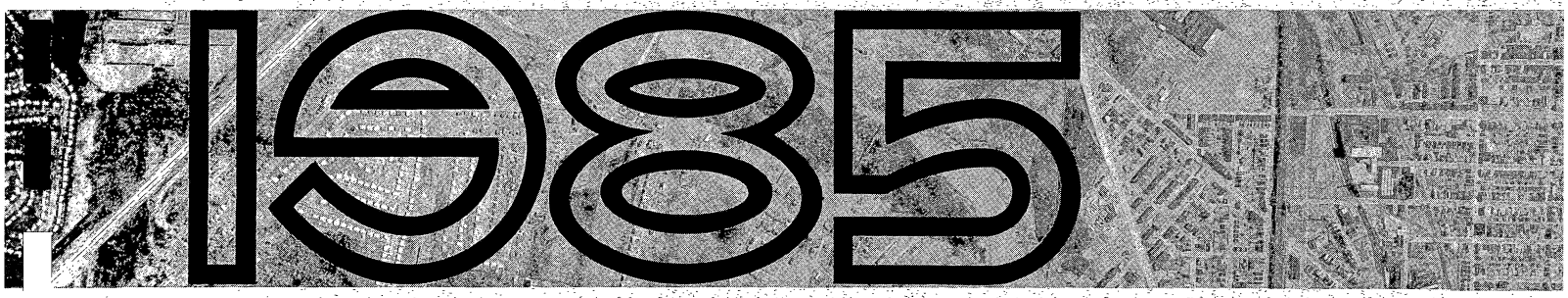
TRI-STATE TRANSPORTATION



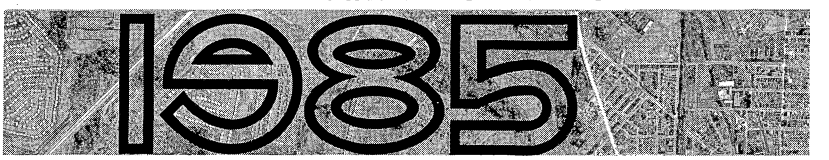
an interim plan

Tri-State Transportation Commission Connecticut ● New Jersey ● New York

May 1966

3007-1110-3M

TRI-STATE TRANSPORTATION



an interim plan

Tri-State Transportation Commission CONNECTICUT • NEW JERSEY • NEW YORK

May 1966

Tri - State Transportation Commission

The Tri-State Transportation Commission is an interstate planning agency directing its full attention to the definition and solution of immediate and long-range transportation and related land use problems of the New York metropolitan region.

It was established by legislative action of the States of Connecticut, New Jersey and New York in 1965, and succeeds the Tri-State Transportation Committee formed by the Governors of Connecticut, New Jersey and New York in 1961.

The Commission has developed a long-range and an immediate action program of work. Immediate action programs were started first to study particular problem areas of transportation and urban development. As a part of its immediate action program, the Commission has initiated several mass transit experiments. These experiments provide for service improvements and for careful measurements of induced changes in travel habits.

Longer-range planning studies began in late 1962. The Commission conducted field surveys in 1963-4 to prepare a careful factual base for projection and for preparing longer-range plans.

The three States and the Federal Government finance the work of the Commission. Federal funds come from highway planning aid administered by the U.S. Bureau of Public Roads and also from planning and mass transportation grants provided by the U.S. Department of Housing and Urban Development.

The Commission Includes:

William J. Ronan, Secretary to the Governor of New York, Chairman of the Commission
J. Burch McMorran, Superintendent of Public Works, State of New York
Bayard S. Forster, Director of Office of Transportation, State of New York
Harold A. Jerry, Jr., Director of Office for Regional Development, State of New York
William F.R. Ballard, Chairman, New York City Planning Commission
Dwight R.G. Palmer, Commissioner, State Highway Department, State of New Jersey
Robert A. Roe, Commissioner, Department of Conservation and Economic Development, State of New Jersey
William F. Hyland, President, Board of Public Utilities Commissioners, State of New Jersey

Leo V. Donohue, Deputy Commissioner, Department of Finance and Control, State of Connecticut
Howard S. Ives, Commissioner, State Highway Department, State of Connecticut
Eugene S. Loughlin, Chairman, Public Utilities Commission, State of Connecticut
Graham R. Treadway, Chairman, Connecticut Development Commission
Frank Reinhold, Chairman, Connecticut Transportation Authority

John A. Swanson, Regional Engineer, U.S. Bureau of Public Roads
Lester Eisner, Jr., Regional Administrator, U.S. Department of Housing and Urban Development
Frank A. Carboine, Chief, Airports Division, Eastern Region, Federal Aviation Agency

J. Douglas Carroll, Jr., Executive Director

The preparation of this report was financed in part through Federal funds made available by the U.S. Department of Commerce, Bureau of Public Roads; the Federal grant from the Urban Renewal Administration of the U.S. Department of Housing and Urban Development, under the planning assistance program authorized by Section 701 of the Housing Act of 1954, as amended; and in cooperation with the three States of Connecticut, New Jersey and New York.

Tri-State Transportation Commission
100 Church Street
New York, New York 10007

CONNECTICUT

NEW JERSEY

NEW YORK

TRI-STATE TRANSPORTATION COMMISSION

100 CHURCH STREET NEW YORK, N.Y. 10007 ● TELEPHONE 433-4200 AREA CODE 212

Honorable John N. Dempsey, Governor of Connecticut
Honorable Richard J. Hughes, Governor of New Jersey
Honorable Nelson A. Rockefeller, Governor of New York

Your Excellencies:

On behalf of the Tri-State Transportation Commission I have the honor to transmit to you an interim transportation plan for the Tri-State Region.

In the next twenty years it is estimated that 6,000,000 more people will live in this Region. This will produce a total population of 24,000,000 persons and bring with it additional burdens on the transportation system of the area.

To meet these future needs and to improve present travel, the Tri-State Transportation Commission has outlined herein a program of transportation improvements in order to provide a truly Regional system of rail and highway facilities.

These recommendations will require an investment of as much as $3 billion for suburban rail and rapid transit facilities, and an estimated $7 billion for new controlled access expressways. Investments of this magnitude totaling $10 billion should be planned and built within the framework of a Region-wide plan.

The Tri-State Transportation Commission believes this is a realistic assessment of needs and represents a desirable and attainable program. The Commission further believes these investments are essential if this Tri-State Region is to continue as a dynamic and attractive place for residential, business and industrial development.

The preparation of the recommendations in this report has involved assemblage and analysis of quantities of data never before collected, and represents a fully cooperative undertaking wherein the three states, the federal government and the many localities have participated.

This is an interim plan because it will be subjected to further testing. In a rapidly changing environment such as ours, all future aspects cannot be accurately foreseen, and so plans must be regularly adjusted. During the next two years these proposals will be subjected to various tests including measures of the likely effect on future land development and also performance tests based upon full simulation through the use of the most advanced electronic data processing methods of present and future traffic loads.

The Commission will continue to bring the most modern scientific and technical information to bear in plotting the future growth of this, the world's most complex urban Region. This work is now being carried forward in full partnership with state, local and appropriate federal agencies.

For the Tri-State Transportation Commission

William J. Ronan
Chairman

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

INTRODUCTION

In the decades ahead billions of dollars worth of new regional transportation facilities will be constructed in the Tri-State Region. One of the major tasks of the Tri-State Transportation Commission is to help guide the orderly development of a regional program of transportation improvements as they are undertaken by the states of Connecticut, New Jersey and New York and their local communities.

The interim plan presented herein represents an initial design for such a program. A process of continuous examination and refinement of this first effort will be a major task of the Commission in the immediate future, to be done in cooperation with the regional community.

The most detailed and complete survey of the region's land and transportation activity ever undertaken is now being processed by the Commission's technical staff. The ordering and analysis of this storehouse of information will lead to a greater understanding of the growing needs and aspirations of the region. With this deeper factual understanding, detailed future transportation plans can be realistically tested to see how well they are likely to perform. Regular review and appraisal of plans will insure that these plans conform to the needs and desires of the people of the region and that the plans do provide the format for purposeful and orderly growth.

THE TRI-STATE REGION TODAY

Nearly one-tenth of the nation lives and works within a radius of 60 miles of Times Square. Concentrated on less than 8,000 square miles of the Atlantic coastal plain are 18.5 million persons living in 5.6 million housing units. About one-third of these persons travels to work each day, over a system of roads and rail lines more elaborate than anywhere else on earth.

Urban development is not spread evenly over the region's land area. Nearly half of the population lives on the central-most five percent of the land. The nation's most dense concentration of housing occurs on Manhattan where at one location 150,000 persons live in a single square mile of land. A great percentage of the development in New York City occurs at densities far above those typically found in any other large city in the United States.

The region's work places are even more concentrated than its population. Nearly one-third of the labor force travels each weekday to the nine square-mile area south of Central Park in Manhattan. More than one million persons arrive at their Manhattan offices or lofts in a single hour each morning, and depart in a single hour each evening. No more than ten percent of these, arriving and departing in the peak hour, can use the typical mode of travel to work used elsewhere in the nation–the automobile. The vast bulk of these workers are accommodated on the 25 pairs of rail tunnels that penetrate the central business district's perimeter. Elsewhere in the region, work places still tend to be more centrally located than residences. Even so, travel to work other than to Manhattan is most often accommodated by auto.

Despite the great intensity of transit travel to and from the center of the region, especially for work trips, more than 65 percent of all the region's daily person trips are by automobile. The 4.5 million autos garaged and cared for within the region travel 100 million miles per day. The ubiquitous road system of 30,000 miles of local streets, arterials, expressways, tunnels and

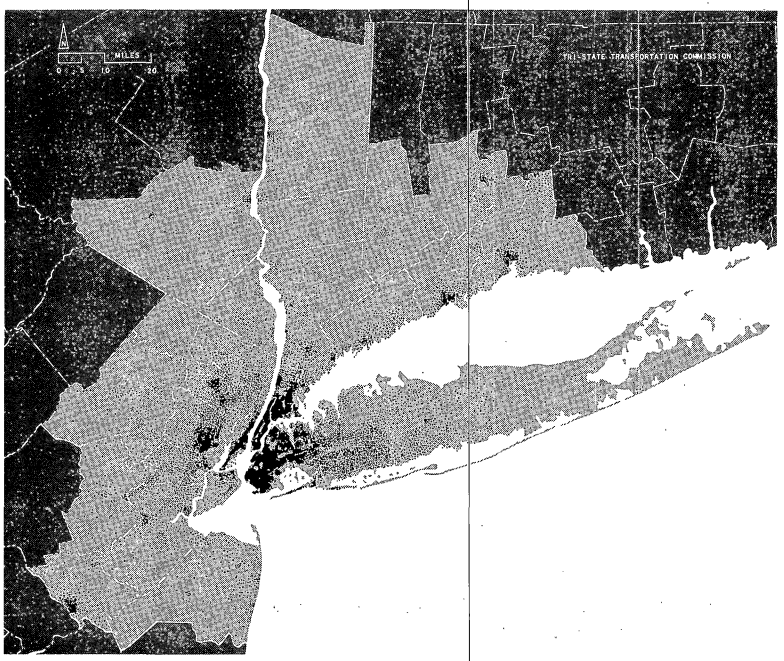


Figure 1. 1960 POPULATION DISTRIBUTION

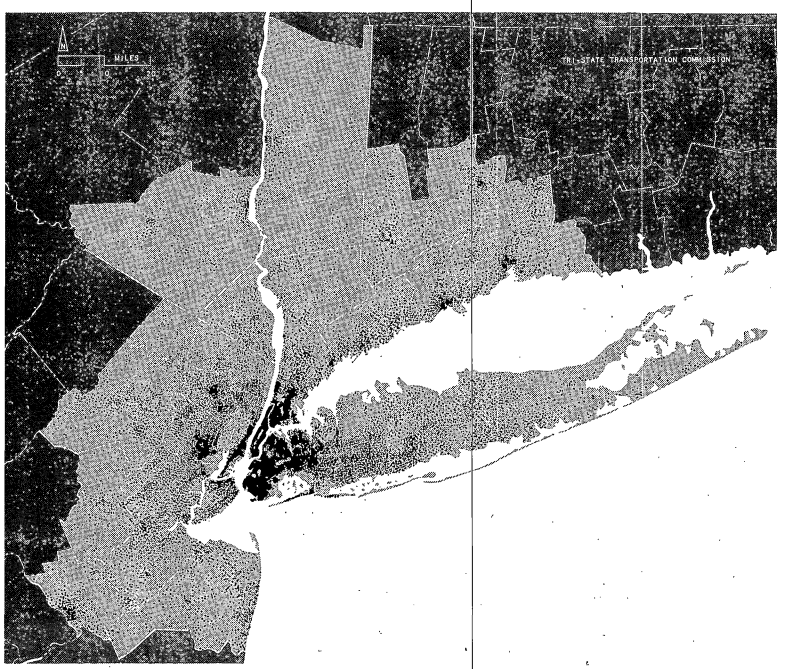


Figure 2. 1985 POPULATION DISTRIBUTION

In 1960, more than half the region's 18.5 million residents were concentrated on the central-most 5 percent of the land. By 1985 there will be 24.4 million persons; about one third of them will be living in the core area. Population gains will be greatest in places 20 to 60 miles out from Manhattan.

bridges permits access to each of the region's 3.6 million separate parcels of developed land. The multi-directional road system permits and stimulates a wide dispersal of auto travel with little radial orientation. This is in marked contrast to the pattern of transit travel which is predominantly aimed to or from the center of the region.

GROWTH AND CHANGE 1965-1985

In the years ahead some parts of the region will show growth while others remain constant or decline. At the same time the entire population will be slowly changing in certain characteristics – for example, a greater portion of older people and, for the average family, higher real incomes from greater productivity. These changes will require adjustments in existing transportation facilities to meet changing travel demands as well as considerable expansion to meet growing total requirements of a larger regional population.

The region has had a long and colorful history of growth with a steady outward expansion of land occupancy. This growth has meant more residents, more buildings and, above all, more travel. Growth is expected to continue at the pace of about 300,000 new residents per year.

The continued increase in the region's work force, combined with steady gains in worker productivity, will result in about $2 billion being added to the region's disposable income each year. This expanding base of real wealth will permit the population to increase its consumption of goods and services and will gradually affect the composite of consumer demands. Predicably, higher incomes will create demands for steady improvement in the quality of the transportation system.

The effect on regional development will be the continued growth in demand for living space, working space, play and recreation space, and automobile ownership. The growing pace of land consumption will continue.

A brief look at the region's development during the past half century reveals the rapid urbanization of land that has occurred with population growth, greater average wealth, and the steady improvement of access derived from steadily improved transport. Figure 3 traces the perimeter of growth in the region for three periods in time. Each generation has resulted in a doubling of of land in urban use. This pace of development can be expected to persist in the generation ahead, and it will gradually alter the geography of transportation demands.

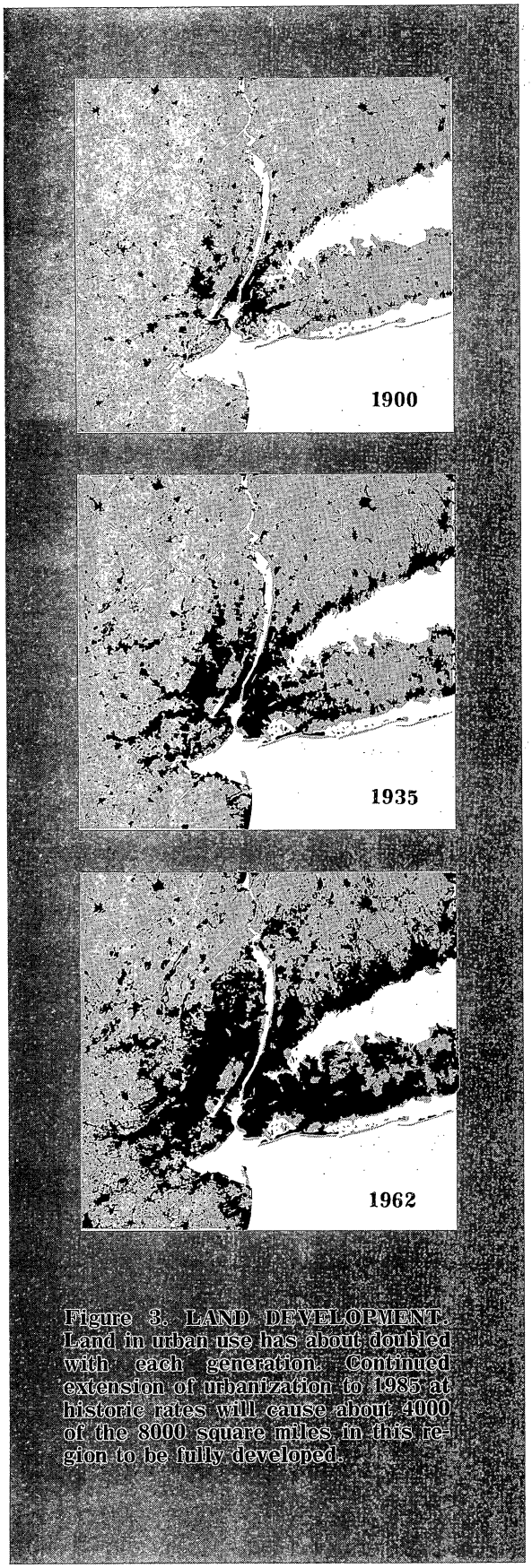


Figure 3. LAND DEVELOPMENT. Land in urban use has about doubled with each generation. Continued extension of urbanization to 1985 at historic rates will cause about 4000 of the 8000 square miles in this region to be fully developed.

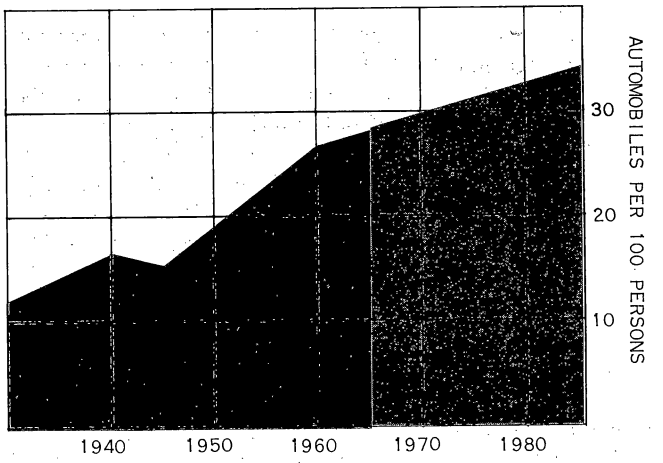


Figure 4. AUTO OWNERSHIP TREND. Growth of auto ownership, outpacing population growth, is expected to continue. Suburban growth and increased incomes are reflected in this projection.

By 1985 there will be from 5 to 6 million more people in the region. However, little population gain can be expected in the fully developed central parts of the region such as Brooklyn, Manhattan, the Bronx, or Hudson County. Gains will be greatest in the places from 20 to 60 miles out from Manhattan, where much of the presently vacant land will be developed. By 1985, on the basis of present trend, more than half of the land in the region will be fully urbanized with homes, stores, schools, offices, factories.

Work places will continue to be more centrally located than residences. However, the trend toward dispersal of work places will persist.

Small total growth can be expected in employment in Manhattan. While the number of workers at the center that must be in close working proximity to each other will continue to increase, the manufacturing and distributing functions will decline. The shift in Manhattan employment from blue collar to white collar will alter the character of transportation demand to the center, but not its overall gross dimensions. The increasingly specialized work force required in Manhattan will mean that the growing labor supply at the region's periphery must be tapped. Travel to the center will be from ever increasing distances, and long distance public transportation will have to be made even more rapid. Major increases in the quality of the journey to the center, both from the boroughs within New York City and from the suburbs, will be sought by the more productive and wealthier Manhattan work force. The expanding population outside of the transit-served core area will place increasing stress on the suburban commuter services, whereas transit usage in the inner areas will tend to remain stable or even decline.

