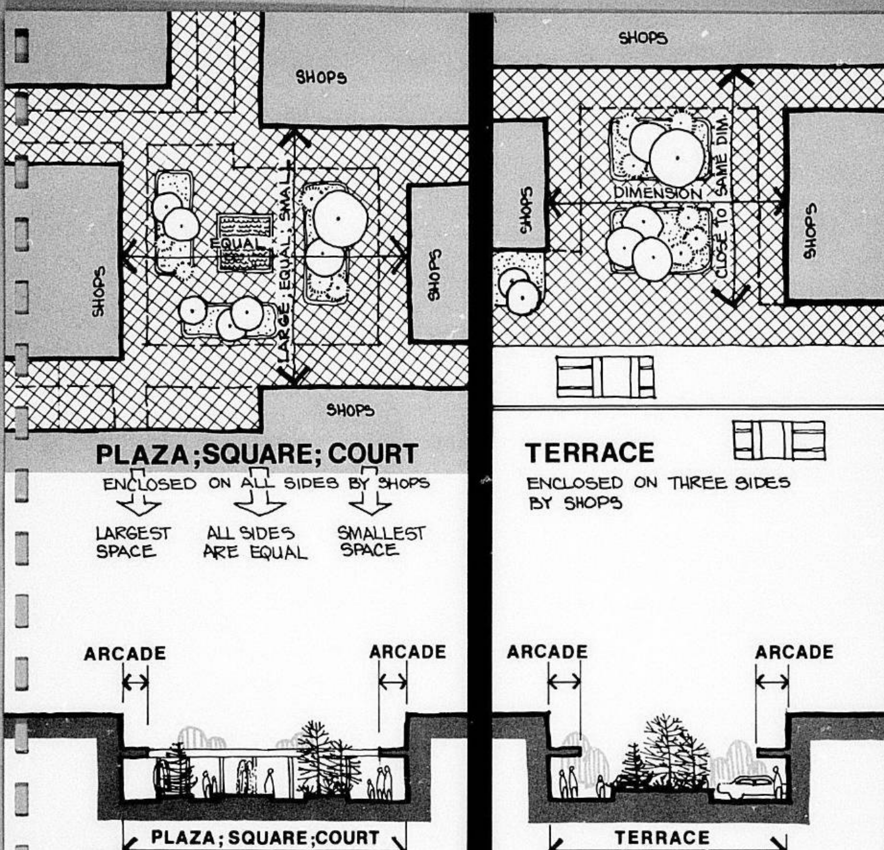
1. Shopping centers and other commercial areas can be greatly enhanced aesthetically and, we believe economically, in the long run, by the use of landscaped open space, sculpture, fountains and pools.

2. Open space can be planned in such a manner as to provide a sequence of experiences as the shopper moves about the commercial center. Some typical spatial configurations are shown in the following illustrations. (See Ill. 13)

NOTE: OPEN SPACE CONFIGURATIONS AFFECT THE CIRCULATION OF SHOPPERS THROUGHOUT THE SHOPPING CENTER AND HAVE A GREAT EFFECT ON THE LOCATION OF PARTICULAR SHOPPING FACILITIES AND MERCHANDIZING TECHNIQUES.



13
Open Space Configurations



13 Open Space Configurations

3. Whenever fountains or other bodies of water are placed in public areas they should be shallow and surrounded by curbs for safety purposes.

4. Where commercial development is to be located close to a residential area, a dense planting strip of at least 20 feet in width should be used to insulate adjacent residential uses. In addition, planting, masonry walls, solid fences or high dense foliage should be provided and featured as part of the landscaping treatment of the center. For regional centers, these buffers should be extensive. Other open space standards are discussed in Standards for Parking and Circulation (Section B) and in the Development Guidelines (Section A and B).

E. Landscaping Standards

1. A detailed landscaping plan must be submitted to the Planning Department for review and approval prior to the issuance of a building permit, at which time special needs for the landscaping of each site will be evaluated and requirements established.

2. Earth banks should be sodded, or, if steep planted with ground cover or low-growing shrubs.

3. Steps in sidewalks should be avoided in favor of ramps wherever possible. Steps may be permissible where slopes of over 15% are encountered. If used they should have a tread of not less than 5 feet to permit alternating feet at each step, and have a 5 inch riser. No single step risers may be used.

4. Significant landscaping standards are included in Parking and Circulation Standards (Section B) and in the Development Guidelines, Physical Appearance and Efficiency Guidelines (Section A) Compatibility with Surrounding Areas (Section B).

F. Lighting Standards

1. Lighting for an entire commercial area should be carefully coordinated with the overall design. The type of lighting used should complement the function of each space, and contribute to safety.

2. Lighting levels for pedestrian shopping areas should be not more than 10 foot candles so as not to compete with shop display windows.

3. A few clusters of mercury vapor lamps mounted on 60 foot high light standards are preferable to a system utilizing many 30 foot standards in parking areas. The taller standards provide the same illumination and are definitely more desirable in terms of appearance, parking lot layout and area identification.

G. Sign Standards

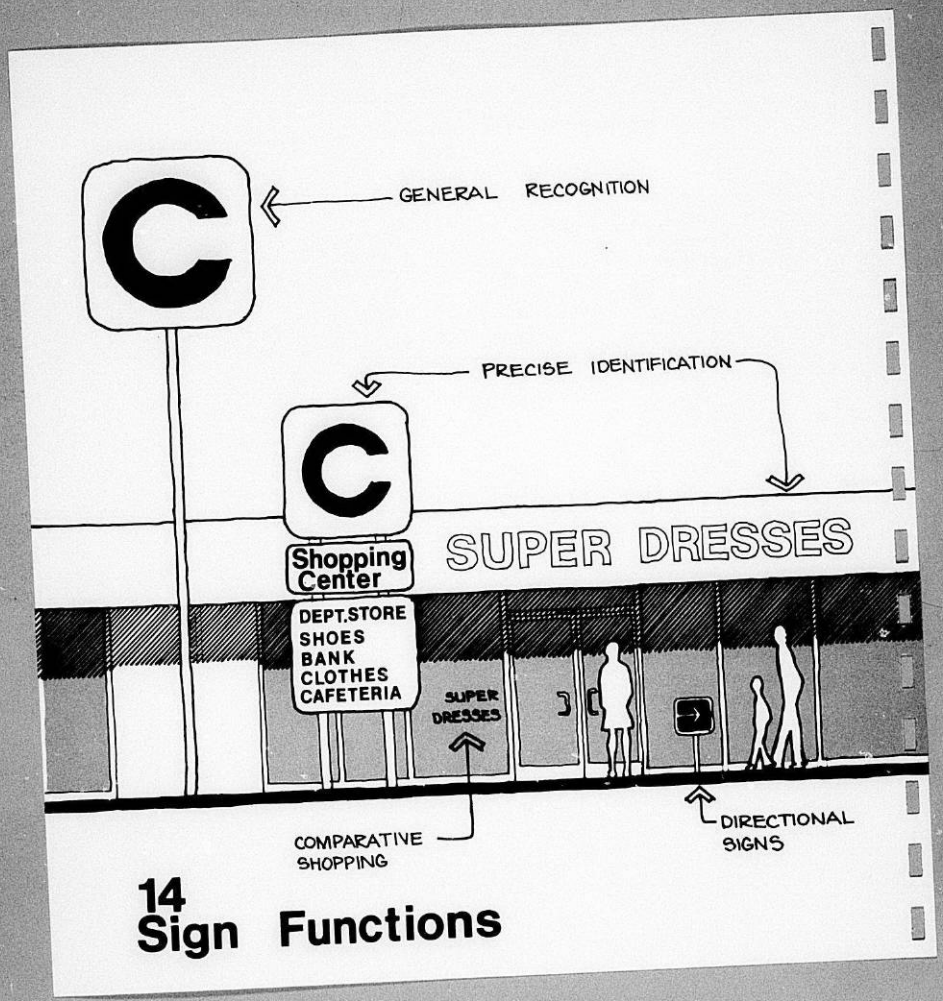
1. Signs in commercial areas have a number of different functions. The location, scale, and character of each sign is largely dependent upon that function. (See Ill. 14) While the main function of a sign is to make the public aware of a service or group of services, a well-conceived, well-placed sign can have such residual benefits to the community as to ease traffic problems by allowing for proper driving decision making and can become a pleasing "man-made" landscape feature.

2. Marquees or changeable lettering are discouraged. Kiosks or poster columns should be used in pedestrian areas instead.

3. Following is a list of sign functions and how they might be fulfilled.

SIGN STANDARDS FOR COMMERCIAL FACILITIES	FUNCTION	COMMERCIAL CENTER OR USE
	General Recognition	Community Center or Larger Use
	General Recognition	Neighborhood Center or Smaller; Plus Individual Users
	Precise Identification	Community Center or Larger Use
	Precise Identification	Neighborhood Center or Smaller Plus Indiv. Uses
NOTE: All these Signs are on-site. The off-site sign is not conducive to a livable environment nor is it necessary economically as it was a decade ago, prior to the success of other mass advertising media. Therefore, the off-site sign is actively discouraged in these policies and ultimately should be eliminated from the urban environment.	Precise Identity of Major Tenants	Community Center or Larger
	Comparison Shopping & Selection (Pedestrian Use)	Any Commercial Use
	Direction and Information	Any Commercial Use

NATURE OR MESSAGE	LOCATION	SCALE
Identification Symbol	High Anywhere	See From Longer Distance (Several Blocks)
Store Name or Small Symbol and Name	In Front of Building	See From a Short Distance (One Block)
Name of Center Plus Major Uses	In Front, Nearer Road	See From a Short Distance (One Block)
Name of Store or Product/Service	On Each Building	Up to 5% of Building Wall
Name of Chain/ Store	On Major Building	Up to 2% of Building Wall
Store Name or Product/ Service	Over Door/Window or Hang Below Canopy	Very Small (A Few Square Feet)
Directions and Information, e.g. Access, Parking Locations, etc.	At Property Lines, in Pedestrian Areas, in Parking Areas	Very Small, A Few Sq. Ft.



14 Sign Functions

Methods of Implementation

A. General Discussion

Methods of implementation are the final step in ensuring that the goals, objectives, guidelines and standards can be used to achieve the desired end of environmental improvement in commercial facilities. Most of these methods are in the form of procedures and documents required by the Planning Commission and departments in the rezoning process and in other processes, e.g., site plan review. Some of the policies listed herein are for the general guidance of developers.

Some of these policies are now being followed; some are new; others will be added from time to time.

Many of the policies outlined in the previous residential strategy report will contribute significantly to attaining a better environment in St. Louis County. Those methods will not be repeated here.

The policies that are being implemented by the Planning Commission in regard to allocation of land for commercial facilities in St. Louis include the following:

1. Comprehensive Study

As part of the comprehensive planning program, the Department will complete a study of the next ten years, a portion of which would determine the approximate size of commercial areas necessary to serve existing and future population. This will be supplemented by studies related to the proper timing for development and would utilize innovative techniques and new information to make projections for the future.

2. Supply of Land for Commercial Development

Under the present zoning ordinance in each major area of the County, the amount of land zoned for any type of urban land use should not be greater than a projected 10 year supply, with allowance for non-use and competitive choice.

3. Expansion of Existing Commercial Areas

When expanding an existing commercial area, parcels of land presently contiguous to land already zoned and developed for commercial use should be rezoned to commercial first, unless there is some factor preventing this procedure and there is a public need to provide commercial services in that location.

B. Additional Guidelines for Commercial Rezoning Requests

Developers who request a major commercial rezoning should submit market analyses with their rezoning application. These analyses should include data on trade area population, income and purchasing power, traffic movement, shopping habits, transportation patterns, growth of developing areas, competition, access, tenant selection and other relevant information. These analyses should contain: assumptions, conclusions, and recommendations, sources of data, and the methodology used in the study, including techniques of analysis, definitions of terms, and delineation of effective market area, and all data necessary to substantiate such.

Analyses submitted with commercial proposals will be reviewed by the Planning Department utilizing previously submitted information plus analyses available from the County data bank. The staff will make a recommendation to the Commission based on this review. The necessity of submitting market analyses, in addition to assessing the economic feasibility of commercial development proposals, would make developers more aware of the potential of their land and discourage blatant speculation in favor of genuine efforts by individuals who desire to establish needed commercial services in an attractive manner. The commercial developer should include in his presentation, grading, paving, street and parking plans, drainage maps, runoff drawings and storm sewer easements, landscaping plans, and circulation plans. Each plan must be approved by the appropriate County agency prior to issue of a building permit.

C. Parking and Circulation Policies

In regard to parking and circulation, some specific policies have been established by the Planning Commission which may be used as a guide by the developer in preparing his case for major commercial rezoning.

1. The traffic analysis should include determination of traffic loads predicted to be generated by the proposed commercial development, and the traffic capacity of the surrounding road exchange facilities proposed between the public road system and the shopping center site. As with the market analyses previously mentioned, the Planning Department would review the traffic analysis and make recommendations to the Commission.

2. The development of service roads may be required to control vehicular ingress and egress along existing and proposed major highways.

3. Off-street parking and loading facilities must be upgraded as the changing situation demands.

4. Property owners are required to provide adequate land for street widening or new rights of way, and minimum improvements necessary to provide for safe traffic movements for the full frontages of their property at the time rezoning is granted and prior to occupancy permits being issued.

5. The installation and location of control devices at the developers expense to regulate the flow of traffic may be required for major development.

Additional policies are being pursued by the County to improve the traffic circulation. These efforts include:

1. Conducting continuing on-going transportation studies to monitor the effects of road construction programs, residential, commercial, and industrial development, and population change and migration on traffic facility and future traffic facility needs.

2. Coordinating transportation, traffic, land use planning, and the annual capital improvements program.

3. Recommending to other jurisdictions any regulations on matters affecting the traffic-carrying capacity or the safe movement of traffic on major and collector streets.

4. Cooperating with other planning authorities in investigating and promoting the feasibility of installing mass transportation service between high density areas, employment centers, and major commercial centers, and educational centers.

D. Aesthetics

The overall aesthetic appearance of existing commercial facilities must be improved over time and as the facility expands. New facilities are to be built to high standards, e.g., landscaping and sign standards, to achieve an overall pleasing appearance.

E. Use of Planned Commercial Districts

The Planning Commission recommends the use of Planned Commercial Districts to accomplish superior commercial development for the whole range of trade and service use. All of the design goals and principles previously listed can be best accomplished through a planned approach. Development under this procedure assures that good site planning will be accomplished prior to a formal proposal by a commercial developer, and the public is assured that such development will be built as the plan specifies. The time limits which can be placed in C-8 Planned Commercial Districts also reduces the possibility of overzoning for commercial developments.

Other significant community improvements which can be accomplished and assured through planned commercial development are:

- Compatibility with surrounding residential and other uses through effective, quality screening and landscaping.

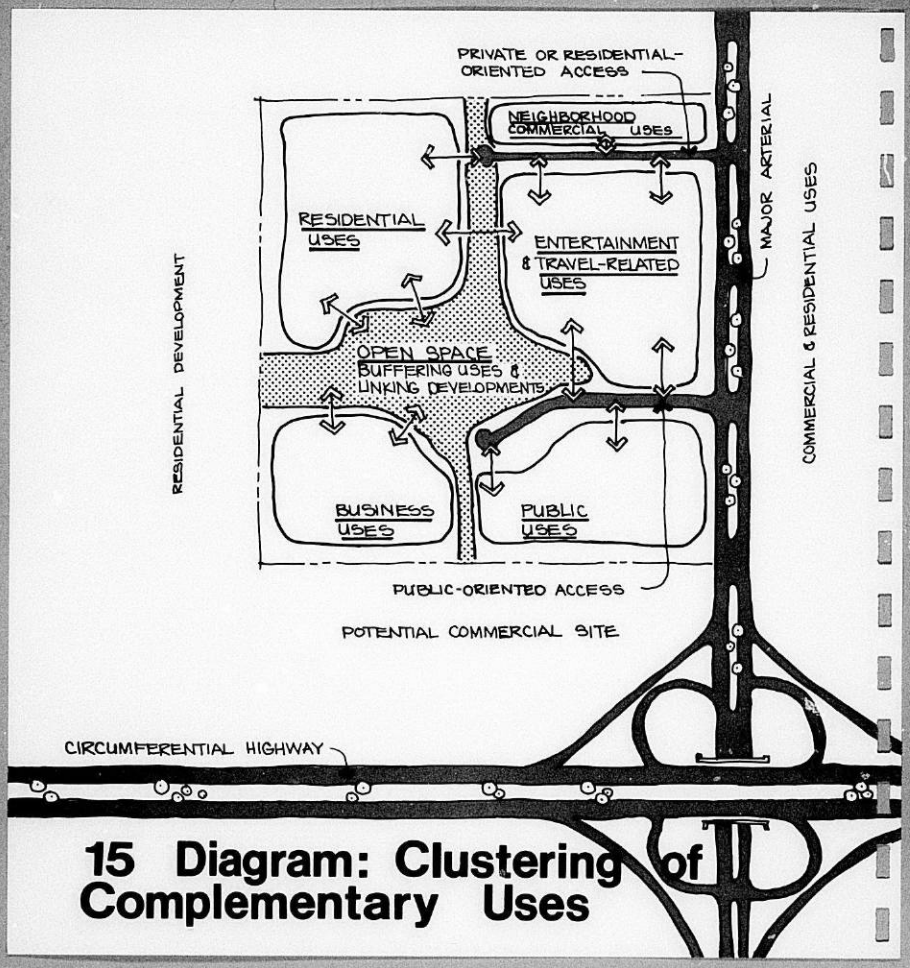
- Superior internal circulation and layout providing special amenities.
- Controlled location and proper screening of waste storage and disposal areas.
- Maintenance of the entire development in a sanitary and sightly manner.
- Safe and adequate circulation and parking improvements.
- Sufficient storm water impounding and drainage improvements.
- Proper planning and installation of sanitary facilities.
- A wide range of other site and related improvements.

