

STUDIES OF LAND DEVELOPMENT AT INTERCHANGES

A Progress Report

by

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Progress Report to the  
U.S. Bureau of Public Roads

on  
STUDIES OF LAND DEVELOPMENT AT INTERCHANGES

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Report on Studies  
of Land Development at Interchanges

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#### NATURE OF THE RESEARCH PROPOSAL

The Texas Transportation Institute as Contractor was charged with the pursuance of interchange studies according to the following objectives or guides:

- a. Conduct intensive studies at approximately ten interchange sites located in urban or urban-fringe areas. These sites will be selected with the approval of Public Roads and may be in Texas or in States other than Texas. Some of the interchange sites selected will have frontage roads and some will not have frontage roads.
- b. Develop, from the study of the selected interchanges, the following information: (1) land development trends and projections; (2) estimates of the traffic impact of future development; (3) evaluation of design alternatives and legal provisions in controlling land development; and (4) land benefit analysis based on trends and projections of land values.
- c. Evolve general principles regarding present and expected land development at interchange points and an evaluation of land use controls possible under existing law.

#### SELECTING INTERCHANGES FOR STUDY

The study of land development at interchanges was justified on the grounds that such development might well generate sufficient traffic over and above designed capacity to impair the operation of the interchange. In other words, a type of strip development as experienced by conventional highways could occur at and near interchanges and load the low-capacity turning ramps with unwanted traffic.

The first step in the study was an attempt to locate at least 10 interchanges which demonstrated the problem. Discussions were held with personnel of the Bureau of Public Roads' Regional Office, Fort Worth, and with members of the Texas Highway Department's Planning Survey. Recommendations were that Texas Highway Department District engineers should be contacted and this was done. During visits to these persons, almost every completed interchange in the Dallas, Fort Worth, Houston, San Antonio, Beaumont, and Austin areas was observed.

Specifically, the search was for interchanges which had experienced or were likely to experience land development in their immediate areas, or showed evidence of traffic volumes which might have come from important land use changes. Although a large number of interchanges was observed, aerial photographs to demonstrate land use changes were obtained for only 15 interchanges. These interchanges were studied in various degrees as is discussed in this report.

As soon as interchanges were selected, an attempt was made to secure the original traffic assignment data which were used in considerations of interchange design (and location). It was believed that such information would comprise an excellent starting point for interchange studies. The projected land uses as tied to the design date (1975 or whatever) might profitably be compared with the rate and kind of actual land development. These in turn could be accorded traffic generation in the same manner as were projected uses. Either the desired assignment data did not exist or was not in systematized files, for no such data were located. Thus perhaps the most meaningful approach conceived for the studies were thwarted.

The subsequent decision was: (1) to study one interchange area intensively this to be an area in which a regional shopping center had located, and (2) to study at least nine other interchanges from the standpoint of land use changes from time of construction to the latest feasible date. It had become evident that the resources available for the work would allow little more than this to be accomplished and that the original objectives had been ambitious indeed. As a consequence, this report is more in the nature of a description of what was attempted rather than a statement of useable results.

Perhaps an additional word should be said here about the special (market area) study. The study of Big Town shopping center (Buckner and I.H. 20, Dallas) had two purposes. First, the researchers were attempting to determine the attractiveness of an interchange location for a planned regional shopping center. Second, they sought to determine the traffic impact of such a center to see if it imposed heavy burdens on the interchange design. It was hoped that this effort would lead to a better concept of the interchange-land use-traffic problem. If the results were promising, additional such work was to be done for Capital Plaza in Austin (I.H. 35 at U.S. 290) and North Star Mall in San Antonio (Loop 13 at San Pedro). As a later section shows, something was learned in the Big Town study. Yet, the conclusion was that the considerable time and expense of what was obtained seemed too high to warrant replication of such studies at other sites.

## INTERCHANGES IN DALLAS

### I.H. 20 and I.H. 30 at Loop 12, Dallas

This interchange was selected for study primarily because a large regional shopping center, Big Town, had recently been constructed. During the period 1956-60, this was the major land use change in the immediate vicinity of the interchange complex. This is reflected in Table 1, which shows that about 100 acres were added to commercial use. Most of this was occupied by the shopping center.

Table 1. I.H. 20 and I.H. 30 Interchange, Dallas, Texas  
Land Uses within One Mile, 1956 and 1961<sup>1/</sup>

<u>Land Use</u>	<u>Acres</u>		<u>Percent of Area</u>		<u>Percent Change</u>
	<u>1956</u>	<u>1961</u>	<u>1951</u>	<u>1961</u>	<u>1956 to 1961</u>
Agricultural and Vacant	2,049	1,897	80.0%	74.1%	- 7.4%
Institutional	108	108	4.2	4.2	0
Public	195	114	7.6	4.5	-41.5
Rights of Way	110	168	4.3	6.6	+52.7
Commercial	44	147	1.7	5.7	+234.1
Residential	21	45	0.9	1.8	114.0
Discrepancy <sup>2/</sup>	33	81	1.3	3.1	--

<sup>1/</sup>Area used was four square miles. See Plates 1a and 1b.

<sup>2/</sup>Includes ditches and minor streets or roads as well as measurement errors. Both discrepancies were undermeasurements.

In Plate 1b, Big Town is in the lower left of the photograph and is distinguished by its parking facilities. In the upper left portion is an orphanage which in 1961 still controlled a sizeable acreage of agricultural land. The buildings in the "Y" of I.H. 20 and I.H. 30 house the District Headquarters of the Texas Highway Department.

Big Town also was studied from the standpoint of traffic generation. This work is summarized in a later section.

#### Loop 12 at North Central Expressway, Dallas

The dominating influence upon land use in the vicinity of this interchange has been and continues to be the ownerships and control of the Caruth family. A comparison of Plates 4a and 4b supports this assertion. Almost all of the open land visible in these photographs is controlled by elements of the Caruth estate.

The upper left quadrant (northwest) at the clover-leaf interchange shown in Figure 4b has within 1961 been placed under a 99-year lease by the Hillcrest Foundation established by the Caruth family. The lessees propose to build a regional shopping center utilizing some 98 acres. By late 1961, however, attempts to obtain a permissive zoning change (from residential) had been unsuccessful. Thus for the time, zoning is a very important deterrent factor.

As a matter of value, the lease was reported as a "50-million-dollar real estate deal." Assuming equal payments over the 99-year term of the lease and a discount rate of five percent, the present value of the lease is about \$10 million, or \$100,000 per acre. Such an estimate shows something of the high regard for the interchange site. Similar open land in the general area but not having a main thoroughfare or interchange location is priced in the range of \$5,000 to \$8,000 per acre (according to economic impact studies in Dallas).

Table 2 reveals the slowness of land use change in the vicinity of the interchange. By far the greatest change was the addition of several blocks of residences (in the \$18,000 to \$25,000 value range).

Traffic-wise, the interchange ramps are far from burdened. Occasional congestion occurs on Loop 12 itself on which construction is underway to improve capacity.

#### Other Interchanges, Dallas

A number of additional interchanges in the Dallas area were inspected. Some of these are shown in Plates 2a and 2b, 3a and 3b, 5a and 5b, and 6a and 6b.

Table 2. North Central Expressway and Loop 12 Interchange,  
Dallas, Texas. Land Uses within One Mile, 1951 and 1961<sup>1/</sup>

<u>Land Use</u>	<u>Acres</u>		<u>Percent of Area</u>		<u>Percent Change</u>
	<u>1951</u>	<u>1961</u>	<u>1951</u>	<u>1961</u>	<u>1951 to 1961</u>
Agricultural and Vacant	1,426	1,138	55.7	44.4	- 20.2%
Institutional	299	299	11.7	11.7	0
Public	126	126	5.0	5.0	0
Rights of Way	50	110	1.9	4.3	+120.0
Commercial	18	56	0.7	2.2	+211.1
Scattered Residential <sup>2/</sup>	252	319	9.8	12.4	+ 26.6
Residential	443	565	17.3	22.1	+ 27.5
Discrepancy <sup>3/</sup>	54	53	2.1	2.1	--

<sup>1/</sup>Area used was four square miles. See Plates 4a and 4b.

<sup>2/</sup>Scattered residences on both subdivided land.

<sup>3/</sup>Sums of measurement errors were positive for both 1951 and 1961.

The I.H. 45 and Loop 12 South interchange is located about six miles SSE of Downtown Dallas. Plate 2a shows it was partially constructed by 1951. With the extension of Loop 12 to the west, the interchange was completed (1954). By 1961, although there was some build-up, the area remained predominantly open land and no traffic problem existed.

Four miles east of I.H. 45 on Loop 12 (and Buckner) is the U.S. 175 interchange. This location is about eight miles SE of Downtown Dallas. Some residential development occurred between 1951 and 1961 but perhaps the more important land use change was continued commercial strip development along U.S. 175, which is being brought to freeway standards at the present time. The southeast quadrant has a large "unplanned" shopping center.

Two interchanges on North Central Expressway were given some attention. These were Mockingbird Lane (Plates 5a and 5b) which has a railroad in the vicinity and Lovers Lane (Plates 6a and 6b) about one mile north. In both sets of plates some increase in commercial and industrial land uses is indicated but again it would seem that a great deal more development will be required before a traffic generation problem can be demonstrated.

#### INTERCHANGES IN FORT WORTH

##### I.H. 35 West and Berry Street Interchange, Fort Worth

Among the many interchanges inspected, this is the only one which demonstrated a critical traffic problem in 1961. The interchange is an elongated diamond with frontage roads. Both Berry Street and the interchange ramps become congested during peak traffic periods.

The major land use changes within about one mile of the interchange from 1950 to 1961 are shown in Table 3. Much of the land classified as "scattered residential" in 1950 had moved into the residential category by 1961. Perhaps the most important change, however, was the increase in commercial land from 184 to 316 acres. Some 12 acres were used for a shopping center next to the interchange in the Northeast quadrant. Also apparent from comparing plates 7a and 7b is the build-up of industrial uses in the Southwest quadrant beyond the railroad and the commercial strip development along Berry Street.

Again no detailed traffic study was made but it was fairly evident that the land use changes in the immediate area were not so important a factor as the growing importance of Berry Street as a cross-town artery. The interchange which is located about three miles south of Downtown Fort Worth is being considered by design engineers for major reconstruction.

##### Other Interchanges, Fort Worth

One of the most potentially interesting situations which was observed is the I.H. 35 W-Seminary Drive interchange, located about 1 1/2 miles south of Berry Street. As may be seen on Plate 8b a large area in the northwest



Table 3. I.H. 35 West and Berry Street Interchange,  
Fort Worth, Texas. Land Uses within One Mile, 1950 and 1961<sup>1/</sup>

<u>Land Use</u>	<u>Acres</u>		<u>Percent of Area</u>		<u>Percent Change</u>
	<u>1950</u>	<u>1961</u>	<u>1950</u>	<u>1961</u>	<u>1951 to 1959</u>
Agricultural and Vacant	452	279	17.7	10.9	-38.3%
Institutional	56	81	2.2	3.2	+44.6
Rights of Way <sup>2/</sup>	357	236	13.9	9.2	-33.9
Commercial	184	316	7.1	12.4	+71.7
Industrial	209	268	8.2	10.5	+28.2
Residential	957	1,215	37.4	47.4	+27.0
Scattered Residential <sup>3/</sup>	643	281	25.1	11.0	-56.3
Discrepancy <sup>4/</sup>	298	116	11.6	4.6	--

<sup>1/</sup>Area used was four square miles. See Plates 7a and 7b.

