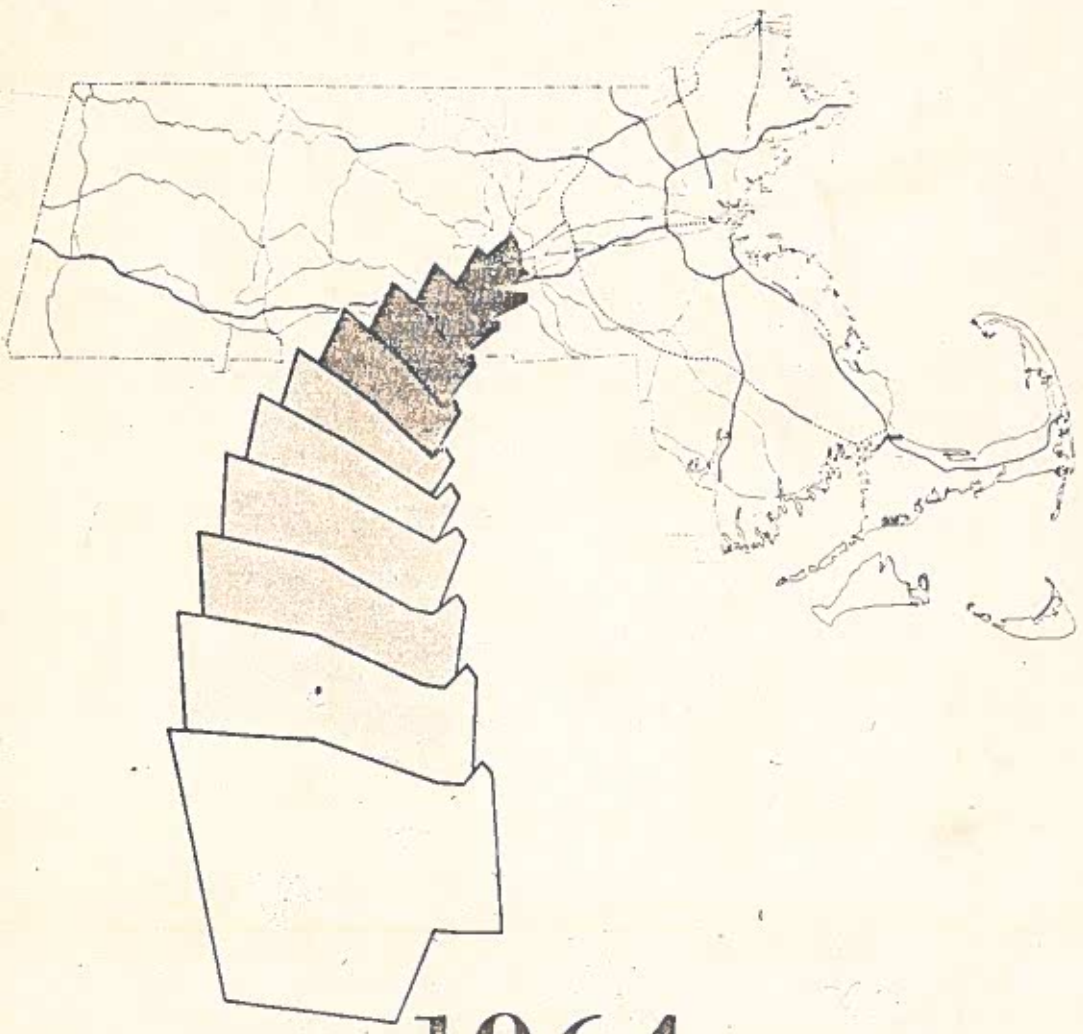
COMPREHENSIVE PLAN



1964

WORCESTER

MASSACHUSETTS

Worcester Massachusetts

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Comprehensive Plan for
Worcester, Massachusetts

August 1964

prepared for the
Worcester Planning Board

by the Staff of the
Worcester Planning Department

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C O N T E N T S

L I S T O F T A B L E S

L I S T O F T A B L E S

L I S T O F M A P S

(Maps, continued)

L I S T O F G R A P H S

L I S T O F I L L U S T R A T I O N S

LETTER OF TRANSMITTAL

City of Worcester
Massachusetts

PLANNING DEPARTMENT

ROBERT A. GORDON PLANNING DIRECTO

August 5, 1964

To the Honorable City Council
City of Worcester
Massachusetts

Gentlemen:

The modern city is, in the philosophical sense, a highly complex structure with various parts so integrated that their relation to each other is, to more or lesser degree, governed by their relation to the whole.

Various mechanisms operate to keep the complex urban structure functionable. The economic system, for example, through the medium of land values, rents, construction costs and the like may direct development along certain paths. Such forces, however, cannot be wholly depended on to bring about an orderly or even socially desirable community pattern. They must be supplemented by the application of foresight and planned administrative and legal coordination if balance, harmony and orderliness are to be insured.

The land of the city and the numerous varied public and private structures or uses placed upon it are all parts of the community and their purposes are related and interdependent. Unless proper relationships in location of one to the other are observed and unless all are located in accord with an overall plan for development and improvement of the community, serious maladjustments and deficiencies are apt to, and most likely will, occur.

City planning deals with methods of guiding or controlling the use and development of land in such a way that maximum social and economic benefits may accrue to the people of the city through continued improvement of the physical environment. Followed through to its ultimate purpose it involves (1) the formulation of goals, (2) surveys and the analysis of survey results, (3) preparation of the plan, and (4) effectuation of the plan. A city plan has three principal features: (1) a plan for the pattern of land uses throughout

To the Honorable City Council

August 5, 1964

the city, (2) a plan and program for community services to be provided by public and semipublic agencies, and the coordination of these two into the development of (3) a comprehensive plan.

It must be emphasized, however, that planning activity moves in an endless stream. The consequences of sporadic as opposed to continuous planning are obvious as one observes the many unpleasant experiences befalling city after city through the failure of leadership to recognize the importance of continuity and follow-through in planning. A true comprehensive plan can never be considered complete.

As policy decisions are reached by whatever responsible body, planning solutions can be developed in only a quite generalized form. As these solutions are reviewed at the appropriate time policy decisions of a more detailed order are reached. The planning process then carries the solution to a more detailed stage. In this manner both policy decisions and plans are progressively refined. It may well be that later developments may alter the applicability of early findings and proposals. In this light it can be expected that policies and plans should and must be continuously studied and reviewed and no doubt will, in many instances, be modified to greater or lesser extent.

Guided by the philosophy expressed above, the Worcester Planning Board endorses, adopts, and presents this document, with its emphasis on planning rather than specific plans, as its Comprehensive Plan for the City of Worcester and prevails upon all interest, public and private, to lend active support to a dedicated goal of an ever more attractive and prosperous City of Worcester. Within the broad objectives herein set forth lies the exciting opportunity for all, each in his own way, to make a significant contribution toward the achievement of that goal.

Respectfully submitted,

Thomas F. J. Dillon

Thomas F. J. Dillon, Chairman
Worcester Planning Board

CHAPTER ONE

INTRODUCTION

This Comprehensive Plan has been prepared by the Worcester Planning Department as a guide for the orderly physical development of the City and for the improvement of its community facilities and services in the years ahead.

OBJECTIVES

The most immediate need for a plan of this type is to guide the City in its continuing program of urban renewal. Like most mature cities in the United States, Worcester must rely upon Federally sponsored programs to renew and restore its aging, worn-out physical properties, particularly in the urban center. In order to be eligible for renewal financing under such programs, the City must present evidence of a continuing local program of city planning, executed within the framework of a comprehensive plan. This plan is submitted to that end.

Another specific objective is the coordination of municipal services with private efforts. City officials as well as business and industrial leaders can use this plan as a reference in preparing programs in their respective areas of operation. It is hoped that those outside the government can rely upon the elected and appointed officials of the city taking cognizance of the Plan, so that individual actions become part of an overall development scheme.

SCOPE OF THIS PLAN

Recommendations are included for the following major items:

1. the development of protected residential neighborhoods, each with its own local services, including elementary schools and playgrounds;

2. the provision of adequate shopping facilities, well distributed through the City;

3. changes and improvements in downtown Worcester, including better vehicular circulation, the separation of pedestrian and vehicular traffic (where feasible), additional parking facilities, and consolidation of land uses;

4. the provision of adequate land for industrial development, properly zoned and protected against encroachment;

5. the construction of additional major highways and arteries, including extensions of the Worcester Expressway, a new East-West Expressway and a new Circumferential Highway, all intended to improve traffic circulation in the City and region;

6. methods to insure an ample supply of high quality drinking water and a way to improve sewage disposal and avoid downstream pollution of the Blackstone River:

7. sites and facilities needed for additional schools, parks, playgrounds, playfields, and police and fire buildings to serve areas growing or presently deficient in such facilities:

8. measures for implementing the Plan including a financial program of capital expenditures:

Because of the ranges in forecasting future needs, the programs proposed are generally broad in coverage. Recommendations of sites for specific improvements are subject to more detailed engineering than a comprehensive plan permits. The programs here proposed or suggested need the advantage of detail planning by those responsible for that particular phase of the Plan. This built-in flexibility allow greater participation by people concerned with plan effectuation.

The Plan is, however, only the beginning for the City. To see elements of it cometo fruition will require the efforts of public and city officials and an active interest by the public.

THE SKETCH PLAN AS A PRELIMINARY

Last year, the Planning Board prepared and issued the *Sketch Plan for Worcester, Massachusetts, 1963*. This report was a preliminary comprehensive plan. It provided a broad view of major urban problems in the City, compiled some of the development standards that should be followed for new community facilities, set forth a series of policy guides for land use, transportation, and (some) municipal services, and reviewed and brought up to date a 10-year financial program for those facilities to be publicly provided.

Much of the data and most of the recommendations of the Sketch Plan have been incorporated into the current report. Some gaps in the earlier plan have been filled in--most notably, in connection with recreation and school facilities. Standards have been revised on the basis of further study, land use data corrected, maps of existing conditions updated, and modifications made in some of the proposals (as in the route of the East-West Expressway).

OTHER STUDIES

In 1955 and 1956 the Planning Board and its consultants prepared a rezoning plan for the entire City. For the first time in almost twenty years (since 1938) a city-wide inventory of land use was made. Population projections and estimated changes in the labor force were translated into land use needs for residence, business, and industry. All of these studies have served as a reference in pre-

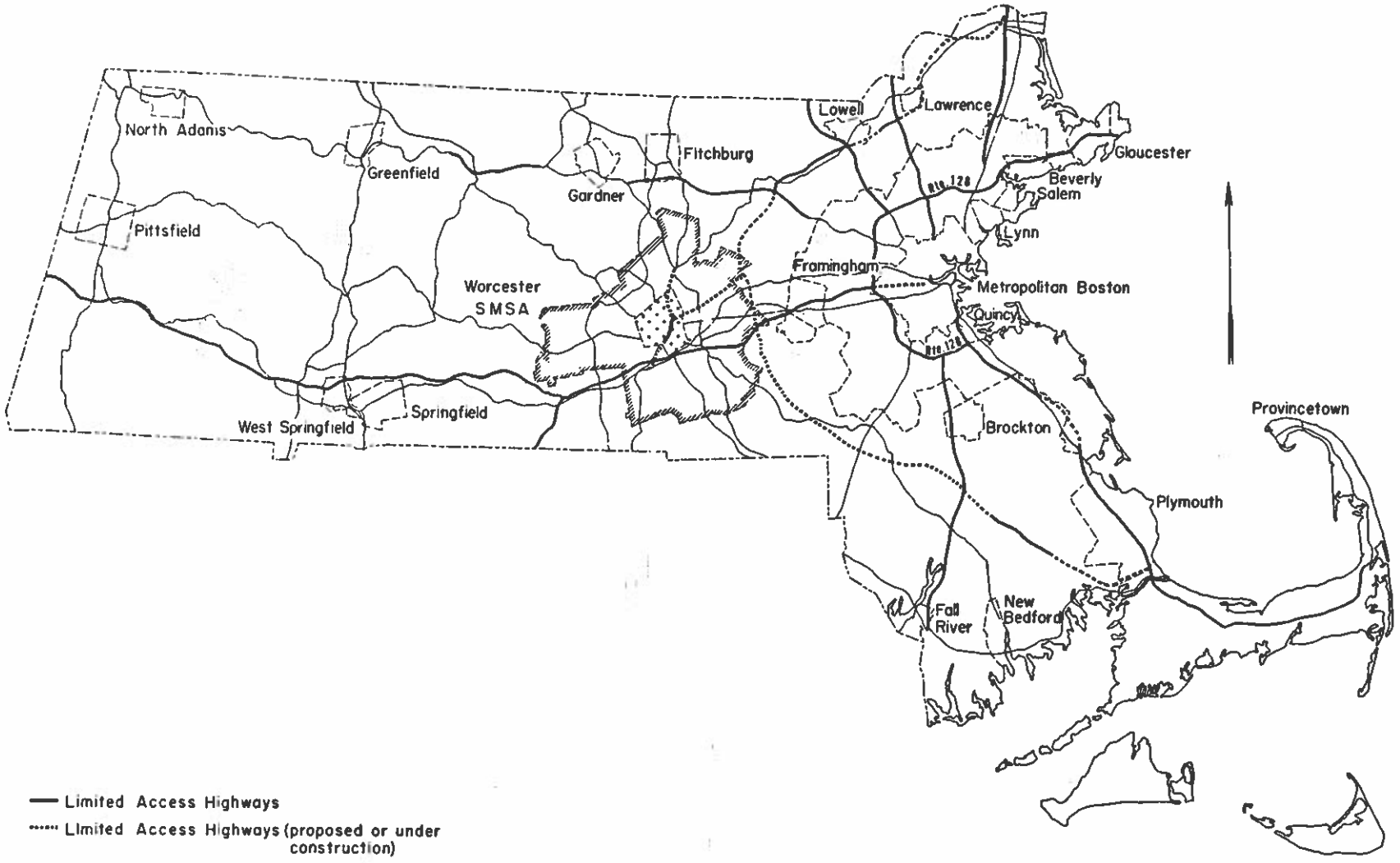
paring the Comprehensive Plan. Housing and blight studies were prepared by the Planning Department to appraise current renewal projects and to evaluate areas where future projects might occur.

The latest of these separate studies was prepared by the Planning Department in 1962. This study analyzed the 1960 Census of Housing data and proposed a program for elimination of blight in the entire City based on a ranking of areas containing blight or blight-causing factors. This report is incorporated in Chapter Five of the Comprehensive Plan. Through the years, the Board has reviewed or prepared and submitted plans like the Goddard Industrial Park Subdivision and relocation or proposed locations for the Worcester Expressway as part of its planning recommendations. They have also reviewed and reported on the Columbia Plan for downtown Worcester and also on the General Neighborhood Renewal Plan developed by the Worcester Redevelopment Authority. Recommendations based on these latter plans have been incorporated in the Central Area Plan submitted with this report.

C H A P T E R T W O

WORCESTER IN A REGIONAL PATTERN

WORCESTER AND THE STATE



Map 2.1

WORCESTER IN MASSACHUSETTS

Worcester has long been known as the "Heart of the Commonwealth" and is indeed situated at the geometric center of Massachusetts (See Map 2.1). It is also situated close to the center of the Nation's fifth largest agglomeration of population. According to a study by the Bureau of the Census of populations living within 50 miles of selected cities, no other such city--outside of the New York, Los Angeles, Chicago, and Philadelphia areas--has a greater concentration within that radius than has Worcester.

Considering that within that radius lie part or all of ten metropolitan areas and a substantial part of three of the four most densely-populated states of the Union the above is not surprising. In each and every year during the decade of the 1950's, over 43,000 persons--the equivalent of a city the size of Fitchburg--has been added to the Bay State population. In 1960, six out of seven Massachusetts residents lived in the State's eleven metropolitan areas. By 1980, the predicted population is expected to approach or surpass six million. Suburban areas are growing most rapidly (in Massachusetts, according to the Census, "urban fringes" have increased 22.0 percent during the 1950's compared with 6.1 percent for central cities and the State average of 9.8 percent) and even rural areas increased by 15.7 percent. Urban places beyond the urban fringes, however, have declined 24.1 percent in the same period.

BOSTON--WORCESTER

Eastern Massachusetts continues to show considerable vitality even though it has a locational disadvantage in relation to other parts of the country. It is out of the main stream of markets and materials (though for some industries this is not as unfavorable as, say, three decades ago), but has an historical and technological headstart which provides the impetus for continued development.

Boston is the urban center of New England. Beginning with World War II, metropolitan Boston, particularly its suburban towns, has had a boom in residential construction and industrial relocation. The latter is evidenced by the emergence of industrial park development, especially along the arc of Route 128. Within this semi-circle, development is approaching saturation. Four cities in the center of the area (Boston, Cambridge, Chelsea, and Everett) have experienced an absolute decline averaging 3.6 percent per decade for the last 30 years (in other words, the 1960 population is 10.8 percent lower than that for 1930) and can be said to have reached saturation. The increase for the balance of the area within the semicircle has been 8.6 percent per decade since 1940; this contrasts with the strong growth (averaging 104.5 percent per decade since 1940) of the towns in the Boston area which are outside the circumferential highway.

Since World War II, industry of a high technical caliber has been moving out of Boston followed by its managerial, professional and technical employees. Framingham, as a convenient mid-point on a good highway between Boston and Worcester, has developed as a retail shopping extension of downtown Boston, providing both a mass-merchandising and a quality-merchandising operation through such centers as Shoppers World and Sherwood Plaza, as well as small specialty shops in Framingham Center. Framingham has attracted customers from Worcester by offering the selectivity of downtown Boston and from the outer portions of the Boston area by offering greater accessibility. As a consequence of these developments, Framingham's population has increased by about 58 percent in the 1950's.

Worcester from its founding has had to be content to occupy a position secondary to Boston and the relationship of Worcester and Boston has, for Worcester, been both a liability and an asset. Today, the ever-increasing network of high design freeways is linking the parts of this area closer together. In the future, it is fair to say that Worcester can expect to share in the growth of the Boston area as the following events occur: (1) as the travel time to downtown Boston decreases, (2) as the circumferential highways like Interstate 495 come into service, and (3) as, *through organized planning*, the convenience and amenities of its own territory are increased.

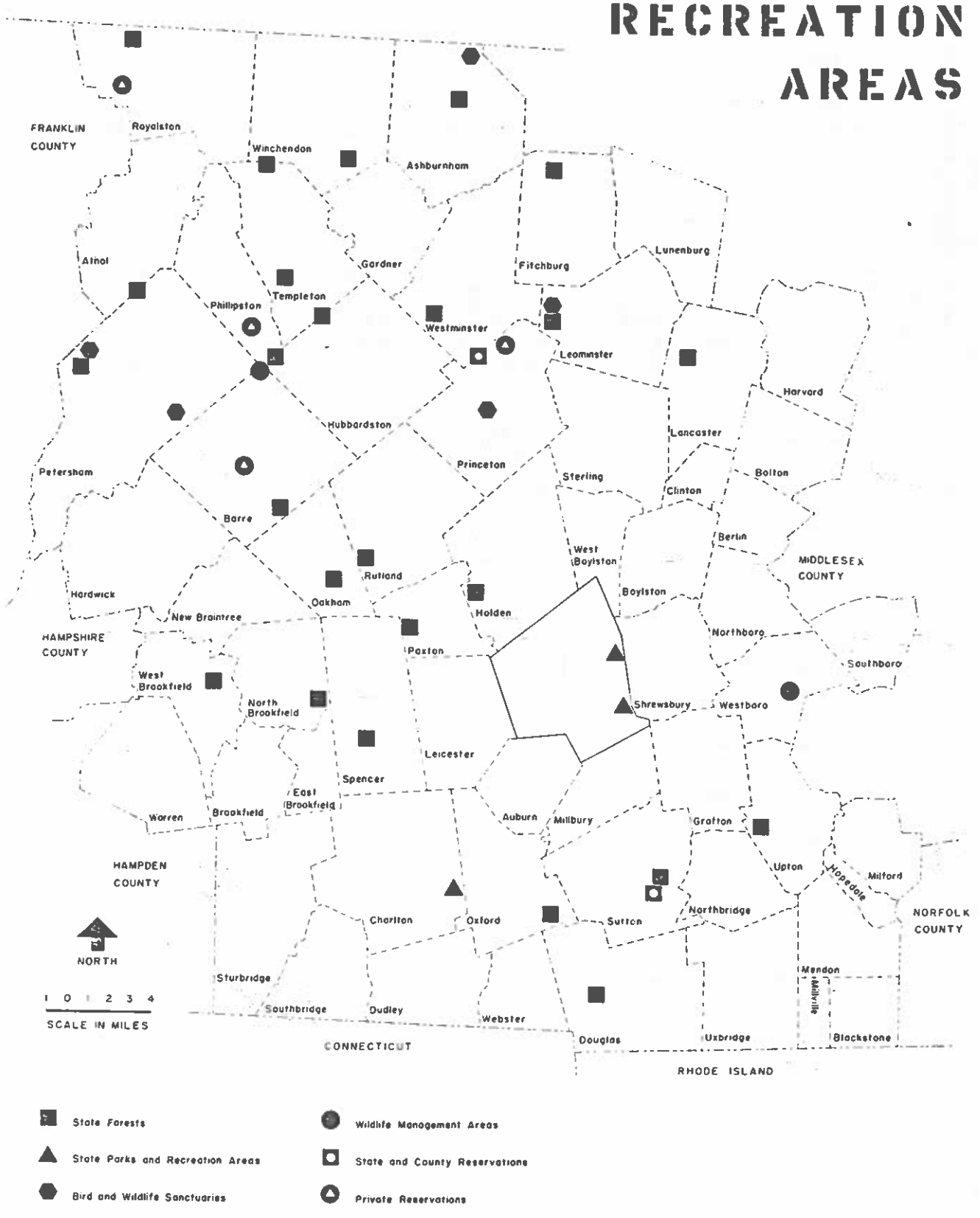
WORCESTER COUNTY

Worcester county, as a governmental unit, is a remnant of the English shire system. In colonial days when town populations were small and widely scattered, county government was important because it served as a more logical extension of the state government. It still provides this function in the agricultural and open areas of the mid-west and west where the town(ship) never developed an importance comparable to that of the New England town. Today, with the decline of agriculture and the rise of industry in New England, the increase in population oriented to central cities, and almost unlimited mobility in time and distance, county government has few functions left. These now include: judicial, custodial, highway design, recreational and hospital functions.

The county government is responsible for the county judicial system, operating district courts in eleven towns and cities, and for operating jail facilities for persons convicted of criminal offenses. It provides only design engineering for roads designated as county highways. Half the cost of these highways is borne by the state, the balance being divided equally between community and county.

In cooperation with the State, Worcester County maintains Mount Wachusett and Purgatory Chasm Reservations in Princeton and Sutton, (see Map 2.2).

WORCESTER COUNTY PUBLIC RECREATION AREAS



Worcester County Base Map Prepared by Worcester Planning Department

An institution also cooperatively maintained is the Worcester County Sanatorium in Boylston, part of a state-wide system for tubercular patients. Adult patients from Worcester are cared for at Boylston but younger patients are sent to hospital facilities in the Boston area. The county's revenue is obtained by assesments from each city and town according to a formula established by the state legislature.

WORCESTER AND ITS REGION

The word "region" has many meanings. There are natural regions which do not necessarily follow political boundaries. The Sudbury--Assabet--Concord River Basin, a multi-purpose conservation project, is an example of a natural area. Region might refer to a group of nations sharing related problems, such as the Common Market countries of Europe. Region may mean a group of states, such as the New England States.

There are regions defined by one criterion such as that region served by the Worcester County Regional Library; multi-criteria regions such as those used for most textbooks which deal with regions: the Arab World, the Free World, the Midwest, the North Shore, and so on and so forth.

WORCESTER REGIONAL STUDY AREAS

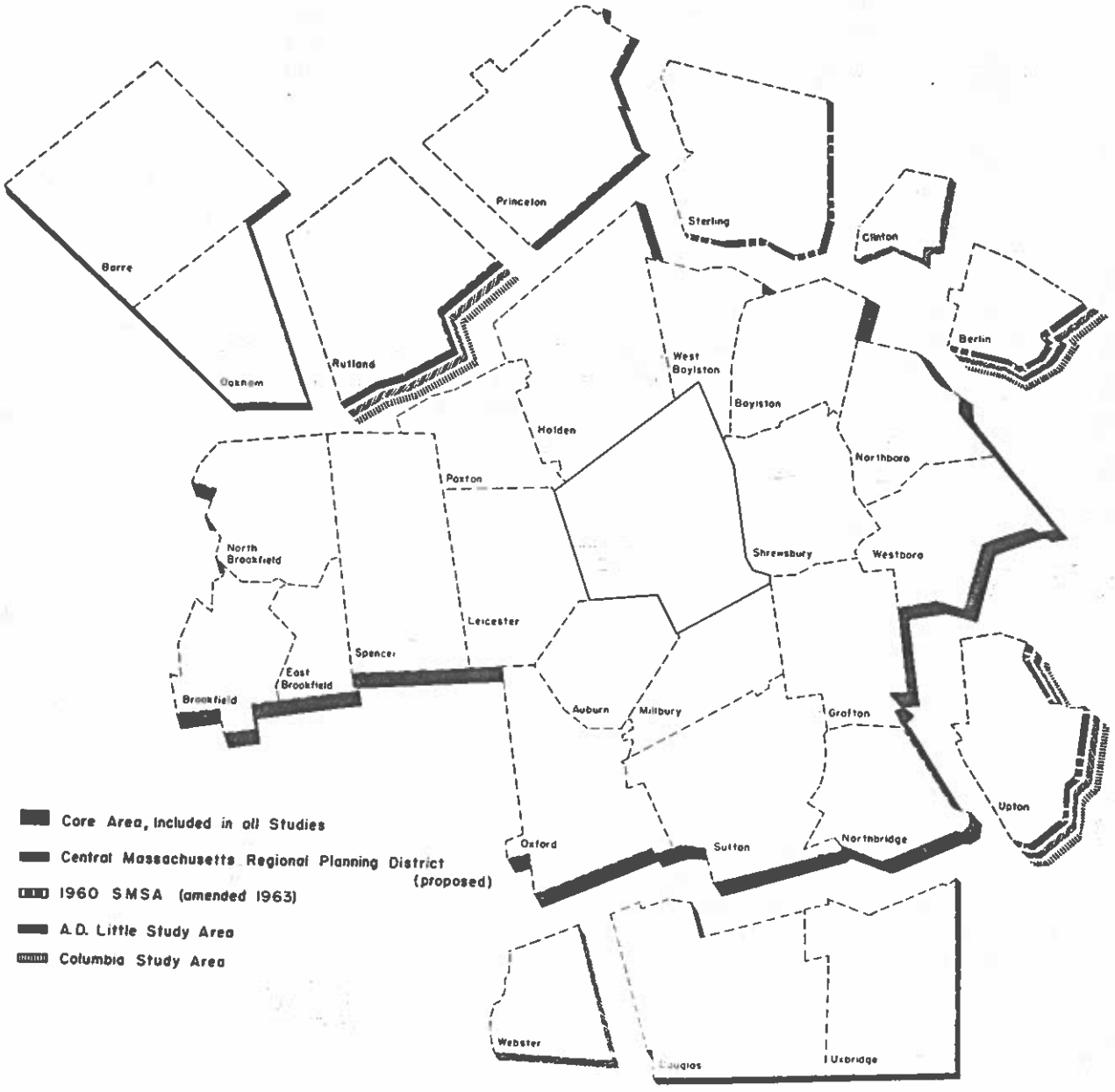
Worcester regional study areas were developed starting with the 1950 Standard Metropolitan Area (SMA) developed by the U.S. Bureau of the Census (see Map 2.3). The 1960 Standard Metropolitan Statistical Area (SMSA) is a statistical refinement of the 1950 SMA. It was further amended in 1963.

Two privately-financed studies of Worcester in a regional setting had contrasting aims. The 1960 "A.D. Little study" for the Worcester Survey Steering Committee was a series of statistical reports of the economic and social characteristics of a region based on the 1960 SMSA plus Paxton, Rutland, Clinton and Webster. "The Columbia Study" was primarily concerned with designing a plan for the commercial center of the City. The region used for this study was the 1960 SMSA plus Paxton and Rutland.

A report entitled *Areas for Regional Planning in Massachusetts* was published by the Massachusetts Department of Commerce in 1960. This was the first study to look at the Worcester area within the context of other "logical areas for regional planning" and is the basis for the proposed Central Massachusetts Regional Planning District.

The delineation of the Planning District was based on the following classes of criteria for "urban centers" and for orientation of non-central cities and towns.

WORCESTER REGIONAL STUDY AREAS



Prepared by Worcester Planning Department

Map 2.

Urban Centers

Population
Covered Employment
    Manufacturing
    Non-manufacturing
Payrolls of Covered Employment
Total Retail Sales
Per-capita Retail Sales
General Merchandising, etc., Retail Sales
Assessed Valuation
Tax Levy

Orientation

Areas of Employment Security Offices
Service Areas of General Hospitals
Standard Metropolitan Statistical Areas
Contiguity to Urban Centers
Continuous Development from Urban Center
Access to Limited-Access Highways
Extended Free Telephone Service
Newspaper Circulation Patterns
Commuting Patterns of Manufacturing Employees

For further discussion of these criteria see the above mentioned report on "logical areas". The Planning District is thus a multi-criteria region not fitting perfectly any one criterion but a balanced regional delineation in terms of the many criteria. For other than planning purposes other delineations might be superior; for general land use planning this appears to be most satisfactory.

WORCESTER'S REGIONAL CONTRIBUTION

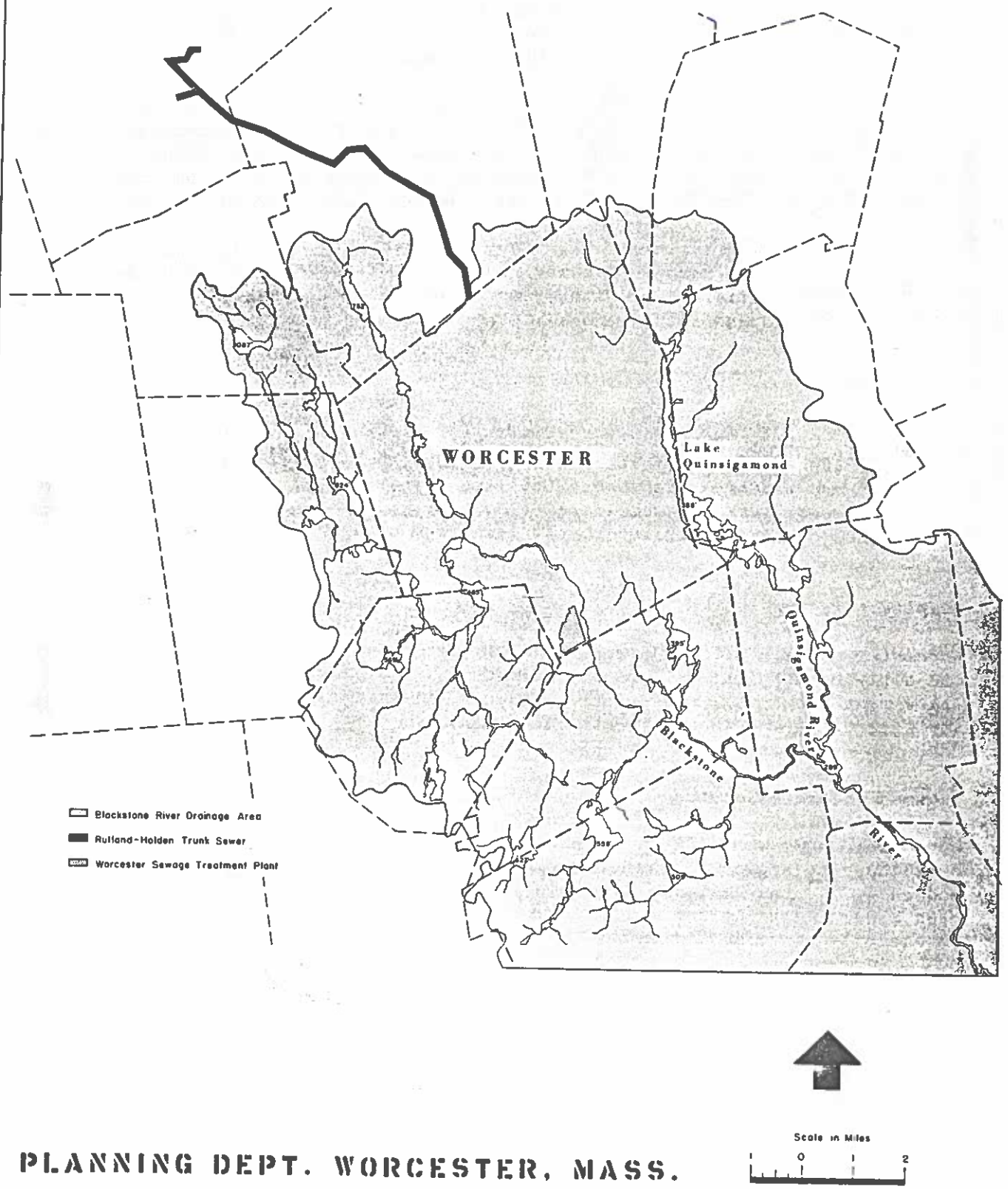
The City makes certain contributions to the well-being of communities beyond its boundaries and receives certain benefits in return. Worcester's contributions, to be discussed first, are to a variety of disparate "regions", ranging in size from the area served by the Worcester Sewage Disposal Plan to the larger-than Worcester-County region of the Central Massachusetts Regional Library System.

Sewage Disposal

Worcester makes a major contribution to regional sewage disposal: a trunk sewer serving the two large hospitals in Rutland and much of the Town of Holden. This sewer was designed to carry large quantities of sanitary sewage away from these large hospitals in a Metropolitan District watershed as a means of protecting Boston's water supply (see Map 2.4).

In 1933 an agreement between the Town of Holden and the Metropolitan District Commission permitted that town to tap into the Rutland trunk sewer in order to handle sewage from the central area. That sewer serves 90% of the town's center, Holden District Hospital, and part of the Holden school system. Sewage from this trunk main is processed at the Worcester sewage treatment plant where it contributes to overloading at critical periods.

WORCESTER SEWAGE DISPOSAL SYSTEM & BLACKSTONE RIVER DRAINAGE AREA



PLANNING DEPT. WORCESTER, MASS.

The upper half of the Blackstone River watershed is shown on the above-mentioned map. Sewage from most of this area could be handled in gravity sewer mains to a regional processing plant below the confluence of the Blackstone and Quinsigamond Rivers. This would be a great service to the health and well-being of residents of the lower Blackstone Valley by ensuring that no untreated sewage is piped into the river. When such a plant becomes operational, the present Worcester sewage disposal plant could be temporarily closed for renovation, whereafter the two plants would be able to handle the increasing load for an indefinite period (see also Chapter Seven, for further discussion).

Shrewsbury has recently installed a sewage system serving the Fairlawn and central areas of the town. Elsewhere in the Worcester area, there are no public sewage facilities. In fact, scattered small areas within the City must rely on cesspools and septic tanks.

Water Supply

Worcester's water system has some regional aspects (see Map 2.5). The City currently supplies water to sections of Auburn, Boylston, Grafton, Leicester, Millbury, and West Boylston near City line. These towns find it more convenient to purchase water from Worcester at a nominal fee than to extend their facilities a long distance to serve a relatively few users at high installation costs.

Hospitals

Worcester has six of the seven general hospitals serving the area towns. The one outlying hospital is located in Holden. In addition, Worcester has a state mental hospital and several public agencies offering medical assistance. It is readily seen that Worcester is a regional medical center.

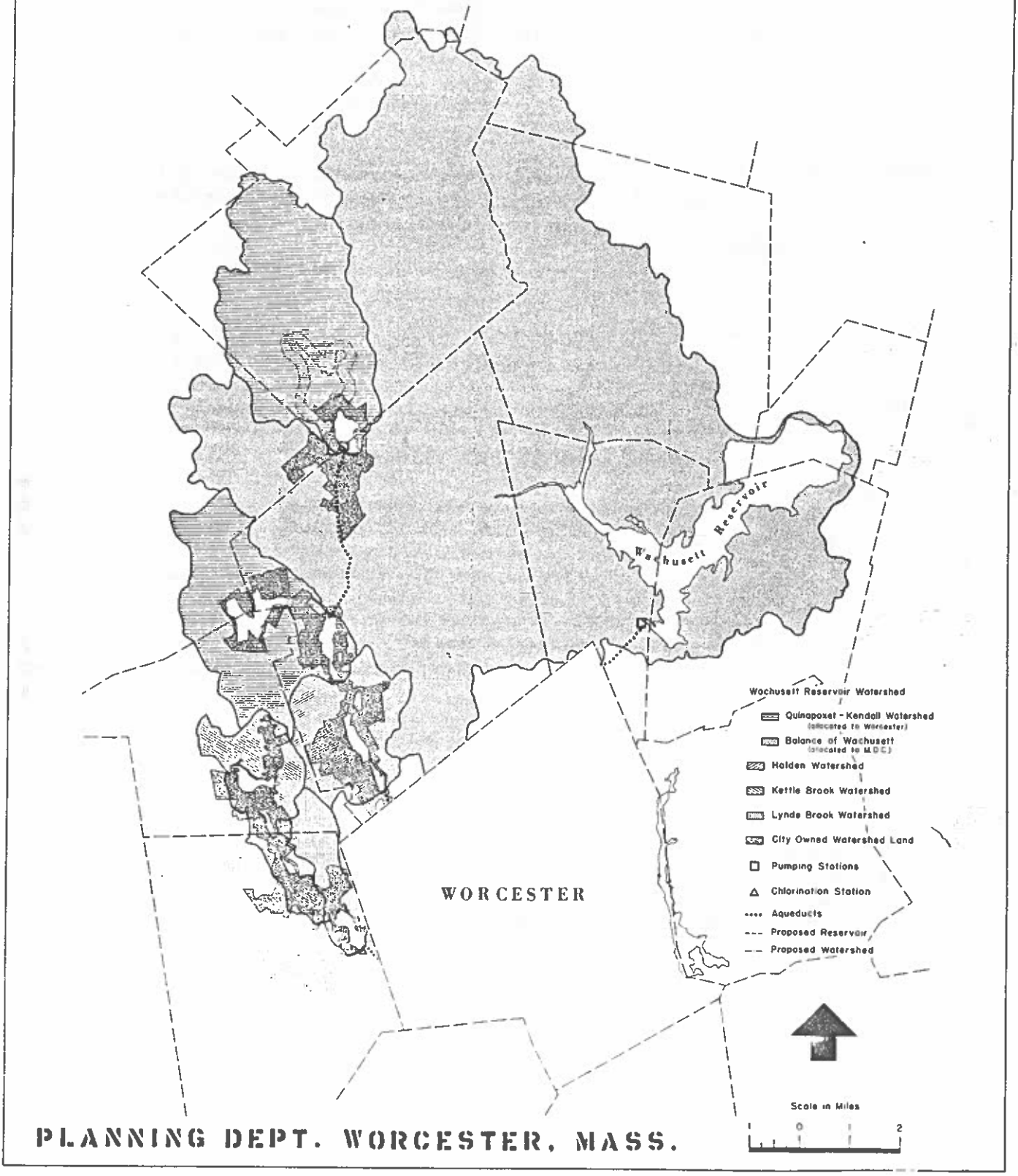
Regional Library Service

Worcester shares with Fitchburg the duty of being headquarters for the Central Massachusetts Regional Library System. With the exception of Clinton, Douglas, and Hardwick, the regional library system encompasses all of Worcester County plus eleven adjacent towns outside the county. This is an example of Worcester's contribution extending well beyond the region.

Regional Parks

Most of Worcester's parks are relatively small and primarily serve their immediate neighborhoods. Green Hill Park has a public golf course, animals on exhibit, swimming, picnic groves, and other facilities that attract people from beyond the City and thereby give it a regional character. Lake Park and Regatta

WORCESTER WATER COLLECTION AND STORAGE SYSTEM



PLANNING DEPT. WORCESTER, MASS.

Point Park are state-controlled recreation facilities available to all at a nominal fee. These parks offer swimming, boating, and picnicking as well as areas for organized games and sport.

Other Regional Institutions

Among cities of comparable size, Worcester is unusual for the variety of cultural services it offers the surrounding area. Within the City there are three private secondary schools and eight institutions of higher learning ranging from junior colleges to universities with graduate study. From Worcester County alone, 3,345 students attended these schools during the 1963-1964 academic year (see Map 2.6).

Museums in Worcester attract members and visitors from throughout the County and beyond. The Worcester Art Museum is nationally known for the excellence of its special exhibits, for its superior painting collection, and for its art school. An unexcelled collection of armor and related exhibits is housed in the Higgins Armory Museum. The Worcester Science Museums include a planetarium and collections on natural history and other science subjects.

The annual presentation of the Worcester Music Festival is not only a cultural highlight of the City and the region, but is internationally known and admired. Several other civic and cultural organizations having an impact on the region and throughout the country are headquartered in Worcester. These include groups such as American Antiquarian Society, Worcester County Horticultural Society, The Craft Center, Worcester Historical Society and Museum, Community Concert Association, Worcester Oratorio Society, and the Mechanics Association. During the past year these organizations have attracted more than 2,300 members from Worcester County outside of the City.

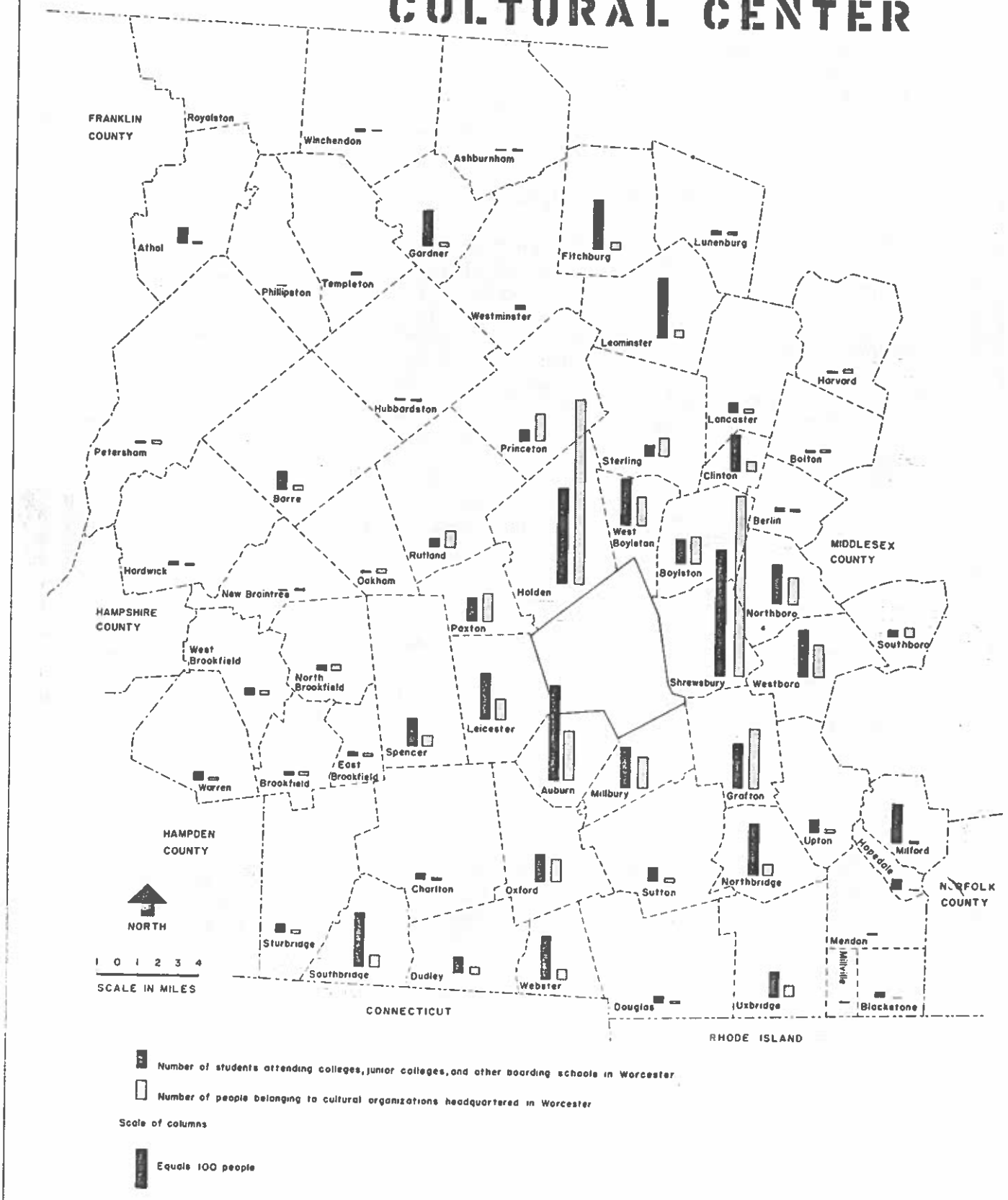
CENTRAL MASSACHUSETTS' CONTRIBUTION TO THE CITY

Water Supply

All of Worcester's reservoirs are located in five towns to the west and north of the City. Whenever emergency purchases of water from the Metropolitan District Commission's Wachusett Reservoir are necessary, four more towns to the north also contribute to Worcester's needs.

In recent years, especially during periods of drought, there has been apprehension about the adequacy of the water supply. It is here that cooperation in regional planning can improve and expand collection and distribution of the water supply to the mutual benefit of Worcester and its region.

WORCESTER AS A REGIONAL CULTURAL CENTER



Number of students attending colleges, junior colleges, and other boarding schools in Worcester

Number of people belonging to cultural organizations headquartered in Worcester

Scale of columns

Equals 100 people

Worcester County Base Map Prepared by Worcester Planning Department

Map 2.6

Regional Health and Medical Services

The only regional contribution of consequence is the Worcester Foundation for Experimental Biology in Shrewsbury. Future growth of the region and the possibility of a state medical school in Worcester are inducements that could very well necessitate new hospitals and research centers in the region.

Regional Parks and Recreation Areas

It is in the realm of parks and recreation areas (see Map 2.2) that benefits to the City are most apparent to its citizens. Although there are no readily available statistics, it is probably safe to assume that more Worcester people go to regional parks and recreational areas outside the City than vice versa.

Wachusett State Park in Princeton offers the only major ski area in the region. Howe State Park in Spencer and Wallum State Park in Douglas offer good swimming, picnicking, and other unorganized recreational facilities. During the summer season they are very often filled to capacity.

Recreation in State Forests: There is a limited range of recreational activity possible in the state forests of the region. Hiking, bird-walks, nature-study, and similar activities on both an organized and unorganized basis (and where facilities are available, camping by permit) are all included in the possible activities.

Recreation in Watershed: In areas owned by the City in the several watersheds, recreation activities similar to those suggested for state forests could be made available with suitable controls to insure that no public nuisances occur. Access to the water's edge should be restricted, but picnic tables in some of the pine groves with a view of the water would be very acceptable to the public. An example of such a site is the east shore of Kettle Brook No. 3 beside Route 31 in Leicester.

Educational Institutions

There are only two institutions of higher learning within the region but outside the city: Anna Maria College in Paxton and Leicester Junior College in Leicester. The majority of the students, however, come from Worcester.

CENTRAL MASSACHUSETTS REGIONAL PLANNING DISTRICT

While a degree of a regional cooperation has gone on in a somewhat fragmented manner as detailed above, it was not until 1955 that a more formal organization of joint planning became possible. The passage in that year of the Regional Planning Law, Chapter 40B of the General Laws, provided for the formation of

advisory planning commissions in "logical planning areas". Such commissions are authorized to "prepare a comprehensive or study plan...and make recommendations for the physical, social and economic improvement of the district".

The Central Massachusetts Regional Planning District was officially established by the Division of Planning, Massachusetts Department of Commerce, on July 30, 1963, and consisted of the towns of Boylston, Leicester, Paxton, Shrewsbury, West Boylston,and the City of Worcester. In early 1964, the Planning District was enlarged by the additions of the towns of Auburn, Holden, and Millbury.

In addition to the nine member communities in the District, sixteen others in the proposed District are eligible to join. The District Planning Commission now represents 71 percent of the population of the District. Spencer and New Braintree have expressed an interest in joining the District in the near future. A full-time planner was employed on February 10, 1964,and a complete regional master plan is proposed making use of federal assistance received under the Urban Planning Assistance Program. It is expected that a full-time regional staff of six will be undertaking this project by January, 1965.

FUTURE OF THE CENTRAL MASSACHUSETTS REGION

At one time communities were relatively isolated--houses and stores clustered around white-steepled churches--and separated from each other by vast areas of rural land; now many towns are growing to their boundaries and their residents are shuttling to and from the city for employment, shopping, education, cultural activities, specialized professional services, entertainment, and possibly other matters. City residents, in increasing numbers, go to the rural areas for recreational purposes. Whether desired or not, these changes are taking place at an ever-increasing pace accompanied by associated problems. Commuting to work, once almost entirely a one-way street, now includes a substantial component of reverse commuting to suburban and rural areas.

The Division of Planning in 1960 defined 34 state-wide areas for regional planning. In some cases these were regions not truly metropolitan in character but with an urban center and a grouping of towns with common orientation. In other cases, for example in the Central Massachusetts area, a true metropolitan complex with core city, suburbs, economic interchanges and spread of services was defined. The regional planning being undertaken here, then, is both truly metropolitan in character and "regional" in that included are extensive areas with little development and only weak orientation to the core city and the urban area. This unit--consisting of the City of Worcester and 26 surrounding towns,totaling 655 square miles--while large in population and area, has been found a most workable unit for coordinating planning efforts at the various levels.

Inevitably a professional planner looks to the future; his foresight must be his trademark. The Central Massachusetts area has changed ever more rapidly since the end of World War II. It has exhibited only modest growth characteristics

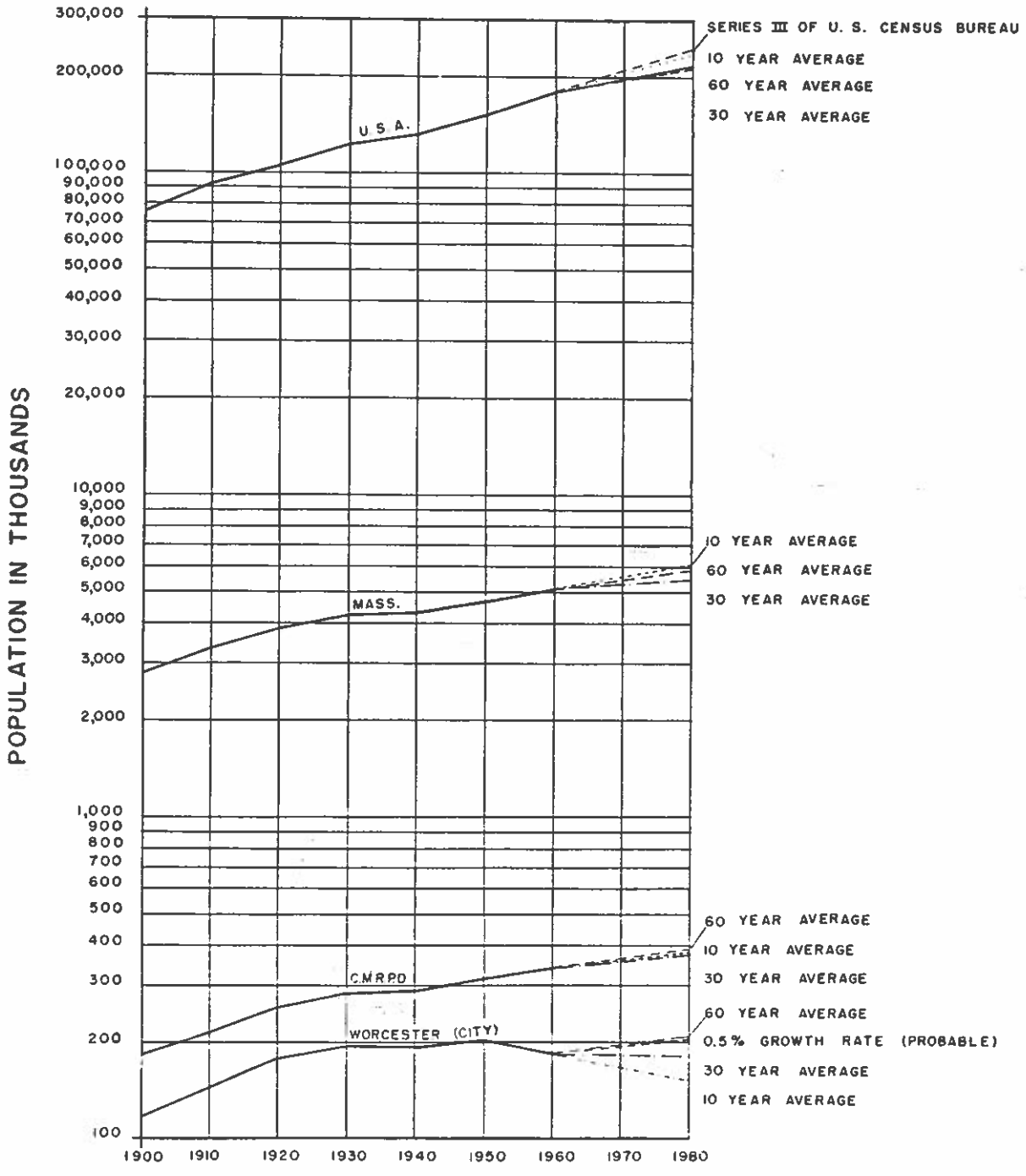
at best in comparison with far western states, but note that these growth rates are based on a density that in 1920 was 22 times that of California and still is 6½ times as great. Central Massachusetts has an economic base that has stood it in good stead. A person coming back to Worcester after an absence of several years notes an industrial city with a dominantly durable-products orientation, an attractive topographic setting, and a widely known group of institutions of higher learning on one hand, contrasted with an obvious lack of capital investment in plant, persistent unemployment, traffic congestion, and political and tax-base conflicts that remain unsolved.

It will be up to the newly formed Regional Planning Commission to attempt to bring into focus such of these problems as can be most successfully approached at a regional level: to define needs, to outline goals, and to suggest workable solutions to them. In addition, this Commission must coordinate the varied planning efforts of the area and must provide the highest quality of technical-assistance leadership. Central Massachusetts has through the growth of the transportation system found itself with a magnificent opportunity to make use of its educational, industrial, and technical advantages. The alternative to this is not attractive: an economic backwater where the three-deckers crumble a little more each year, the tax rates soar, and the communities are beset by seemingly insoluble problems of inadequate economic base to provide the services needed by its citizens. It is confidently expected that the former possibility will be the one guiding the changes to come in this area.

C H A P T E R T H R E E

POPULATION--LABOR FORCE--EMPLOYMENT

POPULATION GROWTH RATES PROJECTED TO 1980



Graph 3.1

POPULATION

As reported by the United States Bureau of the Census, the total population of the Central Massachusetts Regional Planning District (C.M.R.P.D.) in 1960 was 339,800, and that of the City of Worcester, 186,587. For the Worcester Planning Region (equivalent in area to the Regional Planning District), these figures represent an increase of about 7 percent during the 1950's while the City has shown a decline during the same period, of over 8 percent (see Graph 3.1 and Table 3.1).[1] Planning Region figures indicate the resumption of previous long-term upward trends. Since 1900 the Region has experienced three different rates of growth. From 1900 to 1920 a period of relatively rapid growth, the total population increased from 186,597 to 258,099 (19 percent per decade). The City also has the same trend (23 percent per decade) for the same period. During the twenties the growth slowed down in both Region and City. The "depression decade" slowed growth for the Region to 1.4 percent while the City declined 0.8 percent. Since 1930, both the City and the Region have registered growth rates below State and National averages with the exception that for 1940-50 the Massachusetts decennial rate was slightly higher than that of the Region. Since 1910 the Region and State have followed the same trend while the City took a sharp downward trend in the last decade.

Although precise data are not available, there is little doubt that there has been an active population migration both in and out, but with a larger out-migration between the Worcester metropolitan area and other such areas, and also between the City and the Region. Prior to 1930 there is evidence of a considerable excess of immigrants (not positive migration) which added significantly to the natural increase of population in both the City and Region. This trend is continuing for the Region at a slower rate. The margin of net positive migration for the City has fluctuated. Census figures for 1960 indicate that Worcester's population, on the wheels of the automobile, has shifted to the suburbs or to other sections of the country in the past ten years at an unprecedented rate.

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[1] This and other graphs in this chapter are referred to as "semi-log" graphs. This means that one scale, usually the vertical one, is a logarithmic or non-uniform scale. A principal reason for the use of this type of graph is to compare rates-of-growth of curves for different areas or industries. Of two curves, the steeper one shows a greater rate-of-growth (or decline) than the more nearly horizontal one. An arithmetic graph with uniform divisions, on the other hand, is preferred for showing absolute changes (compare employment data on semi-log Graph 3.5 with the same data on arithmetic Graph 3.7 below). It should also be noted that a change of 10,000 has the same slope anywhere on an arithmetic graph, whereas a change of 10,000 in the first (lower) cycle of a semi-log graph (as Graph 3.1) has the same slope as a change of 1,000,000 in the third cycle. On Graph 5.4, page 104, both scales are logarithmic. This "log-log" graph is used, in this instance, to show clustering.

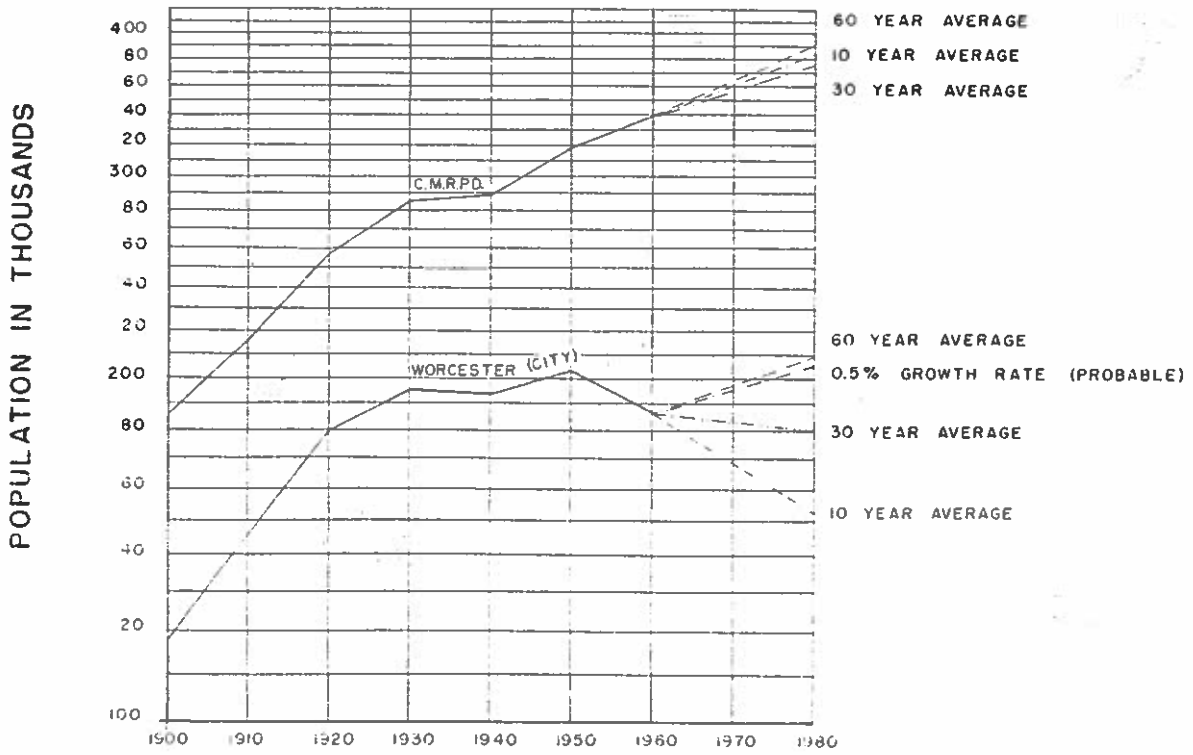
TABLE 3.1

Population and Percent Change by Decennial Periods (in thousands)

Census Year	City of Worcester	%	Planning Region (C.M.R.P.D.)	%	Commonwealth of Massachusetts	%	United States of America	%
1900	118,421		186,597		2,805		76,212	
1910	145,986	23.3	215,898	15.7	3,366	20.0	92,228	21.0
1920	179,754	23.1	258,099	19.5	3,852	14.4	106,022	14.9
1930	195,311	8.7	285,925	10.8	4,250	10.3	123,203	16.2
1940	193,694	-0.8	289,816	1.4	4,317	1.6	132,165	7.3
1950	203,486	5.1	317,678	9.6	4,691	8.7	151,326	14.5
1960	186,587	-8.3	339,800	7.0	5,149	9.8	179,323	18.5
1980 projections by straight line extension of 10-, 30-, and 60-year means								
60-year	209,307		390,868		5,930		213,693	
30-year	180,767		375,720		5,748		210,737	
10-year	152,789		384,044		6,065		235,318	
Other	206,280*		——		——		245,400**	

* Probable realistic projection -- 0.5 percent annual growth

** United States Bureau of Census projection



POPULATION FORECASTS

A plan must deal not only with present needs but with future requirements, and therefore it is just as important to anticipate the future as to understand the forces at work in the present situation. It is assumed that industrial plant locations and retail centers will not change very much unless there is a drastic shift in population. Estimates of the future population of the City of Worcester, the Planning Region, the State, and the Nation may be compared in Table 3.1. The Region and the State have and are expected to continue to have similar growth rates.

Forecast for the City of Worcester: Estimating the future population of the City of Worcester is both an exercise in projection and an application of objectives for the residential land use plan. It is a two way task in the sense that the City must be prepared to meet the needs of future population potential and at the same time, in developing the Comprehensive Plan itself, the City, in effect establishes a capacity for population absorption.

For this study four different population projections have been made (see enlarged portion of Graph 3.1). Three of these are straight-line arithmetical projection of the 60-, 30-, and 10-year average growth rates. A probable realistic projection has been formulated for 1980 with a growth rate of 0.5 percent per year. In selecting the 0.5 percent growth rate, the following factors were taken into consideration: the natural growth rate, out-migration, in-migration and the probable rate of the future industrial growth, as well as the various other aspects in the development of the City. Each of these factors plays an important role within their realm. Which in turn influences very much the growth of the City's population.

It is estimated that the probable population for the City of Worcester in 1980 will be about 206,280 or 52.7 percent of the region. This seems like a low figure in the light of the natural increase in the City; however, Worcester in the last decade had more than 20,000 persons emigrate to the surrounding towns. It is interesting to note that if the trend of the last census period continues, by 1980 the City will be left with only 152,789 inhabitants. Of course, from a practical point of view this figure does not seem possible. If the decennial rate of increase returns to the average of the past sixty years, the City population will reach 209,307. Application of planning objectives to the Ten-Year Program will make the difference between decline and sustained change and growth.

Forecast for the Planning Region (C.M.R.P.D.): For the Region, three different projections are given (see enlarged portion of Graph 3.1). It is estimated that by 1980 the Central Massachusetts Regional Planning District will have 390,868 inhabitants. This growth is due primarily to natural increase within the region. This projection is based on the 60-year average

growth. Active migration within the region has affected to some extent the particular growth of the City and the individual towns. It is expected that the particular migrations will lead to a significantly different pattern than exists today.

Resultant Pattern: By 1980 the general trend indicates that the City of Worcester will experience moderate growth to about 206,000. At the same time it is expected that the Region will experience growth to well over 390,000. The resultant pattern, then, is one of peripheral growth around a stable core. This clearly indicates the significance of City--Regional interdependence.

POPULATION COMPOSITION

Both in the Region and in the City the total number of Non-white persons is not very large. More meaningful is the way in which the White and Non-White populations are distributed.

The proportion of the Non-white population is expected to increase both in the City and in the Region through in-migration and through a somewhat higher rate of natural increase. The Non-white population forms only 1.08 percent of the City's population and is mainly concentrated in a few census tracts. Census tracts 14, 15, 16, 17, 18, 20 and 24 accommodate 85 percent of the Non-white population. These locations are adjacent to factories and other job sources because some of these families are usually--as a consequence of lower educational and employment opportunities--among the lower income groups which seek to live in the City because of greater job opportunities and nearness to work on the one hand and the difficulty of renting or buying homes outside the City on the other.

Age and Sex Composition

In Graph 3.2 are shown one "population pyramid" for 1960 which compares by age and sex groups the populations of both City and Planning Region and three "demi-pyramids" which compare, for the City only, the relative size of the male and female age groups. These three are the more conventional pyramids "folded" on the vertical axis. The "wasp waist" shows up best on the "unfolded" pyramid at the top of the page. The number of children born during the 15-year period, 1925-1939, reflects the drastic drop in the birth rate during the depression years.[1] Migrations between the City and the balance of the Region are reflected in the graphs but external migrations are not; the omission from the following analysis of this and other demographic (population study) factors permits us to make only

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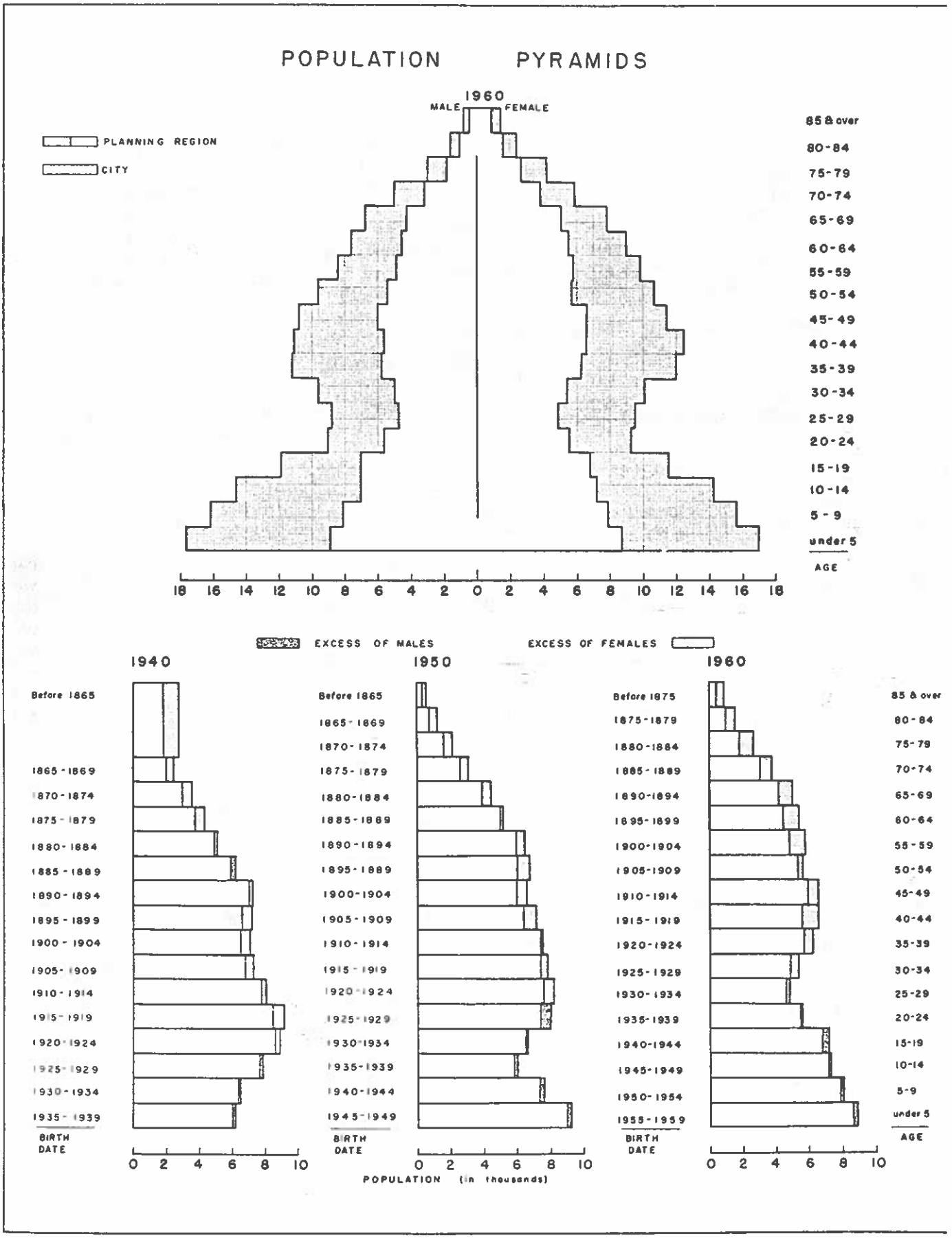
1 The textiles industry in New England was already suffering from overcapacity and obsolescence during the primary post-war depression in the early 1920's.


POPULATION PYRAMIDS
1960
MALE
FEMALE
PLANNING REGION
CITY
85 & over
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
under 5
AGE
18 16 14 12 10 8 6 4 2 0 2 4 6 8 10 12 14 16 18
EXCESS OF MALES
EXCESS OF FEMALES
1940
Before 1865
1865-1869
1870-1874
1875-1879
1880-1884
1885-1889
1890-1894
1895-1899
1900-1904
1905-1909
1910-1914
1915-1919
1920-1924
1925-1929
1930-1934
1935-1939
BIRTH DATE
0 2 4 6 8 10
1950
Before 1865
1865-1869
1870-1874
1875-1879
1880-1884
1885-1889
1890-1894
1895-1889
1900-1904
1905-1909
1910-1914
1915-1919
1920-1924
1925-1929
1930-1934
1935-1939
1940-1944
1945-1949
BIRTH DATE
0 2 4 6 8 10
1960
Before 1875
1875-1879
1880-1884
1885-1889
1890-1894
1895-1899
1900-1904
1905-1909
1910-1914
1915-1919
1920-1924
1925-1929
1930-1934
1935-1939
1940-1944
1945-1949
1950-1954
1955-1959
BIRTH DATE
0 2 4 6 8 10
85 & over
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
under 5
AGE
POPULATION (in thousands)

Graph 3.

tentative observations.

The first such observation is that almost ten thousand persons have been lost to the City and about eighteen thousand to the Region as a whole through depressed birth rates and emigration from this area. A comparison with the population profile for the United States (not illustrated) suggests that most of the "waist" effect is due to emigrations, as the "waist" of the national profile is not as pronounced. The causes of this "loss" lie primarily in the relationships between population and employment, discussed below under the latter heading.

A second observation relates to the changes over two decades in the total populations of given five-year cohorts (for example persons born in the period 1935 to 1939 are referred to below as the 1935-39 cohort).[1] Each cohort can be followed across the set of "folded" profiles by moving from left to right and up two steps between graphs, following the birth dates for each cohort.

Generally, it may be remarked that each cohort declines in size from the normal losses from death--small in early age groups, greater in later ones. The effects of increased job opportunities in Worcester during war years kept the cohorts representing the prime labor force (15 to 45 years of age) from all but minor declines during the 1940's except for the female age group 20-24 and male age groups 15-24. As anticipated, the decline in the higher age groups varies rather directly with age.

In the 1950's, while the pattern in the higher age groups is substantially the same, the prime labor force cohorts declined drastically. The shrinkages in the 1905-29 cohorts (aged 20-44 in 1950) are similar to those in the cohorts from age 60 up. Since these younger cohorts are not losing from 16 and 17 percent to 28 and 33 percent by death (even considering Korean War losses), emigration to areas where the employment possibilities are greater may be taken as the principal reason. From these prime labor force cohorts, the City has lost in one decade a total of over twenty thousand persons or 23 percent (see further discussion below under Labor Force).

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[1] When comparing the changes in the size of an "age group" from 1950 to 1960 we are comparing two completely different groups of people: e.g., the 25-29 age group in the 1950 Census was born during the years 1920-24; the 25-29 age group in the 1960 Census was born during the years 1930-1934. On the other hand, a "cohort" consists of the individuals born during one period and followed through two or more Censuses: e.g., the 1920-24 cohort was age 15-19 in 1940 and just entering the labor force; in 1950 the same cohort was aged 25-29 and in 1960 it was aged 35-39. Except for migration and death, we are dealing, in the case of a cohort, with the same group of people. Since the actual death rate at given ages for any sizeable population is readily estimated, we are thus able to get a reasonable picture of net migration by age groups.

The Sex Ratio by Age Groups: The population pyramids for Worcester cannot effectively be studied in isolation from the rest of the country because of migration. Certain characteristics, nonetheless, can be noted. The excess of males over females declines from conception onwards and after the first two decades of life changes to an excess of females, largely as a consequence of the higher death rate for males. In each cohort including that of 1900-1904 and all older ones, the increase in excess females as the cohort is followed through the three graphs is consistently regular, even in the unusual cohort of 1885-90 which had an excess of males in 1940. Younger cohorts are not as regular, because of migration.

Fluctuation in Future Cohorts: Part of the irregularities in the shape of the population profiles are caused by the radically different reproduction rates of the 1930-40 decade compared with the succeeding 1940-60 decades. Such irregularities are certain to be reflected at intervals of approximately twenty to thirty years for several generations, and may be either amplified or diminished, depending on the level of the economy prevailing at the time each group passes through the reproductive age period. These irregularities will continue to cause fluctuations in the size of school-age groups and the labor force as well as in family formation and hence in the potential housing market.

It has been estimated that under the present zoning ordinance, approximately 26,300 additional housing units can be built within the City limits. This indicates that the City has the capacity to accommodate 290,000 people in all. A detailed treatment of growth rates of housing units is given in Chapter Five, under residential land use.

WORCESTER LABOR FORCE

Worcester industries draw their employees from a labor force that has a diverse ethnic background. Since there are many commuters employed in the City, this study considers the labor force living in the Worcester Standard Metropolitan Area (SMSA) rather than that of the City alone. Except in this section of the Comprehensive Plan, the Regional Planning District is used in preference to the SMSA (see discussion in Chapter Two and Map 2.2).

The colonial settlement of Massachusetts was made largely by Englishmen and Scotch-Irishmen in the 17th and 18th centuries. They came here seeking religious freedom and set a stern Puritan stamp upon a stern landscape. Small numbers from other European groups also settled here, though the Middle Atlantic region was much more the polyglot melting pot. These groups had two centuries to establish themselves before the surge of the newer immigration of the 19th and early 20th centuries.

Irish immigrants escaping from the potato famines were the first to seek entrance into this country in large numbers. Oscar Handlin, a researcher in this field, wrote that, "by 1855 more than 50,000 Irish lived in Boston, almost all having arrived since 1840". They constituted more than a third of Boston's population. Thousands of these and others from similar immigrant groups and lacking capital, training, and opportunity for other endeavors, formed the labor resource pool upon which was created a new industrial complex. A combination of trading fortunes and this supply of labor was employed to satisfy the pent-up demand for construction which had been postponed by the Napoleonic Wars. Around 1860, Scandinavians began to appear in Worcester. Many of these people had been recruited in their homelands to satisfy a specific labor shortage at some local factory. Recruiting took the pattern of soliciting men in that country, city, or town, which had earned a reputation for excellence in the specialty desired. The chosen man would often be followed by family, relatives, friends, or co-workers; thus followed the formation of a distinct ethnic group. These skilled Scandinavians were promptly absorbed into the rapidly developing industrial complex of New England and contributed their skills to the developments of the City's wire, metal working,machine tool, and grinding wheel industries.