Contrasting sharply with the stable size of the mass transportation market will be the expanding dimensions of motor vehicular travel within the region. The increased population in combination with higher average incomes is expected to swell the region's stock of automobiles 80 percent by 1985. An estimated 180 million vehicle miles of travel will have to be accommodated each weekday.

Most of this tremendous new growth in vehicular travel demands will be distributed throughout the region's rapidly growing periphery. New highways will be required, and existing roads must be substantially improved to handle these new demands. Even in the more heavily developed portions of the region where auto traffic growth will be less rapid, roadway improvements will be sought to increase speed and reduce accidents.

Little likelihood exists in the periphery for accommodating much of this traffic on mass transit facilities. Most of the increase in highway trips will occur in areas where local mass transit service would be uneconomic to operate. These trips will have varied origin-destination patterns that fixed transit routes would find hard to serve.

Looking to the future, there will continue to be separate tasks for suburban commuter services, for urban mass transit systems, and for private automobiles. Commuter railroads and, in a few cases, express commuter buses have the prime task of getting the outer residents delivered to Manhattan and to secondary business centers —faster, more comfortably, and more conveniently.

The urban mass transit system consisting of the subways, supported by bus services, has the dual problem of handling the shorter journeys within the dense core of the region and also providing the distribution and delivery system that is the essential backbone of a large, complex central business area.

The automobile generally provides the most convenient means for travelers to make journeys between non-central points, and it is the prime means for recreational travel on week ends and holidays.

These three types of service will each generally specialize in serving a particular class of trips: those moving between suburbs and center; those within the centers; or those within and between the suburbs. Such specialized service tasks of the three systems must be recognized in developing a comprehensive program for investment in transportation for the region.

THE RAIL IMPROVEMENT PROGRAM

The most extensive public transportation system in the world, the region's complex of rapid transit lines, suburban rail lines, and bus facilities permits the accumulation of more than 2 million workers each day in the Manhattan central business district. The predominant goal of transit improvements must be to ease and speed this trip to Manhattan to work, the primary task of the transit system.

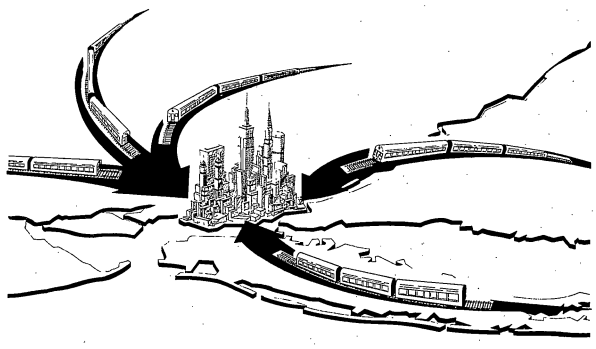
The majority of suburbanites working in Manhattan commute by railroad. Historically, railroads were built to reach from the hinterland to the center of development around Manhattan so that a pattern of spoke-like, radial rail lines exists.

Shifts of traffic to other modes have made it difficult for railroads to provide new capital investments from earnings, and any new equipment bought is generally for freight. Much suburban rail equipment is old, station maintenance has often been put off, and there has been little incentive to modernize plant or to improve service. The railroads have sought to curtail or abandon these commuter services, and public support has been required to preserve service. Yet public actions, until recently, have been directed towards preservation rather than improvement.

For the future of Manhattan and the region, suburban rail service must be improved. To achieve this, the best strategy would be to improve service on the existing lines rather than to plan wholly new rail lines. This means that new equipment, extended electrification, and direct delivery to Manhattan should yield the greatest improvement in service to riders for dollars invested.

Improvements to the rapid transit systems should also be aimed at raising the quality of service. But within the urban transit service area, population is not increasing—rather, there is a gradual rearrangement of homes and jobs which often finds travel needs growing somewhat away from the fixed locations of older subway lines. So, while subway improvements may require investment in some new lines or extensions to relieve overcrowding, most investment should go to provide faster, cleaner, and more comfortable rides for the existing users.

Proposals for improvements in the suburban rail system are outlined in succeeding paragraphs and detailed by sector of the region. Rapid transit proposals follow, and then an estimate is made of the total cost of the recommended improvements. In making these proposals, the Commission has reached past the very real problems of ownership, operational responsibility, and sources of finance to identify the requirements for improved travel for the regional commuter. This is not to suggest that these problems are unimportant, but rather that they can be more readily resolved when there is a well defined goal of improved regional service to be achieved.



Rail access to the center must be improved!

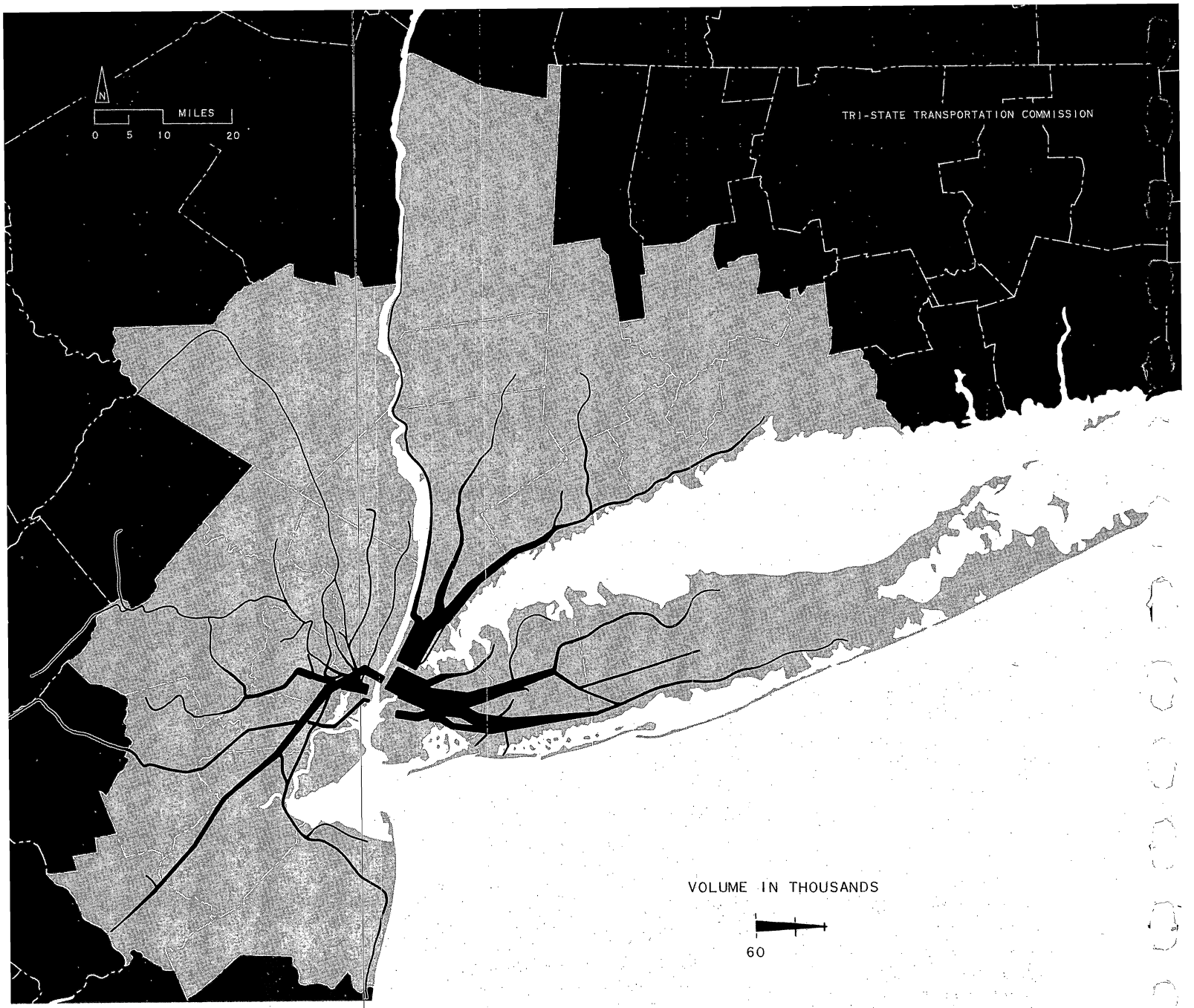
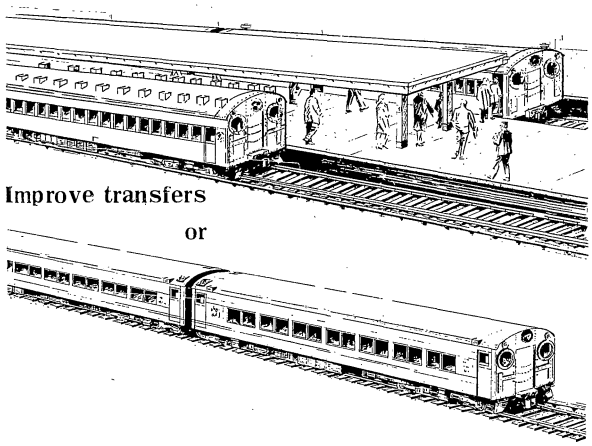


Figure 5. DAILY FLOW, SUBURBAN RAILROAD SYSTEM. More than half of the inbound flow of suburban railroad passengers toward Manhattan occurs in a single peak hour. This concentrated flow is assembled from throughout the region on the many branches of the region's six commuter railroads.

SUBURBAN RAIL IMPROVEMENTS

The suburban railroad system must be modernized. The efficient functioning of the region's central business district demands the provision of high-quality, rapid access from its rapidly developing periphery. No substitute transportation means can economically duplicate the service capabilities of a modernized suburban rail system.

Improvements should aim at ultimately providing a direct, no-change service from each suburban route to mid-Manhattan. Also, where



Improve transfers

or

Supply no-change service

feasible, new direct services to the lower Manhattan financial district should be provided. For the future, means must be found to improve the distribution of passengers throughout the nine square-mile Manhattan central business district, easing the tiring and time-consuming trip from train terminal to final destination.

A revised service pattern has been proposed for the region's suburban rail system that can achieve the goal of a direct ride to a Manhattan terminal. This pattern is shown in Figure 6.

The revised service pattern proposed can be achieved and all service upgraded only with a thorough-going modernization program for these suburban rail lines. This program would include the extension of electrification to the outer reaches of the suburban commuter area some 50 to 60 miles from Manhattan, the introduction of modern, high performance, multiple-unit cars equipped with powered, platform-level doors, the raising of station platforms to car floor level, the provision of automated station fare collection, and related track connections and signaling improvements.

Long Island Sector

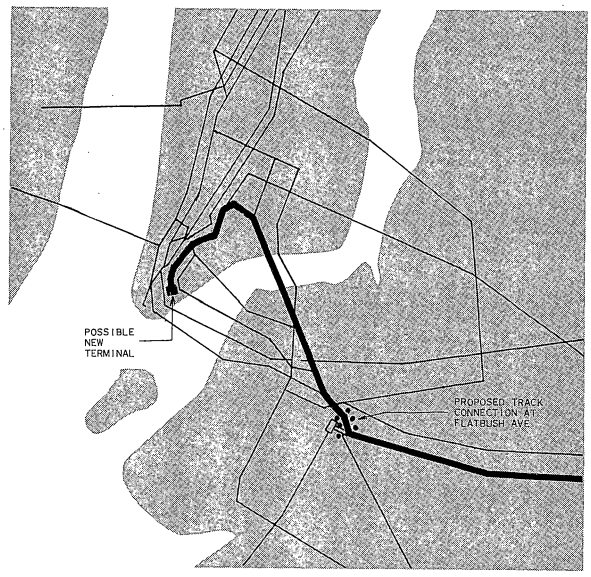
The Commission supports the $200 million modernization program for the Long Island Rail Road proposed by its new owner, the recently created New York State Metropolitan Commuter Transportation Authority.

The tentative rehabilitation program calls for the purchase of 500 new electric multiple-unit cars and the extension of electrification over 70 miles of route shown in Figure 7 including:

- The Main Line from Mineola to Ronkonkoma
- The Montauk Branch from Babylon to Speonk
- The Port Jefferson Branch
- The Oyster Bay Branch

Stations and track would be improved, and automated fare collection installed. Electric power distribution facilities would be brought up to date, and maintenance shops would be consolidated and re-equipped.

The Atlantic Avenue line which terminates at Flatbush Avenue in Brooklyn would be extended via the BMT subway to a new terminal in Manhattan's financial district, if economic and engineering studies being undertaken by the MCTA and the Transit Authority indicate such an extension is feasible. The inconvenient and time-consuming transfer in Brooklyn to the subway would then be avoided by thousands of Long Island Rail Road passengers each day. Use of the Manhattan Bridge tracks would permit LIRR service downtown while providing adequate track capacity for BMT subway passengers to midtown and downtown destinations.



From Nassau County to Wall Street

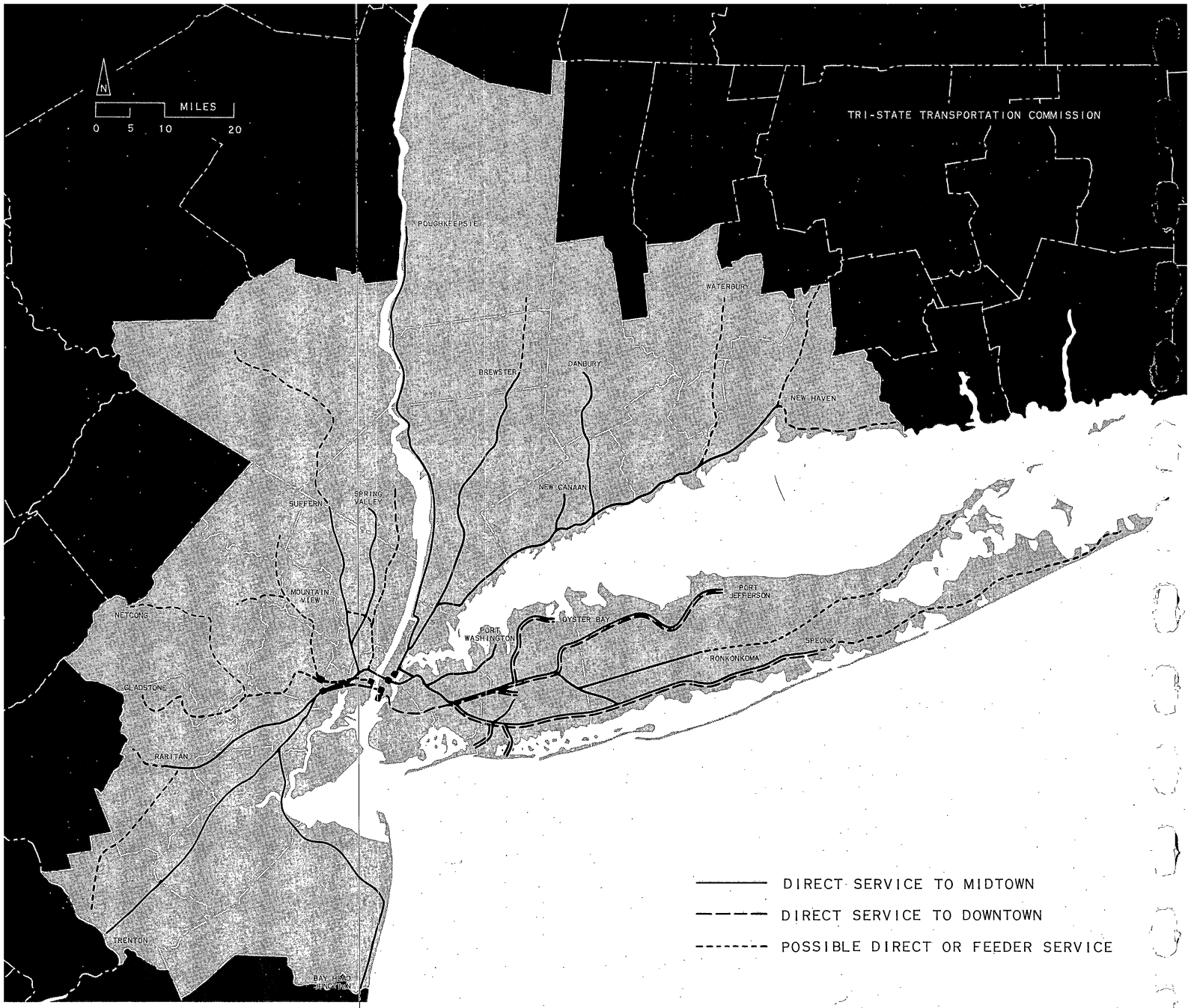


Figure 6. PROPOSED SUBURBAN RAIL SERVICE PATTERN. A regional goal is to provide no-change service from the suburban territory to Manhattan on all lines. Wherever possible, passengers should have a choice of trains to downtown or midtown Manhattan terminals. In New Jersey, all lines possible should provide service to Newark as well as to Manhattan.

The MCTA has initiated a program with the New York City Transit Authority which would enlarge the projected East River transit tunnel at 63rd Street from two tracks to three tracks in order to provide direct access for LIRR trains to the east side of midtown Manhattan.

With the realization of these changes in the dimensions of Long Island Rail Road service, LIRR passengers would have a choice of direct, one-seat service to downtown Manhattan or the east or west side of midtown.

New Jersey - New York State Sector

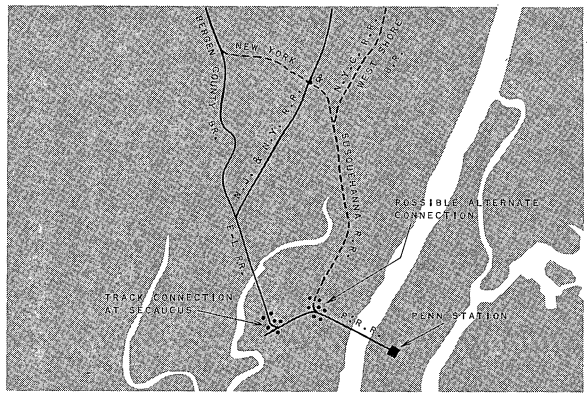
Rail service in the western sector of the region is unlike that in the other sectors in three important respects: (1) there are many services operated over a widespread area, (2) service is predominantly oriented to downtown Manhattan, and (3) very few trains operated in this sector run into Manhattan. Rail service here will become increasingly difficult to support unless these characteristics are altered. Investment in the rail system must aim at upgrading the quality of service if rail patronage is to be retained or increased.

Express bus service has developed to a unique extent in this sector. Buses serve areas without convenient rail access to mid-Manhattan. As New Jersey completes its planned highway improvements, travel by bus and auto will be advantaged, further diverting patronage from the railroads. Though technically feasible, the complete substitution of bus and auto for all rail travel would require sizable outlays for specialized facilities, and the resulting service would not be acceptable to most current rail riders. Provision of both rail and bus service to Manhattan and to Newark and other business centers in the sector will continue to be desired in the several decades ahead.

Investment in suburban rail improvements must be concentrated on the major routes serving the bulk of the passenger travel. These lines must be re-equipped with high-performance, self-powered cars. Stations along these lines must be modernized with car-floor-level platforms and automated fare collection devices. And, these major lines must be better connected to the existing under-utilized trans-Hudson rail tunnels, so that each route can provide service to Manhattan as rail ferries are abandoned.

Three groups of routes contain sufficient traffic potential to justify continued rail operation and substantial improvement.

In the northern third of this sector, two routes



Bergen-Rockland area

– the Erie-Lackawanna Railroad's Bergen County line from Suffern, and the New Jersey & New York Railroad from Spring Valley – carry significant volumes of peak period riders. These routes can be joined to the Pennsylvania Railroad mainline allowing passenger transfer to Pennsylvania Railroad trains or direct train operation into Penn Station, Manhattan. Such a connection will provide much improved rail access to midtown Manhattan, and will make it just as convenient for downtown Manhattan passengers as the present routing through Hoboken.

