EUGENE-SPRINGFIELD TRANSPORTATION

ALTERNATIVES

A product of the
Eugene-Springfield
Area Transportation Study

LANE COUNCIL OF GOVERNMENTS

EUGENE-SPRINGFIELD TRANSPORTATION ALTERNATIVES

September, 1975

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Abstract

Local government agencies in the Eugene-Springfield area, in cooperation with a Citizens Advisory Committee, jointly developed the information contained in this report. Under the general coordination of the Lane Council of Governments (L-COG), staff representatives from Springfield, Lane County, Eugene, Lane Transit District and the Oregon Department of Transportation, who make up the Transportation Planning Committee, jointly studied the issues involved in metropolitan transportation planning while the L-COG Citizens Advisory Committee on Transportation directly involved citizens and acted as a layman's sounding board for the process. Together the two committees identified six general scenarios meant to represent a range of transportation alternatives possible to the Eugene-Springfield area during the twenty-five years between 1975 and 2000. In developing the transportation alternatives the committees considered areawide projections of population and employment within the context of the 1990 General Plan; the alternatives were then determined by varying the modal split for various forms of public and private transportation and by varying the number of trips made in all modes by the resident population. Within the context of the separate alternatives consideration was given to a number of factors including costs, energy consumption, air pollution and noise pollution. Impacts of the alternatives on certain aspects of land usage including housing, parks, schools and sewers were also considered.

This report presents and discusses the six general transportation alternatives but does not attempt to select one of them for further development at this time as an actual master plan. Instead it is intended that this report serve as a basis for public discussion and public hearing prior to the official adoption of a single alternative by local elected officials. Following adoption the alternative selected will be refined and developed as an actual plan. It should be understood that the alternatives presented in this report are not necessarily explicit expectations. Rather, each is an arbitrary combination of circumstances, any one of which is possible for Eugene-Springfield during the next twenty-five years. The contents of this report and supplemental public testimony should together provide a direction for more deliberate, specific planning; it is hoped that the alternative eventually adopted will be tailored by the decision-making process and will thus not be limited to one of the six presented in this report.

The following is a brief characterization of each alternative investigated.

ALTERNATIVE "0" (minimum transit, no trip reductions) is the most likely future for Eugene-Springfield if current trends continue. Population is

projected to grow from 169,000 to 277,000 in the next 25 years, and the added dwellings will be located near the edge of the developed area, inside the 1990 Urban Service Area. Most of the new jobs will be associated with current industrial, government, commercial and educational areas. A few employers will locate in new areas. Sewers will be extended without unreasonable amounts of trunk resizing for Eugene and Springfield. (Since no sewer system is yet constructed to serve the unincorporated part of the metropolitan area, it is assumed that the design of that system will be appropriately sized to serve existing and projected development.) Good park sites will be increasingly hard to find that are within reasonable distance of area residents. The need for school facilities will not grow in proportion to the population because a decreasing proportion of the total population will be in the school age group. But, approximately fifteen new schools will be needed by the year 2000.

A negligible number of people will use public transit and a minimum of 37 miles of the arterial street network would require improvement to satisfy the transportation needs of metropolitan residents and nonresidents who use the area's streets. Daily vehicle miles of travel would more than double and thereby increase the barrier effects of most arterial streets. The cost of street capacity improvements is estimated to be \$69 million to be borne by public agencies. Operating costs would be borne by private individuals and grow to be \$198 per person annually by the year 2000 (assuming 16¢ per mile). Energy requirements would reach 34 billion BTU daily by the year 2000, and one byproduct would be 100 tons of pollutants on an average day. Noise emitted by the vehicles traveling this system would create objectionable noise levels along 120 miles of streets in the area. Automobiles would be able to travel during all periods of the day, but peak hour congestion on much of the system would be considerably worse and of longer duration than would be tolerated today despite the anticipated construction of 37 miles of street improvements. Goods movement via the highway system would become difficult during some periods of the day. Mobility for those people that rely on public transit would be minimal.

ALTERNATIVE 1 (10% transit) is an achievable future for Eugene-Springfield. According to this alternative, the area would grow to population of 277,000 by the year 2000, and the land use requirements would be the same as under Alternative "0." Public transit improvements experienced in the 1970-75 period would be continued through the 1975-2000 projection period. Per capita operating costs for transit would increase from \$19 annually to \$36 annually to support an express bus system fed by a collector system of smaller buses providing smallarea coverage. The increase in transit operating cost would be met by a corresponding reduction in private operating costs (relative to Alternative "0") while the total street improvement required would be 3 miles less than the minimum transit alternative.

Substituting transit trips for automobile trips would reduce the vehicle miles of travel by 4% with an accompanying 4% reduction in energy requirements. Total exhaust emission volume decreases as a result of transit substitution, but some types of emissions would increase because the emission characteristics of buses differ from automobile exhaust. Noise levels would be relatively higher adjacent to transfer stations and heavily traveled bus routes than under the minimum transit alternative. Greater mobility would be available to those persons relying on transit, and those residents with access to an automobile would be somewhat restricted compared with the heyday of the automobile. Peak hour congestion would be troublesome and last for relatively long periods for those who were once accustomed to unrestricted use of their cars. Some of the trips which residents would have previously made in their private cars would be made via transit as a result of more attractive transit system and disadvantages of using the automobile.

ALTERNATIVE 2 (10% transit, 10% trip reduction) has the same land use and population as the two previous alternatives. Transit would provide for 10% of the residents' internal trips, making the remarks related to transit under Alternative 1 fairly appropriate for Alternative 2. But in addition, this alternative specifies a 10% reduction in the number of trips per capita. It is not a prediction that this will happen, it is an examination of "what if" people were to reduce the amount of transportation they consume.

It is difficult to effect a reduction in transportation demand with public policies as long as the service is privately consumed by individuals in private automobiles. It is generally felt that the increases in mobility experienced in the last few decades have been a result of the increased availability of the private car coupled with affluence and more leisure time. The number of trips people take is more likely to be reduced by a change in these fundamental causes than to be reduced by local policy intervention. There are some signs on the horizon that indicate some changes can be expected. Limited fossil fuels without substitutes, extravagant use of hard, nonrenewable resources without significant recycling and political interference with the allocation of resources can change today's consumption patterns. The amount and kind of transportation that is acceptable and achievable will be affected by those changes. For example, a 10% trip reduction was the approximate impact of the February 1974 gasoline shortage on Eugene-Springfield. A similar trip reduction would cause comparable rearrangement in the lives of area residents. In general, these circumstances favor public consumption of transportation (public transit) to a greater extent than current conditions, making the 10% transit use more achievable.

The selection of Alternative 2 for long-range planning should be based on the belief that year 2000 conditions, largely beyond local control, will reduce trip making. If this reduction is found to be a suitable basis for facility plans, then a minimum of 25 miles of the street system will need to be improved to meet the area's transportation needs. Commensurate reductions in air pollution, energy consumption and travel costs can result from 10% fewer trips being made.

ALTERNATIVE 3 (30% transit, 10% trip reduction) represents the option with a "substantial proportion of the trips via public transit." According to this alternative the area would grow from 169,000 population to 277,000 population during the 25-year projection period. Thirty percent of the internal person trips would be made on public transit. For projection purposes, it was assumed that the land use pattern projections used for the preceding alternatives would be appropriate for Alternative 3. It was recognized that heavy reliance on public transit would be accompanied by adjustments in land use patterns that were not reflected in the land use base used for this test evaluation. Generally, cities with heavily used transit systems have more intense land development along corridors and in areas well - served by transit than cities with more personal forms of transportation. But, a land use variation projected specifically for alternatives with high levels of public transit was judged to be an over-refinement of a speculative concept. The small-area projections would not have the degree of reliability that the level of detail would imply. Therefore, the information produced to characterize Alternative 3 must be considered a degree less reliable than Alternatives "0" through 2.

Thirty percent of the person trips made by Eugene-Springfield's projected 277,000 residents would total 210,000 trips per day via public transit. This would require a 500-bus fleet at an annual operating cost of $36 million or $130 per capita during the year 2000. Such a proportion of transit ridership is higher than can be justified through a projection of current practices since it is higher than any contemporary American city of comparable size. The conditions necessary to bring about these dramatic changes in local transportation patterns are almost certainly beyond local policy and in the realm of national-global environment. A justification residents might have for supporting such a system would be to conserve $112 per person per year or save 20% of the energy that would be required if present-day practices were continued. The key is an individual's motivation to change habits growing out of a need to conserve on the increasing costs of transportation. If these economic conditions are present in the year 2000 and habits are altered, some of the adverse effects of transportation would be less than the impact of 277,000 people making automobile passenger trips with today's per capita frequency. There would also be an associated loss in mobility to those people that no longer have the economic choice of private automobile transportation.

ALTERNATIVE 4 (no new construction) was an attempt to define how the present street system could be managed, without new construction, to serve the transportation needs of Eugene-Springfield for the next 25 years. One notion was that new street construction should simply be stopped and allow streets to congest so that the intolerable traffic conditions would be a curb to the use of the private automobile. It has been experienced in other cities with adequate public transit, however, that near-chaotic conditions exist before drivers react by making fewer trips or by substantially adjusting their trip-making habits. It is inconsistent with a democratic form of government to ignore the demands for facilities to the extent necessary for this reaction to occur. Therefore, the achievement of Alternative 4 through deterrent congestion was not studied further as a part of this report.

A second notion was that dramatic economic and social changes could evolve by the year 2000 that would negate the need for added streets. This report does not address whether these conditions will be present in Eugene-Springfield in the year 2000. If, however, the local environment changes to this degree, it will not be as a result of local policies; but it is conceivable that national and global events could create a local environment that would change the standard of living that metropolitan residents enjoy today. With this judgment, the work done as a part of this report was an attempt to characterize some of the changes in the transportation systems that would accompany the implied economic and social changes.

If 277,000 residents were to live in Eugene-Springfield and be making trips at today's per capita rates, a substantial proportion of the internal person trips would theoretically be made on high-volume vehicles unless some new streets were to be constructed. Approximately ten miles of "bottlenecks" could be removed through street improvement or new street construction so that a speculative 50% of the internal person trips could be on public transit while remaining internal trips could use private transportation. But implementation of the high-volume transit system may create the disruption that Alternative 4 seeks to avoid. Exclusive bus lane operation is difficult on many existing Eugene-Springfield streets without reserving the entire street for bus operations. This practice would further aggravate the capacity-deficient streets that would be shared by private vehicles. A more likely scenario for moving high volumes of transit passengers is to provide a combination of rail mass transit and bus transit. The initiation of a new rail system in the developed area would very probably be expensive and be disruptive to social activity within its corridors and vehicular traffic that intersects or is displaced by the new system. A great deal of further study is necessary to give a more precise characterization of Alternative 4.

ALTERNATIVE 5 (balanced land use) is an examination of how land use might be manipulated to decrease the total demand for transportation. Again, 277,000 people were assumed to be living in the Eugene-Springfield area. But to reduce the need for travel, each new dwelling was assumed to locate as close as practical to existing employers, and, conversely, each new job would locate as close as practical to existing population. The trend toward higher density housing would be accelerated to make maximum use of limited space adjacent to employment centers. Sewer service would not be substantially more difficult to provide than if current land development trends were to continue. However, comparable school and park sites would be relatively more difficult to obtain under the land use patterns of Alternative 5. School-age population that creates the demand for parks and schools would be more concentrated if jobs and people were placed in close proximity. Although the same population was assumed for this land use pattern, the prospective new sites are limited in number and size. Acquisition would be expensive because some sites would probably require redevelopment, and the purchase price would reflect increasing competition from other land uses.

Some benefits can accrue from this land use pattern. Total miles of travel could be reduced 5% relative to Alternative "0" assuming no sacrifice in personal mobility. Unfortunately, the 39 miles of street improvements needed would be about equal to the continuation of development practices (Alternative "0") if comparable transit assumptions are made. Although the test did not include a transit subalternative, the multi-nodal pattern would be considerably more conducive to a transit operation that could offer transit as an attractive alternative to private transportation. By minimizing the points of major origin and destination, natural travel corridors could occur that could be served by express transit vehicles. As a contrast to the "forced transit" implied in Alternatives 3 and 4, Alternative 5 could lead to public transportation by choice for trips made between the nodes of concentrated land use.

In addition, adequately balanced nodal areas could provide a variety of services that encourage substitution of pedestrian and bicycle trips for automobile trips. The statistics generated for this alternative do not adequately demonstrate the versatility of this land use pattern because the forecasting techniques do not fully account for substitution of modes. But, regardless of the predominant mode of transportation, residents could have the choice of staying relatively close to home for work, school, business and recreational opportunity. Short trips to close destinations could be candidates for modes that are not now considered for longer trips. The local resident would, therefore, be less vulnerable to external pressures that may force him to change his consumption patterns in the next 25 years.

Again, it should be pointed out that a hybrid is probably the most desirable alternative. Some land use variations with a transit role that differs from any of those tested would be a legitimate direction for future planning. The content of this report is meant to provide the insight necessary to tailor the most attractive transportation future for Eugene-Springfield.

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1 Introduction

This report was prepared by the Lane Council of Governments Transportation Planning Committee. It is not a transportation plan. Six long-range transportation alternatives were studied, and the evaluations are reported in this document so that the governments of Lane County, Eugene and Springfield could involve each other, the public and other affected agencies in making deliberate long-range transportation policies for the Eugene-Springfield area.

There is a need for a revised long-range transportation plan. In 1970, after long study, the Lane Council of Governments adopted a 1985 Interim Transportation Plan (often referred to as the E-SATS Plan). This plan has served as the only long-range, areawide transportation plan although it was never formally adopted by the other units of local government. It met state and federal technical requirements for adoption and plan content. Consequently, the area qualified for federally aided street and highway projects on the basis of that plan. Today the plan and the process used to develop the plan are thought to be inappropriate without a participatory reevaluation. It is perceived that attitudes have changed about involvement in public planning, and the kind of transportation system that is desirable and feasible for the metropolitan area has also changed. A reflection of some of these changes can be seen in the more recently adopted 1990 General Plan.

The 1990 General Plan was adopted by Lane County, Eugene, Springfield and Lane Council of Governments in 1972. As a general plan, it contained several elements for land use and public facilities. Transportation is one of those elements particularly recognized for its relationship to the other plan elements. A policy incorporated into the 1990 General Plan says in part: "Upon completion of the current Eugene-Springfield Area Transportation Study (1985 Interim Plan) review and prior to its adoption as a refinement to the 1990 Plan, it shall be submitted for public review and hearing to ensure its compatibility with the 1990 Plan." An objective in the 1990 Plan was to provide transportation plan alternatives for community evaluation. The current process of reevaluating the long-range transportation plan is one of many steps taken to respond to the transportation-related policies of the 1990 Plan.

The reader should find significant information for setting transportation policies for the metropolitan area within this report. It is intended for this report to be supplemented with public discussion that will lead to an adopted alternative for long-range transportation planning. A later stage in the planning process will allow for further involvement in the development of a plan based upon the adopted alternative.

2 Organization

The formal organization of the transportation study (process) is in response to U. S. Department of Transportation requirements. The Federal Aid Highway Act of 1962 and the Urban Mass Transportation Act of 1964 demand that all transportation improvements (street construction, bus purchase, etc.) in metropolitan areas with federal aid must be a part of a continuous, cooperative and comprehensive planning process. Further, an adopted transportation plan must serve the transportation needs projected for 20 years. Lane Council of Governments, Oregon Department of Transportation and the U. S. Department of Transportation delineated the area to be covered by the comprehensive transportation plan. (See Figure 1.) Within this region, Lane County, Eugene, Springfield, Lane Transit District and the Oregon Department of Transportation are the major public agencies responsible for developing and operating the transportation systems.

An organization (see Figure 2) has been established that allows for a regional cooperative approach to transportation planning. The Lane Council of Governments is a group of local elected officials established for long-range planning through its charter and agreement. Member agencies are listed on the inside of the front cover of this report. Lane Council of Governments has been formally designated by the Governor in accordance with the 1973 Federal Aid Highway Act as being the agency responsible for long-range transportation planning.

To ensure adequate involvement in the preparation and adoption of transportation plans, Lane Council of Governments has three committees playing important roles in the transportation planning process. The Metropolitan Area Transportation Committee serves as a policy committee for the conduct of the process. Its members are as follows:

- Eugene City Manager
- Springfield City Manager
- Lane Transit District General Manager
- Lane County Chief Administrative Officer
- Representative of the Oregon Department of Transportation
- L-COG Executive Director (Nonvoting)
- Chairman, Citizens Advisory Committee (Nonvoting)
- Chairman, Transportation Planning Committee (Nonvoting)

The Transportation Planning Committee (TPC) and the Citizens Advisory Committee (CAC) advise the Metropolitan Area Transportation Committee (MATC) on various transportation planning matters. Local and state staff persons provide technical expertise through TPC.

TRANSPORTATION STUDY AREA

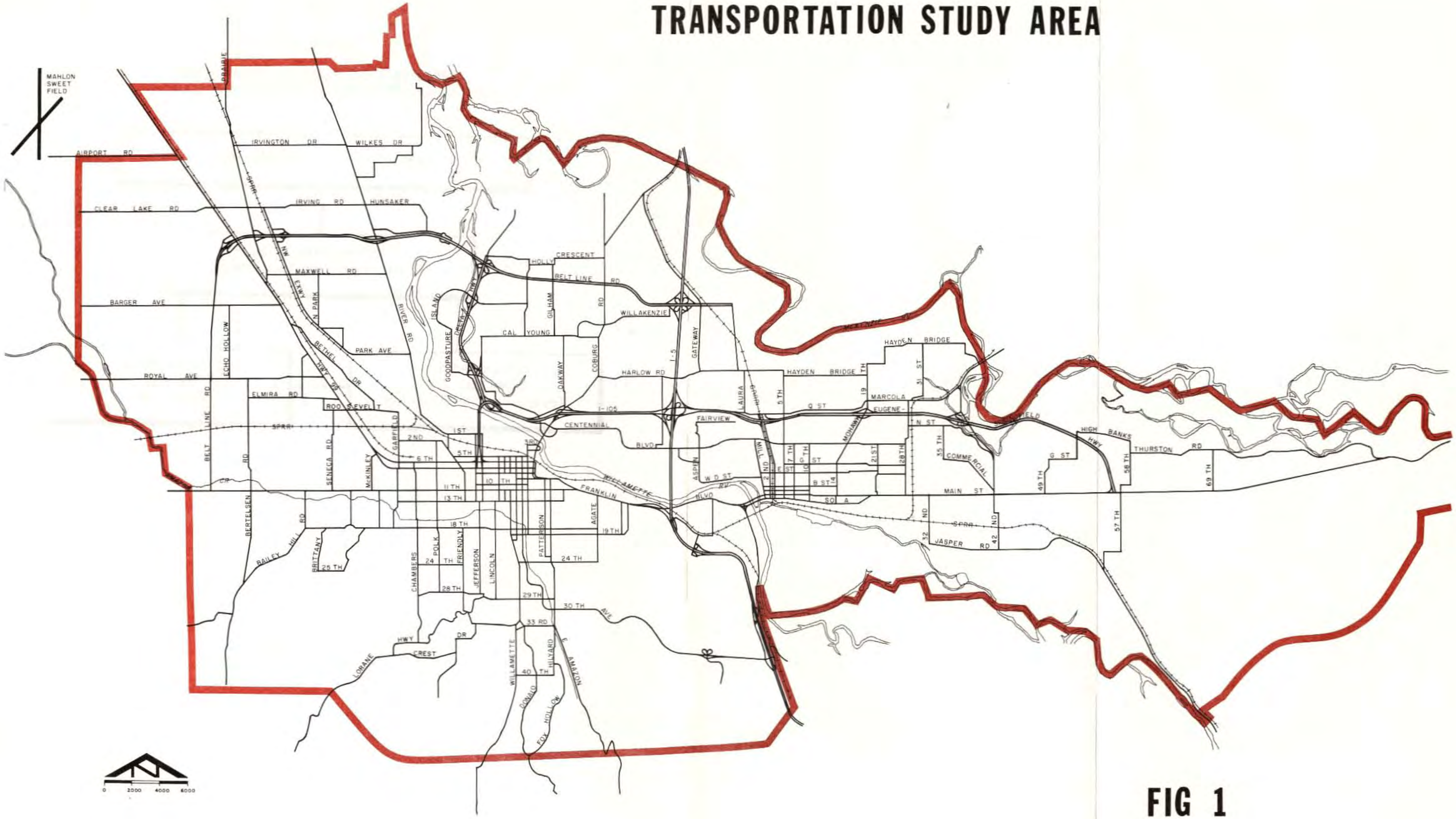
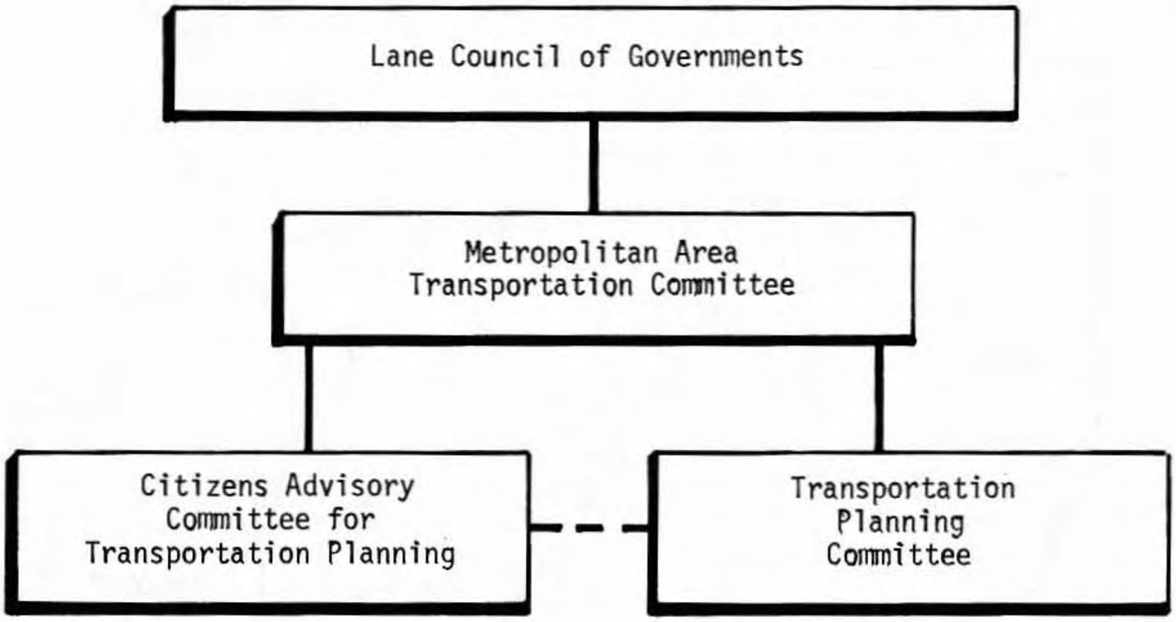


FIG 1

FIGURE 2

TRANSPORTATION PLANNING ORGANIZATION
EUGENE-SPRINGFIELD METROPOLITAN AREA



The membership of the Transportation Planning Committee is as follows:

Director of the Department of Transportation - Lane County
Director of Public Works - City of Eugene
Director of Public Works - City of Springfield
Administrative Assistant - Lane Transit District
Director of Planning - Lane County
Director of Planning - City of Eugene
Director of Planning - City of Springfield
Director of Planning - Lane Transit District
Transportation Planning Engineer - Lane County
Traffic Engineer - City of Eugene
Traffic Coordinator - City of Springfield
Director of Community Development Services - Lane Council of Governments
Representative - State of Oregon Department of Transportation
Manager - Mahlon Sweet Field
Representative - Federal Highway Administration

Lay citizens are appointed by the L-COG Board of Directors to serve on the CAC and act as citizen representatives to carry on a program for direct citizen participation. CAC and TPC defined the range of alternatives investigated in this report; TPC had a major role in the technical preparation of the information in this report.

3 Process

The process that is being followed for the preparation and adoption of a regional transportation plan has been evolutionary. The Eugene-Springfield Area Transportation Study (E-SATS) developed a transportation plan for the year 1985 that was adopted as an interim plan by L-COG in 1970. In 1972 the 1990 Plan was adopted calling for a review of the transportation plan. During May of 1974, the Citizens Advisory Committee held four public meetings in the metropolitan area to explain the process that was being considered and to listen to suggestions about the process and the kinds of alternatives that should be investigated in response to the charge given in the 1990 Plan.

After studying the comments from the May 1974 meetings, the CAC and the TPC agreed that a two-step process was called for.

Step 1

Meetings to hear citizens - May 1974 → Select alternatives for study → Study and report on alternatives → Public meetings on alternatives - October 1975/December 1975

Step 2

Elected officials select an alternative - January 1976	→	Development of master plan - February 1976/ August 1976

The alternatives being asked for were so broad and varied that the preparation of a detailed plan for each alternative would require resources and time far beyond reasonable limits. Therefore, six generalized alternatives were identified in step one that cover a range of ideas that were frequently mentioned at the public meetings and in the committees' meetings that followed. Each alternative concept represents a different course for the metropolitan area to develop during the 1975-2000 period. The characterizations of the six alternatives in this text are quite general. Evaluations will not be expressed in the traditional format of a transportation master plan. Test evaluations of these six concepts are meant to demonstrate the sensitivity of varying certain conditions within a relatively wide range. As an example, the reader should be able to develop an understanding for how many miles of street improvements could be avoided by increasing transit service. Specifically, the tests were designed to illustrate: (1) the relationship between land use and transportation demand; (2) various proportions of transit ridership and private automobile travel; and (3) the transportation implications of reduced trip making. The analysis described here is on a regional basis, and therefore it will be relatively general. The accuracy of the information used to characterize each alternative reflects the best judgment and techniques that the given resources would allow. Information of this kind is subject to the weaknesses of any forecast in that no one really knows what is going to happen; nevertheless, future events have been projected using a knowledge of past experiences.

The information developed from these tests will be documented in later sections of this report. Public meetings will be held and testimony will be heard to provide an additional basis for elected officials to choose one of the six generalized alternatives (or a hybrid using certain elements from the basic six alternatives). Then, in step two a more detailed plan will be developed with proposed facility improvements and service improvements that fit the policies established by the selection of the generalized alternative. Step one has been called "concept planning" where the broad issues of policy are addressed; and step two has been called "master planning" where the more detailed problem solutions are studied.

After a regional transportation master plan is adopted, a five-year Transportation Improvement Program (TIP) is developed. The TIP, prepared jointly by local implementing agencies, serves as the link between the long-range master plan and implementation. At a minimum it includes all street and highway projects, bikeways and transit projects that are of regional significance and are proposed for implementation during the five-year period. The entire program is reviewed and updated annually. As projects are advanced to the first year of the program, the agency responsible for implementation will study each improvement in more detail. Impact reports may be written prior to a project's implementation, and, if appropriate, the implementing agency may further study alternatives at the project level and hold hearings as necessary prior to project authorization by the responsible agency. In most cases the areawide plan would provide a framework for the detailed study of an element in the plan.

Periodically the areawide long-range plan is reexamined for its appropriateness as long-range policy. When changing conditions or attitudes indicate that the adopted long-range plan is no longer the most desirable areawide policy, the process for the long-range plan will begin at the point necessary to eliminate the problems uncovered in the reexamination.

4 Relationship to 1990 Plan

The 1990 General Plan is an adopted set of policies for the development of the metropolitan area. The general location and nature of development was specified in the plan. However, the 1990 General Plan is oriented toward large-scale, persistent, areawide problems of the metropolitan area and lacks the specificity that is desirable for planning facilities whose design is normally based on a specific level of development. A relatively wide range of development can occur at specific locations and yet be consistent with the 1990 General Plan. This discussion is not an argument to give greater detail to the General Plan, but a note of caution that it cannot be used as a precise determinant of a transportation system. Therefore, to the extent possible, the 1990 Plan was used as a guide for assembling the data and making the evaluations of the alternatives. The following transportation goals and objectives were taken from the 1990 Plan (except the second general goal, which was added by TPC). Many of the statements pertain to master planning that is not a subject of this report. Those statements that relate to generalized planning influenced the development of this report in ways too numerous to list.

GENERAL GOALS

1. We must provide for a balanced transportation system to give mobility to all citizens.

2. We must treat transportation and land use as being part of an interacting system, viewing the development of a

transportation system as a means to accomplish a desired land use pattern.

SPECIFIC GOALS

1. Future metropolitan area transportation planning must deal with all aspects and forms of transportation--including automobile, trucks, airplanes, railroad, public transit, bicycles, and pedestrians--and should focus on the interrelationship of the various transportation systems.

2. Transportation systems must be designed and located in such a manner that they will effectively interconnect the numerous activity areas of the metropolitan community.

3. Transportation systems should be designed to minimize the impact of transportation noise, land consumption, pollution, and the division or isolation of neighborhoods and properties.

4. Provision must be made to determine future transportation needs through continuing comprehensive transportation studies.

5. Public policies, particularly land use and transportation planning policies, should be directed toward limiting passenger automobile use while simultaneously developing alternative modes of transportation.

OBJECTIVES

1. Serve our existing and future arrangement of land uses by an efficient, safe and attractive transportation system.

2. Consider the transportation routes' impact on neighborhoods and the environment, as well as motorists' convenience and safety.

3. Ensure that future route selection will consider indirect, as well as direct, costs of construction.

4. Protect abutting land uses from the adverse effects of transportation routes, and the routes from incompatible adjoining developments.

5. Provide for the future requirements of inter-urban rapid transit and emphasize the pressing need for intra-urban public transit.

6. Provide for the future requirements of aviation.

7. Ensure that consideration be given to adequate provision for convenient, pleasant and safe bicycle and pedestrian movement.