F. Clustering of Complementary Uses

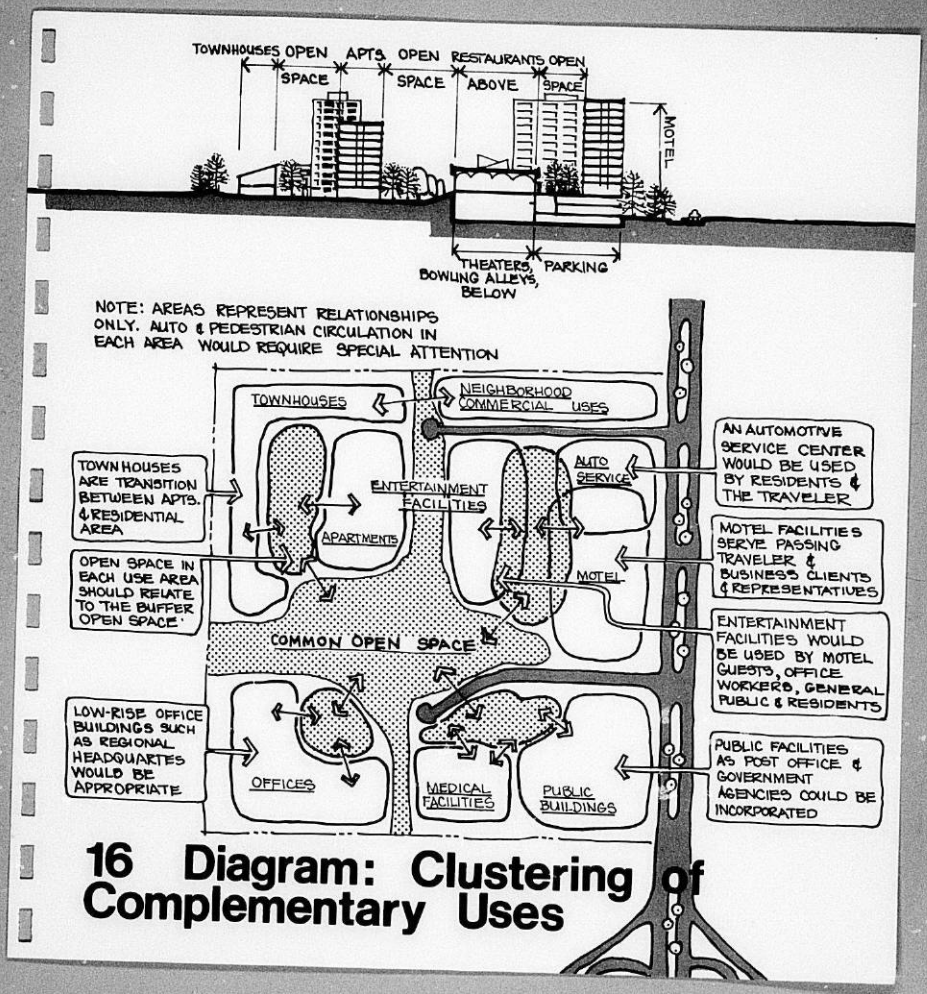
However, most of these advantages can be attained by use of other tools now at the disposal of the various County Departments and the Commission. This is a direct result of previous recommendations to the Council from the Commission after the original adoption of the commercial policies. The Commission and Department will continue to recommend the appropriate adoption or amendment of ordinances to make additional procedures now available only through the planned approach applicable to all districts.

For more advantageous land use relationships, clustered or coordinated development of groups of similar and/or complementary uses are encouraged, for example:

Uses contiguous to larger commercial areas or major shopping centers (illustrations 15 and 16 are diagrammatic plans and sections showing how these uses might be related on a single site.)	multi-level apartments; suburban hotels, motels, and restaurants automotive centers; health center, clinic or hospital; medical-dental offices, general office buildings and related services; churches;
Highway service centers in clusters at strategic highway locations	hotels and motels; restaurants; retail sales and services related to



15 Diagram: Clustering of Complementary Uses



16 Diagram: Clustering of Complementary Uses

	hotels and motels; automobile repair and service facilities recreational uses: bowling alleys, driving ranges, theaters; public and quasi-public uses; electric sub-stations; fire stations, post offices, public office buildings;
General services and personal services clustered at intersections of major arterials or adjacent to existing business districts	general offices; personal services; small shopping centers; quasi-public and public uses.
Uses contiguous to major shopping districts or in locations suitable because of existing similar uses	automotive sales, repairs and services; medical uses; office building uses;

G. Conclusion

The creation of vehicles of expression for the individual within the larger context of urban society should be the major concern of planners and other public officials. Commercial planning which follows the strategy presented here can better fulfill this need for a balanced relationship by providing opportunities to incorporate social, cultural and civic facilities in an attractive commercial environment. Implementation of this and other environmental strategies (i.e. the prior Residential Report and the forthcoming Industrial Report) is a definite process in which the benefits may be realized now and will increase in magnitude in the future. Implementation of this Commercial Strategy will mean the community is well on its way to establishing a truly livable environment with a focus for community life, a scale of things and functions appropriate to human needs both physical and psychological and a richly varied pedestrian environment.

Subject Index:

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SUBDIVISION REGULATIONS

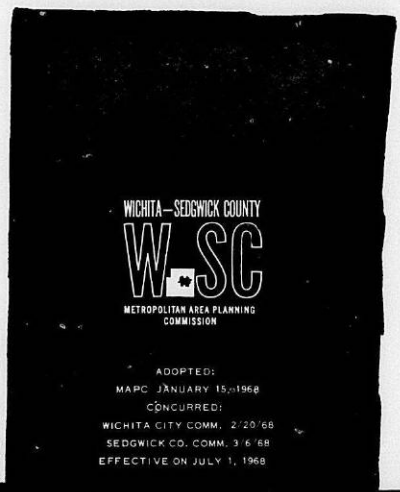

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TABLE OF CONTENTS

SUBDIVISION REGULATIONS OF THE WICHITA-SEDGWICK COUNTY METROPOLITAN AREA PLANNING COMMISSION

ARTICLE 1

SHORT TITLE

1-101. These regulations shall be known and may be referred to as the Subdivision Regulations of The Wichita-Sedgwick County Metropolitan Area Planning Commission. Its short title shall be "MAPC Subdivision Regulations."

ARTICLE 2

INTENT AND PURPOSE

2-102. These Subdivision Regulations are designed and intended to serve the following purposes: to provide for the harmonious development of the City of Wichita and the unincorporated area of Sedgwick County; to provide for the proper location and width of streets, for building lines, open spaces, drainage, safety and recreational facilities, and for the avoidance of congestion of population; to provide for the minimum width, depth and area of lots; to specify the extent to which, or the manner in which roadways shall be graded and improved; and water, sewer and other utility mains and piping or connections or other physical improvements shall be installed; and to provide for and secure to the proper governing body, the actual construction of such physical improvements, and, to exercise the powers conferred by K.S.A. 12-705 and K.S.A. 19-2918.

ARTICLE 3

GENERAL PROVISIONS

PART 1. JURISDICTION, APPLICATION AND DEFINITIONS.

3-101. Jurisdiction. These regulations shall apply to all land located within the City of Wichita and to all unincorporated land in Sedgwick County except as provided in Section 3-102. These regulations shall apply to any other incorporated City when the governing body of the city shall have by Resolution made such a request to the Board of County Commissioners and the Metropolitan Area Planning Commission.

3-102. Exception to Jurisdiction. These Subdivision Regulations shall not apply to the unincorporated areas in the following described sections of land:

(A) Haysville Area

Sec. 34-28-1E lying south of Flood Control Ditch, Sec. 33-28-1E lying south of Flood Control Ditch, Sec. 32-28-1E lying south of Flood Control Ditch, Sec. 31-28-1E lying south of Flood Control Ditch, Sec. 25-28-1W lying south and west of Flood Control Ditch, Sec. 26-28-1W, E½ of Sec. 27-28-1W, Sec. 34-28-1W, Sec. 35-28-1W, Sec. 36-28-1W, Sec. 1-29-1W, Sec. 2-29-1W, Sec. 3-29-1W, N.W.¼ and the E½ of Sec. 10-29-1W, Sec. 11-29-1W, Sec. 12-29-1W, Sec. 13-29-1W, N.W.¼ and E½ of Sec. 14-29-1W, N.E.¼ of Sec. 24-29-1W, Sec. 3-29-1E lying south of Flood Control Ditch, Sec. 4-29-1E, Sec. 5-29-1E, Sec. 6-29-1E, Sec. 8-29-1E, Sec. 7-29-1E, Sec. 17-29-1E, Sec. 18-29-1E, N½ of Sec. 19-29-1E, N½ of Sec. 20-29-1E, Sec. 9-29-1E, W½ of Sec. 10-29-1E, N.W.¼ of Sec. 15-29-1E, Sec. 16-29-1E, Sec. 2-29-1E lying south of Flood Control Ditch and west of Big Arkansas River.

(B) Derby Area

S.W.¼ of Sec. 28-28-2E, Sec. 29-28-2E, Sec. 30-28-2E, Sec. 31-28-2E, Sec. 32-28-2E, W½ and S.E.¼ of Sec. 33-28-2E, Sec. 25-28-1E, Sec. 26-28-1E, Sec. 27-28-1E lying east of Big Arkansas River, Sec. 35-28-1E lying north and east of Big Arkansas River, Sec. 36-28-1E, Sec. 1-29-1E, Sec. 2-29-1E

3-102(B) Continued.

lying east of Big Arkansas River, E½ of Sec. 10-29-1E, Sec. 11-20-1E, Sec. 12-29-1E, Sec. 13-29-1E. Sec. 14-29-1E, E½ of Sec. 15-29-1E, E½ of Sec. 22-29-1E, Sec. 23-29-1E, Sec. 24-29-1E lying north of the Big Arkansas River, Sec. 4-29-2E, Sec. 5-29-2E, Sec. 6-29-2E, Sec. 7-29-2E, Sec. 8-29-2E, Sec. 9-29-2E, Sec. 16-29-2E, Sec. 17-29-2E, Sec. 18-29-2E, N.E. ¼ of Sec. 34-28-1E lying north and east of the Big Arkansas River.

(C) Mulvane Area

S.W.¼ Sec. 22-29-2E, Sec. 21-29-2E, Sec. 20-29-2E, Sec. 19-29-2E, Sec. 27-29-2E, Sec. 28-29-2E, Sec. 29-29-2E, Sec. 30-29-2E, Sec. 31-29-2E lying north of Sedgwick County Line, Sec. 32-29-2E lying north of Sedgwick County Line, Sec. 33-29-2E lying north of Sedgwick County Line, Sec. 34-29-2E lying north of Sedgwick County Line, W½ of Sec. 35-29-2E lying north of Sedgwick County Line, Sec. 25-29-1E, Sec. 26-29-1E, Sec. 35-29-1E lying north of Sedgwick County Line, Sec. 36-29-1E lying north of Sedgwick County Line, Sec. 24-29-1E lying south of the Big Arkansas River;

(D) Valley Center Area

Section 19-25-1E, W½ of Section 20-25-1E, W½ of Section 29-25-1E, Section 30-25-1E, Section 31-25-1E, W½ of Section 32-25-1E, Section 24-25-1W, Section 25-25-1W, Section 26-25-1W lying east of the Little Arkansas River and east of the Little Arkansas River Floodway, Section 35-25-1W lying north of the Little Arkansas River, Section 36-25-1W lying east and north of the Little Arkansas River, W½ of Section 5-26-1E, Section 6-26-1E, Section 1-26-1W lying north and east of the Little Arkansas River.

PROVIDED that the City Planning Commission within any of the areas shall have adopted Subdivision Rules and regulations for the City and the area immediately surrounding the City conforming to the Comprehensive Plan of the metropolitan area and their city.

(E) Those areas immediately adjacent and abutting the city limits of a city which has subdivision regulations adopted as provided by law for that city and where the governing body of that city has agreed by Resolution to annex the proposed subdivision.

1/20/69

3-103. Plat Referral to Other Cities. Whenever a plat shall be filed that lies within the designated area of influence (as designated by the member cities of the Metropolitan Area Planning Commission) of any city which is a member of the Metropolitan Area Planning Commission or of any plat that abuts an incorporated City, the preliminary plat shall be referred to the Planning Commission of the city or if it does not have a planning commission, to its governing body for comments and review. Any design or improvement standards required by these regulations may be modified to meet the design or improvement standards of that city, provided that such improvement will be tied into, connected to or made a part of that city's system (e.g., streets, water and sewer).

3-104. Applicability. Any owner or owners of land subdividing the same into lots and blocks or tracts or parcels for the purpose of laying out any subdivision, suburban lots, building lots, tracts or parcels or establishing any street, alley or other property intended for public use or for the use of purchaser or owner of lots, tracts or parcels of land fronting on or adjacent thereto shall cause a subdivision plat to be made in accordance to these regulations unless exempted under Sec. 3-105.

3-105. Exemptions. Notwithstanding the requirements of Section 3-101 through 3-103, these regulations shall not apply in the following instances or transactions:

(A) For those areas in the unincorporated area, the division or further division of land for residential or agricultural purposes into lots or parcels, each of which contains more than ten acres, where such subdivision does not involve the creation of any new streets or easements of access as may be determined necessary by the Planning Department.

(B) A change in the boundary between adjoining lands which does not create an additional lot;

(C) Land used for street or railroad right-of-way, a drainage easement or other public utilities subject to local, state or federal regulations, where no new street or easement of access is involved;

(D) Land used for highway or other public purposes relating to the dedication of a parcel of land for a public use or instruments relating to the vacation of land impressed with a public use; and

3-105 Continued

(E) A correction of a description in a prior conveyance, provided that such a conveyance shall be clearly labeled as a "Correction Conveyance" and shall clearly identify the prior conveyance which is the subject of correction and the error contained in such prior conveyance.

(F) Whenever any lot, parcel, or tract of land located in the area beyond the City of Wichita and its three-mile ring as of July 1, 1968, has been subdivided, re-subdivided or replatted; and whenever any lot, parcel, or tract of land located within the City of Wichita and its three-mile ring has been divided, re-subdivided or replatted prior to January 1, 1948.

(G) The division of land in the unincorporated area which creates no more than one additional parcel, tract, or lot than specified in subsection (F) above, and which does not involve any new streets or easements of access.

(H) Any lot split approved in accordance with these regulations.

(I) Any transfer by operation of law.

PART 2. ADMINISTRATION AND ENFORCEMENT

3-201. Division of Responsibility. The administration of this regulation is vested in the following governmental branches, agencies or departments of the government of the City and County.

(A) Wichita-Sedgwick County Metropolitan Area Planning Department;

(B) Wichita-Sedgwick County Metropolitan Area Planning Commission;

(C) Board of Commissioners of the City of Wichita;

(D) Board of Commissioners of the County of Sedgwick and the Township Boards of Sedgwick County.

Each of the above-named governmental branches, agencies or departments shall have the responsibilities hereinafter set forth.

3-202. Duties of the Planning Department. The Planning Department shall administer the provisions of these regulations and in furtherance of such authority, the said department shall:

(A) Maintain permanent and current records with respect to these regulations, including amendments thereto.

(B) Receive and file all sketch plans, preliminary plats, and final plats, together with applications therefor.

(C) Forward copies of the preliminary plat to other appropriate governmental agencies and departments and public utilities for their report and recommendations, when such report and recommendations are necessary or desirable.

(D) Review all preliminary plats to determine whether such plats comply with these regulations and review all final plats to determine whether they comply with the preliminary plat and these regulations.

(E) Forward preliminary and final plats to the Subdivision Committee of the Planning Commission, when required by these regulations, together with its recommendations thereon.

(F) Forward final plats to the Planning Commission, together with the recommendations of the Subdivision Committee.

(G) Make such other determinations and decisions as may be required of the department by these regulations or by the Planning Commission.

3-203. Duties of the Planning Commission. The Planning Commission shall:

(A) Review and approve sketch plans in all cases in which the subdivider and the Planning Department have been unable to reach agreement on the sketch plan.

(B) Review and approve, approve conditionally, or disapprove preliminary plats.

(C) Review and approve or disapprove final plats and transmit the same to the governing body for acceptance of dedications of streets, alleys and other public ways and sites.

3-203 Continued

(D) To transmit the final plat to the County Commission of Sedgwick County for acceptance of dedications of streets, alleys and other public ways and sites.

(E) Make such other determinations and decisions as may be required of the Planning Commission from time to time by these regulations, or the applicable sections of the Kansas Statutes Annotated.

3-204. Subdivision Committee of the Planning Commission. The Planning Commission shall, by resolution or rule, designate a Subdivision Committee composed of any three or more of its members. The Chairman of the Planning Commission shall, with the concurrence of the Commission, appoint a chairman and vice-chairman of the Committee for such time as deemed appropriate. Such Subdivision Committee shall perform, on behalf of the Commission, the duties with respect to sketch plans and preliminary plats imposed on the Commission by Section 3-203 (A) and 3-203 (B) of these regulations. Any person aggrieved by any decision or determination of the Subdivision Committee shall have a right of appeal to, and a hearing de novo before, the Planning Commission.

3-205. Utility Advisory Committee. The Planning Commission shall appoint a utility advisory committee whose duty it shall be to review and make recommendations to the Subdivision Committee on all preliminary and final plats, planned development plans or their equivalent submitted to it. The said Committee shall meet with the Subdivision Committee to submit its recommendations. The Utility Advisory Committee shall consist of representatives of those public and private agencies including the township trustee, having a direct interest in public works, public utilities, health and safety, the enforcement of these regulations, and such other persons as the Commission may from time to time deem necessary.

