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16. Abstract

This report presents an analysis of the history and institutional arrangements associated with high-occupancy vehicle (HOV) projects in Houston, Texas; Minneapolis - St. Paul, Minnesota; Orange County, California; Pittsburgh, Pennsylvania; Seattle, Washington; and Washington, D.C./Northern Virginia. The report provides a summary of the elements common to the different projects, and a detailed description of the background and institutional arrangements associated with each of the case studies. The analysis includes an examination of the reasons behind the development of the projects, the background and history of the facilities, a discussion of the relevant issues associated with the HOV projects, and roles and responsibilities of the different agencies and organizations involved in the process. The analysis was conducted to identify common elements and unique characteristics leading to the implementation and operation of the HOV facilities.

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METRIC (SI*) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH				
in	inches	2.54	centimetres	cm
ft	feet	0.3048	metres	m
yd	yards	0.914	metres	m
mi	miles	1.61	kilometres	km
AREA				
in²	square inches	645.2	centimetres squared	cm ²
ft²	square feet	0.0929	metres squared	m²
yd²	square yards	0.836	metres squared	m²
mi²	square miles	2.59	kilometres squared	km²
ac	acres	0.395	hectares	ha
MASS (weight)				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams	Mg
VOLUME				
fl oz	fluid ounces	29.57	millilitres	mL
gal	gallons	3.785	litres	L
ft³	cubic feet	0.0328	metres cubed	m³
yd³	cubic yards	0.0765	metres cubed	m³

NOTE: Volumes greater than 1000 L shall be shown in m³.

TEMPERATURE (exact)

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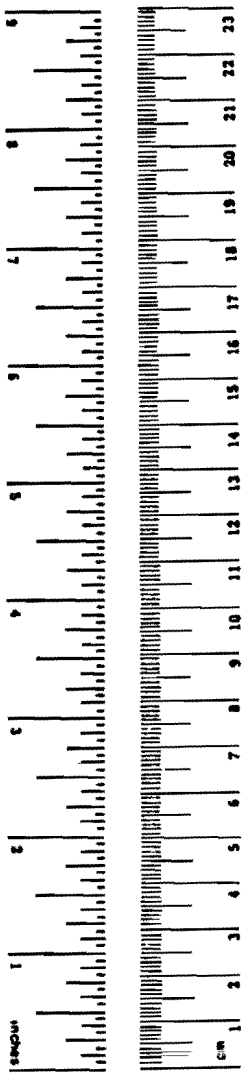

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH				
mm	millimetres	0.039	inches	in
m	metres	3.28	feet	ft
m	metres	1.09	yards	yd
km	kilometres	0.621	miles	mi
AREA				
mm²	millimetres squared	0.0016	square inches	in²
m²	metres squared	10.764	square feet	ft²
km²	kilometres squared	0.39	square miles	mi²
ha	hectores (10 000 m²)	2.53	acres	ac
MASS (weight)				
g	grams	0.0353	ounces	oz
kg	kilograms	2.205	pounds	lb
Mg	megagrams (1 000 kg)	1.103	short tons	T
VOLUME				
mL	millilitres	0.034	fluid ounces	fl oz
L	litres	0.264	gallons	gal
m³	metres cubed	35.315	cubic feet	ft³
m³	metres cubed	1.308	cubic yards	yd³

TEMPERATURE (exact)

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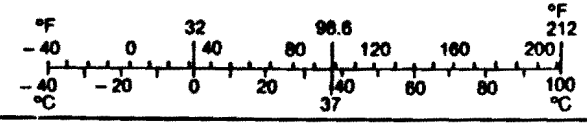

These factors conform to the requirement of FHWA Order 5190.1A.

* SI is the symbol for the International System of Measurements

HIGH OCCUPANCY VEHICLE PROJECT CASE STUDIES

History and Institutional Arrangements

By

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Assistant Research Scientist

Technical Report 925-3

An Assessment of Freeway High-Occupancy Vehicle Projects

Technical Study 2-11-89/1-925

Sponsored by

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Texas Transportation Institute

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I. SUMMARY OF CASE STUDY FINDINGS

Introduction

The Texas Transportation Institute (TTI), a part of The Texas A&M University System, is conducting an assessment of high-occupancy vehicle (HOV) projects located either on freeways or in separate rights-of-way in North America. The three-year research study is being funded by the Urban Mass Transportation Administration through the Texas Department of Transportation (TxDOT). The research study includes an overall assessment of the status of HOV projects on freeways and in separate rights-of-way in North America, an examination of procedures for conducting before-and-after evaluations of HOV facilities, and detailed examinations of specific case study HOV projects.[1]

One of the major elements of this assessment is the detailed examination of selected HOV facilities in six case study sites. High-occupancy vehicle facilities in Houston, Texas; Minneapolis-St. Paul, Minnesota; Orange County, California; Pittsburgh, Pennsylvania; Seattle, Washington; and Washington, D.C./northern Virginia represent the selected case study sites. An intent of the case study analysis is to provide an examination of the history, institutional arrangements, operating characteristics, utilization rates, and impact of selected HOV projects in different parts of the country.

This report contains the analysis of the history and institutional arrangements associated with HOV projects in the six case study sites. The report provides a summary of the elements common to the different projects, and a detailed description of the background and institutional arrangements of each case study.

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[1]The first two elements of the three-year research study, the examination of existing HOV projects in North America and procedures for evaluating HOV facilities, have been completed. The reports, *A Description of High-Occupancy Vehicle Facilities in North America* and *Suggested Procedures for Evaluating the Effectiveness of Freeway HOV Facilities,* are available through the United States Department of Transportation Technology Sharing Program.

Background and Purpose

Since the opening of the Shirley Highway exclusive bus lanes in the Washington, D.C. area in 1969, numerous metropolitan areas have developed priority facilities on freeways for high-occupancy vehicles. As of April, 1990, there were some 40 HOV facilities in 20 metropolitan areas in operation on either freeways or in separate rights-of-way. These facilities, while sometimes differing in design and operation, have similar purposes. In general, HOV facilities are intended to help maximize the person-carrying capacity of the roadway. This is done through altering the design and/or the operation of the facility in order to provide priority treatments, such as travel time advantages and improved travel time reliability, for high-occupancy vehicles (HOVs). High-occupancy vehicles are usually defined as buses, vanpools, and carpools.

In order to obtain a more comprehensive understanding of the variety of factors associated with the planning, implementation, operation, and evaluation of HOV facilities, a series of case studies is being conducted of selected HOV projects. The case study sites were selected to provide a mix of old and new projects, HOV design treatments, and geographic coverage.

One element of the case study analysis focuses on the history of the HOV projects and the institutional arrangements associated with the planning, development, implementation, and ongoing operation of the facilities. This analysis includes an examination of the reasons behind the development of the projects, the background and history of the facilities, a discussion of relevant issues associated with the HOV projects, and the roles and responsibilities of the different agencies and organizations involved in the process. The analysis was conducted to identify common elements, as well as the unique characteristics, leading to the implementation and operation of the HOV facilities.

Report Organization

This report presents the results of the analysis of the history and institutional arrangements associated with HOV projects in the six case study sites. A summary of the similarities among the different projects, is provided in the following section. The individual assessments prepared for each of the case study sites are presented in Chapter II.

Summary of Common Elements

The assessment of the history and institutional arrangements associated with HOV projects in the case study sites identified a number of common elements. While these were not present in all case studies to the same degree, the elements occurred often enough to represent common features that appear to be significant in the decision-making process and the development of HOV projects. The major similarities noted among the case study projects are outlined in this section. The first elements identify common characteristics that led to the decision to implement the HOV facilities, while the later elements relate to similarities during the development of the actual projects. Table 1 provides a summary of the characteristics common to multiple projects.

Common Characteristics in the Decision-Making Process

- **Corridor and Areawide Characteristics.** All of the case study sites are located in major metropolitan areas in the United States; in terms of population, all are within the top 20 in the country. In addition, the HOV projects are all located in major travel corridors. In all cases, the metropolitan areas and the specific corridors were experiencing significant growth in travel demand at the time the HOV projects began to be considered. The need for major improvements had been identified in all the corridors and, in many cases, the examination of alternatives and the development of detailed plans had been initiated. HOV facilities became one of the alternatives examined to address the anticipated travel demand, and ultimately emerged as a major element of the final recommendation.

An awareness of the need to address increasing traffic congestion problems in the corridor had developed.

- **Lack of a Fixed-Guideway Transit Plan for the Corridor.** Another similarity among the case study sites was the lack of an agreed upon or approved long-range fixed-guideway transit plan for the corridor. An approved fixed-guideway transit plan did not exist for most of the case study corridors at the time consideration of an HOV alternative was initiated. In many instances there was disagreement among different agencies over the role transit should play in the corridor and the technology that should be used. In some cases there had been an ongoing debate over this issue.

  In addition, in some instances, such as in Seattle, Houston, and Minneapolis-St. Paul, the lack of consensus over the role of transit and the technology to be used applied not just to the corridor, but to the metropolitan area as a whole. In these cases, the debate, which continues today, relates to the implementation of a rail transit component as one element of the overall public transportation system. Thus, in some areas, the HOV alternative appears to have gained support in response to the lack of consensus on rail alternatives. *No decision had been made on the development of a fixed-guideway transit system in the corridor where the HOV facility was ultimately developed.*

- **Planned or Scheduled Highway Improvements.** Some type of highway improvements were either planned or scheduled in most of the corridors where the HOV projects were eventually built. These ranged from major new freeways, such as I-394 in Minneapolis, I-66 in northern Virginia, and I-90 in Seattle, to pavement rehabilitation projects such as Katy (I-10) in Houston and Route 55 in Orange County. Thus, consideration of the HOV project was often initiated as one approach to increasing the person-movement capacity of the roadway facility.

