

September, 1972

SOUTHWEST

DRAFT ENVIRONMENTAL IMPACT STATEMENT PRELIMINARY LOCATION REPORT PROGRAM PACKAGE EVALUATION REPORT

prepared for

Commonwealth of Massachusetts
Executive Office of Transportation and Construction
Department of Public Works
Massachusetts Bay Transportation Authority

by the

BOSTON TRANSPORTATION PLANNING REVIEW

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Economics Research Associates: land economics

Environmental Research Technology: air pollution

Environmental Systems Laboratories: noise



DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

THIS REPORT
Constitutes a

DRAFT ENVIRONMENTAL/SECTION 4(f) STATEMENT

Prepared by the

BOSTON TRANSPORTATION PLANNING REVIEW

for the

EXECUTIVE OFFICE OF TRANSPORTATION AND CONSTRUCTION
MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

ADMINISTRATIVE ACTION

for

ALTERNATIVE TRANSPORTATION IMPROVEMENTS FOR THE SOUTHWEST CORRIDOR FROM THE PRESENT TERMINUS OF ROUTE I-95 IN CANTON TO CONNECTIONS WITH THE CENTRAL ARTERY AND SOUTH-EAST EXPRESSWAY IN BOSTON, WITH ROUTES TRAVERSING CANTON, DEDHAM, MILTON AND BOSTON. ALTERNATIVES UNDER CONSIDERATION CONSIST OF INTERSTATE EXPRESSWAY (ROUTE I-95) AND NON-EXPRESSWAY (ARTERIAL FACILITIES, WITH A SHARED TRANSIT RIGHTS-OF-WAY.

THESE HIGHWAY IMPROVEMENTS ARE PROPOSED FOR FUNDING UNDER TITLE 23, U.S.C. THIS STATEMENT WAS DEVELOPED IN CONSULTATION WITH THE FEDERAL HIGHWAY ADMINISTRATION AND IS SUBMITTED PURSUANT TO:

SECTION 102(2) (C) OF THE NATIONAL ENVIRONMENTAL POLICY ACT
[Public Law 91-190] and

SECTION 4(f) OF THE DEPARTMENT OF TRANSPORTATION ACT,
as amended [Public Law 89-670] and

FEDERAL HIGHWAY ADMINISTRATION POLICY AND PROCEDURE MEMORANDUM 90-1 [Aug. 24, 1971]

September 15, 1972

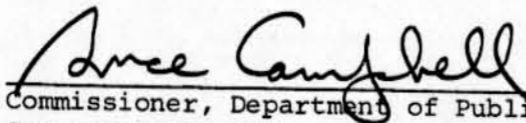
Date



Secretary, Transportation and Construction
Commonwealth of Massachusetts

September 15, 1972

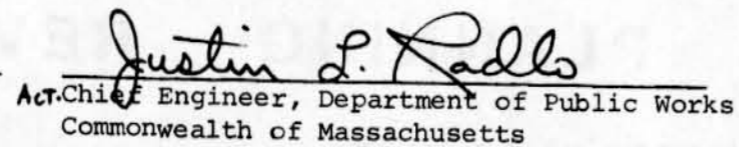
Date



Commissioner, Department of Public Works
Commonwealth of Massachusetts

September 15, 1972

Date



Act. Chief Engineer, Department of Public Works
Commonwealth of Massachusetts

CLEARED BY FHWA FOR CIRCULATION AND COMMENTS

September , 1972

Date

Edward J. DePina /s/
Division Engineer,
Federal Highway Administration

The Boston Transportation Planning Review is a study undertaken for the Commonwealth of Massachusetts, sponsored by the Executive Office of Transportation and Construction through the Department of Public Works (DPW) and the Massachusetts Bay Transportation Authority (MBTA).

State support is contributed by the DPW and the MBTA. This report has been prepared in cooperation with the U.S. Department of Transportation, Federal Highway Administration. The preparation of this report has also been financed in part through a grant from the U.S. Department of Transportation, Urban Mass Transportation Administration, under the Urban Mass Transportation Act of 1964, as amended.



BOSTON TRANSPORTATION PLANNING REVIEW

100 BOYLSTON STREET, BOSTON, MASSACHUSETTS 02116 TELEPHONE: (617)423-2672

September, 1972

TO: PUBLIC OFFICIALS AND PRIVATE CITIZENS CONCERNED WITH
TRANSPORTATION DECISIONS IN THE SOUTHWEST CORRIDOR

The Southwest Report identifies and evaluates alternatives for Route I-95 between Route 128 and downtown Boston. Two program package alternatives are included in the analysis -- one an expressway facility alternative meeting Interstate standards, the other a set of arterial and local street improvements which addresses key transportation needs of the Southwest Corridor. Each program package alternative includes extensive transit options, including a shared highway/transit right-of-way for the proposed Orange Line relocation and extension, replacement of the existing Orange Line service, and provision of an inner-circumferential transit facility. Further, each program package describes potential reuse concepts for lands over and adjacent to the proposed transportation improvements in the Southwest Corridor.

The report was developed through a participatory process by the BTPR, in conjunction with the Southwest corridor communities, and seeks to address a broad range of transportation and development problems and opportunities in these communities.

The Southwest Report can best be understood in context with the North Shore Report, which presents an overview of the principal environmental, social, economic, and transportation considerations which will influence transportation decisions on the North Shore from Route 128 in Peabody to the Revere/East Boston city boundary. In addition, the BTPR is preparing a separate report on the proposed Third Harbor Crossing that will present various transportation alternatives for the East Boston and South Boston communities, including potential connections with new facilities in the Southwest corridor.

Within this context, the purpose of the Southwest Report is to provide public officials, private groups, and individual citizens with a reasoned analysis of the advantages and disadvantages of alternative transportation proposals for the use of the Southwest corridor.

On the basis of this analysis and public response to it, the Governor of the Commonwealth and the State's transportation agencies will decide which of the projects and proposals described herein will be recommended for implementation.

The report is a draft. It is being circulated widely so that it would be subjected to review, criticism, and possible modification based on written and oral statements presented at a formal public hearing and written statements presented within 15 days thereafter. In its present form, the draft is not intended to reflect official State policy with respect to the projects

COMMONWEALTH OF MASSACHUSETTS - EXECUTIVE OFFICE OF TRANSPORTATION AND CONSTRUCTION

and proposals described. Instead, it is a description of alternatives from among which the State will develop its policy, after consideration of comments received from the widest possible range of people and institutions concerned with these decisions.

The Southwest Report represents a significant departure from past practice. It attempts to deal in one document with highways and transit, with localized impacts and region-wide concerns, with present needs and future directions, and with existing statutory constraints and possible statutory changes. Its form responds, we believe, to emerging requirements of the federal government and to essential elements of Governor Sargent's policy, for a balanced and integrated approach to major transportation decisions. The complexity of the report reflects the complexity of these decisions.

We look forward to your comments, criticisms, suggestions for change, and your views on which options should be selected. Individuals, groups, agencies, and public officials who wish to register their views and comments by letter in addition to or instead of testimony at the public hearings may do so by addressing a letter to the Secretary of Transportation and Construction, c/o the Boston Transportation Planning Review, 100 Boylston Street, Boston, Massachusetts 02116. Such letters and a transcript of the public hearings will become part of the official administrative record accompanying projects selected for implementation.

Sincerely,

Alan Altshuler, Secretary
Executive Office of Transportation and Construction

Bruce Campbell, Commissioner
Massachusetts Department of Public Works

Henry Lodge, Chairman
Massachusetts Bay Transportation Authority

John Wofford, Director
Boston Transportation Planning Review

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INTRODUCTION

Early in 1970, Governor Francis W. Sargent halted work on a number of controversial highway projects in the Boston area. He established the Boston Transportation Planning Review to advise him on these controversies and directed that they be reviewed together as part of a balanced transportation program responding to the full range of metropolitan values. To this end, he directed that the planning review process be open and broadly participatory so as to adequately reflect the values, priorities, and proposals that the region's public agencies, private institutions, and private groups may wish to contribute.

The Governor emphasized that he wished the Planning Review to give high priority to the following objectives:

- Integration of expressway planning with planning for arterial and local streets, parking, and transit
- Integration of transportation planning with planning for housing, neighborhood amenity, environmental protection, and economic development
- Maximal local government and public participation in the planning process

A Study Design for the Boston Transportation Planning Review was prepared during the months of August through November, 1970. The Study Design itself is a reflection and a result of the participatory planning process. It is the product of intensive involvement by representatives of the following:

- The Governor's office
- Local elected officials
- State and local public agencies
- Private groups, institutions, and associations
- Professionals from a broad range of disciplines

BTPR STUDY REGION AND FACILITIES

Transportation controversies were found throughout the Boston metropolitan area:

- North Shore -- I-95 North and its connectors, Relocated I-95, the Third Boston Harbor Crossing, and North Shore Transit
- Southwest -- I-95 South, the Southwest Transit Extension, and the Boston section of the Inner Belt
- Northwest -- the Somerville-Cambridge section of the Inner Belt, Route 2 Extension, and the Harvard-Alewife Transit Extension

Therefore, the area within Route 128 was divided into subregions for the purpose of studying these problems. In addition to the major facilities listed above, (see Fig. I-1) a wide range of important but smaller scale facilities, programs, and operational improvements are also under study in each subregion.

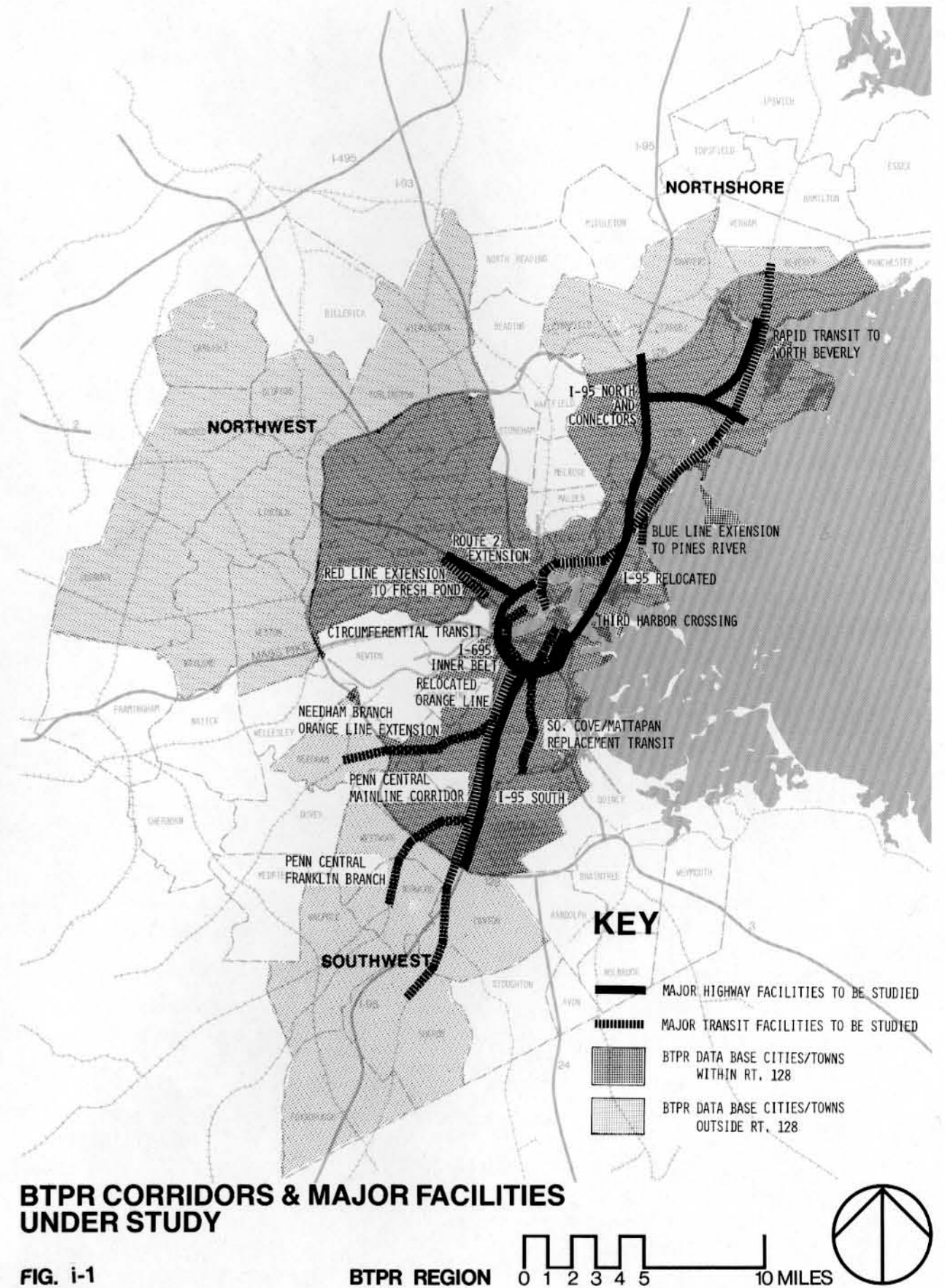
Certain studies, or portions of studies, which do not lend themselves solely to subregional analysis are also being conducted on the full regional level. Examples of these include:

- Regional environmental/economic studies
- Regional core studies
- Commuter railroad improvement studies
- Administrative and institutional studies

THE BTPR STUDY APPROACH

The planning process developed by the Boston Transportation Planning Review is an iterative, continuing process. The key elements of the process include:

- Staged decision points in a framework of continuous community and technical review and feedback
- A concurrent subregional and regional multi-value focus which exposes both transportation and transportation impact issues and insures comprehensive program packages for all alternatives



BTPR CORRIDORS & MAJOR FACILITIES UNDER STUDY

FIG. i-1

BTPR REGION 0 1 2 3 4 5 10 MILES

I.A.3. ALTERNATIVE IMPROVEMENT PROGRAM PACKAGES

The investigation of existing and projected Southwest movement needs a detailed review of previously prepared plans, and reconnaissance of physical opportunities for new construction and operational improvements led to the formulation of two alternative subregional transportation improvement programs. These programs are described at the end of this section of the report. The Southwest subregional opportunities for alternative highway and transit improvements form a complex series of interrelationships which must be understood in and of themselves in order to fully evaluate their consequences. In order to clearly describe these program packages, it is first important to discuss the highway and transit components separately so that the basic choices for each mode can be understood.

It must be kept in mind that a basic choice to be made is whether or not to build the Southwest Expressway. The program components are described and evaluated in this report with respect to that primary decision.

Secondly, choices must be made regarding the transit system to be constructed along with the chosen highway option. However, the transit choice, particularly in the mainline corridor, can be made on its own merit and is not dependent upon the basic choice between highway alternatives. This is more fully explained in Chapter I.A.3.3 following the description of highway and transit choices. Transit corridors are illustrated and described in Figure III-21.

Figure I-3 illustrates the major components of the comprehensive Program Packages.

Program Package 1 contains a new surface arterial and MBTA transit, commuter, and intercity railroad service in the mainline corridor. Transit choices in this basic program package include whether or not the existing railroad embankment will be utilized, the provision of subway or subway/surface rail service in the replacement corridor, and the option of personal rapid transit or rail transit in the

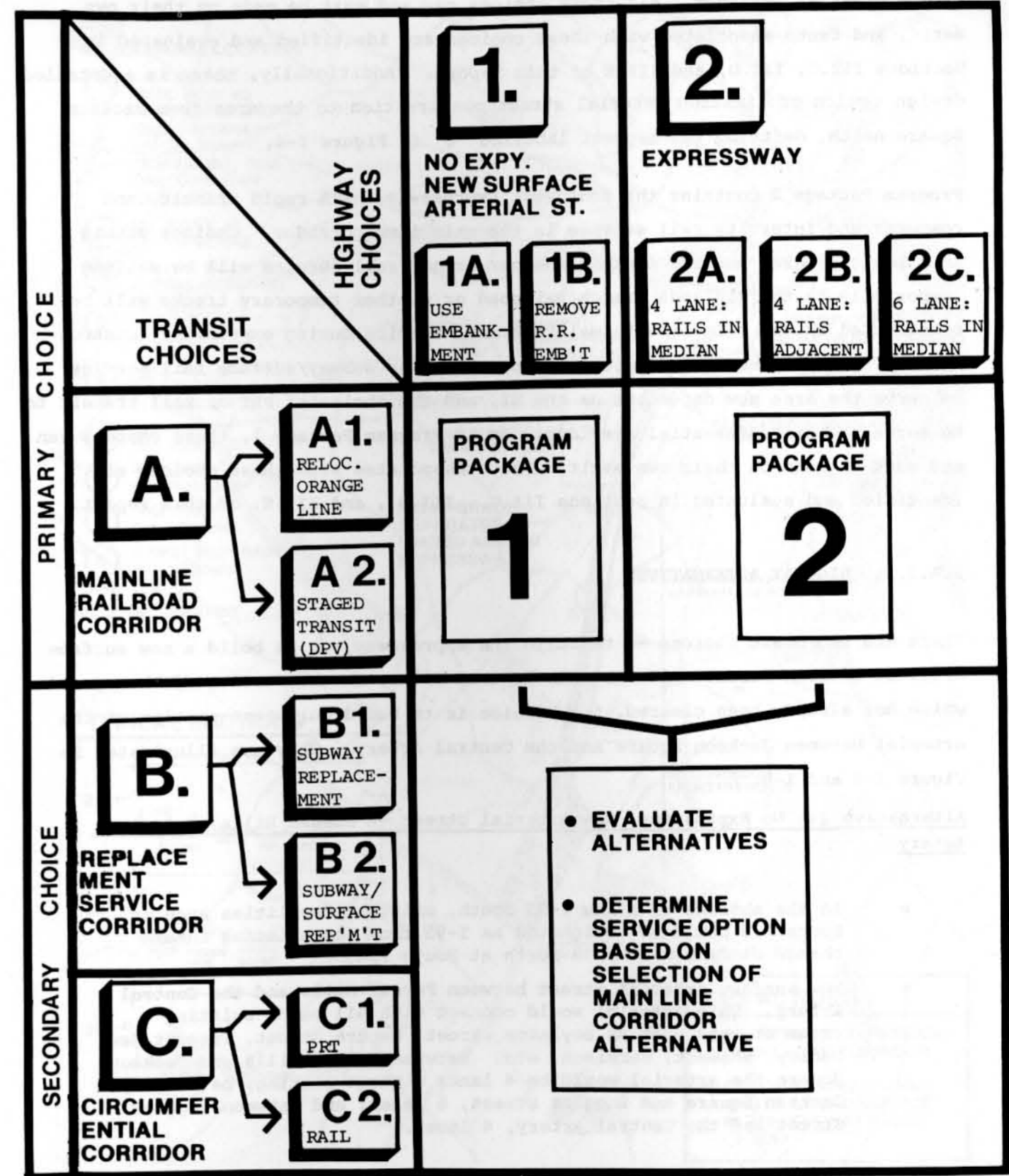


FIG. I-3 COMPREHENSIVE PROGRAM PACKAGE ORGANIZATION

circumferential corridor. All these choices can and must be made on their own merit, and facts associated with these choices are identified and evaluated in Sections III.C, III.D, and III.E of this report. Additionally, there is a detailed design option of limiting arterial street construction to the area from Jackson Square north, omitting the segment labelled "C" in Figure I-4.

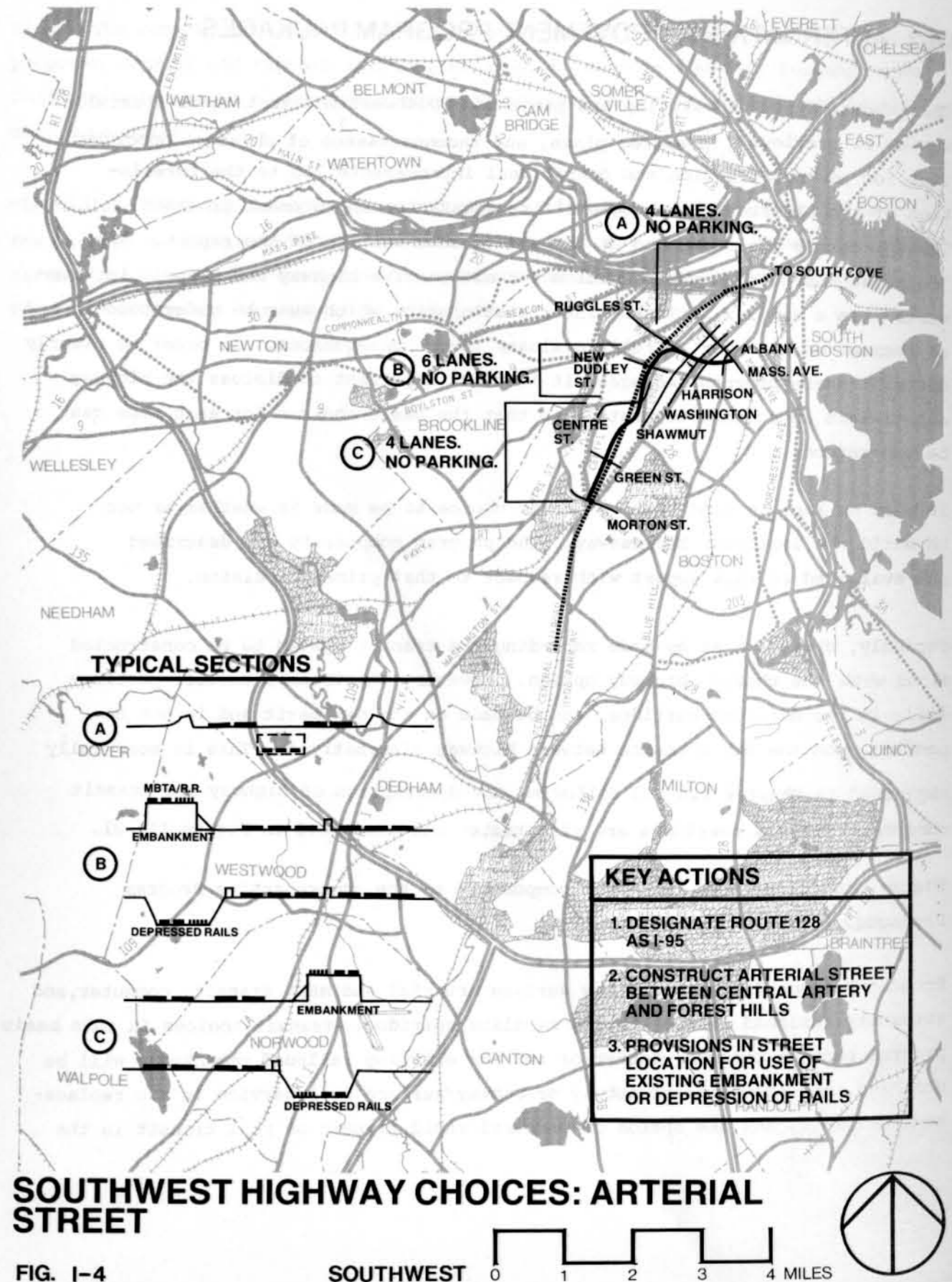
Program Package 2 contains the Southwest Expressway, MBTA rapid transit, and commuter and intercity rail service in the main line corridor. Choices within this basic program package include whether or not rail service will be shifted temporarily to the Midlands Branch Railroad or whether temporary tracks will be constructed in the main line to maintain rail service during expressway construction. Other options include provision of subway or subway/surface rail service to serve the area now dependent on the El, and the choice of PRT or rail transit to serve the circumferential corridor. As in Program Package 1, these choices can and must be made on their own merit. Facts associated with these choices are identified and evaluated in Sections III.C., III.D., and III.E. of this report.