PART 3. FILING FEES

3-301. Filing Fees

(A) The filing fee shall be $50.00 plus $3.00 for each lot over one based on the number of lots shown on the preliminary plat, or the number of lots proposed on any plat filed under Article 4, Part 5.

(B) The filing fees for lot-split shall be $20.00.

3-301 Continued.

(C) Cost of recording documents, publications, writs, and engineering costs are payable in addition to filing fees. This will be billed to the applicant.

(D) A written receipt shall be issued to the person(s) making such payment. No fee shall be required when such proposed plat, subdivision, or lot-split is owned by any department, agency, political subdivision, board or commission of any city, the county or federal government. No fee shall be refunded in the event any preliminary or final plat is disapproved.

PART 4. ENFORCEMENT

3-401. Enforcement. No plat or subdivision shall be approved which does not comply with the provisions of these regulations.

ARTICLE 4

PROCEDURE FOR APPROVAL OF SUBDIVISION PLATS

PART 1. SKETCH PLANS.

4-101. Application for Subdivision Approval. Any person desiring to subdivide land that is subject to the provisions of these regulations shall file with the Planning Department an application which states the name and address of the person making the application, identifies the location of the land to be subdivided, and describes the proposed subdivision in general terms, including the approximate number of proposed lots and typical lot widths and depths. Five copies of the proposed sketch plan of the subdivision shall be submitted with the application, provided however, the Planning Director or his designate may waive the requirement of sketch plat submission on simple subdivisions or those subdivisions on which agreement can be reached without such submittal and on those plats it is determined that no useful purpose would be served by such submittal.

4-102. Development of Sketch Plan. Within seven days after it receives an application for approval of a subdivision, the Planning Department shall be available to confer with the subdivider to develop a mutually acceptable sketch plan of the subdivision. The sketch plan shall contain the data and information set out in Section 4-101, and Section 5-201 of these regulations.

4-103. Failure to Agree on Sketch Plan. If the subdivider and the Planning Department are unable to reach agreement on the characteristics of the sketch plan within 30 days of the date that the application for approval of a subdivision is filed, then the subdivider may appeal to the Subdivision Committee of the Planning Commission for a determination with respect to the characteristics of the Sketch plan on which the subdivider and the Planning Department have been unable to agree. In such event, the subdivider shall submit such number of copies of the sketch plan as may be determined necessary by the Planning Commission for distribution to the Subdivision Committee and the Utility Advisory Committee. The Subdivision Committee

4-103 Continued.

shall make such determination at its first regular meeting following the conclusion of the aforesaid thirty-day period. If the Subdivision Committee disapproves the sketch plan, it shall advise the subdivider in writing of the reasons for such disapproval.

4-104. Approval of Sketch Plan. When the subdivider has received written approval of a sketch plan from the Planning Department, or has received written approval of the sketch plan from the Subdivision Committee of the Planning Commission, then the subdivider may proceed with the preparation of the preliminary plat.

PART 2. THE PRELIMINARY PLAT

4-201. Filing of Preliminary Plat. Such number of copies of the preliminary plat as may be determined necessary by the Planning Commission for proper review by the Subdivision Committee and the Utility Advisory Committee shall be filed with the Planning Department within six months of the date that the Planning Department, or the Subdivision Committee of the Planning Commission, has approved the sketch plan. When the plat is to be referred to any governing body or other planning commission as required in Section 3-103 of these regulations, five (5) additional copies of the plat shall be submitted.

4-202. Filing Fee. The preliminary plat shall not be accepted for filing until the filing fee therefor has been paid by the subdivider.

4-203. Contents of Preliminary Plat. The preliminary plat shall contain the information and data set out in Section 5-302 of this regulation.

4-204. Distribution and Review of Preliminary Plat. The Planning Department shall distribute copies of the preliminary plat to the Subdivision Committee and the Utility Advisory Committee. The Planning Department shall review the preliminary plat and make its report and recommendations thereon to the Subdivision Committee.

4-205. Action by Planning Commission on Preliminary Plat. The Subdivision Committee shall review the preliminary plat and may conduct a public hearing, at which time interested persons may attend and offer evidence in support of or against such preliminary plat.

4-205 Continued.

(A) The Subdivision Committee shall thereupon determine, on the basis of all evidence before it, whether the preliminary plat generally meets the design standards and requirements of these regulations, the comprehensive plan(s) of the area, the zoning regulations in force in the area, and other applicable provisions of ordinances or regulations of the local governments.

(B) If the foregoing considerations are satisfied, the Subdivision Committee shall approve, in writing, the preliminary plat.

(C) If the Subdivision Committee determines that the preliminary plat does not satisfy the foregoing conditions, it may suggest modifications so as to satisfy such conditions, and in such event:

(1) The Subdivider may amend the preliminary plat so as to incorporate such modifications and resubmit the preliminary plat to the Subdivision Committee which shall then grant its approval if such amendments satisfactorily incorporate the suggested modifications; or

(2) The subdivider may reject the suggested modifications, or, within the time allowed for Subdivision Committee action, may refrain from taking any action thereon. In either event, the preliminary plat shall be deemed to have been disapproved and the Subdivision Committee shall thereupon furnish the subdivider with a written statement setting forth the reasons for disapproval of the preliminary plat.

(D) If the Subdivision Committee determines that the preliminary plat does not satisfy the foregoing conditions and that modifications would be too extensive or impractical, it shall disapprove the preliminary plat and immediately notify the subdivider of its action and the reasons therefor.

(E) The foregoing provisions to the contrary notwithstanding, the Subdivision Committee shall approve or disapprove the preliminary plat within 60 days from the date of the filing

4-205(E) Continued.

of such plat or from the date that the subdivider has submitted the last item of required data (when such requirement has been made within said 60 days), whichever date is later, unless such time is extended by mutual consent. If the preliminary plat is disapproved, then within ten days thereof the Subdivision Committee shall furnish the subdivider with a statement in writing setting forth the reason for such disapproval and specifying with particularity the aspects in which the proposed preliminary plat fails to conform to the requirements of these regulations, the comprehensive plan, zoning regulations in force in the area and other applicable provisions of the ordinances of the city.

4-206. Failure of Subdivision Committee to Act on Preliminary Plat. If the Subdivision Committee fails to approve or disapprove a preliminary plat within 60 days after the date such plat is submitted to it or from the date the subdivider has submitted the last item of required data, which ever date is later, then such preliminary plat shall be deemed to have been approved, unless the subdivider shall have consented in writing to extend or waive such time limitation.

4-207. Effect of Approval of Preliminary Plat.

(A) Approval of the preliminary plat shall not constitute approval of the subdivision by the Subdivision Committee or the Planning Commission, but shall signify merely the general acceptability of the proposed subdivision.

(B) Such approval shall be considered permission to prepare the final plat, detailed plans and specifications for the proposed subdivision and for all public improvements to be constructed therein by the subdivider.

(C) Such approval shall be effective for no more than twelve months from the date approval was granted, unless, upon application from the subdivider, the Planning Director grants an extension of time beyond such period. If a final plat has not been approved and recorded as required by the provisions of these regulations within such twelve-month period, or any extensions granted thereto, the preliminary plat must be resubmitted to the Subdivision Committee as if such plat had never been approved, except that no additional fee shall be charged for such resubmission.

PART 3. FINAL PLATS

4-301. Filing of Final Plats. The final plat, on tracing cloth or on other such material as may be authorized by these regulations, together with the same number of copies as are required for submission as a preliminary plat shall be filed with the Planning Department within twelve months after the date that the preliminary plat is approved. The Planning Department shall transmit the final plat to the Subdivision Committee, together with its report and recommendations thereon.

4-302. Action by Subdivision Committee. The Subdivision Committee shall approve a final plat if:

(A) It is substantially the same as the approved preliminary plat;

(B) There has been compliance with all the conditions, restrictions and requirements of these regulations and of the other applicable regulations or laws;

(C) There has been compliance with any conditions that may have been attached to the approval of the preliminary plat.

If the Subdivision Committee disapproves the final plat, it shall advise the subdivider in writing of the reasons for such disapproval within ten days after such disapproval. All actions of the Subdivision Committee shall be forwarded to the Planning Commission for final action and determination.

4-303. Action by the Planning Commission. The Planning Commission shall within sixty days after the plat has been submitted to the Subdivision Committee either approve or disapprove the plat. If the Planning Commission disapproves the final plat, it shall advise the subdivider in writing of the reasons for such disapproval within ten days after disapproval.

4-304. Failure of Planning Commission to Act on Final Plat. If the Planning Commission fails to act on the final plat within 60 days after it has been submitted for final approval, it shall be deemed to have been approved unless the subdivider shall have consented to extend or waive such time limitation.

4-305. Submission to Governing Body. Before a final plat is recorded, it shall be submitted to the appropriate governing body for its acceptance of streets and other public ways, service and utility easements, and land dedicated for public use. When within a City, acceptance of such dedication shall be shown over the signature of the Mayor or any other City official duly authorized to act during the absence or disability of the Mayor and attested to by the City Clerk. When any portion of a final plat is located in the unincorporated area of Sedgwick County, it shall also be submitted to the Board of County Commissioners for acceptance of dedications. The failure of the governing body of the City or the Board of County Commissioners to execute an acceptance of dedications shown on any plat shall be deemed to be a refusal of the proposed dedications shown thereon.

PART 4. UNIT DEVELOPMENTS[1]

4-401. The foregoing provisions of these regulations to the contrary notwithstanding, an approved preliminary plat may be submitted for final approval in separate geographic units rather than as a whole, provided the following conditions are met:

(A) Each unit of a plat of subdivision shall contain an area of sufficient size based on physical conditions and ability to install improvements economically. Such units should, if possible, contain at least 20 lots.

(B) The approval of the Director of Planning upon the advice of the local Public Works or Engineering Officials as to the feasibility of such development, in separate units, including the feasibility of the proposed sequence of development, shall be secured.

(C) A final plat of at least one unit shall be submitted for approval within twelve months from the date of approval of the preliminary plat, and final plats of all such units shall be submitted for approval within three years from the date that the preliminary plat was approved. The Director of Planning on application of the subdivider, may, from time to time, grant extensions of time within which to submit such final plats, provided that each such extension shall be for no more than one year.

4-401 Continued.

(D) All steps required for the approval of final plats, including the recording thereof, shall be adhered to with respect to each unit so submitted.

PART 5. APPROVAL OF PLATS FOR SMALL TRACTS.

4-501. Authorization. Any other provision of these regulations to the contrary notwithstanding, if a proposed plat of subdivision or resubdivision complies with the requirements of Section 4-502 of these regulations, then the Planning Commission may approve a final plat of such subdivision or resubdivision when neither a sketch plan nor a preliminary plat have been submitted by the subdivider and a preliminary plat has not been approved by the Planning Commission.

4-502. Requirements. In order to qualify for approval in the manner provided in Section 4-501 a proposed plat of subdivision shall comply with the following requirements:

(A) The proposed plat of subdivision shall include not more than ten acres if a residential plat, nor more than five acres for any other type of plat.

(B) The proposed plat of subdivision shall create not more than five lots, tracts or parcels of land;

(C) No public street or easement of access is sought to be dedicated, or is contemplated or projected, through (as opposed to adjacent to) the lot, tract or parcel proposed to be subdivided or resubdivided; and

(D) The proposed plat of subdivision shall be in the form required by Section 5-401 of these regulations and shall contain all the data, information and certificates required on final plats by Section 5-402 of these regulations.

(E) Submission of the filing fee required in Section 3-301.

(F) Submission of 15 copies of a vicinity map as described in Section 5-302 (D) (1).

4-503. Procedure.

(A) Final plats submitted for approval pursuant to Section 4-501 shall be filed with the Planning Department so that the plat may be submitted to the Subdivision and Utility

4-503 (A) Continued.

Advisory Committees for review. The Planning Department may require the subdivider to submit the topographic information listed in Section 5-302(B) (2) whenever the property proposed to be subdivided or resubdivided is traversed by, or is adjacent to, a known water course, including intermittent streams.

(B) The approval of final plats by the Planning Commission pursuant to Section 4-501 shall be subject to the provisions of Section 4-301 through 4-305, inclusive, of these regulations except insofar as the said sections require prior approval of, or compliance with, an approved preliminary plat.

PART 6. BUILDING AND OTHER PERMITS.

4-601. No building permit, zoning certificate or occupancy certificate except those involving repairs, maintenance, continuation of an existing use or occupancy provided there is no expansion of floor area or use area (where there are no major structures involved) of more than 30 percent, shall be issued for a building or structure on any lot, tract or parcel of any subdivision that is subject to the provisions of these regulations until a copy of the recorded plat of subdivision is available for examination by the official charged with issuing building permits and/or zoning certificates. No such permits or certificates shall be issued until there has been compliance with all of the provisions of these regulations and conditions of plat approval.

1/20/69

ARTICLE 5

CONTENTS OF PLANS AND PLATS

PART 1. PLATTING ACCURACY

5-101. Platting Accuracy. Plats shall be prepared with the following accuracy:

(A) Sketch plats shall be to a scale. They may be submitted in free hand form.

(B) Preliminary plats shall be drawn to scale with such accuracy as to determine the location of lot, block, property and boundary lines, utility and other facilities, to the nearest foot.

(C) Final plats shall be prepared with the accuracy required for traverse data. The following sheets or drawings shall be submitted with the final plat:

(1) Traverse data for the plat, including the coordinates of the boundary of the subdivision with the error of closure. The error of closure for a perimeter distance having a length of ten thousand (10,000) feet or more shall not be more than one (1) in twenty thousand (20,000). For perimeter distances less than ten thousand (10,000) feet in length, the error of closure shall not be more than one (1) in ten thousand (10,000).

(2) The computation of all distances, angles and courses that are shown on the final plat unless measured in the field.

(3) All stakes, monuments or other evidence found on the ground in use to determine the boundaries of the plat.

PART 2. SKETCH PLAN

5-201. Contents of Sketch Plan.[2] The Sketch Plan shall show the proposed layout of streets, lots, proposed business and industrial areas, parks, playgrounds, and other public areas and features of the subdivision. The Sketch Plan shall contain the following data:

5-201 Continued.

(A) Boundary lines;

(B) Existing major easements on or adjacent to the tract showing location, width, and purpose;

(C) Streets on or adjacent to the tract;

(D) Utility facilities on or adjacent to the tract, including type, location and size.

5-202. Optional Data Required for Sketch Plans. The subdivider, if requested by the Planning Department, shall submit the following:

(A) A topographic survey with ground elevations on the tract and other physical conditions on the tract such as water courses, marshes, wooded areas, and existing structures to be retained;

(B) Physical conditions on adjacent land, including ground elevations whenever needed for drainage purposes, location of structures, railroad rights-of-way, utility lines, community facilities, traffic arteries, shopping centers, schools and parks.

(C) A statement describing the covenants and available community facilities and utilities on and adjacent to the property to be subdivided;

(D) A statement of proposed protective or restrictive covenants, if any.

PART 3. PRELIMINARY PLAT.

5-301. Form of Preliminary Plat. The preliminary plat shall be drawn at a scale of not less than one inch equals 100 feet; however, areas over 100 acres may be at a scale of one inch equals 200 feet.

5-302. Contents of Preliminary Plat.[3]

(A) General Information. The following general information shall be shown on the preliminary plat:

(1) The proposed name of the subdivision. This name shall not duplicate or resemble the name of any existing subdivision within the area subject to these regulations.

5-302 (A) Continued.

(2) Date, north point, and scale of drawing.

(3) An identification clearly stating that the map is a preliminary plat.

(4) Location of the subdivision to define the location and boundaries of the tract which will be subdivided.

(5) Names of adjacent subdivisions or, in the case of unplatted land, the name of the owner or owners of adjacent property.

(6) The name and address of the owner, the subdivider, and the licensed professional engineer or surveyor who prepared the plat.

(B) Existing Conditions. The following existing conditions shall be shown on the preliminary plat:

(1) The location, width and names of all existing public or private streets within or adjacent to the tract, together with easements, railroad rights-of-way, and other important features such as section lines and corners, city boundary lines and monuments.

(2) Contour lines or spot elevations based on City of Wichita datum or Mean Sea Level (MSL) having the following intervals:

(i) Two (2) foot contour intervals for ground slopes less than ten percent (10%).

(ii) Five (5) foot contour intervals for ground slopes exceeding ten per cent (10%).

(iii) Spot elevations where the ground is too flat for contours.

The date of the topographic surveys shall be shown.

(3) The location and direction of all watercourses and areas subject to flooding.

5-302(B) Continued.

(4) Natural features such as rock outcroppings, marshes, lakes, wooded areas, and isolated preservable trees.

(5) Existing use of the property including the location of all existing structures showing those that will be removed and those that will remain on the property after the final plat is recorded.

(6) The horizontal location and elevation within the subdivision and the horizontal location in the adjoining streets and property of existing sanitary and storm water sewers including flow lines, water mains, culverts, underground wiring, pipe lines and gas lines proposed to serve the property to be subdivided.

(7) Zoning on and adjacent to the tract, if any.

(8) Location, elevation and description of the bench mark controlling the vertical survey.

(C) Proposed Subdivision Plat. The following information with respect to the manner in which the tract is to be subdivided and developed shall be included on the preliminary plat:

(1) Streets, showing the location, width, names and approximate grades thereof. The preliminary plat shall show the relationship of all streets to any projected streets shown, or any development plan adopted by the Planning Commission, or governing body, shall be shown, or if no such development plan has been completed, then as suggested by the Planning Commission.

(2) Easements showing width and purpose.

(3) Lots showing approximate dimensions, minimum lot sizes and proposed lot and block numbers.