Once the decision had been made to include the HOV element, coordinating the planning, design, and construction of both the freeway and HOV elements maximized available resources and minimized disruptions to the traveling public. *HOV projects in many of the case study sites were considered and implemented as part of larger highway improvement projects. These ranged from new freeway facilities to pavement rehabiliation projects. This coordination helped maximize available resources and minimize the impacts of implementation on the traveling public.*

- **Project Champion or Champions.** One individual, or a small group of individuals, was identified in most of the case studies as being instrumental in the development, promotion, and support of the HOV project. These were individuals, usually within the state transportation department, highway department or local transit agency, that had the authority and position to influence the outcome of the process. The support of these individuals was identified as a major reason for the development of the projects in many of the case study areas. These individuals reflected a willingness to try new and innovative approaches to dealing with growing traffic congestion problems and to move the projects forward. As many of the projects represented the first uses of the different types of HOV facilities in the country, some risk was associated with their implementation. *Individuals in positions of authority in highway and transit agencies supported the HOV project concept and promoted it through the project development and implementation process.*

- **Legislative Direction and Policy Support.** The consideration of HOV facilities was supported in many of the case study sites by legislative or policy directives. This took the form of policy directives from the federal level on the I-66 facility in northern Virginia and the state level on I-394 in Minneapolis. In other areas, local and regional agencies, such as the metropolitan planning organization, supported the HOV concept. These legislative or policy directives assisted in ensuring that HOV facilities were one of the alternatives considered in the

planning process and supported the implementation of the ultimate recommendation. The involvement of Congress and federal agencies in the many aspects of planning, design, and operation of the HOV facilities in the northern Virginia/Washington, D.C. area represents a unique feature not found in the other case study sites. *Legislative or agency policies and directives played an important role in the decision-making process in some of the HOV case study projects.*

Common Characteristics in the Implementation Process

- **Lead Agency.** In general, the agency responsible for making the decision to proceed with the development of the HOV project, also had the overall responsibility for implementing the project. In these cases, the state department of transportation or the state highway department was responsible for construction of the actual facility. Transit agencies have also been involved in different aspects of many of the case study HOV projects. Thus, while the state department of transportation or highway department usually took the lead role, other agencies were actively involved in the process.

  The Houston transitways can best be described as multi-agency projects requiring multi-agency decisions. The Houston Office of Public Transit, the predecessor agency to the Metropolitan Transit Authority of Harris County (METRO) was the lead agency in the initial contraflow demonstration project. However, on this and subsequent HOV projects, extensive agreements between METRO and the Texas Department of Transportation (TxDOT) were used to identify the roles, responsibilities, and financial participation of the two agencies.

  Most of the HOV case study projects utilized some type of project management team or coordinating group. These groups usually included representatives from the state highway or transportation department, the transit agency, the enforcement agency, and local jurisdictions. *One agency, usually the state*

department of transportation, or highway department, had overall responsibility for implementing the HOV project. However, transit and other agencies were often involved in some aspects of planning, designing, and, in a limited number of cases, financing the projects.

- **Interagency Cooperation.** All of the HOV projects in the case study sites involved some degree of interagency cooperation. The exact nature and level of this involvement varied substantially between projects. Some type of interagency coordination structure, such as a project management team, was used with many of the HOV projects. These coordinating groups were identified as an important component to ensuring that all groups were adequately involved in the implementation process.

  This coordination was noted as especially important due to the unique nature of the HOV projects and the need to involve highway, transit, enforcement, and other groups in the process. In most cases, these committees were actively involved in many aspects of the planning, design, implementation, and operation of the facilities. Representatives from all the relevant agencies, jurisdications, and groups associated with the HOV projects participated in these committees. In addition, in a number of the case study sites, the Metropolitan Planning Organization (MPO) was actively involved in the process and openly supportive of the HOV project. *Interagency cooperation, including the use of multi-agency project management groups, played an important part in the coordinated implementation of most of the case study HOV projects. Thus, on the HOV case study projects, agencies that historically may not have worked together developed close working relationships.*

- **Joint Funding.** A variety of funding sources were used for many of the HOV projects in the case study sites. Different combinations of funds from the Federal Highway Administration (FHWA), Urban Mass Transportation Administration (UMTA), and state and local highway and transit agencies were often used. In

addition, many areas, such as Houston and Minneapolis, used a variety of funding approaches and institutional arrangements to develop the HOV projects. *Multiple funding sources and innovative financing approaches were utilized with some of the case study HOV projects.*

- **Support of Federal Agencies.** The Federal Highway Administration (FHWA) and the Urban Mass Transportation Administration (UMTA) were supportive of the HOV projects in the case study sites. This involvement included providing funding for initial demonstration programs, construction of the HOV lanes and supporting elements, and research and evaluation programs, participating in project management teams, providing technical assistance, and providing policy guidance. *Support from FHWA and UMTA was evident, although in different degrees, in the development of many case study HOV facilities.*

- **Flexibility and Adaptability.** All the case studies seem to indicate that flexibility and the ability to adapt to change were important elements in both the development and ongoing operation of the HOV facilities. For example, almost every project has experienced some change in the operating requirements of the HOV facility. These changes have been the result of both experience and policy directives. In either case, the need to maintain flexibility to respond to changing travel demands and policies appears to be an important element of the HOV projects in the case study sites. *HOV projects provide flexibility to respond to changing travel demands, needs, and policies. Changes in operating policies have occurred in most of the case study sites.*

Conclusion

This chapter has provided a summary of the common elements associated with the development of HOV facilities in the six case study sites. The following ten features, which were common to all or most of the case studies, appear to be significant in leading to the development of HOV projects.

Decision-Making Process

- Corridor and areawide traffic congestion and growth in travel demand.
- Lack of agreed upon fixed-guideway plan for the corridor.
- Planned or scheduled highway improvements.
- Project champion or champions in positions of authority.
- Legislative direction and/or agency policy support.

Implementation Process

- Lead agency.
- Interagency cooperation.
- Joint funding.
- Support of federal agencies.
- Flexibility and adaptability.

The analysis presented in this report should be of benefit to areas considering the development and implementation of HOV projects. Consideration of the extent to which these characteristics are present, while not ensuring success, can serve as guidelines for assessing the potential success of the project. As such, they provide valuable guidance in identifying elements that appear to enhance the development and implementation of the HOV projects. Identification of these common characteristics assists in advancing the understanding of why HOV facilities have been implemented in some areas and not in others. This understanding could be further enriched by examining the history, institutional arrangements, and characteristics associated with areas that have either not considered or not chosen to implement HOV projects. While outside the scope of the current study, additional research in this area would be beneficial.

Table 1. Important Factors In the Development of the Case Study HOV Projects

Features Common to Multiple Projects	Case Study Sites					
	Houston	Minneapolis	Orange County	Pittsburgh	Seattle	Washington, D.C.
Decision Making Process						
Intense Congestion in Corridor	X	X	X	X	X	X
Lack of Agreed upon Fixed-Guideway Transit Plan	X	X	X		X	X[1]
Planned or Scheduled Highway Improvement	X	X	X	X	X	X
Project Champion Within Implementing Agency	X	X	X			
Legislative or Policy Direction		X	X			X
Implementation Process						
Lead Agency in Implementation	X[2]	X	X	X	X	X
Interagency Cooperation	X	X	X	X	X	X
Joint Funding	X	X	X	X	X	X
Support of Federal Agencies, Incl. Funding	X	X	X	X	X	X
Flexibility and Adaptability	X	X	X	X	X	X

[1]In the I-66 corridor, the Washington Metropolitan Transit Authority adopted a plan in 1968 which included a Metro line in the median of I-66 for a portion of the corridor.
[2]The development of the Houston transitways can best be described as multi-agency projects requiring multi-agency decisions.

II. HOV PROJECT CASE STUDIES

This chapter contains the individual history and institutional arrangements case study reports completed for each of the six case study sites. The case study reports, which are presented in alphabetical order, were prepared by the following individuals or firms.

- Houston, Texas - Richard J. Kabat, Texas Transportation Institute
- Minneapolis-St. Paul, Minnesota - Katherine F. Turnbull, Texas Transportation Institute
- Orange County - Charles Fuhs
- Pittsburgh, Pennsylvania - Kilareski and Mason, P.C.
- Seattle, Washington - G. Scott Rutherford
- Washington, D.C./northern Virginia - JHK & Associates

HISTORY AND INSTITUTIONAL ARRANGEMENTS:

HOUSTON TRANSITWAYS

Richard J. Kabat
Texas Transportation Institute

I. INTRODUCTION

The only type of high-occupancy vehicle lane used on Houston freeways in 1990 is called a transitway. In Houston, the term transitway usually refers to a one-lane reversible, limited-access facility located within a freeway median and separated from freeway traffic by concrete barriers. Houston's transitways are open to buses, vanpools and carpools for inbound a.m. and outbound p.m. use. Most trips occur during morning and afternoon peak-periods.

Two transitways began operating in Houston in 1984. From conception through operation, they were the result of a joint undertaking by the Metropolitan Transit Authority of Harris County (Metro) and the Texas State Department of Highways and Public Transportation (SDHPT). Through September of 1990, 46.5 miles of transitways along four radial freeways have been completed. Additional facilities are under construction, with a total system of 97 miles anticipated by 2000. Figure 1 shows the current and planned transitway system.

Planning, designing, financing, constructing, maintaining, and operating Houston's transitways are tasks of significant magnitude and complexity. Accomplishing these tasks required an unprecedented level of cooperation between Metro and SDHPT, agencies which, in some other parts of the nation, have often been at odds. How Metro and SDHPT came to this degree of cooperation -- and the institutional arrangements involved -- are discussed in this section.

Overview of the Transitways

Telling the story of just one of Houston's transitways would not fully explain how the successful Metro/SDHPT arrangement came to pass. Much of the planning and construction of the four transitways now operating took place concurrently. Some segments were retrofitted to existing freeways without significant freeway modification; others were built from scratch as part of major freeway reconstruction projects. Financing has been a joint effort, but the extent of each agency's share in individual segment cost has varied widely. In most cases, SDHPT has been the contracting agency for construction; but, when circumstances dictated, Metro acted as