<sup>2/</sup>Includes railroad right of way.

<sup>3/</sup>Scattered residences on unplatted and non-subdivided land.

<sup>4/</sup>Sums of measurement errors were both positive (overmeasurements).

quadrant, formerly a lake, is being filled and Sears-Roebuck is constructing a very extensive shopping center complex. Residential development near the interchange is also growing at a rapid rate. Overflow traffic from Berry Street is already using the interchange and conjecturally land use changes in the immediate vicinity could demonstrate the traffic generation problem in a very short time. Detailed study for this area appears quite promising.

Another mile south on I.H. 35 W is the I.H. 820 interchange which is of full cloverleaf design (Plates 9a and 9b). Much of this open area (Plate 9b) is zoned for industrial uses. Build-up since 1950 (Plate 9a) is evident and is quite ripe for acceleration in that I.H. 820 to the east is soon to be opened to traffic to other important radial routes. This appears also to be an excellent area for future study.

About 3 1/2 miles west on I.H. 820 is the Old Grandbury Road interchange. This road of rather low capacity has been experiencing continuously increasing traffic for a number of years as the residential demand for the clean rolling land it serves has increased. A railroad parallels the road on the west and the interchange design is non-symmetrical probably for this reason. "Turn-arounds" are provided on either side of Old Grandbury Road. The continued build-up in the area will be predominantly residential (according to trends and zoning). Here the effects of traffic generation at the interchange seem to have been avoided by design, but the testing of this hypothesis perhaps is the traffic engineer's prerogative.

Plates 11a and 11b show the interchange of Camp Bowie Boulevard and I.H. 20. This is an old area of Fort Worth about 4 1/2 miles west of the Central Business District. No land use changes in the immediate vicinity are apparent. Such change would have required some very high supersession costs.

#### INTERCHANGES IN HOUSTON

Although several interchange sites in the Houston Area were inspected, no detailed observations were made. Plates 12a and 12b and 13a and 13b are included because they are believed to be situations worthy of study. The I.H. 45 and S.H. 225 interchange was considered because Gulfgate Shopping Center is located in the area. Gulfgate appears in the left central portion of Plate 12b. There has been some additional development in the general area, but the major question of an inquiry would be in regard to Gulfgate's role as a traffic generator.

Wayside Drive has experienced some strip development and its interchange with I.H. 45 was constructed before 1950. The two facts might make this interchange a worthwhile study project.

#### I.H. 410 AND SAN PEDRO AVENUE INTERCHANGE, SAN ANTONIO

Plate 14b shows the interchange area in early 1959. Table 4, however, has been updated to January 1961 through the use of photographs from low altitudes and field observations. Changes observed were noted by landmarks

Table 4. I.H. 410 and San Pedro Avenue Interchange  
San Antonio, Texas. Land Uses within One Mile, 1952 and 1961.<sup>1/</sup>

<u>Land Use</u>	<u>Acres</u>		<u>Percent of Area</u>		<u>Percent Change</u>	
	<u>1952</u>	<u>1961</u>	<u>1952</u>	<u>1961</u>	<u>1952 to 1961</u>	
Agricultural and Vacant	1,832	717	71.6%	28.0%	-	60.8%
Institutional	28	28	1.1	1.1		0
Public	33	45	1.3	1.8	+	36.4
Rights of Way	97	131	3.8	5.1	+	35.1
Commercial	8	151	0.3	5.9	+	1,787.5
Residential	21	767	0.8	29.9	+	3,552.4
Scattered Residential <sup>2/</sup>	371	719	14.5	28.1	+	93.8
Discrepancy <sup>3/</sup>	170	2	6.6	0.1	--	

<sup>1/</sup>Area used was four square miles. See Plates 14a and 14b.

<sup>2/</sup>Includes about 200 acres of residential land developed with streets and utilities in 1961 but without houses.

<sup>3/</sup>Discrepancies were undermeasurements in both cases.

and then measured on the 1959 aerial photograph. The most important changes not shown in Plate 14b but included in the Table measurements for 1961 are 45 acres in North Star Mall Shopping Center in the Southeast quadrant of the interchange and a motel occupying 17 acres in the Northeast quadrant.

It is obvious from both the photographs and from Table 4 that the build up of residential land uses was substantial after 1952. A great deal of open land remained, however, in 1961 as 28 percent of the area was in agricultural use or vacant.

Traffic data were not obtained for the interchange but it was reported by Texas Highway Department District personnel that no traffic problem had been observed. The interchange is located about 6 miles north of Downtown San Antonio. It was constructed in stages and was opened to traffic as a complete interchange in 1960.

Most interchanges in San Antonio were rather new in 1961. Only I.H. 410 at San Pedro was considered an important study subject. There are other interchanges on Loop I.H. 410, however, which may be included in any future studies; one of these might be the Fredericksburg Road interchange.

#### I.H. 35 at U.S. 290, AUSTIN

This interchange now has the Capital Plaza Shopping Center located near it (in the large open triangle of land in the lower central portion of Plate 15b, abutting I.H. 35). This shopping center is putting traffic pressure on lesser interchanges nearby but not on the I.H. 35 - U.S. 290 interchange. As Austin continues to grow northward as is suggested by a comparison of Plates 15a and 15b, traffic volumes should increase at the interchange. Perhaps at a future time this will be a good study site.

#### BIG TOWN SHOPPING CENTER, DALLAS

The original scheme for evaluating Big Town as a traffic generator was rather complex. It consisted of a determination of the attractiveness of the site and its facilities to shoppers. In other words, a primary and secondary market would be delineated and Big Town's share of these markets by segments (census tracts) would be estimated. The trips which such shopping involves would be assigned to segments and aggregatively would represent the "gravitation" of traffic to Big Town.

This approach seemed reasonable in view of the fact that much of Big Town's primary market area still was open land in 1961. (See Figure 1b). And it was obvious during field observation that the shopping center was not yet a generator of traffic which would seriously overlap the normal or usual work trip peaks in the vicinity of the interchange. The question of whether it might become a traffic generator which would overload the highway facilities thus came to the forefront.

Of course, there was nothing new in the approach nor the analytical tools to be used; many researchers had used them for a variety of purposes.

(See SOURCES CONSULTED.) Nevertheless, it was hoped that some insight might be gained and that something of value might be borrowed from "market area" analysis.

The only cooperation received from Big Town management was that they furnished the area in square feet of various tenants and something of the schedule whereby rentals were paid. Sales volumes and the results of a parking and traffic study (underway at the time) at the shopping center were not made available. Thus the Institute was left to its own devices in the determination of market areas, gross sales of shopping goods and traffic volumes. Only shopping goods were to be considered because of the indication by previous studies that such are the only goods which are important traffic generators at shopping centers. (See Nelson, Richard L., The Selection of Retail Locations.)

Market Areas - The secondary market area was established through the use of driving times from the study site (Big Town). Twenty minutes was taken as the time limit because such was about the mid-point, time-wise, between Big Town and Downtown Dallas, which is some seven miles west. In order not to deviate, the same travel time was used to establish the other boundaries. Figure 16 shows the primary and secondary market areas.

The next step was the determination of the shopping centers within the secondary market area which were in competition with Big Town for shopping goods sales. An adaptation of Reilly's law was used to allocate shopping goods purchases to these centers and to Big Town. The equation used was from Casey (in The Traffic Quarterly, July 1955) and is:

$$B_{1.a} = \frac{F_a/D_{1.a}^2}{\frac{F_a}{D_{1.a}^2} + \frac{F_b}{D_{1.b}^2} + \frac{F_c}{D_{1.c}^2} + \dots + \frac{F_z}{D_{1.z}^2}} \cdot B_1$$

This equation was solved for each census tract within the market area. The  $B_{1.a}$  represents the purchases of an area which will take place at shopping center a whereas  $F_a$  is the floor space of such center and  $D_{1.a}$  is the driving time from the census tract (center) to a.  $B_1$  is the total purchases made by residents of the tract and the other  $F$  and  $D$  values and terms are those for competing centers.

Table 5 gives the results of applying the equation to each census tract which was taken as a potential customer source for Big Town. Column (2) gives the solutions for the fractional coefficient of the equation; this is the proportion of expenditures in a census tract that might be expected to be drawn to Big Town because of its floor space and its relative location (travel time). Column (6) is the product of Columns (2) and (5). Column (7) gives the  $B$  values ( $B_1$ ,  $B_2$ , etc.) and is the result of multiplying Column (6) by the factors shown in Table 6, these being the proportion of total gross income which expectedly might be spent for shopping goods. (Notice this step could have been taken at an earlier point; but the final results would have been the same.) Finally, it was estimated that the residents of all census tracts considered would theoretically purchase \$10,522,164 of shopping goods

TABLE 5

TOTAL DEMAND ALLOCATED TO BIG TOWN FOR THE 1960 CENSUS<sup>1/</sup>

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Census Tract Number	Percent of Gross Sales Estimated	Income Estimated by Census Tract	Number of Households	Total Gross Income in \$1,000	Discounted Income in \$1,000	Yearly Demand for Shoppers Goods at the Site in \$1,000
182	.09	4000	2451	9804.0	882.360	185.295
188	.05	4000	1504	6016.0	300.800	63.168
189	.08	4000	742	2968.0	237.440	49.862
187	.02	4000	1453	5812.0	116.240	24.410
183	.05	6500	1899	12343.5	617.175	129.607
186	.03	6500	1233	8014.5	240.435	50.491
184	.08	4000	509	2036.0	162.880	34.205
185	.06	4000	526	2104.0	126.240	26.510
130	.03	6500	2117	13760.5	412.815	86.691
127	.05	6500	2520	16380.0	819.000	171.990
126	.07	6500	579	3763.5	263.445	25.325
179	.21	6500	1090	7085.0	1487.850	312.449
128	.001	6500	1813	11784.5	11.785	2.475
129	.08	8000	1629	13032.0	1042.560	239.789
81	.18	8000	2016	16128.0	2903.040	667.699
82	.04	8000	1022	8176.0	327.000	75.210
124	.09	6500	1777	11550.5	1039.545	218.304
125	.10	6500	2419	15723.5	1572.350	330.194
180	.15	6500	1148	7462.0	1119.300	235.053
123	.40	6500	1249	8118.5	3247.400	681.954
122	.32	4000	1077	4308.0	1378.560	289.497