8. Provide transportation plan alternatives for community evaluation.

9. Decrease the adverse effects of the automobile.

10. Develop a transportation system which is responsive to:

    a. Changing community needs and conditions; and
    b. Changing transportation technology offering advantages to this community.

5 Relationship to Other Transportation Plans

A comprehensive transportation study can no longer focus on just one mode, but must include all modes that might reasonably be used for travel in a given region. However, some modes with relatively low current usage cannot be adequately treated with the conventional gross tools used in regional system planning. For example, bicycling, inter-urban rail and air travel, because of their current lower level of significance in the total metropolitan transportation picture, require less detailed study than intra-urban highways and transit. Each, however, is important enough to be examined, and the E-SATS process allows for this inclusion. Rather than include these modes in the metropolitan transportation plan and treat them in a cursory manner, each will be treated in individual plans using techniques most suited to the individual mode. The following plans have been developed or are in progress:

a. Metropolitan Bikeway Master Plan

The use of bicycles today is analogous to the use of automobiles in the early 1900's. Although interest in cycling is high, physical facilities are inadequate to handle the potential demand that exists. Emergence of the bicycle as a viable urban vehicle is dependent upon provision of safe, convenient bikeways; before bicycling can be accepted as an alternative transportation mode, it must be increased in stature by the provision of at least a minimum network of bikeways. Since any new bikeway is a major addition to an almost nonexistent network, improvements that would serve a great number of bicyclists are so minor (in relation to the scale of highway and transit improvements) that they would be lost in this plan. Consequently, a separate but concurrent bikeway plan was warranted.

The Metropolitan Bikeway Plan is a product of the E-SATS process. A draft was released for public review in May 1975, and a final version will be adopted as an element of the overall transportation plan. Work on the bikeway plan took place concurrently with work on the six concept alternatives described in this plan. Although the methodology used to develop the bikeway plan was less sophisticated and more subjective than that used in developing the concept alternatives, whenever possible specific information generated by the concept plan process was considered in the bikeway plan. For example, the bicycle will have to function in the same general trip pattern as overall demand indicates if it is to become a major mode of intra-urban travel. Since data from the concept plan process helped identify corridors with heavy trip movements, it was possible to determine a basis for establishing bicycle desire lines that can be served by bikeway construction. Once a concept plan is adopted and a transportation master plan is then developed, the bikeway plan will be re-evaluated with respect to the new highway and transit facilities that are proposed.

b. Statewide Transportation Study

A statewide transportation study is being conducted by the Oregon Department of Transportation to investigate alternative methods of inter-urban travel, including the possibility of a rapid transit system serving the Willamette Valley. The question of the viability of a Willamette Valley rapid transit system is beyond the scope of a single metropolitan area transportation study, but E-SATS can provide continuity between transportation decisions in Eugene-Springfield and the Willamette Valley study.

Choices made by local elected officials regarding the level of public transit in Eugene-Springfield can impact the level of inter-urban rail or bus service between this area and other Willamette Valley locations. Strong local distribution systems are necessary to make an inter-urban rail service attractive since few travelers want to spend as much time reaching a local destination as they have just spent on a trip from Portland to Eugene. Consequently, since the transportation plan in Eugene-Springfield is preceding the Willamette Valley study, the local decision on the type and extent of public transit could impact the inter-urban rail or bus system's potential operations. E-SATS staff or policy representation on the coordinating committee for the Willamette Valley Passenger Study will help to assure some consistency between plans.

c. Mahlon Sweet Field Master Plan

Air travel is even less influenced by local policy than inter-urban rail travel since air travel demand generally follows national and even international policies and economic conditions. The Mahlon Sweet Field Master Plan was prepared by Arnold Thompson Associates Inc. in 1972 with the Transportation Planning Committee serving as a steering committee during the process; basically, the plan details capital improvements to the facility. The plan has been adopted by local jurisdictions and is now in the implementation stage. Since the volume of air person trips, including projected increases, will remain less significant in the overall transportation situation, the interface between air and surface transportation does not approach the problem proportions common in large cities. No special consideration on a system plan level will be necessary to maintain or improve access to Mahlon Sweet Field.

6 Areawide Projection of Population

To fit a transportation plan to the 1990 General Plan, it is important to determine how many people will reside in the metropolitan area, where they will live, where they work and conduct business, and the level of mobility they will have. This particular section is an overview of the areawide population projection and some of the supporting rationale. More detailed information is given in Population and Employment Projections, Lane County, Oregon.[1]

There was some interest expressed in various committee meetings for testing alternative population forecasts. After consideration, it was decided not to introduce population as a variable. It would be difficult, for instance, to compare a plan that serves 277,000 people with a plan that serves 250,000 people. The amount of transportation service would be different for the two plans, and the implications would be correspondingly different. While it may be desirable for agencies providing services to have fewer people to serve, a policy for managing growth-rate must be based upon factors beyond the scope of the transportation study. Without testing alternative population levels, it can be inferred, however, that the transportation needs of the 169,000 metropolitan residents are being adequately served (with a few exceptions) by existing services and facilities, and that capacity deficiencies that accrue by the year 2000 will be a result of increasing resident population. In effect, it can be argued that two population levels were tested--current population and a projection of population to the year 2000. The possibility that the population projected for the year 2000 might be reached sooner or later does not negate the value of the projection in relating travel

1. Population and Employment Projections, Lane County, Oregon, L-COG, 1973.

demand to population numbers. The population projection used is not a goal, a constraint, or an assigned share. Its use does not connote desirability. The projection, is, however, a dispassionate estimate of the number of people that will reside in the metropolitan area unless local policies are established that will change the growth rate, or national and global pressures affecting local growth rates change during the 25-year projection period.

The population estimate used for the evaluation of the alternatives was made using a cohort survival technique. Basically, this method separates population change into natural increase of the resident population (births minus deaths) and net migration. Natural increase for a period is estimated by multiplying the number of women of child-bearing age by their age-specific fertility rate to determine births, and multiplying each age group by their survival probability rate to estimate the population surviving a period. Natural increase of the resident population is then births plus surviving population. Bureau of the Census "Series E" projections were adjusted for local experience and used for the age-specific fertility rates. The total fertility rate using this methodology was 2.1 children for an average woman during her child-bearing life. The University of Oregon student enrollment was treated as a special population using enrollment projections rather than a cohort technique.

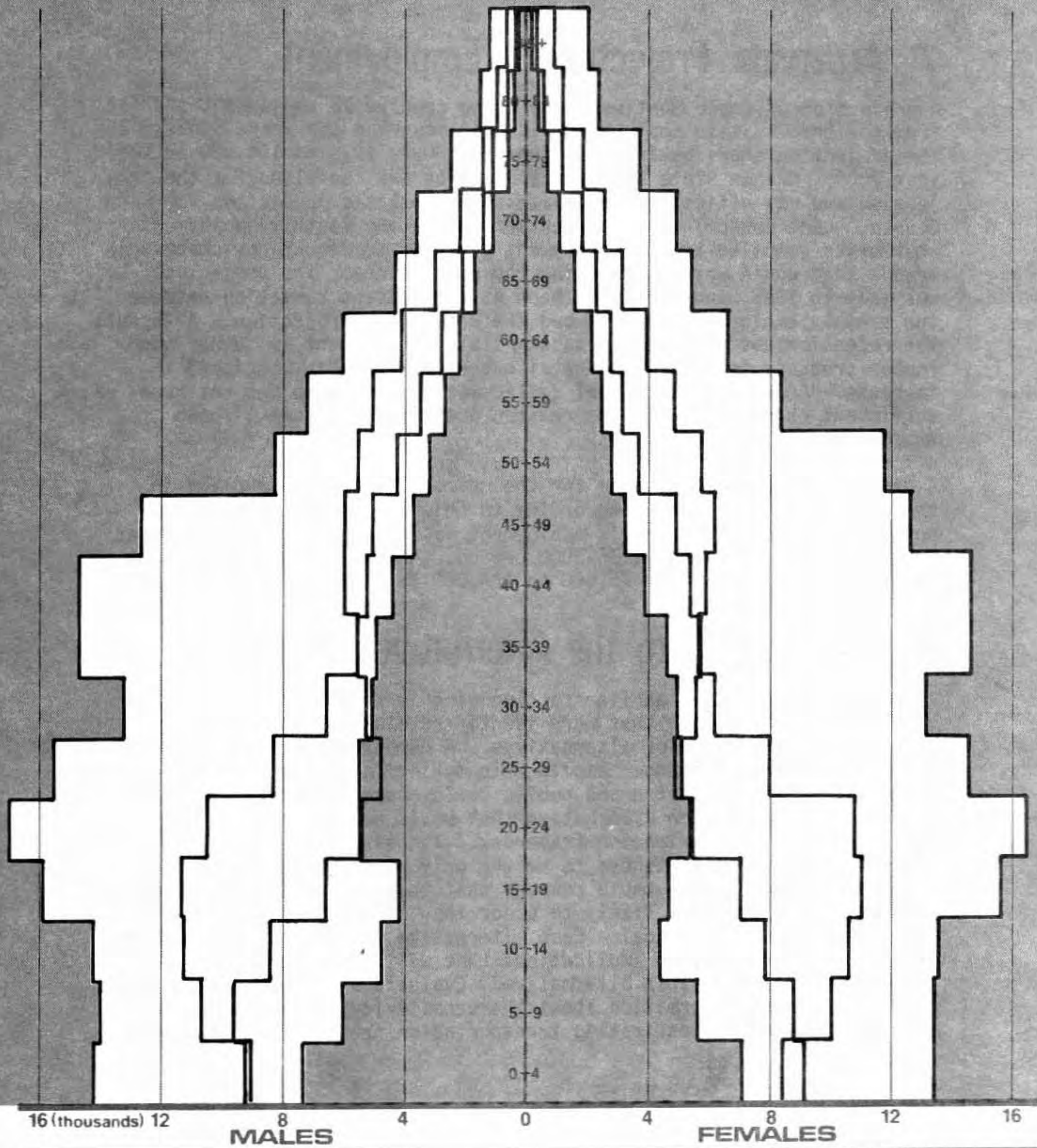
The estimate of net-migration was based upon a comparison of resident civilian labor force with total civilian labor force. An independent projection of total civilian labor force was made for Lane County using Oregon State Employment Division statistics from 1958-1972. Resident civilian labor force was estimated by multiplying each age group by a corresponding labor participation rate. The average female labor force participation rate was projected to increase by fourteen percent during the 1975-2000 period to account for an increasing proportion of females entering the labor force. If the projected total civilian labor force differed from the estimate of resident civilian labor force, migration was assumed to occur. The resident population estimate was adjusted to account for the migrant employee population. Since the estimate of total civilian labor force was a projection, the continuation of in-migration to satisfy job opportunities is predicted over the projection period.

Lane Council of Governments receives and monitors the annual population estimates made by Portland State University that are recognized by the U. S. Bureau of the Census. The short-term projections are compared with the most recent population estimate to detect variations that warrant revising the projections. At the date this report was written, no significant difference had yet been found.

The accompanying age-sex pyramids (Figure 3) demonstrate the transition expected for Lane County population from 1950-2000. The metropolitan

FIGURE 3

AGE-SEX PYRAMIDS
LANE COUNTY, OREGON



Source: Lane Council of Governments

1950 1960 1970 2000

share of Lane County's population is expected to grow from 71 percent in 1975 to 75 percent in the year 2000, from 169,000 to 277,000 metropolitan residents respectively (Figure 4).

7 Areawide Projection of Employment

A projection of employment was made using countywide employment statistics from the Oregon State Employment Division covering the years 1958-1972. The projection shows an increase from 97,000 in 1975 to 164,000 in the year 2000. Oregon State Employment Division was consulted for the projection and now officially recognizes this specific projection for Lane County. Lane Council of Governments monitors the monthly employment statistics compiled by the Employment Division to detect any changes in trends that would warrant revising the projections. The projection was made in 1973, and there has been no significant variation between the monthly employment reports and the short-term projection. Although the recession has resulted in substantial unemployment in lumber and lumber products industry, the total number of jobs has continued to increase. Adjusting for annual cyclic variation, there has not been sufficient change to justify a revised projection (Figure 5 shows employment).

A similar projection was made for the metropolitan area involved in the transportation study. According to this projection, the metropolitan share of the county's employment will increase from 78 percent to 82 percent during the 1975-2000 period. Annual average employment is projected to grow from 75,000 to 134,000 during this period.

8 Introduction to the Alternatives

As it was stated in an earlier section of this report, the number and variety of alternatives that were identified dictated an approach that evaluated a range of alternatives. A number of parameters (land use, public transit and per capita trip-making rate) were varied over a range so that the public and public policy-makers could tailor a regional transportation alternative that would be adopted as a long-range transportation planning framework. The six generalized alternatives listed below are not intended to be the only possibilities. Nor does their appearance in the table connote that they are expected alternative futures. Some are more likely to occur than others, and some may be unreasonable even as a goal. Each alternative will have an associated set of nontransportation implications that will be expressed in the terms appropriate to that alternative. Evaluations later in this text offer the reader information about the sensitivity of varying certain ingredients used for estimating transportation needs. It is expected

FIGURE 4

PROJECTION OF LANE COUNTY AND EUGENE-SPRINGFIELD POPULATION

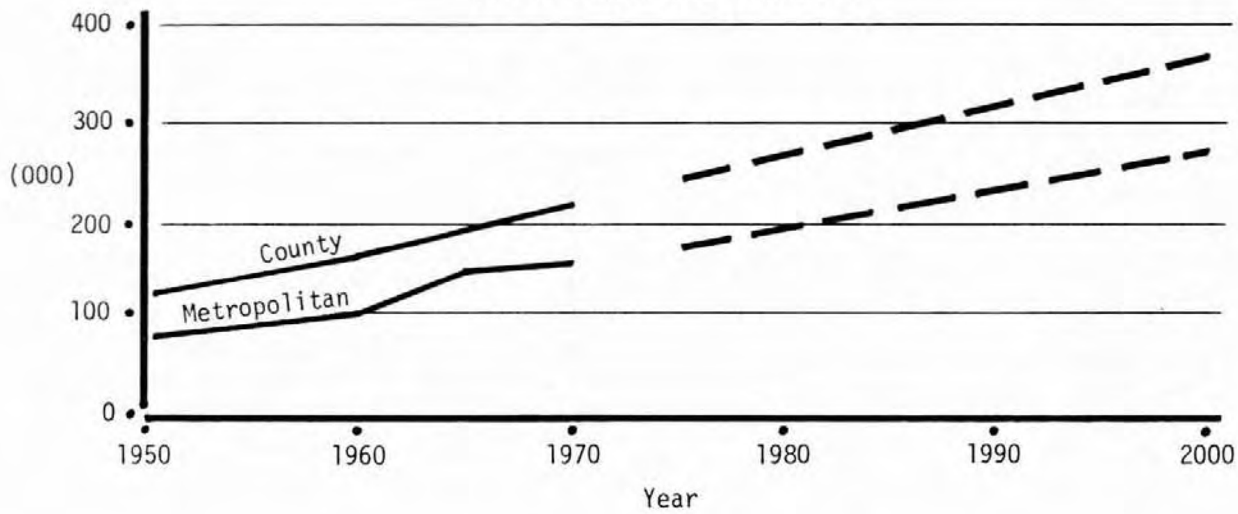
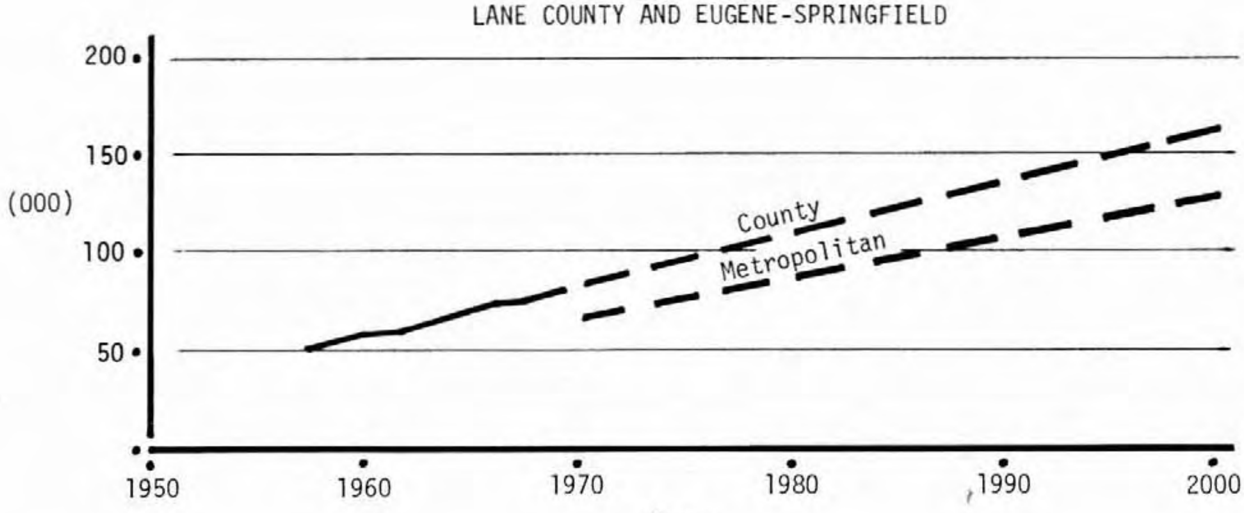


FIGURE 5

EMPLOYMENT PROJECTION OF LANE COUNTY AND EUGENE-SPRINGFIELD



that any adopted regional transportation alternative will be a hybrid of the generalized alternatives listed in Table 1 below that represents the most desirable long-range transportation policy for Eugene-Springfield.

ALTERNATIVE "0" - MINIMUM TRANSIT, NO TRIP REDUCTIONS

Alternative "0" can be characterized as the base alternative. This particular alternative was developed so that other alternatives may be compared with a single, consistent standard. It is a set of conditions that could occur in Eugene-Springfield by the year 2000: (1) population and employment might grow to 277,000 and 134,000 respectively, (2) land development could continue along today's patterns to provide for the residential and employment needs of the expanding population within the constraints of the 1990 General Plan, and (3) the increases in transportation demand could be satisfied solely by highway improvements. Minimum public transit would be available to satisfy only the needs of captive riders that have no other means of transportation. The quantity of trips carried by transit would not have a significant effect on the need for street improvements.

ALTERNATIVE 1 - 10% TRANSIT

Alternative 1 is a slight variation on the base alternative. If the population and land use trends of Alternative "0" are followed, and if ten percent of the area's daily person trips are taken by public transit, then the conditions are characterized by Alternative 1. A comparison with the base alternative can illustrate some of the impacts of continuing to increase the role of public transit to a foreseeable proportion.

ALTERNATIVE 2 - 10% TRANSIT, 10% TRIP REDUCTION

Alternative 2 is (1) continued trends in population growth and land use development, (2) ten percent of the trips made on public transit, and (3) ten percent fewer automobile trips per person than the current rate. From this alternative the reader might determine some of the impacts of reduced trip-making on the need for transportation services and facilities.

ALTERNATIVE 3 - 30% TRANSIT, 10% TRIP REDUCTIONS

Alternative 3 is (1) continued trends in population growth and land use development, (2) ten percent reduction in trips per resident, and (3) thirty percent of the trips made on public transit. This situation was identified to illustrate some impacts of substantially

TABLE 1

SIX CONCEPT ALTERNATIVES

	Land Use			Transportation		
Alternative	Population/ Employment	Residential Location	Employment Location	Public Transit	Per Capita Trip-Making	Street System Improvements
"0 "	277,000/134,000	Continued Trends	Continued Trends	Minimum	No Change	Remaining Deficiencies
1	277,000/134,000	Continued Trends	Continued Trends	10%	No Change	Remaining Deficiencies
2	277,000/134,000	Continued Trends	Continued Trends	10%	-10%	Remaining Deficiencies
3	277,000/134,000	Continued Trends	Continued Trends	30%	-10%	Remaining Deficiencies
4	277,000/134,000	Continued Trends	Continued Trends	?	No Change	Minimum Street Improvements
5	277,000/134,000	Balanced Land Use	Balanced Land Use	Minimum	No Change	Remaining Deficiciencies

reducing the number of the trips taken via private automobile and increasing the role of public transit.

ALTERNATIVE 4 - MINIMUM STREET IMPROVEMENT

Alternative 4 was identified to determine the minimum street and highway system that could serve the transportation needs projected to the year 2000 by increasing the role for public transit. Again, it was assumed that (1) population would continue to grow and (2) land use development would follow current trends.

ALTERNATIVE 5 - BALANCED LAND USE

Alternative 5 was an attempt to minimize transportation costs by introducing a land use form that would lessen the need for travel. It was assumed that (1) the population and employment growth trend would continue and (2) each new dwelling unit and each new employment opportunity would be located in a manner that practically minimized the physical separation between population and employment. On a system scale, this alternative demonstrates a relationship between land use and transportation that may be used to manage a reduction in transportation demand.

9 Format of the Evaluations

The evaluations in the following sections attempt to further characterize the concept alternatives that were introduced above. Each section discusses one aspect of all alternatives.

Thus, Section 10 reviews two land use forms. Continued land use trends are common to alternatives 0-4 while "balanced" land use is a variation used for alternative 5 only. After all elements are discussed, the summary (Section 19) will condense the preceding sections to facilitate a comparison of the alternatives.

10 Residential and Employment Location Trends

The location and magnitude of population and employment for the target year are important determinants of transportation demand. The total number of trips is determined by the number of people projected to live in the area and by the overall level of economic activity. Transportation patterns within the area are determined by the internal arrangement of activities that require the transport of goods and/or people. As primary indicators of the location and magnitude of these activities, projected population for the metropolitan area is divided among smaller areas within Eugene-Springfield. A land use plan normally identifies areas which are to be used for certain broad land use categories: growth in population can be geographically allocated (for projection purposes) in accordance with those anticipated uses. The 1990 General Plan is a useful guideline for projecting the geographic arrangement of population and employment; however, the density ranges and general flexibility presented in the Plan Diagram make it possible to achieve a range of population-employment distributions that are consistent with the plan.

TABLE 2

SUMMARY OF 1973 LAND USE
WITHIN THE TRANSPORTATION STUDY AREA
BY JURISDICTION (ACRES)*

Land Use Activity	Eugene	Spfld.	Other Metro	Total
Developed Residential	5,030	2,050	5,030	12,110
Manufacturing				
Lumber and Paper	300	320	440	1,060
Other	90	60	80	230
Transportation				
Roadways	2,900	1,150	2,300	6,350
Parking	240	110	150	500
Other	420	200	530	1,150
Trade	460	160	150	770
Services	1,470	680	530	2,680
Cultural				
Parks	320	40	220	580
Other	470	60	270	800
Resource Production	20	40	1,450	1,510
Undeveloped and Agricultural	6,430	2,210	27,090	35,730
Water Area	300	40	1,060	1,400
TOTAL	18,450	7,120	39,300	64,870

*Summary from land use parcel file

The transportation study area contains approximately 65,000 acres, roughly half of which is in agriculture or is undeveloped. As the population grows from 169,000 to a projected 277,000, additional land will be developed and some areas will be redeveloped and/or converted to other uses. Consequently, it requires a great deal of judgment to project where people are most likely to live in the year 2000. The modest number of people who attended the Citizens Advisory Committee public meetings held in May expressed interest in developing and implementing a land use policy that differs from the current actual practice; the demands for transportation service were blamed on an uneconomical arrangement of land uses. To provide some insights into the relationship between land uses and transportation demand, two population distribution scenarios were projected for testing purposes: (1) continuation of current trends and (2) balanced growth which would reduce the physical separation between the home and many activities in which the typical resident engages.

RESIDENTIAL LOCATION - CONTINUATION OF CURRENT TRENDS

Current trends in residential location were projected by dividing the transportation study area into 204 transportation zones (see Figure 6). Each of the zones was assessed for its role in accommodating the 277,000 residents projected to be living in the area by the year 2000.

The Planning Departments of Eugene, Springfield, and Lane County determined the potential for residential development within each transportation zone by examining the 1990 Plan, neighborhood studies, zoning, ownership, current development, accessibility, public services, physical character, and other information. The potential was expressed in the number of dwelling units (single family, multi-family, and mobile homes) that might be expected by the year 2000. Using 1970 census information for the same transportation zones, an equation was developed that related population to dwelling units. An independent estimate was made of people living in group quarters (dormitories, rest homes, etc.); total population estimate for each transportation zone was derived by adding the estimates from group quarters and conventional units. A visual display of total population was made by aggregating the estimates for the transportation zones into larger tracts for ease of comparison (see Figure 7).

RESIDENTIAL LOCATION - BALANCED LAND USE

The alternative population allocation was based upon the current geographic arrangement of population and on research conducted by Jerry B. Schneider

E-SATS TRANSPORTATION ZONES

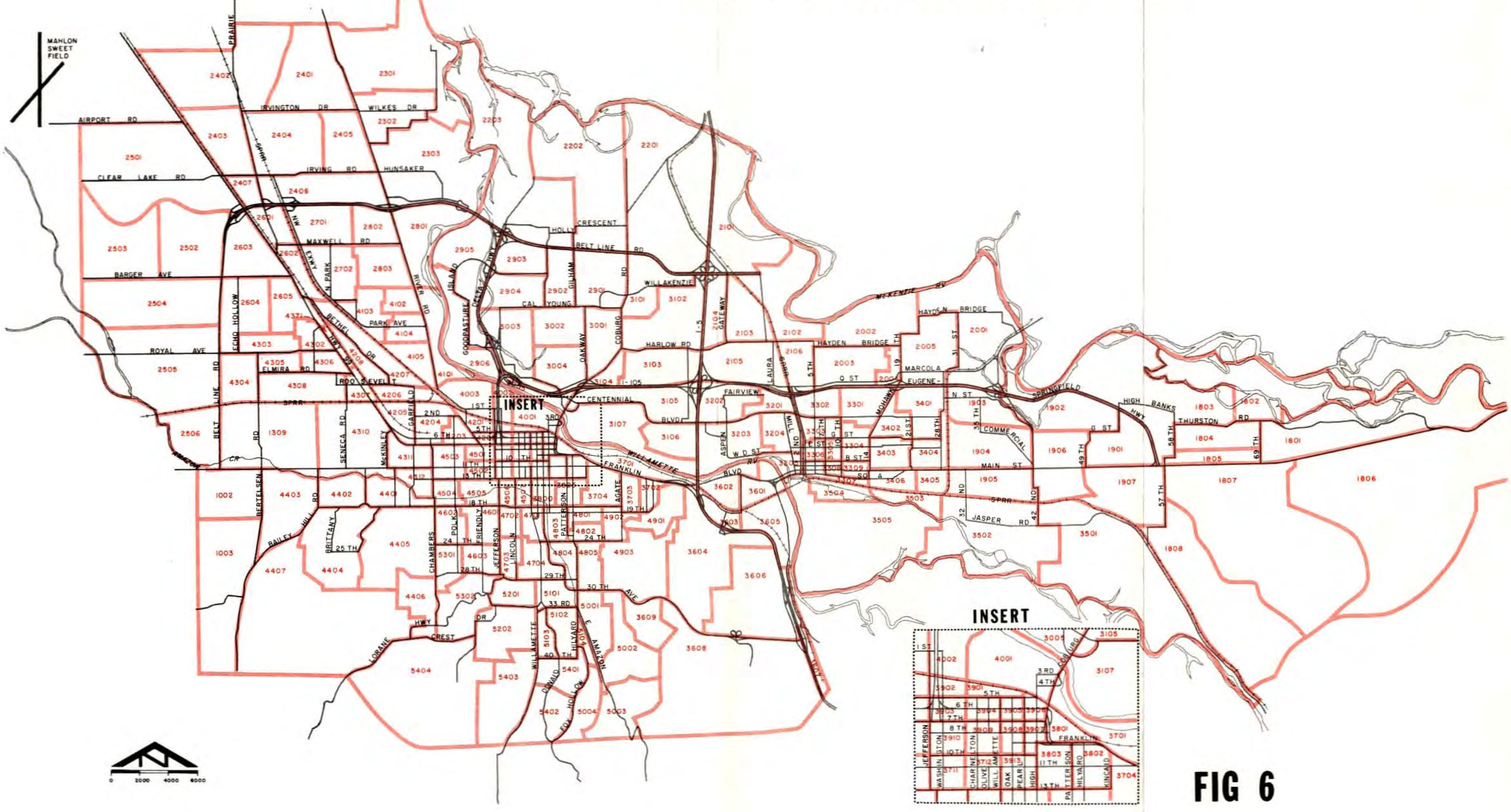


FIG 6

POPULATION COMPARISON

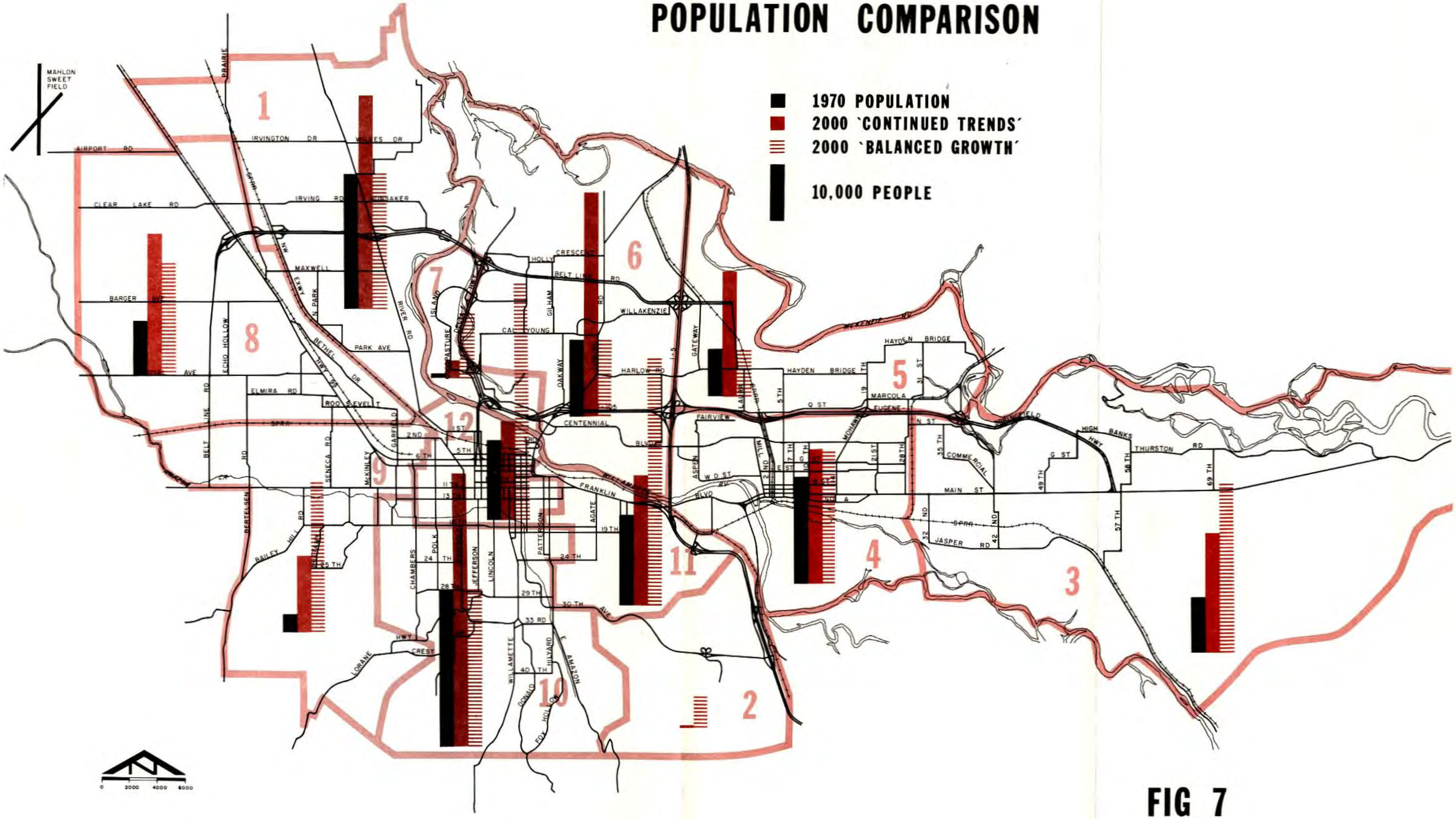


FIG 7

and Joseph R. Beck of the University of Washington.[2] Basically, this research indicated that the total distance which a population travels can be reduced if people live in closer proximity to their place of employment. Without reducing the number of trips made in all modes, total travel distance can be decreased by minimizing trip length. The concept does not require the population to make shorter trips; it merely tends to decrease the length of the average trip by providing an opportunity for the labor force to live close to employment opportunities. In keeping with this theory, twelve areas were delineated that were useful in pursuing the desired allocation for the Eugene-Springfield area. Some areas were overbalanced with existing population (labor force), and others were dominated by an existing employer or employers. The increment (1970-2000) of population growth for the area was divided among the employment dominated areas so that the ratio of labor force to employment was nearly equal to the areawide average, therefore minimizing internal geographic bias. The population growth for each of the twelve areas was further divided into transportation zones to practically minimize the physical separation between labor force and employment within the twelve areas selected for balancing. A quick appraisal of this allocation (see also Figure 7) indicates that the areas containing Lane Community College, Weyerhaeuser Industries, Goodpasture Island, University of Oregon, and Eugene CBD would need greater population growth than is foreseeable with current trends if the "balance" between labor force and employment is to be achieved. Although it would require further analysis to determine whether the alternative population allocation is consistent with the 1990 General Plan, the population distribution would not deviate severely from the plan. The residential density adjacent to the employers mentioned above would be higher than a projection of current development trends but not drastically higher than those indicated in the 1990 Plan, without exception. The LCC basin is not currently within the 1990 Plan urban service area, but it is anticipated that the pending plan update will reevaluate that area. For this population arrangement to be realized, the 1990 Plan would have to be refined and made more specific to implement the higher residential densities in these areas. If market forces are not present to effect the higher residential densities, the success of this concept would rest on the ability of local governments to legislate new controls that would make high-density residential development in these locations more attractive than any other residential option.