By the time that the Southern and Eastern Europeans began immigration, around 1890, much basic industrial building had been done, and Worcester had started a huge expansion of mass production in industries that did not require as much skilled labor. Recruitment in Europe was used again, this time on a generally non-selective basis. Thousands of people responded, to the vast benefit of local industry, until World War I shut off the flow.

OCCUPATIONAL CHARACTERISTICS

Table 3.2, on the next page, presents the percentages of the Worcester Area labor force according to type of work performed without regard to the employing industry,and compares the SMSA with both State and Nation. Employment by industry or industrial group will be discussed below in the section on employment.

Occupational data concerned with the Worcester SMSA reflect the demands of the labor market. Stated another way, the higher Area percentage of craftsmen and skilled workers, which exceeds those for both Massachusetts and the United States, indicates the high calibre of local industry. There also is a reservoir of professional and technical workers considerably larger, on a percentage basis, than that which exists in the Nation as a whole; and one which approaches the State level. Growth of very technical industry in the Boston area has raised the State average. The Worcester Area has an exceptionally high percentage of operatives, or semi-skilled workers, but a low percentage in activities which require less skill and training. As might be expected, the Area also shows very low percentages in Agriculture,

Forestry, Fishing, and Mining employment.

TABLE 3.2

Occupational Characteristics of the Labor Force
Worcester SMSA, Massachusetts and United States, 1960*
(as Percentages)

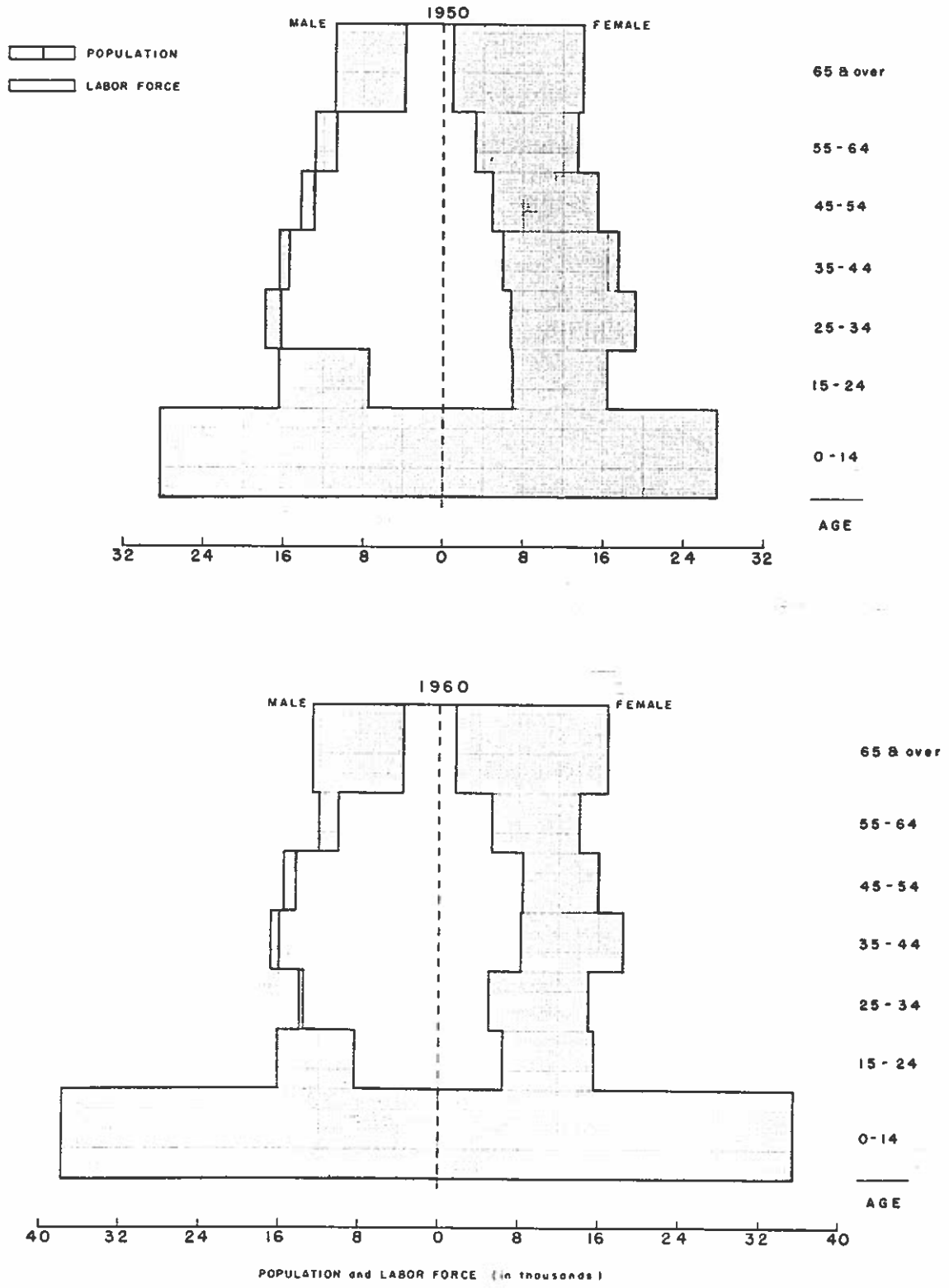
	Male			Female		
	SMSA	State	U.S.	SMSA	State	U.S.
Professional, Technical and Kindred Workers	11.2	12.6	9.7	14.4	13.3	12.9
Managers, Officials, and Proprietors except Farm	10.2	10.5	10.5	2.7	2.8	3.5
Sales Workers	7.6	7.5	6.4	7.8	7.0	7.5
Clerical and Kindred Workers	7.4	7.5	6.5	31.3	31.0	28.4
Craftsmen, Foremen and Kindred Workers	22.3	21.0	18.4	1.3	1.5	1.1
Operatives and Kindred Workers	25.6	21.2	18.7	21.3	22.8	14.7
Private Household Workers	.1	.1	.1	3.9	3.6	7.5
Service Workers, except Private Household	6.6	7.3	5.6	12.9	10.9	12.8
Laborers except Farm and Mine	4.5	5.3	6.5	.4	.4	.3
Farm Laborers and Farm Foremen and Occupations not reported	.6	.6	6.9	.1	.2	6.5
Forestry, Fisheries, Mines	4.1	6.4	10.7	3.9	6.5	4.8
	100.0	100.0	100.0	100.0	100.0	100.0

*Source: U.S. Census 1960 of Population

It should be mentioned that roughly one-third of the Worcester SMSA work force is female; in this third, the Area is 1.5 percentage points higher than the Nation in the professional and technical category, and exceeds the State by 1.1 percentage points. Such a situation may be influenced by the relatively large number of hospitals and other medical facilities in Worcester. Nationally, 7.5 percent of female labor is occupied in private household work. The State and Area have less than half this percentage; clerical and operatives are higher than the National averages, reflecting high female participation in the manufacturing, sales, and service components of the labor force.

The following material is based upon data compiled by the Worcester Area Chamber of Commerce and the Research and Statistics Department of the Massachusetts Division of Employment Security. This study, because of the

POPULATION and LABOR FORCE PYRAMIDS



Graph 3.3

Area-wide interests of the Chamber of Commerce and because of the mobility of the working population, compares the Worcester SMSA with Massachusetts and the Nation. It should be noted, however, that workers cross the boundaries of the SMSA in both directions on their journeys to work; in other words, the labor force studied here is not exactly equal to the sum of total employment plus number of unemployed in the Metropolitan Area.

LABOR FORCE AND POPULATION

The labor force is derived from the population age groups 15 to 64,of which the groups from 15 to 44 may be considered the prime labor force. Relationships between population and labor force for 1950 and 1960 are readily seen in Graph 3.3 which is the conventional population pyramid with the labor force (the "hole in the middle") superimposed.

Labor Force Participation Ratio

A convenient device for labor force analysis is the ratio of *persons employed or seeking employment* to the *enumerated population* within certain specific age classifications. This labor force participation ratio is shown graphically below. The scale in the graph represents 100 percent of the population for each age-sex group and shows the participation of each age-sex group in the labor force. It is evident that males in the prime work force age groups (15-64) are mostly in

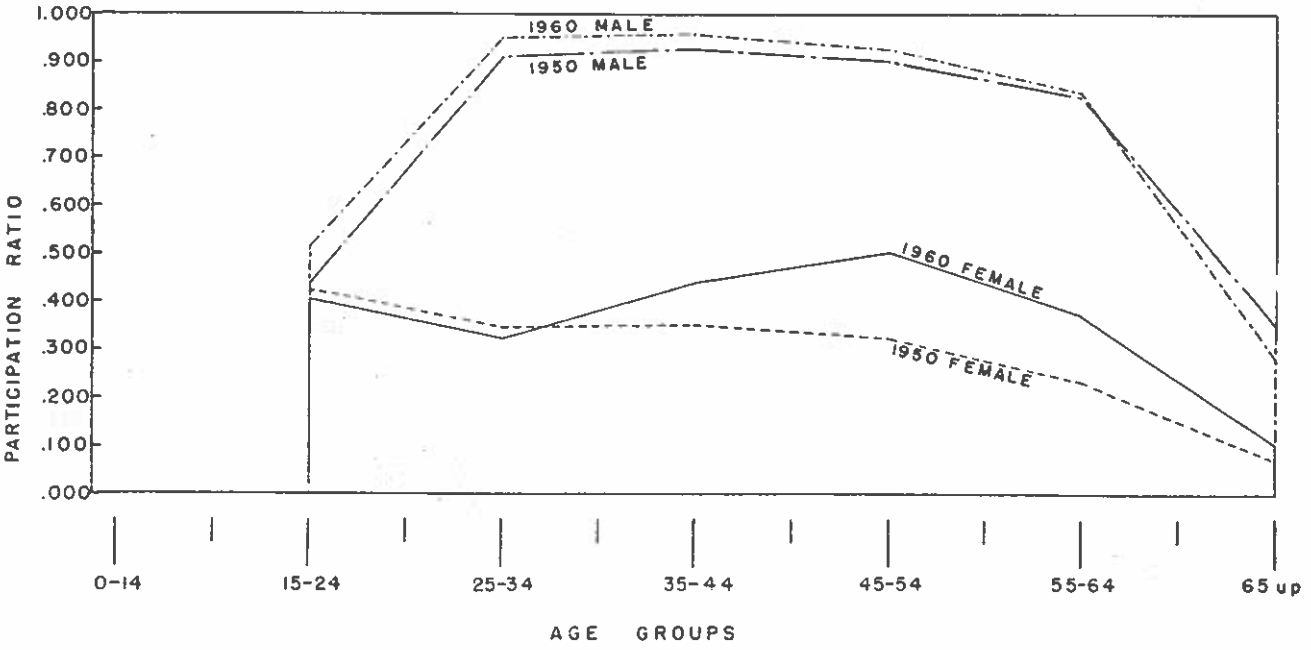


TABLE 3.3

Population, Labor Force, and Participation Ratio by Sex and Age Groups for the Worcester 1960 SMSA and Equivalent Area For 1950

AGE GROUPS MALE	1950 Equivalent Area Population	Labor Force Participation Ratio	Labor Force	1960 SMSA Population	Labor Force Participation Ratio	Labor Force
0-14	35,790	--	--	46,958	--	--
15-24	20,818	.446	9,285	20,254	.519	10,512
25-34	22,402	.910	20,386	17,875	.953	17,035
35-44	20,866	.933	19,468	21,130	.960	20,285
45-54	17,922	.905	16,219	19,532	.931	18,184
55-64	16,172	.830	13,423	15,218	.842	12,814
65 plus	13,523	.354	4,787	16,087	.285	4,585
Male Totals						
0-65 up	147,493	.566	83,568	157,054	.531	83,415
15 + up	111,703	.748	83,568	110,096	.751	83,415
15-64	98,180	.802	78,781	94,009	.849	78,830
FEMALE						
0-14	34,521	--	--	44,898	--	--
15-24	20,662	.428	8,843	19,845	.409	8,117
25-34	24,249	.347	8,414	19,092	.326	6,224
35-44	21,843	.351	7,669	23,237	.442	10,271
45-54	19,536	.322	6,233	20,291	.507	10,288
55-64	17,001	.239	4,063	17,734	.375	6,650
65 plus	17,732	.073	1,294	21,155	.103	2,179
Female Totals						
0-65 up	155,544	.236	36,516	166,252	.263	43,729
15 + up	121,023	.302	36,516	121,354	.362	43,729
15-64	113,291	.311	35,222	100,199	.421	42,550
GRAND TOTALS						
0-65 up	303,037	.396	120,084	323,306	.394	127,144
15 + up	232,726	.513	120,084	231,450	.546	127,144
15-64	201,471	.566	114,003	194,208	.622	120,380

the labor force and that a much smaller portion of women in these groups are working or available for work. The graph clearly shows that for all but three age-sex groups (men from 65 up; women of 15-24 and 25-34) the participation ratio was higher in 1960 than in the preceding census. This indicates that males are both entering the labor force earlier and retiring earlier. This latter tendency can be expected to be strengthened in succeeding censuses as retirement programs are increased. The former, coupled with smaller participation of women from 15-34, suggests a tendency to earlier marriages. It also suggests that these young persons may not have the educational background helpful to keep abreast of the changing job requirements of American industry. The striking increase in participation of women of 35 and older in the labor force is further discussed in another topic below.

Table 3.3 lists the data from which the preceding graphic illustrations are derived. The data shows a constant 40 percent of the total population (aged 0-65 and up) in the labor force, but an increasing percentage (51 to almost 55 percent) of the prime working ages participating. Most of this increase occurred, as has been stated, in the female work force which, during the fifties, rose 6 percentage points from 30 to 36 percent. Other percentages may be read directly from the table by moving the decimal point in the column headed "Labor Force Participation Ratio" two places to the right.

The changes in both population and labor force for the Worcester SMSA between 1950 and 1960 are summarized in Table 3.4. Noteworthy are very large increases

TABLE 3.4

NET CHANGES IN AGE-SEX GROUPS FOR POPULATION AND LABOR FORCE, 1950--1960
(for Worcester SMSA and Equivalent Area for 1950)

Age Group	MALE		FEMALE		TOTAL (BOTH SEXES)			
	Population	Labor Force	Population	Labor Force	Population	as %*	Labor Force	as %*
0-14	+ 11,168		+ 10,377		+ 21,545	+30.6		
15-24	- 564	+1,227	- 817	- 726	- 1,381	- 3.3	+ 501	+ 2.7
25-34	- 4,527	-3,351	- 5,157	-2,190	- 9,684	-20.7	-5,541	-19.2
35-44	+ 264	+ 817	+ 1,394	+2,602	+ 1,658	+ 3.8	+3,419	+12.5
45-54	+ 1,610	+1,965	+ 755	+4,055	+ 2,365	+ 6.3	+6,020	+26.8
55-64	- 954	- 609	+ 733	+2,587	- 221	+ 0.6	+1,978	+11.3
65-plus	+ 2,564	- 202	+ 3,423	+ 885	+ 5,987	+ 1.9	+ 683	+11.2
All Age Groups	+ 9,561	- 153	+ 10,708	+7,213	+ 20,269	+ 6.6	+7,060	+ 5.8
Workers (15-64)	- 4,171	- 49	- 3,092	+6,328	- 7,263	- 3..	+6,377	+ 5.5

* Percentage changes are from the 1950 figure for each group as equal to 100.

and decreases in some age groups. These are accounted for, in part,by the irregular structure of the population pyramid (See discussion of these irregularities for the City and the Planning Region above in the section on population. The Planning Region differs from the SMSA by a few towns; this difference is mapped in Chapter Two). The decline in population in the prime working age groups and the increase in population in the generally dependent age groups (0-14 and 65 and up) is a tendency that is expected to increase in future decades. The male labor force has stayed essentially the same while the over 5 percent increase in the total labor force has been concentrated in the female age groups from 35 and older. Note also that the increase in the female component of the labor force is roughly equivalent to the decline in population in the prime working age groups.

Women and the Labor Force

It can be expected that the striking increase in the participation of women in the labor force over the past decade will continue in future decades. The woman who is now forty can expect to live another 36 years; this compared with her grandmother's life-expectancy of 60 years. With her children in school or college, she feels superfluous at home and looks for a job within her competency, energy, aptitudes, and a capacity for mature decisions.

The increase of women in the labor force is both relative and absolute. In an historical period which has seen an hitherto unprecedented increase in the fertility rate (birth rate), not only are women having more children but also more women are becoming available for jobs outside the home. The long-term results of this phenomenon cannot be predicted with any certainty. Planning methodology, however, requires our best efforts in this direction.

Women are marrying at an earlier age and having families earlier. Life expectancy is increasing, especially for women, under the impact of better medicines and better trained physicians. Wants are increasing, under the impact of mass media advertising, resulting in quantity sales of many items not heard of a few years ago.

These and other economic and social considerations tend to drive more and more families to the conclusion that second jobs in the family would be desirable. Psychological reasons are becoming increasingly significant. A few generations ago, few women other than widows and unmarried women with no breadwinner (father, brother, etc.) would have considered working and even then at only a limited variety of jobs. Woman's biological role had, and perhaps for most women still has, precedence over her desire for a career.

Today, rather, the priorities are at least beginning to be reversed. Highly educated women are less and less willing to be tied to a custodial career for fifteen to twenty years-- their potentially most productive years--while their children grow toward independence. A return to the labor force after such a

long interruption means that a professionally trained woman can expect that the changes in her field will have been so many and so profound that she will, without extensive refresher courses be able to find jobs only at a much lower salary and satisfaction level.

An increasing proportion of women with preschool children are working; finding a grandmother, other relative, or some other person who will care for the younger children while the mother is away at work. In a few cities, mothers are fortunate enough to find organized programs with trained supervisors to care for preschool children. The children do not necessarily suffer from lack of parental attention under these circumstances if both parents are concerned to face up to the situation.

Labor Force Projections, 1965 and 1970

Under certain assumptions it is feasible to make estimates of the labor force for future years, although a word of caution should be entered in advance. Projections based on mass phenomena such as population growth have often been proven erroneous, as basic and unforseen behavior changes occur. Furthermore, the likelihood of error increases with the length of the period projected.

The assumption proposed here is that population in each age group will experience the same rate of mobility, life expectancy, and labor force participation in the 1960's as they did in the 1950's. On the basis of this assumption, population projections of the Worcester SMSA may be drawn for 1965 and 1970. By application of the 1960 labor force participation ratios to the 1965 and 1970 population projections, labor force projection values are as accurate as the assumptions permit (see Table 3.5).

A comparison of labor force totals reveals that Worcester's labor force will grow very slowly until 1965 after which its growth will accelerate somewhat, as the post World-War-II generation of young people enter the labor force. This can be seen in summary figures in Table 3.6.

The above mentioned projections are compared with those in the A.D. Little Study (see Table 3.7). The A.D. Little Study however, included projections for an area which included four towns not included in the Worcester SMSA, and probably did not have actual 1960 census data from which to make calculations, since the study was printed in June, 1960, only two months after the census data was collected.

Although the general magnitude of the A.D. Little projections for 1970 correspond with projections made in this report, these projections are considered more reliable since they are based on later and more accurate census returns than could have been available for the A.D. Little Study (see Table 3.7).

Table 3.5

Projections of Worcester SMSA Labor Force, 1960 - 1965, and 1970, by Sex and Age Groups

	1960*	1961	1962	1963	1964	1965**	1970**
Males							
15-24	10,512	11,112	11,711	12,310	12,909	13,508	14,416
25-34	17,035	16,565	16,096	15,626	15,157	14,688	16,580
35-44	20,285	20,034	19,784	19,533	19,283	19,032	16,182
45-54	18,184	18,301	18,419	18,536	18,653	18,770	18,413
55-64	12,814	12,882	12,950	13,019	13,087	13,156	13,963
65 plus	4,585	4,712	4,840	4,968	5,095	5,224	4,315
total males	83,415	83,606	83,800	83,992	84,184	84,378	83,869
Females							
15-24	8,117	8,457	8,798	9,138	9,479	9,820	10,976
25-34	6,224	6,063	5,902	5,740	5,579	5,418	5,979
35-44	10,271	10,105	9,939	9,773	9,607	9,442	8,084
45-54	10,288	10,116	9,943	9,598	9,598	9,426	10,945
55-64	6,650	6,637	6,624	6,610	6,597	6,597	6,909
65 plus	2,179	2,267	2,356	2,444	2,533	2,622	2,272
total females	43,729	43,645	43,562	43,303	43,393	43,325	45,165
total labor force	127,144	127,251	127,362	127,295	127,577	127,703	129,034

* U.S. Census of Population and Housing: 1960, Final Report PHC (1) - 175 Census Tracts, Worcester, Mass. Standard Metropolitan Statistical Area. December 1961, Washington, D.C.

**The 1965 and 1970 population projections were obtained by applying the attrition rate of the decade 1950 to 1960 of each age group to the age groups as shown in 1960. An example can be taken as follows. The formula is:

$$\text{Population projection 1970, for age groups 25-34} = \frac{\text{Population 1960, age grps. 25-34}}{\text{Population 1950, age grps. 15-24}} \times \text{pop. 1960 age grp. 15-24}$$

The projected labor forces are obtained by multiplying 1960 labor force participation ratios by the 1965 and 1970 population age groups, respectively.

Labor force estimates for the years 1961 to 1964, inclusive, were reached by application of standard statistical interpolation method.

Table 3.6

Labor Force Growth 1950-1970

	1950	1960	1965*	1970*
Male	83,568	83,415	84,378	83,869
Female	36,516	43,729	43,325	45,165
Total	120,084	127,144	127,703	129,034

* Chamber of Commerce projections

Table 3.7

Comparative Projections of Labor Force Growth 1960 - 1970

	1960 U.S. Census Labor Force	A.D. Little 1960 Labor Force	C. of C. 1970 Labor Force	A.D. Little 1970 Labor Force
Males				
15-24	10,512	11,709	14,416	16,600
25-34	17,035	17,031	16,580	17,400
35-44	20,285	20,278	16,182	16,600
45-54	18,184	18,184	18,413	19,400
55-64	12,814	12,825	13,963	14,200
65 plus	4,585	4,591	4,315	4,300
Totals	83,415	84,618	83,869	88,500
Females				
15-24	8,117	8,995	10,976	13,000
25-34	6,224	6,226	5,979	6,500
35-44	10,271	10,262	8,084	9,500
45-54	10,288	10,281	10,945	13,000
55-64	6,650	6,655	6,909	8,400
65 plus	2,179	2,172	2,272	2,600
Totals	43,729	44,591	45,165	53,000
Grand Totals	127,144	129,209	129,034	141,500

TABLE 3.8

Employment Comparison, 1940--1960

SIC CODES	MAJOR GROUPS	WORCESTER			MASSACHUSETTS			UNITED STATES		
		1940	1950	1960	1940	1950	1960	1940	1950	1960
19-39	Manufacturing	29238	33437	27590	553143	677800	709268	10576842	14575692	17513086
40-49	Transportation, Communications, and Utilities	3805	4825	4068	99649	127011	115464	3107568	4368302	4458147
50	Wholesale Trade	1729	2777	2726	43811	66520	65911	1204761	1975817	3066085
52-59	Retail Trade	11105	13042	10802	24409	286200	260609	6341157	8571752	8726550
60-67	Finance, Insurance, and Real Estate	2240	2914	3455	62742	77553	96307	1472397	1916220	2694630
72	Personal Service	5081	3778	3163	127842	95604	84802	3974717	3488551	*
70,73-76	Business and Repair Service	1051	1586	1256	30440	43587	47724	890904	1411357	*
78-79	Entertainment	450	532	323	13215	15155	11912	419527	554029	*
80-84,89	Professional	6930	8557	11453	144?52	183091	271929	3289881	4674548	*
86,88	Other	2157	651	2273	259847	25047	*	727836	839924	*
91-94	Government	2358	2909	2746	58588	87989	94993	1406472	2488778	3202890
01-09	Agriculture, Fisheries, and Forestry	269	261	153	41924	38914	26147	8496147	7005403	*
10-14	Mining	22	22	8	1515	1453	1213	913600	929152	647000
15-17	Construction	2451	3474	2727	68610	100783	99823	2075274	3439924	3815937
	Totals	68886	78856	72743	1530487	1826707	2000312	44888083	56239449	64639252

* Data for 1960 not readily available in these categories which are combined with others in Bureau of Labor Statistics data.

EMPLOYMENT

The present industrial complex of Worcester has its roots in the City's settlement in 1713, for the charter of settlement called for land allocation to a sawmill, a gristmill, and other "builders and maintainers of works promoting useful trades." In the early days, the sawyer and the miller worked part time at their specialties, and every man, from the preacher and lawyer to the humblest, farmed his own land. Population growth did eventually prompt the emergence of a tradesman group which could devote all of its time to the management and expansion of Worcester's small, early semi-industrial developments.

A century after settlement, mainly because of a much improved road system, Worcester had become a marketing and manufacturing town for the surrounding area. Local products were processed in the distilleries, breweries, tanneries, and paper mills now located here. Sugar refiners, chocolate mills, gunpowder mills, carding mills, spinning mills, rope walks, forges, furnaces, bloomeries, rolling and slitting mills, and cut-nail manufacturers dealt with imported material.

The Blackstone Canal, completed in 1828, and the completion of rail connections in 1830, opened Worcester to the commerce of the world; and employment climbed sharply. Many of the manufacturing firms which are an important part of the present employment picture had their beginnings in this period. There were many wild swings of employment in Worcester, but manufacturing continued its upward trend until the mid-1950's.

The Twentieth Century brought a constantly changing structure of industry as well as a constantly changing pattern of location. Per-man-hour output increases (automation) and the changes in total production by industries (as a result of substitution of one output of one industry for another) plus the decline, conversion, or diversification of whole industries (rail passenger transportation, tobacco, wooden box making) are well known. So, too, are the changes of location through merger and attempts to lower production costs. The overall effect has been one of declining employment in manufacturing since the middle fifties as a portion of total employment and the emergence of service activity as a vital employer.

COMPARISON OF EMPLOYMENT BY MAJOR INDUSTRY GROUPS

While the total labor force working in the Worcester S.M.S.A. (regardless of place of residence) has risen slightly in the last decade, (and a further increase is projected), the number of persons employed working within the City proper has declined. This is a consequence of the relative decentralization of places of employment--from the City to the suburbs--and is not necessarily a reflection on the economic vitality of the region as a whole. Employment within the SMSA has also declined, though less sharply (see Table 3.8 and

3.9,also Graph 3.5).

Employment within the City is here considered, not as a measure of Worcester's economic base (which transcends municipal boundaries), but rather as an indicator of its future industrial and commercial space requirements. As an aid in analysis of this factor, the changing pattern of the City's employment is compared with that of the State and Nation (Table 3.8).

Manufacturing[1]

Manufacturing is the largest component by far of total employment in Worcester; representing about 42 percent in both 1940 and 1950, though it declined to just under 40 percent in 1960 (Graph 3.4). In the twenty-year period considered, manufacturing jobs declined 1618, or 6 percent. In the forties, total employment rose 9970 of which manufacturing accounted for 4199 or almost one-half. In the fifties, the loss of 5847 to manufacturing accounts for all by 266 of the total employment loss of 6113 (non-manufacturing, on the other hand, after a 14 percent increase in the forties, remained relatively stable in the fifties). The loss to manufacturing jobs is the result of a complex of interlocking reasons including increasing mechanization and efficiency on the one hand and relocation on the other. Some industry which has relocated elsewhere has not moved so far as to be beyond commuting distance of Worcester residents who have continued to live in the City and commute to their old jobs. Their salaries continue to be part of the City's income.

Industries Manufacturing "Soft" Goods: The Manufacturing Major Group consists of twenty-one two-digit industries which can be loosely divided into producers of "soft" or "consumer-oriented" goods on the one hand and "hard" or "industry-oriented" goods on the other. Certain industries, not large employers in the City, have both orientations. The "soft" goods industries are compared in Graph 3.5, which also has curves for all employment, all manufacturing, and all "metalworking". Curves 1 and 2 in Graph 3.5 and 2 and 4 in Graph 3.7 represent the same data plotted on semi-log and arithmetic graph paper, respectively (the semi-log graph enables a comparison of the rates-of-change of curves with a wide range of values--in this case from 1,000 to 85,000--whereas the arithmetic graph permits easier comparison of changes in quantities). These curves declined in 1954 and 1957-58 along with National economic indicators.

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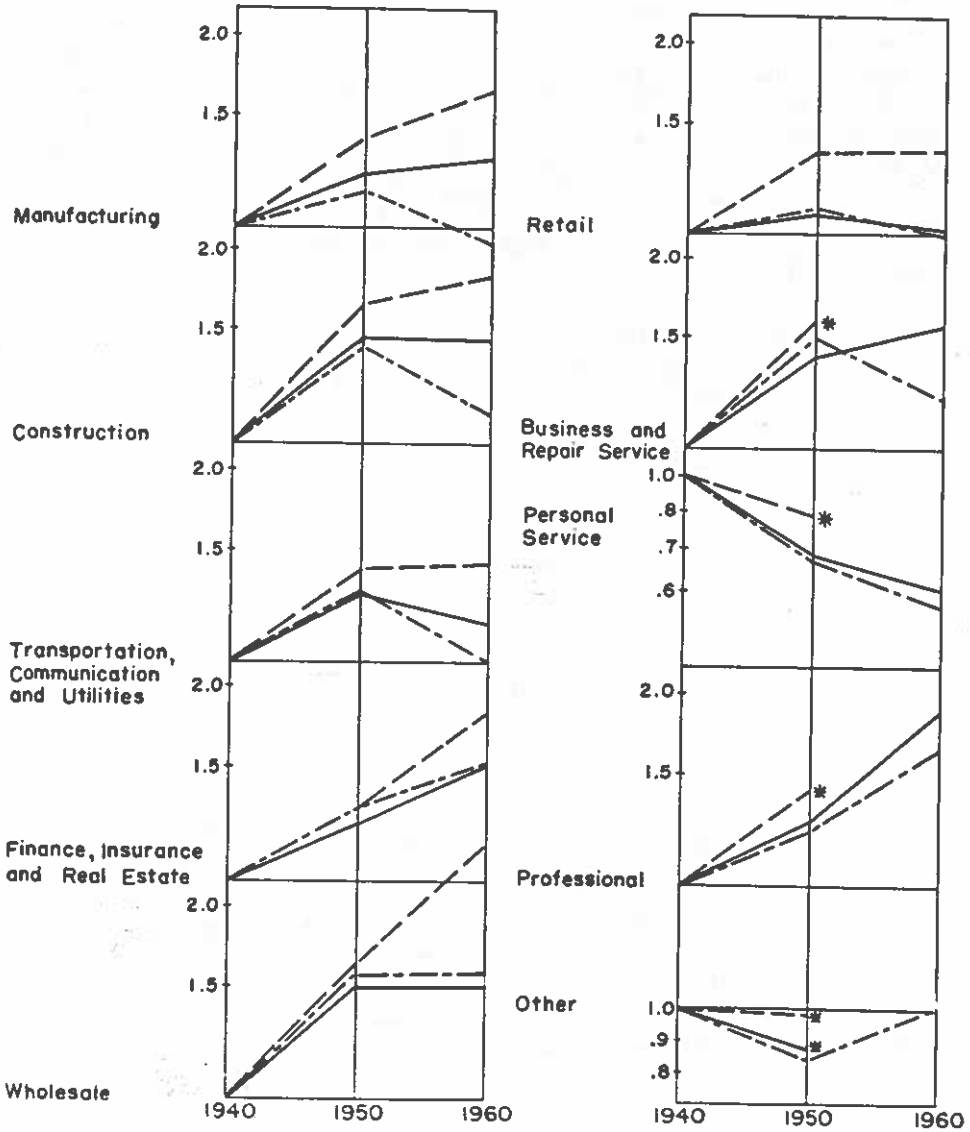
[1] The Standard Industrial Classification system (SIC), is arranged by *divisions* (manufacturing is Division D), which are subdivided into *major groups* (Food manufacturing is Major Group 20, primary metal manufacturing is Major Group 33), and *groups* (bakery products comprise Group 205, foundries comprise Group 332). These are listed and discussed in the Appendixes. The SIC system, set up in the fifties by a Federal inter-agency committee, is the basis for statistical breakdowns of industry-related data by both non-governmental and all levels of governmental agencies.

EMPLOYMENT INDEXES
1940 - 1960



Graph 3.4

such as gross national product and industrial production, but have not shown the resiliency of these indicators. The third curve in Graph 3.5, labelled "metal working", is discussed in components below. The fourth curve, "all other", represents the employment in the manufacture of food, lumber, furniture, chemicals, petroleum, and rubber and plastics.

Industries Manufacturing "Hard" Goods: The several industrial groups that are summarized in the third curve mentioned in the preceding topic are shown in detail in Graph 3.6 (note that the scale on this graph is in hundreds rather than thousands). Of the four largest employing groups, machinery and primary metals have declined between 15 and 20 percent in a decade while stone, clay, and glass and fabricated metals have about held their own. The other groups indicated are considerably smaller and their changes in employment seem without going into further analysis, to be rather erratic. Except for ordnance, they reflect the declines in National production in both 1954 and 1957-58, and taken altogether represent a small percentage of the total employment of the City.

In the State, manufacturing jobs have increased 28 percent in twenty years, while National employment has increased 65 percent. This contrasts with population growth over the same period of 19 and 36 percent, respectively.

Construction

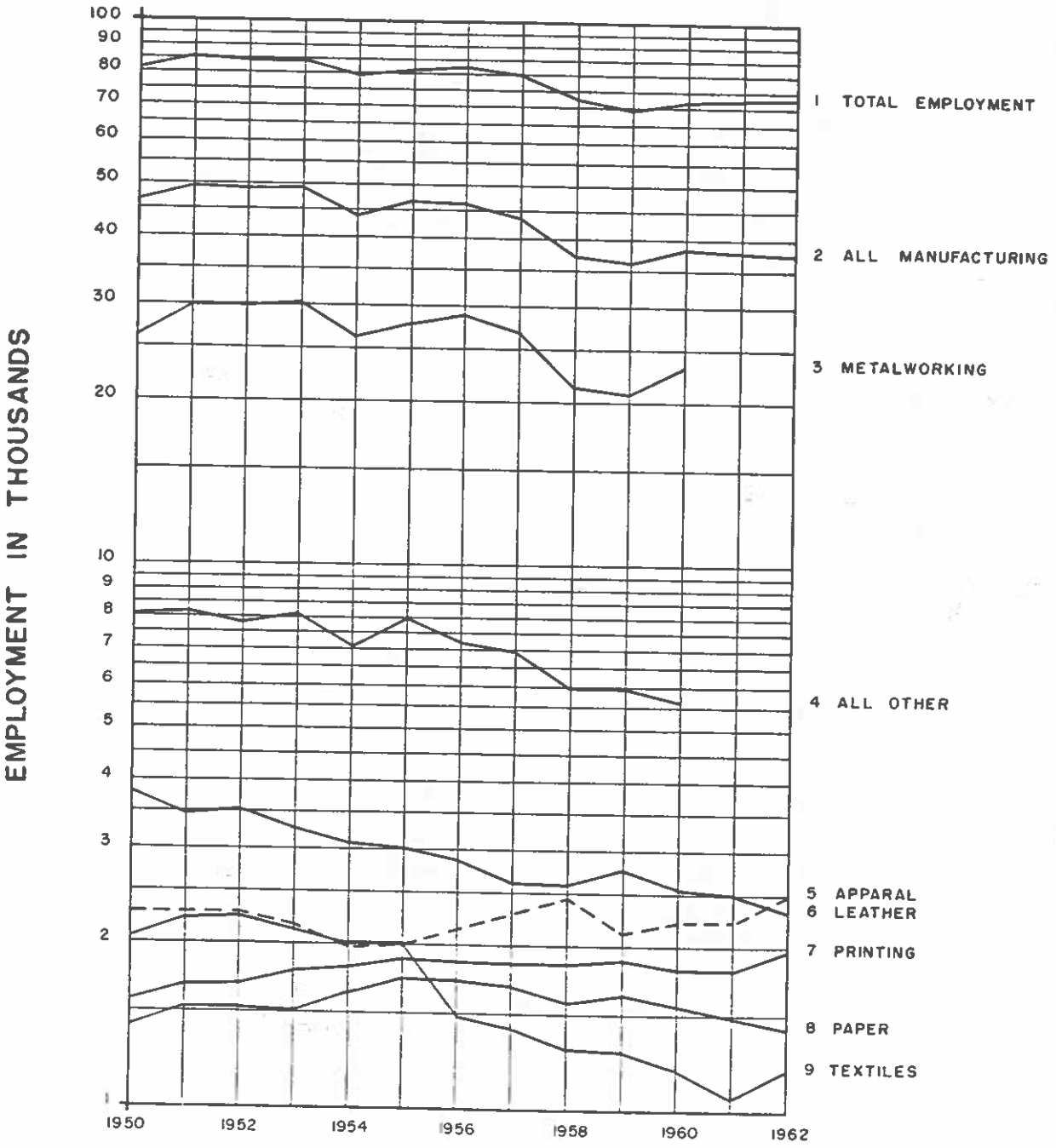
In absolute numbers, contract construction has never absorbed very much of the local labor force. The industry is a none-the-less faithful reflector of local economic activity, for no new manufacturing plants of any appreciable size have been built in Worcester for many years. While there is a constant, small amount of residential building and commercial remodelling taking place, large building projects in this locality have usually been in the hands of "imported" labor.

The popularity of the suburbs as a place to live has meant that much construction, which is truly oriented to Worcester, has taken place on the periphery of the City. Consequently, construction employment on a State basis has shown no great change since 1950. Over the Nation as a whole, as manufacturers seek more profitable locations, urban redevelopment speeds up, and commercial situations develop in response to a growing population, the construction industry stays quite healthy. New materials, new techniques, and attractive new building configurations keep the industry moving and growing.

Transportation, Communications, and Utilities

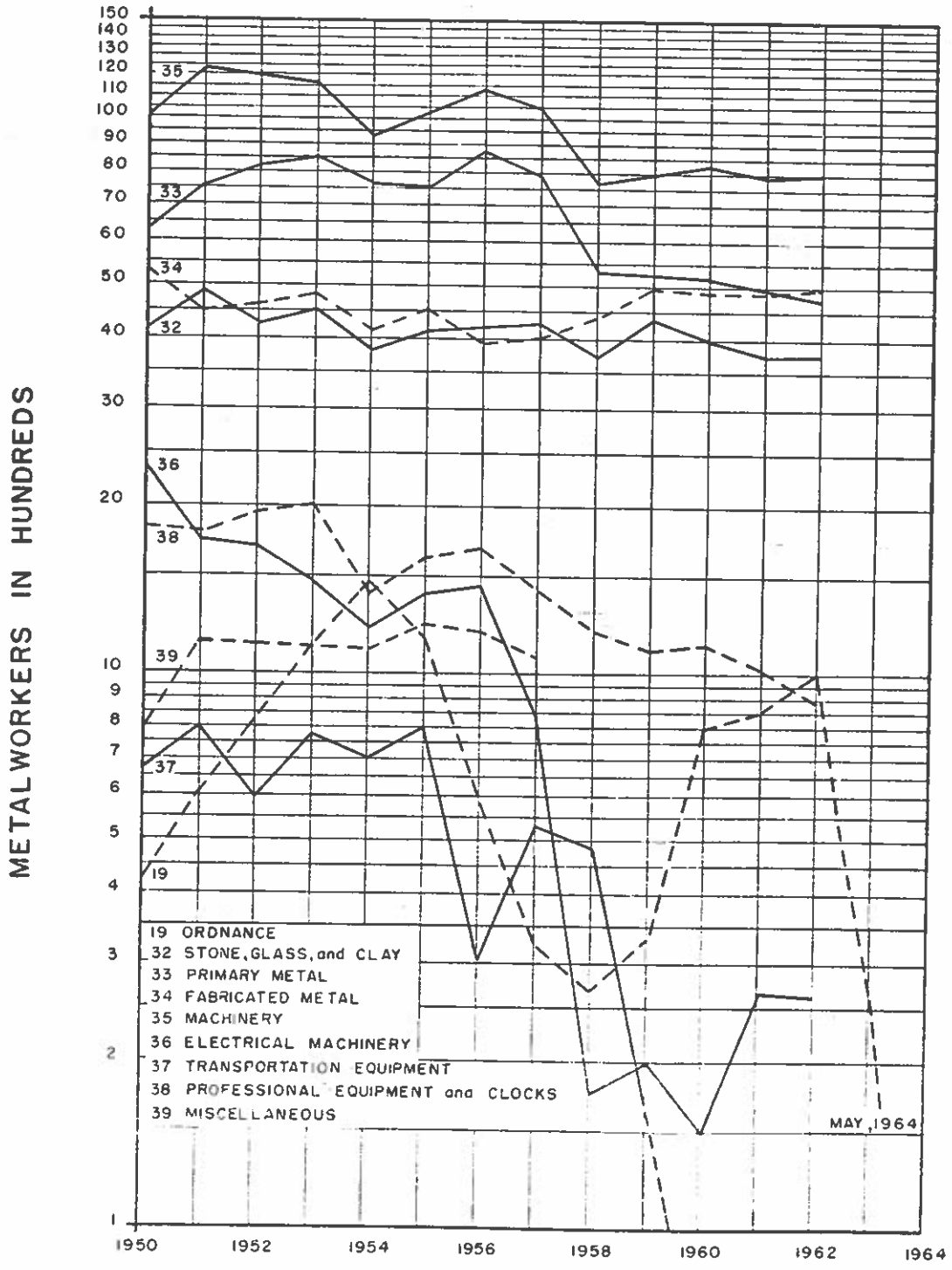
This group of activities has been combined because they have a common characteristic; they are, with minor exceptions, all subjected to government supervision. If unlimited competition were allowed, for example among trucking

WORCESTER EMPLOYMENT, SEPTEMBER 1950–1962



Graph 3.5

WORCESTER METALWORKING EMPLOYMENT, SEPTEMBER 1950–1962



Graph 3.6

firms in the transportation group, public interest could be expected to suffer from the concentration of economic power (to set rates and quality of service) in the hands of the few firms who would survive under free competition.

Transportation activities are oriented to both industry and population. They do not thrive where industry is unhealthy or where the population is becoming more and more conscious of the automobile as personal transport. Across the country, many retiring transportation workers have not been replaced with resultant declines in employment totals. This decline is compensated by the other parts of this group of regulated industries, which showed a 6 percent rise in the City, 15 percent for the State, and 43 percent for the Nation.

Utilities and communications are more stable in their employment, absorbing a substantial variation in output of product or service with minimal change in employment. Innovations in automatic equipment presage an employment increase at a slower rate than business growth, and decline in the local economy as a whole is likely to be reflected in these industries.

Finance, Insurance, and Real Estate

Like construction, this group is a small part of total, local employment. It also is the brightest star in a changing picture of employment in Worcester. Using 1940 employment of Worcester as a base, this group increased 54 percent by 1960. The group includes banks of deposit and other financial organizations, including those devoted to consumer finance; insurance home offices, agents, and insurance carriers of all sorts; and those employed in real estate in all its many forms.

It is impossible to state, in a few words, the impact of installment buying on the people of the United States. Worcester has its fair share of this type of buying, with attendant growth of those employed who originate, consumate, and administer this form of business activity. There is no reason to assume that experience statewide has been at any variance with that of Worcester.

People are also saving money at unparalleled rates. This money must be received, handled, and invested by employees. Attention must be paid to the branches which have been built within the City by existing banks, for they represent part of increased financial employment.

Home office insurance activities have some of the characteristics of public utilities; the major one is the ability to handle, within broad limits, varying work loads with no personnel change. In spite of this, the several companies headquartered in Worcester have experienced steady growth of employment. Over the entire country, experience has been similar. Growing

home office employment could only have been preceded by increased insurance sales, which means expansion of sales force.

The mass movement of Worcester's population to the suburbs has had tremendous impact on real estate operations. Real estate employment within the City has grown in spite of the heavy development outside of it. The conclusion to be drawn is that Worcester is a "headquarters" city for real estate operators who do much of their work in the suburbs.

Suburban growth has inevitably meant the development of a large real estate industry outside of the cities of Massachusetts, which when combined with City real estate employment, has kept State activity at a high level.

The Country as a whole has experienced even greater subdivision development than New England; which explains, in part, the sharp upward trend of this curve for the United States. From another point of view, the National levels of manufacturing and construction activity imply location promotion, land transfer, building sales, and the like, part of which is in the hands of realtors.

Wholesale Trade

Wholesale trade is a small but significant industry. It performs many services for most other industries such as breaking bulk, maintaining inventories of parts, extending credit, and advertising.

Worcester is in an excellent position to be the distribution center for this area. In some respects, the City does function in such a manner, but the area of distribution is, at most, within a 50-mile radius of the city. This 50-mile limit is most circumscribed in the direction of Boston, Springfield-Holyoke, and Providence. These cities, especially Boston, are very competitive.

Wholesale employment in Worcester and the State has stayed about constant for the last 10 years after a 50 percent increase in the forties. As with most other sectors of the National economy, population growth and the concomitant growth of manufacturing have stimulated wholesaling activity and employment to tremendous levels. As an employer, this activity has increased by 154 percent since 1940.

Retail Trade

Retail employment for 1960 in Worcester dropped abruptly from the 1950 level, and now is below the 1940 figure. The major cause of such a decline is the same as that for most other sectors of the local economy: although the people who once lived, worked, and spent their salaries within the City may still work within the City, too many of them now live in the suburbs and spend their money

in the area where they live. Retail stores over the entire country have a similar problem and have responded in many ways; among them are the establishment of suburban branch stores and advertising aimed towards an area market rather than a local one.

Retailing employment within the State has dropped from the 1950 level, but it is still above the 1940 figure, for the State total would include the suburban retailers that cities have lost or never had.

Nationally, retail employment, like employment in so many other fields, reflects a growing population (which has more money to spend on a growing variety of goods). The level has crept up from 1950, but the decade 1940-1950 was one of swift growth which far outstripped, on a percentage basis, the State and local growth of the same period.

Business and Repair Service

The emergency period of the early 1950's spurred local industry to record high employment totals and encouraged the formation and growth of many secondary commercial activities. Business and repair service is typical of such employment types, incorporating as it does a miscellany of advertising and mercantile agencies; duplicating, mailing, blueprinting, and employment agencies; plus news reporting and research activities. The group grew rapidly between 1940 and 1950, on the City, State, and National levels; but has sustained this growth, if at a lesser pace, only in the State and Nation.

Locally depopulation of the City and continual failure or out-migration of industry has meant a distinctly downward trend of business and repair service. It should be noted, however, that local employment in this field is still some 10% above that of 1940. It would appear that until such time as total Worcester employment and population become more stable, business and repair service, though it represents a growing percentage of the lessening number of employed, cannot reverse its downward movement.

Personal Service

Personal service activities are those which supply care to a person or his apparel, such as laundries, cleaning and dyeing plants, barber and beauty shops, cleaning and pressing establishments, and suppliers of industrial linen and clothing. The type of firms in the group illustrate quite clearly that personal service levels will be influenced by population growth as well as by industrial activity. In addition, the levels of skill or education or both which exist in the labor force appear to have considerable influence.

Considering these general qualifications, the fading population and industry in Worcester have depressed personal service employment to considerable degree, though

it must be pointed out that the rate of decrease has been less sharp since 1950. Very likely, the steep decline of 1940 to 1950 was caused, in part, by the absorption of personal service employees by the then prosperous industial complex of Worcester. Part of the remaining loss can probably be explained by the increased size of the National military establishment.

Professional

Professional workers (e.g., teachers, engineers, doctors, lawyers, etc.) continues as the fastest growing local activity group. The tremendous growth is influenced by a number of factors, each of which should be mentioned very briefly:

a. we have entered the era of the specialist--the student who wishes a good job thinks of specializing before he even leaves school;

b. the Country as a whole has become very education minded--we are building and staffing schools as fast as possible;

c. research and development has become vital to firms wishing to maintain their competitive position--this, more than anything else, raises demand for scientists and technicians;

d. widespread hospital and medical insurance has encouraged physicians to hospitalize more of their patients for the sake of improved diagnosis and treatment, much of which is provided by insurance only for persons actually hospitalized.

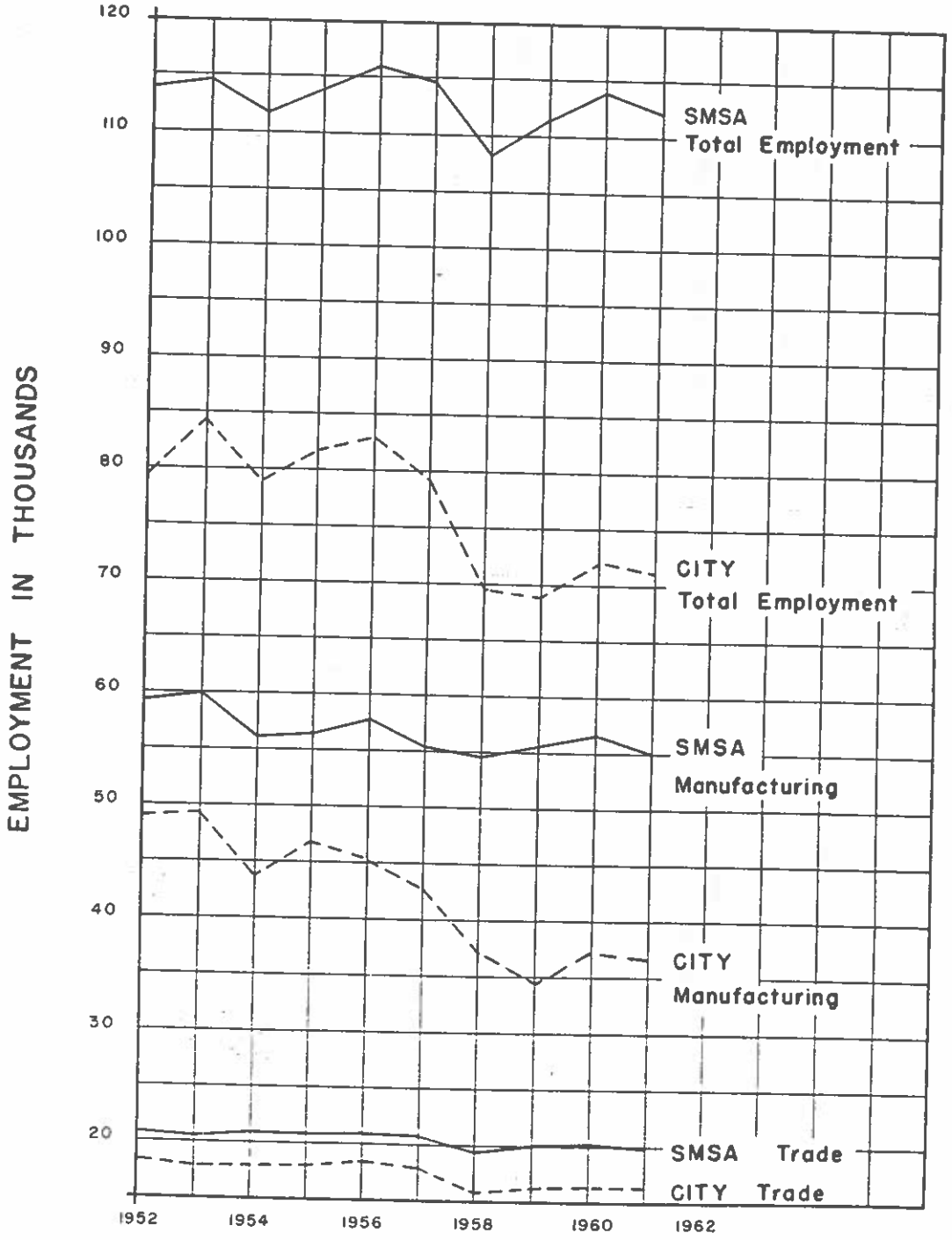
When classrooms and teachers are on hand in great enough numbers to properly accommodate the younger generation, when industry relaxes its search for market strength and society loses its technical orientation, and when hospital plants are large enough to handle all seekers of treatment, then pressure for professionally trained people will be reduced. This will probably never happen.

Other

This last curve is for a catchall grouping of employment in government, entertainment, agriculture, fishing, forestry, and miscellaneous. As with personal service, and excepting the group contribution made by government employment, it would seem that the group was absorbed by the industrial growth of the early 50's. After 1954, industrial employment began to drop, with the result that the "Other" group began to regain members.

The part played by government is submerged in the "other" curve, which is indicated by the fact that greatest government employment (for City only) occurred at the lowest point of the curve. Government employment is one of the largest components of "other". In the future, the shortening work week and rising pay scales suggest

EMPLOYMENT IN WORCESTER — CITY AND SMSA



Graph 3.

TABLE 3.9

Worcester City* and SMSA** Employment

1952 - 1961 (in thousands)

		1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Manufacturing	City	49.1	49.4	43.7	46.7	45.2	42.7	37.1	34.8	38.1	36.9
	SMSA	59.3	60.0	55.6	56.5	57.8	55.2	49.6	50.7	51.7	50.0
Construction	City	3.2	3.8	3.4	3.5	3.7	3.4	3.0	2.6	2.9	3.0
	SMSA	4.0	4.0	4.0	4.5	4.6	4.5	3.9	4.0	4.1	4.2
Transportation, Communications, and Utilities	City	4.8	4.7	4.6	4.5	4.9	4.9	4.6	4.5	4.4	4.3
	SMSA	4.6	4.6	4.5	4.3	4.3	4.4	4.5	4.5	4.4	4.3
Trade	City	18.5	18.0	18.1	18.1	18.5	17.9	15.8	16.3	16.4	16.3
	SMSA	20.8	20.5	20.9	20.9	21.1	20.8	19.5	20.2	20.4	19.8
Finance, Insurance and Real Estate	City	3.7	3.8	4.0	4.2	4.5	4.6	4.6	4.7	5.0	5.0
	SMSA	4.0	4.1	4.3	4.4	4.7	5.0	5.0	5.0	5.3	5.4
Total Employment	City	79.4	84.4	79.0	81.8	83.0	79.5	69.6	68.9	72.0	71.2
	SMSA	114.0	114.7	111.7	114.1	116.5	114.8	108.2	111.4	114.1	112.3

* City Data from Massachusetts Department of Commerce, Division of Employment Security

** SMSA Data from United States Department of Labor, Bureau of Labor Statistics

that there will be a growing number of employees who will be classified under entertainment.

COMPARISON OF EMPLOYMENT--CITY WITH SMSA

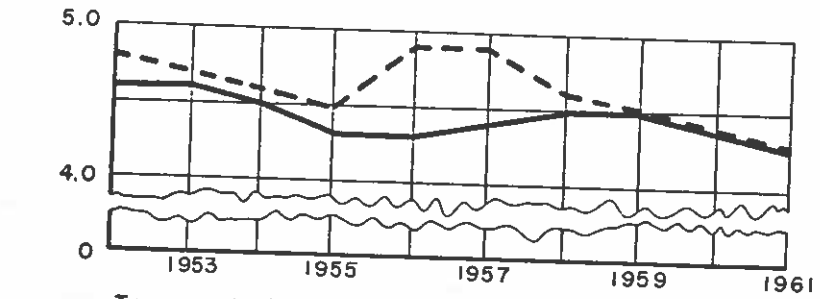
The data for this subsection are included to round out the comparisons for City and region of population, resident labor force, and employment. The data series for the City are covered employment from the Division of Employment Security, Massachusetts Department of Commerce. Certain classes of self-employed and not insured are thus excluded from these data. The data for the SMSA, however, are from the United States Bureau of Labor Statistics. These data exclude agricultural workers, domestics, self-employed persons, and unpaid family workers. Only five categories plus total employment lent themselves to comparisons (see Graphs 3.7 and 3.8, also Table 3.9). These data are presented with the warning that comparability of the two series is very much in question. This questionability is supported below.

It is immediately apparent that the curves for the group in the SMSA are, on the whole, much smoother than their opposite numbers. One possible explanation for this is what the curves suggest: employables who have lost jobs in the City found other jobs, not necessarily in the same industry group, in the balance of the SMSA. Six out of nine years show the difference between the two curves growing as the City employment shrank, and vice versa. Between 1957 and 1959, while 10.5 thousand jobs were lost to the City, the difference between the curves (ostensibly the employment of the towns surrounding Worcester) increased from 35.5 to 42.5, from which it would follow that the balance of the SMSA absorbed two-thirds of the City's loss, thus increasing its employment 16.5 percent in two years. This possibility should be investigated further. A similar relationship though in different years, is found on examination of the data for manufacturing employment. The data for Trade (bottom of Graph 3.7--note that the base of this graph is not zero but 15,000 employees) and Finance, Insurance and Real Estate (bottom of Graph 3.8) form pairs of curves with a high degree of parallelism (note change of scale between graphs). In the former the City portion of employment is showing a slight relative decline, while Finance, Insurance, and Real Estate has registered an absolute increase of about 1300 jobs in the City, about 35 percent.

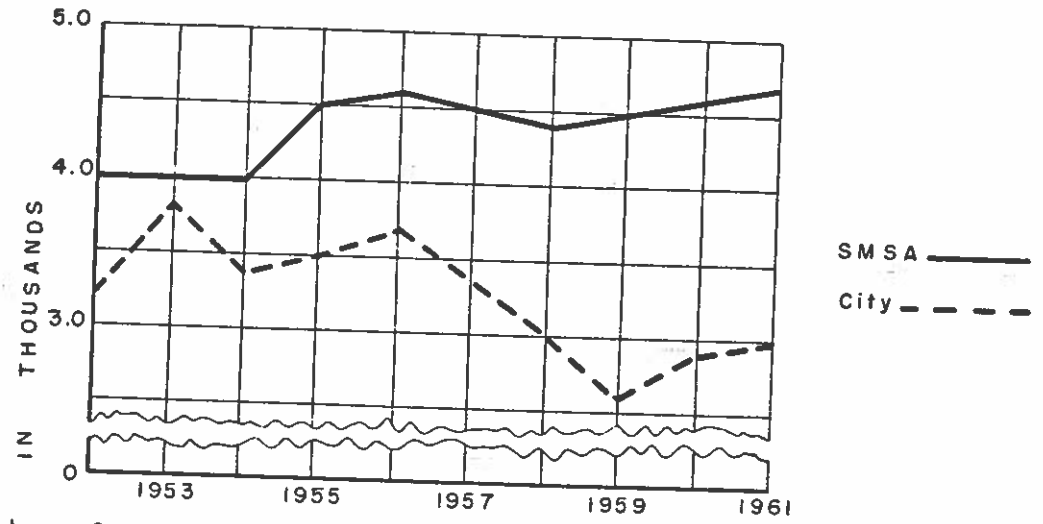
The most suspect pairs of curves are those for Transportation, Communications, and Utilities and for Contract Construction. In the latter case, the industry is historically one of great variation of employment; thus it is conceivable that the amplitude of the change in employment for the balance of the SMSA, though much smaller than that of the City, has the same amplitude or width of variation, if the comparability of the two curves be accepted. The curves for Utilities present a figure for City employment that is larger than that for the

EMPLOYMENT IN SMALLER INDUSTRIAL GROUPS

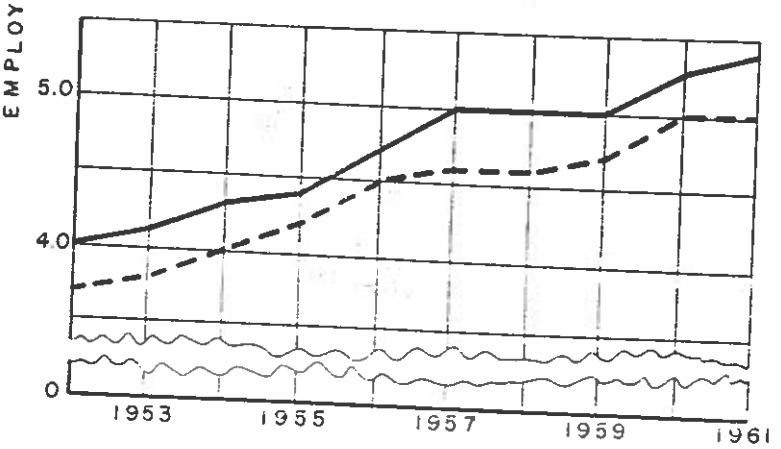
City and SMSA



Transportation, Communications, and Utilities



Contract Construction



Finance, Insurance, and Real Estate

Graph 3.8

whole SMSA (the City plus 19 surrounding towns) by as much as 500 employees. Can there be any explanation of such a reversal except incompatibility of the two series of data? It would seem that data collected as a part of the Employment Security program should have a reasonably small and consistent error; it is believed that this is the more reliable series.

The evidence from these data can be used, but only tentatively, to support either pessimistic or optimistic statements about SMSA employment as compared with that of the City. Further study is indicated, however, to determine whether the statistics of the sections on population and labor force for both City and surrounding towns and for employment in the City only, are or are not supported by comparable series of data for the Region.

A close estimate of unemployment has not been made; the number of "continued claims" filed with the Division of Employment Security from the Worcester area each month has ranged between 18 and 22 thousand during the past five years. The number of unemployed should be substantially above this range, which does not include either those looking for their first job or those, who have exhausted their benefits but have not yet found work.

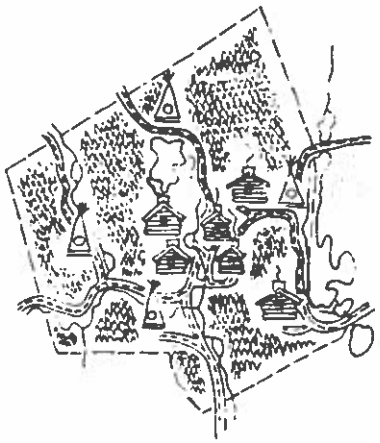
In summary, there is without question, a large decline in the prime working age groups of the population and an increase in the generally dependent groups under 15 and over 65; this is true in both City and SMSA for the 1950's. Conversely, the labor force has increased in the same period through the increase in women working or available for work. Employment has declined in most industries except for a few such as Finance, Insurance, and Real Estate. Unemployment in the Worcester area is probably in the twenties of thousands. These data must be considered as an integral factor in the planning process.

C H A P T E R F O U R

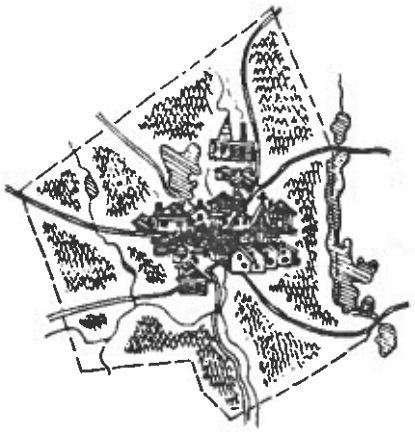
THE GROWTH OF WORCESTER SETS THE CONTEXT OF PLANNING

In the early days Indian settlements were located on high ground near permanent water sources. Chief among these were Indian Lake, Lake Quinsigamond, Tatnuck Brook, and the Blackstone River. Indian trails formed the only access routes across this part of Massachusetts, following lines of least resistance around the rugged hills and swampy areas near lakes and rivers.

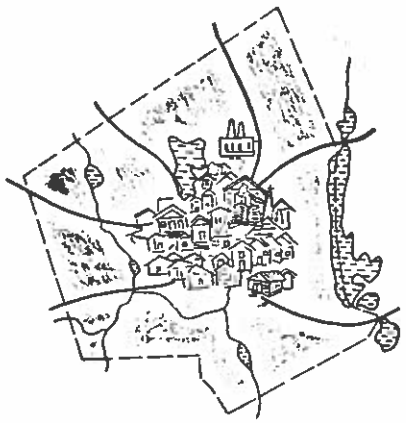
Early settlers followed Indian trails into what is now Worcester and there they settled near fresh water and green meadows ready for tilling. In this densely wooded part of the country men lived in relative peace with their Indian neighbors for a while at least.



Following King Philip's War, white and Indian neighbors resolved their differences and lived in peace. Worcester became a permanent settlement and then a way station for a westward moving population, much of which was newly arrived from Europe. Indian trails soon became wagon trails.



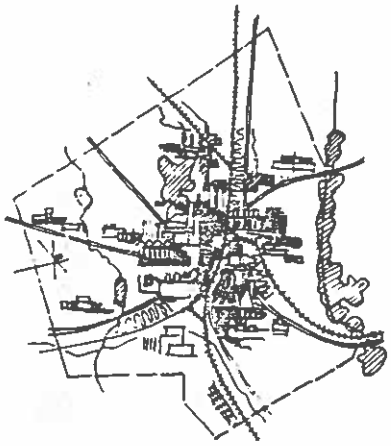
With permanent settlement Worcester became a thriving village. Farmers cut back timber to build houses and cleared land was planted. In the settlement grew schools and churches and new houses. A mill was built in Lincoln Square to grind grain and forge to work metals. Worcester was on its way to becoming an industrial community.



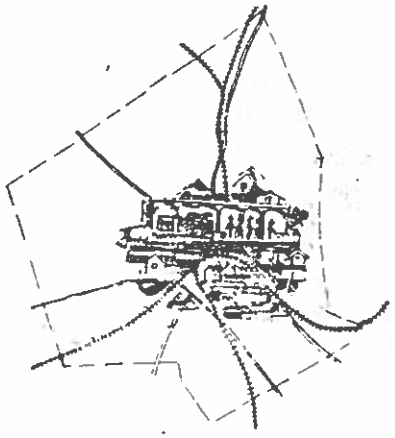
Worcester grew as the colonies grew. Participating in the Revolutionary War it tasted the fruits of victory with the rest. As a county seat of the State of Massachusetts, it assumed a role of importance in government and law. Worcester as a market town grew and prospered.

Roads now connected all parts of the county with Worcester, its governmental seat. Roads connected all parts of the City and enterprising residents turned streams into water power and power into production. All that was needed was fast, cheap transportation.

Following the Revolutionary War, Worcester expanded as a transportation and manufacturing center. In the 1830's the Blackstone Canal was built, connecting Worcester and the mill towns to the south with Narragansett Bay and the water route down the eastern seaboard to New York. The Blackstone aided in the expansion of the textile industry in central New England.

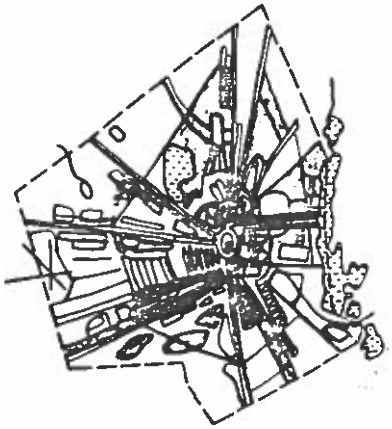


Development of the railroad system spelled the end of the Blackstone Canal. Moving on rails, passenger and freight traffic was fast and direct to the south and west where the markets were. Weather made no difference, the trains got through. Aided by the Iron Horse, Worcester became a leading manufacturing center of the North.

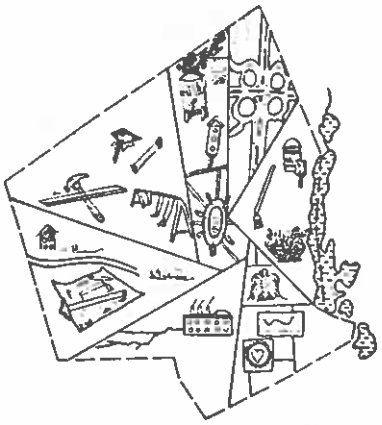


Caught up in the vast upheaval of industrial change following the Civil War, Worcester grew in the tide of industrial change and expansion. Hundreds of immigrants moved into the City to work cotton, leather, and steel; hundreds of others came to plant the land and serve in all capacities. Steam-powered factory whistles and trains with a great blast signaled entry into the Twentieth Century.

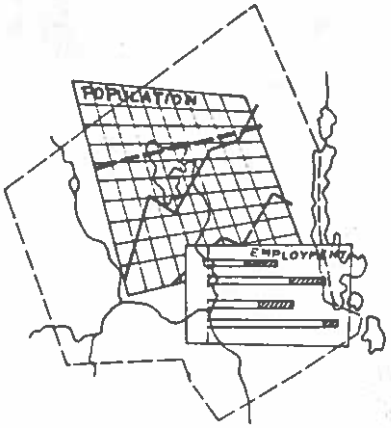
Its major land use patterns set by early development beside water supply and power resources, along highways that were once Indian trails and rigidly engineered requirements of railroad locations, Worcester matured and grew old through two World Wars and entered the second half of the Twentieth Century with all the problems of an old city and without many of the human and physical resources of the past.



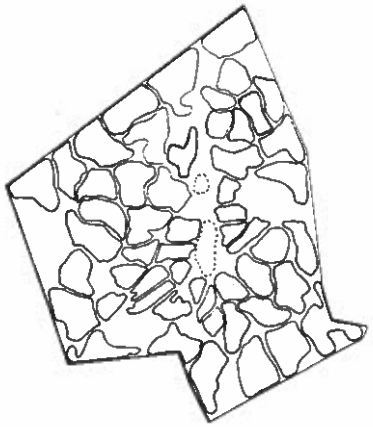
In facing the challenge of the Sixties, Worcester has assessed its shortcomings and resources, and decided to move ahead. From the romantic disorder that represents the unplanned heritage handed to us by our forefathers, we have started to plan for orderly growth, including the renewal of the heart of our city. Much as the core must be bridged with a long needed east-west highway, so the heritage of the past must be bridged by the road to the future.



Some elements of the plan for the future are with us now and can be readily included. Others, like new schools, playgrounds, increased water storage, new traffic signals, etc., the City must provide out of local income. Many of the county facility needs can be provided only when state and federal financial assistance are available. Through new state and federal programs for planning and financing such as urban renewal, a new sewage treatment plant, revitalization of core, and renewal of older residential areas can be accomplished in a partnership for progress. Joint effort can bring about change--and soon. But it must be planned, and the plan must be something upon which agreement can be had by all concerned--planner, elected official, administrator, business community, and the general public. When said agreement exists, the plan will work.

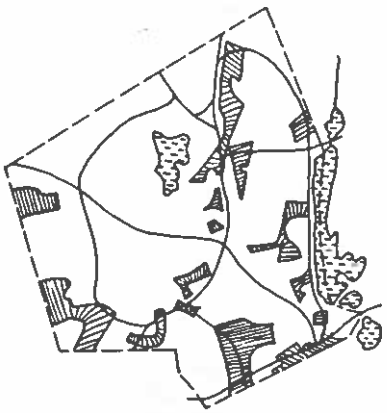


What does one mean when we say plan? Sketch? Design? Forecast? Schedule? Organize, or what? Let's say measure need, forecast, schedule, build--all of these are part of making a PLAN and put it into operation.



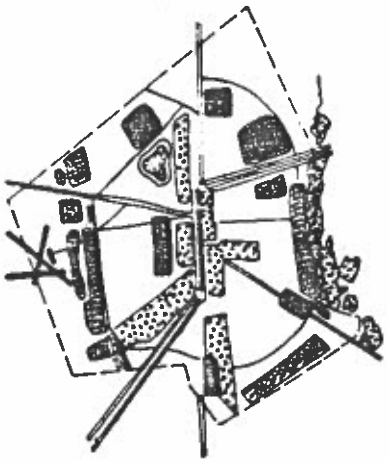
Residential developments cover the landscape. Separated by physical barriers high and low, highways and railroads, factories and forest, each little enclave with its school, playground, and shopping area becomes a neighborhood: a place where one can play, go to school, shop, visit and carry on a thousand human activities without a car, bus, or trolley. Each neighborhood should be sufficient unto itself, free of excessive traffic, noise, dirt, fumes, and still not too far from places of work, culture, major needs. Worcester has 54 such neighborhoods, each with its own identity and individuality.

The city region which we have called a community is a larger area. At this level groups of neighborhoods are related physically, topographically, and by boundaries of convenient service established by distance. Here are major transportation facilities such as limited-access roads separating one group of neighborhoods from another, or perhaps major rail lines. Each has a large planned regional shopping center or unplanned business cluster or a spread of business uses along arterial roads. Factories have been built along rail lines or, at lower densities, in new industrial parks. The community, also, is self-sufficient. Secondary schools located centrally draw children now able to go beyond the neighborhood.



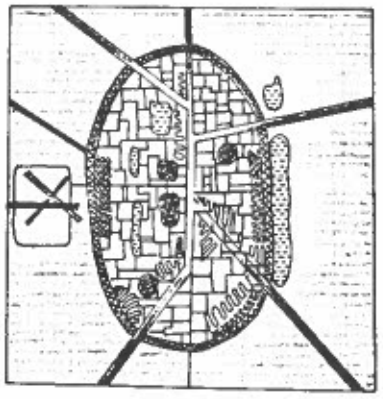
Manufacturing land uses have changed a lot in recent years. As an example, it is no longer necessary to locate plants directly on major railroads. Changes in manufacturing techniques and subsequent plant needs for semi-automated and automated production have spelled finis for the old loft buildings identified with the industrial revolution. Small one-story plants with room for growth and room for employee amenities guarantee a low density development pleasing to look at and inoffensive in operation.

Spread out as industry is in Worcester, along the old lines of communication from core to summit, with much that is inefficient and unsightly, it is not too much to expect that a renaissance in industrial planning could take shape much like Goddard Industrial Park and form satellite industrial areas focused in groups of residential neighborhoods. Of course, this happens now. What we must do is plan for more change (like Goddard) in the future, at the Airport for example, and on city-owned land in Shrewsbury as another. Not all of our industry can leave sites along railroads. These plants should be encouraged to stay and grow. Renewal plans should provide space for them to grow in. The Comprehensive Plan must show that there is land available for voluntary and renewal relocation of other than rail-oriented manufacturing plants.



Perhaps the most disorganized land use pattern in the City today is commercial use. As the population spread upon the land, so commercial establishments followed them. Lack of control or even the will to control this spread brought about disorganization. As long as the mass transportation system held the population together with steel ties, the center of the City--the hub of the system--thrived. Automotive advances changed all that. Each family with its own conveyance had unlimited range for its maneuverability. Goods and services began to focus on easy auto access.

At that point the old way died. All of the shackles that bound the City to its past melted away and enterprising businessmen and alert citizens were early in recognizing this change, and they began to adjust to it. Changes in marketing habits, location of stores, provision of space for automobiles, decentralization of entertainment, all of these things followed and the old core declined.