A transfer station could be provided where the Bergen County line crosses under the Pennsylvania Railroad in the New Jersey Meadows. A direct track connection could also be made at this point, or it could be made via the New York, Susquehanna & Western tracks connecting to the Pennsylvania Railroad at the tunnel portal where the Pennsylvania Railroad passes beneath the Palisades. This alternate connection has the virtue of making possible a future rail service on the New York Central West Shore Right-of-Way. More detailed engineering feasibility studies will be required to evaluate these two options.

In the southern third of this sector, the State of New Jersey is constructing a new connection to realign the Central Railroad of New Jersey so its trains can run into Penn Station, Newark. Thus all three routes serving the southern counties will come through Newark and there provide a transfer for downtown Manhattan-bound travelers and a connection allowing continuation of trains into midtown Manhattan.

The New Jersey Highway Department's Division of Railroad Transportation plans to electrify and re-equip the Central Railroad service into Newark. When electrified, these trains can run into Manhattan over the Pennsylvania Railroad line. Studies completed by Tri-State have shown that available capacity exists for more trains

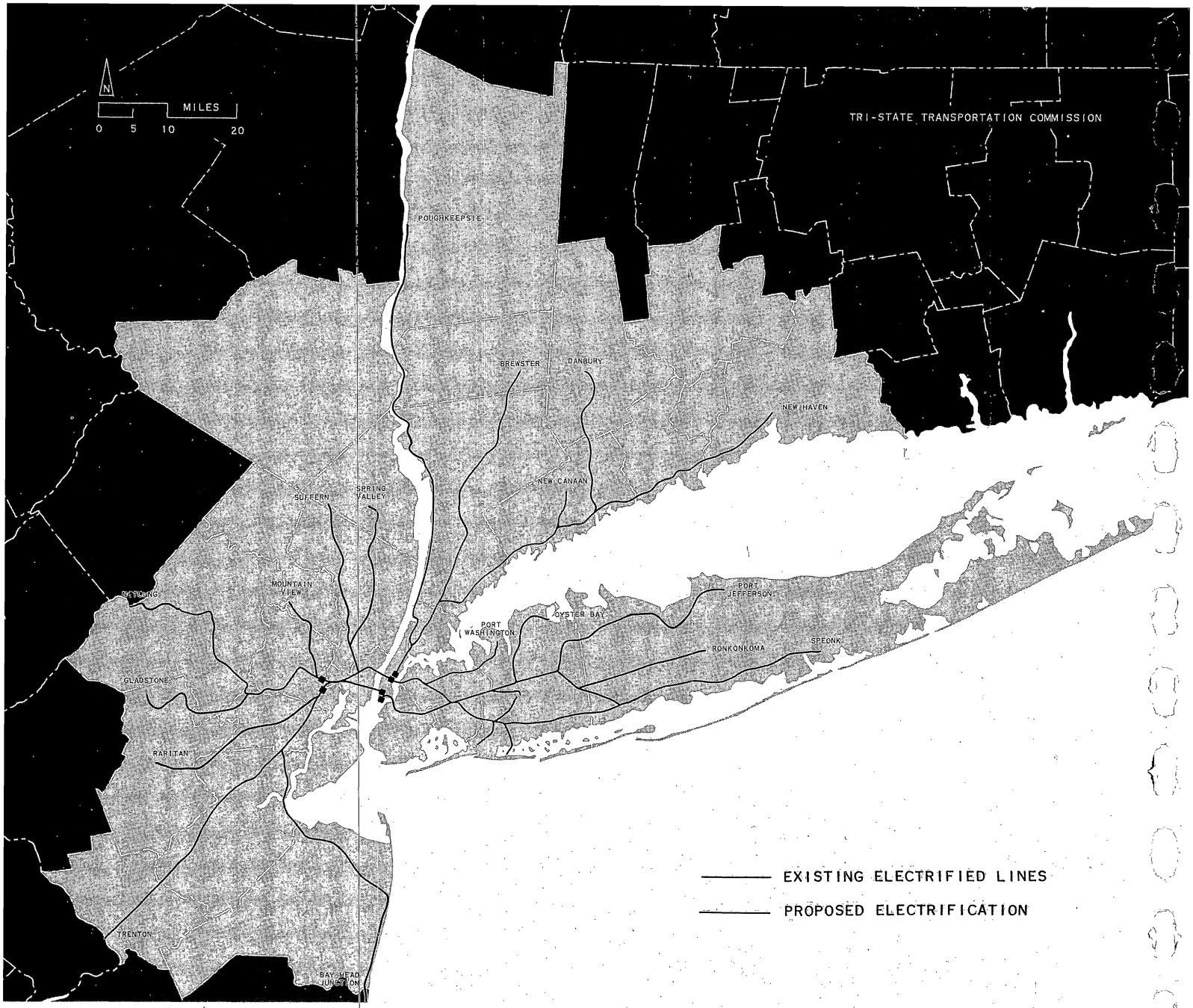
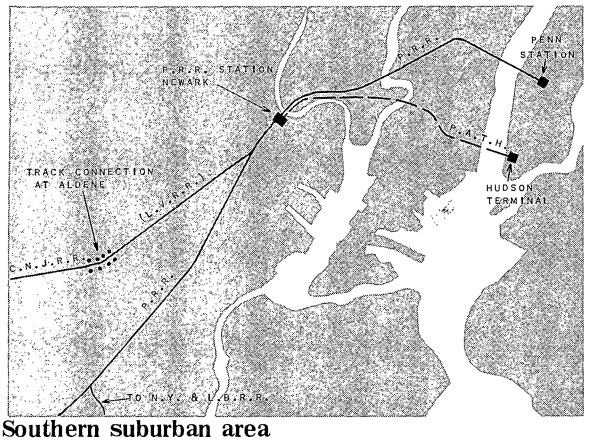


Figure 7. PROPOSED SUBURBAN RAIL ELECTRIFICATION. Extended electrification means: (1) extended, through service (no need to change equipment); (2) swifter service with new, high-performance cars; and (3) more service for expanding suburbs. A potential alternate to electrification is the new, self-powered gas turbine car which is now being tested.

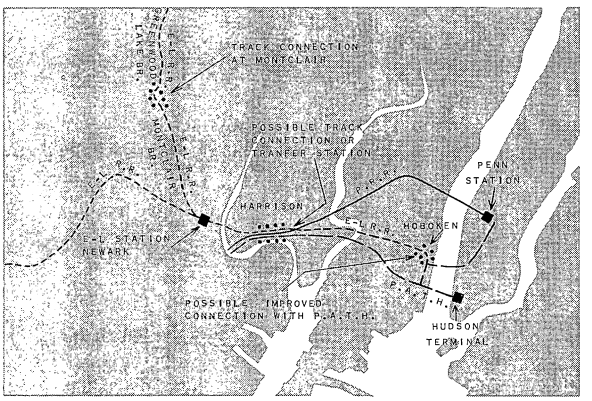


Southern suburban area

during peak hours into Penn Station, particularly when all trains are made up of self-powered, new equipment. Also, in anticipation of new electric powered equipment, the possibility of running some trains through to Hudson Terminal should be studied and evaluated.

The third family of routes lies to the west. Here three lines of the Erie-Lackawanna electrified system reaching out to Dover, Gladstone and Montclair currently serve more than 20,000 travelers each day. A short track connection at Montclair would tie the relatively short Montclair branch into the more extensive Greenwood Lake – Boonton line. Electrification to Mountain View would provide improved service to this growing suburban area.

All three lines would thus feed through the Newark Station of the Erie-Lackawanna Railroad and continue on the same alignment to Hoboken. At Harrison these tracks are directly adjacent to those of the Pennsylvania Railroad, and here a track connection or transfer station can be built to reduce travel time to midtown Manhattan. Downtown travellers can continue to go to Hoboken and then into Manhattan via PATH. However, the ultimate cessation of Erie-Lackawanna ferry services will warrant consideration of ways to improve the transfer to PATH as well as exploring the possibility of through operation into Hudson Terminal. Track connections are possible at Harrison and Hoboken.



Passaic-Morris-Essex area

While direct service is attractive to the rider, the lack of equipment compatibility, joint operating problems, and related construction costs may be too great for this to be feasible. A full examination of all of these possibilities is recommended prior to purchasing new equipment for these lines.

Throughout this western sector, the problems of separate ownership and separate operating patterns present difficulties in planning for more coordinated service. Yet these differences must be resolved if an improved and unified rail service is to provide a convenient and useful travel alternative for the projected six million residents in this part of the region.

Of paramount importance in any such program will be the problem of finance. To re-equip and to electrify these services will cost an estimated $200 million – half for equipment and half for the related track and station improvements. In addition there will be needed expenditures to provide essential grade separations. If rail services are to be maintained and customers held and increased, a substantial public investment program will be required.

Investment cost might be reduced by as much as $50 million if gas turbine propulsion can be substituted for the extensive electrification needed to improve rail performance. A test of this type of propulsion is part of a mass transportation demonstration project now being sponsored by the Commission.

The substantial volume of travel by buses serving this sector of the region would justify certain improvements beyond the new highway construction outlined later in this report. Specialized bus roadways using rail rights of way are under intensive study by the Commission. A feasibility study has been made for a possible bus roadway along the West Shore Right-of-Way. The Port Authority is actively pursuing the problem of bus performance through the constricted Lincoln Tunnel and approaches, and is also studying the need for expansion of bus terminal capacity. When new expressways are designed, attention should be given to bus turn-outs and possible use of separate bus loading facilities at interchanges. These possibilities should be explored jointly with the bus operators to insure the need and utility of special designs.

These recommended improvements can be

approached in steps. The first phase would be completion of the southern group of routes. Next, service from Bergen County and the north could be merged into midtown direct service either with electrification or other, turbine powered, electric equipment. Finally, re-equipping of the electrified lines of the Erie-Lackawanna can be undertaken and improved Manhattan delivery options resolved and implemented.

This new pattern of service has many operational and institutional problems that must be overcome. However, the alternative will be gradual loss of patronage to buses and autos, and thereby a gradual increase in highway demands and need for new investments in terminals and other facilities to handle travelers by bus.

This is a critical time for this sector. The existing rail equipment is virtually worn out, and there is a recognized, urgent need for the public to take action to supply commuter services. Such a plan represents a realistic goal for the guidance of public investment and public policy.

Connecticut - New York State Sector

In this sector of the region the New Haven and the New York Central railroads have generally good track alignments and serve well developed corridors. What is needed here is modernization of these important routes.

Extension of electrification on the New York Central is needed to bring northern Westchester, Putnam and Dutchess counties within more reasonable commuting range of Manhattan. A total of 66 route miles shown in Figure 7 are suggested for electrification; specifically, the Hudson Division from Croton to Poughkeepsie, and the Harlem Division from North White Plains to Brewster. On the New Haven Railroad, the reactivation of electrification on the South Norwalk to Danbury Branch would permit improved service to a close-in section of Connecticut which is expected to grow rapidly in the decades ahead.

The New York Central has made considerable progress in rehabilitating its commuter fleet through the New York State Commuter Car Program, but additional, modern, electric multiple-unit cars are needed in the years ahead to replace overage equipment and serve extended electrified lines. A rehabilitation program is currently being outlined for the New Haven Railroad by the MCTA and the Connecticut Transportation Authority through the recently established New Haven Mass Transportation Demonstration Project. In the years ahead, as many as 200 new cars would be required to fully modernize both rail services.

Ultimately only modern multiple-unit cars should operate on these lines into Grand Central Terminal. The long-haul passenger trains on the two railroads will, to a great extent, be diverted to Penn Station under merger plans for the Penn-Central system.

Construction of high-level platforms in conjunction with improved station facilities will permit reduced operating cost and time savings. Signal and power supply improvements, and shop and yard modernization will round out the development program.

Total improvement cost for the two services is estimated to be about $120 million.

Direct downtown service from the eastern New York State-Connecticut Sector, though ultimately desirable, would be considerably more costly to initiate and operate than the comparable service recommended for New Jersey and Long Island, and would benefit far fewer passengers.

STAGING THE IMPROVEMENT PROGRAM

The region's commuter rail system, bringing 200,000 passengers from the suburbs to Manhattan each weekday, must be revitalized as quickly as funds can be made available. The goal of direct, no-change service to Manhattan terminals must be achieved in a rapid and orderly fashion early in the decade ahead in order to maintain levels of traffic on major lines. The detailed sequence of modernization and improvement will be established from technical studies planned or under way. Major revisions in routing patterns, and operating and institutional changes recommended for New Jersey lines will require more time to complete.

Useful guidelines for determining the extent and role of electrification will be developed in the previously mentioned demonstration project sponsored by the Commission, in which gas turbine propulsion as an alternative to electrification will be tested. The cost of achieving the desired performance levels over presently non-electrified lines may well be reduced if the project is successful.

Second in priority is improvement in the distribution of rail passengers within the Manhattan central business district. Major improvement must necessarily await completion of the modernization and direct delivery sought initially.

MANHATTAN DISTRIBUTION OF PASSENGERS

The provision of direct rail service outlined above to midtown and downtown Manhattan terminals will bring 50 to 60 percent of the region's

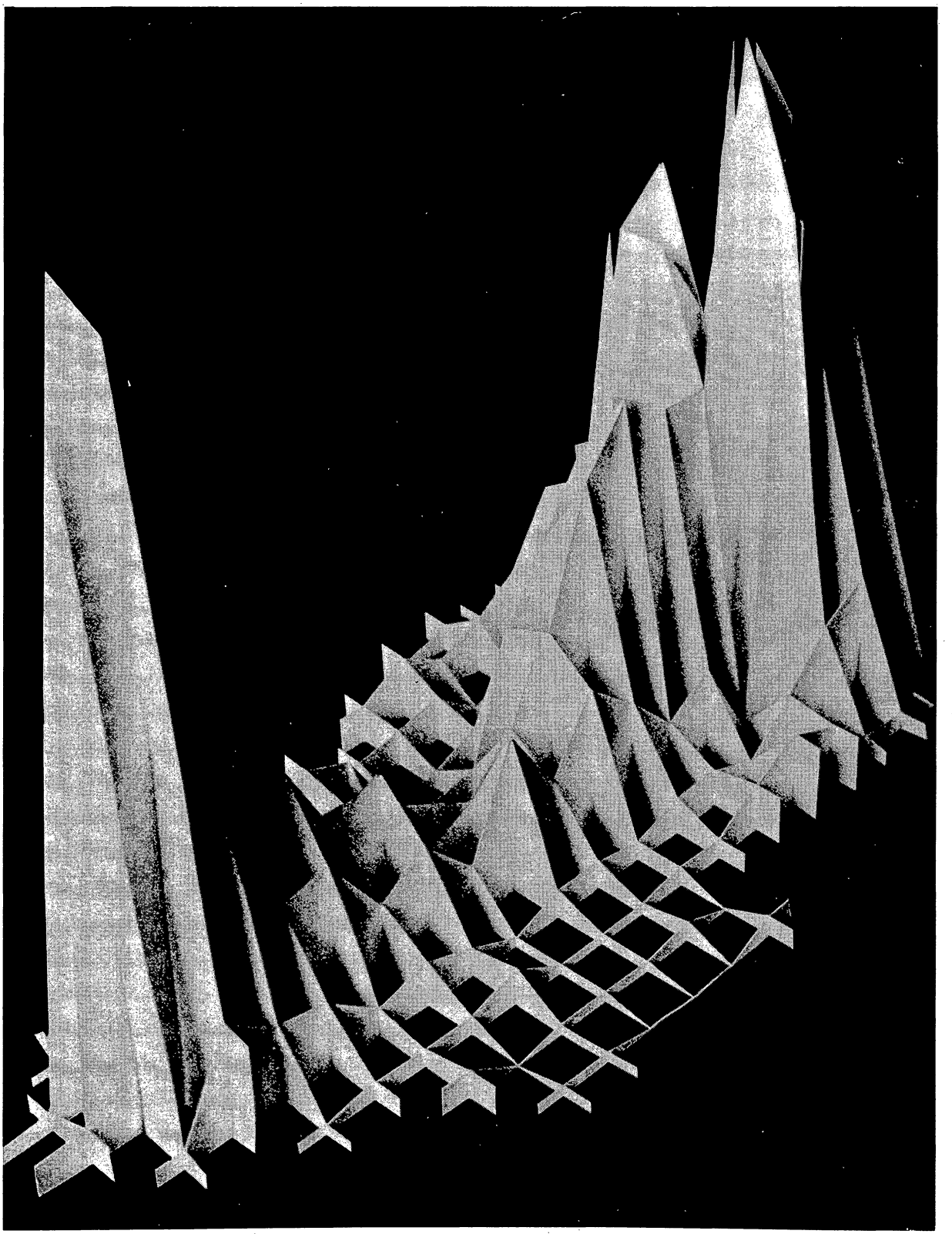


Figure 8. MANHATTAN CENTRAL BUSINESS DISTRICT EMPLOYMENT. The two major concentrations of activity in Manhattan are illustrated in this employment density model developed by the New York City Planning Commission. The total volume enclosed by the model represents the two million jobs in the Manhattan central business district.

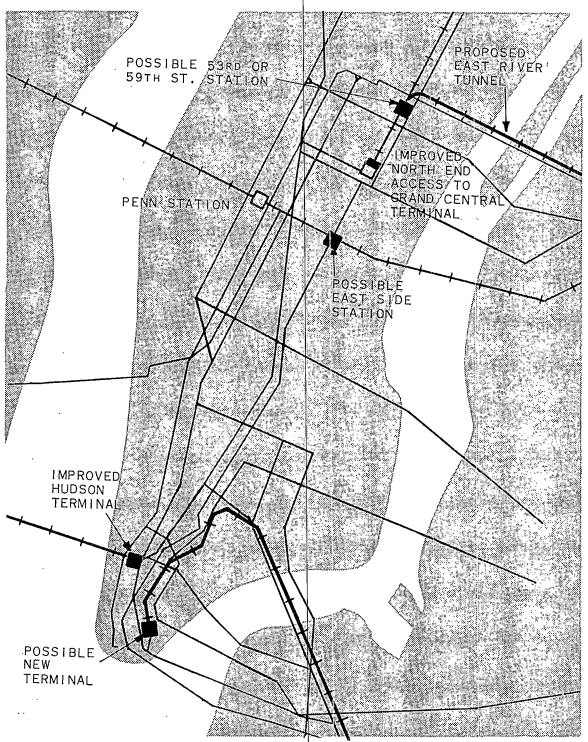


Figure 9. IMPROVED DISTRIBUTION. More station stops in Manhattan will bring more rail commuters within walking distance of their eventual destinations.

Manhattan-bound suburban railroad passengers within walking distance of their destinations. Other passengers will still require supplementary transportation – subway, bus or taxi – to reach stores and offices. Considerable benefit to these passengers would result from easing and speeding the journey from rail terminal to destination.

Improvements at Existing Terminals

Initial Manhattan distribution improvements would be made at existing terminals of the region's suburban railroads. At Grand Central Terminal, direct access to station platforms from the north would shorten walking time from the rapidly expanding East Side and Rockefeller Center office areas. As commuter service from the New Haven and New York Central railroads is modernized, train operation may be concentrated on fewer tracks, making platform access to the north less costly. This modernization would also permit consideration of an on-line station stop on the approach to Grand Central at 53rd or 59th streets. A new station at this location would benefit passengers transferring to West Side and downtown subway lines.

Greatly increased usage of Penn Station can be expected with provision of increased direct service from major rail routes in New Jersey and Long Island. Therefore, there will be greater demand for convenient access to East Side offices and stores. An additional station stop on the east approach to Penn Station at Park Avenue and 32nd Street, where a convenient transfer to the East Side IRT subway could be established, could provide this improved access.