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2. Jerry B. Schneider and Joseph R. Beck, "Reducing the Travel Requirements of the American City; An Investigation of Alternative Urban Spatial Structures," Transportation Research Record 499 (Washington, D. C., Transportation Research Board, 1974), p. 12.

EMPLOYMENT LOCATION - CONTINUATION OF CURRENT TRENDS

The projected employment for the metropolitan area (134,000 in the year 2000) was allocated to the 204 transportation zones based on several guidelines: using nine different industrial categories it was possible to estimate the physical location for the projected increases in employment. The following table is an indication of the parameters that were used for locating specific employment groupings. Given a control total from the areawide projection, the locational factors in the table were used to judge employment location in the study area.

TABLE 3

PARAMETERS USED FOR ALLOCATING EMPLOYMENT TO TRANSPORTATION ZONES

Employment Grouping	Determinants Used in Location
Agriculture, Forestry, Fisheries, Mining, and Construction	Allocated to fringe and flood plain. Mining allocated to existing gravel operation sites and areas with resource potential; construction allocated in proportion to housing starts and central building construction.
Manufacturing	Area's major manufacturers (wood products, publishing, and food processing) were projected independently; remaining increase allocated to industrially zoned land.
Transportation, Communications, and Utilities	Area's major employers projected; remaining increase allocated to industrial zoned land, transportation corridors and opportunity areas (large vacant sites with specialized development potential).
Wholesale Trade	Growth along transportation facilities and at existing wholesale facilities.
Public Service	Numerous facility plans consulted for site-specific projections; additional projected for existing locations without facility plans.

(continued)

TABLE 3 (continued)

Employment Grouping	Determinants Used in Location
Educational	All schools assumed to have kindergartens; specific projections used for day care and nursery schools, U of O, LCC. Remaining increase distributed throughout to simulate day care, etc., whose location is not yet known.
Retail Trade	Employers with over 100 employees were projected separately; new neighborhood shopping centers were considered for growing residential areas; known future developments were accounted for; remainder allocated to present locations (to be consistent with 1990 Plan).
Commercial Service (banks, insurance, credit, real estate, investment, lodging, personal service, business service, medical, legal, etc.)	Employers with over 100 employees were projected separately; planned office buildings were considered; new neighborhood commercial considered. Remainder allocated to present locations.

EMPLOYMENT LOCATION - BALANCED LAND USE

The balanced growth concept has a component for employment location that complements the population allocations discussed above. In keeping with the concept of placing population and employment in close proximity, the employment growth projected for the metropolitan area was geographically allocated to those areas within the metropolitan area that now have an "excess of labor force." Those areas that now have chiefly residential land uses but few complementary services were identified and allocated a share of the employment growth that would create a balance between labor force and employment opportunity. Taken together with the residential allocation adjacent to existing employment opportunity, this allocation of the population-employment growth increment would practically minimize the physical separation of population and employment. Figure 8 visually compares the alternative locations of employment under continued trends and balanced land use. The balanced land use alternative, which can be described as a strategic decentralization of many business and social functions, would add each new job in a location with excess labor force to create the opportunity for people to live, work, shop, recreate and conduct business within one area. New "balanced land use" development might best be typified by neighborhood shopping centers, satellite offices, extension libraries or general stores. This would represent a reversal in a trend that has brought large-scale regional facilities for shopping, government, education, etc.

TABLE 4

SUMMARY OF SOCIOECONOMIC PROJECTIONS USED
FOR ESTIMATING TRANSPORTATION DEMAND FOR ALTERNATIVE "O"

Item	1970 Value	2000 Projection
Population	147,928	278,175**
Population 5+	135,515	255,885
Population 16-65	93,656	189,342
Labor Force	55,268	112,237
Dwelling Units	49,456	95,397
Automobiles Owned	84,730	162,095*
Employment	59,685	134,442
Agriculture, Forestry	173	196
Mining and Construction	3,601	5,472
Manufacturing	12,736	25,404
Transportation, Utilities, etc.	3,798	7,338
Wholesale	2,895	5,977
Retail	12,080	25,834
Service (Commercial)	11,915	30,408
Public	4,505	9,688
Education	7,982	24,125

*Varies with alternative.

**Two hundred seventy-seven thousand metropolitan residents were projected in Section 6. When the dwelling unit estimate was made for each transportation zone, occupancy rates were estimated for each zone depending on the character of the projected housing. The sum of the population projections for the transportation zones exceeded the areawide projection by 0.4% but was not corrected since the small "error" was consistent with the accuracy of other information in this report.

EMPLOYMENT COMPARISON

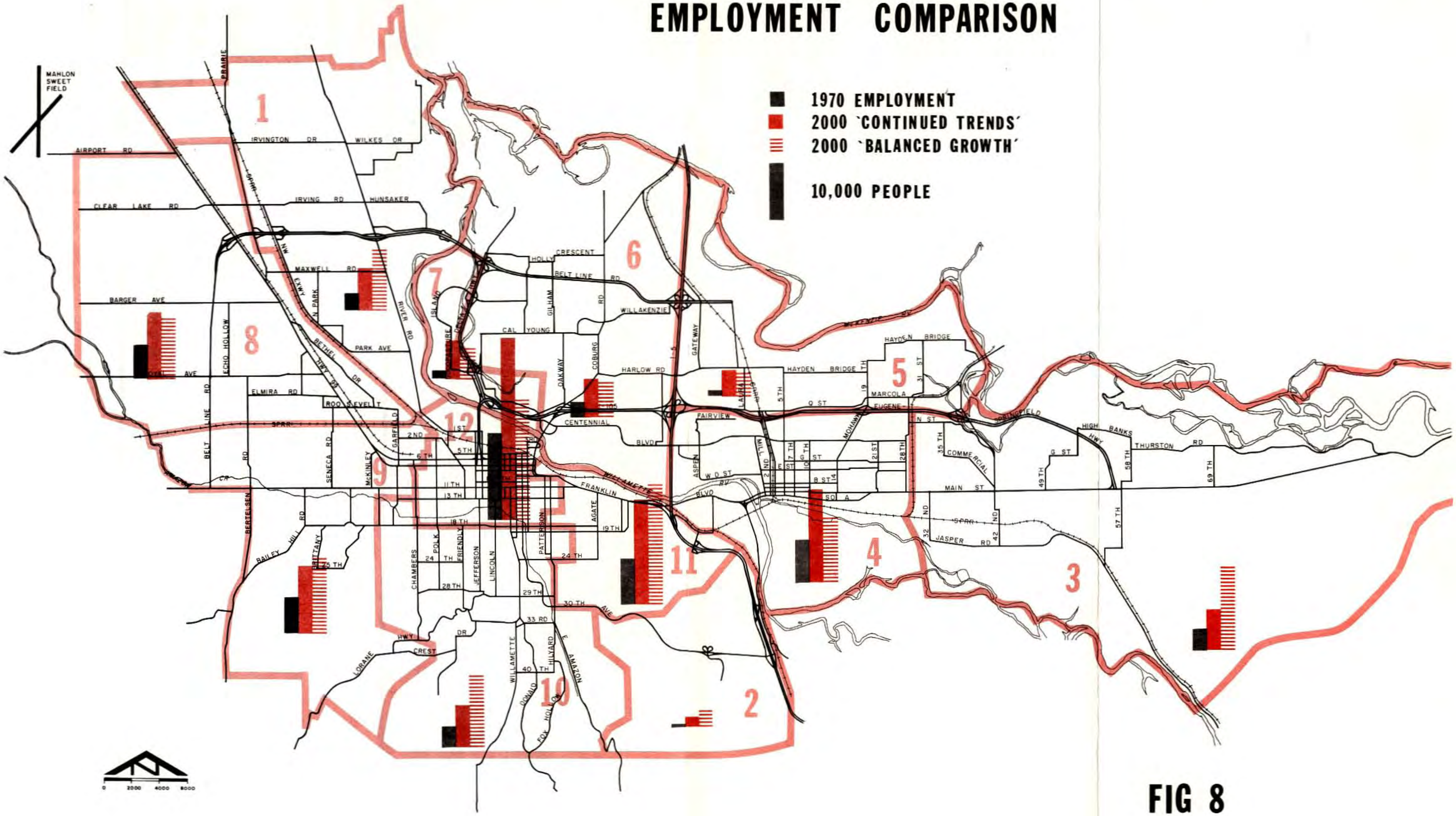


FIG 8

TABLE 5

SUMMARY OF DAILY INTERNAL PERSON TRIPS ASSIGNED TO AUTOMOBILE MODE

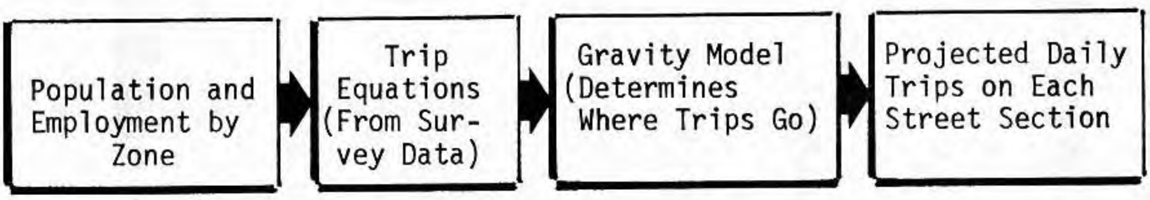
Purpose of Trip	Alternative "0"	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Work	190,396	163,169	163,169	112,334	No Assignment Made	190,504
Shopping	114,935	100,918	87,109	62,500		113,304
Misc. (From Home)	237,998	221,482	178,076	145,425		234,461
Trips w/o Origin or Destination at Home	213,539	205,029	164,845	145,933		209,442
School (LCC & University)	24,805	14,493	14,493	4,960		24,805
Truck	81,834	81,834	81,834	81,834		79,495
Total*	863,507	786,925	689,526	552,986		852,011

* Excludes trips with origin and/or destination outside study area

11 Travel Demand Projections

The population and employment projections for the transportation zones discussed in a previous section are important ingredients for estimating transportation demand. Data collected from an origin-destination survey in 1964 was used to determine the relationship between population-employment "variables" and transportation demand. These relationships, or equations, are then used to estimate the transportation demand when the population and employment within the transportation zones is varied.

As an example, the relationships from the 1964 survey were used to simulate a 1970 situation using population-employment data from the 1970 census as independent variables to estimate the number of trips originating or ending within a transportation zone.

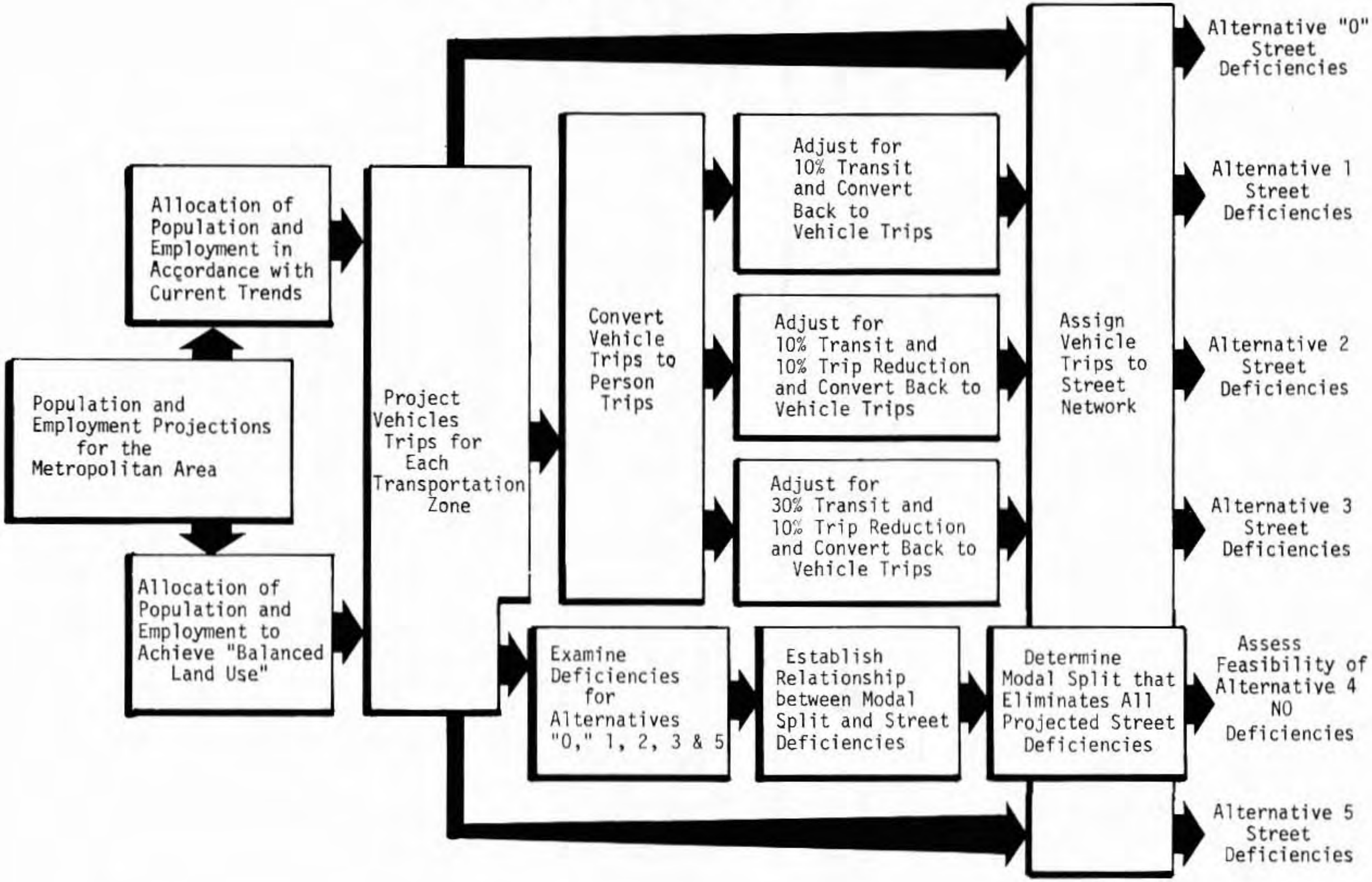


Then a "gravity" model, calibrated with 1964 data, was employed to determine <u>where</u> (other transportation zones) the trips were made to and from. Then, with the origin and destination of all trips determined, the trips were assigned to streets via the shortest time path between origin and destination to estimate the traffic volume that was created by the population and employment during 1970. These traffic volume estimates were compared with traffic volumes counted in 1970, and it was found that the estimates were reasonably accurate. The general conclusion was that the same relationships that were surveyed in 1964 could be used to project transportation demand when population and employment projections for transportation zones were available.

For a better understanding, it should be added that traffic volume on roads entering and leaving the metropolitan area is estimated with a separate procedure and added to the total traffic volume that moves between internal zones. Unlike the internal zone-to-zone trip volume projections, the traffic volume projections for roads entering the metropolitan area are not directly determined by the amount and location of the metropolitan area population. A separate historical traffic projection is made for each road at its point of entry to the metropolitan area. The average 1970-2000 growth factor was 2.30 (roughly equal to 3 percent compound annual growth) and was used to project the year 2000 traffic volumes for roads entering the Eugene-Springfield area. This projection results in 21% of the projected auto trips having an origin or destination outside the Eugene-Springfield area.

FIGURE 9

TRANSPORTATION DEMAND ANALYSIS



With the same general tools mentioned above, the alternatives in Table 1 (see page 17) were tested. Traffic volumes were projected for each set of conditions so that the consequences of the alternative conditions could be better determined.

The entire traffic projection methodology would be extremely lengthy and intricate to explain in this text. Documentation that follows is only in summary. It should provide insight into the major decisions that were made in order to simulate the alternative concepts. Some technical decisions (particularly on alternatives which deviate significantly from current practices) are open to challenge. Often there was not unanimous agreement among the technicians that carried out the work. Much of the work represents pioneering in the field of transportation planning, and commensurate accuracy should be expected by the reader. Some very speculative assumptions (both explicit and implicit) were made to answer some of the questions associated with specific alternatives. Whenever possible, weaknesses will be identified for the reader.

It is probably most fruitful to examine the total number of trips used to construct each alternative. Figure 9 indicates how each alternative was constructed for testing purposes. The number of vehicle trips was estimated for each transportation zone using the socioeconomic projections for each transportation zone as independent variables. Vehicular trip estimates were converted to person trips by multiplying the vehicular trips by an auto occupancy factor derived from survey data. Adjustments were made to reflect the public transit and per capita trip rates designated in the alternatives. (The mechanics of these adjustments will be documented further in Section 12 on modal split.) The auto person trips, excluding walk, school and bicycle trips, were converted back to vehicular trips by dividing by occupancy factors. Vehicle trips were then assigned to the street network according to the shortest time path.

Figure 10 was prepared to demonstrate that Alternative "0" projected "steady state" trip-making rate. Although the number of trips per person has been increasing for a relatively long period (the national trends show that the average American made 50% more trips in 1970 than in 1940), the number of trips per person was predicted to level during the 1970-2000 period. Moreover, Alternatives 2 and 3 represent a reversal in the trend toward higher mobility. (The ten percent reduction from 1970 approximates the mobility reduction experienced during the February 1974 gasoline shortage.)

Reducing the number of trips per person could be accomplished in a number of ways, the most drastic of which would be simply to eliminate some trips currently being made. Substituting walking and bicycling trips for some now made by auto and transit is another possibility.

FIGURE 10

TRENDS IN THE NUMBER OF TRIPS PER PERSON

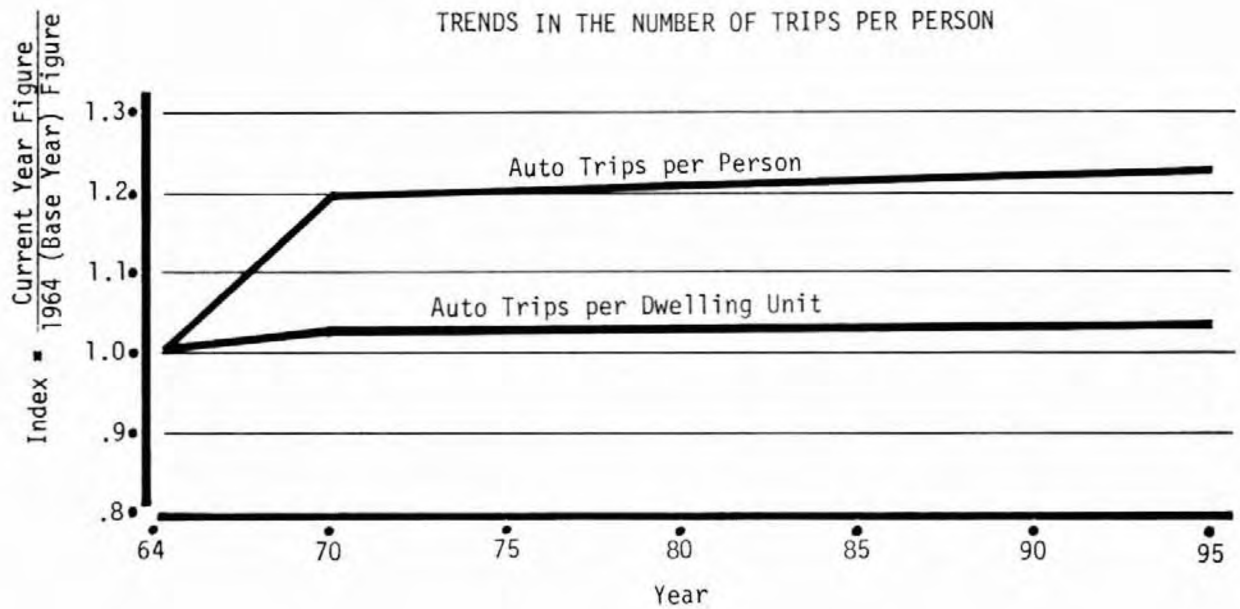
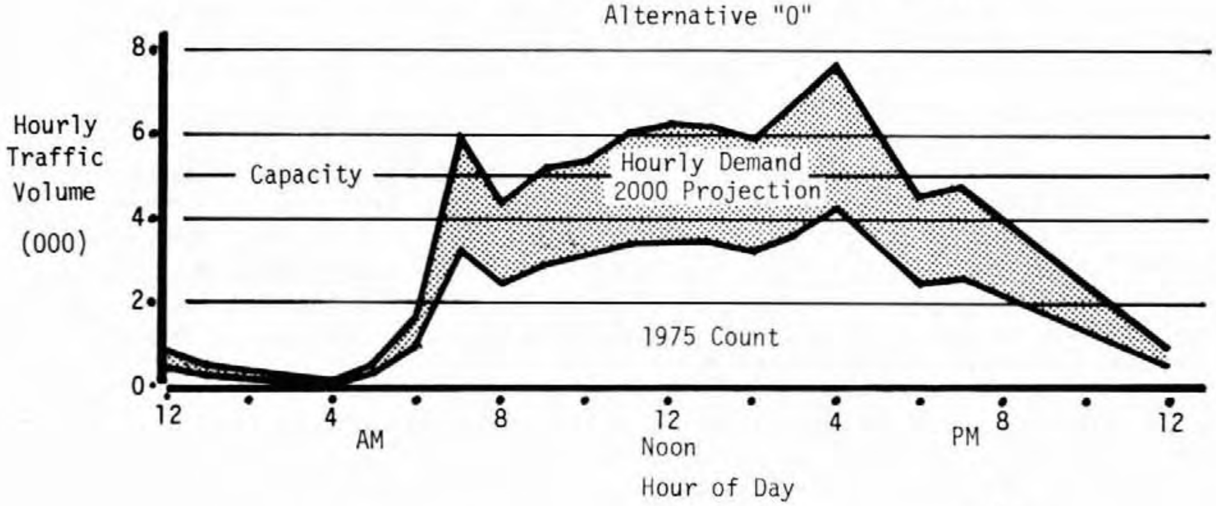


FIGURE 11

FERRY STREET BRIDGE DEMAND-TO-CAPACITY
COMPARISON FOR AN AVERAGE DAY IN 2000

Alternative "0"



Although higher auto occupancy (car pooling) may also be thought of as a reduction in mobility, such action would not result in fewer person trips. It would meet the intent of the reduction in trip-making rates though, as a higher auto occupancy would reduce the need for public capital and operating expenditure and decrease per capita operating costs. Auto occupancy rates were never explicitly modified during the testing process, but through the trip reductions contained in Alternatives 2 and 3, insight into the impact of higher auto occupancy can be obtained, assuming that appropriate incentives are provided to encourage car pooling.

The projected traffic volume on each street was then compared to the "capacity" of that facility, and the street deficiencies were identified. Figures 12-17 identify the existing streets that are expected to be capacity deficient by the year 2000 for each respective alternative. Projected traffic volumes were compared with a standard rule-of-thumb capacity. Normally, street and intersection capacities are expressed in vehicles per hour of green signal-time. The Highway Capacity Manual[3] uses 2,000 vehicles per lane as a maximum number of vehicles that has a reasonable expectation of passing over a given street segment during one hour under "ideal" conditions. Conventionally, an estimate of capacity is reduced to account for red signal-time, trucks, lack of lateral clearance, pedestrians, etc.

Six different conditions have been identified by the Capacity Manual that define the quality of service offered by a given street segment under different demand to capacity ratios: Level of service A exists when traffic volumes are low and there is virtually no restriction in maneuverability due to the presence of other cars; level of service B occurs with some restriction in lane operation from the presence of other vehicles; level of service C represents stable flow with most vehicles experiencing operating restrictions; level of service D approaches unstable flow at a volume approximately 105%-120% of service volume C; level of service E is experienced at approximately 120%-140% of service volume C with all cars being seriously impeded by other traffic and momentary stoppages are normal; level of service F occurs at a point where demand exceeds capacity.

Hourly demand in excess of capacity causes breakdown conditions so that fewer vehicles may pass than the quantity that represents capacity. The Transportation Planning Committee and the Citizens Advisory Committee studied video tapes of traffic at several intersections within the Eugene-Springfield area and collectively established 1900 vehicles per lane per hour of green signal time (or 140% of service volume C) as a rule-of-thumb traffic capacity to use for evaluation purposes. No street other than Railroad Boulevard is currently experiencing a demand

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3. Highway Capacity Manual (Washington D. C. Highway Research Board, 1965).

to capacity relationship, and only during peak hours. (It should be noted that streets and highways are often improved for reasons other than increasing capacity. In addition, it is typical for users to demand street improvements well before the capacity of a given facility is reached. The method used here is merely a single, consistent means of identifying capacity deficiencies, and it should be realized that it does not indicate all facilities that may need improvement before the year 2000.)

To make traffic volume-to-capacity comparison it was necessary to express the daily traffic projection in terms of peak hour demand. Currently, the traffic using major streets of the area has its maximum flow during the late afternoon. Approximately 10 percent of the daily traffic using a given street will use it during the peak hour. Therefore, 10 percent of the daily traffic projection was compared with the hourly capacity of that street estimated at 1900 vehicles per hour of green signal time. Streets whose volume projection exceeded the capacity were considered to be deficient. In some minor cases the excess demand during peak hours might be neglected and the facility could saturate until the drivers would seek alternative routes during peak demand hours or attempts could be made to reduce the peak hour demand through staggered work hours, etc. But the demand is expected to exceed the capacity to such a degree and on such an extensive portion of the system that alternative routes would also be jammed for several hours per day. On the worst overloaded streets alternative routes may be few or nonexistent.