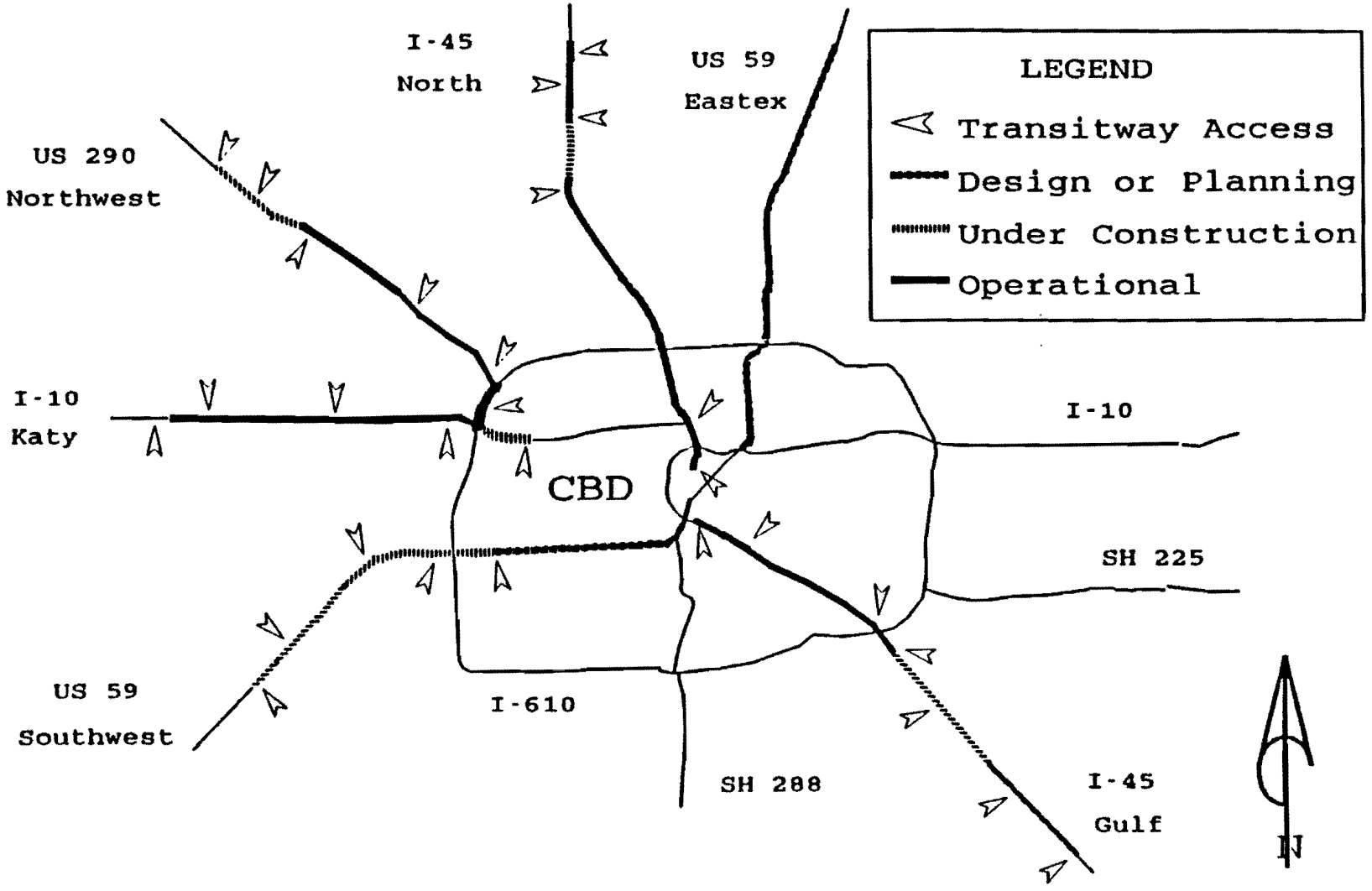

Figure 1. Houston Transitway System, 1989

contracting agency. Metro and SDHPT share responsibility for transitway maintenance, while Metro bears primary responsibility for enforcement and operations. Overall management of the transitway system is a joint responsibility. Throughout their association, both agencies have shown flexibility and adaptability in tailoring their arrangements to fit changing conditions.

Moreover, the genesis of Metro/SDHPT cooperation on HOV projects began in 1974 with their predecessor agencies, the City of Houston's Office of Public Transportation (OPT) and the Texas Highway Department (THD). Since then, the evolution of institutional arrangements has occurred to some degree during the planning of all of Houston's transitways. Accordingly, some familiarity with the nature and timing of key elements of the system should help understanding of that evolution. The following is an overview of the development of each transitway.

- NORTH (Interstate Highway 45 north from Houston)

    1. The initial demonstration project was a contraflow lane, a 9.6 mile project conceived by OPT/THD and executed by Metro/SDHPT. This took an opposing freeway lane for use in the peak-direction by authorized buses and vans during a.m. and p.m. peak-periods. Considered an "exemplary" UMTA demonstration project, the facility was highly successful and was the catalyst for the development of the current transitway system. The contraflow lane operated from 1979 to 1984, when it was replaced with a transitway.

    2. A 3.3 concurrent flow HOV lane was added to allow a.m. contraflow vehicles to bypass freeway congestion upstream of the contraflow entrance by using the left freeway shoulder. This HOV segment operated from 1981 to 1988, serving both the contraflow lane and the transitway which replaced the contraflow lane.

3. The contraflow lane was initially replaced by a temporary a 9.6-mile barrier-protected, reversible HOV lane. This was designed to accommodate HOVs during a major freeway reconstruction project. This facility operated from 1984 to 1987.

4. A 19.7-mile HOV lane, scheduled in three phases, was constructed as part of the freeway reconstruction. 9.1 miles opened in 1987, 5.0 miles opened in mid-1990, and 5.6 miles are scheduled to open by 1993.

- KATY (Interstate Highway 10 west of Houston)

1. An 11.5-mile transitway was constructed in the existing freeway median as part of an SDHPT repair and overlay project. The first 4.7 miles began operating in 1984, with the remainder opening in 1985 and 1987.

2. A 1.5-mile eastern extension of the Katy Transitway, built to eliminate the need for HOV's to traverse local streets through traffic signals to use the transitway, was opened in January of 1990. It also was retrofitted into the freeway median through the major directional freeway interchange with Interstate Highway Loop 610 on Houston's west side.

- NORTHWEST (US Highway 290 northwest of Houston)

1. A 9.5-mile transitway was open in 1988. This facility was constructed in the median of U.S. Highway 290. It includes approximately 2 miles of two-lane, two-way HOV lanes at the connection to the Northwest Transit Center. The final 4 miles of the Northwest Transitway were opened in February 1990, bringing the total length of the facility to 13.5 miles.

- GULF (Interstate Highway 45 southeast of Houston)

  1. When completed this will include a 15.5-mile transitway. Construction is occurring as part of a major reconstruction project on the first freeway built in Texas. The only transitway in Houston financed largely by Federal-Aid Interstate funds, it is being constructed in three sections. The first 6.5 mile segment opened in 1988.

- SOUTHWEST (US Highway 59 southwest of Houston)

  1. This project will include a 9.0-mile transitway being built as part of three contracts for the major reconstruction of the existing freeway. Construction began late in 1989.

- EASTEX (US Highway 59 north-northeast of Houston)

  1. A 20-mile transitway is scheduled to be constructed in the future when SDHPT undertakes major upgrading of the existing freeway.

Table 1 summarizes the status of the Houston Transitway System.

Table 1. Houston Transitway System Status

Facility	Miles Open to Traffic				
	1984-1989	1990	1991-95*	Post 1995*	Total
Committed					
North	9.1	4.4	5.6	—	19.7
Katy	11.5	1.5	—	—	13.0
Gulf	6.5	—	9.0	—	15.5
Northwest	9.5	4.0	—	—	13.5
Southwest	—	—	9.0	4.8	13.8
Planned					
Eastex	—	—	—	20.0	20.0
Sub-Total	36.6	10.5	23.6	24.8	95.5
Cumulative Totals	36.6	47.1	70.7	95.5	95.5

*Scheduled
Source: Metro/SDHPT

Over the years, various names have been used in Houston to describe the facility which is now called a transitway; e.g., buslane, busway, and authorized vehicle lane (AVL). Unless pertinent to a given subject, the transitway term is used in this study.

On transitway/highway projects, both Metro and SDHPT have taken advantage of the availability of federal assistance from both the Urban Mass Transportation Administration (UMTA) and the Federal Highway Administration (FHWA). A number of UMTA, FHWA, and other federal and state agencies regulations have to be met to receive this funding. However, compliance with such requirements, while critical, is not unique to transitway development. Both agencies face such requirements in nearly all their endeavors and have staffs geared to handle these matters as part of their normal duties. Accordingly, the institutional relationships involving federal agencies will not be discussed unless they have particular bearing.

II. HISTORY OF THE DEVELOPMENT OF THE TRANSITWAYS

Organizations Involved in the Development of the Transitways

While the first Metro/SDHPT transitway began operating in 1984, the transitway concept in Houston took root in the late 60's and has involved several institutions. The following organizations played prominent roles in Houston's transitway development.

- The Texas Highway Department (THD) had long been recognized as one of the leading highway agencies in the country. Moreover, since the early 1960's, the THD was involved with the development of innovative traffic management techniques, cooperative endeavors with local governments, and ridesharing activities such as park-and-pool lots on highway rights-of-way.

  In 1975, the Texas Legislature enacted two bills designed to foster public and mass transportation -- and which substantially increased the State's role in pursuing that goal. One provision of the new legislation established a State Public Transportation Fund which could be used to help local transit agencies meet matching fund requirements of federal programs. The legislation vested responsibility for all aspects of these new laws with the THD, renaming the agency the State Department of Highways and Public Transportation.

- The SDHPT operates under a three-member Commission, each of whom is appointed to a staggered six-year term by the governor. It is headed by an Engineer-Director selected by the Commission. The Engineer-Director and the administrative/technical staff are headquartered in Austin; however, the Department operates in a decentralized manner. The State is divided into 24 multi-county districts, each headed by a District Engineer who is responsible for designing, building, maintaining, and operating all roads on the federal and state systems within the District. The District Engineer is given considerable authority to carry out his responsibilities -- within the confines of the policies and programs

adopted by the Commission and the departmental administration. Houston is located in, and is the headquarters of, District 12.

Shortly after World War II, the THD established an Urban Expressway Office in Houston to plan, design, and administer construction of the Gulf Freeway (US 75). In the late 1950's, the Urban Office was given similar responsibilities for Interstate Loop 610 and the radial freeways within the loop. In addition, it helped administer various federal urban programs. In September, 1984, the Urban Office was absorbed by District 12. As each Urban Office project was constructed, District 12 took on the tasks of maintenance and operation. Depending on workload and availability of personnel, the District and Urban offices frequently traded projects.

- The City of Houston is the fourth most populous city in the nation. Several city departments work closely with SDHPT and Metro on matters of mutual interest; e.g. Traffic and Transportation, Public Works and Police. But with respect to transitways, the most significant city agency was the short-lived Office of Public Transportation (OPT). In existence only from 1975 through 1978, it had a profound effect on transit in general and transitways in particular. OPT activities were, in large measure, responsible for Metro's formation and set the stage for Houston's transitways.

- Metro began operation in January, 1979 as the result of a successful referendum held in August, 1978. Voters in each of the cities and the county precincts of Harris County were allowed to determine if their part of the county would be included in Metro's jurisdiction and, thereby, impose a one-percent sales tax on themselves to finance it. The City of Houston and much of the area outside of Houston voted to do so; however, several entities in the eastern part of the county opted not to join Metro. Metro is governed by a nine-member Board of Directors appointed by the City of Houston, the suburban cities, and Harris County. It is headed by a General Manager who is selected by the Board.

- The Texas Transportation Institute (TTI), a part of The Texas A&M University System, is an interdisciplinary transportation research organization headquartered on the University campus at College Station, Texas. Since 1955, it has been active in multimodal research for a wide variety of federal, state and local governments, as well as, private clients. TTI is also the official research arm of the SDHPT. Through contracts with SDHPT and Metro, TTI personnel from its Houston and headquarters offices have been deeply involved with HOV facility planning and development in Houston for over fifteen years.

