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A COMPARATIVE STUDY OF NINE CENTRAL BUSINESS DISTRICTS*

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THE Central Business District (CBD) of the American city is so familiar to the average citizen that he is likely to take it for granted. Under one name or another, it is thought of as an area of urban concentration that has been in existence since the beginning of the city and that will last as long as the city endures. But the CBD, as it is known today, is relatively modern, and its place in the city of tomorrow is a subject of wide debate. This uncertainty is based upon the many problems with which planners and other students of the city are grappling.

To meet these problems, a better understanding of the district is necessary, and this cannot be attained through concentrating on any one city. Instead, comparative studies are needed, just as they are in many other phases of urban research. This paper is one of the products of such a study, dealing with the CBDs of nine cities—Worcester, Massachusetts; Grand Rapids, Michigan; Salt Lake City, Utah; Tacoma, Washington; Sacramento, California; Phoenix, Arizona; Tulsa, Oklahoma; Mobile, Alabama; and Roanoke, Virginia.

A comparison of CBDs involves sev-

eral steps or phases. First is delimitation on a standardized basis, without which the comparison would mean little. Techniques of delimitation were discussed in an earlier paper, and the nine districts were delimited.¹ In the current paper, the CBDs will be compared on the basis of the total picture that each presents. The third and concluding paper of the series will deal with the internal structure of the CBD as far as it may be inferred from the nine districts studied.

ELEMENTS OF THE PROBLEM

In the total aspect that each presents, CBDs differ from city to city in size, in shape, in orientation, in location within the urban area, in land use, and in other aspects as well. These CBD variations may be considered in relation to site, regional setting, city area, city population, extent and buying power of trading area, city age, economic support of the city, wholesale trade, retail trade, and other general background information.

In the comparison presented in this paper, CBD differences form one element, and relevant background information a second (Tables I and II). But it is necessary to keep in mind still a third element: the special characteristics imparted by the delimitation technique used. For example, the delimitation was done on a block basis. Also, a distinction was made between certain forms of land use that were regarded

*This is the second of three related articles presenting the results of a research project supported by the Geography Branch of the Office of Naval Research. The first, "Delimiting the CBD," appeared in the July, 1954, issue of this magazine; the third and concluding article, "Internal Structure of the CBD," will be published in the January, 1955, number. For acknowledgments of assistance see the first article. When the series is completed, it is planned to make the three articles available under separate cover, with a bibliography, and with an appendix giving land use data in detail.

¹ Raymond E. Murphy and J. E. Vance, Jr.: "Delimiting the CBD," *Econ. Geog.*, Vol. 30, 1954, pp. 189-222.

as typically central business in character and others that were non-central business; and indexes for deciding whether a block was or was not to be included in the CBD were developed and used, together with certain rules.

TABLE I
CBD DATA RESULTING FROM FIELD MAPPING

	<i>Grand Rapids</i>	<i>Mobile</i>	<i>Phoenix</i>	<i>Roanoke</i>	<i>Sacramento</i>	<i>Salt Lake City</i>	<i>Tacoma</i>	<i>Tulsa</i>	<i>Worcester</i>	<i>Average</i>
Gross area of CBD (acres).....	97.3	73.0	126.7	77.4	188.2	189.4	67.8	136.3	87.1	115.9
Ground floor area (acres).....	58.9	50.4	76.8	53.3	108.8	120.8	52.4	79.8	59.6	73.4
Total height index.....	3.320	2.124	1.806	2.337	2.009	2.114	2.336	3.154	2.964	2.422
Central Business Height Index....	2.4	1.5	1.5	1.9	1.5	1.5	1.9	2.6	2.0	1.8
Central Business Intensity Index...	72.9	70.5	82.0	82.8	73.1	73.0	80.5	82.5	67.9	76.0
Total floor space in CBD (acres)	195.5	107.1	138.8	124.5	228.4	255.4	122.4	251.8	176.7	177.8
Central business floor space in CBD (acres).....	142.5	75.5	113.8	103.1	167.0	186.4	98.6	207.7	120.0	135.0
Average block size (acres).....	1.73	2.02	2.13	1.72	2.13	6.71	1.59	1.86	2.13	2.45
Gross land area of CBD as percentage of area of incorporated city.....	.65	.45	1.16	.46	1.74	.55	.22	.80	.37	.71
Gross land area of CBD as percentage of area of urbanized area.....	.33	.28	.36	.35	.71	.40	.17	.56	.31	.39

TABLE II
BACKGROUND DATA FOR THE NINE CITIES

	<i>Grand Rapids</i>	<i>Mobile</i>	<i>Phoenix</i>	<i>Roanoke</i>	<i>Sacramento</i>	<i>Salt Lake City</i>	<i>Tacoma</i>	<i>Tulsa</i>	<i>Worcester</i>	<i>Average</i>
Incorporated city, area in sq. mi. (1950).....	23.4	25.4	17.1	26.5	16.9	53.9	47.9	26.7	37.0	30.5
Incorporated city, population in thousands (1950).....	177	129	107	92	138	182	144	183	203	151
Urbanized area, area in sq. mi. (1950).....	46.7	41.0	55.1	34.7	41.6	76.1	62.2	37.7	43.6	48.7
Urbanized area, population in thousands (1950).....	227	183	216	107	212	227	168	206	219	196
Percentage of urbanized area population inside central city.	77.9	70.3	49.2	86.0	64.6	80.1	85.7	88.5	92.7	77.2
S.M.A., area in sq. mi. (1950)...	862	1,248	9,226	303	985	764	1,676	572	286	1,769
S.M.A., population in thousands (1950).....	288	231	332	133	277	275	276	252	276	260
Curtis market area, area in sq. mi. (1950).....	6,083	9,121	19,354	7,226	9,146	91,586	6,209	7,301	1,516	17,505
Curtis market area, population in thousands (1950).....	551	421	399	421	467	568	455	414	546	471
Wholesale trade of urbanized area, employees (1950).....	4,715	2,780	4,717	1,951	4,651	6,205	2,268	5,349	2,976	3,957
Retail trade of urbanized area, employees (1950).....	15,376	11,348	16,012	7,855	15,716	17,185	11,467	18,613	13,936	14,167
Clerical and kindred workers in urbanized area (1950).....	13,009	9,087	10,687	6,758	18,268	15,248	8,263	16,019	12,849	12,243
Sales workers in urbanized area (1950).....	8,956	4,589	7,261	4,223	7,604	8,868	5,198	8,281	6,824	6,867
Wholesale trade of incorporated city, employees (1950).....	3,725	2,249	2,592	1,786	3,226	5,179	1,967	4,498	2,777	3,111
Retail trade of incorporated city, employees (1950).....	12,517	8,674	8,788	6,989	11,296	14,225	10,084	15,216	8,219	10,668
Clerical and kindred workers in incorporated city (1950).....	10,917	7,502	6,834	5,982	13,927	13,202	7,380	14,911	11,994	10,294
Sales workers in incorporated city (1950).....	7,234	3,556	4,209	3,734	5,446	7,513	4,487	7,663	6,351	5,577

Sources: Curtis Market Areas after *Market Areas in the United States*, The Curtis Publishing Company, Philadelphia, 1952. All other data based on U. S. Census.

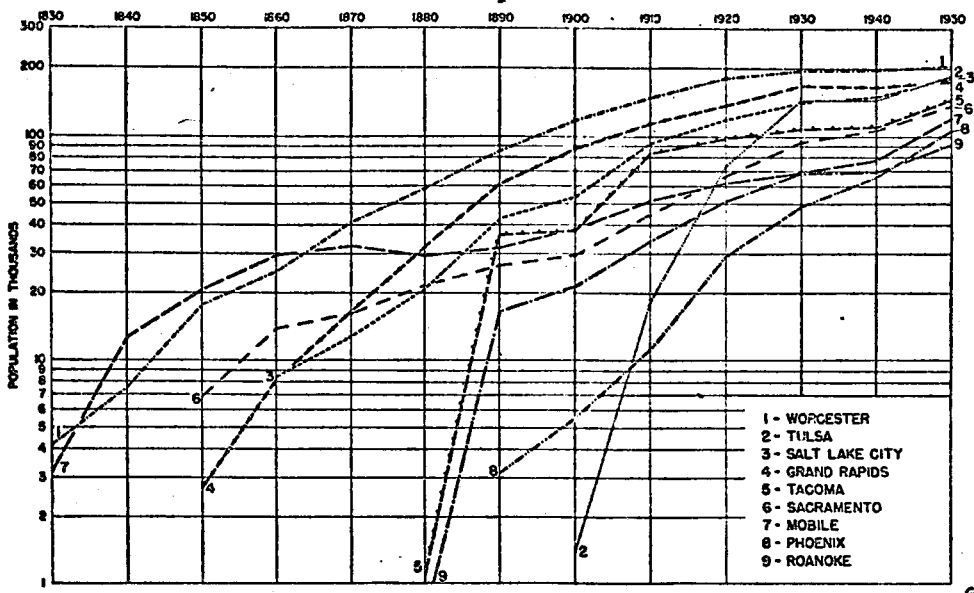


FIG. 1. Population curves for the nine cities. Mobile and Worcester are the oldest cities; Phoenix, Tulsa, and Roanoke are the youngest. Note the way in which Mobile's curve levels off in the latter part of the 19th century and then begins to rise again. Note, also, the phenomenal growth of Tulsa between 1900 and 1930.

OBJECTIVES

The comparison of CBDs in their total aspects, which is the subject of this paper, has broader objectives than a mere determination of facts. Throughout the article, an attempt is made to reach justifiable generalizations, keeping in mind the fact that only nine cities were studied and that the range in size was small (Table II). Various problems emerge: To what factors does the size of the CBD appear to be related? Does the District have a typical shape? Why are some CBDs centrally located in their urban areas and others not? What land use proportions are typical for the Districts of cities of the size studied? How do the CBDs vary with the economic specialization of the city? How do the CBDs of the older cities of the East differ from those of the newer cities of the West? The major purpose of the comparisons is to arrive at answers to questions such as these.

THE CITY AND THE CBD

Before beginning a systematic study of CBD characteristics, it is well to have a general view of each city in its regional and local setting. The purpose of this section is to present in brief form the character of each CBD and the background for its development.

Worcester

Worcester, Massachusetts, is old, and the incorporated city has the largest population total of any of the nine cities considered in this study (Fig. 1). It is an industrial center, set in a region of closely spaced urban communities. Boston lies only 45 miles to the east, and Providence the same distance to the south. New York City is only 150 miles to the southwest, and the intervening space is well served by a number of competing cities such as Springfield, Hartford, and New Haven. These facts help to explain the character of Worcester's CBD.

Worcester's site, in the midst of rough terrain, was probably the best possible one for city development between Boston and the Connecticut Valley. The city is located in a hilly region, where the headwaters of the southward flowing Blackstone River etched out a knobby, lozenge-shaped basin (Fig. 3). The basin is elongated in a north-south

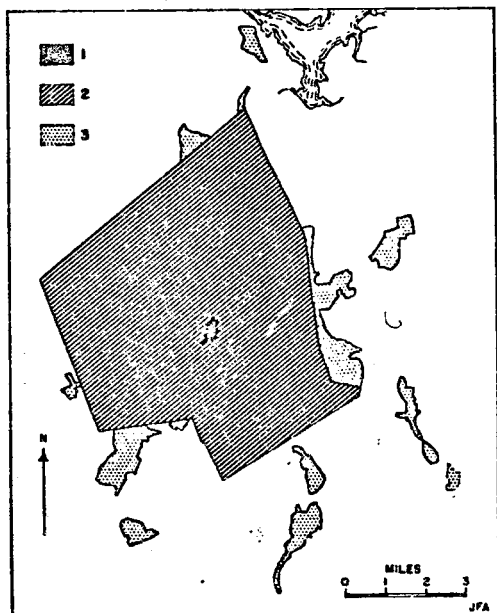


FIG. 2. Worcester's CBD in relation to the incorporated city and its urbanized area. Compiled from United States Census maps. Numbers refer as follows: 1. CBD as delimited in first article of this series; 2. remainder of incorporated city; 3. urbanized area extensions beyond incorporated city.

direction, being about five miles long as opposed to two miles wide.

During late colonial times the Upper Boston Post Road passed through the Worcester area en route to New York City, and its course can readily be traced in the main axis of the city of today. The Post Road passed north of Lake Quinsigamond and, crossing the hilly area just to the west, dropped into the northern end of the Worcester basin near Lincoln Square. From this point the road, now called Main Street, took

a south-southwesterly course along the basin floor. Finally, after traversing the lowland for more than three and a half miles, the road climbed its western edge. Worcester's CBD extends for nearly a mile along this route, skirting the hills on the western edge of the basin.

In 1808 a more direct, toll road, known as the Worcester Turnpike, was laid out between Worcester and Boston. The Turnpike crossed Lake Quinsigamond from the east and took a straight course over rather steep hills to converge with the Post Road at Lincoln Square. Here, the first nucleus of urban development appeared, well outside the present CBD.

In the meantime, New England was becoming industrial and Worcester along with it. New methods of transportation appeared. The Blackstone Canal, linking Worcester to Providence, was completed in 1828, with its terminus at Lincoln Square. In 1835 the Boston and Worcester Railroad was built, with its terminus more than half a mile farther south. The canal was abandoned soon after railroads came to the city. These improvements were financed by Worcester industrialists. Industry combined with good transportation to promote the city's development.

For three-quarters of a century the city of Worcester, like near-by American cities, was dominated by its railroads. Worcester industrialists built their factories along them, and the present location of the CBD reflects the attraction of the railroad terminus. Today, the peak land value intersection lies about half a mile south of Lincoln Square on Main Street, almost due west of the Union Station.²

Although Worcester's railroads have

² For the location of the peak value intersection in each city and for the details of street patterns see Murphy and Vance, *op. cit.*, Figs. 6-14, pp. 210-218.