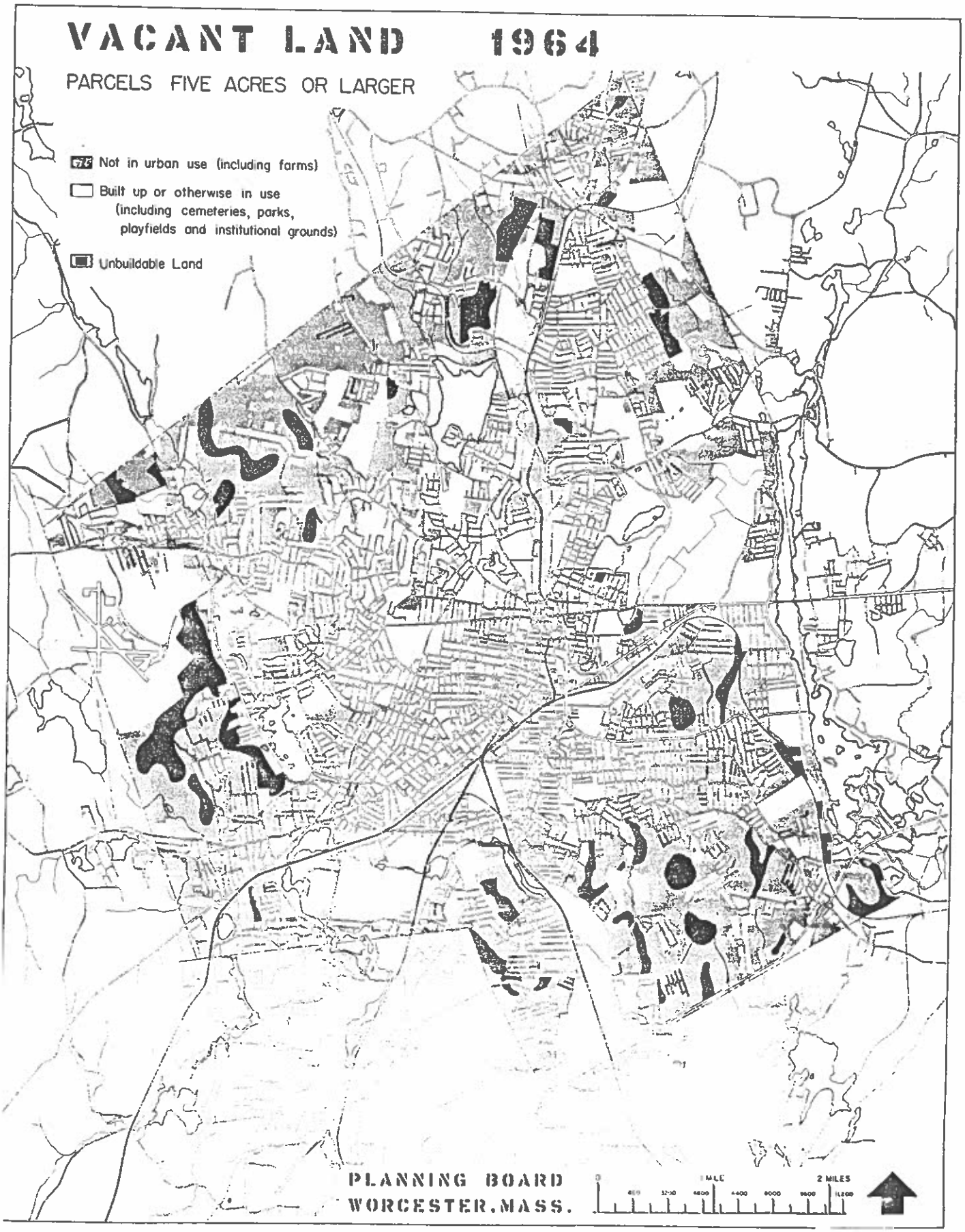


Now there is nothing wrong with dispersion or concentration of goods and services alike. What is wrong is the fact that this change is unplanned and generally uncontrolled, and the result is economic disaster to the country and to the region. The planner does not want to dictate--merely to advise--and in this case advice is seldom heeded. There is a reason for establishing a hierarchy in commercial services. The reason is order. Certain uses, because of their size or nature, occur only a few times, and only in areas where such mass transportation as exists is focused. Normally these uses are located downtown (specialty shops, professional services, entertainment and the like) and so they should be.

The land of the city and the numerous varied public and private structures or uses placed upon it are all parts of the community and their purposes are related and interdependent. Unless proper relationships in location of one to the other are observed and unless all are located in accord with an overall plan for development and improvement of the community, serious maladjustments and deficiencies are apt to, and most likely will, occur. To this end, that order may be achieved in the future development of our city, this comprehensive plan has been prepared.

CHAPTER FIVE

LAND USE


VACANT LAND 1964
PARCELS FIVE ACRES OR LARGER
Not in urban use (including farms)
Built up or otherwise in use (including cemeteries, parks, playfields and institutional grounds)
Unbuildable Land
PLANNING BOARD
WORCESTER, MASS.
1 MILE
2 MILES

Map 5.1

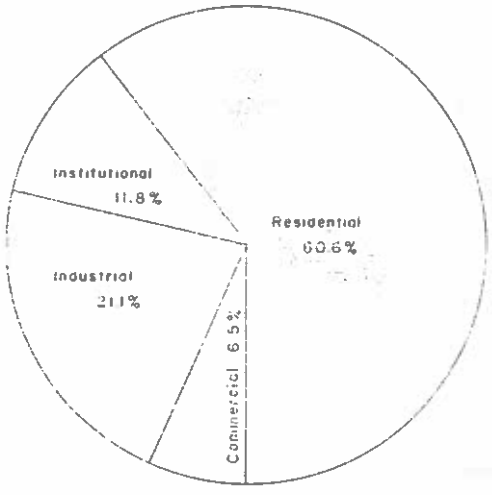
GENERAL LAND USE

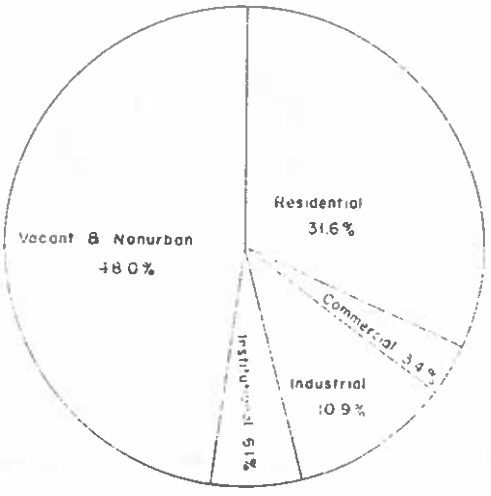
The existing land use of the City of Worcester reflects the impact of change in population growth rates of the City and its region. The population curves, in turn, reflect changes in employment, as discussed above in Chapter Three.

LAND USE IN WORCESTER IN 1961

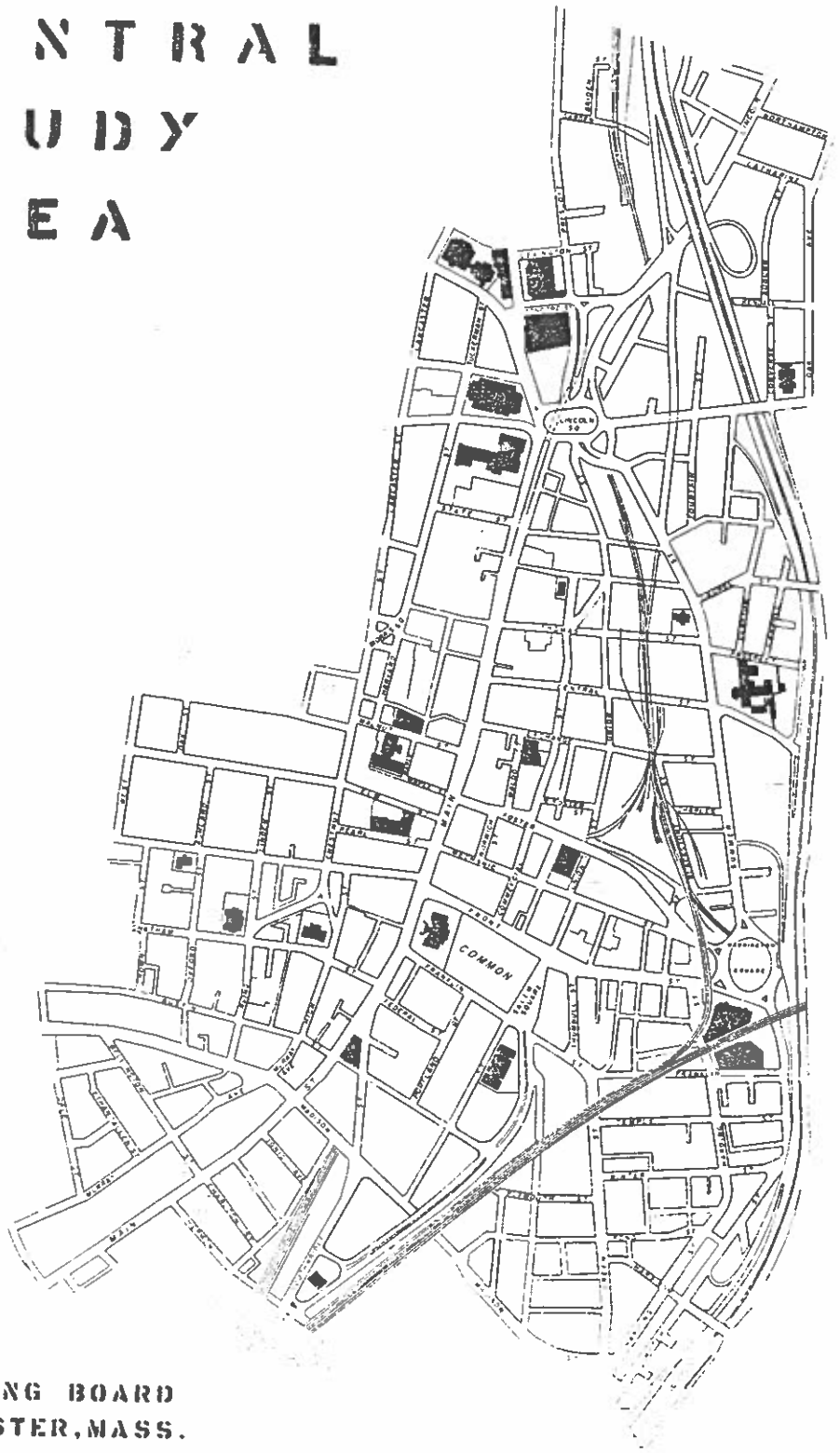
The City was field-surveyed in the summer of 1961 by teans of staff members of the Worcester Planning Department. This survey consisted of two parts: an on-foot survey of both land area and floor space in the Central Area; and a"windshield survey" of the rest of the City. The detailed data from the Central Area Study have been generalized to the categories of the city-wide survey and included in the totals of the latter.

A graphic presentation of the land use of the City as percentages is made below. In the graph to the left are percentages of *net urban land use* (gross area less railroads, streets, vacant and nonurban land, and major water bodies). Roughly three-fifths of the net urban area is in residential use, about one-quarter is used for production of goods or services (commercial, general business and transportation, and industrial uses) and the remainder is in public and semi-public institutional use. The second graph (below right) shows each of these uses plus vacant and nonurban uses as percentages of *total net land use* (that is, net urban land use plus vacant and nonurban--agriculture, wooded areas,etc.). It may be seen that almost one-half of total net land use is classified as vacant and nonurban (see Map 5.1). It is toward the efficient use or development of this one-half of the area of Worcester that many of the planning programs are aimed today.





CENTRAL STUDY AREA



PLANNING BOARD
WORCESTER, MASS.

Map 5.2

Central Area Study

The Central Area of Worcester was delimited to include the most heavily built-up portion of the City (see Map 5.2). Within this area a detailed survey of land area and floor space use was tabulated in 35 categories, including 13 categories of "commercial" uses. [1] Uses of space on the first, second, and third and above floors and in basements were summarized by block. In order to avoid generalizing the relatively large amounts of upper floor space in the tallest buildings as "third floor and above", a "micro-study" was made of seven such buildings. Careful definition of use categories and consideration of building setbacks in the space computations allow precise statements on the distribution of types of space use.

The overall composition of the Central Area is shown in Table 5.1. It should be noted the "Net Floor Space" refers to all land area and floor space in Census Tract 17 and portions of tracts 5, 13, 14, 15, 16, 18, 22, 24 and 25 with the exception of area in streets, railroads, and other rights-of-way.

The total net floor space in Census Tract 17 is 16,722,000 square feet or 383.9 acres. The map area in railroads and streets and other public rights-of-way in Tract 17 is 27,300,000 square feet or 626.7 acres. These data are detailed in the appendix.

Concentrations of various types of space use have been computed for Tract 17. Office space is very strongly localized in buildings along the west side of Main Street from Pearl Street to Eden Terrace and along the east side from Mechanic to Exchange Streets. An office building on Harvard Street, the three blocks immediately south of the Common, and the upper floors of buildings on the north side of Front Street have various combinations of office and trade uses.

It appears that space devoted to retail service use is not localized. In general, older structures are favored by the small retail service operations. Retail sales space is concentrated along both sides of Main, Pleasant, and Front Streets, as would be expected.

Parking space distribution shows the result of plans to provide a "ring" of public parking at 300-400 yards from the City center. Vacant ground floors and lots are widely dispersed. Parking use succeeds older housing and obsolete industrial property in most cases. The old manufacturing district in the north-

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[1] For details of classification see Worcester Planning Department, *The Classification of Land Use*, Planning Study #1, Worcester, Massachusetts, 1961.

east of the Central Area and upper floors of the older buildings along Main Street, north and south, account for a large share of vacancy. Several factors influence occurrence of vacancy. These include lack of elevator service, association with low-grade retail activity, and the availability of abatements for upper floors over ground floor retail space. The loft building is not necessarily structurally obsolete. Factors of obsolescence include: shape of available space, access, lack of parking and loading facilities, as well as cost of renovation within the existing property tax structure.

TABLE 5.1

Land Uses in Central Worcester

(as percentages of total net floor space)

	Census Tract 17	Central Area
Residential	9.57%	19.73%
Commercial		
Retail Sales	13.11%	9.08%
Retail Services	4.72%	3.27%
Offices	8.79%	6.20%
Auto Sales & Services	1.84%	2.04%
Parking	14.54%	13.58%
Terminals	2.62%	2.11%
Light Industry & Distribution	10.31%	7.75%
Manufacturing	10.90%	9.89%
Public and Semi-Public	11.33%	14.86%
Recreation	1.67%	1.40%
Vacant		
Land	3.16%	3.46%

City-wide Survey

The "windshield survey" of the balance of the City surrounding the Central Area was, by contrast, quite generalized. The 35 categories tabulated in the Central Area Study were reduced to 22 on the land use maps and to 9 in the tabulations.

For the 1961 Land Use Study, the classification code was revised from an earlier code, a color code was prepared, and a property-line plat of the City at a scale of 400 feet per inch was divided into 60 sections corresponding to census tracts (12 sheets) or portions of larger tracts (48 sheets) and mounted on boards for field use.

Each property-line plat was taken to the field by a team of two men for a "windshield survey". The team mapped land uses for each lot by making a mark in the appropriate color to indicate the land use or uses of each lot.

All plats were colored in the office of the Planning Department and then taken to the Assessor's office where lot areas were tabulated under 9 categories (see listing below). For each category of land use, a block total in square feet was summed and these were added together to obtain totals for each plat. Where plat and tract were not coextensive, land use totals by plats summed to give census tract totals. These totals by 9 land use categories for 31 census tracts are tabulated in the appendix. The figures have been extensively revised.

The land use tabulations are ranked below by percentages of total net land use in 8 categories and again in combined categories. Land use is shown on Map 5.3 (foldout facing page 118) in twelve categories.

1.	vacant and nonurban	48.0%
2.	low density residential	26.1
3.	industrial	10.8
4.	institutional	6.1
5.	medium density residential	4.5
6.	commercial	2.8
7.	high density residential	1.2
8.	mixed commercial and residential	.5
		100.0

1.	vacant and nonurban	48.0
2.	residential	31.7
3.	industrial	10.8
4.	institutional	6.1
5.	commercial and mixed	3.4
		100.0

With the foregoing tables and graphs, it has been shown that the largest class of land use is vacant and non-urban. For planning purposes one may in the long run take this whole class as the potentially developable area into which the

other components of land use may expand. At present much of the vacant and non-urban land must be catalogued as more potential than immediately developable for reasons of slope, drainage, sub-soil, and bedrock outcropping. Although difficult to evaluate, such factors as accessibility, zoning, ownership, and availability of scenic landscape features may bring development to any given plot of land in the City. In the analysis of planning needs, the potential of vacant land as represented in this part of the study should be of primary concern.

Summary of Land Use Survey

Individual census tracts in Worcester vary in gross area from about 150 acres in tract 26 to about 2000 acres for such tracts as 7 and 28 (see Map 5.4 and Graph 5.1). Detailed land use tabulations may be found in the appendix. Difference between net and gross tract areas represents major water bodies, railroad rights-of-way, and streets.

The greatest acreage in low density residential use is in tracts 8, 6, and 7, in that order; in medium density residential, tracts 12, 24, and 19 rank highest; and in high density residential, tracts 13, 14, and 15 lead.

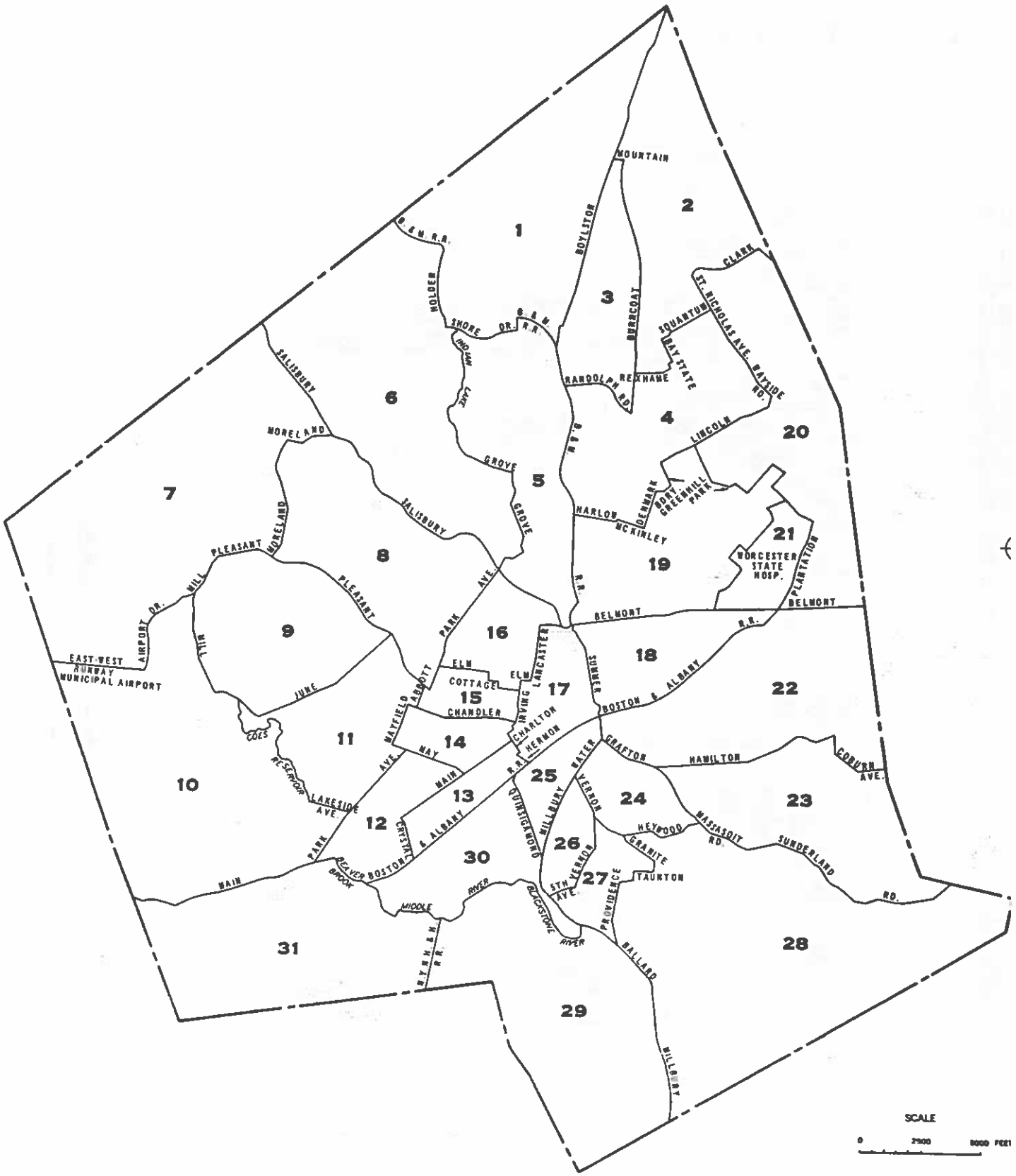
Commercial land use is greatest in tracts 20, 17 (center city), and 28. Mixed commercial and residential (usually first floor commercial with residence above) ranks highest in tracts 29, 30, and 16. These are among the smallest (with high density residential) components of land use, but are intensive uses and most important to the viability of the City. This includes retail sales and services and offices.

Industrial land use, also of highest importance in maintaining the life of a city, is greatest in tracts 7, 29, and 10. This category includes transportation, utilities, communications, contract construction, industrial services, wholesaling with stocks, storage and warehousing, and last but not least, manufacturing.

Institutional land use is greatest in tracts 21, 6, and 20. This use includes public and private education generally, semi-public organizations, and governmental uses.

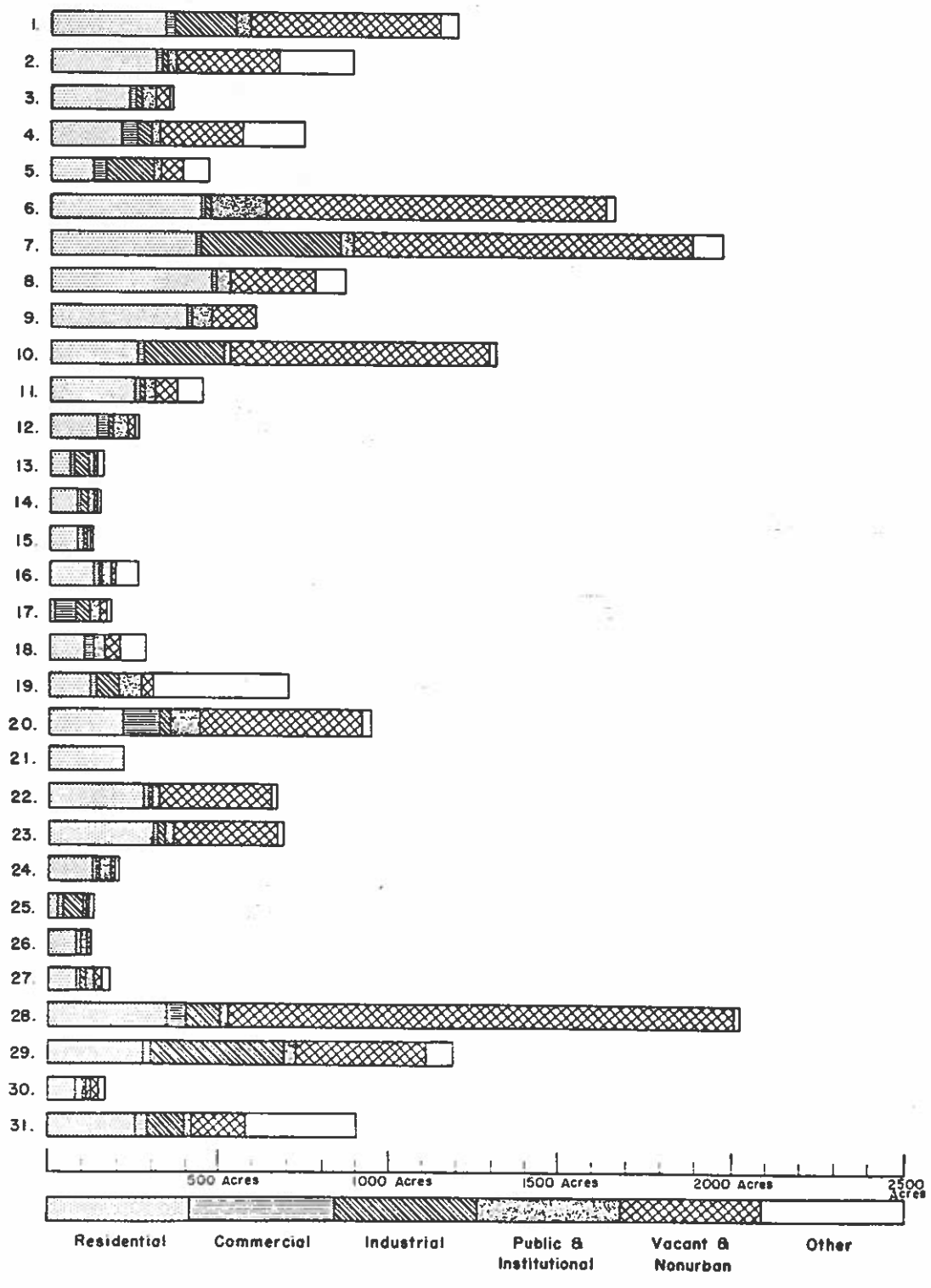
The combination of land uses listed as "other" is largest in tracts 19, 31, and 2. This includes cemeteries, recreational areas, and miscellaneous small uses.

CENSUS TRACTS IN WORCESTER



Map 5.4

LAND USE BY CENSUS TRACTS IN ACRES



Graph 5.1

COMPARISON WITH LAND USE IN OTHER CITIES

The land use survey which is discussed in the previous subdivision is, in this subdivision, placed in a larger perspective by comparing land use in Worcester with that in other cities of like size. This comparison is based on a Rand Corporation report by John H. Niedercorn and Edward F. R. Hearle entitled *Recent land use trends in forty-eight large American cities*, published in 1963.

The land use data collected have been grouped into six categories for the purpose of this analysis and comparison. These categories follow.

i. Residential
ii. Industrial
iii. Commercial
iv. Roads and Highways
v. Other Public and Semi-public
vi. Vacant

Residential land includes both single-family and multi-family dwellings; industrial includes both heavy and light industry; and commercial includes wholesaling, retailing, and service uses. The "other public" category includes schools, public buildings, parks, playgrounds, and cemeteries as well as related public and semipublic uses. Although the definitions of these six major categories are not precisely uniform for all cities, they are reasonably comparable, and thus suitable for many types of land-use analysis (see Table 5.2).

TABLE 5.2

Land Use in Worcester and Other Cities of Like Size
(as percentages of gross area)

City & State	Population	i	ii	iii	iv	v	Total Developed	vi	Year
Hartford, Conn.	162,178	39.1	5.0	5.0	15.9	20.6	85.6	13.9	1954
Portsmouth, Va.	144,773	32.0	6.2	2.8	14.9	12.6	68.5	31.5	1960
Providence, R.I.	207,498	33.5	14.4	3.6	16.7	19.5	87.6	12.5	1953
Sacramento, Calif.	191,667	38.2	8.2	4.7	20.0	11.5	82.5	6.7	1953
San Jose, Calif.	204,196	38.7	8.6	2.8	22.1	8.8	81.0	19.0	1948
Syracuse, N.Y.	216,038	36.5	6.3	5.7	22.9	14.1	85.6	12.3	1959
Youngstown, Ohio	166,689	26.4	10.6	4.0	12.1	8.9	62.7	35.9	1951
WORCESTER, MASS.	186,587	26.8	9.3	3.0	12.1	5.2	56.4*	43.6	1961

* Includes roads and highways.

Most of the available data were compiled as net measurements. Seven cities have been selected for comparison of their land use with that of Worcester. These range in size from 144,000 to 216,000 in population. Unfortunately land use figures available are for the years varying from 1948 to 1961. This does not permit the comparison of land use figures for any one year but a general picture can be obtained by comparing the given figures for these eight cities of similar nature, as land use percentages change slowly.

Six out of the eight cities have their largest percentage of land under residence (category i). The two cities Worcester and Youngstown, Ohio, still have the largest percentage of land under vacant (category vi). This indicates that these two cities have enough room for expansion. But this also depends upon how much land is actually suitable for development for other uses.

Under category ii, which represents industrial land use, Worcester has 9.3 per-cent of its land. This figure is above the average. Providence, Rhode Island, has the highest percentage (14.4) and Hartford, Connecticut, has the lowest (5.0 percent). This shows that Worcester is more active industrially than many other large cities.

In Worcester land under commercial (category iii) occupies 3 per cent of its total land. In the other seven cities the percentage of land use under com-mercial ranges between 2.8 and 5.7. This indicates that Worcester has occu-pied normal space for commercial activities. The variation among these cities is not much.

Roads and highways (category iv) occupy only 12.1 per cent of the total land in Worcester. From the table it is apparent that Worcester and Youngstown, Ohio are tied with the lowest percentage (12.1 each). Syracuse, New York, has the highest (22.9 per cent) of its land area under roads and highways. It seems that lower percentages under this category have a direct relationship with higher percentages of vacant land (category vi). More land under category iv is usually associated with development.

In the category v (other public and semi-public) again the City of Worcester is marked by the lowest figures (5.2 percent). This figure is very low in compari-son to other cities. Hartford, Connecticut, has one-fifth of its land in such uses, which is the highest for this category.

The City of Worcester has the highest percentage (43.6) of its land as vacant (category vi). In comparison to other cities except Youngstown these figures are very high. The lowest percentage (6.7) is registered by Sacramento, Calif-ornia. There is a great range in this category, between 6.7 and 43.6.

In comparing the figures for total developed land, Worcester has the lowest figures (56.4 percent) whereas Providence, Rhode Island, has 87.6 percent of its land developed. The City of Worcester has developed only a little more than

half of its total land, while in most other cities little is left for further development. This may bring encroachment on public properties like parks and other uses. In Worcester a good percentage of this vacant land can profitably be used for residence, industry, commerce,and so on. But the rate at which this development takes place depends on the dynamic nature of the City and its activities.

ZONING IMPLICATIONS OF FUTURE LAND USE

The future land use development of Worcester will be guided by the recently enacted zoning ordinance of the city. In the development of this ordinance many studies were made which attempted to project the needs of residential, commercial, and industrial uses and their future growth. The Planning Board took these existing land uses and their future projections into consideration when they prepared the zoning maps for the new ordinance.

Realizing that the life blood of the City is the expansion of existing industry and the attraction of new industry, the Board zoned large areas of undeveloped land for industrial uses. This action has already begun to bear fruit through the preliminary development of a large tract of land on Grafton Street for an industrial park. This land, previously zoned for residential use under the old ordinance, has been lying vacant for many years and its tax return to the City has been negligible. Its development will now bring new tax dollars to the City at the same time creating many new jobs. The surrounding land, some of which is of a residential nature, will be protected by the presence of a buffer zone of light manufacturing uses with a low floor-area-ratio and stringent minimum lot dimensions.

Another major addition to the new zoning ordinance was the creation of a Business Office District on the western extremities of the central area. This district is located in the Elm Park neighborhood which is now for the most part occupied by large single-family mansions which are not economically feasible to operate. The Board foresaw the need to convert these buildings into revenue-producing property as professional offices.

The two preceding changes in the zoning ordinance, representing the greatest innovation, were not the only changes the Board saw fit to make. An expansion in the building of garden-type apartments was predicted and to this end the Board used "special permit" legislation which would allow this type of building in restricted residential areas. It was thought that this type of construction would most likely occur in the undeveloped areas near East Mountain Street and south of the Worcester Airport. Shortly after the ordinance was adopted this forecast was substantiated by the granting of a special permit to allow construction of a 450-unit garden type apartment complex in the East Mountain Street area.

It must now be apparent to everyone that a zoning ordinance, to be comprehensive and equitable, must be established upon a base of documented studies accurately cataloging the existing land use of the City and analyzing and projecting these studies and their computations into a workable future land use pattern. It is thought that the zoning ordinance as adopted in 1963 has done all these things with the best balance obtainable and that from this base a better city will emerge in the coming years.

RESIDENCE

INVENTORY OF EXISTING HOUSING TYPES

Worcester is an old City and this fact is reflected in the condition and variety of its housing. Decay associated with age has become a major problem in certain sections of the inner part of the City. The predominant housing types are discussed in the paragraphs below.

"Three-decker" houses, clapboards over wooden frames, still dominate certain neighborhoods. Three to six families can live in these houses, a house type characteristic of New England industrial urban centers. In Worcester such houses are most common in the following areas: Union Hill, Vernon Hill, Greendale, Chandler Hill, and eastern section of Chadwick Square, the southern half of Brittan Square, and the western part of Belmont Hill, and the western part of Shrewsbury Street adjacent to Washington Square. Also included are portions of Elm Park, Oak Hill, Columbus Park, and Woodland on either side of Park Avenue, Quinsigamond, Hamilton, and Rice Square adjacent to Union Hill neighborhood. Their location signifies that most of these houses were built to accommodate the factory workers as these housing units are located fairly close to the industrial establishments and railroads.

Walk-up apartment buildings are mostly located in and near the center of the City. These are old brick buildings, located on main roads. Such houses are 3- to 5-storied buildings. As these buildings are old, they lack elevator facilities whereas most of the new brick buildings with 4 or 5 stories have elevator facilities. Sometimes such apartment houses may cover a whole block. These elevator apartments are usually occupied by elderly people.

Public housing projects have been developed with private and public finance in certain sections of the City. Brookside neighborhood has three locations. In this neighborhood such public housing units have occupied a huge area. Hill Street, Piedmont, and Union Hill neighborhoods have small areas consisting of these public housing units. At the junction of Salisbury Park, Institute, and North Streets a privately owned public housing project has been developed. Many of these public housing units are specially built for the retired elderly city dwellers. These are new developments.

Single-or two-family residences comprise the bulk of the City's houses. Such houses are situated away from the center of the City. Western and north-western parts of the City, especially Salisbury Heights, West Tatnuck, Tatnuck, Westchester, North Worcester, and Summit are single-family neighborhoods. These neighborhoods have sufficient open spaces and present a healthy atmosphere with a country flavor for city dwellers. The rest are mixed as single- and two-family houses.

QUALITY OF EXISTING HOUSING

Housing in Worcester reflects the age and growth of the City. As one enters the City and travels toward the core along any of the major routes differences are well marked in the type and age of residential housing structures. This subdivision provides an inventory of the present quality of existing housing. This inventory is designed to furnish an objective basis for subsequent recommendation of a suitable program for the treatment of existing housing in the City and a ceiling of housing units in relation to the projected population for the year 1980.

Perhaps the best standard source for an objective appraisal of housing quality is the *1960 Census of Housing*. A variety of information pertaining to housing, gathered and reported by census tracts, has been used in *Worcester Housing Inventory 1963* (which see for details). This study was done on the basis of the 1962 delineation of neighborhoods, which were essentially residential areas.

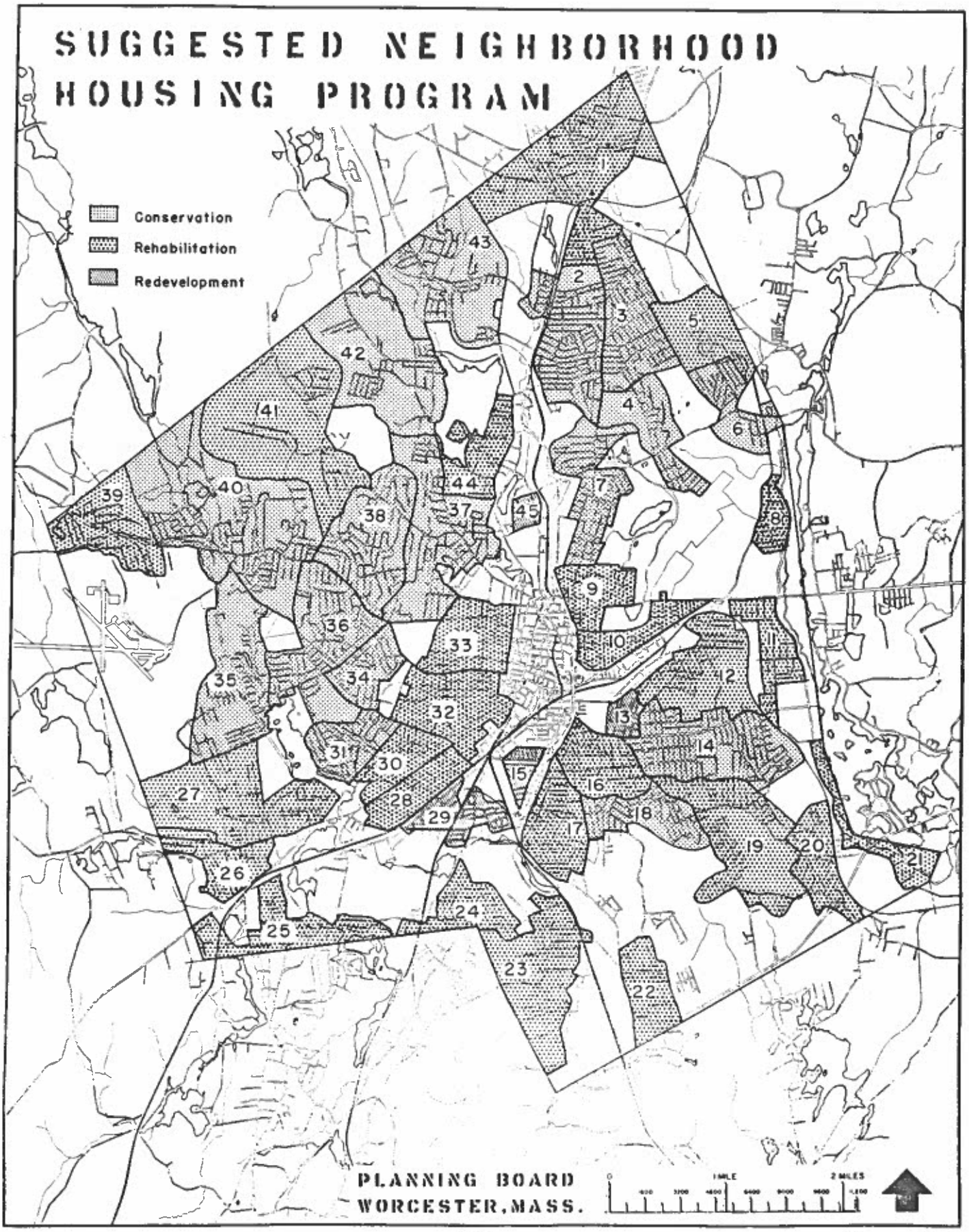
Housing is a subject with which every citizen should be concerned. Each citizen is identified with the dwelling in which he lives, and subsequently, with the area or neighborhood in which his home is located. In 1962, Worcester was divided into 45 predominantly residential neighborhoods. These 45 neighborhoods are listed in Table 5.3 and shown in Map 5.5 (below). It should be emphasized that this is an earlier study and that the number of neighborhoods has been increased to 54 and many boundaries have been changed for the 1964 Plan (see Neighborhood Plan, Map 8.3, page 222).

Factors of Housing Quality

Three factors were chosen to represent a cross-section of housing quality. These factors--vacancy, condition, and overcrowding--were obtained either directly or indirectly from the Census of Population and Housing. The following text is summarized from *Worcester Housing Inventory 1963* prepared by the Worcester Planning Department, which is also the source of the basic data tabulated in the appendix.

Vacancy was determined in the following manner: The total number of housing units in the neighborhood was obtained from the Census; from these totals, the number of housing units in each neighborhood that were occupied was subtracted from the total number of housing units. This difference then was the number of housing units that were vacant in each neighborhood.

Condition of housing is poor when a housing unit exhibits the following one or both Census determined factors:


SUGGESTED NEIGHBORHOOD HOUSING PROGRAM
Conservation
Rehabilitation
Redevelopment
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PLANNING BOARD
WORCESTER, MASS.
1 MILE
2 MILES

Map 5.5

1. Physical dilapidation.
2. Unsound or deteriorating housing plus absence of some or all plumbing facilities.

It was felt that the absence of plumbing facilities alone was not universally significant as an indicator of poor housing condition, but became a significant indicator in combination with physical deterioration.

TABLE 5.3

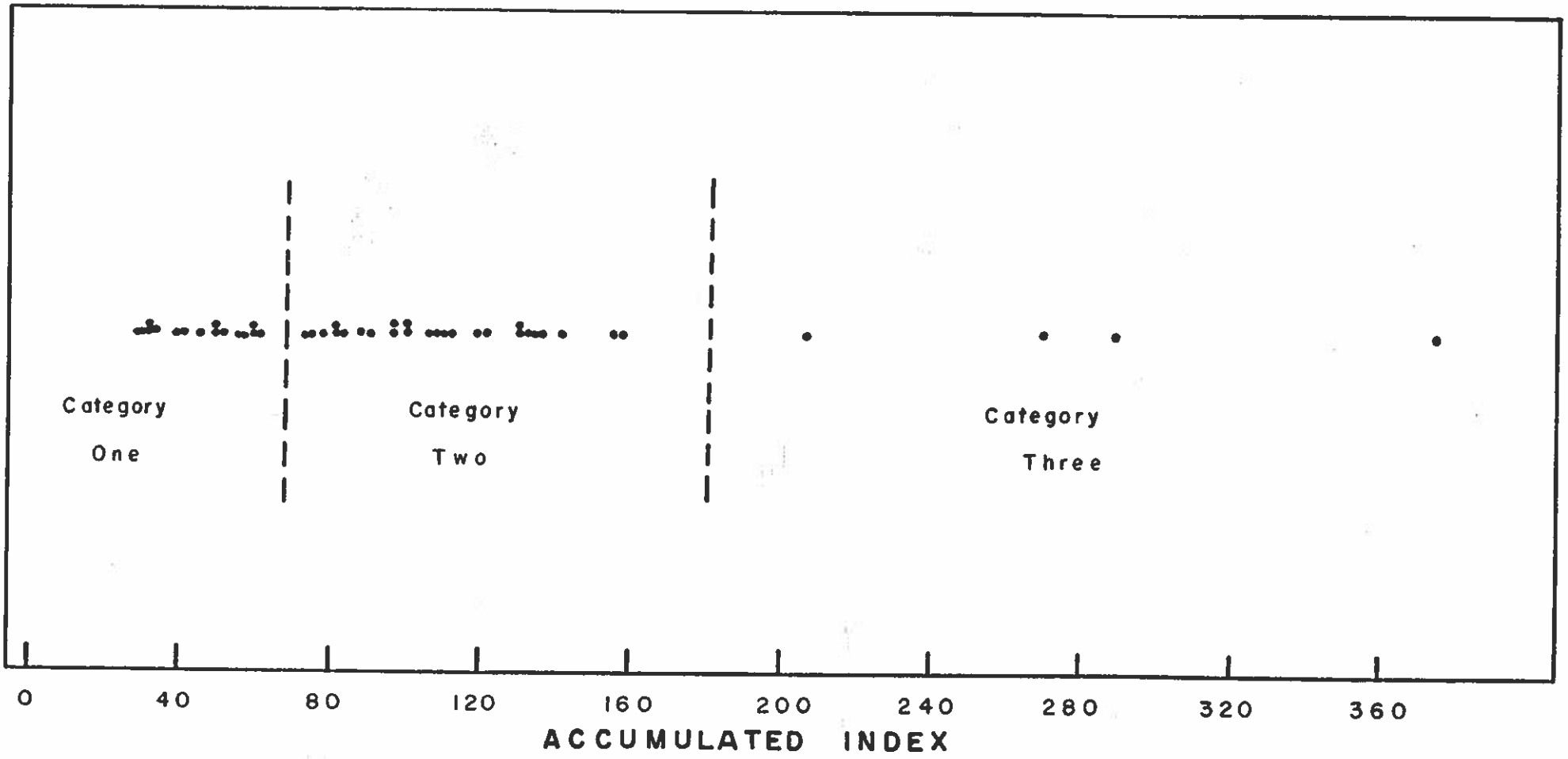
1962 Neighborhood* Identification

1. Summit
2. Burncoat
3. Greendale
4. Beverly Road
5. Great Brook Valley
6. Brookside
7. Brittan Square
8. Wigwam Hill
9. Chandler Hill
10. Shrewsbury Street
11. Lakeview
12. Bloomingdale
13. Oak Hill
14. Hamilton
15. Island
16. Union Hill
17. Vernon Hill
18. Rice Square
19. Sunderland
20. South Grafton Street
21. Pinecrest
22. Oakland Heights
23. Quinsigamond Village
24. College Hill
25. Heard Street
26. Ludlow
27. South Worcester
28. University Park
29. Cambridge
30. Woodland
31. Columbus Park
32. Piedmont
33. Elm Park
34. Beaver Brook
35. Mill Street
36. June Street
37. Salisbury Park
38. Westwood Hills
39. West Tatnuck
40. Tatnuck
41. Salisbury Heights
42. Westchester
43. North Worcester
44. Chadwick Square
45. North Street

* Although many neighborhood names are the same, the boundaries of the 54 neighborhoods in the Neighborhood Plan (1964) are quite different in most cases (see Map 8.2, page 219).

Overcrowding was obtained directly from the Census which states that conditions of overcrowding exist in housing units that contain more than one person per habitable room. Overcrowding in each neighborhood, then, is represented by the number of instances where there are 1.01 or more persons per room.

RANGE OF HOUSING QUALITY INDEXES



Graph 5.2

TABLE 5.4

Neighborhoods Ranked According to Accumulated Housing Quality Index

Rank	Neighborhood	Factors				
		Vacancy	Condition	Overcrowding	Accumulated Index	
1.	Beaver Brook	45	7	33	28	
2.	Beverly Road	48	0	42	30	
3.	Westwood Hills	77	4	12	31	
4.	June	65	1	28	31	
5.	Greendale	58	5	56	39	
6.	Burncoat	58	0	62	40	
7.	Brittan Square	42	27	67	45	
8.	North Worcester	93	0	53	49	I
9.	Salisbury Park	110	3	35	49	
10.	Brookside	36	0	114	50	
11.	Westchester	77	17	72	55	
12.	Rice Square	42	42	84	56	
13.	Hamilton	67	12	97	58	
14.	Tatnuck	81	36	29	58	
15.	Mill (Street)	77	33	71	60	
16.	Summit	102	34	85	73	
17.	West Tatnuck	153	0	71	74	
18.	Ludlow	86	62	85	77	
19.	Chadwick Square	131	26	86	81	
20.	South Worcester	91	44	108	81	
21.	Pinecrest	114	26	107	82	
22.	Bloomingdale	102	62	98	87	
23.	So. Grafton (Street)	69	89	112	90	
24.	Lakeview	85	109	95	96	
25.	Columbus Park	92	26	171	96	
26.	Salisbury Heights	102	109	90	100	
27.	Sunderland	36	126	139	100	
28.	Wigwam Hill	47	71	202	106	II
29.	Woodland	244	10	69	107	
30.	Quinsigamond Village	153	96	75	108	
31.	Elm Park	185	97	49	110	
32.	Vernon Hill	94	191	73	119	
33.	University Park	102	126	135	121	
34.	Heard (Street)	81	176	134	130	
35.	Chandler Hill	212	64	116	130	
36.	Great Brook Valley	53	0	341	131	
37.	Union Hill	127	171	105	134	
38.	Oakland Heights	93	181	131	135	
39.	College Hill	33	66	329	142	
40.	Shrewsbury (Street)	179	167	124	156	
41.	Piedmont	215	171	86	157	
42.	Cambridge (Street)	175	314	131	206	
43.	Oak Hill	218	446	144	269	III
44.	North (Street)	369	280	217	288	
45.	Island	217	803	104	374	

Mean Housing Quality Index

An index for each of the three factors was calculated for each neighborhood. Indexes for the three factors were then combined to form an accumulated Mean Housing Quality Index.

Neighborhoods have been ranked according to this Index in Table 5.4. It can be noticed that there are fairly distinct natural breaks in the distribution of indexes which are placed along a line (see Graph 5.2). These breaks provide objectively obtained boundaries for the neighborhood treatment programs.

It is generally accepted that there are three main ways through which neighborhood maintenance and improvement can take place under a renewal program. These are conservation, rehabilitation and occasional demolition, and clearance and redevelopment.

Neighborhoods with indexes of 60 or below or those in Category I would be suited to a program of conservation. Those with indexes between 73 and 157 or in Category II would be in need of a program of rehabilitation. In the neighborhoods with indexes over 206 or Category III, there is need of redevelopment.

Evaluation and Treatment

The 45 neighborhoods with the program of maintenance and improvement recommended for each neighborhood are shown on Map 5.5 (above). On the basis of these Index figures it has been proposed that the following neighborhoods with indexes in Category I need redevelopment. Further detailed study should be made in the field before such a program is inaugurated.

Island
North Street
Oak Hill
Cambridge

The following neighborhoods needing rehabilitation have Indexes in Category II. The arithmetic range of these is large as in the actual range of the housing quality: nevertheless, the breaks in distribution indicate that these neighborhoods have more in common with one another than with any of the neighborhoods in the other two categories.

West Tatnuck
Salisbury Heights
Great Brook Valley
Chadwick Square
Wigwam Hill
Shrewsbury Street
South Worcester
Summit
Lake View
Bloomingdale
Pinecrest
South Grafton Street
Sunderland
Union Hill
Vernon Hill
Ludlow
Oakland Heights
Quinsigamond Village
College Hill
Heard Street
University Park
Piedmont
Elm Park

Rehabilitation can be carried on in these neighborhoods through a well organized program of improvement of housing conditions. This should be supplemented with improvement of community facilities, such as off-street parking, parks and playgrounds, schools, public safety, and sanitation.

Neighborhoods needing conservation have indexes in Category 3. At present these neighborhoods have the best housing quality in the City but the deteriorating conditions which sometimes go unnoticed, can bring a marked change in the character of housing quality in a relatively short time. One of the most common threats of the maintenance of high quality in such neighborhoods is the infiltration of non-conforming uses.

Tatnuck	Salisbury Park	Greendale
Hamilton	North Worcester	Mill Street
Rice Square	Beaver Brook	June Street
Westchester	Brittan Square	Westwood Hills
Brookside	Burncoat	Beverly Road

The program of conservation should be coupled with strict enforcement of laws and regulations. These neighborhoods need regular proper maintenance of public facilities.

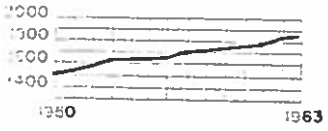
In conclusion it can be said that *it is the responsibility of each citizen to take direct action in his own environment.* It had been suggested that this can best be carried out through neighborhood organizations. The role of conservation and rehabilitation should be brought to the attention of all citizens of the City through these neighborhood organizations. It is through such groups the most effective programs can be carried out. The study here summarized is based on data from the 1960 Census. Further detailed study in both office and field should be made before any drastic clearance is proposed. Census data can and do reflect the differing standards of individual enumerators; office studies should always be supplemented in the field. The cost of City services to an area--police, fire, schools, parks, welfare, and others--should be studied and compared with City receipts--taxes and future citizens, mainly. Some of these items are difficult or impossible to put on a basis of dollars and cents. Housing, on the other hand, is easily so evaluated. Present sale value, if less than the cost of restoring a residential building to satisfactory standards, is not enough to warrant the investment. And yet, what is the cost to the City of the disruption of the social fabric of a neighborhood? Public housing in many cities has received a bad name. Is it not precisely because even a slum neighborhood has, in spite of the fragmentary and interrupted nature thereof, such a natural social fabric that has not been, and, perhaps, cannot be built into a new project?

PROJECTION OF FUTURE HOUSING BY CENSUS TRACTS

Trends in housing development by census tracts have been graphed, (selected typical curves are shown in (Graph 5.3), then grouped into eight categories of

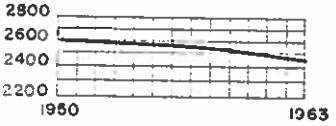
SELECTED TRENDS IN HOUSING UNITS

FOR REPRESENTATIVE CENSUS TRACTS (1950–1963)

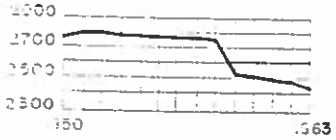


Census Tract 29

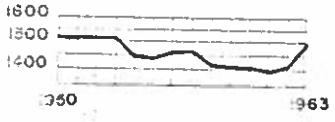
Census Tract 26



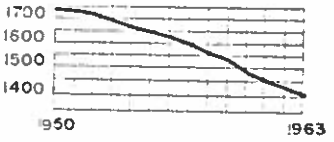
Census Tract 15



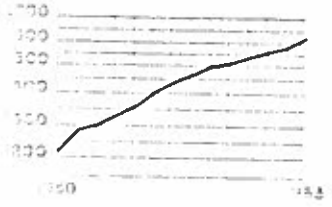
Census Tract 18



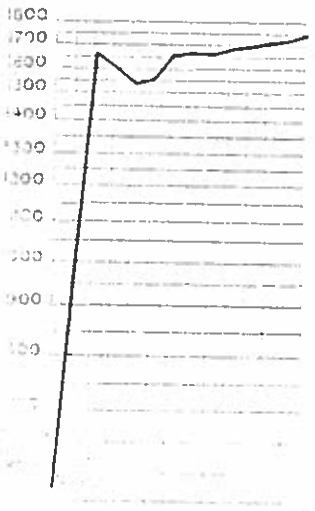
Census Tract 5



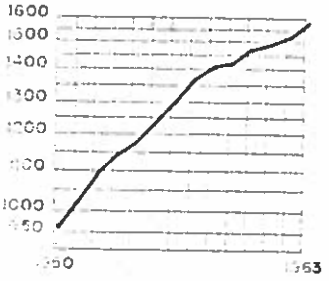
Census Tract 25



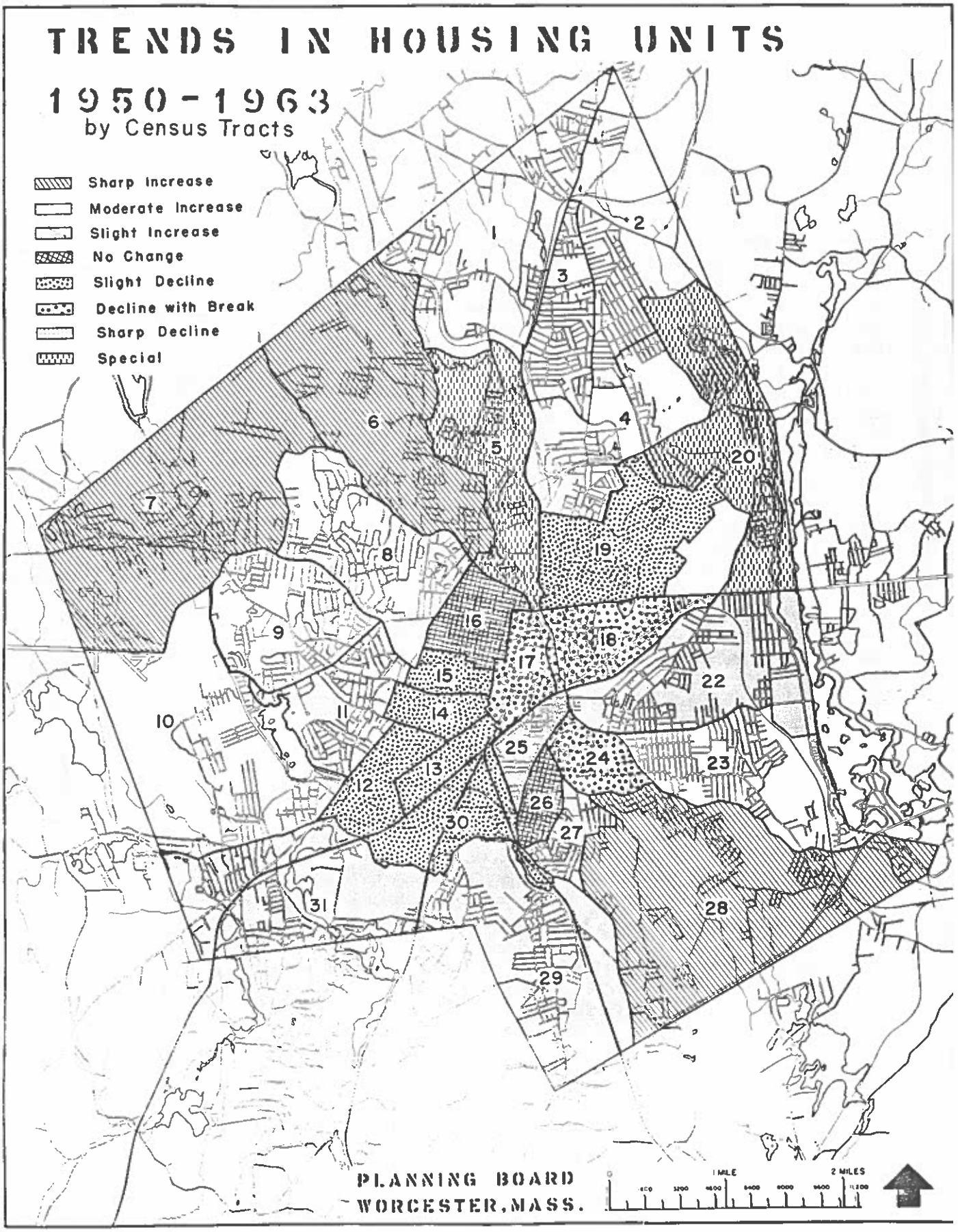
Census Tract 2



Census Tract 20



Census Tract 7


TRENDS IN HOUSING UNITS
1950-1963
by Census Tracts
Sharp Increase
Moderate Increase
Slight Increase
No Change
Slight Decline
Decline with Break
Sharp Decline
Special
1
2
3
4
5
6
7
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PLANNING BOARD
WORCESTER, MASS.
1 MILE
2 MILES

Map 5.9

similar curves (see Map 5.6). The net change in dwelling-unit permits per year for fourteen years (1950 to and including 1963) for each tract forms the basis for projection of future housing. From this map it becomes clear that tracts in the peripheral or outer part of the Cityhave shown increase in the development of housing units, whereas those in the central or inner part of the City have shown a downward trend. This is not a peculiar phenomena in an industrial city like Worcester. During this period of fourteen years a well marked change has appeared in housing development. The larger tracts 6, 7, and 28 have shown a sharp increase. This is because these tracts had more open land favorable for development. Because of this situation, construction has been marked in these three census tracts. Census tracts 1, 2, 3, 4, 8, 9, 10, and 23 have had moderate increase. Except tract 23, all of these are situated in the western and northern parts of the City. This moderate increase relates to the planned housing projects. Slight increases have been registered in census tracts 11, 22, 27, 29, and 31. These tracts are mostly located in the southern half. The slight increase is because slopes are not very good. Land is being used for other purposes: for example, cemeteries, industries, and wet land. Center-of-the-city tracts (17, 18, and 26) have marked decline with break. This is because of the construction of the expressway and transition from one use to another, especially from housing to business and parking lots. Tract 25 has shown sharp decline because of expressway construction.

There is a slight decline in census tracts 12, 13, 14, 15, 19, and 30. These are all older areas where active land clearance for other uses has taken place. Census tracts 16 and 26 are the only two which are more or less static and have shown essentially no change. There appears to be a balance between conversions and demolitions in these tracts. On the other hand, there are always chances for decline in the future.

The distribution of housing units for the year 1960 and also the future increase or decrease of housing units are shown in Map 5.7. The dot map of housing units may be compared with the population Map 5.8. Both maps show similar patterns of the present and the future. The latter is based on the total available land for housing units. It again appears that the outer portions of the City, especially the western and northern parts, are going to have a substantial number of new housing units in the future. The central section of the City will lose housing units to make room for parking facilities and other non-residential uses.

This is a good sign for a healthy atmosphere in city life. It will ease the congestion in the central part of the City, which has very little room for modern needs, such as parking facilities, etc.

The basis for the change in housing units on Map 5.7 ("to ultimate saturation") is an unpublished study made in this Department. The net change in housing units for each census tract for four years (based on a study of building and demolition permits) and the 1960 census totals of housing units were graphed. Three projections (high, medium, and low) have been made for each tract. On the basis of total land available for residential building under the new zoning ordinance, two "saturation levels" (high and low) have been made for each tract. Most probable projections and saturation levels were chosen for each tract and these are summarized in the unpublished study.

To use the study in connection with planning for community facilities, especially at the neighborhood level, this data was converted cartographically into neighborhood data and the results are summarized in Table 5.5. In this table, the data of column I is derived from the census data, *column III* represents the saturation level without regard to time, while *column II* represents the projection for the year 2000 (see also discussion of the neighborhood plan on Chapter Eight). For more detailed information on the methods of projection, the above-mentioned study may be consulted. This work brings out important information on housing and also presents a good comparison with the population figures both for the present and the future.

TABLE 5.5

HOUSING UNITS BY NEIGHBORHOODS

NEIGHBORHOOD	I 1960 counted	II 2000 estimated	III ULT. computed
1. Summit	790	1300	1630
2. Burncoat Plain	830	1000	1040
3. Brookside	630	1200	1660
4. St. Nicholas	430	700	740
5. Fairhaven	710	750	790
6. Greendale	610	650	670
7. Thorndyke	820	1000	1050
8. Lincoln	590	800	1060
9. Coalmine Brook	450	600	840
10. Millstone Hill	1750	1700	1620
11. Brittan Square	830	900	910
12. Burncoat Park	970	1400	1420
13. North Worcester	1010	1700	2110
14. Chadwick Square	1050	1050	1020
15. Salisbury Park	920	1200	1400
16. Indian Lake	580	1100	1500
17. Winter Hill	320	1300	1760
18. Salisbury Heights	510	1400	2430
19. Westwood Hills	900	1250	1310
20. Olean	340	850	1440
21. Tatnuck	650	1100	1530
22. West Tatnuck	460	1150	1860
23. Mill-Swan	500	1000	1700
24. Wildwood	1070	1500	2290
25. Heard	730	850	970
26. Coes Pond	530	650	700
27. Pleasant	1050	1350	1440
28. June	1070	1300	1370
Subtotals	21,100	30,750	38,260

(Table 5.5 continued - Housing Units by Neighborhoods)

(NEIGHBORHOOD) District		I 1960 counted	II 2000 estimated	III ULT. computed
Brought forward		21,100	30,750	38,260
29.	Newton Square	1040	1250	1260
30.	Beaver Brook	870	870	860
31.	Columbus Park	1140	1200	1250
32.	Woodland	2950	2750	2640
33.	University Park	1970	1850	1710
34.	Cambridge	1720	1650	1560
35.	Island	1020	800	690
36.	Beacon	1140	800	660
37.	Piedmont	3150	2800	2640
38.	Elm Park	2900	2900	2810
39.	Chandler Hill	1010	950	940
40.	Shrewsbury	1300	1200	1150
41.	Millbury	1930	1900	1890
42.	Union Hill	2700	2750	2760
43.	Hamilton	1990	2250	2350
44.	Bloomingdale	1150	1500	1550
45.	Lake View	1190	1400	1430
46.	Grafton	1110	1500	1730
47.	Massasoit	340	550	820
48.	Providence	610	950	1400
49.	Vernon Hill	900	950	980
50.	College Hill	630	850	1120
51.	Quinsigamond Village	950	1300	1800
52.	Oakland Heights	290	800	1840
53.	Blithewood	400	850	1690
54.	Pinecrest	800	1100	1800
	Central	680	500	0
Subtotals		35,880	38,170	41,330
Grand Totals		56,980	68,920	79,590

COMMERCE

The first store of any kind in Worcester was opened in 1750 at what is now the north corner of Main and Front Street. A grist mill just north of Lincoln Square had been established several decades earlier, during the second unsuccessful settlement of Worcester, but trade as a specialized activity conducted for cash in a building equipped for trading awaited the growth of the settlement into a village strung along Main Street from the Common and the Meeting House to Lincoln Square and the Court House. The period 1750-1829 witnessed such a development.

Most of the early businesses established in what has become downtown Worcester handled a variety of merchandise lines: dry goods, hardware, groceries, and produce. Firms which specialized usually were associated with trades like printing or leather working. Specialization in apparel began between 1800 and 1820 as widows of general merchants dropped other lines of their husbands' firms and concentrated on cloth and clothing. About this same time another development became significant: separation of business and residence.

"Block" or "row" buildings began to appear along the main street-frontages. Instead of discrete buildings set on lots, several firms occupied a single building, renting space from the building's owner while the firms' proprietors lived in separate quarters. In 1829 there were 83 establishments on the segment of Main Street between the Common and Lincoln Square. No other business cluster in the town was so intensively developed, though smaller centers had appeared at New Worcester (Webster Square) and at Washington Square.

The years immediately following 1829 brought the first railroad to Worcester. Industrial growth was especially rapid and business activity intensified apace. Specialization of function in the downtown increased. General stores gradually disappeared. Business uses took up lots formerly used for residences along Main Street south of the Pleasant-Front intersection, thus expanding the business district. By 1860 Front and Pleasant Streets both had increased their frontages devoted to business uses.

A railroad terminal on Foster St. was approached by tracks which crossed the Common in back of City Hall. This terminal and right-of-way was abandoned as a mistake before the end of the century.

By 1896 downtown Worcester stretched from Chandler and Main to Lincoln Square and from Pleasant and Oxford to Front and Spring. It was strung out and cruciform in pattern. But growth continued to fill the zone between the "arms" of the cross.

First, the blocks south of the Common along Portland, Myrtle, and Salem Streets and later (between 1896 and 1929) the Mechanic--Commercial-Street section north of the Common were taken into business uses. In this way downtown became more nearly rectangular.

Besides increases in size and changes in shape, development brought with it a sorting-out of functions within the central business area of Worcester. Banks and other financial offices grouped on Main near Exchange Street midway between City Hall and the Court House. Food stores and residences both left the central district altogether. Clothing stores concentrated near the intersections except in department stores where furniture was displaced vertically to the upper floors. Transportation terminals and garaging facilitis which had been on Main Street in the days of the stage coaches moved to the edge of the center but remained within it. This sorting of functions has not been haphazard nor has it been completely systematic, but there seems to be a variation in centrality according to the ability to pay "land rent", which is the sum of shop rent, mortgage payments, and real estate taxes.

Over the long term, then, in the area now known as "downtown", land use has changed in these ways: (1) Retail sales and financial service functions have increased at the expense of residences and vacant land; (2) services other than financial have fluctuated up and down, changing little in the frontage which they occupy; (3) expansion of the business district has been along its southern and eastern edges so that the geographic center has shifted southward without abandoning the older business area of Main Street between Lincoln Square and the Common; (4) the peak value intersection has been very stable, remaining at Front and Main for the past ninety years.

Change, of course, has not ceased. There will continue to be significant changes. But this discussion has ignored the details for the sake of describing trends. Perhaps the best way to predict the future is to project the pattern of past events into future time. Trends however are only part of the broader "patterns". Merely extrapolating the trends of frontage in various uses therefore is not going to predict the future of those use frontages. To do this we must know more about how businesses are linked to the populations they serve, and why past changes have occurred.

Will any other retail functions besides food and variety stores leave downtown and go to outlying business districts? Will banks and financial offices continue to take more and more space in the central business area? The answers to these questions would be of great value in planning for downtown Worcester.

We cannot accurately predict future changes in the City, given the present state of planning and related theory. The use of electronic data processing and the consequent development of theory permits the confident expectation that much more will be possible in the years ahead. In the meantime planning will be largely based on educated guesses; and educated guessers do not always agree.

RETAIL COMMERCIAL LAND USE

Most individuals, in Worcester as elsewhere, obtain goods and service which they are not ready or able to produce for themselves (nearly everything from food to insurance) in shops, stores, and offices located along city streets at points of convenient access; at least *access was convenient* when these businesses were originally located--before the days of parking problems. While a certain amount of retail business is done by mail or by direct home-soliciting, such activities account for a very small portion of all retail sales. So frequently do people use the stores and other facilities in retail areas that these have become prominent landmarks out of all proportion to the small amount of land area occupied (see foldout Map 5.3).

Because of the advantages of clustering, stores frequently agglomerate into planned or unplanned shopping centers. This concentration into centers, each center with many different establishments serving a clientele by face-to-face confrontation, makes retail districts powerful magnets attracting people of all sorts, classes, and tastes. Stores in short are central places. Individual establishments attract customers from an area near the store. This service area must be large enough to "support" the store. Groups of stores in a retail center have overlapping service areas but do not compete unless they perform the same function. Instead of competing they complement their neighboring stores. This linking of stores together into larger and larger groups increases the functions of the center, increases the size of its service area, and causes smaller centers nearby to nestle into the service area of the larger center. Hence a hierarchy of central places is formed.

Central places in rural areas are the hamlets, villages, and towns which serve the dispersed farm population around and between the centers. In cities, of course, there is no intervening open space between the retail centers and their supporting population. Indeed, people live in the same buildings behind or above the retail floor space. But despite lack of physical separation the functional linkages of consumers with merchants create ordered patterns of retail centers which in Worcester may be considered as a three-level hierarchy of central places. Within the city, hamlets, villages, and towns have as functional equivalents street-corner, neighborhood, and community shopping areas.

In a center at a given level of this hierarchy are generally available all the goods available in centers of a lower order. For instance, neighborhood centers have stores performing all the functions of street-corner centers plus the higher order stores unique to a neighborhood center. Similarly community centers are neighborhood centers plus. In this way each higher-order center is independent of any other center of the same or lower order. Retail marketing of goods and services thus organizes space so that a nested hierarchy of central places come into being. Downtown Worcester is not included in this (three-level) hierarchy as it is at a level considerably above any of the centers discussed).

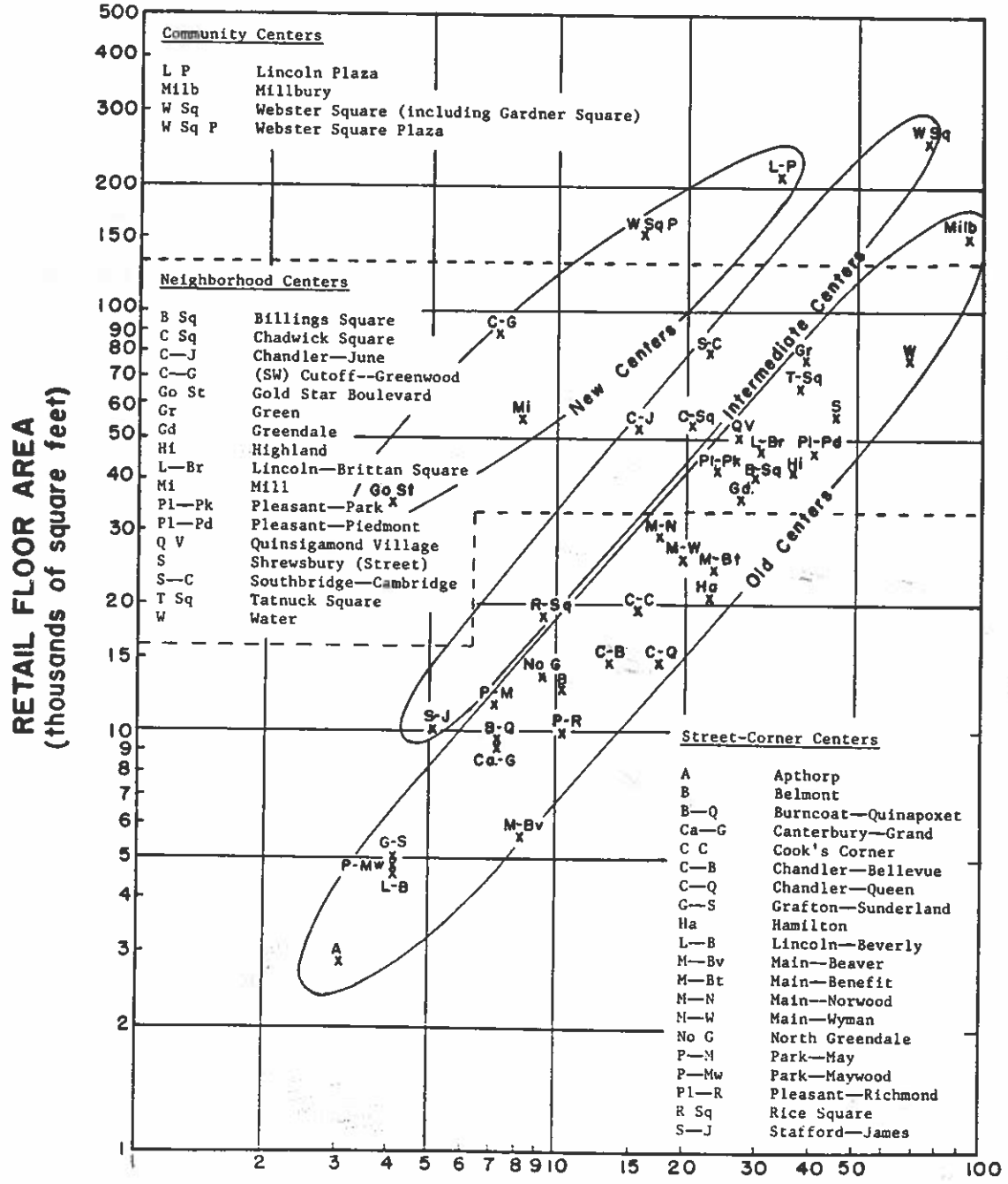
Outside downtown Worcester, however, retail shopping centers are found corresponding in size to the three orders of the central place hierarchy as discussed above. In the absence of front-foot market valuation data the limits of these centers were determined from secondary sources. Measurement of gross retail business floor space (excluding automobile sales and service) and a count of the retail establishments was performed for each of these outlying business centers. Each center was then plotted on a log-log graph (see Graph 5.4). The vertical logarithmic scale represents retail floor space, while the horizontal logarithmic scale represents number of establishments for each center. The location on the graph of the plot for each center is identified by code letters which are further identified in margins. The delineation of each center is shown on Map 5.9. Examination of the log-log graph has led to the classification of the centers on an empirical basis and to identification of an important similarity between planned and unplanned shopping centers in Worcester. Note that most of the plots are concentrated in a narrow ellipse extending from "A" in the lower left to "Milb" in the upper right.