Development of the Transitways

Background

From the late 1940's through the mid-1970's, the Houston metropolitan area grew at a rate well above the national average, increasing in population from less than half a million to over two million. Until the late 1960's, highway and street construction kept reasonable pace with growth. But, by 1970, peak-period freeway congestion had begun to worsen to the point of public concern. Moreover, the privately-owned bus system began to lose money in the late 1960's. Subsequently, bus service was reduced, maintenance was deferred, and the condition of the bus fleet deteriorated. Against this backdrop, local and state officials sought ways to increase the effectiveness of existing facilities and to finance additional capacity. Concurrently, City of Houston officials and community leaders also began efforts to establish a transit authority.

The first serious proposal for a transitway on a Houston freeway came from the THD Urban Office in 1969. Long-range planning for the future upgrading of the Gulf Freeway to full Interstate standards had been initiated and THD requested FHWA approval to include a median transitway in such planning. The proposal was not approved.

During the early 1970's, several steps were taken by the City of Houston toward establishing a regional transit authority. One of these steps was a long-range transit plan

prepared by Alan Voorhees & Associates for the City in 1973 (called the Voorhees Plan) (1). The Voorhees Plan proposed an extensive rail transit system, but it also included transitways along the North, Gulf, and future South freeways. It recommended that the 1969 THD Gulf Transitway proposal be constructed. The Voorhees Plan was the basis for an election held in October, 1973, to determine if a Houston Area Rapid Transit Authority (HARTA) should be created. Although heavily supported by the City and community leaders, the HARTA proposal was defeated by a margin of nearly 3 to 1.

The City of Houston, however, remained committed to development of a mass transit system -- as well as pursuing other measures to alleviate traffic congestion. In 1974, under a new mayor, the City, with UMTA assistance, purchased the privately-owned bus company. The City also commissioned THD's District 12 to study techniques which could be used to reduce freeway congestion. In late 1974, the City hired a Public Transportation Administrator who was charged with establishing a new City department, the Office of Public Transportation (OPT).

The OPT began operation in January, 1975. It quickly embarked on an ambitious program to upgrade bus service and facilities, find ways to reduce traffic congestion and foster ridesharing, and to mount an effort to establish a regional transit authority with adequate financial resources. To achieve these goals, OPT aggressively pursued several courses of action. Among them was establishing a close working relationship with the local staff of the THD, including continuation of the District 12 study on congestion-reducing measures.

North Freeway Contraflow Lane Demonstration Project

In July, 1975, OPT received UMTA approval for a Service and Methods Demonstration grant to investigate in more detail the feasibility of the contraflow lanes suggested in the 1974 District 12 study -- and to construct any which could be justified (3). The City/OPT then contracted with THD for District 12 personnel to make an investigation. The District 12 study, completed in March, 1976, concluded that the funds available would finance a contraflow lane along only one of the two freeways where traffic patterns still allowed such treatment. The

North Freeway Contraflow Lane (CFL) was selected. So began the first step toward the Houston Transitway System.

Several months passed while the OPT and District 12 attempted to obtain UMTA and FHWA approval of design features and to resolve UMTA and FHWA jurisdictional problems. By 1977, these problems were resolved. But, as plan-preparation for the CFL progressed, it became apparent that the construction needed to implement the CFL would cost more than the amount provided in the original grant. OPT and District 12 staffs vigorously sought the additional funds needed from a variety of federal, state and local programs. After considerable effort, they succeeded, and, under a formal contractual agreement between the City and SDHPT, construction was authorized. When CFL construction began in January, 1978, funding for it, and associated projects for park-and-ride lots, freeway ramp metering, and contracted bus service, came from local sources, state programs, UMTA Section 5, Federal-Aid Urban System, Federal-Aid Primary, UMTA Section 6, Federal-Aid Interstate, and UMTA Section 9 programs.

The unusual mixture of funding sources demonstrated the degree of local and state inventiveness and cooperation. But the mixture also demonstrated cooperation at the federal level from FHWA and UMTA. Traditional highway-related funding helped support a public transportation improvement while transit-related funding helped further the highway aspects of the project.

The OPT and SDHPT not only joined forces to get the money needed to finance the CFL group of projects, they also worked together to coordinate and execute the several construction contracts involved. District 12 personnel handled construction management, engineering and inspection of the CFL project while OPT administered the funds for contractor payment and reimbursement of SDHPT expenses. The SDHPT Urban Office, with the assistance of the OPT, planned and constructed a park-and-ride lot financed with Federal-Aid Urban System and State funds available to the City of Houston. District 12 handled the contract for installation of the freeway ramp metering system and OPT handled the contract for construction of a remote park-and-ride lot.

While helping develop the CFL, the OPT also spearheaded the drive to establish the Metropolitan Transit Authority of Harris County (Metro), which was created in a successful election in August, 1978. Its purpose accomplished, the OPT was dissolved in January, 1979 when Metro began its existence by taking over all of OPT's functions, including the CFL. Discussion of OPT's many other activities is not directly applicable to transitway development. But, a discussion of the 1978 Regional Transit Plan (2) prepared by OPT for the Metro election is more than germane to the transitway concept. This plan did not just include a few transitways; it was dependent upon them.

Like the 1973 Voorhees Plan, the 1978 plan had an extensive (80-90 miles) rail-transit system as its long-term goal, but it did not specify the exact extent, location or technology. Unlike its predecessor, the 1978 Plan set out to achieve its goal by first building 75 to 84 miles of "interim" transitways -- suggesting that they be designed to allow possible future conversion to automated guideways or rail transit as dictated by a final plan which was to be developed by Metro. However, such conversion was to be contingent on UMTA approval and funding, as well as voter approval of any final plan which would require Metro to issue long-term bonds to finance the rail system. The 1978 plan estimated that some $542 million would be devoted to interim transitway development during the first ten years of the program. Nearly one billion dollars was estimated for the later rail transit development, including transitway conversion.

In January, 1979 Metro assumed all of OPT's functions, most of OPT's small staff, and the City's Public Transportation Administrator was named Metro's General Manager. Accordingly, Metro was able to begin implementing the 1978 Plan by continuing the programs started by OPT, but with the vastly increased local funds generated by the Metro one-cent sales tax.

Among the new agency's first efforts was continuation of the CFL project with the SDHPT. In August, 1979, less than nine months after Metro's formation, the CFL began operating. As required by the CFL Contractual Agreement, the CFL was operated in accord with a jointly prepared Operations Plan under the direction of a joint management team consisting of one representative from each agency.

The CFL operated during a.m. and p.m. peak-periods by using the off-peak direction inside freeway lane for peak-direction CFL vehicles. It was separated from opposing freeway traffic by plastic pylons placed in pre-drilled holes by Metro crews who then recovered the pylons after the CFL closed. For reasons of safety, only authorized buses and vanpools (displaying authorizing stickers) driven by individuals screened and trained by Metro under CFL Management Team guidelines were permitted to use the CFL. Initially, Metro paid the Houston Police Department to handle CFL enforcement. When Metro formed its own Transit Police in 1982, they assumed responsibility for CFL enforcement. Maintenance of the CFL was a joint Metro/SDHPT effort, with specific responsibilities spelled out in the CFL Agreement. As required by the Agreement, Metro stationed medium and heavy-duty wreckers on the CFL to insure speedy removal of disabled CFL vehicles or accidents. The wreckers, along with police vehicles, also helped with the placement and recovery of the CFL pylons in accordance with a procedure spelled out in the Operations Plan.

The CFL was never intended to be a permanent facility. Considerations for the use of hand-placed pylons rather than a permanent automatic system, low capital cost ($2 million for 9.6 miles), and stringent regulations were all based on the premise that the CFL would be a short-term experimental exercise. Indeed, the UMTA Demonstration grant anticipated only an 18-month operating period. The CFL's primary purpose was to determine if the auto-oriented people in the Houston area would make use of buses and vans on a high-speed, congestion-bypassing priority lane. The success of the project indicated that people would change their commuting behavior.

Within six months, the CFL carried nearly as many persons during the peak-hour as a freeway lane; at the end of the 18 month trial period, it carried nearly as many persons in the peak-hour as two freeway lanes. But access to the a.m. CFL entrance at the northern end was inhibited by heavy upstream freeway congestion. At the instigation of the CFL Management Team, a 3.3-mile concurrent flow lane immediately upstream of the a.m. CFL entrance was opened in March, 1981. This allowed CFL vehicles to bypass most of the congestion (9). When the concurrent flow lane opened, CFL patronage was under 11,000 persons per day. One year later, it had grown to over 15,000 per day.

Because the CFL was so successful, and because it was an UMTA "exemplary" demonstration project, it was studied closely by several researchers, highly publicized, and the subject of many reports. It was even the subject of a short movie produced by TTI for Metro/SDHPT. For those desiring more information about the CFL, several sources are listed in the references.

At its inception, neither SDHPT nor OPT/Metro envisioned long-term CFL operation. But the CFL's high usage compelled them to change it from a test project to an operational facility which functioned for five years -- and which ceased to operate only when it was replaced with a transitway. The SDHPT did not want CFL users to return to the freeway where they would add to peak-hour queueing extending over ten miles in length. And for the fledgling Metro organization, the CFL represented a major success story.

However, the CFL was not destined to have a long tenure. Even before the CFL test period was over, the SDHPT CFL Project Engineer initiated a TTI study to determine how long the CFL could operate before traffic growth in the off-peak direction would force its termination. The study concluded that the CFL should not operate past 1985 (8).

Late in 1981, the Metro Board authorized funds allowing its staff to work with SDHPT to develop a transitway for buses and vanpools as a CFL replacement. The SDHPT had previously been authorized to upgrade and expand Interstate Highway 45 and had already begun the planning to do so -- but without a transitway. After the Metro action, a joint Metro, Urban Office, District 12, City, TTI design team was formed to integrate a transitway into the SDHPT construction plans, but in a manner which would not impede CFL operation.

In 1983, the first of several construction contracts for CFL replacement (as part of the highway reconstruction) began under an agreement where Metro acted as the contracting agency and the SDHPT Urban Office provided construction management, engineering and inspection. In response to an incentive clause in the $8,200,000 construction contract, the HOV project was completed in record time of 269 days. In September, 1984, CFL operations were stopped, and Houston's first transitway began to operate. Construction, maintenance, and operation of the

North Transitway was governed by the same type of agreement and operations plan used for the CFL. In fact, the Team which had managed CFL operations was named to oversee operation of the North Transitway.