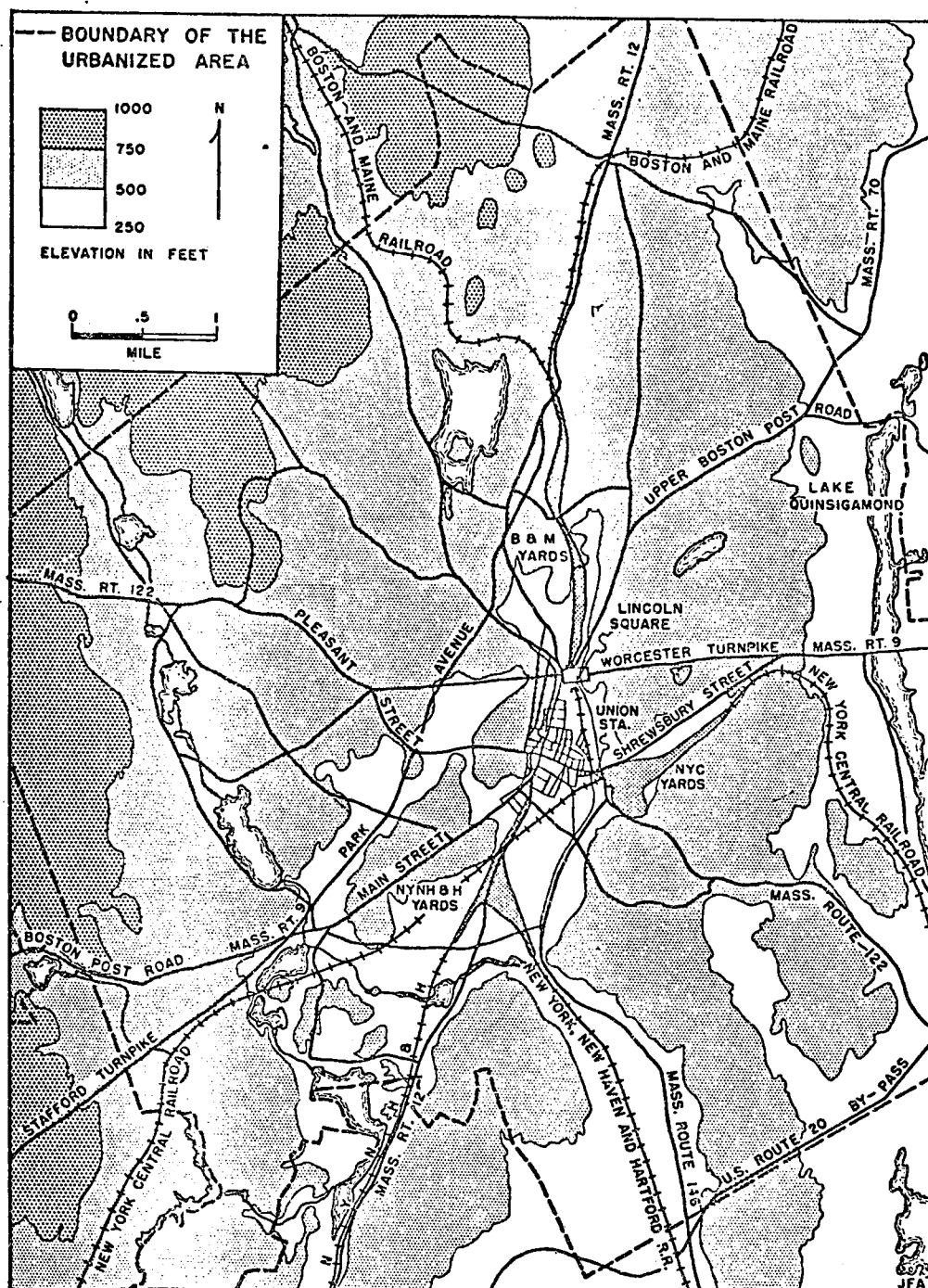


FIG. 3. Although Worcester's CBD lies in a lowland, the city sprawls over surrounding hills and valleys alike. Compare with Figure 2.

affected the location of its CBD, there is only one spot where the present CBD comes into actual contact with the railroad, and there it is only a spur track. Elsewhere, a cushion of other uses always keeps them apart. Perhaps this is to be expected in an industrial city where railroad frontage is more important for manufacturing sites than for CBD usage. In Worcester, wholesale houses and factories compete for space near the railroad.

The railroads describe a great sweeping barrier a few blocks to the east of Worcester's CBD, but expansion of the District has been restricted in other ways as well. Hills, which rise a hundred or more feet above the basin floor, lie within a block or so of Main Street toward the west. In places the slopes are steep, and commercial uses have lapped up on no more than the lower portions of the hills. In a few localities, however, commercial development has actually progressed well up the slope in spite of the obstacle of difficult terrain.

Worcester's CBD is small in area, ranking sixth among the nine cities (Table I). Undoubtedly, this is due in part to the presence of barriers that have impeded its expansion (Fig. 23), but there are other reasons for its limited area. It may be that an industrial city does not require as large a CBD as do cities devoted primarily to commercial pursuits. It must be remembered, too, that Worcester's CBD took form a long time ago. Because, at that time, mass transportation had to be depended upon, people placed a premium upon close association of as many urban functions as possible at the center of a city.

There is another reason for Worcester's CBD being small. Not only is the city overshadowed to some extent by Boston and even New York, but it is located in a region of thick-set urban development. Numerous cities, large

and small, serve the commercial needs of the people. In New England, shopping is more likely to be a matter of "going down town" than of "going to town" as it is elsewhere in the United States.

The presence of so many competing cities accounts for the small size of Worcester's market area. According to a recent delimitation of retail market areas by the Curtis Publishing Company,³ the region dominated by Worcester is far smaller than the market area of any other of the nine cities (Fig. 4 and Table II). It is significant, however, that this market area is far more densely peopled than any of the others.

Worcester's CBD has been described as small in area. On the other hand, it has a greater average height of buildings than most of the other CBDs studied in this group (Table I). Worcester's CBD is not as high as Tulsa's or that of Grand Rapids, but there is a definite clustering of four- and five-story buildings close to the center of the area, and the general average for the whole CBD is nearly three stories. A small, but high, CBD is not an unreasonable expectation for an old industrial city like Worcester.

What is surprising is the city's low Central Business Intensity Index (Table I). Worcester's index of 67.9 per cent puts the city at the bottom of the list. A partial explanation may be found in the large, irregularly shaped blocks. Sometimes a block fronts on a major business street but extends back into areas of industrial or residential development. Probably more important is the factor of tradition. Worcester is a 19th century city, and in such cities commercial, industrial, and residential land uses are likely to share the space near the center.

³ *Market Areas of the United States*, Curtis Publishing Company, Philadelphia, 1952.

Grand Rapids

In several respects Grand Rapids is similar to Worcester, though of course different factors contributed to its development. Like Worcester, Grand Rapids is an old city as American cities go (Fig. 1). It was located at rapids in the Grand River as a sawmill site in 1831 and reached its greatest period of urban growth shortly before the turn of the century. Like Worcester, it is an industrial city, but Worcester specializes in metal products and Grand Rapids' specialty is furniture. Like Worcester, too, Grand Rapids is primarily a product of the railroad age.

An interesting contrast between the two cities results from the fact that Grand Rapids lies in an area of Congressional townships, a system of land division that was not in use until late

in the 18th century. This survey system is characterized by north-south and east-west boundary lines, which explains the orientation of much of the boundary of Grand Rapids' CBD as well as the courses of many of the District's streets (Fig. 5). Worcester, on the other hand, was laid out in a region where metes and bounds surveying and irregularly shaped towns were used. Hence, that city lacks any orientation to the cardinal compass directions.

However, the pattern of Grand Rapids' CBD is not altogether one of north-south and east-west lines. In part of the CBD a notably different orientation of the streets prevails. An explanation of this contrast lies in the fact that two rival promoters laid out plats, one to the north and the other to the south. The promoter who laid out the streets

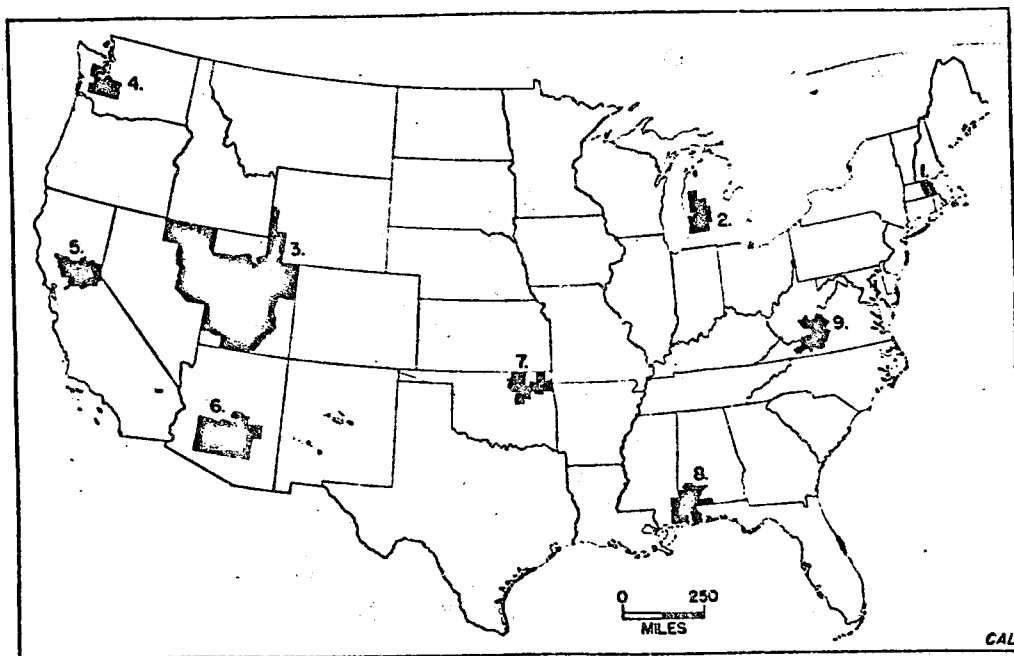


FIG. 4. Curtis Market Areas for the nine cities. Numbers refer to market areas as follows: 1, Worcester; 2, Grand Rapids; 3, Salt Lake City; 4, Tacoma; 5, Sacramento; 6, Phoenix; 7, Tulsa; 8, Mobile; 9, Roanoke. The small size of Worcester's market area reflects the competition of adjacent cities as well as the density of population of southern New England. The vast extent of the Salt Lake City market area results from just the opposite conditions. Salt Lake City is in a sparsely populated, dry area, with the nearest large competing centers hundreds of miles away. The area and population of each of the market areas is given in Table II. (Extent of market areas from *Market Areas of the United States*, Curtis Publishing Company, Philadelphia, 1952.)

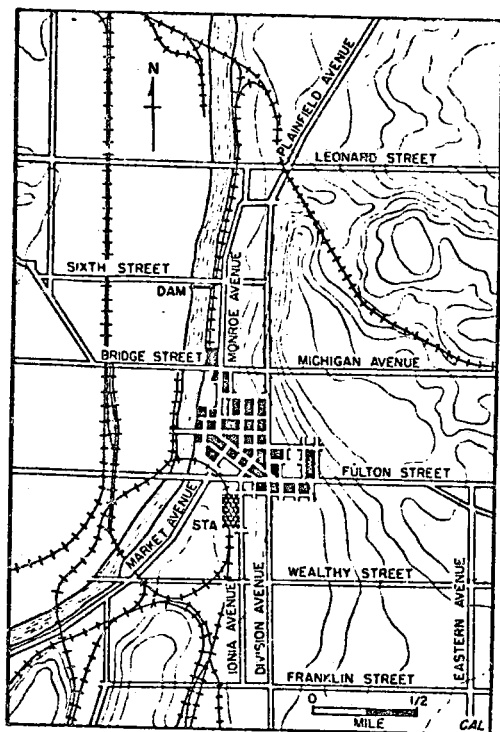


FIG. 5. Grand Rapids' CBD, represented on the map by the filled-in blocks, lies between the Grand River and a belt of hills. Expansion of the city westward, across the river, and eastward, up the slope, has left the district in a fairly central position in the city. Compare with Figure 6. (Contour Interval: 20 feet.)

of the more southerly plat used a grid pattern, but deliberately planned it with northwest-southeast and northeast-southwest streets so it would not conform with the grid to the north. It is one of these diagonal streets, Monroe Avenue, that forms the heart of the present CBD. On this street the peak land value intersection occurs, and along this street are the city's tallest buildings.

Grand Rapids' CBD, like those of many other cities, has been impeded in its development by the presence of barriers (Fig. 23). First, there is the Grand River, with a belt of old factories along its eastern bank. Then, there is a knot of railroad lines, rail yards, and a union station directly south of the main part of the CBD. Another barrier,

one that has had much to do with the CBD's outline, is the mass of hill land northeast of the peak value intersection. The CBD lies on the Grand River flood plain, between the hills and the river, an area of relatively level land that narrows toward the north. This plain allowed the District to spread eastward in its southern reaches, but has restricted it considerably in the north. Barriers, plus the presence of diagonal streets, explain the arc-like outline of Grand Rapids' CBD. The extreme irregularity of the outline, on the other hand, is probably due to overzealous commercial expansion in the past.

The lack of serious barriers toward the southeast helps to explain the fact that the CBD is shifting and intensifying in that direction. This shift is particularly well demonstrated by the

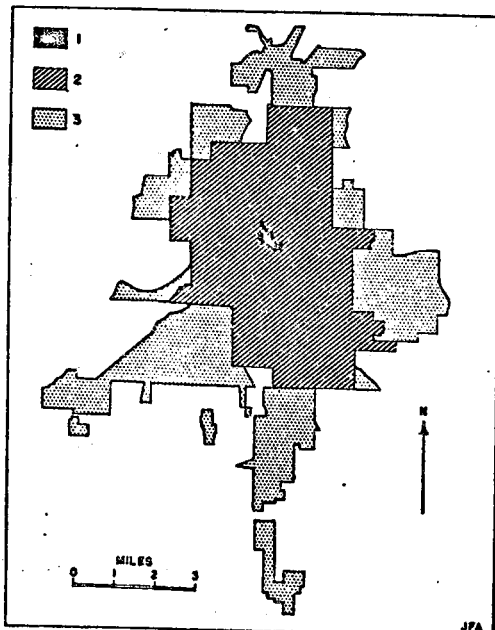


FIG. 6. Grand Rapids' CBD in relation to the incorporated city and its urbanized area. Compiled from United States Census maps. Numbers refer as follows: 1. CBD as delimited in first article of this series; 2. remainder of incorporated city; 3. urbanized area extensions beyond incorporated city.

city's largest department store, which has moved into new quarters a block farther southeast. Its former quarters have been taken over by a second store that was previously located four blocks to the north and west.

Sharp contrasts exist between most eastern and western cities in the matter of area of the Central Business District. This measure alone would classify Grand Rapids as an eastern city. Its CBD is only one-half to two-thirds as large as the CBDs of such western cities as Sacramento, Salt Lake City, Phoenix, and Tulsa. At least part of the explanation for the limited areal extent of Grand Rapids' CBD lies in the fact that its average height, 3.32 stories, is greater than that of any of the other eight CBDs. But the District's Central Business Intensity Index is low, reflecting the use of space for wholesaling and the existence of considerable vacancy, the latter resulting from over-expansion of the District in an earlier period.

Although Grand Rapids is predominantly a manufacturing city, it has the reputation, too, of being a regional trade center. Its tributary area (Curtis Market Area) is about 6000 square miles, which is not large as compared with those of western cities, but, in total population, the market area ranks second only to Salt Lake City's (Table II and Fig. 4). Moreover, Grand Rapids is above the average of the nine cities in number of both retail and wholesale trade employees in its urbanized area.

Salt Lake City

Salt Lake City, the capital of Utah, the wholesaling center for a vast area in western United States, and the administrative center for the Latter-Day Saints' church, has a CBD commensurate with its regional importance. It is a large, low, open area, composed of 10-acre blocks. As might be expected,

the Central Business Intensity Index of the CBD is low, and many non-commercial uses appear within the District.

Salt Lake City was laid out in 1847 on a gently sloping area of coalescing alluvial fans at the base of the Wasatch Mountains (Fig. 8). There was ample space, and the church authorities laid out a city with generous gardens, and streets adequate for turning farm teams. From the first, Salt Lake City was planned, not as a possible city, but as an actual city. The tradition of the Latter-Day Saints' church called for residence in towns and the focusing of these towns upon a metropolitan city. The original concept of the city was so vast that only recently has it become necessary to expand into newly platted land.