TABLE 5 - Continued

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Census Tract Number	Percent of Gross Sales Estimated	Income Estimated by Census Tract	Number of Households	Total Gross Income in \$1,000	Discounted Income in \$1,000	Yearly Demand for Shoppers Goods at the Site in \$1,000
120	.40	4000	359	1436.0	574.400	120.624
85	.24	4000	1093	4372.0	104.928	22.035
90B	.25	4000	715	2860.0	715.000	150.150
91A	.24	6500	1840	11960.0	2870.400	602.784
116	.25	4000	1370	5480.0	1370.000	287.700
93A	.13	4000	1093	4372.0	568.360	119.356
172	.32	4000	833	3332.0	1066.240	223.910
171	.27	4000	1007	4028.0	1087.560	228.388
170	.27	4000	1740	6960.0	187.920	39.463
117	.25	4000	1100	4400.0	110.000	23.100
118	.27	4000	580	2320.0	626.400	131.544
92B	.19	4000	1298	5192.0	986.480	207.161
93B	.15	4000	1146	4584.0	687.600	144.396
115	.09	2600	2800	7280.0	655.200	131.040
91B	.15	4000	2197	8788.0	1318.200	276.822
92A	.12	4000	1307	5228.0	784.200	164.682
119	.20	4000	314	1256.0	251.200	52.752
175	.33	4000	703	1212.0	399.960	83.992
174	.33	4000	884	3536.0	1166.880	245.045
177	.51	4000	1449	5796.0	2955.960	620.752
176	.29	4000	1347	5388.0	1562.520	328.129
121	.42	4000	94	376.0	157.920	33.163
90A	.52	4000	295	1180.0	613.600	128.856

TABLE 5 - Continued

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Census Tract Number	Percent of Gross Sales Estimated	Income Estimated by Census Tract	Number of Households	Total Gross Income in \$1,000	Discounted Income in \$1,000	Yearly Demand for Shoppers Goods at the Site in \$1,000
84	.27	5000	2290	11450.0	3091.500	649.215
83	.27	6500	661	4296.5	1160.055	243.612
178	.50 est.	6500	419	2723.5	1361.750	285.968
12	.11	5000	1948	9740.0	1071.400	224.994
1	.10	8000	1323	10584.0	1058.400	243.432
80	.08	8000	1906	15248.0	1219.840	280.563
26	.08	4000	768	3072.0	245.760	51.610
114	.05	3000	2013	6039.0	301.950	66.429
D-8	.05	4000	424	1696.0	84.800	17.808
86	.06	3000	1295	3885.0	233.100	51.282
88	.01	4000	2820	11280.0	112.800	23.688
87A	.07	4000	499	1996.0	139.720	29.341
87B	.04	4000	2625	10500.0	420.000	<u>88.200</u>
Total Yearly Expenditures at the Big Town Site						10,522,164

1/Big Town Shopping Center is shown on Plate 1b in the lower left portion.



TABLE 6

THE PERCENTAGE OF PERSONAL INCOME SPENT ON TYPES  
OF SHOPPERS GOODS\* BY INCOME CLASS

	Under 2000	2000- 2999	3000- 3999	4000- 4999	5000- 6999	7000- 9999	10,000 or more
Clothing and Accessories	11	11	13	12	11	13	14
Furniture & Household Appliances	7	8	8	8	9	9	10
TV Appliances	1	1	1	1	1	1	1
Total	19	20	22	21	21	23	25

\*These percentages in the body of the table were derived from statistics given in Life Study of Consumer Expenditures, Vol. I, 1957, by Alfred Politz Research, Inc.

at Big Town annually. Census tracts which would purchase 50 percent or more of all shopping goods at Big Town comprised its primary trade area. (See plate 16.)

Now, in reality, the above is but a skimpy exercise. It should be reiterated here that the study was made in an attempt to become more familiar with the problem of determining the quality of interchanges.

By questioning Big Town tenants, it was found that the shopping center was operating far below optimum sales and that increasing population in the area was the major hope of tenants and center management. No actual total sales data could be obtained.

Traffic - It has been stated that observation (on various week days and at various hours) did not find evidence of traffic problems in the vicinity of the interchange complex. As an extension of the market area study, however, an attempt was made to estimate something of the traffic volume that would result from shopping goods trips. This was done by assuming four trips per month per household for shopping goods shopping and then applying the drawing power of Big Town to the assumed total shopping goods trips for each census tract. (Four trips per month by automobile users is at least a fairly realistic assumption according to Jonassen in Highway Research Board Bulletin 227, 1959.)

The results of these calculations are shown in Table 7. The shopping goods trips to Big Town per month totalled 42,203. Using 26 week days per month, an average daily traffic of 1,623 is obtained as that generated by shopping goods shopping.

This result has a large number of limitations, only one of which is that it comprises only trips for shopping goods. What had been hoped (based on early conversations with management) was that the Institute's work be complemented with the results of a traffic study conducted at Big Town by the shopping center's management. Such additional data would have been useful in a number of ways. The data might be compared with the various estimates of the researchers and also used to verify or reject the conclusions from casual field observation that Big Town traffic occurred for the most part between the work-trip peaks.

Not all of the shopping goods shoppers would have to use the interchange complex to reach Big Town. However, it may be worthwhile to compare the estimated shopping goods trips to the total traffic at various points around the interchange. For the period 1957-58 (and traffic volumes have probably increased since then) the Texas Highway Department estimated the following average daily traffic volumes:

Loop 12 north of the interchange .....	16,420
Loop 12 south of the interchange .....	15,340
I.H. 20-30 east of the interchange .....	9,000
I.H. 20-30 west of the interchange .....	13,910

Counts for the various ramps were not obtained.

TABLE 7  
 TRAFFIC GENERATIONS - BIG TOWN  
 FOR SHOPPERS GOODS ONLY

Census Tract Number	Drawing Power of Big Town	Number of Households	Number of Shoppers Goods Trips	Trips Per Month Generated at Big Town
182	.09	2451	9804	882.36
188	.05	1504	6016	300.80
189	.08	742	2968	237.44
187	.02	1453	5812	116.24
183	.05	1899	7596	379.80
186	.03	1233	4932	147.96
184	.08	509	2036	162.88
185	.06	526	2104	126.24
130	.03	2117	8468	63.51
127	.05	2520	10080	504.00
126	.07	579	2316	162.12
179	.21	1090	4360	915.60
128	.001	1813	7252	7.25
129	.08	1629	5616	521.28
81	.18	2016	8064	1451.52
82	.04	1022	4088	163.52
124	.09	7777	7108	639.72
125	.10	2419	9676	967.60
180	.15	1148	4592	688.80
123	.40	1249	4996	1998.40
122	.32	1077	4308	1378.56
120	.40	359	1436	574.40
85	.24	1093	4372	1049.28
90B	.25	715	2860	715.00
91A	.24	1840	7360	1766.40
116	.25	1370	5480	1370.00
93A	.13	1093	4372	568.36
172	.32	833	3332	1066.24
171	.27	1007	4028	1087.56
170	.27	1740	6960	1879.20
117	.25	1100	4400	1100.00
118	.27	5580	2320	626.40
92B	.19	1298	5192	986.48
93B	.15	1146	4584	171.90
115	.09	2800	11200	1008.00
91B	.15	2197	8788	418.20
92A	.12	1307	5228	627.36
119	.20	314	1256	2251.20
175	.33	703	2812	927.96
174	.33	884	3536	1166.88
177	.51	1449	5796	2955.96

TABLE 7 - Continued

Census Tract Number	Drawing Power of Big Town	Number of Households	Number of Shoppers Goods Trips	Trips Per Month Generated at Big Town
176	.29	1347	5388	1562.52
121	.42	94	376	157.92
90A	.52	295	1180	613.60
84	.27	2290	9160	2473.20
83	.27	661	2644	713.88
178	.50	419	1676	838.00
12	.11	1948	7792	857.12
1	.10	1323	5292	529.20
80	.08	1906	7624	609.92
26	.08	768	3072	245.76
114	.05	2013	8052	402.60
0-8	.05	424	1696	84.80
86	.06	1295	5180	310.80
88	.01	2820	11280	112.80
87A	.07	499	1996	139.72
87B	.04	2625	10500	<u>420.00</u>
Total				1406.74

In conclusion, the study or exercise regarding market area and traffic generation is far from complete and in fact is quite disjointed. It hardly even constitutes a start. It is suggested that future research in land development at interchanges should certainly give consideration to the implications of such an approach, however, as certain parts of the associated theories and the idea that attempts should be made to improve predictive systems of analysis should not be ignored.

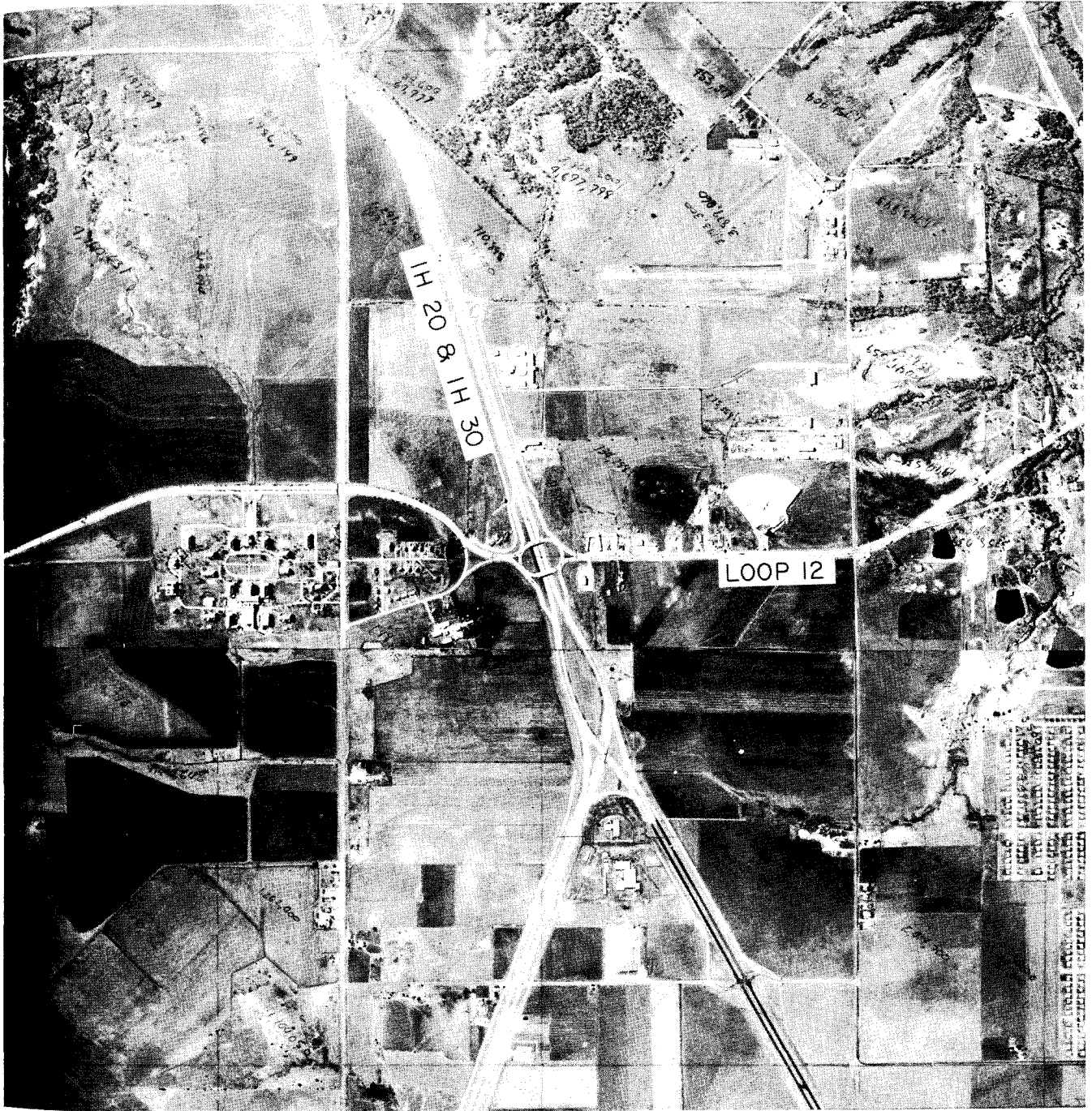
#### CONCLUSIONS AND RECOMMENDATIONS

That this inquiry by the Institute into the interchange-land use problem has produced findings of major consequence is not claimed. Indeed, in retrospect it is quite evident that an acceptable scheme or approach of analytical relevance to the problem has not been developed. The general hypothesis that interchanges are (or may become) subject to some modification of strip development has not been refined or adapted to allow meaningful testing.