Development of Other Transitways

Houston's second transitway, built in the median of the Katy Freeway, came about in a different way. In the late 1970's, SDHPT's District 12 identified an upcoming need to repair and overlay a ten-mile portion of the Katy Freeway immediately west of IH 610 due to pavement deterioration. A long-term project to reconstruct the Katy Freeway was under consideration, but it became evident that the pavement repair work would not wait for the reconstruction project. Accordingly, District 12 began to plan for the repair project.

Meanwhile, it became clear to the Metro transitway staff that timely commencement of operations along the Katy Transitway as outlined in their 1978 Plan was unlikely because of the lengthy delay attendant with including the transitway in the long-term IH 10 reconstruction project or the difficulties associated with building the transitway as a separate project. Sensing an opportunity to expedite the Katy Transitway, the CFL Team members suggested that the SDHPT delay the pavement repair project and that Metro accelerate the Katy Transitway planning schedule so that transitway construction could take place as part of the pavement repair contract. The SDHPT District Engineer was reluctant to delay the needed repair work, but did so because combining the two projects would greatly reduce the extended traffic disruption that freeway drivers would have to endure if the repair work and transitway construction were done separately. Early in 1982, Metro and SDHPT formally agreed to another joint endeavor, using the same types of Agreement and Operations Plan employed on the CFL and the North Transitway.

Once more, a joint design team directed Metro's consultants who incorporated transitway elements into the pavement repair plans. This was not an easy task. The transitway had to be squeezed into a twenty-foot median; bridges had to be widened; freeway lane widths had to be reduced; and FHWA design approval was hard to obtain. Nonetheless, the first of the contracts,

covering a 4.7-mile section, began in 1983. In October of 1984, the transitway was opened to buses and vanpools -- and Houston's second transitway began operating, less than two months after the North Transitway. The Katy Transitway operates under the guidance of the same management team which handles the North Transitway.

The timing of the remaining sections of the North and Katy Transitways is outlined in the Introduction. In each case, they were a joint Metro/SDHPT effort, regardless of which agency handled construction contracting. Construction of each individual section was covered by a separate Metro/SDHPT agreement, following the approach mentioned earlier.

There was a four-year delay before the first segments of the Gulf and Northwest Transitways were opened in 1988. But the reasons for such timing were different for these two transitways. The Gulf Transitway is unique among Houston's transitways in that it was planned and developed by the SDHPT as part of the upgrading of a portion of Interstate Highway 45 -- and was financed largely with Federal Aid Interstate and State funds. Although Metro agreed to assist in developing the transitway portion and ancillary facilities in 1980, the pace of construction was determined in large measure by the difficulty of, and the availability of federal highway construction funds for, the larger overall freeway project. Even so, transitway design, as part of the freeway plans, was overseen by the joint design team approach employed on the other transitways.

From 1979 to 1983, neither the Northwest nor Southwest transitway proposals received much attention. During these years, Metro concentrated much of its resources in preparing a long-range transit plan featuring heavy rail and satisfying UMTA requirements for plans which would include new rail starts. One of the rail lines in their plan would have followed the Southwest Freeway corridor. In June, 1983, Metro submitted their plan to the voters in the form of a $2.35 billion bond referendum. The referendum failed by a 62% to 38% margin.

Shortly thereafter, Metro decided to pursue the development of transitways along the Northwest and Southwest Freeways as joint projects with SDHPT. The SDHPT had already begun to plan for the major reconstruction of the Southwest Freeway, but agreed to work with

Metro to make the adjustments in planning needed to incorporate the transitway into the freeway plans under the typical Metro/SDHPT construction agreement. Plan preparation took place under the joint design team approach. The start of construction of the first segment of the Southwest Transitway/Freeway, which occurred in late 1989, was determined by the difficulty of acquiring right-of-way in a heavily developed freeway corridor.

Development of the Northwest Transitway required a different approach. As noted earlier, it follows a portion of the West Loop as well as the Northwest Freeway. When planning for the Northwest Transitway began in 1984, the full freeway extended about 8 miles beyond the northwest corner of IH Loop 610. Beyond that, only the service roads had been constructed, but the SDHPT had started to prepare plans for adding the freeway mainlanes.

Because the SDHPT did not have plans to work on the completed portions of the West Loop and the Northwest Freeway, Metro took the lead in developing plans to retrofit the transitway within the existing freeway rights of way. Where only the frontage roads were in place, the SDHPT agreed to incorporate the transitway into the mainlane construction. In both cases, the usual Metro/SDHPT agreement and design team process was followed. Construction of the first leg, along the existing full freeways, began in 1986, financed by Metro and with SDHPT handling construction management. This first phase opened to buses, vanpools and carpools in August, 1988. The second phase opened in February, 1990.

Additional work is either underway or planned on each of the transitways discussed previously. While Metro and SDHPT have agreed to develop a transitway along the Eastex Freeway as part of the freeway reconstruction, it is too early to make an accurate estimate of when it will be operational.

III. INSTITUTIONAL ARRANGEMENTS

Metro's Board of Directors and the SDHPT's Commission have agreed to develop Houston's transitway system jointly. The specific institutional arrangements between them have their formal expression in contracts and agreements which have passed the scrutiny of legal staffs. There are numerous agreements between Metro and SDHPT; both agencies have had several contracts with TTI for technical assistance; and all three have contracts or agreements with other organizations who in some way have been involved with the transitways. Only the rationale and primary thrust of significant agreements will be discussed in this section.

Of equal, or perhaps of even greater importance, are the informal relationships that existed between key individuals in each organization. These relationships paved the way for the formal agreements and helped avoid some of the bureaucratic lethargy common in interaction between governmental agencies. The relationships also encouraged a pattern of informal person to person communication which helped to coordinate efforts and often prevented small problems from developing into big ones.

Formal Arrangements

Over the years, Metro and SDHPT have, with TTI's help, developed a two-stage process for formally adding an additional segments to the transitway system:

1. When it becomes evident that an authorized construction project for a transitway segment can be scheduled, a construction agreement, generally following the pattern of previous segments is prepared. The construction agreement spells out: each agency's share of design and construction costs; the contracting agency; responsibilities for construction management, engineering and inspection; and other matters specific to the construction of that particular segment.

2. Until 1988, nearly all of the individual construction agreements included lengthy provisions covering maintenance, operations, and other matters common to all

transitways. Some of the difficulties these provisions posed included the following.

- They made for lengthy documents with relatively little that applied to the construction project at hand;
- The maintenance and operational provisions in each construction agreement required the project construction file to be maintained in perpetuity because it contained the basis for post-construction activities; and
- Over the years, several individuals prepared the construction agreements. Minor changes in the language covering maintenance and operations crept into some of the documents. Therefore, to check on an operational requirement, it might be necessary to examine the maintenance and operations provisions of all segments.

To address such problems, a Master Operation and Maintenance Agreement was executed in 1988. It covered all of Houston's transitways and became the only "live" document needed to handle all post-construction transitway concerns. It allowed each construction agreement to "die" after project completion, thereby avoiding as many as twenty separate agreements to cover operation and maintenance. When an individual transitway segment is enabled by a construction agreement, it is automatically added to the list of projects covered by the Master Agreement.

Most of the construction agreement provisions provided that Metro would defray most of the actual transitway cost and that the SDHPT would provide experienced personnel to supervise the design, construction, engineering, and inspection necessary to bring a major highway improvement to fruition. The basic thrust of operations and maintenance provisions was to specify joint responsibilities. In essence, the maintenance provisions make Metro responsible for signs, control devices, electrical power, and other items specifically associated with the transitway. The SDHPT is to maintain the transitway pavement, barriers, supporting structures, non-transitway items, and is to handle routine sweeping and litter pickup.

The primary thrust of the Master Agreement's operational provisions is that Metro will provide all the resources needed to operate the transitways -- but will do so in accordance with a jointly prepared Operational Plan which covers all aspects of operations, enforcement, eligibility, and safety. Moreover, the Master Agreement requires a Transitway Management Team which is composed of one representative from Metro and District 12. Their tasks include preparation of Rules and Regulations, Operating Manuals, and amendments to Operations Plans. They also monitor transitway operation, meet monthly, and make recommendations to enhance transitway safety and effectiveness. TTI has been an active participant in Transitway Management Team activities from the CFL project to now. They have also been heavily involved in preparation of the Master Agreement, Operations Plans, and other activities.

Informal Arrangements

Prior to the creation of OPT and Metro, key staff members of THD, TTI, the City of Houston, and Harris County had developed close working relationships. These developed through contacts on joint projects, planning groups, research activities, and professional societies. Through such informal personal contacts, interagency communication and cooperation functioned at a higher level than could be achieved by formal committees and correspondence alone.

During the 1950's and 60's, both public and private organizations in the Houston area took pride in a "can do" attitude. They often joined forces to support such endeavors as NASA's Manned Spacecraft Center and the Astrodome. Most of the staff members mentioned above shared this attitude. When it was formed in 1975, the OPT entered this climate already possessing a strong mandate from the Mayor to pursue its goals aggressively. The young, energetic OPT staff took full advantage of the already developed informal relationships between City of Houston staff and local THD staff, particularly those of District 12 and TTI, to help expedite the formalities needed to pursue the CFL project. Later, when it looked as if the CFL project would be stalled by lack of funds, OPT and local THD/SDHPT staff worked together to get their parent organizations to combine funds from a wide variety of programs to enable project continuation. In another instance, when FHWA and UMTA jurisdictional problems

delayed CFL planning, the SDHPT's Engineer-Director personally interceded with the Federal Highway Administrator in Washington.

The CFL Operations Management Team also took informal initiatives. The team's charge, under the CFL Contractual Agreement, was to see that the CFL functioned in accordance with its Operation Plan. When team members saw that CFL utilization was hampered by upstream a.m. traffic congestion, they initiated efforts within each organization to implement a concurrent flow lane. After its installation, CFL utilization increased by over 30%.

As noted earlier, the SDHPT representative on the CFL team was able to initiate a TTI study (8) to determine how long the CFL could operate before growth in off-peak direction traffic would force its abandonment. The study's conclusion that the CFL should not operate beyond 1985 was an important factor in the Metro/SDHPT decision to take the measures necessary to replace the CFL before then.

Although not required to do so by formal agreements, Metro and the local SDHPT offices set up informal ad hoc design groups to direct and coordinate the efforts of those preparing individual construction plans. Headed by senior design staff, the design groups included in-house designers, outside consulting firms, and individuals from other SDHPT and Metro departments. As appropriate, other design group participants included representatives from TTI, FHWA, City, and County traffic engineers, and law-enforcement agencies. These groups usually met monthly to monitor progress, deal with design problems, cut red tape, and settle differences. By so doing, they handled matters which might otherwise not have emerged until plan preparation and review were complete.