In a sense, Salt Lake City was planned from the beginning for what it has become. Far-sighted as the planners were, they could hardly be expected to foresee the urban development of the automobile age. Fortunately, the streets were wide to begin with (132 feet), so Salt Lake City has been spared much of the expense of adjusting itself to automotive travel. But the gigantic blocks, originally planned to contain a few houses with their associated gardens, have lent themselves oddly to the uses of a CBD. In many blocks the façade of high value business buildings hides an interior given over to non-CBD uses such as manufacturing, power generation, residence, and the accumulation of waste. The city's CBD is composed of a series of hollow squares when considered from the point of view of commercial land use. This situation helps to explain the low Central Business Intensity Index of Salt Lake City (73.0) as well as the fact that its CBD has the largest area of any city studied (Table I).

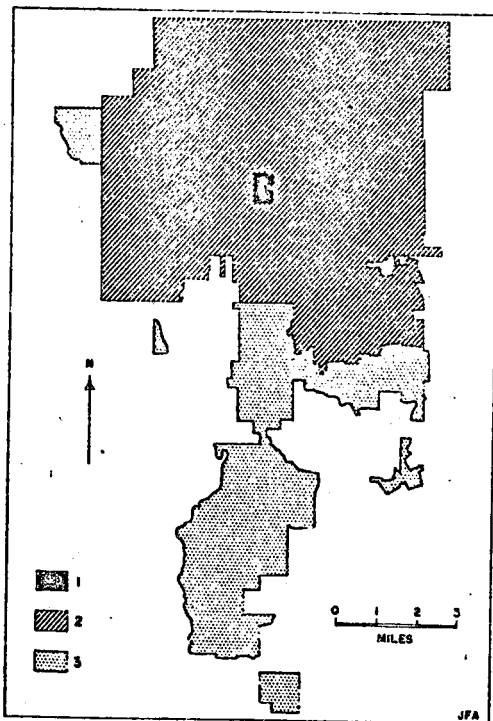


FIG. 7. Salt Lake City's CBD in relation to the incorporated city and its urbanized area. Compiled from United States Census maps. Numbers refer as follows: 1. CBD as delimited in first article of this series; 2. remainder of incorporated city; 3. urbanized area extensions beyond incorporated city.

Salt Lake City's CBD is almost wholly without barriers (Fig. 23). Although the Wasatch Mountains are present, nowhere, except in the north where the North Bench lies adjacent to the blocks occupied by the church buildings, do the mountains approach the CBD closely enough to block expansion. The CBD has been particularly free to move southward along Main Street. The movement in this direction has been accentuated by the location of Gentile (non-Mormon) business establishments well to the south of the Mormon business area, which is located near the church center. As a result, Salt Lake City is almost bi-polar in its CBD, with a Mormon pole in the north near the Temple Block and a Gentile pole farther south near and

beyond Third South Street. The present peak value intersection lies between these poles, and the CBD has an elongated shape rather than an equidimensional one.

The Wasatch Oasis is the immediate market area for Salt Lake City. Because it depends upon irrigation from mountain streams, it is extremely linear, conforming to the straight, north-south Wasatch Front. It is divided into two parts by a transverse spur of the Wasatch Mountains, which lies just to the north of the CBD. The District is centrally located as far as the whole oasis goes, but since the built-up area has expanded almost entirely to the south, the CBD is off center for the city, itself (Fig. 7).

Beyond the Wasatch Oasis, Salt Lake City draws upon an open mesh of settlement in parts of northeastern Nevada and southwestern Wyoming as well as most of the State of Utah. This vast area has a sparse but mobile population. Worcester and Tacoma may lose out to larger near-by neighbors, but Salt Lake City has no rivals within 500 miles in any direction. This helps to explain why it is an important wholesaling center.

Another feature that makes the city a wholesale center is the absence of many large, diversified settlements in the intermontane West. There are agricultural towns (largely Mormon), mining towns, ranches, and lumber camps, but each of these serves a specialized function and lacks a broad economic base with a well-developed wholesale and retail trade. For this reason, Salt Lake City dominates the Great Basin to a much greater degree than most trade centers dominate their tributary regions.

Strangely enough, the city has only recently acquired adequate railroad connections. The route of the Union

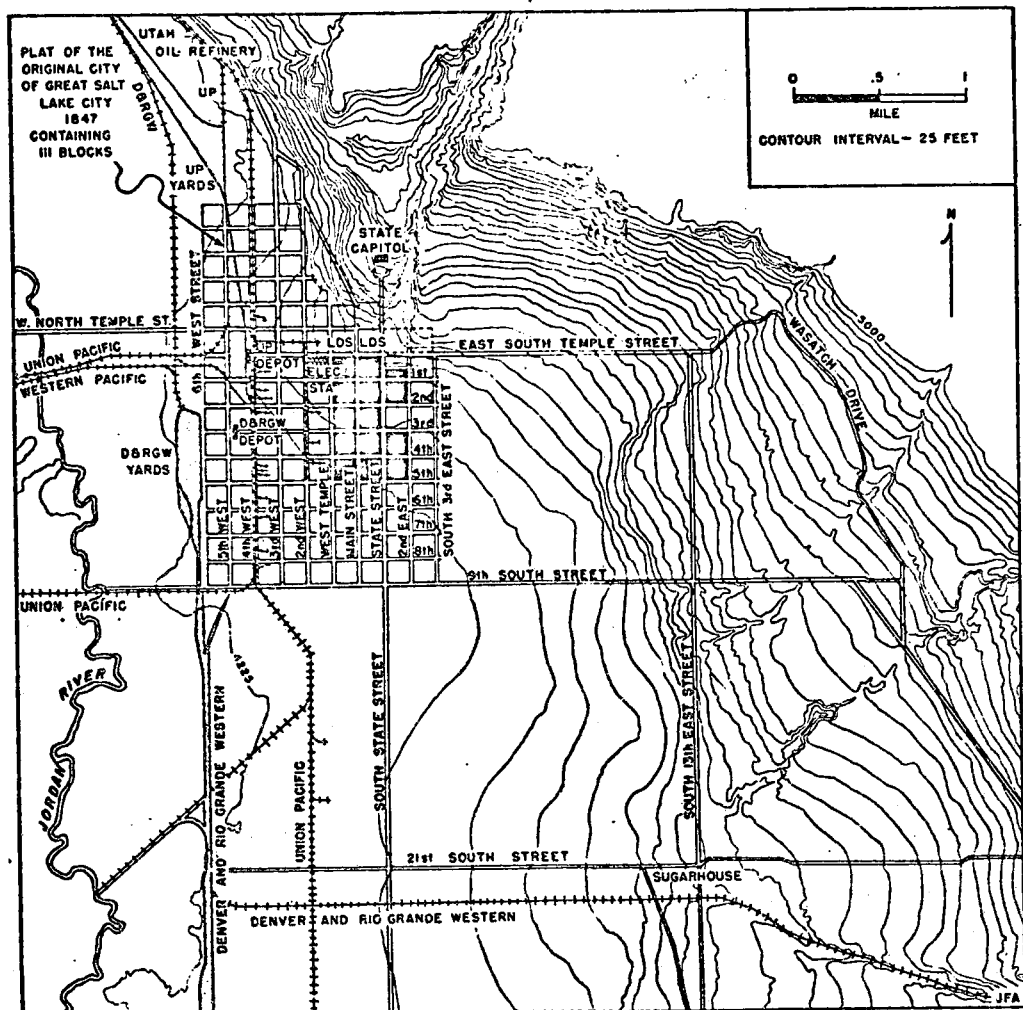


FIG. 8. Salt Lake City's CBD is oriented according to the cardinal points of the compass in a region where the Congressional township survey system prevails. Nevertheless, the city's orientation is not related to the survey system, since Salt Lake City was established before the region had been surveyed according to the Congressional township system. The area divided into blocks on the map is that of the original plat of Great Salt Lake City. Elsewhere, only major arterial streets are shown. CBD blocks are in black. The letters "LDS" mark the Mormon church blocks, one of which contains the Temple. Compare with Figure 7.

Pacific-Southern Pacific line between San Francisco and Chicago was opened through Ogden in 1869. Later, the Union Pacific continued its line southward through Salt Lake City to Los Angeles. However, this transcontinental route was relatively unimportant before the recent burgeoning of Southern California. This Los Angeles to Chicago-

line gave the city its first truly transcontinental route. Recently, the Denver and Rio Grande Western and the Western Pacific have joined in the formation of an additional transcontinental route passing through Salt Lake City. Thus, Salt Lake City offers the paradox of an American city becoming increasingly railroad oriented in the automobile

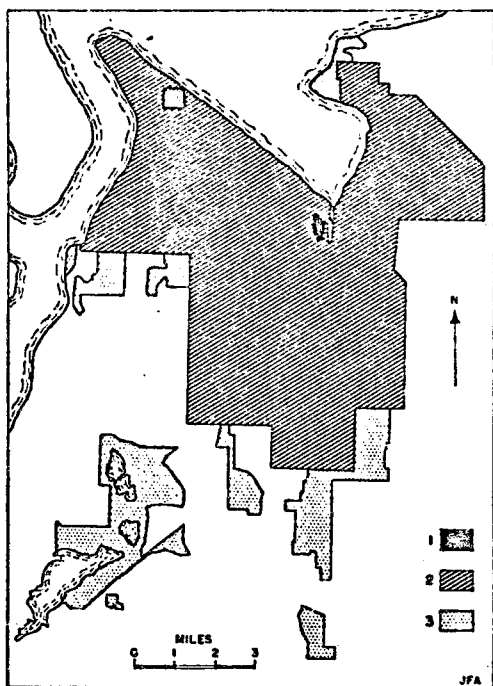


FIG. 9. Tacoma's CBD in relation to the incorporated city and its urbanized area. Compiled from United States Census maps. Numbers refer as follows: 1. CBD as delimited in first article of this series; 2. remainder of incorporated city; 3. urbanized area extensions beyond incorporated city.

age. In a very real sense, though, the railroads came to the city. The city was not the creation of the railroad.⁴

Tacoma

In the late 19th century, Tacoma became the major port of the Puget Sound area. It had decided assets. The young city was located on the deep water of Commencement Bay; it became the first rail terminus on the Sound; and the great lumber industry of the Pacific Northwest was getting under way. But Tacoma's assets proved to be short-lived. Seattle, only 35 miles to the north along the Sound, acquired equally good, or even better, rail connections

with the East, and the northern city quickly outgrew its southern rival. Furthermore, the great timber resources, which had fed Tacoma's sawmills and wood-working industries, were soon nearly exhausted. The city stagnated, growing old long before its time.

Though the peninsula on which the city is built is on the whole gently rolling, it has a steep shore along Commencement Bay (Fig. 10). On this steep face, the embryo city, the present CBD, was laid out in regular, rectangular blocks. Both the District, and the blocks which comprise it, are elongated in a roughly north-south direction, nearly parallel to the water front. The whole CBD slopes sharply to the northeast, dropping as much as 150 feet between its western and eastern edges. The north-south streets are fairly level, but the cross streets plunge down steep slopes, dropping as much as two stories in a single block.

Fitting a business district to such a site has resulted in an interesting and unusual CBD. Tacoma has a smaller and slightly higher CBD than the other western cities studied here, both of which facts may be due to steep slopes and the attendant difficulties of spreading the CBD widely in such a situation.

The odd, bench-like appearance of the CBD, like a steep section of bleachers, results in a peculiar piling up of retail establishments. The stores on lower streets often extend completely under stores on the streets above. This doubling of available ground-floor retail space gives Tacoma the highest proportion of space devoted to retailing of any city studied (Fig. 25). That, at the same time, the city's CBD has a high proportion of vacancy, may indicate that Tacoma's retail space is actually greater than it needs. All this is accentuated by the small block size found in Tacoma's CBD, the smallest of

⁴For a more detailed consideration of Salt Lake City see Chauncy D. Harris: *Salt Lake City, A Regional Capitol*, Private Edition, University of Chicago Libraries, Chicago, 1940.

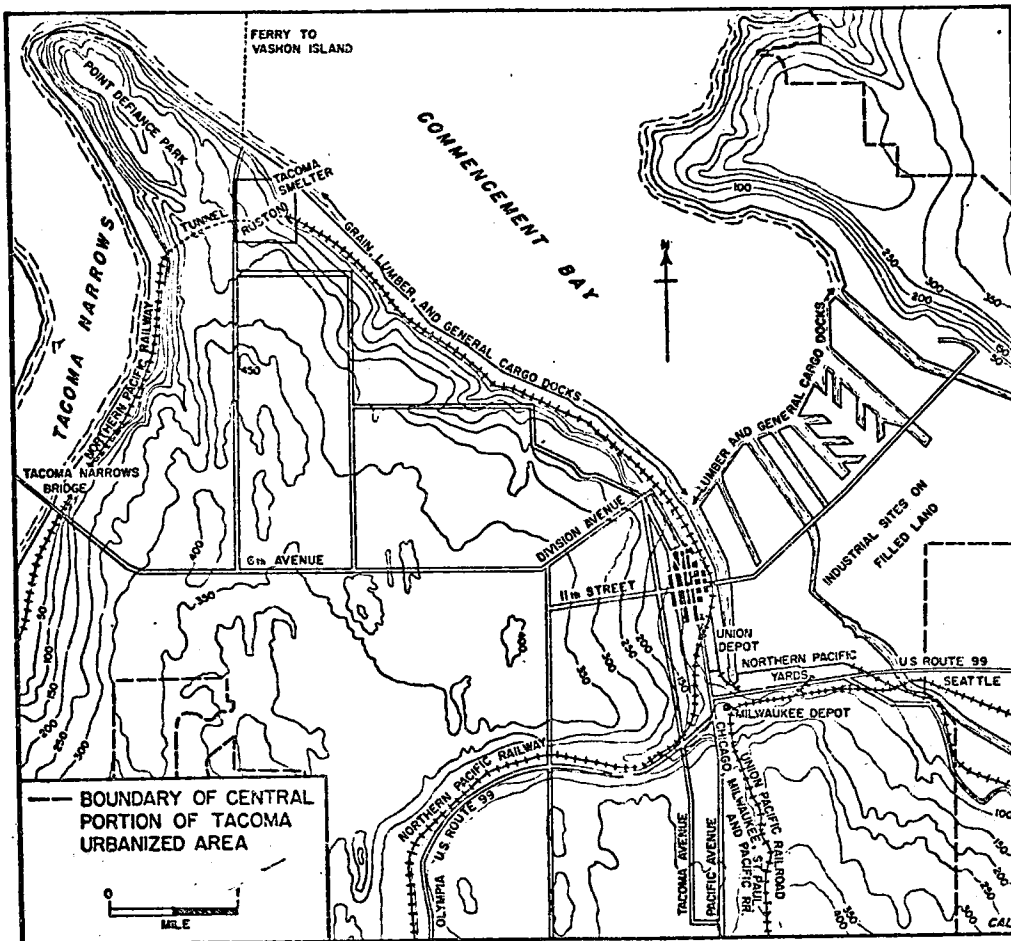


FIG. 10. Tacoma's CBD is the only one of the nine that has a steeply sloping site. It is not surprising, therefore, that the District has developed with its long direction parallel to the water front instead of developing at right angles to it, which seems to be more normal in port cities. Elevations in feet. Compare with Figure 9.

any of the nine CBDs. Small blocks give a CBD a high proportion of street frontage, though in Tacoma only the bench streets are intensively used. The cross streets are often too steep to attract much use.