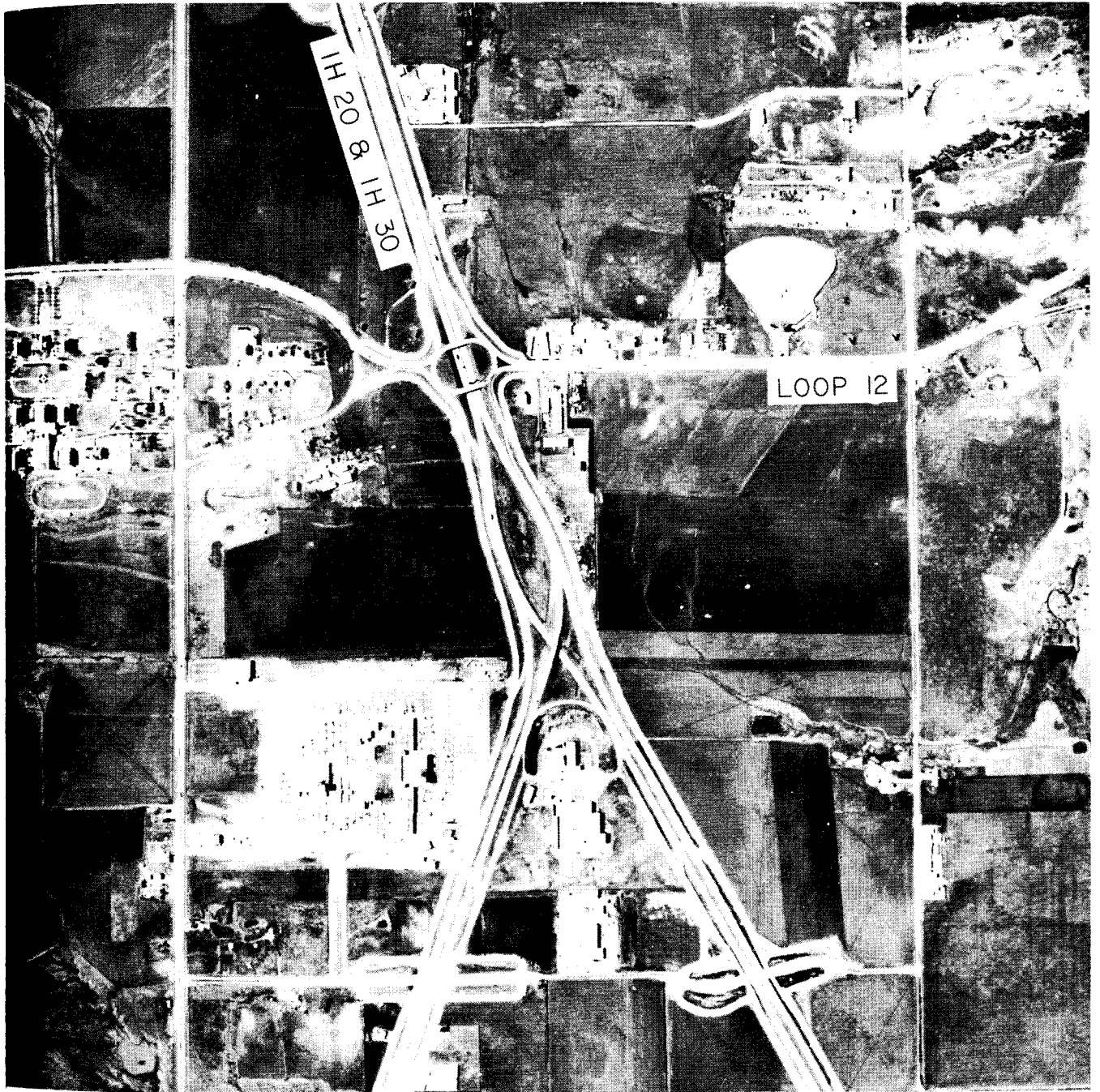
There are nevertheless several conclusions which may be put forth tentatively based upon the Institute's experience in attempting to research the problem. These may be stated briefly as follows:

- (1) It would appear that case studies in depth should be conducted using interchange areas where the land use problem has definitely been demonstrated. The aim of these studies would be to glean sufficient knowledge of aspects or factors of the problem to permit a substantive definition or formulation. It would also be discovered perhaps whether the problem requires more or less additional research effort. (The Institute's study and observations failed to identify a single interchange which had experienced land use change in the immediate vicinity, at or near the access ramps, which generated a critical traffic volume. Within a mile, however, such land use changes seemingly were found and it is suggested that residential development was likely the greatest traffic generator in the aggregate.)
- (2) The formulation of the problem and of attendant hypotheses it would appear must be cognizant of traffic implications and theory from the outset. The Institute was aware of this but because of limited resources confined its effort simply to locating interchanges which demonstrated at least some suggestion of the general problem.
- (3) The seemingly surmountable problem of defining or deciding an "interchange area" needs some attention, perhaps a great deal. It may be that further study would suggest that the concept of a particular area (size- or time- wise) is not fruitful. Perhaps the origins of actual or potential traffic flow should delineate the interchange area.

- (4) It is believed that land value determination can be dropped from the objectives of interchange studies without damage to the land use-traffic problem concept. Land values appear to be irrelevant in this instance and the study of them would serve an independent objective.
- (5) It is believed that study of possible means of land use control and their effectiveness probably also should be considered as an independent objective. This is not to deny the importance of the objective. Perhaps existing controls should be identified. It is rather to say that the problem of trying to conceive or develop schemes of control probably could proceed best after land use effects of interchanges had been identified.
- (6) It seems reasonable to assume that the newness of most interchanges in Texas may have precluded definite demonstration of the land use problem. However, such a statement assumes that the supply of suitable sites may be sufficient to meet current aggregative demand. These general hypotheses lead one to wonder whether studies of interchange areas must somehow take into account the availability of developed sites including those at other interchanges and at other locations. (The fact that generally Texas' interchanges are closely spaced may obscure the hypothesized problem.)
- (7) The land use-interchange problem draws its complexity from the need to develop a predictive solution. Although case study and perhaps certain descriptive (inventory) studies may be needed, it would appear that findings of importance to designers and planners must explain something of the "why" of land development at interchanges and thus something of future probabilities.