District 12 has embarked on the planning of a major traffic management system which will cover all of the freeways in the Houston Metropolitan Area. The City of Houston has also started to develop a city-wide coordinated traffic signal control system. And Metro/SDHPT have built the first elements of sophisticated surveillance, communication and control system (SC&C) for the transitways. All of these systems employ computers, electronic control devices, detectors, electronic and/or television surveillance, communication/data transmission cables, and

other devices common to the genre. Each is designed to operate independently. But they are all being planned for eventual interconnection. The larger data-gathering network thus formed should help enhance real-time problem solving on each system.

Again, the three agencies have formed an informal group called the SC&C Committee. Its function is to work with TTI, designers and consultants, and others to coordinate SC&C planning, design and construction. For examples, during construction of the Katy Transitway, a conduit for transitway SC&C cables was to be installed. After considering long-range SC&C planning, committee members were able to convince SDHPT and FHWA officials to approve the more economical, less intrusive installation of a larger conduit to handle both the transitway cable and the cable for the future freeway system.

There is another manifestation of the informal interagency arrangements extant in the Houston area. This is the Houston Traffic Management Team (HTMT). It was formed in 1981 by the SDHPT representative on the CFL Operations Team (12) and was patterned after a similar group started in San Antonio several years earlier (4). The HTMT is an ad hoc voluntary association of key individuals from agencies interested in the operational aspects of traffic in the Houston area. It includes representatives from: each city, county and state transportation agency; TTI; Metro; law enforcement agencies; and the fire department's emergency services. As topics for discussion arise, other participants may include individuals from FHWA, railroad companies, hazardous material spill response teams, public information officers, and others. The HTMT meets monthly to discuss such topics as upcoming project proposals, multi-jurisdictional traffic problems, proposed traffic control strategies for major urban projects and events, and traffic management planning. While HTMT activities are not confined solely to transitways, the increased level of interagency communication they foster does bring greater awareness of transitway effects and how other activities infringe on transitways.

III. CONCLUDING COMMENTS

In most areas of the nation, limited-access, barrier-protected HOV lanes within highway rights-of-way are constructed and operated by state departments of transportation, (14, 15) with enforcement a collateral duty of state highway patrols. The joint Metro/SDHPT approach is unique. Metro's involvement with the transitways represents one of the most extensive of any transit agency in the country.

Metro's involvement can be better understood by examining its brief history. As an operating agency, Metro is only eleven years old. From its inception, Metro's Board of Directors and senior management have focused primarily in two major tasks: resurrecting a decrepit bus system, and developing a transit system which included a substantial rail element. Transitways were originally viewed as a means to an end rather than high-priority items in their own right. By the mid-1980's, Metro succeeded in improving the bus system to the point where it won a national award for operational performance. However, Metro was less successful in developing plans for a rail transit system.

The rail-related 1983 bond referendum failure resulted in Metro taking a revised approach. More emphasis, personnel, and resources were devoted to transitway development, including park-and-ride lots and other associated activities. Previously, Metro's joint transitway projects with SDHPT consisted of the CFL replacement and a target of opportunity along the Katy Freeway. After the bond defeat, Metro initiated and aggressively pursued development of the Northwest and Southwest transitways with the SDHPT. Metro's interest in the SDHPT effort to build the Gulf Transitway as part of the IH 45 reconstruction was also heightened. This greater emphasis on transitways was evident in the 1988 Metro Transit Plan which received voter approval. While the plan included a rail component, it also incorporated the transitway system as a major component.

The basis for the SDHPT role in Houston's transitway system has its roots in events which predate OPT and Metro. In the mid-1970's, the department was facing a funding short fall. Rising costs made it doubtful if previous highway construction commitments could be

honored. For the first time in the department's history, there were widespread employee layoffs. Taking on any additional projects would have been difficult. It was at this juncture that OPT proposals for the CFL came about. The SDHPT staff in Houston welcomed the concept; it could, along with other endeavors, squeeze more capacity out of overloaded freeways where money was not available for near-term upgrading. The SDHPT administration was willing to lend the expertise and experience of its personnel to such efforts but not its diminishing funds. As a result, the OPT paid the SDHPT for the studies, plan preparation, and construction management personnel needed to construct the CFL. The OPT also paid for the CFL construction cost from the several sources mentioned earlier. The SDHPT did participate in the cost of associated projects, such as the ramp metering and a park-and-ride lot, to the extent necessary to match available federal funds.

The CFL Agreement also specified that OPT was to be responsible for the direct costs of operating the CFL. The SDHPT did, however, allow its staff to help with operational management and maintenance. As noted earlier, the arrangement established for the CFL project became the pattern for subsequent Metro/SDHPT transitway projects. In the late 1970's, legislation improved the SDHPT financial position and they were able to make modest increases in their participation in the transitways. But by that time, the 1978 Metro Regional Transit Plan had established Metro's ongoing commitment to the transitways. Even with SDHPT's improved finances, there is little likelihood that they would have embarked on as ambitious a transitway program, given their large backlog of unfinished projects. In confirmation of this premise, there is only one other significant HOV project in Texas.

Throughout the entire transitway development process, TTI has been an active participant. As the research arm of SDHPT, TTI was deeply involved in studies relating to all facets of departmental activities. Thus, it was natural that TTI became involved in studies relating to HOV lanes early on. In addition, when THD was assigned public transportation responsibilities and become the SDHPT, TTI involvement also expanded. When OPT and Metro were created, they also utilized TTI's expertise to assist in numerous projects.

The development of the Houston transitways were the result of the joint efforts of SDHPT and Houston Metro. Without Metro's financial capabilities, its willingness to operate the transitways, and the transitway enthusiasts on its staff, it is almost certain that the transitways would not be operating in Houston. The way transitways came to pass in Houston, both agencies had to participate; neither could have done it alone. While there have been some disagreements among the two agencies, for the most part they have managed to establish a good ongoing working relationship.

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15. Kabat, R.J., An Analysis of the Use of Incentive/Disincentive Contracting Provisions for Early Project Completion - North Freeway Transitway. Texas Transportation Institute for METRO, 1986.

16. Kabat, R.J., High Occupancy Vehicle Lanes Enforcement Survey, TTI Technical Memorandum for METRO, 1988.

17. METRO-SDHPT, Various Construction Agreements for transitways in Houston, 1979-1989.

18. METRO-SDHPT-TTI, Various Operations Plans for transitways in Houston, 1979-1989.

19. Transitway Master Operation and Maintenance Agreement, for METRO and SDHPT by TTI, 1988.

20. METRO, Annual Reports, 1979-1989.

21. METRO, Briefing on METRO Transitway Projects, April, 1989.

22. METRO-SDHPT, Correspondence, 1974-1989.

APPENDIX A

Agencies, Organizations, and Committees Referenced in the Houston Transitway Case Study

The following is a list of agencies, organizations, and terminology are referenced in the Houston Transitway Case study. A brief description of each is noted.

Authorized Vehicle Lane (AVL). One of the terms used initially to describe the Houston transitways. This term was used on both the Katy and North Transitways when use of these facilities was restricted to authorized vehicles only. Eligible vehicles (vanpools initially on both facilities, and later carpools on the Katy Transitway) were authorized to use the facilities through a registration program administered by Metro. To become authorized a variety of actions, such as vehicle inspection, minimum insurance requirements and driver training, were required. Vehicles authorized to use the lane displayed permits and drivers eligible to drive in the lane were issued special licenses.

Federal Highway Administration (FHWA). FHWA is part of the United States Department of Transportation and is the agency responsible for the federal highway system. FHWA funding has been, and continues to be, used to support the planning, design, and construction of the Houston transitways.

Houston Area Rapid Transit Authority (HARTA). The creation of this agency, along with the development of an extensive rail transit system, was proposed in 1973. The proposal was defeated by the voters in an October, 1973 election.

Houston Traffic Management Team (HTMT). The HTMT was formed in 1981 by the State Department of Highways and Public Transportation. The HTMT is an ad hoc voluntary group, comprised of representatives of key agencies concerned with the operational aspects of traffic and transportation in the Houston area. The HTMT focuses on insuring that there is communication and coordination among the different agencies relating to projects, multi-jurisdictional traffic problems, traffic management problems, and other transportation issues.

Houston Office of Public Transportation (OPT). The Office of Public Transportation (OPT) was established as a city department in January, 1975. It was responsible for managing the city owned bus service, which had been purchased by the city in 1974 from the private bus operator. The city agency operated the bus system from 1975 to 1978. During this time, OPT initiated major improvements in bus services and facilities. In addition, OPT was actively involved in the initial planning for the transitways. The functions of OPT were assumed by Metro in 1979.

Houston Metro. Houston Metro is the common name used for the Metropolitan Transit Authority of Harris County, the publicly owned transit authority for the Houston area. The agency was created as the result of a referendum approved by the voters in August, 1978. The

referendum authorized the creation of the transit agency and the imposition of a one-percent sales tax to finance the system. Metro, which is governed by a nine member appointed Board, began operation in January, 1979. Metro operates service in the city of Houston and some, but not all, of the adjacent communities. Metro has been actively involved in planning design, funding, operating, and enforcement of the transitways.

Houston Urban Expressway Office (Urban Office). The Houston District (District 12) of the Texas Highway Department established the Urban Office as a second office in the 1950's to assist with the rapid development of the freeway system in the Houston area in the 1950's, 1960's, and 1970's. The major focus of the Urban Office was on the design and construction of the Interstate Loop 610 and freeways within the loop. In 1985, the Urban Office was merged back into the District 12 office.

Surveillance, Communication and Control Committee (SC&C Committee). An informal group comprised of representatives from the City of Houston, SDHPT, and Metro established to assist in the development and coordination of the surveillance, communication, and control system for the transitways, freeways, and city traffic signal system.

Texas State Department of Highways and Public Transportation (SDHPT). The SDHPT was created in 1975 when the additional responsibilities for public transportation were given to the Texas Highway Department. SDHPT is responsible for the highway and public transportation programs within the state. Houston is located in District 12, one of the 25 multi-county SDHPT districts. SDHPT, and either the OPT or Metro, has been, and continues to be one of the lead agencies in the planning, design, construction, and operation of the transitways.

Texas Transportation Institute (TTI). The Texas Transportation Institute (TTI) is the interdisciplinary transportation research institute of The Texas A&M University System. TTI was established in 1950 and has been active in a wide scope of multi-modal transportation research. TTI is the official research arm of the Texas State Department of Highways and Public Transportation. TTI has been actively involved with the planning, design, monitoring, and evaluation of the Houston transitways, under contract to SDHPT and Houston METRO.