For example, Ferry Street Bridge is projected to have a peak hour demand that exceeds its capacity by 53%, given Alternative "0" (see Figure 11). If the demand were to display a normal hourly variation, traffic would begin to back up daily at 7 a.m. and remain over-capacity (because of the back-up) until after midnight. Theoretically, 10,000 cars would be waiting to cross the bridge by 6 p.m. In truth, however, many trips would not be made because alternative routes would experience similar congestion and occupants and drivers would consider the delays intolerable. (The possibility for serving the peak hour excess will be further explored in Section 12.) Without construction to eliminate peak hour capacity deficiencies (or most of them) Alternative "0" would not be attainable. Life styles would change to reflect a dramatic change in transportation habits; otherwise the plan diagram of the 1990 Plan could not be achieved because the transportation facilities (streets and highways in Alternative "0") would not support the land activity implied in the 1990 Plan.

Table 7 summarizes the information presented in Figures 12-17. The specific improvements necessary to eliminate these deficiencies were not addressed in this report. Depending somewhat on the concept chosen

STREET DEFICIENCIES- 1970 LOADING

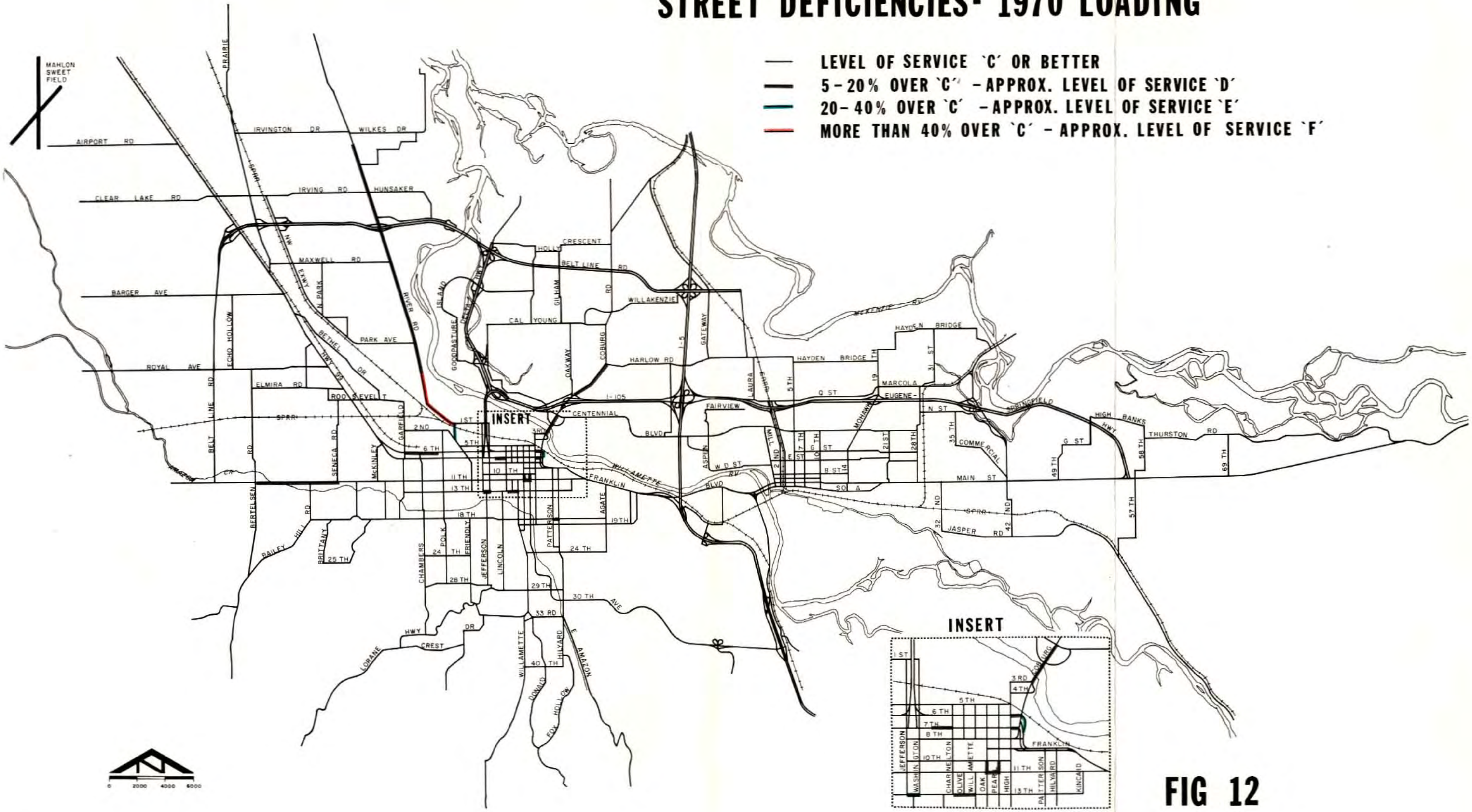


FIG 12

TABLE 6

SUMMARY OF VEHICLE TRIPS

Purpose of Trip	1970 Estimated	Alternative "0"	Alternative 1	Alternative 2	Alternative 3	Alternative 4**	Alternative 5
Work	83,771	167,014	143,131	143,131	98,538		167,109
Shopping	43,396	82,700	72,616	62,668	44,964		81,514
Misc. (From Home)	87,082	166,432	154,886	124,529	101,696		163,959
Trips w/o Origin or Destination at Home	87,816	168,141	161,441	129,799	114,908		164,915
School (LCC & University)	14,043	16,536	9,662	9,662	3,307	No Assignment Made	16,536
Truck	47,202	81,834	81,834	81,834	81,834		79,495
External-Internal	38,606	84,427	63,917	60,721	60,722		84,427
Internal-Internal	28,783	63,917	84,427	80,206	80,206		63,917
External-External	6,463	21,220	21,220	21,220	21,220		21,220
Total*	437,162	852,221	793,134	713,770	607,395		843,092

* Excludes transit bus trips in all cases

** This information was not developed for Alternative 4. See Section 12.

STREET DEFICIENCIES - ALTERNATIVE 'O'

- LEVEL OF SERVICE 'C' OR BETTER
- 5-20% OVER 'C' - APPROX. LEVEL OF SERVICE 'D'
- 20-40% OVER 'C' - APPROX. LEVEL OF SERVICE 'E'
- MORE THAN 40% OVER 'C' - APPROX. LEVEL OF SERVICE 'F'

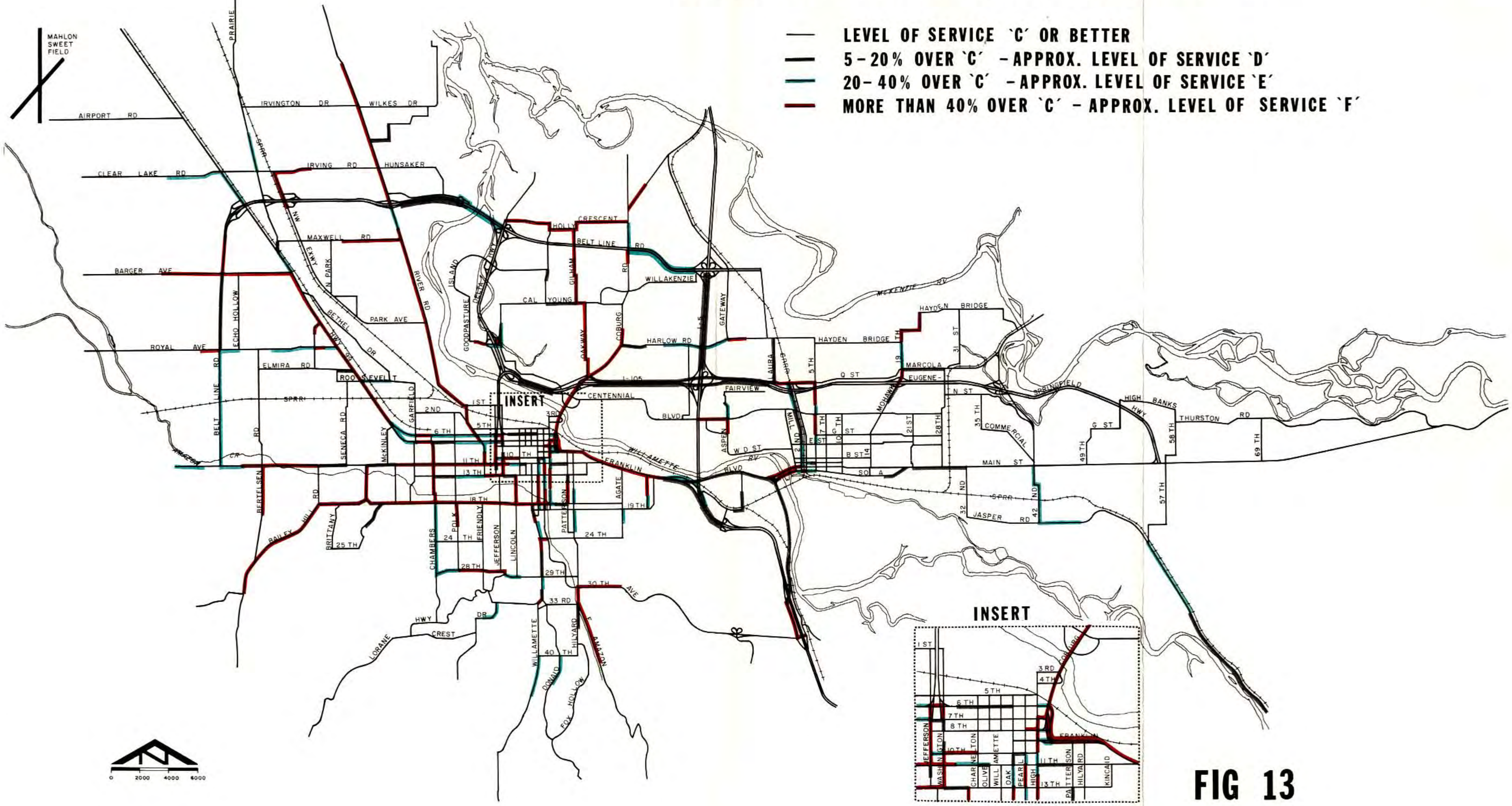


FIG 13

STREET DEFICIENCIES - ALTERNATIVE 1

— LEVEL OF SERVICE `C' OR BETTER
— 5 - 20% OVER `C' - APPROX. LEVEL OF SERVICE `D'
— 20 - 40% OVER `C' - APPROX. LEVEL OF SERVICE `E'
— MORE THAN 40% OVER `C' - APPROX. LEVEL OF SERVICE `F'

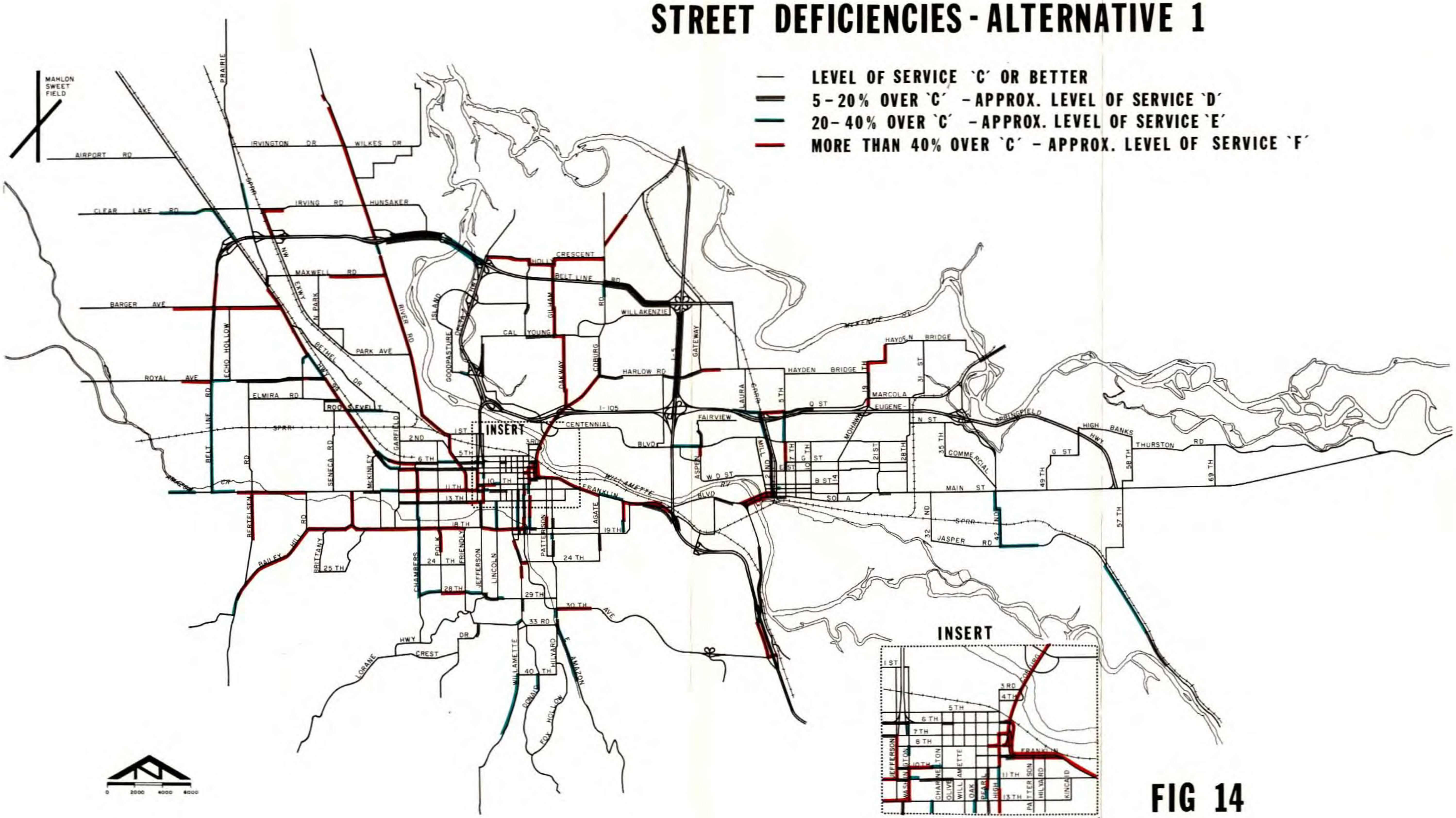


FIG 14

STREET DEFICIENCIES - ALTERNATIVE 2

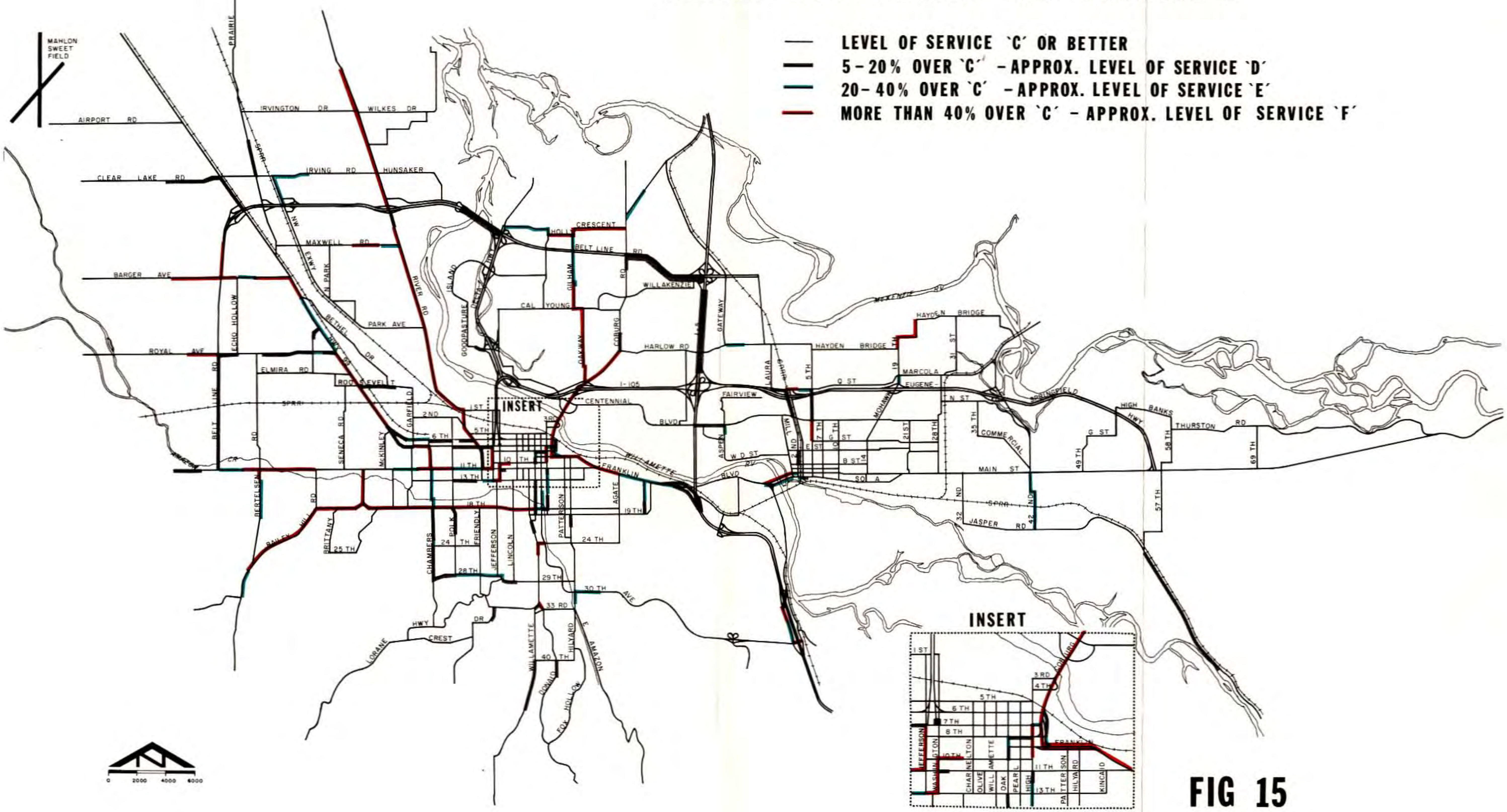


FIG 15

STREET DEFICIENCIES - ALTERNATIVE 3

- LEVEL OF SERVICE 'C' OR BETTER
- 5-20% OVER 'C' - APPROX. LEVEL OF SERVICE 'D'
- 20-40% OVER 'C' - APPROX. LEVEL OF SERVICE 'E'
- MORE THAN 40% OVER 'C' - APPROX. LEVEL OF SERVICE 'F'

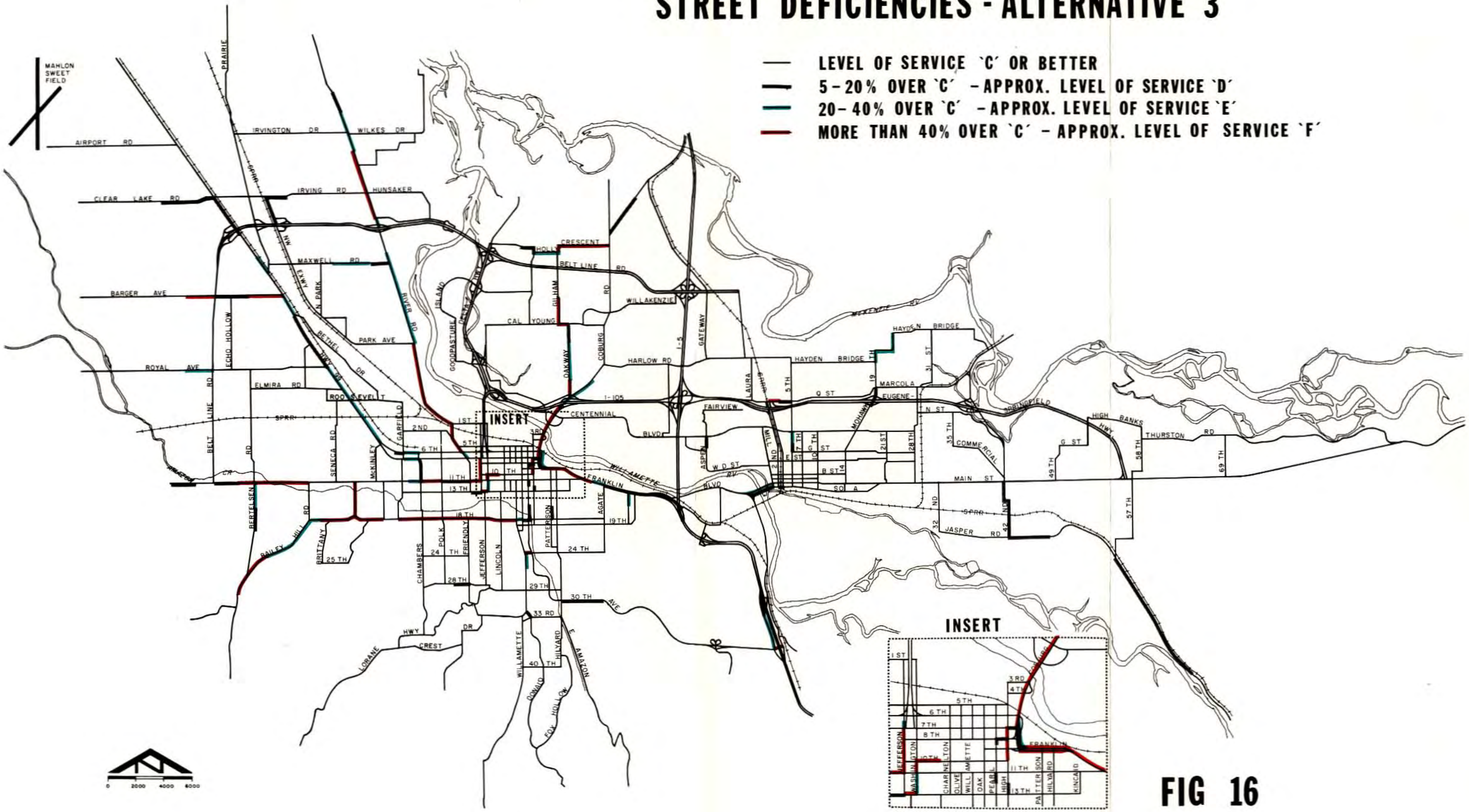


FIG 16

STREET DEFICIENCIES - ALTERNATIVE 5

LEVEL OF SERVICE 'C' OR BETTER
5-20% OVER 'C' - APPROX. LEVEL OF SERVICE 'D'
20-40% OVER 'C' - APPROX. LEVEL OF SERVICE 'E'
MORE THAN 40% OVER 'C' - APPROX. LEVEL OF SERVICE 'F'

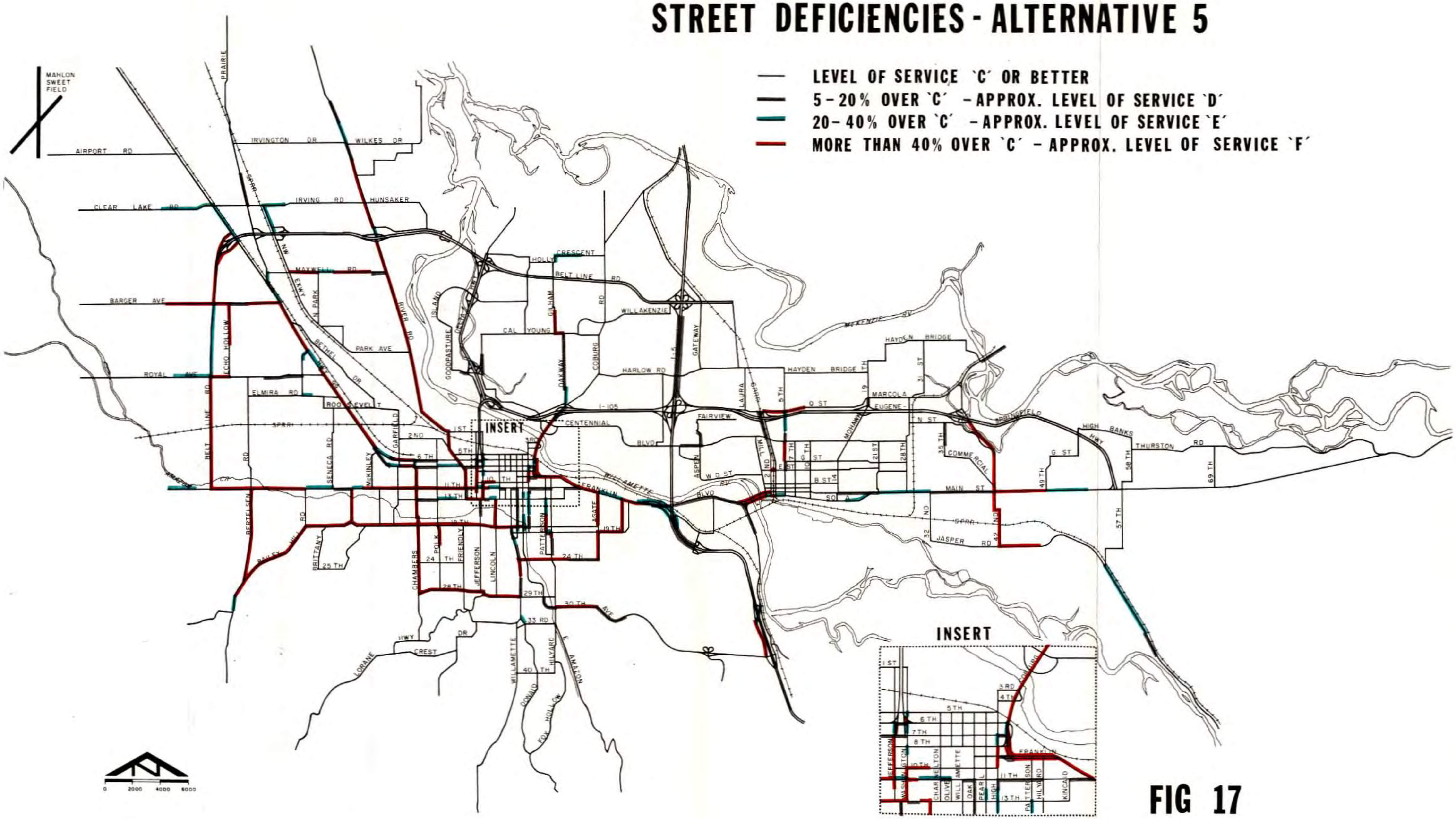


FIG 17

TABLE 7

COMPARISON OF MILES OF DEFICIENT STREETS

	Alternative "0"		Alternative 1		Alternative 2		Alternative 3		Alternative 5	
	Miles	%	Miles	%	Miles	%	Miles	%	Miles	%
Street Miles at Level "D"	21	8	24	10	20	8	18	7	17	7
Street Miles at Level "E"	21	8	19	8	12	5	9	4	14	6
Street Miles at Level "F,"	37	15	34	14	25	10	13	5	39	16
Lane Miles at Level "F"	85		65		38		26		76	
Street Miles Exceeding Level "C"	79	32	77	32	57	23	40	16	70	29

and the respective magnitude of the deficiency, a given deficient segment may have its capacity problem eliminated by widening, relocation, utilization of parallel streets, etc. These subalternatives will be studied after the adoption of a generalized alternative, and then a system plan will be set forth in another report for public review.

12 Public Transit Modal Split

Modal split refers to the share of the transportation market using a particular mode. A 10% modal split for public transit would mean that 10% of the person trips would be made in the transit mode. In the context of this report it refers to the percentage of trips with both origin and destination within the metropolitan area. Trips with origins and/or destinations outside the area were not considered to be candidates for local public transit and therefore not subject to local policies to the same degree as internal trips. Table 8 lists some of the typical modal splits for American cities during 1971 that were reported to Congress for the National Transportation Study. Many other countries would vary considerably from the contemporary American cities shown in Table 8. Historically, changes in modal split have accompanied changes in availability of the automobile and availability of adequate transit service. Eugene-Springfield in 1975, for example, has a transit modal split roughly equal to Denver in 1971.

Pedestrian trips and trips made by bicycle were not considered for the travel demand projections nor were they assigned a modal share. The relationships that were derived from the 1964 origin destination survey and mentioned in the preceding section did not explicitly include trips made by bicycles, pedestrians or trips made to elementary, junior and senior high school. Their omission from the "model" implies that all alternative projected roles for bicycle, pedestrian and school trips were of the same significance as their roles in 1964. For instance, the bicycle accounted for a minor proportion of the trips in 1964, so the projection used for all alternatives studied makes the same assumption. At the time the alternatives were identified, it was reasoned that the projection techniques were not adequately sensitive to warrant projecting for a mode with less than 5% of the market. And since there is little data and experience for projecting bicycle traffic, the bicycle element of the transportation plan was treated in the Metropolitan Bikeway Master Plan without quantifying the traffic expected to use the system. Similar reasons could be cited for not projecting pedestrian and school trips. In theory, higher levels of bicycle and pedestrian trips might help account for the hypothetical 10% reduction in "mechanized" trips assumed for Alternatives 2 and 3. Completion of the metropolitan bikeway system would need to be reassessed under these alternatives to accommodate substitution of bike trips for auto trips.