I.A.3.1. HIGHWAY ALTERNATIVES

There are two basic choices -- to build the expressway, or to build a new surface arterial between Forest Hills and the Central Artery in the Section of the corridor which has already been cleared. A subchoice is to build only that portion of the arterial between Jackson Square and the Central Artery. They are illustrated in Figure I-4 and I-5.

Alternative 1: No Expressway; New Arterial Street -- Forest Hills to Central Artery

- In the absence of a new I-95 South, existing facilities such as Route 128 could be designated as I-95 from the existing interchange at Canton to I-95 North at Route 128.
- New surface arterial street between Forest Hills and the Central Artery. This arterial would connect with all major existing cross streets such as Boylston Street, Centre Street, Tremont/New Dudley, Shawmut, Harrison, etc. Between Forest Hills and Jackson Square the arterial would be 4 lanes without parking; between Jackson Square and Ruggles Street, 6 lanes; and between Ruggles Street and the Central Artery, 4 lanes.



SOUTHWEST HIGHWAY CHOICES: ARTERIAL STREET

FIG. I-4

SOUTHWEST 0 1 2 3 4 MILES

Major Suboptions

- New surface arterial with the existing railroad embankment between Forest Hills and Ruggles Street. This alternative relates to mainline corridor transit option B.1, wherein the existing embankment is utilized and modernized for rail transit use.
- New Surface arterial with removal of the existing railroad embankment between Forest Hills and Ruggles Street, and the depression of the rail facilities in that section of the corridor.
- New arterial from Jackson Square North only, with TOPICS improvements to local Jamaica Plain Streets between Forest Hills and Jackson Square.

In addition to the specific improvements identified above, a comprehensive TOPICS program would be initiated throughout the Southwest subregion including improved traffic signals, possible offstreet parking, and selected reconstruction of existing streets such as New Dudley street at Campus High School. In addition, a new truck route between the Readville rail yards and Route 128 South could be constructed (see Chapter II.A.6).

Alternative 2: I-95/Southwest Expressway between Route 128 South and the Third Harbor Crossing/Central Artery

- Construct a new fully depressed limited access expressway to full Interstate standards from the existing interchange at Route 128 Canton, through the Penn Central Railroad Mainline Corridor and Inner Belt Right-of-Way to the Third Harbor Crossing and Central Artery.
- Reconstruct the existing interchange between the Southeast Expressway, the Mass. Turnpike and Central Artery, to allow full connections between the Southwest Expressway, Southeast Expressway, Mass. Turnpike and the Third Harbor Crossing.
- Tremont Street and Columbus Avenue would be reconstructed in the Ruggles Street area and be merged into a single new street of six lane capacity between Ruggles Street and Jackson Square.
- Reconstruct all existing crossings of the Penn Central Railroad between Ruggles Street and Route 128, and new bridge structures.
- Provide interchange points with major arterial streets at Albany Street, Shawmut Street, Centre Street, Arborway/Morton Street, Cummins Highway, West Street, Neponset Valley Parkway and Route 128.

There are several sub-options to this program as described below:

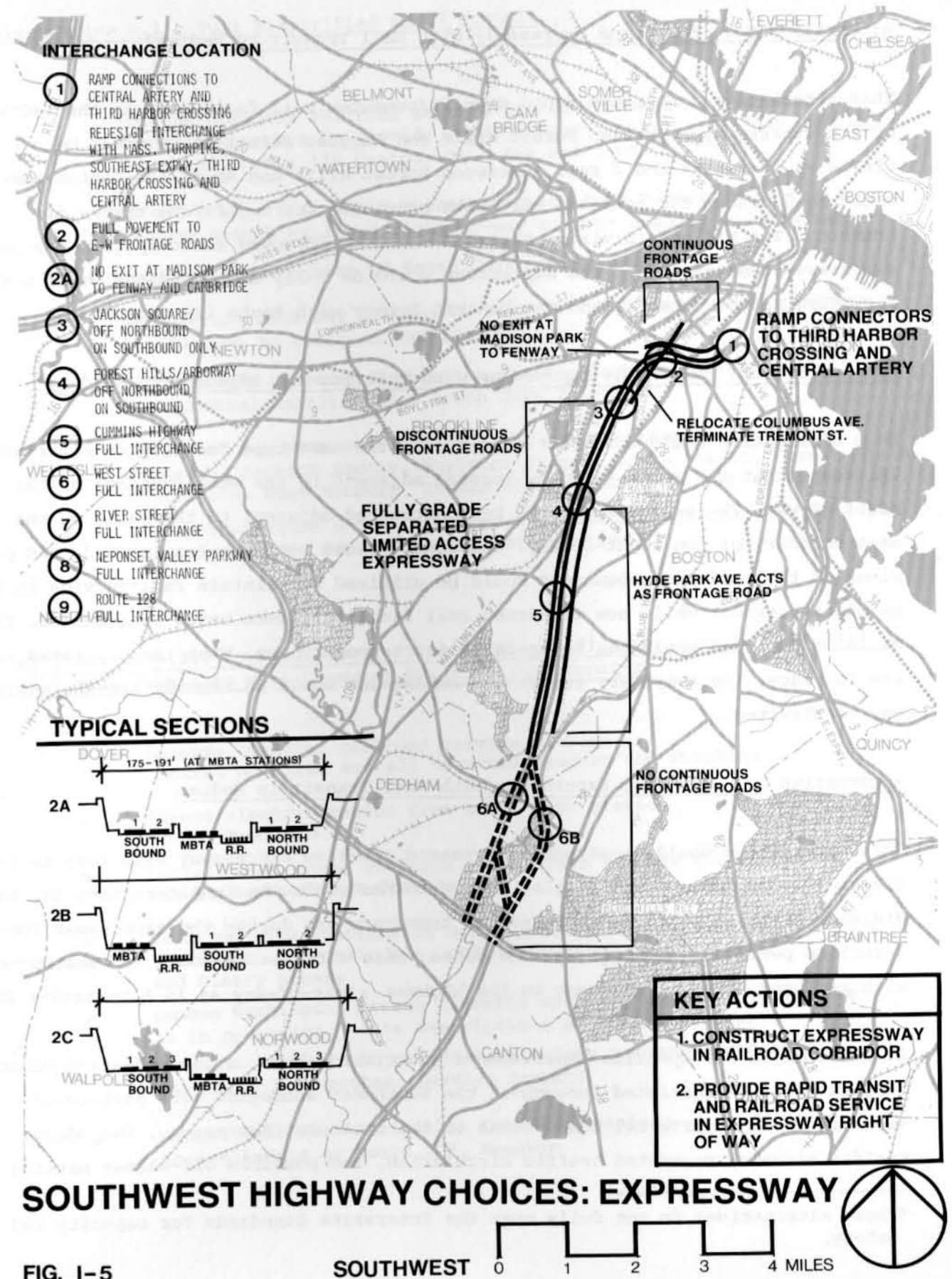


FIG. I-5

Alternative 2A: Four-Lane Expressway with Rail Transit in Median*

This alternative constructs rapid transit/commuter rail facilities in the median of the expressway. Between Forest Hills and Ruggles Street there would be 5 tracks -- 3 transit and 2 rail. Between Forest Hills and Route 128 Canton there would be 2 tracks for commuter rail with provision for two future tracks for transit. The Midlands Division Railroad would be improved for temporary use during expressway construction. The expressway would be fully depressed and would connect the Third Harbor Crossing and the Central Artery with Route 128 Canton.

Alternative 2B: Four-Lane Expressway with Rail Transit Adjacent to Roadway*

This alternative would construct essentially the same type facility as Alternative 2A except that the rails would be located adjacent to the west boundary of the right-of-way. The expressway would be constructed adjacent to the rails on the east boundary of the right-of-way. Temporary tracks would be constructed, and portions of the railroad embankment would be utilized to maintain rail service in the mainline corridor while new depressed rail facilities were being constructed. The Midlands Railroad would not be upgraded for temporary use. When the depressed rails are in place, the temporary tracks and embankment would be removed and the expressway constructed.

Alternative 2C: Six-lane Expressway with Rail Transit in Median

This alternative would construct a depressed six-lane expressway with four rails in the expressway median from Ruggles Street to Readville. As in Alternative 2A, the Midlands Railroad would be upgraded for temporary use during the expressway construction period. (Although not indicated, this alternative could be constructed with rail and transit, adjacent to the highway right-of-way as in Alternative 2B.

In addition to the specific improvements identified above, a comprehensive TOPICS program would be initiated throughout the Southwest subregion with particular emphasis on major arterial connections to the Southwest Expressway, including traffic signals, re-routed traffic circulation, and possible off-street parking.

*These alternatives do not fully meet the Interstate Standards for capacity and safety.

I.A.3.2. TRANSIT ALTERNATIVES

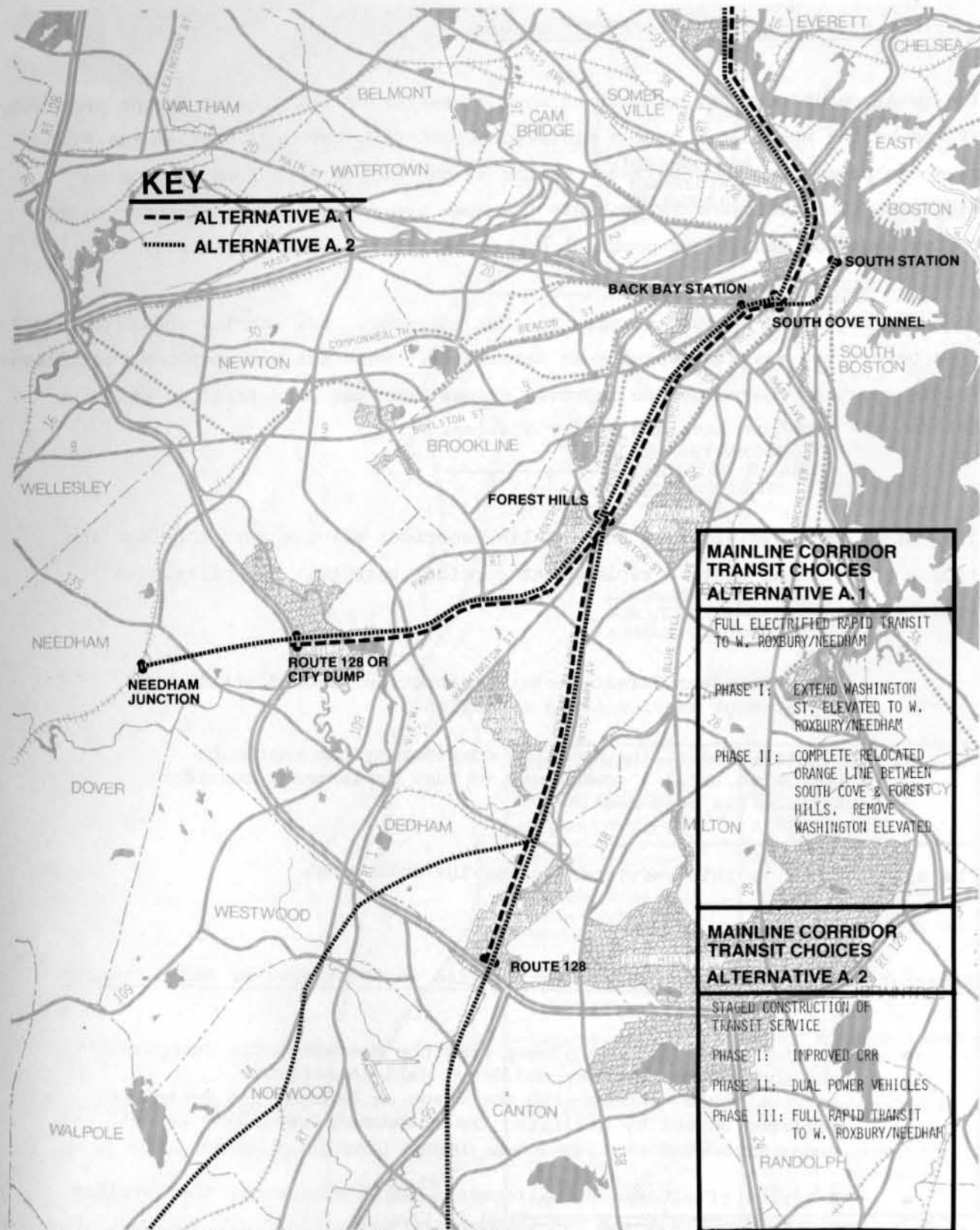
In addition to the alternative highway improvements, a series of transit improvement choices within the Southwest subregion are possible as part of a comprehensive transportation system improvement program. Those options include choices in 3 major corridors:

- Penn Central Mainline corridor -- Back Bay station to Route 128
- Replacement Service Corridor -- South Cove to Dudley Station and Mattapan Square
- Circumferential Corridor -- South Station to Kendall Station or Harvard Square

Corridor A: Penn Central Mainline Corridor

In this corridor, electrified rapid transit options to serve the inner city and middle suburban areas, particularly to the west, and improve commuter railroad service between Back Bay and South Station and suburban communities beyond Route 128 are the major facilities considered. Transit improvements both to the west and south are essential elements in the overall subregional transportation system.

Key choices in this corridor deal not with the ultimate long-range plan but rather with the staging of the transit improvements. Due to limitations in funding the differences in staging in this corridor have an impact on the improvement program in the replacement corridor. In general, Alternative A.1. concentrates on investment in the mainline corridor first and then improves the replacement corridor. Alternative A.2. invests in both corridors simultaneously providing a series of moderate incremental improvements in service in both corridors. The sequence of improvement activities for both alternatives is set forth in the following paragraphs.



SOUTHWEST TRANSIT CHOICES: MAINLINE CORRIDOR

FIG. I-6

SOUTHWEST 0 1 2 3 4 MILES



Alternative A.1: Full Electrified Rapid Transit

- Improve commuter railroad service in Penn Central Main Line and Franklin Branches to provide service from existing stations beyond Route 128, Route 128 Canton, Back Bay and South Station
- Extend Orange Line rapid transit service from Forest Hills via Needham Branch railroad right-of-way to West Roxbury and Needham.
- Complete construction of South Cove tunnel under Mass. Turnpike
- Reconstruct Back Bay Station to include 2 MBTA tracks and platform in addition to railroad facilities
- Relocate the existing Washington Street Elevated (Orange Line) to the Penn Central Mainline from South Cove Tunnel to
- Construct new MBTA stations at Mass. Ave, Northeastern, Roxbury Crossing, Jackson Square, Boylston Street, Green Street, Forest Hills, Roslindale, West Roxbury, Temple Street, and City Dump or Route 128
- Remove Washington Street Elevated when new replacement service is in operation. (See descriptions of Alternative B)

Alternative A.2.: Staged Construction of Electrified Rapid Transit Utilizing Dual Power Vehicles with Commuter Railroad Improvements

- Improve commuter railroad service on Penn Central Mainline and all branches Needham and Franklin
- Extend electrification from South Cove station to Northeastern
- Install dual power vehicles and storage sidings for Power Pak at Northeastern Station
- Construct new stations at Northeastern, Jackson Square, Forest Hills, Roslindale, West Roxbury, Cummins Highway and Cleary Square
- Remove Washington Street Elevated when new replacement service is in operation. (See descriptions of Alternative B)
- Completion of all intermediate stations between Northeastern and Route 128 Needham (Needham Branch)
- Extend full electrification from Northeastern to Roslindale or Route 128, Needham

It should be noted that all of the present alternatives differ from the previous plans for this corridor is that they call for the maintenance of inter-city rail facilities. This change is in response to increased awareness of the future value of highspeed intercity ground transportation on the part of both the Federal and State Governments.

On September 18, 1971, Governor Sargent joined with the other New England governors in the following:

"We declare that the establishment of a viable regional rail system is a vital, although long and seriously neglected, component of a balanced New England Inter-City Transportation System. We believe that the Achievement of this objective is of the highest priority to the New England states.

We find that it would be technically feasible and economically justifiable to establish by 1975 two and one-half to two and three-quarter hour Boston-New York rail passenger service. We are committed to the realization of this objective....

We urge and support continued but greatly expanded research, development and demonstration by the U.S. Department of Transportation on very high-speed transportation system which hold promise for the achievement of 90-minute service or less in the Boston-New York corridor by the mid-1980's."

Corridor B: "Replacement Corridor" Service

The replacement corridor is defined as that sector of the City of Boston presently served by the Washington Street Elevated; South End, Roxbury, and Jamaica Plain, plus the presently under-served sector of the city from Dudley Station to Mattapan. This corridor is probably the most transit-dependent corridor in the region based on density of population, income and automobile ownership.

To avoid degrading transit service in that corridor, new service should be available before the existing service is terminated. When the Washington Street Elevated is removed, there must be improved transit service in operation, at least between the downtown area and Dudley Station.

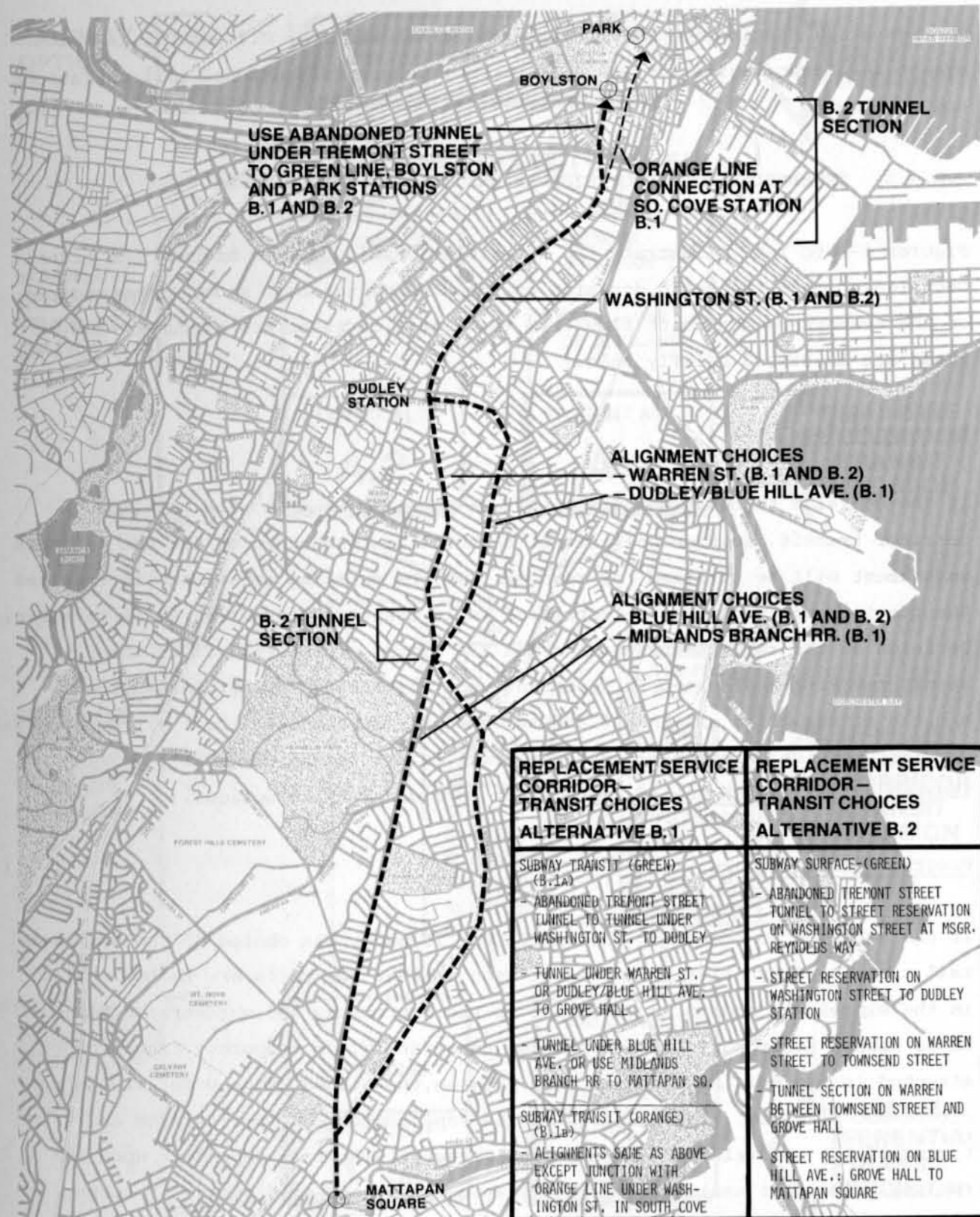
This means that decisions on the mainline corridor service must consider the timing and funding of this replacement corridor service. Two principles apply in this regard:

- The Washington Street elevated cannot be removed until replacement service is in operation
- Construction of the Mainline corridor system cannot be completed until a commitment to fund replacement corridor service has been made.