1a. Before (1956) - IH 20 and IH 30 at Buckner Blvd. (Loop 12), Dallas



1b. After (1961) - IH 20 and IH 30 at Buckner Blvd. (Loop 12), Dallas

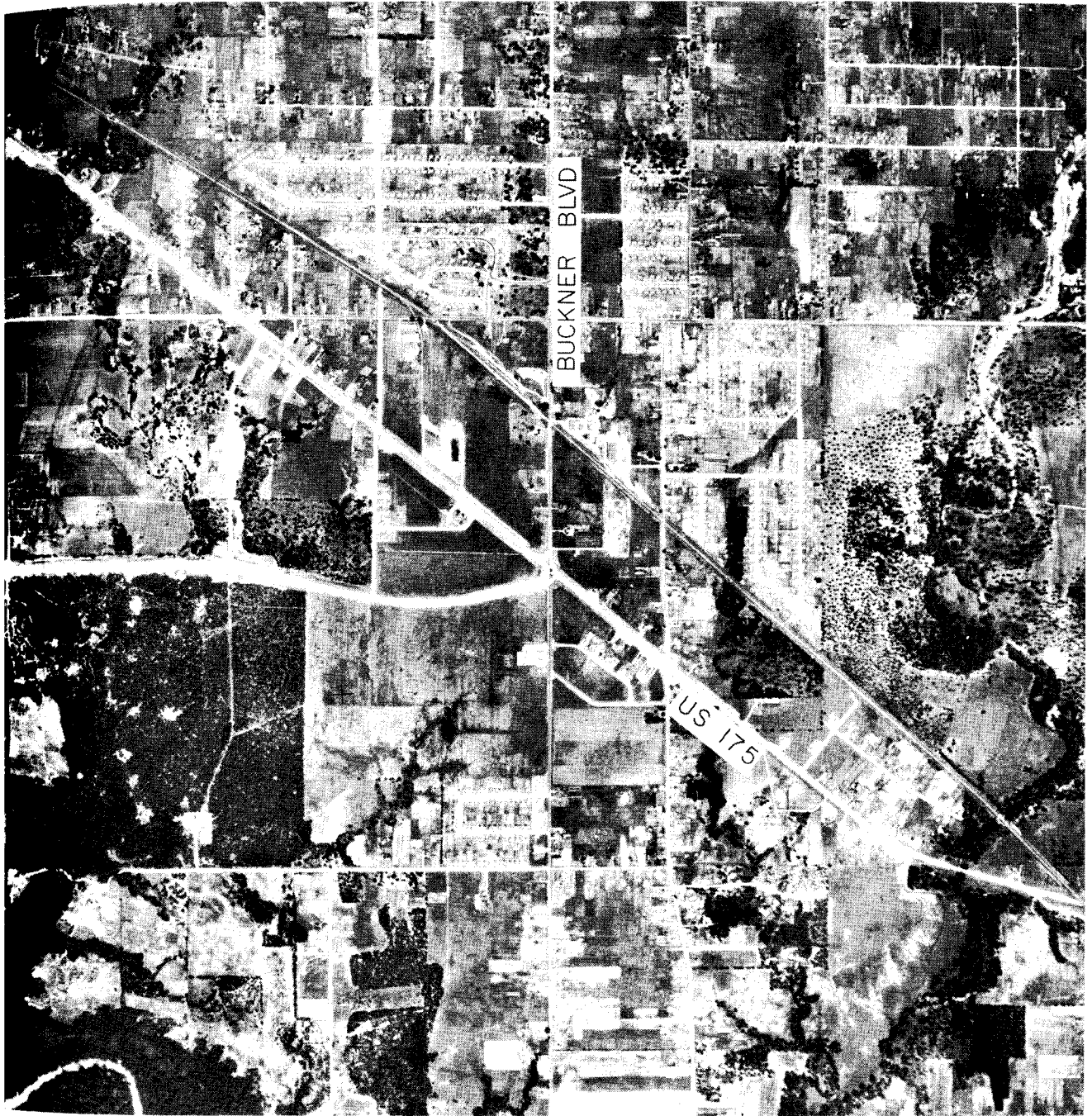




2a. Before (1951) - IH 45 at Loop 12 (South), Dallas

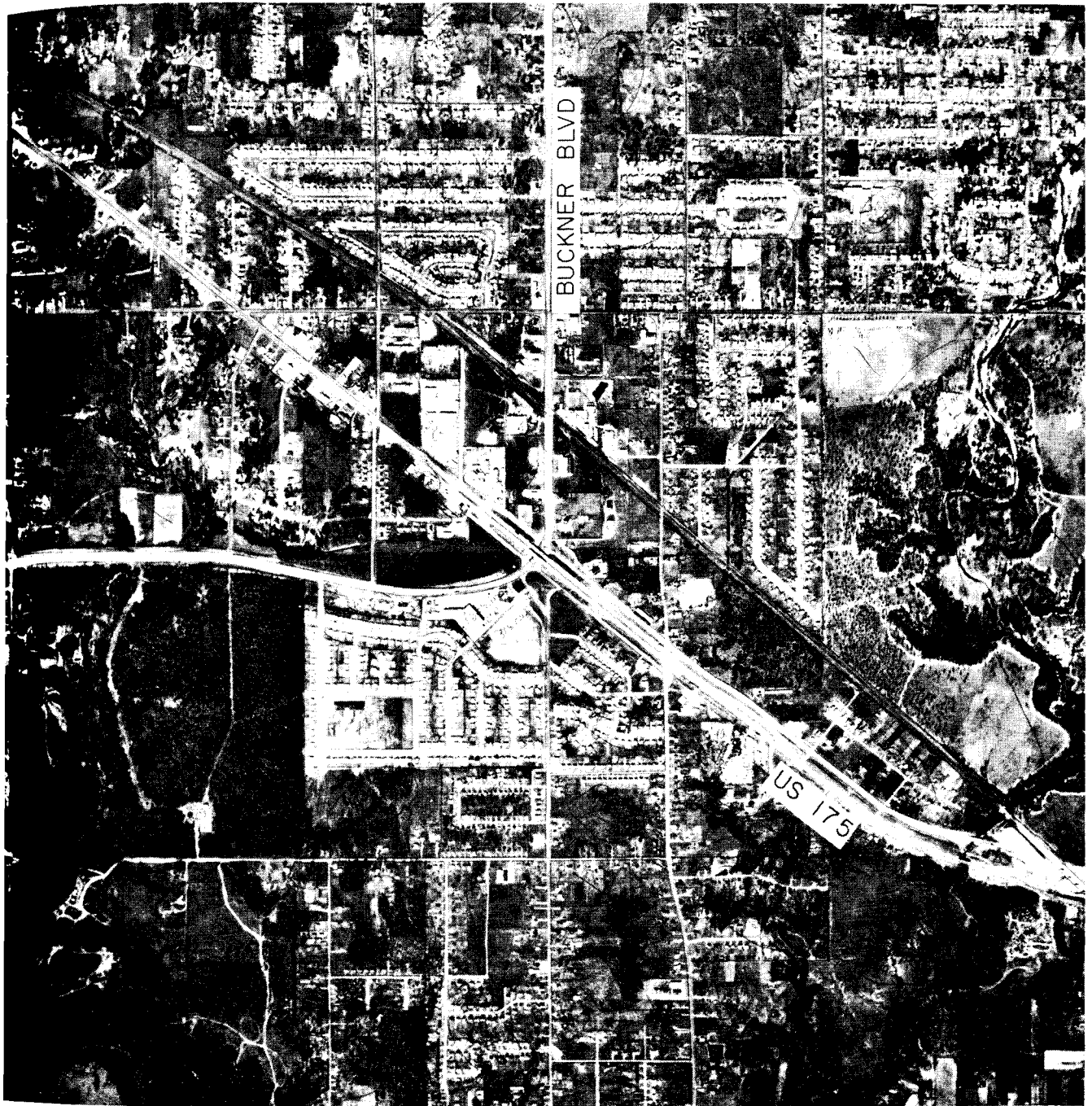


2b. After (1961) - IH 45 at Loop 12 (South), Dallas

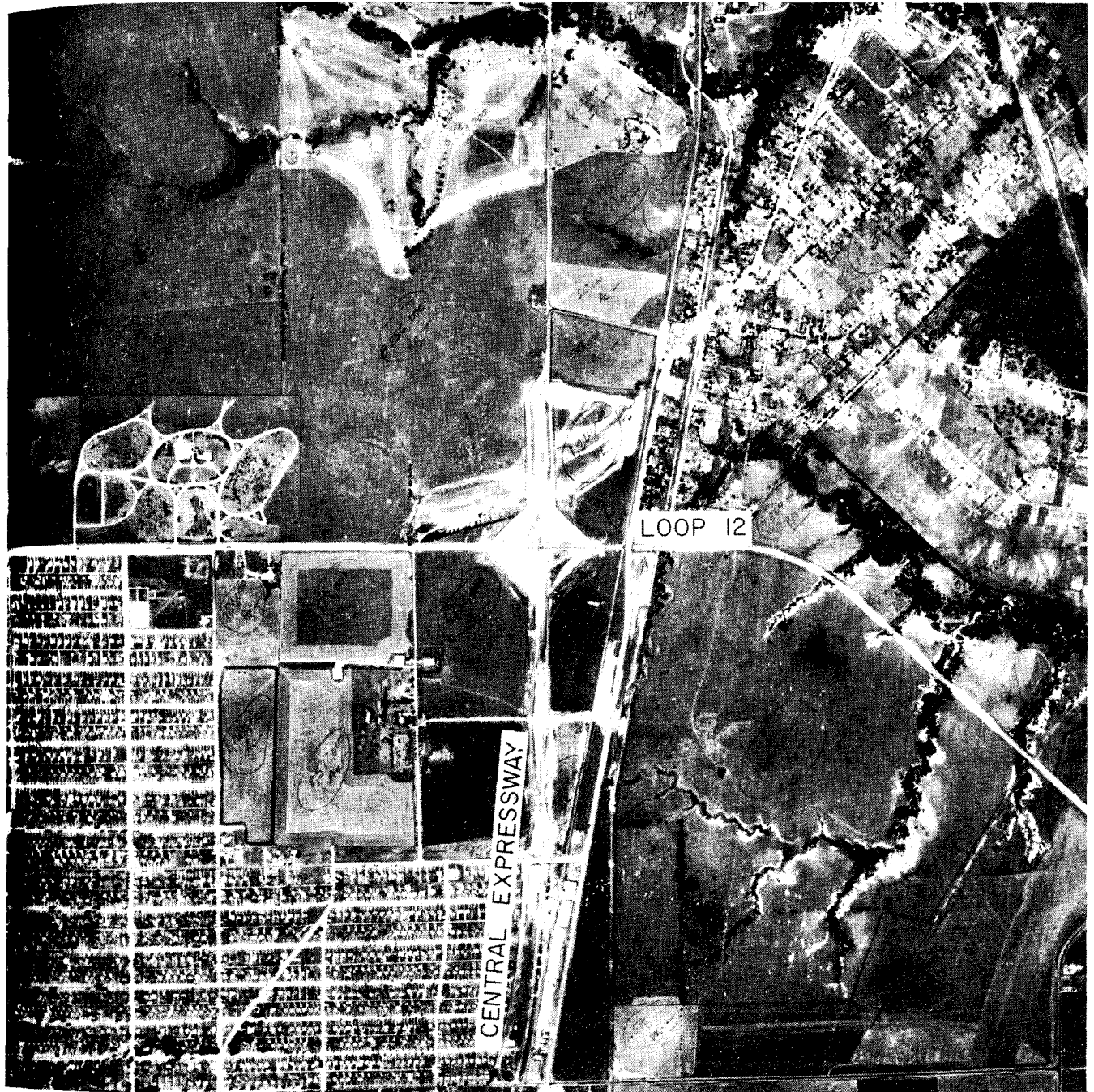


3a. Before (1951) - US 175 at Buckner Blvd. (Loop 12), Dallas





3b. After (1961) - US 175 at Buckner Blvd. (Loop 12), Dallas



4a. Before (1951) - Central Expressway at Loop 12, Dallas



4b. After (1961) - Central Expressway at Loop 12, Dallas