The operational and economic feasibility of additional on-line station stops must be assessed. If technical requirements dictate high construction cost, then alternate means for achieving the desired improvements must be explored.

The proposed downtown service of the Long Island Rail Road (and the comparable delivery pattern proposed for New Jersey commuters) would place many more riders within convenient walking distance of their destinations. Further, many commuters will have a choice of midtown or downtown trains at their boarding stations.

Longer Term Improvements

With the proposed high-performance equipment, and with terminal delivery to Manhattan, there will remain a problem of moving travelers from the rail discharge point to the final destination. If travelers climb stairs and walk, this is time and energy consuming. If destinations are too far for walking, time-consuming transfers to subways or buses are required. For many rail travelers, this is the slowest portion of the entire journey.

In the future, attention must be given to this problem. Solutions will vary from installation of escalators at stations to a more elaborate and expensive system of pedestrian ways that are separated from existing surface traffic and possibly fitted with continuous flow pedestrian conveyors. Other possibilities are for trains to be routed down the center of Manhattan or for subways to be rearranged in routing and location to serve better the major terminals.

IMPROVEMENTS TO RAPID TRANSIT

A most urgent improvement needed for the region's rapid transit system is relief from overcrowding. Transit passengers in New York City are accomodated in crowded subway trains at loading densities far greater than in other U.S. cities. This is due to the dense settlement pattern and the very high capital cost of building more subways. It is also a pattern deriving from the policy of a very low, uniform fare that is supposed to cover all operating costs of the system. The financial squeeze brought about by these restraints produces a physical "squeeze" for the rush hour rides.

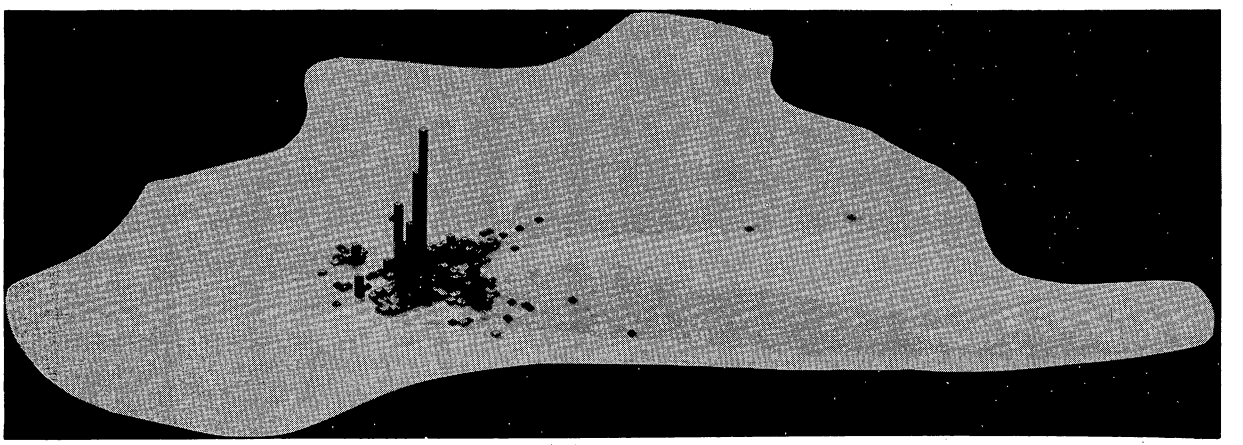


Figure 10. PUBLIC TRANSPORTATION TRIP ENDS. Each weekday nearly 10 million trips are made via public transportation in the region. The blocks in this model indicate numbers of person trips starting or stopping in that square mile each day. The highest, near Grand Central Terminal, represents 614,000 trips.

The most critically congested lines – the Lexington Avenue IRT and the Queens Boulevard IND – are operated at maximum track capacity. Only new channels of flow can ease congestion on these lines. Relief from overcrowding in other subway routes can occur with the assignment of more cars per train as station platforms are lengthened and the scheduling of more frequent service, particularly where signal improvements and track connections, now under construction, are completed.

Although the New York City Transit Authority has been carrying out a billion dollar improvement program during the last twelve years, throughout the subway system improvements are still needed to reduce operating cost, increase speed, and improve passenger comfort. The long-term program of replacing rolling stock, power distribution facilities, signaling, yard and shop equipment must be continued. Complete renovation or renewal is needed at many subway stations for passenger convenience.

In the years ahead, new construction of rapid transit improvements should be carefully planned to obtain high usage of existing routes – while avoiding overcrowding. In a region with such a rich investment of standard gauge trackage, providing critical, new connections will often allow a much more flexible adjustment of train services to meet changing traffic demands.

Two aspects of city growth have caused particular overload problems on the city's subways – the rapid development of Queens and the concentration of office employment on the east side of mid-Manhattan. Growth in Queens has produced the overloads on the Queens IND subway service. Growth of the East Side office complex as well as abandonment of parallel elevated lines has contributed to the congestion on the Lexington Avenue IRT line. Relief for these two lines is an immediate problem.

In the future, growth on Staten Island may very well bring about a comparable problem requiring improved connections between this part of the city and Manhattan.

There are alternate means for solving each of these problems, and further evaluation will be required to identify the best solution in each case.

Alternate Improvements for Queens

The bottleneck for Queens service occurs at the East River. The existing IND tunnel is severely overcrowded in peak hours. A new tunnel is planned near 63rd Street for both subway and LIRR use. Given the new tunnel, the next planning problem is to decide how best to incorporate new service routes in Queens to take advantage of this additional capacity under the East River.

There are three major options for service connections to the tunnel in Queens and at least three options of routing on the Manhattan side of the tunnel. In Queens one option is to use existing subway trackage to the maximum extent. A second alternative is to build new lines into Queens to increase service area coverage. The third option would use existing railroad trackage of the Long Island Rail Road if compatible with the modernization program planned for this railroad by the MCTA.

Using existing subways involves major readjustment in operations such as resignaling the

four-track Queens IND subway so that three tracks can be used inbound in the morning and three outbound in the evening. Also, other subway services may have to be rerouted or changed to supply the additional trains needed to use the tunnel to reasonable capacity.

Extensive new subway construction would provide service to more parts of Queens, but would be very expensive. Traffic projections are being made to see whether new lines would attract sufficient patronage to fully justify the expenditures.

Usage of existing railroad rights-of-way presents new and complicated operating and institutional problems. With substantially increased service from outer Long Island resulting from the modernization program, it remains to be seen whether any reserve capacity would exist for this purpose.

In Manhattan, the new tunnel lines can connect to either the BMT 7th Avenue or IND 6th Avenue tracks at 57th Street. Alternatively, a possible connection can be made to the New York Central Railroad tracks at Park Avenue, with a delivery point at Grand Central Station. Or, at much greater expense, a new distribution subway under Madison Avenue or some other East Side avenue could be constructed.

These possible solutions are currently being studied under the Queens-Long Island Demonstration Project. These studies will provide the additional detail on cost and performance that is required for the preferred solution.

The capital costs of providing this improved service could vary from $150 million to as much as $520 million depending upon the exact solution chosen.

Increasing East Side Capacity

The problem of providing relief for the Lexington Avenue IRT is very similar to that for the Queens IND line. Again, a new facility is needed to relieve an overcrowded one. In this case, however, there are three possible relief routes.

One solution would involve use of existing trackage on the Park Avenue line of the New York Central Railroad. This requires a most careful examination of the effect on existing train service as well as on potential service expansion stemming from population growth in the suburban rail service area. Further, this would involve solution of institutional as well as operating problems.

An alternate solution would be the Central Park express tunnel. This, however, would be more an extension of the Sixth Avenue IND line and therefore of less value in providing relief to the IRT line.

A wholly new Second Avenue subway would provide the greatest amount of new service, yet would probably be the most expensive solution.

Any of these possibilities has further choices of routing in the Bronx and also possible connections into lower Manhattan.

Each alternative taps a different service area and would attract different kinds of riders and provide varying kinds of relief to the IRT. Transit riding in the area served by these routes is not likely to increase in the future and may have a declining trend. The capital costs of these solutions vary widely from $50 million to as much as $400 million. Given this cost range, the dominant consideration must rest on a careful assessment of the possible benefits.

Staten Island

Finally, the problem of how to provide better access from Staten Island to Manhattan exists. The population on Staten Island is expected to triple in the next 20 years. Average commuting time for Staten Islanders going to Manhattan is well above an hour. Recent technological advances in tunneling raise the possibility of a direct rail connection beneath the Upper Bay of New York Harbor. Capital outlay for this five-mile link, possibly as much as $200 to $250 million, would have to be justified by the benefits. Pending full justification of this possibility, improvements to the Staten Island Rapid Transit and connecting ferry and bus services are certainly warranted.

Other Rapid Transit Improvements

Major capital expenditures are required each year to permit New York City's fleet of 6700 rapid transit cars to operate efficiently over the city's 720 miles of track. Programmed retirement of rolling stock after 35 years of service will result in purchase of at least 4000 new transit cars in the two decades ahead. Including purchases of higher performance cars for new high-speed routes, a $500 million expenditure for equipment is estimated.

Renewal and replacement of signals, power distribution facilities, fixed rail equipment, shops and structures will require continued annual expenditures of $20 to $30 million. Substantial added investment in comfortable, attractive, and efficient station facilities will be demanded by passengers using the rapid transit system in the decades ahead, and $100 to $200 million might be necessary to provide satisfactory access at major subway stations.

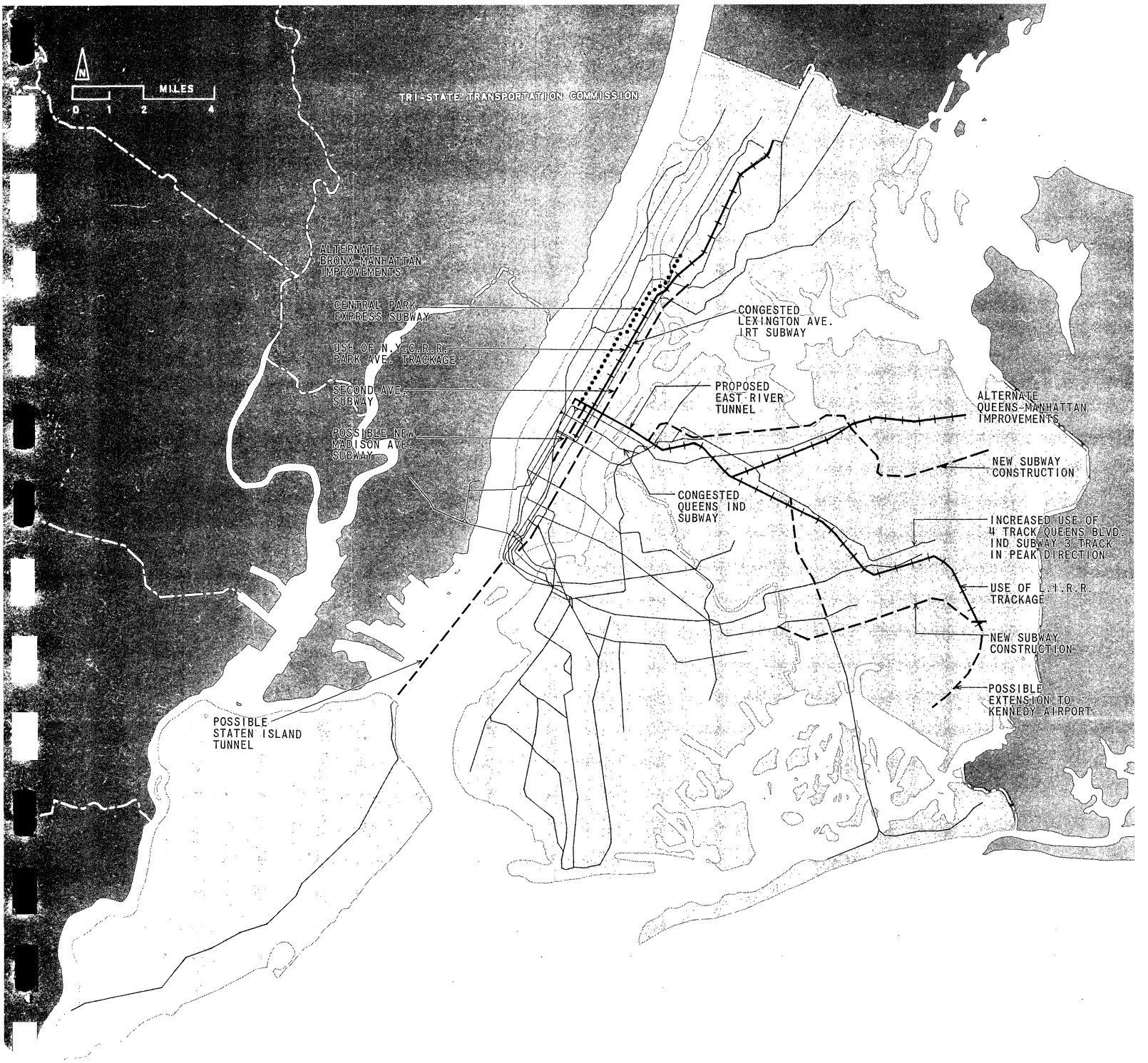


Figure 11. RAPID TRANSIT SYSTEM IMPROVEMENTS. A number of alternate solutions must be considered in detail to reduce overcrowding and to increase coverage. Bronx-Manhattan travel can be improved by constructing a Central Park express subway, a Second Avenue route, or by using part of the New York Central Railroad trackage under Park Avenue. Queens-Manhattan improvements, connecting with the new tunnel to be constructed under the East River, include three major alternates: new subway construction, increased service over existing trackage by operating three of the four Queens Blvd. tracks in the predominant direction of flow; or by using Long Island Railroad trackage. Connections in Manhattan, to the new Queens tunnel, would be coordinated with the Bronx-Manhattan improvements, and also possibly with a new Madison Ave. subway. Extensions to Kennedy Airport, to Staten Island, and along proposed new expressways must also be evaluated as the longer-term improvement plan is developed.

PUBLIC TRANSPORTATION IMPROVEMENT COSTS

Modernization of the suburban railroad system together with needed improvements on the rapid transit system including relief from overcrowding will require an expenditure of from $1,365 to $2,085 billion in the decade ahead. An additional billion dollar investment program will be required for the decade 1975-1985 to maintain and improve the region's transit system.

The various elements of the transit development program are summarized in the table below. The first decade, immediate needs, can be regarded as rapid completion of an overdue modernization program. The second decade, future needs, represents both continued updating of the properties as well as potential new investments.

Not included in the summary of transit improvement costs are the related local highway improvements that will be necessarily provided in the vicinity of rail lines and stations. Rail-highway grade separations and station access and parking largely benefit the motorist. Also not summarized are local, feeder, and express bus equipment and garage renewal.

FINANCING AND OPERATING THE SYSTEM

From $2.3 to 3 billion worth of capital improvements are needed to modernize and improve the region's rail and transit systems over the next two decades.

The means for financing these needed improvements and also for insuring operation of essential transit services are being resolved in each of the three states. Public action is essential because

COST SUMMARY OF PUBLIC TRANSPORTATION IMPROVEMENTS
(In Millions of Dollars)

IMPROVEMENT ELEMENT	ESTIMATED COST		
	Immediate (1966-75)	Future (1975-85)	Total
Suburban Railroad System			
LONG ISLAND SECTOR			
New Cars	$ 90.	-	$ 90.
Electrification	25.	-	25.
Station Platforms and Fare Collection Facilities	18.	-	18.
Other Improvements	27.	$40.	67.
TOTAL	160.	40.	200.
NEW JERSEY - NEW YORK STATE SECTOR			
New Cars	100.	-	100.
Electrification	50.	-	50.
Station Platforms and Fare Collection Facilities	30.	-	30.
Other Improvements	10.	10.	20.
TOTAL	190.	10.	200.
CONNECTICUT - NEW YORK STATE SECTOR			
New Cars	50.	-	50
Electrification	30.	-	30.
Station Platforms and Fare Collection Facilities	25.	-	25.
Other Improvements	10.	5.	15.
TOTAL	115.	5.	120.
MANHATTAN DISTRIBUTION OF SUBURBAN PASSENGERS	50.	250.	300.
TOTAL, SUBURBAN RAILROAD SYSTEM	515.	350.	820.
Rapid Transit System			
Construction of New Routes	200. to 920.	220. -	420. to 1,140.
Car Purchase Program	250.	250.	500.
Station Renovation Program	100.	100.	200.
Renewal of Plant, Power Supply, etc	300.	200.	500.
TOTAL, RAPID TRANSIT SYSTEM	850. to 1,570.	770.	1,620. to 2,340.
TOTAL IMPROVEMENT PROGRAM COST	$1,365. to 2,085.	$1,075.	$2,440. to 3,160.

of the financial inability of private enterprise to maintain its traditional role of supplying mass transit services, particularly suburban rail service.

Public participation in the financing of local transit improvements is not new to the region. More than 60 years of municipal investment by the City of New York has produced the largest and most complex subway system in the world. For a quarter of a century all subway and elevated lines also have been operated by the City of New York. More recently the bulk of the local bus routes within New York City have been transferred to public ownership.

Within the past decade the region's privately owned suburban railroad lines have ceased to be self-sustaining operations. Without the significant programs of tax relief, capital improvement and direct operating subsidy instituted by the states and local communities, these essential rail services probably would not be in operation today.

Funds for Improvements

Relatively few of the proposed improvements to the region's rapid-transit system and suburban rail network can be financed from passenger revenue. The needed improvements must come from public sources – local, state, and federal. The commitment of the three states and New York City to provide funds for transit improvements has been made.

In Connecticut, the Connecticut Transportation Authority was created in 1963 with financial resources to help provide for stabilization and modernization of the New Haven Railroad passenger services.

In New York State, the Metropolitan Commuter Transportation Authority, created at the 1965 session of the Legislature, was authorized to purchase the Long Island Rail Road and embark upon a $200 million modernization program for this carrier. In addition, the MCTA is authorized to work out a long term solution for the preservation and improvement of the New Haven Railroad's passenger services west of New Haven, in cooperation with the Connecticut Transportation Authority.

New York City has been providing transit improvement funds from its capital budget for many years which has permitted an extensive rehabilitation of the plant and rolling stock of the subway system. The current annual contribution of the City of New York to cover debt service resulting from acquisition and improvement of the subway system is over $100 million.

New Jersey, for the past several years, through its state highway department, has channeled funds into rail connections and improvements.

The Port of New York Authority, the joint public agency of the states of New Jersey and New York, has provided the resources necessary to modernize the former Hudson and Manhattan Railroad transit service.

Transit improvements must, of course, compete with other essential public services for limited state and local resources. In recognition of this, the federal government has now acted in regard to the needs of the nation's urban regions for improved public transportation services. The Federal Mass Transportation Act of 1964 provides federal grants of up to two-thirds of net project cost for transit improvement programs, but the federal act limits the amount of aid available to any individual state.

Nonetheless, federal assistance has already been made available to New Jersey for Jersey Central Railroad improvements, to the Port of New York Authority for related PATH modernization, and to the New York City Transit Authority for needed new subway cars. Federal aid, under this program, is also being sought by New York State and Connecticut for improvements in the rolling stock of the New Haven Railroad, and by New Jersey for Pennsylvania Railroad commuter cars.

Operating the Rail System

The various elements of the region's transit system exist as separate, unique operations. Each suburban railroad, the New York City Transit Authority, the Port Authority Trans-Hudson Corporation, and the many private bus lines manage and operate their individual services. Unified region-wide planning, however, is a responsibility of the Tri-State Transportation Commission.