TABLE 8

TRANSIT MODAL SPLITS FOR SOME AMERICAN CITIES*

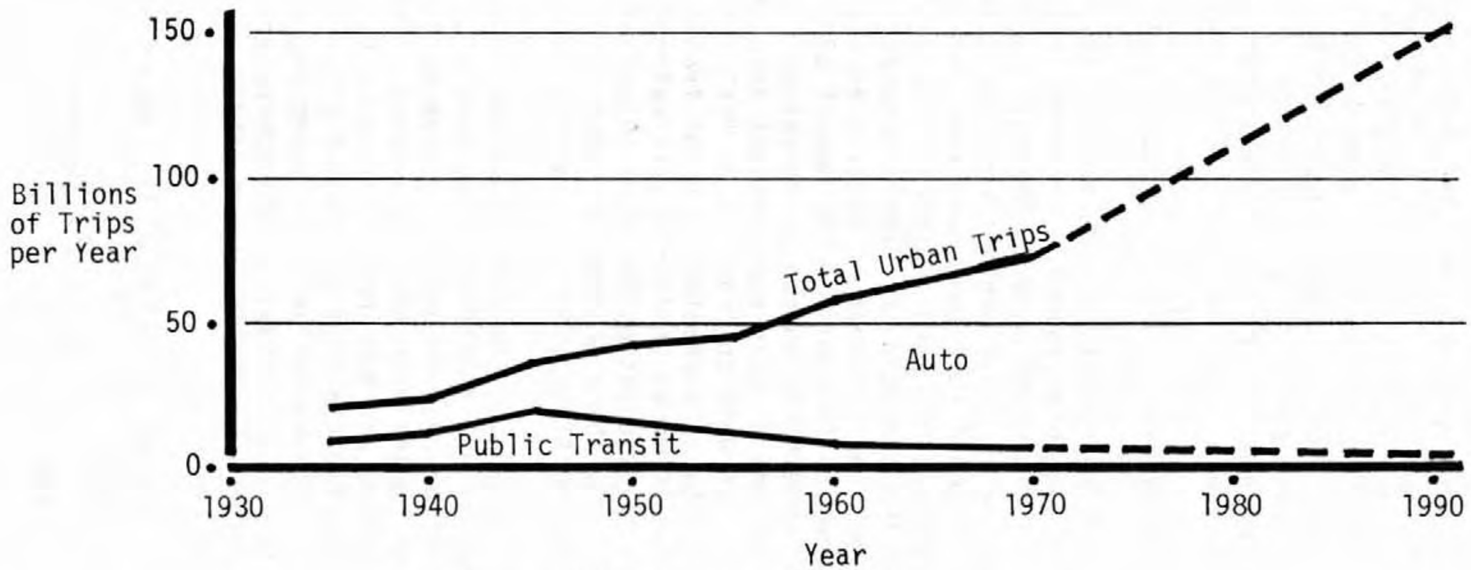
Urbanized Area	Percent of Person Trips Using Public Transportation
Phoenix	0.6
Los Angeles	2.6
San Francisco	4.2
Denver	2.6
Honolulu	6.4
Des Moines	2.0
Baltimore	8.7
Boston	9.2
Buffalo	6.2
Rochester	5.0
Eugene	0.7
Pittsburgh	7.7
Madison	2.7

* 1971 data reported for Urbanized Areas as part of the 1974 National Transportation Study

Figure 18 shows the national trend for the 1930-1970 period. During the height of World War II nearly half of this country's urban person trips were made by transit, but this had dwindled to about 8% in 1970. The national impact of more federal funding for transit, energy shortages and higher fuel prices had not been recorded at the time this report was written. However, the story in Eugene-Springfield is not identical to national trends. In the 1964 origin-destination surveys, approximately one percent of the internal person trips were made on transit. The service remained marginal until Lane Transit District was formed and the system came into public ownership in 1970. Ridership has increased to 12,000 daily person trips or 2.4% of the intra-urban market as a result of dramatic improvements in the convenience, comfort and reliability brought about by public ownership. If the trend in service improvements continues to the year 2000, 10% of the intra-urban trips by transit would be achievable. This increase in ridership will not happen automatically. It has been found that urban areas with marginal public transit systems can precipitate increases in ridership with service improvements whereas ridership in cities with heavily patronized systems is considerably

FIGURE 18

USE OF PUBLIC TRANSIT 1930-1990 - PRESENT TRENDS



Source: The Future of Public Transportation, Booz, Allen Applied Research, February 1973 less responsive to systems improvements.[4] If today's market conditions persist and if Eugene-Springfield is to repeat the experience of many American cities, substantial improvements will be necessary to attain 10% transit modal split. An expanded system and more frequent service was studied with the conclusion that only 3% of the intra-urban trips could be attracted by decreasing the travel time difference (time required to make a trip by transit, minus the time required by private automobile) without changing other conditions.[5] Increasing the modal split to substantially higher levels will depend on a combination of additional legislative actions, further changes in the market conditions, new vehicle types added to the service and other continued system innovations.

MODAL SPLIT AND THE ALTERNATIVES

Alternative "0" implicitly represents a negligible role for public transit. Alternative 1 has a vigorous role projected for transit (10% of the internal person trips) as discussed above. The public meetings held in May 1974 detected that some of those present perceive that there will be a change in the market conditions that now favor the use of the private automobile. That testimony stimulated an interest in testing the results of substantially increasing the role of transit greater than a projection of trends would indicate. The interest in testing an expanded role for transit stemmed from a desire to minimize the impact of transportation on the community and a concern for energy conservation. Tests were performed on these conditions to gain some insight into what else might happen "if" 30% of the trips were on transit, or "if" all street deficiencies were avoided by an increased role for transit. Therefore, the higher levels of transit modal split for alternatives 3 and 4 are not to be considered as an expectation but as a potential goal. There was not full agreement among those technicians contributing to this report on how to depict conditions under the two high transit alternatives.

It was demonstrated in Section 11 that the projected capacity problem for the Ferry Street Bridge was greatest during peak hour demand conditions. Nearly half the peak hour demand would have to use mass transportation to satisfy the demand with transit service. This quite likely could mean 100 bus crossings per hour on exclusive or semi-exclusive rights of way. The exclusive traveled way is not likely to be provided by designating existing lanes exclusively for buses because the existing facility is not compatible with exclusive lane operation. In addition, it is difficult to vary transit service to the extent necessary to match

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4. "Wisconsin Ridership Analysis," Newsline, Washington D. C. Transportation Research Board, April 1975).

5. "An Approach to Modal Testing for the Eugene-Springfield Area Transportation Study" (L-COG, 1974).

hourly demand within a corridor. In relatively small metropolitan areas the hourly variation is more severe than in cities where commuter corridor solutions are effected by adding train cars during peak hour demand periods. Therefore, the approach taken is that modal split would be fairly uniform throughout the area, and particular corridor demands were not studied independently of each other. Given that transit modal split was fairly uniform and given data from two transit passenger surveys, Figure 19 was constructed by extrapolation. At lower levels of transit modal split, school trips (LCC and U of O) and work trips dominate the ridership. This remains true until very high levels of ridership are achieved. Using the figure, it can be determined what percent of the trips for a given purpose would be likely to be traveled by transit "if" a given areawide transit modal split were to be achieved. With the resultant factors, information in Table 9 was tabulated and used to make estimates regarding the transit system necessary for each alternative.

At 10% transit modal split, a system of bus rapid transit could become workable using 19 nodes which have been identified[6] for transfer points. (See also Figure 21 and assume one route implies buses at 20-minute intervals.) Collection and distribution to the nodes might be provided by conventional transit buses, and the nodes could be linked with high capacity express buses. The mixed fleet would require an estimated 186 buses. Each route would have a bus passing every 20 minutes during off-peak hours. Whenever routes overlap or during peak hour operations, buses would be more frequent. The collection-distribution systems which serve the nodes would cover virtually all of the metropolitan area.

Thirty percent transit modal split would require an approximate bus fleet of 500 vehicles that would create an opportunity for sophisticated operations. The design of such a system could easily be the subject of a lengthy investigation. It was assumed for projection purposes that public transit at 30% modal split would be rubber-tired buses, but in many areas of the country 30% transit modal split is considered the threshold for rapid rail transit, depending on the intensity of the development and the length of the corridor. But regardless of the system assumed to carry 30% of the internal trips, substantial improvement in the frequency is almost a certainty. At 10% usage the entire metropolitan area would have reasonably frequent and convenient service; the capacity of the system would probably be increased to accommodate 30% of the trips by increasing the frequency of service, by using larger vehicles and to a lesser extent by increasing the coverage.

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6. "Hand Assignment of 10% Transit Modal Split to Node to Node Network" (Lane Transit District, February 1975).

FIGURE 19

RELATIONSHIP OF AREAWIDE MODAL SPLIT BY PURPOSE TO AVERAGE AREAWIDE MODAL SPLIT

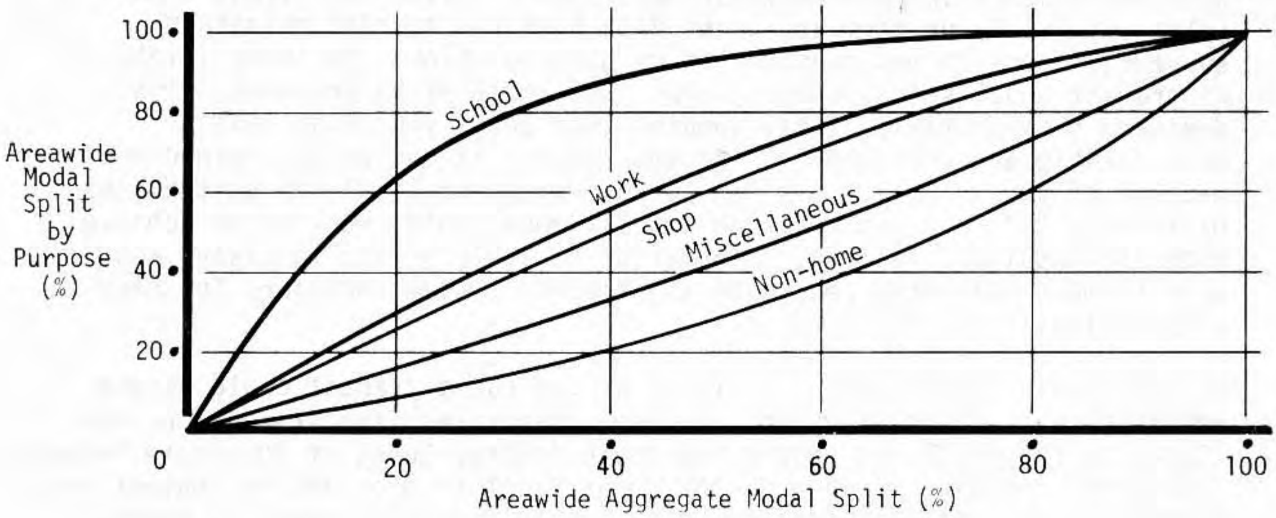
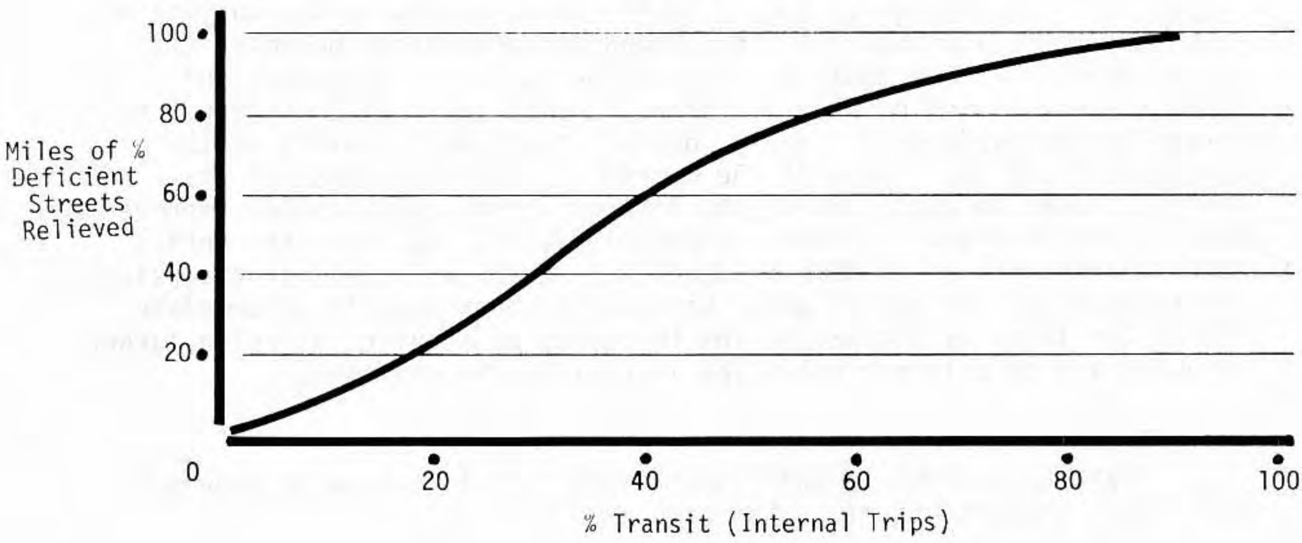


FIGURE 20

MODAL SPLIT VS. NEED FOR ADDITIONAL CAPACITY



NODE TO NODE BUS SYSTEM FOR TEN PERCENT PUBLIC TRANSIT

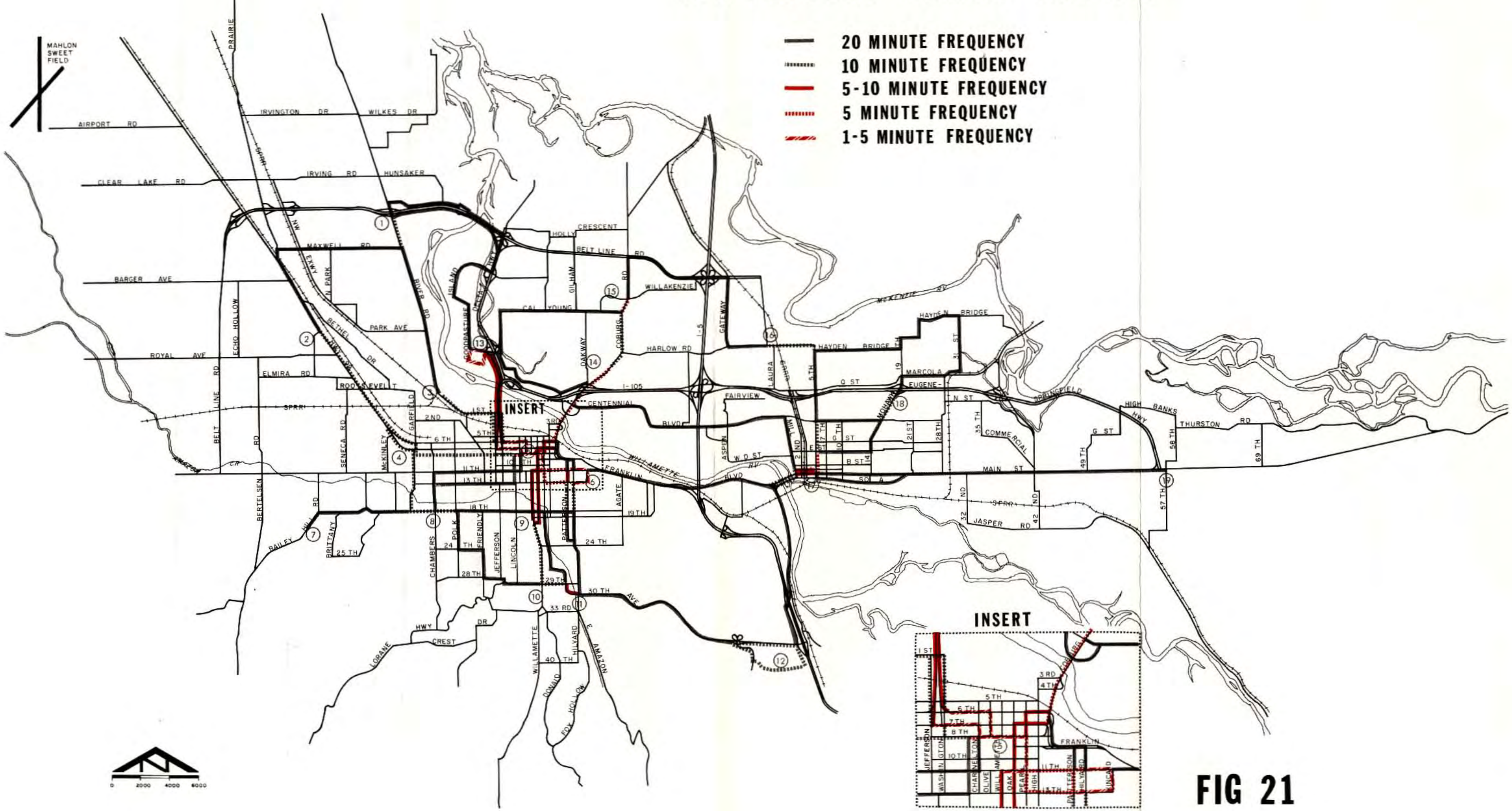


FIG 21

TABLE 9

SUMMARY OF DAILY INTERNAL PERSON TRIPS ASSIGNED TO TRANSIT MODE

Purpose of Trip	Alternative "0"	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Work	Negligible	27,227	27,227	78,062	No Assignment Made	Negligible
Shop	Negligible	14,017	12,097	40,958		Negligible
Miscellaneous	Negligible	16,516	13,279	45,924		Negligible
Trips w/o Origin or Destination at Home	Negligible	8,510	6,842	25,753		Negligible
School	Negligible	10,312	10,312	19,844		Negligible
Total*	Negligible	76,582	69,757	210,541		Negligible

* Excludes trucks, external-internal, internal-external and external-external

Personal Rapid Transit (PRT) is an experimental concept that has been touted as a means of attracting transit riders. To provide personal service, the vehicles are normally low capacity (less than six passengers). In the high volume systems serving 30 percent or more of the area's trips, PRT at most would play a secondary role. Main corridors would require relatively large vehicles (standard transit coaches, articulated super bus, or rail cars) while PRT could be used for priority areas such as the Central Business District. Even here the cost (both financial and environmental) would be very high relative to more conventional modes. Suffice to say that the role of PRT would have to be assessed in detail if a high transit alternative is chosen; but it is unrealistic even at the concept level to envision PRT as the basic system for transportation.

Figure 20 was prepared to demonstrate the relationship between transit modal split and the deficient mileage relieved by increased transit ridership. To accomplish total relief with internal transit only, makes the transit modal split unrealistically high. A majority of the relief is attained at 50% modal split. It is assumed for the purposes of this analysis that the Willamette Valley will be served by a rail passenger system by the year 2000 and that multiple stations will allow for intra-urban movements. A system of rail passenger service (or some other high-volume system) that supplements the Willamette Valley system is far more imaginable than a purely bus transit system if a 50% modal split were to be attained. Conventionally, a system would have a collector-distributor system composed of buses, park and ride, and other smaller-capacity vehicles to serve a high passenger volume fixed rail skeleton. Such a combination system could not be implemented in the developed area of Eugene-Springfield without the initial construction which would sacrifice the minimum disruption objective that was being sought in Alternative 4. Because it is such a technician's no man's land, no other statistics were generated for Alternative 4.

Alternative 5 was designated to have a negligible transit role for testing purposes, in order to assess the impact of land use changes only, by comparison with Alternative "0." However, the multi-nucleated pattern of this population-employment allocation makes transit a more desirable mode choice with any given set of market conditions than continued land development practices. A relatively attractive node-to-node express bus can be designed that requires a less extensive local feeder system. Natural corridors of travel are formed that would be more likely to create a favorable shift to transit usage than continued land use practices would allow under a similar mode-choice situation. Moreover, the pattern for population and employment creates an opportunity for bicycle and pedestrian trip substitution that the technique used for estimating trip demands did not adequately reflect. Whereas current land use practices tend to place residences farther from employment and business centers, the nodal pattern of Alternative 5 could reduce trip lengths so that walking and bicycling for some trip purposes become a real option.

The impact of the Alternative 5 nodal design can probably be best demonstrated by a discussion of two key highway facilities. Throughout the investigation of the alternatives, the magnitude of the projected capacity deficiency on the Ferry Street Bridge and Franklin Boulevard seemed to be a near-insurmountable problem. Under Alternative 5 and 10% transit (a combination not tested for the entire network) these facilities approach a range that may be tolerated with some street management and construction elsewhere in the street system. The deficiency maps in the preceding section indicate the total length of the system deficiencies at generally the same magnitude for Alternatives "0" and 5, but it should be acknowledged that some of the street improvements necessary under Alternative 5 are easier to construct than those in Alternative "0." But only with an unrealistically high transit modal split or with a population employment arrangement allocation similar to Alternative 5 with a strong transit program does it appear that considerable expansion of the Ferry Street Bridge and Franklin Boulevard can be avoided.

13 Financial Analysis

STREET AND HIGHWAY IMPROVEMENTS

The cost of a street or highway improvement project is very difficult to estimate without knowing the location and making a preliminary design study of specific right-of-way and construction problems involved. Making such detailed studies for the entire system for five separate alternatives was found to be prohibitive. However, Alternatives "0"-5 have separate cost implications that were thought to be important to setting broad policies. Without good agreement among those carrying out the technical work, it was decided to use average costs from recent urban construction projects.

There can be extreme variation between these unit costs depending on location, design standards, terrain, assessed values, etc. There can also be wide variety in the purchase cost of a bus. In no case was the location or type of improvement specified; the values in Table 11 were applied against the facilities identified at level of service F in Figures 12-17, and new buses required to attain the fleet size listed in Table 10, without studying what kind of street improvements should be made.

TABLE 10

ESTIMATE OF FLEET SIZE

Measure	Alternative 1	Alternative 2	Alternative 3
Average Weekday Person Trips by Transit	76,582	69,757	210,541
Passengers per Bus Mile	2.29	2.29	2.29
Daily Bus Miles	33,442	30,462	91,939
Daily Bus Miles/Active Bus*	180	180	180
Fixed Route Fleet*	186	169	511

* Units needed for special services to handicapped or suburban are not included in table.

TABLE 11

AVERAGE UNIT COSTS FOR SYSTEM COST ESTIMATING

Unit	Average Cost (1974 Dollars)
Roadway (State Highways)	$385,000 per Lane Mile
Roadway (City-County)	$300,000 per Lane Mile
Right of Way	
CBD	$10.00 per Foot
City Center	$ 6.00 per Foot
Suburban	$ 2.00 per Foot
Structures	$40.00 per Foot
Major River Bridge	$20,000,000
Transit Coach	$70,000 Each

OPERATING COSTS

Operating costs were estimated using 1975 unit costs. Private automobile costs were estimated at 16¢ per mile including depreciation, maintenance, gas and oil, garage and parking, insurance and taxes. Transit bus operating costs were estimated at $1.06 per bus mile. Street maintenance and bus replacement were not included in the cost estimate because street maintenance cost was found to be difficult to estimate. Since street maintenance and fleet replacement are approximate counterparts, it was felt consistent to omit both from the analysis.

Rates for construction costs and operating costs will obviously change during the 25-year projection period. Current price estimates were assumed for all calculations so that the statistics would be kept free of conjecture over technology. Estimating the long-term reaction to high fuel prices, for instance, would foster disagreement that this report could never resolve. Not only would higher fuel prices tend to encourage more efficient engines, it would accelerate the search for substitute power units. Higher prices would also be reflected in the increased cost of labor for maintaining private cars and operating and maintaining transit vehicles. These kinds of reactions are difficult to identify in relative terms, and it is completely impractical to judge their magnitude. Therefore, the costs in Table 12 are for current prices; and it will be the burden of the reader to make any inferences regarding the importance of unit changes.

If one accepts the constraints of Table 12, a few observations are worthy of noting. Street construction costs are a small proportion of

TABLE 12

COST ESTIMATE FOR ALTERNATIVES (ALL COSTS IN 1975 DOLLARS)

		1975 Only	Alternative "0"	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Non-Transit	Construction 1975-2000 (Millions)	--	$69	$61	$34	$30	no data	$69
	Average Annual 1975-2000 (Millions)	$1.2[a]	$2.8	$2.4	$1.4	$1.2		$2.8
	Average Annual Per Capita (1975-2000)	$ 7	$13	$11	$ 6	$ 5		$13
	Daily Miles of Travel - Year 2000 (1000's)	1,923	3,398	3,192	2,918	2,526		3,220
	Daily Private Operation - Year 2000[b]	$307,680	$543,654	$510,753	$466,947	$404,185		$515,224
	Annual Operation - Year 2000 (Millions)[b]	--	$198	$186	$170	$148		$188
	Average Annual Operation 1975-2000 (Millions)[b]	$112	$155	$149	$141	$130		$150
	Average Per Capita Annual Operation (1975-2000)[b]	$663	$695	$668	$632	$583		$673
Transit	Fleet Size Increase - Buses	--	0	126	109	451		0
	Cost of Fleet Increase (Millions)[c]	--	0	$8.8	$7.6	$31.6		0
	Average Annual Fleet Cost 1975-2000 (Millions)[c]	$0.6	0	$0.4	$0.3	$1.3		0
	Average Annual Per Capita[c]	$4	0	$2	$1	$6		0
	Daily Bus Miles - Year 2000	9,828	7,750	33,442	30,462	91,939		7,750
	Daily Bus Operation - Year 2000[d]	$10,418	$ 8,220	$35,449	$32,290	$97,455		$ 8,220
	Annual Operation - Year 2000 (Millions)[d]	--	$3	$13	$12	$36		$3
	Average Annual Operation 1975-2000 (Millions)[d]	$3	$3	$8	$8	$20		$3
	Average Annual Per Capita[d]	$18	$13	$36	$36	$90		$13
Total	Total Capital Cost 1975-2000 (Millions)	--	$69	$70	$42	$62		$69
	Average Annual Capital 1975-2000 (Millions)	$1.8	$2.8	$2.8	$1.7	$2.5		$2.8
	Average Annual Capital Per Capita 1975-2000	$11	$13	$13	$ 7	$11		$13
	Average Total Annual Operation 1975-2000 (Millions)	$115	$158	$157	$149	$150		$153
	Average Annual Operation Per Capita 1975-2000	$681	$708	$704	$668	$673		$686
	Total Per Capita Annual Cost 1975-2000	$692	$721	$717	$675	$684		$699

a. $1,200,000 is the approximate amount used during 1975 for construction that increased capacity. This kind of expenditure tends to be sporadic, and 1975 may not be a typical year.

b. Assumes 16¢ per vehicle mile.
c. Assumes $70,000 per bus.
d. Assumes $1.06 per bus mile.

the total cost of transportation. The largest portion of the cost is derived from private vehicle operation, which is also difficult to manipulate because it is privately consumed. Despite this characteristic, the potential for conserving on cost seems greatest for private operating costs because of its magnitude. Alternative 5, for example, can reduce the operating costs by 3.1% without any substitution of transit for auto trips, even though substitution would be vastly enhanced by the pattern of origins and destinations. Secondly, transit proves to be a cost-saving device even at low levels of transit modal split. While Alternative 1 assigns 7% of total trips (10% of internal trips) to public transit, only 5% of the total cost is in transit operation. Another way of saying the same thing is to say that Alternative 1 saves $29 per capita in construction and auto operation costs annually relative to Alternative "0" while costing only $25 per capita above the minimum transit operation--a benefit/cost ratio of greater than one.

FINANCIAL RESOURCES

The cost estimates from Table 12 are of little value unless there is some means of assessing whether they can be afforded. In this subsection only the revenue sources for public expenditure will be examined. It should be noted that the vehicle operating costs of the automobile mode are borne privately and constitute a large portion of the total system cost of any alternative studied. This fact makes the viability of all alternatives strongly dependent on the private individual's ability and willingness to finance the private share of costs. It was not practical to numerically project the private financial posture as part of this report, but despite this relatively substantial omission, public agencies' ability to pay is discussed below as one criterion on which to base the choice among alternatives. The reader, however, is urged to give substantial weight to the total costs in Table 12 when comparing alternatives.

Street and Highway Revenues

Local revenue for street construction includes parking taxes, parking citations, bond issues and property assessments. However, the purpose of street assessment is to improve streets, curbs and sidewalks to urban standards and with few exceptions these types of projects do not eliminate capacity problems of the kind discussed in this report. Therefore, assessments will not be considered a revenue source for Table 13. Other locally generated resources were estimated to continue at $700,000, just slightly below the current level.

Cities and counties are allocated a share of the state gasoline tax: Eugene, Springfield and Lane County receive about $4 million annually through this transfer. Similar to the timber revenues, the county

TABLE 13

ANNUAL REVENUE PROJECTION IN 1975 DOLLARS*

		1975	Alternative "0"	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Street Finance								
Local	Assessment	0	0	0	0	0	0	0
State to Local	Locally Generated	834,000	700,000	700,000	700,000	700,000	--	700,000
	Gasoline Tax	2,315,000	2,000,000	2,000,000	2,000,000	2,000,000	--	2,000,000
	Timber Revenues	2,082,000	2,000,000	2,000,000	2,000,000	2,000,000		2,000,000
Federal	Urban System	700,000	600,000	600,000	600,000	600,000	--	600,000
Other Programs	State-Federal	0	0	0	0	0	--	0
	State	0	0	0	0	0	--	0
Total Street Finance		5,931,000	5,300,000	5,300,000	5,300,000	5,300,000	--	5,300,000
Transit Finance								
	Fares	712,000	712,000	4,783,000	4,357,000	13,150,000	--	712,000
	Payroll Tax	1,885,000	1,885,000	3,400,000	3,400,000	3,400,000	--	1,885,000
	Operating Grants	279,000		3,306,000	3,019,000	10,622,000	--	
	Capital Grants	393,000	393,000	400,000	300,000	1,300,000	--	393,000
	New Local Charges	0	0	1,511,000	1,224,000	8,828,000	--	0
Total Transit Finance		3,269,000	2,990,000	13,400,000	12,300,000	37,300,000	--	2,990,000

* The reader is not advised to use this table without a complete reading of the accompanying text on revenues.

allocation is used on a project-by-project basis for the entire county. It was assumed that the metropolitan share would be in proportion to the metropolitan population in unincorporated areas, thus placing the estimated annual revenue for this source at $2 million. Although there have been proposals to increase the state gasoline tax and the ton-mile tax, the increase would only offset rising construction costs.