Classification by Number of Establishments

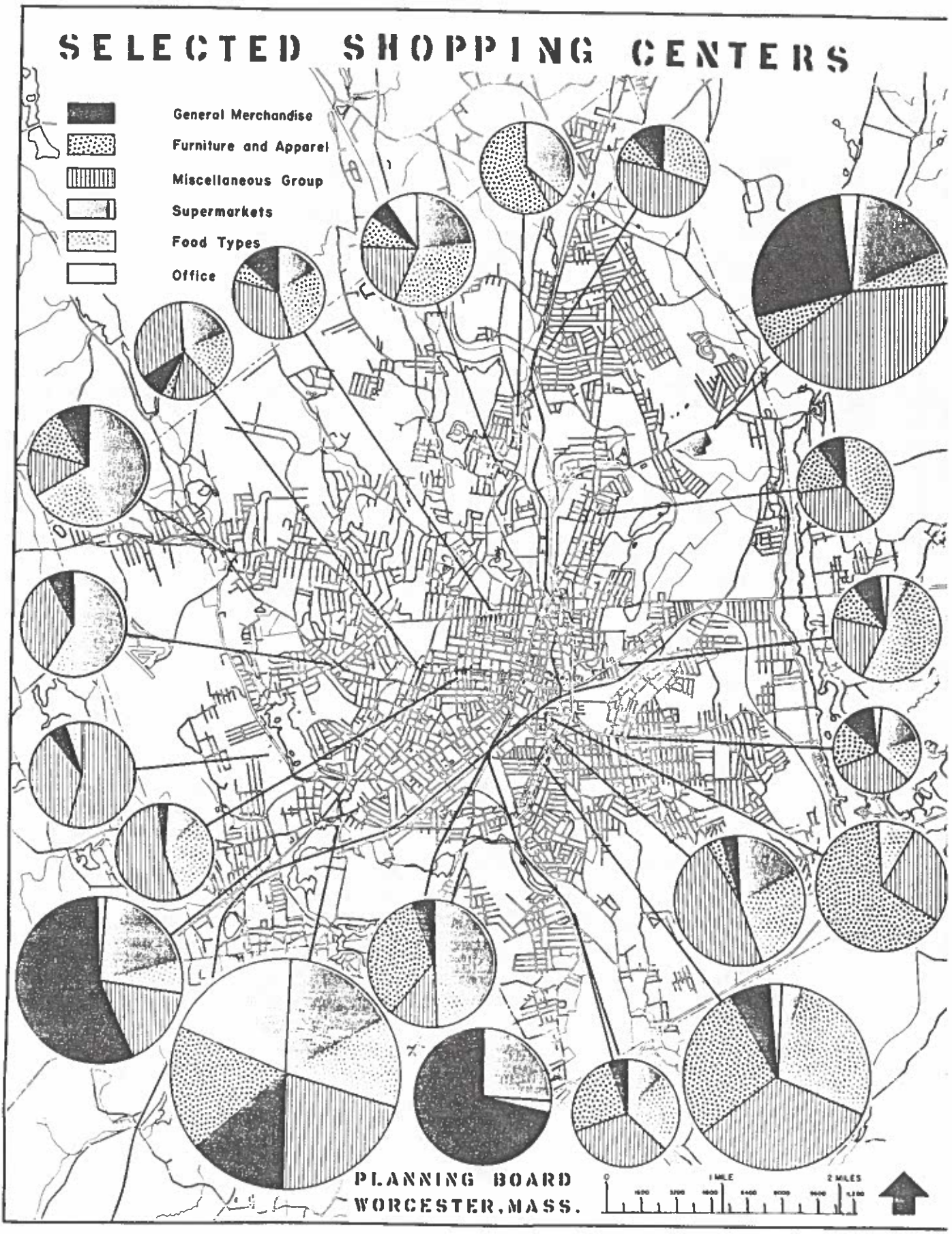
A line along the axis of this ellipse expresses, approximately, the relationship between the size of the centers and the number of different stores in the center. The larger centers, such as Water Street, Webster Square, (excluding the Plaza), Lincoln Plaza, Southbridge--Cambridge, and Cutoff--Greenwood, each have more than seventy thousand square feet of retail floor space (gross ground floor area including storage, offices, and loading areas). Presumably they also have a large variety of goods and services for sale but some of the centers perform these functions in many different small stores and shops while other centers have fewer, larger establishments performing the same number of functions. Modern shopping plazas are always made up of a large establishment like a department store, supermarket, or variety store and several smaller "specialty" shops, but the *average* size of these new establishments is several times those in an old center. As an example of this difference, compare Water Street with a new center of about equal floor area, Cutoff--Greenwood. At Water Street (including Harding St. frontage) there are 65 retail establishments; the Cutoff has only 7 establishments.

The newer centers (Lincoln Plaza, Webster Square Plaza, Cutoff--Greenwood, Mill, and Gold Star Boulevard) have fewer (and larger) establishments and are thus displaced to the left (and upward). In the area between the two ellipses are the plots of a few centers which form a very narrow ellipse. This group includes street-corner clusters of older, smaller stores modernized by the addition of paved parking areas and containing one or more large retail units such as a super-market or variety store or both. These centers form an intermediate group which share some of the characteristics of both newer and older centers, but more of the latter. It can be anticipated that the plot for some of these centers will migrate upward to the right as their service areas develop or redevelop.

CLASSIFICATION OF SHOPPING CENTERS



Graph 5.4


SELECTED SHOPPING CENTERS
General Merchandise
Furniture and Apparel
Miscellaneous Group
Supermarkets
Food Types
Office
PLANNING BOARD
WORCESTER, MASS.
1 MILE
2 MILES

Map 5.

Classification by Size

As the points plotted on the graph represent floor space as well as number of establishments, they can be grouped in another way according to the gaps observed along the vertical axis of the graph. Centers larger than 150,000 square feet are community retail shopping centers comparable to towns in farming areas. No gaps occur in the group of centers from 4,000 to 90,000 square feet but significant differences in function occur at about 30,000 square feet.

Classification by Types of Enterprises

The segmented circles of Map 5.9 present the relative sizes of the principle non-central shopping areas in the city of Worcester. Each shopping center is presented in terms of the ground floor area occupied by six general occupant types:

1. Office;
2. Food (supermarkets of over 5,000');
3. Food, other (small markets, fruit and fish stores, restaurants, taverns, etc.);
4. Miscellaneous group (specialty sales, personal service, recreation, also vacant and unclassifiable establishments);
5. Apparel and furniture sales;
6. General merchandise (drug, variety, and department stores, discount houses except food, etc.)

In general, the community centers can be characterized as the new (Lincoln Plaza and Webster Square Plaza) and the old (Millbury Street and Webster Square). With the exception of Millbury Street, all have at least 15 percent of their floor area devoted to supermarket operations, and the two Plazas have more than 25 percent of their area in large general merchandise outlets. Because of the new construction at Webster Square, this center reaches the Plaza level of supermarketing and is considerably higher than Millbury Street in general-merchandise sales area. The ethno-centered beginnings of the Millbury Street center are a partial explanation of the small-scale retail outlets in the area; much of the rest is a product of center development before the automobile and parking lot became a major shopping consideration. There is a conspicuous variation between Millbury Street and the remaining community centers as regards food-type stores and apparel-furniture sales. Foods, other than supermarkets have a limited representation at the Plazas and Webster Square (having been absorbed by supermarkets) but account for slightly over 25 percent of floor space at Millbury Street. Apparel and furniture stores (exclusively these) don't even appear at Webster Square, but occupy 13 percent of Millbury Street. Much apparel-furniture has, of course, been absorbed by the general merchandise outlets at the other community centers, but there is a vague suggestion that a readily accessible store at Millbury St., which combined many of the small store functions, might be successful.

TABLE 5.6
Percentage Ranking of Six Retail Floor Space Uses
at Neighborhood Centers

	Offices	Food		Misc.& Service	Apparel, Furniture	Gen'l Merch
		Supermarkets	Other			
Greendale	-	-	13	15	6	13
Mill	-	-	2	17	11	4
Green	-	-	4	8	15	-
Lincoln--Brittan Square	-	-	16	12	10	11
Shrewsbury (Street)	-	1*	17	7	7	10
Quinsigamond Village	-	2	10	9	8	5
Highland	-	3	14	13	3	14
Water	-	4	12	16	2	1*
Pleasant--Piedmont	-	5	11	14	4	2
Park--Pleasant	3	6	9	5	1*	8
Billings Square	1*	7	7	10	12	12
Chadwick Square	2	8	15	6	5	6
(SW) Cutoff--Greenwood	-	9	1*	1*	-	15
Gold Star Boulevard	-	10	3	2	14	-
Southbridge--Cambridge	-	11	5	3	13	3
Tatnuck Square	-	12	8	4	9	7
Chandler--June	-	13	6	11	-	9

* The lowest rank number is the lowest percentage of that use type.

It has been established that a shopping center must have a nucleus; that is, a "drawing card". Examination of Table 5.6, which is a ranking of neighborhood centers by percentage of floor area in the six previously mentioned categories, shows several interesting relationships. The chart indicates that though a community center may be able to satisfy area food demands, it does this in a number of ways; there is a general inverse proportion between center supermarkets and the other food types. When a center ranks high in one, it will rank poorly in the other.

Those centers which rank high in other food floor space also generally rank high in the miscellaneous group. When the centers with vacancy rates of more than 5 percent have been eliminated, the correlation becomes more nearly perfect. There is often a relationship between center location and the degree of the correlation. In other words, when a center serves an area which has been quite distinctly isolated from downtown Worcester, the center has developed all the functions of a complete neighborhood center. Greendale, Highland Street, Pleasant-Piedmont, and Billings Square all display considerable equivalency of rank between other food and miscellaneous--and this in conjunction with partial or complete absence of supermarkets.

Street-corner Commercial Centers

The smallest centers of 30,000 square feet or less of gross retail floor space are street-corner clusters. Twenty such centers have been identified in Worcester. All of them are old-style centers. No new-style centers have been built in this size class. One street-corner center (Rice Square) has been modernized by addition of a large food supermarket, the rest are threatened by loss of their functions to larger, more widely spaced centers. Increased consumer mobility may have made them superfluous.

Spacing

Street intersections are more accessible than mid-block frontages but the spacing between centers is more important than street design. Spacing, of course, is dependent upon the maximum distance consumers are willing to travel to obtain a given good or service. Research has shown that spacing of retail centers is also related to population density and that customers are willing to travel longer distances in the country than in the city for any particular good or service. So there is a minimum distance between centers of business activity. In the densely settled neighborhoods this spacing may be a thousand feet (e.g. Main Street has centers at Benefit, Norwood, Wyman, and Beaver; four of them in a distance of about 4,000 feet) but out in the "single-family" neighborhoods minimum spacing is about 3500 feet. In the country retail centers are several miles apart.

Neighborhood Commercial Centers

By far the most numerous centers in Worcester are those with floor areas between 9,000 and 90,000 square feet. Twenty of the centers studied have less than 30,000 square feet of gross retail floor space in them. Seventeen others, including three new-style centers, have more than 35,000 square feet. The smaller neighborhood centers are not all old style. Unlike street-corner centers some small neighborhood centers have been modernized by new construction. These new stores are large, brightly lighted, and provided with a paved parking lot larger than the store itself. This new investment is most evident in the centers larger than 18,000 square feet. The small neighborhood centers (9,000-29,000 square feet of gross retail floor space) which have not been modernized are in neighborhoods that have achieved residential saturation. There is no land available for expansion of the retail center. If present consumer preference for new-style shopping centers continues, these small neighborhood centers may be doomed to decay as retail centers unless organized planning and action prevent. Perhaps wholesale or office uses will replace merchandising and consumer services in some such centers. Auto service stations will appear on the edges of decaying centers seeking the prominence of a central location but unable to pay the high land rent of healthy centers.

Large neighborhood centers (35,000 to 90,000 square feet of floor space) have more variation among them in numbers of establishments than either larger of smaller centers. This means that a few big stores make up some centers like

Chandler--June, Mill or Cutoff--Greenwood, but that many small stores make up other centers such as Greendale, Shrewsbury Street, Highland, or Billings Square. The size of stores, of course, does not affect the number of central functions which these centers perform. As a group they duplicate all the functions of the smaller (low order) centers with their grocery store, spa or drug store, and personal services such as laundry, cleaning, and barber and beauty shop. In addition to these functions (which may be incorporated into a large firm) large neighborhood centers perform middle-order functions not performed by small neighborhood centers. Instead of a grocery store with a selection of 600 items there is a supermarket with 2,000 items or more, or (what amounts to the same thing functionally) several specialty food shops for meat, fruit, and bakery products. Television repair, building materials, and hardware stores first appear in these larger centers. Instead of, or in addition to the spa, a more diversified drug store or a "five-and-dime" variety store is found there, as well as six or seven personal-service shops. Sometimes the large neighborhood center has a jeweler or gift shop also. Restaurants and bars are sensitive to special tastes and demands. A large neighborhood business center will have at least one restaurant and a package store, but bars may be absent altogether or present in numbers. Shrewsbury Street and Tatnuck Square have two or more restaurants, while all other large neighborhood retail centers have only one.

Locational Specialization

Functional specialization and a dispersed population require duplication of functional units in many centers spaced more or less regularly throughout the supporting consumer population. The outlying business districts of Worcester are such centers primarily, but not solely. The Italian-restaurant function at Shrewsbury Street (western end) is locational, not functional, specialization. The neighborhood, which is the residence of most recent Italian immigrants in Worcester, is the resource, not the service area, of these restaurants. The service area is the whole metropolitan region, but this neighborhood has imported food shops as well as residents who know the skills and techniques of Italian-style cuisine. Other ethnic centers exist in Worcester which provide services or products to the dispersed population. Water Street is such a retail center predominantly occupied by Jewish merchants but serving a dispersed clientele. Kosher food shops are present *in addition to* the standard functions of a large neighborhood retail center. Store vacancy is very high in the Water Street district due perhaps to the migration of the Jewish community from the Water Street neighborhood to the west side after about 1958. Some, at least, of the merchants who vacated these shops have re-established in the new Jewish neighborhoods. The merchants remaining at Water Street serve the Jewish population and the dispersed non-Jewish population in ways which utilize the localized resources of the Water Street district. Like the Italian restaurants on Shrewsbury Street, it is a locational specialization. Any ethnic or racial group may modify the pattern of duplicate retail centers by utilizing its distinctive resources to its own profit. Worcester's other ethnic communities, however, have not affected retail centers in ways that our analytic procedures can distinguish.

INDUSTRY

This division, like the preceding one on Commerce, is concerned with a land-use sector that produces a major portion of the income of the City. Under "industry" are considered transportation, utilities, communications, wholesaling with stocks, storage and warehousing, contract construction, industrial services, and last but not least, manufacturing. These several industries vary somewhat in their characteristics but, in general, may be said to be characterized by a high volume of goods handling, of vehicular access, of a traffic pattern with decided peaks. They are discriminated from commercial uses principally by lesser or non-existent demand for centrality or for customer access.

PROJECTIONS OF INDUSTRIAL EMPLOYMENT AND ACREAGE

This text summarizes a 1954-1955 industrial land survey, based in part on information received from manufacturers, with the objective of estimating the amount of industrial land needed for expansion and new facilities. Each industrial plant was appraised in terms of:

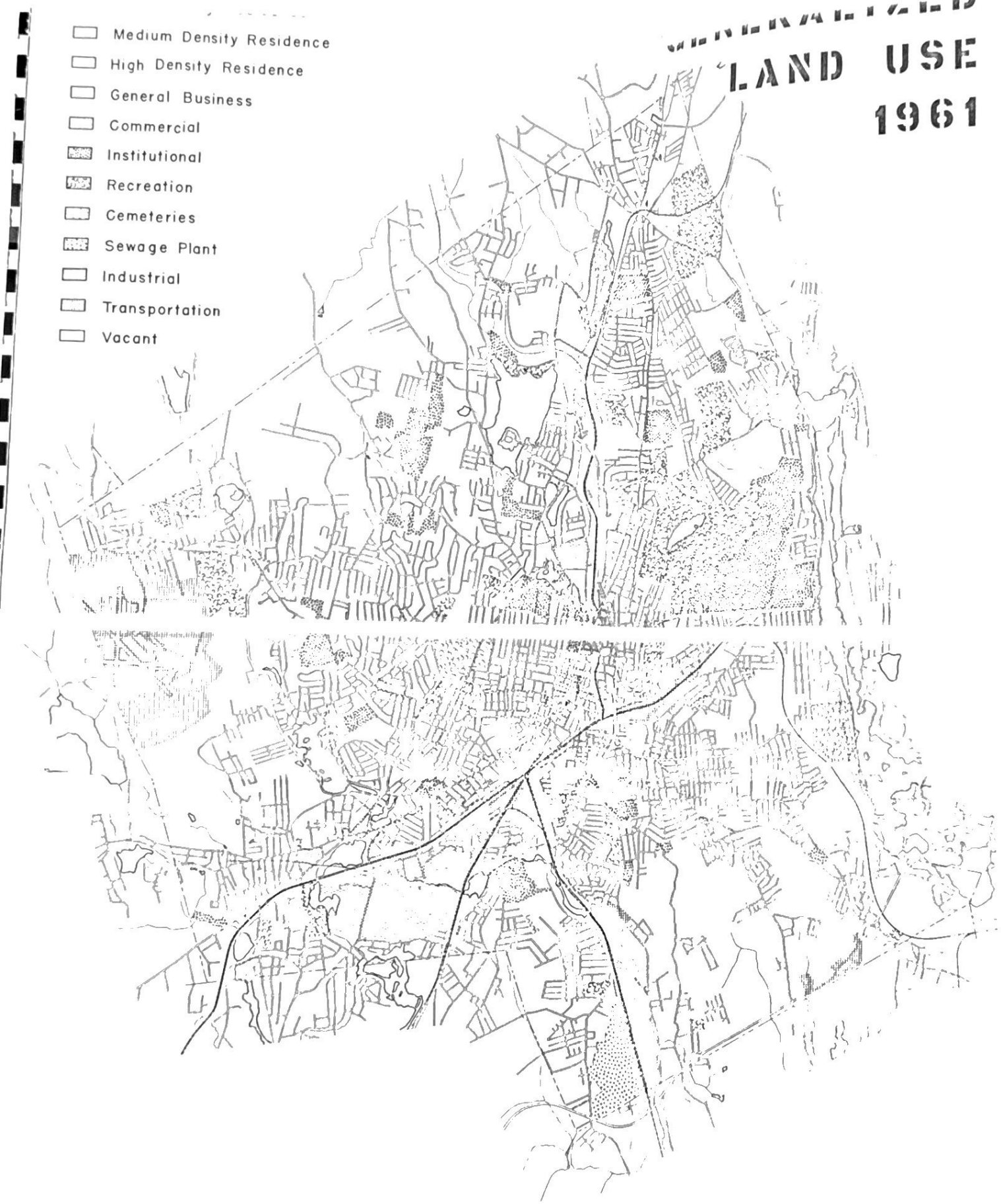
a. land area used for buildings, driveways, parking, and outdoor storage;
b. floor area: total floor area under roof;
c. floor area ratio: total floor area of building(s) divided by total land area used;
d. employee density (employees per acre of land used);
e. square feet of floor area per employee.

The areas of analysis were land in *use*, rather than a combination of land in use and land held for expansion. The study included firms holding their own property and those operating in leased property: building(s) which were occupied by a single firm, and blocks with a variety of tenants. Business men were queried as to their plans for expansion and relocation.

Future land needs of manufacturing were determined by using the present floor-area-per-employee for each type of industry, in relation to estimated trends in employment. Floor-area needs were then translated into land requirements by using a standard floor-area-ratio of .5.

At the time of the original survey, considerable import was given to opinions expressed by a committee of the Industrial Bureau from the Chamber of Commerce, which anticipated the following future developments.

a. Machinery manufacturers, machine shops, tool manufacturers, and makers of *fabricated metal products* would increase employment. It was expected that


Medium Density Residence
High Density Residence
General Business
Commercial
Institutional
Recreation
Cemeteries
Sewage Plant
Industrial
Transportation
Vacant
LAND USE
1961
0
1 MILE
2 MILES
1600
3200
4800
6400
8000
9600
11,200
PLANNING BOARD
WORCESTER, MASS

C H A P T E R S I X

TRANSPORTATION

TABLE 5.7

Comparison of 1955 Employment

Worcester Planning Department Study 1954 - 1955				Division of Employment Security 1955	
SIC	Industry	Number of Employees	Status in 1970	Industry	Number c Employee
19	Ordnance	800	Unchanged	Ordnance	115
20	Food	1178	Up 20%	Food	168
21	--	--	--	--	--
22	Textiles	2302	Down 30%	Textiles	207
23	Apparel	2099	Unchanged	Apparel	201
24	Lumber & Wood	--	--	Lumber & Wood	22
25	Furniture & Fixtures	--	--	Furniture & Fixtures	39
26	Paper	2082	Up 5%	Paper	173
27	Printing	1704	Unchanged	Printing	188
28	Chemicals	624	Up 20%	Chemicals	47
29	Petroleum	--	--	Petroleum	6
30	Plastics	688	Up 100%	Rubber & Plastics	5
31	Leather	2652	Down 25%	Leather	300
32	Stone, Clay & Glass	5151	Up 10%	Stone, Clay & Glass	416
33	Primary Metals	4508	Unchanged		
339	Forgings	2063			
33	*Total*	6571		Primary Metals	751
34	Fabricated Metals	3982	Up 10%		
346	Stampings	1322	Up 10%		
34	*Total*	5304		Fabricated Metals	452
35	Machinery	5044	Up 25%		
354?	(Machine?) Tools	1212	Up 20%		
355?	Misc. Textiles (card cloth)	571	Down 30%		
3552	Textile Machinery	2591	Unchanged		
3591	Machine Shops	952	Up 20%		
35	*Total*	10,370		Machine ex. Elect.	10,37
36	Electric Machinery	1454	Up 10%	Electric Machinery	138
37	Transport Equipment	571	Unchanged	Transport Equipment	79
387	Electric (clocks?)	836	Up 20%	Precision Instruments	161
	Others	1854	Up 10%	Misc. Mfg.	--
	Grand Totals	46,240			46,36

large companies in the group would expand on their own land holdings, and that some small firms would need new sites of 5 to 20 acres.

b. Electric and *electric machinery* manufacturers would be somewhat unstable, in that only half of them would remain where located. The remainder would move about and possibly be supplanted by new companies. Additional land would be needed.

c. Chemical, food, and *paper* makers would increase employment and need small amount of new land.

d. Stone, glass, and clay and *transportation equipment* industries would be stable and need no land.

e. Apparel, forging, ordnance, primary metals, printing and *textile machinery* industries would have stability and no land needs.

f. Leather and *textile* trades would decrease in employment. No land would be needed.

Considering the opinions expressed by those in a position to know the industrial picture of Worcester in late 1954, there was more than adequate reason for optimistic projection of Worcester's industrial future. The industries of Worcester are required to make frequent reports of employee totals to the Massachusetts Department of Employment Security (D.E.S.), in order that correct amounts of money may be paid by employers into state unemployment funds for these people. These reports were the data source used to update and verify the employment projections of late 1954. Unfortunately, the categories of manufacturing used by D.E.S. are slightly different from the breakdown used in the earlier study. The earlier breakdown of manufacturing output is more detailed in some sectors. For comparative purposes, the categories of the D.E.S. are presented (see Table 5.7).

Since the total employment of both studies is so similar, the variation probably being that the total from the earlier study was derived at a slightly different time and the earlier categories can be condensed, rearranged, or retitled to match those of the D.E.S., the projections to 1970 can appropriately be partly verified by comparison with September 1962, D.E.S. figures (see Table 5.8).

The most perfect correlation, assuming a constant rate of increase, is in fabricated metals, with lesser degrees of agreement in the food and chemical groups. It is interesting to note that the positive correlations are in consumer-oriented items, and that in apparel and printing, which were projected as

unchanged, increases of employment did occur. This would suggest that Worcester might well encourage such industries as produce soft goods.

TABLE 5.8

Employment Projections and Change to Date

	Projected 1970 increase	Results to 1962
Ordnance	unchanged	down 12%
Food	up 20%	up 6%
Textiles	down 30%	down 42%
Apparel	unchanged	up 20%
Paper	up 5%	down 17%
Printing	unchanged	up 4%
Chemicals	up 20%	up 81%
Leather	down 25%	down 20%
Stone, Clay and Glass	up 10%	down 9%
Primary Metals	unchanged	down 36%
Fabricated Metals	up 11%	up 10%
Machinery except Electric	up 25%	down 22%
Electric Machinery	up 13%	down 67%
Transportation Equipment	unchanged	down 97%
Scientific Equipment	incompatible	incompatible
Miscellaneous Manufacturing	incompatible	incompatible

Experience has shown that some activities which displayed growth potential have done nothing to fulfill their promise. Others have declined in employment faster than expected. The projected industrial land requirement of 75 acres has been reduced by 33 percent (see Table 5.9). Land designated for relocated industry amounted to 126 acres. When adjusted to the total of land vacated by relocation, the net land requirement (in 1955) came to approximately 95 acres. The net area need of 170 acres should be reduced to 112 acres on the basis of present employment trends. The 1955 study also considered land needed for other industrial uses, that is, storage, utilities, and distribution. Declining manufacturing employment puts a serious limitation on industrial land use, but the changing function of Worcester as a central city should somewhat intensify other land uses. In 1955, the other uses were projected as shown in Table 5.10.

TABLE 5.9

Revision of Projections

Type of Mfg.	Original 1954 Empl.	Original Projected Employment Increase to 1970 %	Original Projected Employment Increase to 1970 No.	Original Median Floor Space/Empl. (Sq. Ft.)	Revised Revised Empl. Increase %	Revised Revised Empl. Increase No.	Revised Added Floor Space needed in Acres	Revised Added land at .5 FAR (Acres)
Stone, Clay and Glass	5,151	10	515	530	10	515	6.3	13
Machinery	5,044	25	1,260	440	5	252	2.2	5
Prim. Metals	4,508	-	-	670	-	-	-	-
Fab. Metals	3,982	10	400	580	10	400	11	22
Leather	2,652	-25	-880	610	-25	-880	-1.2	-
Textile Mach.	2,591	-	-	530	-	-	-	-
Textiles	2,302	-30	-700	740	-30	-700	-11.8	-
Apparel	2,099	-	-	185	-	-	-	-
Paper	2,082	5	100	340	-	-	-	-
Forgings	2,063	-	-	230	-	-	-	-
Printing	1,704	-	-	410	-	-	-	-
Elec. Mach.	1,454	10	150	150	-	-	-	-
Stamping	1,322	10	130	380	-	-	-	-
Tools	1,212	20	240	540	-	-	-	-
Machine Shops	952	20	200	280	-	-	-	-
Electric	836	20	160	110	10	85	.2	.1
Ordnance	800	-	-	160	-	-	-	-
Food	1,178	20	200	650	10	120	1.5	3
Plastics	688	100	700	220	100	700	3.5	7
Chemicals	624	20	120	150	-	-	-	-
Misc. Textiles	571	-30	-170	330	-30	-170	-1.3	-
Trans. Equip.	571	-	-	1,400	-	-	-	-
Other	1,854	10	180	500	-	-	-	-
Net			2,610			322	22.2	50.1 (75)

Table 5.10

1955 Projections of Acreage for Storage, Utilities and Distribution.

	Needed for Expansion (Net)	Needed for Relocation (Net)	Total Additional Needed
Storage	10 Acres	10 Acres	20 Acres
Warehousing	3	6	10
Building Materi-) als and Fuel)	3	4	7
Auto Wrecking	3	-	3
Utilities	15	15	30
Municipal	10	10	20
Private	5	5	10
Distribution	15	-5	10
Trucking	15	-	15
Railroad Yards	-	-5	-5

Functional change of the City will inevitably bring changes in storage area requirements, with most change being in warehousing and auto wrecking. This is a buyer's market; consequently inventories of considerable depth and breadth must be nearby to aid the process of keeping the customer happy and well served. Suburban retailers demand more and better service from jobbers and wholesalers in order that they may supply a growing suburban clientele. Storage space in a central location, like Worcester, would be a partial solution.

Coal and oil storage requirements shouldn't change much. The decreasing use of coal and the increasing use of pipelines for oil transportation (with built-in storage possibilities) preclude sweeping changes.

Considering the increasing number of automobiles which are retired from service each year, the wrecking yards can be nothing but busy. Also, to be considered is the perpetually wavering and generally poor market for scrap steel, which would tend to keep automobile carcasses in storage rather than returning them to the furnace.

The acreage allocated to warehousing appears adequate, that of coal, oil, and building materials a bit high, and that of auto wrecking a bit low. Looking back to 1955, the allocations have been revised as follows:

	Expansion	Relocation	Total
Warehousing	3 Acres	6 Acres	10 Acres
Building Materi-) als and Fuel)	2	-	2
Auto Wrecking	4	-	4

The Federal Department of Commerce is dubious about the future of utility employment, for this group is generally quite susceptible to automation. Not automation in the construction of new facilities (often done by contractors) but automatic switching, recording, and routing after facility development is complete. Such developments and concomitant reduction of labor force might well spell reduction or removal of personnel-oriented facilities from new utility structures and a commensurate reduction of space required. Should the present area development pattern persist (and it very likely will), the heaviest utility development will be suburban. This puts a definite limit on a real utility requirements within Worcester, and so this proposed acreage has been eliminated.

Allied with warehousing activity, the trucking aspect of distribution should also experience growth and a need for enlarged facilities. As the population grows and shifts, and the Interstate highway system takes more complete shape, some trucking terminals may be forced into relocation for the sake of preserving or enhancing their competitive position. Some of the 15 acres allocated to expansion in this field might well be designated as relocation area.

The reason for the 1954-55 study was to ensure that enough land was set aside for industrial expansion and relocation. In 1954, some 525 acres were used by industry for manufacturing purposes and about 365 acres more were utilized for storage, utility, and distributive uses. Some 230 acres were projected for expansion and relocation giving a 1970 land utilization of 1125 acres.

Chamber of Commerce records indicate that during the period, late 1954 to late 1962, approximately 89 firms, with terminal employment of 2384 people, went out of business. In this same period, 81 new firms, with a basic employment of 1181 appeared. If the net job loss in that period was 8696, then declining industry, plus failed industry, must have accounted for 10,507 lost jobs. The projections made in late 1954 showed a manufacturing employment increase of 1260, or 2 percent, by 1970 D.E.S. manufacturing employment in September, 1962 was 37,669; a decline of 8696 jobs, or 18 percent at that point.

The 1954-55 study calculated the median area requirements of each industrial activity group. These medians, when averaged, show that 436 square feet of space was used by a typical industrial employee in 1954. 8696 lost jobs add up 3,791,456 square feet, or 87 acres, of space which are no longer in use. It must be emphasized that an unknown percentage of the 87 acres is in buildings which are quite obsolete. However, the empty space is over 16 percent of the area used for manufacturing in 1954.

Industrially zoned land in Worcester now aggregates about 12,000 acres. About 200 acres is consumed in narrow strips of light-industrial land, which act as a buffer between residential areas and heavy industry. Effective use of these buffer strips, of course, means that parts of the adjacent heavy industrial zone would be used by any light industry, or a heavy industrial plant could use the buffer strips for such purposes as landscaping, parking, employee recreation, or storage.

Several other developments will have influence on industrial land usage in Worcester. The first is the General Neighborhood Renewal Project (GNRP) of the Worcester Redevelopment Authority. This plan will cause the demolition of approximately 50 percent of the substandard plants of the city. Possibly half of the tenants of the demolished buildings will erect new buildings on the old sites but *at lower densities with proper parking, loading and ancillary areas*. The remainder must resettle, in the City or elsewhere.

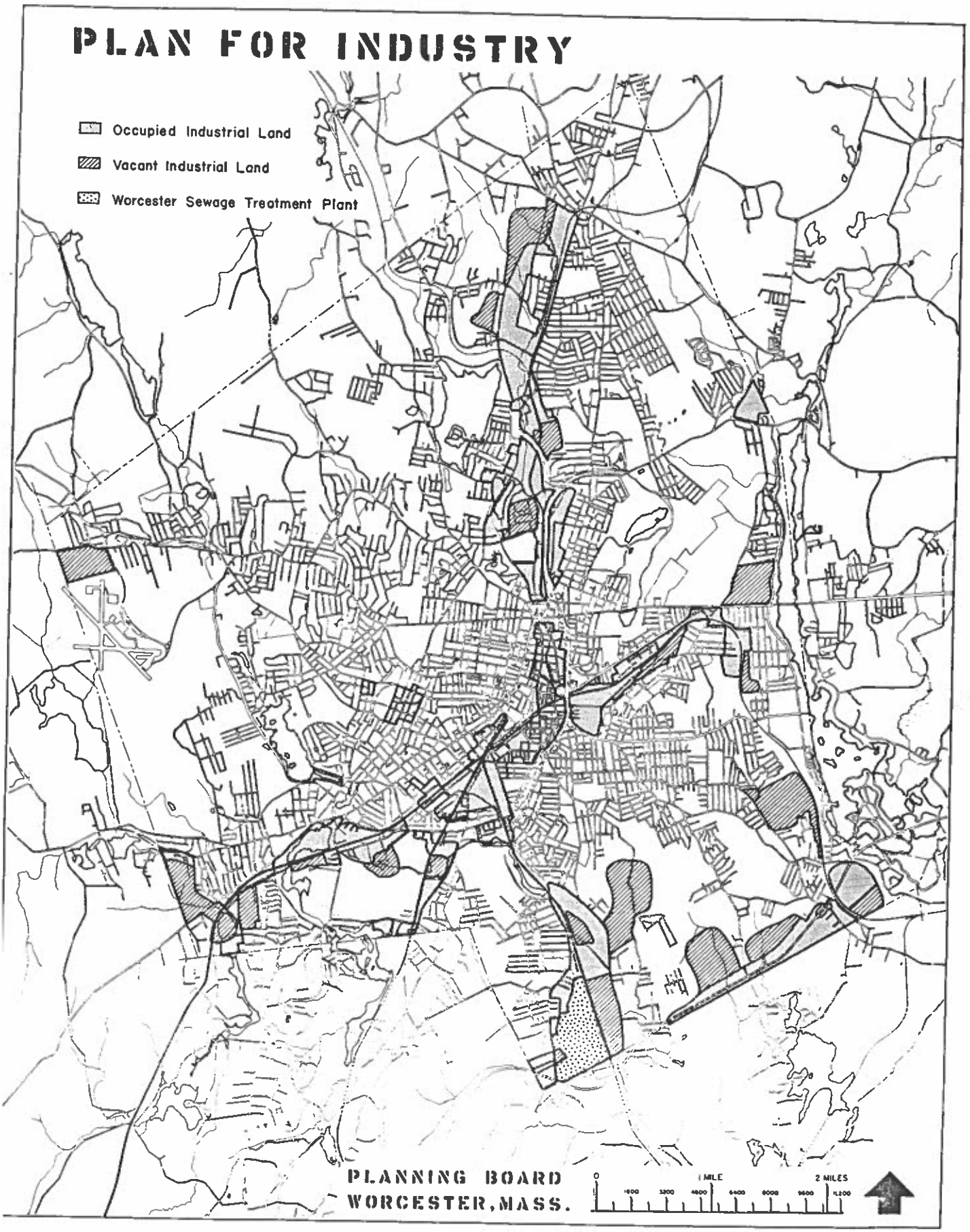
A second program must be effected in the immediate future. The City is discussing the creation of a development commission which could borrow money, float loans, acquire and develop land, and do anything else which was required by a program of industrial development; this commission *must* become a high priority project.

A synthesis of the preceding ideas and facts leads to the realization that industrially zoned land, though many acres of it are on paper, is far from being plentiful. Some of it will be expensive to bring into use, some will be developed less intensively than estimated, and some of it with seriously deteriorated buildings will have the really bad structures on it removed through redevelopment. Worcester must have more, not less, industrial land.

THE PLAN FOR INDUSTRY

Land in Worcester which is presently considered suitable for industry is shown on Map 5.10. Most but not all of this is industrially zoned. The areas shown as "vacant industrial land" are or could be made available for industry. Some of the area now shown as "occupied industrial land" is in residence or commerce which precludes its immediate industrial use. Some of this land can be made available through ordinary real estate market operations; some of it only through urban renewal.

The general industrial requirement of ready access to transportation is reflected on this map. Most of the industrial land is located near railroads. Industries requiring highway access can be located along the Southwest Cutoff or in areas related to the Worcester Expressway or the East-West Highway. A provision for industry desiring immediate access to air transportation has been made on the northern fringe of the Worcester Airport. Attention has been given in this latter case to protecting nearby residence by a reserved planting zone between light industrial uses and residence.


PLAN FOR INDUSTRY
Occupied Industrial Land
Vacant Industrial Land
Worcester Sewage Treatment Plant
PLANNING BOARD
WORCESTER, MASS.
1 MILE
2 MILES

Map 5.10

Chapter Six will concern itself with transportation problems under two major headings: (1) Highway Facilities and Problems, treating the road system itself within the right-of-way lines and also access to that system; (2) Public Transportation, treating certain classes of vehicles and licensed under State or Federal(or both) commerce commissions to carry passengers or goods. The following passage from the introduction to *A Policy on Arterial Highways in Urban Areas* published by the American Association of State Highway Officials (AASHO) is a clear and brief statement of the problems in this area.

> " The ever-growing motor vehicle travel has resulted in increasing traffic congestion, with the greatest distress evidenced in urban areas. The use of the motor vehicle--passenger car, truck, and bus--is such a significant part of the social, commercial, and industrial life of any community that inability to move safely and efficiently results in anguish, inconvenience and economic loss. Relief of traffic congestion in urban areas is most urgent and should be accorded high priority.
>
> Traffic congestion in cities will be relieved effectively only by a broad attack in several areas in which the improvement of streets, highways, and allied facilities is an important one, but even here there are several directions in all of which improvements are needed. They are:
>
> (1) Construction of new arterial highways and improvement of existing ones.
>
> (2) Improvement of distributor [collector] streets.
>
> (3) Solution of the terminal problem by improvement of facilities for parking and for the loading and unloading of goods.
>
> (4) Improvement of the transit system, particularly in the larger cities.
>
> (5) General improvement in operation of existing facilities, particularly at intersections."

HIGHWAY FACILITIES AND PROBLEMS

Modern highway planning for the City of Worcester began in 1911 with the "Final Report and Recommendations of Commission Relief of Street Congestion" by a group of prominent Worcester citizens. Western and eastern arterials were proposed parallel to Main Street with a trolley terminal located at the eastern end of the Common and related to a new Civic Center.

In 1911, recommendations were made for widening Chandler and Madison Street and for constructing a new street diagonally from Madison Street to Washington Square. This long-needed link has yet to be constructed. *A City Plan for Worcester,Mass.*, published in 1924, repeated these and added more recommendations concerned with traffic problems: central loop for trolley lines, widening streets for expected increase in motor vehicle traffic (and emphasized the drastic decline in horse-drawn traffic), and straightening out such intersections as Harrington Corner.

It was during this period that the initial planning for a circumferential route was started. The purpose of this route was to connect the existing arterial streets near their outer ends, thus creating an arterial "wheel", portions of which were outside the City limits.

In the thirties, City-sponsored WPA projects improved selected arterials such as Belmont, Burncoat, and Pleasant Streets. In 1954, the downtown western artery was completed but it has had insufficient capacity from the beginning. As yet, no work has been done on an eastern downtown arterial as originally conceived.

EXISTING FACILITIES AND PROBLEMS

Classifying streets by types and bringing them closer to the standards is a primary highway problem. The solution of this will help to solve problems of traffic congestion and parking.

Classification of Street Types

Early roads in Worcester were undifferentiated cart tracks following the route of least resistance around rocks and stumps, and crossing streams at fords or ferries. These roads were neither graded or gravelled--dusty in summer, frozen ruts in winter, and a quagmire in spring. The first turnpike era, at the beginning of the 1800's resulted in substantial improvements to selected heavily-traveled routes. It was not until well into the automobile era in the second quarter of the present century that all-purpose roads began to give way to roads classified by use and designed each for a specific level of traffic. The classification described below is based on that in the above-mentioned *A Policy on Arterial Highways in Urban Areas.* The following text is partly quoted and partly paraphrased from this same source.

> Highways were developed principly as land-service roads to provide an access to homes, businesses, factories, parks. Access to the highway by abuttors was unquestioned. As motor vehicle use expanded, the service character of main roads changed, particularly those in and approaching cities. Local commercial establishments developed along main roads and this tendency was encouraged by zoning ordinances which, intending to protect residential areas from encroachment, confined such uses to certain streets. Property valuations along these streets tended to increase

with business. Traffic also increased with business and the capacity of the streets to handle traffic of all kinds decreased due to parking, stopping, cross-street delays, and the general complexity of urban driving. Highway widening, because of increased property valuation, became increasingly costly, even prohibitive. Both through and local traffic as well as business suffered.

A division between land service roads (the lower classis of streets described below) and through-traffic service roads (the higher classes) is now beginning to emerge, though there is a very considerable degree of overlapping. Streets will be discussed under the subtopic headings of expressways, arterials, and land service streets (see fold-out Map 6.1, *Arterial System 1964* facing page 134).

Expressways: In Worcester, this term has come to be used to refer only to divided arterial highways with full control of access. In the AASHO classification, this highest classification is known as a "freeway". The Worcester Expressway and the Massachusetts Turnpike would both be classified as "freeways", the toll on the latter notwithstanding.

Expressways in Worcester, then, as hereafter referred to, are divided highways with full control of access, with minor cross streets terminated, major cross streets with grade separation, clover leaf or ramps provided for access, frontage roads provided where needed, pedestrian crossings as needed with grade separation, no provision for parking but paved shoulders for emergency use included and with high design speeds. Radical grade separation of opposite lanes is desirable where terrain permits. This plus shrub and tree plantings or natural vegetation between lanes reduces or eliminates not only glare from opposing headlights but also head-on collisions. Expressways may or may not be part of the Interstate, the Federal-aid primary, or the Federal-aid secondary system.

The Massachusetts Turnpike is an example of an expressway built with money from bond issues authorized by the State legislature. The tolls levied on vehicles using this road will be used to retire these bonds. It is part of Interstate Highway Route 90 which will eventually extend from Boston to Seattle. The Worcester Expressway, Interstate 290, as indicated by the even prefix, 2, is a major loop auxiliary to Route 90 and serving an urban area. It will eventually link Interstate 90 and 495 with downtown Worcester. Interstate 495 is an outer circumferential route auxiliary to Interstate 95. The latter will eventually run from Houlton, Maine, to Miami, Florida. It is being constructed with both Federal and State funds and in Massachusetts is not a toll road. The Connecticut Turnpike, a toll road, is also part of Interstate 95.

There are, in the Worcester area, no highways which would be classified in the AASHO system as "expressways". Such roads have partial control of access, special treatment for interchanges (channelization, restricted or no left turns, added lanes for permitted turn movements), elimination of parking from roadways for through traffic but with emergency space for stopped vehicles, planted median strips, elimination of minor cross roads, rights-of-way with all access rights where possible or alternatively frontage streets provided in some areas, and with design speed of 40-60 mph.

Arterials: This classification corresponds to the "Major Streets" of the AASHO classification system. All high-design urban highways are referred to by AASHO as "arterials" but this report will continue to use the accepted local terms. Arterials, then, have three sub-classes: primary or major arterials; secondary or minor arterials; and connectors or tertiary arterials.

Major Arterials are, basically, local streets improved wherever practical by the several means discussed in another section below. All state and federal numbered highways and circumferential streets in the City are so classified. These streets have high traffic volumes (at least 2000 vehicles per day) and are characterized by extensive commercial and industrial frontage development especially since the advent of the "drive-in" business types.

Chandler--Madison, Grafton, Shrewsbury--Belmont, and West Boylston Streets are typical examples of major arterials. Not only are they numbered routes but they also are the only major streets serving their respective sectors of the City as well as the suburbs beyond.

Minor Arterials supplement major arterials but carry slightly lesser traffic volumes (at least 1800 vehicles per day) and are not necessarily characterized by industrial or commercial frontage development. They carry traffic parallel to or connecting with major arterials and, especially during rush hours, relieve traffic pressure on major arterials.

Typical examples of minor arterial streets are Burncoat, Plantation, Hamilton, and Greenwood Streets. They interlock segments of the major arterial system, provide for lower traffic demands, and fill an intermediate role in the sectors between major arterial streets.

Connector Streets have the principal function of main links between two or more radial arterials. They carry substantial volumes (at least 4000 vehicles per day). Richmond--Flagg, Hammond, and Heywood Streets are excellent examples of connector streets which meet the basic definition. The traffic on many of these connector streets would be relieved by the development of the Circumferential Highway.

Land Service Streets: All streets in the City not classified above are land service streets, having no arterial function. There are two categories of these streets, depending upon their service level.

Collector Streets, also referred to as "distributor" streets,run as directly as possible from a series of local streets on the one hand to one or more arterial streets on the other. They carry relatively low traffic volumes (at least 100 vehicles per day) funneled from local streets.

Local Streets are undifferentiated land service streets designed to carry traffic originating on or destined to that street itself. They should not and normally do not carry either high volume of traffic or through traffic. All streets not designated under a higher category are local streets.

Traffic Volumes and Congestion

In an era of electric trolley cars and Model"T" automobiles, when the only way to get an automobile up some of the steeper hills in town was to turn it around and back up, no traffic-volume or origin and destination studies were needed. Everyone's destination was downtown and all trolley tracks and all streets led there. An elaborate plan for rerouting trolley lines in the downtown area was proposed in the 1924 City Plan. Stores like Brockelman's Market thrived at trolley transfer points while peripheral shopping areas like Webster and Lincoln Plazas and Bradlees--Spags--Fairlawn did not exist (except for the White City entertainment park on the Boston-Worcester trolley line).

Forty years later in 1964 the trolley cars and Brockelman's Market are only memories; the mass-merchandising of automobiles and the mass-advertising on radio and television have helped to create a different world set in the constraints of the same pattern of city streets. Only recently a few changes such as the Worcester Expressway and the Ernest Johnson Vehicular Tunnel under Lincoln Square have begun to ease at a few points the ever-increasing circulatory congestion that is slowly throttling the City.

Today, both origins and destinations are spread across the map of the City and its regions in as random a pattern as are the homes, offices, shops, and plants of the people who work and play, buy and sell, drive and reside here. The pattern of straight lines connecting each origin of a trip with its destination forms a network across the map like a cobweb with a concentration focused on downtown, on every shopping area, on every manufacturing plant, on every office, on every college or university, on every government building, on every place of entertainment, on every transportation terminal, and on every other place to which many people want to go. Every area of urban activity is dependent upon the efficiency with which a road system serves the traffic demand or, in other words, that system serves best that reduces to a minimum the sum of travel times between each pair of origins and destinations.

There is no question in the mind of any driver trying to move along principal arteries leading to the heart of the City that improvement is due and overdue. Some spot improvements are proposed in another section of this chapter. A table of traffic volumes is included in the appendix. Most of these were taken during the years 1958 to 1960, inclusive, and computed to represent the average daily traffic volumes for 1960 on downtown streets and principal streets elsewhere. Additional streets which have been measured since 1960 are included but are not adjusted to 1960.

This primary information, coupled with other traffic studies, provides a basis for locating traffic problems and for most traffic planning and improvement. It is essential to the economic health of the City that the capacity of arterial streets and the rush-hour demand be brought into better balance. As accessibility to areas outside of downtown continue to improve, congested downtown areas have an increasing disadvantage.

In 1951, Charles Maguire & Associates, through the Massachusetts Department of Public Works, submitted a Master Highway Plan for Worcester featuring the greater part of the expressway presently being constructed. This expressway extends through Worcester following generally the principal north-south traffic movements. The impact of use of sections of this highway now completed and open has already been felt in surrounding areas. Since the volume data of 1960 compiled, significant changes on existing streets in the vicinity of the expressway have resulted.

Effect of Expressway on Traffic Volumes: Traffic volumes have been *reduced* between 25 and 40 percent on streets that parallel the expressway such as Harding, Millbury, Water, and Summer Streets, the section of Grafton Street between Posner Square and Washington Square, the Lincoln Square bypass, and Lincoln St. from Lincoln Square to Brittan Square. This is readily evidenced by improved traffic flow, especially during peak hours. Reductions in volume of between 10 and 25 percent have occurred on Green, Southbridge, and Union Streets and Grove Street between Lincoln Square and Park Avenue.

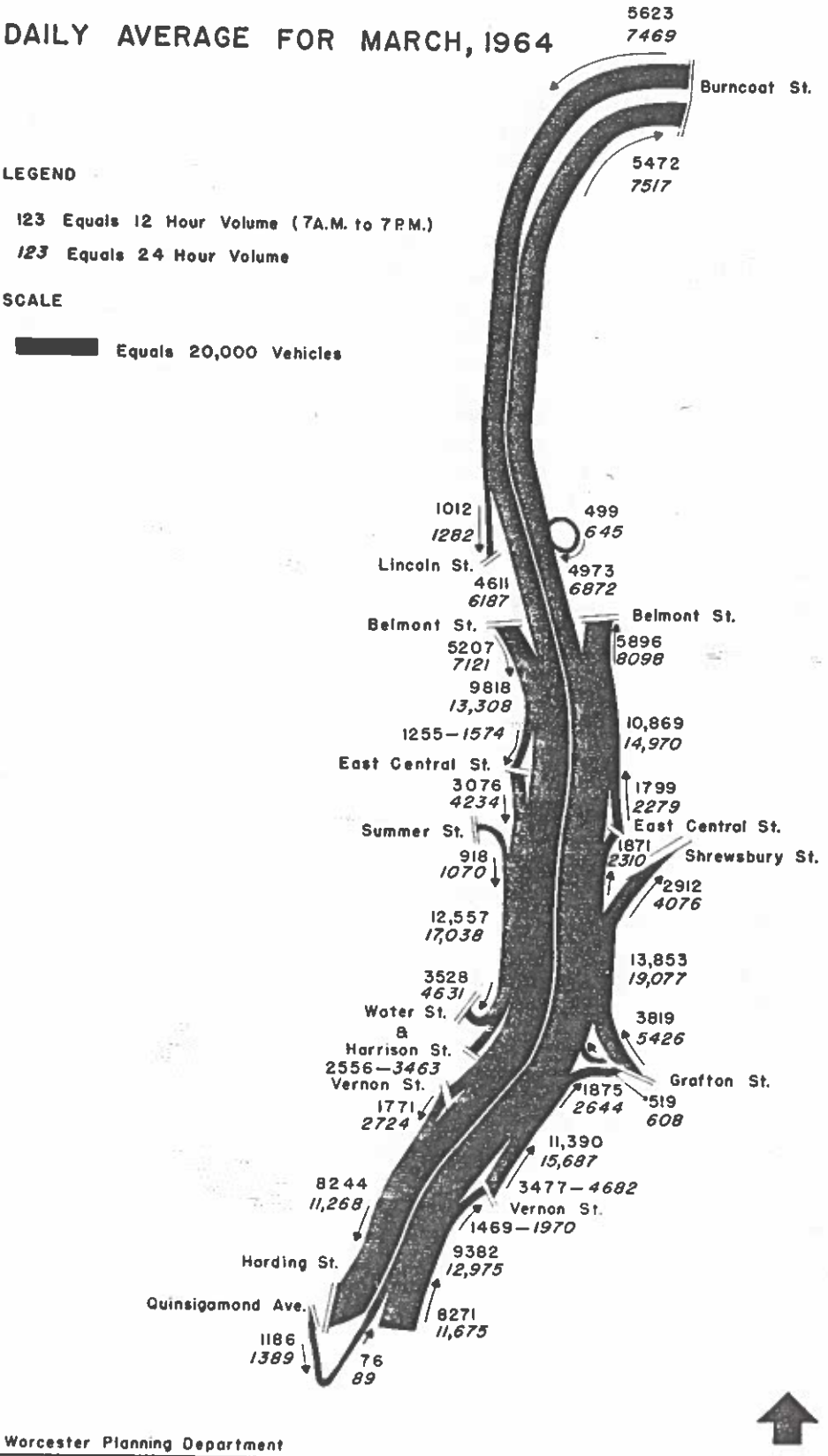
Conversely, streets leading to the expressway ramps have shown an increase in volumes, and congestion at these locations is frequent (see Map 6.2). Belmont Street between Lincoln Square and Converse Street, East Central Street, Grafton Street between Posner Square and Coral Street, as well as Burncoat and Melrose Streets near the expressway ramps have *increased* in volume between 25 and 40 percent. This increase has necessitated the installation of parking and traffic signal control to ease resulting congestion.

Downtown Congestion: Downtown Worcester with its complex of narrow streets is clogged with slow-moving pedestrian and vehicular traffic as well as on-street parking, both legal and illegal. Main Street with heavy pedestrian crossings and with blocks of varying lengths makes efficient progressive traffic-light control difficult if not virtually impossible. Pleasant--Front and Chandler--Madison Streets are often at or over capacity and the lack of an east-west arterial route between Pleasant--Front and Belmont--Highland contributes to the decreased accessibility of downtown Worcester.

Arterial Congestion: Since most of the downtown streets are at capacity at peak periods, a great amount of traffic bypasses this area. The present traffic volumes on Main Street are substantially what they were in 1940 prior to the construction of the Western Artery in 1954, which provided the downtown area with additional north-south capacity. The volumes on the Artery have built up and have now stabilized.

EXPRESSWAY FLOW MAP

DAILY AVERAGE FOR MARCH, 1964



Prepared By Worcester Planning Department

The City of Worcester has many arterials radiating like spokes of a wheel from the central area but cross-connections are inadequate in both capacity and location. This condition exists throughout most of the City putting an extra demand on already heavily loaded major arteries. Narrow residential streets like Flagg Street and Richmond Avenue must accommodate this type of through traffic. Outbound traffic on Pleasant Street experiences tie-ups at Richmond Avenue during peak periods.

At several other locations involving major arterials, serious congestion occurs at these same rush hours. Webster--Gardner Squares, in a business area including a shopping center and a junction of several important arterials, has been the most critical. Cambridge Street is narrow and congested and Millbury Street between Brosnihan Square and Hurley Square is a peak-hour bottleneck.

The "Summit", an area where West Boylston, Malden, Burncoat and East and West Mountain Streets meet, is another problem area. The low capacities of these streets are further complicated by the B & M railroad bridge. During peak hours (when commuting motorists head homeward, and when week-end traveler and vacationer traffic is heavy) the problem is aggravated.

Belmont Street, between Shrewsbury Street and the lake bridge, carries the heaviest volumes within the city. Its three major intersections have long been on the Police Department high-accident list.

Grafton Street (Route 122A) is heavily travelled and runs through a local commercial center at Billings Square. This street now is a "feeder" street to the expressway and capacity is not adequate.

Measure of Volume and Congestion: While the preceding paragraphs have referred to congestion in a qualitative way, it is possible to develop a quantitative measure of volume and congestion. This has been done by the Worcester Bureau of Traffic Engineering on Maps 6.3 (off-peak hours) and 6.4 (peak hours). This measure, referred to here as *vehicle-minutes of delay*, can be thought of as the number of vehicles using a segment of an arterial street multiplied by the minutes of delay experienced. Note that the scale of congestion is a geometric one; that is, each class of increasing congestion begins with a rate twice that of the preceding class.

Off-peak-hour-congestion, it may be noted on the maps, is largely confined to downtown. The exceptions to this are the Webster--Gardner-Squares area, Park Avenue between Chandler and Pleasant, and Belmont Street between Shrewsbury and Plantation Streets.

Peak-hour congestion is practically universal downtown and extends out principal arterials in some cases half-way to the City line. It is particularly severe at the "inner loop" and "second loop" referred to below in the subsection on existing streets with circumferential use. It may be expected that improvements to these "loops" and the implementation of the proposed circumferential highway

further out will help to relieve this congestion.

This discussion of traffic congestion is confined to problem areas along existing major arterials. It should be recognized that congestion problems do exist on other streets and also deserve attention but have a lower priority because of lower traffic volumes.

Trucking Congestion: Worcester has a large amount of trucking, delivery, and express facilities. An average of approximately 10 percent of traffic on major arterials is truck traffic. These commercial vehicles reduce the capacities of the streets because of their lower acceleration rates and because they occupy more street space than passenger cars. Their turning movements are slower and more cumbersome and at narrow intersections can seriously impair traffic flow.

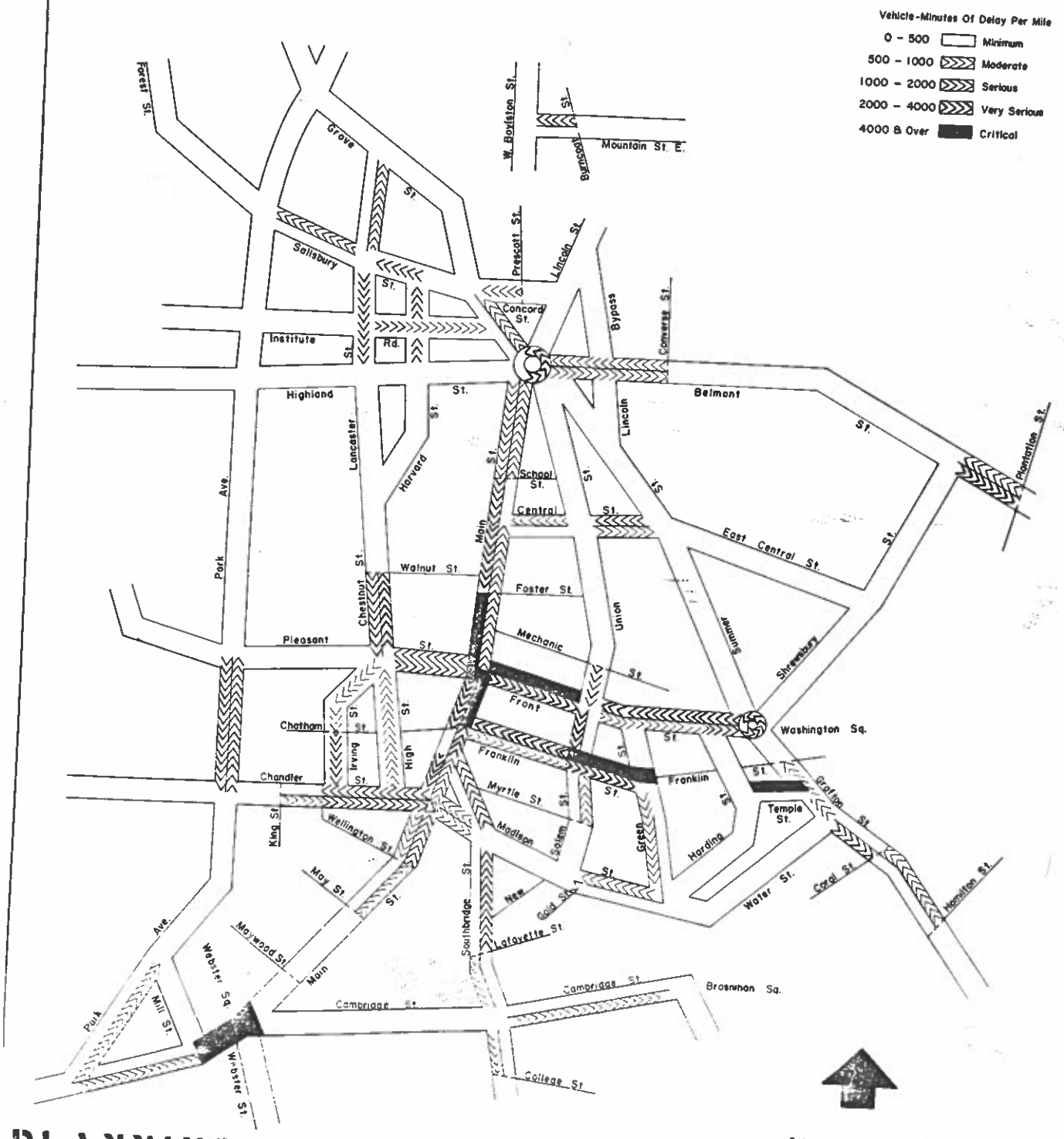
Several restrictions have been imposed upon trucks within the City. Vehicles which exceed certain carrying capacities have been restricted from Melrose, Beverly, Russell, Forest, Grandview, Evers, and Ludlow Streets or portions of them. Commercial vehicles over 28 feet in length have also been prohibited from entering the downtown area between 4 and 6 P.M. Commercial deliveries and pick-ups are prohibited on many downtown streets during the same period. Truck traffic is an integral part of the Worcester traffic pattern and must be considered in planning the future arterial system.

Changing Traffic Patterns and an Essential Part of any Proposed Solution

The relatively uncomplicated traffic problems of a generation ago lent themselves to simpler solutions than will those of today. While the need for improvement to radial arterial highways calls for immediate action, the need for consecutive concentric links at right angles to the radial highways is less obvious to the average motorist who may himself not need them.

Existing Streets with Circumferential Use: First, it should be noted that Worcester has such routes already in existence and they function quite well but are very often at or above capacity, especially at critical intersections: an "inner loop" of arterial streets is formed by Summer Street, Lincoln Square, Salisbury Street, the Western Artery, Chandler--Madison, and then by devious byways back to Washington Square; a "second loop" around downtown Worcester is formed by Belmont Street, Lincoln Square, Highland Street, Park Avenue, Mill Street, Webster Square, Cambridge Street, and the Worcester Expressway. Anyone frequently using either of these "loops" is aware how often some segments are at capacity and it takes up to 3 traffic-light cycles to get through one intersection, especially if a large left-turn demand exists. By carrying through traffic so far intown these inner loops increase congestion without adding substantially to the City's income; insofar as they drive out potential shopping traffic, the City's income is actually decreased.

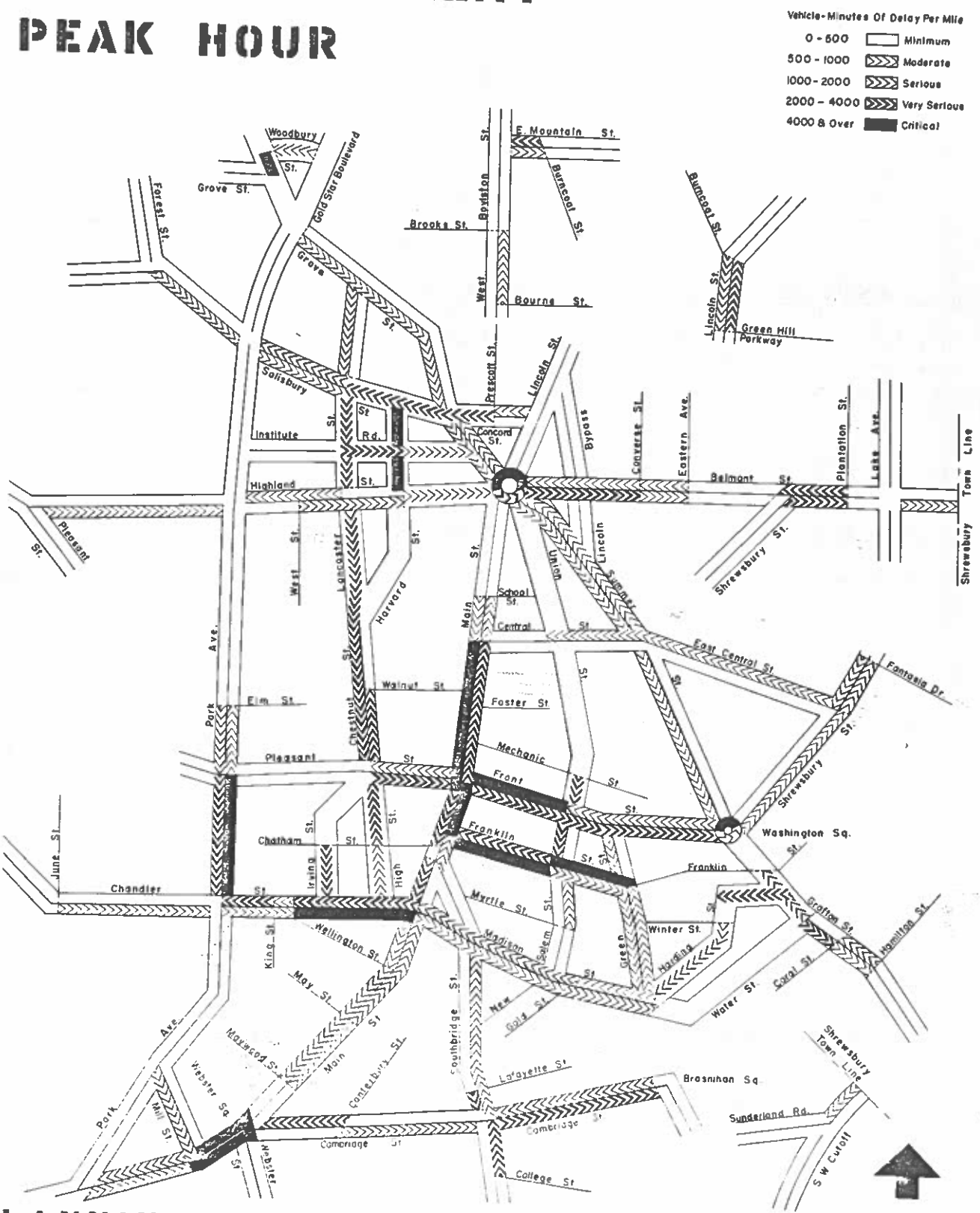
SPEED AND DELAY OFF PEAK HOUR



PLANNING DEPT. WORCESTER, MASS.

Map 6.3

SPEED AND DELAY
PEAK HOUR



PLANNING DEPT. WORCESTER, MASS.

Conflicting Traffic Demands along Inner Loops: It is again obvious to users of the above-mentioned inner loop arterials that one of the reasons for congestion is the conflicting traffic demands of those, on the one hand, who wish to proceed along these streets to a destination beyond and those, on the other hand, who wish to get to a destination or to start a "trip" from a place of business along an arterial street. This problem is capable of solutions which will facilitate both kinds of demands. Comprehensive transportation planning, which for this area is still in the future, is required.

Changing Land Uses and Circumferential Traffic: The proliferation of new shopping centers and of independent roadside retail sales enterprises, the migration from the central part of the City of growing enterprises of all kinds, from manufacturing to research and development organizations, the increasing number of job changes and of working wives (see Chapters Five and Three) has lead to a much more complex pattern of traffic demand. An increasingly large circumferential traffic component exists in every city where an origin and destination study has been made. A circumferential highway will expedite fast fire and police service to the developing periphery of the City.

Circumferential Highways in Other Cities: The advantages of circumferential highways have been recognized by many cities throughout the United States. This is evidenced by the existence of these highways in cities that range in size from the very large metropolises to those only one-sixth the size of Worcester. A number of cities comparable in size to Worcester have completed, or are in various stages of completing, such "ring" routes to serve their needs.

On the Eastern seaboard, for instance, Norfolk--Portsmouth, Virginia provides a multi-lane highway neatly arched around the landward side of the central cities which lie on the edge of the James River estuary. Further inland, Winston-Salem, North Carolina, is found to have linked roads which form a major portion of a well defined circumferential route. Scranton, Pennsylvania, by a combination of existing roadways and the completion of current highway construction, will also provide circumferential facilities.

Among the midwestern cities which have completed or are in the process of completing circumferential highways are Grand Rapids and Flint, Michigan; Springfield, Missouri; and Madison, Wisconsin. The Madison, Wisconsin, loop consists of limited access highways linked to existing arterials. In Grand Rapids, Michigan, the circumferential is composed of a multi-lane highway to the south and west of the city, which connects to both ends of a limited-access highway covering the northern and eastern sides. Ample interchanges along this latter highway allow easy access to all parts of the city. Flint, Michigan, follows a similar pattern, except that the northern edge of the city circumferential does not as yet have a high-design link. Springfield, Missouri, completes its four-square "ring" entirely along arterial highways.

In the Southwest, especially in the state of Texas, circumferential highways seem to be part of the scene in practically all of the larger cities. Lubbock, Texas,

a city close to Worcester in size, has completed over half of its egg-shaped loop which runs just within the city limits. When completed, it will ideally fulfill the purposes of a circumferential highway. Wichita, Kansas, has three-quarters of a circumferential highway completed. Jackson, Mississippi, is also in the process of completing a ring route while the small city of Dothan, Alabama, has what appears to be an almost perfectly circular route.

Other cities of Worcester's size utilizing circumferential highways include Columbus, Georgia; Knoxville, Tennessee; Little Rock, Arkansas; Mobile and Montgomery, Alabama; Omaha, Nebraska; and Topeka, Kansas. Here in southern New England, components of circumferential routes can be found in several smaller cities. Lawrence, Massachusetts, is rapidly completing a limited access loop which has a diameter of five to six miles. Fall River, Massachusetts, has completed about one-half of a triangular route which is adjusted to its particular location between bay and pond. Greenfield, Lenox, and Orleans, Massachusetts; Brattleboro, Vermont; and Rochester, New Hampshire, also have bypasses which may develop into circumferentials.

Parking Facilities and Problems

Parking may be considered as a highway terminal facility and must be provided in proportion to traffic increases. Garages and off-street parking spaces in most areas of high residential density ("three-deckers" and other multi-family dwellings built near to the old trolley lines) are at a premium and space for additional parking units is quite limited. Since the advent of the automobile, the streets have begun to take on the appearance of linear parking lots. As it is the primary function of streets to accommodate moving traffic, parking restrictions and regulations have been imposed resulting in hardships to many car owners. It cannot be denied that many of the restrictions were tempered with the car owner in mind and half measures resulted. Also, since many businesses are located on arterials to take advantage of the passing volume of potential customers, and the average driver's parking habits being what they are, enforcement of the most stringent restrictions on arterials is not always evenly applied. This is a situation that has begun to be reversed and through the proper planning can be resolved.

Privately-financed Parking: Since the end of World War II, many new homes with off-street parking were built, mostly in the outlying sections of Worcester. With the adoption of the revised City Zoning Ordinance in 1963, minimum off-street parking space for all new building construction has been made mandatory. This applies to both commercial and residential buildings and it is believed to be the single most important step toward solving the on-street parking problem. It can be pointed out that in areas such as Goddard Industrial Park where ample off-street parking was a condition to building construction, on-street parking has not been a problem. Off-street parking provided in the Seven Hills Plaza (Salem Street Redevelopment Area) plus the large metered lot across Myrtle Street was expected to accommodate parking needs in that area. The opening of the employment security offices, the YWCA, and the Library suggest that more

parking space will be needed before many years have passed. Shopping centers such as Webster Square Plaza and Lincoln Plaza were built to accommodate all of their customers' parking needs and business is observed to flourish although street traffic flow in the vicinity is congested at peak shopping hours. Commercial and industrial plants along Gold Star Boulevard independently developed adequate off-street parking areas prior to the adoption of new zoning requirements as a matter of good business practice.

Private enterprise has shouldered the brunt of the problem in developing 846 spaces downtown. This represents an increase of 10 percent over the past 4 years and shows an increasing awareness among businessmen of the need of parking spaces in maintaining their business and an increasingly healthy trend in providing these parking spaces. Ideally, there should be three types of parking provided for downtown; (1) close-to-commercial-establishment parking for customer and other short-term uses; (2) further-out all-day employee parking; (3) premium-priced business and professional parking. Large scale employers should expect to provide space to accommodate their employees' vehicles.

Publicly-financed Parking: Worcester has also provided 1241 on-street parking meters throughout the City and expended last year $26,643 in their maintenance. Income from meters in the same period amounted to $91,221 and from parking fines estimated at $30,000 from all parking meter violations.

The Off-Street Parking Board is continuing its parking program. At present in addition to the Water Street Lot it is in the process of expanding the Pearl-Elm Garage into the old library site. It is also eager to help the outlying business areas and has indicated as much to area business groups which have indicated a willingness to take a financial part in solving the parking needs of their shopping areas. The future off-street parking program is included in the 10-year Community Facilities Program in the appendix.

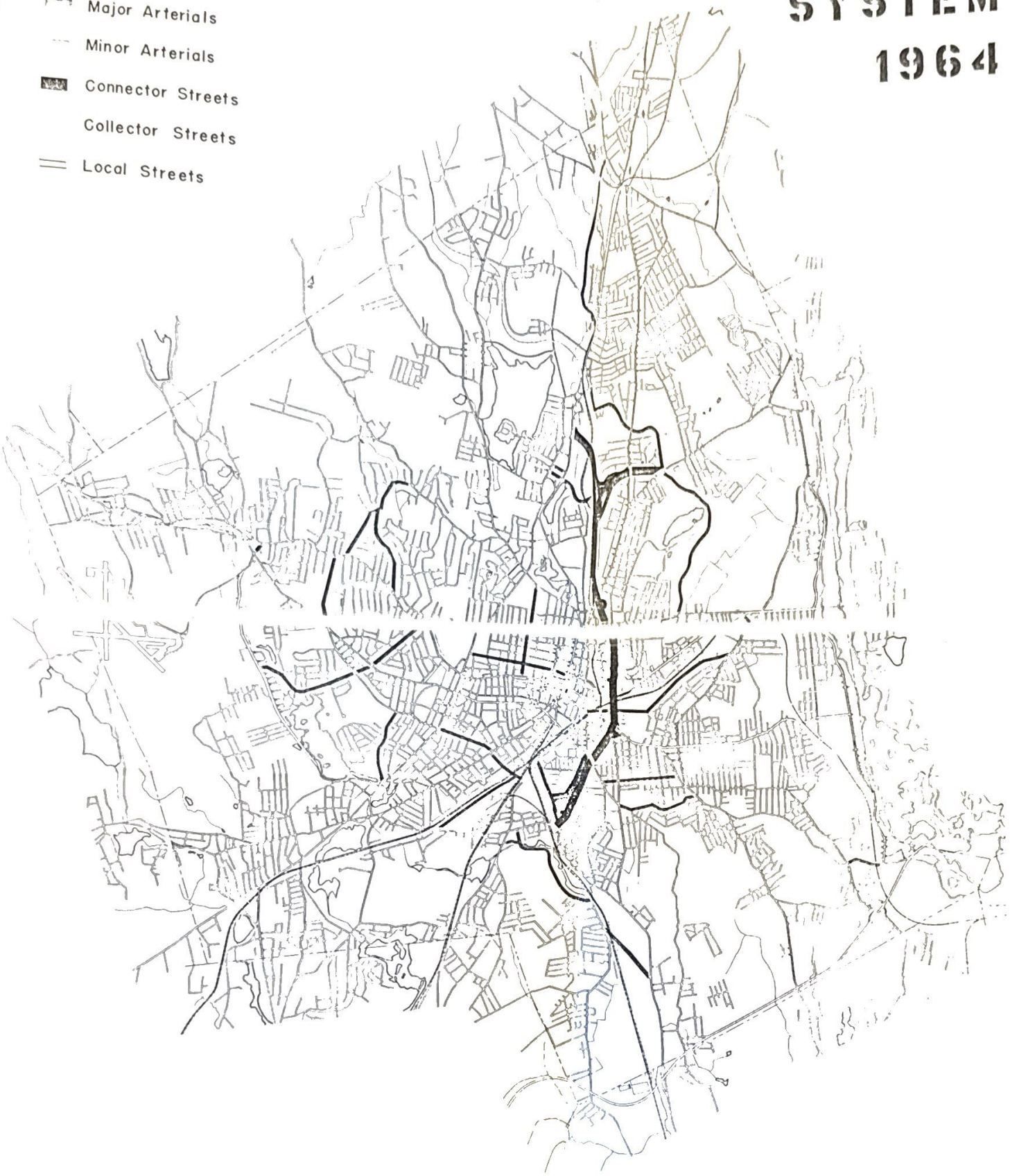
In creating the Off-Street Parking Board, Worcester has met a critical parking problem and has taken long strides toward solving it. Since 1952 when the first off-street parking facility was opened, the City has developed thirteen surface lots and two multi-decked garages in the downtown area, three all-day parking facilities under the Worcester Expressway, and two facilities outside of the downtown area on Millbury and Water Streets.

To date, the City has spent in excess of $3,568,179 for capital expenditures in the off-street parking program in providing 1768 spaces and in 1963 spent over $117,449 in their upkeep. The reciprocal savings in time and other costs by the motorists using these facilities are difficult to measure but substantial.

The City, through the Worcester Redevelopment Authority, is currently studying the need for urban renewal projects in the older, more densely-occupied parts of the City where the shortage of off-street parking is the most severe. Under

ARTERIAL SYSTEM 1964

- Worcester Expressway
- Major Arterials
- Minor Arterials
- Connector Streets
- Collector Streets
- Local Streets



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1600 3200 4800 6400 8000 9600 11,200

PLANNING BOARD
WORCESTER, MASS.

rehabilitation or redevelopment programs, it is anticipated that more adequate off-street parking will gradually be supplied. A high proportion of commercial and industrial buildings in the downtown area were constructed without adequate provision for off-street loading areas. The use of streets for loading and for standing while waiting to load puts an intolerable constraint on traffic movement. Only a major renewal effort will relieve this situation.