The alternatives in this corridor include the following:

Alternative B.1 -- Subway Replacement Service -- Light Rail or Rapid Transit

- Construction of a new subway from the Massachusetts Turnpike through Dudley Station, and Grove Hall to Mattapan. Service would connect with the Green or Orange Line System at Boylston Street by utilizing the abandoned Green Line tunnel under Tremont Street, or a new Orange Line junction at South Cove.
- A series of alternative alignments exist throughout the corridor which are more fully described in Chapter III.C.



SOUTHWEST TRANSIT CHOICES: REPLACEMENT CORRIDOR

FIG. I-7 SW/SO. COVE TO MATTAPAN SQ. 0 2000 4000 8000

Alternative B.2.: Subway/Surface Light Rail Replacement Service

- Construct a new light rail facility between Boylston Street and Mattapan via Dudley Station and Grove Hall. For the most part, this service would operate in the median of existing surface streets similar to the Green Line operation on Beacon Street. In areas where street right-of-way conditions restrict or prohibit both automobile and transit operation, the transit system would be tunneled. These tunnel sections vary with the alignment chosen and are identified in Chapter III.C.

Corridor C: Circumferential Corridor Services

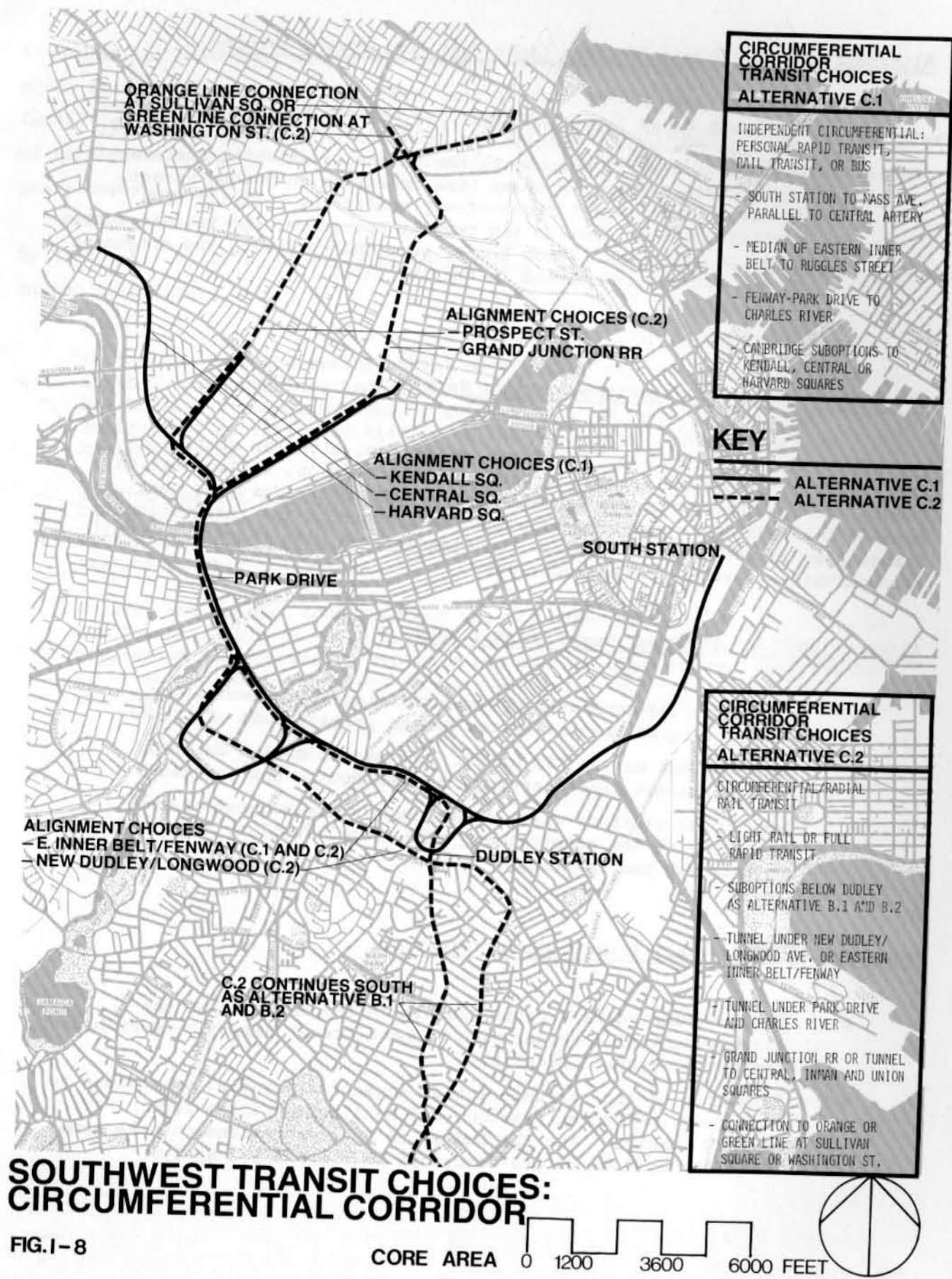
The circumferential corridor is defined as the semi-circular section of the cities of Boston and Cambridge between South Station, Dudley Station, Fenway, Boston University and Kendall Square. This corridor lies just outside the downtown core of Boston, and passes through the institutional fringe area in Back Bay. There are two alternatives with respect to public transportation service in this corridor.

Alternative C.1.: Personal Rapid Transit (PRT)

- A fully grade-separated system utilizing a new technology personal rapid transit system as the primary mode of travel.
- New stations on the PRT at all intersections with existing radial transit lines serving downtown Boston and Cambridge.
- Additional stations where demand levels are highest, particularly in the hospital and educational facility complexes in Back Bay and Cambridge.

Alternative C.2.: Rail Transit Circumferential

- Grade-separated rail rapid transit in the sections of the circumferential corridor with highest travel demand between Dudley Station to Kendall Station.
- Extension of the circumferential segment via radial extensions to Mattapan from Dudley Station, and Wellington Circle from Kendall Station. For the Dudley to Mattapan extension, the same alignment options as are described in B.1 and B.2 apply.



The essential distinction in the concepts of Alternatives C.1 and C.2 is the use of new technologies for system equipment versus conventional rail operations and equipment.

I.A.3.3. INTERRELATIONSHIP OF HIGHWAY AND TRANSIT ALTERNATIVES

Figures I-9 to I-12 illustrate the interrelationship between highway and transit decisions. Once the basic decision on the highway has been made, the structure of the transit option which flow from that basic decision are circumscribed. These are described briefly below:

Program Package One:

If the decision to construct a new surface arterial is made, the mainline corridor transit decision consists of a choice as to whether or not the railroad embankment will be utilized, or removed. If the existing embankment is retained the staging construction of electrified rapid transit Alternative A2 is possible. Decision on the replacement service and the timing of the removal of the Washington Street elevated is dependent upon the funding priorities assigned and the construction staging of subway or subway/surface service. Circumferential corridor service, whether conventional rail or new technology (PRT), is independent of the choice of replacement corridor service options.

Program Package Two:

If the decision to construct the expressway is made, the choice of the mainline rail transit alternative is dependent upon whether the rails are to be located in the expressway median, or adjacent to the expressway and whether the Midlands Branch Railroad is to be upgraded temporarily, or temporary tracks constructed in the mainline. Under this program, the staged program for rapid transit is not possible. The decision on the replacement corridor service and the timing of the removal of the Washington Street elevated is dependent upon the funding priorities assigned and the construction staging of subway or subway/surface service. Circumferential corridor service, whether conventional rail, bus or new technology (PRT), is independent of the choice of replacement corridor service options.

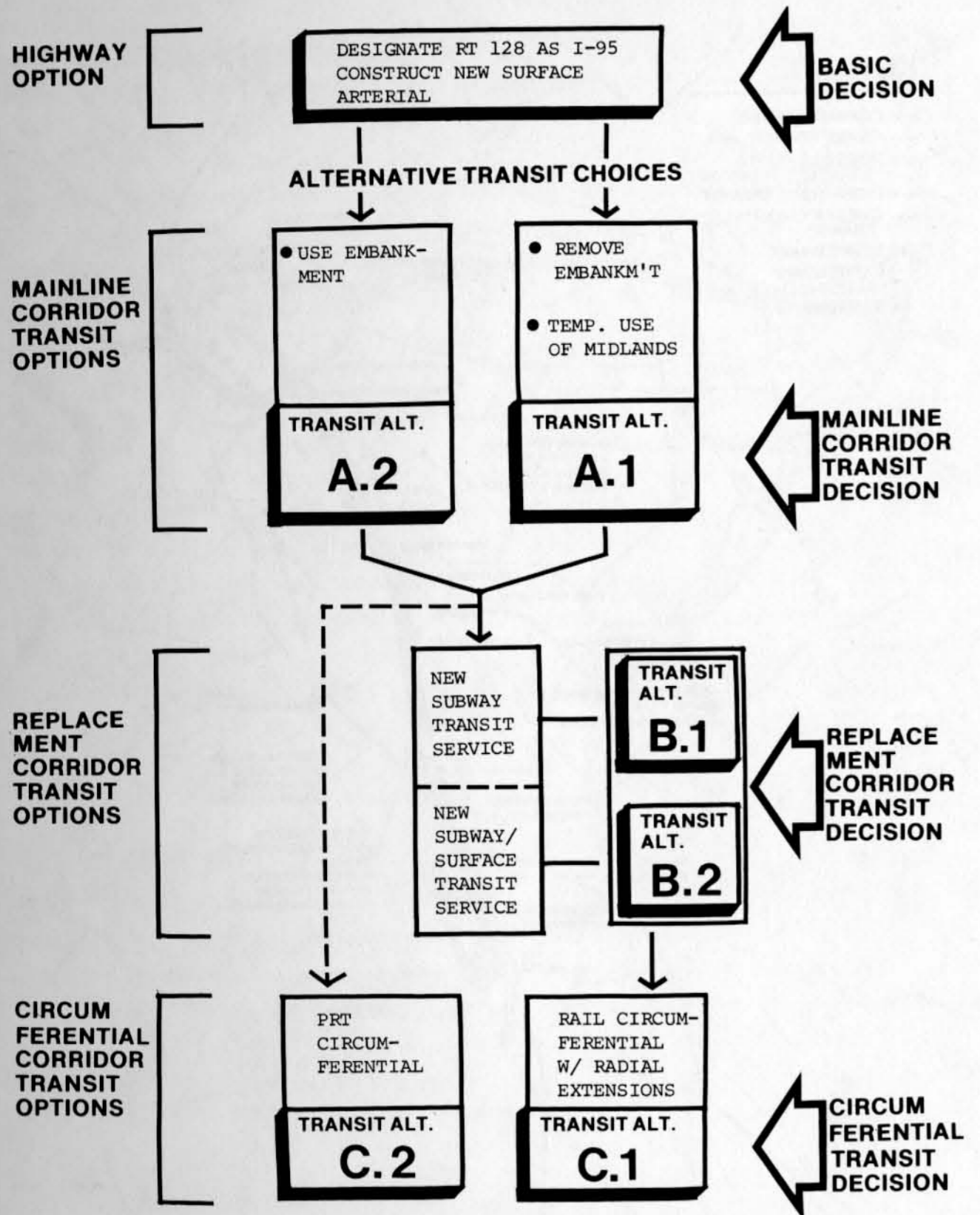


FIG. I-9 TRANSPORTATION IMPROVEMENT CHOICES: PROGRAM PACKAGE 1 – NEW ARTERIAL STREET

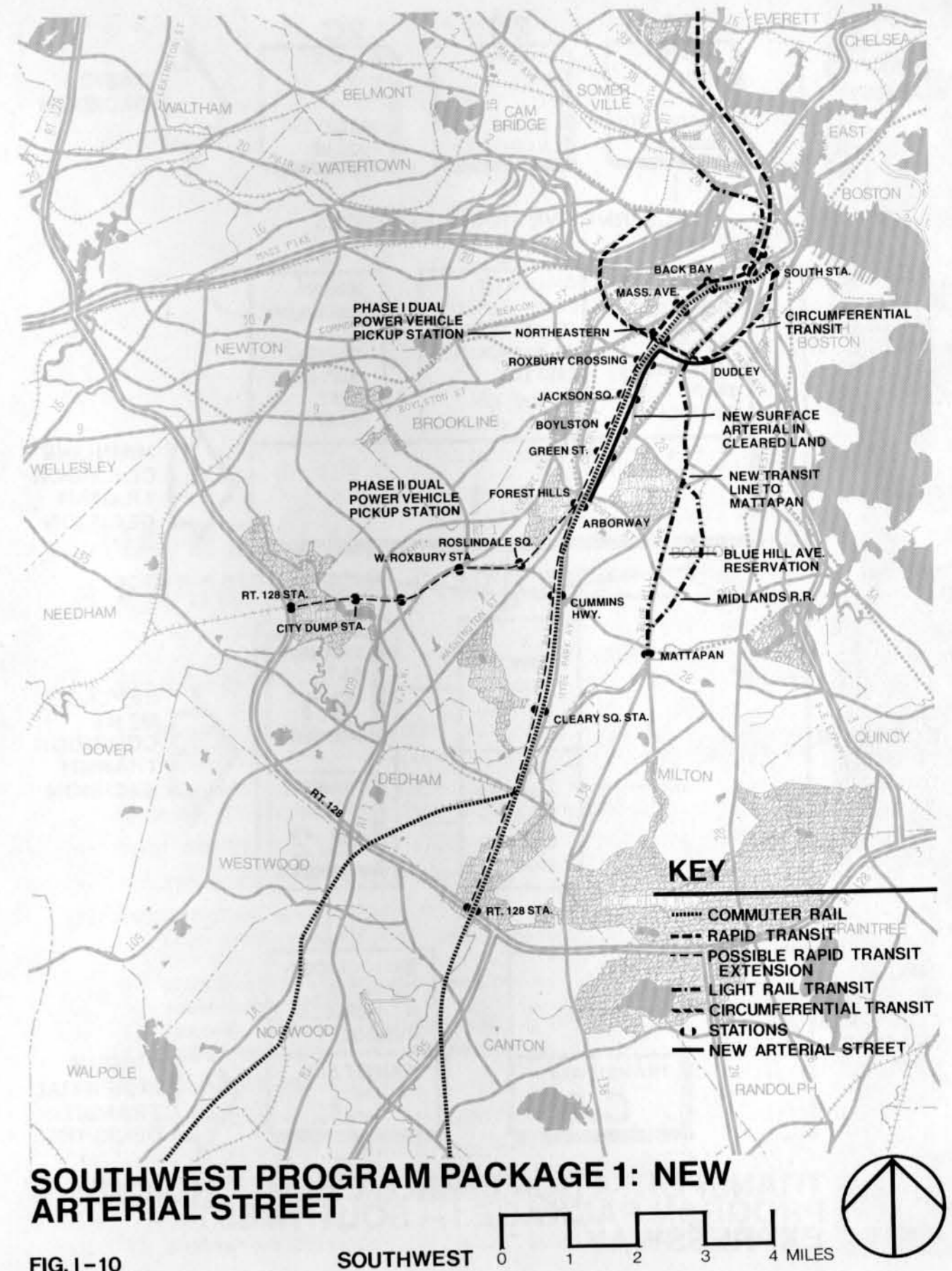


FIG. I-10

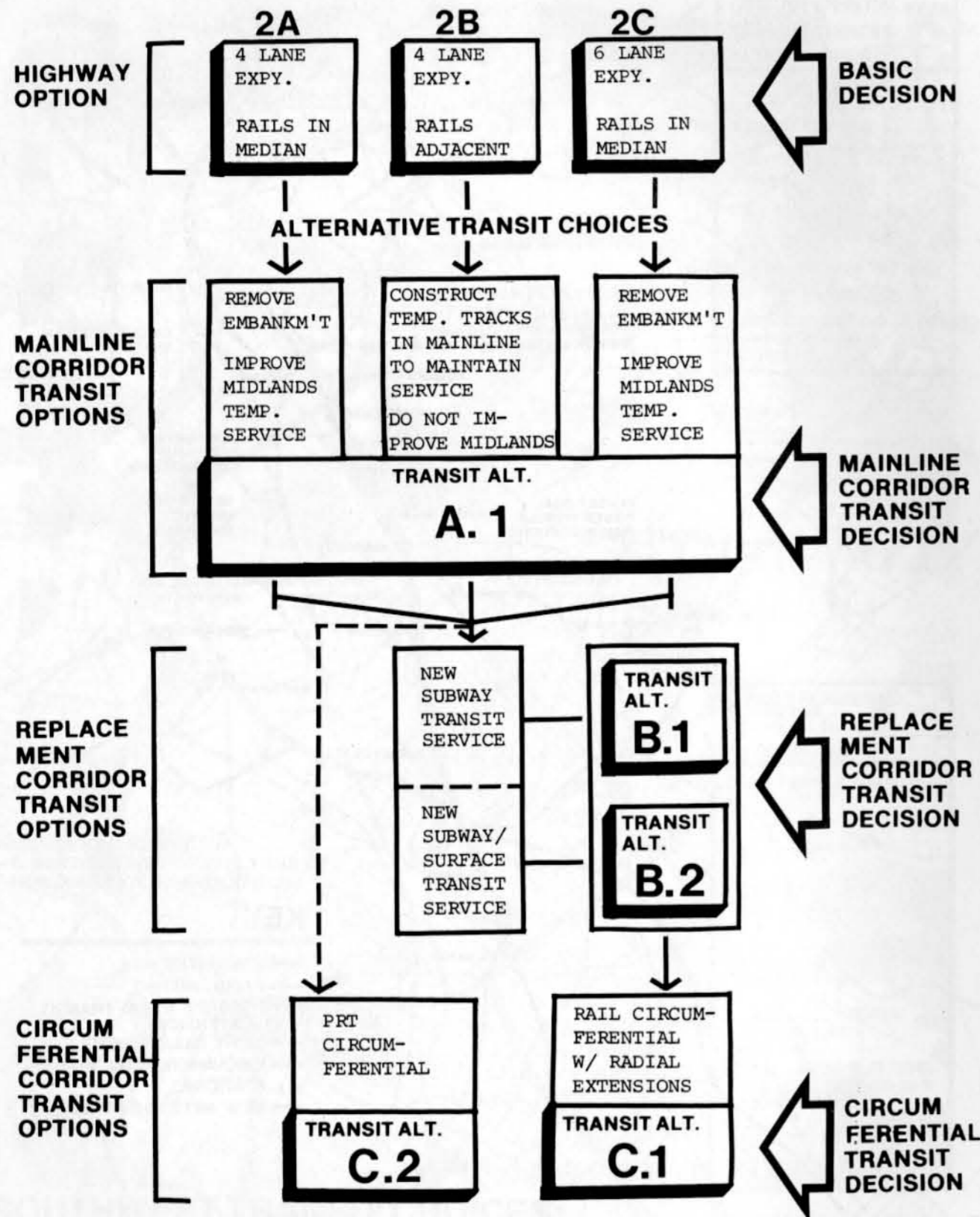


FIG. I-11 TRANSPORTATION IMPROVEMENT CHOICES: PROGRAM PACKAGE 1 - SOUTHWEST EXPRESSWAY

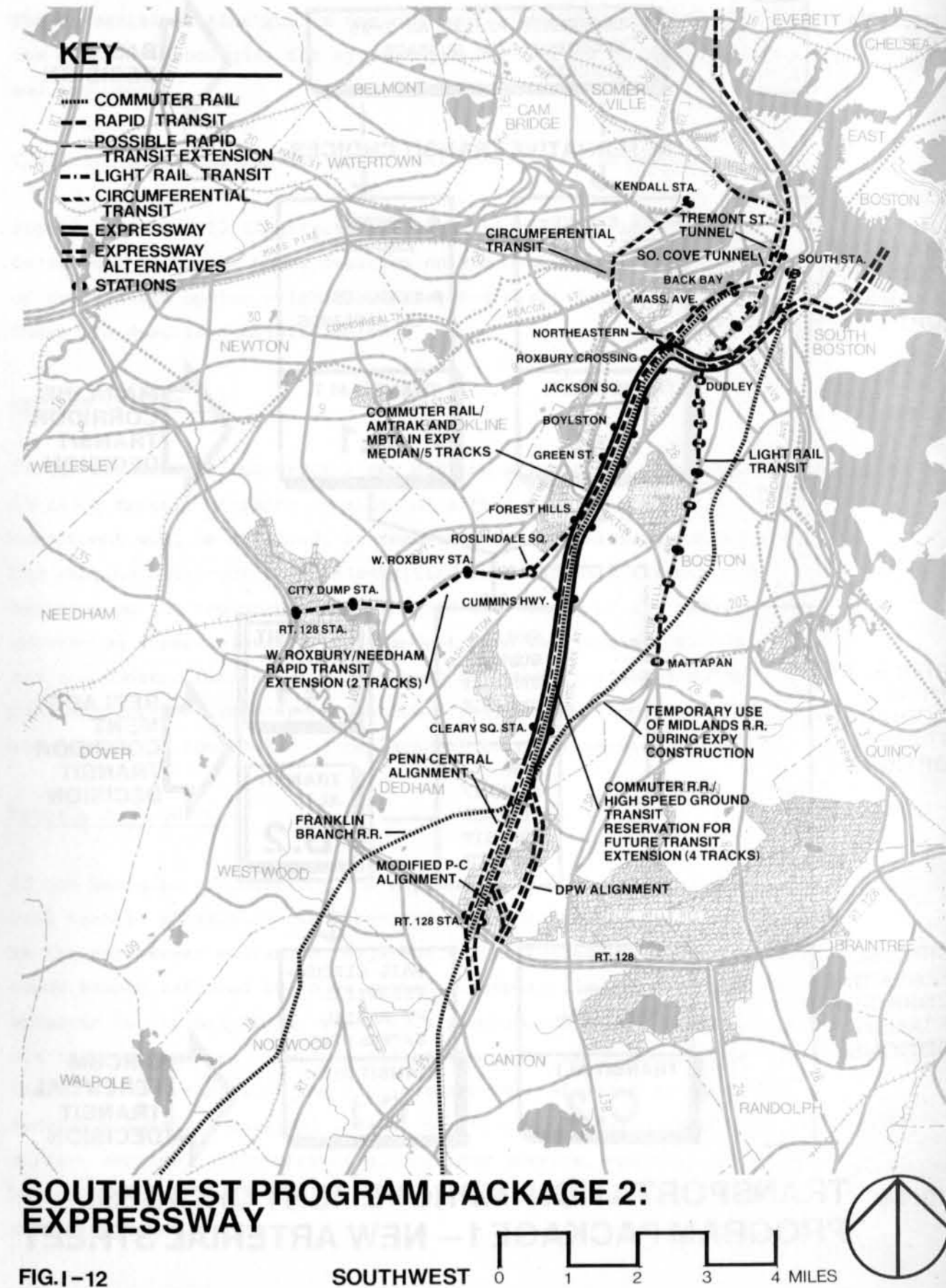


FIG. I-12

I.B.1. GOVERNOR'S POLICY: INCREASED ROLE FOR TRANSIT TO DOWNTOWN BOSTON

This chapter is designed to assist decision-makers in dealing with the questions posed in the previous section. It sets forth major constraints on decisions -- constraints of state policy, federal and state law, technological feasibility, and fiscal responsibility. In addition, it sets forth key alternative transportation service approaches and alternative visions of what the Boston region's future could be like in order to evaluate the particular transportation improvement proposals described in this report. These constraints and objectives have been, in effect, the main planning and design criteria during Phase II.