Lane County receives a share of federal timber revenues that currently amounts to approximately $5 million annually. However, only a portion of this is spent for projects within the metropolitan area since improvements on county-financed arterials must compete with the needs on many miles of county rural roads. It was assumed that this revenue would continue at its current rate and that the share used for the metropolitan area would be proportional to the population residing in the unincorporated sections of the metropolitan area. The yield would be an estimated $2 million annually. Federal Aid Urban System (FAUS) funds are allocated by the state on a population basis. These funds may be used for projects designated by local officials on arterial streets or for transit capital expenditure including bus purchases, transfer stations and shelters. Although a continuation of this fund depends on future legislation, it is probable that the provision of this fund and for its modal flexibility will continue. The fund was projected at $700,000 per year with $600,000 of it to be used for street projects.

For a number of reasons it is not advisable to project the use of other state or federal funds for the area. With the rising costs of maintenance and construction, the state is unable to undertake much construction without the use of federal assistance. The Eugene-Springfield area is technically eligible for Federal Aid Interstate funds and Primary Extension funds, but the completion of the interstate system is not likely to include new highways in Eugene-Springfield (other than the existing I-5 and I-105). The Primary Extension fund has only $2.5 million annually for the entire state with none programmed for Eugene-Springfield before 1981. A $150 million state bond program authorized by the 1973 legislative session was intended to provide $13 million over a 6-year period to make state highway improvements in Lane County. Locally established priorities indicate that the need for most of the money is outside the metropolitan area; only a River Road project has any metropolitan capacity-improving potential from this fund, and given the great number of competing projects this project is far from certain. For these reasons no revenues were projected from state or federal programs other than those already discussed.

Some caution is warranted before concluding that the resources are adequate. Federal funds are likely to change, and if recent trends continue, less money will be earmarked for highways and more will be "discretionary," available for either transit or highway projects. No reduction was assumed in gas tax or timber sale revenues, but this cannot be taken for granted. No allowance was made for inflation since in the past revenues have kept pace with expenditures primarily because increasing automobile travel increases user tax revenues. Most recently, though, construction costs have spiraled, and revenues have grown more slowly. Furthermore, the construction costs in Table 12 include only the cost of sustaining a street system that is barely tolerable (i.e., only level of service "F" is improved). The public may desire a higher level of service, and the cost of such a system would appear less affordable than the system assumed for the cost estimates.

In spite of these qualifications, it seems evident that the dollar resources necessary for street and highway construction will not be a primary constraint on the attainment of the desired alternative. The estimated $5.3 million per year that is available exceeds the $2.8 million per year required to correct the "worst case" street deficiencies. The fact that only $1.2 million was spent in 1975 on capacity-increasing projects (Table 12) demonstrates that revenues are commonly used for safety projects and other general upgrading in addition to relieving capacity deficiencies.

<u>Transit Revenues</u>

The latest budget estimate of Lane Transit District shows revenue projections for fiscal 1975 of $712,000 in fares, $1,885,000 in local payroll tax, $279,000 in federal operating subsidy and the remainder of the $3.2 million budget is a federal capital grant. Assuming the present fare structure, farebox revenues were projected to the year 2000 based upon the projected ridership from Table 9, yielding $4.783 million, $4.357 million and $13.150 million annually for Alternatives 1, 2 and 3 respectively.

The local payroll tax was assumed to continue at the same rate, and the tax base was assumed to grow in proportion to the 1975-2000 employment projection; approximately $3.4 million annually may be projected from this source. Recently, federal operating subsidies have become available for 50% of the cost of increased service, providing the other 50% is generated locally. The purpose of this program is to supplement increases in service and not replace the local support for the transit system operation. Currently, these funds are allocated in accordance with a formula, and Eugene-Springfield is projected to receive only $522,000 (in 1975 dollars) per year through 1980 from this source. It is speculative to assume that this fund will not be subject to an upper limit in future legislation; but for the purposes of this revenue estimate, it was assumed that federal subsidies would finance 50% of the cost of added service, regardless of the current subsidy level. The assumption resulted in estimated revenues from this source of

$3.306 million, $3.019 million and $10.622 million for Alternatives 1, 2 and 3 respectively. For simplicity it was assumed that Federal Aid Urban System funds, discussed under the highway revenues section, and transit capital grants would fund all necessary transit capital expenditures.

Alternatives "0" and 5 could be financed with current revenue levels. The cost of adequately covering the metropolitan area with minimum acceptable transit service is roughly $3 million annually in 1975 dollars, an amount which is comparable to current revenues.

Alternatives 1 and 2 would generate (and depend on) substantially increased ridership and farebox revenues. In the year 2000 Alternative 1 could be financed by $4.8 million in farebox revenues. $3.3 million in federal operating subsidy and $4.9 million in other local charges. Since only $3.4 million is projected from local taxes, $1.5 million annually is yet to be found for the alternative to be financially feasible in the year 2000. However, given the uncertainty in funding levels, this alternative should not be rejected as a fiscal impossibility. A similar generalization can be made for Alternative 2.

It might further be noted that a transit operation substantial enough to carry 10% of the metropolitan area trips will need a financial and philosophical commitment from public agencies having jurisdiction over the street and highway system. The costs in Table 12 do not represent the cost of support facilities such as shelters, transfer stations, bus pull-outs, bus lanes, traffic signal preemptors, etc., that require joint effort from the transit operator and agencies responsible for street management. Since Alternatives 1 and 2 will need some combination of support facilities just mentioned, these two alternatives should indicate a reevaluation of local government's role in transit system operation.

With similar assumptions made for Alternative 3, $8.8 million annually must yet be found to supplement currently identifiable resources. However, as stated elsewhere in this report, a transit ridership as high as that of Alternative 3 almost by definition implies a major shift in personal preference and/or externally caused constraints on auto travel, accompanied on both the local and national levels by a major shift in resources away from private transportation and toward public transit. Therefore, it would not be valid to conclude that Alternative 3 (or an even greater transit usage) is necessarily beyond financial feasibility simply because it cannot be financed with currently identified resources.

In general, none of the alternatives can be ruled out on the basis of costs vs. resources. There are simply too many unknowns about future funding of both transit and highways, and too many considerations other than costs to be weighed. This is not to say that the choice of an alternative will not require financial commitment; for transit as well as for auto travel, the demand for the service obviously will be closely related to the willingness to pay for it. To the extent that the general public and public officials respond to changing demand, financing schemes will be developed to meet the total demand. In a sense the "bottom line" of Table 12 is the amount that must be paid for each alternative, whether the mix of gas taxes, fares, property or payroll taxes, etc.

In order to bring about large increases in transit usage, very large expenditures must be made to provide the necessary capacity and service. But large expenditure for public transit will not alone guarantee that the system will be heavily used, any more than a large expenditure for streets will generate a viable system. Transit usage (and fares) must accompany the investment to generate the necessary political acceptance and financial support. For public transit to once again become a major means of urban transportation, improvements will have to follow a cyclical process in which public acceptance and response is a vital link. Timing is all-important. Just as Alternative "0" can be financed but may be unworkable for other reasons, a very high transit alternative can also be "afforded" but may not necessarily be achievable. The comparative cost estimates, and this discussion of resources, can be used to help weigh the alternatives; but they constitute only one of many criteria that must be used to decide upon the most desirable (and attainable) future for the urban area.

14 Energy

Energy consumption was calculated by assuming a rate of 13 miles per gallon for private automobiles and 6 miles per gallon for diesel buses. Energy costs of maintaining the system (i.e., roads, stations, etc.) were ignored. This equates to approximately 10,000 BTU per automobile mile and 24,700 BTU per bus mile. Neither of these rates could be achieved on highly congested streets; therefore, the results of Table 14 are predicated on a solution to the street capacity deficiencies cited in Table 7. As in the preceding section, no adjustments were made for potential changes in technology.

TABLE 14

COMPARISON OF ENERGY REQUIRED

Measure	Alternative 0	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Annual Auto Miles Year 2000 (Millions)	1,240	1,165	1,065	922	No Data	1,175
Annual BTU-Auto (Trillions)	12.4	11.6	10.6	9.2		11.8
Annual Bus Miles (Millions)	--	12	11	34		--
Annual BTU-Bus (Trillions)	--	.3	.3	.8		--
Total Annual BTU Year 2000 (Trillions)	12.4	11.9	10.9	10.0		11.8

15 Air Pollution

It has been found that air pollution does not increase in the same proportion as the growth in vehicle miles of travel. Federally imposed emission controls have become increasingly stringent for new cars in the last several years. As new cars replace older ones without emission-reducing equipment, the emissions per vehicle mile decrease for most pollutants. (No attempt will be made here to evaluate the secondary effects of the catalytic converter currently being installed on some American cars.)

Ambient air standards were established by the U. S. Environmental Protection Agency (EPA) as a response to the Clean Air Act, and the Oregon Department of Environmental Quality (DEQ) has promulgated standards which in some cases are more stringent than those set by EPA. These air quality standards are expressed as maximum allowable concentrations (in parts per million) at the point of a receptor. The state-of-the-art in air quality prediction makes forecasting pollution concentrations an intricate process and beyond the scope of Step 1 of the transportation planning process (Section 3). During fiscal 1976, the Department of Environmental Quality and Lane Regional Air Pollution Authority (LRAPA) will prepare an air quality plan for

Eugene-Springfield which has been dictated by EPA because the area is expected to violate the particulate concentration standards during the 1976-1985 period. The air quality plan process will make more specific projections of air pollutant concentrations than can be made for the transportation study.

In a preliminary examination by LRAPA it was found that the ambient air standard for carbon monoxide (as well as particulates) was being violated in some metropolitan locations during certain meterological conditions. But overall there was a substantial degree of compliance with the standards and therefore Eugene-Springfield is not required to develop and plan for the attainment of standards. Instead, the plan being required by EPA is for the maintenance of air quality that meets federal criteria during the 1976-1985 period. A focus of the air quality plan will be particulate emissions to ensure that the area does not violate EPA criteria during the 1976-1985 study period. Although transportation is not a major contributor to the particulate problem, it is expected that vehicular emissions will receive added attention in the preparation of that plan. In several cities the transportation element of the air quality plans has involved emission controls, mandatory inspections, parking management and mass transportation incentives. Dust abatement on unimproved roads may also be a component in the Eugene-Springfield particulate control plan. Whatever form the Eugene-Springfield plan takes, it will be coordinated with step two of the transportation planning process cited in Section 3 of this report.

AIR QUALITY AND THE ALTERNATIVES

It was possible to examine three major vehicular emissions for the transportation study to partly compensate for not being able to project pollutant concentrations. Although at many locations the presence of nontransportation air pollution sources should be considered before drawing a conclusion about violation of standards, the information developed in the transportation analysis is nevertheless an important ingredient in making inferences about future concentrations. To make the information most useful to LRAPA and DEQ when developing the 1976-1985 air quality maintenance plan, it was decided to examine vehicular emissions in 1985 for the five transportation alternatives; 1985 was chosen as the test year for air quality since it constitutes the last year of the EPA study period. Although it is anticipated that total emissions will continue to decrease for several years after that due to increasingly strict emission standards and replacement of older vehicles with cleaner new ones, evaluation of air quality for a later year would provide little additional useful data for the type of comparative analysis performed here. Total vehicular emissions might be more or less in 2000 than 1985, but the relative difference between alternatives would remain the same. The Department of Environmental Quality provided vehicle emissions data that was used to estimate the quantity of pollutants generated by transportation sources studied in each alternative.

Figure 24 demonstrates the relative magnitude of carbon monoxide, oxides of nitrogen and hydro carbons estimated for 1970 and the five alternatives. Other pollutants such as sulphur dioxide, suspended particulate and lead have a proportionally less significant contribution from transportation sources, and will be further studied at a later date. Carbon monoxide, which decreases the oxygen-carrying capacity of blood, is produced by the internal combustion engine and thus becomes an obvious concern in making transportation decisions. Violations of the carbon monoxide standard have been measured in the Eugene Central Business District and the overpass at Valley River Center. These violations were known at the time EPA designated Eugene-Springfield as an Air Quality Maintenance Area, but the criteria gave some tolerance to occasional violations of the eight-hour concentration standard. Consequently, the area was not specifically directed to prepare a carbon monoxide attainment plan. Irrespective of the fact that Eugene-Springfield's plan need not include steps to attain the carbon monoxide ambient air standard, compliance with the standard is a requirement of legislation. Measurements taken in the two locations mentioned above suggest that violations are also occurring along South "A" in Springfield, on Ferry Street Bridge, Railroad Boulevard and Franklin Boulevard during unfavorable meteorological conditions, even though these measurements have not been taken. Using Figures 22, 23 and 24 in combination, some observations can be made about transportation's contribution to the carbon monoxide problem in these areas of concern.

Areawide emissions of carbon monoxide are expected to decrease between the 1970 base period and 1985. Since the expected reduction in carbon monoxide comes from restrictions on automobiles and since transit vehicles or any heavy duty vehicle (over 6000 pounds) are not subject to the same restrictions, the difference among the five modal alternatives is not significant in 1985. The air quality of areas in Figure 22 that now have carbon monoxide problems would probably be improved by 1985 under any alternative studied, since the projected carbon monoxide emissions from transportation sources decrease significantly from current levels in all areas which are currently suspected of violation. Given that internal combustion is a major source of this pollutant, it appears that the increasing emission controls are adequate to ensure substantial compliance with the carbon monoxide standard by 1985.

Incidence of oxides of nitrogen and unburned hydrocarbons is significant because of their role in smog formation: when present in adequate

COMPARISON OF VEHICULAR EMISSIONS-CARBON MONOXIDE

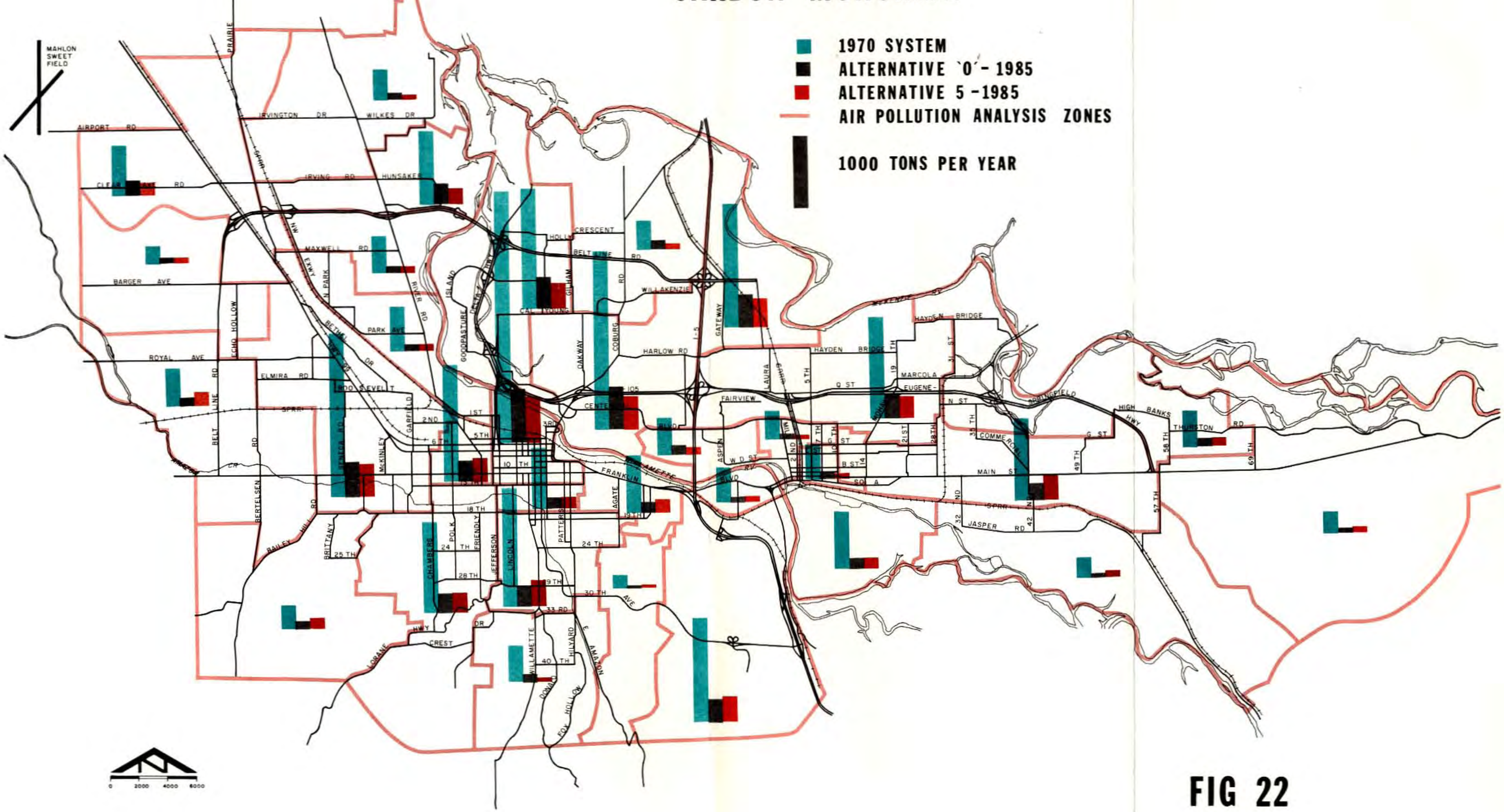


FIG 22

COMPARISON OF VEHICULAR EMISSIONS-CARBON MONOXIDE

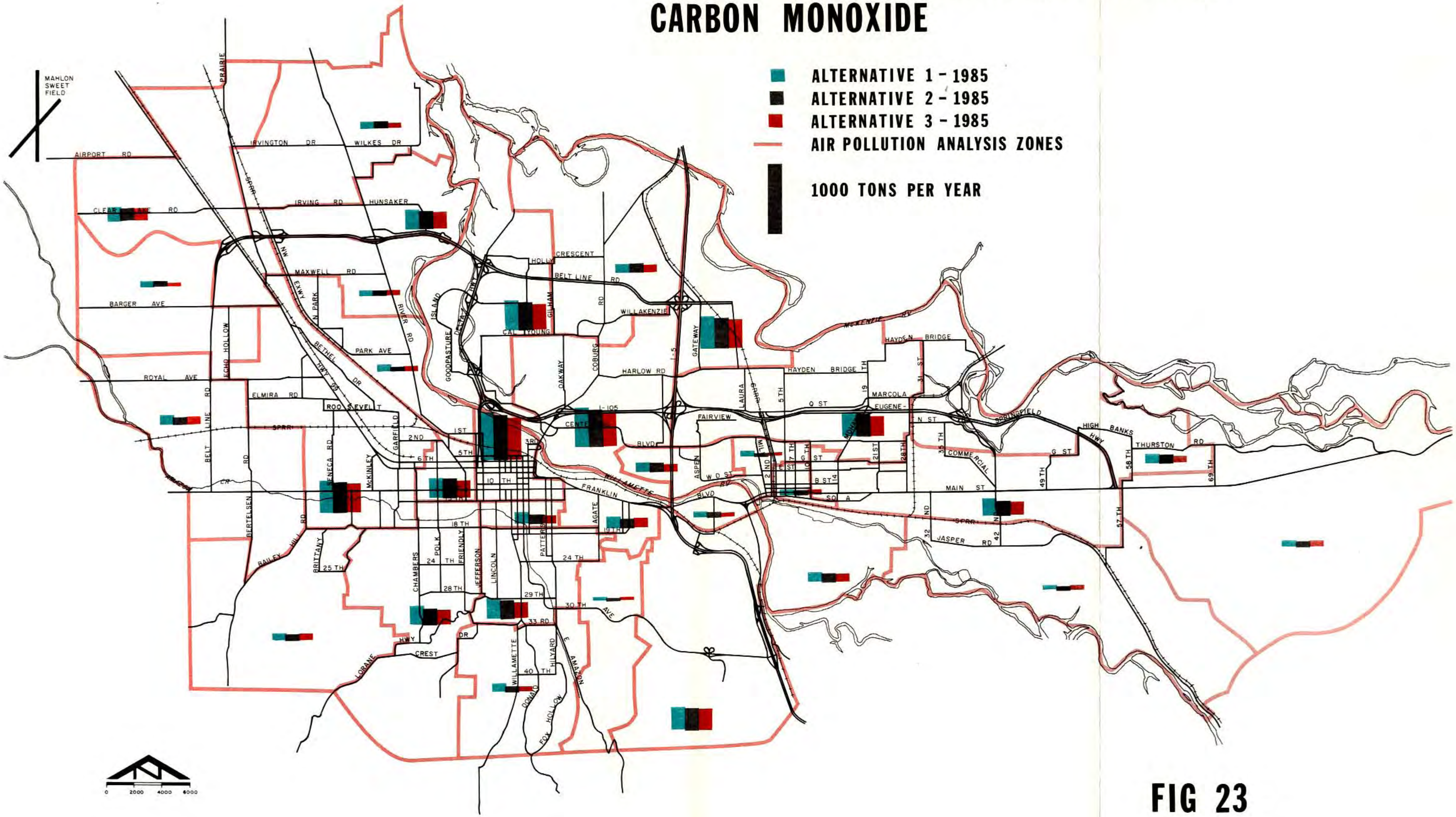
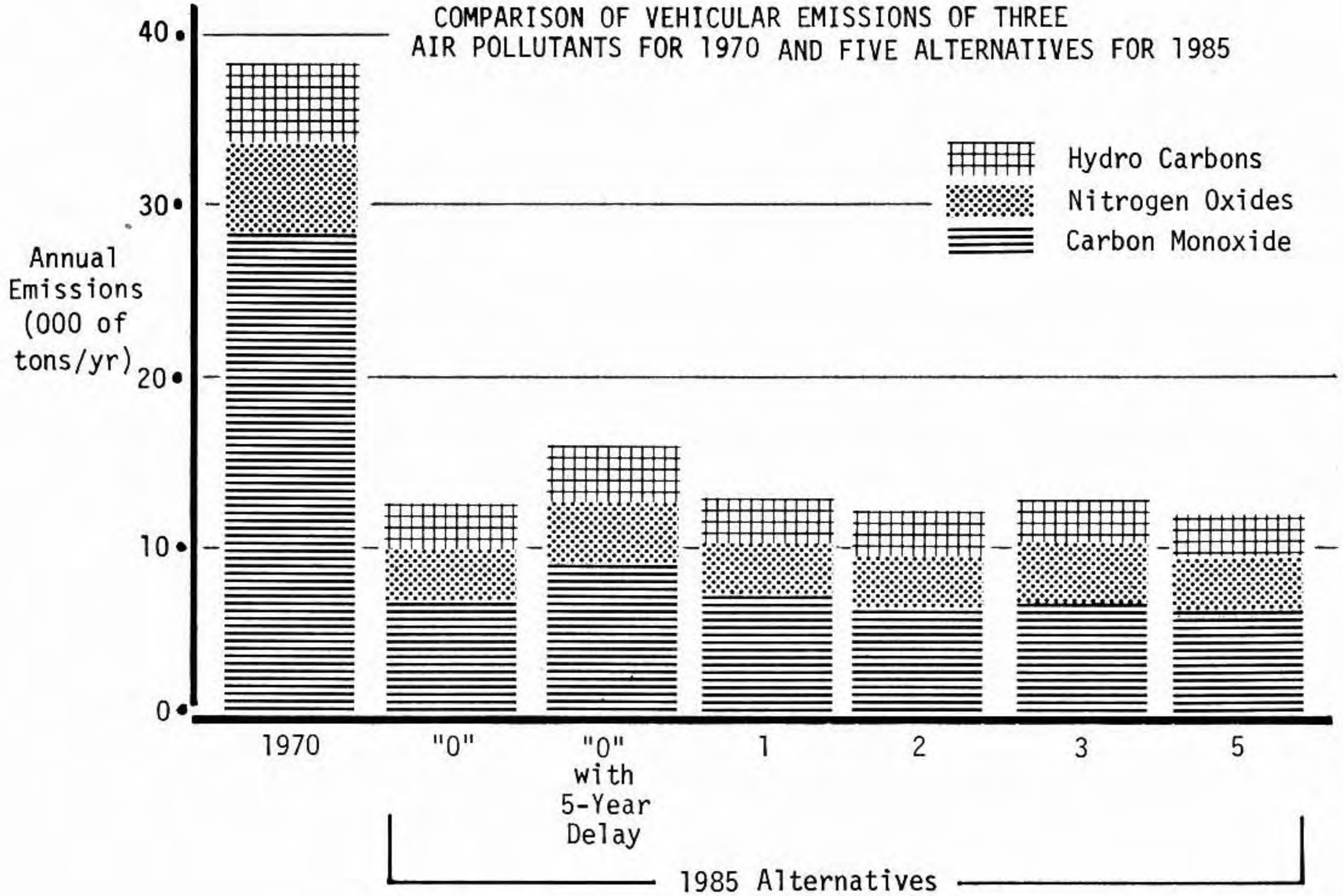


FIG 23

FIGURE 24

COMPARISON OF VEHICULAR EMISSIONS OF THREE AIR POLLUTANTS FOR 1970 AND FIVE ALTERNATIVES FOR 1985



proportions, these by-products of combustion react in sunlight to produce oxidants that irritate mucous membranes and reduce resistance to respiratory infection. The concentration of primary pollutants is usually not as serious as the concentrations of photo chemical by-products. Therefore, it is probably quite helpful to examine the total volume of these two pollutants rather than to examine smaller subareas associated with their emission. Similar to the carbon monoxide projections, the total volume of oxides of nitrogen and hydrocarbons is expected to decrease during the 1970-1985 period due to increasing restrictions on emissions, and the 1985 projections of emissions for the five alternatives do not differ substantially.

Probably the significant observation that can be made from this analysis is that the most workable means of controlling air pollution caused by transportation is to control the source. Emission controls can produce more aggregate reduction in air pollution volumes than any reasonable land use or transportation strategies, and a five-year delay in the imposition of emission controls would not substantially change this expectation (see Figure 24). However, land use and transportation strategies can be employed to reduce localized effects such as particulate concentrations in the vicinity of industrial development or carbon monoxide adjacent to heavily traveled streets.

16 Noise Pollution

An area of increasing concern in the urban environment is the impact of noise on the residential population. Objectionably high noise levels can at minimum be an annoyance and ultimately can be a source of physical and psychological impairment. The annoyance caused by a particular noise is dependent on the amount and nature of the noise, the amount of background noise present, and the nature of the activity where the noise is heard. Motor vehicles are only one source of noise, but in many nonindustrial areas traffic may be the major source of objectionable noise. Recommended Federal Highway Administration noise criteria for streets vary depending on the adjacent land use, but for residential areas, noise levels in excess of 70 decibels 100 feet from the noise source for at least 10% of the time are considered objectionable. (A vacuum cleaner 10 feet from the observer would produce a noise measurement of about 70 decibels.) This standard is needed as a cutoff because it is the threshold level which precipitates a significant number of complaints in residential areas.