Since Tacoma's CBD is located on slopes that would prove too steep for most cities, slope as a barrier must be discounted here. Only in one place, where there is a sheer drop of 40 feet, is there a barrier that can definitely be attributed to slope. But the straight western boundary of the CBD may be due to slope indirectly. Steepness of

the cross streets makes expansion up the slope difficult, and when once it has been achieved there is a tendency to utilize the bench street fully before going up to the next level.

Nevertheless, Tacoma's CBD has expanded up the slope. It was originally centered on Pacific Avenue, two blocks nearer the water front than the location of the present peak value intersection. But Pacific Avenue, though easily reached from the port and railroad terminals, was hard to reach from the residential districts farther out the peninsula. Consequently, the CBD has

moved up the slope, now centering on Broadway. Its original location on Pacific Avenue has been virtually abandoned.

As is the case with other port cities, Tacoma's CBD is located off center with respect to the urban area as a whole (Fig. 9). Most of the city lies to the west and north. Unlike the situation in most port cities, though, Tacoma's CBD axis parallels the water front. This is no doubt due to two factors, steep slopes, which tend to encourage the elongation of the bench streets, and the general orientation of the shore upon which the District is built.

Because Seattle effectively competes with Tacoma to the north, the city's trade area lies largely to the south and west (Fig. 4). Also, Tacoma still has better connections with the Kitsap peninsula than has Seattle. Tacoma has a bridge across the intervening narrows, whereas at present Seattle must

reach the peninsula by way of a ferry. This means that Tacoma is as asymmetrically located within its trade area as the city's CBD is within its urban area.

Sacramento

Sacramento, the capital of California, is located in the broad Central Valley 35 miles north of the coalescing deltas of the San Joaquin and Sacramento Rivers. Here the floodplain is no more than 20 feet above sea level. Relief is always relative, and in Sacramento a rise of ten feet is sufficient to create a "hill." On such a hill, John Sutter established his fort in 1839. The first road in the vicinity connected the fort with Sutter's landing, on the Sacramento River a short distance below its junction with the American River. A village grew up near the landing, and this nucleus expanded out along the road which has become known as K Street, the major business street of the city.

On so flat a site, relief is no barrier to the expansion of a CBD. But the rivers with their extensive flood plains and the danger of floods have made effective barriers to the north and west. Sacramento's CBD has other barriers, too (Fig. 23). The presence of a group of government buildings associated with the capitol building and its park makes a seven-block barrier along the southern edge of the District. With barriers of one kind or another in the north, west, and south, the CBD has been particularly free to expand eastward, resulting in an elongated District which seems strangely out of place in so flat a scene.

This CBD, 14 blocks long, and only three or four blocks wide, has an interesting variation from west to east. The western part of the District contains the remnants of the early center along the river. Here one finds old, multi-

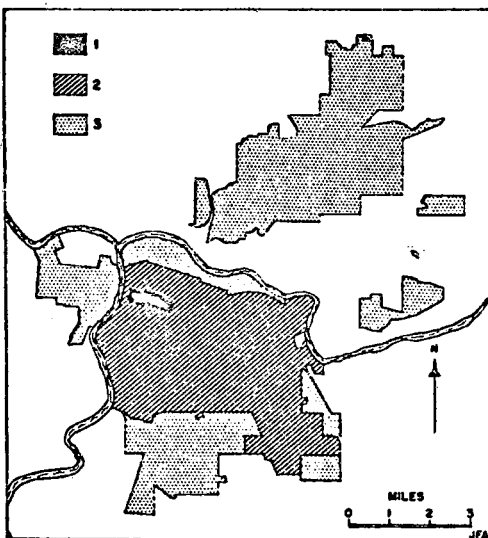


FIG. 11. Sacramento's CBD in relation to the incorporated city and its urbanized area. Compiled from United States Census maps. Numbers refer as follows: 1. CBD as delimited in first article of this series; 2. remainder of incorporated city; 3. urbanized area extensions beyond incorporated city.

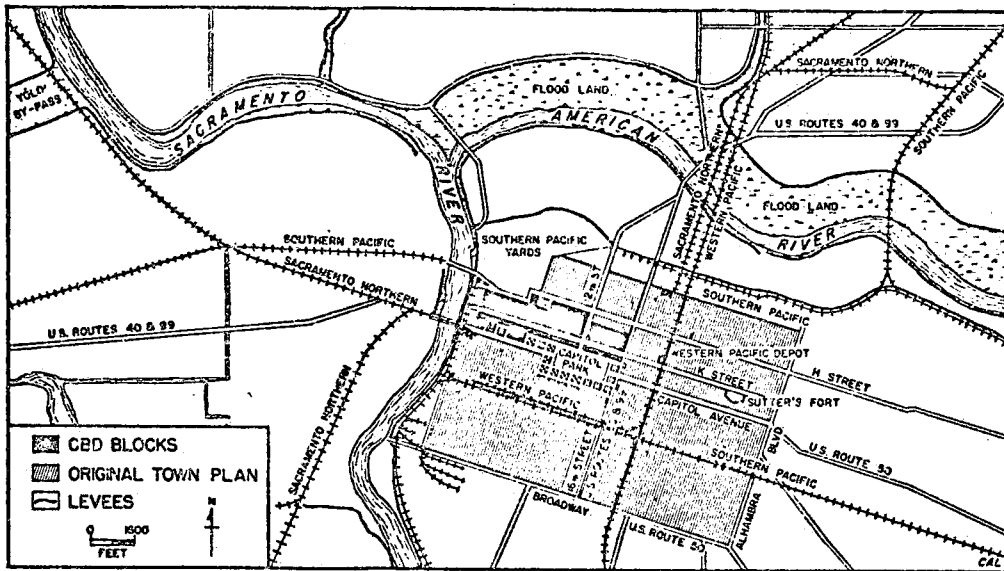


FIG. 12. Sacramento occupies a portion of the flood plain of the Sacramento River. Its CBD originated near the river but owes its present elongated shape to barriers which have prevented expansion except in an E-SE direction. Compare with Figure 11 and Figure 23.

storied buildings, now used for housing and particularly serving the needs of the large transient labor force which characterizes this part of California. In contrast, at the eastern edge of the District one finds an area of single-storied, relatively new buildings, erected during the automobile era and oriented toward serving motor-borne customers. Midway between these contrasting areas lies the core of the District, with its department stores, associated retail establishments, and the few tall office buildings of the city. The combination of these three rather distinct parts of Sacramento's CBD results in a District that is large, with relatively low buildings, a District whose intensity index is low for so young a city.

The non-central location of Sacramento's CBD with respect to its urbanized area is striking and can be explained by several factors (Fig. 11). In the first place, the city developed as a port, which always seems to work against a central position for a CBD. The low, marshy character of the Yolo

flood-water by-pass to the west of the city discouraged growth of the urbanized area in that direction and so tended to leave the CBD off center. The growth of city toward the east may have been intensified somewhat by its close ties with the Mother Lode country in the foothills of the Sierras. Though the CBD has expanded eastward, too, it has not been able to keep pace with the eastward expansion of the urbanized area. This is brought out by the fact that there are several outlying shopping centers in this direction which compete with the CBD.

Although Sacramento is classed as a government center (Table III), this classification does not fully describe the economic support of the city. Basically, Sacramento is the major trade center for the whole Sacramento Valley, and it lies between this rich agricultural region and any possible rival, whether San Francisco or Stockton. The nine-county Curtis Market Area of 9146 square miles, the area most intimately tied to Sacramento, is the third largest

market area among the cities studied (Fig. 4). Sacramento's CBD is large, partly because the city is the State Capital and partly because the District is expanding rapidly eastward. But undoubtedly the considerable size of the CBD also reflects Sacramento's rich tributary region, which makes it one of the most dynamic cities of the United States.

Phoenix

Phoenix is a young city. It started as an agricultural settlement in 1864, and by 1870 the first extensive irrigation works were begun. With the completion of the large Salt River Valley project in 1911, the city developed as a regional trade center for a rich agricultural area. After serving as territorial capital, it became State Capital in 1912. Winter warmth that made agriculture productive as soon as water was supplied also made the valley attractive to tourists. After World War I, the population of Phoenix, together with

its immediate vicinity, continued to grow rapidly, partly as a result of the rise of manufacturing (Fig. 1).

The site of Phoenix is flat and nearly featureless (Fig. 14). About five miles north of the CBD, and a similar distance to the south, steep ranges break the very gentle slope of the alluvial fans within the valley. However, near the center of the city no appreciable slope is found, and the Salt River, itself, is located about a mile and a half south of the CBD. Thus, natural barriers to the expansion of the CBD are absent. Only the tracks of the Southern Pacific Railroad, a block and a half south of the District, can be thought of as barring normal expansion.

With an open site on which to grow, and with the needs of the automobile era paramount, Phoenix's CBD has become almost a textbook example of a low Western city. The District is fairly large, exceeded in area only by the CBDs of Sacramento, Salt Lake City, and Tulsa, and it has the lowest average

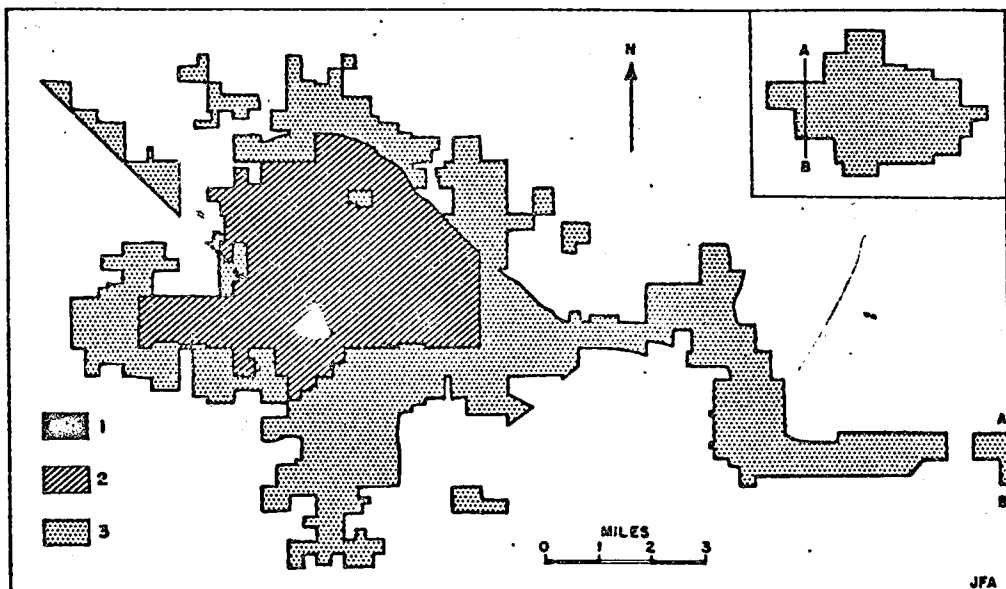


FIG. 13. Phoenix's CBD in relation to the incorporated city and its urbanized area. Compiled from United States Census maps. Numbers refer as follows: 1. CBD as delimited in first article of this series; 2. remainder of incorporated city; 3. urbanized area extensions beyond incorporated city.

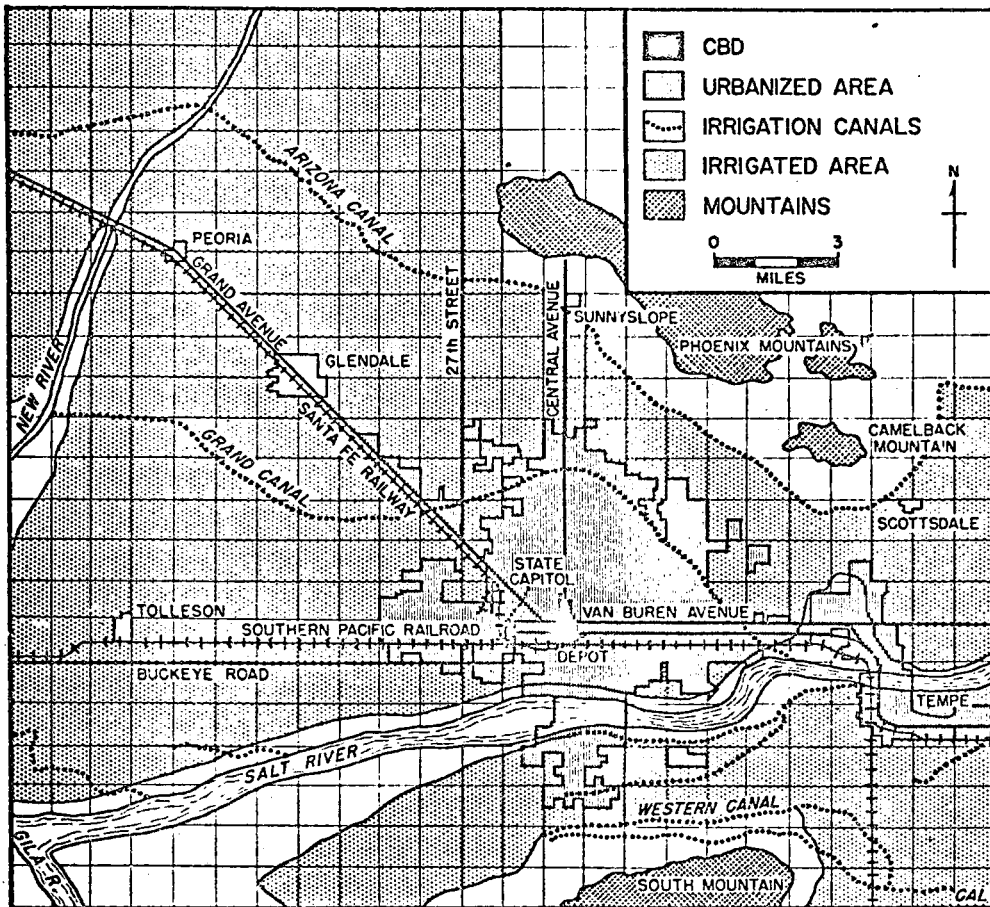


FIG. 14. Phoenix developed on the flats of the Salt River in a particularly good locality for serving the irrigated lands of the valley. The white areas on the map are unirrigated lowlands. The grid shown in the flat lowlands represents the sections of the Congressional township survey separated by section line roads. Compare with Figure 13.

building height of any of the CBDs (Table I).

Phoenix's recent urban growth has led to a neat segregation of uses within the city. Retail uses dominate the CBD with little of the admixture of industry, wholesaling, and residence characteristic of older, Eastern cities (Fig. 25). For this reason, the Phoenix CBD has an extremely high intensity index, higher than any other Western city studied except Tulsa.

Phoenix has a few moderately tall buildings. Since there is no serious lack of space, this vertical expansion may be

explained more by the demands of local pride and the current desire for office space in tall, named buildings than by real necessity. This combination of low, generally single-story retail buildings and a few tall office buildings and hotels means that there are few two-, three-, and four-story buildings. In older cities, these are the buildings that tend to remain unused in their upper stories and thus increase the percentage of vacancy. Phoenix has very little vacancy in its CBD.

Phoenix is the only city studied whose CBD is laid out in complete conformity

with the Congressional township grid. The shape of the District reflects this adjustment very well. Its shape is somewhat like that of an isosceles triangle, with the base parallel to the railroad and the apex extended far to the north along the major axis of the District. That the CBD did not reach south along this axis is no doubt due to the reluctance that arises to extending a CBD across a railroad. The main east-west axis parallel to the railroad is well developed, giving the CBD almost as much length in this direction as it has north and south. The relatively uniform block size within the CBD makes such symmetry possible, particularly since the blocks are small—much smaller than those of Salt Lake City.