(4) Sites, if any, to be allocated for development with other than single-family dwellings.

(5) Location and type of utilities to be installed.

(6) Sites, if any, to be dedicated or reserved for park, playground or other public purposes.

(7) Proposed building setback lines, if any.

5-302. Continued.

(D) Additional Data and Information to be Submitted with the Preliminary Plat. The following data and information shall be submitted in separate statements and/or maps accompanying the preliminary plat, or, if practical, such data and information may be shown on the preliminary plat:

(1) A vicinity map showing existing subdivisions, streets and unsubdivided tracts adjacent to the proposed subdivision and showing the manner in which the proposed streets may be extended to connect with existing streets.

(2) Proposed deed restrictions, if any, in outline form.

(3) A statement of the manner in which it is proposed to finance improvements.

(4) A statement as to the general nature and type of improvements proposed for the subdivision, and in what manner the subdivider intends to provide for their installation, e.g., petition, actual construction, monetary guarantee, etc. If other than by petition, the approximate time that such improvements will be completed should be indicated.

PART 4. FINAL PLAT.

5-401. Form of Plat. The final plat shall be prepared by a licensed professional engineer, or surveyor as defined in Article 11 Section 11-102 Definitions, and drawn in waterproof black ink on Imperial tracing cloth or its equivalent as may be approved by the Planning Department. Alternatively, a final plat may be prepared with a photographic process provided it is submitted on 0.004 inch mylar cronoflex engineering photographic film or its equivalent as may be approved by the Planning Department. The permitted page sizes shall be twenty-two (22) inches by thirty- four (34) inches, or smaller. Larger sizes will not be accepted. The scale shall be not less than 100 feet to one inch except that a variation in scale may be allowed where the Planning Department determines it is necessary for a proper exhibit of the subdivision. When more than one sheet is used for any plat, each such sheet shall be numbered consecutively and each such sheet shall contain a notation showing the whole number of sheets in the plat and its relation to other sheets (e.g., sheet 1 of 3 sheets). Linear dimensions shall be given in feet and decimals of a foot.

5-402. Content of Final Plat.[4] The final plat shall show on the face thereof:

(A) The name of the subdivision.

(B) The date, scale, north point, legend and controlling physical features, such as water courses, highways and railroads.

(C) A legal description of the tract boundaries.

(D) Reference ties to previous surveys and plats, as follows:

(1) Distance and direction to the monuments used to locate the land described in the certificate of survey.

(2) The location of all other monuments required to be installed by the provisions of these regulations.

(E) Tract boundary, block boundary, street and other right-of-way lines with distances and angles (and/or bearings). Where these lines follow a curve (all curves must be circular), the central angle, the radius, points of curvature, length of curve and length of intermediate tangents shall be shown.

(F) Lot lines with dimensions. Side lot lines shall be at right angles or radial to street lines unless otherwise shown. Rear lot lines shall be parallel to block or tract lines unless otherwise indicated. Points of deflection of rear lot lines shall be indicated by angles and distances.

5-402 Continued.

(G) The width of the portion of the streets being dedicated and the width of any existing right-of-way.

(H) All easements shall be denoted by fine dashed lines, clearly identified, and if already on record, the recorded reference of such easements. If an easement is not definitely located of record, a statement of such easement shall be included. The width of the easement with sufficient ties to locate it definitely with respect to the subdivision must be shown. If the easement is being dedicated through the plat map, it shall be properly referenced in the owner's certificate of dedication and identification.

(I) Lot numbers beginning with the number one, and numbered consecutively in each block.

(J) Block numbers or letters continuing consecutively without omission or duplication throughout the subdivision. Such identification shall be solid, of sufficient size and thickness to stand out, and so placed as not to obliterate any figure.

(K) Land parcels to be dedicated for any purpose, public or private, to be distinguished from lots or tracts intended for sale.

(L) Building setback lines, if any.

(M) The name of each street shown on the subdivision plat.

(N) Location and elevation of permanent bench mark, if required.

(O) The following certificates, which may be combined where appropriate.

(1) A certificate signed and acknowledged by all parties having any record, title, or interest in the land subdivided, and consenting to the preparation and recording of the said subdivision map.

(2) A certificate signed and acknowledged as above, dedicating all parcels of land shown on the final plat and intended for any public use except those parcels which are intended for the exclusive use of the lot owners of the subdivision, their licensees, visitors, tenants, and servants.

NOTE: The typewritten or printed names of all persons required by this section shall appear below the signature of that person.

5-402 (O) Continued.

(3) A certificate signed by the licensed professional engineer or surveyor responsible for the survey and final map. The engineer or surveyor shall not sign the plat until he has or has had all monuments, irons, or benchmarks set required by these regulations. Said signature shall be accompanied by the engineer's or surveyor's seal and shall state the month and year such survey was made.

(4) The acknowledgement of a notary in the following form:

State of Kansas, County of Sedgwick, SS.

Be it remembered that on this ____ day of _____, 19__, before me, a notary public in and to me personally known to be the same person who executed the foregoing instrument of writing and duly acknowledged the execution of same. In testimony whereof I have hereunto set my hand and affixed my notarial seal the day and year above written.

(SEAL) _____, Notary Public

My Commission expires: _____

(5) The certificate of the Planning Commission in the following form:

This plat of _____ has been submitted to and approved by the Wichita-Sedgwick County Metropolitan Area Planning Commission, Wichita, Kansas.

Dated this ____ day of _____, 1970.

Wichita-Sedgwick County Metropolitan Area Planning Commission

By _____, Chairman

(SEAL) _____, Secretary

(6) The plat approval and acceptance of dedications by the municipal governing body, when required, in the following form:

This plat approved and all dedications shown hereon, if any, accepted by the (name of the governing body) of the City of _____, Kansas, this ____day of _____, 19__.

NOTE: The typewritten or printed names of all persons required by this section shall appear below the signature of that person.

2/12/70

5-402 (O) (6) Continued.

_____, Mayor

(SEAL) _____, City Clerk

(7) The plat approval and acceptance of dedications by the Board of County Commissioners, when required, in the following form:

This plat approved and all dedications shown hereon, if any, accepted by the Board of County Commissioners of Sedgwick County, Kansas, this ____day of _____, 1970.

ATTEST: _____

_____ _____

County Clerk _____

(SEAL) County Commissioners

(8) A blank space for noting entry on the transfer record in the following form:

Entered on transfer record this ____ day of _____, 19___.

_____County Clerk

(9) The certificate of the Register of Deeds in the following form:

State of Kansas, County of Sedgwick, SS.

This is to certify that this instrument was filed for record in the Register of Deeds Office, at _____ a.m. - p.m., on the ____day of _____, 19____.

_____Register of Deeds

_____Deputy

(10) Provision for all other certifications, approvals, and acceptances which are now, or which may hereafter be required by any statute, ordinance or regulation.

(11) The form of the certification may be modified as necessary with the approval of the Planning Department legal counsel to meet statutory or other requirements.

NOTE: The typewritten or printed names of all persons required by this section shall appear below the signature of that person.

2/12/70

5-403. Supplemental information to be submitted with Final Plat. The following additional data shall be submitted with the final plat:

(A) A title report by an abstract or a title insurance company, or an attorney's opinion of title, showing the name of the owner of the land and all other persons who have an interest in, or an encumbrance on the plat. The consent of all such persons shall be shown on the plat.

(B) A certificate showing that all taxes and special assessments due and payable have been paid in full; or of such taxes have been protested as provided by law, monies or other sufficient escrows guaranteeing such payment of taxes in the event the protest is not upheld, may be placed on deposit with such officials or governing bodies to meet this requirement.

(C) A copy of any deed restrictions applicable to the subdivision.

ARTICLE 6

LOT SPLITS

6-101. General Intent. The Planning Commission hereby delegates to and designates the Director of Planning or his appointed agent, authority for approving or disapproving lot splits in accordance with the following regulations.

6-102. Application Procedure. Requests for lot split approval shall be made by the owner of the land to the Wichita-Sedgwick County Metropolitan Area Planning Department. Four (4) copies of a drawing to scale of the lots involved if there are no structures thereon, or if structures are located on any part of the lot being split, four (4) copies of a survey of the lot(s) and the location of the structure(s) thereon, together with the precise nature, location and dimensions of the split, shall accompany the application.

6-103. Approval Guidelines. Approval or disapproval of lot splits shall be made based on the following guidelines:

(A) No lot split shall be approved if:

(1) A new street or alley is needed or proposed.

(2) A vacation of streets, alleys, setback lines, access control or easements is required or proposed.

(3) If such action will result in significant increases in service requirements, e.g., utilities, schools, traffic control, streets, etc.; or will interfere with maintaining existing service levels, e.g., additional curb cuts, repaving, etc.

6-103 Continued.

(4) There is less street right-of-way than required by these regulations or the Comprehensive Plan unless such dedication can be made by separate instrument.

(5) All easement requirements have not been satisfied.

(6) If such split will result in a tract without direct access to a street.

(7) A substandard sized lot or parcel will be created.

(B) The Director of Planning may make such additional requirements as deemed necessary to carry out the intent and purpose of existing land development regulations and governing body policy. Requirements may include, but not be limited to, installation of public facilities, dedication of right-of-way and easements, and submission of covenants for the protection of other landowners in the original subdivision.

(C) The Director of Planning or his designated agent shall, in writing, either approve with or without conditions or disapprove the lot split within thirty (30) days of application. If approved, and after all conditions have been met, he shall sign and furnish a certificate of approval to be affixed to the lot-split survey, and a certified copy thereof shall be filed with the Register of Deeds, the official designated to issue building or occupancy permits, and the Office of the Planning Department, and a copy shall be furnished to the applicant.

ARTICLE 7

DESIGN STANDARDS

PART 1. GENERAL STANDARDS.

7-101. Scope. All subdivision of land subject to these regulations shall conform to the design standards of this Article 7.

7-102. Development Plan. No subdivision shall conflict with the comprehensive plan of the metropolitan area.

7-103. Land Subject to Flooding

(A) No land subject to periodic flooding, or the 100-year flood where delineated, shall be subdivided for residential use or any other use which would be incompatible with such flooding.

(B) If improvements meeting the standards and requirements of Wichita-Valley Center Flood Control Office, or available published standards and requirements, designed so as to render such land safe for residential or other intended occupancy are made on land which is subject to periodic flooding or which has inadequate drainage, then and only in that event, the provisions of paragraph (A) above shall not bar the approval of such subdivision. The costs of such improvements shall be at no expense to local units of government provided that participation in the costs by state and federal agencies may be accepted.

7-104. Access. All lots located in any subdivision shall be served directly by a public street except that private streets may be permitted as a part of a Planned Unit Development or equivalent thereto.

7-105. Parks, Playgrounds, Open Space, Schools and Public Facility Sites. The Planning Commission may require as a condition precedent to approval of any subdivision plat:

(A) That said subdivider offer to sell to the appropriate public body, agency or authority, lands, sites, and locations for parks, playgrounds, open space, schools or other public facilities. If such public body, agency or authority purchases any such offered lands, sites or locations prior to the date on which the subdivider's plat of subdivision is recorded with the Register of Deeds, the market price for such lands, sites or locations shall be computed as the appropriate proportion of the fair market value of the entire subdivision area as undivided land as of the date on which the subdivider submits his preliminary plat of subdivision for approval, or if no preliminary plat is required to be submitted, as of the date

on which the subdivider submits his plat of subdivision for approval, plus that percentage of the costs of improvements required as a part of the plat allocable to that portion being purchased.

(B) That said subdivider reserve for sale to the appropriate public body, agency or authority, lands, sites, and locations for parks, playgrounds, open space, schools or other public facilities; provided, however, that a subdivider shall not be required to reserve such lands, sites and locations for a period longer than (i) two (2) years after the date of recording the subdivision plat with the Register of Deeds, or (ii) sixty (60) days after actual construction shall have been commenced on 75 percent of the residential units in the subdivision, whichever shall result in a longer period of time. The market price for such lands, sites, and locations shall be their fair market value as of the date that such public body, agency, or authority notifies the subdivider, in writing, of its intention to purchase such lands, sites or locations or portions thereof, plus that percentage of the costs of improvements required as a part of the plat allocable to that portion being reserved, plus all taxes and assessments which have been paid from the time such reservation of lands was required until such lands are purchased.

(C) These provisions shall apply only to subdivisions or the parts thereof designed or intended for residential development or occupancy.

7-106. Land Subject to Excessive Erosion by Wind or Water. On land subject to excessive soil movement by the forces of wind and/or water and that may cause environmental health hazards, necessary preventive measures shall be a part of the subdivision plan. Conservation standards adopted by the Sedgwick County Soil Conservation District shall be adhered to.

PART 2. SPECIFIC STANDARDS.

7-201. Streets - Layout and Design.

(A) The arrangement, character, extent, width, grade and location of all streets shall conform to the comprehensive development plan and shall be considered in their relation to existing and planned streets, topographical conditions, to public convenience and safety, and their appropriate relations to the proposed uses of the land to be served by such streets.

7-201. Continued.

(B) Where such is not shown on the development plan, the arrangement of streets in a subdivision shall either:

(1) Provide for the continuation or appropriate projection of existing principal streets in surrounding areas; or

(2) Conform to a plan for the neighborhood approved or adopted by the Planning Commission to meet a particular situation where topographic or other conditions make continuance or conformance to existing streets impracticable.

(C) Local streets shall be laid out so that their use by through traffic will be discouraged.

(D) If a subdivision abuts or contains an existing or proposed limited access highway or arterial street, the Planning Commission may require marginal access streets,[5] reverse frontage lots with access control provisions along the rear property line, deep lots with rear service alleys or such other treatment as may be necessary for adequate protection of residential properties and to afford separation of through and local traffic.[6]

(E) If a subdivision borders on, or contains a railroad right-of-way or a limited access highway, the Planning Commission may require a street approximately parallel to and on each side of such right-of-way, at a distance suitable for the appropriate use of the intervening land. Such distances shall also be determined with due regard for the requirements of approach grades and future grade separations.

(F) Reserve strips controlling access to streets shall be prohibited except where their control is placed with the governing body under conditions approved by the Planning Commission.

(G) Street rights-of-way requirements for other than arterials shall be determined by the total aggregate needs for the functional components for the particular system being considered. The total aggregates shall be in increments of two feet, even numbers only. The components involved shall be:

Moving or Traffic Lanes - variable from nine (9) to twelve (12) feet depending on function, e.g. low density residential, cul-de-sac residential, collector, industrial, etc., and on design speed of the roadway. A moving lane may utilize a portion of the surface of certain types of curb construction, however, for purposes of determining rights-of-way shall be computed without curb areas.

Parking Lanes for on-street storage of vehicles. Parking lanes shall be at least eight feet in width. For computation purposes, up to two (2) feet for curb or shoulder may be included as part of the parking lane.

7-201 (G) Continued.

Curb or shoulder. Curbs shall be considered to require two (2) feet irrespective of construction type. Shoulders (for suburban or rural roadways) shall be not less than three feet in width.

Border Area. For urban streets (sometimes referred to as the "parking") the border area shall be fourteen and one-half feet in width from the back of curb to property line. This area shall be used for installation of utilities, street lighting, traffic control devices, fire hydrants, sidewalk and to provide a transition area in grades (if necessary) between the roadway and the property adjacent to the right-of-way. Border areas for suburban areas shall be variable in width, based on drainage needs.

Based on the above general criteria, street rights-of-way and roadways shall be as follows:

Urban Area	R-O-W for Street In Feet	Roadway Width In Feet*
(1) Collector; or Local-Business, Office, Commercial and Industrial Areas; or Local-Residential rowhouses, Garden Apartments, Multi-Family, High Rise or other similar type of dwelling units: - 2 moving lanes (12') - 2 parking lanes	70**	40**
(2) Local Residential - Single and Two-family dwellings - 2 moving lanes (9') and 2 parking lanes	64	34

*Face of curb to face of curb.

**Street and roadway widths for collector may be required to be greater than the width listed for that portion 150 feet back from the intersection with an arterial. The increased width shall not be more than 78 feet and 48 feet respectively.

7-201(G) Continued.

	R-O-W for Street in feet	Roadway Width in Feet
Urban Area		
(3) Local Residential - Single-family Dwelling - 2 moving lanes (10') - no parking lanes - mandatory roll curb or equivalent - (Note: this shall be used with extreme discretion for very low density housing of one DU/gross acre or less. The design of the subdivision shall eliminate through traffic. Guarantee shall be provided for at least 3 off-street parking spaces per DU, either by local regulations or restrictive covenants)	54	24
(4) Local - Marginal Access Road - 2 moving lanes - no parking, plus 7 feet of border area between curb and the main road right-of-way	50	28
(5) Alleys	20	20
(6) Sidewalk (other than adjacent to arterials)	Not Applicable	4
Suburban		
(7) Collector, Industrial or Commercial - 2 moving lanes (17.5') - shoulder, ditches and border areas	80	47***
(8) Residential - 2 moving lanes (12.5') - shoulder, ditches and border area	70	31***
(9) Sidewalk (if required - See Section 8-103(B))	Not Applicable	4

***Including Shoulder.

7-201 (G) Continued.

These widths may be modified by the Commission on a showing that special conditions exist such as parallel drainage and roadway systems, utility requirements, considerations for safe and efficient traffic and pedestrian movement, grade problems, intersection design, etc. In applying these standards, workable street systems must be established. Once a pattern of widths based on function for a given area has been established, the pattern shall be followed throughout the street system until another system can be established or ties into a collector or arterial system.

(H) Arterial right-of-way widths shall be as shown on the Comprehensive Development Plan and where not shown thereon shall not be less than 100 feet, except that 150 feet of right-of-way shall be required within 250 feet from the intersection of the center lines of an arterial street with any other arterial or collector street and taper to 100 feet at a distance of 350 feet from the intersection center line. Federal Aid Secondary (FAS) roads in unincorporated areas shall not be less than 120 feet.