Figure 25 shows the streets that exposed potential noise receptors to 70 decibels or greater in 1970, and Figures 26-30 show streets for each alternative which are expected to exceed objectionable noise levels by the year 1985. After assuming that the traffic using any

1970 LOADING-NOISE ANALYSIS

EXCEEDS 70 DECIBELS FOR 10% OF PEAK TRAFFIC HOUR
EXCEEDS 70 DECIBELS FOR 50% OF PEAK TRAFFIC HOUR

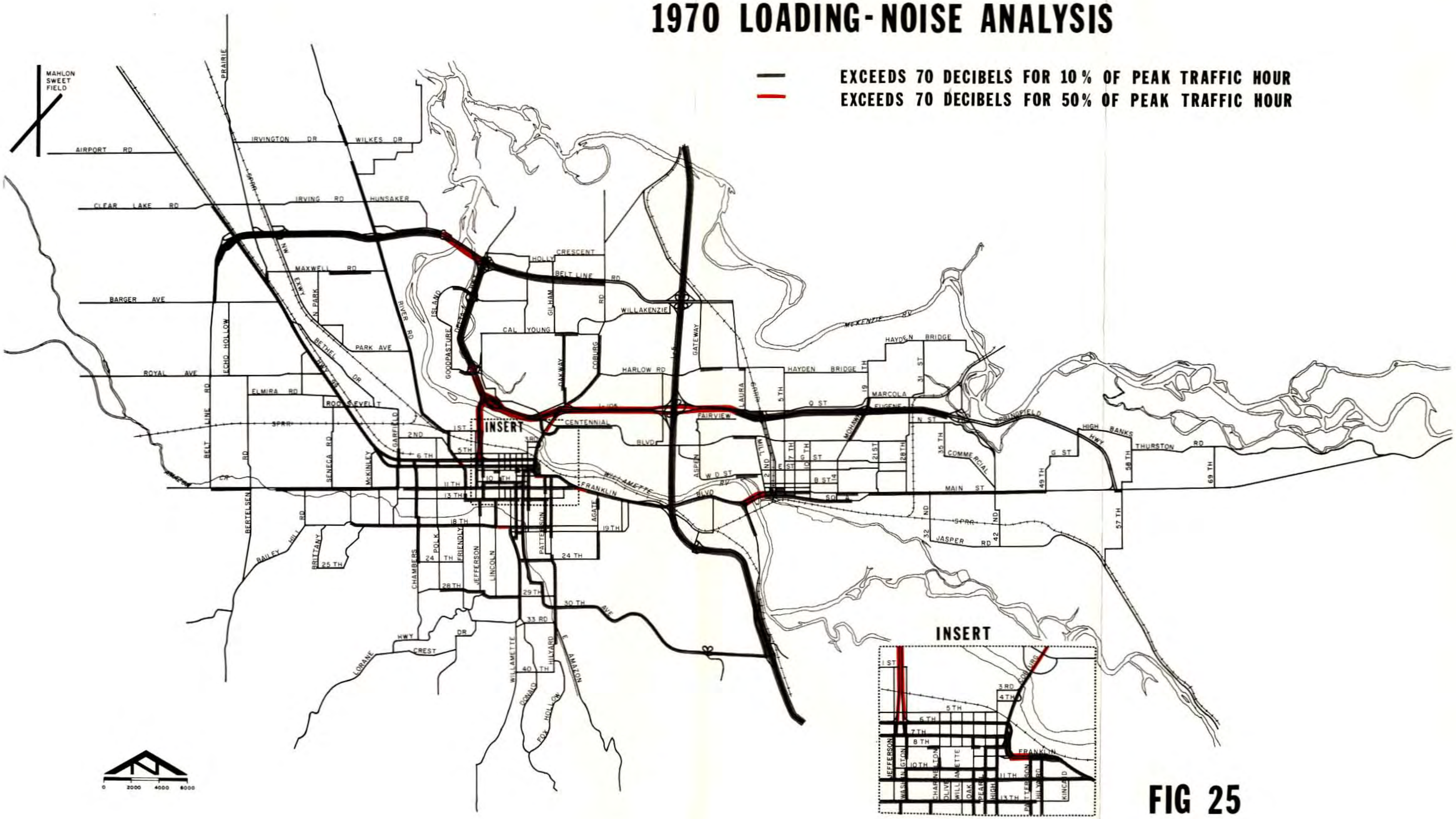


FIG 25

ALTERNATIVE 'O' NOISE ANALYSIS ‹1985›

EXCEEDS 70 DECIBELS FOR 10% OF PEAK TRAFFIC HOUR
EXCEEDS 70 DECIBELS FOR 50% OF PEAK TRAFFIC HOUR

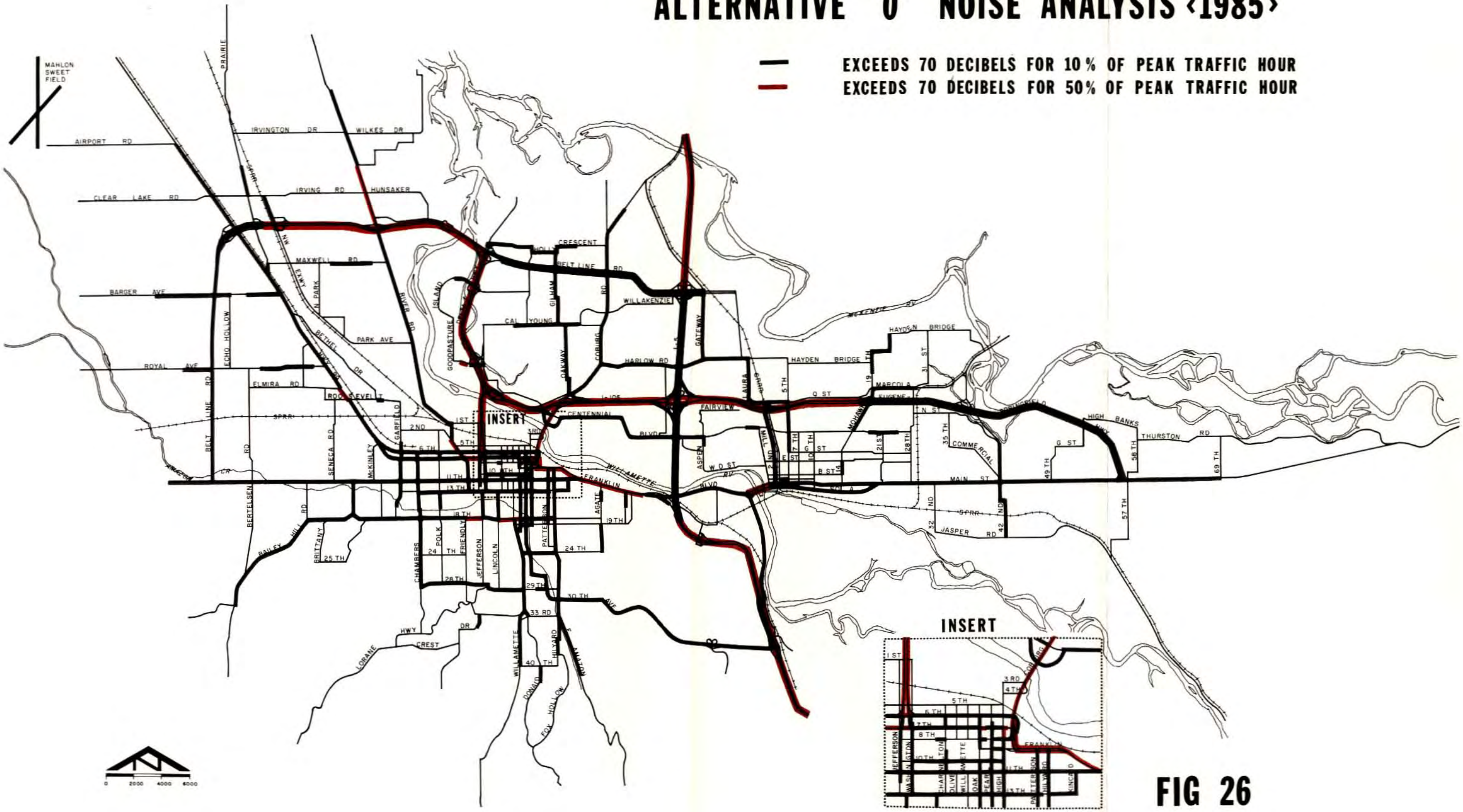


FIG 26

ALTERNATIVE 1 - NOISE ANALYSIS ‹1985›

EXCEEDS 70 DECIBELS FOR 10% OF PEAK TRAFFIC HOUR
EXCEEDS 70 DECIBELS FOR 50% OF PEAK TRAFFIC HOUR

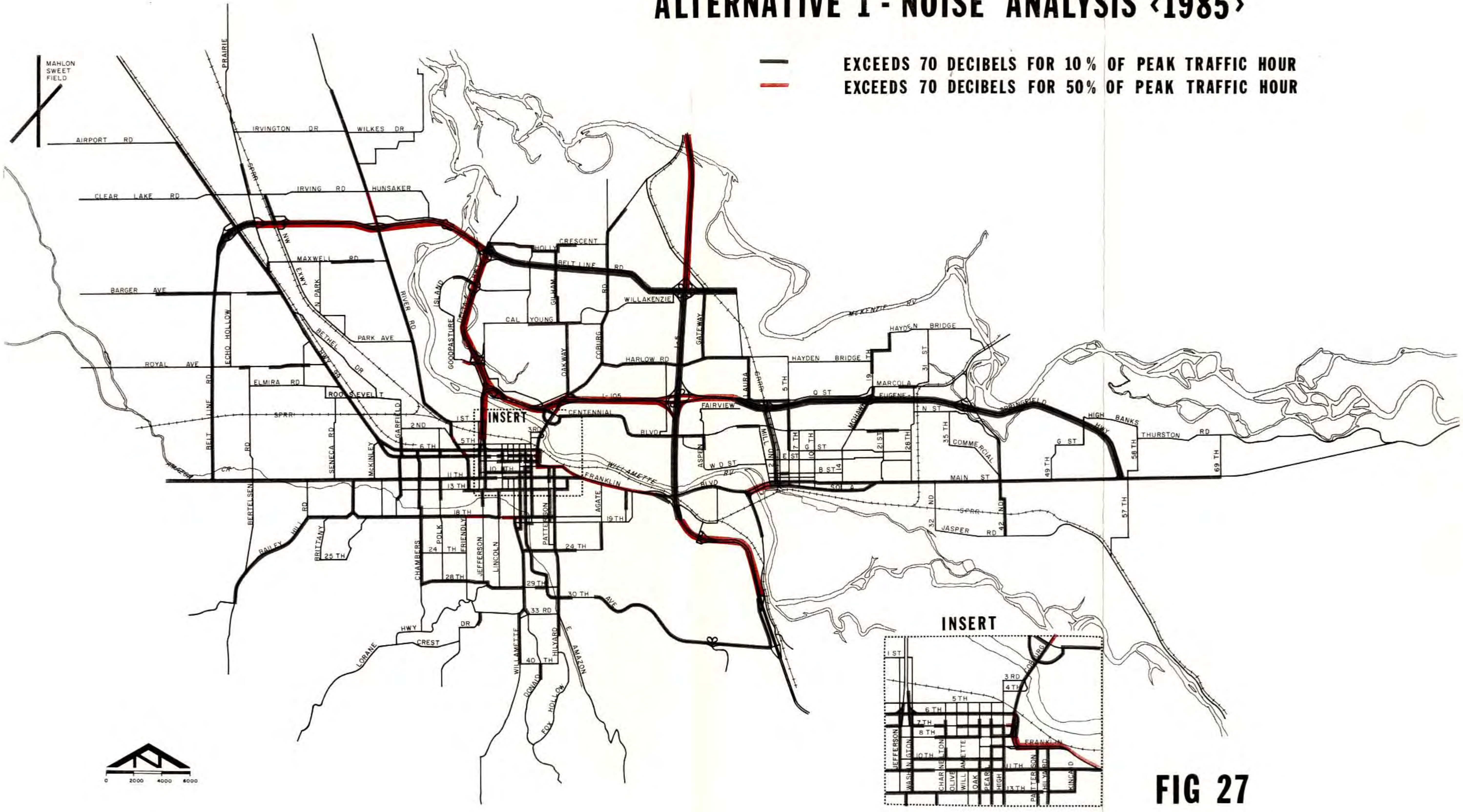


FIG 27

ALTERNATIVE 2 NOISE ANALYSIS ‹1985›

EXCEEDS 70 DECIBELS FOR 10 % OF PEAK TRAFFIC HOUR
EXCEEDS 70 DECIBELS FOR 50% OF PEAK TRAFFIC HOUR

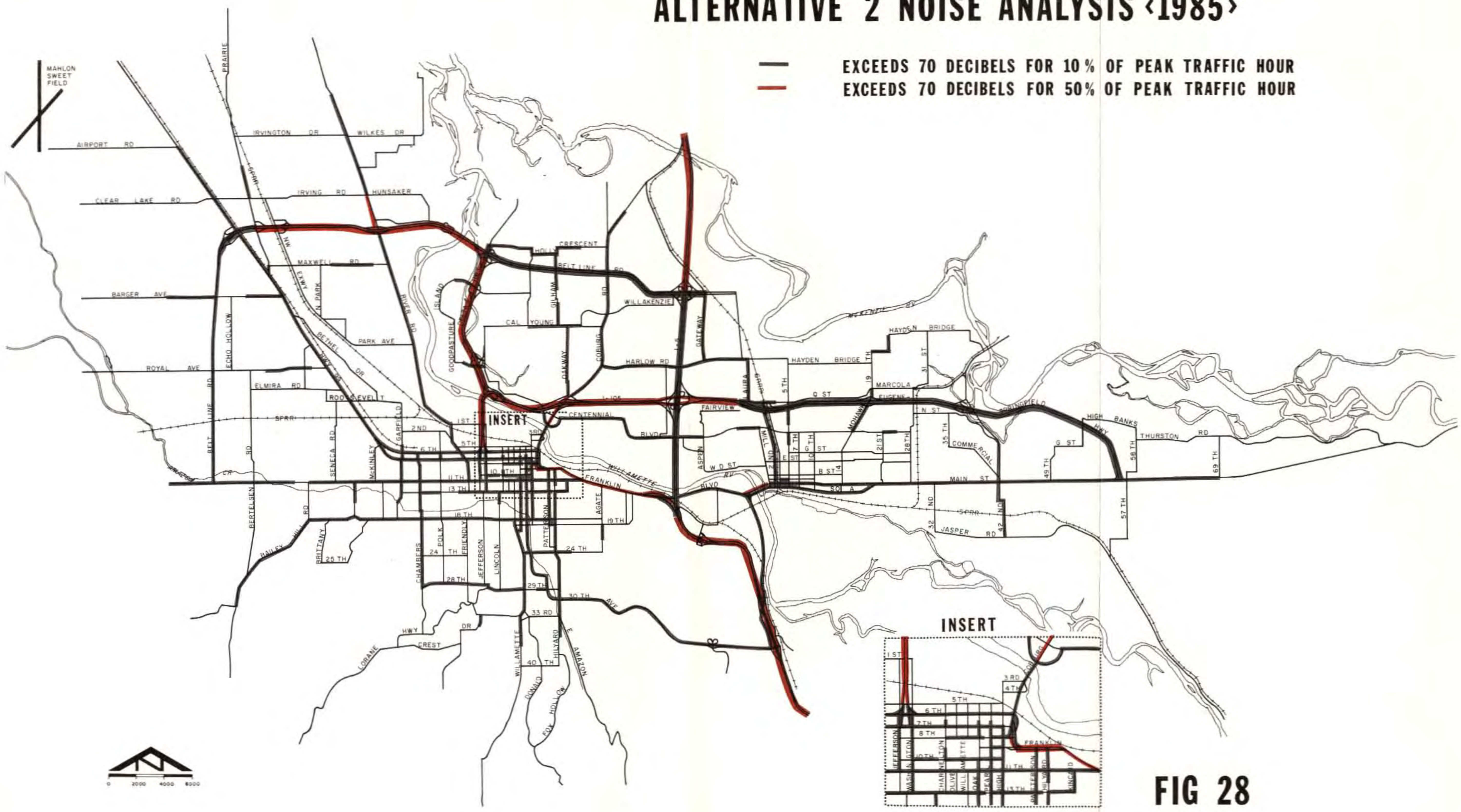


FIG 28

ALTERNATIVE 3 - NOISE ANALYSIS ‹1985›

EXCEEDS 70 DECIBELS FOR 10% OF PEAK TRAFFIC HOUR

EXCEEDS 70 DECIBELS FOR 50% OF PEAK TRAFFIC HOUR

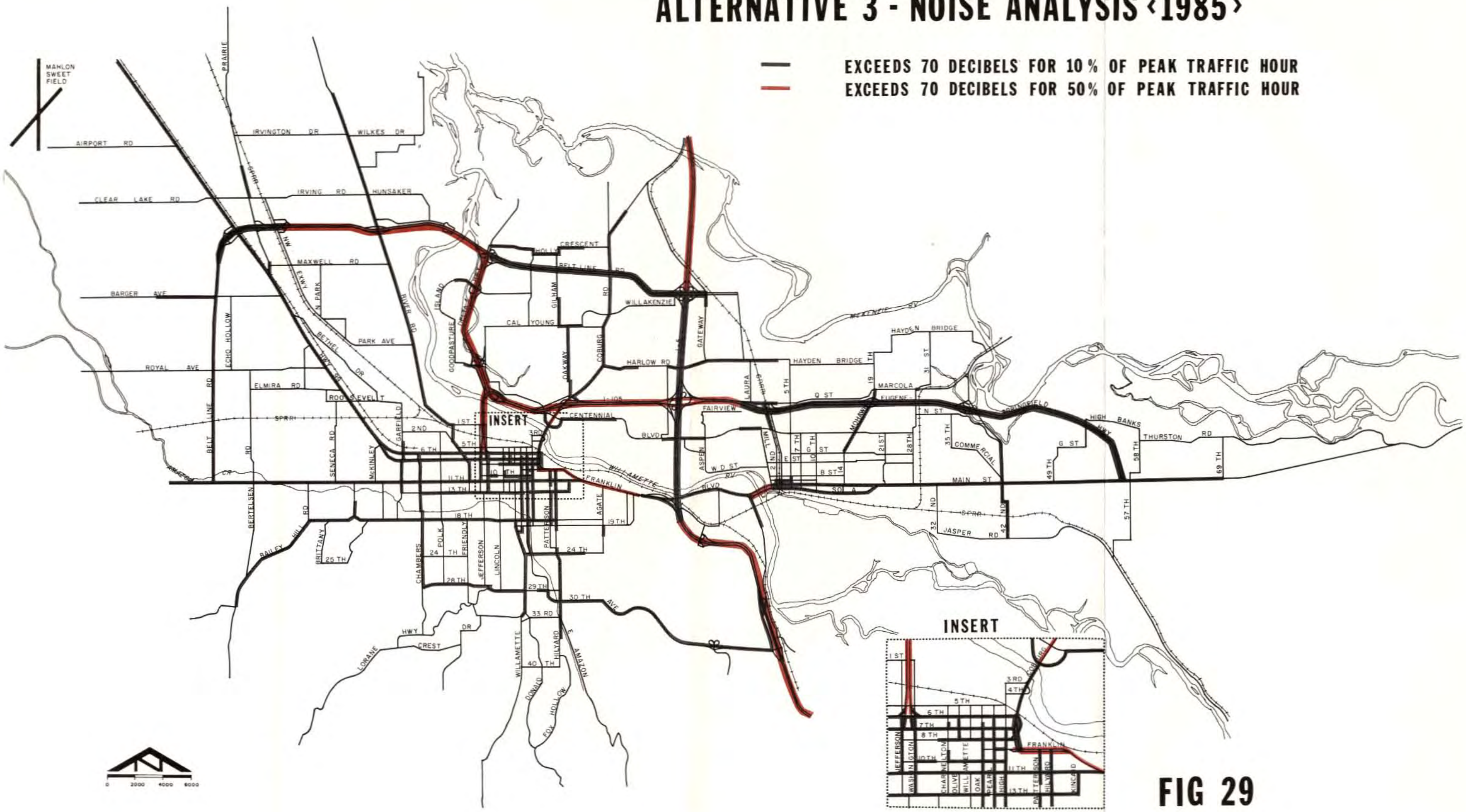


FIG 29

ALTERNATIVE 5 - NOISE ANALYSIS ‹1985›

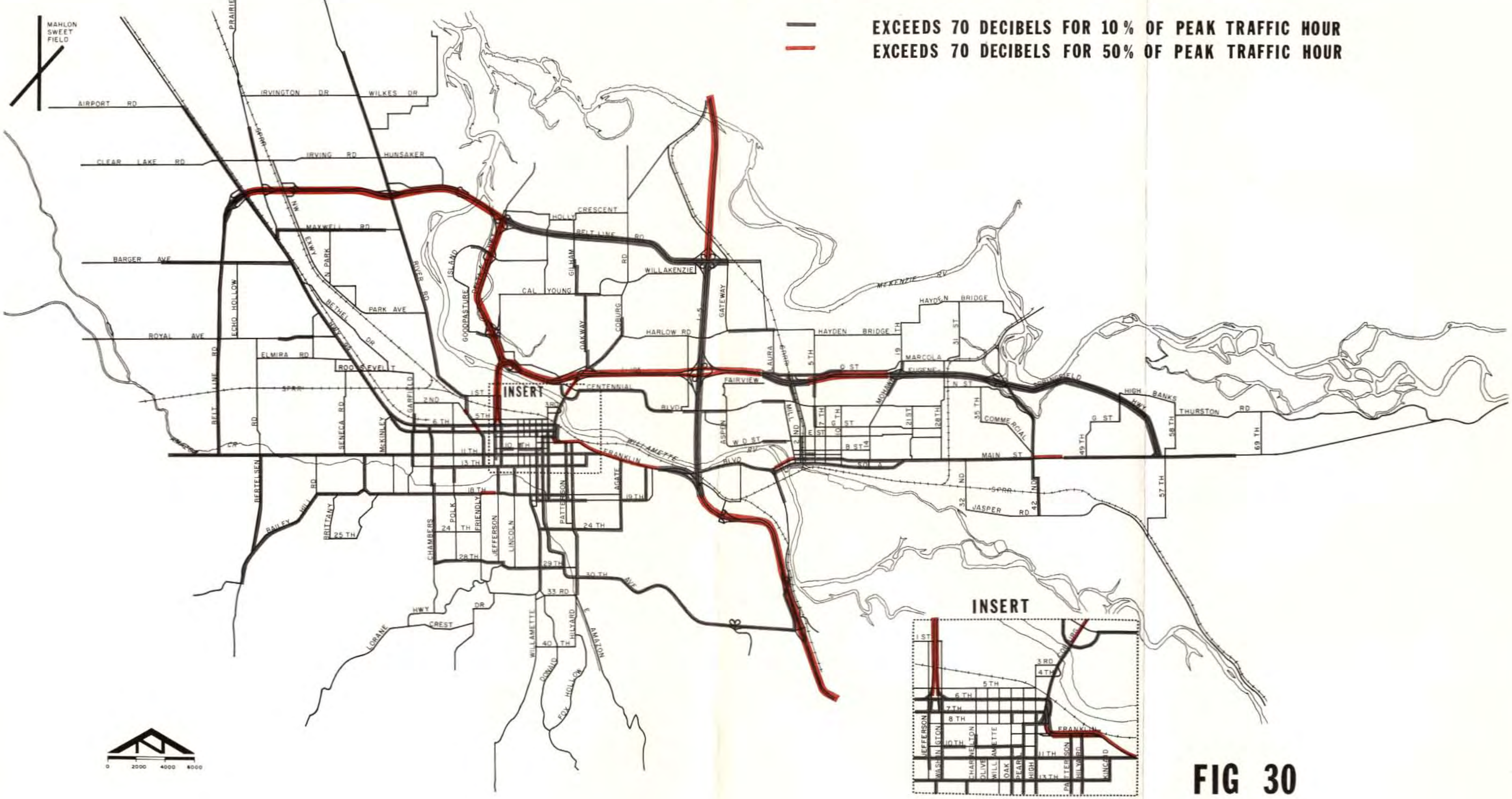


FIG 30

TABLE 15

COMPARISON OF MILES OF STREETS
WITH OBJECTIONABLE NOISE LEVELS

	At Least 10% of Peak Hour	At Least 50% of Peak Hour	Total	Total % of Street System
1970	76	8	84	34%
Alternative "0"	100	23	123	50%
Alternative 1	99	19	118	48%
Alternative 2	97	18	115	46%
Alternative 3	92	17	109	44%
Alternative 5	94	19	113	46%

given street would have a typical auto/truck/bus vehicular mix and a typical hourly variation, streets were identified which would be expected to produce a 70 decibel noise measurement 100 feet from the street for (1) at least 10% of the time during peak traffic hours and (2) at least 50% of the time during peak traffic hours. In some cases obstructions or barriers exist between the street and the observer that would result in a lower noise level than the assumed conditions; other facilities have little chance that a receptor would be within the specified distance or the kind of activity there would be less sensitive to noise than residences. In some particular cases an improved facility could be designed with features that mitigate the impact of noise pollution in sensitive areas.

As evidenced in Table 15, there is little significant difference with respect to noise quality among the alternatives. The projected increase in the mileage that exceeds the residential standard is not a result of noisier vehicles; the increase in traffic volumes is expected to produce objectionable noise levels and for long enough duration to exceed the standard set above. Thirty-four percent of the arterial street mileage experienced objectionable noise levels in 1970, and while this mileage is expected to increase to 50% in Alternative "0," a dramatic shift to transit would not materially decrease projected noise exposure. In fact, the maximum noise level on many streets is governed by the volume of heavy duty vehicles (trucks and buses) rather than the volume of automobiles. In a number of heavily traveled transit corridors, the transit vehicles would significantly influence the critical noise levels mapped in the preceding figures. For example, Alternative 1 (10% transit) would have approximately 80 buses per hour during peak hour operation on 8th Avenue adjacent to the Eugene Central Transfer Station. Alternative 3 (30% transit, 10% auto trip reduction) would load 200 vehicles on the streets adjacent to the station and 80 vehicles on Ferry Street Bridge during a peak hour. These quantities of bus traffic would be large enough that the noise standard would be exceeded with bus noise alone.

From 1970 to 1985, much of the increase in street mileage with noise levels in excess of 70 decibels 50% of the time will occur on freeways or other facilities with very high truck or bus volumes. Since there is generally little residential development directly adjacent to freeways, annoyance and complaints can be expected to occur more often on many of the arterial streets through residential areas. The prospects of decreasing vehicular noise along existing streets lies primarily with the ability to reduce traffic noise at its source. Aside from restricting auto and truck volumes on specific streets, relief will have to come in the form of increased state or federal regulation of truck, bus and motorcycle design. Since late model automobiles are considered as quiet as current technology permits, noise reductions will have to be engineered into the other vehicles. It would thus be equally important to enforce the regulations to ensure that the user maintains the noise-reducing equipment. Although the prospects of greater federal control appear likely in the future, no attempt was made in this analysis to predict when the standards might be implemented or what they might be.

17 Land Use: Specialized Aspects

Using the same population assumptions employed in the transportation study, a brief examination of other functional planning areas has been made to ensure that a transportation plan is not optimized at the expense of other functional plans. This section discusses several specialized aspects of land use and facility planning including housing, parks, schools and sewers. Since in theory the transportation system serves the same resident population served by the other facilities, it is appropriate that planning for the various functional areas be coordinated using similar assumptions.

HOUSING

Meeting future housing needs was not addressed specifically for the dwelling unit projection used for estimating trips in this document since each transportation zone has been assessed regarding only land oriented trends. However, the following is an examination of the area's population profile, which is expected to change during the projection period; an attempt is made to arrive at some independent estimate of the housing needs of the resident population based on both the continuation of current trends and the balanced land use concepts.

In projecting future housing needs based on the continuation of current trends a variety of information involving all segments of the population was utilized. For example, the 1970 Census of Population and Housing provided cross tabulations showing the percentage of persons in specific age groups who have head of household status; by definition, one head of household corresponds to one household. It was anticipated that a larger proportion of the 18-24 year age group would be heads of households in the year 2000 than in 1970. This adjustment was made to reflect the trend for college age students to seek housing off campus. The proportion of persons of retirement age who live in conventional housing was reduced from the 1970 level to reflect an increase in the number of persons expected to be living in retirement homes. With these adjustments it was estimated that there is a need for increasing the housing supply to satisfy a demand for 101,935 occupied units in the year 2000.

TABLE 16

NUMBER OF HOUSEHOLDS, BY AGE OF HEAD
EUGENE-SPRINGFIELD METROPOLITAN AREA

1970 Actual*

(The Number of Occupied Households Equals the Number of Household Heads)

Age Group	Population 18 & Over in Households	Percent Total Population	Percent Who Are Household Heads	Number of Household Heads
18-24	20,844	14.5%	32.3%	6,732
25-34	20,523	14.3%	51.8%	10,627
35-44	15,050	10.5%	53.6%	8,059
45-64	26,376	18.3%	56.3%	14,861
65+	10,882	7.6%	66.0%	7,179
Totals	93,675	65.2%	50.7%	47,458
		Year 2000 Estimates		
18-24	33,812	12.4%	43.0%	14,539
25-34	43,276	15.9%	51.0%	22,071
35-44	42,929	15.7%	54.0%	23,182
45-64	53,452	19.6%	56.0%	29,933
65+	19,381	7.1%	63.0%	12,210
Totals	192,850	70.7%	53.0%	101,935

* Census of Population of Housing, Second Count Summary Tape, File A, Tabulation 9

Some insight can be gained into the kinds of housing that will be necessary by examining the family size of the projected 101,935 households. For example, the declining birth rate indicates that younger families may be smaller in size; this has implications for location, size and price of some new units. A further analysis beyond this report shows what implications such trends as decreasing family size have for the area's projected need for single family, multi-family and mobile home units. (See Forecast of Occupied Housing Units for the Eugene-Springfield Area, Year 2000, L-COG, 1975.) The specific findings of the housing forecasts have more importance to land use planning than to transportation planning and therefore will not be discussed further here.

The number of dwelling units is one indicator of the number of trips used in transportation demand analysis. Two separate methods have been mentioned for estimating the number of dwelling units that corresponds to the year 2000 projection: (1) Projecting land use trends, there will be 95,395 occupied dwelling units, and (2) projecting land use trends but changing age and household profiles, there will be 101,935 occupied dwelling units needed. The difference in the two estimates is approximately 6%. It was found, however, that the method of projecting trips is not particularly sensitive to changing the number of dwelling units unless the amount of population is also changed. A substantial investment has been made using the dwelling units estimated from land use trends (95,395); that estimate was used consistently for all transportation demand evaluations. The "error" contributed by this choice results in less than a 1% under-estimation of trips.

It is more difficult to elaborate on housing needs with the balanced land use concept of population distribution. Although the same population would be housed under either option, predicting housing distribution under the balanced land use alternative is so uncertain that it is examined here only in relative terms. Balanced land use would mean developing and redeveloping some strategic areas at relatively high densities adjacent to employment locations while leaving some currently developing areas void of new residential development. Two- and four-story apartments and an occasional high rise complex are particularly well suited to higher densities. A substantial proportion of the new housing units would need to be of this type for the balanced growth concept to occur. However, much of the area adjacent to the Eugene CBD and the University of Oregon is already developed, thus precluding the use of large planned unit developments without substantial redevelopment. Other areas offer options for achieving the desired residential density, and, in general, more people will have to inhabit smaller areas to make this concept work.

Although housing needs can be satisfied through construction of more high density residential units, preference has led to today's large

TABLE 17

NUMBER OF HOUSEHOLDS, BY AGE OF HEAD AND SIZE OF HOUSEHOLD
EUGENE-SPRINGFIELD METROPOLITAN AREA

1970 Estimated Actual

Age of Household Head	Number of Households*		1-Person Households		2-Person Households		3-Person Households		4-Person Households		5 or More Person Households	
	%	#	%	#	%	#	%	#	%	#	%	#
18-24	100	6,732	24.4	1,643	44.8	3,016	21.4	1,441	6.8	457	2.6	175
25-34	100	10,627	9.0	956	22.8	2,423	19.5	2,072	25.8	2,742	22.9	2,434
35-44	100	8,059	6.7	540	8.5	685	10.3	830	26.7	2,152	47.8	3,852
45-64	100	14,861	14.1	2,095	39.6	5,885	21.5	3,195	13.1	1,947	11.7	1,739
65+	100	7,179	41.9	3,008	49.6	3,561	5.6	402	1.6	115	1.3	93
Total	100	47,458	17.4	8,242	32.8	15,570	16.7	7,940	15.6	7,413	17.5	8,293

Year 2000 Estimate

Age of Household Head	%	#	%	#	%	#	%	#	%	#	%	#
18-24	100	14,539	32.0	4,652	48.0	6,983	17.0	2,472	1.5	219	1.5	221
25-34	100	22,071	14.5	3,200	30.0	6,620	19.0	4,193	20.5	4,525	16.0	3,531
35-44	100	23,182	10.0	2,318	17.0	3,941	12.0	2,782	31.0	7,186	30.0	6,955
45-64	100	29,933	19.5	5,827	46.6	13,942	18.0	5,388	7.6	2,280	8.3	2,484
65+	100	12,210	44.3	5,409	51.0	6,230	3.7	455	.5	61	.5	61
Total	100	101,935	21.0	21,406	37.0	37,716	15.0	15,290	14.0	14,271	13.0	13,252

* 1970 U. S. Census of Population and Housing, Second Court Summary Tape, File A, Tabulation 9

proportion of single family houses. A transition in family size discussed earlier could have some impact on the desirability of particular housing types, but it is optimistic to rely on changing family structure as the only impetus in changing traditional preferences for single family structures. Limiting residential development to certain types and to certain areas in order to achieve the "balanced land use" population distribution may result in housing that would be higher priced, less available and not as well tailored to residents' desires. Such "market interference" may result in an inadequate supply of housing of the desired type and density; a publicly financed incentive program would likely be necessary to encourage construction of the desired types. Assuming no public housing program, the short fall in supply would probably drive the price of all housing upward, including the price of existing single family detached units for which there may be a lingering preference.