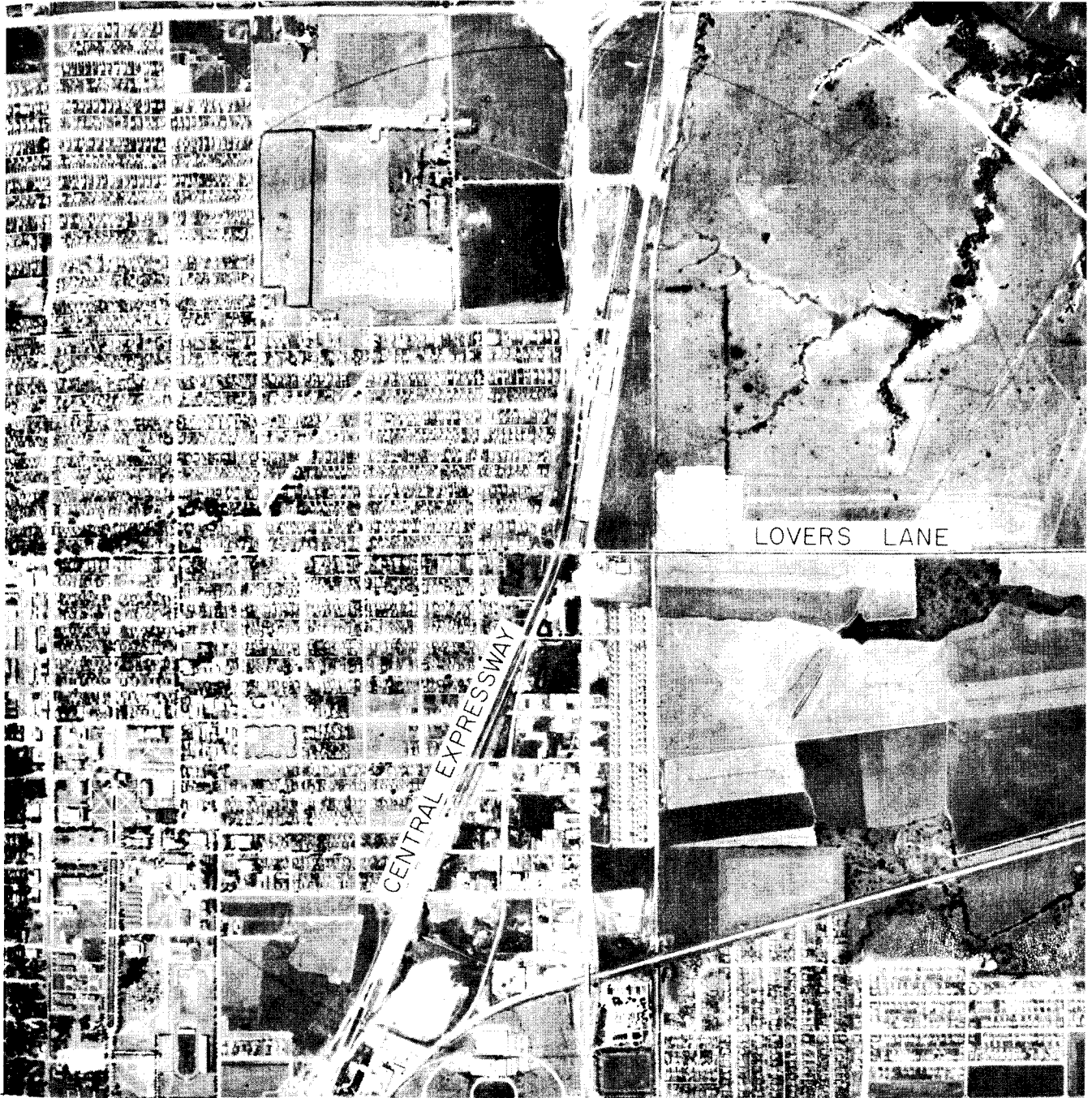


5a. Before (1951) - Central Expressway at Mockingbird Lane, Dallas

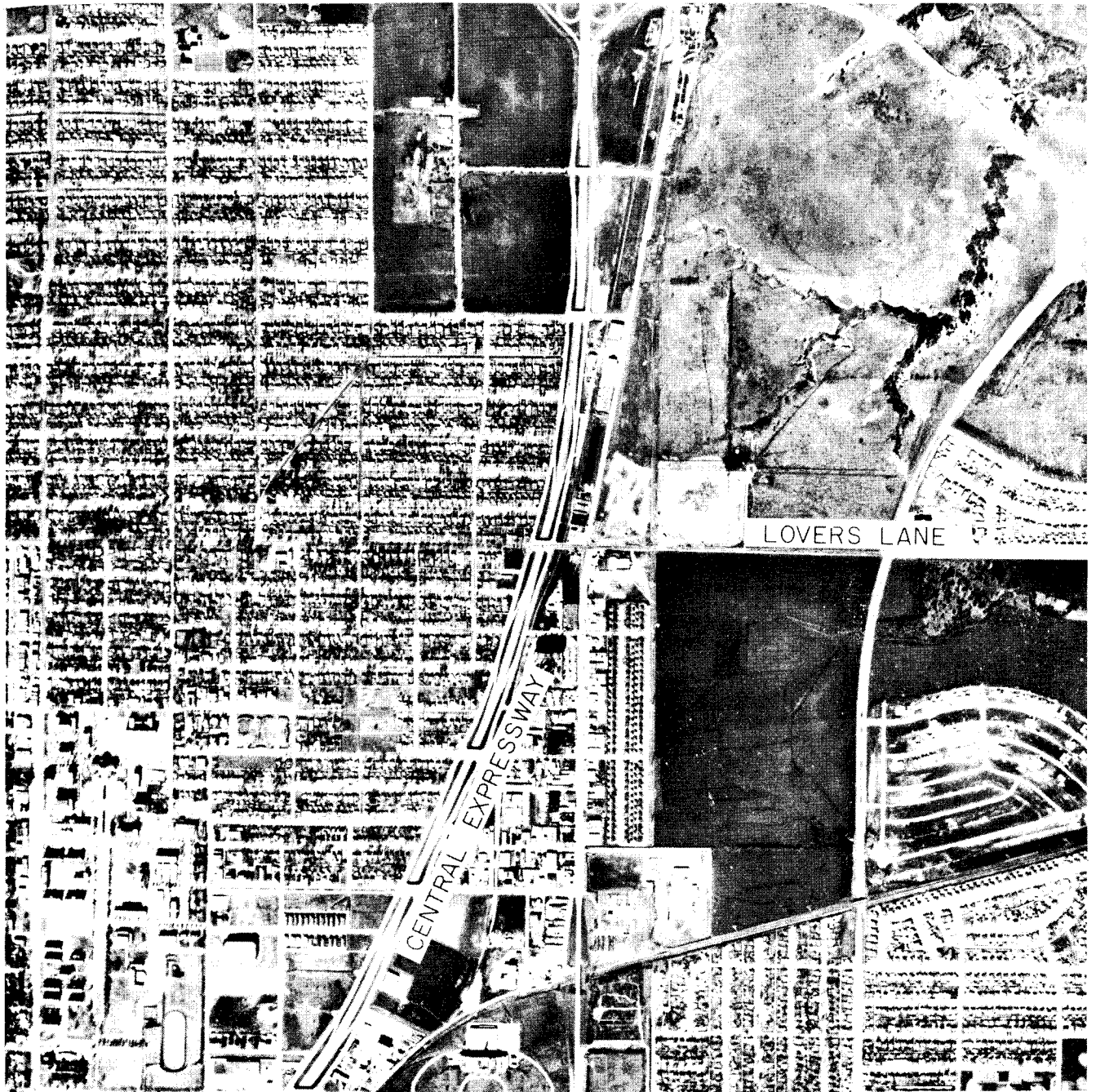


5b. After (1961) - Central Expressway at Mockingbird Lane, Dallas

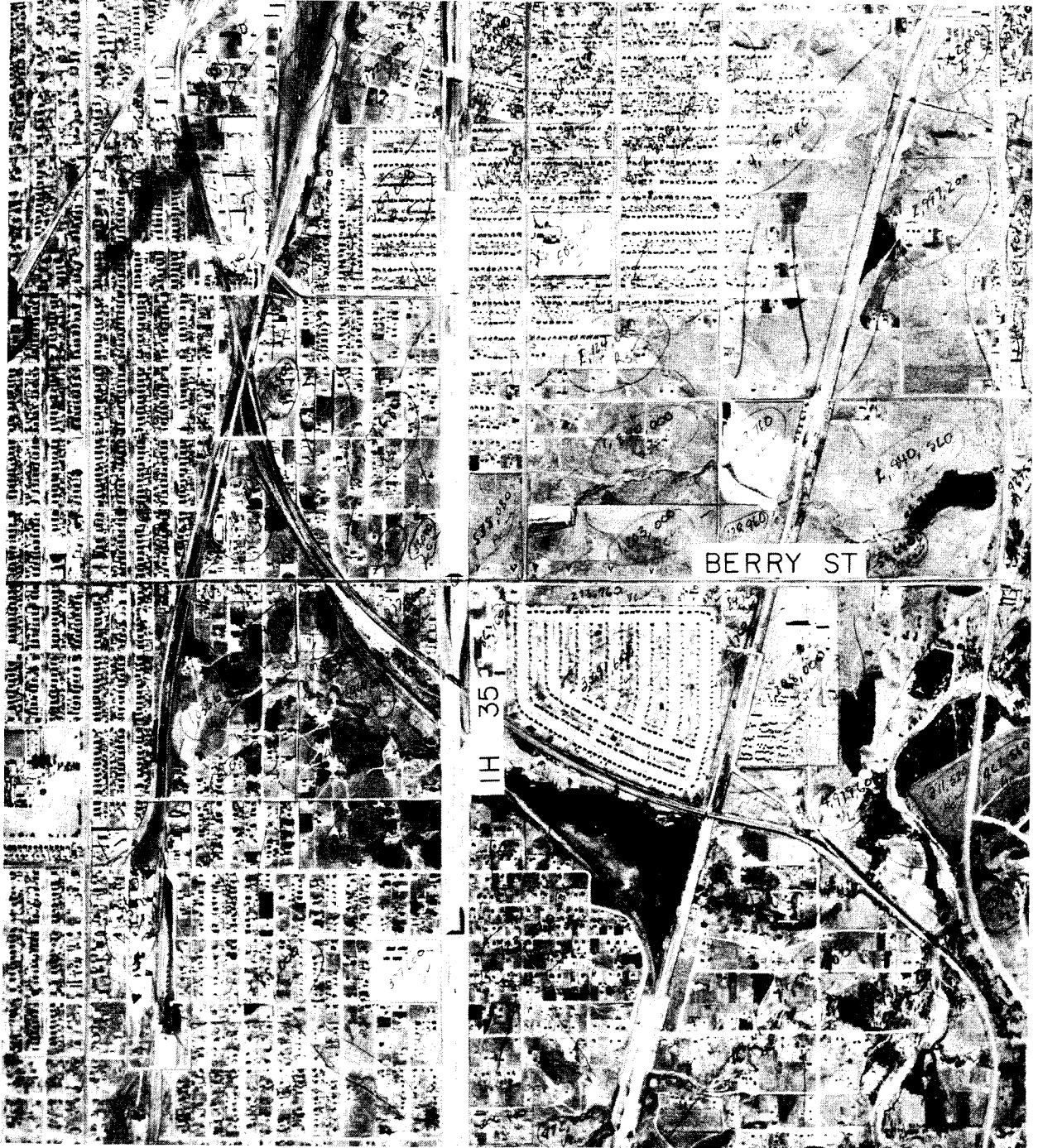




6a. Before (1951) - Central Expressway at Lovers Lane, Dallas

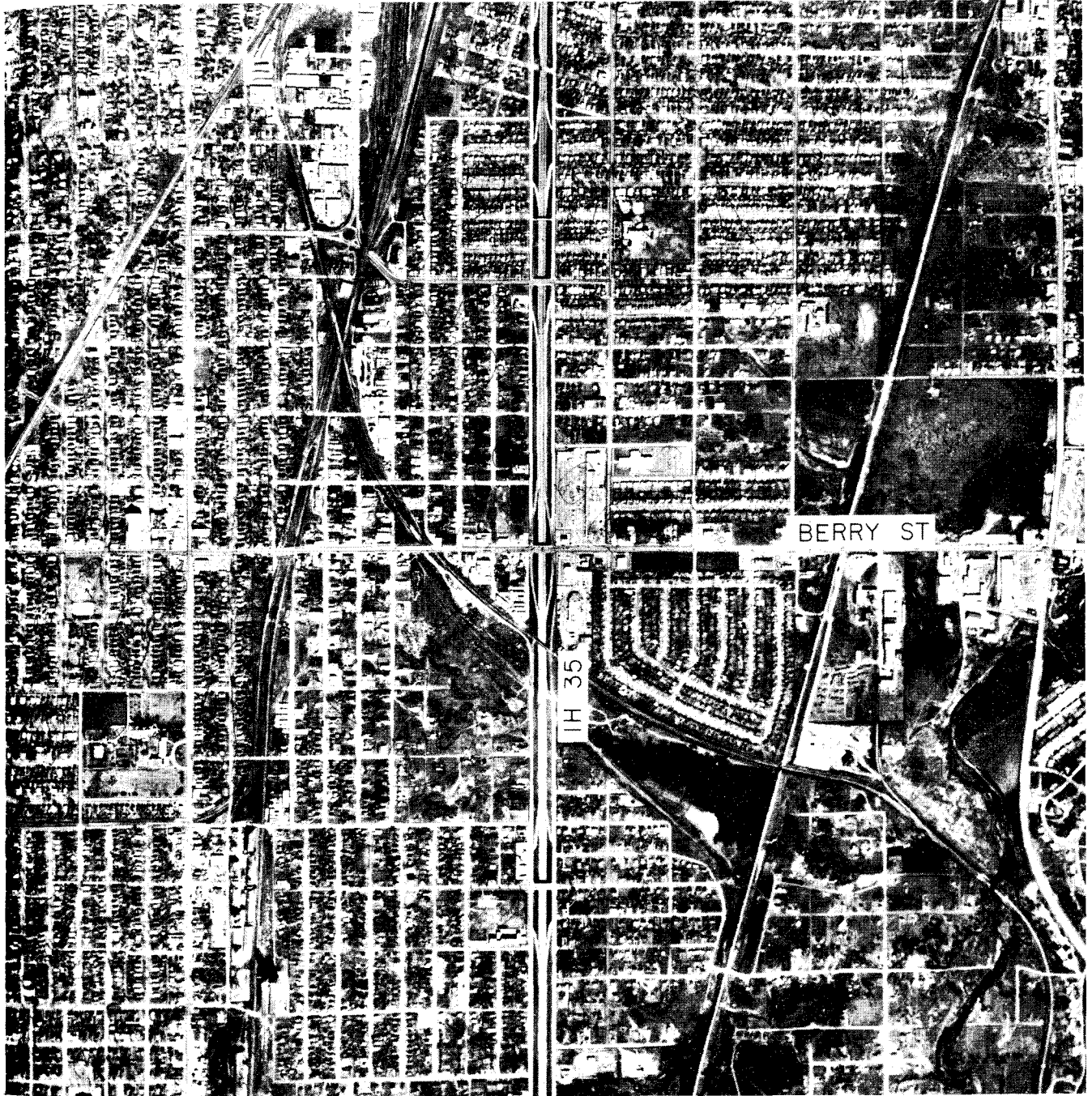


6b. After (1961) - Central Expressway at Lovers Lane, Dallas



7a. Before (1950) - IH 35 at Berry St., Fort Worth





7b. After (1961) - IH 35 at Berry St., Fort Worth

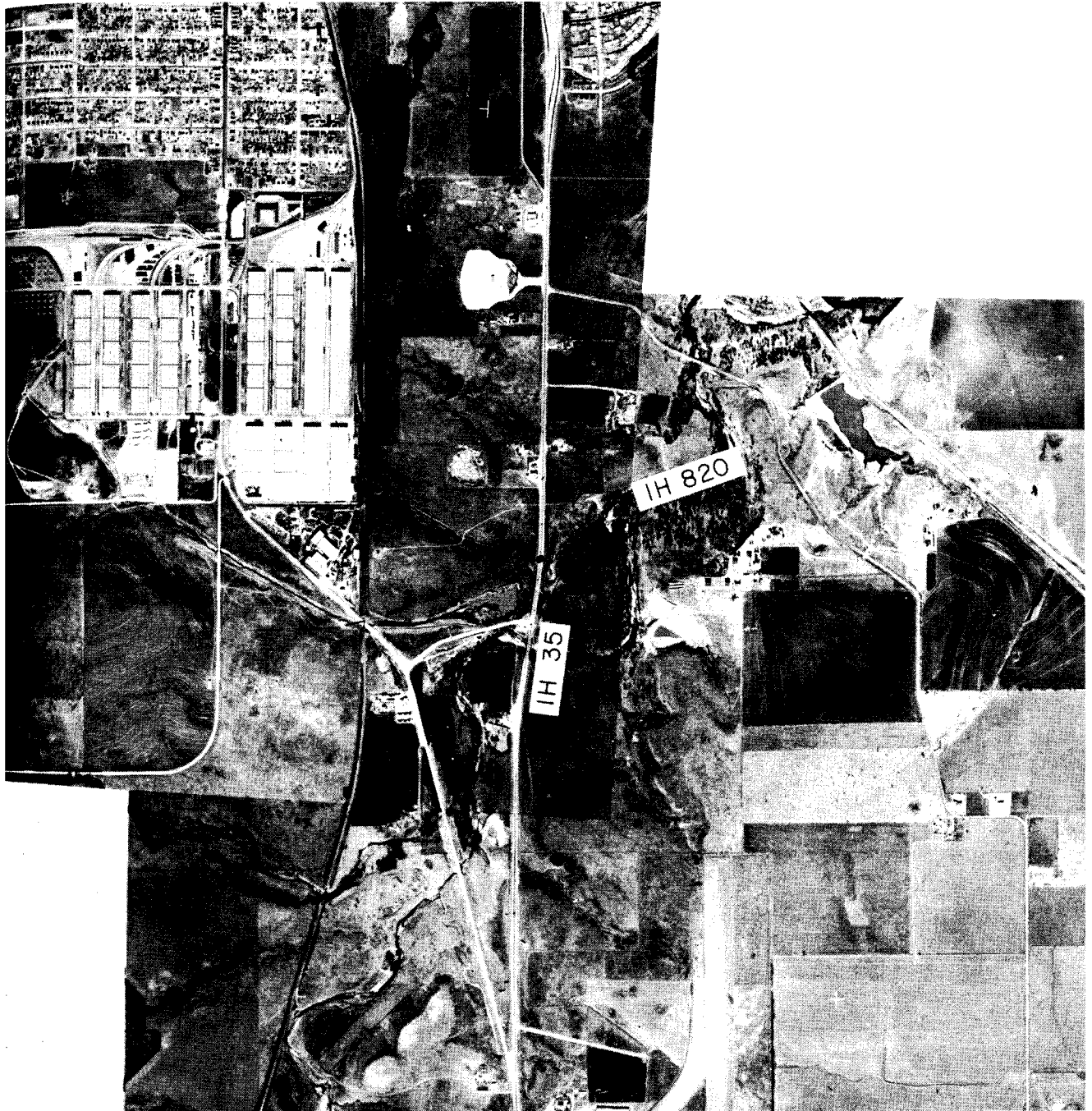


8a. Before (1950) - IH 35 at Seminary Dr., Fort Worth