Transitway. Term used to describe the Houston high-occupancy vehicle (HOV) lanes. Other terms, such as contra flow lanes (CFL), authorized vehicle lane (AVL), busway, and buslane were used at different times during the development and evolution of the HOV lanes. The term transitway appears to be generally well understood by both the public and transportation professionals.

Urban Mass Transportation Administration (UMTA). UMTA is part of the United States Department of Transportation. UMTA is the transit counterpart to FHWA. UMTA is the agency responsible for federal financial assistance to public transit systems, including support for planning, operating, and capital elements. UMTA funding has been used to support different aspects of the Houston transitways.

HISTORY AND INSTITUTIONAL ARRANGEMENTS: I-394, MINNEAPOLIS, MINNESOTA

Katherine F. Turnbull
Texas Transportation Institute

I. INTRODUCTION

This technical report presents the I-394 case study. Information is provided on the history and development of the I-394 project, the institutional arrangements, the design and operating plan, before and after traffic volumes, HOV lane utilization rates and other relevant operating statistics.

The information presented in this report was obtained from a variety of sources including; published reports and documents from agencies in the Twin Cities metropolitan area, information provided by agency staff and interviews with individuals responsible for the different aspects of the I-394 project.

II. PROJECT DESCRIPTION

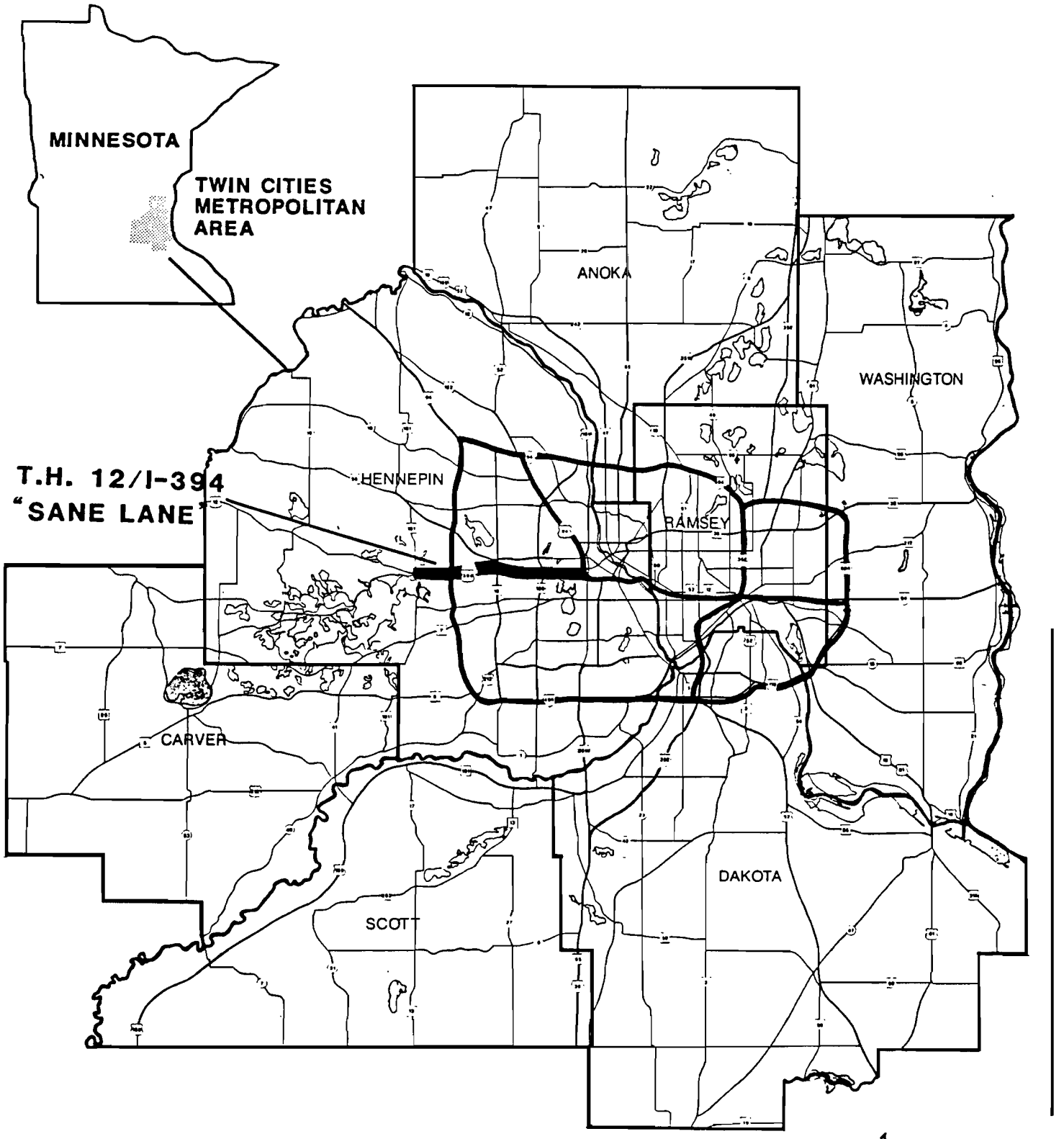
I-394 is the last segment of the interstate system to be constructed in the Twin Cities metropolitan area. As shown in Figure 1, I-394 is located on the western side of the metropolitan area; extending eleven miles from downtown Minneapolis to the City of Wayzata. Communities directly adjacent to I-394 include the cities of Minneapolis, Golden Valley, St. Louis Park, Plymouth, Minnetonka and Wayzata.

I-394 is being constructed on the existing TH 12 alignment. TH 12 consists of three miles of freeway on the eastern end, while the remaining eight miles are a signalized arterial. Both sections are comprised of two lanes in each direction, with auxiliary and turn lanes in some areas.

The ultimate design of I-394 is shown in Figure 2. When completed, I-394 will include a combination of High Occupancy Vehicle (HOV) lanes, mixed traffic lanes and supporting transit elements. In the eight mile segment west of TH 100, the I-394 design consists of three lanes in each direction. The inside lanes are diamond lanes, reserved for buses, carpools and vanpools in the morning and afternoon peak periods. East of TH 100 the design consists of two mixed traffic lanes in each direction and a barrier separated, reversible 2-lane HOV facility in the median. These HOV lanes will operate inbound in the morning peak period and outbound in the afternoon peak period.

A variety of supporting transit and traffic management elements are also included in the final design of I-394. Many of these are shown in Figure 2 and include two major transit stations, seven park-and-ride lots, ramp metering, HOV bypass lanes at selected ramps and three new parking garages in downtown Minneapolis, which are directly accessible from I-394 by way of the new Third Avenue Distributor.

To support these capital elements a number of improvements are planned for the bus and rideshare systems. Bus service in the corridor will be improved through the implementation of a timed-transfer system. This will provide improved express bus service to downtown



REGIONAL LOCATION OF I-394

I-394 CASE STUDY PHASE II

1

SRF

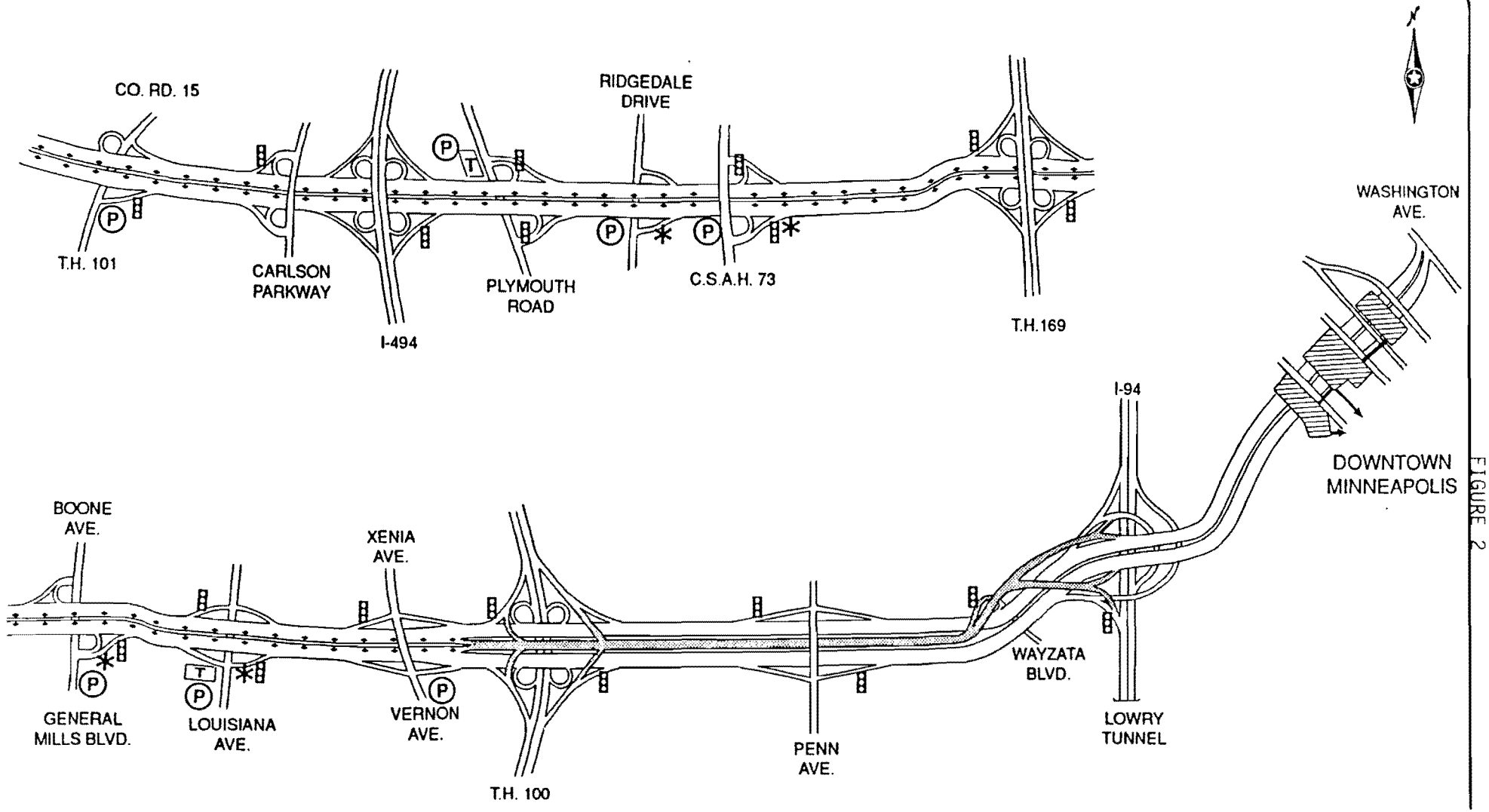


FIGURE 2

I-394 TRANSPORTATION SYSTEM

I-394 CASE STUDY PHASE II

2

SRF

Minneapolis and new service linking major activity centers and neighborhoods within the corridors. The three new parking garages will provide reduced parking rates for carpools and vanpools using I-394, and two of the garages will include major bus facilities. Other transit and rideshare marketing and promotional activities are also planned for the corridor to encourage the use of the HOV lanes.