More unified operation and management of the region's transit system, though ultimately desirable, must of necessity be achieved in increments. Where rail operations involve joint use of trackage and terminals, unified management would appear to allow more efficient utilization of equipment and personnel, while avoiding transfer payments and cost allocations. Yet voluntary coordination has produced many joint agreements in the past and is now in evidence where the Transit Authority is exploring, with the MCTA, the feasibility of joint subway track use to achieve a downtown destination for Long Island Rail Road trains. In addition the MCTA and the Transit Authority are exploring the joint use for subway and LIRR services of the projected East

River transit tunnel designed to provide access to the east side of midtown Manhattan. Local bus networks can better serve transit riders where coordination of routes, transfer privileges, uniform intervals, etc., are provided.

Closely related to the problem of unification is the degree to which transit revenues sustain operating cost. None of the region's rail operations is completely self-supporting. Subsidy comes from a variety of sources.

The New York City Transit Authority has in recent years slipped from surplus to deficit operating results. The absorption by the City of New York of various operating costs has preserved the uniform 15-cent fare at an annual cost to the general fund now approaching $40 million. The City of New York must decide whether the utility of subsidized transit service outweighs other demands for public service placed upon the municipal government. The city must further decide whether a uniform fare throughout the city yields benefits greater than a graduated or zonal fare based on trip length.

Subsidy to suburban railroad passenger operations has occurred from the railroads' owners and creditors, and from public bodies. Real property tax relief, amounting to an annual saving of over $20 million in the metropolitan area of New York State, and complete tax relief for the New Haven Railroad in Connecticut, has required the states and local governments to seek substitute sources of revenue. In New York, the state government reimburses the local governments for one half of the tax revenues lost to the local governments through railroad real property tax relief.

The New York State Commuter Car Program has provided, in effect, an annual financial aid to the two participating railroads (the New York Central and the Long Island Rail Road) by assuring a low interest rate on new cars purchased by the Port Authority and leased to the railroads.

In Connecticut, the state makes an annual payment to the New Haven Railroad of $500,000 which is designed to offset charges to the railroad for its costs of highway grade separations.

In New York State, counties and local governments are required to provide funds for station maintenance and operation for MCTA-supported rail services and are authorized to offer their assistance where there is private rail operation. When the full program is put into effect several million dollars annually will be channeled to the state's suburban rail operations through station maintenance and operation assistance.

In New Jersey, a $7.5 million annual subsidy program, based on maintenance of operation agreements, has helped preserve the bulk of New Jersey's suburban service. Much of New Jersey's rail subsidy is returned in the form of property taxes on rail facilities. Partial relief from this taxation, to be effective in 1966, will benefit New Jersey railroads.

The losses resulting from operation of the Hudson and Manhattan Railroad rapid transit system are borne by the system's new owner, the Port of New York Authority. A current subsidy of over $6 million annually is involved.

The Staten Island Rapid Transit Company receives $1 million annual subsidy from New York City – and the city's nickel fare Staten Island Ferry operates at an annual loss of $7 to $10 million.

Stable, long-term financial and operating arrangements for the region's suburban rail transit services are being made a reality in New York and Connecticut through the MCTA and the Connecticut Transportation Authority. Similar arrangements must be achieved in New Jersey to retain and improve essential rail services. The establishment of secure financial support for mass transportation rail service by each state and its localities in the region represents the first state of unification. The further joining of systems can proceed as interconnection of routes, and joint services and fares, become desirable.

THE HIGHWAY IMPROVEMENT PROGRAM

The highway system in the Tri-State Region today serves a major portion of the travel needs of 18 million persons in the 8000 square-mile area. Efficient transportation in the future is necessary if the region's productivity and attraction as a place to live, work and do business are to be maintained and enhanced. New and improved highways are required to meet these evergrowing highway needs.

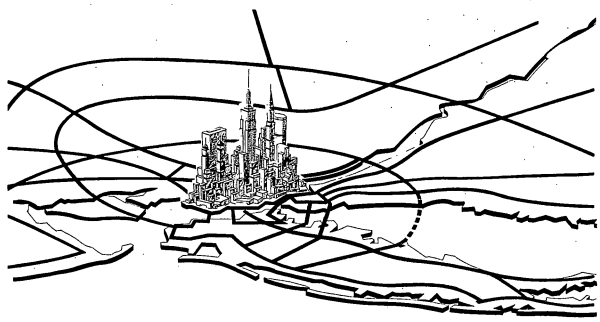
At the same time, mass transit usage to Manhattan and Newark should be encouraged to preserve and promote the densely developed central business districts: the heart of the region. Rail transit must be maintained, and unduly competitive highway facilities must be avoided. Thus, the highway and rail systems must be designed to provide complementary services.

Demands for highway improvements in the Tri-State Region can be expected to grow in the future, despite needed improvements totalling as much as $2.5 billion for transit improvements as previously outlined. Due to rising income and continued outward spread of land development, growth of autos owned will outpace growth of population. Consequently, the present rapid increase in vehicular traffic can be expected to continue through the next two decades.

The current high rate of highway construction must be maintained to keep pace with this growth and to improve the ability to travel within the region. This means that an average investment of over $300 million annually for roadway improvements of regional importance must be maintained during the coming years.

Most of the recent additions to our regional highway network have been controlled access expressways and major river crossings. The controlled access road, pioneered nationally in our Tri-State Region 45 years ago, generally represents the most economical strategy for productive highway investment. While expressways are expensive to build, they produce the greatest improvement per dollar spent. An expressway lane can accommodate three times the traffic flow possible on an arterial street, at twice the speed. Moreover, well designed, controlled access highways will have one-third as many accidents per vehicle-mile as conventional urban streets. Finally, the addition of expressways draws off traffic from adjacent surface arterial streets, better allowing them to serve local business and nearby residents.

A network of expressways supplementing the existing pattern of arterial streets will provide the most effective roadway plan to serve the diverse auto and truck movements of the region. The most efficient placement of individual routes making up the region's expressway system will occur when spacing between routes is uniform and when all facilities are crowded in peak hours. When these conditions are met, the total costs of traveling, including time, accident and operating costs, plus payment for the land and construction costs, are lowest. In metropolitan areas



Highways should bypass the core to join suburbs

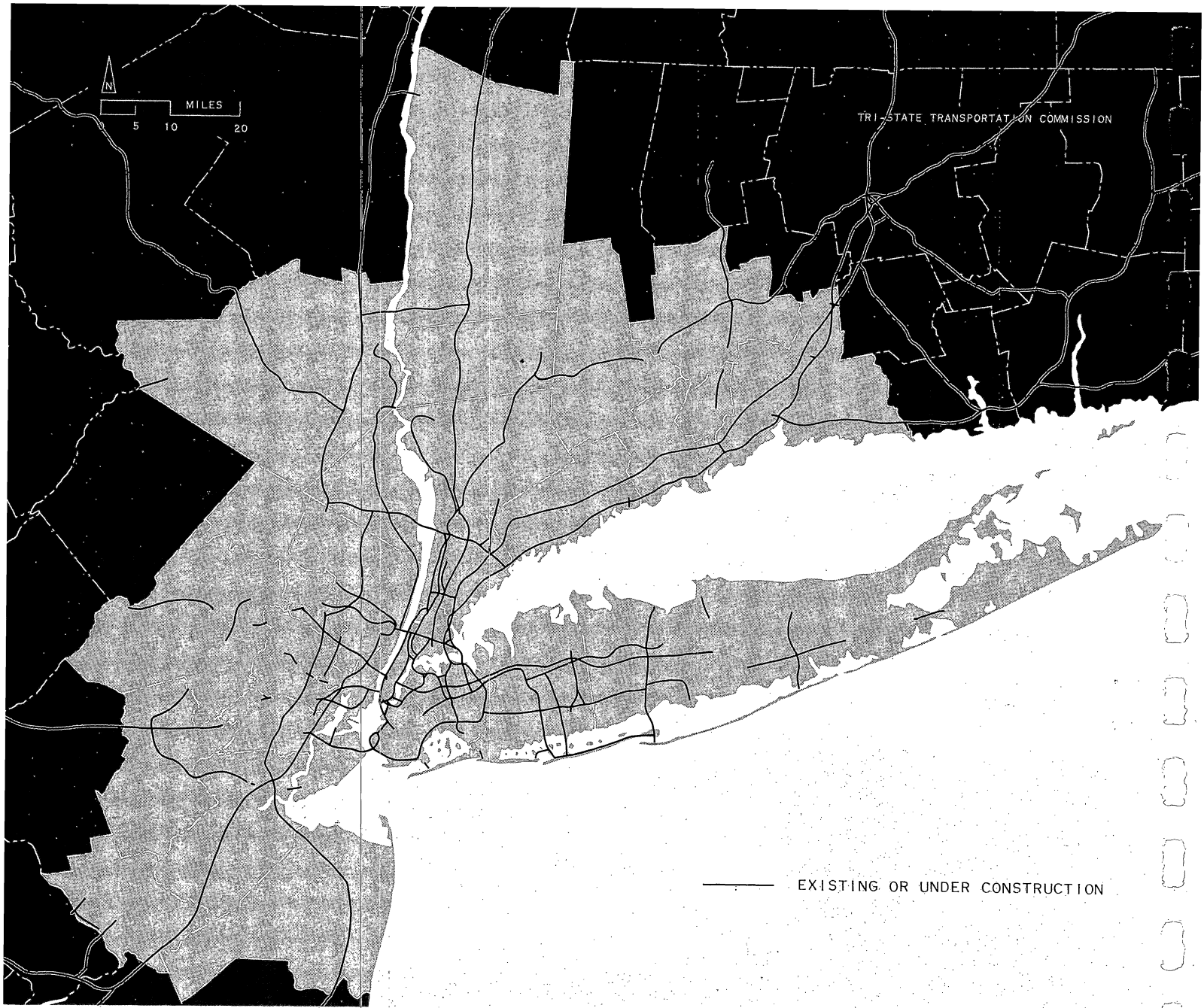


Figure 12. EXISTING LIMITED ACCESS HIGHWAYS. A regional highway network is growing, but unjoined pieces must be interconnected and new routes added to serve the expanding suburbs.

this "least cost" optimum condition tends to occur when expressways are spread from four to six miles apart in suburban areas and about three to four miles apart in heavily urbanized areas.

Figure 12 shows the present network of expressways in the Tri-State Region open to traffic or under construction as of January 1966. Figure 13 shows an index of existing service – the miles of existing controlled access routes compared to automobiles registered for each of the region's counties and planning regions. By this measure, portions of New Jersey and New York City are considerably less well served by expressways than other parts of the region.

Converting a disconnected group of existing expressway links into an inter-related system is a difficult design problem. Many alternative patterns might be considered. However, establishment of a few criteria for system design leads to a selection of a preferred highway plan.

Probably the most important of these network planning criteria is continuity. Expressway segments obviously are more efficient when connected to form long, continuous routes. At the present time, some of the region's tunnels, major bridges, and many segments of express roadway connect only to congested arterial streets. Future planning should aim at a fully interconnected system, tying together the present truncated and isolated pieces.

Another system planning criterion is balanced spacing of routes. Again, expressways perform most efficiently when regularly spaced. Duplication and overlapping of routes, as has occurred in some parts of Westchester and Nassau counties, concentrate high quality facilities at a few locations leaving other areas unserved. Similarly, the construction of too much highway capacity in one particular corridor results in poor service for those people who must travel long distances out-of-direction to use that route, thus adding additional vehicle miles of traffic to already congested surface streets. Future highways should tap areas unserved at present and should effectively be aligned to relieve the surface arterial streets of intense traffic congestion. Routes should be more closely spaced in areas of high travel demands and more widely spaced in sparser suburban areas where traffic densities are much lower.

A further criterion is avoidance of directional bias in expressway routing patterns. To serve the region's diffuse auto travel patterns, the network should develop high-quality access uniformly in all directions. The present concentration of radial routes leading to Manhattan

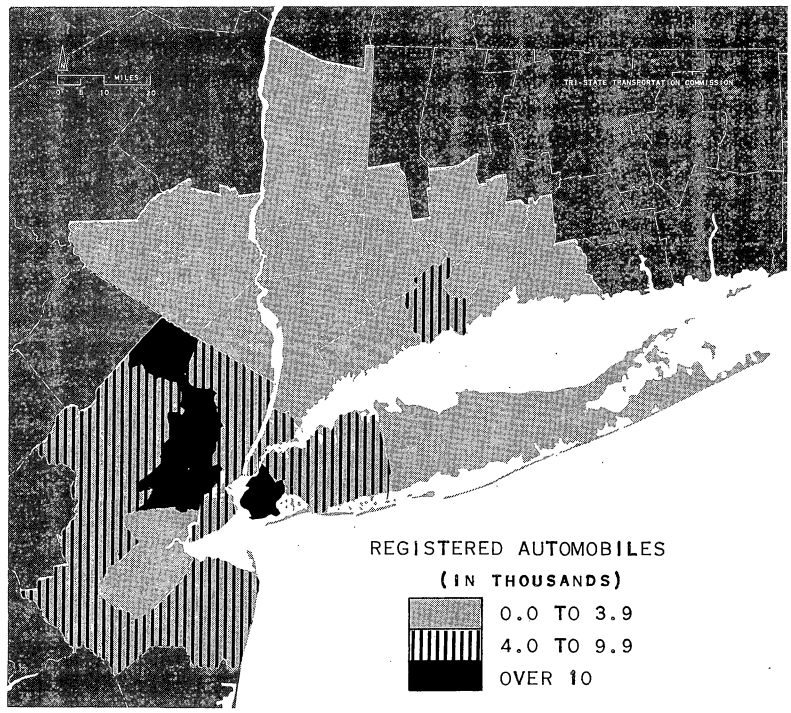


Figure 13. AUTOS PER HIGHWAY MILE.
A coarse index of highway service is a comparison of automobile ownership to miles of limited access highway in operation. Several counties in the region are significantly less well served by limited access routes than others.

should be modified in the future in order to serve better the entire region. In this way, new highway routes which compete directly with the rail transit system will be kept to a minimum, so that serviceability of the regional transportation network of combined rail and highway routes will be strengthened.

The road network must be planned to these system standards, but it must also be designed to provide the improved access that will be necessary for industrial expansion – improved trade and increasing ease of exchange needed for an expanding urban region. Good highways can unlock areas like Long Island or Staten Island, and thus open up new opportunities for work and new home sites and industrial sites. A good highway system will increase the work and living choices that represent a major goal in our society.

PRIORITIES

A fully matured highway plan will take years to complete. This raises the important questions of what should be done first and what must be put off.

The Interstate Highway System, supported

90 percent by federal assistance, is required to be completed by 1972, and the state highway departments are committed to this goal. These highways provide vital connections to other regions of the country while at the same time they supply important links within the Tri-State Region.

Needs are greatest in the fully developed, central part of the region surrounding Manhattan. Here are the most pressing congestion problems because of existing high-density development. These areas have suffered from severe congestion which is worsening as more residents acquire automobiles. Here the traffic demands are fully developed and expressways will be heavily used immediately. While capital costs and the social costs of disruption run high, the benefits are generally highest in these areas. Special emphasis on these improvements, therefore, continues to be warranted for the immediate future.

Routes for future highways in the newly developing parts of the region should be planned so as to promote more orderly development and to avoid higher right-of-way costs and dislocations in the future. While needs in these places are still growing and are not all immediate, they should be fully anticipated. Advance right-of-way acquisition, together with advance planning, should be used to fix these future highway routes, preserve right-of-way and assist local planning. Earlier completion schedules may be justified in the outer perimeter for certain routes which offer additional recreation advantages.

A REGIONAL HIGHWAY PLAN

The interim regional highway plan shown in Figure 14 represents a design based on consideration of traffic demands and on the aforementioned criteria. Route locations are meant to be general and approximate. The routes given priority as shown in the plan allow the expressway network to shift toward a balanced regional network, at the same time insuring that construction for immediate needs will fit with future additions to the regional network.

The priority segments are aimed for completion by approximately 1975. Particular attention is given to finishing routes already started, as well as major portions of the Interstate System. Additional possible future routes constitute a second stage aimed at 1985. These potential future additions must be considered if the more immediate projects are to be planned and built as important parts of a complete regional system.

The routes laid out do not attempt to consider specific location, but rather to identify channels of needed new capacity. Specific locations must be determined from much more detailed site studies. Also, as the long-range studies now underway mature, the facts may indicate additional needs over those proposed in this interim plan. Transportation planning is a process of constantly measuring needs and reviewing policies as newer and better information becomes available. Thus, these proposals will be under continuing test and review as time goes on.

As shown by the map, the recommended program calls for adding 660 miles of new expressways between now and 1975, in addition to the 80 miles now under construction. These new routes include 85 miles in Connecticut, 270 miles in New Jersey, 235 miles in New York State (exclusive of New York City), and 70 miles in New York City.

The more detailed discussion of this interim program with comments on individual segments of the system is presented in the following sections.

RECOMMENDATIONS-CONNECTICUT

The Connecticut portion of the Tri-State Region is ahead in its highway program. The immediate needs for east-west facilities have been largely satisfied by the Connecticut Turnpike and Merritt Parkway through the Long Island Sound communities, and by the nearly complete Interstate 84 through the inland area.

A critical assumption is that the New Haven Railroad will continue its operation. Substantial curtailment of commuter rail service in the Southwestern Fairfield area would undoubtedly add a considerable volume to Connecticut Turnpike traffic which is already rapidly approaching capacity levels in peak periods. Interstate 91, recently completed, provides a much needed expressway between New Haven and Hartford. Figure 15 shows the highway network proposed for Connecticut.

The most urgent needs in Connecticut are for better north-south routes to handle the growing suburban movements perpendicular to the New York - Boston corridor. These are needed in such cities as Stamford, Norwalk, Bridgeport, and New Haven. An improved east-west route is needed in Meriden, perpendicular to the main New Haven-to-Hartford corridor. First attention should be given to the portions of these routes which lie within the cities to achieve maximum relief from existing congestion. Care should be used to assure that new links will add to the interconnectivity of the regional system.

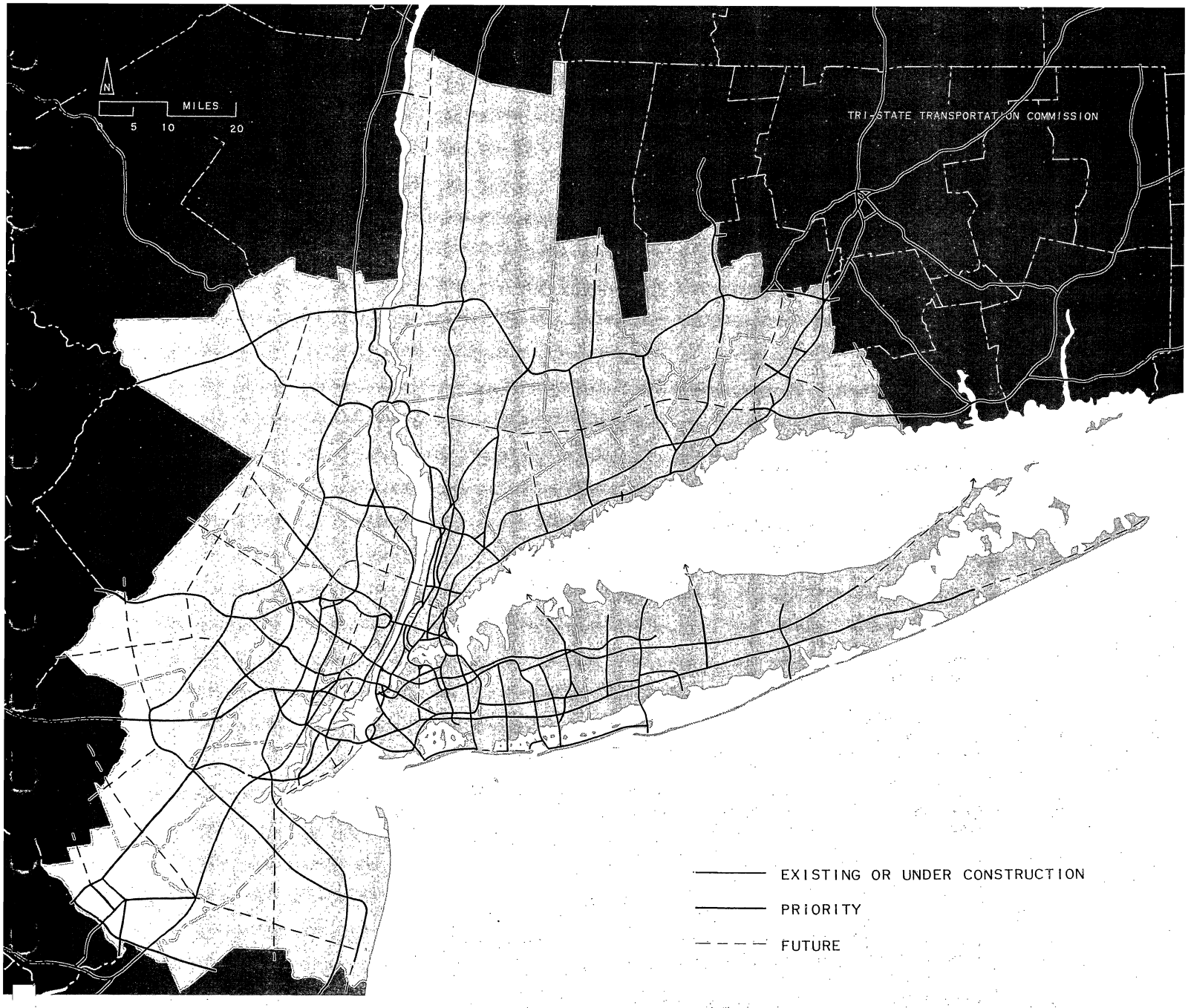


Figure 14. INTERIM REGIONAL HIGHWAY PROPOSALS. Lines in this map refer to channels of needed capacity, not specific locations. The priority segments, 660 miles of new expressways aimed for completion by 1975, allow the expressway network to acquire better regional balance. Particular attention is given to serving congested areas and completing major portions of the Interstate System. Future routes, aimed for completion by 1985, must be considered now if the priority projects are to be built as parts of a complete regional system.