8b. After (1961) - IH 35 at Seminary Dr., Fort Worth





9a. Before (1950) - IH 35 at IH 820, Fort Worth



9b. After (1961) - IH 35 at IH 820, Fort Worth





10a. Before (1956) - IH 820 at Old Grandbury Rd., Fort Worth



10b. After (1961) - IH 820 at Old Grandbury Rd., Fort Worth



11a. Before (1956) - IH 20 at Camp Bowie Blvd., Fort Worth





11b. After (1961) - IH 20 at Camp Bowie Blvd., Fort Worth



12a. Before (1952) - IH 45 at SH 225, Houston



12b. After (1959) - IH 45 at SH 225, Houston



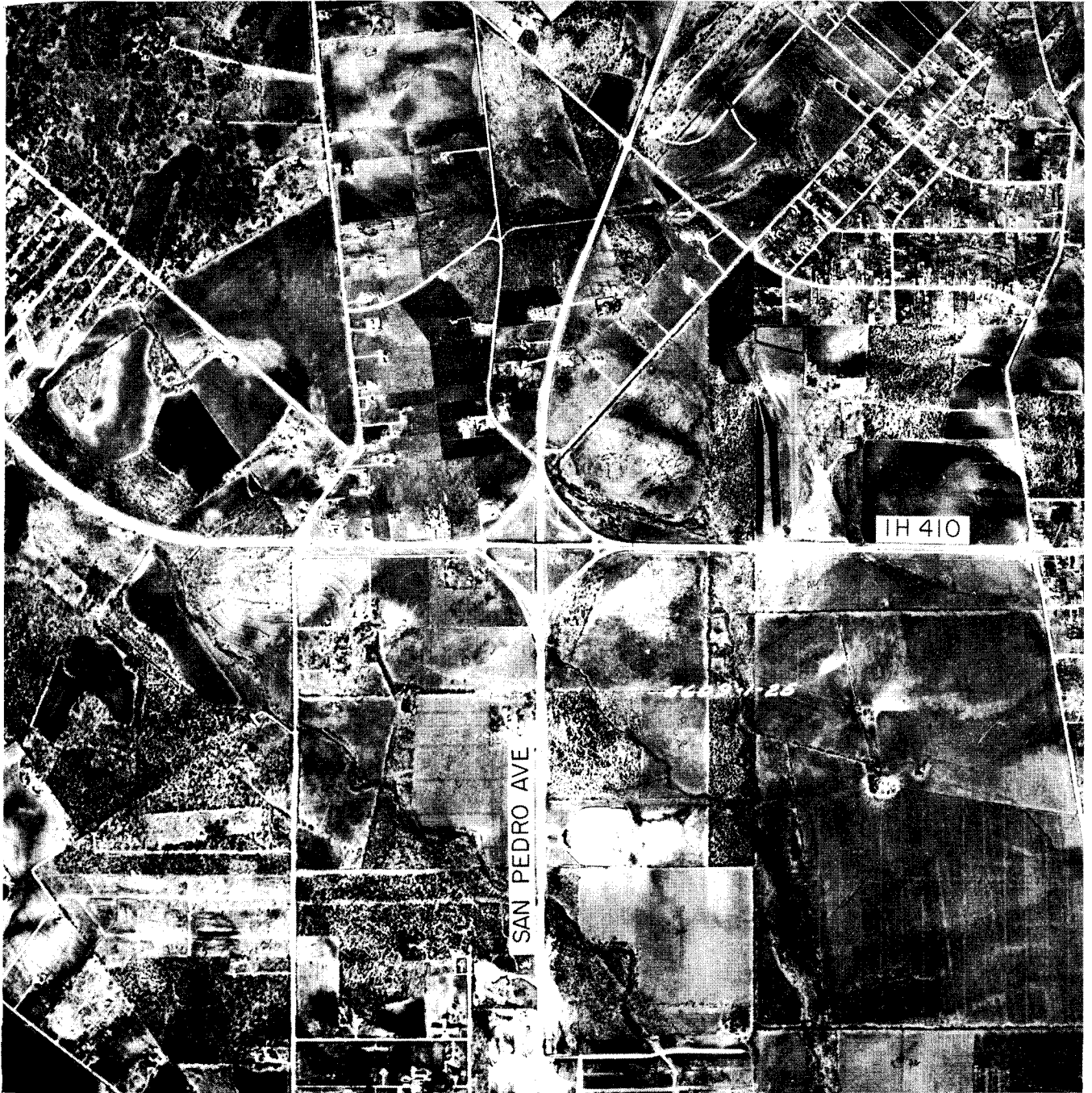
13a. Before (1952) - IH 45 at Wayside Dr. (US 90A), Houston