PARKS

The metropolitan area now has 25 neighborhood parks and 10 community parks. People residing within one-half mile of a neighborhood park or within one mile of a community park were judged to be served by that neighborhood or community park respectively. This technique is not a uniformly accepted manner of park site assessment; it is meant to be a uniform, objective way to relate park planning and transportation planning. The analysis is only as accurate as the small-area population projections used for the transportation study.

Using the above criteria it was found that 110,200 of the 148,000 metropolitan residents now have access to a neighborhood park or public school ground (see Table 18). Therefore, 37,800 residents live beyond walking distance of a neighborhood recreational facility. Similarly, only 83,700 residents have access to a community park, and 64,600 are without access (see Table 19).

Projecting residential development to reflect a continuation of current trends and comparing the trends with proposed park development, it appears that the park facility needs of the expanding population will not be fully met. Thirty-eight thousand residents are expected to be without access to a neighborhood recreational facility, and 82,200 residents are not expected to have access to a community park unless more parks are planned. Similarly, 49,000 residents would be without access to a neighborhood park, and 86,000 residents would be without access to a community park if the "balanced land use" population distribution is used. The difference between the number of residents with park access under the two population allocations is not significant, considering the technique used to establish accessibility.

TABLE 18

NEIGHBORHOOD PARK SUMMARY

Area	1970 Population	Existing Parks	1970 Population Served	1970 Population Not Served by Park	1970 Population Not Served by Park or School	Year 2000 Population Projection	Existing Plus Planned Parks	2000 Population Served	2000 Population Not Served by Park	2000 Population Not Served by Park or School
North	53,800	7	11,100	42,700	19,500	115,000	30	84,500	30,500	12,300
South	57,800	9	28,900	28,900	11,400	96,500	24	76,000	20,500	15,400
East	36,700	9	15,000	21,700	6,900	66,000	18	40,400	25,600	10,900
Total	148,300	25	55,000	93,300	37,800	277,500	72	200,900	76,600	38,600
Alternative Population Allocation										
North						89,000	30	60,800	28,200	20,500
South						129,000	24	91,500	37,500	21,000
East						59,500	18	41,600	17,900	8,000
Total						277,500	72	193,900	83,600	49,500

PARK ANALYSIS

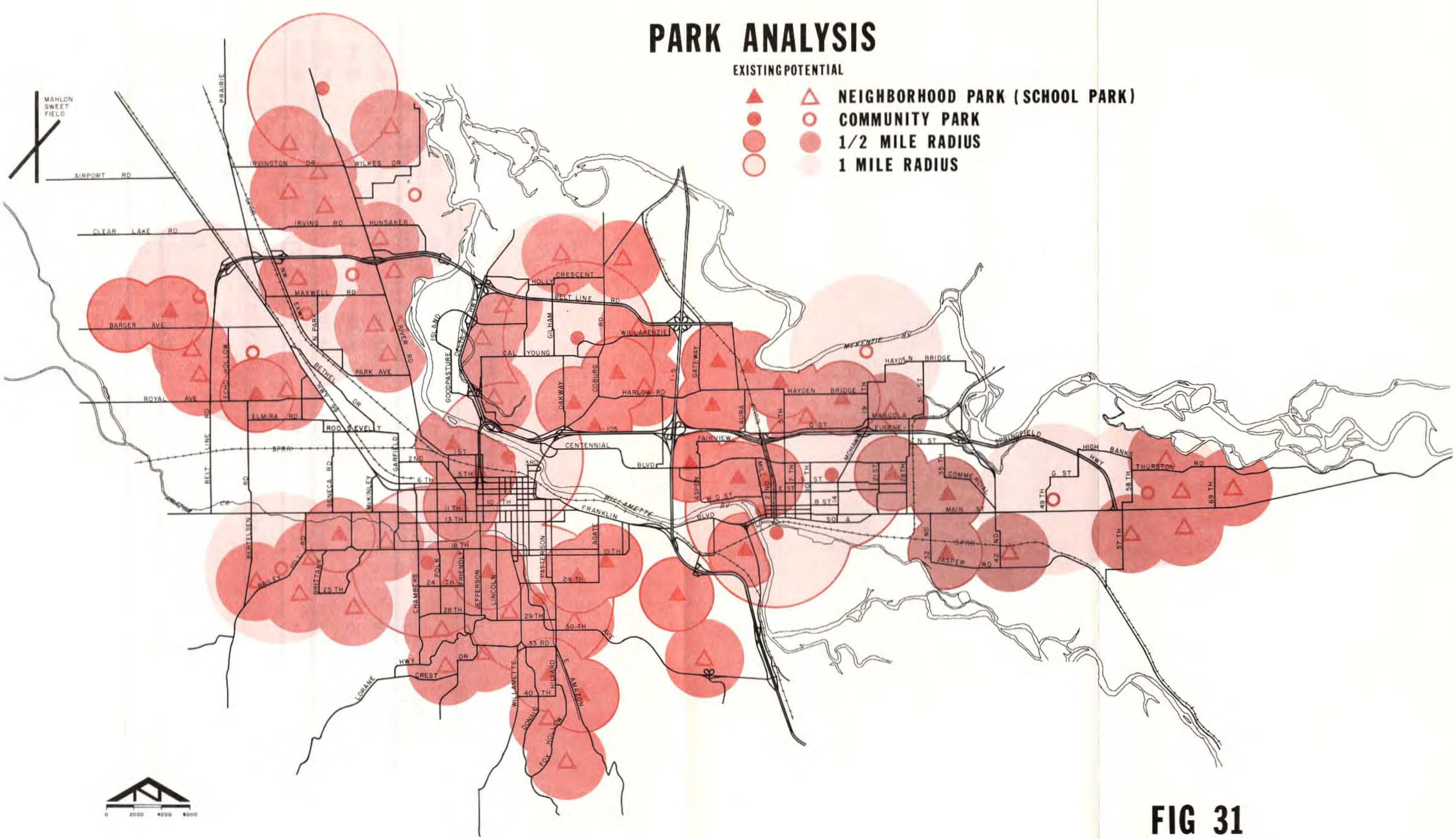


FIG 31

TABLE 19

COMMUNITY PARK SUMMARY

Area	1970 Population	Existing Parks	1970 Population Served	1970 Population Not Served	Year 2000 Population	Existing Plus Planned Parks	2000 Population Served	2000 Population Not Served
North	53,800	4	25,300	28,500	115,000	9	85,300	29,700
South	57,800	2	36,400	21,400	96,500	4	64,000	32,500
East	36,700	4	22,000	14,700	66,000	7	46,000	20,000
Total	148,300	10	83,700	64,600	277,500	20	195,300	82,200
Alternative Population Allocation								
North					89,000	9	56,000	33,000
South					129,000	4	99,000	30,000
East					59,500	7	36,500	23,000
Total					277,500	20	191,500	86,000

SCHOOL FACILITIES

School sites and buildings are long-term investments, the needs for which should be considered well in advance. Accessibility to schools, especially elementary schools, is an important planning consideration which relates directly to long-term planning for transportation facilities. The following attempts to relate transportation planning to planning for educational needs by examining the capacities and accessibility of existing school facilities under conditions projected to the year 2000. The analysis admittedly omits many factors a school board may have to consider when locating a new school or closing an old one. Furthermore, the analysis does not consider the period between 1975 and 2000 when some difficult school management problems may arise. Regardless of these shortcomings, it was felt that the urban service area concept of the 1990 Plan encourages the coordination of services that this analysis recognizes. Although the three school districts involved have jurisdiction outside the metropolitan area, the evaluation was limited to the metropolitan transportation study area. However, students living outside the study area and parochial school students were compensated for.

Assuming a continuation of current trends, if all elementary school-age children were to attend public school in the year 2000, additional elementary schools will be necessary. The capacity of each school was appraised using 500 students as a maximum desirable limit and recognizing that some schools are limited in their capacity by the site size. (State of Oregon Minimum Standards for Public Schools specifies five acres plus one acre per 100 students for elementary school sites.) No school was assumed to have less capacity than its present enrollment, and existing schools with sufficient sites were assumed to expand to the 500 student level.

With this evaluation the following observations were made. School District 19 can be served by building two planned schools and two additional schools in Census Tracts 33 and 35. School District 52 needs only the new elementary school planned in Census Tract 25 by the year 2000. District 4J needs a minimum of seven new elementary schools while only three potential sites have been identified. Some central Eugene schools are relatively small to be operated economically and are not well located with respect to today's student population. An accurate estimate of the number of elementary schools necessary to serve the expected enrollment can be made only after completing more comprehensive analysis which assumes a particular management plan for the central schools. In lieu of that evaluation and assuming all present elementary schools would be in use in the year 2000, the district needs four elementary schools in addition to those planned for Census Tracts 22, 23, and 29. Generally, the areas needing new school sites would be Census Tracts 22, 24, 30, and 54.

In a similar fashion, the projected junior high school enrollment was compared with the present capacity of the junior high schools. Assuming that all junior high age students will attend public schools and a maximum capacity of 800 students per school, School Districts 19 and 52 have adequate facilities through the year 2000. (State of Oregon Minimum Standards for Public Schools indicates 10 acres plus one acre per 100 students for junior high and high schools.) Where available, substandard sites were credited with acreage shared with adjacent schools or parks; where no credit was available, the capacity was limited by the usable acreage available. District 4J will have adequate student population to justify two new junior high schools--one in Census Tract 22 and one in the area of Census Tracts 44, 51, and 54.

Senior high school facilities were submitted to a comparable analysis. The capacity of a high school was assumed to be 1,500 students except for North Eugene High School, whose capacity was assumed to be its 1970 enrollment of 1,272. Using these assumptions, it was found that Districts 19 and 52 have adequate capacity for projected enrollment. The expected number of senior high students within the jurisdiction of District 4J, particularly the central Eugene area, will exceed the capacity of its facilities. Although accessibility is not as important for senior high schools as it is for schools with younger students, a location that is central with respect to the student population is desirable.

If the projected population were to reside in the balanced land use configuration, the projected school needs would change accordingly. District 19 would need two new schools, generally near Tracts 18 and 19. Under balanced growth District 52 is projected to have excess student population in the area of Tract 43 that would justify two new schools. A deficiency of 10 schools is projected for District 4J with the following breakdown: two in the Lane Community College basin, three or four in southwest Eugene, one near the existing Edison School, and three or four in the central Eugene area.

There is a projected need for two new junior high schools in District 4J if balanced land use in Alternative 5 is achieved by the year 2000. Generally, the central to the southeast part of Eugene would be the optimum placement for one, and the LCC basin would be an appropriate location for the other.

There would be a projected need for one new high school in Eugene with this residential pattern.

A few generalizations can be made regarding the impact on projected school facility needs under the two alternative residential patterns. Although the metropolitan population is projected to grow from 165,000

SCHOOL ANALYSIS

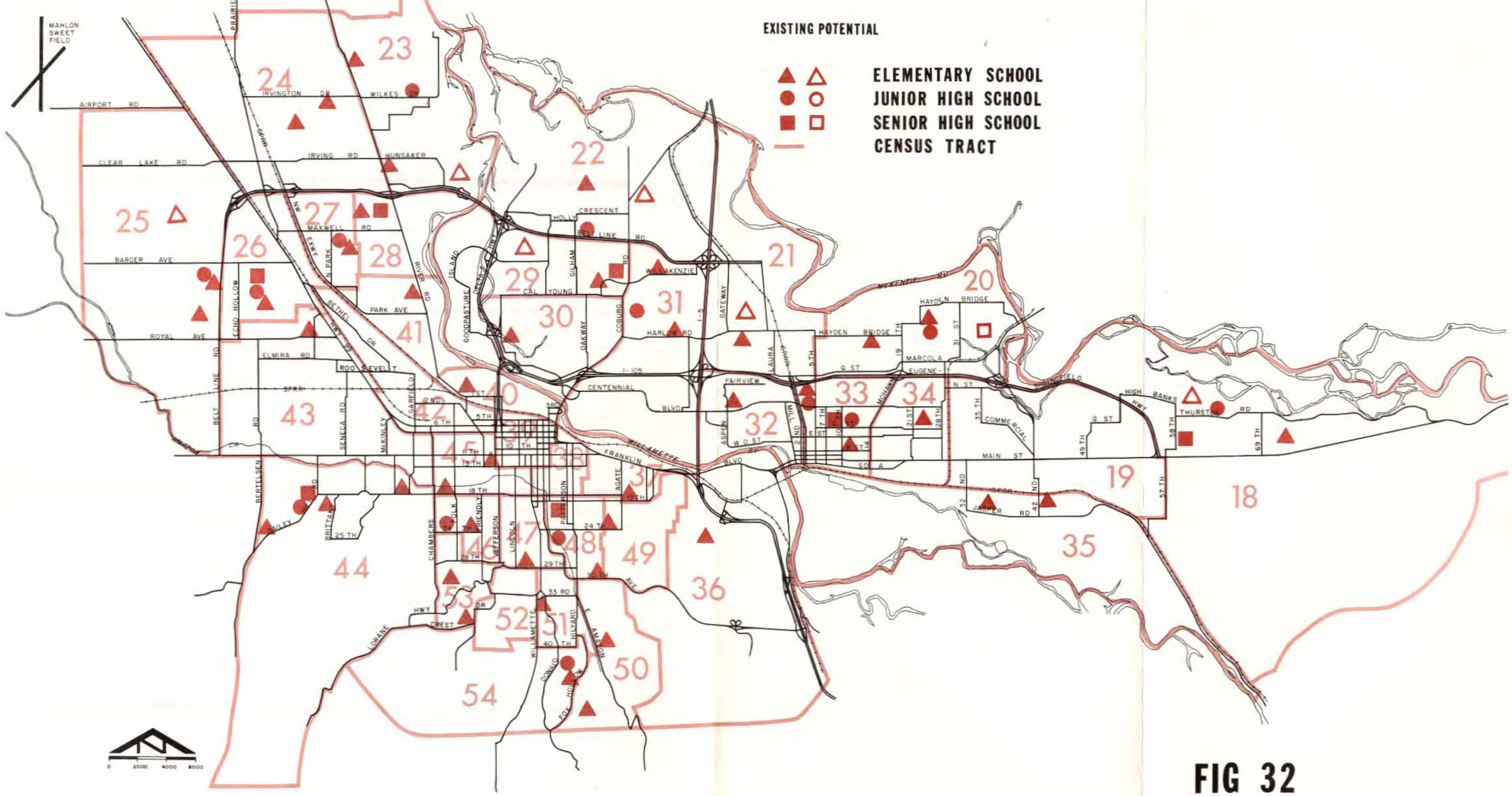


FIG 32

TABLE 20

PROJECTION OF SCHOOL FACILITY NEEDS
WITH TWO ALTERNATIVE RESIDENTIAL PATTERNS

School District	Existing Metropolitan Schools	Continued Trends		New Schools "Balanced Land Use"
		Planned	Additional Needed	
		Elementary		
4J (Eugene)	29	3	4	10
19 (Springfield)	10	2	2	2
52 (Bethel)	5	1	0	2
Total Elementary	44	6	6	14
		Junior High		
4J	8	--	2	2
19	4	--	0	0
52	2	--	0	0
Total Junior High	14	--	2	2
		Senior High		
4J	4	--	1	1
19	2	--	0	0
52	1	--	0	0
Total Senior High	7	--	1	1

to 277,000 during the next 25 years, school facility needs were not projected to increase proportionally. A general stabilization in birth rates that was assumed in the population projections reflect a smaller proportion of the resident population in the school-age group. A total of 65 metropolitan schools needs to increase only by 15 although the projected population increase is 112,000.

The two alternative residential patterns assume the same projected population and student population, simply in a different geographic pattern. The two additional elementary schools required for balanced land use can be attributed to the River Road area schools being under capacity, and unless students are transported from more populated areas, this capacity would go unused. Furthermore, the need for more schools would generally be located closer to the central areas with the balanced residential pattern. The need for a north Springfield school would be replaced by deficiency near Weyerhaeuser Industries. School District 4J would experience needs in the central area and the LCC basin with balanced growth. The possible implication is that land in adequate supply to meet state acreage standards is not generally available. If balanced land use is achieved and sites are to be reasonably close to student population, relatively expensive acquisition is a strong probability.

SEWERS

Several evaluations of the sewer system serving Eugene were prepared by the City of Eugene within the context of neighborhood refinement plans; the sewer system serving Springfield was examined as part of the transportation study. An approximate allowable sewage volume was derived for each sewer service zone using the population that was projected to reside within that area. The relative volume attributable to residential sources was large enough to allow an estimate of the population capacity of each sewer zone. It is important to note that these "capacities" are in no sense absolute; they represent a desirable limit to residential development to avoid major sewer construction in those areas. Based on an analysis of the major trunk lines, Eugene's sewer system would not represent a major constraint on physical development within the range considered for the transportation analysis, given the continuation of current trends.

The flow rate necessary to serve the expected population was compared with the capacity of four major sewer subsystems in Springfield which might place a constraint on development. In all, 17 sewer mains were analyzed for Springfield and found to be adequate for the assumed development served by the sewer system. This analysis did not include an investigation of plant capabilities.

The population distribution as allocated in the balanced land use alternative produces some significant changes in several nodal areas. The most significant of the changes having an impact on the sewer system occur in nodes 9, 11, and 12.

Nodes 11 and 12 constitute the central area of Eugene, and projections under the balanced land use alternative indicate slightly more than a doubling of the population over the continued trends allocation. The existing system would be impacted, however; one factor which needs to be taken into consideration is the possible abandonment of the Eugene Fruit Growers cannery located in this area. Abandonment would provide additional system capacity for other uses. The impact could also be approached by providing some means to utilize the separate sewer system currently being considered north of the Willamette River.

Node 9 in the southwestern portion of Eugene will be served by a new trunk system in the future. Since lead time with respect to the design of this system still exists, decisions about future population can be taken into account.

In general, the projected flow rates in Springfield for this alternative were reduced from the flow rate projected from continued trends in land use development. The net result of attaining balanced land use would be less population within most areas in Springfield than if current land development continues to the year 2000. Since residential development is the major contributor to sewage volume, the land use of Alternative 5 implies significantly less volume for collection and transmission within the limits of Springfield. Trunk capacities in Springfield, therefore, would not prohibit the attainment of balanced land use.

18 Other Effects of Modal Choice

The sections above provide quantified information for comparing transportation alternatives, but the effects of transportation extend beyond those areas that have been quantified. Without attempting to assign numeric values, this section identifies certain concerns and observations about transportation systems that have been important in the past.

SAFETY

Traffic fatalities and personal injury accidents are normally expressed as a rate per hundred million vehicle miles. Safety can be increased by minimizing vehicle miles of travel (Alternative 3) or by increasing the amount of travel on controlled access facilities where accident rates are lower than for streets without access control (Alternatives "0," 1, 2, 3, or 5 if the capacity deficiencies were addressed by limited access highway construction). In both cases it is a matter of minimizing the vehicle to vehicle, and vehicle to bike/pedestrian conflicts; transit reduces the number of vehicles in circulation while limited access facilities physically separate conflicts.

Personal safety from crime is perceived to be greater in private automobiles than in public transit vehicles and transfer waiting stations. Although it is difficult to verify, many people feel that the privacy and protection of the private automobile affords a greater degree of personal safety than a public shared-ride system. It may be noted, however, that the automobile and parking lots offer an opportunity for some kinds of crimes that are encouraged by privacy.

VULNERABILITY-FLEXIBILITY

A transit system, particularly a rubber-tired bus system, is labor intensive and flexible. A route may be added, discontinued or changed when the need for the service changes. The operation of the transit system depends on the existence of an adequate street system so that these service adjustments can be made, and therefore the transit operation is not totally independent of the fixed investment in streets. But a good system of public transit creates added flexibility that should be strongly encouraged, given the accuracy of land use and travel demand forecasting.

The labor intensity of bus transit that provides its flexibility has desirable and undesirable aspects. Salaries for drivers are a very substantial proportion of a bus system's operating costs. Whether the revenues come from fares, or taxes at the local, state, or federal levels, the salaries are quickly circulated in the local economy, and therefore the lack of community interest associated with absentee management is not a problem with local transit operations. The labor intensity is, however, an argument against very heavy reliance on public transit. Transit strikes can be detrimental to those communities and individuals that rely on public transportation to a great extent; the users because they are without the service during a strike, and the nonusers because of the added traffic and confusion caused by the influx of normal transit users.

A system dominated by private automobile transportation is also vulnerable, but for different reasons. The automobile requires a relatively large capital investment in private cars and public streets. While the user is less vulnerable to employee strikes or being stranded by route changes, the continued functioning of the system is based upon the continued availability of resources to build, maintain, and operate the system. If future decisions or circumstances change the demand for certain streets, the value of an under-utilized street is hard to recoup, and the unexpected widening of an over-utilized street can precipitate disproportionate costs.

MOBILITY

It is a normally accepted idea that the availability of the automobile has brought added mobility in the form of discretionary trips. An adequate on-going street construction program will ensure that a high degree of mobility is continued. In the aggregate, mobility has spiraled, but transit service has often dwindled and in some cities disappeared during the same period that people with access to an automobile were enjoying new heights in mobility. Destinations were becoming more dispersed and difficult to reach via transit systems whose service had shrunk to a minimum. While it is not likely that a high transit alternative alone will reverse the trend toward dispersion of activities, it is foreseeable that an extensive transit system could restore lost mobility for persons without full access to an automobile.

SOCIAL DISRUPTION

Basically, the disruption caused by transportation facilities is of three kinds: (1) temporary disruption caused by interruption of service in a busy corridor; (2) relocation effects caused by obtaining right-of-way in business and residential areas; and (3) disruption caused by the use of the facility that creates noise, dust, air pollution, danger, and community separation. Although these impacts have not been quantified, some information from earlier sections provides some insight into the relative magnitude of the impacts under the various alternatives. For instance, the disruption caused by construction and the dislocation caused by major projects may be associated with the lane miles of construction in Section 11, Table 7. The disruption from use of the system can be associated with the noise and air quality analysis and the vehicle miles of travel for each alternative in Table 12.

ECONOMICS

The economics of transportation has two major facets. It may be asked, (1) "How much does it cost and who pays for it?" and (2) "How do the economy and transportation demand interact?" In an earlier section it was stated that automobile oriented systems have a high private cost, and transit has a relatively high public cost assuming public ownership with operating subsidies. No assumptions were made about the revenue source for the public operator, but higher levels of transit modal split are almost certainly dependent on a broader tax base than the current payroll tax. Transit as a public service is one conceivable option.

The interaction of the economy and transportation demand is a difficult topic, and this report will only acknowledge that a relationship exists.

A viable local economy requires adequate transportation for goods and people. Some people might say that the high transit alternatives in this report do not meet those economic requirements. On the other hand, an active economy stimulates transportation demands through population growth and a higher rate of trip-making with commensurate demands for improvements. In contrast, there could be a high demand for public transit if a change in the economy created high numbers of transit users. If some doomsday prophets prove to be correct, the transportation market share for transit discussed in Section 12 is likely to be greater than present market conditions could justify.

A suitable transit strategy would therefore depend on the best guess of what might happen to the external economy. If the national economy is healthy and the Eugene-Springfield area is to compete as part of that economy, then an adequate system for free movement of people and goods would be called for. But, if the national economy plummets by the year 2000, a system for high transit ridership and lower general mobility would be not only acceptable but desirable. To guess which it should be is a calculated risk that this report and many experts fail to eliminate.

19 Summary

The purpose of the study documented in this report has been to generate discussion leading to agreement on a single premise on which transportation planning can be based; this report contends that such a premise should be the same at the policy level for all regional facility plans including parks, schools and utilities as well as transportation. Because there is but one actual future for the metropolitan area, a strong consensus on the nature of that future will greatly enhance the region's ability to achieve it.

In the interest of generating such a consensus this study examined a range of hypothetical futures for Eugene-Springfield. This report documents six alternative sets of conditions which were investigated to provide necessary background information on which to base the decision as to the most desirable future. This examination is not intended as a plan; it simply has produced information on the consequences of each of the six alternatives examined. Based on this study and assuming additional public discussion, a choice can be made which will set the direction and outline the constraints for the development of a regional transportation plan. The development of such a plan will be the subject of a document to be published at a later date.

The information generated by the past several months of study provides a characterization of conditions assuming that any single alternative

TABLE 21

SUMMARY INFORMATION FOR FIVE LONG-RANGE TRANSPORTATION ALTERNATIVES
FOR EUGENE-SPRINGFIELD

Analysis	Continued Trends Alternative "0"	10% Transit Alternative 1	10% Transit with Reduced Trips Alternative 2	30% Transit with Reduced Trips Alternative 3	New Land Use Form Alternative 5
Development					
Parks	Little Change	Little Change	Little Change	Little Change	Redevelopment Req.
Schools	15 New	15 New	15 New	15 New	17 New
Sewers	Compatible	Compatible	Compatible	Compatible	Compatible
Capacity Improvements Needed					
Street Miles	37	34	25	13	39
Street Lane Miles	91	70	42	30	89
New Buses	N.A.	126	109	451	N.A.
Costs (Millions)					
Capital Street Costs	$ 69	$ 61	$ 34	$ 30	$ 69
Transit Capital Costs	0	9	8	32	0
Annual Private Operating Costs	$198	$186	$170	$148	$188
Annual Transit Operating Costs	$ 3	$ 13	$ 12	$ 36	$ 3
Energy Requirements					
Annual BTU (Trillions)	12.4	11.9	10.9	10.0	11.8
Air Pollution (Tons/Year)	12,000*	12,000*	12,000*	12,000*	11,000*
Noise Pollution (Miles Exceeding 70 Decibels)	123	118	115	109	113
Mobility					
For Transit	Poor	Improved	Improved	Greatly Improved	Poor
For Automobile	Decreased from Current	Decreased from Current - Some Restrictions	Decreased from Current - Some Restrictions	Decreased from Current - Many Restrictions	Decreased from Current

* Carbon monoxide, nitrogen oxides and hydrocarbons (only) for 1985

is implemented. For example, Alternative "0," which was prepared as the base alternative to which other alternatives may be compared, represents a continuation of current trends, although this terminology does not necessarily imply the most likely future for Eugene-Springfield. In assuming that 277,000 people will be living in the metropolitan area by the year 2000, Alternative "0" examines regional conditions if 110,000 people are added to the metropolitan population and if practices for providing facilities and services are the same as at present. For example, the investigation of Alternative "0" indicates need for additional parks and schools while indicating that sanitary waste collection and transmission facilities would not be a major constraint to physical development. Thirty-seven miles of street improvements would be needed to add capacity to the street corridors projected to be deficient in Alternate "0." Total annual private operating costs are estimated to be $198 million with an additional $3 million in annual transit operating costs.

Alternatives 1 through 5 assumed the same level of population and employment as Alternative "0." Alternative 1 examined the effects of a 10% transit modal split in the year 2000; it is anticipated that 34 miles of street improvements would be necessary. The annual private operating costs of Alternative 1 are estimated to be $186 million, with annual transit operating costs an additional $10 million. Mobility for transit users would be improved relative to Alternative "0" while automobile mobility would encounter some restrictions.

Alternative 2 investigated impacts of a 10% transit modal split coupled with a 10% reduction in the number of automobile trips in the year 2000. Twenty-five street miles of improvements are anticipated, and the annual private operating cost would be $170 million with annual transit operating costs of $12 million. Transit mobility would be increased relative to Alternative "0" while there would be some restriction in automobile mobility.

In investigating Alternative 3, which calls for a 30% transit modal split and a 10% reduction in the number of automobile trips, it was determined that 13 miles of street improvements would be required. A total annual private operating cost of $148 million was predicted, with an additional annual transit operating cost of $33 million. Mobility for transit users would be greatly improved relative to Alternative "0," while there would be many restrictions on automobile users.

Alternative 4 was initially identified so that the conditions might be described assuming no more street capacity improvements before the year 2000. While this situation is not dismissed as impossible, the conditions specified for this alternative deviate so vastly from current circumstances that Alternative 4 could not be further characterized with any confidence.

Alternative 5 investigates the impacts of a balanced land use pattern where residents live and work in close proximity. It is estimated that 39 miles of street improvements would be necessary. The annual private operating costs of Alternative 5 would be $180 million with an additional $3 million in annual transit operating costs. Unless this alternative is combined with a more substantial transit program, mobility for transit users would be poor, and mobility for automobile users would be decreased from present levels.

The alternatives just summarized are intended to present a range of futures for Eugene-Springfield. As discussed earlier, a choice about which concept is used as a basis for specific facility planning, in this case transportation system facilities, must soon be made. The alternative chosen may be one presented above or a hybridization of aspects from several alternatives as decided by the public and their appointed and elected officials. A regional transportation plan will be prepared based on whichever concept is approved.