(I) Wherever possible, there shall be an inside tangent at least 100 feet in length introduced between reverse curves on arterial and collector streets.[7]

(J) Collector streets if they curve, shall have a minimum center-line curve radius of at least 350 feet. This is based on a design speed of 30 m.p.h. The curve radius may be modified to meet special conditions for other design speeds.

(K) Streets shall be laid out so as to provide for horizontal sight distances on all curves. These distances shall be:

Local Streets:	200 feet
Collector Streets:	300 feet
Arterial Streets:	500 feet

The sight distance shall be measured within street rights-of-way from a height of four and one-half feet above the proposed pavement surface in the right-hand lane of the roadway.

(L) Streets shall be laid out so as to intersect as nearly as possible at right angles, and no street shall intersect any other street at less than 80 degrees.

(M) Street jogs are to be avoided on arterial and collector streets. On local streets with a right-of-way of 64 feet or less, center line offsets of less than 150 feet shall be avoided.

6/26/72

7-201 Continued.

(N) Roadway grades, wherever feasible, shall not exceed the following with due allowance for reasonable vertical curves:

Roadway Type[9]	Per Cent Grade
Arterial	3%
Collector	4%
Local	5%
Marginal Access and Frontage Roads	5%

(O) No roadway grade shall be less than 0.32 of one percent unless approved by the appropriate engineer. Greater percentages of grade may be required where necessary to provide adequate drainage.

(P) Roadway pavement at intersections shall be rounded by the following minimum radii:

Type of Roadway	Intersecting Width	Minimum Curb Radii
Local Residential	Local Residential	20 feet
Local Residential	Collector	30 feet
Local Residential	Arterial	30 feet
Business, Commercial or Industrial Collector or Arterial	Business, Commercial or industrial Collector or Arterial	50 feet

Right-of-way lines may be required to be rounded by an arc having at least the same radii as the arc of the curb when normal right-of-way requirements are not sufficient to allow the construction of roadways having the radii set out alone.

(Q) Half-streets shall be avoided, except for arterial streets and collector streets where applicable, or where they are essential to the reasonable development of the subdivision in conformity with the other requirements of these regulations; or, when the Planning Commission finds that it will be practicable to require the dedication of the other half of the street when the adjoining property is subdivided. Whenever a half-street, or portion thereof, is existing and adjacent to a tract to be subdivided, the other half of the street based on standards in (G) shall be platted within such tract.

(R) Dead-end streets, designed to be so permanently, shall not be

7-201(R) Continued.

longer than seven times the average lot width or 600 feet, whichever is less, and shall have a turn-diameter of at least 70 feet and a street property line diameter of at least 100 feet, or shall have an alternate turn-around area such as hammer-heads, etc., as may be approved by the Planning Department as providing service equal to the foregoing requirement.

For Suburban Subdivisions a minimum street property line diameter of 150 feet, or more as shall be determined by the appropriate engineer, shall be required.

(S) No street names shall be used which will duplicate or be confused with the names of existing streets. Existing street names shall be used where they are or would be logical extensions of existing streets even though separated by undeveloped land after "streets." Street names shall be subject to the approval of the Planning Commission.

7-202. Alleys.

(A) Alleys shall be provided in commercial and industrial districts, except that the Planning Commission may waive this requirement where other definite and assured provision is made for service access, such as off-street loading, unloading and parking spaces consistent and adequate for the uses proposed. Alleys in residential districts are to be discouraged.

(B) When provided, the width of an alley shall be 20 feet.

(C) Alley intersections and sharp changes in alignment shall be avoided, but where necessary, a turning radius shall be provided to permit safe vehicular movement.

(D) Dead-end alleys shall be avoided where possible, but if unavoidable, such alleys shall be provided with adequate turn-around facilities at the dead-end.

7-203. Blocks.

(A) The lengths, widths and shapes of blocks shall be determined with due regard to:

(1) Provision of adequate building sites suitable for the special needs of the type of use contemplated.

(2) Zoning requirements as to lot sizes and dimensions.

7-203(A) Continued.

(3) Need for convenient access, circulation, control and safety of street traffic.

(4) Limitations and opportunities of topography.

7-203 Continued.

(B) A block should not exceed 1,300 feet in length, unless such block is adjacent to a limited access highway or arterial street or unless the previous adjacent layout or topographical conditions justify a variation of this requirement.

(C) All blocks shall be so designed so as to provide two tiers of lots, unless a different arrangement is required in order to comply with Sections 7-201(D), 7-201(R), or is permitted by Section 7-204(G).

(D) Blocks may be irregular in shape, provided they are harmonious with the overall pattern of blocks in the proposed subdivision, and provided their design meets the requirements of lot standards, traffic flow and control considerations, and development plan requirements.

(E) In blocks of 800 feet or more in length, a public crosswalk for pedestrian travel may be required to provide access to public or private facilities such as schools or parks. Such crosswalk shall have a right-of-way not less than 10 feet, and extend entirely across such block at approximately the midpoint of the length of such block. A sidewalk shall be placed along the length of such right-of-way, and constructed in accordance with the requirements for sidewalk improvements.

7-204. Lots.

(A) The lot size, width, depth, shape and orientation, and the minimum building setback lines shall be appropriate for the location of the subdivision for the type of development and use contemplated.

(B) Lot dimensions shall conform to the requirements of the zoning regulations unless established in accordance with this subsection (B). In those areas where there may be municipal-type water and sanitary sewer facilities, but which are not yet available, the lots shall be so designed and arranged that they may readily be converted to urban-type building sites without replatting. When such a condition prevails, land should be subdivided into lots so that by combining lots, a building site is created with an area of not less than that required for individual sewage treatment systems. Usually lots should have a frontage of seventy-five (75) feet and an area of twelve thousand five hundred (12,500) square feet. In no instance

7-204(B) Continued.

shall the minimum lot width be less than sixty feet. The creation of such a building site through use of multiple groups of lots shall be contingent upon the establishment for record of restrictive covenants satisfactory to legal counsel of the Planning Department, providing that no more than one dwelling unit shall be built on an aggregate group of lots having an area twenty-five thousand (25,000) square feet or less, until such time as municipal-type water and sewer service is available.

(C) The maximum depth of all residential lots shall not exceed two and one-half times the width thereof. For all other lots, the depth shall not exceed three times the width.

(D) The minimum widths of residential lots measured at the setback lines thereof shall not be less than:

(1) 60 feet when the lot contains an area of 6,000 square feet but less than 8,750 square feet.

(2) 75 feet when the lot contains an area of 8,750 square feet or more, but less than 15,000 square feet.

(3) 90 feet when the lot contains an area of 15,000 square feet or more, but less than 20,000 square feet.

(4) 100 feet when the lot contains an area of 20,000 square feet or more, but less than 30,000 square feet.

(5) 125 feet when the lot contains an area of 30,000 square feet or more, but less than one acre.

(6) 150 feet when the lot contains an area of one acre or more.

(E) Where lots front upon a cul-de-sac or curved street having a radius of 200 feet or less, the minimum lot widths set forth in subparagraph (D) above, shall be measured at the building setback line along an arc parallel to the right-of-way of such cul-de-sac or curved street. Such lots shall also be laid out so that their lot frontage, as measured on the arc of such right-of-way line, is not less than 50% of the required lot width measured at the building setback line.

7-204 Continued.

(F) The area of the street right-of-way shall not be included and calculated in the area of the lot with respect to minimum lot area requirements of these regulations or of any zoning ordinance applicable to the property. Lots shall be required to have more than the minimum area dimensions provided for in this section where such greater area or dimensions are required to meet the yard requirements of the zoning ordinance.

(G) There shall be no double frontage lots[10] for individual dwellings (e.g., single and two-family units), except where the lots abut upon a limited access highway or arterial street or where the topography of the land prevents reasonable subdivision in small units. Double frontage lots shall not have vehicular access between such lots and an abutting limited access highway or arterial street.

(H) The depth and width of properties reserved or laid out for commercial and industrial purposes shall be adequate to provide for the off-street service and parking facilities required by the type of use and development contemplated.

(I) Corner lots for residential use shall have extra width to permit appropriate building setback from an orientation to both streets.

(J) Reversed frontage lots[11] shall be avoided except where such are essential to provide a separation of residential development from limited access highways and arterial streets or to overcome specific disadvantages of topography and orientation.

(K) Lots on arterial street intersections and all acute angle intersections which, in the opinion of the Planning Commission, are likely to be dangerous to traffic movement shall have a radius of 20 feet at the intersection of street rights-of-ways. On business, commercial and industrial lots, a chord may be substituted for a circular arc.

7-205. Easements.

(A) Utility easements shall be provided where necessary, and centered on rear or side lot lines and shall be at least 20 feet wide along rear lot lines and 10 feet wide along side lot lines, except that easements for street lighting purposes shall not in any event be required to exceed 10 feet. Side lot easements, when needed for other than street lighting purposes, may exceed 10 feet.

7-205 Continued.

(B) Drainage Easements. If a subdivision is tranversed by a water course, drainage way, channel or street, then a storm water easement or drainage right-of-way shall be provided. Such easement or right-of-way shall conform substantially to the lines of such water course and shall be of such width or construction, or both, as may be necessary to provide adequate storm water drainage and for access for maintenance thereof. Parallel streets or parkways may be required in connection therewith.

On suburban plats a triangular drainage and utility easement may be required at the corners of intersecting street rights-of-way. Where street rights-of-way intersect at 90 degrees, the limit of such easement would be defined by a line drawn between two points located on the rights-of-way lines which are 25 feet back each way from the corner.

Drainage easements will be vegetated with adapted perennial grasses or otherwise stabilized to prevent soil erosion and sediment movement by wind or water. Conservation standards adopted by the Sedgwick County Soil Conservation District shall be adhered to.

(C) Vision triangle easements may be required on any corner lot to provide an open and usable vision path for drivers of vehicles approaching the intersection. The extent of vision triangle easements shall be based on the type of intersection (3-way, four, protected, unprotected, etc.), the type of street (local, collector, arterial, commercial or industrial), topography, proposed street grades (if any), and the design speeds contemplated for such roadways.

7-206. Business, Commercial and Industrial Subdivisions.

(A) Streets. Notwithstanding the other provisions of this regulation, the minimum width of streets adjacent to areas designed, proposed or zoned for business, commercial or industrial use may be increased by the Planning Commission to such extent as the Commission may deem necessary to assure the free flow of through traffic without interference from parked or parking motor vehicles.

(B) Blocks. Blocks intended for business, commercial or industrial use shall be designed specifically for such purpose, with adequate space set aside for off-street parking and loading.

6/26/72

7-206 Continued.

(C) Marginal Street Access. When lots or blocks in a proposed business, commercial or industrial subdivision front on any limited access highway or arterial street, the subdivider may be required to dedicate and improve a marginal access street to provide ingress and egress to and from such lots or blocks.

7-207. Planned Unit Developments. A comprehensive group development, including the townhouses, garden apartment complexes and condominiums, together with necessary drives and ways of access, may be approved by the Planning Commission although the design of the project does not include standard street, lot and subdivision arrangements; provided that departure from the standards of the regulations can be made without destroying their intent.

For all condominium plats, the following shall apply:

(A) The plat must be in 3-dimensions relating vertical control to City or U.S.G.S. datum.

(B) A bench mark must be set on or near the building at ground level for future reference in locating units in the plat.

(C) Each floor plan of the permanent structure must be shown as well as basement and roof levels and area of plot plan. The dimensions and ties shown for each parcel must be definite enough with respect to both vertical and horizontal control so that the boundaries of each apartment may be accurately located by the use of standard survey methods.

(D) All unit or apartment property lines shall be the interior surfaces of the perimeter walls, floor, ceiling, windows, and doors thereof.

(E) A condominium plat must contain all of the certifications and approvals required for any plat. There must also be an approval by the official authorized to issue building, zoning or occupancy permits indicating that the building plans have been approved by his office and a certification by the architect that the plat is in agreement with the building plan.

ARTICLE 8

INSTALLATION OF REQUIRED IMPROVEMENTS

8-101. Subdivision Types. For purposes of this Article, Subdivisions shall be classified as follows:

Urban Subdivisions: All subdivisions lying within an incorporated city; and those subdivisions in unincorporated areas having or intended to have a density of more than one dwelling unit per 25,000 square foot lot, and all subdivisions or portions thereof, for commercial, industrial, and public or semi-public purposes (directly related to an urban residential subdivision).

Suburban Subdivisions. All other lands in unincorporated areas required to be platted either by Statute or by the Subdivision Regulations.

In interpreting this Article, any time an ownership of a tract of land is split by the application of a three-mile ring (e.g., a line drawn in a circular fashion "three miles therefrom" from a city), said tract shall be considered to be within three miles only, if over 50 percent of the area of the tract lies directly within said three-mile line. If over 50 per cent of the tract lies within the ring, then the entire tract shall be considered to lie within the three-mile ring.

8-102. Engineering Jurisdictions. In setting standards and specifications, approving engineering drawings, inspecting improvements, recommending acceptance of improvements, preparing petition form and establishing the amount of surety for guaranteeing the installation of such improvements, the following engineers, departments, agencies or personnel shall be designated as the "appropriate engineer" for the type of required improvement listed:

8-102 Continued.

Improvement	Appropriate Engineer		
	Column A	Column B	Column C
	City of Wichita and 3 miles thereof except those areas that may be excepted under the provisions of Sec. 3-102	Areas that may be excluded under the provisions of Sec. 3-102	All other unincorporated areas not listed in Columns A and B
Roadways, alley, curbs and gutters, sidewalks and street drainage facilities	City Engineer of Wichita	City Engineer*** of the city adjacent to areas that may be excluded in Sec. 3-102	County Engineer
Water Supply Systems	Director of Water and Sewage Treatment of the City of Wichita*	City Engineer*** of the city adjacent to areas that may be excluded in Sec. 3-102*	City-County Health Department
Fire Hydrants	Director of Water and Sewage Treatment Department of the City of Wichita and the Fire Chief of the City of Wichita	Fire Chief of city adjacent to areas that may be excluded in Sec. 3-102 or County Fire Chief	County Fire Chief

B-102 Continued.

Improvement	Appropriate Engineer		
	Column A	Column B	Column C
Sanitary Sewer System	City Engineer of City of Wichita*	City Engineer*** of city adjacent to areas that may be excluded in Sec. 3-102*	City-County Health Department
Storm Sewer System	City Engineer of Wichita except on major water courses or drainage channels**	City Engineer*** of the city adjacent to areas that may be excluded in Sec. 3-102**	County Engineer
Street Signs	Traffic Engineer of the City of Wichita	County Engineer	County Engineer
Underground Wiring	Utility company involved	Utility company involved	Utility Company Involved
Bench marks and monuments	City Engineer	County Engineer	County Engineer

*With the approval of the State Board of Health and the City-County Health Department when required by law.

**On major water courses and drainage channels, the Wichita-Valley Center Flood Control Office shall be the "appropriate engineer."

***Or the County Engineer in the event the City does not have a City Engineer.

8-103. Required Improvements. The subdivider of a proposed subdivision shall install, or provide for the installation of, the following facilities and improvements:

(A) All roadways, alleys, curbs, gutters and street drainage facilities in accordance with the standards set by the appropriate engineer. All urban streets shall be constructed of concrete, asphalt, or asphaltic concrete and no gravel or sanded roadways shall be constructed in the urban area or to serve urban service standards. All suburban or rural roadways required by these regulations shall be constructed with gravel or sanded surface and no other materials such as oiled surface, macadam or similar materials shall be used. If other than gravel or sanded surface materials are used, urban construction standards as described above shall be used.

(B) Sidewalks shall be required in accordance with the standards set by the appropriate engineer under the following conditions:

Urban

(1) On both sides of the street wherever urban streets are required except:

(a) along streets with residential lots of 200 feet or more frontage or residential lots one acre or larger in average size; and

(b) along streets adjacent to large non-pedestrian generating uses as may be determined by the Planning Commission (e.g., local streets along cemeteries); local streets along sand pits; streets along parks that are developed with walks and trails (e.g., Park Villa and Oak Park); and

(c) where the lots have no direct access to the abutting street.

The sidewalk shall be guaranteed from curb to curb of intersecting streets rather than to property lines.

Sidewalks shall be constructed as near as possible to property lines rather than curb lines.

Suburban

(2) Although not normally required, the appropriate engineer may require sidewalks when needed to service

8-103(B) (2) Continued.

pedestrian traffic flow leading to schools, parks, or places of public assembly.

(C) Sanitary Sewer*

(1) Within the City of Wichita.

(a) Laterals in accordance with the standards of the appropriate engineer. On a temporary basis where permanent facilities are in the planning or construction stage, temporary facilities may be used provided lot sizes shall be those designed for use with a municipal system and provided restrictive covenants or other such devices shall be used to guarantee the proper spacing and lot areas for development needed for proper utilization of the temporary facilities. If individual treatment systems are used, then the minimum aggregate building site areas prescribed in 8-103(C) (4) shall be followed.

(b) Mains and submains shall be installed at the direction of the governing body. The cost of such installation may be assessed to properties benefitted or paid from other funds.

(2) Within unincorporated areas designated for urbanized growth as shown on an adopted comprehensive development plan, or on a map approved by the governing body which shows areas designated for future growth or showing areas of future sewer line extensions, the following requirements shall apply:

(a) Laterals in accordance with the standards of the appropriate engineer. Temporary facilities may be used as provided in (1) (a) above.