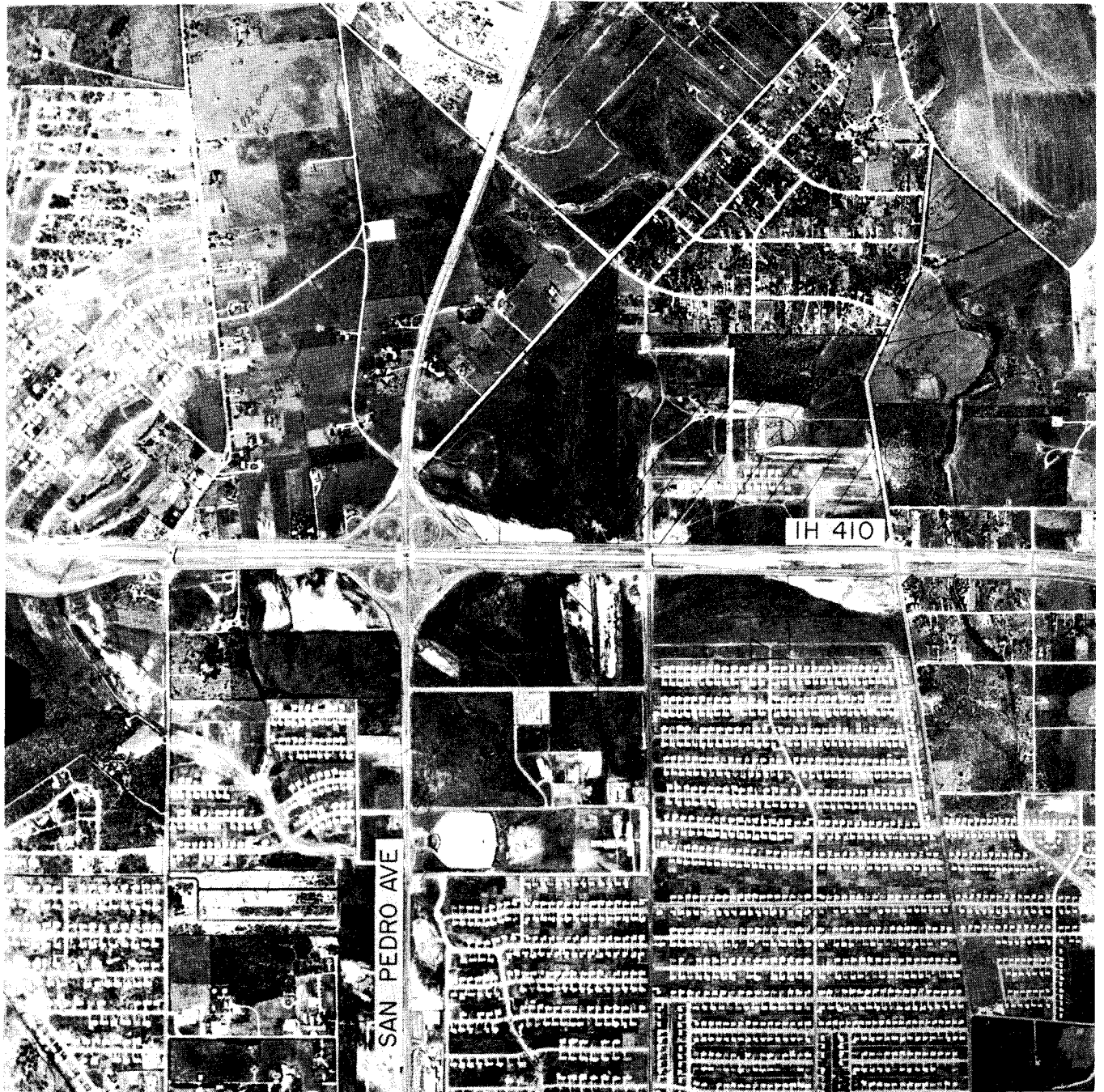


13b. After (1959) - IH 45 at Wayside Dr. (US 90A), Houston





14a. Before (1952) - IH 410 at San Pedro Ave., San Antonio



14b. After (1959) - IH 410 at San Pedro Ave., San Antonio



15a. Before (1952) - IH 35 at US 290, Austin



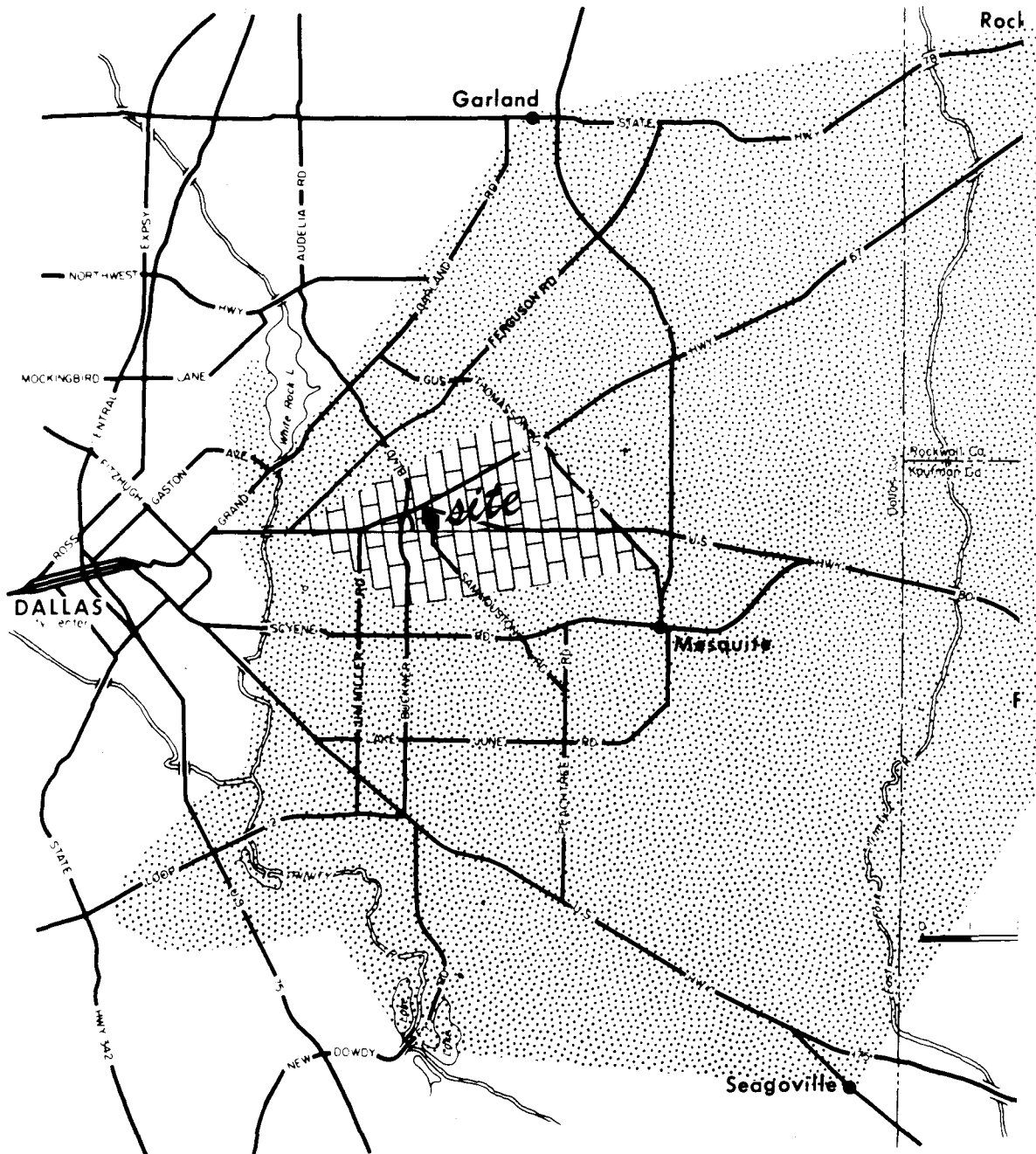


15b. After (1958) - IH 35 at US 290, Austin

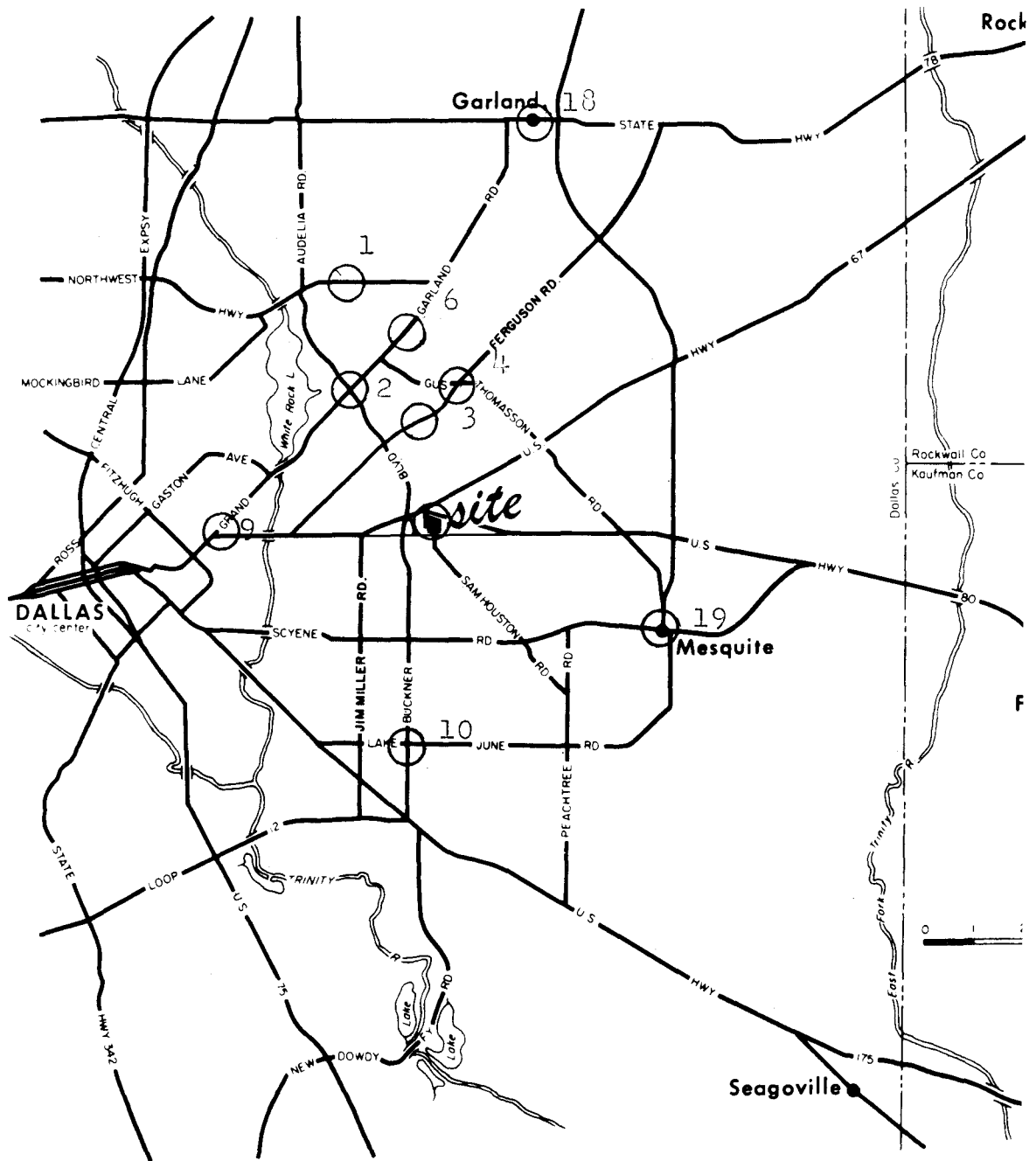
# THE TRADE AREA...

primary

secondary



16. Theoretical primary and secondary market areas for Big Town Shopping Center, Dallas, 1961.



17. Shopping centers in competition with Big Town Shopping Center, Dallas, 1961.

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