In Sections II and III, the particular Southwest improvement proposals are described and evaluated, facility by facility, with advantages and disadvantages, costs and benefits, compared. This section is intended to provide a larger framework for making those particular choices.

At the completion of Phase I of the BTPR, Governor Sargent announced a set of basic decisions which narrowed the range of facility alternatives for detailed Phase II study, and established policy objectives to guide the continuation of the BTPR's transportation planning efforts.

The Governor's December 29, 1971, statement articulated several fundamental reasons why new radial expressways designed to accommodate peak-hour travel demands to downtown Boston are unacceptable as a matter of public policy:

- Inability of already crowded Boston core streets to receive and distribute additional expressway traffic
- Lack of adequate off-street parking capacity, and inability to provide such capacity in an efficient, orderly fashion
- Competition with line-haul transit service, both existing and proposed, leading to increased transit operating deficits
- Inescapable social disruption and environmental degradation as a result of direct displacement, air and noise pollution, visual intrusion and so forth.

In light of these constraints, Governor Sargent directed the BTPR not to give further consideration to new expressways having more than four general purpose traffic lanes plus two special purpose travel lanes for buses, emergency vehicles, and other special vehicles such as minibuses, taxis, trucks and car pools.*

At the same time, the Governor recognized the importance of highways in meeting the travel demands of persons who work outside the downtown Boston core, who come to the core at times other than peak commuting periods, such as tourists and shoppers, or who have no effective means of traveling other than on highways, such as truckers. The BTPR was therefore asked to determine how much of this non-commutation demand for highway space could be accommodated at acceptable social, economic and environmental cost.

*Alternative 2C, with six general purpose lanes, has been included in order to compare highway service provided by a six-lane expressway with the proposed four-lane alternatives.

Finally, in order to provide efficient accessibility to downtown Boston and to maintain the continued growth and vitality of the region's central core, the BTPR was directed to consider innovative improvement programs for the metropolitan transit system. As stated by Governor Sargent:

"Our policy must be to encourage those who work in the Boston core to commute by transit ... Implementation of this policy will require an intensive effort to improve our public transportation system. It must take on a bigger share of the job. It will need facilities, services, and funds to do that job. We will look to the Planning Review, working closely with the MBTA, to develop better means of getting around in downtown, and of serving areas that are not adequately served at present."

This policy of not meeting peak hour highway tunnel demands is presently in conflict with Sections 109(a) and (b) of Title 23 of the United States Code which states in part:

...[s]tandards to be adopted for the Interstate System...shall be adequate..to accommodate the types and volumes of traffic anticipated.... for the twenty-year period commencing on the date of approval...of such project.

It is for this reason that the four-lane alternatives are indicated as not meeting Interstate standards for capacity and safety. This reservation would not apply if the facility were funded as a non-Interstate highway.

Moreover, whether funded as an Interstate facility or not, the four-lane alternatives may be better able to comply with other conflicting standards contained in Section 109(g), (h), (i) and (j), which are designed to assure that:

possible adverse economic, social, and environmental effects relating to any proposed project on any Federal-aid system, have been fully considered...and the final decisions on the project are made in the best overall public interest, taking into consideration the need for fast, safe and efficient transportation, public services and the costs of eliminating or minimizing...adverse effects.

I.B.2. SPECIAL LEGAL PROTECTION OF PUBLIC PARKLANDS --THE NATIONAL ENVIRONMENTAL POLICY ACT AND SECTION 4(f)

The possible use of parklands and other environmentally significant lands for various transportation proposals was one of the principal factors leading to the creation of the BTPR. In particular, the proposed use of Lynn Woods on the North Shore and Fowl Meadow in the Southwest Corridor aroused substantial opposition among both local and national environmental groups. Other smaller-scale, but nevertheless important, conflicts with environmental resources are also presented by many of the highway and transit proposals under restudy by the BTPR.

These environmental concerns are given special focus by the legal requirements of the National Environmental Policy Act of 1969 (NEPA), and Section 4(f) of the Department of Transportation Act of 1966, as amended.

Section 102 of NEPA requires the preparation of a detailed Environmental Impact Statement for "major federal actions significantly affecting the quality of the human environment," including a description of the environmental impact, unavoidable adverse effects, alternatives, and irreversible commitments of resources. The DOT Transportation Act of 1966 is intended to result in a comprehensive evaluation of all the effects of federal-aid transportation projects that require the use of significant public parklands, recreation areas, wildlife and waterfowl refuges, and public or private owned historic areas. For every involvement with Section 4(f) lands, a Section 4(f) report must be prepared and included in the Environmental Impact Statement. The report must be sufficiently detailed to permit the U.S. Secretary of Transportation to determine that:

- There is no feasible and prudent alternative to the use of such land
- The program includes all possible planning to minimize harm to any park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use of such lands

If there is a feasible and prudent alternative, a proposed project using Section 4(f) lands cannot be approved by the U.S. Secretary of Transportation. If there is no feasible and prudent alternative, the proposed project must include all possible planning to minimize harm to the affected lands.

The Section 4(f) review differs significantly from the more general NEPA review in terms of:

- The geographic scope of the review -- only the designated classes of significant lands are protected by Section 4(f) while all environmentally significant consequences of a project are covered by NEPA
- The legal consequences which flow from the findings of the review process -- the use of Section 4(f) lands is prohibited if a feasible and prudent alternative can be found, but NEPA requires only a careful comparison and evaluation of the relative merits of various alternatives as a basic step in the decision-making process.

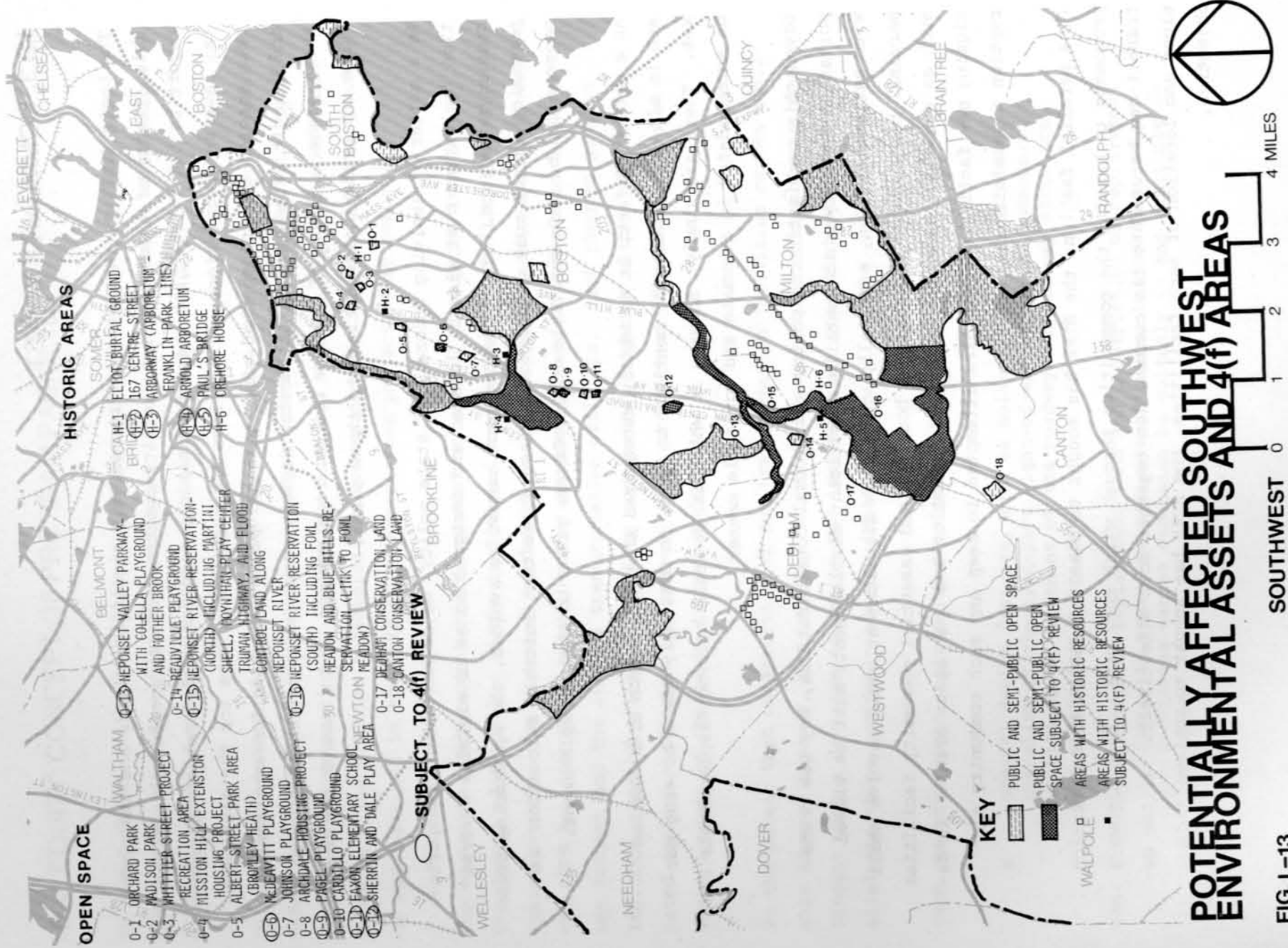
Although the Governor's decisions will be influenced strongly by his interpretation of the requirements of state and federal law, including Section 4(f), the ultimate responsibility for determining whether Section 4(f) has been satisfied lies with the U.S. Secretary of Transportation.

The 1971 U.S. Supreme Court's landmark Overton Park decision unanimously stated that the protection of parks and other 4(f) lands must be given "paramount importance" in determining whether any particular transportation facility should be approved for implementation.

Section 4(f) does not permit a wide-range balancing of competing interests, such as is permitted by NEPA. The Court noted in the Overton Park decision:

"The requirement that there be no feasible alternative route admits of little administrative discretion. For this exemption to apply, the Secretary must find that as a matter of sound engineering it would not be feasible to build the highway along any other route." (Emphasis Added)

Thus, a "feasible" alternative is any substitute route or project which is physically possible to construct, and which is safe to operate.



POTENTIALLY AFFECTED SOUTHWEST ENVIRONMENTAL ASSETS AND 4(f) AREAS

FIG. 1-13

I.B.3. COMMUNITY IMPACT

With regard to the definition of "prudent", the Overton Park case held that an alternative is prudent:

"...unless there were truly unusual factors present in a particular case of the cost or community disruption resulting from alternative routes reached extraordinary magnitudes. If the statutes are to have any meaning, the Secretary cannot approve the destruction of parkland unless he finds that alternative routes present unique problems." (Emphasis Added)

As is often the case in Supreme Court opinions, the Court did not define precisely what would constitute extraordinary magnitudes or unique problems. These issues are assessed on a case-by-case basis by the U.S. Secretary of Transportation, state transportation agencies, and in some instances, by federal courts.

The basic findings regarding environmentally significant lands and the probable effects of transportation facility construction are presented in this report to aid in reaching the determinations required by federal environmental laws and regulations. These laws and regulations have for the most part been enacted and interpreted since original plans were made for expressways and transit extensions in the Boston region, requiring a re-examination of those plans in light of the new federal requirements, and a search for feasible and prudent alternatives to those plans.

As a matter of evolving federal and state policy, major new urban transportation facilities must also be located and designed so as to minimize adverse community impacts. Where displacement cannot be avoided, the sponsoring transportation agency must give concrete assurances that suitable relocation resources can be made available to displacees prior to their displacement.

As a matter of fact, it is widely recognized that the Boston area has had, and in all likelihood will continue to have, an extremely tight housing market. There are simply no ways in which large-scale housing displacements can be accommodated in a humane and equitable manner.

Given this combination of policy and factual considerations, any new transportation facility which entails significant displacements must be viewed with extreme caution, especially where such displacement would involve small marginal businesses, lower-income housing, and essential community facilities such as schools, churches, and local recreation and open space areas. In designing new facilities, the BTPR attempted to keep any such community disruption to a minimum.

In a parallel fashion, the BTPR has sought to plan and design transportation proposals to benefit the communities through which they pass. Both highways and transit can be used to tie communities together more effectively. In the design and location of such facilities, the BTPR has sought to achieve this objective.

I.B.4. EQUITY: CONCEPT OF PROGRAM PACKAGES

As noted above, the basic planning principle guiding the effort of the BTPR has been to identify alternative transport facilities and systems which cause minimum environmental degradation and community disruption.

Nevertheless, transportation progress implies change, and any change in dense urbanized areas inevitably causes a certain amount of disruption. Equity requires full compensation to all who are affected negatively by transportation projects. The BTPR has endeavored to develop programs and designs that leave no one worse off in the wake of transportation projects than before.

The equitable readjustment of transportation related disruption requires a broadening of the scope of the traditional transportation facility decision-making process. As discussed in detail in in subsequent sections of this report, the BTPR has identified comprehensive program packages for decision by Governor Sargent and the state's transportation officials. Each program package includes a set of transport facility components, together with a set of related actions which must be implemented in order to eliminate or reduce adverse impacts of the basic transport facility.

To the extent that construction of new transportation facilities causes avoidable adverse impacts, any decision to construct such facilities must be contingent upon a decision to design and implement all possible measures to eliminate those avoidable adverse impacts.

Such measures might include, in an appropriate case:

- Special design features, such as noise attenuation barriers, tunneling of the transport right-of-way, special landscaping, architectural treatment of the roadway and roadway structures, and pedestrian overpasses
- Acquisition of replacement land and construction of replacement facilities in areas where displaced homes, businesses, and public facilities cannot otherwise be suitably -- and equitably -- relocated

- Development of additional compensatory programs for those persons who -- although not physically displaced -- are significantly harmed as a result of project construction or operation

- Creation of new institutional mechanisms allowing continued community participation and review of detailed project planning and design activities following the termination of the BTPR.

In some instances, these associated programs can be implemented under existing laws and administrative regulations; in others, new legislation and institutional delivery mechanisms will be required. Moreover, due to federal funding limitations, portions of the costs of such programs may have to be supported largely with state funds.

In the final analysis, however, the cost of building a new facility as it should be done, dealing fairly and comprehensively with both displacees and the natural environment, will amount to only a small percentage of the total project cost, while the benefits to be derived by the individuals affected will in many instances be immeasurable.

I.B.5. INSTITUTIONAL ADAPTABILITY

Alternatives analyzed in this report assume that there are areas where existing state and federal laws will remain unchanged over the next decade, and other areas where modification in such laws is possible. Some changes in administrative mechanisms, particularly at the state level, are assumed to be possible within the existing statutory requirements.

Fixed institutional assumptions include:

- Existing environmental constraints or regulations will not be relaxed
- Existing relocation requirements will not be relaxed
- Zoning powers will not be taken away from existing local jurisdictions
- The federal government will not participate in operating subsidies for transportation facilities other than on demonstration projects

There are other areas where institutional change appears possible and desirable, and -- in some instances -- essential if program packages are to be implemented which minimize environmental and neighborhood disruption, provide equitable compensation for unavoidable damages, and combine highway and transit facilities into an integrated transportation service system. The precise nature of such changes will vary with particular decisions made; however, the principal areas where changes appear most desirable are summarized below.

I.B.5.1. COORDINATION OF HIGHWAY AND TRANSIT PLANNING OPERATIONS

All improvements or extensions of the transit system should be made in close coordination with major highway or arterial street improvement programs which may have positive effects on transit patronage. In the Southwest, proposed highway and transit options have closely interrelated markets since they are identical catchment areas. Moreover, the potential use of the Penn Central corridor for both roadway and transit improvements, as well

as the desire to continue rail service, leads to alternate programs with close physical design interrelations, including complex staging problems. This relationship extends to terminals, including station areas and park-and-ride facilities which should be planned and built as integral components of overall highway and transit projects. Most, if not all, of the needed coordination between DPW and MBTA can be achieved within existing statutory powers. Finally, the operation of the street system and enforcement of traffic laws to provide preferential treatment for local bus operations is an important and overlooked aspect of coordination.

I.B.5.2. MODIFICATION OF TRANSIT SERVICE AND ASSESSMENT PROGRAMS

Considerable discontent has arisen among the 79 constituent cities and towns which form the MBTA service district. This discontent has roots in two closely related issues -- the quality of service provided, and the cost of service as expressed in the annual operating deficit assessments collected from the localities. Several solutions have been put forward. One would return a measure of control over the provision of local transit service to individual cities or towns, or groups of cities and towns. A local transit sub-district might determine and pay the net costs of routes, schedules, and fares of all local bus services, subject to review by the MBTA for consistency with the requirements of the regional line-haul express and commuter services. These latter facilities would remain under the control of the MBTA as a whole. A second solution which addresses the deficit funding issue would have the Commonwealth assume the cost of all or a portion of the annual operating deficit. Additionally, the assessment formula itself should be drastically revised. For instance, communities could be encouraged to seek the location of transit stations within their borders; currently the portion of the deficit paid by any such community increases as the number of transit riders who board in that community increases. A system, imposing less of the deficit on such communities, would be worth consideration. Many other issues raised by the assessment formula need serious consideration if the objective of an effective public transportation system is to be achieved.

I.B.5.3. SPECIAL COMPENSATORY PROGRAMS

Actions designed to offset the negative impacts of transportation facilities are founded on existing property acquisition and relocation policies and procedures, but in many instances they go beyond what is presently permissible under general state law or practically possible given existing administrative practices. For instance, the proposed actions would include acquisition of replacement sites, construction of replacement buildings, compensation for loss of business during construction, etc. New administrative mechanisms, and possibly new legislative authority, will be required. Moreover, given the single-purpose transportation functions of MBTA and DPW, it is essential to create ad hoc entities with adequate powers to prepare detailed plans and implement the broad range of compensatory programs required to offset adverse transportation impacts. These ad hoc entities would include representatives of local governments and affected citizens or major interest groups, and would function as a review board during the project execution phase. Since impact-offsetting programs are presented by the BTPR as necessary components and pre-conditions to any "build" decision on the facilities under study, the legislative requirements and administrative mechanisms for their implementation must be accorded priority attention.

I.B.5.4. LAND DEVELOPMENT IMPLEMENTATION

A number of proposals are made to develop the land adjacent to possible new highway and transit facilities to produce benefits to the surrounding community. Implementation of such joint development proposals will require the creation of special development entities, capable of formulating and carrying through to completion the land development schemes. Such implementation requires effective community participation as well as firm funding commitments from public and private sources. New ad hoc organizations tailored to the particular institutional and land use contexts of the proposed location are called for. In some instances these can be created by agreements among existing agencies; in some instances, new legislation may be required.

I.B.6. TECHNOLOGICAL FEASIBILITY

The BTPR is concerned with both the present and the future. It is attempting to avoid a preoccupation with the long-range future at the expense of immediate needs. At the same time it is attempting to devise an evolutionary strategy to transport planning which, while building on existing sunk investment and ridership habits, does not preclude options to take advantage of new technologies as they become available.

The Governor's commitments to decision-making require that the alternative transportation improvements be implementable with known off-the-shelf technologies and not be dependent on unpredictable research. This does not mean that the Boston area is limited only to those kinds of facilities it now has.

There are promising highway and transit technologies which are available but have not yet been widely applied. Several of those under serious consideration by the BTPR are listed below.

- Dual-powered trains -- a transit vehicle which can run on non-electrified suburban railroad tracks and in electrified downtown transit tunnels. This would extend the downtown distribution capabilities of the present subway system to the suburban commuter. Requires hard core development using existing components. BTPR has investigated a number of possibilities for providing this capability. The most promising consists of using a power pak -- a separate vehicle containing turbine-powered generators -- which would automatically connect with the rapid transit train and supply power to the regular motors. Technically, this power-pak could probably be available within five years; however, there are numerous, jurisdictional and institutional difficulties which would have to be overcome. This concept is more fully described in Section III of this report.