The improvement of arterial traffic flow and the development of off-street parking areas, both metered and free, must go hand in hand. Either program alone cannot be justified. Restriction of parking on arterial streets without simultaneous development of off-street parking along them will injure the commercial enterprises whose properties form an important part of the local tax base. Provision of off-street parking without improving arterial traffic flow will lead to underuse of the parking areas and will only defer solutions of traffic problems which will not disappear.

In order to keep traffic flowing freely, street parking restrictions should be faithfully observed. The parking fines recently enacted eliminating the free first offense and increasing the fines after the fifth parking violation are believed to be a step in making this possible.

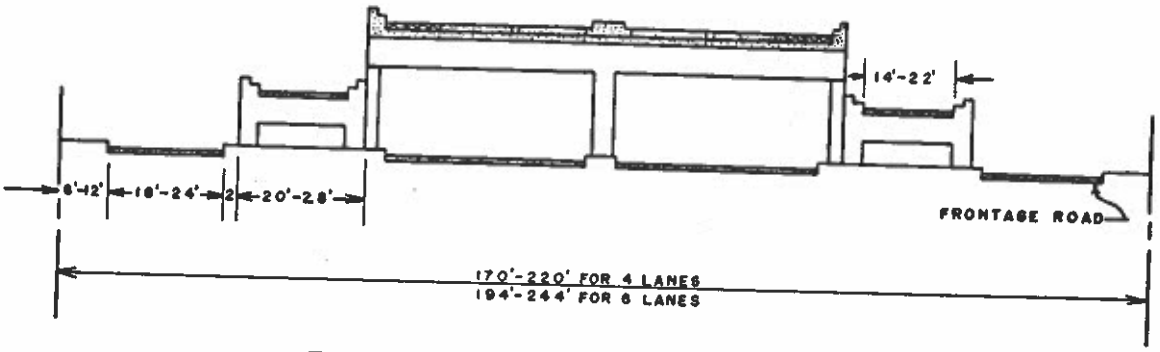
PROPOSED HIGHWAY FACILITIES

Proposed highway facilities will be discussed under topic headings of Worcester Expressway, east-west highway, circumferential highway, and arterials (all of the the foregoing are arterial or through-traffic service streets--see *Arterial Plan*, Map 6.8) and land service streets.

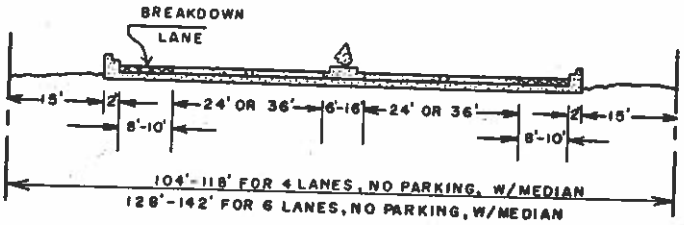
Worcester Expressway

This is the popular name for Interstate Route 290, the first limited-access "freeway" (AASHO terminology) to be constructed in the City. It has, to a great extent, assumed the function of the downtown eastern arterial recommended in 1911. Traffic on the completed section of this route is already heavy (see Map 6.2) and has already proven the value of the Maguire recommendation for such a route contained in the 1951 *Master Highway Plan*. Typical cross-sections are shown in Illustration 6.1.

Interstate 290 through Worcester was originally conceived as a loop connection to and from the Massachusetts Turnpike. Construction of Interstate Route 495 has progressed to the point where a decision was made to extend the Worcester Expressway east to connect with that route north of Route 9 rather than as a return loop to the Turnpike.

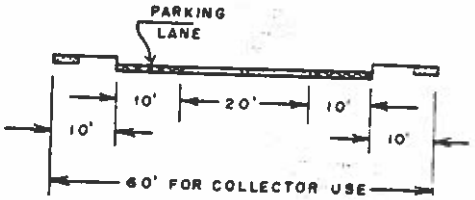


TWO-WAY STRUCTURE
WITH PARALLEL RAMPS

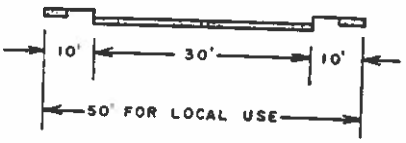


TWO-WAY STRUCTURE
WITHOUT RAMPS

TYPICAL CROSS SECTION FOR EXPRESSWAY



NOTE: LOCAL USE IN COMMERCIAL AND MANUFACTURING AREAS.



TYPICAL CROSS SECTION FOR LOCAL and COLLECTOR STREETS

Illustration 6.1

East-West Highway

The idea of an east-west highway or expressway just north of downtown Worcester has only recently received specific mention in Worcester highway planning. It was first proposed in 1961. A route for the central section, to be designed as an expressway, was tentatively established by the Worcester Redevelopment Authority in 1962 as part of its General Neighborhood Renewal Plan. The first formally published route was proposed in the *Sketch Plan* in 1963.

With the development of the north-south leg of the Worcester Expressway, it became evident that there was a need for a high-design route to provide relatively uninterrupted travel east and west (see also discussion below under major arterials). There is now no such arterial because of barriers caused by topography, railroads, and the complexity of land use along the northern fringe of downtown Worcester.

By surmounting these barriers, the quick access to undeveloped land areas outside the City would make them more desirable and strengthen Worcester's position in the regional plan. It is estimated that about one-quarter of the traffic volume into and through downtown Worcester would be carried by this highway, thereby relieving localized congestion.

Circumferential Highway

In 1957 the Planning Department completed a plan for a circumferential highway within the perimeter of the city, a layout actually started in 1929. Within the two years following completion, not only was the location plan sent to the Federal Massachusetts Department of Public Works as part of the submission for the northern leg of the Worcester Expressway but also an extension of Plantation Street (across what is now Goddard Industrial Park) was laid out to the standards proposed for the circumferential highway. Only two lanes were built at that time but reservation of land was made for the median strip and the north-bound lanes to be built when demand warrants.

The *Sketch Plan*, published in May 1963, included a proposed alignment for a circumferential highway with some variations from the earlier proposal. This plan was endorsed and adopted by the Planning Board and submitted to the Housing and Home Finance Agency as part of the Workable Program recertification for 1963. Subsequently, the State Department of Public Works has indicated that it has proposed, on the strength of the Worcester Planning Department recommendation, that a spur from the Worcester Expressway to the Webster Square Plaza area be extended to Mill Street approximately along the proposed alignment for our "outer ring road".

Service Areas: A hypothetical distribution of service (between those who would drive inbown towards the ring highway and those who would drive out towards the City line to use it) was set at a two-thirds to one-third ratio; that is, the outer primary service area is twice the width of the inner primary service area. The highway is generally located well within the City so that a maximum number

of Worcester residents will find it a convenient route to destinations not along the radial highway on or near which their trips originate. The primary service belt contains most residents of the City and part of the population of adjacent towns.

Proposed Routes: Existing rights-of-way are used for the circumferential highway for 15.8 miles, of which 6.4 miles are of adequate width (see Arterial Plan, fold-out Map 6.8 facing page 156 and detailed tabulation in the appendix). The balance of the route, 6.7 miles, is across private land. In some sectors, feasible alternate routes are offered. It should be noted that any alternate route which pushes the highway closer to the boundary of the City reduces the population in the primary service belt because sparsely-populated areas are substituted for the more-densely populated areas toward the center of the City. For reasons of cost it has not always been possible to put the alignment precisely where it will serve the greatest population. There are relatively few areas where the proposed highway will interfere with existing development patterns.

Relief to residential streets that now must absorb arterial traffic volumes will be provided by the circumferential highway. Examples of these are Richmond Avenue and Lovell, Flagg, Forest, Ararat, and Brooks Streets. All have rights-of-way too narrow either for arterial traffic volumes or for adequate sidewalks.

Construction Standards: A right-of-way no greater than 120 feet is proposed for the belt route to accommodate two lanes in each direction with a median strip and protected loading lanes for left turns. Intersections would be at grade with signals as needed.

Steps in Acquisition of Rights-of-way: State legislation has provided two means of implementing such a proposed highway. The first step is to place an approved alignment on the Official Map and the second, which is a piecemeal approach, is to acquire rights-of-way as part of subdivision control. The City of Worcester adopted an Official Map under General Laws, Chapter 41, Section 81E, on June 9, 1953. Section 81F of this planning enabling legislation provides for the addition by City Council of proposed rights-of-way for future streets and highways after public hearing. Damages occuring to private property may be recovered under Chapter 79 of the General Laws. The Subdivision Enabling Act, Chapter 41, Sections 81K-GG provided in Section 81M - Purposes of Subdivision Control Law: "... provide adequate access to ... subdivision by ways that will be safe and convenient for travel, for reducing damage to life and limb in the operation of motor vehicles, for serving safety in case of fire, panic, flood or other emergency ... and for coordinating the ways in a subdivision with each other and with the public ways in a city or town ..." By this regulation now in force in the City, the Planning Board may request a subdivider to provide adequate access to this and other areas of the City by providing a right-of-way for highways greater than is specified in the regulations for wholly residential streets. Recent court cases will substantiate this view.

Cost Estimates for the Circumferential Highway have been estimated in the Sketch Plan as follows. For alignments on new rights-of-way, cut and fill, foundation, and paving, $100.00 per linear foot. Where the right-of-way is now in use in whole or in part, widening and rebuilding, $70.00 per linear foot. Costs are summarized in the table below at just over nine million dollars.

	Miles	Percent	Estimated Cost per Linear Foot	TOTAL COST
On existing right-of-way; width adequate	6.4	28.5	$70	$2,345,000
On existing right-of-way; width inadequate	9.4	41.5	70	3,444,000
On private land; right-of-way to be acquired	6.7	30.0	100	3,510,000
	22.5	100.0		$9,299,000

Cost Apportionments could be made under any of several highway improvement programs that are in effect. These could be used to reduce city costs for large parts of this proposed construction. These include both Federal and State-aid programs.

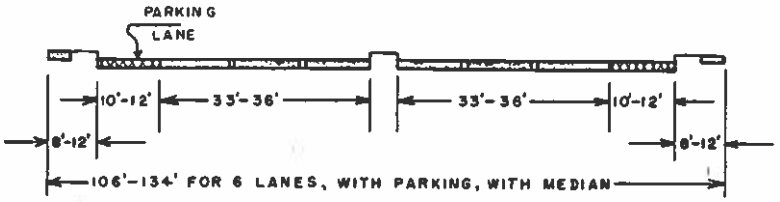
Federal-aid Urban grants would be available for one section. It was earlier proposed to replace the (Maguire-study) expressway connection from Webster Square-Gardner Square area to College Square with a spur from the interstate system by way of Hope Avenue, Hadwen Park, and Gates Lane to Mill Street. This section, if constructed, would be financed wholly by the State and Federal Governments. The State would maintain the highway after construction.

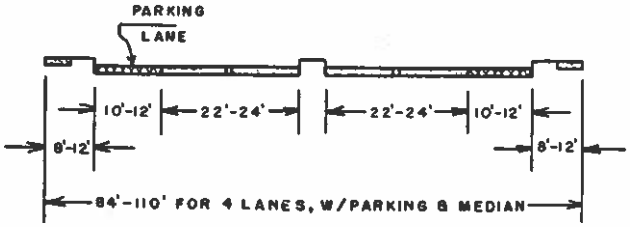
Federal-aid Secondary assistance would be available for the northeast section. A previous report of this Department was concerned with the development of the eastern section of the circumferential highway from Route 12 (relocated) to Route 20 (some 37,600 feet or 7.1 miles) including a new bridge connecting East and West Mountain Streets at the Summit. Costs would be divided between Federal and State governments with the City's share being only land acquisition where needed.

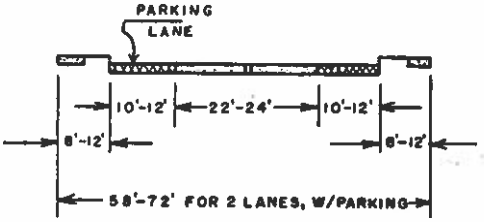
State Chapter Ninety highway construction funds would be available for other sections of the circumferential highway. The City would be involved for one quarter of construction costs as well as land damaged for the right-of-way.

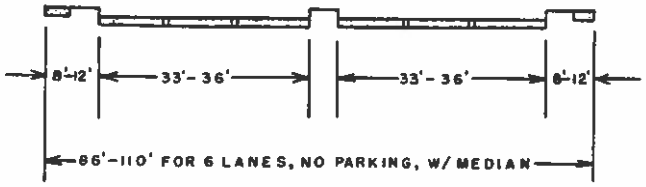
Arterial Standards

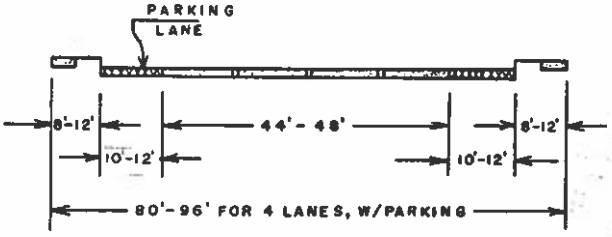
Arterial streets in Worcester do not always meet the minimum standards of cross-sectional width, as designated in this chapter (above). The existing right-of-way widths and pavement widths of the arterials are shown in the appendix and the

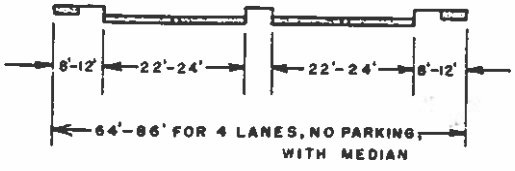


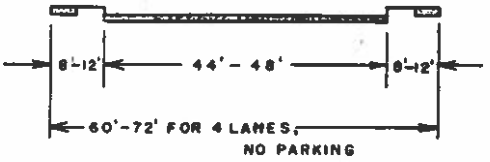












TYPICAL CROSS SECTION FOR ARTERIALS

Illustration 6.2

desired typical cross-section widths are shown in Illustration 6.2. The number of lanes applicable to the arterial should be determined by the volume it carries or is expected to carry at some future date.

As an average, major arterials with "active" abutting property usually cannot handle more than 350 vehicles per hour for each ten-foot lane during peak hours. Under efficient traffic regulation, including synchronized traffic signals and one-way operation, this capacity may exceed 600 vehicles per hour.

The manual prepared in 1958 by the National Committee of Urban Transportation, Standards for Street Facilities and Services, contains tables of hourly volume capacity at signalized intersections. Capacities are affected by location, whether street is one- or two-way, street width, distribution of two-way traffic by direction, parking restrictions, hourly percentage of green time and the amount of truck traffic and turning movements. With all these variables, the tables should be used with circumspection.

On Maps 6.3 and 6.4, a measure of existing traffic service is shown. This measure consists of the total of minutes-delay-per-hour for all vehicles traveling on the various sections of the arterials measured against an ideal minimum over-all speed of 25 miles per hour. The time lost in traveling a street is a measure of congestion and serves to locate the points of delay.

Improvements to all arterials should be made, wherever physically and economically practicable, by the following methods. Traffic signals at major intersections and "STOP" or "YIELD RIGHT OF WAY" signs at intersections of minor streets are usually the first method and are applicable almost everywhere. Other improvements may include: interconnected traffic signals to improve arterial flow, elimination of parking on inbound side in the morning and outbound side in the evening rush hours, pavement markings or installation of "rumble" buttons to provide two or more traffic lanes in each direction, median strips or, where space is limited, "rumble" medians. Median barriers reduce or eliminate head-on collisions and even side scrapes. Barriers also permit only right turns from driveways, alleys, and business entrances, eliminating a major source of traffic friction. Bus stops *off traveled lanes*, especially if they are placed *after* traffic lights thus enabling buses to pull out with a minimum of interference, add considerably to street capacity. Reversible center lanes are a useful device where traffic is predominantly one-way commuting. Pedestrian control by means of cross-walks and, where heavy, by means of "Don't Walk" lights, will provide necessary protection. Design speed is desirably 30-40 mph.

Needed Arterial Improvements and the Proposed Circumferential Highway

A spur from the Expressway at Hope Avenue to the west and north, crossing Main Street near Gates Lane and connecting to Mill Street as a part of the circumferential highway, is planned to bypass the Webster and Gardner Squares area. This will remove a considerable portion of the through traffic, leaving the area free

for local traffic and shoppers. The expressway and spur will also take through traffic from Southbridge Street (see Map 6.5).

A better and more direct link to the circumferential highway is proposed at June Street. This link would extend from a location west of Hemlock and June Streets to Mill Street opposite Swan Avenue.

A connection between Mill Street at Airport Drive to Pleasant Street opposite Olean Street is proposed. This would provide the required 2 lanes of traffic each way now lacking on the north end of Mill Street including the narrow bridge over Tatnuck brook.

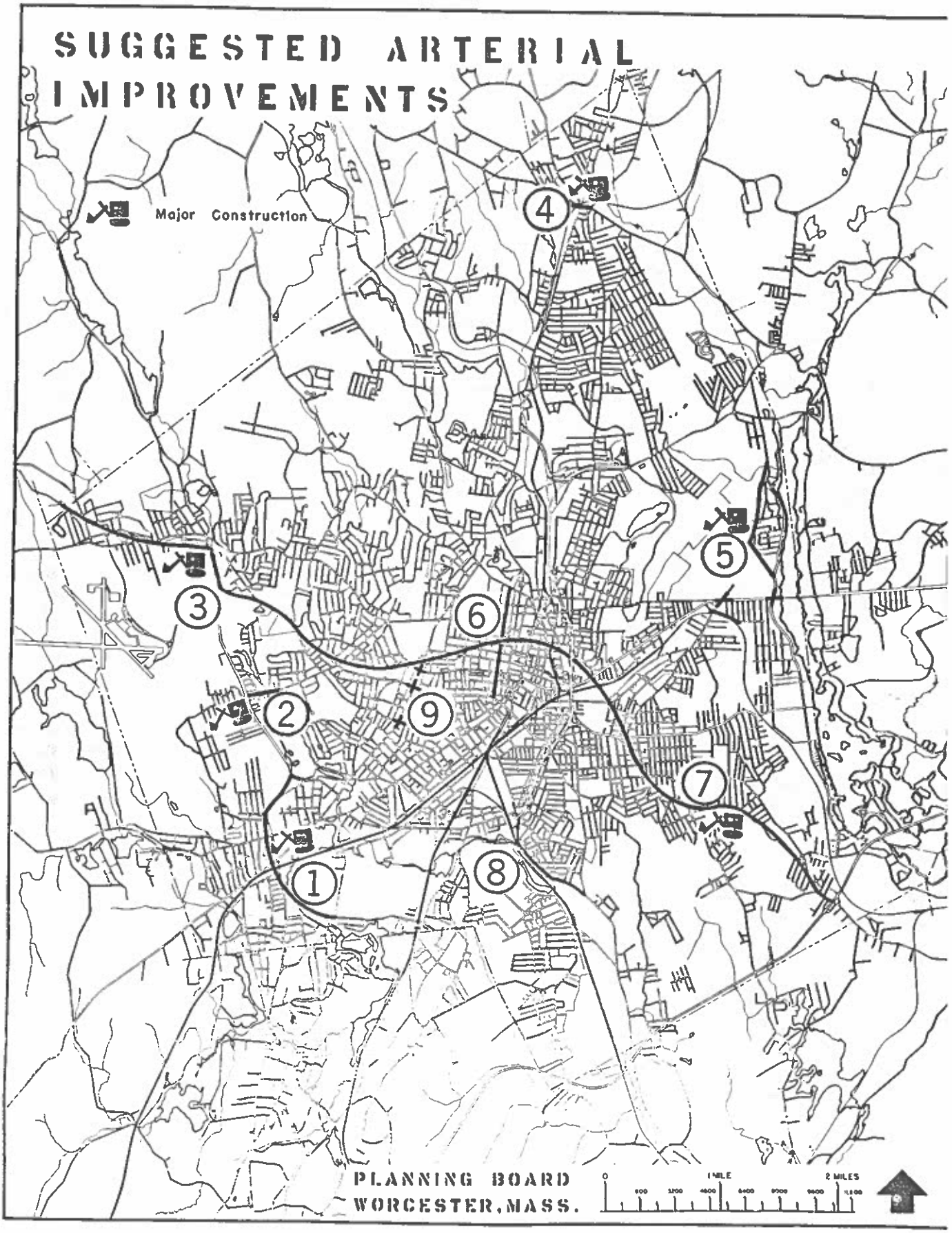
The congestion at the intersection of West Boylston, East and West Mountain, Malden, and Burncoat Streets can be alleviated only with a major reconstruction plan. This would include the building of a bridge over the B & M railroad and West Boylston Street to form a direct connection and a right-angle intersection between East Mountain Street and West Mountain Street. This connection will provide a portion of the circumferential highway. Malden Street and West Mountain Street traffic is funnelled into one outlet on to West Boylston Street at a location offset from East Mountain Street. This short stretch of West Boylston Street is a railroad bridge and as such lacks storage room and has become a bottleneck. This section of West Boylston Street needs to be widened to provide two lanes of traffic in each direction.

North Lake Avenue narrows to a pavement width of about 20 feet above a sharp slope to Lake Quinsigamond. A connection is proposed starting from North Lake Avenue approximately half way between Belmont Street and Mohican Road to Plantation Street at Dominion Road. Plantation Street from this point north requires widening as far as a point beyond Teconnett Path with a connection to Natural History Drive. This would eliminate a dangerous "S" curve and permit a more gradual grade on Plantation Street. The entire connector would by-pass an extremely dangerous condition created by a curve on a narrow street with limited visibility and provide for two-lane traffic in both directions.

At Belmont Street and Lake Avenue it is proposed that a grade separation be constructed. Lake Avenue at this point would provide a high-design link of the circumferential highway.

Needed Arterial Improvement Connected with Proposed East-West Highway

It is proposed above an east-west highway with a central section to expressway standards be constructed to provide major relief. This could tie in with the Worcester Expressway to form a high-type interchange at East Central Street. From here it could be extended to the Massachusetts Turnpike in East Millbury, completing a direct route from downtown Worcester to Boston. This would replace the commercially-lined Belmont Street and Shrewsbury Streets along which Boston-bound traffic now proceeds. Belmont Street between Lincoln Square and


SUGGESTED ARTERIAL IMPROVEMENTS
Major Construction
1
2
3
4
5
6
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8
9
PLANNING BOARD
WORCESTER, MASS.
1 MILE
2 MILES

Map 6.5

Shrewsbury Street is narrow and does not meet the minimum standards of cross-sectional width. The proposed east-west highway would also relieve much of the congestion on Grafton Street. The west end of this highway would tie into the belt route south of Tatnuck and then continue along the alignment of Pleasant Street toward Paxton.

If the proposed east-west highway is not built for several years, it may be necessary to make an interim improvement. East Central Street, now carrying heavier volumes because of the Expressway off and on ramps, requires widening of the south side between Summer Street and the on ramp to provide four lanes of traffic. This would also provide storage room on East Central Street and eliminate the blocking up of the off ramp. East Central Street from Mulberry Street to Shrewsbury Street requires widening as an approach to these ramps.

Other Arterial Improvements Needed

It is proposed that a street west of and parallel to the Western Artery be constructed to pair with the existing artery between John Street and Chatham Street. It would in part utilize Irving and Linden Streets but would require a link between Lancaster and John Streets to Linden and Elm Streets. This would provide a pair of parallel one-way streets from Salisbury Street to Chandler Street. It would eliminate the two-way section of the artery between Pleasant Street and John Street which has a pavement width too narrow to accommodate properly the heavy flow of traffic desiring to use this section. Particular consideration should be given to existing and proposed land use between the paired arterials.

Cambridge Street, with pavement widths of 26 and 33 ft. and lined with three-deckers with little or no setback, is to be relieved of some of its traffic by the completion of the Worcester Expressway to the south. Millbury Street and Ballard Street provide a major link to points south. Between Brosnihan Square and Hurley Square the minimum right-of-way width requirements are not met. A major widening improvement project or a pair of one-way arterial streets between these points should be scheduled soon to be followed eventually by improvement as far as Millbury line.

Downtown Worcester shows the greatest concentration of delay. It is expected that the completion of the Worcester Expressway will provide increased north-south capacity by removing much of the through traffic from the area. The lack of sufficient east-west arterial capacity is evidenced by the serious delays existing on Chandler, Franklin, Pleasant, Front, Highland and Salisbury Streets; by the serious delays that exist on such downtown streets as Austin, Chatham, Pearl, and Elm Streets, and by the delays on the streets crossing Park Avenue.

Park Avenue traffic signals would have better progression through interconnection of the signals. This would allow signalized intersections which frequently go out of step because of temporary power failure to remain in a designated progression sequence.

At Belmont Street and Plantation Street a grade separation of the intersecting streets is proposed. This plan would depress Plantation Street under Belmont Street, and have ramp connections in the northwest quadrant, and a new connection from Plantation Street for eastbound traffic to enter Belmont Street by way of Natick Street. Under this plan, all cross and turning conflicts would be eliminated at the intersection of Belmont and Plantation Streets.

Sections of many arterials within the City are much below the required pavement widths and capacity for major arterials and warrant severe parking restrictions to be imposed to bring them up to standards. As the expressway system and route relocations are completed, the volumes remaining on these arterials would determine the amount of improvement required.

It is also proposed that a public local street connection be made between the westerly end of Wigwam Avenue and Plantation Street opposite Aitchison Street. The primary benefit of such a connection would be to the local traffic south of Belmont Street which is now forced to use Belmont Street with restrictions caused by the closing of several cross-overs. It would help to relieve pressure on Plantation and Belmont Streets.

These are some of the conclusions reached in the arterial plan. It is understood that the Cooperative Transportation Planning Study of the Worcester area will be made by the Massachusetts Department of Public Works to be fitted into the so called "Central Corridor Study". The proposals outlined should be reviewed in this over-all study plan to obtain a balanced highway system with adequate expressway, arterial, collector, and local streets for the safe, convenient, and economic movement of traffic. This plan should be incorporated into an intercity and interstate transportation system.

PUBLIC TRANSPORTATION

This section covers 2 quite different *varieties* of commercial activity--transportation of persons and transportation of goods; by 3 *modes*--rail, highway, and air; and in 2 *categories*--intra-city (including to adjacent towns) and intercity (including interstate). Though formerly it was usual that both varieties were conveyed in the same "vehicles"--now more often than not the reverse situation is becoming more common. Public transportation, as "mass transit", competes with the private motorcar to fill the transportation demand.

PASSENGER TRANSPORTATION

Passenger trains, "mixed" trains and "Buddliners", buses (and still in some cities electric trolley cars), and "prop", "jet prop" and jet-propelled airliners as well as helicopters are the passenger conveyors of the present. Several variants on these vehicles are likely developments for the future.

Rail Transportation

Many of Worcester's citizens can remember, in wartime twenty years ago, when Union Station was a busy place with passengers crowding the loading platforms. This was the "Indian Summer" of unsubsidized passenger transportation. Today, passenger traffic is just a lingering ghost.

Revenue Passengers: The current passenger total is estimated at 100 persons per day (50 departures and 50 arrivals) and most of these are commuters to Boston. Revenue passengers to and from New York City as reported by the New Haven Railroad for 1962 will illustrate the relative position of Worcester railroad passenger traffic.

	1960 Population				
	Central City	Metro-politan area	1962 Revenue Passengers	Participation Ratio *	Participation Distance Ratio (PR x Dist.)
New Haven	152,048	278,794	668,000	240	172.8
Hartford	162,178	381,619	337,186	88	95.9
Bridgeport	156,748	366,654	624,230	170	95.2
Providence	207,498	659,542	256,683	39	72.5
Springfield	174,463	478,592	177,452	37	49.6
Boston	697,197	2,589,301	500,717	19	43.7
WORCESTER	186,587	323,306	9,721	3	5.9

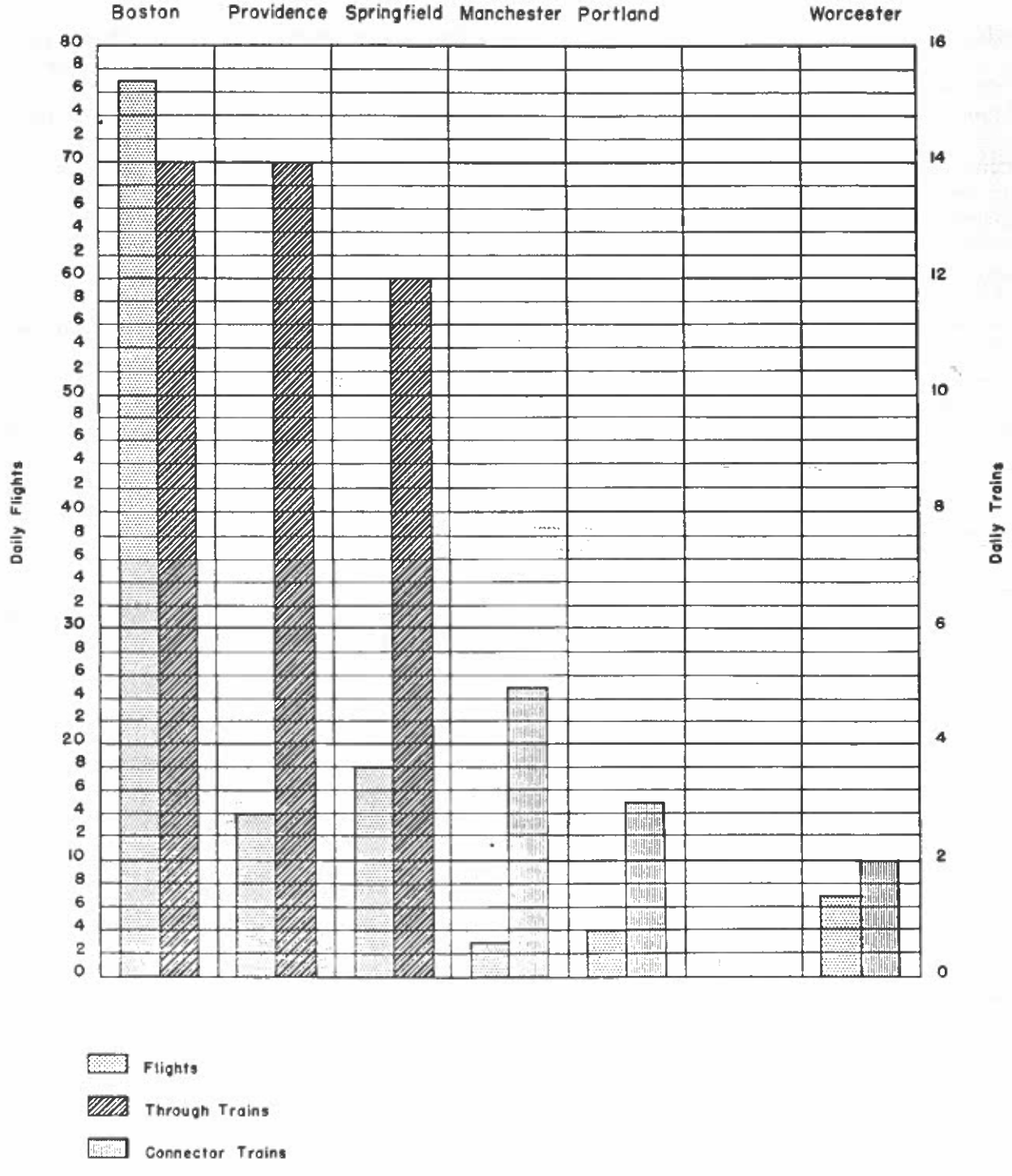
* $\frac{\text{Passengers}}{\text{Metro. Pop.}} \times 100 = \text{PR}$

The number of passenger trains from selected New England cities to New York City (Graph 6.1) further illustrates the disparity between Worcester and its sister cities.

There are currently only nine passenger trains per day, both east and west bound, connecting Worcester with Boston and Springfield. Two of these are commuters from Worcester to Boston. For Worcester, the third largest city in New England, this discrepancy requires an explanation.

Rails in Central Massachusetts--Retrospective and Prospective: Since the first rails of the Boston and Worcester Railroad were opened to Worcester in 1835, they have been an important factor in her growth. From a population of 4173 in 1830, the Bureau of the Census recorded 7497 people in 1840, or 79.7 percent increase, and 17,049 in 1850, a jump of 127.4 percent in a decade or 408.5 percent in twenty years.

DAILY AIR & RAIL SERVICE TO NEW YORK CITY 1964



Graph 6

This early Massachusetts railroad, after leaving the Charles River Valley near Newton, pursued a tortuous course across New England's Eastern Upland to Worcester and thence (as the Western Railroad) to Springfield, often going three miles to get one mile further west. Since its inception, this railroad has been disadvantaged by topography in competing with its sister lines.

The merger of the individual small lines into larger railroads and then into systems was a further disadvantage to the Boston and Albany Railroad, formed from the Boston and Worcester and Western railroads. As most lines south of the B & A were eventually consolidated into the New Haven Railroad, the latter, with a direct line between Boston and New York City, tended to gather more and more of the traffic between these cities. The greater the percentage of the traffic it obtained, the greater the relative frequency of service on its lines, and the poorer the service on competing lines. When the B & A became a part of the New York Central System, the line became more a feeder to the Port of New York than a supplier to Boston. The pre-railroad trade channels had developed along the valleys of south-flowing rivers (Hudson, Housatonic, Connecticut, Thames and tributaries, and Blackstone Rivers) and now fed to the New Haven Railroad and its branch lines as easily as to the B & A.

The Hoosic Tunnel was completed in 1847 with state aid, from the Connecticut and Deerfield Valleys to the Hoosic and Hudson Valleys. Thus a direct competitor for trade with Albany and the west, the present Fitchburg Division of the Boston and Maine Railroad, emerged as a line with better gradients and higher-speed operations. As the Boston and Maine or the New Haven or both now serve all the principal cities of Massachusetts, the Boston and Albany is left with little or no exclusive territory. As a consequence of these events Worcester is left with what is essentially branch line operation from all these railroads. The consequences have been diversion of both freight traffic to other rail and to trucks which can use any state highway, and the passenger traffic to bus, plane, and private automobiles.

The prospective is that there is little likelihood of restoring any volume of rail traffic over the existing circuitous lines serving Worcester in the face of competition by other conveyors and the private automobile. Express buses over the Mass Pike and Interstate highways will more efficiently handle surface passenger service with air transportation taking a share.

Should talk of mergers of New England's railroads actually occur, there may be some opportunity for an alert community, prepared through advanced planning, to improve its rail passenger service. The Massachusetts Mass Transit bill offers another possibility for improvement of passenger service.

Air

To be a success, any facility must be developed and maintained by the enthusiastic support of the community. A booklet issued at the dedication of the Worcester Municipal Airport in September, 1954, contained the following statements:

"It can be said, . . . without fear of contradiction, . . . that there has been developed an excellent Airport outstanding in beauty and sufficient for the aviation needs of Worcester for a long time to come." and". . . Worcester has an Airport fully adequate for its aviation needs and unique in the country as to the quality of its facilities and the beauty of its surroundings."

The role of private aviation at Worcester Airport will be considered first. A glance at the data for non-scheduled flights in Table 6.1 speaks for itself. Many business firms in central New England, especially along Route 128 and in the Framingham area, are relying more than ever on private planes. Because of the congestion that now afflicts Logan Field in Boston, many of these firms are beginning to recognize Worcester's strategic location in time and distance. An executive from an electronics plant on Route 128 can leave his plant and be airborne from Worcester in less time than from Boston even though Worcester is approximately twice as far from his office.

In the decade which has elapsed since that statement was published, airport traffic increased in all categories followed by a sharp decline in all but one (see Table 6.1). The number of scheduled flights fell off 22 percent in one year from the 1959 peak and 43 percent in the past four years. The number of passengers peaked two years earlier in 1957, however, and has declined over 35 percent. Several factors in this decline should be noted. The two major airlines serving Worcester are in financial difficulties. Whatever the factors initiating the cycle, it is clear that a decline in revenue passengers was followed by a decline in flight frequency followed by more of the same. It is conceivable that, unless positive measures are taken, air transportation here may take on the tones of rail transportation and the Airport may come to look like Union Station.

The lack of passengers at Worcester Airport is attributed to the limited extent of service. Flights are scheduled only to New York City, where connections are made for long range flights, or in short hops across New York State to Buffalo. Worcester is about forty-five miles from Logan International Airport in Boston. It is much easier to drive that forty-five miles to Boston and take a direct flight to New York, Montreal, the West Coast,or overseas.

The future of aviation at Worcester Airport, aside from non-scheduled operations discussed above and goods shipments discussed in another section below, would appear to be shuttle service, at as frequent intervals as can be maintained, to Logan Airport and to New York via helicopter or prop planes or both. An example of such an operation is that of Statewide, an airline recently added to the Worcester scene whose recent operations are summarized below. It is noteworthy that this increase occurred during the winter months, ordinarily a time of curtailed operations for an airline offering only shuttle service between Worcester and New York City. The prime contributory factor is more flights at convenient times.

Summary of Operations

	November 1963	December 1963	January 1964	February 1964
Passengers Enplaned	29	45	57	82
Passengers Deplaned	34	53	46	68
Total	63	98	103	150

Because Logan Airport is so close, Worcester Airport should concentrate on frequent service to both Boston and New York plus whatever other feeder line operations can be self-sustaining; Worcester also serves as an emergency field when Logan is closed by adverse weather conditions or congested with traffic.

The new fixed-base operator who maintains facilities for and services non-commercial planes at the Airport, has done an admirable job in the short time he has been there. It is the unanimous consensus of the Airport management, the fixed-base operator, and the Worcester Planning Department that the potential of private aviation at Worcester Airport is virtually unlimited, given necessary improvements: new heated hangers of sufficient size, new service and maintenance equipment plus replacement of present obsolete equipment, and a new fuel storage system of greater capacity.

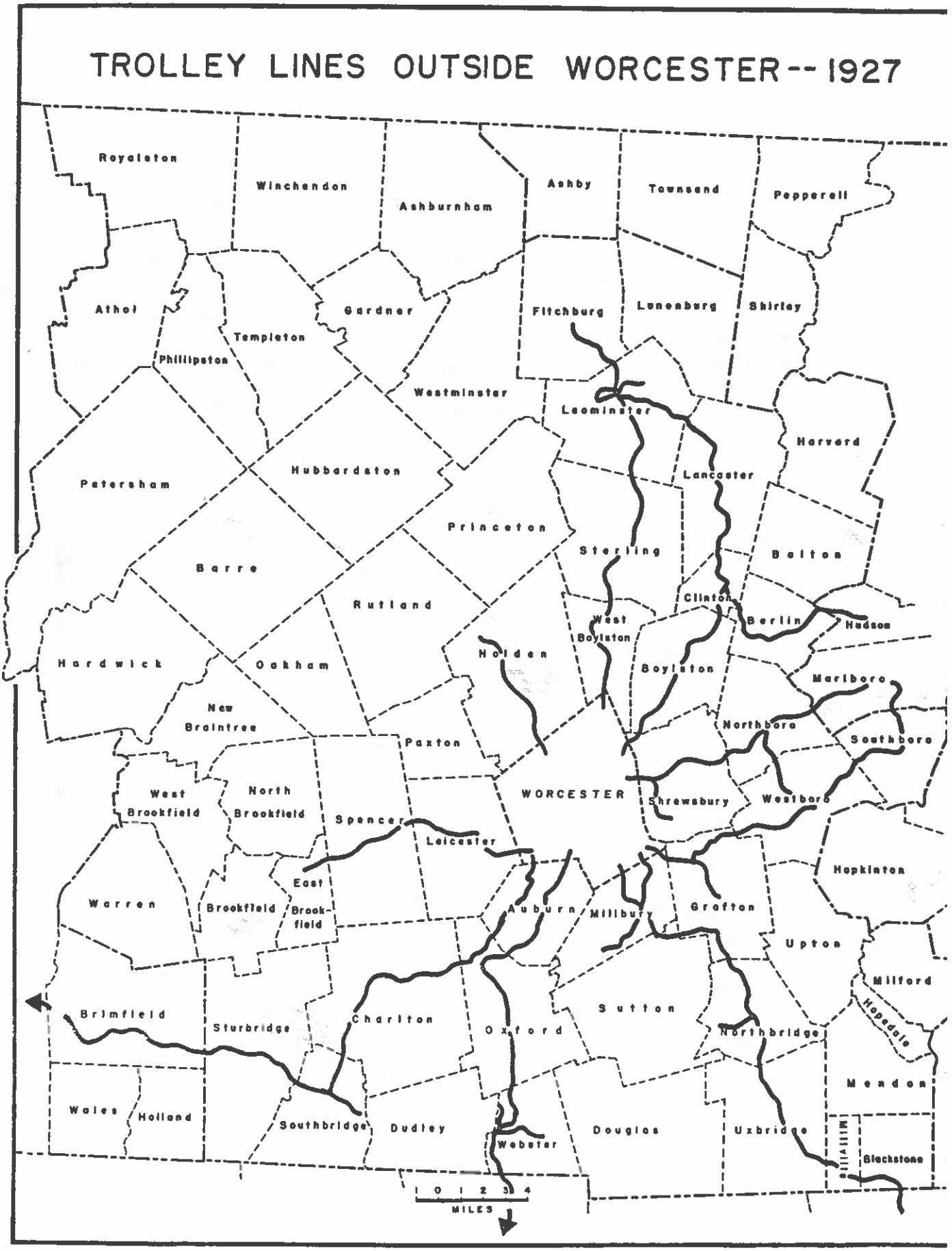
Aviation in the United States is under rigid Federal controls. Within the next few years the Civil Aeronautics Bureau is expected to make a comprehensive study of the situation in New England. Future planning for aviation in Worcester must consider the results of this study.

Trolley

The trolley cars in Worcester is but a memory; but because it was an important part of public transit for 84 years and because its routes became bus routes it is worthy of mention. Trolley service in Worcester was initiated by the Worcester Horse and Railroad Company in 1861. By 1863 the replacement of horse cars by new electric trolleys was completed. From then until 1932 the Worcester Consolidated Street Railway Company was a subsidiary of the New Haven Railroad.

The period from 1924 to 1927 marked the height of trolley service in the Worcester region (see Map 6.6). Trolleys ran regularly to Woonsocket, Rhode Island; North-Grosvenordale, Connecticut; and in Massachusetts, Fitchburg, Marlboro, and also to Palmer, where by special arrangement with the Springfield company they went on to Springfield and to New York City. Many of Worcester's older citizens recall that it was once possible to ride the trolley all the way to New York City.

After 1927 the trolley gradually gave way to the more maneuverable bus and private automobile. The few remaining trolleys made their last runs on December 31, 1945. Since then virtually all traces of the trolleys have disappeared in this area.


TROLLEY LINES OUTSIDE WORCESTER -- 1927
Royalston
Winchendon
Ashburnham
Ashby
Townsend
Pepperell
Athol
Gardner
Fitchburg
Lunenburg
Shirley
Templeton
Phillipston
Westminster
Leominster
Harvard
Petersham
Hubbardston
Lancaster
Princeton
Sterling
Bolton
Barre
Rutland
Clinton
West Boylston
Berlin
Hudson
Hardwick
Oakham
Holden
Boylston
Marlboro
New Braintree
Northboro
Southboro
Paxton
West Brookfield
North Brookfield
WORCESTER
Shrewsbury
Westboro
Spencer
Leicester
Hopkinton
Warren
East Brookfield
Brookfield
Auburn
Millbury
Grafton
Upton
Milford
Hopedale
Brimfield
Sturbridge
Charlton
Oxford
Sutton
Northbridge
Mendon
Wales
Holland
Southbridge
Dudley
Webster
Douglas
Uxbridge
Blackstone
MASS.
0 1 2 3 4
MILES

Bus Service

Inter-city and Interstate: As noted earlier, improved bus service for Worcester has been a factor in the decline of railroads. Two national bus lines, Greyhound and Trailways, presently serve Worcester with 40 to 55 stops per day, depending on the season. Between them they pick up or deposit from 60,000 to 80,000 passengers annually. These buses are Worcester's only direct surface link to the rest of the country and as such provide an invaluable service to the City. A significant increase in service is expected from the new terminal in Seven Hills Plaza.

Local and Suburban: In addition, Worcester has six local-service bus lines covering almost all of the county as well as runs to Boston, Springfield, and Providence. No modern city can long survive without an adequate and dependable public transit system whether it be trolley, subway, or bus. The Worcester Bus Company, which succeeded the Worcester Consolidated Street Railway Company in 1951, is a private profit-making company that provides the City and several suburban towns with adequate and dependable service. It is as yet uncertain what effect the Massachusetts Mass Transit bill will have on bus transportation here.

The Worcester Bus Company usually uses 56 buses for the normal daily schedules but this is increased to 138 during peak-load hours. This unequal distribution of passengers throughout the day is a problem common to public transit carriers. A solution to this problem is beyond the reach of the independent transit company.

Despite the above-mentioned problem, the local company manages to operate 25 bus routes offering a daily weekday total of 1009 trips from the downtown area. Eleven of these routes extend into suburban towns and one even goes to a state hospital in Rhode Island (see Map 6.7).

How does this bus system affect downtown Worcester? By adding considerably to traffic congestion, especially at peak-traffic hours. Most bus routes focus at City Hall. For north-south runs, the major transfer point is at Barnard's Department Store; and for suburban routes, the terminal is at Salem Square.

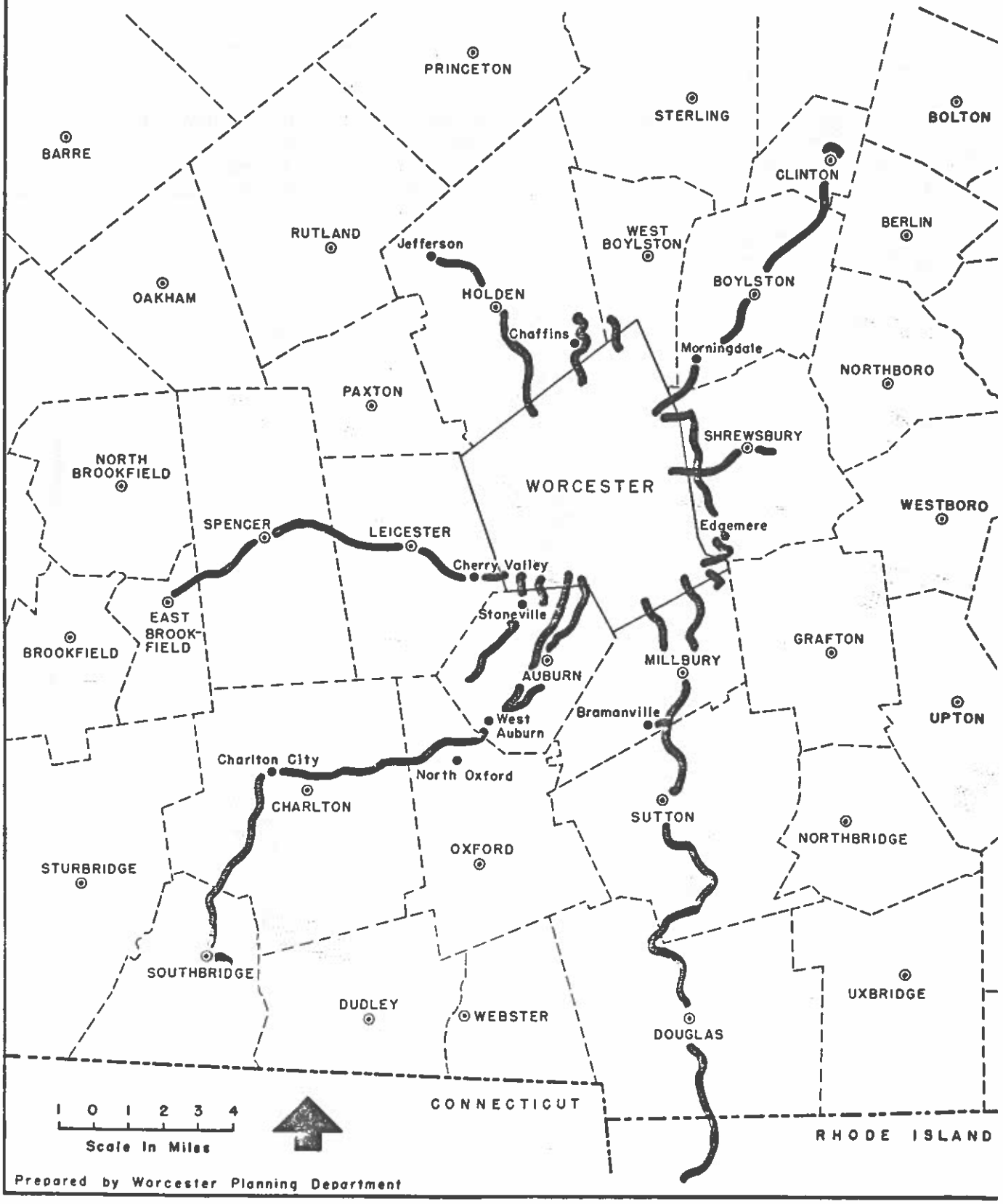
Improvement in and enforcement of parking and other traffic regulations, will partially alleviate congestion for buses as well as other traffic. No piecemeal attack on Worcester's transportation problems can be expected to do more.

GOODS TRANSPORTATION

Rail

Railroad passenger service in Worcester may be almost extinct, but not so freight service. Worcester is still one of the largest and busiest freight terminals in New England. In this respect, Worcester's geographic position is an asset rather than a liability. It is a natural distributing point for area industry.

SUBURBAN ROUTES OF WORCESTER BUS COMPANY 1964



The three railroad lines serving Worcester share equally in freight shipments. An average of approximately 30,000 tons of freight in 1500 cars passes through the City each day. Of this total, 200 cars, or 4,000 tons, is consigned into Worcester and 70 cars, or 1500 tons, is shipped from the City. The balance is through freight.

In other parts of the country, railroads have voiced concern about the ability of trucks to capture a large share of the freight business. Many of these areas depend on light manufacturing where truck mobility has the advantage. Worcester is primarily a heavy manufacturing city dealing in goods not considered suitable for trucks. Perhaps the two best examples are Norton Company, which receives carloads of ores and ships huge mill stones, and American Steel and Wire Company, which receives carloads of raw materials and ships carloads of wire and cable rolls.

About 80 percent of Worcester's total freight tonnage comes in by rail and about 30 percent goes out by rail. These are the most significant statistics pointing out Worcester's dependence on rail freight.

Air

Air freight is a service offering the greatest potential for Worcester. An Airport official and the fixed-base operator have both expressed enthusiasm over the possibility of major use of the Airport as a freight terminal. The intent is not to exclude commercial passenger and private aviation but rather to try to realize some of the potential voiced in 1954.

Worcester has a central location in the industrial complex of Southern New England. It is the natural collecting point for air cargo. It does not have the congestion that delays shipments from Boston.

In 1963 commercial airliners carried a total of 132 tons of freight out of Worcester; or an average of less than half a ton a day. (see Table 6.1). From five to eight tons of air-freight is daily being hauled from Worcester to Boston. Why not ship it from Worcester? American Optical in Southbridge ships five to six thousand pounds of rush air freight every day. This is trucked to Bradley Field outside of Hartford, Connecticut, more than twice the distance to Worcester. Why not ship it from Worcester? At least part of the answer relates to frequency of service.

It is clear that a market for air cargo exists in southern New England. With the establishment of terminal facilities at the Worcester Airport, the City can share the benefits of increased activity and revenue.

Truck

As was stated above, railroads are still the most important freight carriers for Worcester. They do not, however, carry all freight. Since the airline and bus contributions are negligible, what other carrier can fill the gap? The answer, obviously, is trucking

Traffic At Worcester Municipal Airport

All Flights - Airline, Commercial, Private, Military, Itinerant						Passengers		Shipments - In Pounds		
	Airline Scheduled Flights		Non-scheduled Flights		Flights Cancelled	Scheduled Only		Mail	Express	Freight
Year	In	Out	In	Out		In	Out			
1953	3,126*	3,126*	12,285*	12,285*	628*	26,507	27,784	207,913	379,596	313,776
1954	3,838*	3,838*	15,505*	15,505*	772*	32,544	33,036	216,007	480,925	394,560
1955	4,565*	4,565*	18,625*	18,625*	918*	38,704	41,061	244,390	493,181	486,015
1956	4,533	4,533	18,766*	18,766*	912*	39,352	41,545	222,094	427,647	400,283
1957	4,501	4,501	19,129*	19,129*	717	44,088	45,804	255,119	431,570	358,976
1958	4,407	4,407	19,041	19,041	1,058	37,825	39,981	236,201	333,846	269,947
1959	4,545	4,545	17,611	17,611	1,152	36,441	38,220	270,270	401,163	278,343
1960	3,531	3,531	18,060	18,060	767	31,143	32,647	282,143	312,176	290,034
1961	3,330	3,330	16,752	16,751	813	27,797	27,774	292,162	340,193	296,408
1962	2,894	2,894	18,878	18,876	570	23,577	22,856	182,770	306,566	158,567
1963	2,670	2,670	24,303	24,302	401	19,852	20,420	145,331	262,322	187,166

* Estimated by the Planning Dept.

Table 6

Because many of Worcester's trucking firms are relatively small and sometimes do not survive the stiff competition in the industry, the total number fluctuates and actual figures are difficult, and at times impossible, to obtain. In addition, the trucking industry by nature is very flexible. All statistics in this section, by necessity, are approximations.

In the Spring of 1964 there were 166 trucking firms of all types and sizes serving the City of Worcester; very few of them headquartered in the City. Of this total, 127 were freight common carriers (58 large interstate and 69 smaller intrastate and local carriers)with the balance made up of the small firms engaged in delivery service, rubbish collection, and the like. This section is only concerned with common carriers.

At present, only 20 percent of Worcester's inbound freight comes by truck but at least 60 percent goes out by truck. Four hundred trailer trucks enter and leave the City each day. Those outbound carry an average of 15 tons of freight each for a total of about 3,000 tons per day. A little less than 2,000 tons per day comes in. To this must be added an unknown amount of tonnage from smaller intrastate carriers.

In general, the railroads and the truckers have been ardent suiters for the same business. The railroad-trucking feud isn't dead yet but they have reached an important area of cooperation: the so-called "piggy back" trains. A pool (or co-operative) of Worcester truckers loads an average of at least 40 outbound trailer vans per day onto railroad flat cars at the two yards converted for the purpose: one at the old freight terminal on Franklin Street and the other at the site of the former round-house on Southbridge Street. Also almost 20 vans are unloaded per average day.

In addition to serving the transportation needs of Worcester, the trucking industry also provides employment. The latest official figures available from the Massachusetts Division of Employment Security place the average total employment at 825 to 850 employees with a payroll of nearly $5,000,000 in 1962. A local trucking union has estimated that by mid-1964 employment had shrunk to a maximum of approximately 700 employees.

Worcester can expect to continue to be well served by truckers. Competition and operating costs will cause the number of truckers to decline and those remaining will grow larger. The older terminals are near the railroads closer to the central area of the City while the newer terminals tend to cluster along Route 20 at the south-east corner of the City which has quicker access to major highways.

A slow trend is now developing to centralize terminals serving all of eastern Massachusetts in the area between Worcester and Framingham. With the completion of Interstate Routes 290 and 495, this trend will quicken. If Worcester is to retain any terminals in the future it must provide easy truck access to the Massachusetts Turnpike and Route 495 via Route 290 or any other means as soon as possible.

ARTERIAL PLAN

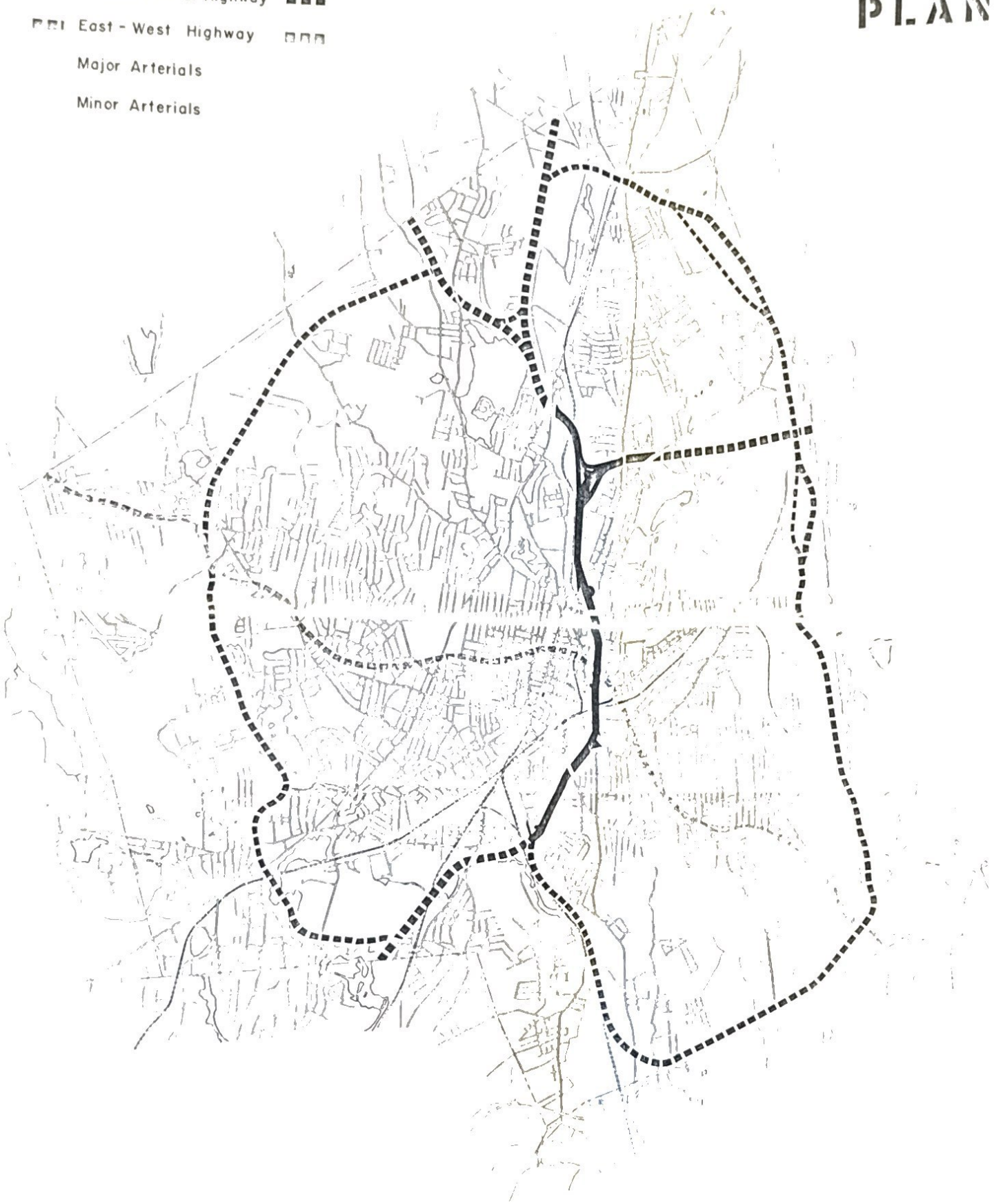
Worcester Expressway

Circumferential Highway

East - West Highway

Major Arterials

Minor Arterials



0 1600 3200 4800 1 MILE 6400 8000 9600 2 MILES 11,200

PLANNING BOARD
WORCESTER, MASS.

C H A P T E R S E V E N

COMMUNITY FACILITIES

The provision of community facilities is a basic task of any municipality. To provide such services--in the range that urban living demands--requires planning and organization, however, if it is to be done both economically and satisfactorily. The adequate provision of school, libraries, and recreation facilities; of water supply, disposal services, and utilities; and last but not least, police, fire, medical, and other protective services is an imperative.

In developing these facilities, the approach to a solution of problems--such as siting and financing--by an individual municipality is often inadequate in both scope and breadth. An attack with much greater compass can be made at the regional level, particularly on problems of water supply, sewage disposal, regional libraries, hospitals, parks, and other regional institutions (see discussion in Chapter 2, pages 14 to 21, inclusive). At the city level greater economy can be accomplished with eventual elimination of duplicate facilities through joint sponsorship and operation of facilities by departments with co-similar responsibility, as discussed below.

INTERRELATIONSHIPS AMONG COMMUNITY FACILITIES

The joint development by school and park departments of "park-school" facilities has become widely accepted in recent years. This is one of the most fruitful types of projects in terms of reductions of both capital costs and maintenance costs. It is discussed further in other parts of this chapter.

The interrelationship of public library facilities with those of school libraries is another area of potential co-operation which could lead to reduced costs: by planning branch libraries and junior and senior high schools in relation to one another; by planning book purchases to supplement rather than to duplicate.

Some of the facilities and services supplied by the City can best be concentrated at such locations as City Hall, East Worcester Street, Lamartine Street, or City Hospital. Others lend themselves to being brought closer to the citizens or to being concentrated at other sites in the City. It is proposed that future planning take into consideration how best to concentrate or to distribute such facilities to ensure the most economical and satisfactory provisions of community services.

Branch administrative centers have been developed in some cities to which such distributable services are assigned. By bringing such services from several departments under one roof, maintenance and supervisory costs can be reduced and public accessibility improved. Some reduction in traffic congestion can also be expected from such arrangements.

RECREATION FACILITIES

Worcester has a proud heritage of public parks and outdoor recreation. Public-spirited citizens and their City government provided open space around heavily populated neighborhoods in the nineteenth century long before professional recreationists began to establish standards of service for parks and playgrounds. These citizens believed that people living in cities need these sites for play and relaxation so they took steps jointly to ensure the preservation of grass and trees among the mill-worker's homes. Today Worcester's parks and playgrounds are more widely scattered. No significant new sites have been purchased by the Parks and Recreation Department since the first World War.

Worcester has been living on its heritage of public recreation facilities for several decades. Since 1920 the acreage of land dedicated solely to public recreation uses (parks, playfields, and playgrounds) has declined although the population now is greater than it was then. An *increased need* for developed public recreation space (landscaped or wild vegetation with facilities and buildings available to all persons without respect to residence) has come up against a *decreased supply* of land usable for recreation by residents.

Measures of social need will change from time in order to reflect the changing tastes of our population and its increased leisure time. Standards summarized by the Planning Department in its *Sketch Plan for Worcester, Massachusetts, 1963,* were preliminary and have been revised to reflect more accurately goals accepted by responsible public officials. Professional planners insist that any measure of adequacy of public recreation must proceed from the concensus of values of our generation and times.

RECREATION AREA STANDARDS FOR WORCESTER

The revised standards or adequacy criteria summarized in Table 7.1 reflect the conclusions of studies of outdoor recreation activity by means of interviews and statistical analysis of permit records. A seminar on recreation resources in the Graduate School of Geography, Clark University, brough together social scientist committed to basic research on problems of public recreation policy. Their work, done without cost to the City of Worcester, has improved the analysis of existing deficiency which is the basis for recreation proposals contained in the sections below. The responsibility for these proposals remains, of course, with the Planning Department.

Need for Classification

The English language is rich in words for recreation activities and facilities. Parks and touring are evoked in many minds by talk of recreation. Others think of sports and competition. Sites for these activities have been called fields;

Table 71

STANDARDS FOR PUBLIC RECREATION SITES

Order	Recreation Sites TYPE Ideal or Typical Location	Facility-Resource Complex	Acreage Requirements per 1000 people	Acreage Requirements minimum size of components	Acreage Requirements of function	Number of People served	service radii at various population densities (in miles) 30,000 (high) persons per gross square mile	15,000 (med.)	5,000 (low)
I	PLAYGROUND Central to a neighborhood so as to minimize aggregate travel. Adjacent to a public school if it is near the point of minimum travel		-		5	5000	¼	1/3	½
		2 60-foot diamonds		3					
		2 tennis courts		1/3					
		multi-purpose courts		1/3					
		apparatus)							
		spray pool)		1					
		passive area)							
		building (in lieu of school)		1/3					
	NEIGHBORHOOD PARK Central to a neighborhood		1	-	5	5000	¼	1/3	½
		landscaped trees, grass, water							
II	PLAYFIELD Along main artery in residential area adjacent to a public high school		-		12	20,000	½	2/3	1-1/6
		as in a playground (omit one diamond) plus		3½					
		3 90-foot diamonds		6					
		2 more tennis courts		1/3					
		skating rink		1/2					
		swimming pool)							
		building (in lieu of school)		2/3					
		parking		1					
	COMMUNITY PARK On edge of built-up area, in lieu of neighborhood parks		1	-	20	20,000	½	2/3	1-1/6
		picnic areas, benches, walks, parking							
III	RECREATION PARK Where natural features permit		-		100	50,000	2/3	1-1/6	2-1/3
		facilities of playfield		12					
		resources and facilities of a community park plus		20					
		swimming beach(es)							
		winter sports facilities)							
		hiking trails)		63					
		picnic areas)							
		golf course)							
		parking		5					

forests; playgrounds; wilderness areas; to penetrate this verbal tangle it will be necessary to identify what we are talking about in terms of facilities and resources.

The data of recreation are amorphous. To measure the adequacy of public recreation in Worcester it will be necessary, because of the indefiniteness of the subject of recreation itself, to classify the sites used for recreation according to the *resources used* and the *facilities provided*, rather than classifying activities and programs. This choice is made in the conviction that resources and facilities, though necessary for recreation, derive their importance from their usefulness for human beings. City planning focuses on non-human features for the purpose of ensuring that human use of these features not only will satisfy the users but also will augment the stock of facilities and resources available to future users.

Types of Sites

In terms of size and complexity there are three orders of recreation sites common to American cities, but the smaller sites may be separated according to their purpose and development into two sub-orders. For purposes of crediting sites against needs, therefore, there are in Worcester five distinct kinds of municipal recreation sites: playgrounds, neighborhood parks, playfields, community parks, and recreation parks. The public bathing beach, because it is both resource-based and also requires facilities, fits either parks or game centers at any level in the hierarchy, or it may occur independently of any other recreation facility.

First-order Recreation Sites: Neighborhood parks and neighborhood playgrounds together comprise the lowest order of public recreation sites. Adequate service requires that they be spaced at intervals of one half mile in densely peopled residential areas so that (1) one park or playground is provided for each 5,000 people and (2) no boy or girl (or parent) need walk more than one quarter mile to reach the recreation site. These spacing standards can be relaxed to one third of a mile only if population is less dense (for example, 15,000 persons per gross square mile of residential land). Because of the "lumpiness" of their requirements, playgrounds (unlike neighborhood parks) are no less necessary in large-lot neighborhoods. Ball diamonds have dimensional as well as spacial needs which call for compact parcels of about two acres for each diamond. Despite their differences, neighborhood parks and playgrounds are the smallest, most numerous and, in the aggregate, most important elements of any city's system of public recreation sites

Playground as used here refers to an outdoor game center on a site not less than five acres in size, located centrally to a neighborhood of 5,000 people so as to minimize aggregate travel. Sites smaller than five acres are *playlots*, or deficient playgrounds. Five acres are needed to provide a full complement of facilities;

game fields and courts, spray pool, children's play apparatus in a landscaped corner with benches for supervising adults, and a building for toilets, equipment storage, and an office for recreation leaders. Central-location criteria may be relaxed when classifying existing sites.

If the playground is adjacent to an elementary school, the school building should accomodate arts and crafts, dramatics, and music. Where no school exists or an existing school is not suitable for leisure-time use, separate facilities must be built on Park Department sites. Such duplication is wasteful. The school-game center is a more economical means of serving both education and recreation with a minimum of public works expenditure.

The Neighborhood Park is a facility in which there is an attempt to preserve water or forest resources where they occur, or to simulate them artificially where they do not, as a restful, quiet setting for informal activities and a relief from the congestion of urban development. Since the times of Thoreau, open space--especially when it contains outstanding recreational resources--has been valued for its own sake. At least one acre of such park land should be provided for each thousand persons, although in low density neighborhoods the larger private yards may be considered as a substitute for public park land.

As the name implies, such a park should be provided, ideally, in each neighborhood; thus it would be easily accessible to the maximum number of users. In Worcester, however, the needs of several neighborhoods may be met, with less maintenance cost per acre, by aggregating the park space into "community parks" of twenty acres or more. This is, in fact, the pattern of present development in the City, where only six (out of more than 50) neighborhoods have their own park, but about 30 neighborhoods (in groups) are served by community parks. Moreover, the five-acre playgrounds, as here prescribed, provide a small amount of undeveloped open space for passive recreation at the neighborhood level. Although existing neighborhood parks are credited in the Comprehensive Plan (and, of course, should be retained) no new neighborhood parks are considered necessary provided that deficient areas are to be served by new community parks.

Second-order Recreation Sites: Playfields and community parks constitute second-order public recreation sites. They serve not one, but several contiguous neighborhoods, or a total of not over 20,000 people. Hence, spacing for second-order sites in the densest residential area is approximately one mile between facilities and in medium density areas one and one-third miles. Relaxation of spacing criteria is necessary where intervening non-residential land renders neighborhoods non-contiguous.

The Playfield contains at least twelve areas of land developed principally to serve youth and adults in sports competition, but without fixed spectator facilities, in order to retain flexibility for alternate uses. One playfield is needed for every four contiguous neighborhoods (of about 5,000 people each).

Part of a twelve-acre playfield may consist of the facilities of a playground (with its complement of 60-foot diamonds, courts, pool and quiet area). This part is less than half of the playfield, however, because of 90-foot diamonds, lawns for croquet, additional game courts, parking, and a gymnasium or swimming pool must also be accomodated on the playfield site.

When playfields are located on secondary-school sites, they offer the same possibility of sharing outdoor and indoor facilities as do combined playgrounds and elementary schools, and can meet community playfield needs at a reduced capital expenditure. However, unlike separate park department playfields, which may contain a playground in one corner, they generally do not satisfy the need of a separate play site (that is, a neighborhood playground) for younger children in the vicinity.

The Community Park variable in size from a minimum of twenty acres upward, provides needed open space for passive recreation for a group of neighborhoods (it may thus be considered as a substitute for individual neighborhood parks). The minimum acreage requirement is derived from the open space standard, already mentioned, of 1 acre per 1,000 persons (in medium and high-density areas). Thus, each group of four neighborhoods served by such a park (about 20,000 people) should contain at least 20 acres of land. This size requirement is met by Worcester's existing community parks, all of which are close to, or in excess of, this minimum.

The typical community park provides foot trails, picnic sites, and off-street parking space. Many of Worcester's hillside parks are not suitable for building because of ledge and useless for games because they slope too steeply. Those that do contain play areas are considered here to be both a community park and a playground, since the latter facilities are not inherently part of such a park. In fact, it is urged that the remaining community park space, and the new parks here recommended, *not* include play areas, since the latter are planned for separately, and if constructed on community park land only reduce the acreage reserved for passive recreation.

Third-order Recreation Sites: The third order of public recreation sites serve not one, but several communities, which are major sections of the City. Their location depends more on the availability of space or natural resources, or both, than on any particular standards of distance. The recreation park is more nearly a park in the sense widely understood by the majority of people. It provides a pleasant "natural" environment of woodland, hills and meadows with a minimum of roads, together with playground or playfield facilities for competitive activities. The latter can be provided in one corner, and accordingly need not conflict with creative pursuits. Otherwise, activities should be limited to picnicking, hiking, winter sports, photography, horseback-riding, golfing, and swimming. Shelters, incinerators, sanitary and parking facilities should also be provided.

Recreation parks of less than 100 acres are not large enough to include such a flexible mixture of space and facilities. Generally, each such park should serve about 50,000 people (or 10 neighborhoods).

Other Sites: These sites are outside the hierarchy. Included are bathing beaches and miscellaneous open spaces.

Bathing beaches on unpolluted water bodies are valuable recreation sources. Public beaches need facilities to protect swimmers. Swimmers average three percent of the population and each swimmer needs twelve feet of water surface less than six feet deep.

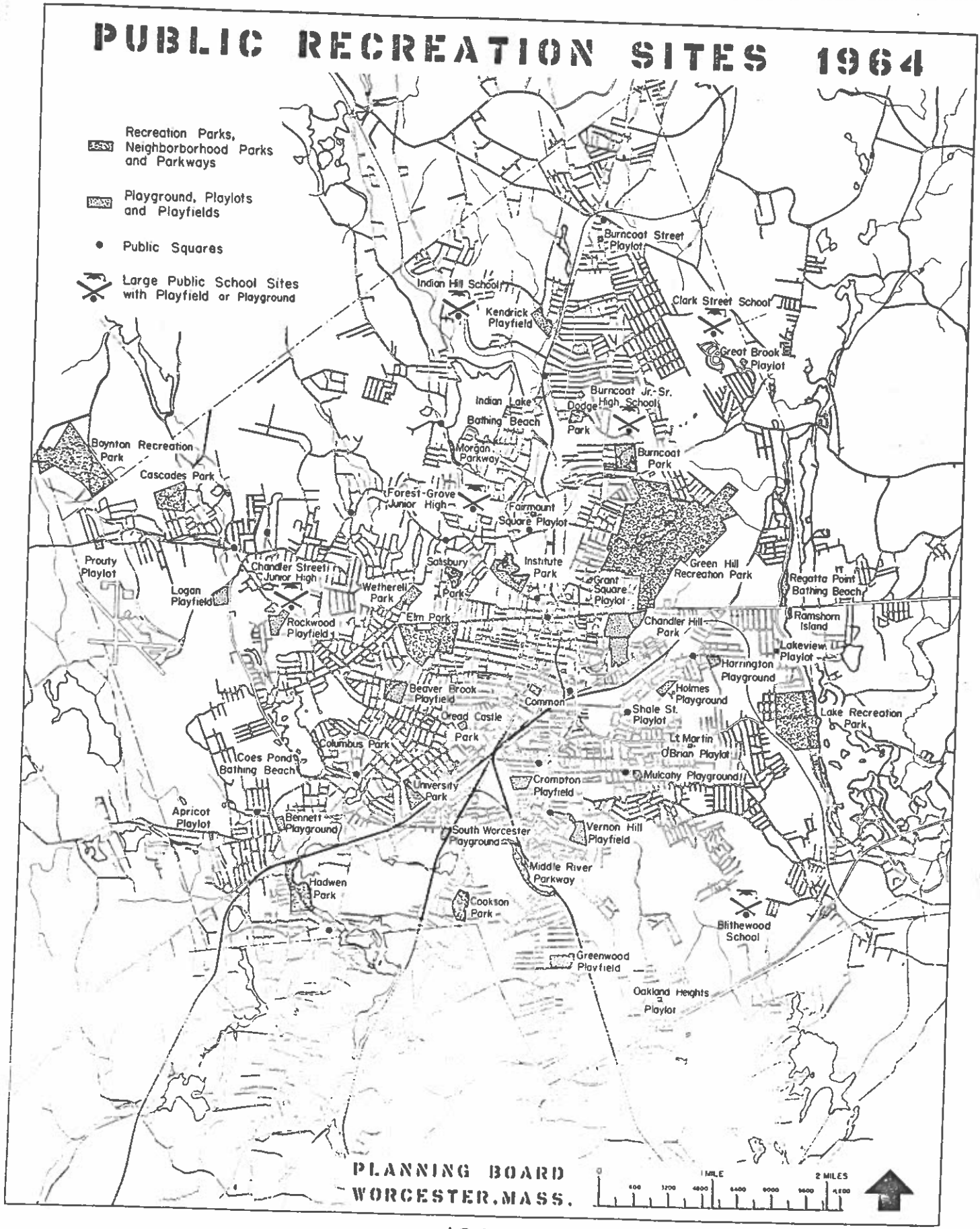
Swimming pools, if open to the public for a nominal fee, can be credited toward satisfying this need. All outdoor swimming beaches, whether in a recreation park, in a lower order site, or outside the recreational hierarchy altogether, must have supervision and facilities for water safety.