Though the railroad has curtailed the

TABLE III

ECONOMIC CLASSIFICATION OF THE NINE CITIES
(After Victor Jones, "Economic Classification of
Cities and Metropolitan Areas," Municipal Year
Book, 1954, pp. 62-70 and Table IV)

<i>Symbol Classification</i>	
Grand Rapids.....Mm.....	Manufacturing
Mobile.....Rm.....	Diversified, with retail trade predominant
Phoenix.....Rr.....	Retail
Roanoke.....Rm.....	Diversified, with retail trade predominant
Sacramento.....G.....	Government center
Salt Lake City.....W.....	Wholesale
Tacoma.....Mr.....	Diversified, with manufacturing predominant
Tulsa.....Rm.....	Diversified, with retail trade predominant
Worcester.....Mm.....	Manufacturing

Mm—employment in manufactures 50 per cent or more of aggregate employment in manufactures, trade, and service establishments (excluding hotels and amusements), and employment in retail trade less than 30 per cent.
Rm—retail trade predominant and with employment in manufacturing more than 20 per cent but less than 50 per cent.

Rr—employment in retail trade greater than employment in any other category and employment in manufacturing less than 20 per cent.

G—15 per cent or more of labor force resident in city employed in governmental service.

W—number employed in wholesale trade at least 25 per cent of aggregate employment in manufacturing, trade, and service.

Mr—employment in manufacturing less than 50 per cent of the aggregate employment but greater than employment in retail trade.

growth of the CBD to the south, rail transportation has not been as important to Phoenix as to most cities. Since the city in its early days was the capital of a thinly populated area, the main transcontinental line of the Southern Pacific was not shifted to Phoenix until as late as 1926. For this reason the automobile has played a large role in Phoenix and the CBD has been free to adjust itself to the needs of the automobile age.

Phoenix's trading area is large, but somewhat limited in population. Its Curtis Market Area, made up primarily of the irrigated oasis of the Salt River Valley and the adjacent mining country, is 19,000 square miles in extent (Fig. 4). However, due in part to its capital function and in part to the high mobility of the population, Phoenix can call the State of Arizona its tributary region. In fact, the nearest trade centers of competitive size are Los Angeles, nearly 400 miles to the west, and Albuquerque, a similar distance to the east. Salt Lake City is a difficult 500 miles to the north. Even the smaller cities such as Prescott and Tucson are more than a hundred miles away.

Tulsa

Tulsa is young among the cities of this study. From a small village in 1900, it grew in half a century to a city of nearly 200,000 (Fig. 1). Salt Lake City and Sacramento are at least twice as old, and Worcester and Mobile are four or five times as old. Nevertheless, Tulsa is the most metropolitan of the cities studied and contains the most impressive CBD. Jutting up from the nearly featureless plain of northeastern Oklahoma, Tulsa's group of skyscrapers announces the city's importance long before the outlying residential areas have been reached.

Young as Tulsa is, it is a product of

the railroad age, for it was located where the Saint Louis and San Francisco (Frisco) Railway crossed the Arkansas River. In addition, the railroad accounts for the peculiar orientation of Tulsa's CBD, which does not conform to the normal Congressional township grid that blankets this area. Instead, the District stands at a right angle to the main line of the Frisco. The railroad gave Tulsa its first impetus and oriented its CBD, but it was the development of oil fields near by that caused the city's really phenomenal growth and created its core of high office buildings.

In a sense, Tulsa's CBD is an anachronism. Though Tulsa is located well to the west of the Mississippi River, its CBD, in being high in proportion to its area, is more like those of Worcester and Grand Rapids than like the CBD of a Western city. This is not what one would expect of a city that has grown up almost entirely in the automobile age. But, unlike the CBDs of Worcester and Grand Rapids, Tulsa's business district has a high Central Business Intensity Index (Table I). This seems to be characteristic of all the younger cities of this study. Tulsa has the highest and most modern buildings, the highest proportion of office space, and the least vacancy of any of the nine cities. This may be explained by the fact that Tulsa was built primarily as an office city, and, since it is only about half a century old, there is little obsolescence.

The city of Tulsa has spread easily to the north, east, and south, but it has been blocked to some extent from an equal spread to the west by the presence of the Arkansas River, the Frisco Railway, and a whole battery of oil refineries and storage tanks (Fig. 16). For this reason the CBD lies definitely off center in the city and in the urbanized area (Fig. 15). The CBD, itself, is

bordered by the main line of the Frisco Railway in the north-northwest and by the Midland Valley Railroad in the east. These railroad barriers combine with slightly lower land in the west-southwest to funnel any extension of the District generally southward along Main Street and the parallel streets, Boston and Boulder Avenues. The fact that Main Street is very little more dominant than Boston Avenue as the chief axis of the CBD has led to the development of a District which, though elongated, is also rather broad.

The peak value point of the CBD has shown a definite tendency to migrate to the southeast. It started in the northwest at a junction of the main line of the Frisco Railway with a siding, at First and Main Streets, and has moved four blocks in the intervening years. It appears to be moving on toward the next intersection at the present time. In fact, the whole District seems to be growing in that direction and to be pulling away from its point of origin.

Tulsa, with its hundreds of offices associated with the oil industry, stands alone among the nine cities as an office city. For a number of years it has been a major headquarters center for all sorts of prospecting, refining, and sales operations within the Mid-Continent Oil Field. So many concerns engaged in these activities have central or regional offices in Tulsa that they account for 17 or 18 per cent of all the CBD space (Fig. 25). The petroleum industry and the services it requires undoubtedly go far toward explaining the presence of general offices, too, which require an equal amount of CBD space. All in all, offices account for more than one-third of Tulsa's CBD floor space.

Tulsa has more clerical workers and more retail trade employees than any other of the nine cities. Its market area, chiefly northeastern Oklahoma, is

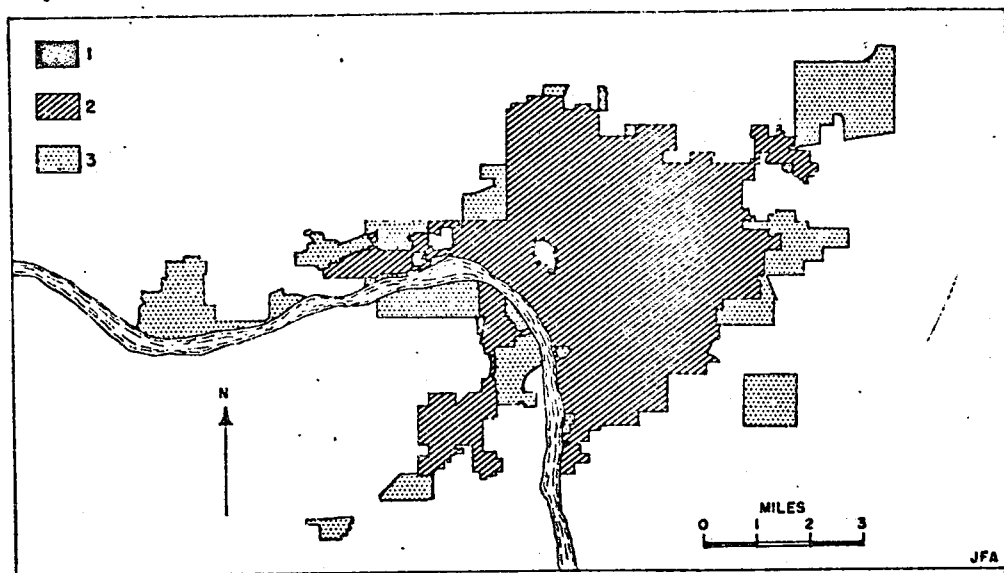


FIG. 15. Tulsa's CBD in relation to the incorporated city and its urbanized area. Compiled from United States Census maps. Numbers refer as follows: 1. CBD as delimited in first article of this series; 2. remainder of incorporated city; 3. urbanized area extensions beyond incorporated city.

7000 square miles in extent (Fig. 4), but it is significant that half the population of the market area lies in Tulsa's urbanized area. This suggests that Tulsa is its own best customer. Apparently, the large employment in offices results in a large local retail market.

Mobile

Mobile Bay, a deep inlet in the Gulf Coast, ends at the north in a maze of marshy patches separated by wide but shallow indentations (Fig. 17). Only the bay's eastern and western shores provided suitable sites for port and city development, and the western shore was the better of the two, being somewhat lower and hence better for dock space and settlement than the eastern shore. Here, French colonists established a village as early as 1710, and the city of Mobile grew up on this spot.

Mobile is one of three ports considered in this study, and it is also the oldest of the cities studied. Although it achieved the stature of a small city

early in the 19th century, it stagnated after the Civil War (Fig. 1). But, with the building of the Alabama State Docks, the city began a new period of progress, and it is still growing rapidly.

As a port, Mobile draws upon a large hinterland. It is Alabama's sole outlet to the sea, and the state is an important producer of heavy industrial products, lumber, and cotton. Much of this produce finds its way to Mobile by means of the Warrior-Tombigbee waterway, one of the major canal systems of the South. Because Mobile is so vital to the state's economy, large sums of money have been spent to give the city some of the most modern port facilities in the United States. But the port of Mobile draws upon a wider hinterland than Alabama, for north-south rail routes tie the industrial Middle West to the Gulf at this point.

Mobile is rapidly changing from its role as a minor Southern port to one of the nation's major seaports, and the city is developing industrially as well.

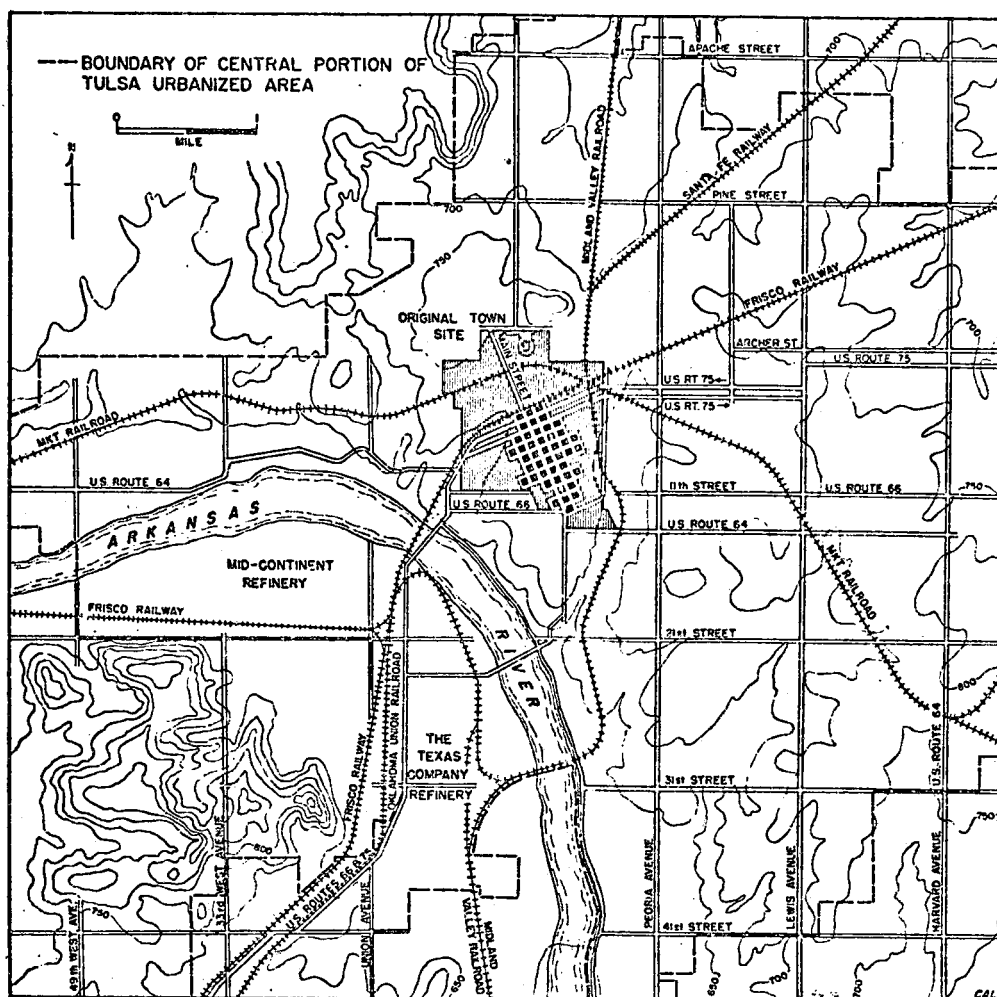


FIG. 16. The pattern of Tulsa's CBD is notably at variance with the survey system of the region. The district was laid out at right angles to a railroad. Compare with Figure 15. (Contour Interval: 50 feet.)

But Mobile's CBD does not live up to the city's current importance. It is small in area and most of its buildings are of only medium height. It is the least modern of any CBD analyzed in this study. Extremely narrow streets are lined by partially-used buildings that give an impression of decadence, out of character in so dynamic a city.

Mobile's CBD has the highest proportion of vacancy of any of the nine cities, 9.4 per cent (Fig. 25). This may be due to the fact that the District is characterized by old, two-, three-, and four-

story buildings. It seems to be true that people who rent space in a CBD, today, want either of two types of location. They want ground-floor sites that are useful for retailing, or they want office space in tall buildings. Second, third, and fourth floors, of old, low buildings are not in demand. Where a city has an inheritance of old, multi-storied buildings, vacancy is likely to result. Such is the case in Mobile.

That steps are being taken to correct this situation in Mobile can be seen in the construction of new office buildings.

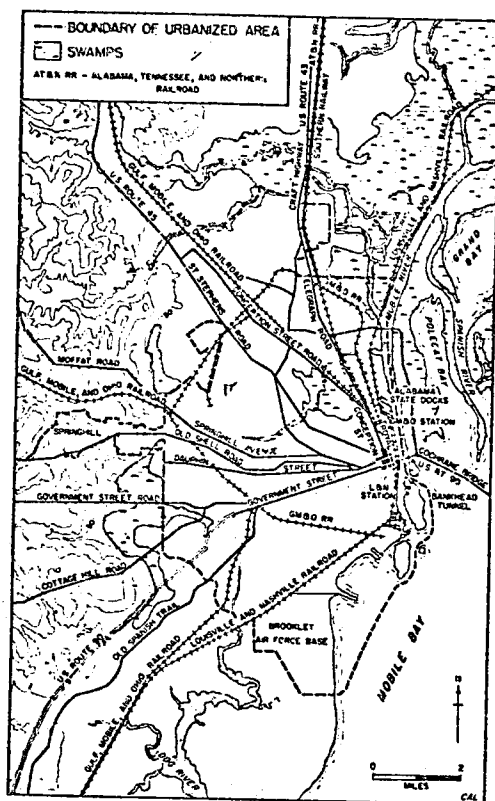


FIG. 17. The city of Mobile developed on the western shore of Mobile Bay. The CBD, like those of most port cities, has become less and less "central" as the city has grown. Compare with Figure 18.

The Gulf, Mobile, and Ohio Railroad Building, and the Waterman Steamship Company Building have been built since World War II to provide office space in the type of tall buildings in current demand.