- Personal Rapid Transit (PRT) -- a new technology, consisting of small automated vehicles running on a private grade-separated guideway. Vehicles most commonly are electrically-powered and run on rubber tires. Stations are off the trunk line, giving PRT the capacity for demand-responsive non-stop service from origin to destination, bypassing intervening stations, which can be frequently spaced without impinging on travel times. Pre-scheduled mode of operation is also possible. Vehicles and guide-

way can be small, offering a relatively private ride while fitting into tighter, less obtrusive configurations whether elevated, at-grade, or underground. Despite the small vehicles, close headways and the non-stop ride permit high-volume capacity. PRT is relatively noise- and pollution-free, and has lower operating costs than MBTA transit due to demonstrated, and is to begin actual operation in several examples across the country within the year.

- Within the general category of Personal Rapid Transit there is considerable variety possible in size of vehicle and capacity of system, suspension and propulsion technology, and details of operation and construction of the systems available. For the purposes of our investigations we have assumed size and technology constraints common to most of the rubber-tire-on-guideway systems, using a mid-sized (20 passenger) vehicle. Further technical analysis, simulation and design work is necessary to tailor a final specific system to the particular demands of this corridor.

- Dial-a-bus -- a minibus system which operates like a taxicab in response to a phone call but which is more efficient since it can be computer scheduled and can carry more than one person. This type of service is especially useful as a collection and distribution service to line-haul transit systems in lower density areas.

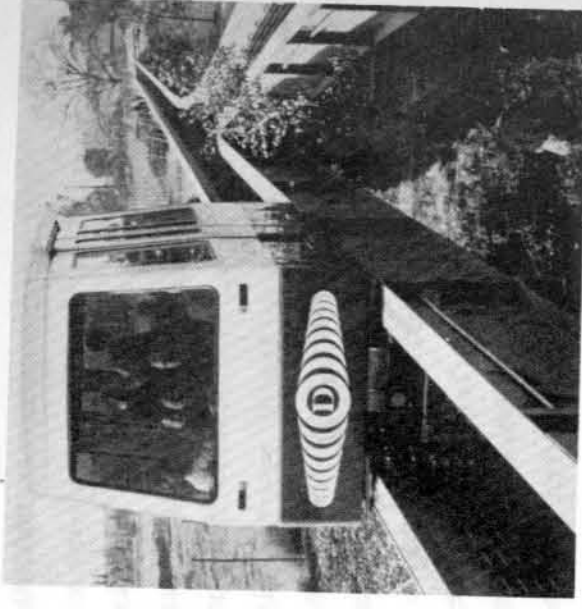
- Highway usage control -- Techniques are being investigated to provide selective control on the use of existing and proposed highways. Special use or bus lanes, flow metering at ramps, and reversible lanes are all examples of known techniques which can be applied.

Consideration is being given to securing federal and state grant assistance to develop applications of these technologies in the Boston region.



DUAL-POWERED TRAINS

A transit vehicle which can run on non-electrified suburban railroad tracks and in electrified downtown transit tunnels. Shown: the "Metropolitan," developed by the New York Metropolitan Transportation Authority for the Long Island Railroad.



PERSONAL RAPID TRANSIT

Computer operated small vehicles on a fixed, grade-separated guideway, running on demand basis. Shown: The Dashaveyor PRT vehicle.



DIAL-A-BUS

A minibus system operating like a taxicab in response to a phone call and carrying more than one person. Shown: the "Dial-a-Ride" system in operation in Haddonfield, N.J.

I.B.7. FISCAL RESOURCES AND FUNDING LIMITATIONS

Highways

State Highways are designed, constructed and maintained by the Department of Public Works with funds appropriated from the State Highway Fund. Construction costs of new routes situated on designated federal-aid systems are eligible for funding from the Federal Highway Trust Fund. Routes on the Interstate Highway System are eligible for 90 percent federal funding. Routes on all other federal-aid systems are presently eligible for 50 percent federal funding (to be increased to 70 percent after July 1973).

The principal federal-aid systems include:

- Interstate System -- a national system of major expressways, approximately 42,500 miles in total length, serving and connecting the major centers of population and economic activity
- Primary and Secondary Systems -- principal routes and arterials in both urban and rural areas. Examples in the Boston area include Route 2 and Route 128
- Urban System -- a recently created system located only in urbanized areas. It will include those routes serving major activity centers and high volume travel corridors
- TOPICS System (Traffic Operations Program to Increase Capacity and Safety) -- includes selected upgrading and improvements to city streets, such as provision of turning lanes, right-of-way widening, traffic control signals, and similar measures to improve traffic flows and safety

Public Transportation

Primary responsibility for the design, construction, operation, and maintenance of public transit facilities and services in the Boston area lies with the Massachusetts Bay Transportation Authority. Funds for capital construction are derived from bonds authorized by the State Legislature. Funds for bond retirement, maintenance, and operating costs are provided by transit fares, annual assessments of the 79 cities and towns in the MBTA district, and state aid.

Construction costs, including costs of acquiring buses and rail vehicles, are eligible for federal assistance in accordance with the Urban Mass Transportation Act of 1964, as amended. Up to two-thirds of such project costs can be met with federal funds.

Future Flexibility

Until the recent past, transportation funding flexibility at both the state and national levels has been limited, in part by statutory and constitutional restriction, in part by administrative unwillingness to undertake coordinated transportation funding programs under existing powers. This situation has begun to change; even more change can be expected in the future.

The BTPR process itself exemplifies the major trends in transportation funding flexibility. First, the BTPR is studying alternative transportation systems, both highway and public transit. Second, the BTPR is developing programs for offsetting the negative side effects of transportation facility construction, as required by evolving state and federal relocation and environmental protection guidelines. These programs are proposed for funding as integral parts of the basic transport facility construction project.

Various proposals at both the state and federal levels for broader funding flexibility, including the possibility of a combined highway/transit trust fund, are still in the formative stage. While there is increasing evidence that there will be much greater flexibility with regard to the use of federal transportation funds in the future, this is not the case now. Figure I-15 indicates the amount of federal monies made available to the state for various types of highway and transit facilities. It should be noted that no federal money is available for either the maintenance of highways or the operation of transit services. As shown by these figures, the amount of federal funds available for highway is over twice that for transit, and within the highway funds the bulk is available only for Interstate routes.

FIG. I-15

FEDERAL AID AVAILABLE TO MASSACHUSETTS FOR HIGHWAY
AND TRANSIT PROJECTS, 1972

Federal aid for transit:	\$ 77,400,000
Federal aid for highways:	
Interstate System	\$ 135,400,000
Primary and Secondary Systems	18,400,000
Urban System	3,500,000
TOPICS	3,100,000
Planning, Research, etc.	2,400,000
<hr/> TOTAL: Highways and transit	<hr/> \$ 240,200,000

A special sub-issue of the question of funding flexibility is that of Interstate System Connectivity. Considerable confusion has arisen as to the connectivity requirements of the Interstate Highway System. As stated in federal law (23 U.S.C. Section 103(e)), the Interstate System:

"shall be so located as to connect by routes as direct as practicable, the principal metropolitan areas, cities, and industrial centers (of the nation)..."

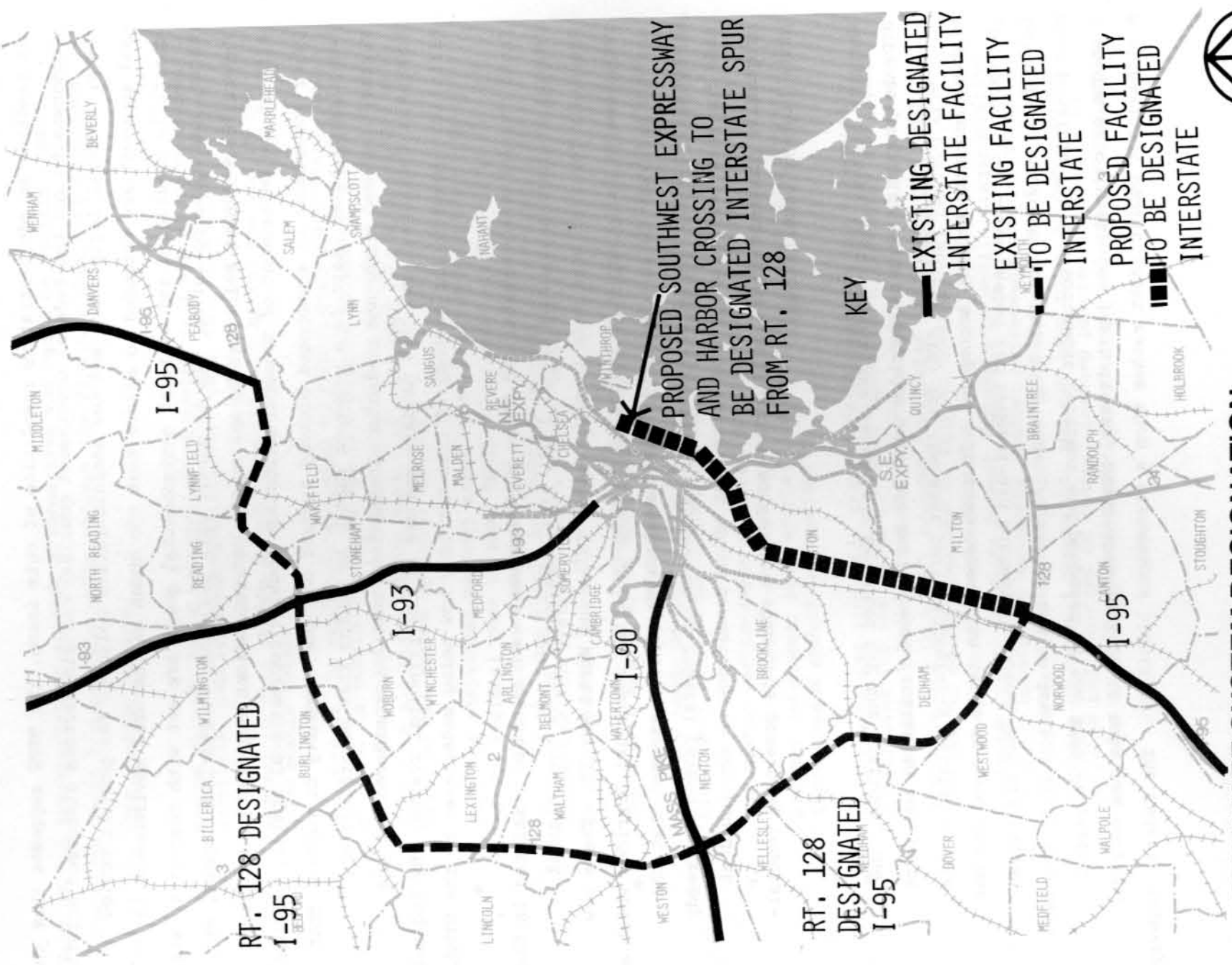
This does not require, as is sometimes assumed, that Interstate highways must connect with other Interstate highways at both ends. Interstate "spurs" have been approved in various cities throughout the country. Such spurs terminate at interchanges with non-Interstate arterial highways or major streets. The purpose of such spurs is to provide access to and from the local population and economic activity centers of a particular city and the basic through, or bypass, Interstate System. Any such spurs or extensions would be eligible for Interstate funding only if approved by the Federal Department of Transportation as part of an integrated system.

The Boston area already has two existing Interstate highways into its center -- Route I-90 (the Massachusetts Turnpike), and Route I-93. And the Northeast Expressway, built with state funds, is currently designated as a part of Route I-95, as are portions of the Central Artery. Thus, there are a number of alternative ways in which Interstate funds could be used to construct any of the new facilities under study here without necessarily requiring a new Interstate (I-95) by extending or creating spurs from existing routes. And, conversely, Route I-95 can be constructed inside the Route 128 perimeter without assuming that truly "through" traffic (Rhode Island to New Hampshire, for example) will use it; such traffic is more likely to use existing Route 495 and 128. (All BTPR traffic assignments, in fact, show such traffic -- small though it is -- on those existing bypass routes.)

Figures I-16 and I-17 indicate how it would be possible to construct any of the major expressway facilities under study by the BTPR as Interstate spurs from Route 128, or as extensions of other existing Interstate routes within Route 128. Thus, a "build" decision on any particular segment of the major expressway system now under study does not necessarily imply a "build" decision on all segments of the total system. Each segment can be judged in terms of its capacity to serve metropolitan travel and access needs.

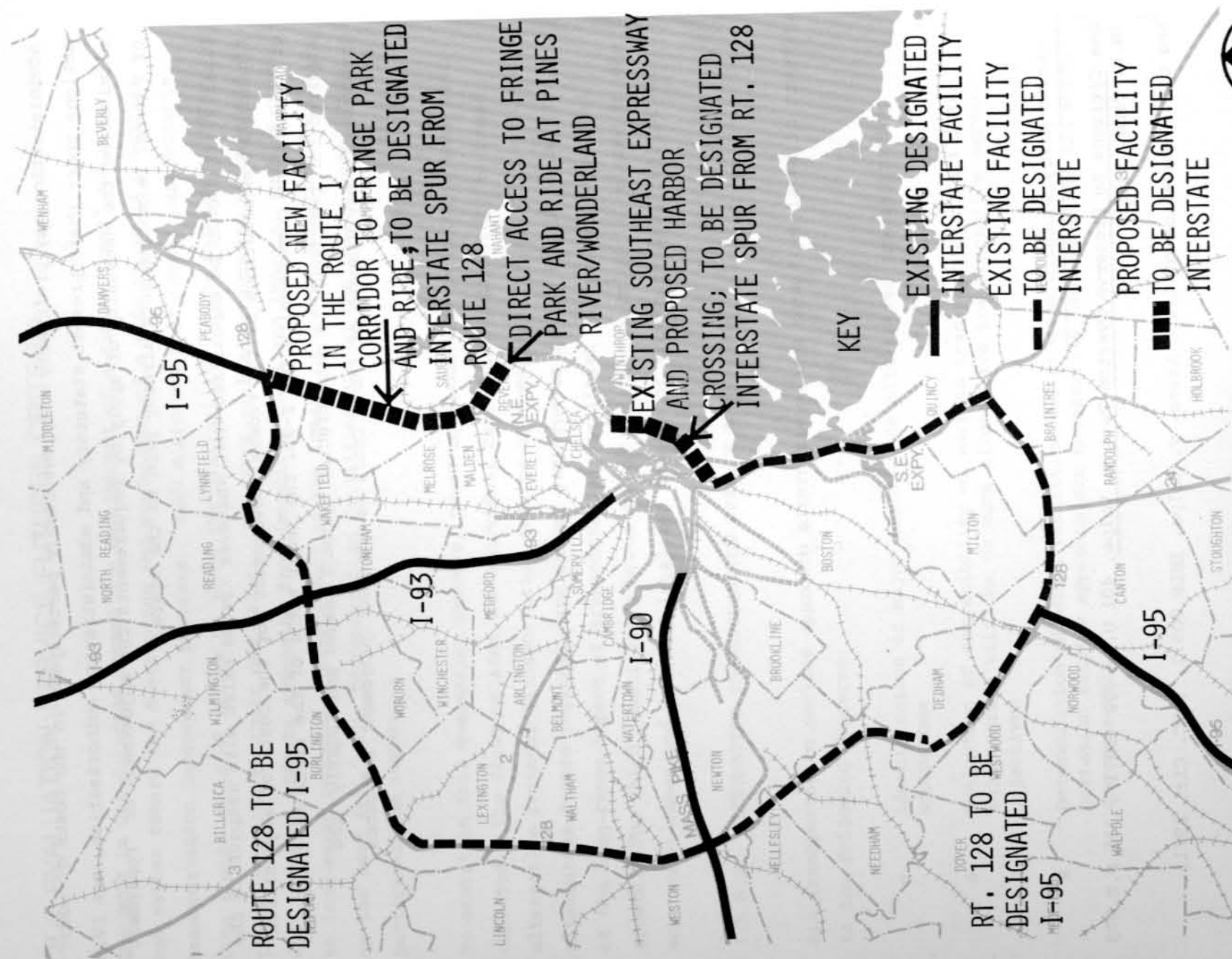
Possible Adjustments in Federal-aid Reimbursements

A special issue is raised by the fact that the state, with federal approval, has already expended \$34 million towards the acquisition and preparation of right-of-way for I-95 South in the Penn-Central corridor. The Commonwealth may ultimately propose for Federal approval an arterial improvement which will require less land than that originally designated for I-95 South. There is a possibility that the Federal Highway Administration may require some form of adjustment in the federal share of costs for which the state has already been reimbursed. For example, in the case of the arterial option, such improvements and their related joint development costs may be eligible for Federal-aid funding as part of the "urban system" network of streets. In this case, Federal reimbursement ratios would drop from "90-10" to "70-30".



**INTERSTATE SYSTEM DESIGNATION-
EXAMPLE 2**

FIG. I-17



**INTERSTATE SYSTEM DESIGNATION-
EXAMPLE 1**

FIG. I-16

In reaching an administrative resolution of this issue, the BTPR suggests that the Commonwealth and the Federal Government consider certain factors discussed briefly here. Federal legislation and new administrative policies for project review and approval are intended to assure that the human and natural environment is carefully considered and national environmental goals are met with respect to air, water, and noise pollution, use of public park and other recreational space, etc. Federal courts have held that in making the determinations required by Section 4(f) of the Department of Transportation Act (public recreational space), neither prior investment in a proposed highway project nor the community disruption that has already taken place is a relevant factor in making that determination.¹ Further, reduced scale and no-build alternatives must be considered for the Southwest Corridor,² and this mandate was one of the principal reasons why Federal officials agreed to the restudy of this Corridor now being undertaken by the BTPR.

These changed environmental and other requirements, such as those initiated in the Federal Uniform Relocation Act of 1971, have supervened since the original proposals for I-95 were made in the decades following World War II. These new requirements fully apply to Federal-aid projects in the Southwest Corridor which are now underway or in planning by the Commonwealth. It is assumed that the Commonwealth would not be privileged by adjustment of Federal payments already made for work performed in good faith, but which cannot now be continued as originally planned because of supervening federal standards governing Federal-state highway undertakings.

Whatever highway improvements are ultimately selected for the Corridor, the BTPR is proposing uses of corridor land for replacement facilities and joint development purposes which are, for the most part, integrally related to the highway investments they accompany. In such cases, the lands so used are not in "excess" of those needed for Federal-aid highway purposes, but are indeed being fully employed for such purposes. As emphasized in Section IV.B, the land uses possible for the Southwest Corridor and proposed by the BTPR represent a unique opportunity for joint federal-state-local action to make the corridor a significant public asset rather than a tremendous liability. The Federal Highway

Administration may profitably and justifiably participate in the costs of such actions under their present statutory and administrative authorization, see IV.B.6, eliminating the necessity of applying requirements for adjustment or "repayment" of Federal reimbursements already paid to the state.

Finally, it should be emphasized that whatever issues exist with respect to the financial contributions of the Federal Government for the costs of acquisition of land by the Commonwealth for I-95, the legal title of the state to the lands acquired for I-95 South is not affected by such issues and legally, the Commonwealth may dispose of those lands as its best judgement indicates.

¹See Citizens to Preserve Overton Park v. Volpe, 401 U.S. 402 (1971); 335 F.S.873 (W.D. Tenn. 1972).

²See D.C. Federation of Civic Assoc. v. Volpe, IELR 20572, (D.C. Cir. 1971).

I.B.8. EVALUATION: SERVICE, FUTURES, CRITERIA

The BTPR is not directed toward the development of a simple "best" solution but rather toward the description and evaluation of a wide range of potential transportation improvement programs. Such a process must permit participants with a wide range of values to judge the desirability of the various alternatives according to their own values. The BTPR evaluation process encompasses a wide range of effects extending from immediate localized impacts, such as noise, to long-range regional concerns such as the impact of a transportation facility on the need for other transportation facilities and on the future development pattern of the region.

To assist in this evaluation process, three complementary procedures have been employed. The first relates the individual facilities under study to broad alternative regional transportation service approaches. The second specifies alternative future regional development patterns to assist in the evaluation of the long-range impact of transportation facilities on future subregional growth. The third identifies a broad set of additional criteria related to the more short-range and detailed localized impacts of transportation facilities.

I.B.8.1. ALTERNATIVE TRANSPORTATION SERVICE APPROACHES

Six transportation service approach alternatives have been formulated in response to the following concerns:

- Identification of major region-wide alternative transportation approaches
- Evaluation of compatibility of various transportation facilities and programs with one or more alternative transportation service objectives
- Determination of which facilities and program within a given transportation service approach are necessarily tied together and which are separable.

Each of the transportation service alternatives was based on certain common assumptions about transportation which reflect the findings that have developed out of the BTPR studies to date.

- Boston already has a transportation system -- a set of expressways, arterials, public transportation services, etc. One prime purpose of the BTPR is to identify realistic proposals for improving or augmenting this system so that it will work better now and in the foreseeable future.

- The core of the region is expected to remain strong and vital, and, as such, to remain the focus for the highest volume of travel in the region well into the future. Providing access to the regional core from all parts of the region is important to the continued well being of the entire regional economy.

- Building additional highway capacity to serve access requirements to the regional core at peak hours by private automobile is not the most appropriate means available. The work travel access requirements of the core should be provided through an expanded public transportation system. Access to the regional core by auto should be discouraged.

- The Boston region needs much improved programs for new public transportation services including special services to handle the special mobility needs of people who do not have easy access to transportation, many of whom are living in the high density, in-city communities.

- The Boston region needs a strong program for improving ways to move goods into, out of, and within the region. Goods movement is largely highway dependent; both special purpose construction and operational improvements should be considered.

- Expressways and line-haul transit facilities are not necessarily substitutes for one another. Each functions differently and caters to different kinds of travel. However, radial general purpose expressways and line-haul transit facilities that serve the same corridor or communities may in fact be competitive, particularly in providing travel service to the core. In light of the clearly evolving policy to place primary emphasis on public transportation to serve core-bound movements, radial expressway proposals must be evaluated in terms of their potential effects on the market feasibility of transit proposals, and may have to be accompanied by policies and programs to control parking pricing and supply in downtown Boston and to control access to the expressways themselves.