Miscellaneous open spaces such as the Common, numerous public squares, and several narrow ribbons of public land (here called "parkways") are examples of miscellaneous open space. No standard may be prescribed for such areas (since they are not used for recreation activities related to population distribution), but their value is immeasurable in maintaining a city's character.

INVENTORY OF RECREATION SITES

Outdoor recreation sites are not entirely in public ownership. Private and parochial schools, industrial firms, private country clubs, and the Roman Catholic Diocese of Worcester account for twenty-one sites larger than five acres developed and in use for outdoor recreation. However, such private recreation lands and facilities are not creditable to public needs due to limitations on their use (such as for members or employees only). Fifty-two sites, totalling about 1,500 acres, are controlled by governmental agencies and are available for recreational purposes. The Parks and Recreation Commission and the School Committee of the City of Worcester are responsible for all but two of these sites, Regatta Point and Quinsigamond Park, which are under the Commonwealth of Massachusetts (Department of Natural Resources). Recreation sites vary in size from playlots of half-an-acre or less to Green Hill Park, now over 500 acres. Although the latter will decrease to 480 acres when landtakings for the Worcester Expressway are complete, Green Hill Park will still be, after these losses, the largest municipal park in Worcester.

The holdings of the Parks and Recreation Commission are either very large or very small, there being few medium sized sites of five to seven acres. The smallest sites maintained by the Commission are the public squares shown by dots on Map 7.1. These squares are for decoration and commemoration but cannot serve as sites for active recreation. Two other acres, locally called "squares"


PUBLIC RECREATION SITES 1964
Recreation Parks, Neighborborhood Parks and Parkways
Playground, Playlots and Playfields
Public Squares
Large Public School Sites with Playfield or Playground
Burncoat Street Playlot
Indian Hill School
Kendrick Playfield
Clark Street School
Great Brook Playlot
Indian Lake Bathing Beach
Burncoat Jr.-Sr. High School
Dodge Park
Boynton Recreation Park
Cascades Park
Morgan Parkway
Burncoat Park
Forest Grove Junior High
Fairmount Square Playlot
Prouty Playlot
Chandler Street Junior High
Salisbury Park
Institute Park
Green Hill Recreation Park
Regatta Point Bathing Beach
Logan Playfield
Wetherell Park
Grant Square Playlot
Rockwood Playfield
Elm Park
Chandler Hill Park
Ramshorn Island
Lakeview Playlot
Harrington Playground
Beaver Brook Playfield
Common
Holmes Playground
Shale St. Playlot
Lake Recreation Park
Dread Castle Park
Columbus Park
Lt Martin O'Brian Playlot
Coes Pond Bathing Beach
University Park
Crompton Playfield
Mulcahy Playground
Apricot Playlot
Bennett Playground
South Worcester Playground
Vernon Hill Playfield
Middle River Parkway
Hadwen Park
Cookson Park
Blithewood School
Greenwood Playfield
Oakland Heights Playlot
PLANNING BOARD
WORCESTER, MASS.
1 MILE
2 MILES

Map 7.1

are actually small playgrounds of half-an-acre in size. These are shown by angular symbols on the map, and counted as recreation sites. Together with eight other play areas, ranging upward in size to four acres, these small sites are designated "playlots". Six other small sites are situated along shore lines, three of which are designated as bathing beaches. Of the remainder,two are boat launching sites on Indian Lake (Morgan Park) and Lake Quinsigamond (Coalmine Brook delta) and the other, Ramshorn Island, has no recognizable function.

Thirty-six of the public recreation sites are relatively large ones, all of which are shown on the map. Sites of over twenty acres account for more than half of these. Three are new high school sites, seven are playfields of the Parks and Recreation Commission (hereinafter called Park Department) four are undeveloped Park Department sites (such as, Cookson and Cascades), and four are large landscaped parks (such as, Elm and Green Hill Parks). Chandler Hill and Lake Park contain playfields within larger undeveloped sites.

Classification of Existing Sites

The fifty-two sites appearing on the accompanying map are identified by their official specific designations (that is, Forest Grove, South Worcester, Kendrick, Wetherell, Lake View, Morgan, etc.) followed by the unofficial *generic* designations (Junior High, Playground, Playfield, Park, Playlot, Parkway) used in this study. Popular *specific* designations sometimes differ from official usage for the same site (Compare Maloney with South Worcester, Duffy with Wetherell, Bancroft Tower with Salisbury, or Dana Avenue with Lt. Martin O'Brien). The generic terms are, of course, classificatory.

A complete list of sites, classified according to their dominant recreational function, is contained in Table 7.2. Since a number of these sites are multipurpose (having two or more distinct types of facilities), or multi-ordered (serving two or more levels in the recreation hierarchy, as defined above) the table also indicated the various functions for which each was credited.

Analysis of Deficiencies

In a sense, all that has been said in this section on recreation so far has been preparatory. The ground has been cleared for an analysis of adequacy which could not proceed without information about existing resources and some notions about the kinds of places that our people expect "parks" to be.

Preliminary Analysis: The recreation section of the *Sketch Plan* also started with a definition of functional types followed by a separate analysis for each functional type. Sites controlled by the Park Department were thus classified and mapped at a scale of 1000 feet to the inch. For each of three kinds of sites, areas of service were estimated by aggregating existing population in

TABLE 7.2

SUMMARY OF EXISTING PUBLIC RECREATION SITES AND FUNCTIONS
(Grouped by Theoretical Functional Types and Actual Functions Present)

Code	Site Designation	Functional Types* RP	P	PF	PG	BB	OO
RP	RECREATION PARKS	3	3	1	3	1	
	Green Hill	x	x		x	closed by pollution	
	Lake (including part of Quinsigamond State Park)	x	x	x	x	x	
	Boynton	x	x		x		
P	COMMUNITY PARKS		7	1	4	1	
	Cascades		x				
	Chandler Hill (East Park;Bell Pond)		x	x	x	x	
	Cookson		x		x		
	Hadwen		x		x		
	Elm		x				
	Salisbury (Bancroft Tower)		x				
	Institute		x				
F	NEIGHBORHOOD PARKS		6	0	5	1	
	Dodge		x		x		
	University		x		x		
	Columbus		x			x	
	Burncoat (North Park)		x		x		
	Wetherell Estate (Duffy)		x		x		
	Oread Castle		x		x		

* Functional types: RP--Recreational Park; P--Park; PF--Playfield; PG--Playground; BB--Bathing Beach; OO--Other Open Areas.

(Table 7.2 continued--Summary of . . . Recreation Sites . . .)

Code	Site Designation	Functional Types* RP	P	PF	PG	BB	OO
PF	PARK DEPARTMENT PLAYFIELDS	0	0	7	7	0	
	Logan			x	x		
	Rockwood			x	x		
	Beaver Brook			x	x		
	Crompton			x	x		
	Vernon Hill			x	x		
	Greenwood			x	x		
	Kendrick			x	x		
PF	HIGH SCHOOL PLAYFIELDS	0	0	3	0	0	
	Burncoat Junior (or Senior)			x			
	Forest Grove Junior			x			
	Chandler Junior			x			
PG	PARK DEPARTMENT PLAYGROUNDS	0	0	0	5	0	
	Mulcahy				x		
	Holmes				x		
	Harrington				x		
	Bennett				x		
	South Worcester (Maloney)				x		
PG	GRADE SCHOOL PLAYGROUND	0	0	0	3	0	
	Clark Street				x		
	Indian Hill				x		
	Blithewood				x		

(Table 7.2 concluded--Summary of . . . Recreation Sites . . .)

Code	Site Designation	Functional Types* RP	P	PF	PG	BB	00	
PG	PLAYLOTS (DEFICIENT IN SIZE)	0	0	0	11	0		
	Banis				x			
	Burncoat Street				x			
	Great Brook				x			
	Grant Square				x			
	Fairmount Square				x			
	Prouty				x			
	Apricot				x			
	Shale Street				x			
	Lake View				x			
	Lt. Martin O'Brien (Dana Ave.)				x			
	Oakland Heights				x			
BB	BATHING BEACHES	0	0	0	0	3		
	Coes Pond					x		
	Indian Lake					x		
	Regatta Point (portion of Quinsigamond State Park)					x		
00	OTHER PUBLIC OPEN AREAS	0	0	0	1	0	5	
	Morgan Parkway				x			Launching
	Middle River Parkway							None
	Common							Historic
	Ramshorn Island							None
	Coalmine Brook							Launching

planning districts. (Service area boundaries were the municipal limits and the planning district boundaries drawn by this office.) Small scale maps of these districts were published with the *Sketch Plan* on which unserviced planning districts were indicated and presumed to be deficient in the facility in question. Broadly speaking, the greatest deficiencies in public recreation service were found to be in the lower order functions, playground and neighborhood parks. Although the analytic procedures used in this Comprehensive Plan have been refined in several ways during the past year, this conclusion has not been materially affected.

Changes in Approach to Adequacy Analysis: Four changes have been made in the approach to adequacy analysis since the *Sketch Plan*. These have led to more thorough analysis.

The first change in procedure here used has been to credit public school grounds larger than necessary for the building site (for example, lawns, parking, and recess yards) as public outdoor recreation sites. On the inventory map, five school grounds (two secondary and three elementary) actually functioning as game centers are shown which were not counted in the earlier analysis (with the qualification that secondary school playfields are considered as not meeting neighborhood playground needs).

The second change is that standards of service for neighborhood and community parks have been prescribed, with the result that deficiencies of open land containing natural recreational resources are now shown. This inclusion had the effect of increasing the total number of public recreation sites needed, both in 1964 and also when population saturation will have been reached.

The third change in procedure involved utilization of the varying-service-radius concept promulgated in the *Sketch Plan* standards, but not applied in its analysis of deficiencies. The radii indicated in Table 7.1 are linked to numbers of people served and vary according to the density of their settlement. Higher density and greater crowding mean that an existing game center serves a smaller area, or, stated another way, crowded areas require more playgrounds (or playfields) than open areas, and surplus playgrounds (or playfields) in open areas do *not* satisfy the needs of high density neighborhoods. The distribution of play areas is, therefore, as important as their total number.

The final change is that the distribution of recreation sites on the basis of neighborhood units rather than planning districts, is the last significant change in adequacy measurement. Physical neighborhoods delimited specially for this study will contain approximate clusters of 5,000 persons (or 1,250 families) at saturation. There are 54 such neighborhoods for which community facilities, including parks and schools, should be provided. The proposals for recreation would provide at least one playground for each of these areas, one playfield and one community park for every four neighborhoods, and a recreation park for a group of ten neighborhoods.

PROPOSED RECREATION SYSTEM

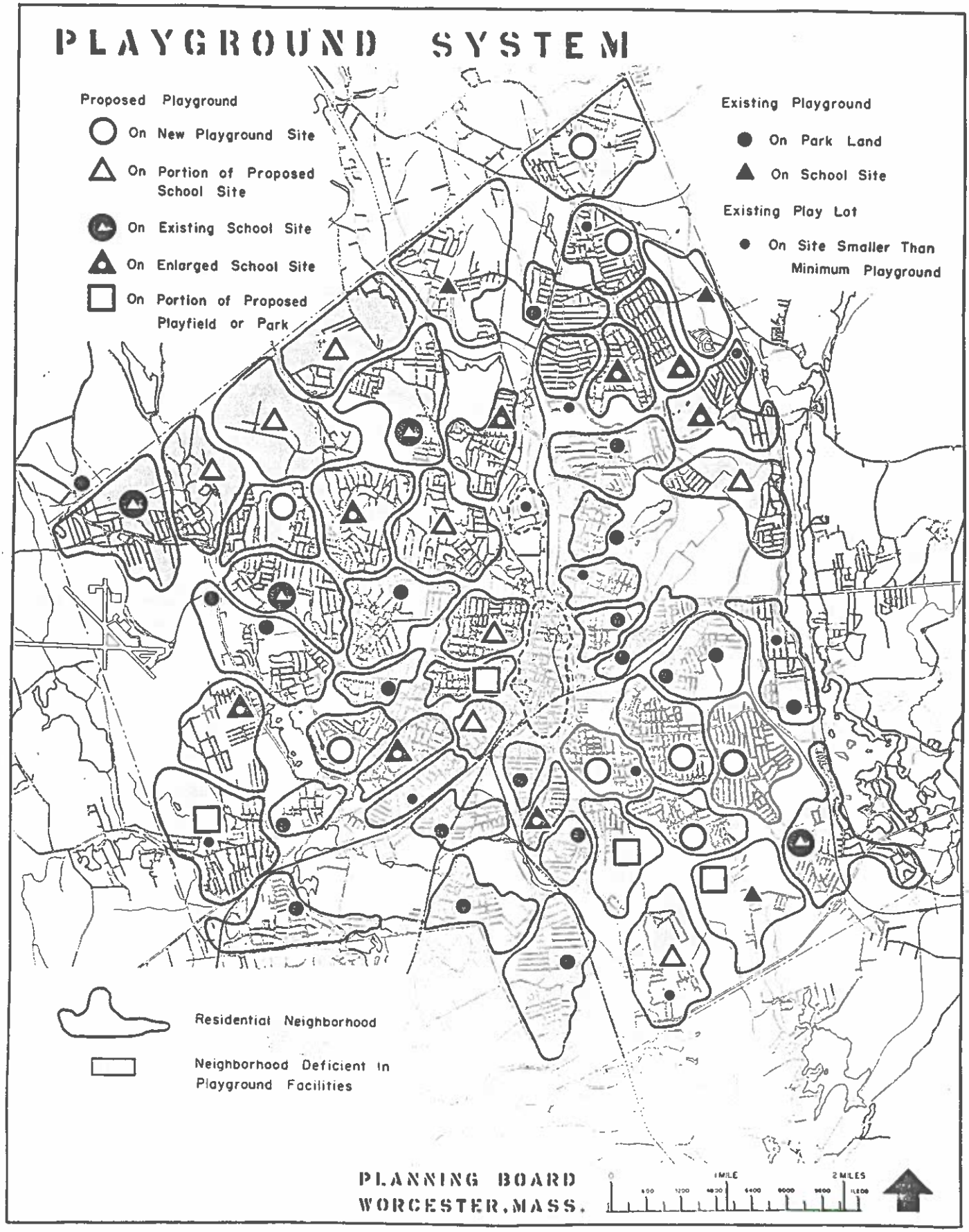
The system of recreation facilities proposed for Worcester is shown diagramatically on the three accompanying maps. Each map indicates the location of: (1) existing facilities in relation to the neighborhood or group of neighborhoods that they serve, (2) those facilities which exist but are inadequate, (3) neighborhoods or groups of neighborhoods now completely unserviced, (4) new or enlarged facilities proposed to correct these inadequacies and deficiencies.

Neighborhood Playground Plan

Under the neighborhood playground system(Map 7.2), 32 new or enlarged playgrounds are proposed (as compared with a deficiency of 31 playgrounds pointed out in the *Sketch Plan*). Most of these are needed in neighborhoods already intensively developed, although a few are proposed for growth areas which are still largely vacant (see priorities below). As the map symbols indicate, playgrounds are proposed as follows:

Number of Playgrounds Proposed	To be located on
8	wholly new site
8	portion of proposed school site
4	existing school site
8	enlarged school site
4	portion of proposed playfield or park
32	

Thus, of the total number of playgrounds proposed, only nine would require the acquisition of a site for playground purposes only. In addition, it is recommended that one existing playlot (that is, small playground), at University Park be changed to a playfield.


PLAYGROUND SYSTEM
Proposed Playground
On New Playground Site
On Portion of Proposed School Site
On Existing School Site
On Enlarged School Site
On Portion of Proposed Playfield or Park
Existing Playground
On Park Land
On School Site
Existing Play Lot
On Site Smaller Than Minimum Playground
Residential Neighborhood
Neighborhood Deficient in Playground Facilities
PLANNING BOARD
WORCESTER, MASS.
1 MILE
2 MILES

Map 7.2

The Playfield Plan

Under the Playfield System (Map 7.3) 8 new or enlarged facilities are proposed. These can be provided as follows:

Number of Playfields Proposed	To be located on
2	wholly new site
2	portion of proposed school site
1	existing school site
1	existing park
2	enlarged park
8	

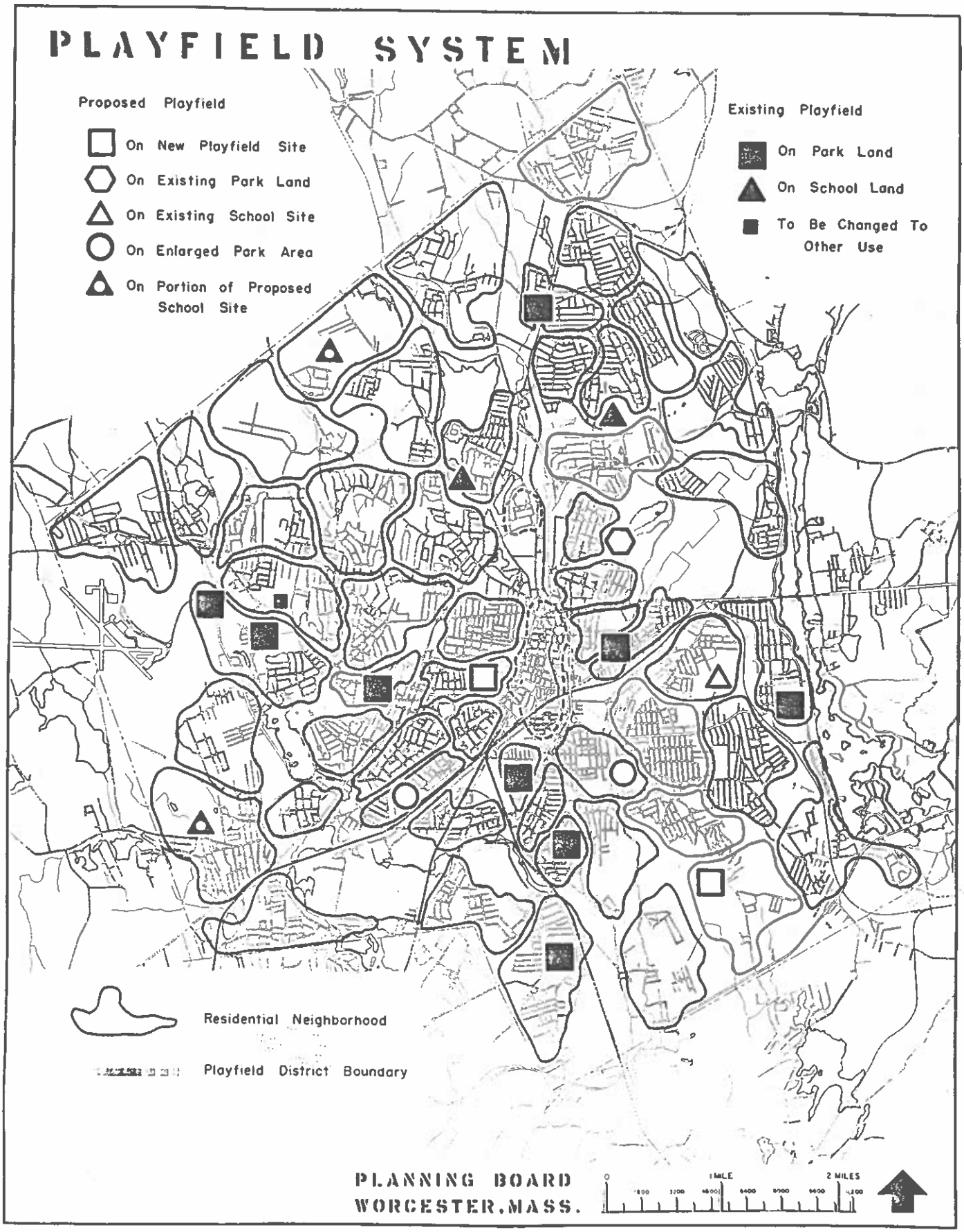
One of the existing playfields, Chandler Junior High --now in an area already served by two other fields--is proposed as an elementary school site in this plan.

As far as recreation parks are concerned it is proposed that one new park of this type be provided in the southwest quadrant of the City. Worcester's present population requires four such parks, of which there are three already available (although not fully developed), and four should continue adequately to serve the city at ultimate development. Since the service area map for these facilities appearing in the *Sketch Plan* is still valid and unchanged, no separate analysis map for recreation parks is included in the present report.

The Neighborhood and Community Park Plan

Finally, 4 new community parks are needed for the Neighborhood and Community Park System (Map 7.4). Three of these are proposed as separate sites; for the fourth, the aforementioned recreation park would also serve as a community park for the population in its immediate vicinity. One existing neighborhood park, Oread Castle, would be removed from the inventory by incorporation into a consolidated school and playground site or would be included in an "acreage" site for the proposed state medical school.

When the new facilities described above are provided, the overall status of recreation facilities in Worcester will be shown on the Comprehensive Plan. Although 45 new facilities of various types are proposed, they will require only 34 new and 10 enlarged sites. This is due in part to inherent overlapping of certain facilities and service areas (as is found in the existing systems), and in other part to the intentional policy of locating new facilities on existing public property, where feasible. Of the 34 new or enlarged sites, 18 would be for combined school-recreation use and 16 for recreation alone.


PLAYFIELD SYSTEM
Proposed Playfield
On New Playfield Site
On Existing Park Land
On Existing School Site
On Enlarged Park Area
On Portion of Proposed School Site
Existing Playfield
On Park Land
On School Land
To Be Changed To Other Use
Residential Neighborhood
Playfield District Boundary
PLANNING BOARD
WORCESTER, MASS.
1 MILE
2 MILES

Map 7.3

Site Acquisition

The specific sites needed to accommodate the proposed recreation facilities are incorporated into the "Future Land Use Plan" and the"Comprehensive Plan Map" of this report. They are listed below in the recommended order of acquisition.

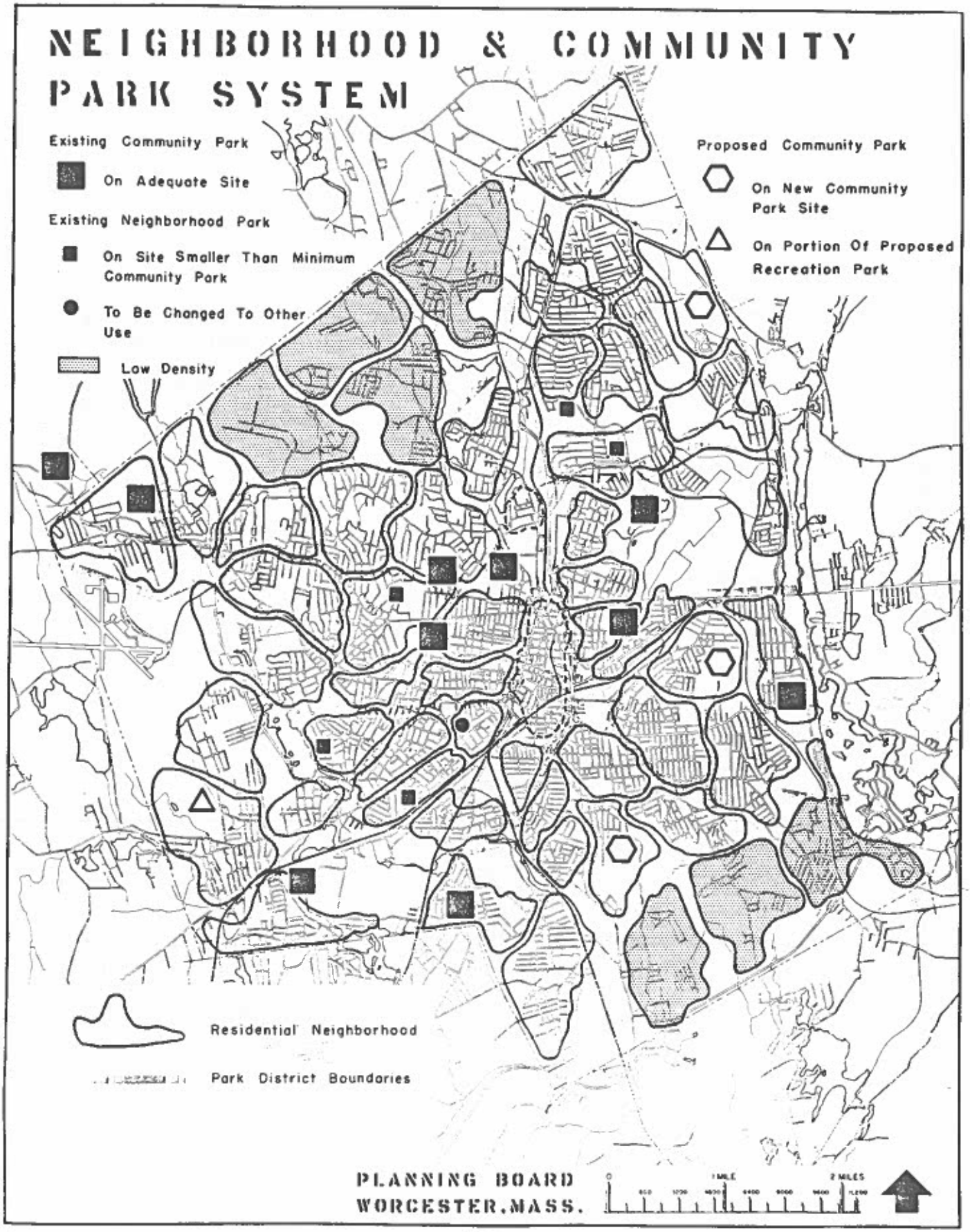
First Priority:

1. Enlargement of Flagg Street School site for playground.
2. Small enlargement of Thorndyke School site for larger playground.
3. Enlargement of St. Nicholas School site for playground.
4. Community park adjacent to Clark Street School.
5. Enlarged Lincoln Street School site for playground.
6. Enlarged Mill-Swan School site for playground.
7. Elementary school site, including playfield and playground in Winter Hill Neighborhood.
8. Elementary school site, including playground, in Salisbury Heights Neighborhood.
9. Elementary school site, including playground, in Olean Neighborhood.
10. Community Park adjacent to proposed Harrington Way Junior High.
11. Recreation park and adjacent site for new South Secondary School, including playground and playfield.

Enlargements of existing elementary school sites, or new sites adjacent to same, where land is still vacant in 1964.

Sites for first priority schools, to also contain needed recreation areas.

Sites for, or adjacent to, proposed or scheduled secondary schools which could be developed as joint school-park centers.


NEIGHBORHOOD & COMMUNITY PARK SYSTEM
Existing Community Park
On Adequate Site
Existing Neighborhood Park
On Site Smaller Than Minimum Community Park
To Be Changed To Other Use
Low Density
Proposed Community Park
On New Community Park Site
On Portion Of Proposed Recreation Park
Residential Neighborhood
Park District Boundaries
PLANNING BOARD
WORCESTER, MASS.
0
1 MILE
2 MILES

177

Map 7.4

Second Priority:

12. Community park, including playground, in Providence Neighborhood.

13. Playfield, including playground, in Blithewood Neighborhood.

14. Playground in Burncoat Plain Neighborhood.

15. Elementary school site, including playground, in Salisbury Park Neighborhood.

16. Playground in Grafton Street Neighborhood.

17. Playground in Massasoit Neighborhood.

18. Playground in Columbus Park Neighborhood.

Sites in areas still partially vacant, but close to built-up sections, or site not likely to be built upon in immediate future.

Third Priority:

19. Playground in Summit Neighborhood.

20. Elementary school site, including playground, in Coalmine Brook Neighborhoods.

21. Elementary school site, including playground, in Oakland Heights Neighborhood.

22. Existing playground in Tatnuck Neighborhood.

Sites in slow growth areas, with much vacant land still remaining.

Site already in private recreation use, but to be acquired by city to round out its public system.

Priority Dependent On Other Factors:

23. Enlargement of Mulcahy Playground for playfield (especially needed if Grafton Street High School is enlarged).

24. Enlargement of University Park for playfield (especially needed if South High is to be retained and modernized).

Enlargement of existing sites requiring building clearance, where school programs may precipitate action.

25. Playground in Hamilton neighborhood.

26. Playground in Union Hill Neighborhood.

27. Enlargement of Downing School site for playground.

28. Consolidated school site, including playground, in Elm Park Neighborhood.

29. Playfield, including playground, in Piedmont Neighborhood.

30. Enlargement of Oread Castle Park for consolidated school site, including playground.

Enlargement of existing sites to be deferred until, and timed with any urban renewal in the neighborhood.

31. Enlargement of Millbury Street school site for playground.

32. Enlargement of West Boylston Street school site for playground.

Enlargement of existing site to coincide with land takings for Expressway extension.

Construction of Facilities

The construction of new playground and playfield facilities within the proposed sites, and the development of walks, picnic areas, and other facilities in the proposed parks should follow the same general sequence as recommended above for site acquisition, but must be dovetailed into the further improvement of existing underdeveloped sites. As part of the total recreation plan, the following specific facilities are proposed on such existing sites (and shown by symbol on the respective recreation map):

1. Playground in West Tatnuck School site.

2. Playfield in Green Hill Park.

3. Playground in Nelson Place School site.

4. Elementary school, including playground, on rear of Chandler Junior High site.

5. Playground in Roosevelt School site.

6. Playfield in Harrington Way Junior High School site.

SUMMARY OF RECOMMENDATIONS

1. Playground sites and facilities should be provided for 32 neighborhoods presently unserved (or inadequately served).

2. Playfield sites and facilities should be provided for 8 groups of neighborhoods presently unserved.

3. Three new community parks, of at least 20 acres, should be provided in those sections of the city now deficient in open space.

4. A 100-acre site for a new recreation park should be obtained in the Main-South section of Worcester.

5. A school-play area or school-park concept should be developed, so that each new school, and existing school where possible, has adequate facilities for a year-round recreation program, including the period when schools are closed for the summer.

6. The City should acquire, according to the priority schedule recommended, the 32 new (or enlarged) sites needed to accommodate the above facilities. (This number is predicted on the multi-use of school sites; otherwise, a larger number of recreation sites will be called for).

7. Recreation (and school) sites needed in the older sections of the City should be included in urban renewal programs, so that land clearance and re-use plans recognize and provide for recreation service.

PUBLIC SCHOOLS

The development of the Worcester Public School facilities is the subject of this report. Recommendations are based on Planning Department expansion of the "Linn Reports" and should be executed in compliance with the School Site Development Standards compiled for the *Sketch Plan*, published in 1963.

CONSTRUCTION UNDER TWO "LINN REPORTS"

The public schools of Worcester have twice--in 1949 and 1955--been surveyed by members of the professional staff of Teachers College, Columbia University, under the direction of Henry H. Linn. These two reports, popularly known in Worcester as the "Linn Reports", have served as the basic school plan upon which the school-building program since 1949 has been developed.

Recommendations of the 1949 Linn Report

The first Linn Report (*The report of the survey of the plant facilities of the public schools of Worcester, Massachusetts, 1949*) recommended that the School Department institute a K6--3--3 system (kindergarten through sixth grade; seventh through ninth grade; and tenth through twelfth grade). Since the adoption of this system, three new junior high schools, one senior high school, and eight elementary schools have been constructed. The Linn report also recommended a rehabilitation program for some of the older schools, the closing of other old structures, and additions to existing outlying schools where population is increasing. Senior high needs were to be met in the following manner; construction of a new senior high school at Burncoat Street (now ready for occupancy) and, upon completion of the Harrington Way Junior High School, conversion of the Grafton Street Junior High Schooland the new building at Commerce to senior high schools (the last two elements of the program have not as yet been started).

The Linn Report provided for meeting junior high needs with a total of seven schools as follows: Providence Junior High School (built in 1932) to be retained as a junior high; construction of four new schools (three since constructed in the interim plus Harrington Way); when Burncoat Senior High opens closing of North High and conversion of its new building to a junior high; finally, when Doherty opens, conversion of South High to a junior high.

A program was outlined for the gradual elimination of all older schools in the center of the City by the construction of five new schools. Each school building would represent the replacement of at least two old buildings and the consolidation of these school districts. This latter program will commence with the construction of a consolidated replacement for Cambridge Street and Canterbury Street schools on a site off Cambridge Street, and a replacement school in the Elm Park renewal area. The Comprehensive Plan proposes an additional consolidation in the area between City Hospital and Elm Park Neighborhood.

Summary of school system changes made as a result of the first Linn Report 1949.

New Schools Constructed

Elementary Schools

Clark Street
Flagg Street
Ludlow Street
Mower Street

Junior High Schools

Chandler Street
Burncoat Street
Forest--Grove

Elementary Schools Already Eliminated

Sycamore Street
Thomas Street
Ash Street
Mason Street

Additions To Existing Elementary Schools
(because of increased school population)

May Street
Columbus Park
Nelson Place
Tatnuck
Thorndyke Road
West Boylston
Roosevelt
Lee Street

Recommendation of the 1955 Supplementary Linn Report

The second Linn Report (*Supplementary report: survey of public school facilities, Worcester, Massachusetts;* assessed the accomplishments since the 1949 report and made further recommendations for new facilities and for additions to existing facilities.

Summary of changes made or in process under the second Linn Report 1955.

New Elementary Schools Constructed

Mill Street
St. Nicholas Avenue
Wawecus Road
Woodland Street
Norrback Avenue

Elementary Schools Eliminated

Providence (e)
Ledge (e)
Ward (e)
Adams Square (e)
Woodland (f)
Millbury--three buildings (e)

(e) expressway demolition
(f) destroyed by fire

Additions made to Elementary School Buildings

May
Roosevelt
Union Hill

New Schools to be Constructed

Elementary
none
Junior High Schools
a. Harrington Way
Senior High Schools
a. Burncoat
b. Doherty (under construction)

Schools to be Converted

Junior High School
North conversion
South conversion
Senior High School
Grafton Street conversion
Central conversion

The post-war program of new school building and additions to meet growth and change in suburban sections of the City will be completed at the elementary level when Norrback Avenue school opens. The *Comprehensive Plan* goes on from this point with new projections and new recommendations based on estimated ultimate needs for the City in the years ahead.

At the secondary level the changeover from a K--8--4 system to a K6--3--3 system with junior high school facilities for all seventh graders necessitated the construction of four new schools for this purpose. Three of these have been built and the fourth and last school (Harrington Way) is now on the drawing boards.

At the senior high school level a change in policy regarding the generalization of commercial or business training courses as universal subjects in all high schools instead of in one centrally located high school such as Commerce High together with new buildings in each section made it possible to plan to eliminate almost all of the three downtown high school plant facilities when the Burncoat Senior High School and the Doherty Senior High School are constructed. Plans to convert the Grafton Street Junior High to a Senior High upon completion of the Harrington Way School will complete the upper levels of the secondary school system as recommended by Dr. Linn.

In the Fall of 1964 the Burncoat Senior High will be opened for use. By September of 1965, Doherty Senior High should be ready and ground should be broken for Harrington Way Junior High. So it appears that by the Fall of 1966 Linn recommendations will be completed and the system in full operation including the conversion of the new building at North High as a junior high school for the central area.

With the new school needs geared to growth and change of system, Dr. Linn recommended the consolidation of pairs of older intown schools into single elementary school units. These would number 5 large elementary schools of about 600 pupils each. As these schools are not yet even in the planning stage, they are included in the school construction proposals prepared for this *Comprehensive Plan.*

As many of the elements proposed by the Linn Report have been completed and are actually in use, the evidence is available that long-range planning is essential in order to:

1. insure proper facilities in growing areas of the City;

2. insure proper sites centrally located in the proposed school districts based on optimum pupil enrollment in growth areas.

Optimum Pupil Enrollment

School Level	Pupil Enrollment	Existing Schools	Proposed Number of Units
Elementary	300-600	57	55
Junior High	1000	5	7
Senior High	1500	4	5

Part of the research carried out in preparation for the *Comprehensive Plan* was to establish a ceiling or ultimate development estimate for each of the 31 Census Tracts (see discussion in Chapter Five and Table 5.5, page 98f). These estimates were mapped, converted to estimates for the 54 neighborhoods, and then compared with present population figures in each district and with school population for the area. Capacities of existing systems were analyzed and definite projections have been made in preparation for a new long-range building program based on ultimate saturation outlined in the plan.

FUTURE SCHOOL CONSTRUCTION PROGRAM 1964

The school construction program and the residential neighborhood plan were conceived simultaneously. The latter is discussed below in Chapter Eight which also contains an identification of the 1964 neighborhoods (see Map 8.2, page219). In Chapter Five may be found for comparison the earlier 1962 neighborhoods (Map 5.5, page 86).

Elementary Schools--Grades K-6

Four areas in the northwest quadrant (Pleasant, Olean, Salisbury Heights, and Winter Hill) are each expected to have populations in the near future that will support a 300-pupil elementary school. These pupils could not be accomodated in any school building now located in nearby neighborhoods (the Winter Hill site was recommended in the *Sketch Plan* published in 1963). The Elementary School Plan is elaborated in Map 7.5 and Table 7.3 below.

To the east of Lincoln Plaza Shopping Center, the Worcester Expressway will bisect a large section of residential land. Ultimate population in this neighborhood will be in the vicinity of 850 families ample in size to support an estimated 300-pupil elementary school which is herewith proposed. An elementary school is proposed for the area east of Millbury Street when population growth warrants it.

In two areas of the City, relocations are proposed. The Edgeworth Street School built in 1870 is located in an area where urban renewal is almost certain to

TABLE 7.3

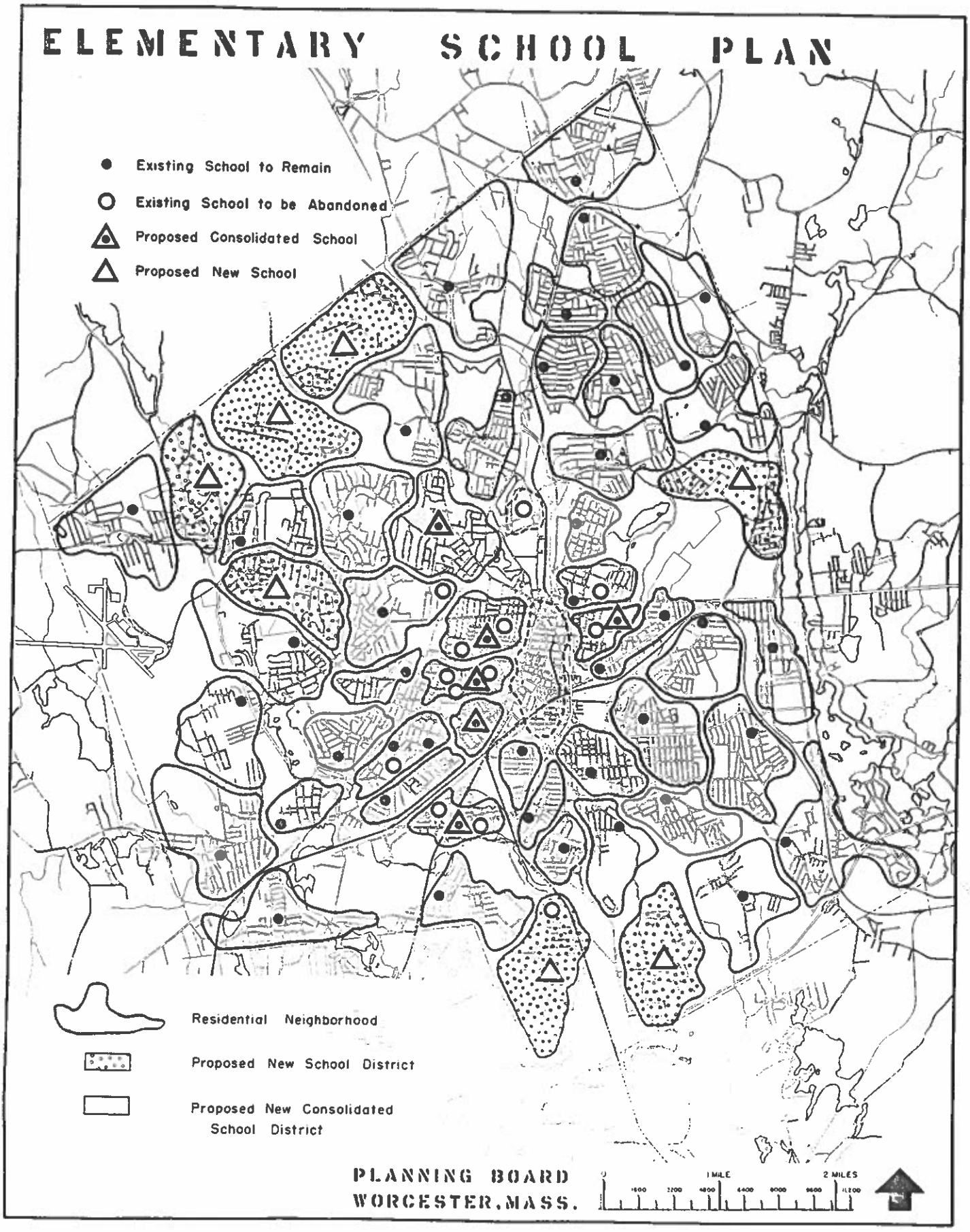
Proposed Long-range Elementary School Plan For Worcester

District (Neighborhood)	School	Ultimate number of Families	Estimated Ultimate No. Pupils	Desirable No. of units* in School
1	Norrback Ave.	1630	650	2
2	Burncoat	1040	400	1
3	Clark Street	1660	650	2
4	St. Nicholas Ave.	740	300	1
5	Greendale	790	300	1
6	Andover Rd.	670	250	1
7	Thorndyke	1050	400	1
8	Lincoln Street	1060	400	1
P 9	Coalmine Brk.	840	350	1
10	Belmont Street	820	350	1
11	Harlow Street	910	350	1
12	Wawecus Rd.	1420	550	2
13	Indian Hill	2110	850	3
14	W. Boylston St.	1020	400	1
P 15	Lee-Edgeworth cons.	1400	550	2
16	Nelson Place	1500	600	2
P 17	Winter Hill	1760	700	2
P 18	Salisbury Hgts.	2430	950	3
19	Flagg Street	1310	550	2
P 20	Olean	1440	550	2
21	Tatnuck	1530	600	2
22	West Tatnuck	1860	750	2
23	Mill-Swan	1700	700	2
24	Ludlow Street	2290	900	3
25	Heard Street	970	350	1
26	Gates Lane	700	300	1
P 27	Pleasant St.	1440	550	2
28	May Street	1370	550	2

P - Proposed (not available in 1964)
* of from 280 to 300 pupil capacity

(Table 7.3 continued--Elementary School Plan)

District (Neighborhood)	School	Ultimate number of Families	Estimated Ultimate No. Pupils	Desirable No. of units* in School
29	Midland	1260	500	2
30	Abbott St.	860	350	1
31	Columbus Park	1250	500	2
32	Woodland & Downing	2640	1000	3
33	Freeland St.	1710	650	2
P 34	Cambridge - Canterbury cons.	1560	300	1
35	Lamartine St.	690	300	1
P 36	Beacon cons.	660	200	1
P 37	Piedmont cons.	2640	550	2
P 38	Elm Park cons.	2810	550	2
P 39	Merrifield cons.	940	350	1
40	Gage & Adams St.	1150	450	1
41	Millbury St.	1890	750	2
42	Union Hill	2760	1050	3
43	Dartmouth	2350	950	3
44	Bloomingdale	1550	600	2
45	Lake View	1430	550	2
46	Middlesex	1730	700	2
47	Rice Sq.	820	350	1
48	Granite	1400	550	2
49	Upsala	980	350	1
50	Malvern Rd.	970	350	1
P 51	Greenwood	1900	700	2
P 52	Oakland Hgts.	1840	750	2
53	Blithewood	1690	700	2
54	Roosevelt	1800	700	2


ELEMENTARY SCHOOL PLAN
Existing School to Remain
Existing School to be Abandoned
Proposed Consolidated School
Proposed New School
Residential Neighborhood
Proposed New School District
Proposed New Consolidated School District
PLANNING BOARD
WORCESTER, MASS.
0
1 MILE
2 MILES

Map 7.5

replace residence with industrial sites. When such plans are in the execution stages, a new site must be found which will serve relocated housing and replace an old school at Lee Street which has little or no play space. Thus the recommendation to locate an elementary school in the area of Sun Valley Drive and Salisbury Street. This school would add to the number of consolidated schools recommended by Dr. Linn.

The last potential growth area where a new school would better serve present and future population is Quinsigamond Village. As population projections for the Village neighborhood make it possible to predict up to 700 pupils when saturation is reached, a new school is proposed which can house all of the Village elementary-school-age children and would be located somewhat more centrally to the ultimate population.

Junior High Schools--Grades 7-8-9

The seven junior high schools proposed by Dr. Linn will adequately serve the City at ultimate saturation. If neighborhoods are grouped around each school in the manner shown on the Junior High School Plan (see Map 7.6 and Table 7.4) an eventual pupil distribution of from 1050 to 1200 per school will result, close to their 1000 pupil optimum. Since it is doubtful that all sections of the City will reach theoretical saturation on any given date, there should be some leeway in capacity which could be equalized by shifting a bit of the attendance district boundaries from those of the neighborhood groups here shown.

The site for the Harrington Way Junior High School has already been acquired by the City; the buildings for six other junior highs already exist. Hence, no additional junior high sites are needed. However, under an alternate senior high plan, discussed below, South High would be retained for grade 10-12 use; and an alternate junior high school on a new site would be called for in this part of the City.

Senior High Schools--Grades 10-11-12

The plans for a four-unit senior high school system, however, pose a different problem. Distribution of the ultimate school population shows a distinct need for an additional high school in the southwest quadrant of the city. Provision of this facility after the year 1975 will allow for this grade group a fairly even distribution of 1500 pupils per school over the whole City (see Table 7.4 and Map 7.7).

TABLE 7.4

Proposed Long-Range Secondary School Plan for Worcester

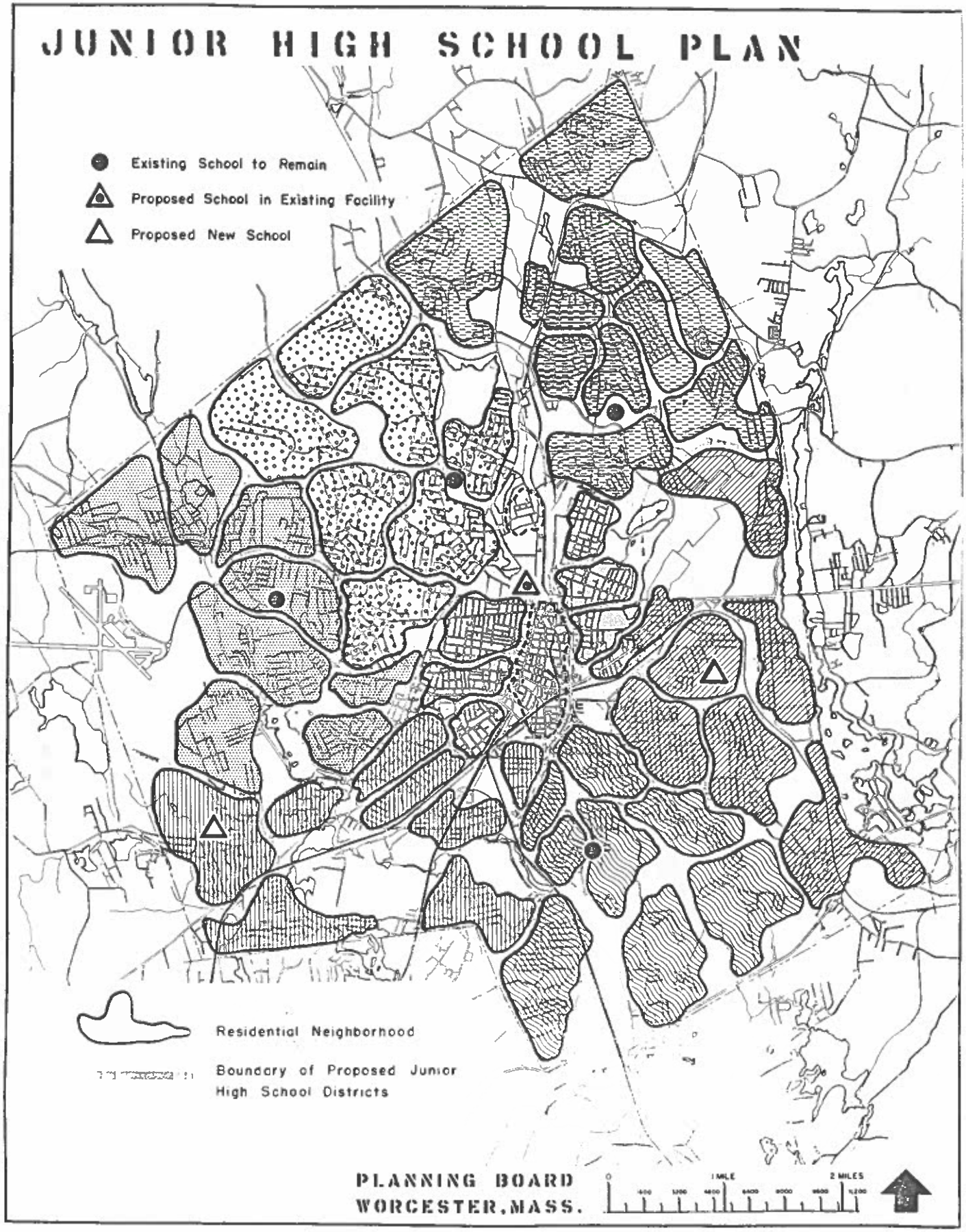
Type of School	School	Number of Neighborhoods Served	Ult. no. of Families Served	Est. Ult. Number of Pupils
JUNIOR HIGH SCHOOL	Burncoat Jr.	10	12,170	1200
	Forest Grove	7	10,680	1050
	Chandler	8	11,450	1150
	P South	8	11,680	1150
	North	7½	10,155	1000
	Providence	8	11,490	1150
	Harrington Way	6½	10,275	1050
SENIOR HIGH SCHOOL	Burncoat Sr.	13	15,510	1550
	Doherty	11	15,160	1500
	South Worcester	10	15,740	1575
	Grafton	9-2/3	16,450	1650
	Central	11-1/3	15,820	1600

P - Proposed (not available in 1964)

Alternative programs have been considered. South High may be retained as a senior high and a new junior high constructed on Apricot Street at the site indicated on Map 7.6, or one of the intown high schools scheduled for demolition, either Commerce old building or Classical, can remain in service for that period when Doherty Senior High is overcrowded. One plausible reason for construction of a new senior high school in South Worcester is obvious when studying the senior high location map. Doherty Senior is quite off-center in its service area and can easily reach 1500 pupils and over as and when the northwest quadrant, now predominantly vacant, fills up with new homes. When this new residential construction approaches saturation, Doherty will be above capacity and another high school in South Worcester can relieve an overcrowded condition.

As these projections are quite long-range and there are possibilities that saturation might as well take place earlier than predicted under exceptional economic conditions in Worcester, it is well to plan ahead towards a detailed site study and land acquisition program now. Growth is coming in the critical areas outlined in the *Comprehensive Plan* and City officials have the responsibility to be prepared for it.

JUNIOR HIGH SCHOOL PLAN



Map 7.6

Recommendations

1. Future school construction should follow the standards outlined in the appendix. Also the school districts should be reapportioned to overcome the crowded conditions prevalent in certain areas.

2. Future site selection should be made bearing in mind that the standards set forth are only minimum standards for proper sites.

3. Sites have been chosen so that a coordinated recreation program and future expansion of facilities is possible.

4. All future site selection should carefully consider small area population projections for the City. [1]

5. Sites for consolidated schools in potential renewal areas must be coordinated with urban renewal land clearance and re-use programs.

6. New elementary schools proposed: 1. Oakland Heights, 2. Lincoln Street, 3. Olean, 4. Pleasant, 5. Salisbury Heights, 6. Winter Hill.

7. Relocations proposed: 1. Greenwood, 2. Lee-Edgeworth.

8. New junior high schools proposed (South).

9. New senior high schools proposed (none).

10. Following the plan outlined, school needs in the future should be met with a minimum of capital expense.

Site Acquisition

The specific sites needed to accommodate the proposed school system plans are incorporated into foldout Map 8.1, facing page 222 and foldout Map 8.4, Comprehensive Plan, facing page 236. The sites are listed below in the recommended order of acquisition.

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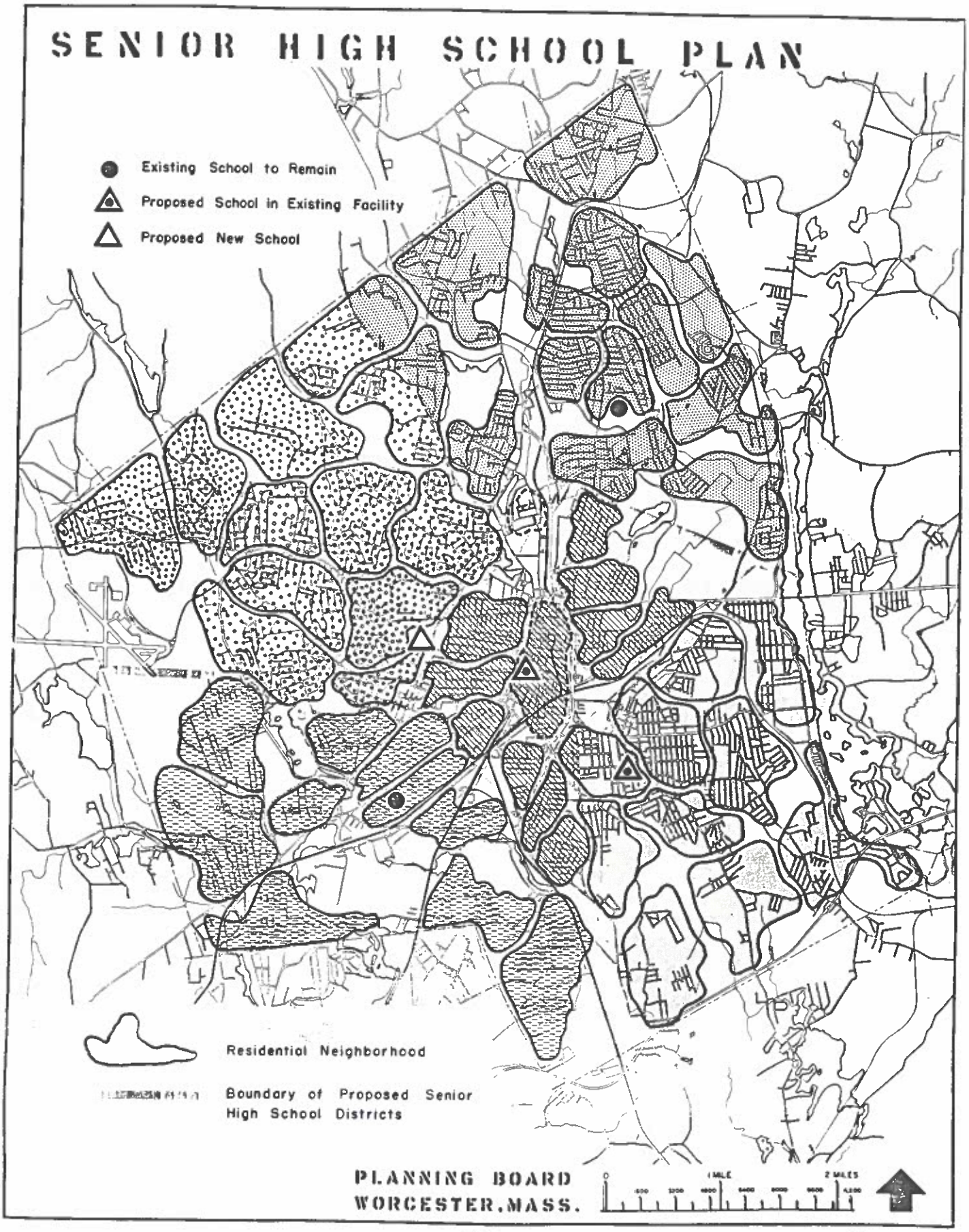
[1] General comments on regions of greatest expected growth are included in Chapter Five. The Planning Department is engaged in estimating these regions for some sixty Planning Districts, 54 of which are residential neighborhoods.


SENIOR HIGH SCHOOL PLAN
Existing School to Remain
Proposed School in Existing Facility
Proposed New School
Residential Neighborhood
Boundary of Proposed Senior High School Districts
PLANNING BOARD
WORCESTER, MASS.
1 MILE
2 MILES

Map 7.7

First Priority Sites

1. Winter Hill School 2. Salisbury Heights School 3. Olean School	Sites in areas of rapid growth where at least one new building is needed now with the others to follow in a decade.
4. Cambridge--Canterbury Consolidated School	Only one vacant site remains in the vicinity.
5. New South Worcester Secondary School (Apricot Street)	Site needed for building construction within decade.

Second Priority Sites

6. Lee--Edgeworth Consolidated school site (in Salisbury Park Neighborhood)	Limited choice of sites still available, but area near saturation.

Third Priority Sites

7. Coalmine Brook School 8. Greenwood School 9. Oakland Heights School	Sites are in slow growth areas, with much vacant land still remaining.

Sites Outside Priority System

10. Elm Park Consolidated School 11. Merrifield Consolidated School (in Chandler Hill Neighborhood) 12. Piedmont Consolidated School	Sites requiring building and clearance, to be deferred until, and timed with, an urban renewal in the neighborhood.

All new sites should be of sufficient size to accommodate a playground (or in the case of a secondary school, a playfield) and should meet the standards of development set forth in the School Site Development Standards in the appendix. In addition to the sites listed above, this chapter proposes in the recreation plan that eight existing school sites be enlarged for new or more adequate recreational use. These include the following:

Sites to be Enlarged

Flagg Street School	Mill-Swan School
Thorndyke School	Downing School
St. Nicholas School	West Boylston Street School
Lincoln Street School	Millbury Street School

Construction of Facilities

The construction of new elementary school buildings on the proposed new sites and the development of play areas on existing and enlarged sites would follow the same general sequence as recommended immediately above and in the recreation portion of this report, respectively. The first new school should undoubtedly be built (and as soon as possible), on the Winter Hill site, since there is already enough school population resident in the vicinity to fill a 300-pupil school. Beyond that, the short term sequence of new construction can best be determined on the basis of school census data.

A comparison of the projected ultimate number of pupils in each existing school district with the present capacity of the building serving that district points up the future need for enlarging many existing schools. Clearly, such a program of enlargement must be dovetailed into a program for new construction, but cannot be regarded as a substitute for such new construction without abandoning altogether the concept of neighborhood schools. Even so, many elementary schools will have to end up as double or triple units (600 and 900 pupils respectively).

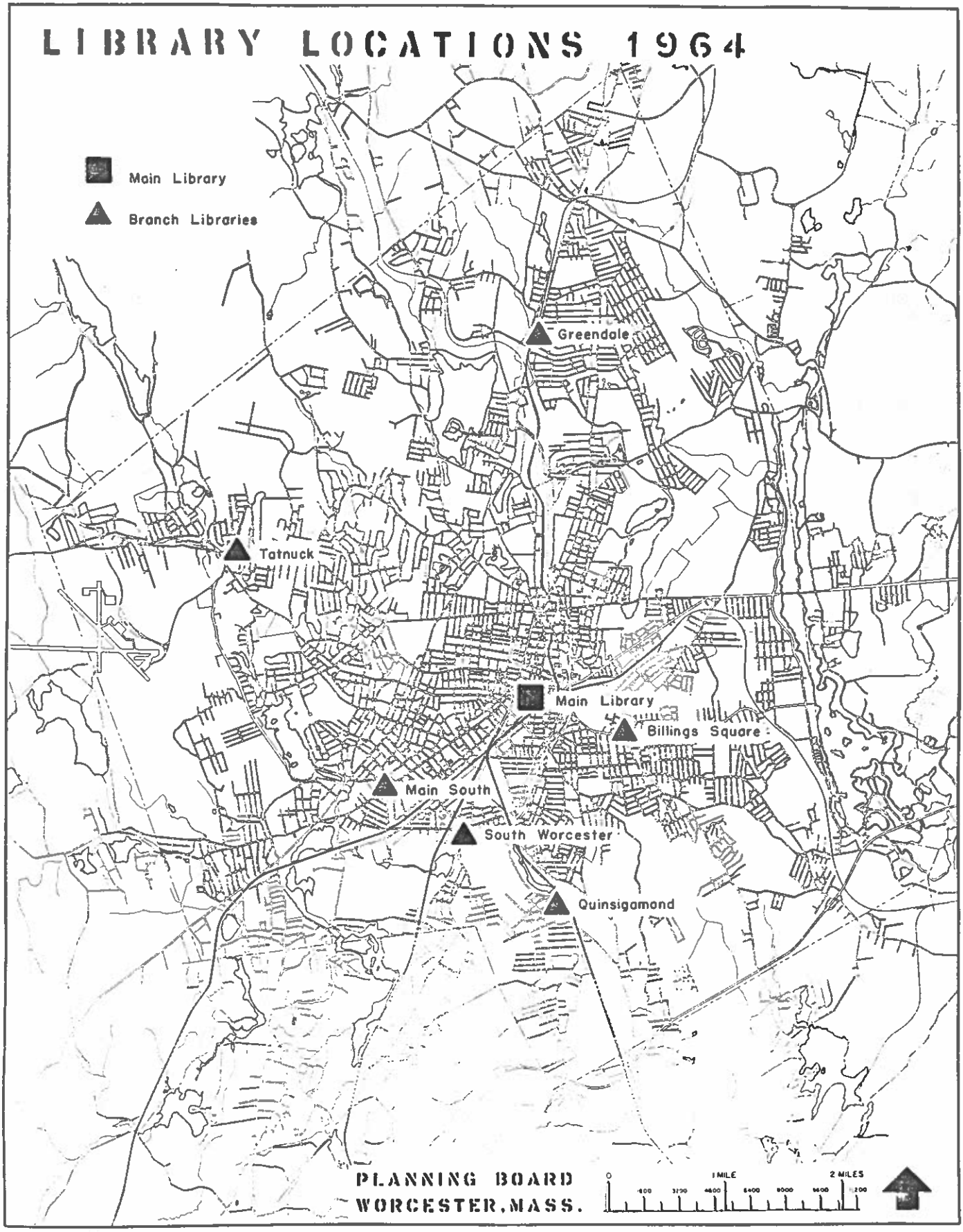
The new elementary schools needed are listed in Table 7.3 and correspond with the new sites listed above with one exception. The proposed Pleasant Street School is recommended to be built on the rear portion of the Chandler Junior High site and consequently does not need a site of its own.

Finally, before the last of the new schools are constructed, a replacement or renovation or both of some of the older existing schools will be in order. Although the plan for school consolidation here recommended will permit the elimination of most of the older schools, there will still remain a number of buildings over 50 years of age, such as Harlow, Gates Lane, and Grafton Street, which fall into this category.

As far as secondary schools are concerned, the proposed South Junior High referred to above is the only wholly new secondary school demonstrably needed in the forseeable future. If its site is acquired at once, plans for its construction can safely be deferred a few years, while the scheduled conversion of existing secondary school buildings takes place.

WORCESTER FREE PUBLIC LIBRARY

The Worcester Free Public Library System now includes the Main Library at Salem Square with branch libraries at Tatnuck, Greendale, Billings Square, Quinsigamond, South Worcester, and Main South (see Map 7.8). The new Main Library offers to the public additional services and more books and seats than could be offered in the old building on Elm Street. Changing library needs of school children and older students and expanded reading and reference needs of adults are not being


LIBRARY LOCATIONS 1964
Main Library
Branch Libraries
Greendale
Tatnuck
Main Library
Billings Square
Main South
South Worcester
Quinsigamond
PLANNING BOARD
WORCESTER, MASS.
0
1 MILE
2 MILES

Map 7.8

met by the present branch system according to the librarian. In relation to these needs, the present small branch libraries are so inadequate they may almost be considered obsolete. One branch library, the Main South, is not in a building owned by the City, but located in a rented retail store.

Even though the fine new Main Library has just been finished, the City should begin to plan to replace its outdated branch libraries with new branches that will meet the needs of the population. A satisfactory solution to the problem of outdated libraries would be to build three or four branches to replace the present six branches. These new branches would contain approximately twenty to thirty thousand square feet of floor space and cost four to five hundred thousand dollars each. Each branch of this size could serve thirty to fifty thousand people if strategically located. Financial aid for this future building program may be available from federal sources under the Library Services and Construction Act. Funds from this federal Act are not directly available to local government agencies, but must be channeled through a state agency such as the Board of Library Commissioners.

The area that is in most need of a new branch library is in the western part of the City where the Tatnuck Branch is most conspicuously inadequate. This branch should probably be located within the triangle defined by Tatnuck, Newton Square, and the intersection of May and June Streets. Other locations for large branches are more problematic; they should be located at points where they are easily accessible by public and private transportation and contiguous to other activities which attract large numbers of people such as schools and shopping centers.

One bookmobile has, for some time, been used to supplement the branch system. The schedule of this lone bookmobile is now filled, but some areas of the City are still without service. Until large branch libraries can be built the addition of a second bookmobile could help to fill the need for popular and general reading and circulative books in these areas. Bookmobiles do not, however, meet the reference needs of students or adults; these facilities must be provided at the Main Library or at branches.

The Regional Library System encompassing all of Worcester County is just coming into actual use (see also Chapter Two). By means of this system, a person will be issued a regional card which entitles him to borrow books from any library in the County. Planning new libraries on a regional scale would get more library value per library tax dollar by having larger libraries with sizeable collections serving greater numbers of people. Under a regional system more service such as films, records, tapes, periodical, document, and other reference collections would be available. Such services can now be found only in larger city libraries. Possibilities which should be further explored, include planning new branch libraries in relation to regional needs in adjoining towns and the eventual use of a bookmobile in the regional program. This is predicted upon the purchase of a second bookmobile to fill the short-term gap until a branch library program could be carried out.

PUBLIC-WORKS-ORIENTED FACILITIES

Discussed hereunder are several areas which are the responsibility of the Worcester Public Works Department and related utilities. Other responsibilities, such as public buildings, streets, and street lighting are not discussed.

WATER SUPPLY

The regional aspects of Worcester's water supply have been mentioned in Chapter Two (pages 16 and 18). Map 2.5 (page 17) shows the watersheds discussed below.

Collection and Storage

The water collection and storage system is located principally in the towns of Holden, Paxton, Leicester, and Rutland. The City of Worcester has the water rights in five watersheds (Holden, Kettle, and Lynde Brook in the Blackstone Valley watershed, Kendall and Quinapoxet in the Wachusett Reservoir watershed) containing ten open impounding reservoirs with a total capacity of 7750 million gallons. Some 6550 acres of land have been acquired to protect the water supply.

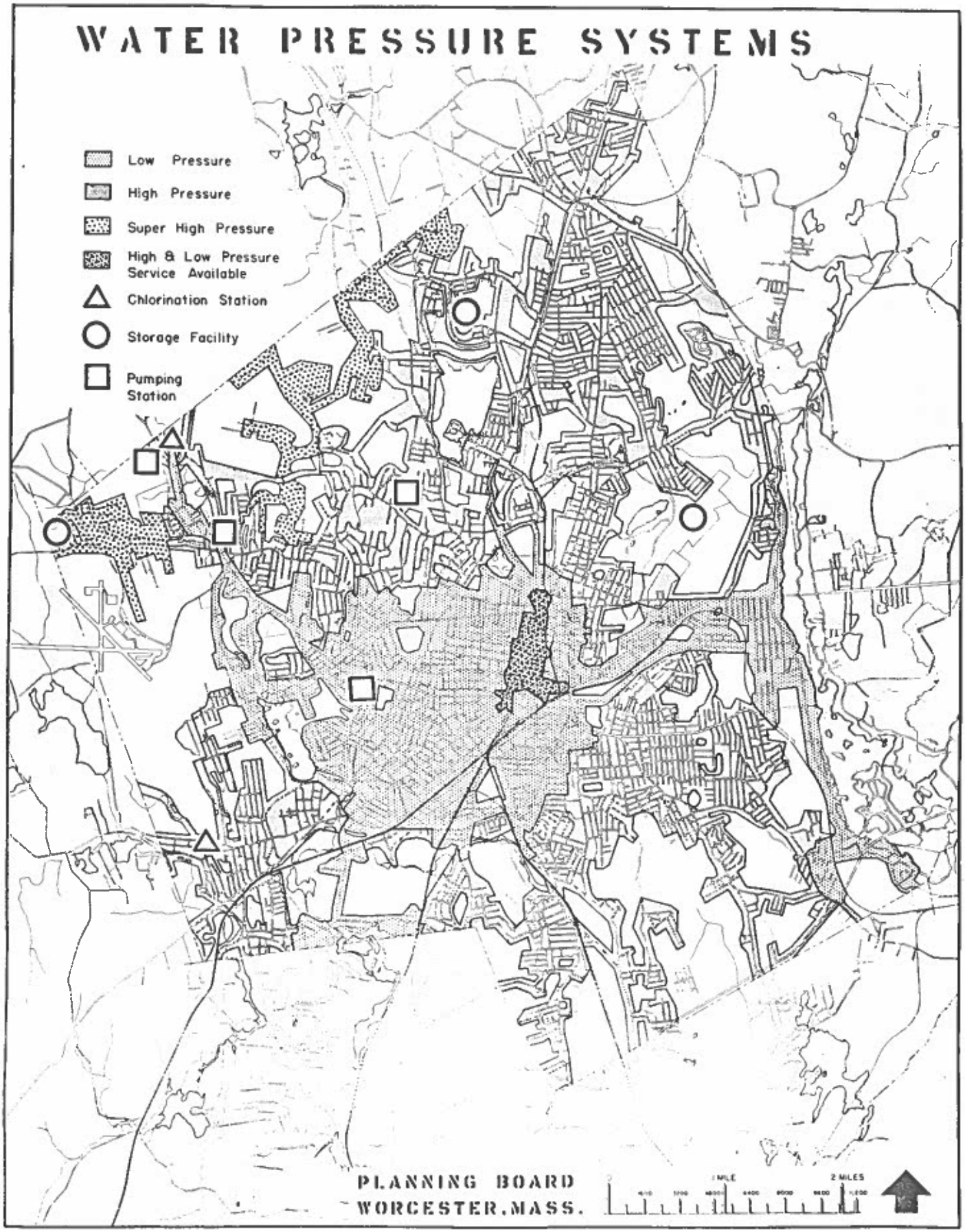
Within the City are located the Howland Hill covered reservoir north of the Worcester Airport and three steel reservoirs on Millstone and Indian Hills with a combined storage capacity of about 4 million gallons (see Map 7.9). These reservoirs are used to maintain adequate pressure in the distribution system described below.

Additional sources of water include small amounts purchased from Holden and from the Cherry Valley and Rochdale Water District (to supply certain small areas in the City), a ground water supply in Great Brook Valley which would be significant if open storage should be contaminated by nuclear fallout, and emergency supplies pumped from Wachusett Reservoir which can be purchased under the terms of an agreement with the Metropolitan District Commission. This last is an expensive source in view of the discussion below.

Distribution

Water from the storage system enters the City at Olean Street and north of Apricot Street and is chlorinated at these points. Emergency supplies are chlorinated at and pumped from a station on the shore of Wachusett Reservoir and enter the City at Hartwell St. near Burncoat.

There are three pressure systems in Worcester, consequent upon the high relief of some 650 feet. The super high service area in the north and northwest of the City is supplied by Howland Hill Reservoir at an altitude of 1052 feet. From


WATER PRESSURE SYSTEMS
Low Pressure
High Pressure
Super High Pressure
High & Low Pressure Service Available
Chlorination Station
Storage Facility
Pumping Station
PLANNING BOARD
WORCESTER, MASS.
1 MILE
2 MILES

Map 7.9

there it flows by gravity to areas off upper Pleasant, Mower, Moreland, Salisbury, Chester and Grove Streets.

A second system is supplied from Holden No. 2 Reservoir, the low service distributor, which handles water for the central portion of the City and much of the area near Lake Quinsigamond. Lynde Brook Reservoir at 823 feet is the high (nominally intermediate; the super high service being the last to be established) service distributor and supplies the moderately hilly remainder of the City. In the downtown area low service is supplemented by high for fire protection and for hydraulic equipment.

Pumping stations at Westwood Hills, Beaver Brook, Tory Fort Lane (near Tatnuck Square), and Olean Street are used to maintain minimum pressure or to convert water from a lower to a higher pressure. Water mains ranging in size from 2 to 48 inches in streets, and other easements conduct the water from storage areas to all parts of the City. Service taps varying from 3/4 inch for residential use to up to 12 inches in diameter for factories and stores, for hydraulic elevators, and for sprinkler systems.

Evaluation

In evaluating the water supply of Worcester, the text table following shows several trends. Additional trends for 1960 are 3.8 million gallons purchased from adjoining towns, 216.7 million gallons sold to users in adjoining towns, and a maximum daily consumption of 35.9 million gallons.

(millions of gallons)	1950	1955	1960
Total Consumption	7876.4	8634.3	8569.5
Average Daily Consumption	21.6	23.7	23.4
Per Capita Daily Consumption	104.9	113.9	122.3
(miles of mains in use)			
Total All Sizes of Mains	463.4	493.7	506.4
Mains Less than 6" in Diam.	79.8	64.4	58.1

Two trends show a steady increase: per capita consumption and total miles of mains in service. In addition a program of replacing mains of less than 6" in diameter (inadequate for fire protection) and of cleaning and lining large mains is being carried forward.

In 16 out of the past 53 years the City has purchased emergency supplies of water from the Metropolitan District (Water Supply) Commission. The amounts pumped from Wachusett Reservoir varied from a minimum of 38 million to a maximum of almost 900 million gallons in any one year.

Worcester purchased all water rights in the Quinapoxet River above elevation 708 (Princeton Street) for $1,000,000 from the Metropolitan District in 1926. The average annual runoff from this watershed is estimated at 6,000 million gallons. The Quinapoxet Reservoir will hold 1,296 million gallons and most of the balance of the runoff is lost to Wachusett Reservoir although as much as 2,633 million gallons was pumped from Quinapoxet in 1957. Paradoxically, when Worcester purchases emergency supply from the Metropolitan District, this is in effect a repurchase of water that flowed through Quinapoxet and was not stored there (or in Kendall Reservoir).

A recent field survey of the South Wachusett Brook Valley area showed that where there were some 14 buildings in 1940 likely to be affected by proposals for increased storage in the Quinapoxet watershed, there are now some 38 residential buildings, most of them showing signs of present occupancy (Spring, 1964).