In contrast to Tacoma's CBD, Mobile's has a low Central Business Intensity Index, almost as low as that for Worcester (Table I). The District gives the appearance of being greatly overexpanded in spite of its small size. This might be expected of a city that had reached its peak of population growth and had fallen into decline, but it does not seem logical in a city that is growing as is Mobile. One reason for Mobile's CBD being small in proportion to the city's population may be the

presence of a separate Negro shopping district north of the main CBD. A combination of these two districts might make a single CBD that would be more in proportion to the city's population.

Mobile's CBD is not greatly hampered by barriers (Fig. 23), but the water front, reinforced by the Louisville and Nashville Railroad, does tend to block growth toward the east. And there is a group of government buildings that hampers growth to the south. Most of the District's expansion has been toward the north and west. There has been, however, very little movement of the peak value intersection, probably because the city's population remained nearly static for so many decades.

Mobile's CBD, like those of other port cities, is decidedly off center with respect to the city's population (Fig. 18) and with respect to its market area as well (Fig. 4). In its capacity as a market center, Mobile serves the coastal plain sections of eastern Mississippi and southern Alabama as far north as the Black Belt. This function may not

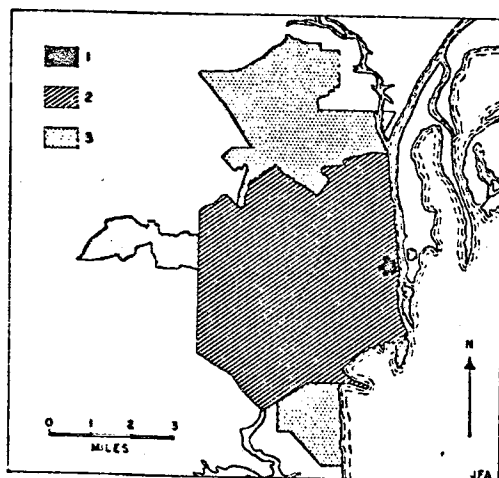


FIG. 18. Mobile's CBD in relation to the incorporated city and its urbanized area. Compiled from United States Census maps. Numbers refer as follows: 1. CBD as delimited in first article of this series; 2. remainder of incorporated city; 3. urbanized area extensions beyond incorporated city.

seem to be as important as Mobile's port function, but it is significant enough to cause Mobile to be classed as a diversified city with retailing predominant (Table III). Mobile's CBD will probably continue to be off center with respect to the urbanized area in spite of efforts to link the city with the eastern shore of Mobile Bay by means of a bridge and a tunnel.⁵

Roanoke

Roanoke is young as compared with most cities of the East (Fig. 1). Its development is explained in considerable part by the activities of the Norfolk and Western Railway. The real growth of the city dates from the 1880's, when the newly organized Norfolk and Western Railway moved its offices from Lynchburg to Roanoke, and the Roanoke Machine Works became the Roanoke Shops of the railroad. At the time it was chartered as a city, in the 1880's, Roanoke had a population of only 5000, but in that and following decades the city grew rapidly until today it has approximately 100,000 residents.

Relief features are important in explaining the location of the city and the trend of its railroads. The city lies in the Great Valley at the western base of the Blue Ridge (Fig. 20). Ridges dominate this section of the Valley, but the Roanoke River and its tributaries have developed a basin in which Roanoke is situated. The meandering river takes a west to east course across the lowland. In approaching Roanoke from the west the Norfolk and Western Railway follows the meanders of the river, but about at the city boundary the tracks branch. The main line leaves the river and takes a course that roughly

bisects the city. A second railroad, the Virginian Railway, follows the river more closely and plays little part in the pattern of the CBD.

The trend of the Norfolk and Western is reflected in the city's street pattern: one set of streets tends to parallel the slightly curving east-west course of the railroad, and most of the blocks of the main body of the city are elongated in an east-west direction. This elongation of blocks may be seen in the CBD and also the tendency of the east-west streets to parallel the course of the railroad.

Though the chief role of the Norfolk and Western was that of getting the city started, the company is still Roanoke's largest single employer. But Roanoke is by no means a one-industry city. Trade and manufacturing now overshadow transportation in employment. A recent economic classification shows Roanoke as a diversified city with retail trade predominant rather than as a transportation center (Table III).

Let us consider Roanoke as a retail trading center. Most of the trade is drawn from the city itself, with Roanoke County forming a second-level hinterland. But it should be noted that Roanoke is the largest city in a rather large area. This third-level retail hinterland is represented by the 7000-square mile Roanoke Market Area delimited by the Curtis Publishing Company (Fig. 4).

Since Roanoke is the smallest in population of the nine cities, it might be expected that the city's CBD would have a corresponding rank in area and floor-space measures (Table I). The fact that, instead, it ranks seventh among the nine in these respects reflects in part a northward extension of the CBD across the Norfolk and Western tracks, an extension consisting of a hotel and an office block, both of which

⁵ For a more detailed consideration of Mobile see Edward L. Ullman: *Mobile: Industrial Sea-port and Trade Center*, University of Chicago, Chicago, 1943.

are Norfolk and Western Railway property.⁶ This projection beyond a railroad is a development not found in any of the other eight cities.

For a city of its size, Roanoke has a CBD that is unusually metropolitan in aspect. It ranks fourth among the nine CBDs in average height, and it has a higher proportion of available floor space devoted to central business uses than any of the others (Table I). A high central business intensity such as

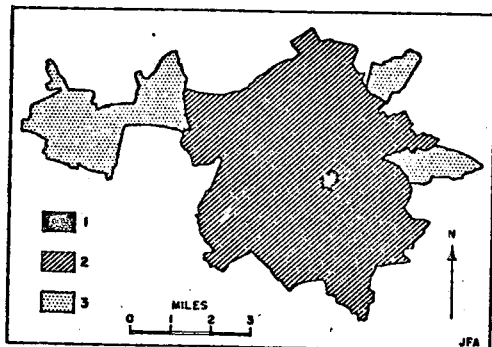


FIG. 19. Roanoke's CBD in relation to the incorporated city and its urbanized area. Compiled from United States Census maps. Numbers refer as follows: 1. CBD as delimited in first article of this series; 2. remainder of incorporated city; 3. urbanized area extensions beyond incorporated city.

this seems to be characteristic of the younger cities of the group.

A SYSTEMATIC TREATMENT OF CBD CHARACTERISTICS

The preceding section of this paper dealt with each of the nine cities and their CBDs individually. We are ready, now, to consider CBD characteristics systematically.

Size of the CBD

The popular conception of the size

⁶ The bases for including these blocks in the CBD are discussed in Murphy and Vance, *op. cit.*, pp. 218 and 221. A "Y" viaduct now being constructed to carry traffic across the Norfolk and Western tracks will improve connections between the sections of the CBD on the two sides of the railroad right of way.

of a CBD is a two-dimensional one. It is true, a CBD does occupy a certain area. But a more realistic consideration of size includes the factor of height, so that in the last analysis it is the volume of a CBD with which we are properly concerned.

Total Floor Space in the CBD.—Since story heights are essentially standard, one may think of the volume of a CBD as expressed by its total floor space. The derivation of total floor space was described in the first article of this series. (It is obtained by adding the area of the upper floors to the area of the ground floor, minus alleys.) The advantage of such a figure, as compared with CBD area, is particularly evident in the case of Tulsa, where the growth of office buildings has meant expansion of the CBD upward and hence an increase in total floor space, without a corresponding increase in CBD area.

Central Business Floor Space in the CBD.—An even better measure of CBD size is obtained by subtracting, from total floor space in the CBD, the floor space devoted to non-central business uses: residence, public and organizational functions, industry, wholesaling, and vacancy. The remainder, central business floor space (or central business space), ranges from 75.5 acres for Mobile up to 207.7 acres for Tulsa (Table I). The reasons for variation in central business space have been dealt with subjectively in the city summaries. Here, we are concerned with possible relationships between central business space and other factors.

It was assumed in advance that central business space might be closely related to the population (and possibly the buying power) of the city's market area. To test this idea, the totals of central business space for each of the cities were plotted on semilog graph paper in descending order, and on the

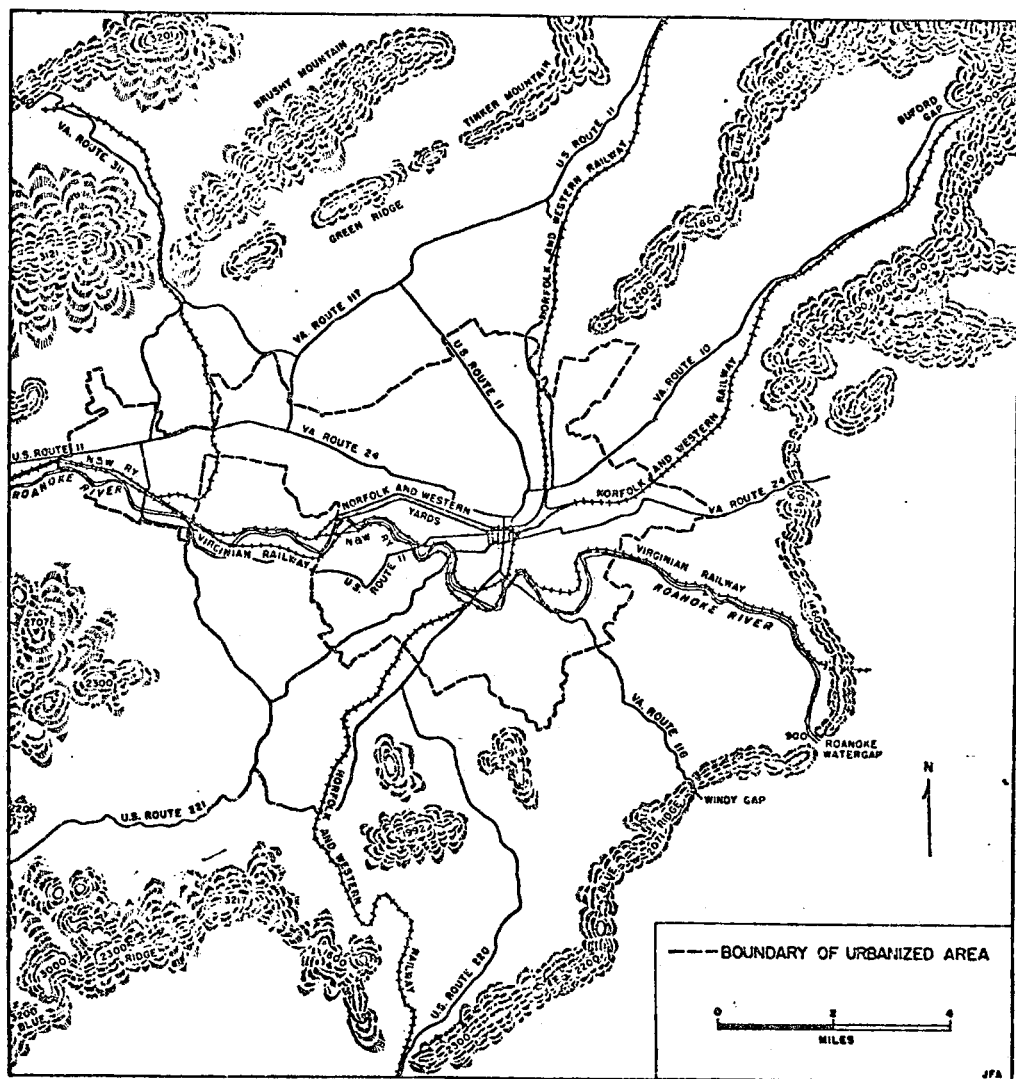


FIG. 20. Roanoke lies in a basin in the Great Valley at the western base of the Blue Ridge. The city is bisected by the main line of the Norfolk and Western Railway, and the CBD has an extension northward across the tracks. The area divided into blocks is the CBD. Compare with Figure 19.

same chart the populations of the Curtis Market Areas and the Standard Metropolitan Areas were plotted (Fig. 21, C). The fact that little, if any, correspondence of the curves is evident, suggests that CBD size is not as closely related to the population of these larger areas as has been generally supposed.

A second possibility is that central business space may vary with population of the urbanized area or of the

incorporated city. When these values are plotted against central business space it is found that, although the population of the urbanized area shows little relation to central business space, there appears to be some relationship between population of the incorporated city and central business space (Fig. 21, B).

The reason for a closer relationship of central business space to incorporated

city population than to urbanized area population may well be that the typical urbanized area contains outlying urban centers with their own stores, and that these detract from the importance of the central city's CBD. This appears to be the case in Phoenix, where several outlying centers are large enough to compete materially for some of the business of the central district.

Since CBDs are areas of trade and office activities, Census data representing these activities were compared with central business space (Fig. 21, D-G). The fact that the numbers of clerical workers, sales workers, retail trade employees, and wholesale trade employees vary rather closely with central business space may not be surprising, but study of the chart serves to bring out several interesting points. First, central business space seems to vary more closely with incorporated city data than with urbanized area data, thus tending to confirm the idea that the size of the CBD depends more upon the incorporated city than upon the adjacent built-up areas. Second, the rather close correspondence between variation in central business space and variations based upon the several Census items serves as a rough verification of the techniques used in this study. Third, the variation in central business space corresponds so closely to that of retail and wholesale employees in each city that one could almost use the number of these employees to estimate the central business space. Each thousand retail trade employees in the incorporated city, for example, appears to mean some 12 to 13 acres of central business floor space. It should be emphasized, however, that these tentative conclusions are based on a limited number of cities of moderate size.

Shape of the CBD

As was brought out in the discussion of size, the CBD of a city is three-dimensional, but this shape is hard to evaluate and hard to express. Hence, most discussions of CBD shape have concentrated on the plan view or outline.

CBD Outline.—When the CBDs of the nine cities are presented on a single chart, a striking variety of outlines appears (Fig. 22). The course of each boundary is largely the result of block shapes, since blocks were the units used in delimitation. There are many right angles, reflecting the predominance of grid street patterns. Even Worcester, whose street pattern departs farthest from a grid, has many angles in its CBD boundary that approach right angles. Had the delimitation technique been based on lots, the boundaries of the various CBDs would have shown much the same irregularity but finer detail (see Figure 3 in the first article of this series). Coarseness of outline is particularly noticeable in the CBD of Salt Lake City, a result of the fact that average block size is more than three times that of any of the other eight districts (Table I).

Looking broadly at the CBD outlines, one sees little evidence of the star-like pattern, or of the "tilted square or diamond" pattern, that has been postulated as the theoretical shape of a CBD.⁷ The former is hardly to be expected since none of the CBDs studied here has radial streets sufficient in number to result in such an outline. But since grid patterns predominate, and since in many instances the CBD has two principal, intersecting (and hence radial) streets, we might expect a tilted square

⁷ George W. Hartman: "The Central Business District—A Study in Urban Geography," *Econ. Geog.*, Vol. 26, 1950, pp. 237-244, reference on p. 239.