RECOMMENDED ROUTES-CONNECTICUT

Map Place Number	Route Number or Name	Location	Needs and Benefits
		Priority	
1.	I-84	U.S. 202 in Newtown to Housatonic River	Upgrading two-lane highway to expressway standards. Completes inland route across state.
2.	Conn. 8 Expressway	I-95 Bridgeport to Conn. 110 in Shelton	North-south route through Naugatuck Valley. Provides a route perpendicular to New York-Boston corridor. Serves suburbs north of Bridgeport. Completes expressway to Waterbury and north. Complements downtown urban renewal.
3.	Conn. 34 Expressway	I-95 in New Haven to West Haven	East-west route through New Haven urban area. Extends existing stub-end route westward. Serves westerly suburbs. Ties in with redevelopment program.
4.	U.S. 7 Expressway	I-95 in Norwalk to I-84 Danbury; and Danbury to Conn. 25 in New Milford	North-south route through the Southwestern and Housatonic Valley planning regions. Distributes traffic to urban area for corridor radials. Relieves congested arterials. Serves fast-growing suburbs.
5.	Conn. 66 Expressway	I-84 in Cheshire to I-91 in Meriden.	East-west route through Meriden. Peripheral route between interstates. Distributes traffic to urban area. Extends stub-end expressway.
6.	I-91 Connectors	East Rock in New Haven Mount Carmel in North Haven Wharton Brook in Wallingford	East-west connectors to Interstate 91. Connects major traffic generators to principal New Haven-Hartford routes. Serves regional industrial area.
7.	Conn. 25 Expressway	Conn. 8 in Bridgeport to I-84 in Newtown	North-south route through the Greater Bridgeport Planning Region. Serves fast-growing suburbs north of Bridgeport. Connects new industrial areas to interstate routes.
8.	Conn. 137 Expressway	I-95 in Stamford to Merritt Parkway	North-south route through Stamford. Relieves congested arterials. Distributes traffic for corridor radials. Serves to tie suburbs to redeveloped city center. Fills major gap in regional grid.
9.	Conn. 72 Expressway	Conn. 8 in Thomaston to Bristol	East-west route north of Waterbury. Completes expressway between Naugatuck Valley and New Britain. Relieves existing arterials.
		Future	
10.	Conn. 10 Expressway	I-91 and I-95 in New Haven to I-84 in Cheshire	North-south route north of New Haven. Serves fast-growing suburbs north of New Haven. Provides route to western part of Hartford metropolitan area.
11.	Conn. 110 Expressway	Bear Mt. Bridge (N.Y.) to I-95 in New Haven	East-west route through the former Fairfield County. Fills 18-mile gap in regional highway grid. Connects rapidly developing suburbs. Extends stub-end expressway.
12.	Conn. 22 Expressway	I-91 in North Haven to I-95 in Branford	Easterly bypass for New Haven. Connects eastern suburbs with valley industry. Provides service for unserved area. With Conn. 15, provides bypass for New Haven.
13.	Conn. 137 Expressway	Conn. 15 in Stamford to I-87 (N.Y.)	North-south route north of Stamford. Serves area of potential development. Fills gap in regional highway grid.
14.	Conn. 8 Expressway	Beacon Falls	North-south route in Naugatuck Valley. Relocation of existing divided arterial. Eliminates last uncontrolled access section of expressway route.
15.	Conn. 79 Expressway	I-95 in Madison to Conn. 66 in Middlefield	North-south route east of New Haven. Serves major recreation areas. Fills large gap in regional grid.
16.	U.S. 7 Expressway	Conn. 25 in New Milford through northwest region	North-south route for scenic rural and recreational area. Fills need for facility between Taconic Pkwy. and Conn. 8, a gap of 35 miles. Replaces existing narrow highway.

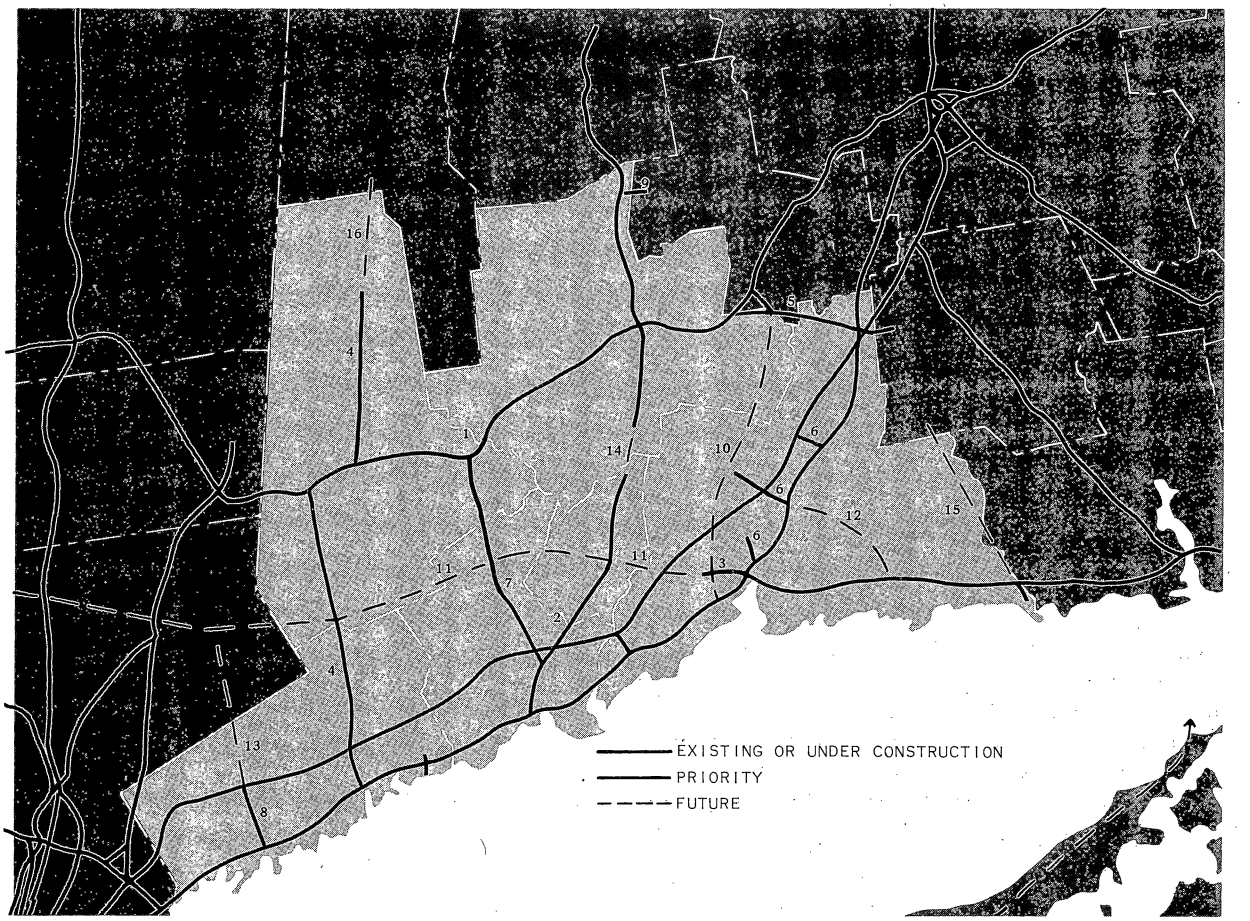


Figure 15. INTERIM REGIONAL HIGHWAY PROPOSALS-CONNECTICUT

About 85 miles of expressways are recommended additions to the highway system within the Connecticut portion of the region by 1975 to provide a more complete network and to improve the level of traffic service. The estimated cost of these priority projects is $350 million. The entire Interstate System in Connecticut's part of the Tri-State Region will be open to traffic by the end of 1966.

In the future, additional routes will be required to provide more complete area traffic service to the growing region. This longer view anticipates such routes as an east-west expressway to the north of the Merritt Parkway and a circumferential route around the east side of New Haven. These future routes would add 60 miles to the Connecticut network, at an estimated cost of $180 million.

TOTAL ADDITIONAL COSTS: CONNECTICUT

Priority	**$350 million**
Future	**$180 million**
Total	**$530 million**

RECOMMENDATIONS-NEW JERSEY

In New Jersey a substantial lag has occurred in completion of the Interstate System and other expressways in the state's master plan. New Jersey has been hard pressed to provide the state funds to match available federal monies. This has resulted in overloads on many existing arterial highways, with particularly bothersome spots in Passaic, Essex and Union counties, as well as in the Trenton area. High density areas such as Jersey City and Newark are inadequately served by existing highways.

The old growth patterns in northern New Jersey reflecting the adjustment to natural barriers of mountains and rivers complicate problems of new highway location. Historical development has favored settlement east of the Watchung Mountains, and solid development is found along the foot of this range from Paterson to Plainfield. This band of settlement as well as the Watchung Mountains behind it present a difficult obstacle for building new highways. Yet new crossings are required to provide im-

proved access in northern New Jersey. Additional problems arise in the marshy meadowlands and the rivers emptying into Newark Bay.

Fast-growing suburbs have caused the problem of serving a fan-shaped area of increasing size. The new expressways in New Jersey must be designed with this dispersion in mind, and must provide an interconnected network to serve these spread locations of people and jobs.

The most urgent highway needs in New Jersey are for east-west facilities in the Union-Essex-Passaic area. This will be largely relieved by completion of the planned federal interstate highways. A north-south route through the City of Newark should also receive high priority. Additional routes perpendicular to the radial corridors are needed in such older areas as Passaic, Paterson and Trenton.

There is also an immediate need to improve routes leading to Staten Island and the Verrazano-Narrows Bridge to improve access to the southerly bypass around Manhattan. A direct route is needed between Trenton and the western portion of the metropolitan area. Also of high priority is completion of the interstate outer belt route.

A key link is a north-south route between the Holland Tunnel and the George Washington Bridge. Other priority projects include routes connecting urban centers in Morris and Union counties; expressways to serve the Monmouth shore areas; a north-south route through the area between the Garden State Parkway and the interstate outer belt as well as routes serving Trenton.

Again, system interconnectivity is considered of the utmost importance. New additions would link together existing elements of the network to provide the maximum utilization of the region's investment in highways. Stub-ends and gaps would be avoided.

Figure 16 shows the recommended highway plan for New Jersey. About 270 miles of new controlled access highways are recommended for the state by 1975. These priority projects are estimated to cost $1.25 billion to complete and will require a substantial increase in the rate of new highway construction in New Jersey.

After 1975 other expressways will be needed to serve the outer portions of Passaic, Morris, Somerset, Middlesex and Monmouth as well as new routes through Bergen County and a new Hudson River bridge. Another route would serve the Meadowlands development. These future routes total 210 miles at an estimated cost of $650 million.

TOTAL ADDITIONAL COSTS NORTHERN NEW JERSEY

Priority	**$1,250 million**
Future	**650 million**
Total	**$1,900 million**

Since automobiles continue to increase and existing roads are already congested, the costs of these highway improvements will be paid for in annual losses of time, increased operating costs and additional accidents, if not in capital improvements.

RECOMMENDED ROUTES-NEW JERSEY

Map Place Number	Route Number or Name	Location	Needs and Benefits
		Priority	
1.	I-80	U.S. 46 in Denville to Main St. in Paterson	East-west route through Morris and Passaic counties. Fills gap between completed sections. Relieves congested U.S. 46. Strengthens northern bypass to George Washington Bridge.
2.	I-78	Berkeley Heights to I-95 and U.S. 1 in Newark	East-west route through Union County. Connects completed sections of route. Relieves U.S. 22. Connects Newark and western suburbs.
3.	I-280	I-80 in Parsippany to I-95 in Kearny	East-west route through Essex County. Serves suburbs northwest of Newark. Fills large gap in regional highway grid. Relieves congested arterials.
4.	N.J. 21 Expressway	I-78 and U.S. 1 in Newark to I-80 in East Paterson	North-south route through Newark and Passaic. Completes existing expressway. Distributes downtown Newark traffic for radial routes. Relieves congested McCarter Highway. Alternate route to Garden State Parkway for truck traffic.

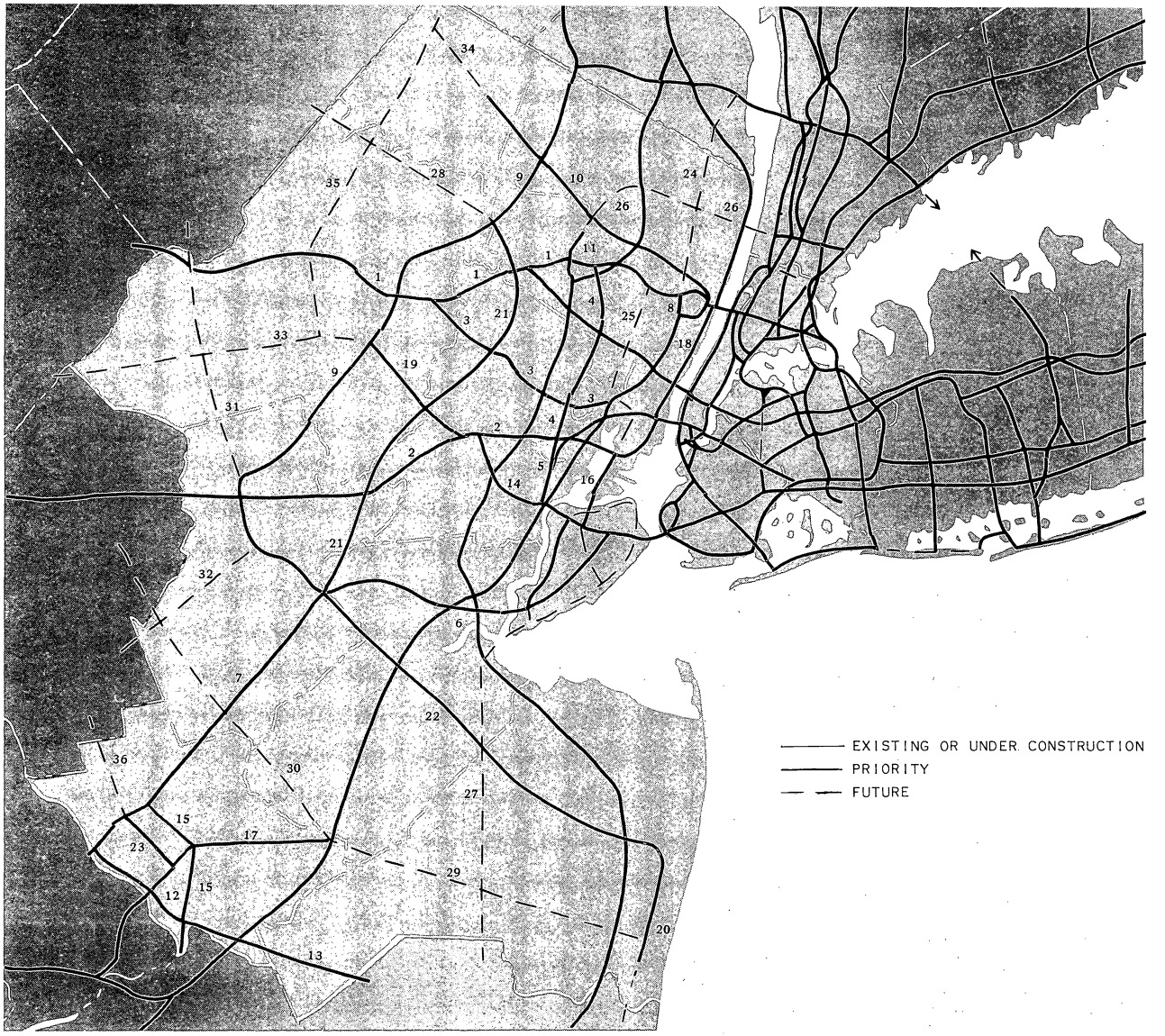


Figure 16. INTERIM REGIONAL HIGHWAY PROPOSALS-NEW JERSEY

Map Place Number	Route Number or Name	Location	Needs and Benefits
5.	U.S. 1 Relocation	I-278 and I-95 at Goethals Bridge to I-78 and N.J. 21 in Newark	North-south route through Elizabeth. Provides improved connection to Narrows Bridge bypass route for Newark and eastern Essex County. Improves access to N.J. Turnpike for Newark. Relieves congested arterial streets.
6.	N.J. 440 Expressway (South)	I-95 and U.S. 1 near Metuchen to Outerbridge Crossing in Perth Amboy	East-west approach to Staten Island. Also serves Perth Amboy traffic to and from the west. Makes Narrows Bridge route more attractive for New Jersey-Long Island traffic. Provides continuity with New York routes.
7.	I-95	Delaware River at Ewing Township to I-287 in Middlesex County	North-south route through Mercer and Somerset counties. Fills large gap in regional highway grid. Relieves congested U.S. 1. Better utilizes completed bridge over Delaware River. Serves fast-growing suburban area.
8.	I-95	U.S. 46 in Ridgefield Park to I-80 in Teaneck	Completes controlled access route to George Washington Bridge and provides connection to Interstate 80. Relieves congestion on existing parallel routes.
9.	I-287	Bernardsville to N.J. 10 in Hanover; and U.S. 202 in Montville to N.J. 17 in Mahwah	Completes outer belt route around western portion of the region. Ties together completed parts of belt route. Provides route between suburban areas, including important new industrial areas.