Unserviced areas within the City are shown on Map 7.9 as unpatterned areas. In general, these are small and are in the process of development with water service being extended as needed, or they consist of larger tracts of wooded, undrained, ledge-infested, remote, or otherwise not-yet-ready-to-be-developed land. Before development occurs in these larger tracts, study is required to determine how best to service them.

Specific improvements in the water distribution system which are now needed include: (1), a 12" main to service industrial development along Gold Star Boulevard; and (2), a new 24" main in Cambridge Street near Brosnihan Square. It should be noted that the Water Department is an income-producing part of the City government and that these projects are self-amortizing.

Recommendations

Land acquisition: Further land acquisition near several of the reservoirs, most particularly north of Quinapoxet Reservoir, is urgently recommended. Land in the Kettle Brook watershed which is needed to protect those reservoirs can be expected to be subdivided in the near future if it is not acquired. Land in the upper Quinapoxet watershed is approaching the stage of extensive subdivision. Land values and costs of condemnations can be expected to increase at an increasing rate, therefore purchases should be made as soon as feasible.

Increased water storage: Increasing the capacity of Quinapoxet Reservoir or building a new dam above the present reservoir is recommended. A preliminary survey indicates that a new dam backing a pool of water to approximately the 300-foot contour would retain some two billion gallons of the estimated flow of six billion gallons now lost in a year of average rainfall. Any study of this proposal must give consideration to the effects on the Gardner line of the Boston and Maine Railroad. The roadbed had to be raised when the present level of Quinapoxet Reservoir was established.

Pitometer Survey: A new survey of the efficiency of the system should be made. This survey will detect and point up any decreases in service due to lack of pressure leaks, or heavier drafts of water than planned for in a given area. Such a survey should be made at regular intervals of not less than ten years to maintain highest efficiency in the system now in operation.

SEWAGE DISPOSAL

Worcester's sewage is handled in small part by private domestic systems and in large part by an integrated public system. Our building and health codes allow private disposal systems in areas remote from public sewer service. Cesspools are allowed where subsurface conditions allow proper leaching. In areas where this is impossible, sewage is broken down biologically in septic tanks. In high water table areas as well as in soils of extremely low permeability, building permits are withheld until public sewers are available.

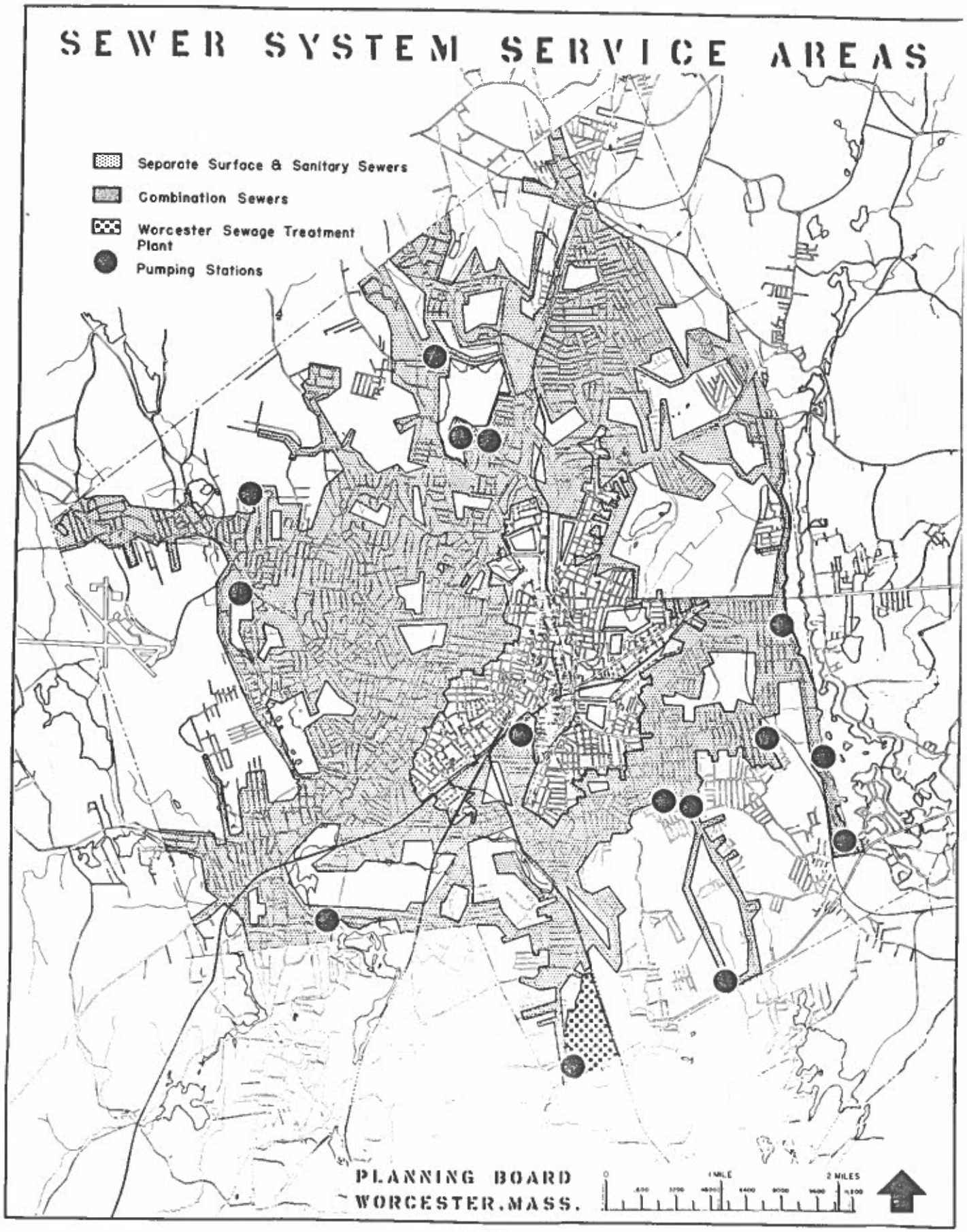
The public sewer system collects and processes approximately 27.2 million gallons of sewage per day. Sources of this sewage are household, business, and institutional wastes, as well as 3 to 3.5 million gallons of industrial waste daily.

In the central area of the City, older mains were designed to collect both surface and sanitary sewage and carry it to the treatment plant. In the remainder of the sewered area in the City, surface water and sanitary sewage is collected in separate mains. Surface drainage in this part of the system is carried to nearby ponds and streams (see Map 7.10).

Worcester's sewage treatment plant was designed to treat an optimum 28 million gallons of sewage per day, but can handle up to 44 million gallons per day. Average daily flow in the past 18 years has been 27.2 million gallons. Highest daily flow for this period occurred in 1955 when 65.4 million gallons was measured. Average daily flow for the last full year (1963) was 22.9 million gallons per day; highest daily flow in the same year was 47.8 million gallons.

Raw sewage is treated at the plant by a screening, settling, and trickling filter process. Anaerobic bacteria act upon the sewage in the lower compartment of a series of 12 Imhoff tanks. Treated effluent after the trickling filter and secondary settling process is discharged into the Blackstone River.

The capacity of the sewage treatment plant is inadequate especially during winter and spring. Frozen ground in winter and high water table in spring increases surface runoff. Surface water not collected in storm sewers flows into combination sewers which discharge into the sewage treatment plant. When this volume is greater than capacity (44 million gallons per day) some sewage passes directly into the Blackstone River. If the combined sewer system cannot handle surface runoff during an ordinary rainstorm, regulators on the trunk main cause part of the diluted raw sewage to flow directly into the covered portion of the Blackstone Canal and then, untreated, into the Blackstone River. In areas where


SEWER SYSTEM SERVICE AREAS
Separate Surface & Sanitary Sewers
Combination Sewers
Worcester Sewage Treatment Plant
Pumping Stations
PLANNING BOARD
WORCESTER, MASS.
1 MILE
2 MILES

Map 7.10

sewer mains are old and have been laid below the water table, ground water infiltrates the system and adds to the volume burdening the sewage treatment plant.

The present sewage treatment system is not adapted in either mechanical equipment or size to handle the additional burden put upon it by garbage resulting from new household garbage disposal methods. Garbage takes longer to process and thus lessens the effectiveness of the system.

There is no easy or inexpensive solution to the problems relating to the treatment of sewage. However, there are two approaches which could provide Worcester with adequate sanitary facilities in the forseeable future and provide facilities for future expansion.

The first step is included in the Community Facilities Plan in the 1963 *Sketch Plan* for Worcester. It is construction of the new Millbrook sewer thus beginning the separation of the combined system. Scheduling, financing, and construction of such a project is dependent upon coordination of local community facility planning and urban renewal planning. No major renewal program for downtown Worcester should be put into execution without planning for and including this project.

The second step is to improve or rebuild the sewage treatment plant. Improvement should come in the form of expansion of capacity and modernization of the equipment. The alternative is to build an entirely new treatment system (but see also discussion in Chapter Two - pages 14-16 including Map 2.4).

ELECTRIC POWER GENERATION AND DISTRIBUTION

Electric power for the city of Worcester is provided by the Massachusetts Electric Company. The Worcester Division (Worcester and Leicester) consumed 457,808,603 kilowatt-hours in 1960. In the city of Worcester, the Massachusetts Electric Company has about 65,000 customers (a list of the ten largest customers is attached). Approximately 60 percent of the power for Worcester is generated by the Webster Street plant, which has a net capability of 72,500 kilowatts. All other power is delivered at various take points by the interconnected transmission network of New England Electric System. The City is supplied by 19 distribution substations and 93 feeder lines.

To indicate electrical growth, the Massachusetts Electric Company compiled the following kilowatt-hour statistics for their Worcester Division (Worcester and Leicester).

Sales of Kilowatt-hours

	1952	1955	1960
Residential	92,182,702	111,751,493 +21%	140,712,009 +26%
Commercial	96,659,536	120,888,244 +25%	166,884,175 +38%
Industrial	131,477,650	141,454,629 +7.5%	150,212,419 + 6%
Totals	320,319,888	374,094,366 +16.5%	457,808,603 +22%

(Increase 1952-1960 - 42%)

These figures show an overall increase from 1952 to 1960 of 42% or an average 5¼% per year gain. In the light of national and area conditions, the company found it difficult to forecast growth in the years ahead. Generally speaking, however, they anticipate a 5 to 6 percent per year increase in kilowatt-hour consumption for the next few years.

Construction in the foreseeable future will concentrate on improving and extending existing facilities. No major feeder lines or substations are anticipated. The company has petitioned the State Department of Public Utilities for the discontinuance of four steam turbines at the Webster Street generating station by December, 1962. The high cost of operation these turbines (installed prior to 1930) makes it more efficient to use power generated at other points. Underground construction will not be extended beyond the present two mile radius required by law since construction costs are approximately five times higher and underground maintenance is much more difficult than an overhead line.

Nine Largest Customers In The City Of Worcester

1. Norton Company*
2. Wyman-Gordon Company*
3. Johnston Steel & Wire Company
4. Heald Machine Company*
5. Crompton & Knowles Loom Works
6. State Mutual Life Assurance Company
7. National Standard Company (Worcester Wireworks)
8. American Steel & Wire Company (Division of U. S. Steel Corp.)*
9. Morgan Construction Company

* Indicates customer is served by New England Power Company.

NATURAL GAS STORAGE AND DISTRIBUTION

Natural gas was introduced to the Worcester area in 1951 by the Worcester Gas Light Company. Prior to 1951, the area was serviced by manufacured gas. The company's franchise includes Shrewsbury, Holden, Westboro, the Blackstone Valley towns, and Worcester.

Natural gas, purchased from the Tennessee Gas Company, enters Worcester at the Auburn line near Upland Street through a twelve-inch high-pressure underground line. At the company plant on Quinsigamond Avenue, gas is distributed to Worcester at two different pressures. The low pressure system covers most of the City and can be used directly by the consumer. The high pressure system or "belt line" extends roughly parallel to the perimeter of the City and reinforces the low pressure system at fourteen automatic regulator stations. Places served directly by high pressure lines require individual regulators.

Pressure is regulated by two storage tanks with a total capacity of six million cubic feet. In an emergency, these tanks could supply the area for a limited time. An emergency tie-in with the Algonquin gas transmission line at Framingham provides additional security. In the event all natural gas supplies should fail, the company maintains stand-by facilities on Quinsigamond Avenue capable of producing manufacured gas equal to present demands.

In normal periods, particularly during the winter months, gas is manufactured for "peak shaving" a process whereby natural gas, maintained at a constant flow, is supplemented by manufactured gas during peak use periods.

From August 1960 to August 1961, the company supplied 5.85 billion cubic feet of gas to approximately 80,000 customers, of whom 40,000 are located in Worcester. Purchased natural gas accounted for 5.4 billion cubic feet and manufactured gas for .45 billion cubic feet. The largest users during this period were Wyman-Gordon Company, American Steel & Wire, Norton Company, Johnston Steel & Wire, Worcester Wireworks, Massachusetts Steel Treating Corp., Crompton & Knowles Corp., Chain Belt Company, and Reed & Prince Manufacturing Company.

Urban renewal and freeway construction resulted in a decrease in the number of consumers in Worcester, but this has been offset by an increase in the volume of gas sold. Looking to the future, the Worcester Gas Light Company predicts an annual volume increase of approximately seven percent.

Long-range plans consist of extension, repairs, and beefing up of existing facilities. Present capacity and future loads are determined by an analog computer at Tufts University. Essential work programs are then scheduled around the City's program of street construction and rebuilding. There are no plans at present for construction of new large feeder mains because of the high pressure "belt line" which assures adequate pressure throughout Worcester.

PROTECTIVE SERVICES

FIRE DEPARTMENT FACILITIES

In its early years, Worcester's population was clustered close to Main, Belmont, Shrewsbury, Salisbury, Grove, Millbury, and Grafton Streets. Today, however, the City has filled much of its easily developable land and has grown beyond the service limits of its Fire Department for many areas. The construction of fire stations followed residential area growth quite closely until World War II. With the exception of replacements, no stations have been built for over 20 years.

The general line of fire station distribution is North-South with individual stations having their main area of responsibility in the core of the City or in contiguous fringe areas. The stations at Winslow, School, Woodland, Hermon, Providence, Webster, Cambridge, Exchange, and Grove Streets, and Eastern Avenue, are oriented toward the City center while the stations on West Boylston and Franklin Streets, at Brittan Square, and in Tatnuck afford fire coverage to more distant neighborhoods. This division is logical because the City center represents the area of greatest fire potential and also the area where a major fire would be disastrous (see Map 7.11).

The areas expected to have the greatest need for more coverage are in those census tracts which lie along the city boundary in the North, Northwest, and Southeast. The proposed Worcester Circumferential Highway would give direct access to those areas which have the poorest coverage. This road could be the answer to most fire service problems in the fringe areas, for all stations near it, by virtue of access to a high-speed road, would have enough mobility to eliminate coverage deficiencies.

Recommendations

1. Immediate attention should be given to arterial construction within the City, especially a circumferential route so that areas now lacking good police and fire protection might gain better service.

2. Constant attention must be paid to urban and outlying neighborhood development so that protection services keep pace with change or expansion or both.

3. A new fire station should be constructed to service the southeastern part of the City in accordance with the recommendations of the fire underwriters report of December, 1959.

4. A new fire station be located in the vicinity of Washington Square with access to the Worcester Expressway. This station would be a replacement for the School Street station located in the first General Neighborhood Renewal Plan.

POLICE DEPARTMENT FACILITIES

Today existing police station arrangement in Worcester still follows the very old headquarters and precinct station plan. Over the years the precinct station system has been abandoned for a motor patrol system until presently there remains only the police headquarters building on Waldo Street, the Lamartine Street garage-and-service-area for the motor patrol, and the Lake station at North Lake Avenue and Route 9. The Lake station is used primarily for patroling Lake Quinsigamond and control of summer recreation activity in the Lake Park--Regatta Point area (see Map 7.11).

The mobility of municipal protective services which is possible through the use of motorized patrols has been demonstrated by the variety of tasks performed by the Department. The city-wide personal and property protection may be hindered as much as it is abetted by this mobility. For example, continuous police coverage may have to be sacrificed in areas which need it in order to meet increasing demands from other localities.

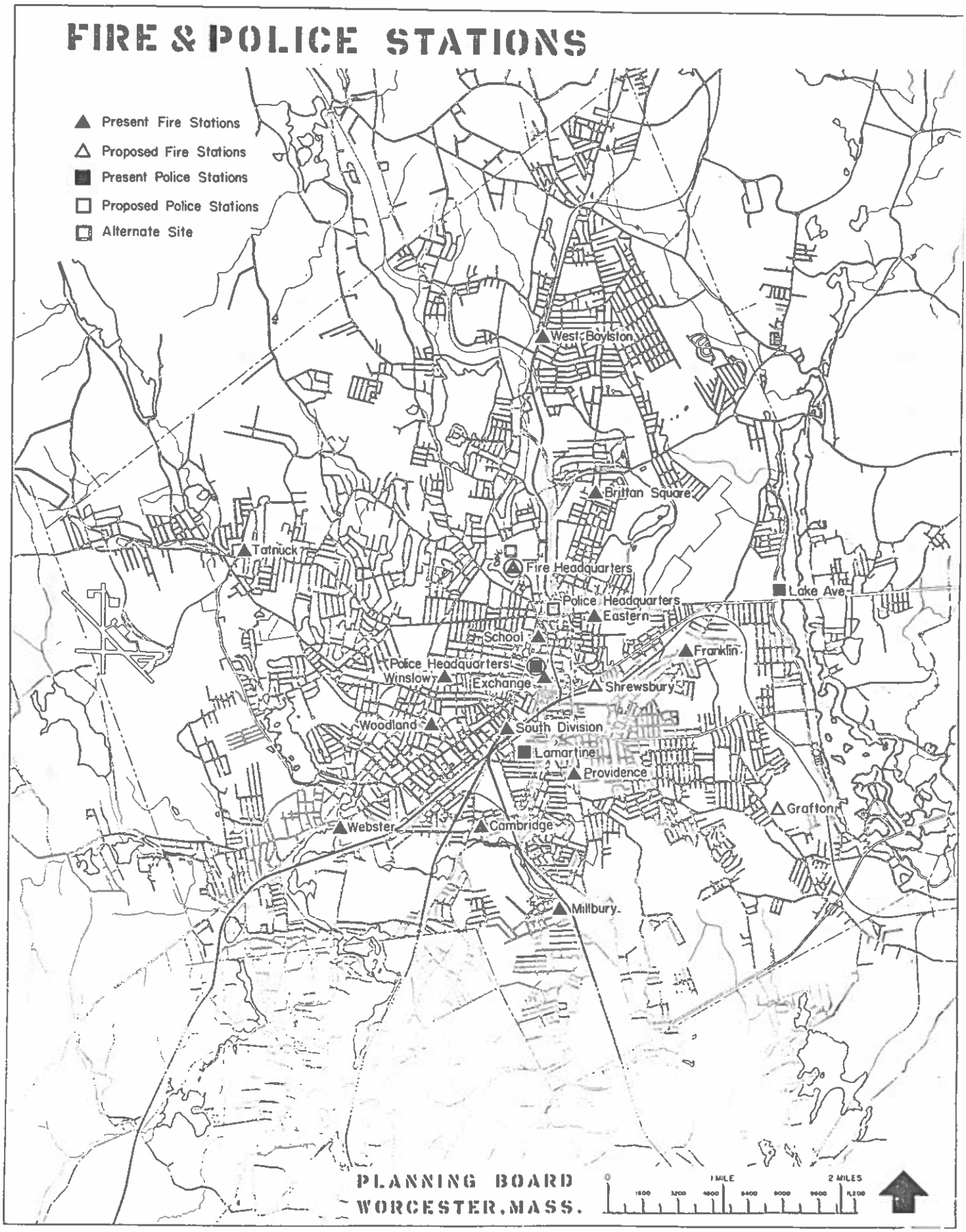
The discussion in chapters Three and Five indicate the regions of the City that are expected to experience new or increased human activities. It is likely that augmentation of coverage will be required to new low-density residential neighborhoods in the north and northwest. As the proposed central area arterials are completed, additional traffic direction and law enforcement responsibilities will necessitate a considerable increase of foot patrols.

Present services must be located in proximity to expressway and arterial highways in order to insure proper coverage of outlying areas. Improvements in the arterial system can enhance the mobility of police services.

The Worcester police headquarters is located in the first project area of the General Neighborhood Renewal Plan by the Worcester Redevelopment Authority. This site is adequate as to location in the center of the city but the building is old and more modern facilities are desirable. GNRP Plans show a site for such services on the edge of the Central Area north of Lincoln Square. This proposal takes into consideration site availability, access to arterial streets, especially the Worcester Expressway, and coverage of the central area of the City. This site is recommended for the replacement of present police headquarters.

Recommendations

A new police headquarters building should be located off Lincoln Square on a site that has direct access to the Worcester Expressway system.


FIRE & POLICE STATIONS
Present Fire Stations
Proposed Fire Stations
Present Police Stations
Proposed Police Stations
Alternate Site
West Boylston
Brittan Square
Tatnuck
Fire Headquarters
Police Headquarters
Eastern
Lake Ave.
School
Franklin
Police Headquarters
Winslow
Exchange
Shrewsbury
Woodland
South Division
Lamartine
Providence
Grafton
Webster
Cambridge
Millbury
PLANNING BOARD
WORCESTER, MASS.
1 MILE
2 MILES

Map 7.11

HOSPITALS AND MUNICIPAL HEALTH SERVICES

The hospitals within Worcester total seven; six are short-stay general service facilities and the other is a long-stay psychiatric. Each of the larger and longer established hospitals has specialties which are a tremendous help to the development of city reputation as a medical center. These specialties include:

City Hospital

General Practice
Internal Medicine
Orthopedic Surgery
Pathology
Pediatrics
Surgery

St. Vincent Hospital

Anesthesiology
Internal Medicine
Pathology
Pediatrics
Surgery

Memorial Hospital

Internal Medicine
Pathology
Surgery

Worcester State Hospital

Psychiatry

These institutions also have active and varied out-patient departments:

City Hospital

Allergy
Arthritis
Cardiac
Chest
Chiropody
Dental
Dermatology
Diabetes
Ear, Nose & Throat
Employees Health
Endocrine
Endocrine Research
Eye
Getchell
Gynecology
Hematology
Medical
Neurology
Orthopedic
(Orthopedic
Follow up)

Memorial Hospital

Allergy
Arthritis
Cancer
Dental
Dermatological
Diabetic
Ear, Nose & Throat
Endocrine
Eye
General Medicine
Gynelogical
Heart
Hematology
(General
Neuropsychiatry)
(Neuropsychiatry
Child Therapy Unit)
(Neuropsychiatry
Seizure Unit)
Obstetrical
Orthodontia

St. Vincent Hospital

Alcoholism
Dermatology
Diabetes
Gynecology
Hematology
Medicine
Muscular Dystrophy
Oncology
Opthamology
Orthopedics
Otolaryngology
Pediatrics
Postnatal
Prenatal
Psychiatry
Rheumatic Fever
Rheumatology
Surgery
Well-baby

(continued)

(continued)

City Hospital (cont'd)

Childrens Orthopedic
Pediatric
Post Partum
Prenatal
Proctology
Surgical
Surgical Follow-up
Tumor
Urology
Venereal Division
Well-baby
Chest X-Ray Screening

Memorial Hospital (cont'd)

Orthopedic
Pediatric
Physiotherapy
General Surgical
Urological

Worcester State Hospital

Psychiatric

The Worcester State Hospital has working arrangements with the Child Guidance Center to provide psychiatric care.

These hospitals, except Worcester State Hospital, are involved in large scale basic and clinical research, and each maintains an educational program of nursing, internship,and residency. Hahnemann, Doctors, and Fairlawn Hospitals, have no outpatient or research programs, and with the exception of Hahnemann, no nursing schools.

The hospitals of the City reflect clearly the regional character of Worcester, the City has hospitals which in quality and comprehensiveness cannot be duplicated short of Boston. Local institutions have expanded their facilities in response to an ever increasing number of patients seeking admittance. To be sure, part of the patient load has arisen from the growing tendency of physicians to hospitalize for the sake of the complete equipment available on the one hand and the availability of "free" insured services not available to outpatients.

City Hospital opened a new glass and concrete addition in 1961; Memorial Hospital has just completed a $2,500,000 building program; St. Vincent Hospital built an entire new $9,000,000 plant in 1954 and is still expanding. Worcester State, Hahnemann, Fairlawn, and Doctors Hospitals have all added new facilities recently.

Municipal Health Services Children, from birth to high school graduation, are of great interest to the Worcester Public Health Department. Naturally, there are other areas of concern, and eventually the Department will have to develop a program oriented to the aged and probably another concerned with mental health, but, at present, much attention is given to the young.

A child who has had a normal birth (without complications) received his first visit from a public health nurse shortly after going home from the hospital. At this time, the mother is encouraged to use the services of municipal

well-child clinics if normal pediatric care is beyond her means. A premature baby is followed up for six months after birth by the Visiting Nurses Association, then the duty is assumed by public health nurses. The child can receive complete medical service, including the full array of immunization shots which prepare him for entrance to school, at the well-child clinics maintained at:

Lamartine Street School - 2nd and 4th Tuesdays
Friendly House (Wall Street)- 2nd and 4th Tuesdays
Tacoma (Project Administration Building) Wednesday only
Gage House (Visiting Nurse Headquarters) Friday only

The Health Department, in cooperation with the School Department and the Worcester "Host" Lions Club, sponsors a free pre-school visual screening clinic. The clinic is designed for children from 3 years 8 months to 5 years 6 months, for these are the years when eye abnormalities are most easily corrected.

As a student, the child may have frequent contact with the Health Department in several ways. Every grammar school child receives annual eye and ear examinations. The Department maintains school dental clinics, with the cooperation of the School Department, at:

Lamartine Street School - every school day
Grafton St. Junior High - every school day
South High School - every school day
Friendly House - Tuesday only

In addition, before the student can participate in any athletic events, he must be examined by the school physician. Similarly, the Health Department assists with the recreation programs at Winthrop House and Lincoln House Girls Clubs and the Y.W.C.A.

City Hospital and the Health Department jointly maintain a Getchell Clinic at the hospital. This meets on Wednesdays, and is the follow-up for anyone who has been treated for active tuberculosis. Others, who have simply been exposed, are examined on Thursdays. Communicable diseases are reported to the state and followed up by Public Health nurses. The nurses also help to select those children who attend the fresh air camp, Camp Putnam.

A less visible, but very vital, part of Worcester's Public Health Department is the Environmental Health section. Considering the tremendous variety of items to be inspected, checked, and licensed the group could use more personnel, as it is short handed. Actual activities can be divided into three categories, though some areas of responsibility are shared with other departments.

Food Handling is the first: the preparation, storage, handling, and sale of all food. Activity in this field is primarily a matter of law enforcement and covers all food operations with the exception of those related to milk.

Milk Sanitation amounts to a division in itself. All aspects of the production, distribution, and sale of milk, cream, butter, oleomargarine, and frozen desserts are regulated by this division.

Environmental Sanitation is the complex third category. This section has a wide range of responsibility dealing, at the least, with:

1. Nuisances
2. Animal Keeping
3. Insect and rodent control
4. Air and stream pollution
5. Bathing areas
6. Inspection and licensing of recration areas, camps, and trailer parks
7. Inspection and licensing of vapour baths and massage parlors
8. Private water and sewage facilities
9. Inspection and licensing of funeral parlors
10. Assignment of dumping areas
11. The hygiene of housing

The last point covers a multitude of assignments in the housing field, and includes potential inspection and approval of anything which qualifies as a housing unit. As a practical matter, the routine is applied to rooming houses, hotels, nursery schools, day-care centers, nursing homes, and the like, which have a significant number of transients complicating the public health situation.

The Environmental Health Section maintains an analysis laboratory at Belmont Home, where samples from the municipal water supply are tested for purity. Some milk and food analysis is also done at this lab, but it is limited, for the program was not set up for much beyond water analysis.

Water supply, sewage, and garbage disposal facilities are the responsibilities of the Department of Public Works, which maintains the facilities, but the Health Department supervises the sanitary measures carried out at the facilities.

MILITARY SERVICE

In the aggregate, there is a surprisingly large amount of military activity in Worcester, for every branch of service maintains either a training or operational group or both within the City.

The Army operates on both the Federal and the State levels, for there are both a Federal Training Center on Lake Avenue North, near Belmont Street; and Massachusetts National Guard facilities on Lincoln Street, near Plantation, and at the intersection of Grove and Salisbury Streets. The new Guard armory on Lincoln Street will eventually absorb all activities now at Grove and Salisbury Streets and the empty building will then be given to the City for expansion of nearby

schools. It should be mentioned that the new building has good accessibility, parking space, and congestion-relieving potential, which was very much missing at the older facility. Army operational activities are limited to the 108th CIC Detachment which has offices in the Post Office Building.

The combined Navy, Marine, Coast Guard, and Seabee training facility on West Boylston Drive is to be replaced with new quarters on Plantation Street, near Lincoln. The new building formally became Naval property on July 1,1964, and the same benefits attach to it as the new Guard armory. When the move is made, the West Boylston Drive property will revert to the Norton Company, the original tenant.

The Air Forces 8301st Reserve Group has its quarters on Airport Drive. This outfit functions as a recovery group and has a permanent staff of one officer, five sergeants, and one civilian. There are approximately 50 additional reservists who report to this center. A number of rumors have been passed about the continuity of this operation; none of them have any substance at the moment.

The Air Force has two operational units in the City which share a new building on Skyline Drive, at the edge of Green Hill Park. One outfit is a communications group and the other an aircraft warning group. This building had to meet locational criteria for proper function, but it also has desirable accessibility, parking area, and the non-congestion factors of a proper site.

Two local universities have R.O.T.C. detachments on campus. Holy Cross has Army and Air Force units and Worcester Tech has Army Signal Corps units. The units have an important training function, for students who rank well in R.O.T.C. can obtain direct officer commissions upon graduation.

Collectively, the military, as represented in Worcester, utilize considerable acreage for their activities. Federal money is spent in Worcester both through local procurement by the military units and private expenditures by the military personnel.

CHAPTER EIGHT

THE COMPREHENSIVE PLAN

FUTURE LAND USE PLAN

The Future Land Use Plan (foldout Map 8.1, facing page 222) shows the probable pattern of land use--public and private--within the City when presently vacant areas are all developed and non-urban uses have been converted to residence, business, or industry. No exact date can be given by which this 48 percent of Worcester will be converted to urban use but it will occur more rapidly in some areas and more slowly in others--it is probable, however, given present growth rates that ultimate development will not come before the year 2000. On the other hand, any given small area could be brought into urban use "tomorrow" if its owner decides to develop, so that the plan is both short-term (for development areas) and long (for the City as a whole).

RELATION TO ZONING

The pattern of future use shown on this map corresponds closely with the pattern of major land uses authorized by the recently adopted Zoning Map for the City. Areas zoned for residence are shown as residential; for business, as business or commercial; for industry, as industrial. Exceptions occur where non-conforming uses are likely to be retained or where areas zoned for a particular use are likely to be used (or are recommended) for a less intensive use--as for example, a shopping plaza in an area zoned industrially. In two instances, areas shown for future industry would require amendments to the Zoning Map.

PUBLIC SITES AND UNBUILDABLE LAND

The plan also includes the majority of the thirty-three new sites recommended for public acquisition (Chapter Seven) for playgrounds, playfields, parks, elementary schools, and a secondary school. (Only those too small to be shown at map scale are omitted). These are classified either as "Recreational" for parks and recreation proposals, or "Institutional" for schools. Areas of rough topography which are expected to remain undeveloped even at saturation are also shown, although it should be pointed out that a drastic rise in overall land values may make it economically feasible to utilize some of those sites.

INTERRELATIONSHIP OF USES

Existing land uses in Worcester are extremely mixed, especially in the older sections of the City. Many blocks that are zoned entirely for residence, and so shown on the plan, contain some non-conforming business or commercial uses. Other areas that are zoned (and shown) for business contain lots now occupied by an industrial use. Other areas, planned for industry, contain isolated residential or commercial uses. The land use plan does not indicate this mixture, but rather classifies each area according to the predominant use of that area,

existing or proposed.

With the passage of time the mixture should be reduced. Under zoning, as non-conforming uses are abandoned, the land must revert to the uses permitted in the district. Under urban renewal, if clearance and rebuilding are involved, the zoning must also be complied with. In the presently vacant areas, development should take place without the mixing of the past, since zoning will control all construction. It is in such areas (48 percent of the City) that the Future Land Use Plan will be most meaningful.

Scatteration of use areas is also a problem in Worcester. Residential developments have not always spread from the center outward, but have leapfrogged over other areas in their search for less expensive land; thus, they are now separated from each other and from community facilities by large vacant tracts. This is particularly evident in each quadrant of the City close to the city line. Again, future development should reduce such scatteration, gradually taking up the remaining vacant land.

Business and commercial scatteration is less susceptible to improvement. Projection of commercial uses make it seem clear that an excess of street frontage is zoned for business, extending in long strips on both sides of the street. While it would be difficult to rezone some of this back to residence, at least the line should be held--as on the plan--and further extensions of existing business frontage resisted. Thus as population growth precipitates a greater business demand, some of these frontage areas should be filled in. This will make for more compact commercial areas--that is more nearly true "centers"--and should give maximum protection to residential property.

The shopping plaza represents the only type of new business development that seems justified outside of existing strip zones. Two such centers now exist--Lincoln Plaza and Webster Square Plaza. The plan shows three others: (a) at Tatnuck, which would be an increase in depth of the present zone in one quadrant of the intersection, and which would be related to the route of the proposed circumferential highway; (b) in the Summit area north of the railroad where about 7 acres of business land fronts on Route 12, (c) on the Perkins property" on Grafton Street, an industrial area, the frontage area of which is zoned for commercial use. Each of these will eventually be needed to serve as a regional center in its respective district, now lacking its own plaza. Such compact, carefully located shopping areas should not be regarded as further business scatterations; in fact, they may reduce the pressure for unplanned, piecemeal development which could harm adjacent residential property.

Industrial areas are also scattered. The plan proposes two new locations--near the Airport, and on state-owned land at Lake Avenue and Belmont Street--but otherwise follows existing zoning, which in turn coincided closely with areas of present industrial concentration. Again, a filling-in or vacant land within these areas should make industry even more compact and eliminate any justification for unplanned, scattered industrial growth.

NEIGHBORHOOD IDENTIFICATION

PLANNING BOARD
WORCESTER, MASS.

0 1 MILE 2 MILES

Map 8.2

RESIDENTIAL NEIGHBORHOOD PLAN

The areas shown as residential on the Future Land Use Plan extend through all parts of the City. Large concentrations of residence are clearly separated from others shown on the plan by intervening non-residential uses such as industrial or commercial areas, railroads, water bodies, institutions, large parks, or areas of rough topography. They are also separated by other barriers--existing and proposed major highways and arterials. Even where no physical barrier exists, orientation toward the nearest school or playground separates one portion of a large residential area from another. Applying all of these determinants, existing and future residential land has been divided into "neighborhoods".

BASIS FOR NEIGHBORHOOD DELINEATION

Many of these neighborhoods meet the description of the ideal neighborhood given in Chapter [illegible]. They are "separated by physical barriers high and low, highways and railroads, factories and forest, each little community with its school and playground and shopping area . . . Each neighborhood sufficient unto itself, free of excessive traffic, noise, dirt, and fumes . . ." Some neighborhoods in Worcester fail to meet all of these criteria--they have no local shopping (and none is desired by the residents), or they are not free of through traffic, noise, etc. This latter situation should be improved, with time, as non-conforming uses are eliminated, voluntarily or through urban renewal.

NEIGHBORHOOD IDENTIFICATION

Each of the 54 neighborhoods as described above have been given an identifying name and number (see Map 8.2). Estimates have been made for each neighborhood of the number of families (considered as equivalent to housing units) see Table 5.5, pages 98f. In this table, Column I is the census figure for 1960; *column III* is an estimate of the ultimate capacity of each neighborhood under existing zoning requirements; while *column II* is an interpolation between the pairs of figures to give a third figure more useful for planning purposes, bringing in the variable of time. The uncertainty in Column II, a consequence of the small size of the areas considered and of the unknown variables possible in their future development, does not preclude the cautious use of these figures for neighborhood planning.

NEIGHBORHOODS AND TRAFFIC

The grid of existing streets in much of the older parts of Worcester means that almost every street carries at least a limited amount of through traffic. Radial arteries, which have been developed along existing routes with much residential frontage, also result in the penetrating of neighborhoods with through traffic.

While some grid streets can be closed or replaced through urban renewal, and here and there, arterial traffic diverted onto new routes, most of the older neighborhoods will retain more through traffic than desirable. In what are now outlying neighborhoods, however, the proposed circumferential highway should do much to divert through (cross-town) traffic from the existing residential streets (radials and connectors) that are used at present by those seeking substitutes for a continuous route. In wholly new areas, local subdivision streets can be designed to discourage through traffic completely.

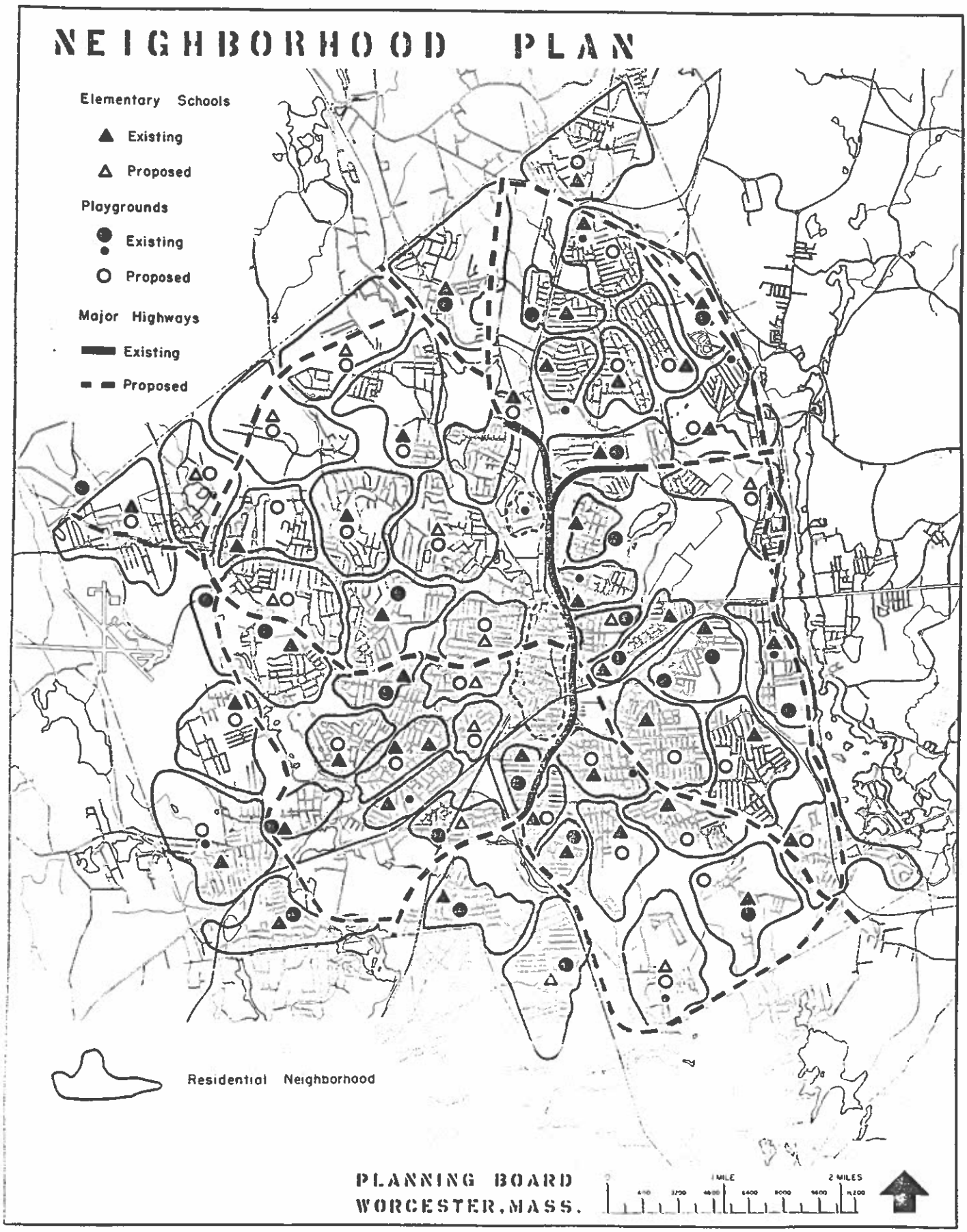
In the case of proposed new arterials, both in new streets and old sections, can be designed to discourage through traffic completely, an attempt has been made to plan their alignment to pass between, rather than to penetrate, the residential neighborhoods. This is illustrated by the routing of the Worcester Expressway, East-West Highway and Circumferential Highway as shown on the accompanying plan. The Expressway divides only one neighborhood, Brittan Square, and here its extension is to be depressed, and the portions of the neighborhood connected by bridges at grade. The East-West Highway, proposed to be built to expressway standards across the heart of the City, passes through the edge of two neighborhoods (at its extremities) but topography does not permit a feasible shift of route. Since much of the route of the proposed circumferential highway is to utilize existing rights-of-way--already built upon--full separation from residential areas could not be achieved.

RESIDENCE AND COMMUNITY FACILITIES

The Neighborhood Plan (Map 8.3) also shows, by symbol, the location within each neighborhood of the elementary school and playground which exists, or is proposed to serve that neighborhood. Consistent with the definition set forth under recreation in Chapter Seven, these may be considered as "first-order" facilities--serving only *one* neighborhood. (In addition, there could be a neighborhood park and a local shopping area, but since such parks are considered in this study as being replaced by community parks serving several neighborhoods, and since local shopping is not being planned for each neighborhood, they are not shown on the Plan).

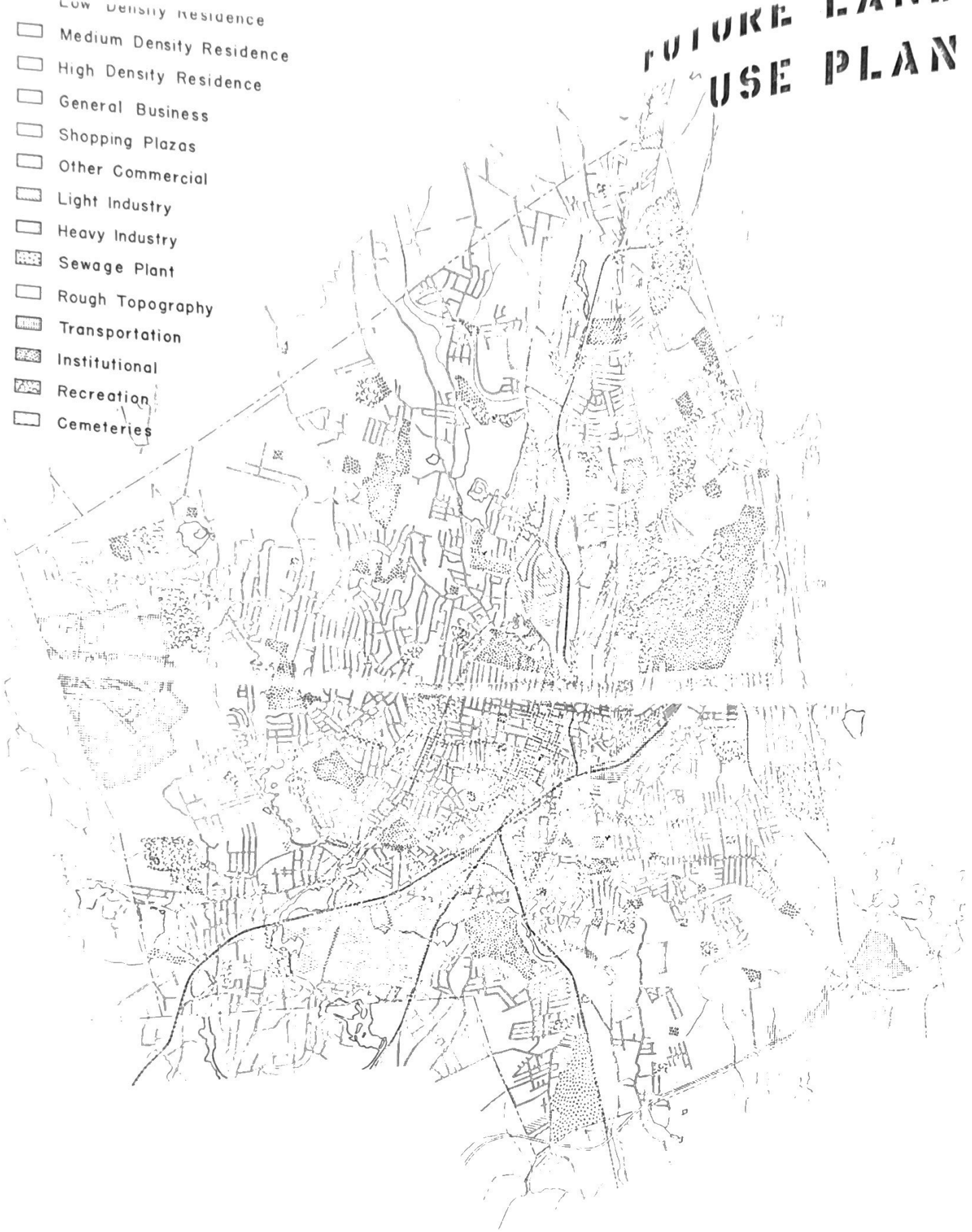
At the second-order or "community" level, every three or four neighborhoods have been grouped to be served by a playfield and community park. Those groupings have already been shown on the respective recreation maps. Community shopping areas, discussed under commerce in Chapter Five, also serve small groups of neighborhoods. As might be expected the service-area boundaries vary from playfield to community park to shopping area; such boundaries are not truly linear features but zones with many persons crossing them in both directions, for personal reasons not within the competence of planning. Nonetheless, as delineated on the map, they represent break points at which such cross-traffic is assumed to be at a minimum.

Third-order facilities, serving larger groups of neighborhoods, include junior


NEIGHBORHOOD PLAN
Elementary Schools
Existing
Proposed
Playgrounds
Existing
Proposed
Major Highways
Existing
Proposed
Residential Neighborhood
PLANNING BOARD
WORCESTER, MASS.
1 MILE
2 MILES

Map 8.3

FUTURE LAND USE PLAN



PLANNING BOARD
WORCESTER, MASS.

high schools, senior high schools, recreation parks, branch libraries, fire stations, and shopping plazas or centers. These community facilities serve the downtown area (which, in the case of fire stations, contains more than one facility) and either 4, 5, or 6 outlying districts. Here, the correlation of districts among the facilities is quite good, there being identifiable areas, such as Tatnuck or Greendale--each of which has a core group of 5 or 6 neighborhoods all served by the *same* schools, parks, fire station, libraries, etc. However, near the edges of the district, there is much overlapping from one facility's service district to another.

The new facilities proposed have been located to maximize this hierarchy of neighborhoods and thus increase community and district identification by having as many facilities as possible served by the same neighborhood.

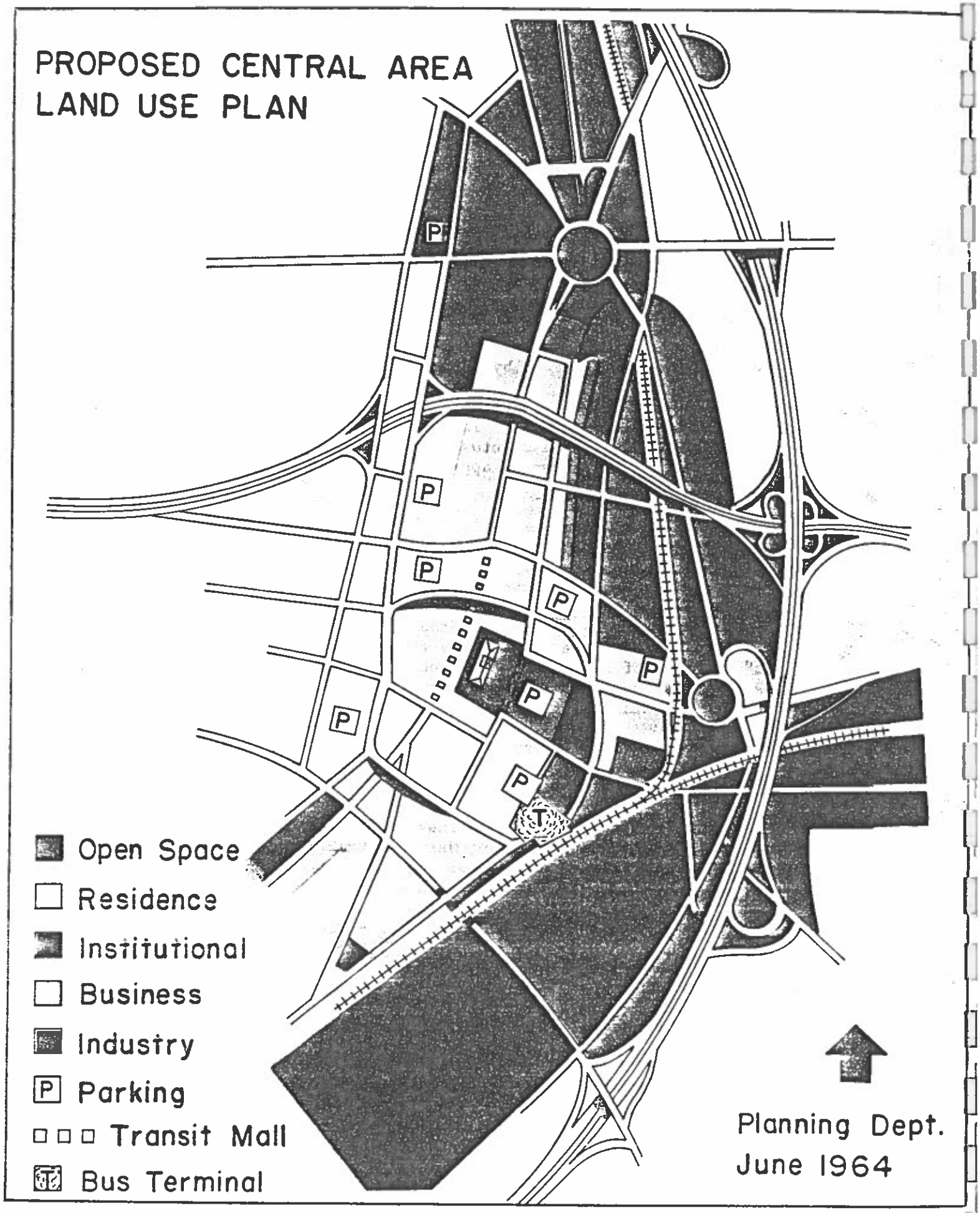
As the fourth order of service in Worcester are those facilities covering either the whole City or major portions of it. These include police station, fire headquarters, recreation parks, and the downtown commercial district. These, and the lower-order facilities are all shown by appropriate symbol on the *Comprehensive Plan* (foldout Map 8.4, facing page 236).

CENTRAL AREA PLAN

Since publication of the *Sketch Plan* which included a summary of existing land use and a highway plan for downtown Worcester, the Planning Department has reviewed the *Worcester CBD Project,* (Columbia Study) and the *General Neighborhood Renewal Plan* for the central area prepared by the Worcester Redevelopment Authority. The "Best" elements of each study have been incorporated with Department-sponsored ideas on land use and highways and are put forth in this text as a point of departure for detailed planning by responsible urban renewal authorities (see Map 8.5).

COMMERCIAL LAND USE AND CIRCULATION

Commercial land uses lie along the main business thoroughfare, from Seven Hills Plaza northerly across the Common and long Main and Commercial Streets to the proposed location for the elevated East-West Highway over Main Street just south of School Street. In the more highly developed areas of the hard core, separation of vehicular and pedestrian traffic is proposed. Following the general ideas proposed in the Columbia Study, an expanded loop system carrying downtown traffic over Main Street at Mechanic-Pearl and Myrtle Street is submitted for review. Under ideal topographic conditions Main Street in the hard core should be studied for a pedestrian mall. Because of the extreme topographic variation between eastern and western extremities of the downtown area, however, particularly the steep hill to the west, it seems advisable to consider Main Street in


PROPOSED CENTRAL AREA
LAND USE PLAN
P
P
P
P
P
P
P
T
Open Space
Residence
Institutional
Business
Industry
P Parking
Transit Mall
Bus Terminal
Planning Dept.
June 1964

Map 8.5

this location as a "transit mall" allowing passage of busses only. The plan illustrates the expectation that Front Street east of the downtown loop would remain in retail business uses in the future. From Foster Street and Commercial Street northeasterly, first surface parking facilities, then new medium density industrial and wholesale uses would be developed through urban renewal processes.

If frontages along Franklin from Portland Street to Main Street and along Front Street from Commercial Street to Main Street are devoted to pedestrian uses, then access to an underground garage under the easterly end of the Common can in effect become an underground service connection between Portland and Commercial Streets giving continuous access parallel to Main Street to service stores and offices in the area.

Surface access from Kelley Square to Lincoln Square is provided by an eastern artery composed of Green Street, the downtown loop, Union Street and a connecting street between Union Street and the railroad bypass.

An important step in traffic improvement in the central area is the relief of the two-way section of the western artery between south of Pleasant and Bowdoin Streets. A one-way south-bound connection from Lancaster and John Streets to Elm and Linden Streets and thus to Irving Street southerly of Pleasant Street will make a complete one-way south-bound section.

RESIDENTIAL USES

Some high-rise luxury apartments, in this and in earlier proposals, would stand on the crest of the hill west of downtown overlooking the panorama of a new core area. High-rise public housing can be placed out on the easterly flank of downtown, between the Worcester Expressway and the railroad bypass. This site, on a high knoll overlooking the Square and its institutional buildings such as the Auditorium and Courthouse, has distinct "walk in" advantages for the residents.

PUBLIC AND QUASI-PUBLIC USES

There are two Civic Centers in downtown Worcester. One, a sub-center focused on Lincoln Square, contains churches, Auditorium, Courthouse, and other institutional uses. The second, focused on the Common, contains institutional uses including City Hall, churches, the new library, and the Young Women's Christian Association.

PARKING AND TERMINAL FACILITIES

One of the major needs evidenced in the Worcester Redevelopment Authority's *General Neighborhood Renewal Plan* and the Columbia Study as well as in this review, is for adequate strategically located parking facilities. The plans of

Off-Street Parking Board for enlarging garages and decking existing surface lots in hard core areas can easily meet required parking demand in the central area when a municipal parking garage with approximately 1400 spaces is constructed under the easterly end of the Common. Completion of an expansion program planned with urban renewal authorities would insure a maximum of 3400 downtown parking spaces constructed on city-operated parking facilities and developed on city-owned land.

Worcester has long needed a central terminal for rail service located as closely as possible to the hard core. Such a location exists at the site of the New Salem Street municipal parking lot. Here an upper deck can be constructed with access over New Salem Street to the railroad. Beyond this a main line track would have direct contact with the heart of the City.

Adequate storm and sanitary drainage in separated mains must be provided if the flooding of the lower areas that occurred in the past are to be prevented. The proposed Millbrook sewer is the first step in implementing this plan.

Plans for highways, parking, retail business uses, transportation facilities, industry, and lastly, residence in the central area must be worked out as part of a total community problem. For the central area to grow, coordination of urban renewal projects with needed public works and public facility improvement is necessary.

Because of the ranges in forecasting future needs, the programs proposed are generally broad in coverage. Recommendations for sites for specific improvements, particularly for a project of such scope and importance as the proposed East-West Highway, need the advantage of detailed planning by responsible agencies. In this case, development of the land use and highway access plan for downtown is the responsibility of the Worcester Redevelopment Authority and its consultants.

C H A P T E R N I N E

IMPLEMENTATION OF THE COMPREHENSIVE PLAN

LEGAL TOOLS FOR IMPLEMENTATION

The General Laws of Massachusetts as enacted by the State Legislature allow cities and towns to adopt certain regulations which will, if diligently enforced, permit a systematic building and development pattern which will benefit the community and its inhabitants. These regulations, which will be elaborated upon below, have been or are being adopted by the City of Worcester.

COMPREHENSIVE PLAN

The *Comprehensive Plan,* while not having the legal powers of the aforementioned regulations, should be used as a guide by the boards, commissions, and municipal officers enforcing these regulations. It is imperative that the boards and commissions which have the power to grant zoning variances and licenses which could have an effect on the growth of the City as set forth in the Plan seek the help and advice of the planning officials of the City before acting upon such requests.

THE OFFICIAL MAP

This is a document which was prepared under the direction of the Planning Board and adopted by the City Council on June 9, 1953. It is authorized by the General Laws, Chapter 41, Section 81-E to 81-J inclusive. Information shown on the *Official Map* includes public ways and parks as theretofore laid out and established by law, and the private ways then existing and used in common by more than two owners at the time of adoption of said map and new or proposed public ways and proposed parks. After a plan bearing an endorsement of approval or accompanied by a certificate as provided in the subdivision control law has been recorded, the ways shall be and become a part of said map.

The adoption of the *Official Map* gives the City the legal power to refuse a building permit for any lot which does not have the required frontage on a way which has been made a part of such map. This refusal of permits on other than official streets, results in the subdivision of large tracts of land under the direct control of the Planning Board and the construction of public streets and sewer systems at the developer's expense. These regulations along with the City's policy of private street conversion will someday eliminate the greatest portion of private ways within the City. This is, of course, a major benefit to the citizens of Worcester.

ZONING

The 1924 Zoning Ordinance

Until July 1,1963, the City of Worcester operated under a zoning ordinance--adequate when enacted in 1924 but archaic in mid-century--which, while regulating the use of land, lacked any dimensional control. The lack of these requirements resulted in the building of homes on very small lots and also allowed business and manufacturing firms to cover their entire lot with buildings, thus leaving no room for off-street parking. In 1956 the Planning Board began preparation of a new zoning ordinance. In 1961 after rejecting 5 drafts submitted by the Board, the City Council formed a committee known as "The Mayor's Committee on Zoning" which was instructed to write a zoning ordinance. This was presented to the Planning Board in 1962 for their study and recommendation. The City Council ordained the Zoning Ordinance of the City of Worcester into law on April 29, 1963, to take effect on July 1,1963. While the final ordinance is somewhat watered down from the original draft prepared by the Planning Board, it is still a satisfactorily restrictive ordinance which will guide the City well in its future development.

The 1963 Zoning Ordinance

The City of Worcester now has a comprehensive zoning ordinance which is expected to guide the development of the City for many years. A zoning ordinance is a legal means of insuring that each and every land owner develops his land in a way that is beneficial to both himself, his neighbor, and the community. With the inclusion in the ordinance of dimensional yard requirements, floor-area-ratios and off-street parking and loading restrictions, it is instrumental in preventing the overcrowding of land and promoting the public health, safety, and welfare. Without a zoning ordinance the City would develop in a haphazard pattern which would eventually prove to be its own destruction.

While changes will no doubt be made in the new ordinance as conditions within the City change, this zoning ordinance will be in force for a good many years. But what comes next? This new ordinance will someday become outdated. The Planning Boards and City Councils of the future must be ever alert to the changing times, and it will be their responsibility respectively to suggest and to ordain legislation which will help the City keep pace with new methods of controlling its growth.

Definition

For the benefit of those unfamiliar with the terms of zoning language the following brief definitions of the preceding restrictions are presented.

Use restrictions: The City is divided into residential, business and manufacturing districts and no buildings, structure or land in any district may be used, erected or designed to be used, in whole or in part, for any use not expressly permitted for that district.

Lot size requirements: In residential districts, minimum lot areas have been established which must be maintained in the laying out of new lots. These requirements are a major step toward preventing the overcrowding of land and providing adequate light and air for the inhabitants.

Dimensional requirements: Minimum front, side, and rear yard dimensions are set forth for each zoning district and help to prevent the overcrowding of land.

Floor-area ratio: The ratio of the total gross floor area of a building or buildings on one lot to the total area of the lot. These restrictions also help prevent the overcrowding of land.

Off-street parking: It is the intent of the ordinance that all new buildings and other land uses be provided with sufficient space located off street for the accessory parking of automobiles to meet the needs of persons employed or otherwise making use of such buildings and land thereby facilitating the flow of traffic on the streets.

Off-street loading: It is the intent of the ordinance that all new buildings, except residential structures, requiring the delivery of goods as part of their functions be provided with facilities for off-street loading and unloading vehicles. This measure is also intended to facilitate the flow of traffic.

SUBDIVISION CONTROL

The subdivision control law, established in the General Laws of Massachusetts, Chapter 41, Sections 18-k--81GG, inclusive, allows the Planning Board to regulate the laying out and construction in subdivisions of ways which will provide access to the several lots within the subdivision. *The Subdivision Regulations* ensure the protection of the safety, convenience, and welfare of the inhabitants of the City by setting forth standards of roadway construction, of sanitary facilities, and in certain cases, parks and open areas which will be used in the development of land not now serviced by public ways. These regulations do not control the laying out of lots or the placing of houses on lots providing only that they meet the minimum requirements of the zoning ordinance. The regulations require that the developer, at his own expense, construct sewer systems, both surface and sanitary; and paved streets and sidewalks to the specifications of the Department of Public Works and under that Department's inspection. After completion of this work and on the recommendation of the Commissioner of Public Works, the Planning Board and the City Council will accept the streets involved as public streets and the City will then assume all future responsibilities for maintenance and improvement.

Before the Planning Board may grant approval to a subdivision plan it must receive a written approval of the plan from the Health Department of the City. This provision ensures that the sanitation facilities plans are sufficient to protect the future home owners from any health problem. A negative report from the Health Department is sufficient grounds for denial of the subdivision plan.

Any developer, if he feels the existing regulations will incur a hardship upon him, may petition the Planning Board to waive one or more of the regulations in his particular subdivision. The Planning Board after weighing the reasons for the request may or may not grant the waiver. This system of petitioning for waivers has been and must continue to be rigidly enforced, not only for the benefit of the City but also to ensure that the developer fully understands his responsibilities.

The present subdivision regulations, while adequate, could use a certain amount of strengthening. With this purpose in mind, the Planning Board has undertaken the task of rewriting the regulations and should within the next few months begin their public hearings on the new regulations. The new regulations will spell out in greater detail certain requirements of the developer and will be re-arranged and re-written in part to conform to a greater degree with the suggested format of the state enabling act. Any actual changes in the regulations will be made to bring Worcester in line with its surrounding towns and with other cities of similar size. It is believed that the new regulations will help the prospective developer to understand exactly what will be expected of him.

BUILDING CODE

Before any construction, extension, alteration, restoration, removal of, or demolition for any building is begun, a permit must be obtained from the Bureau of Public Buildings. Prior to the issuance of this permit, the Superintendent, or any person he may designate, will check the proposed plan against the *Building Code of the City of Worcester, Massachusetts*. This code sets forth the construction details that must be met, the placing of buildings upon the lot as set forth in the zoning ordinance and the fire district regulations, and also the types of materials that must be used in order to withstand any loads that may be brought to bear on the building. If the plan conforms in all aspects to the Code, the Superintendent will issue a permit for the work.

The Code was ordained into law in the late Nineteenth Century, however, and since ordained has been amended several times. With the development in recent years of new and better building materials and methods of design, it has become apparent that the existing code is out of date. In 1963, therefore, a committee was set up by the City Manager to draft a new code. This work is now in progress and it is hoped that a new code will be ordained into law shortly. The new code is expected to result in an increase in building permits because the cost of building will not be inflated by antiquated controls. Although decreasing the costs of building, the use of some new materials should result in a beneficial increase of safety factors.

HEALTH REGULATIONS

The Health Department is responsible for public health in the City. Much of its responsibilities have been discussed in Chapter Seven under protective services. Some of these responsibilities are discussed here in relation to implementation of the Comprehensive Plan.

Housing Code

In this area the Health Department is mainly concerned with the sanitation problems of the home owner. As stated previously, each subdivision plan must be approved by the Health Department in order to insure that the sewage plan, both sanitary and surface, is adequate to provide maximum health standards for the inhabitants. In case of individual requests for building permits where no public sewage is available, the Health Department must make individual inspections to ascertain whether or not the lot is of sufficient size and the soil of sufficient permeability to maintain a septic tank or cesspool conformable to health standards.

It is also within the power of the Health Department to investigate existing buildings, and determine whether or not these buildings are fit for human habitation. If the findings show that a building can not properly maintain human life the Health Department can require the owner to make certain repairs. If the owner refuses to do so the Department can list the building as unfit for habitation and the City is legally enabled to demolish the building at the owner's expense.

The condemning of sub-standard housing is moving at too slow a pace. This stems directly from a lack of funds to do the job. Even though demolition is done at the owner's expense, the City must first appropriate the money, do the job, and then collect its expenses from the owner which can be a long process. A noted increase was made for this action in the budget for this year and it is recommended that even greater appropriations be made in future years.

Air Pollution Control

Air pollution is recognized as a problem by many authorities but one about which very little is being done. Every day, motor vehicles, factories, and residences discharge into the air millions of particles of health-impairing chemicals. While not noticeable in many instances, occasionally atmospheric conditions reach a state where smog is created and then a major health problem exists. This was brought to the fore by the occurrences of smog in recent years in London and in Donora, Pennsylvania, each of which caused many deaths and increased the severity of respiratory illnesses. Los Angeles, California, is a city which lives with this problem all the time. California has adopted a law which will require all motor vehicles be equipped with anti-smog devices after 1965. Application of these

devices and the careful policing of private buildings will eventually solve this problem in California.

The Commissioner of Public Health is working with the state and federal authorities to develop and to maintain a continuous air pollution sampling and enforcement procedure. Regulations on air pollution are being completed by the Department.

The fact that Worcester is located in an area having rapidly changing weather patterns has lessened its problem in this field. The problem does exist, however, and we should be aware of it. Increases in respiratory and other diseases correlate with high incidences of air pollution.

Water Pollution Control

The New England states are blessed with some of the finest water in the entire country. Its ponds and lakes for the most part are clear and clean and its streams and rivers, at their sources at least, are the same. As these waters move toward the sea, however, they are being polluted by some manufacturing plants dumping chemicals and other waste products into them and, in some cases, raw sewage released by municipalities. The City of Worcester is an occasional offender as detailed in Chapter Seven. The sewage treatment plant of this City is not of sufficient size to handle the ordinary sewage disposal when swollen by run-off of major rainstorms. As a result, raw sewage, while diluted, is sometimes dumped into the Blackstone River.

It is imperative that such laws as are now on the books concerning the discharge of material into our rivers be rigidly enforced. It should also be a moral obligation of all industrial firms that are using the water bodies for discharge of liquids that they do so in a manner which will protect the health of humans and wildlife and will keep our water clean and safe. The City of Worcester is not above obligation in this matter either. The recommendations set forth in Chapter Seven (above) should be implemented to solve the problem of discharging sewage into the Blackstone River. It should be obvious to all that a solution to this problem will be greatly beneficial not only to the people of Worcester but also to the region as a whole.

PLANNING FOR URBAN RENEWAL

Urban renewal is a planning technique underwritten by federal funds whereby redevelopment agencies make studies and recommendations and subsequently carry out programs with the goal of elimination of slums and the rebuilding of American cities. It is not intended that renewal should be only the mass demolition of slums but rather a process where the bad is eliminated and the good is saved and enhanced. Under the general title or urban renewal there are three methods of attaining this goal. A general discussion of each method follows.

Redevelopment

This is a process in which there is general demolition of our most substandard areas. In a redevelopment program, areas which are too dilapidated to be rehabilitated are completely cleared, after which it is intended that they be rebuilt by private enterprise in conformity with a previously adopted land use plan approved by local government officials. An example of this in Worcester is the New Salem Street project. The Redevelopment Authority is required by law to relocate all families and business firms displaced by redevelopment projects prior to project execution. It is the aim of redevelopment programs that individual families be relocated from a substandard environment into a higher quality neighborhood. While redevelopment is a major tool of renewal it should be used sparingly as possible and greater emphasis placed on its counterparts, rehabilitation and conservation to protect the social values often disrupted by wholesale clearance projects under the Redevelopment Act.

Rehabilitation

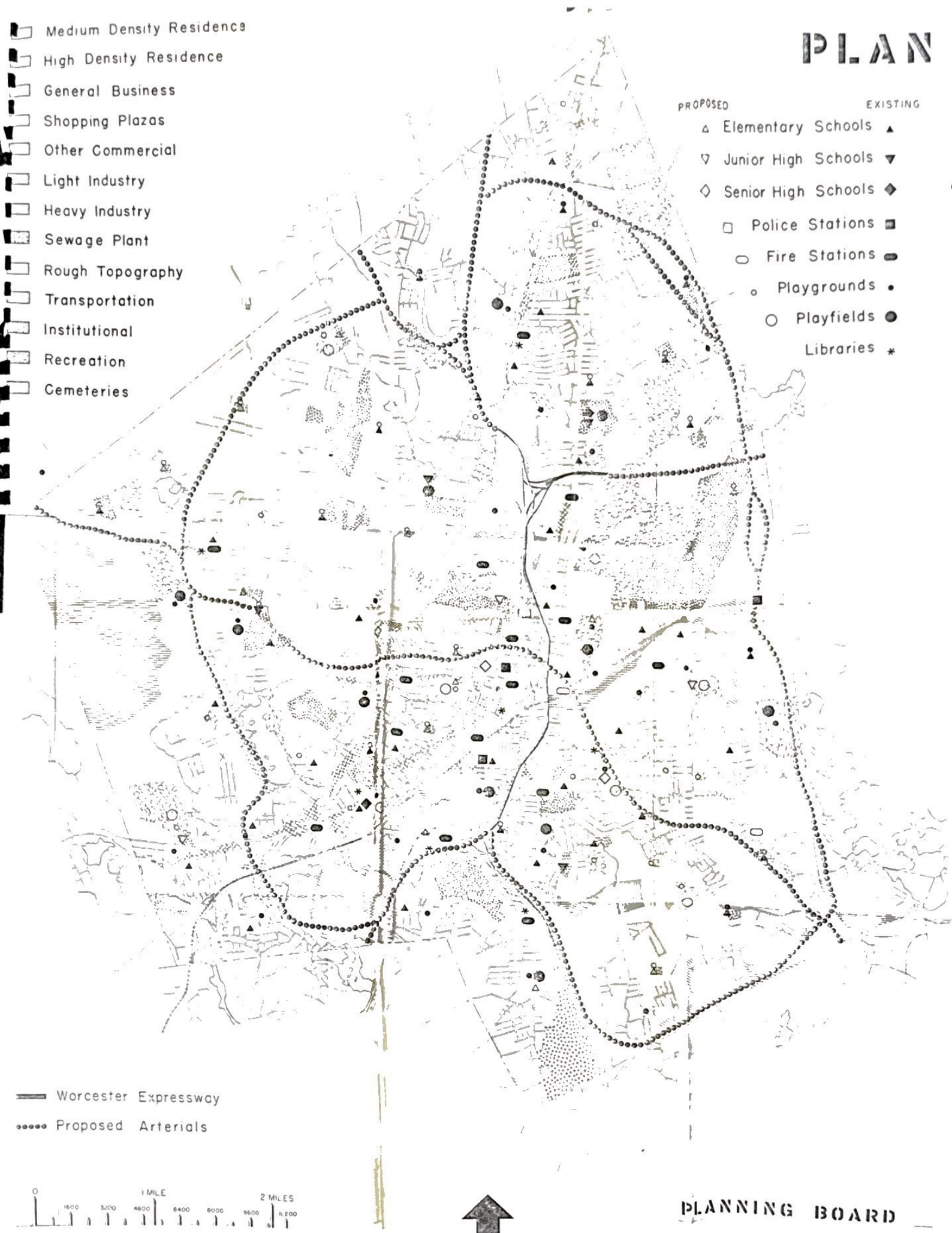
In each urban center there are areas which have deteriorated over the years but have not by any stretch of the imagination reached the stage where they may be classified as slums. It would not be feasible, economically or esthetically, to do a complete redevelopment project in areas like these. Consequently, the tool of rehabilitation is brought into play. An inventory is made of each building in the study area. This information, which includes the age of the building and its interior and exterior condition, will lead to an evaluation of the building. If a building has deteriorated to a point where it is structually unsound and the needed repairs are not economically feasible then it will be demolished. In most cases, however, with a small amount of capital, a building can be repaired and rehabilitated to a point where once again it is a credit to the community. The Redevelopment Authority can arrange for engineering and architectural advice for the owner, and also financing at a low interest rate. Although the owner must bear the expense of the rehabilitation it follows that the money spent by the owner and his neighbors will result in an increase in value of their property.

Conservation

Many other areas in the City are not classified as slums or even deteriorating neighborhoods. There are many sound, well kept areas which do not need rehabilitation. However, blight is a disease which never stops spreading. Any substantial neighborhood which is adjacent to a deteriorating area will gradually be afflicted with the disease if it does not wage a continuous fight against it. Therefore, a program aimed at the conservation of these areas has been set up. Once again, as in rehabilitation, an inventory of each building is taken. The greatest percentage of these buildings will be found to be of excellent quality

and in good repair. A few will have to be rehabilitated. Very seldom, if ever, will a building in this type of area need to be demolished. As before, the Authority will arrange for financing and professional advice for those needing rehabilitation. Once the area reaches the stage where strictly preventive maintenance is required, the neighborhood improvement associations can work with the Authority to preserve their area. This preventive maintenance, if diligently carried out coupled with the rehabilitation of surrounding areas, may someday mean the end of slums as we now know them.

The stages of urban renewal, as outlined above, will never reach reality without cooperation between all parties--City government, the Worcester Redevelopment Authority, the federal government and, most important, the property owners involved. It is important that communication be maintained between all parties so everyone concerned will know what is going on and what part he is expected to play. This type cooperation will someday restore in Worcester a healthy, functioning urban fabric of which all its citizens may be proud.


PLAN
Medium Density Residence
High Density Residence
General Business
Shopping Plazas
Other Commercial
Light Industry
Heavy Industry
Sewage Plant
Rough Topography
Transportation
Institutional
Recreation
Cemeteries
PROPOSED
EXISTING
Elementary Schools
Junior High Schools
Senior High Schools
Police Stations
Fire Stations
Playgrounds
Playfields
Libraries
Worcester Expressway
Proposed Arterials
0
1 MILE
2 MILES
1600
3200
4800
6400
8000
9600
12,800
PLANNING BOARD

A P P E N D I X E S*

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* Material from the housing quality study which was originally proposed for inclusion in the appendix has been included in the text pages (pages 88 and 89).