Figure I-18 relates the major transportation facilities under consideration to alternative regional transportation service approaches. A review of this figure will indicate three important facts:

- A given regional transport service approach can be achieved through different combinations of the facilities.
- A given facility may be consistent with several transport service approaches. For example, building a Third Harbor Crossing is consistent with four of six transportation service approaches.
- In the Southwest, there is a wide variety and range in possible transit improvement program which are possible under either a build or no-build expressway decision. However, for reasons set forth in Section III of this report, those transit alternatives consistent with service approach 1 -- maximum service by highway -- have not been studied in detail.

The following paragraphs briefly describe the major features of each alternative transportation service approach.

Approach 1 -- Emphasizes maximum improvements to the expressway system consistent with evolving policy. Expressways included would consist of four general purpose lanes plus two special purpose lanes, designed to provide service for non-core destined, off-peak hour travel demand. Includes construction of through bypass system consisting of I-95 North, I-95 Relocated, the Third Harbor Crossing, the Boston Inner Belt and the Southwest Expressway, plus other improvements such as a Route 2 Mass. Turnpike connection and special purpose roadways in the Boston & Maine right-of-way on the Fitchburg Division.

Approach 2 -- Includes completion of a smaller scale (4-lane) expressway system of I-95 Relocated, the Third Harbor Crossing, Boston Inner Belt, and the Southwest Expressway, along with some improvements in line-haul transit, including whatever investments are consistent with the proposed expressways. A variant on this expressway program includes using an upgraded Southeast Expressway instead of constructing a new Southwest Expressway and/or using the Northeast Expressway rather than I-95 Relocated.

Approach 3 -- The regional expressway program would include only those facilities that provide a limited bypass system around the core. This consists of the Third Harbor Crossing as the key improvement, with connections to existing facilities in the North, the Mass. Pike and the Southeast Expressway in the South, and possibly to I-93. The Southwest Expressway and I-95 North would not be constructed as through facilities but might be built as local arterial service facilities. Connector roads and spurs would be constructed in outlying areas to Route 128, which might receive Interstate designation and be selectively upgraded. Major emphasis and priority would be put on improvements in the line-haul transit system -- either commuter rail or rapid transit, whatever makes the best sense in each of the subregional corridors.

Approach 4 -- This approach is the converse of Approach 3. Regional expressway program includes only those facilities providing new capacity in outlying portions of the region, where necessary or desirable. Facilities providing a bypass around the core of the region are not included. Thus, the Third Harbor Crossing is not included in the program, but some appropriately scaled facility could be considered in the North Shore and Southwest corridors as part of a program of improvements to provide better subregional and local movement, perhaps as spurs on the Interstate system with appropriate connections to the arterial system for dispersal. Emphasis is on major improvements to the line haul transit system, consistent with highway construction. Route 128 could be designated as I-95 and selectively upgraded.

Approach 5 -- Major future investments are for public transportation. The optimum public transit program would be developed for each subregion. Major highway facilities would be constructed only if they can fit into or help out the particular public transportation program and to provide whatever local road improvements are deemed as desirable by the localities themselves.

Approach 6 -- The only major investments will be for public transportation, and only for those transit facilities that do not require the construction of any new highways anywhere within Route 128. No more expressways would be built. A major program would be initiated to upgrade and extend the existing

public transportation system and to provide a wide variety of new and different public transportation services to handle new and emerging travel requirements. Essentially the same public transportation improvements as Approach 5, but with no major highway improvements.

I.B.8.2. TRANSPORTATION AND ALTERNATIVE SHAPES OF THE FUTURE

Concurrent with the preparation of alternative service approaches discussed in the preceding section, alternative concepts of future development patterns for the Boston region represent the implications of the long-range goals and values of several widely divergent policy positions have also been formulated. This was done to assist decision-makers in considering the relationship between different visions of the future and present decisions about transportation.

The Alternative Futures were formulated on the hypothesis that the most significant effects of new transportation facilities at the regional scale are upon the distribution of future activities in the region, particularly population and employment. The numerical interpretation of these distributions of jobs and residences in the region is used as a basis for estimating future travel demands. The evaluation of alternative transport facilities will reveal the degree to which a given facility alternative assists or hinders the achievement of the Alternative Futures.

The following paragraphs and accompanying Figures I-19 to I-22 describe the alternative future development strategies which have been identified by the BTPR.

Trends Extended -- This alternative assumes that the past trends in the Boston metropolitan area will continue indefinitely into the future. Population will continue to decline in the core cities, stabilize in the inner suburbs, and increase sharply in the Route 128 to Route 495 suburbs. Employment will show slight increase in the core cities, particularly in downtown Boston and in Cambridge. Employment will grow most sharply, however, in the suburbs beyond

Route 128. This alternative implies an increasing concentration of low and lower-middle income families in the core cities, and increasing concentration of new jobs in suburban communities. Increased use of suburban land at relatively low densities will occur, reducing existing open space patterns and natural resources. It further assumes that the existing tax structure and other means for implementing change will continue into the future. (See Figure I-19).

Trends Extended: "Nodal" Concentrations -- Though assuming the same distributions of population and employment, this alternative would counter what some consider the wasteful use of suburban areas, particularly in the Route 128 to Route 295 suburbs. These nodes range from relatively small clusters, such as planned unit developments, to planned new communities. Such development patterns offer the opportunity, by concentrating population, of extending transit into suburban areas to serve the concentrations of population grouped around the nodal clusters. (See Figure I-20).

Core Intensive: Employment -- This alternative recognizes the unique characteristics of Boston's core, particularly downtown Boston, the frame around downtown, and parts of Brookline, Cambridge, and Somerville. Building upon existing policy, it assumes as a target a high level of jobs in core cities, particularly Boston. Boston possesses one of the most unique cores in the nation, with a combination of a close-in airport, a downtown which is a regional center for six New England states, several of the most important educational institutions in the United States, and one of the most important hospital complexes in this country. This alternative proposes building upon these assets to continue Boston's strength. Employment would still grow outside the core cities, but not at as fast a rate as at present. Implicit in this alternative are major policy changes and intensive use of all core area vacant sites for job development corporation and the writedown of land costs. It further accepts the trend of population moving to suburban areas, but assumes, as with the second alternative, that this population concentrates in nodes at strategic locations.

Core Intensive: Employment and Population -- This alternative recognizes the special characteristics of the core cities for in-city living. It accepts the

changing life styles of today's world, where people marry and have children at an older age. In the United States, only such cities as Boston can provide the special life style these people seek. Originally attracted by the universities and employment opportunities in downtown Boston, these people provide an unusual opportunity for developing a strong in-city housing market. The attractions of Boston's cultural assets make it even more possible to attract and hold such persons in the city. Further, Boston, Cambridge, Somerville, and Brookline possess certain neighborhoods unique in American cities -- old, ethnic neighborhoods that have survived with vitality. These, too, can serve as the basis for a new Boston. (Figure I-22)

The relationship between the alternative regional development strategies and alternative transportation service approaches is at the heart of transportation land use planning. The mix and location of transportation facilities affects the relative accessibility and attractiveness of land use locations, and thus is an important influence on the activity structure of a region. Conversely, the location and mix of activities such as housing, employment, etc., generate a need for movement and thus for transport service.

Although the long-range influence of transportation service has often been overemphasized, particularly in those metropolitan areas like Boston, where there is already a high level of accessibility, the relationship between transportation and land use bears investigation. The Boston region already has a land use pattern, involving a distribution of jobs, people and the community facilities that serve them, including a system of transportation facilities and services. This land use pattern and this transportation system represent the bulk of activities that will be in the Boston region for, at minimum, the next thirty to fifty years. Additions to people, employment, and transportation facilities and services represent increments to an already existing system.

At issue is in which direction those incremental improvements will lead. To put it another way, which groups and functions will receive the rewards and sustain the losses of incremental improvements to the transportation system and additions to jobs and people?

The effects of different mixes of transit and highway improvements can be generally described for various urban and suburban contexts. Transit, because it can be reached only at certain points (stations), tends to generate highly differentiated accessibilities. Since there will be more economic demand for these areas which are easier and cheaper to get to, the competition for such locations will tend to raise the value of the land. Therefore, activities which can afford higher land prices, such as apartments and office buildings, will tend to locate near transit stops. The implication of these relationships is that suburban transit extensions will tend to cluster office and apartment development in higher density nodes, but will have relatively little influence on industrial-related employment locations. This pattern of a dense regional core is reflected in the two Core Intensive Futures.

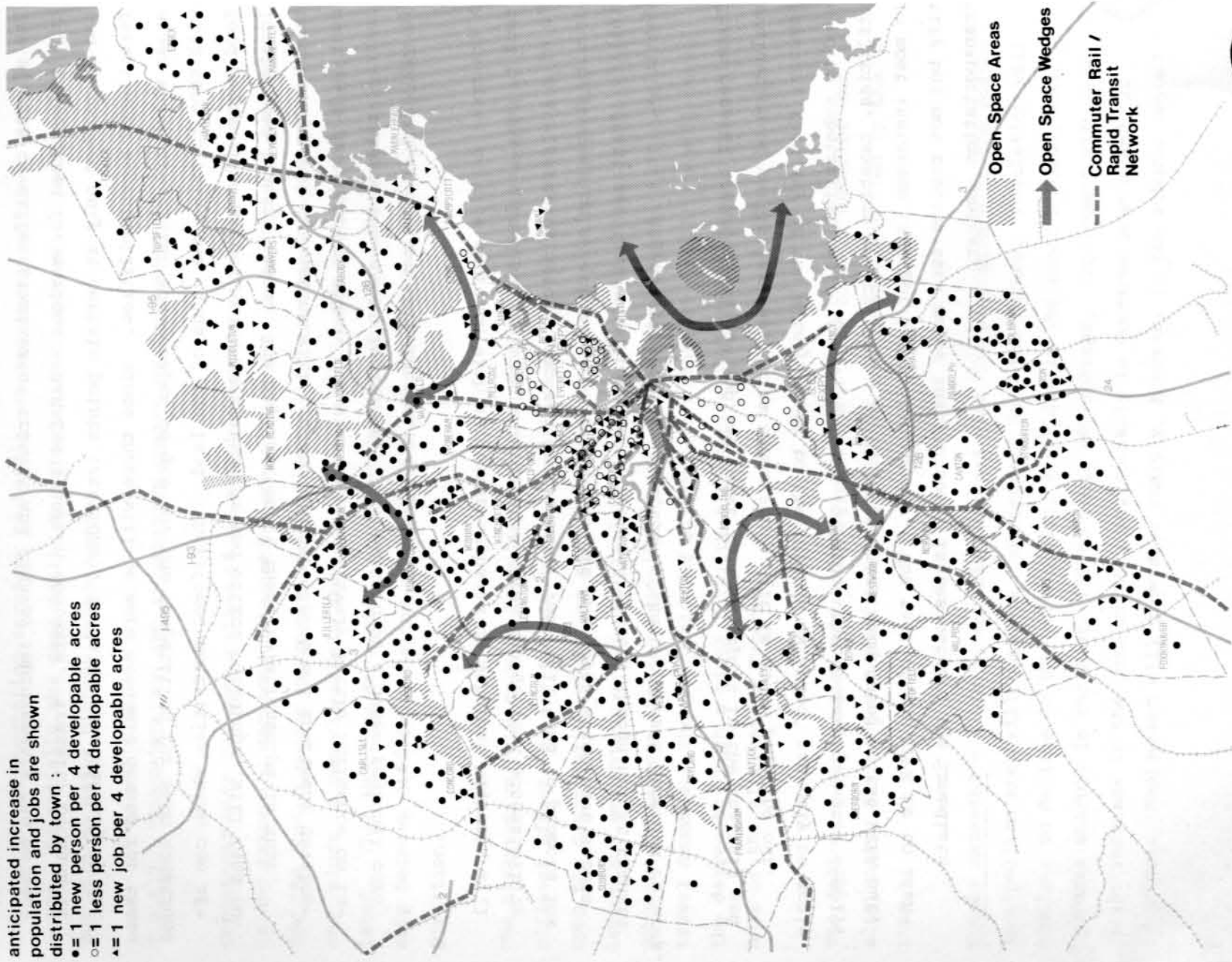
A transport service approach with a greater emphasis on suburban highways will tend to equalize land values over a large area, even though that accessibility is of a low capacity nature compared to transit. This will tend to promote low density dispersion of activity. Interchanges are the areas which have accessibility advantages that would tend to attract activities, though not at transit densities. This land use pattern is reflected in the two Trends Extended Futures.

These general comments will be applied later in this report in the analysis and evaluation of particular facilities under study. It is worth pointing out, however, that any of the alternatives to the "Trends Extended" can only be achieved by substantial public policy changes in such areas as zoning, water supply, utilities, taxation policy, etc. These issues have been noted by the BTPR but, in most instances, are not under its purview. The task of the BTPR is to identify but not resolve such major institutional issues outside the immediate transportation context.

KEY

For illustration the anticipated increase in population and jobs are shown distributed by town :

- = 1 new person per 4 developable acres
- = 1 less person per 4 developable acres
- ▲ = 1 new job per 4 developable acres



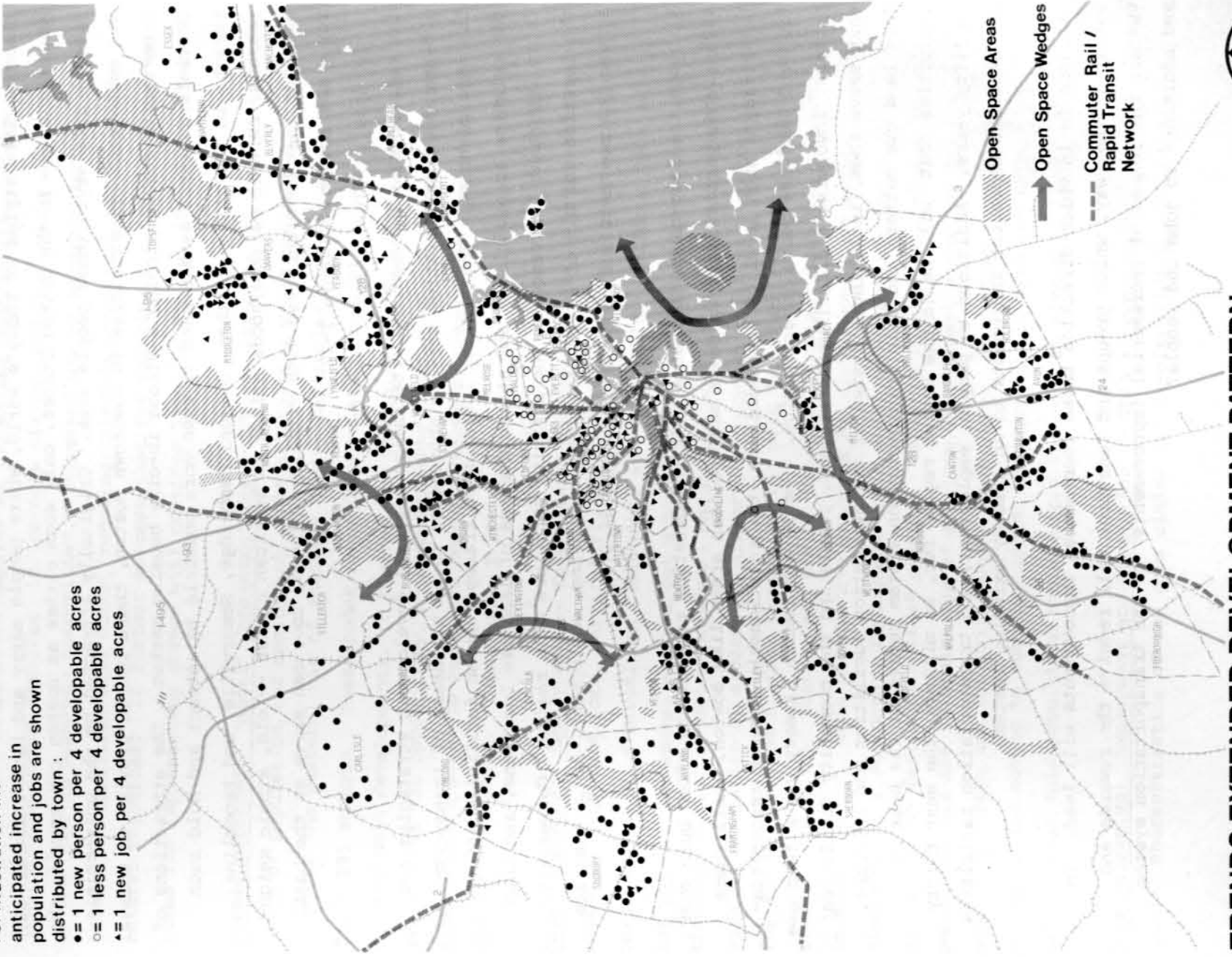
TRENDS EXTENDED DEVELOPMENT PATTERN –

FIG. I-19

KEY

For illustration the anticipated increase in population and jobs are shown distributed by town :

- = 1 new person per 4 developable acres
- = 1 less person per 4 developable acres
- ▲ = 1 new job per 4 developable acres



TRENDS EXTENDED DEVELOPMENT PATTERN –

FIG. I-20

KEY

For illustration the anticipated increase in population and jobs are shown distributed by town :

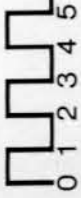
- = 1 new person per 4 developable acres
- = 1 less person per 4 developable acres
- ▲ = 1 new job per 4 developable acres



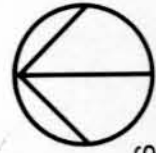
CORE INTENSIVE DEVELOPMENT PATTERN – EMPLOYMENT

FIG. I-21

BTPR REGION



10 MILES

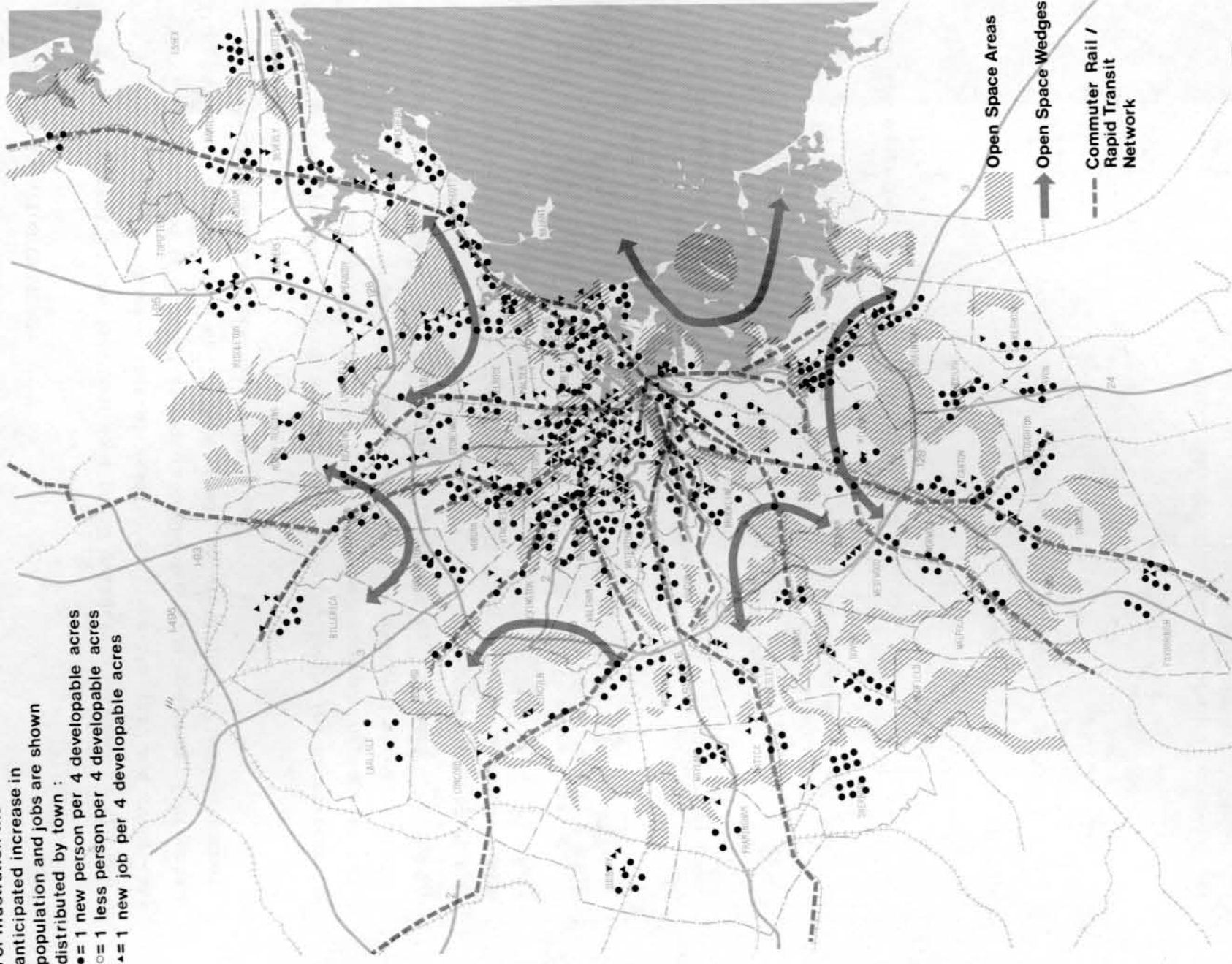


Open Space Areas
 Open Space Wedges
 Commuter Rail / Rapid Transit Network

KEY

For illustration the anticipated increase in population and jobs are shown distributed by town :

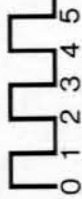
- = 1 new person per 4 developable acres
- = 1 less person per 4 developable acres
- ▲ = 1 new job per 4 developable acres



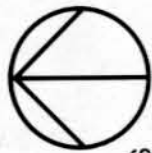
CORE INTENSIVE DEVELOPMENT PATTERN – EMPLOYMENT AND POPULATION

FIG. I-22

BTPR REGION



10 MILES



Open Space Areas
 Open Space Wedges
 Commuter Rail / Rapid Transit Network

I.B.8.3. EVALUATION CRITERIA

The third component in the approach to a broad evaluation process is the use of evaluation criteria. These criteria, used in Sections II, III, and IV of this report, are designed to provide information about a wide spectrum of effects that transport options have on people, their physical and social environment and the economy, and the Alternative Futures.