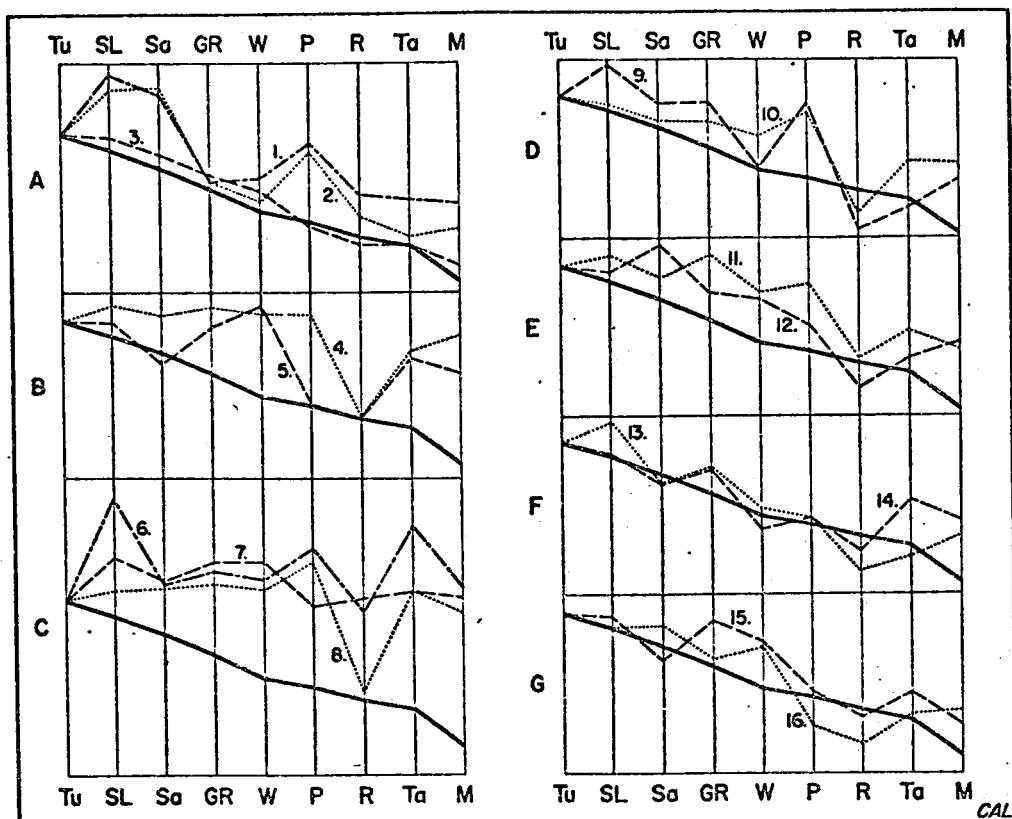


FIG. 21. In this semilog chart the city to city variation in CBD size (central business space in the CBD) is compared with the city to city variation in other data. In each section, CBD size has been plotted as a solid line. Connecting the plotted points gives a line with which other curves can be compared to test the degree to which the several factors vary from city to city at the same rate as central business space. No absolute values are indicated, as it is only the shapes of the curves that are being compared. To facilitate comparison, all curves in each section have been shifted so that they have the same starting point.

The numbers refer as follows: 1. ground floor area; 2. gross area of CBD; 3. total CBD space; 4. population of urbanized area; 5. population of incorporated city; 6. area of urbanized area; 7. population of Curtis Market Area; 8. population of Standard Metropolitan Area; 9. wholesale employees in urbanized area; 10. retail employees in urbanized area; 11. sales workers in urbanized area; 12. clerical and kindred workers in urbanized area; 13. wholesale employees in incorporated city; 14. retail employees in incorporated city; 15. sales workers in incorporated city; 16. clerical and kindred workers in incorporated city.

Section A tests the degree to which total area, ground floor area, and total space in the CBD vary with central business space. The lack of correspondence of the area curves and the space curves reflects chiefly variations in average building height in the CBD from city to city. In Section B the possible relationships between population data for the incorporated city and for the urbanized area and central business space are investigated. It is clear that central business space varies more closely with incorporated city population than with that of the urbanized area. In Section C the lack of significant relationships between central business space and area of urbanized area, population of Curtis Market Area, and population of the S.M.A. is obvious. From Sections D and E it is apparent that certain trade and employment data for the urbanized area vary significantly with central business space. Finally, Sections F and G make it clear that these same factors for the incorporated city are even more closely related to central business space.

For basic data and for sources of data see Tables I and II.

or diamond. A suggestion of this pattern may be seen in the northeastern quadrant of Phoenix's CBD.

However, it seems unrealistic to think of the space between the radial streets as having been filled in sufficiently to form a true diamond, since location on or near one or the other of the radial streets is so important for central business functions. Filling in of the CBD between the radials goes on near the

in the first article of this series). It is likely that the current ribbon development along streets leading away from the CBDs of various cities is causing the Districts to approximate more and more the quadrate cross.

The concept of an idealized outline, whether quadrate cross or diamond, is based on the idea of two intersecting thoroughfares of equal importance. Actually, this perfect balance is probably never found, so no district can be expected to achieve more than a rough resemblance to a theoretical shape. When the two intersecting thoroughfares differ considerably in importance, the district becomes elongated along one axis. The shapes presented by the CBDs of the nine cities might be classified as follows: (1) fairly equivalent intersecting axes, an approximation of a quadrate cross—Roanoke, Mobile, and, to a certain degree, Phoenix and Worcester; (2) dominant single street, with resulting elongation of the CBD—Worcester, Grand Rapids, Sacramento; (3) parallel streets that exceed in importance any crossing street, with a resulting block-like CBD—Tulsa, Salt Lake City, and possibly Tacoma.

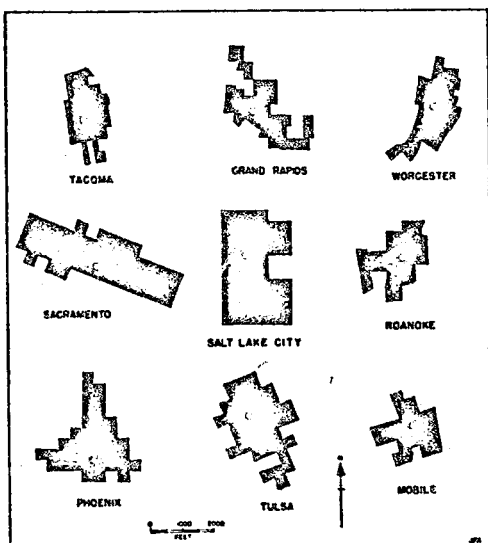


FIG. 22. Plan view of the CBDs. Each peak land value intersection appears as a white dot. Compare with Figure 23.

peak value intersection, but with increasing distance from the center these "in between" areas rapidly lose their attractiveness for central business activities. Instead of a diamond, therefore, the idealized outline seems to be more nearly one of a four-pointed area with concave sides, or, better still, to approximate a quadrate cross (Fig. 24). There is a suggestion of this shape in the CBD outlines of Phoenix, Roanoke, and Mobile. And, although it is not much in evidence in the outline of Worcester's CBD in Figure 22, it is clearly shown on the map of the district delimited on a lot basis (see Figure 2

The CBD as a Three-dimensional Figure.—But the CBD, as we have pointed out, is not just two-dimensional. It is a solid, and might well be thought of as some modification of a pyramid. If we follow the idea of the CBD outline being diamond-shaped, then the pyramid would have a square base, and each of its four corners would rest on one of the four radiating streets. If, however, we follow the idea of the quadrate cross in place of a diamond, the solid would no longer be a simple pyramid, but would have to be modified accordingly.

Since the modifications would be difficult to compute and would not greatly change the results, it is sufficient for our purpose at the moment to concen-

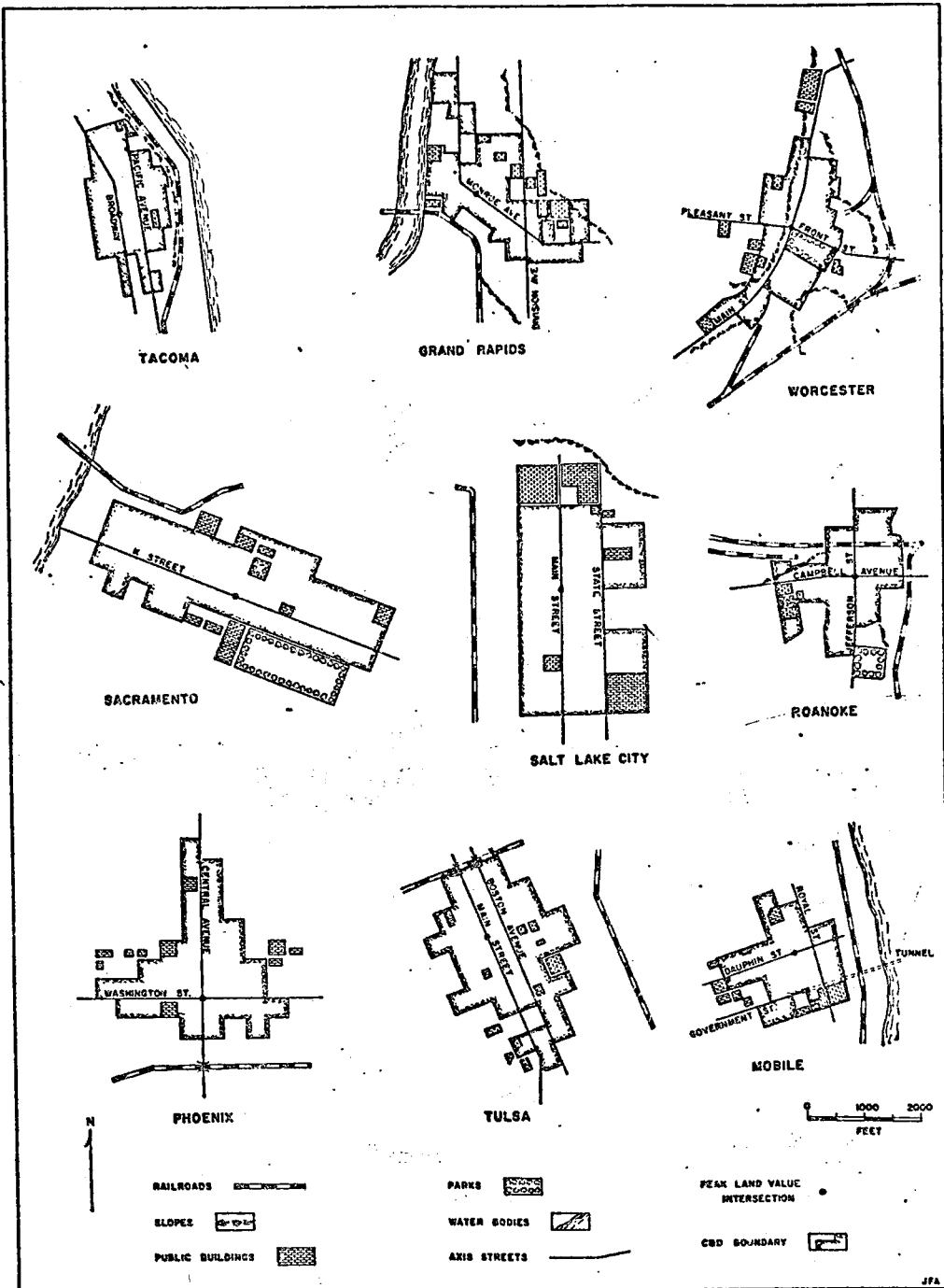


FIG. 23. Barriers have affected the shape of the CBD through limiting expansion in certain directions.

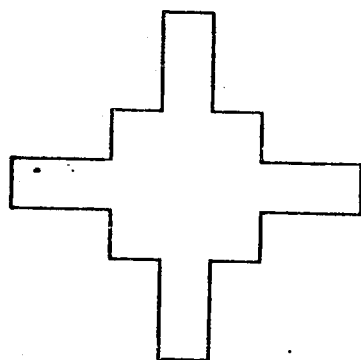


FIG. 24. A quadrate cross. This seems best to represent the idealized outline of the CBD.

trate upon the idea of the CBD corresponding to a pyramid-like figure. The base corresponds to the ground floor area of the CBD (Table I). The volume amounts to the central business floor space in the CBD (Table I), which, as was pointed out earlier, may be thought of as volume if a uniform story-height is assumed. The height may be calculated by using the formula $V = 1/3 Bh$. Applying this formula to each of the nine CBDs the following pyramid heights are obtained: Tulsa, 7.8 stories; Grand Rapids, 7.2 stories; Worcester, 6.0 stories; Roanoke, 5.8 stories; Tacoma, 5.7 stories; Salt Lake City, 4.6 stories; Sacramento, 4.6 stories; Mobile, 4.5 stories; and Phoenix, 4.4 stories.

This concept is admittedly theoretical, but there is some value in thinking of it in connection with the CBD. The height of the pyramid as computed here is a way of expressing the relation of the ground floor area to the central business floor space. In other words, it relates areal size of the CBD to volume.

There is a mathematical relationship between the height of the CBD pyramid and the Central Business Height Index (Table I). The Index is computed by dividing the total floor space devoted to central business uses by the total ground floor space of the CBD. Hence,

the Central Business Height Index amounts to one-third as many stories as the peak of the pyramid.⁸

Neither the pyramid heights nor the Central Business Height Indexes are more than theoretical, of course. The Central Business Height Index assumes that central business uses are spread evenly over the district, which we know is not the case. On the other hand, the height of the pyramid assumes that central business uses tend to pile up, reaching a peak at the geographic center of the CBD, which we know is not exactly the case, either, though it does come closer to describing the actual situation.

Factors that Limit CBD Expansion.—

To what extent is the shape of a CBD related to the barriers that surround or interrupt it? The subject of barriers was discussed earlier as it arose in the case of each of the CBDs. At this point we need only to summarize and generalize our findings. That there are barriers to the expansion of a CBD is obvious. Railroads, water bodies, areas devoted to public buildings, and a variety of other tangible land uses act as barriers. In some cases, the CBD may approach the barrier closely. This usually happens with public buildings, where the CBD may be adjacent to them or occasionally surround them. It happens also in the case of parks. But, where there are railroad and water barriers, the CBD does not, usually, abut directly upon these barriers. There is commonly a cushion of other uses between the CBD and the barrier.

Relief as a barrier deserves special mention. There is no doubt that steep slopes serve as an obstacle to CBD

⁸ Applying the formula for the volume of a pyramid to the CBD, it can be written as follows: central business floor space = $1/3$ (total ground floor space) h . Then $h = 3$ (central business space \div total ground floor space) or $h = 3$ (Central Business Height Index).

development; if it is at all possible, steep slopes are avoided. But we have examples where steep slopes have been used, just as we have one example in the nine cities of the CBD crossing a railroad.

Just how important these tangible barriers are in helping to determine the shape of a CBD is difficult to assay. Grand Rapids and Worcester, both of which have tall, compact CBDs, are hampered by barriers (Fig. 23). But Tulsa's CBD, which is even taller and even more compact, is not particularly restricted by tangible barriers. Obviously, there are other barriers to the expansion of a CBD than tangible, physical ones.

It has been suggested that CBDs tend to be limited by a distance factor. The district has been called a "walking zone." Since people usually walk from one part of the CBD to another, there is a certain amount of reluctance to use areas that are located too far from the peak value intersection for easy walking. In American cities of the size here considered, however, the distance factor is offset by the fact that in marginal sections of a CBD, where space is more available for parking, the automobile can be used. There seems to be a marginal zone in a normal CBD that might be called the automobile-oriented zone. Perhaps the walking zone is coincident with the so-called hard core of the CBD, and the automobile-oriented zone is related to the part of the CBD that lies outside the hard core.⁹

However, sooner or later, the CBD comes to an edge where other uses take over and the combination of floors of central business use plus the intensity of such use does not warrant including a block in the CBD. This will happen

in CBDs that are uninhibited by barriers as well as in those that are more restricted. But no doubt the breaking point comes sooner in a direction in which a CBD has to overcome tangible barriers than it does in other directions.