RECOMMENDED ROUTES-NEW JERSEY continued

Map Place Number	Route Number or Name	Location	Needs and Benefits
		Priority	
10.	N.J. 208 Expressway	N.J. 4 in Fairlawn to Wanaque	East-west route serving western Bergen County. Expands existing congested route. Serves rapidly developing suburbs, plus recreational traffic.
11.	N.J. 20 Expressway	Garden State Parkway in Clifton to existing N.J. 20 in Paterson	North-south route through Paterson. Connects major radial routes to Paterson area. Peripheral route around Paterson business district, aiding renewal efforts.
12.	N.J. 29 Expressway	West of U.S. 1 in Trenton to I-295 in Hamilton	North-south route along Delaware River. Completes existing expressway. Provides relief to congested U.S. 206. Provides direct route between I-295 and downtown Trenton.
13.	N.J. 37 Expressway	I-295 and N.J. 29 in Hamilton to the Central Jersey Expressway in Ocean County.	East-west route between Trenton and Jersey Shore. Serves large area lacking expressway access. Serves recreational traffic.
14.	I-278	I-78 in Union County to Goethals Bridge at N.Y. state line	East-west route through Union County. Provides route to Narrows Bridge from suburbs west of Newark. Relieves congested N.J. 82. Important link in southerly bypass of Newark and Manhattan.
15.	I-295	N.J. 38 in Burlington County to I-95 in Ewing Township-Hopewell area	North-south route in Mercer County. Provides bypass of Trenton to the east. Fills large gap in area grid lacking freeway access. Serves fast-growing suburbs.
16.	N.J. 440 Expressway	Bayonne Bridge to I-78 in Jersey City	Connects I-78 to Bayonne Bridge. Provides direct route to western Staten Island from Manhattan. Improves access to Narrows Bridge for Hudson County.
17.	Trenton - Hightstown Spur	U.S. 1 in Trenton to N.J. Turnpike in Hightstown	East-west route through Mercer County. Relieves existing congested N.J. 33. Provides route for recreational traffic. Serves suburban areas east of Trenton.
18.	Hudson River Expressway	I-78 in Jersey City to I-95 and Palisades Parkway in Fort Lee	North-south route along Hudson River waterfront. Serves heavy industry and waterfront, as well as high-density residential areas. Would fill gap to form continuous controlled access route along Hudson. Provides an alternate to the West Side Highway, allowing distribution of traffic to river crossings. Relieves local arterials of congestion, especially of heavy trucks.
19.	N.J. 24 Expressway	I-78 in Springfield to I-287 near Morristown	East-west route through eastern Morris County. Fills large gap in regional highway grid. Relieves congested existing route. Provides needed connection to Morristown and fast-growing suburbs.
20.	N.J. 35 Expressway	N.J. 70 in Brielle to N.J. 36 in Eatontown	North-south route along urban Monmouth shore. Serves densely developed shore area. Provides alternate to Garden State Parkway for trucks, and overloads of recreation traffic.
21.	N.J. 23 Expressway	I-95 in Piscataway to I-287 in Wayne	North-south route through Middlesex, Somerset, Union, Essex and Passaic counties. Fills major gap in highway grid with a route through area between Garden State Parkway and I-287. Serves traffic perpendicular to radial routes. Ties together fast-growing suburbs. Provides alternate to Garden State Parkway for trucks. Relieves congested arterials.
22.	N.J. 18 Expressway	I-95 and I-287 in Piscataway to N.J. 35 in Eatontown	East-west route through Middlesex and Monmouth counties. Most urgent is new bridge across Raritan River to relieve existing congestion. Easterly extension to the shore area fills gap in grid and provides alternate to Garden State Parkway for trucks and peak recreational traffic. Serves fast-growing suburban area, ties to New Brunswick to strengthen renewal efforts.

Map Place Number	Route Number or Name	Location	Needs and Benefits
23.	N.J. 69 Expressway	I-95 in Hopewell Township to U.S. 1 in Trenton	North-south route through Trenton. Relieves existing arterial. Provides traffic service perpendicular to radial corridor routes.
		Future	
24.	Bergen North-South Expressway	I-95 and I-80 in Ridgefield Park to I-287 (N.Y. State Thruway) in Nyack	Northern extension of I-95 to Tappan Zee Bridge. Fills major gap in regional highway grid. Serves large fast-growing suburban area. Relieves congested local arterials. Provides a route for truck traffic through Bergen (parallel facilities are both parkways).
25.	N.J. 17 Expressway	Vicinity of I-95 to I-280 in Kearny to I-80 in South Hackensack	North-south route through lower Bergen County. Serves heavy industrial area. Adjoining parallel routes (N.J. Turnpike and N.J. 21 Expressway) do not provide adequate service. Relieves congested arterials. Spurs potential development of Hackensack Meadows. Possible connection to Holland Tunnel.
26.	Bergen East-West Expressway	N.J. 20 Expressway in Paterson to Yonkers (N.Y.)	East-west route through Northern Bergen County, plus new Hudson River bridge. Fills gap of 13 miles between expressways in network. Serves rapid growth suburban area. Relieves congested local arterials. With new Hudson River bridge, provides close-in bypass north of New York City.
27.	Central Jersey Expressway	Garden State Parkway in Toms River to Shore Front Drive in Staten Island	North-south route through Central New Jersey. Fills gap between New Jersey Turnpike and Garden State Parkway. New bridge across Raritan Bay relieves bottleneck in route to east Middlesex and Monmouth counties. Utilizes available capacity on Staten Island and also the Narrows Bridge. Serves rapid growth area.
28.	N.J. 23 Expressway	I-287 in Wayne to I-84 in Port Jervis, N.Y.	East-west route through Passaic and Sussex counties. Serves large area of potential development, also recreational areas. Fills large gap in regional highway grid.
29.	N.J. 33 Expressway	New Jersey Turnpike in Hightstown to N.J. 35 Expressway in Wall Township	East-west route through Monmouth County. Completes expressway between Trenton and New Jersey shore resorts. Serves fast-growing suburban area. Relieves existing congested route.
30.	N.J. 92 Expressway	New Jersey Turnpike in Hightstown through Hunterdon County	North-south route through Middlesex and Somerset counties. Serves fast-growing suburbs. Fills major gap in highway grid.
31.	U.S. 206 Expressway	I-287 in Bedminster through Sussex County	North-south route through Somerset and Morris counties. Strengthens westerly bypass for traffic approaching the region from the west. Serves major recreational area.
32.	U.S. 202 Expressway	I-287 in Somerville through Hunterdon County	East-west route through Somerset County. Fills needs of area between I-78 and I-95. Connects with proposed Piedmont Expressway in Pennsylvania.
33.	N.J. 24 Expressway	I-287 near Morristown to I-78 in Phillipsburg	East-west route through Morris and Warren counties. Fills gap in service for area between I-80 and I-78. Serves fast-growing suburbs.
34.	N.J. 208 Expressway	Wanaque to N.Y. 17 in Chester, N.Y.	East-west route serving Passaic County. Extends route to recreation area and developing suburbs. Serves as alternate to New York Thruway for peak recreation movements.
35.	N.J. 53 Expressway	N.J. 24 Expressway in Morris County to N.J. 208 Expressway in West Milford	North-south route through Morris County and Western Passaic County. Serves suburban area of high growth potential west of interstate belt route.
36.	N.J. 69 Expressway	I-95 in Hopewell Township to U.S. 202 Expressway in Ringoes	North-south route through northern Mercer County. Serves suburbs north of Trenton.

RECOMMENDATIONS-SUBURBAN NEW YORK

The New York portion of the Tri-State Region outside New York City has a well developed network of radial routes, particularly in Nassau and Westchester counties. With the commuter rail network maintained and improved as proposed, these radial routes are generally sufficient to meet the needs of the immediate future.

The expansion of land development eastward in Suffolk County has outdistanced the highway system. There is an urgent need to extend expressways in this area and to complete gaps in facilities where they exist. Similarly, in the northern part of Westchester County, existing routes should be completed to eliminate gaps and dead-ends in existing routes to serve this fast-growing area. Expected area growth will require some additional radial facilities east of New York City to provide a more inclusive network.

By 1975 there is need to provide additional peripheral routes in New York, that is, routes perpendicular to the existing radial expressways and parkways. Particularly in Nassau County, but also in Suffolk, growth in commercial and industrial activities is increasing traffic demands for better north-south facilities. There is also a need for better facilities to serve commercial traffic.

In Westchester there is a pressing need to provide improved east-west service in the lower portion of the county by upgrading the Cross County Parkway. An east-west route is needed by 1975 across the northern counties of the region, and this route is included in the Interstate System. Improvements are also needed in routes to serve recreational traffic, both to the mountains and to the shore.

Priority projects in New York include an expressway through southern Nassau County to provide an alternate to the Long Island Expressway, plus additional north-south routes in both Nassau and Suffolk. Other routes are recommended in Westchester and Rockland to provide a more interconnected system and better utilization of existing routes. In suburban New York, these priority routes comprise 235 miles of new expressway at an estimated cost of $600 million.

Between 1975 and 1985, the outward spread of development will require additional express facilities in such areas as northern Nassau, Suffolk, northern Westchester, Putnam, Dutchess and Orange counties. Another crossing of the Hudson River near Yonkers would connect with a cross-Bergen route in New Jersey. New crossings of Long Island Sound would help to unlock waterbound Long Island, providing needed outlets to the burgeoning population of Nassau-Suffolk, expected to exceed four million by 1985. These crossing possibilities are huge engineering tasks and will require detailed evaluation of their potential effects on land uses as well as the existence of sufficiently well developed exchange potential to justify their very high investment costs. New York State, Nassau, Suffolk and Westchester counties and Connecticut all have official studies of these several crossings in process. All told, these future routes, including two bridges across the sound, would add 145 miles to the region's network at an estimated cost of $700 million.

TOTAL ADDITIONAL COSTS: NEW YORK (EXCLUDING THE CITY)

Priority	$ 600 million
Future	$ 700 million
Total	$1,300 million

RECOMMENDED ROUTES-SUBURBAN NEW YORK

Map Place Number	Route Number or Name	Location	Needs and Benefits
		Priority	
1.	N.Y. 495 Expressway	Ronkonkoma to N.Y. 25 in Riverhead	East-west route through Central Suffolk County. Extends Long Island Expressway to serve rapid growth suburban area, as well as recreation traffic.
2.	N.Y. 135 Expressway	Wantagh State Parkway to N.Y. 105 in Wantagh; and N.Y. 25 to N.Y. 106 in Oyster Bay	North-south route serving eastern Nassau County. Completes Wantagh-Oyster Bay Expressway at both ends. Better utilizes existing route. Provides through cross-island route for commercial traffic.
3.	Nassau Expressway	I-78 in Queens to Atlantic Beach Bridge in Lawrence	North-south route through southwestern Nassau County. Serves dense suburbs. Relieves congested arterials. Serves recreation traffic.

Map Place Number	Route Number or Name	Location	Needs and Benefits
4.	Sprain Brook Parkway	Yonkers to Taconic State Parkway at Hawthorne Circle	North-south route through central Westchester County. Extends stub-end route to connect with parkway system to north. Relieves congested parallel outmoded parkways. Provides interchange with Interstate 287.
5.	I-84	Delaware River at Port Jervis to I-87 in Brewster	East-west route through Orange, lower Dutchess and Putnam counties. Provides a cross route for northern portion of region. Better utilizes completed Hudson River bridge and approaches, plus completed Conn. route. Promotes industrial development.
6.	Long Mountain Parkway	N.Y. Thruway at Harriman to Palisades Parkway	East-west route through Orange County. Extends Quickway (NY 17) to Palisades Parkway and Bear Mountain Bridge. Serves as overflow route for congested N.Y. Thruway for recreation traffic. Increases utilization of Bear Mountain Bridge and Palisades Parkway.
7.	I-87	N.Y. 22 in Armonk to N.Y. 22 in Katonah	North-south route through eastern Westchester County. Serves fast-growing suburban area, including major industrial area. Provides an expressway route for commercial traffic. Extends stub-end route for system continuity.
8.	N.Y. 27 Expressway	I-78 in Queens to Water Mill	East-west route through southern Nassau and Suffolk counties. Connects completed expressway sections. Provides route for commercial traffic. Serves recreation area. Completes alternate route to Long Island Expressway.
9.	N.Y. 45 Expressway	I-287 in Spring Valley to Palisades Parkway near New Square	North-south route through Rockland County. Provides direct connection between Garden State Parkway and Palisades Parkway. Serves fast-growing suburban area, including regional shopping centers.
10.	Nichols Rd. Expressway	N.Y. 27 in Patchogue to Neconset Highway near Port Jefferson	North-south route through central Suffolk County. Fills large gap in regional highway grid. Serves developing suburban area, including new state university. Serves airport and transportation center.
11.	U.S. 9 Expressway	I-287 in Tarrytown to N.Y. 9-A in Ossining; and I-84 in Fishkill to N.Y. 9-G in Hyde Park	North-south route in western Westchester County and in western Dutchess County. Connects Poughkeepsie urban area to interstate route. Serves fast-growing suburban and industrial areas. Relieves existing arterials. Better utilizes completed expressway.
12.	Cross County Parkway Extension	Hutchinson River Parkway to I-95 in New Rochelle	East-west route through lower Westchester County. Extends reconstructed route to connect with principal north-south route through eastern Westchester County. Serves need for peripheral route for close-in suburbs. Promotes redevelopment efforts in older cities.
13.	U.S. 6 Expressway	U.S. 9 in Peekskill to Bear Mountain Bridge	Provides better route to Bear Mountain to utilize better its capacity.
14.	Babylon-Northport Expressway	N.Y. 27-A in Babylon to N.Y. 25-A in Northport	North-south route through eastern Suffolk County. Serves need for peripheral route in fast-growing suburbs. Fills unserved area in regional highway grid. Serves as feeder to transportation center on Long Island Rail Road.
15.	Nassau North-South Expressway	Long Beach to N.Y. 495 in North Hempstead	North-south route in eastern Nassau County. Serves densely developed suburbs including major industrial and commercial centers. Serves commercial traffic (spaced between two parkways). Relieves congested local streets. Fills large gap in regional highway grid.
		Future	
16.	Bergen Expressway Extension	Bergen County to I-287 at Nyack	North-south route through eastern Rockland County. Completes northern bypass route between New Jersey Turnpike and Tappan Zee Bridge. Provides truck route to Rockland County from industrial New Jersey.
17.	Long Beach Expressway	Nassau Expressway at Atlantic Beach to Loop Parkway at Point Lookout	East-west route along Long Beach Island. Connects stub-end of two routes. Serves recreation traffic. Relieves congestion on local streets.

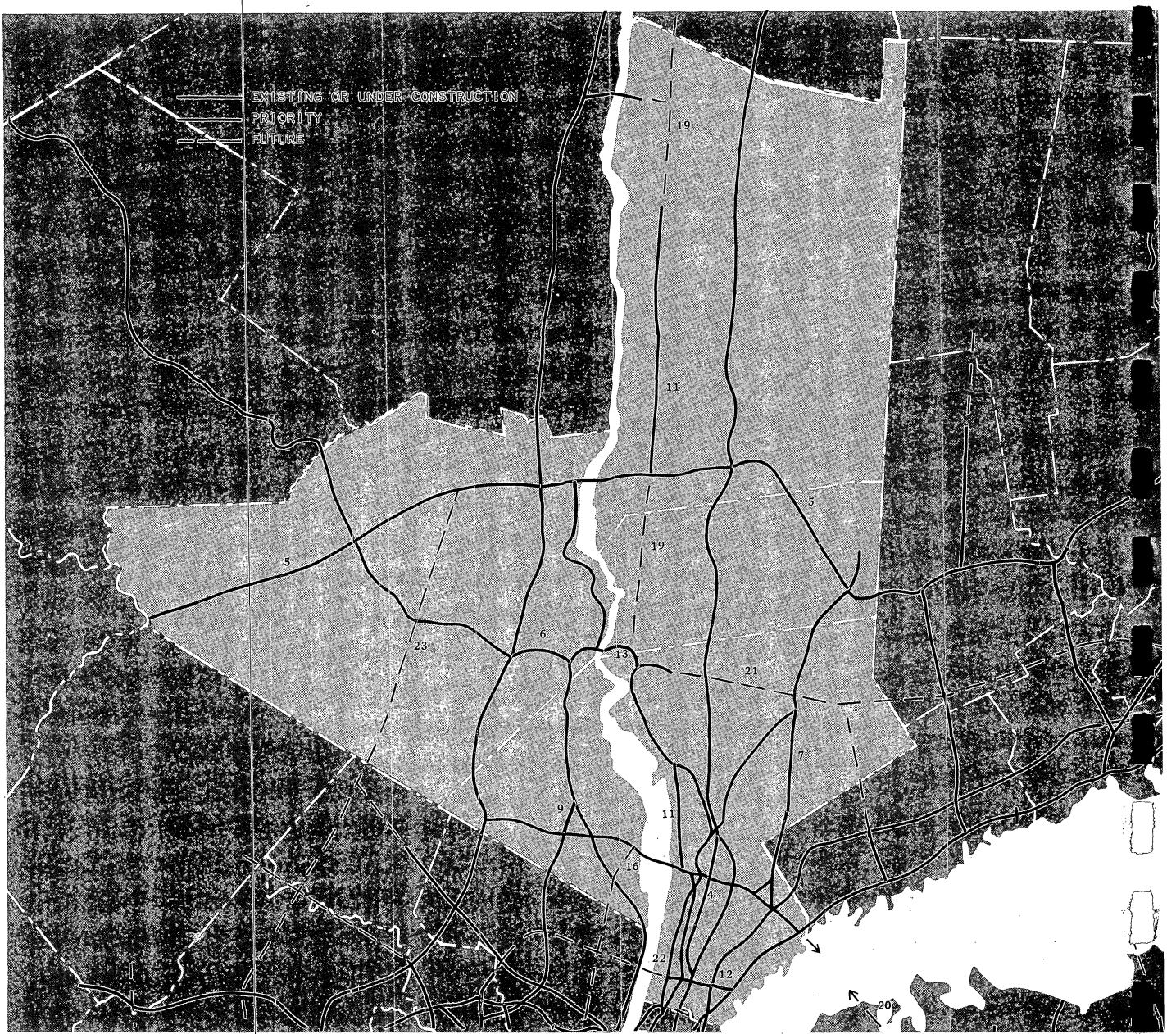


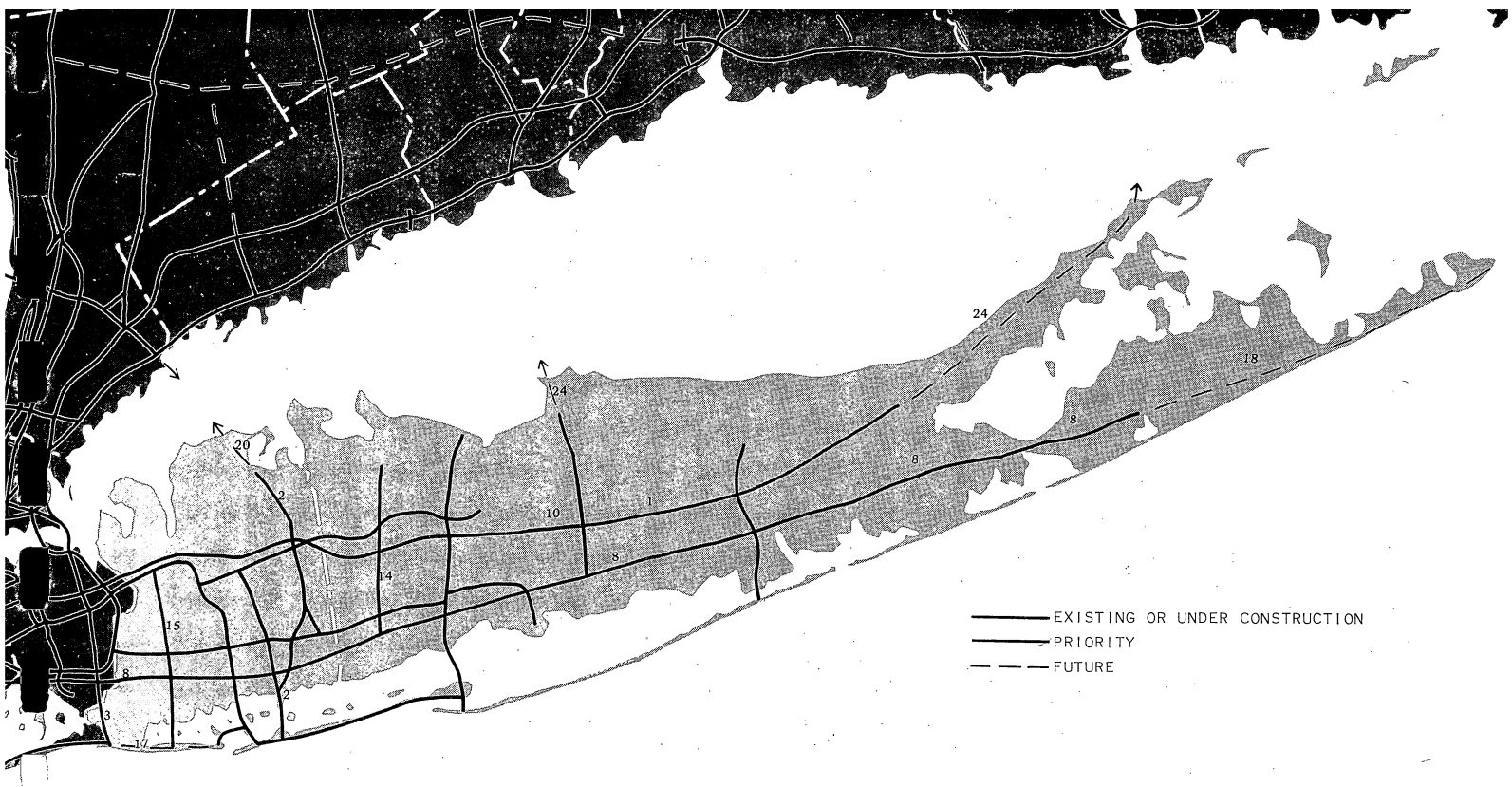
Figure 17. INTERIM REGIONAL HIGHWAY PROPOSALS-NORTHERN SUBURBAN NEW YORK

RECOMMENDED ROUTES-SUBURBAN NEW YORK continued

Map Place Number	Route Number or Name	Location	Needs and Benefits
		Future	
18.	N.Y. 27 Expressway	Water Mill to Montauk	East-west route through eastern Suffolk County. Bypasses Bridgehampton and East Hampton relieving bottlenecks on route to Montauk recreation areas. Extends expressway to serve eastern limits of development.
19.	U.S. 9 Expressway	U.S. 6 in Peekskill to I-84 in Fishkill; and N.Y. 9-G in Hyde Park to U.S. 9 at Red Hook	North-south route through Putnam and Dutchess counties. Serves commercial traffic needs east of the Hudson River. Relieves existing two-lane highway.