The evaluation considers direct and indirect effects, long- and short-term impacts, local and regional scales. It addresses the incidence of impacts and includes positive and negative aspects. Impacts are measured where possible and otherwise described. As in the case of alternative transport service approaches and Alternative Futures, the criteria have been generated out of a community-technical interaction designed to permit an informed decision-making process. The major categories for evaluation are:

- Capital Costs
- Transport Service
- Family Relocation and Replacement Housing
- Regional Economics
- Community Economic Impacts
- General Landscape, Open Space, and Historic Impacts
- Air and Noise Pollution
- Community Quality
- Ecological Impacts

These are described in detail in Section IV.C.

The Lowland Province lies mostly below an elevation of 50 feet; however, it rises to maximums of 140 feet where Roxbury conglomerate (bedrock) or glacial features outcrop. Conspicuous among the glacial features are the Parker Hill and Forest Hill, both identified as Drumlins.

The Upland area, referred to as the Needham Uplands, is occupied by alluvial plains and glacial outwash. Relief is due to an extensive drumlin field. The most conspicuous features in the Southwest Corridor are the Blue Hills, rising to an elevation of 647 feet from a lowland area, and the Fowl Meadow at an elevation of approximately 50 feet.

Major lowland areas follow the preglacial valleys of the Neponset River and Stoney Brook. Numerous wetlands and marshes in these lowlands reflect the poorly integrated drainage and the youthfulness of the glaciated surface. North of the Fowl Meadow much of the land area has been drained or filled by man to provide for human use and necessary development areas. The Fowl Meadow and Route 128 provide the barrier or buffer between an extensively modified natural environment and one which is essentially natural.

Parks and Recreation Areas -- The developed ecological assets of the Southwest subregion north of Fowl Meadow affected by the alternative transport improvements under review consist of a series of public parks and open spaces along the Penn Central Railroad corridor. They are shown in Figure I-30.

The majority of the public parks are not significant in terms of plants or wildlife. In most cases, recreational facilities at the present time are more or less maintained. These include:

- Orchard Park Housing Project (playground/baseball diamond)
- Elliot Burial Ground (Cemetery)
- Madison Park
- Whittier Street Project (Recreation area)

- Carter Field (Recreation area)
- McLaughlin Playfield
- Martini Shell
- Moynihan Playground
- Readville Playground

Larger Park and recreation areas, with a broader diversity of plant and wildlife, forms include:

- Highland Park
- Flood Control land along the Neponset
- Neponset Valley Parkway
- George Wright Golf Course

Finally, two areas are of greater ecological significance because of the broader diversity of plant and wildlife communities they contain. This diversity more closely approaches natural conditions and would be sensitive to increases in the air pollution intensity.

- Franklin Park -- containing a golf course, playfield, the zoo, and woods. The latter two support medium density groves of middle-aged trees as part of their natural aesthetic and recreational appeal.
- Arnold Arboretum -- the tree park and garden contains thousands of woody plants from all parts of the world, nearly the broadest variety which can exist in the urban environment.

Fowl Meadow Marsh -- The Fowl Meadow lies athwart the Neponset River just north of Route 128. The River which drains the Marsh conforms to a deep valley on the underlying bedrock scarred by glaciers to the depth of 100 feet below sea level. Glacial and post glacial deposits, while varying in depth and erodability, because

of their permeability and their uniform presence combine with the underlying bedrock to render the Fowl Meadow marsh essentially a single, unified aquifer. The aquifer and related geological cross-sections are shown in figure .

The fact of the unified aquifer implies two important facts -- first that any hydrological change of magnitude cannot be localized, and second that any introduced pollutants will spread from the point of their introduction. An unpublished USGS report notes that the Fowl Meadow subwatershed, the area covered in this report, stores 13 billion gallons of water. Currently 1.6 million gallons per day are pumped, which quantity falls short of the recharge capacity of 5 million gallons. Recharge occurs in two ways -- from the river when the water table lies below the surface level of the river and from the surface through the porous soils. Any pollution entering the aquifer in either fashion -- polluted river or contaminated surface runoff -- will spread from its source through the aquifer water supply. One recent and increasingly significant pollutant is road salt used on Route 128. Chloride levels have risen from 11 in 1963 to 28 in 1970. Although these levels are considerably below Class A water quality standards of 250 parts per million, accompanying sodium levels are close to or in excess of standards of 20 parts per million.

Upland and oxbow ponds, the river and its tributaries, permanent and ephemeral, and the associated swamps and marshes are the surface manifestations of the hydrology. Oxbow ponds indicate that channelization of the river has occurred recently, increased spring runoff due to continuous urbanization and construction of I-95 and Route 128 has caused this channelization. Channelization in turn has contributed to lower effective water level in the river in the summer.

Broad fluctuations in the level of the local water table are a threat to the fragile existence of the wetlands. Wetlands, peats and mucks have been built up over years of stable water regimen. These soils, of all the soils in the region, are the least permeable. They tend to hold up to 20 times their own weight of water and thus accumulate pollutants. During periods of unseasonably highwater, they oxidize and release their pollutants into the aquifer. The functional loss of the wetlands with their holding capacity further exacerbates the periodicity of

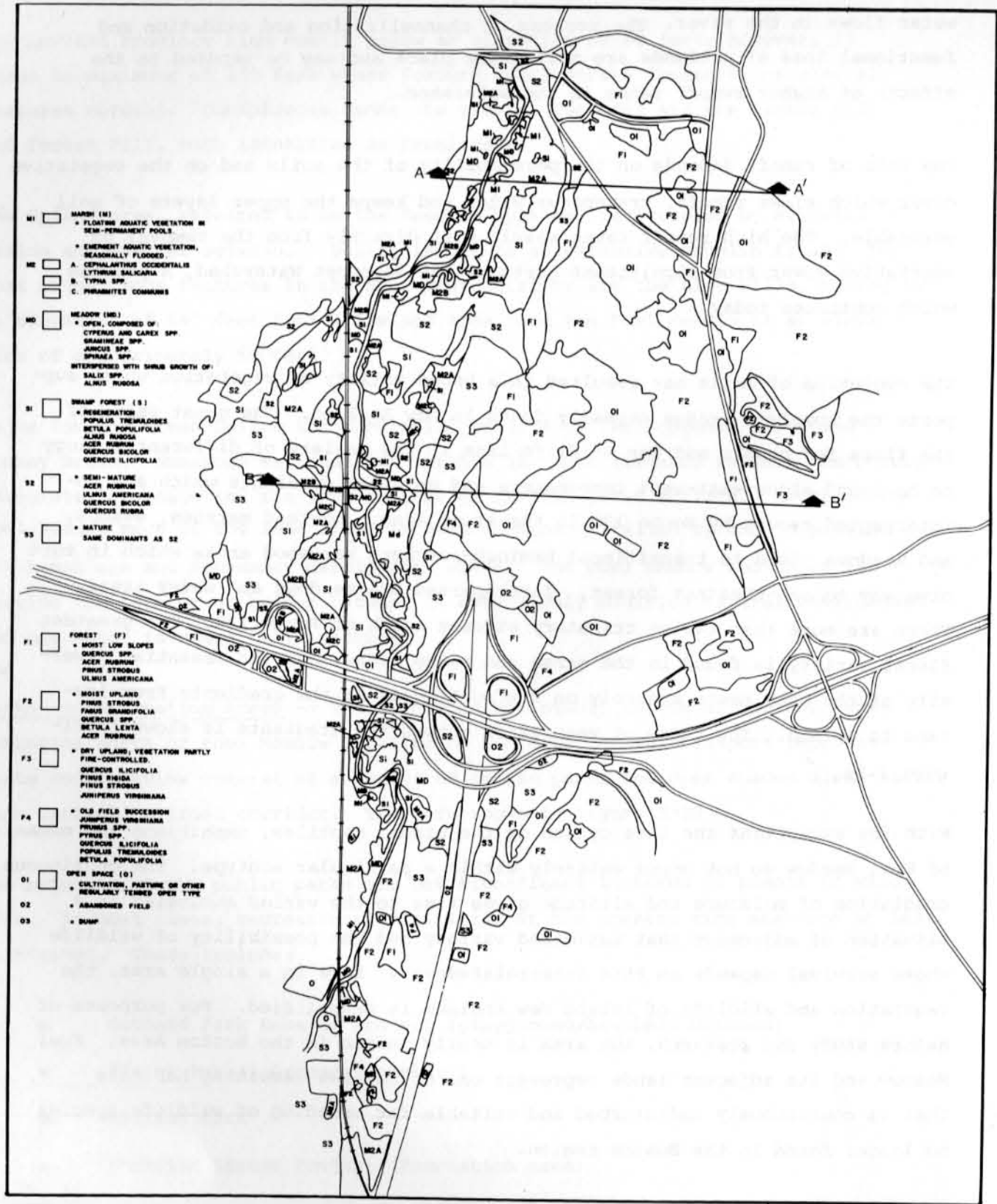
water flows in the river. The process of channelization and oxidation and functional loss of wetlands are now taking place and may be imputed to the effects of higher runoff rates in the watershed.

The rate of runoff depends on the permeability of the soils and on the vegetative cover which slows runoff, transpires water and keeps the upper layers of soil permeable. The high runoff rates result most directly from the removal of vegetative cover from significant parts of the Neponset Watershed, a process which continues today.

The evolution of soils has resulted in a broad variety of vegetation which supports the complete range normally found in New England. The great value of the flora for people and for wildlife lies in the variety of different ecology to be found along east-west temperature and moisture gradients which are uninterrupted except by Route 138 in the study area. Lowland marshes, swamps, and meadows yield to transitional hemlock-northern hardwood areas which in turn give way to oak-chestnut forest. Interspersed are meadows and water areas. There are more than twelve tributary streams north of Route 128. The greatest floral variety is found in the marsh and swamp areas, but the essential diversity of the area rests squarely on the continuity of the gradients from lowland to upland. The range of vegetation across the gradients is shown in figure I-26.

With few exceptions the life cycles of the birds, reptiles, amphibians and mammals of Fowl Meadow do not occur entirely within a particular ecotype. The continuous gradation of moisture and altitude gives rise to the varied ecologies in a situation of adjacency that maximized variety and the possibility of wildlife whose survival depends on this interrelatedness. Here in a single area, the vegetation and wildlife of inland New England is exemplified. For purposes of nature study and research, the area is nearly unique in the Boston Area. Fowl Meadow and its adjacent lands represent one of the few remaining habitats that is continuously undisturbed and suitable for breeding of wildlife species no longer found in the Boston region.

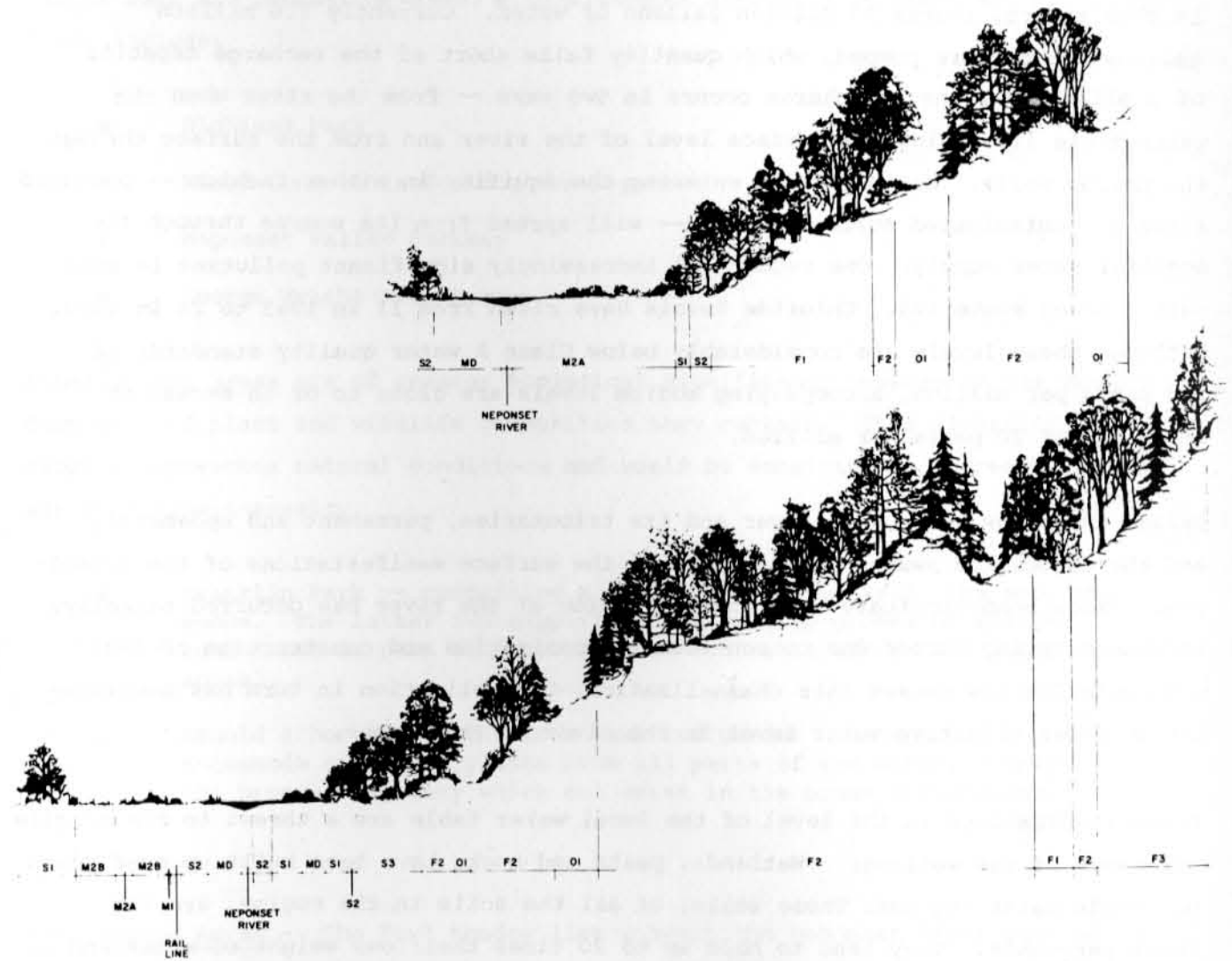
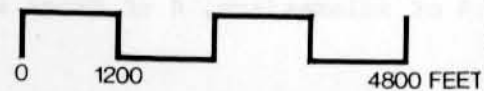
The marshes support 5 species of game birds, 7 of insectivorous birds, 3 of song birds, 4 of salamanders, 4 of frogs and toads, 8 of turtles, 3 of snakes and



- M1 MARCH (M)
• FLOATING AQUATIC VEGETATION IN SEMI-PERMANENT POOLS
• EMBENT AQUATIC VEGETATION, SEASONALLY FLOODED
- M2 A. CEPHALANTHUS OCCIDENTALIS
LYTHRUM SALICARIA
B. TYPHA SPP.
C. PHRAGMITES COMMUNIS
- M3 MEADOW (MD)
• OPEN, COMPOSED OF CYPERUS AND CAREX SPP. GRASSHEAL SPP. JUNCUS SPP. SPHRAEA SPP. INTERSPERSED WITH SHRUB GROWTH OF SALIX SPP. ALNUS RUBOSA
- M4 SWAMP FOREST (S)
• REGENERATION
POPULUS TREMULOIDES
BETULA POPULIFOLIA
ALNUS RUBOSA
ACER RUBRUM
QUERCUS BICOLOR
QUERCUS ILICIFOLIA
- S2 • SEMI-MATURE
ACER RUBRUM
ULMUS AMERICANA
QUERCUS BICOLOR
QUERCUS RUBRA
- S3 • MATURE
SAME DOMINANTS AS S2
- F1 FOREST (F)
• MOIST LOW SLOPES
QUERCUS SPP.
ACER RUBRUM
PINUS STROBUS
ULMUS AMERICANA
- F2 • MOIST UPLAND
PINUS STROBUS
FABUS GRANDIFOLIA
QUERCUS SPP.
BETULA LEVIA
ACER RUBRUM
- F3 • DRY UPLAND, VEGETATION PARTLY FIRE-CONTROLLED.
QUERCUS ILICIFOLIA
PINUS RIGIDA
PINUS STROBUS
JUNIPERUS VIRGINIANA
- F4 • OLD FIELD SUCCESSION
JUNIPERUS VIRGINIANA
PINUS SPP.
QUERCUS ILICIFOLIA
POPULUS TREMULOIDES
BETULA POPULIFOLIA
- O1 OPEN SPACE (O)
• CULTIVATION, PASTURE OR OTHER REGULARLY TENDED OPEN TYPE
- O2 • ABANDONED FIELDS
- O3 • BUMP

FOWL MEADOW VEGETATION AND VEGETATIVE CROSS SECTIONS

FIG. I-26



3 of mammals. Additionally some 37 species of birds and ducks including 12 game species, and the marsh and pigeon hawks use the area in fall and spring migrations. The reptiles and amphibians which breed here are important for control of insects and rodents over a wide area in many habitats.

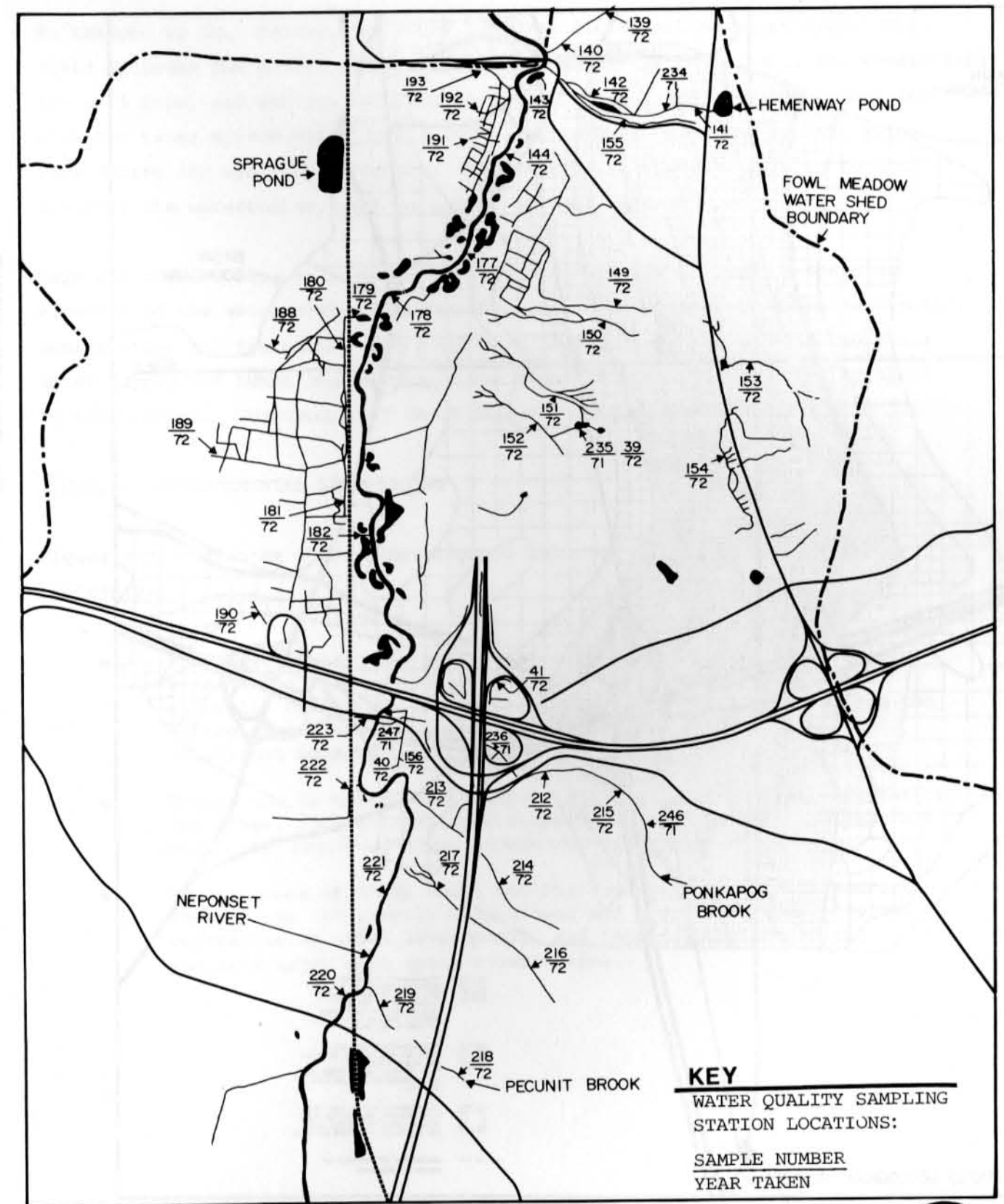
The meadows harbor 27 species of birds including the bluebird and 10 other songsters, the redtail, broadwing and sparrow hawks, and 8 insectivorous species. Sixteen other bird and duck species use the meadows during migration. There are 2 species of frogs, 4 of snakes, and 4 of mammals, including the red and grey foxes.

The woody swamp-transition area is used for breeding by 13 species of birds. Eleven of these are insectivores, 7 are songbirds, and one is a game bird. Sixteen species of birds and ducks, including the ruffed grouse, quail and pheasant use the area in migration. Additionally there are 3 species of snakes, 3 of turtles, 11 of mammals, 4 of salamanders, and 9 of frogs and toads.