A P P E N D I X A

TEN-YEAR COMMUNITY FACILITIES PROGRAM

TEN-YEAR COMMUNITY FACILITIES PROGRAM

UPDATED 1964

Worcester Planning Department

Facility	Location	Item	Est.Area req. (acres)	Est. Unit Cost	Est. Total Cost	Priority	Year
LAND ACQUISITION FOR SCHOOL AND RECREATION SITES	Flagg St. School	enlargement of site for play-ground	3	2,000	6,000	1	1965
	Thorndyke Road School	moderate enlarge-ment of site for larger playground	1/10	2,000	200	1	1965
	St. Nicholas Ave. School	enlargement of site for playground	12	partially city-owned	0	1	1965
	Clark Street School	adjacent site for community park	18	city-owned	0	1	-
	Lincoln Street School	enlargement of site for playground	5	1,000	5,000	1	1965
	Mill-Swan School	enlargement of site for playground	5	1,000	5,000	1	1965
	Winter Hill neighborhood	site for elementary school, playfield & playground	20	1,000	20,000	1A	1965
	Salisbury Heights neighborhood	site for elementary school & playground	7	1,000	7,000	1A	1965

(Appendix A - Ten-Year Community Facilities Program - continued)

Facility	Location	Item	Est. Area req. (acres)	Est. Unit Cost	Est. Total Cost	Priority	Year
School and Recreation Sites (cont.)	Olean Street neighborhood	site for elem. school and playground	7	1,000	7,000	1A	1965
	Cambridge - Canterbury area	site for cons. elem. school	3	2,000	6,000	1A	1965
	Harrington Way Jr. High School	adjacent site for community park	37	1,000	37,000	1B	1965
	Apricot St. area	site for secondary school, playfield and recreation park	110	1,000	110,000	1B	1965
	Columbus Park neighborhood	site for playground	6	1,000	6,000	2	1967
	Providence St. neighborhood	community park, playground	30	1,000	30,000	2	1968
	Blithewood neighborhood	site for playfield	12	1,000	12,000	2	1968
	Burncoat Plain neighborhood	site for playground	5	1,000	5,000	2	1968
	Salisbury Park neighborhood	site for elem. school, playground	7	1,000	7,000	2	1968
	Grafton Street neighborhood	site for playground	5	1,000	5,000	2	1968
	Massasoit neighborhood	site for playground	5	1,000	5,000	2	1968

(Appendix A - Ten-Year Community Facilities Program - continued)

Facility	Location	Item	Est. Area req. (acres)	Est. Unit Cost	Est. Total Cost	Priority	Year
School and Recreation Sites (cont.)	Mulcahy Field	site for enlargement for change of playground to playfield	5±	each site requires building clearance		3B	to be timed with any enlargement of Grafton St. High School
	University Park neighborhood	playfield	2±	as part of an urban renewal program that includes land clearance in central area		3B	to be timed with any renovation of South High
	Hamilton neighborhood	site for playground	5±			3C	to be timed with any urban renewal
	Union Hill neighborhood	site for playground	5±			3C	"
	Downing St. School	enlargement of site for playground	1±			3C	"
	Elm Park neighborhood	site for consol. school & playground	7			3C	"
	Piedmont neighborhood	site for playfield	12			3C	"
	Oread Castle Park	enlargement of site for consol. school & playground	3			3C	"

(Appendix A - Ten-Year Community Facilities Program - continued)

Facility	Location	Item	Est. Area req. (acres)	Est. Unit Cost	Est. Total Cost	Priority	Year
School and Recreation Sites (concl.)	Millbury St. School	enlargement of site for playground	5	see previous page		3C	to be timed with any urban renewal
	West Boylston St. School	enlargement of site for playground	3	2,000	6,000	3C	to coincide with expressway land taking program

Note: priority 1 = enlargement of elementary school sites or new sites adjacent to same where land is still vacant in 1964.
priority 1A= site for first priority schools to also contain needed recreation areas.
priority 1B= sites for or adjacent to proposed or scheduled secondary schools which could be developed as school-park centers.
priority 2 = sites in areas still partially vacant but close to built up areas or site not likely to be built upon in the immediate future.
priority 3B= enlargement of existing sites requiring building clearance where school program may precipitate action.
priority 3C= priority dependent on other factors.

(Appendix A - Ten-Year Community Facilities Program - continued)

Facility	Item	Units	Unit Cost	Total Cost	Completion Date	Comments
SCHOOLS						
Elementary	Winter Hill elementary school	600	1,500	900,000	1965	needed now
	Cambridge-Canterbury consolidated school	300	1,417	425,000	1967	
	Elm Park consolidated school	600	1,417	850,000	1970	
	Merrifield consolidated school	300	1,417	425,000	1972	
Junior High	Harrington Way	1,000	2,200	2,200,000	1966	ready to be built
	North High conv.	1,000	500	500,000	1966	
	South High conv. (temporary)	1,000	500	500,000	1967	
Senior High	Grafton conv.	1,000	500	500,000	1966	
	Central conv.	1,000	500	500,000	1970	
	South Senior High	1,500	2,000	3,000,000	-	

(Appendix A - Ten-Year Community Facilities Program - continued)

Facility	Location	Item	Est. Cost	Total Cost	Year
RECREATION					
Improvement of existing sites	Bennett Field	restrooms swimming pool	10,000) 195,000)	205,000	1965
	Burncoat Park	swimming pool	195,000	195,000	1970
	Dodge Park	restrooms	10,000	10,000	--
	Green Hill Park	storehouse greenhouse pumping station sprinkling system	8,000) 8,000) 10,000) 15,000)	41,000	
	Green Hill Park	playfield			immediate future
	Hadwen Park	restrooms	10,000	10,000	
	Logan Field	baseball facilities restrooms	8,000) 10,000)	18,000	
	Morgan Park	restrooms	10,000	10,000	
	Wetherell Estate	restrooms	10,000	10,000	
	Rockwood Field	restrooms	10,000	10,000	--
	W. Tatnuck school site	playground facilities			1965
	Harrington Way Jr. High School site	playground facilities			1966
	Roosevelt School site	playground facilities			1971
	Nelson Place School site	playground facilities			1974

(Appendix A - Ten-Year Community Facilities Program - continued)

Facility	Location	Item	Est. Cost	Total Cost	Year
RECREATION					
Improvement of new or enlarged sites	New Winter Hill School site	playfield			1965
	New Apricot St. sec. school site	playfield			1965
	Flagg St. School site, as enlarged	playground			1966
	Lincoln St. School site, as enlarged	playground			1966
	New Columbus Park playground	playground			1967
	Park site adjacent to Clark St. school	community park			1967
	New Grafton St. playground site	playground			1968
	New Salisbury Park playground site	playground			1969
	New Burncoat Plain playground site	playground			1970
	St. Nicholas school site, as enlarged	playground			1972
	New Providence St. community park	playground			1973
	clearance and/or urban renewal sites	possible 6 playgrounds 3 playfields		construction should follow immediately after land acquisition	

(Appendix A - Ten-Year Community Facilities Program - continued)

Facility	Item	Units	Unit Cost	Total Cost	Completion Date	Comments
WATER MAINS	16" main Webster St. - B.A.R.R. southerly to Lyman St.			20,000	probable 1965 construction	
	12" main Gold Star Boulevard Grove to Millbrook			24,000	completed in 1963	main to service new industrial development
	12" main Brooks St. Norton Machine Div. to Pullman Standard			16,000	probable 1965 construction	
	12" main Freemont St. - Webster St. easterly 1000 ft.			14,000	probable 1965 construction	
	12" main Institute Rd. - West St. to Trowbridge Rd.	))))		15,000	both mains probable 1964 construction	
	12" main Institute Rd. - Einhorn Rd. to Park Avenue	))))				
	12" main Providence St. - Doane St. southerly about 700 ft.			9,000	this point south to Ballard Street completed in 1965	
	engineering study by Pitometer Co.			30,000	recommended 1964 - 1965	
	24" main Cambridge St. near Kansas to Perry Avenue at Diamond			50,000	exact route depends on expressway construction 1965	
	12" main St. Nicholas Ave. at Erie to White Ave.			14,000	when street is developed	

(Appendix A - Ten-Year Community Facilities Program - continued)

Facility	Item	Units	Unit Cost	Total Cost	Completion Date	Comments
WATER MAINS (cont.)	12" main in location from Clark St. to Tacoma St.			15,000	when and if new street is developed	
SEWER TRUNK MAINS	Chester St.	5000 ft.	26	130,000	1964	
	Ararat St. Brook	6600 ft.	23	150,000	1965	
	Moreland St. trunk					
	Bel Air, Orrison Walter	4000	34	135,000	1965	
	Great Brook (Clark to Summit)	10500	24	250,000	1966	
	Broad Meadow Brook	7000	30	210,000	1968	First Realty on circumferential highway
	Ararat A	6600	23	150,000	1968)	
	Ararat B	3200	25	80,000	1968)	
	Pasadena Parkway - Chino Ave.	1790	22	40,300	1964	opens area to n.w. of Cook's corner
Gravity Trunk Mains	Grafton St.-Sunderland Rd. incl. Lake Ave. to Whitla Dr. pumping sta.	1100	27	300,000	1964	
	Everton Ave. pumping sta. (replaces Whitla Dr..) and force main	10000	17	300,000 170,000	1965) 1965)	30% Federal aid (P.L. 660)
DRAINAGE AND FLOOD CONTROL	Millbrook-Prescott St. area-old North Works stream improvement	1500	167	250,000	1964	
	Blackstone River at Kane Sq. stream improvement	4000	150	600,000	1965	
	Coalmine Brook - Lincoln St. to Notre Dame Convent	3500	86	300,000	1965	
	Coes Reservoir spillway improvement			75,000	1965	
	Coes Lower Reservoir stream improvement to terminus of Webster Sq. project	1500	133	200,000	1965	

(Appendix A - Ten-Year Community Facilities Program - continued)

Facility	Item	Units	Unit Cost	Total Cost	Completion Date	Comments
DRAINAGE AND FLOOD CONTROL (cont.)	Cooks Pond Dam			90,000	1965	
	Cooks Pond-Smith Pond stream improvements	3500 ft.	103	360,000	1965	
	Holden St.-brook bet. Holden and Grove stream improvement	3500	57	200,000	1965	
	Indian Lake near Mattson Ave.- new spillway, dam improvements, outlet to 84" storm sewer			125,000	1965	
	Indian Lake north to Stonleigh Rd. stream improvement	6000	67	400,000	1965	54" pipe at Stonleigh Rd.
	Middle River bypass around Am. Steel & Wire to Blackstone River	1500	400	600,000	1965	
	Smith Pond-Patches Res. stream improvement	1000	50	50,000	1965	
	Broad Meadow Brook Dunkirk Ave. to Dupuis Ave. - stream improvement	3500	86	300,000	1966	
	Patches Res.-Coes Res. gatehouse, sluice gate, drain pipe, spillway			200,000	1966	
	stream improvement	4000	50	200,000	1966	
	Weasel Brook stream improvement	6000	83	500,000	1966	
	Wyman Gordon area			150,000	1966	urban renewal aid
	Millbrook-Lincoln Sq. via Union St.,Front' St., Harding St.- flood conduit	3200	938	3,000,000	1969	urban renewal aid
	Millbrook-Washington Sq. to Brosnihan Sq.-flood conduit at Harding Sq.	6000	1000	6,000,000	1969	urban renewal aid
	Millbrook-Brosnihan Sq. to Blackstone River- improvement of existing	1500	200	300,000	1969	urban renewal aid

(Appendix A - Ten-Year Community Facilities Program - continued)

Facility	Item	Units	Unit Cost	Total Cost	Completion Date	Comments
STREETS AND HIGHWAYS	Belmont Street Skyline Dr. - Daniels includes sewer separating surface and sanitary drainage	2500 ft.	40	100,000	1964	
	Lake Ave.-Winneconnett to Plantation-lane direction separation by grade	7000 both ways	36)	250,000	1964	
	Massasoit Road at Rice Sq. to city line	10500	29) 7)	(300,000 total (75,000 to city	1964	
	Plantation-Belmont St. grade separation traffic improvements			(650,000 total (162,500 to city	1965	
	St. Nicholas Ave. connector highway improvement	3500	25	87,000	1965	
	Chester St. to Holden circum. highway	4000	100	400,000	1966	
	Main to Mill - circum. highway mod. expressway	3000	100	300,000	1966	
	Boylston St.-Clark St. circum. highway mod. expressway	4500	100	450,000	1967	
	Expressway spur to Route 9 mod. expressway	9500	105	1,000,000	1967	
	Lake Ave. to Route 20 connector modified expressway const.	1600	100	160,000	1967	
	Salisbury to Chester circum. highway	4500	100	450,000	1967	
	Briarcliff to Salisbury circum. highway	5000	90	450,000	1968	

(Appendix A - Ten-Year Community Facilities Program - continued)

Facility	Item	Units	Unit Cost	Total Cost	Completion Date	Comments
STREETS AND HIGHWAYS (concl.)	Holden St. to West Mountain circum. highway	7000	100	700,000	1968	*
	Summit Bridge - e. to West Mountain St. circum. highway			200,000	1968	*
	Mill St. - Tory Fort Lane via South Olean St.	1800 ft.	150	270,000	1970)	
	Tory-Fort - Moreland	4600	100	460,000	1970)	
	Moreland - Salisbury	1100	100	110,000	1970)	

* Route 12-20 potential Federal aid secondary program.

(Appendix A - Ten-Year Community Facilities Program - continued)

Facility	Item	Units	Unit Cost	Total Cost	Completion Date	Comments
OFF-STREET PARKING	Water Street	39 spaces	564	22,000	1964	planned
	Myrtle St. Site 5 of Salem St. Re-development area- at main metered lot	35 spaces	2,057	72,000	1965	decision pending
	Pearl-Elm Garage- addition of 2 floors expansion into old library site	added 350 spaces	3,714	1,300,000	1965	planned
	Highland Street- West Street	31 spaces	1,050	32,500	1966	studies made
	Lincoln Street- Harlow Street- McKinley Rd. area	64 spaces	726	46,500	1966	leaseback arrangement
	Mercantile Garage expansion to Mechanic Street	added 96 spaces	4,427	425,000	1967	adaptable for expansion
	Salem Street double decking	301 spaces	5,315	1,600,000	1968	cost/space in double decking $2,685
	Spring Street double decking west of Spring only	added 107 spaces	5,420	580,000	1973	cost/space in double decking $2,710
	parking under common	1,433 spaces	4,396	6,300,000	1974	3 levels
	alternate parking under common	957 spaces	4,396	4,200,000	1974	2 levels

(Appendix A - Ten-Year Community Facilities Program - concluded)

Facility	Unit	Projected Location	Cost	Comment
POLICE AND FIRE FACILITIES	Police Headquarters	vicinity of Lincoln Square	$2,500,000	in renewal area
	Fire Station	Grafton St. near Rice Square		single-company station
	Fire Station	Washington Square Area		four-company station Union Station site

A P P E N D I X B

LAND USE AREA TABLES

Appendix B Table 1

1961 Generalized Land Use Areas
(square feet)

Census Tract	Residential (by densities) Low	Medium	High	Mixed Co. and Res.	Commercial	Industrial	Institutional	Vacant & Nonurban	Other	Total
1	14,935,757	256,141	23,264	43,325	603,349	8,055,083	1,555,606	25,020,309	1,913,299	52,406,133
2	13,739,264	45,065		39,269	172,097	96,150	659,458	13,634,724	10,474,873	38,860,900
3	8,963,074	1,105,724	185,571	92,585	571,546	177,445	2,953,879	1,760,048	78,484	15,888,356
4	8,770,271	627,854	175,394	141,824	1,595,233	1,920,392	1,209,782	10,474,432	7,418,268	32,333,450
5	4,109,468	1,132,271	209,803	90,736	1,869,361	5,594,748	812,935	3,107,052	3,645,178	20,571,552
6	18,936,391	292,182	295,240	37,732	319,339	450,344	7,350,661	31,368,634	886,233	59,936,756
7	18,992,032	24,940	28,200	34,538	352,272	18,287,851	1,930,431	42,284,494	3,168,845	85,103,603
8	21,124,826	199,548	77,004	176,170	170,622		1,837,248	9,775,067	4,115,400	37,475,885
9	17,668,958	154,982	29,852	129,833	154,339		2,311,615	5,391,766	167,180	26,008,525
10	11,008,197	571,900	143,873	133,092	648,547	10,894,321	802,763	34,560,073	736,083	59,498,849
11	9,431,507	1,410,435	402,324	139,950	461,221	478,702	1,337,030	3,095,331	3,405,379	20,161,879
12	2,269,738	3,621,623	495,388	116,097	1,430,518	169,732	1,760,180	716,622	277,100	10,856,998
13	590,981	1,460,443	895,752	133,150	285,588	1,767,424	542,759	111,160	615,174	6,402,431
14	1,124,684	1,537,729	837,688	246,012	381,980	701,393	631,368	197,132	155,991	5,813,977
15	1,204,345	1,747,678	587,519	257,033	537,230	250,148	279,468	67,810		4,931,231
16	3,240,360	1,499,885	1,085,582	311,203	295,484	83,325	1,048,409	269,373	2,967,161	10,800,782
17	69,565	60,440	392,104	262,312	2,643,153	1,871,418	1,464,996	803,008	279,699	7,846,695
18	2,078,706	2,251,792	247,805	240,643	949,087	1,527,266	1,154,917	1,983,557	3,549,557	13,983,330
19	2,055,509	3,233,291	151,276	141,616	177,900	2,987,247	3,008,039	1,569,389	19,242,832	32,567,099
20	5,974,761	14,168	3,291,357		4,687,950	1,272,731	3,789,038	21,022,762	1,076,613	41,129,380
21							9,604,980			9,604,980
22	10,383,948	2,217,960	303,260	280,165	682,126	4,090,675	821,809	11,370,657	5,409,462	35,560,062
23	11,388,505	1,755,308	22,701	145,736	511,173	71,788	871,125	14,510,706	467,824	29,744,866
24	1,783,111	3,557,879	194,297	230,161	139,418	61,942	1,418,599	386,411	174,799	7,946,617
25	287,992	809,756	225,142	218,232	490,670	2,571,304	317,743	115,552	612,890	5,649,281
26	508,543	2,976,779	16,616	219,305	76,498	36,362	386,539	221,676		4,442,318
27	1,536,258	2,119,020	20,706	65,021	205,079	304,650	1,003,099	879,998	715,691	6,849,522
28	14,872,129	572,973	48,921	63,604	2,619,937	4,378,509	938,083	64,093,802	180,754	87,768,712
29	10,682,997	1,377,938	85,967	463,550	666,685	17,677,623	1,775,618	17,256,084	3,435,693	53,422,155
30	1,659,548	1,855,778	153,497	330,499	493,708	6,728,655	261,917	994,544	785,690	13,263,836
31	10,116,305	829,911		126,644	1,244,857	4,963,956	834,300	7,300,520	14,600,587	40,017,080
City	229,507,730	39,321,393	10,626,103	4,910,037	25,436,967	97,471,184	54,674,394	324,342,693	90,556,739	876,847,240

Appendix B Table 2

Central and East Central Detailed Land Use Study

		Tract 17		Central Area*		East Central Area**	
		Ground Floor Area	Total Floor Area	Ground Floor Area	Total Floor Area	Ground Floor Area	Total Floor Area
100 OPEN AREAS	Total	806,145	807,745	1,413,085	1,414,685	86,400	86,400
130 Recreation		279,700	279,700	382,675	382,675	0	0
160 Vacant Land		526,445	528,045	1,030,410	1,032,010	86,400	86,400
200 RESIDENTIAL	Total	497,190	1,600,275	2,669,542	5,633,882	408,425	842,425
210 Single Family		15,085	22,605	177,640	241,935	25,800	30,900
220 Two Family		53,580	75,780	391,775	583,255	118,025	192,025
230 Three Family		60,440	91,140	578,095	664,580	199,000	449,100
240 Multi Family		226,755	709,890	996,452	2,583,327	54,400	144,000
250 Rooming House		141,330	700,860	525,580	1,560,785	11,200	26,400
300 OFFICE	Total	219,980	1,470,160	326,690	1,754,670	9,400	63,225
310 Finance, Insurance and Real Estate		135,985	609,115	145,310	622,890	0	0
320 Professional		18,930	520,390	68,395	580,405	4,000	6,900
330 General		65,065	340,655	112,985	551,375	5,400	56,325
400 COMMERCIAL	Total	1,524,970	3,303,545	2,090,750	3,958,370	16,000	16,000
RETAIL SALES	Sub-Total	1,046,810	2,210,015	1,307,120	2,517,075	16,000	16,000
410 Food and Beverages		253,240	312,030	390,520	455,610	16,000	16,000
420 Apparel		204,215	367,645	217,880	381,310	0	0
430 Household		186,630	363,525	249,485	465,390	0	0
440 General Merchandise		241,200	938,300	248,585	945,685	0	0
450 Specialty (shops)		161,525	228,515	200,650	269,080	0	0
RETAIL SERVICES	Sub-Total	478,160	1,093,530	783,630	1,441,295		
460 Personal		106,115	232,520	160,670	288,025	0	0
470 Recreational		67,725	206,550	67,725	206,550	0	0
480 Miscellaneous		45,510	352,680	65,825	396,500	0	0
490 Automobile Sales and Services		258,810	301,780	489,410	550,220	0	0
500 TRANSPORTATION, UTILITIES, COMMUNICATIONS	Total	1,532,256	2,875,571	2,197,202	4,288,515	262,700	262,700
511-514 Commercial		605,481	1,919,761	829,542	2,891,820	252,000	252,000
515-516 Public		348,555	348,555	383,265	383,265	1,800	1,800
517-519 Private and Other		163,545	163,545	432,835	432,835	8,900	8,900
530 Terminal Facilities		413,055	438,240	549,940	575,125	0	0
540 Utilities and Communications		1,620	5,470	1,620	5,470	0	0
600 INDUSTRIAL	Total	1,099,205	3,544,815	2,089,245	5,227,840	293,400	412,300
610 Wholesaling and Distribution		313,215	577,545	601,035	934,770	124,300	135,500
620 Storage and Warehousing		256,000	1,083,115	318,125	1,289,085	13,400	88,700
630 Contact Construction and Industrial Services		40,250	64,925	139,235	167,210	46,900	47,700
640-660 Manufacturing		489,740	1,819,230	1,030,850	2,836,775	108,800	140,400
700 INSTITUTIONAL	Total	797,650	1,894,135	2,081,360	4,135,310	72,400	120,900
710 Private Education		11,475	25,365	120,475	222,725	0	0
720 Public Education		107,020	212,570	332,265	632,465	39,200	57,900
730 Quasi-public		279,920	696,760	638,480	1,493,300	24,000	43,200
740 Residential Institution		159,770	265,080	263,530	447,855	9,200	19,800
750 Public Administration		100,910	424,195	107,210	465,445	0	0
760 Public Service		138,555	270,165	619,400	873,520	0	0
800 VACANT STRUCTURES	Total	236,315	241,681	465,845	905,436	22,600	101,700
GRAND TOTAL		6,713,711	15,737,927	13,333,719	27,318,708	1,171,325	1,905,650

* includes tract 17 and parts of tracts 5, 13, 14, 15, 16, 18, 22, 24, and 25. (see Map 5.2, page 74)

** includes portions of tracts 5 and 19.

Appendix B Table 3

Net and Gross Area of City by Census Tracts*
(millions of square feet)

Census Tract	Gross Tract Area	CRUDE ESTIMATES			ADJUSTED GROSS minus:		Corrected 1961 Net Land Use
		Streets & Railroads	Major Water Bodies	Water plus Streets & Railroads	Corrected 1961 Net Land Use	Water plus Streets & Railroads	
column:	1	2	3	4	5	6	7
1	61.90	6.54	.32	6.86	9.50	55.04	52.40
2	43.73	5.27	.03	5.30	4.87	38.43	38.86
3	20.57	4.17		4.17	4.68	16.40	15.89
4	36.22	4.24		4.24	3.89	31.98	32.33
5	36.60	4.30	9.10	13.40	16.03	23.20	20.57
6	68.87	5.57	.19	5.76	7.40	63.11	61.47
7	92.74	5.92	.90	6.82	7.64	85.92	85.10
8	44.23	5.55	.10	5.65	6.75	38.58	37.48
9	35.03	3.81	1.55	5.36	9.02	29.67	26.01
10	75.75	4.82	4.25	9.07	16.25	66.68	59.50
11	24.42	4.12		4.12	4.26	20.30	20.16
12	13.86	2.63	.38	3.01	2.95	10.85	10.91
13	8.08	1.62		1.62	1.68	6.46	6.40
14	7.87	1.88		1.88	2.06	5.99	5.81
15	6.39	1.59		1.59	1.46	4.80	4.93
16	13.46	2.78		2.78	2.66	10.68	10.80
17	12.30	3.56		3.56	4.45	8.74	7.85
18	18.56	4.04		4.04	4.58	14.52	13.98
19	35.59	3.84		3.84	3.02	31.75	32.57
20	47.77	4.35	2.19	6.54	6.64	41.23	41.13
21	9.81				.21	9.81	9.60
22	49.15	7.16	4.22	11.38	13.59	37.77	35.56
23	39.40	6.56	.43	6.99	9.66	32.41	29.74
24	11.22	2.66		2.66	3.27	8.56	7.95
25	7.84	2.38		2.38	2.19	5.46	5.65
26	6.75	1.56		1.56	2.31	5.19	4.44
27	8.58	1.95		1.95	1.73	6.63	6.85
28	99.52	8.32	1.22	9.54	11.75	89.98	87.77
29	60.90	6.21	.90	7.11	7.48	53.79	53.42
30	20.63	3.54	.41	3.95	7.37	16.68	13.26
31	53.63	5.03	3.05	8.08	13.61	45.55	40.02
	1,071.37*	125.97*	29.24	155.21	192.96*	916.16*	878.41*

* Notes on this table will be found on the following pages.

Notes on Appendix B, Table 3: Net and Gross Area of City by Census Tracts

In the design of the 1961 Land Use Survey, major water bodies in parks and other public land were to be measured as part of the public acreage surrounding them. Other major water bodies as well as streets and railroads were intentionally omitted from the tabulations. Gross areas of census tracts were planimetered and the difference between the sum of the net land use acreages and the sum of the gross tract areas was taken as equivalent to the area in streets, railroads, and water. This "single-entry" tabulation of land use permitted gross errors to go unchecked. In future land use surveys, it is proposed to use a "double-entry" tabulation similar to that given in Table 3, but maintaining better control of errors by measuring both net and gross block areas and adjusting to the accepted gross area of the city.

The gross area of the city was determined by the city Engineering Department in 1933 to amount to 38.491 square miles. Following a court decision in 1941, adjusting the Worcester--West Boylston boundary, the gross city area was reduced to 38.430 square miles (24,595.27 acres or 1,071,370,000 square feet). Accepting this as the gross area of Worcester, all other areas are measured to sum to within 3 percent of this figure and then adjusted to it.

In 1963, using the Official Map (scale: 1000 feet = 1 inch), each census tract was planimetered several times. The sum of the means of these measurements was smaller than the accepted city area by 2.555+ percent of the former. The mean of such tract was then increased by 2.555 percent and rounded to total the city area. These adjusted means are tabulated in column 1 of Table 3. Columns 2, 3, and 4 are estimates for each tract of, respectively, streets and railroads, major water bodies, and the sum of these two. These are very crude estimates and were developed in order to find and reduce the gross errors which were still included in the land use tabulations at the time when they were published in preliminary form in the *Sketch Plan for Worcester, Massachusetts, 1963*. Column 5 is the difference between gross (column 1) and corrected net (column 7) areas. Column 6 is the difference between the estimated totals of land in streets, railroads, and major water bodies and the adjusted gross. The figures in columns 5 and 6 are extremely tenuous and unreliable; they are included only for comparison with columns 4 and 7, respectively, which are presently the Planning Department's best estimates of area in major water bodies, streets, and railroads on the one hand and net land use area on the other.

Some of the differences between these pairs of figures are large (over three million square feet in Tracts 9 and 30 and over five million in Tract 31;)some are remarkably small (100,000 to 150,000 square feet or 20 to 30 small house lots in Tracts 11, 15, 16, and 20). The data does not permit any precise conclusions as to whether or not there is any significance in either the close correspondences or the large differences because of the disparate nature of the figures compared.

Except for the adjustment of the gross tract areas to the area of the city, no other adjustments of these figures have been made as there is no possible justification for bringing them into balance. On the other hand, the corrected totals of the 1961 Land Use Survey (column 7) are the sums of the individual land uses which will be used until a newer survey is completed. The difference between columns 1 and 7 (column 5) then becomes, in effect, the sum of streets, railroads and water bodies.

This residual figure cannot be defended as in any way consistent or accurate as a study of this table will plainly demonstrate, but it may be used until better data has been developed. The adjusted gross tract areas and the city total area to which they are adjusted are considered as sufficiently reliable for any planning purpose. Until a large-scale photogrammetrically-controlled base map of the city is available, a more reliable and internally consistent set of gross tract areas cannot be expected.

A P P E N D I X C

TRANSPORTATION TABLES

Appendix C Table 1

Average Daily Traffic Volumes Adjusted to 1960

Segment Measured			
Street	From	To	24-hour Volume
Aldrich	High	Chestnut	5,684
Austin	High	Main	4,060*
Ballard	Providence	Millbury	11,882
Belmont	Lincoln Square	Fountain	14,625
	Skyline Drive	Shrewsbury	12,267
	Shrewsbury (Street)	Plantation (eastbound)	12,101
	Shrewsbury (Street)	Plantation (westbound)	12,437
	Plantation	Lake Avenue (eastbound)	14,625
	Plantation	Lake Avenue (westbound)	15,552
	Lake Avenue	Shrewsbury Town Line	37,022
Beverly Road	Lincoln	Rexhame Road	3,216
Boylston	Lincoln	Great Brook Valley Ave.	14,390
	Great Brook Valley Ave.	Shrewsbury Town Line	9,086
Brattle	Holden	Holden Town Line	2,360
Bridge	Foster	Front	861
Burncoat	Lincoln	Millbrook	10,038
	Millbrook	Randolph Road	11,630
	Randolph Road	East Mountain	8,640*
Cambridge	Main	Fremont	13,332
	Fremont	Southbridge	14,336
	McKeon Road	Brosnihan Square	15,227
Canterbury	Cambridge	Grand	4,302
	Grand	Hammond	5,520
Central	Main	Commercial	4,154
	Commercial	Summer	5,320*
Chandler	Main	Murray Avenue	18,132*
	Murray Avenue	Park Avenue	19,119
	Park Avenue	June	10,212
	June	May	6,774
	May	Mill	7,360
	Mill	Pleasant	6,823
Chatham	Main	High	4,311*
Chestnut	Lancaster	Elm	15,294
	Elm	Pearl	16,644*
	Pearl	Pleasant	12,741
	Pleasant	Chatham	5,098
Commercial	Front	Mechanic	6,672
	Mechanic	Foster	5,647
	Foster	Exchange	7,725
	Exchange	Central	6,608
	Central	School	5,300

* Count taken after 1960.

(Appendix C Table 1 continued- Average Daily Traffic Volumes Adjusted to 1960)

Street	From	To	24-hour Volume
Concord	Prescott	Salisbury (westbound)	6,202
East Central	Mulberry	Shrewsbury	6,189
Endicott	Harding	Millbury	3,333
	Millbury	Ward	5,186
	Ward	Vernon	4,803
Elm	Main	Chestnut	5,570*
	Chestnut	West	6,459
Ernest Johnson Tunnel Expressway	School	Concord	6,680*
	Grafton	Shrewsbury (northbound)	6,730
	Shrewsbury St. off-ramp		1,177
	Belmont St. off-ramp		6,298
	Belmont St. on-ramp		3,993
	Water St. off-ramp		4,589
Exchange	Main	Commercial	3,571
	Commercial	Union	1,122
Federal	Main	Portland	2,681
Flagg	Pleasant	Salisbury	5,647
Forest	Salisbury	Grove	9,590
Foster	Main	Commercial	6,699*
	Commercial	Union	6,459
Franklin	Main	Portland	9,369
	Portland	Salem Square	15,625
	Salem Square	Trumbull	14,021
	Green	Harding	10,586*
	Harding	Grafton	14,479
	Grafton	Suffolk	10,335
	Suffolk	Plantation	7,590
Fremont	Webster	Cambridge	2,644
Front	Main	Commercial	17,875*
	Commercial	Salem Square	18,822*
	Salem Square	Trumbull	14,893
	Trumbull	Harding	13,479
Gold Star Blvd.	Grove	Millbrook	17,964
	Millbrook	Ruthven Avenue	16,651
	Ruthven Avenue	Neponset	13,894
Grafton	Washington Square	Franklin	18,087
	Franklin	Posner Square	14,898
	Posner Square	Expressway ramp	21,513*
	Expressway ramp	Billings Square	13,791
	Billings Square	Rice Square	8,511
	Rice Square	Southwest Cutoff	10,148
	Southwest Cutoff	Millbury Town Line	8,959
Green	Winter	Kelley Square	11,755*
Greenwood	Millbury	Southwest Cutoff	7,348

(Appendix C Table 1 continued - Average Daily Traffic Volumes Adjusted to 1960)

Street	From	To	24-hour Volume
Grove	Wheaton Square	Lancaster	9,740
	West Boylston	Park Ave. (southbound)	15,923
	West Boylston	Forest	3,646
	Holden	Holden Town Line	5,106
Hamilton	Grafton	Delmont Avenue	10,215
	Commonwealth Avenue	Lake Avenue	5,483
Harding	Front	Franklin	14,715
	Franklin	Winter	18,418
	Winter	Kelley Square	8,980*
	Kelley Square	Endicott	6,680*
	Endicott	Quinsigamond Avenue	5,284
Harrison	Waverly	Barclay	1,490
Harvard	Morris Square	Institute Road	8,600*
Hermon	Main	Southbridge	3,678
	Southbridge	Lamartine	1,621
Heywood	Winthrop	Massasoit Road	7,467
Highland	Main	Harvard	2,290
	Harvard	Lancaster	6,981
	Lancaster	West	11,877
	West	Park Avenue	9,410
	Park Avenue	Pleasant	10,646
Holden	Grove	Brattle	4,713
	Brattle	Holden Town Line	3,362*
Hope Avenue	Southbridge	Webster	5,622
Houghton	Grafton	Heywood	2,187*
Institute Road	Salisbury	Tuckerman	7,949*
	Tuckerman	Lancaster	3,730
	Lancaster	Park Avenue	1,142
Irving	Chatham	Chandler	6,690
Lafayette	Southbridge	Quinsigamond Avenue	6,111
	Quinsigamond Avenue	Washington	2,336
Lake Ave. North	Belmont	Natural History Road	5,522
Lamartine	Harding	Hermon	3,079
	Hermon	Quinsigamond Avenue	2,895
Lancaster	Grove	Salisbury	5,050
	Salisbury	Institute Road	11,510
	Highland	Morris Square	9,282
Laurel	Summer	Eastern Avenue	1,642
Lincoln	Lincoln Square	Concord (northbound)	5,654*
	Concord	Catherine	21,231
	Catherine	Burncoat	21,545
	Burncoat	Melrose	10,162
	Melrose	Beverly Road	15,270
	Beverly Road	Trinity Avenue	12,344
	Trinity Avenue	Boylston	14,735
	Boylston	Plantation	13,157
	Plantation	Shrewsbury Town Line	7,283

(Appendix C Table 1 continued - Average Daily Traffic Volumes Adjusted to 1960)

Street	From	To	24-hour Volume
Lincoln St.			
Bypass	Summer	Lincoln	5,261*
Lovell	Park Avenue	May	4,299
Madison	Main	Southbridge	17,380*
	Southbridge	Gold	15,915*
	Gold	Kelley Square	14,490*
Main	Lincoln Square	School (southbound)	11,049*
	Lincoln Square	School (northbound)	6,016*
	School	Central	15,300
	Central	Foster	17,603*
	Pearl	Pleasant	15,601*
	Pleasant	Franklin	20,987*
	Franklin	Chatham	24,806*
	Southbridge	Chandler	17,237*
	Chandler	May	14,245
	May	Webster Square	12,628
	Mill	Gardner Square	16,067*
	Gardner Square	Young	18,562*
	Ludlow	Leicester Town Line	12,498
Malden	West Boylston	W. Boylston Town Line	5,219
Maple	Main	Maple Terrace	1,270*
Maple Terrace	Maple	Walnut	1,270*
Massasoit Road	Rice Square	Heywood	6,563
	Blithewood Avenue	Southwest Cutoff	2,625
May	Park Avenue	June	5,566
McKeon Road	Riverside	Millbury	7,256
Mechanic	Main	Norwich	3,710
	Norwich	Commercial	4,850
	Commercial	Bridge	5,190
Mercantile	Front	Mechanic	1,200
Mill	Main	Park Avenue	11,874*
	Park Avenue	June	5,022
	June	Chandler	3,728
Millbrook	Burncoat	Byron Road	7,931
Millbury	Kelley Square	Endicott	6,297*
	Endicott	Ashmont Avenue	4,728*
	Brosnihan Square	Vernon	13,297
	Vernon	Millbury St. south	10,410
	Millbury St. south	Greenwood	5,340
	Greenwood	Millbury Town Line	13,449
Mountain St.			
East	West Boylston	Burncoat	3,260
	Burncoat	Briar Lane	3,951
	Briar Lane	W. Boylston Town Line	3,296

(Appendix C Table 1 continued - Average Daily Traffic Volumes Adjusted to 1960)

Street	From	To	24-hour Volume
Murray Avenue	Austin	Chandler	5,750
	Chandler	Wellington	4,740
	Wellington	Piedmont	3,795
Myrtle	Main	Southbridge	4,834
	Southbridge	New Salem	6,309*
New Salem	Franklin	Myrtle (southbound)	2,983*
	Franklin	Myrtle (northbound)	8,634*
	Myrtle	Salem St. Relocation (southbound)	3,432*
	Myrtle	Salem St. Relocation (northbound)	7,050*
	Salem Street Relocation	Hermon	11,061*
Norwich	Mechanic	Foster	3,120
Park Avenue	Grove	Salisbury	22,948
	Salisbury	Highland	22,529
	Highland	Pleasant	24,098
	Pleasant	Chandler	25,200
	Chandler	May	24,750
	May	Mill	22,283
	Mill	Main	21,263
Pearl	Chestnut	Main	4,897*
Plantation	Hamilton	Franklin	7,200
	Franklin	Belmont	14,400
	Belmont	Natural History Road	4,081
	Natural History Rd.	Lincoln	7,797
Pleasant	Main	Chestnut	8,446*
	Chestnut	West	8,750
	West	Park Avenue	12,994
	Park Avenue	Highland	7,912
	Highland	Chandler	10,912
	Chandler	Paxton Town Line	5,796
Portland	Federal	Myrtle	3,066*
Providence	Heywood	Ballard	7,576
Quinsigamond Ave.	Lafayette	Endicott	10,716
Randolph Road	Burncoat	Bourne	4,709
Salem Street Relocation	New Salem	Southbridge	7,762
Salem Square	Front	Franklin	11,600
Salisbury	Lincoln Square	Institute Road	23,138
	Wheaton Square	Tuckerman	12,532*
	Lancaster	Park Avenue	11,200
	Park Avenue	Forest	13,990
	Forest	Flagg	8,086
School	Main	Commercial	4,240

(Appendix C Table 1 concluded - Average Daily Traffic Volumes Adjusted to 1960)

Street	From	To	24-hour Volume
Seymour	Millbury	Ward	1,642
Shrewsbury	Washington Square	Central (eastbound)	9,621
	Washington Square	Central (westbound)	9,219
	Central	Belmont (eastbound)	9,307
	Central	Belmont (westbound)	7,264
Skyline Drive	Belmont	Lincoln	4,087
South Ludlow	Ludlow	Auburn Town Line	6,874
Southbridge	Main	Myrtle	7,244*
	Myrtle	Madison	9,716*
	Madison	Salem St. Relocation	8,988*
	Salem St. Relocation	Hermon	11,290*
	Hermon	Hammond	21,796
	Riverside	Hope Avenue	14,770
Southwest Cutoff	Millbury	Massasoit Road	13,632
Stafford	Main	Curtis Parkway	13,628
	South Ludlow	Leicester Town Line	2,110
Summer	Lincoln Square	Lincoln Street Bypass	7,812
	Lincoln Street Bypass	East Central	21,649
	East Central	Shrewsbury	20,559
Sunderland Road	Grafton	Lake Avenue	5,711
	Lake Avenue	Southwest Cutoff	7,398
Thomas	Main	Summer	1,715
Trumbull	Franklin	Front	6,000
Union	Lincoln Square	School	3,577
	School	Central	2,822
	Central	Mechanic	3,303
Vernon	Kelley Square	Expressway Ramp	16,250*
	Winthrop	Millbury	6,808
Walnut	Main	Chestnut	2,500*
Ward	Millbury	Seymour	1,560
Water	Kelley Square	Harrison	5,380*
	Harrison	Posner Square	5,631*
Webster	Hope Avenue	Webster Square	8,107
Wellington	Main	Murray Avenue	3,706*
West	Pleasant	Highland	4,921
Winter	Harding	Grafton	13,201*
West Boylston	Grove	West Boylston Drive (southbound)	19,496
	West Boylston Drive	Bourne (northbound)	11,748
	West Boylston Drive	Bourne (southbound)	10,813
	Bourne	Malden	19,065
	Malden	West Boylston Town Line	12,788

* Count taken after 1960.

Appendix C Table 2

Average Operating Speeds, 1960

STREET	AVERAGE SPEED MAINTAINED	
	OFF PEAK MPH	PEAK MPH
Ballard	31	27
Belmont	23	21
Boylston	32	32
Cambridge	21	16
Central	15	15
Chandler	23	20
Chestnut	22	11
East Mountain	No Data	No Data
Forest	33	27
Front	9	8
Gold Star Boulevard	36	31
Grafton: - Posner Square - Town Line	25	22
Green	12	10
Grove: - Lincoln Square to Park Avenue	21	16
Forest to Holden Town Line	36	22
Harvard	34	27
Highland	21	15
Hope	27	27
Lincoln	26	21
Madison	18	15

(Appendix C Table 2 -- Average Operating Speeds, 1960 -- continued)

STREET	AVERAGE SPEED MAINTAINED OFF PEAK MPH	PEAK MPH
Main: - Lincoln Square - Wellington	11	12
Wellington to Gardner Square	16	13
Gardner Square to Town Line	29	26
Mill: - Main to Park Avenue	15	18
Millbury: - Kelley Square to Brosnihan Square	19	11
Brosnihan Square - Town Line	25	25
Murray: - Chandler to Irving	14	11
New Salem	No Data	No Data
Park Avenue	23	21
Pleasant: - Main to Park Avenue	15	14
Park Avenue to Chandler	24	23
Chandler to Town Line	30	31
Salisbury	20	19
Shrewsbury	23	22
Southbridge	19	17
Southwest Cut-off	No Data	No Data
Summer	17	11
Union	14	17
Vernon	24	19
Webster	29	28
West Boylston	29	27
West Mountain	No Data	No Data

Appendix C Table 3

Widths of Arterial Streets

STREET	SECTION LOCATION	RIGHT OF WAY FEET	PAVEMENT FEET
Ballard		60	40
Belmont:	Summer - Shrewsbury	60	40
	Shrewsbury - Lake Avenue	100	31 each direction
Boylston		80	60
Cambridge:	Webster Square - Saugus Place	50	33-1/3
	Saugus - Fremont	60	40
	Fremont - Kansas	50	33-1/3
	Kansas - Quinsigamond Avenue	40	26-2/3
Central:	Main - Summer	varies 60-41	
	Summer - Shrewsbury	widens at bridge 49.5	32
Chandler:	Main - Park Avenue	80	
	Park Ave. - Pleasant	widens at State Teachers College 60	40
Chestnut:	(Western Artery) northbound		
	Austin - Chatham	52	40
	Chatham - Pleasant - southbound	59	43
	Chandler - Austin	38.5	24±
	Austin - Chatham	49.5	41±
	Remainder - north & southbound	50	40
East Mountain		40 - 66+	24 - 40±
Forest		50	30
Front:	Harding - Eaton Place	65	43
	Eaton Place - Main	varies 65-120	varies 43-92
Gold Star Boulevard		60	40

(Appendix C Table 3 -- Widths of Arterial Streets -- continued)

STREET	SECTION LOCATION	RIGHT OF WAY FEET	PAVEMENT FEET
Grafton:	Washington Square - Penn Ave.	60	42±
	Penn Ave. - Barclay	83	66-1/3
	Barclay - Billings Square	66	49-1/3
	Hale - Rice Square	50	33-1/3
	Rice Square - City Line	75	53±
Green		varies 70±	46±
Grove:	Salisbury - Park Avenue	60	43-1/3
	Chadwick - Forest	49.5	33
	Forest - Holden Town Line	60	43-1/3
Harvard:	(See Chestnut Street)	50	40
Highland:	Lincoln Square - Lancaster	50	32
	Lancaster - Pleasant	60	40
Hope		80	48
Lincoln		66	44
Madison:	Main - Southbridge	70	46-2/3
	Southbridge - Gold	50	33-1/3
	Gold - Green	80	58
Main:	Lincoln Square - School	lower level 44	34
	School - Myrtle	varies 98-65	70-42
	Myrtle - Webster Square	65	42
	Webster Square - Park Avenue	60	44
	Gardner Square - Gates Lane	varies 55-90	39-72
	Gates Lane - Ludlow	65	48
	Ludlow - Town Line	60	44
Mill:	Main - Park Avenue	80	58
	Coes Beach - Fowler	100+	80+
	Chandler - Pleasant	33	23
	Remainder	50	33
Millbury		49-1/2	33
Murray:	Austin - Irving Place	60	42
	Irving Place - Dale	50	33-1/3
	Dale - Piedmont	41	27-2/3

(Appendix C Table 3 -- Width of Arterial Streets -- continued)

STREET	SECTION LOCATION	RIGHT OF WAY FEET	PAVEMENT FEET
New Salem		84	each direction 34
Park:	Grove - May	80	56
	May - Mill	80	52
	Mill - Main	80	60
Pleasant:	Main - West	49.5	31.5
	West - Park Avenue	varies to 70	31.52
	Park - Highland	60-80	40-60
	Highland - Town Line	60	42
Salisbury:	Lincoln Square - Forest	60	42
	Forest - Moreland	50	38
	Moreland - Town Line	70-80	50-60±
Shrewsbury:	Washington Sq. - East Worcester	80	58
	East Worcester - Belmont	100	each direction 33
Southbridge:	Main - Myrtle	49.5	33
	Myrtle - Jackson	60	44±
	Jackson - Quinsigamond	49.5 - 45	33±
	Quinsigamond - 260' no. of Hammond	60	44±
	No. of Hammond-160' no. of Gladstone	66	40±
	Gladstone - Cambridge	45	30±
	Cambridge - Riverside	60	44±
	Riverside - Town Line	49.5	33±
Southwest Cut-off		85±	
Summer		60	40
Union		40	26-2/3
Vernon:	Most of street	50	33-1/2
	Dorchester - Endicott	42	28-2/3

(Appendix C Table 3 -- Width of Arterial Streets -- concluded)

STREET	SECTION LOCATION	RIGHT OF WAY FEET	PAVEMENT FEET
Webster	Main - Hope Cemetery Entrance	49-1/2	33
	Hope Cemetery Entrance - Hope Ave.	65	45
West Boylston:	Chadwick Sq. - W. Boylston Drive	60	40
	Neponset - Andover	67-80	51-60
	Andover - New Bond	67-55	51-38
	New Bond - Airlie	65-85	49-65
	Airlie - Town Line	50	33-40
West Mountain:	West Boylston - Brooks	60	40±
	Brooks - Holden Town Line	66	46±

Appendix C Table 4

General Standards of Highway Classification*

E x p r e s s w a y (Local usage; equivalent to AASHO *freeway* classification)

1. Access
   Fully controlled access; cross streets either passing over or terminated
2. Minimum desirable speed
   Off-peak, 35-50 mph; peak, 35 mph
3. Traffic lanes
   Four and up, each at least 12 feet wide
4. Medians
   Minimum, 20-foot width (expressway 2- to 3-foot inner shoulders and 12 feet raised)
5. Outer separations
   a. Shoulders or emergency parking lanes
      Not less than 10 feet
   b. Widths of outer separations
      Normally, less than 35 feet
   c. Landscape development
      All slopes and other neutral areas within the outer separation, if possible, should have vegative cover:
      breaks in slopes and swales should be well rounded:
      appropriate tree and shrub planting should be used when feasible
6. Frontage roads
   Should be one-way
7. Right-of-way
   It is neither practicable nor necessary to maintain a uniform width right-of-way
8. Underpass
   Vertical clearance at least 14 feet with an additional 4 inches or more for future resurfacing (Interstate vertical clearance requirements now 17 feet)
9. Depressed Expressway ("Freeway") Width of Right-of-Way Including Frontage Roads

	4 Lanes	6 Lanes
Desirable, with ramps	315-375'	340-400'
Restricted, with ramps	225-260'	250-285'
Restricted, without ramps	105-140'	130-165'

* American Association of State Highway Officials, *A Policy on Arterial Highways in Urban Areas,* AASHO, Washington, 1957.

(Appendix C Table 4 -- General Standards of Highway Classification - continued)

10. Elevated Expressway ("Freeway") Width of Right-of-Way Including Frontage Roads

	4 Lanes	6 Lanes
Two-way with parallel ramps	137-198'	161-222'
Two-way without ramps	76-97'	88-121'
One-way with parallel ramps	88-115'	100-127'
One-way without ramps	66'±	78'±

11. At Grade Expressway - Width of Right-of-Way Including Frontage Roads

	4 Lanes	6 Lanes
Desirable	250'±	275'±
Restricted	135'±	160'±

A r t e r i a l (Including Secondary Arterial)

1. Access
   No control, however, side street and driveway connections are minimized
2. Minimum desirable speed
   Off-peak, 25-35 mph; peak, 25 mph
3. Traffic lanes
   See next table
4. Medians
   Desirable but not essential; if possible, the median should be a curbed section 14 feet wide as a minimum; if no median is possible, a "barrier" centerline strip should be marked
5. Outer separations
   a. Shoulders or parking lanes 10 feet wide
   b. Borders
      Total area desirable 12 feet wide with minimum of 8 feet with minimum sidewalk width of 4 feet
   c. Landscape development
      The remainder of the outer separation after sidewalk width is considered should be used, wherever possible, as a green belt
6. Right-of-way
   See next table
7. Intersections
   a. Channelization
   b. Intersection control
      Stop sign; signal control; or grade separation
   c. Sight control
      Without parking, 180-220 feet on the left, 200-280 feet on the right; with parking, 100 feet on the left, 70 feet on the right

(Appendix C Table 4 -- General Standards of Highway Classification - concluded)

C o l l e c t o r

1. Access
   No control; normally at reasonable intervals, intersections usually not greater than 1000 apart
2. Minimum desirable speed
   Off-peak, 20-25 mph; peak, 20 mph
3. Traffic lanes
   Two lanes, each 10 feet wide
4. Medians
   Painted centerline
5. Outer separations
   a. Shoulders or parking lanes 10 feet wide
   b. Borders
      Total area 10 feet wide with minimum sidewalk width of 4 feet
6. Right-of-way
   The combined right-of-way including street and sidewalks is normally 60 feet
7. Intersections
   a. Intersection control
      Stop signs if needed
   b. Angle of access streets
      Normally at right angles

L o c a l

1. Access
   No control; normally at reasonable intervals, intersections usually not greater than 1000 feet apart
2. Minimum desirable speed
   Off-peak, 20 mph; peak, 15 mph
3. Travelled way 30 feet
4. Medians
   Not required
   Borders 10 feet
   Minimum 4 foot sidewalks
5. Right-of-way
   Combined street width and area to the outside of the sidewalk is usually 50 feet
6. Intersections
   a. Intersection control: stop signs if needed
   b. Angle of access streets not less than 60 degrees

Appendix C Table 5

Minimum Cross-Section Widths

section	type of urban area	through traffic lanes			median		border		right-of-way	
		no.	width in feet*		width in feet		width in feet		width in feet	
			A	B	A	B	A	B	A	B
shoulders--no curbs	res.	2	11	12	0	0	12	20	66	84
	res.	4	11	12	0	14	8	12	80	106
curbed--no parking	com.	4	11	12	0	4	8	12	62	80
	res.	4	11	12	0	4	12	16	70	88
	com.	6	11	12	0	4	8	12	84	104
	res.	6	11	12	0	4	12	16	92	112
curbed with parking lanes	com.	4	11	12	0	4	8	12	80	98
	res.	4	11	12	0	4	12	16	88	104
	com.	6	11	12	0	4	8	12	102	122
	res.	6	11	12	0	4	12	16	110	128
divided with parking lanes**	com.	4	11	12	4	14	8	12	84	110
	res.	4	11	12	4	14	12	16	92	116
	com.	6	11	12	4	14	8	12	106	134
	res.	6	11	12	4	14	12	16	114	140
divided with frontage roads	com. or res.	4	11	12	4	14	8	12	116	150

Note: A = acceptable minimum; B = desirable minimum; Res. = residential; Com. = commercial

* 10-foot widths may be considered in special cases, but not on 2-lane streets

** Without parking lanes, deduct 20 feet from right-of-way

A P P E N D I X D

SCHOOL SITE DEVELOPMENT STANDARDS

Appendix D Table 1

School Site Development Standards
Composite*

Standards	Elementary	Junior High	Senior High
Pupil Capacity	280-300	1000	1500
Optimum Site Size	5 acres - 1 - 1	20 acres - 1 - 1	30 acres - 1 - 1
Building			
Stories	2 maximum	2 maximum	2 maximum
Classrooms	10 changeables 6 specials	26 changeables 21 specials	32 changeables 27 specials
Total Rooms	21-22	55-60	74-78
School District			
Walking Distance	1/4-1/2 mile maximum	1/2-1 mile maximum	1-1½ mile maximum
Pupils Served	280-300	1000-1200	1300-1500
Transport	For pupils living further than maximum walking distance	For pupils living further than maximum walking distance	For pupils living further than maximum distance
Administration	1 for clerical 1 for principal	4-5 rooms	5-6 rooms
Office	In office	1	1
Vault	In a combined room	1 room suite	2 room suite
Health	In a combined room	1½ rooms partitioned	3 rooms partly partitioned
Guidance	In a combined room	2 rooms	3 rooms
Teachers			
Recreation			
Gymnasium	none	76' x 96' x 22'	50' x 84' x 22' & provision for 5000 bleacher seats
Fields	1 or more	3	At least 4 all-purpose fields
Courts	1 for neighborhood use	3	9
Library	1 small room	2500 square feet	3750 square feet
Cafeteria	None	450 seating capacity	450 seating capacity
		and provision for kitchen facilities	
Auditorium	1 all purpose room	750 seating capacity	750 seating capacity
Parking**	1 space for each faculty member	1 space for each faculty member and 1 space for each 10 seats of auditorium capacity	1 space for each faculty member, 1 space for each 10 seats of auditorium capacity and 1 space for each 15 units of student capacity

* A range of standards is indicated whenever recommended

** All parking spaces will be at least 300 sq. ft. including the aisle

Appendix D Table 2

School Site Development Standards
Elementary Schools

Standards	Requirements
Pupil Capacity	280-300 units, for consolidated schools that are planned the range would be 300-580
Optimum Site Size	5 acres plus one additional acre for each additional 100 pupil units
Buildings	
Stories	2 maximum, 1 for wings
Classrooms	
-changeables	10-16*
-specials	1 - 2*
-shops	none
-homemaking	none
Total Rooms	21-22
School Districts	
Walking distance	1/4 - 1/2 mile
Pupils	The range runs anywhere from a low of 180 to a high of 600 depending on the location of the school district and the potential number of pupils in the district. The recommended range for Worcester is 300-580.
Transportation	If the distance to the school is more than 1/2 mile transportation should be provided
Districts per School	School districts should be set up to include just the pupils going to an elementary school
Administration	
Office	1 room for clerical help and separate room for the principal

* Changeables refers to rooms that serve a multiple purpose for subjects taught in these rooms.

(Appendix D Table 2 -- School Site Development Standards -- continued)

Elementary Schools

Standards	Requirements
Vault	Should be included in the office space in the elementary school
Health Office	Combined offices of the teachers rooms, guidance rooms, and the health office
Guidance	Combined as above
Teachers	Combined as above
Recreation	
Gymnasium	None
Fields	1 as the site allows
Courts	1 hard surface court for the use by neighborhood children
Library	Possiby a small one for the faculty plus periodicals for the pupils
Cafeteria	None
Auditorium	An all purpose community room that can be utilized by the public without disturbing the rest of the school.
Parking	1 car space for each faculty member of 300 square feet including consideration for the aisle

Appendix D Table 3

School Site Development Standards
Junior High Schools

Standards	Requirements
Pupil Capacity	
Optimum Site Size	20 acres plus 1 additional acre for each additional 100 pupil units
Buildings	
Stories	2 maximum, 1 for wings
Classrooms	47
-changeables	26@ 35 pupils / room
-specials	11@ 30 pupils / room
-shops	5 @ 15 pupils / room
-homemaking	5 @ 15 pupils / room
Total Rooms	55-60
School District	
Walking distance	1/2 - 1 mile
Pupils	1000-1200
Transportation	If pupils live more than 1 mile from the school
Districts per School	The number of school districts included in the area serviced by a junior high school will depend on the placing of the junior high and its capacity.
Administration	
Office	4-5 rooms, includes principal & assistant principal
Vault	1 near the administrative offices
Health Office	1 or 2 room suite with extra facilities
Guidance	1½ rooms with partitions to give privacy

(Appendix D Table 3 -- School Site Development Standards -- continued)

Junior High Schools

Standards	Requirements
Teachers	1 woman's lounge and 1 men's lounge and rest rooms for each
Recreation	
Gymnasium	76' x 96' x 22'
Fields	3 fields plus general play area
Courts	3 courts; 1 basketball, 1 tennis, 1 volleyball
Library	2500 square feet
Cafeteria	450 seating capacity plus kitchen facilities
Auditorium	750 seating capacity plus stage facilities
Parking	300 square feet per car space, includes aisle; 1 space every member of faculty, 1 space per 10 units auditorium capacity

Appendix D Table 4

School Site Development Standards
Senior High Schools

Standards	Requirements
Pupil Capacity	1300-1500
Optimum Site Size	30 acres plus one additional acre for each additional 100 pupil units
Buildings	
Stories	2 maximum, 1 for wings
Classrooms	59
-changeables	32 @ 30 pupil capacity
-specials	19 @ 25-30 pupil capacity
-shops	4 @ 15 pupil capacity
-homemaking	4 @ 15 pupil capacity
Total Rooms	74-78
School Districts	
Walking Distance	1 to 1-1/2 miles
Pupils	1300-1500
Transportation	If pupils live more than 1½ miles from the school
Districts per school	The number of school districts serviced by a high school will depend on the position of the school and the number of high schools in the city.
Administration	
Office	5-6 rooms, including principal's and assistant principal's rooms
Vault	1, off the administrative offices
Health Office	2 room suite with extra facilities

(Appendix D Table 4 -- School Site Development Standards -- continued)

Senior High Schools

Standards	Requirements
Guidance	1 standard classroom, 1 small library, and six small cubicles for conferences
Teachers	1 small common room for all teachers, 1 smaller room for women teachers, and 1 smaller room for the men teachers and rest room facilities for each
Recreation	
Gymnasium	50' x 84' x 22' basketball floor plus provision for 500 spectators seats
Fields	1 football, 1 baseball and at least 2 all purpose fields
Courts	2 basketball, 4 tennis, 1 volley ball, 2 badminton
Library	3750 square feet
Cafeteria	450 seating capacity to double as a study plus kitchen facilities
Auditorium	750 seating capacity plus stage facilities
Parking	300 square feet per car space including aisle; 1 space for every member of the faculty and 1 space per 10 units of auditorium capacity

A P P E N D I X E

STANDARD INDUSTRIAL CLASSIFICATION SYSTEM (1963)

Divisions and Major Groups of Standard Industrial Classification System (1963)

Division A. AGRICULTURE, FORESTRY AND FISHERIES

Major Group
- 01 Commercial farms
- 02 Noncommercial farms
- 07 Agricultural services and hunting and trapping
- 08 Forestry
- 09 Fisheries

Division B. MINING

Major Group
- 10 Metal mining
- 11 Anthracite mining
- 12 Bituminous coal and lignite mining
- 13 Crude petroleum and natural gas
- 14 Mining and quarrying of nonmetallic minerals(n.e.c.) except fuels

Division C. CONTRACT CONSTRUCTION

Major Group
- 15 Building construction--general contractors
- 16 Other construction--general contractors
- 17 Construction--special trade contractors

Division D. MANUFACTURING

Major Group
- 19 Ordnance and accessories
- 20 Food and kindred products
- 21 Tobacco manufactures
- 22 Textile mill products
- 23 Apparel and other finished products made from fabrics and similar materials
- 24 Lumber and wood products, except furniture
- 25 Furniture and fixtures
- 26 Paper and allied products
- 27 Printing, publishing, and allied industries
- 28 Chemicals and allied products
- 29 Petroleum refining and related industries
- 30 Rubber and miscellaneous plastics products
- 31 Leather and leather products
- 32 Stone, clay, and glass products
- 33 Primary metal products
- 34 Fabricated metal products (n.e.c.) except ordnance, machinery, and transportation equipment
- 35 Machinery, except electrical
- 36 Electrical machinery, equipment, and supplies
- 37 Transportation equipment

(Divisions and Major Groups of Standard Industrial Classification System (1963) Appendix E - continued)

Division D. MANUFACTURING (continued)

Major Group	38	Research instruments; photographic and optical goods; watches and clocks
	39	Miscellaneous manufacturing industries

Division E. RAILROAD TRANSPORTATION

Major Group	40	Railroad transportation
	41	Local and interurban passenger transportation
	42	Motor freight transportation and warehousing
	44	Water transportation
	45	Transportation by air
	46	Pipe line transportation
	47	Transportation services
	48	Communication
	49	Electric, gas and sanitary services

Division F. WHOLESALE AND RETAIL TRADE

Major Group	50	Wholesale trade
	52	Retail trade--building materials, hardware and farm equipment
	53	Retail trade--general merchandise
	54	Retail trade--food
	55	Automotive dealers and gasoline service stations
	56	Retail trade--apparel and accessories
	57	Retail trade--furniture, home furnishings and equipment
	58	Retail trade--eating and drinking places
	59	Retail trade--miscellaneous retail stores

Division G. FINANCE, INSURANCE AND REAL ESTATE

Major Group	60	Banking
	61	Credit agencies other than banks
	62	Security and commodity (contracts) brokers, dealers, exchanges and services
	63	Insurance carriers
	64	Insurance agents, brokers and service
	65	Real Estate
	66	Combinations of real estate, insurance, loans, law offices
	67	Holding and other investment companies

(Divisions and Major Groups of Standard Industrial Classification System (1963) Appendix E - concluded)

Division H. SERVICES

Major Group	70	Hotels, rooming houses, camps and other lodging places
	72	Personal services
	73	Miscellaneous business services
	75	Automobile repair, automobile services and garages
	76	Miscellaneous repair services
	78	Motion pictures
	79	Amusement and recreation services, except motion pictures
	80	Medical and other health services
	81	Legal services
	82	Educational services
	84	Museums, art galleries, botanical and zoological gardens
	86	Nonprofit membership organizations
	88	Private households
	89	Miscellaneous services

Division I. GOVERNMENT

Major Group	91	Federal government
	92	State government
	93	Local government
	94	International government

Division J. NONCLASSIFIABLE ESTABLISHMENTS

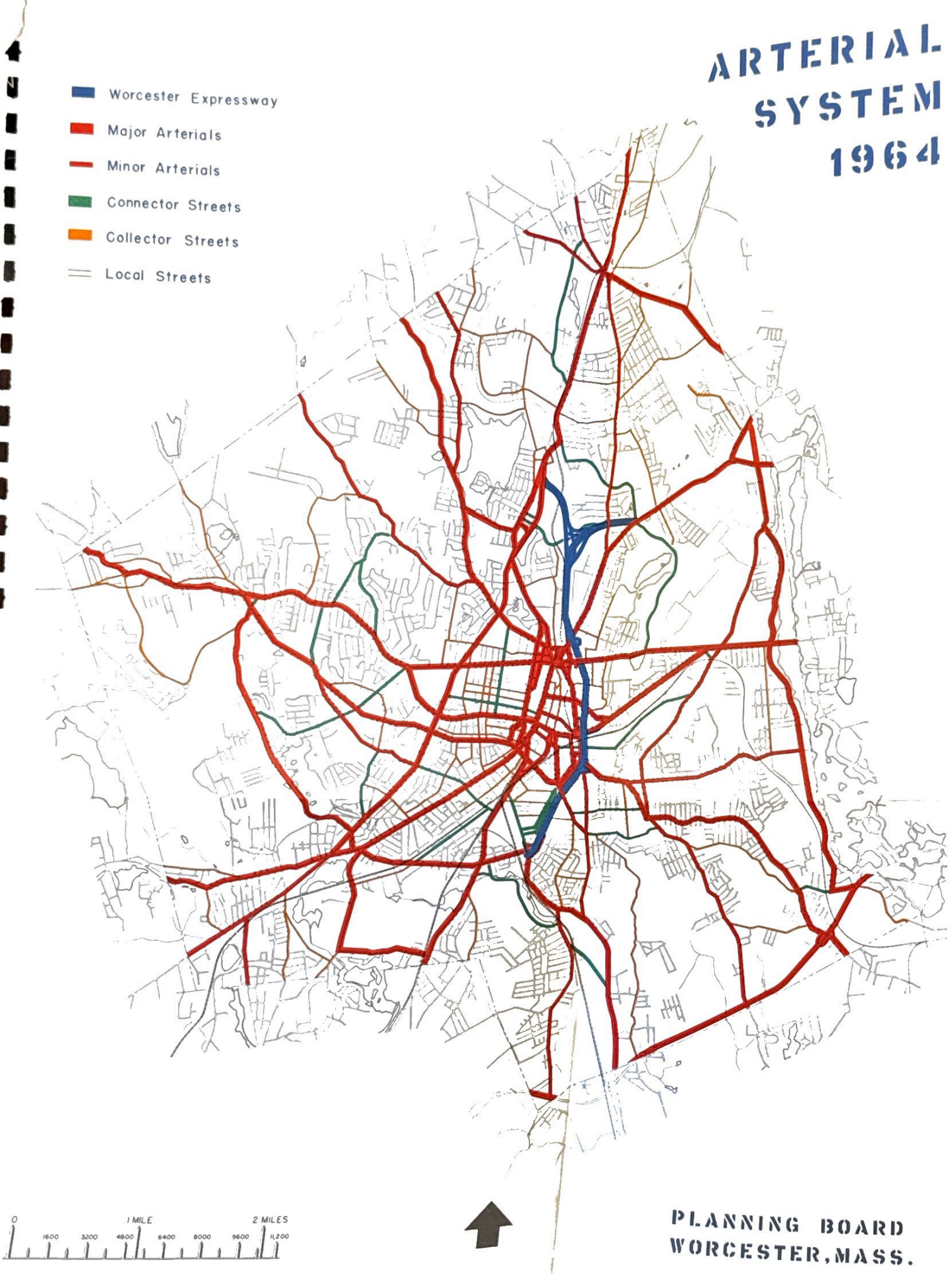
Major Group	99	Nonclassifiable establishments

n.e.c. - not elsewhere classified

COMPREHENSIVE PLAN

PLANNING BOARD
WORCESTER, MASS.

ARTERIAL SYSTEM 1964



PLANNING BOARD
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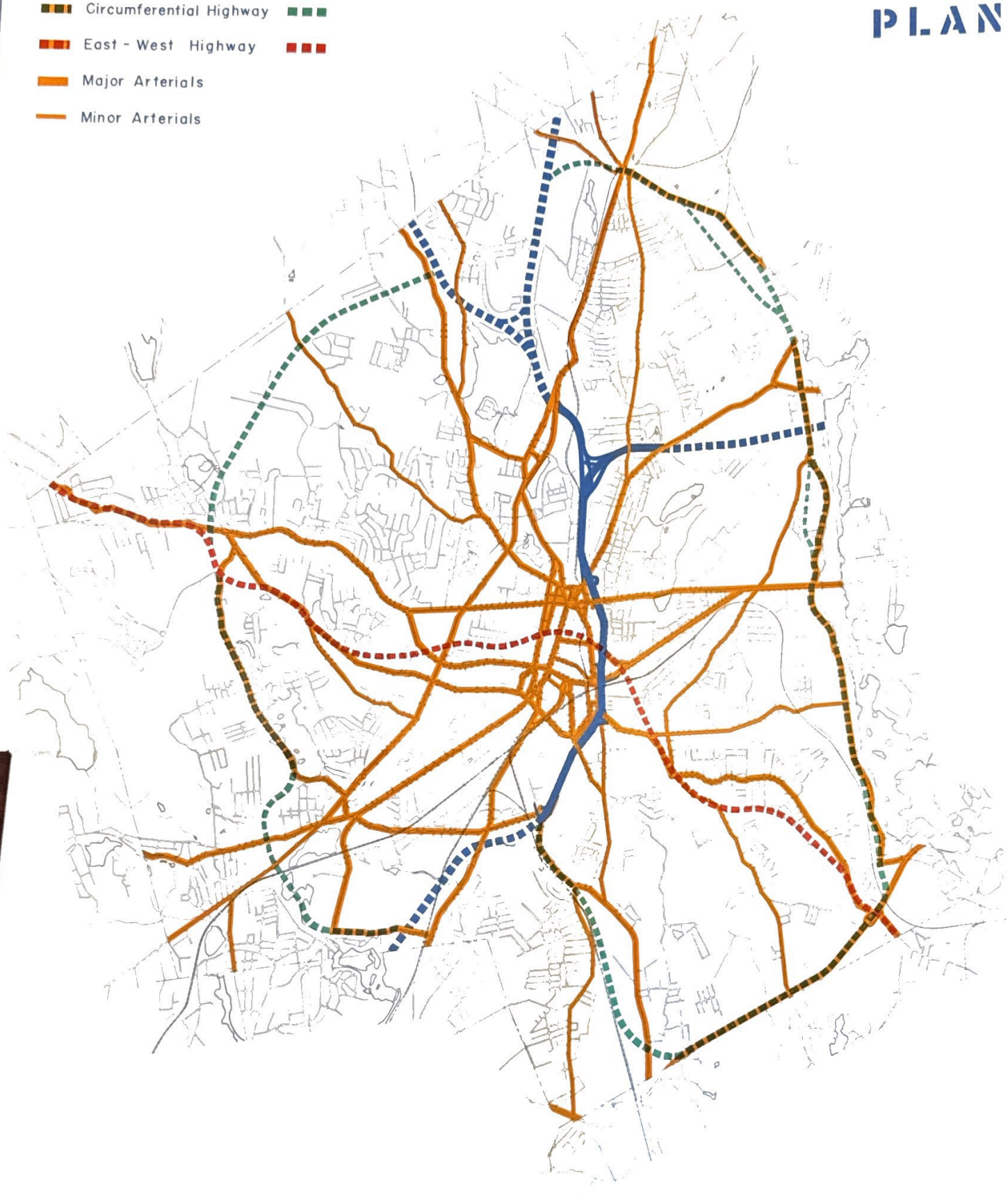
ARTERIAL PLAN

EXISTING

- Worcester Expressway
- Circumferential Highway
- East - West Highway
- Major Arterials
- Minor Arterials

PROPOSED

- Worcester Expressway
- Circumferential Highway
- East - West Highway



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GENERALIZED LAND USE 1961

- Low Density Residence
- Medium Density Residence
- High Density Residence
- General Business
- Commercial
- Institutional
- Recreation
- Cemeteries
- Sewage Plant
- Industrial
- Transportation
- Vacant

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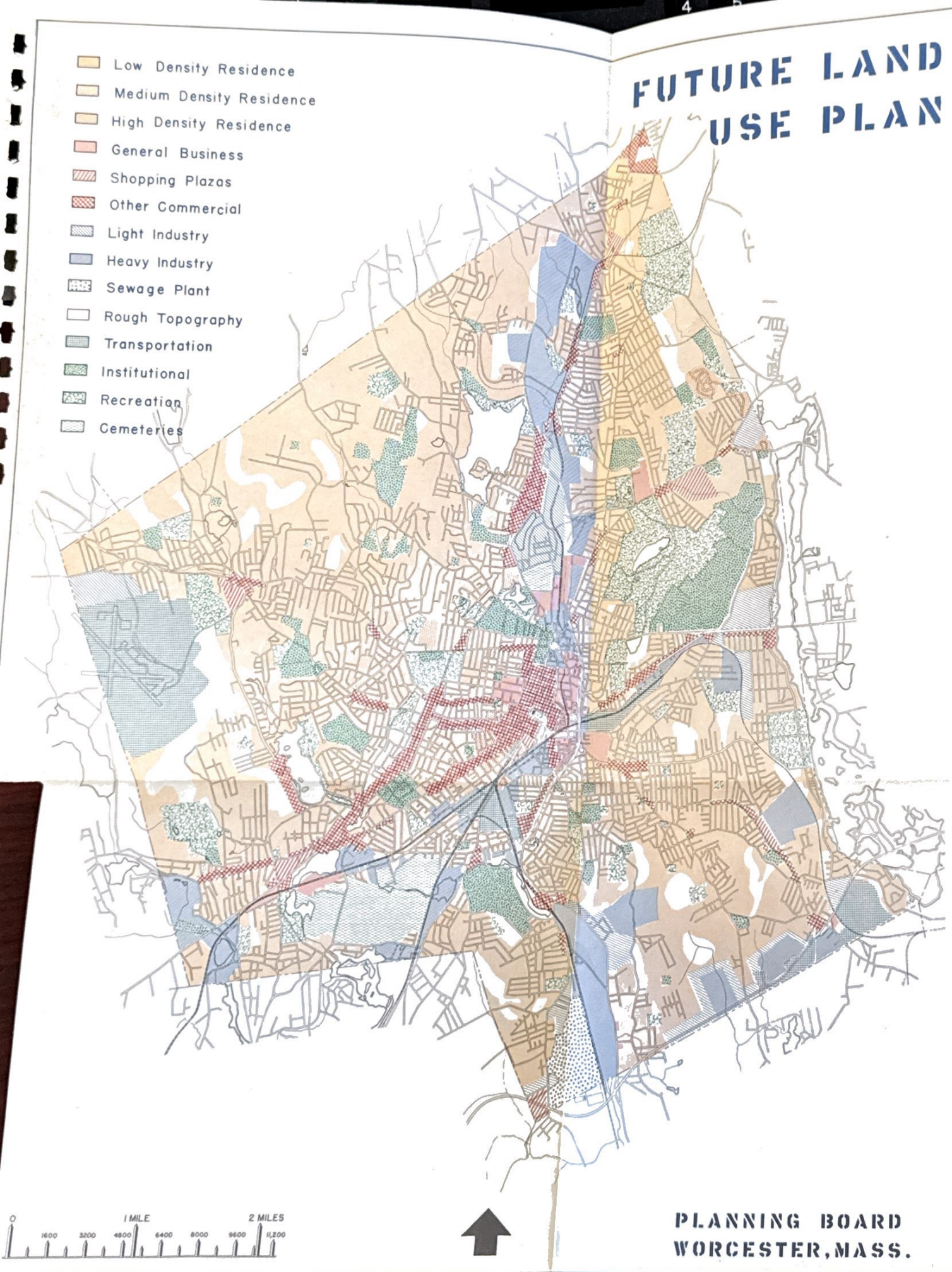
FUTURE LAND USE PLAN



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