Map Place Number	Route Number or Name	Location	Needs and Benefits
20.	Nassau-Westchester Bridge	Long Island Sound Crossing	Would connect interstate outer belt route to Long Island and also provide connection to north and west without passing through New York City. This crossing as well as two others (See No. 24) are being more carefully studied to find the most satisfactory routes for "unlocking" waterbound Long Island.
21.	N.Y. 35 Expressway	U.S. 9 Expressway in Peekskill to Connecticut	East-west route through northern Westchester County. Serves rapidly developing suburban area. Fills need for peripheral route, including approach to Bear Mountain Bridge from the east. Includes route to Stamford, Connecticut.
22.	Westchester-Bergen Bridge	Hudson River Crossing	New bridge midway between George Washington and Tappan Zee bridges. Provides close-in northern bypass. Connects east-west expressway in Bergan with Cross County Parkway and City Line Expressway in Westchester County. Diverts traffic from congested Cross-Bronx Expressway.
23.	Orange North-South Expressway	I-84 in Montgomery to N.J. 208 Freeway at Greenwood Lake	North-south route through Orange County. Extends New Jersey route through New York. Serves rapidly developing area. Provides alternate to New York Thruway to relieve peak overloads of recreation traffic. Serves large area now without expressway access.
24.	A Suffolk to Connecticut Bridge	Long Island Sound Crossing	The feasibility of a crossing of Long Island Sound is under study by Connecticut and New York. Two possible locations are being considered: (1) eastern Suffolk County to eastern Connecticut; or (2) the Port Jefferson vicinity to the Bridgeport area. Such a facility would eliminate the "dead-end" status of Long Island, encourage the development of Suffolk County, and serve recreation travel between Connecticut and Long Island.

Figure 18. INTERIM REGIONAL HIGHWAY PROPOSALS-SUBURBAN LONG ISLAND



RECOMMENDATIONS-NEW YORK CITY

In New York City, several shortcomings in the regional highway system are in need of correction. First among these is the lack of a complete southern bypass route around Manhattan. Beginning at the Outerbridge Crossing, an expressway route for both cars and trucks should connect with the Verrazano-Narrows Bridge and thence across Brooklyn to Queens and on north. In Brooklyn, this route is particularly needed to serve an area of about three million people presently without any good highways with the exception of a circuitous parkway around its perimeter which cannot be used by commercial vehicles.

The need for a limited access crossing of Manhattan is one of long standing. The new bypass routes, while of great significance, are far removed for large traffic volumes moving between close-in-areas along the Hudson and East rivers. The Lower Manhattan Expressway should be completed to join together the disconnected portions of the regional network approaching lower Manhattan.

In the Bronx and in Queens, gaps in the partially completed interstate highways should be closed. This would allow existing stub-end facilities to be utilized more efficiently, and also provide better services for non-radial oriented traffic in the boroughs.

Throughout New York City, as well as in certain other portions of the region, there is an urgent need to replace and reconstruct outmoded and worn-out facilities. The city is unique in its need for highway renewal as well as urban renewal, for it has many early facilities which have undergone long and heavy usage. The prime candidate for replacement is the West Side Highway, whose tortuous curves and constricting width are far below modern design standards required for better speeds and higher volumes. The changing face of the City's waterfront also provides the opportunity to coordinate this highway reconstruction with potentially new and more appropriate uses of the adjacent land. In such a case, highway renewal coupled with new land uses provides an unparallel opportunity for civic improvements.

Elsewhere in the city such facilities as the Interborough Parkway, the interchange between the Long Island Expressway and the Brooklyn-Queens Expressway, and the major bridges crossing the East and Harlem rivers are obsolete and require modernization. Many other facilities have been and will continue to be worn down by continuous, heavy traffic so that increasing allowance must be made to preserve and reconstruct such facilities as the Brooklyn-Queens Expressway, the East River Drive and parts of the Long Island Expressway.

Also included in the priority needs is an extension of the Prospect Expressway to serve southern Brooklyn and the Rockaways and the Bushwick Expressway between the Williamsburg Bridge and the Nassau Expressway.

A route crossing midtown Manhattan, connecting the East River Drive and West Side Highway as well as the Lincoln and Queens-Midtown tunnels, has long been proposed. It is intended to remove from the city streets traffic that wishes to cross from one side of the island to the other. This facility, currently a segment of the federal Interstate Highway System, would penetrate the area of highest cost real estate and greatest commercial density in the region. Clearly, this should receive the most intensive study and design evaluations to assess whether such a roadway can be satisfactorily adapted to the very dense and complicated environment. Also, the potential effect on the delicate transit balance in the midtown area must be carefully weighed, particularly in view of the proposed East River subway tunnel. In such an evaluation radical departures from the present design concept should be examined.

In total, the priority recommendations include 70 miles of new expressways at an estimated cost of $1 billion.

In the future, between 1975 and 1985 in New York City, additional expressways will be needed, including an east-west route across the north Bronx and a more complete network for Richmond County. Planning for many of the routes on Staten Island is well advanced, and rights-of-way should be secured as soon as possible to preclude encroachment. Actual construction, however, can await development of the traffic needs. These expressways would connect to a future crossing of Raritan Bay to provide a more direct route to southern New Jersey. Also, a future expressway in Queens is recommended to serve as an extension of the Cross Brooklyn Expressway to complete the circumferential continuity at good expressway spacing. These future routes total 35 miles, with cost estimated at $400 million.

Coordination in community planning and highway planning is of the utmost importance in New York City. Highways must be designed to balance traffic service considerations against the impact on area development and mass transit proposals. Proper highway access is a necessity for an improved and more attractive New York, but new highways must be worked out as a positive asset to existing and proposed new

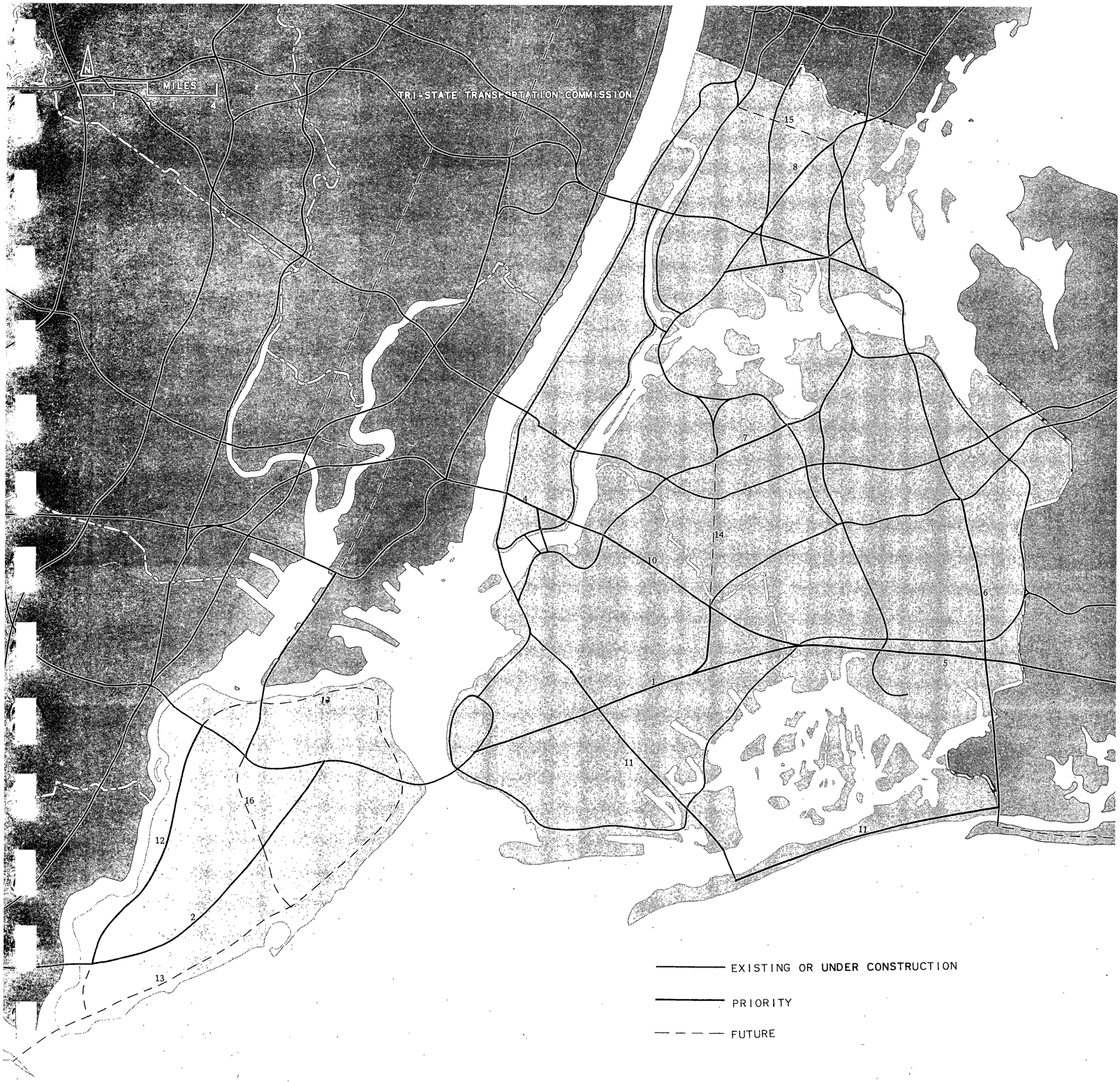


Figure 19. INTERIM REGIONAL HIGHWAY PROPOSALS-NEW YORK CITY

development. Maximum use should be made of joint highway and urban renewal projects. Use of air rights for development can aid in returning ratables to the city's tax rolls. Where possible, highway median strips should be considered for rapid transit, particularly in areas where existing elevated structures could thus be replaced. The modernized and expanded highway network within New York City can be a positive force through planning to serve better the city and the region.

TOTAL ADDITIONAL COSTS: NEW YORK CITY

Priority	**$1,000 million**
Future	**$ 400 million**
Total	**$1,400 million**

RECOMMENDED ROUTES-NEW YORK CITY

Map Place Number	Route Number or Name	Location	Needs and Benefits
		Priority	
1.	Cross Brooklyn Expressway	I-278 near Narrows Bridge to Nassau Expressway and Interborough Parkway in Queens	East-west route through Brooklyn. Fills need for route through area presently served only along its perimeter. Improves southern bypass around Manhattan, particularly for commercial traffic. Better utilizes full capacity of Narrows Bridge.
2.	Richmond Parkway	Outerbridge Crossing to I-278 on Staten Island	Connects interstate outer belt route to Narrows Bridge. Makes southern bypass more attractive. Serves fast-growing suburban area.
3.	I-878 (Bruckner Expressway)	I-278 to I-95 in the Bronx	Completes gap between existing facilities. Provides vital interchange between Long Island-New Jersey routes and Westchester routes. Improves northern bypass around Manhattan.
4.	I-78 and I-478 (Lower Manhattan Expressway)	Holland Tunnel to Williamsburg Bridge and Manhattan Bridge in Manhattan	Route across Manhattan. Serves traffic with close-in termini which cannot be bypassed. Particularly needed for trucks. Closes gap in regional network.
5.	I-78 (Nassau Expressway)	Cross Brooklyn Expressway to Clearview Expressway in Queens	Connects southerly bypass route with outer Queens and Nassau County. Provides improved airport access.
6.	I-78 (Clearview Expressway)	Nassau Expressway to Grand Central Parkway in Queens	North-south route through Queens. Eliminates "dead-end" in existing route, increasing utilization of completed portion. Relieves congestion of Van Wyck Expressway and the Belt Parkway. Improves airport access for Nassau and Suffolk counties. Extends southern bypass to the Throgs Neck Bridge.
7.	I-678	I-278 to Grand Central Parkway in Queens	East-west route through Queens. Connects completed Whitestone Expressway with Brooklyn-Queens Expressway. Provides alternate to Long Island Expressway, particularly for commercial traffic.
8.	I-278 (Sheridan Expressway)	Cross-Bronx Expressway (I-95) to New England Thruway in the Bronx	Extends existing "dead-end", increasing usage of completed portion. By-passes two congested six-way interchanges. Provides direct connections for Bronx River Parkway.
9.	I-495 (Mid-Manhattan Expressway)	Lincoln Tunnel to Queens Midtown Tunnel in Manhattan	Serves traffic between close-in portions of Queens and New Jersey. Serves as cross-connection between East River Drive and West Side Highway. Removes traffic from midtown streets, particularly through trucks.
10.	I-78 (Bushwick Expressway)	Williamsburg Bridge to Cross-Brooklyn Expressway in Brooklyn	East-west route through northeast Brooklyn. Provides relief route for Long Island Expressway, as well as replacement for congested arterial streets. Opportunity to revitalize declining area, possibility of coordinated rail transit improvement.
11.	Prospect Expressway	Prospect Expressway to Atlantic Beach Bridge in Brooklyn and Queens	North-south route through Brooklyn to the Rockaways. Fills need for highway access in large unserved area. Extends existing stub-end route, better utilizing existing capacity. Serves recreation travel needs. Serves redevelopment areas, including possible industrial sites.
12.	West Shore Expressway	Outerbridge Crossing to I-278 on Staten Island	North-south route through western Richmond County. Serves rapidly growing borough as well as potential industrial areas.
		Future	
13.	Shore Front Drive	Outerbridge Crossing to St. George, then to Goethals Bridge on Staten Island	Waterfront routes along periphery of Staten Island, including Raritan Bay Bridge. Serves rapid growth area, including industrial, redevelopment and recreation needs. Improves access to all bridges and ferry. Provides new route to South Jersey.

Map Place Number	Route Number or Name	Location	Needs and Benefits
14.	Cross-Brooklyn Expressway Extension	Interborough Parkway to I-278 and I-678 in Queens	North-south route through Queens. Further strengthens southerly bypass route. Connects Narrows Bridge to Triborough-Whitestone complex. Provides relief to congested Brooklyn-Queens Expressway.
15.	City Line Expressway	I-87 to I-95 in the Bronx	East-west route through northern Bronx. Relieves congestion on Cross-Bronx Expressway and Cross County Parkway. Provides direct route to Throgs Neck Bridge for routes approaching the City from the north. Could connect with future Hudson River crossing. Serves peripheral traffic.
16.	Willowbrook Parkway	I-287 to Shore Front Drive on Staten Island	North-south route through Staten Island. Serves recreation areas plus cross-island traffic needs.

FINANCING THE HIGHWAY PROGRAM

The cost of the recommended plan must be compared with the availability of funds for highway purposes to assure the feasibility of achieving the recommended improvements within a reasonable time span. The regional highway program, recommended for the Tri-State Region, calls for the expenditure of $5.1 billion for new facilities in the next 20 years: an annual rate of $275 million. The priority projects in the three states add up to $3.2 billion for 660 miles of new expressways to be constructed by 1975. Future routes now envisioned after 1975 add another 450 miles at $1.9 billion.

During this 20-year period, many of the expressways now in existence will be wearing out and will require major reconstruction to keep them functioning as an integral part of the growing expressway network. These costs must also be considered. Although difficult to estimate, the costs of such major improvements could amount to as much as $1.5 billion, thus raising the estimated total capital outlay for construction and reconstruction of the expressway system in the Tri-State Region to $6.6 billion for the next 20 years. This would raise the annual average investment to $350 million without allowing for some inflation.

The existing 1100-mile network of expressways and parkways now serving the area has been mainly financed by highway user taxes in the form of gasoline taxes, vehicle registration fees, etc. In addition, bond financing has been used to construct major turnpikes, bridges and tunnels supported by tolls imposed on the users. Bonds have also been issued in anticipation of future federal aid allocations and future tax income. In the past seven years nearly $2.1 billion were spent for both new and rebuilt expressways in the region; a rate of $300 million per year. Looking to the future, an annual rate of $350 million is in scale with anticipated revenues drawn from a growing population of highway users.

Estimated present income available in the region for highway purposes is approximately $700 million per year in user taxes. Projections for 1985 user taxes at current rates and based on today's dollars indicate approximately $1 billion annually. Assuming an increased expenditure for debt service to redeem existing bond issues, more than the required $350 million annually can be available for new and renewed expressways between 1966 and 1985. Thus, despite the size of the recommended program, present and projected highway user tax revenues appear sufficient to pay for the recommended program, provided a greater share is allocated to highway purposes in New Jersey. Additional security in these estimates lies in the possibility that some of the recommended facilities will be financed through toll revenues.

The most prominent overall aspect of the recommended highway program is the attempt to make a significant reduction in the backlog of urgently needed facilities in New Jersey. This program represents a doubling of New Jersey's current rate of expenditures. The recommendations for New York and Connecticut approximate current spending rates.

This summation of a 20-year program presents a tremendous total investment need. Yet it is in scale with what the region has been doing in the past and is in scale with its projected income and growth. Certainly real economy and benefit will derive from planning and scheduling this investment toward a well-directed plan allowing orderly expansion of the region's highway network to meet steadily growing needs.

Special work in preparing this report was undertaken by William L. Mertz, technical director; John Tone, liaison representative, Connecticut Highway Department; George Haikalis, research engineer; and Vincent Berberich, liaison representative, New Jersey Highway Department.