(b) Mains (and submains) shall be installed at the direction of the governing body. The extensions of such mains shall be made at the discretion of the governing body and shall be limited to the extent that is reasonable, based on the expected rate of growth and the utilization of such line

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*All sanitary sewer and sewerage treatment systems are subject to regulation by the Kansas State Board of Health.

8-103(C) (2)(b) Continued.

compared to the cost of such extension. The cost of such construction may be paid from such funds of the governing body as deemed proper by them and those costs which might be properly chargeable to a benefit district may be so charged if legally possible or such costs may be recovered later by use of a connection or "hook-up" fee payable at the time of development. In those areas where growth is expected within the planning period, but extension of main sewers is not yet feasible, as determined by the governing body, then the subdivider shall provide either the necessary main extensions to connect to an existing sanitary sewer system (such as a "package plant") satisfactory to the appropriate engineer. When the subdivider is required to provide the main sewer, treatment facilities, or submain sewer, the governing body may participate in such costs to the degree that it determines the public interest is served.

(3) For urban subdivisions in other areas, the subdivider shall provide municipal-type sanitary sewer service approved by the appropriate engineer.

(4) For all other areas not covered by the preceding sections, septic tank systems of sewage disposal may be used on individual lots provided that:

a) There is at least 25,000 square feet of lot area per dwelling unit or such other area as may be required by zoning regulation, and;

b) There is a percolation test made for each lot or such number of lots as may be specified by the Wichita-Sedgwick County Department of Community Health. The lots shall be satisfactory if there is a percolation rate of 90 minutes or less (with the percolation test being accomplished by the subdivider under the supervision of and the percolation rate determination being made by the Wichita-Sedgwick County Department of Community Health). Soils information available at the Office of the Sedgwick County Soil Conservation District, shall be consulted where conditions indicate that more detailed soils information is needed, and;

c) There is sufficient ground cover above the water table and impervious ground formulation as determined by the Wichita-Sedgwick County Department of Community Health.

Where soil conditions are not suitable for septic tank systems as determined by the Wichita-Sedgwick County Department of Community Health, sanitary sewer and/or sewage treatment facilities approved by the appropriate engineer shall be provided.

6/26/72

8-103(C) Continued.

(5) In any of the above requirements calling for, or dependent on, action by a governing body or agencies or departments thereof, when the governing body does not fulfill its obligation, a period of time (not to exceed five years) determined by the Planning Commission at the time of final plat approval, then the requirements for municipal-type sewer facilities shall be void and the subdivider may proceed with approved individual treatment systems.

(D) Water Supply Systems. A public water supply system or its equivalent in accordance with the standards of the appropriate engineer shall be provided in all areas where lateral sanitary sewers are required and in all urban subdivisions. Local rules regarding cost allocations for installation of water lines shall apply.

In all other areas, a water supply approved by the City-County Department of Health shall be provided. In those areas where there is a public water supply system, mains shall be of such size as to support the use of fire hydrants as required in Sec. 8-103(E).

(E) Fire hydrants, in accordance with the standards of the appropriate engineer, shall be provided wherever there shall be required a public water supply system.

(F) A storm sewer system, separate and independent of the sanitary sewer system, meeting all of the specifications and requirements of the appropriate engineer. Such storm sewer shall be connected to any existing storm sewer system, where available, of the city in which the subdivision is located, or the system of the nearest city or to the nearest major water channel. If such connection is not available, other adequate means for the discharge of such storm sewer system shall be provided by the subdivider.

(G) Street signs of such location, type and size as shall be approved by the appropriate engineer, giving due regard to the prevailing type, size and pattern of location utilized throughout the area.

(H) Underground wiring in residential subdivisions, including both electric power and telephone service, except:

(1) For lines rated over 12,000 volts.

8-103(H) Continued.

(2) Appurtenance serving such lines which may be mounted on the ground, such as transformers, transformer pads, and telephone service pedestals.

(3) For those proposed subdivisions or replats of existing subdivisions located in areas which presently have an overhead type of distribution system.

All such construction and installation shall be under contract with the utility. Construction or installation shall occur after sanitary sewer lines, if any, are in place. CATV, if installed, shall be placed underground in accordance with the above requirements.

Nothing in this section shall be construed as to requiring underground installation of lines beyond the boundaries of the area contained in the preliminary plat.

(I) Monuments shall be placed at all blocks corners, angle points, points of curves in streets, and at intermediate points as shall be required by the appropriate engineer. Monuments shall be of galvanized iron pipe not less than 3/4 inch diameter and not less than two feet in length. All monuments shall be securely placed and set in such a manner that the top of the monument shall be at least twelve inches below grade or ground level. The appropriate engineer may add additional specifications as determined necessary. Bench marks may also be required as determined by the appropriate engineer. Benchmarks shall be of such material, size, and length as may be approved by the appropriate engineer.

(J) Relocation of Existing Facilities. Whenever existing sanitary or storm water sewers, water lines, drainage channels, culverts, underground or overhead electric and communication, gas lines, pipe lines, transmission lines are required to be relocated due to the subdivision or construction of improvements required as a condition of approval of the subdivision and in the event such was not known at the time of subdivision approval for any reason, the costs of such relocation shall be the sole responsibility of the subdivider.

(K) Where required, applicable measures will be taken during construction to minimize soil erosion and sedimentation by wind or water. Conservation standards adopted by the Sedgwick County Soil Conservation District shall be adhered to.

8-104. Exceptions for Existing Improvements.

(A) Where the proposed subdivision is a resubdivision or concerns an area presently having any or all required improvements set out in Section 8-103, and where such improvements meet the requirements of said section and are in good condition as determined by the appropriate engineer, no further provision need be made by the subdividers to duplicate such improvements. However, where such existing improvements do not meet the requirements of Section 8-103, the subdivider shall provide for the repair, correction, or replacement of such improvements so that all improvements will then meet the aforesaid requirements of Section 8-103.

(B) Where the proposed subdivision is a resubdivision or concerns an area presently abutting or containing any existing public street of less than the minimum required right-of-way width or roadway width, land shall be dedicated so as to provide a minimum street right-of-way width established by these regulations and/or Metropolitan Area Planning Commission policy, and the subdivider of such proposed subdivision shall provide an additional roadway pavement meeting the minimum standards set by these regulations and the appropriate engineer. The engineer shall determine what adjustment to make where the aforesaid widenings merge with existing streets which are of smaller width at the boundary of such proposed subdivision. The engineer may reduce the minimum roadway required by these regulations to match an existing roadway system if the extension of such roadway is already improved at each end of the roadway in the subdivision and the roadway in the subdivision to be reduced is two blocks or less in length. The appropriate engineer may also require lanes to be painted on such widened streets designating driving and parking areas. The foregoing provisions requiring the widening of pavement may be waived by the Planning Commission when the length of such pavement is less than 135 feet.

8-105. Agreement, Bond, Deposit and Petitions Guaranteeing Installation of Required Improvements. Except for monuments and underground wiring, one of the following methods shall be used by the subdivider to guarantee that improvements required by these regulations can or will be installed in accordance with approved plans and specifications.

(A) Fiscal sureties may be offered and the following shall apply:

8-105 (A)(1) Continued.

(1) Upon final approval of plans or specifications for required improvements, the owners and/or the subdivider of the land proposed to be subdivided shall enter into an agreement with the City or County (depending on the association of the appropriate engineer establishing the standards for the improvements), under which the owners and/or subdivider agree to install such required improvements at their own expense in accordance with the theretofore approved plans and specifications, within the time prescribed by the provisions of these regulations. Such agreement shall be conditioned upon the approval of the final plat of subdivision.

(2) Simultaneously with the execution of the agreement provided for in subparagraph (1) above, the owner and the subdivider of the land proposed to be subdivided shall furnish a corporate completion bond by a firm authorized to do business in Kansas with good and sufficient sureties thereon, or a cashier's check, escrow account, or irrevocable letter of credit in favor of the governing body, in the amount of the estimated cost as approved by the official responsible for setting and enforcing the applicable design and construction standards of the installation of the required improvements as aforesaid. Such financial guarantee shall be conditioned upon the approval of the final plat and further conditioned upon the actual completion and installation of such required improvements within two (2) years from the date that the final plat is approved by the Planning Commission.

(3) Simultaneously with the execution of the agreement provided for in Section 8-105(A)(1) above, if the subdivider furnishes a corporate completion bond, he shall also deposit in escrow with the governing body who is to accept such improvements, cash in the amount of fifteen per cent (15%) of the cost of all improvements to be made in accordance with the plans and specifications for required improvements therefor approved by the Planning Commission. If a subdivider furnishes a cashier's check, escrow account or irrevocable letter of credit in favor of the governing body, fifteen per cent (15%) of the amount of such cashier's check, escrow account, or letter of credit of the governing

8-105(A)(3) Continued.

body, and shall be held as a deposit in escrow after the final completion of such improvements. The subdivider shall agree that such deposit in escrow may be held by the governing body for a period of eighteen (18) months after the final completion of such improvements for the purpose of:

(i) Guaranteeing and securing the correction of any defect in material or workmanship furnished for such improvements, latent in character, and not discernible at the time of final inspection or acceptance by the governing body; and

(ii) Guarantee against any damage to such improvements by reason of the settling of the ground, base or foundation thereof.

Such escrow agreement shall also provide that, as such defects have so developed, that the deposit may be applied by the governing body for any amounts incurred correcting such defects; and that the balance of such deposit, if any, held at the end of such eighteen (18) month period shall be returned by the governing body to the depositor, or paid to the order of the depositor without payment of interest by the governing body.

(4) Prior to offering any improvement to the governing body, the subdivider shall furnish good and sufficient guarantee that all indebtedness incurred for supplies, material, labor furnished, or engineering and professional services in the construction of improvements shall have been paid in full and that there are no claims for damage or suits against such contractor involving said improvement.

(B) Petitions to the governing body of any city or of the county may be submitted as a means of guaranteeing to the governing bodies the authority to install improvements at such time as they deem appropriate. Petitions may be submitted only when the following conditions exist:

(1) The petitions (to be secured from the appropriate engineer) must be valid petitions as may be provided for under Kansas law.

1/20/69

8-105(B)(2) Continued.

(2) The petitions must be concurred in by the appropriate engineer and accepted and approved by the governing body concurrently with the approval of the subdivision.

(3) The initiating resolution for such improvement must be adopted by the governing body concurrently with the petition approval or as soon thereafter as may be provided by law. The cost of the publication of said resolution shall be born by the subdivider.

(4) Recording with the Register of Deeds either the petitions or a certificate signed by the petitioners stating that such petitions have been filed and approved by a governing body, that certain lands as described will be liable in the future for special assessments for the required improvements which are to be listed on the certificate.

(C) Monuments and bench marks shall be installed by the subdivider before the subdivision plat is released for recording with the Register of Deeds.

(D) The subdivider shall prior to the release of the subdivision plat submit a letter from the utility(ies) involved stating that satisfactory arrangements have been made by the subdivider guaranteeing the installation of underground wiring.

8-106. Vacation of Undeveloped Subdivision. When no lots on a plat of subdivision have been sold, the subdivider may request the vacation of the plat prior to the time that the improvements covered by the bond are installed, and when such plat is vacated, all fiscal sureties shall be returned to the subdivider.

1/20/69

ARTICLE 9

IMPROVEMENT PROCEDURES

9-101. Submission of Petitions. If petitions are submitted to meet the requirements of Article 8, the subdivider shall so indicate at the time of submission of the preliminary plat. If the petition method is authorized by the Subdivision Committee, petitions shall accompany the final plat and shall be acceptable for submission to the governing body only with the affirmative recommendation of the appropriate engineer.

9-102. Final Improvement Plans. In all other instances when petitions have not been authorized for submission, upon the approval of the preliminary plat, the subdivider shall have prepared by a licensed professional engineer (which may be contracted for, with any governmental agency or utility), engineering drawings for proposed required improvements containing the data and information specified in Section 9-103, of these regulations. Such drawings shall be certified by a licensed professional engineer, and shall be submitted in duplicate to the appropriate engineer at least thirty (30) days prior to the date that approval of the final plat is requested. Failure to do so will be considered automatic consent to an extension of or a waiver by the subdivider of any time limitation for plat approval.

9-103. Content of Engineering Drawings. Engineering drawings for required improvements shall contain the following data and information:

(A) Plans, details, specifications and cost estimates for roadway and sidewalk construction, including plans, profile indicating existing topography and elevation, including curb and sidewalk elevation, intersection control elevation and paving geometrics for each street with a typical cross section of the roadway. The profiles of grade lines shall be shown to a scale of one inch equals 100 feet horizontal, and one inch equals 10 feet vertical; or to a scale approved by the appropriate engineer. This information shall be shown on standard plan and profile sheets unless otherwise required by the appropriate engineer.

(B) Plans, profiles, details, specifications and cost estimates of proposed storm drainage improvements.

1/20/69

9-103. Continued.

(C) Plans, profiles, details, specifications and cost estimates of proposed water distribution systems and proposed water supply facilities and water hydrants, if any.

(D) Plans, profiles, details, specifications and cost estimates of sewage systems and of sewage treatment plants, if any.

(E) Grading plans for all lots and other sites in the subdivision.

(F) When unusual site conditions exist, the Planning Department or Planning Commission may require such additional plans, specifications, and drawings as may be necessary for an adequate review of the improvements to be installed.

(G) All plans shall be based on City datum or MSL (Mean Sea Level)as published by the U.S.G.S. for vertical control.

(H) All plans for underground wiring shall be prepared by or at the direction of the utility involved.

9-104. Review of Plans. The appropriate engineer, official or agency responsible for determining specifications and standards referred to in 8-103 shall review all engineering drawings in order to determine whether such drawings are consistent with the approved preliminary plat and comply with their design standards. If such drawings are consistent and so comply, the reviewing official shall forward to the Planning Commission, a notice that they so conform and comply. In the event that the drawings do not so conform or comply, the reviewing official shall notify the subdivider of the specific manner in which such drawings do not so conform or comply, and he may then correct such drawings. If such drawings are not corrected, the reviewing official shall forward to the Planning Commission a notice as to the items of nonconformity or non compliance.

9-105. Approval by Planning Commission. The Planning Commission shall approve a final plat only when the approval of the appropriate engineer has been received that the plans and engineering drawings have been approved or that the appropriate petitions, if authorized, have been filed with the Planning Department.

9-106. Construction of Improvements. No improvements shall be constructed nor shall any work preliminary thereto be done until such time as a final plat and the engineering drawings accompanying it shall have been approved and there shall have been compliance with all of the requirements relating to an agreement, bond and deposit specified in Section 8-105 of these regulations.

9-107. Inspection. All improvements constructed or erected shall be subject to inspection by the appropriate engineer or official responsible for setting and enforcing the applicable design and construction standards of the required improvement. The cost attributable to all inspections required by this regulation shall be charged to and paid by the subdivider. Before any required inspections take place, the subdivider may be required to post a deposit with such official or such agency entrusted to keep such security for the official, to cover the cost of such inspections. The subdivider shall give at least forty-eight (48) hours written notification to such official prior to the performance of any of the following work:

(A) All phases of roadway and sidewalk construction.

(B) All phases of construction including, but not limited to water lines, sanitary sewer lines, storm sewer, underground wiring and other required improvements.

9-108. Inspection Procedures. After notice is received as specified in Section 8-106, the official designated in 8-106 may conduct an on-site inspection to determine that the work complies with the approved engineering plans and specifications. If in the opinion of such official, such work does not comply with such final drawings, he shall have authority to order that all such work shall be terminated until such time as necessary steps are taken to correct any defects or deficiencies. Upon the correction of such defects or deficiencies, the subdivider shall again notify the official as provided in Section 9-107.

9-109. Final Inspection. Upon completion of all improvements within the area covered by the final plat, the subdivider shall notify the official designated in 9-107, who shall thereupon conduct a final inspection of all improvements installed. If such final inspection indicates that there are any defects or deficiencies in such improvements as installed, or if there are any deviations in such improvements as installed from the final engineering plans and specifications, he shall notify the subdivider in writing of such defects, deficiencies or deviations and subdivider shall, at his sole cost and expense, correct such defects or deviations within six (6) months of the date of notification. When such defects, deficiencies or deviations have been corrected, the subdivider shall notify the official that the improvements are again ready for final inspection. After the final inspection is made and before acceptance of the improvement by the governing body, the subdivider shall file an affidavit with the appropriate engineer which is executed by the subdivider, certifying that all obligations incurred in the construction of the improvement involved have been properly paid and settled.

9-110. Report to Planning Commission and Governing Body. If a final inspection indicates that all improvements as installed contain no defects, deficiencies, or deviations, within ten (10) days from the submission of the subdivider's certificate or liens as required above, the official shall certify to the Planning Commission, the governing body and utility that all improvements have been installed in conformity with the engineering plans and specifications accompanying the final plat. The receipt of such notification by the governing body or utility shall constitute the date on which the 18-month period specified in Section 8-105(A) (3) shall commence.

9-111. Acceptance of Improvements. Upon the receipt by the governing body of the certificate of the official that all improvements have been installed in accordance with the engineering drawings, as approved, and in conformity with the requirements of this regulation and all other applicable statutes, ordinances and regulations, the governing body shall thereupon by resolution or utility by letter formally accept such improvements. The improvements shall become the property of the governing body or utility company involved.

ARTICLE 10

APPEALS, WAIVERS AND VARIANCES

10-101. Appeals General. The subdivider of a proposed subdivision may appeal decisions made in the enforcement of these regulations by the Planning Department to either the Subdivision Committee or the Planning Commission; by the Subdivision Committee to the Planning Commission; by the Planning Commission to the Governing Body of the appropriate engineer for streets as established in Section 8-102 unless otherwise provided for in these regulations. Any such appeal shall provide a hearing de novo. In the event the governing body sustains the Planning Commission, the action of the Planning Commission shall be final, except as otherwise provided by law. If the governing body overrules the Planning Commission, the reasons therefor shall be reflected in writing or the minutes of the meeting.