Land Use in the CBD

Even more important than the size and shape of the CBD, are the ways in which the district is occupied and used.

Land use proportions for each of the nine CBDs and for an average of all of them are shown in summary form in Figure 25. The chart serves, first of all, to give a picture of the land uses that one may expect to find in the average CBD. It can be used in other ways as well. One can see, for example, the land use pattern of each of the nine CBDs. But individual CBDs were discussed in an earlier section of this paper in connection with the cities they serve. Here, we will consider land use types and groups of land use types to see how their proportions vary from city to city, and why.

Non-central Business Uses and the Central Business Intensity Index.—Looking at the three major divisions of the land use chart, it can be seen that one of these groups consists of non-central business uses, and that both of the other groups consist of central business uses. The chart presents graphically, therefore, the Central Business Intensity Index, i.e., the proportion of all CBD floor space that is devoted to central business uses. It is immediately apparent that Roanoke, Tulsa, and Phoenix have the smallest proportions of non-central business uses; in other words, they have the highest Central Business Intensity Indexes (Table I). All three of these cities are young. By the time they were built, there was little demand for space at the center of the city except for true central business uses. It can

⁹ Murphy and Vance, *op. cit.*, p. 192 and Fig. 2, p. 193.

be seen from the chart, too, that these cities have the lowest percentages of central business space devoted to industry, and that all three are below average in residential land use.

Worcester's CBD is at the opposite end of the scale, with the lowest Central Business Intensity Index of the nine. This is partly because the city devotes more central business space to industry and to residences than do most of the other cities, a condition that is largely a reflection of prevailing custom in New England at the time Worcester developed. Moreover, a large Common and the presence of much church property gives the district an unusually large proportion of public and organizational land use. Mobile's CBD, with almost as low an intensity index as Worcester's, has a large amount of upper story vacancy, apparently the result of overbuilding of two- and three-story structures in the past. Both of these cities are above average in the proportion of space devoted to wholesaling, though the proportion is higher still in Salt Lake City, which is known for its specialization in wholesaling (Table III).

Service, Financial, and Office Uses.—A second major group shown on the chart is "service, financial, and office uses." Tulsa's CBD has the highest proportion of space in this group, reflecting, of course, its great development of offices, both "headquarters" and general. Grand Rapids is second in its proportion of space in this group, and here, too, the explanation is the large office development. This high proportion of office space reflects Grand Rapids' importance as a regional trade and service center, a point that is often overlooked because of the city's importance as an industrial center. Worcester and Mobile have the lowest percentage of CBD space devoted to service, financial, and office uses. To some extent these two

cities may be overshadowed by near-by, larger centers—Boston, in the case of Worcester, and New Orleans, in the case of Mobile. But, in addition to this, for reasons mentioned earlier, their proportions of non-central business space are large, and this tends to keep down their percentages in other groups.

Another point of interest in connection with this group of land uses is the large development in Roanoke and Sacramento of transient residence, a land use made up chiefly by hotels. Roanoke's situation is explained, in considerable part, by a large hotel and grounds operated by the Norfolk and Western Railway. This attracts a constant stream of conventions and other regional meetings to the city. In Sacramento the situation is even clearer: the city is a state capital and also lies in a region that needs to house a large seasonal migrant labor group. These same conditions help to explain the importance of food retailing in Sacramento's CBD.

Retail Business Land Uses.—In the third group of land uses shown on the chart, "retail business uses," it will be noted that Tacoma and Roanoke rank first and second, and that Phoenix ranks third. As pointed out earlier, the development of Tacoma's CBD on steeply sloping land appears to have resulted in an unusual amount of ground floor retail space (see p. 312).¹⁰ The basis for Roanoke's high proportion of retail space is not so clear, although the city is known as an active retail center. The high proportion of retail business space in Phoenix is not surprising since Phoenix is regarded as a retail city (Table III).

It may be seen from the chart that

¹⁰ The high proportion of space in retail business may reflect, in part, the difficulties of mapping urban land use on a steeply sloping site. On such sites, mapping techniques that work well in flatter areas prove hard to apply.

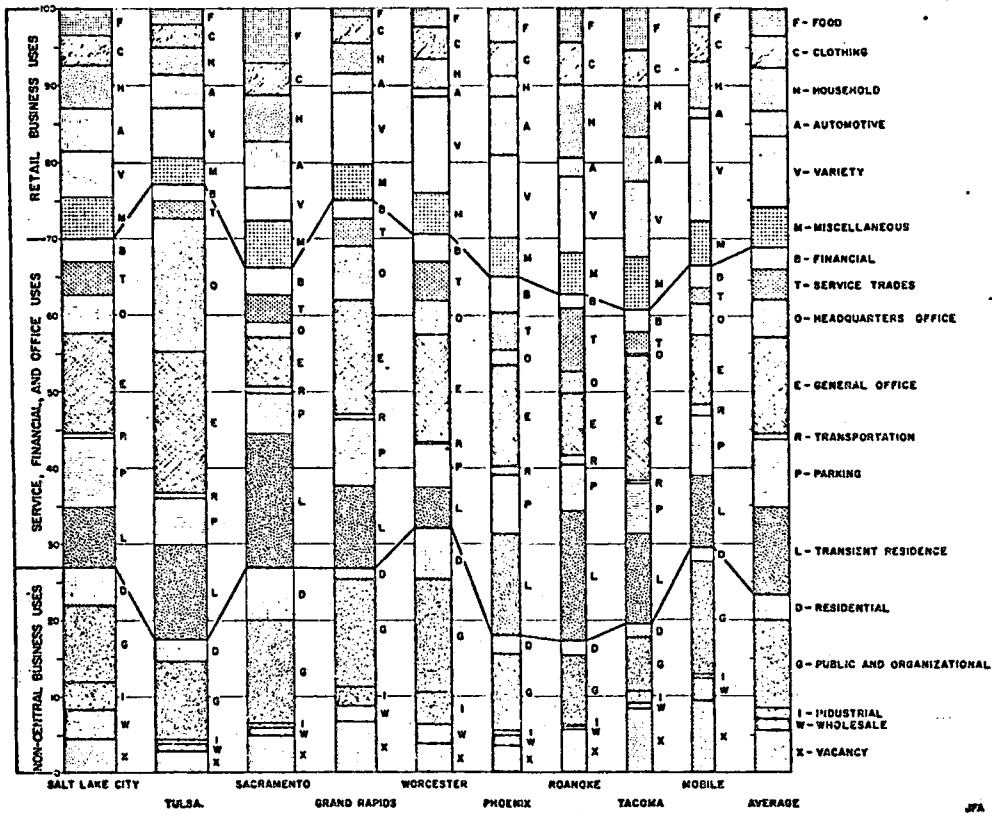


FIG. 25. Percentage chart showing proportions of total floor space of each CBD (and of an average of the CBDs) devoted to various uses. The bars are proportional in width to total floor space in the CBD. The proportions shown are based on data from field mapping carried on during 1952 and 1953.

It is important to keep in mind that the picture presented by each bar on the chart is one of land use in the CBD, not in the city. For example, a smaller proportion of automotive sales is shown for Worcester than for any of the other eight cities. This does not mean that in the city of Worcester automotive sales are less important than in the other cities. It merely means that less of this business is carried on within the Worcester CBD. Automotive sales in Worcester happen to be concentrated in several areas that are well outside the CBD.

the proportion of Tulsa's central business space devoted to retailing is less than that for any of the other cities. This does not mean, however, that the city has little retailing. As a matter of fact, it has more employees in retail trade than any of the others. But each of the bars on the chart represents 100 per cent of central business space, and offices occupy so much space in Tulsa's CBD that the percentages of space devoted to other uses are reduced accordingly. Grand Rapids' CBD, another district with more than average office development, has only a slightly

higher proportion of retail business use than Tulsa's.

From field data too detailed to be reproduced in this article, comparisons are possible within subdivisions of the chart. For example, supermarkets were mapped as one subtype under "Food." No supermarkets were recorded within the CBDs of Grand Rapids, Mobile, or Phoenix; but to some degree they were present in the CBDs of all the other cities. Yet they seem to be out of place; as a CBD function the operation of supermarkets has been declining. They are being replaced by supermarkets

farther away from the center of the city, in areas where ample parking space can be set aside.

Land Use Normal to the CBD.—Probably the most valuable purpose served by the sort of land use analysis that has just been presented is that it leads to conclusions as to which land uses are typical of a CBD and which are not. The situation is summed up in Table IV.

It is interesting to note that most of the retail types listed in Group A were mentioned by Proudfoot, in a study carried on some 20 years ago, as typical of the CBD. He wrote, ". . . Here retail occupancy is characterized by large department stores, numerous women's and men's clothing

stores, furniture stores, shoe stores, jewelry stores, and similar outlets selling shopping goods. Added to these, though of subordinate importance, there are numerous drug stores, tobacco stores, restaurants, and other stores selling convenience goods"¹¹ Since Proudfoot was concerned only with retail outlets for commodities, his list is, of course, not as extensive as the list of "Present and apparently typical" land uses given in Table IV.

A logical step beyond this analysis would be to suggest what combination of CBD land uses would bring the greatest prosperity to a city. This poses a problem that might be solved through further comparative studies of CBDs.

TABLE IV

A CLASSIFICATION OF LAND USES IN THE CBD

The order in which the items appear on each list is not intended as indicative of their importance but merely represents the order in which they were tabulated in the office. No attempt has been made to include all minor forms of land use. (From tabulations based on the authors' field notes.)

A. Present and apparently typical:

- Restaurants
- Women's clothing
- Men's clothing
- Furniture
- Hardware and appliances
- Department stores
- "5 and 10" stores
- Drug stores
- Jewelry and gifts
- Amusement establishments
- Banks
- Insurance and real estate
- Personal service (barbers, beauticians, etc.)
- Clothing service
- General offices
- Commercial parking
- Hotels and other transient lodging

B. Rare enough to be absent or essentially so from one or more of the CBDs:

- Supermarkets
- Automobile sales
- Service stations
- Accessory, tire, and battery sales
- Newspaper publishing
- Headquarters offices
- Railroad station
- Bus station
- Residences
- Industrial
- Wholesale

C. Occupying substantial space in all CBDs but not typically central business land use:

- Public land and buildings
- Organizational and charitable institutions
- Vacant building or lot space

CONCLUSIONS

In fulfilling the objectives stated at the beginning of this article, the authors arrived at a number of generalizations. Some of these generalizations are hardly debatable; others, although strongly indicated, cannot be fully substantiated from the evidence now at hand. A further qualification is needed. The evidence is based on only nine, moderate-sized cities chosen from within a limited size range. Keeping in mind these limitations, the following may be listed as the principal findings:

1. Specific transportation features—port works, railroad stations, early road junctions—generally were responsible for the original location of the city. This initial development, in turn, formed the nucleus of the modern CBD.

2. As cities grow, many CBDs tend to become more and more off center for their urban area as a whole. Of course, this is particularly true of port cities.

¹¹ Malcolm J. Proudfoot: "City Retail Structure," *Econ. Geog.*, Vol. 13, 1937, p. 425.

3. The size of a CBD is best measured by the total floor space at all levels devoted to "central business" uses. Since a uniform story height is assumed, this total may be regarded as the volume of the CBD.

4. CBD size varies with incorporated city population more than with that of the urbanized area or that of the tributary market area of a city.

5. Variations in CBD size from city to city are so closely paralleled by variations in number of employees in commercial activities, as reported by the Census, that such data might be used to estimate the central business space in a CBD.

6. The theoretical outline of the CBD seems best to approximate a quadrate cross; the theoretical shape of the CBD is that of a modified pyramid.

7. Where a CBD has only one important axis, a narrow, elongated District is likely to result.

8. Relative equality of several parallel axes tends to produce a broad, elongated CBD.

9. Where two intersecting axes are of approximately equal importance the District approaches an equidimensional outline.

10. Railroads and rivers are important barriers to CBD expansion. This barrier effect, in the modern city, is reflected in a belt of non-central business uses, so that the CBD rarely reaches a railroad or river.

11. Parks, and public buildings, where they are extremely large or grouped, may serve as barriers to CBD expansion.

12. Slope is a powerful deterrent to CBD expansion.

13. The land uses typical of the

CBD—the ones that are truly "central business" in character—are offices and retail outlets for goods and services.

14. The CBD, more than any other business area of the city, serves the entire community rather than any one part of the city or any one ethnic group.

15. Ordinarily, vacancy in the CBD reaches its greatest proportions in old cities and cities that have grown old before their time. Within these cities it is greatest in old buildings, several stories in height.

16. The current demand for office space in CBDs is focused upon new, high office buildings.

17. There seems to be a type of new, Western city, built essentially on a single plane, but having a few peaks of tall buildings for offices, hotels, and department stores.

18. The CBD has ceased to be entirely a "walking zone." It has acquired outer sections that are, in part, automobile oriented.

19. The size and shape of a CBD are constantly changing.

20. In most cities the position of the peak land value intersection has shifted at one time or another, but where it corresponds to a particularly well developed route focus the peak point may remain stable for a long time.

These findings and others not listed here represent only a beginning. More studies of CBDs are needed. For example, the Districts of larger and smaller cities than those studied here need to be mapped and analyzed, so that the relationships between CBD size and city size can be worked out more fully. It would be of interest, too, to study the CBDs of various types of cities—port

cities, manufacturing centers, state capitals, etc.—to see how the Districts vary with the type of city. Equally intriguing is the whole question of how CBDs differ regionally. Is there a typical Western CBD? Do the CBDs of Southern cities differ from those in other parts of the country? Is a typical CBD for the American city in the process of evolution?

The question might well be asked, Why were land values neglected in comparing the CBDs? The answer is, as explained in the first paper, that land values are extremely difficult to use and often impossible to obtain. But the study of CBD land values is important. More work is needed along this line. Land values in the CBD, if properly interpreted, might represent the key to much that we would like to know.

Another characteristic that should be studied is CBD quality. In the delimitation technique used in this project, no measure of quality was included, yet the writers are well aware of definite contrasts between CBDs in this respect. It is undoubtedly true, for instance, that the CBD of Tulsa is of much higher average quality than that of Tacoma. But quality is complex. It includes more than the value of buildings and

the level of merchandise handled by the stores. There is a dynamic aspect, too. It involves the questions of whether, through the erection of new buildings and the remodelling of old ones, a city's CBD is being kept up to date, and whether the District really reflects the potential of the area it serves. Subjective judgments are not sufficient to bring out such contrasts, but a good, objective measure of CBD quality remains to be developed.

It is not intended to give the impression that the lines of research suggested here represent entirely uncharted seas. As a matter of fact, work has been done and is being done on some of these problems, but such work is little more than a start. The points of view of various disciplines are needed; certainly one of these disciplines is urban geography. In such research, comparative studies based on uniformly delimited CBDs should, in the long run, prove more productive than studies of single Districts.

Of course the study presented in this paper deals with the CBD as a whole, and this is only part of the story. Obviously, the district has an internal structure as well. This will form the subject of the third and concluding article of this series.

MURPHY, Raymond E. and VANCE
J.E.

A comparative study of nine
central business districts

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