The northern hardwood-hemlock forest shelters 49 species of birds year round, including 3 of owls and 3 of hawks. Thirty-four species of birds migrate through the area. Seven species of salamanders are found, as are 6 of frogs, 8 of turtles, 10 of snakes and 18 of mammals.

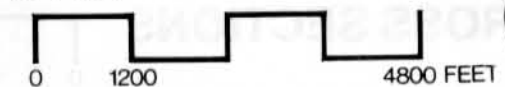
The health and condition of the surface waters in this Fowl Meadow system are indicative of the state of the watershed. The Neponset River itself is rated C by the Massachusetts Division of Water Pollution Control. All other surface waters in the area are rated B. Figure I-27 locates surface water sampling.

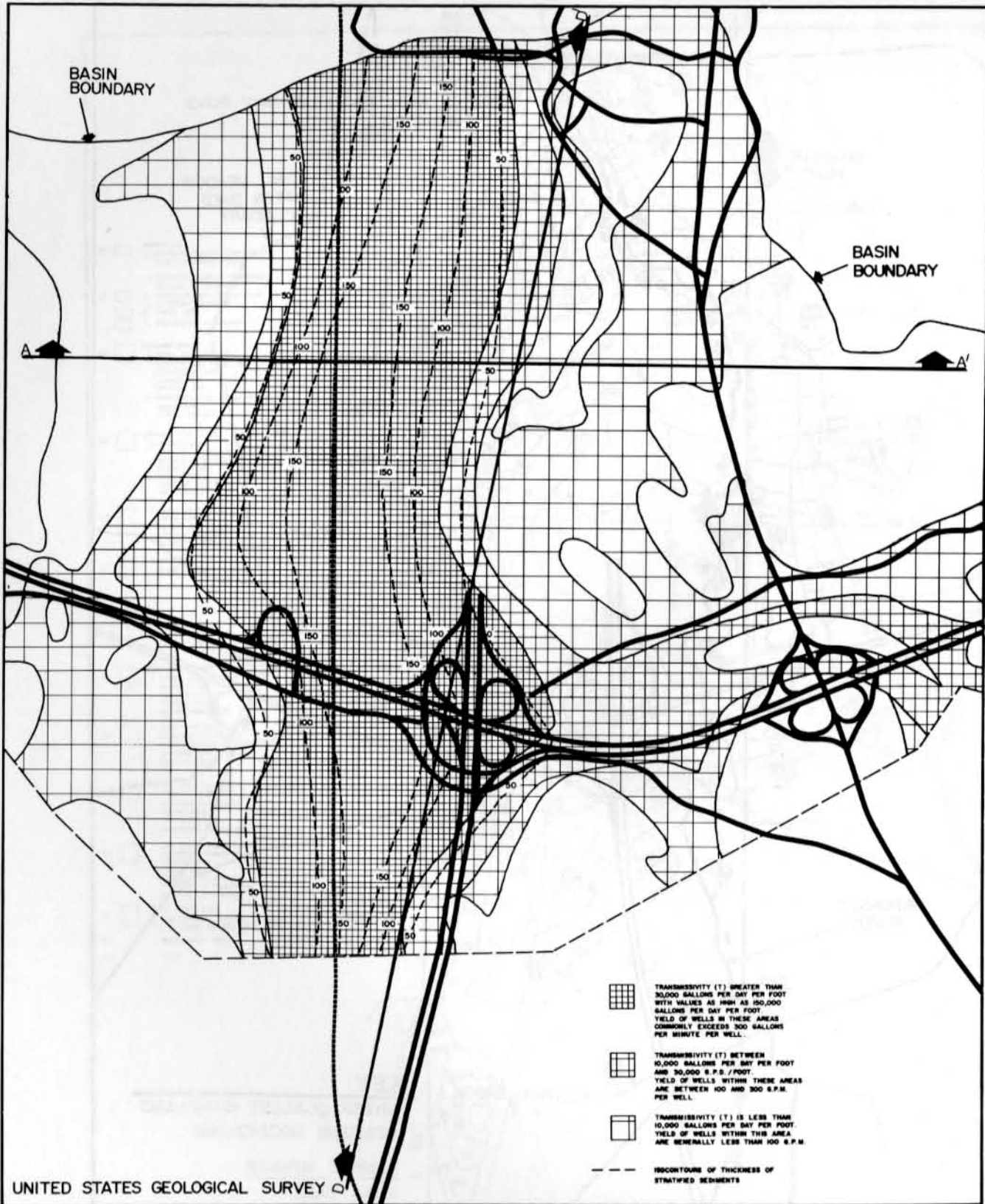
For this study 46 samples were taken from various locations and tested for 23 parameters each. The sampling locations fell into 3 groups-- those on the Neponset, those to the east of the River, and those to the west. Analysis reveals generally that the highest quality water is found to the east of the River, except in streams to the southeast of the intersection of Route 95 and 128. Poorest in quality are waters in and from the urbanized area to the west. This water violates nearly all class B criteria. Water in the portion of the Neponset under



FOWL MEADOW SURFACE WATER

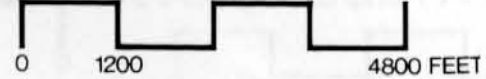
FIG. I-27



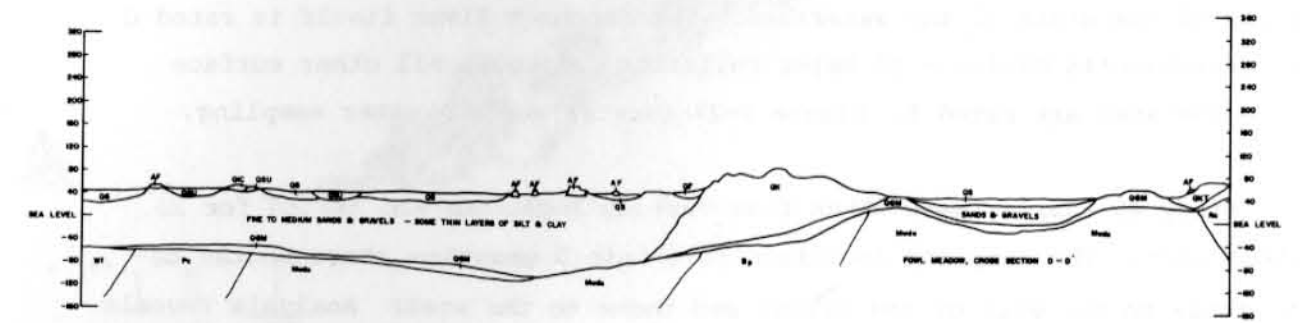
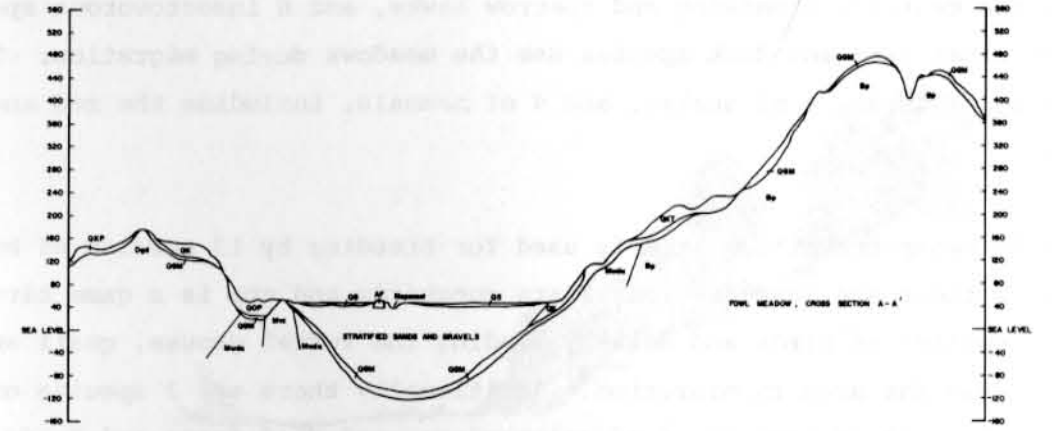


FOWL MEADOW GROUND WATER AND GEO-LOGICAL CROSS SECTIONS

FIG. 1-28



- BLACIAL DEPOSITS**
- OSM** OSMOND SANDS
 - OSM¹** OSMOND SANDS - LOWER PART
 - OSM²** OSMOND SANDS - UPPER PART
 - OSM³** OSMOND SANDS - MIDDLE PART
 - OSM⁴** OSMOND SANDS - UPPER PART
 - OSM⁵** OSMOND SANDS - LOWER PART
 - OSM⁶** OSMOND SANDS - UPPER PART
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 - OSM⁴⁸** OSMOND SANDS - UPPER PART
 - OSM⁴⁹** OSMOND SANDS - LOWER PART
 - OSM⁵⁰** OSMOND SANDS - UPPER PART
- POST BLACIAL DEPOSITS**
- OS** OSMOND SANDS
 - OS¹** OSMOND SANDS - LOWER PART
 - OS²** OSMOND SANDS - UPPER PART
 - OS³** OSMOND SANDS - MIDDLE PART
 - OS⁴** OSMOND SANDS - UPPER PART
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 - OS⁴⁹** OSMOND SANDS - LOWER PART
 - OS⁵⁰** OSMOND SANDS - UPPER PART



study is generally of higher quality than was the case in the recent past. Upstream pollution has been curtailed. Survey of aquatic life in the same waters confirms these very general conclusions. There were no pollution-tolerant species found anywhere. The preponderance of pollution-sensitive forms was found in the waters to the east. The waters to the west lacked sensitive species.

Chain pickerel, red fin pickerel, white sucker, and carp are found in the Neponset. Bluegill, pumpkin seed, common shiner and gold shiner are thought to use the River. These are all warm water species. Several ponds and streams to the east of the Neponset are stocked with brook and rainbow trout.

The climate of the area, which ultimately governs all natural processes, is a typical temperate continental climate with some maritime influence. Temperature varies seasonally, notwithstanding a small, almost patternless variation in precipitation averages of 47.5 inches yearly, 14 inches of which are in the form of snow or sleet. Microclimate varies with aspect. Thermal inversions are common. Due to local conditions, fog is more prevalent in the eastern meadows, particularly near Paul's Bridge than it is in other parts of the area.

Water Supply -- Water supply is an important environmental concern for the Southwest subregion. As previously stated, regional water supply needs are served by the Metropolitan District Commission's Quabbin Reservoir, located in the middle of the State. Current annual water consumption already exceeds the safe water yield by 12 million gallons per day. Several communities beyond Route 128 have had serious deficiencies in their local supply systems.

It is imperative that as many local water supply systems in the region as possible be continued to prevent overburdening the Metropolitan District Commission water supply system. In the southwest some communities have local water systems that take water from the Neponset River associated aquifer which has been estimated to have a safe yield of 5 million gallons/day. A recent water resources planning study prepared for the MDC recommended a well be drilled to use the capacity of the Neponset to augment water supply in those local communities experiencing water shortage.

To respond to this concern the water resource field must be considered. The field includes the watershed or drainage lands for surface waters; the vegetation; the soil type, and geology existing in the watershed; the wetlands associated with the water system which retain water, prevent flooding and augment water flow during dry spells; the aquifer (the waterbearing strata related to the system); the waterbodies, such as ponds, streams, and/or rivers.

Only one element need be impacted to have wide ranging effects on the other elements of the water system and thereby effecting vegetation, wildlife habitat, conservation and recreation uses, and most importantly, the fragile, marginal water supply for human consumption. The Neponset River Watershed is critical in this regard. (Discussion of these impacts are contained in Section IV.10).

I.C.2.3. ENVIRONMENTAL SENSITIVITY

Figure I-29 indicates three general physical areas within the subregion including:

- The coastal plain and major river basins which have historically offered the least physical restraint to urban development and generally constitute the most intensely urbanized areas within the subregion and are the areas most sensitive to transportation-associated impacts.
- Transition to upland areas which have presented moderate limitations (of slope, soil and geologic characteristics) to urbanization, and which are generally less intensively urbanized today.
- Upland areas of steep slope and shallow soil deposits on bedrock. These areas are largely undeveloped and present serious physical restraints to urban development, and include portions of the region's major open space reservations.

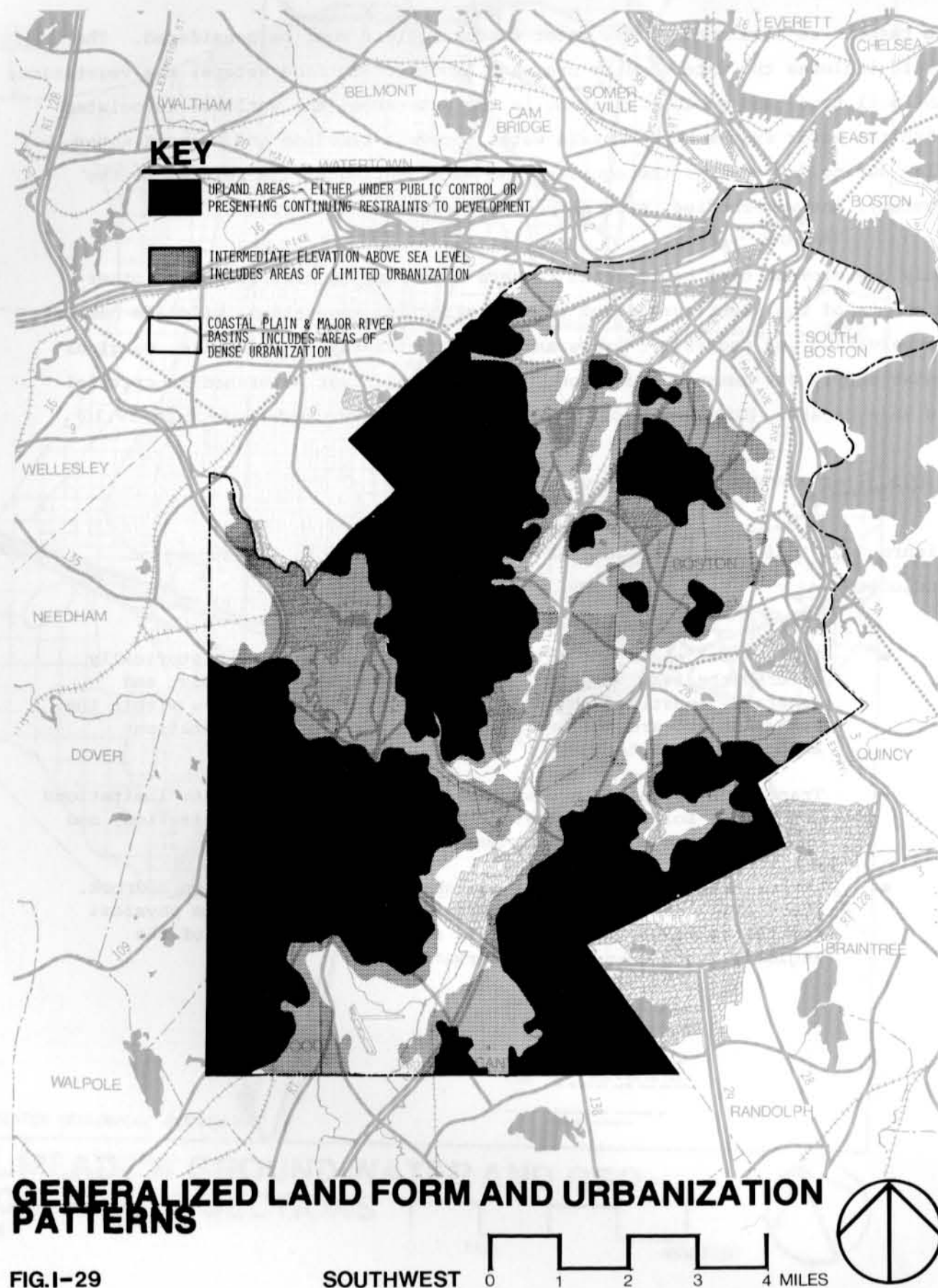


Figure I-30 is an interpretive synthesis of natural and urban landscape factors derived from open space and natural resource inventories and/or urban amenities and public facilities. Natural features include:

- Significant wetlands and floodplains generally associated with major river systems, and generally upland areas presenting significant vegetation and wildlife support, and/or open space value.
- Open spaces, generally in transition to upland areas and generally within the urban environment, including several large institutions.

The darker areas indicate where the natural landscape is most sensitive to disruptions by urban transportation development. Urban features mapped include:

- High density residential areas presenting significant concentration of social and economic investment, and higher density residential neighborhoods giving substantial evidence of complex social, economic and environmental problems.
- Moderate density residential neighborhoods not in significant need of major environmental improvements.

The darker areas indicate where the urban landscape is most sensitive to disruption from urban transportation development, and where, in addition, a high level of present transportation associated impacts are present.

Figure I-13 previously presented gives a more specific record of open spaces and historic sites potentially subject to direct or indirect impacts from current transportation proposals and, therefore, subject to 4(f) review. Direct impacts are those which constitute an actual physical displacement and land taking of the sites and/or facilities indicated. Indirect impacts are those which are generated from the physical presence or use of a proposed transportation facility within the vicinity of a site or facility indicated.

In summary, the following environmental concerns become apparent when considering the major features of the subregion and must be considered in the evaluations of the program-package alternative:

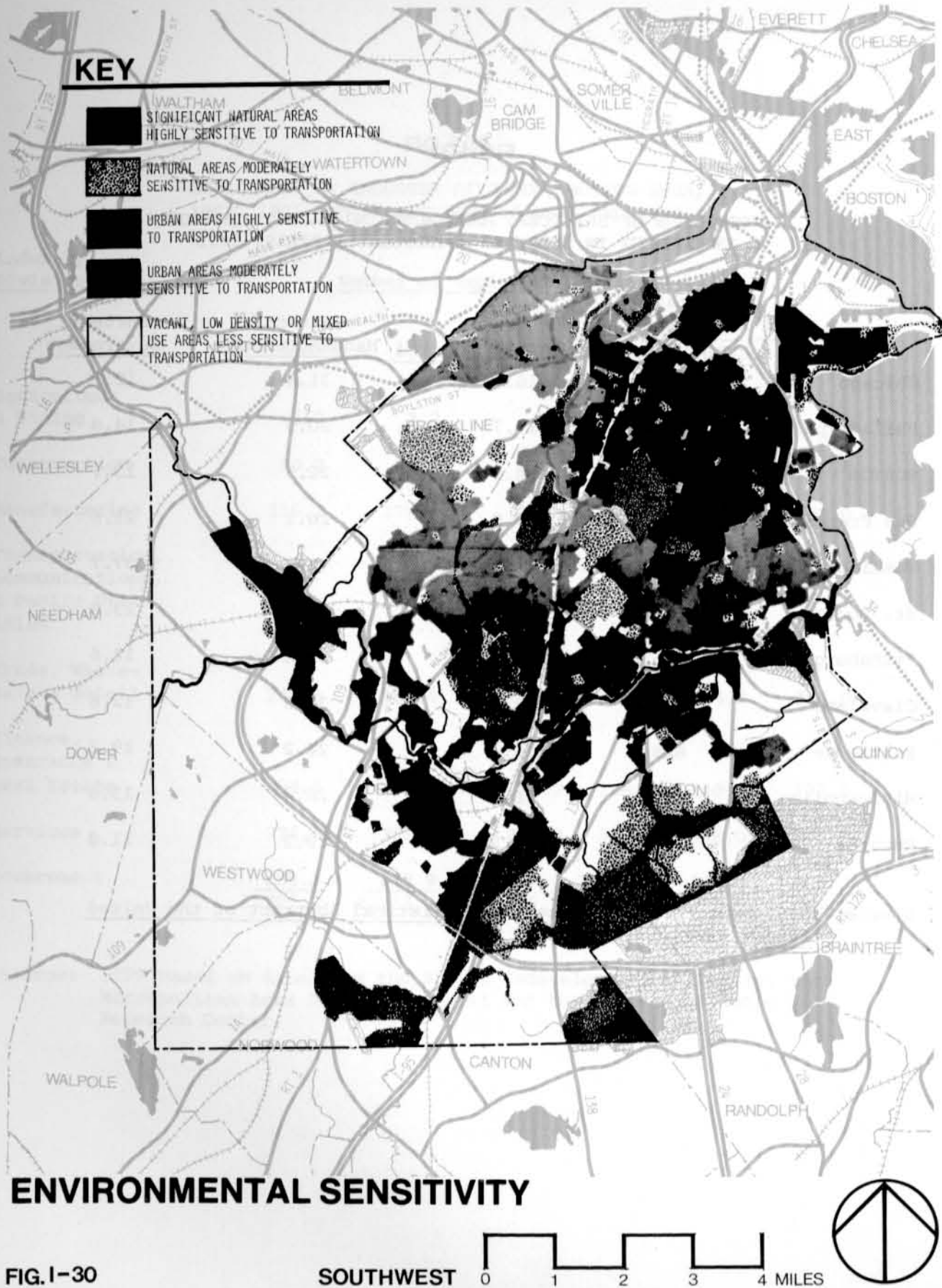


FIG. I-30

- The protection and improvement of the quantity and quality of water resources and the protection of related watershed lands (including undeveloped lands not otherwise protected), particularly of the Neponset River and its tributaries to maintain it as a source of drinking water, wildlife and waterfowl refuges, and recreation
- The reduction of the high ambient levels of air and noise pollution (to within EPA Standards), and vibration and visual intrusions existing in the subregion, especially within the inner city neighborhoods and along the heavily traveled arterials
- Large publicly controlled lands already protected from development must not be intruded upon in any way that would reduce their effectiveness to provide natural area contrast, recreational opportunities
- The protection of existing neighborhood parks and other community facilities throughout the corridor and the options or potentials for increasing parks or facilities, particularly in the inner city neighborhoods where extreme deficiencies exist
- The protection and the improvement of the quality of historic residential areas and historic parks and buildings within the corridor
- The capability of related public and private, regional and local plans and programs for environmental improvement and protection