10-102. Appeals on Improvement Standards. Any appeal as to approval as to standards, or plans and engineering drawings in connection with required improvements shall be directed to the governing body and that action shall be final.

10-103. Waiver of Required Improvements or Guarantees of Installation of Same. Any waiver of the required improvements may be by only the governing body on a showing that such improvement is technically not feasible.

10-104. Variances. In cases in which there is unwarranted hardship in carrying out the literal provisions of these regulations, as to design criteria, e.g. lot width, lot depth, block length, etc., the Planning Commission may grant a variance from such provision.

(A) An application for a variance shall be made to the Planning Department which shall transmit the application to the Planning Commission. The Planning Commission shall give the applicant and any other interested person an opportunity to be heard with respect to the proposed application for a variance.

(B) The Planning Commission shall not grant a variance unless it shall find that the strict application of these regulations

10-104(B) Continued.

will create an unwarranted hardship, and unless the proposed variance is in harmony with the intended purpose of these regulations and that the public safety and welfare will be protected.

(C) Variances permitted under the provisions of this Article shall not include variances from the requirements of making improvements required in Article 8, unless approved as provided for in Sec. 10-103, the standards of specifications thereof, nor from the provisions of the zoning ordinance of a city, except as to variances for minimum lot width and/or area requirements. Consideration of an application for a variance pursuant to this Article does not relieve the applicant from the necessity of proceeding under the applicable provisions of any other regulations (including zoning regulations) of the City or County relating to variances.

(D) When used in this Section, the term "unwarranted hardship" shall mean the complete deprivation of use as distinguished from a mere inconvenience.

10-105. Variance - Planned Unit Development. When a plat or subdivision is prepared in connection with a planned unit development authorized by any legally adopted zoning regulation regulating the same area, then the Planning Commission may vary the design standards contained in this regulation to such extent as may be necessary to permit the preparation of a planned development plan in accordance with the standards, conditions and restrictions of such zoning regulation.

ARTICLE 11

INTERPRETATION, CONSTRUCTION AND DEFINITIONS

11-101. Interpretation and Construction.

(A) Where the conditions imposed by the provisions of these regulations are either more restrictive or less restrictive than comparable conditions imposed by any other provision of any other applicable law, ordinance, resolution, rule or regulation of any kind, the regulations which are more restrictive and impose higher standards or requirements shall govern.

(B) The provisions of these regulations are not intended to abrogate any easement, covenant or other private agreement, provided that where the requirements of these regulations are more restrictive or impose higher standards or regulations than such easement, covenant, or other private agreement, the requirements of these regulations shall govern.

(C) A subdivision of land which was not lawfully existing at the time of the adoption of these regulations shall not become or be made lawful solely by reason of the adoption of these regulations.

(D) The provisions of these regulations are cumulative and additional limitations upon all other laws and ordinances heretofore passed or which may be passed hereafter governing any subject matter set forth in the provisions of these regulations.

11-102. Definitions. Any word or phrase which is defined in this Section shall have the meaning assigned to it by this Section whenever the word or phrase is used in these regulations.

ALLEY: A strip of land along the side of or in the rear of lots intended to provide a secondary means of access to and from streets and such lots.

ARTERIAL STREET: Any street serving major traffic movements which is designed primarily as a traffic carrier between cities or between

11-102 Continued.

various sections of the city, which forms part of a network of through streets, and which provides service and access to abutting properties only as a secondary function.[14]

BLOCK: A tract of land bounded by streets, or by a combination of streets, railway rights-of-way or waterways.

BUILDING SETBACK LINE (FRONT): A line nearest the front of and across a lot or parcel of land establishing the minimum open space to be provided between the front line of a building or structure and the line of the fronting street right-of-way.

COLLECTOR STREET: Any street designed primarily to gather traffic from local or residential streets and carry it to the arterial system.[14]

COMMISSION: The Wichita-Sedgwick County Metropolitan Area Planning Commission.

COMPREHENSIVE DEVELOPMENT PLAN: Any official map or street plan, the future land use map or plan, or any other plan or map of any city or of the Wichita-Sedgwick County Metropolitan Area Planning Commission, for the guidance of municipal growth and improvement of that City, the Metropolitan Area, or of Sedgwick County.

CROSSWALK: A strip of land dedicated for public use which is reserved across a block for the purpose of providing pedestrian access to adjacent areas.

CUL-DE-SAC: A street having only one outlet and being permanently terminated by a vehicle turn-around at the other end.[15]

DEAD-END STREET: A street having only one outlet.

DESIGN STANDARDS OR DESIGN REQUIREMENTS: All requirements and regulations relating to design and layout of subdivisions contained in Article 7 of these regulations.

DIRECTOR OF PLANNING: The chief administrator or executive of the Wichita-Sedgwick County Metropolitan Area Planning Department.

ENGINEER: When used in the sense as designing or surveying the plat or subdivision, he shall be a professional engineer or a surveyor licensed by the State of Kansas or licensed to practice in the State of Kansas. When used in connection with designing or engineering any improvements either on site or off site, he shall be a professional engineer licensed by the State of Kansas or licensed to practice in the State of Kansas.

11-102 Continued.

EXPRESSWAY: Any divided street or highway with no access from abutting property and which has either separated or at-grade access from other public streets and highways.[16]

FREEWAY: Any divided street or highway with complete access control and grade separated interchanges with all other public streets and highways.[16]

FRONTAGE: The property on one side of a street between two intersecting streets (crossing or terminating) measured along the line of the street; or with a deadend street, all property abutting one side of such street measured from the nearest intersecting street and the end of the deadend street.

FRONTAGE LOT: That portion of the frontage which lies between the side lot lines of a single lot.

FRONTAGE ROAD: A public or private marginal access roadway generally paralleling and contiguous to a street or highway and designed to promote safety by eliminating unlimited ingress and egress to such street or highway by providing points of ingress and egress at more-or-less uniformly-spaced intervals.

GOVERNING BODY: The elected governing body of any city or of Sedgwick County.

HALF-STREET: A street bordering one or more property lines of a subdivision tract to which the subdivider has allocated only a portion of the ultimate and intended street width.[17]

IMPROVEMENTS: All facilities constructed or erected by a subdivider within a subdivision to permit and facilitate the use of lots or blocks for a principal residential, business or manufacturing purpose. Improvements shall include all facilities listed in Article 7 of these regulations.

LIMITED ACCESS HIGHWAY: An expressway or freeway, as defined in these regulations.

LOCAL STREET: Any street designed primarily to provide access to abutting property.[18]

LOT: A portion or basic parcel of a subdivision or other tract of land intended to be the parcel by which such land would be individually developed and transferred.[19]

11-102 Continued.

LOT, DOUBLE FRONTAGE: A lot, two opposite lot lines of which abut upon streets which are more or less parallel.[19]

LOT DEPTH: The distance between the midpoint of the front lot line and the midpoint of the rear lot line.

LOT LINE: The boundary line of a lot.

LOT SPLIT: The dividing or redividing of a lot or lots in a recorded plat of a subdivision into not more than two tracts which meet the criteria established within these regulations.

LOT WIDTH: The distance on a horizontal plane between the side lot lines of a lot, measured at right angles to the line establishing the lot depth at the established building setback line.

MARGINAL ACCESS STREET: A local street which is parallel with and adjacent to a limited access highway or arterial street and which provides access to abutting properties and protection from through traffic on the limited access highway or arterial street.[20]

OWNER: Any person or persons, firm or firms, corporation or corporations, or any other legal entity having legal title to land sought to be subdivided under these regulations.

PLANNING DEPARTMENT: The Wichita-Sedgwick County Metropolitan Area Planning Department.

PLAT: A subdivision as it is represented as a formal document by drawing and writing.

RESUBDIVISION: The subdivision of a tract of land which has previously been lawfully subdivided and a plat of such prior subdivision duly recorded.

ROAD or ROADWAY: The paved or improved area existing on the street right-of-way, exclusive of sidewalks, driveways or related uses.

SCREENING: Decorative fencing or evergreen vegetation maintained for the purpose of concealing from view the area behind such fencing or evergreen vegetation. When fencing is used for screening, it shall be not less than six nor more than eight feet in height.

STREET: The street right-of-way or easement, whether public or private; not the area of the paving or other improvements on the street right-of-way unless such paving or improvements coincide with boundaries of such right-of-way. Such is to include but not be limited to, that which is named or commonly referred to as street, avenue, road, lane, boulevard, way, etc.

11-102 Continued.

STREET WIDTH: The shortest distance between the property lines abutting both sides of a street right-of-way.

SUBDIVIDER: The owner, or any other person, firm or corporation, authorized by the owner, undertaking proceedings under the provisions of these regulations for the purpose of subdividing land.

SUBDIVISION: Any division or redivision of land by means of mapping, platting, conveying, changing or rearranging of boundaries, or otherwise, and shall also relate to the process of subdividing or other land subdivided where appropriate to the context.

TURN-AROUND: An area at the closed end of a deadend street or cul-de-sac within which vehicles may reverse their direction without any backing up.

VISION TRIANGLE: A triangular area at the intersection of streets maintained in such a manner as to provide a safe and open line of vision for drivers of vehicles approaching the intersection. Within the vision triangle, no one shall install, set out or maintain or to allow the installation, setting out or maintenance of any sign, fence, hedge, shrubbery, natural growth or other obstruction to view; however, such restriction shall not apply to public utility poles; hedges trimmed to a height of less than thirty-three inches above gutter grade for urban roadways, or above the midpoint of the adjacent travel lane for rural roadways; trees, the limbs of which are at all times kept trimmed of limbs and sucker growth on the trunk to a height of at least eight feet above the ground level or the limbs of which overhang the public street and are at all times kept trimmed of sucker growth to a height of at least thirteen feet six inches above the street level, or plant species not planted in the form of a hedge which are so planted and trimmed as to leave at all times a clear and unobstructed cross view; ornamental fence not exceeding four feet in height, provided the ratio of the solid portion of the fence to the open shall not exceed one to four; official warning signs or signals, to places where the contour of the ground is such that there can be no cross visibility at the intersection or to signs mounted ten feet or more above the ground whose supports do not constitute an obstruction.

ARTICLE 12

AMENDMENTS

12-101. Procedure. These regulations may be amended at any time after the Planning Commission shall have held a public hearing on the proposed amendment. A notice of such public hearing shall be published in the official city and county newspaper as provided by law. At, or after such public hearing is held, the Planning Commission may adopt such amendments, but such amendments shall not become effective until approval by both the Board of Commissioners of the City of Wichita and the Board of Commissioners of Sedgwick County. The Commission shall by January 31 each year thru 1973 hold a public hearing to consider amendments, if any, to these regulations.

ARTICLE 13

REPEAL AND EFFECTIVE DATE

PART 1. REPEAL.

13-101. The existing Subdivision Rules and Regulations of the Wichita-Sedgwick County Metropolitan Area Planning Commission dated July 17, 1958, with amendments thereto, are hereby repealed effective June 30, 1968.

PART 2. EFFECTIVE DATE

13-201. These Regulations shall be in effect July 1, 1968, after their adoption by the Wichita-Sedgwick County Metropolitan Area Planning Commission and approval by both the Board of Commissioners of the City of Wichita and the Board of Commissioners of the County of Sedgwick.

13-202. Amendments to these regulations, adopted February 10, 1972, shall become effective immediately after approval by both the Board of Commissioners of Sedgwick County, Kansas, and the Board of Commissioners of the City of Wichita, Kansas.

ADOPTED at Wichita, Kansas, this 10th day of February, 1972.

S/ Robert E. Blakey
Vice-Chairman, Wichita-Sedgwick County Metropolitan Area Planning Commission

ATTEST:

S/ Robert A. Lakin
Secretary, Wichita-Sedgwick County Metropolitan Area Planning Commission
(SEAL)

APPROVED BY THE BOARD OF COMMISSIONERS of the City of Wichita this 2nd day of May, 1972.

S/ Glenn J. Shanahan
Mayor, City of Wichita

ATTEST:

S/ Ralph C. Eberly
City Clerk
(SEAL)

6/26/72

13-202. Continued.

APPROVED BY THE BOARD OF COMMISSIONERS of the County of Sedgwick, Kansas, this 10th day of May, 1972.

S/ Earl E. Rush, Chairman

S/ Elmer S. Peters, Commissioner

S/ Tom Scott, Commissioner

ATTEST:

S/ Sharon Dearing, Deputy for
Marie Warden
County Clerk
(SEAL)

NOTE: The following is the original signature block which adopted these Subdivision Regulations on January 15, 1968, and which became effective on July 1, 1968.

ADOPTED AT WICHITA, KANSAS, this 15th day of January, 1968.

S/ Theodore H. Hill
Chairman, Wichita-Sedgwick County
Metropolitan Area Planning Commission

ATTEST:

S/ C. Bickley Foster
Secretary, Wichita-Sedgwick County
Metropolitan Area Planning Commission

(SEAL)

APPROVED BY THE BOARD OF COMMISSIONERS of the City of Wichita, this 20th day of February, 1968.

S/ William D. Anderson, Jr.
Mayor, City of Wichita

ATTEST:

S/ Ralph C. Eberly
City Clerk
(SEAL)

APPROVED BY THE BOARD OF COMMISSIONERS of the County of Sedgwick, this 6th day of March, 1968.

13-202. Continued.

S/ Elmer S. Peters, Chairman

S/ Earl E. Rush, Commissioner

S/ Tom Scott, Commissioner

ATTEST:

S/ Sherley Markey, Deputy for Marie Warden
County Clerk
(SEAL)

2/12/70

FOOTNOTE REFERENCES

1 - An Illustration of a plat for a development in units appears on Plate 5.

2 - See Plate 2 for an illustration of a sketch plan.

3 - See Plate 3 for an illustration of a preliminary plat.

4 - See Plate 4 for an illustration of final plat.

5 - See Plate 6 for an illustration of street and highway types.

6 - See Plate 1 for an illustration of a reverse frontage lot.

7 - See Plate 6 for an illustration of street types.

8 - This width may be reduced if a one-way service road system has been or is to be established.

9 - See Plate 6 for an illustration of street and roadway types.

10 - See Plate 1 for an illustration of a double frontage lot.

11 - See Plate 1 for an illustration of a reversed frontage lot.

12 - Face to face of curb.

13 - Add six foot (total) for shoulders.

14 - See Plate 6 for an illustration. Cf. Transportation Study for the Wichita-Sedgwick County Metropolitan Area, Volume 2, pp. 29-31.

15 - See Plate 6 for an illustration.

16 - See Transportation Study for the Wichita-Sedgwick County Metropolitan Area, Volume 2, p. 29.

17 - See Plate 6.

18 - See Plate 6. Cf. Transportation Study for the Wichita-Sedgwick County Metropolitan Area, Volume 2, p. 31.

19 - See Plate 1 for illustration of lot types.

20 - See Plate 6.

LOTS

a. CORNER LOT
b. INTERIOR LOT
c. THROUGH or DOUBLE FRONTAGE

SOURCE: OBLINGER + SMITH

PLATE 1

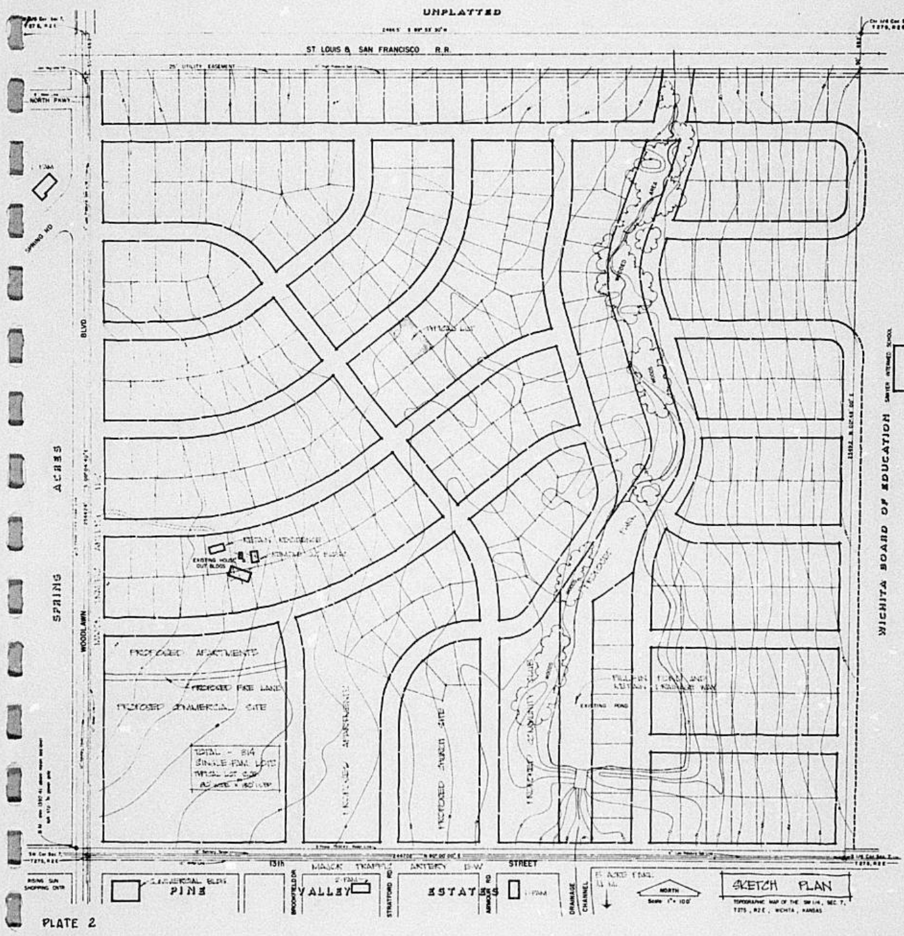
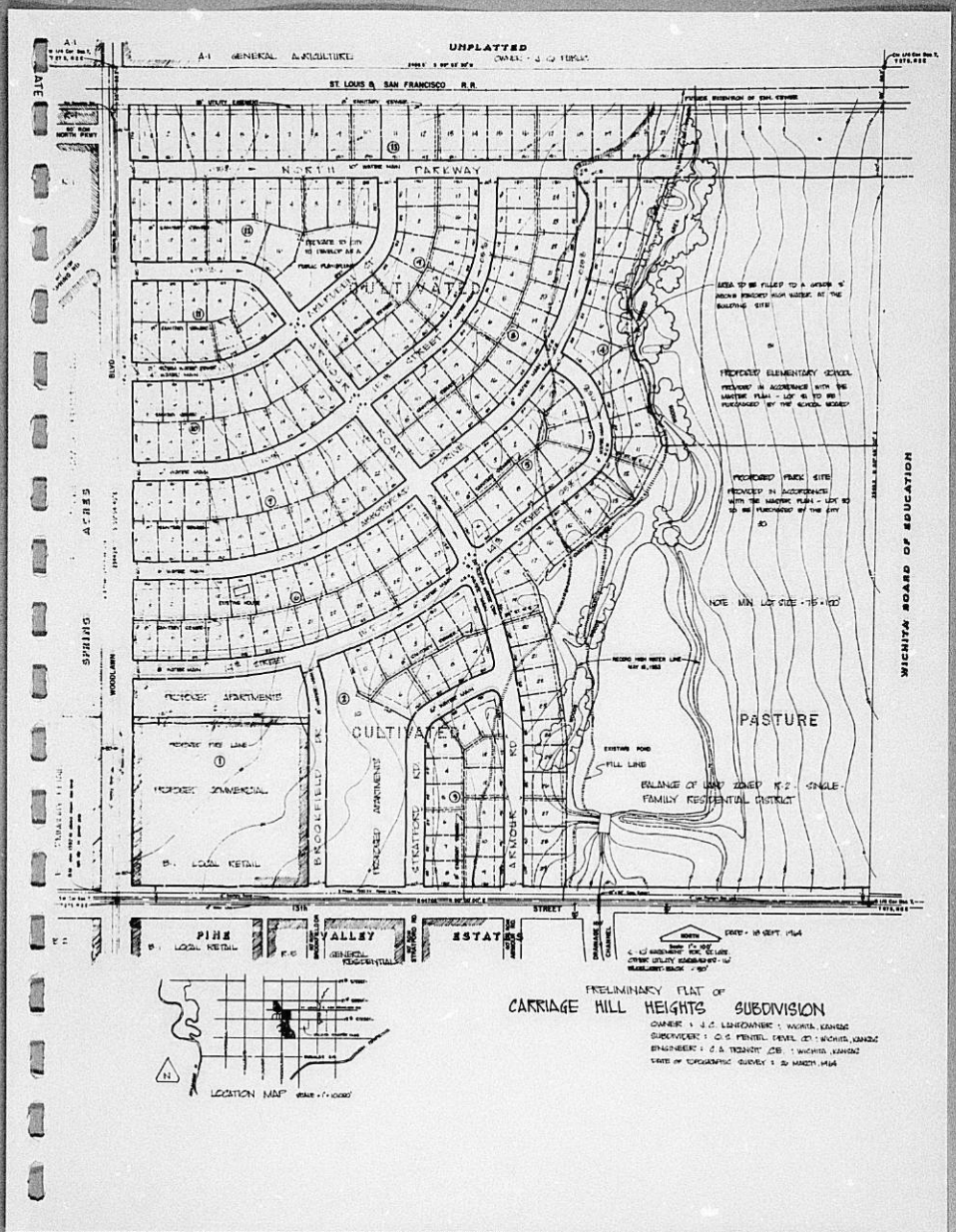

UNPLATTED
ST LOUIS & SAN FRANCISCO R.R.
25' UTILITY EASEMENT
NORTH PKWY
SPRING RD
WOODLAWN BLVD
SPRING ACRES
WICHITA BOARD OF EDUCATION
EXISTING HOUSE OUT BLDGS
EXISTING POND
PROPOSED APARTMENTS
PROPOSED COMMERCIAL SITE
TOTAL - 814
SINGLE-FAM. LOTS
13th
STREET
RISING SUN SHOPPING CNTR
PINE VALLEY ESTATES
BROOKFIELD DR
STRATFORD RD
ARMOUR RD
DRAINAGE CHANNEL
NORTH
Scale 1" = 100'
SKETCH PLAN
TOPOGRAPHIC MAP OF THE SW 1/4, SEC. 7, T27S, R2E, WICHITA, KANSAS

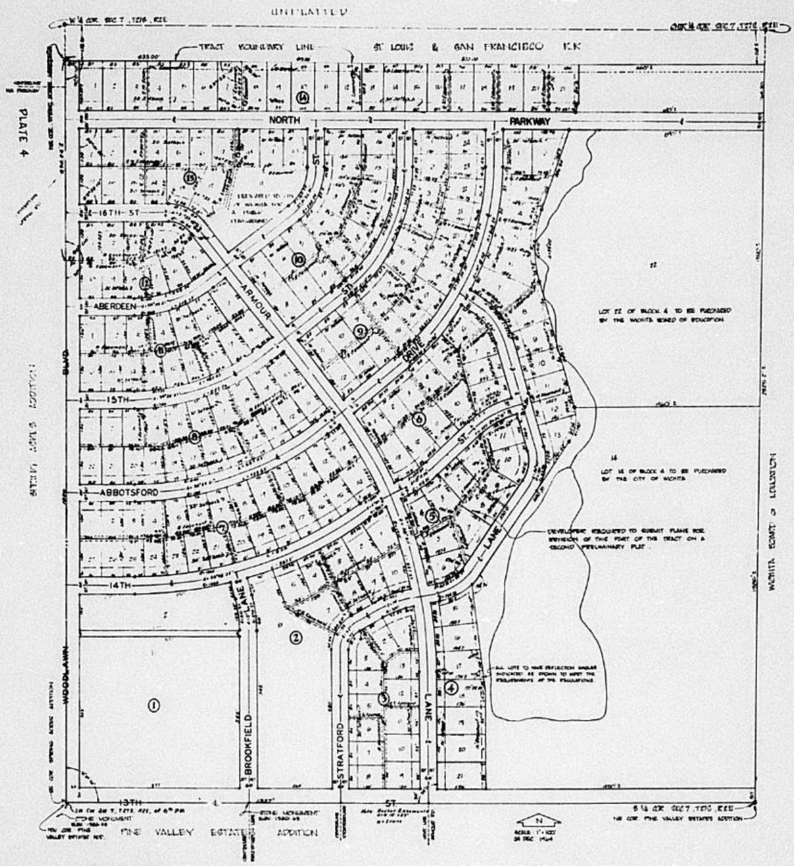
PLATE 2



PRELIMINARY PLAT OF

CARRIAGE HILL HEIGHTS SUBDIVISION

OWNER : J. C. LEINEWEBER : WICHITA, KANSAS
SUBDIVIDER : O. S. PENTEL DEVEL. CO. : WICHITA, KANSAS
ENGINEER : C. A. TEGNER, JR. : WICHITA, KANSAS
DATE OF TOPOGRAPHIC SURVEY : 20 MARCH, 1954



State of Kansas, County of Sedgwick, SS:

I, Clyde A. Transit, C.E., a Civil Engineer in said State and County, do hereby certify that I have surveyed and platted "Carriage Hill Heights", an addition to the City of Wichita, Sedgwick County, Kansas, into Lots, Blocks, Streets, Roads, Drives, a Boulevard, and a Fire Lane, the same being accurately set forth on the accompanying plat and described as follows: The Southwest 1/4 of Sec. 7, T 27S, R 2E, of the 6th P.M.; excepting the North 110.30 feet thereof.

Clyde A. Transit, C.E., Consulting Civil Engineer

Know all men by these presents, that I, the undersigned property owner of the land as above set forth in the Civil Engineer's Certificate, have caused the same to be surveyed and platted into Lots, Blocks, Streets, Roads, Drives, and a Boulevard, the same to be known as "Carriage Hill Heights Subdivision", an addition to the City of Wichita, Sedgwick County, Kansas; the Streets, Park, Roads, Drives and Boulevard are hereby dedicated to and for the use of the public, and easements as indicated on the accompanying plat for the construction and maintenance of public utilities, are hereby granted.

James C. Landowner, Owner

State of Kansas, County of Sedgwick, SS:

Be it remembered that on this 28th day of December, 1964, before me, a notary public in and for said County and State, came James C. Landowner, to me personally known to be the same person who executed the foregoing instrument of writing and duly acknowledged the execution of same. In testimony whereof I have hereunto set my hand and affixed my notarial seal the day and year above written.

_______________, Notary Public

My commission expires Jan 10th, 1966

This plat of "Carriage Hill Heights" has been submitted to and approved by the Wichita-Sedgwick County Metropolitan Area Planning Commission, Wichita, Kansas.

Dated this 28th day of January, 1965

Wichita-Sedgwick County Metropolitan Area Planning Commission

By _______________ Chairman

_______________ Secretary

FINAL PLAT OF

CARRIAGE HILL HEIGHTS

AN ADDITION TO WICHITA, SEDGWICK COUNTY, KANSAS
OWNER: JAMES C. LANDOWNER, WICHITA, KANSAS
SUBDIVIDER: O S PENTEL DEVEL. CO., WICHITA, KANSAS
ENGINEER: C. A. TRANSIT, C.E., WICHITA, KANSAS

The dedications shown on this plat accepted by the City Commission of the City of Wichita, Kansas, this 1st day of February, 1965.

____

_______________ City Clerk

The dedications shown on this plat accepted by the Board of County Commissioners of Sedgwick County, Kansas, this 5th day of February, 1965.

ATTEST:

_______________ County Clerk

_______________ County Commissioners

State of Kansas, County of Sedgwick, SS:

This is to certify that this instrument was filed for record in the Register of Deeds Office on the 1st day of February 1965

_______________ Register of Deeds

_______________ Deputy

Entered on transfer record this 11th day of February, 1965

FINAL PLAT OF CARRIAGE HILL HEIGHTS SUBDIVISION - UNIT 1

AN ADDITION TO WICHITA , SEDGEWICK COUNTY , KANSAS

OWNER : J. C. LANDOWNER ; WICHITA , KANSAS
SUBDIVIDER : O.S. PENTEL DEVEL. CO. ; WICHITA , KANSAS
ENGINEER : C.A. TRANSIT , C.E. ; WICHITA , KANSAS

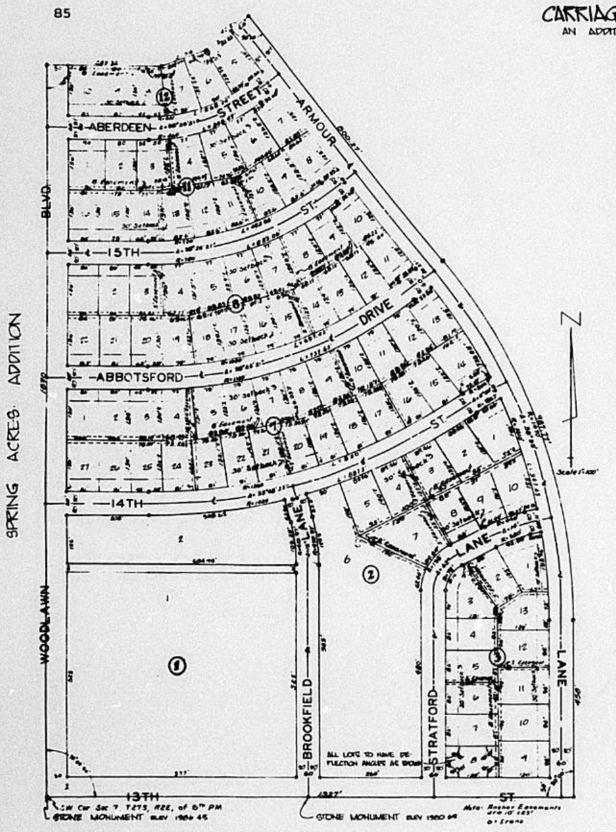


PLATE 5 PINE VALLEY ESTATES ADDITION

State of Kansas, County of Sedgwick, SS:

I, Clyde A. Transit, C.E., a Civil Engineer in said State and County, do hereby certify that I have surveyed and platted "Carriage Hill Heights - Unit 1" of an addition to the City of Wichita, Sedgwick County, Kansas, into Lots, Blocks, Streets, Roads, Drives, a Boulevard, and a Fire Lane, the same being accurately set forth on the accompanying plat and described as follows: Beginning at the S.W. Corner of Sec. 7, T 27S, R 2E, of the 6th P.M.; thence North along the West line of said Sec. 7, a distance of 1870 feet; thence East at an angle of 90°00' a distance of 285.32 feet; thence Northeasterly at an angle to the left of 19°00' a distance of 121.54 feet; thence Northeasterly at an angle to the left of 19°00' a distance of 142.85 feet; thence Southeasterly at an angle of 90°00' a distance of 800.27 feet to the P.C. of a curve to the right having a radius of 1470 feet; thence along said curve to the right and through a central angle of 38°30' a distance of 987.77 feet to the P.T. of said curve; thence South along the tangent of said curve; a distance of 450 feet to a point in the South line of said Sec. 7; thence West along the South line of said Sec. 7, a distance of 1327 feet to the point of beginning.

Clyde A. Transit, C.E. Consulting Civil Engineer

Know all men by these presents, that I, the undersigned property owner of the land as above set forth in the Civil Engineer's Certificate, have caused the same to be surveyed and platted into Lots, Blocks, Streets, Roads, Drives, and a Boulevard, the same to be known as "Carriage Hill Heights Subdivision", an addition to the City of Wichita, Sedgwick County, Kansas; the Streets Roads, Drives and Boulevard are hereby dedicated to and for the use of the public, and easements as indicated on the accompanying plat for the construction and maintenance of public utilities, are hereby granted.

James C. Landowner, Owner

State of Kansas, County of Sedgwick, SS:

Be it remembered that on this 24th day of December, 1964, before me a notary public in and for said County and State, came James C. Landowner, to me personally known to be the same person who executed the foregoing instrument of writing and duly acknowledged the execution of same. In testimony whereof I have hereunto set my hand and affixed my notarial seal the day and year above written.

______________, Notary Public

My commission expires Jan 10th, 1966.

This plat of "Carriage Hill Heights" has been submitted to and approved by the Wichita-Sedgwick County Metropolitan Area Planning Commission, Wichita, Kansas.

Dated this 24th day of January, 1965

Wichita-Sedgwick County Metropolitan Area Planning Commission

______________ Chairman

______________ Secretary

The dedications shown on this plat accepted by the City Commission (name of governing body) of the City of Wichita, Kansas, this 1st day of February, 1965.

______________ Mayor

______________ City Clerk

The dedications shown on this plat accepted by the Board of County Commissioners of Sedgwick County, Kansas, this 5th day of February, 1965.

ATTEST:

______________ County Clerk

______________ County Commissioners

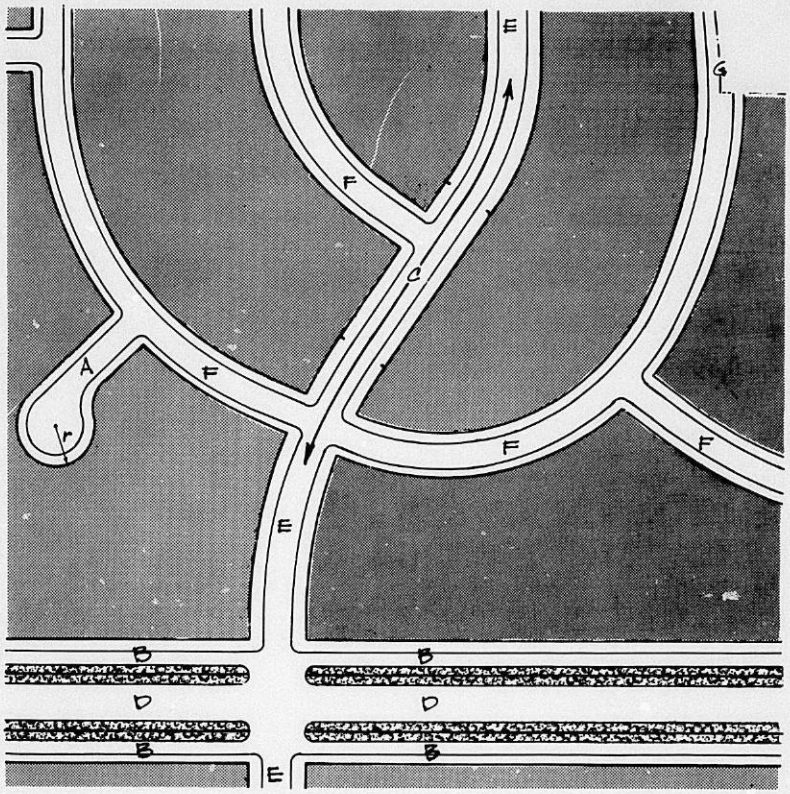
State of Kansas, County of Sedgwick, SS:

This is to certify that this instrument was filed for record in the Register of Deeds Office on the 11th day of February 19 65.

______________ Register of Deeds

______________ Deputy

... transfer ... 11th ... February ... 19 65



STREETS

A CUL DE SAC
B MARGINAL ACCESS
C REVERSE CURVE
D ARTERIAL STREET
E COLLECTOR STREET
F LOCAL STREET
G HALF - STREET
r RADIUS

PLATE 6

INDEX