To help manage traffic during the construction of I-394 and to introduce the concept of HOV lanes to the motoring public, an interim HOV lane was implemented. The interim HOV lane, or "Sane Lane", as it is called, was first open in November 1985. Initially, two segments of the Sane Lane were open. These consisted of a three mile section in the TH 100 area and a one mile section through the Plymouth Road interchange. Both of these segments are primarily barrier separated, reversible facilities. As construction on I-394 proceeded, the Sane Lane was expanded to assist with traffic management. In addition to the barrier separated segments, diamond lanes are being used in some portions of the corridor. The location of the interim HOV facilities and the schedule of I-394 construction activities is shown in Figure 3.

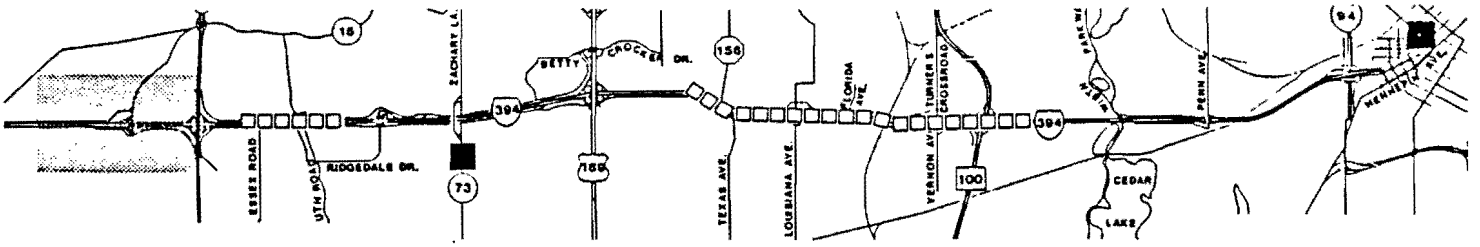
Construction started on I-394 in 1985. The two initial segments of the Sane Lane were open in November of 1985. Additional portions of the interim HOV lane were open in 1987 and 1988. The first parking garage in downtown Minneapolis was open in 1989. Completion of the full I-394 facility is scheduled for 1993.

Information on the utilization rates of the interim HOV lane is examined later in this report. The section of the facility included in this analysis will be maintained throughout the construction period, providing a relatively uniform basis of comparison. In addition, the location, which is just to the west of TH 100, is close to the start of the permanent barrier separated reversible lanes. This should provide for useful comparisons between utilization rates on the interim HOV lane and the permanent HOV lanes.

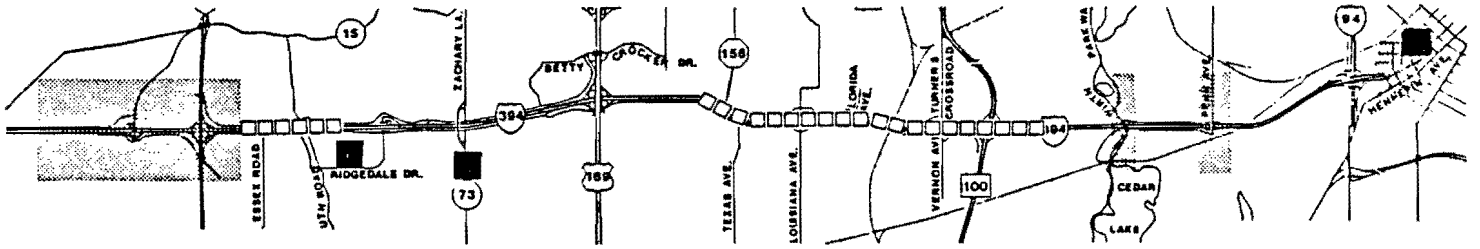
FIGURE 3

I-394 CONSTRUCTION STAGING SCHEDULE

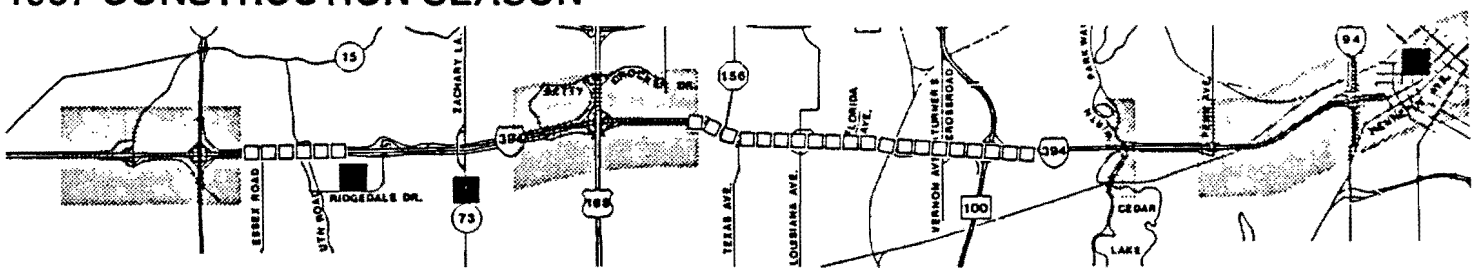
1985 CONSTRUCTION SEASON



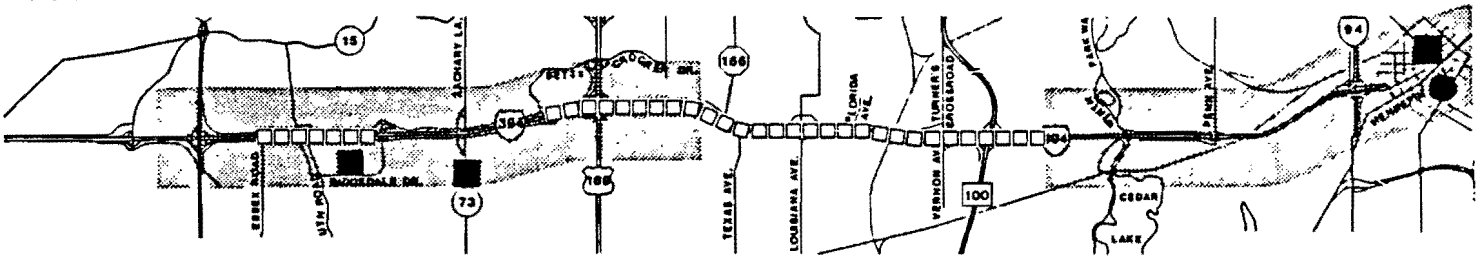
1986 CONSTRUCTION SEASON



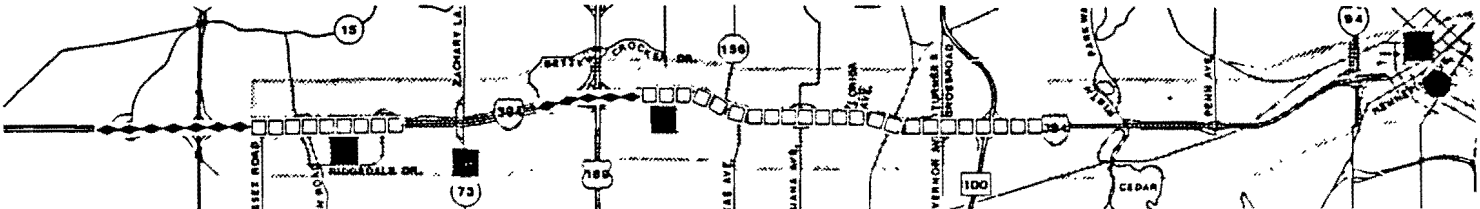
1987 CONSTRUCTION SEASON



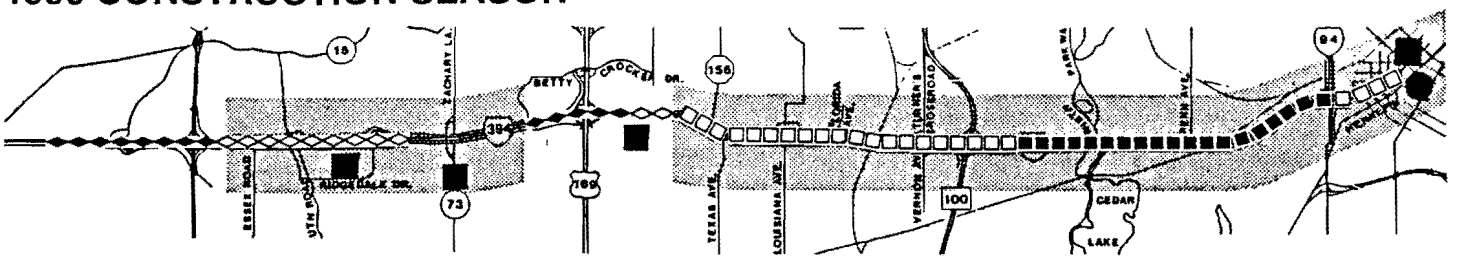
1988 CONSTRUCTION SEASON



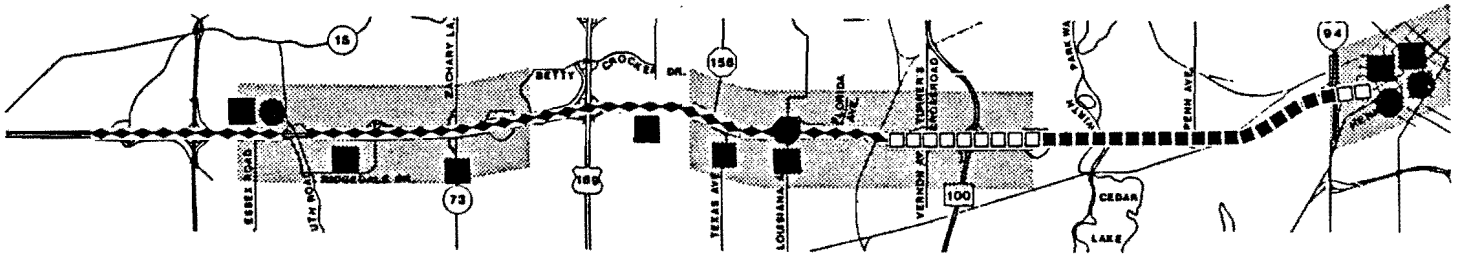
1989 CONSTRUCTION SEASON



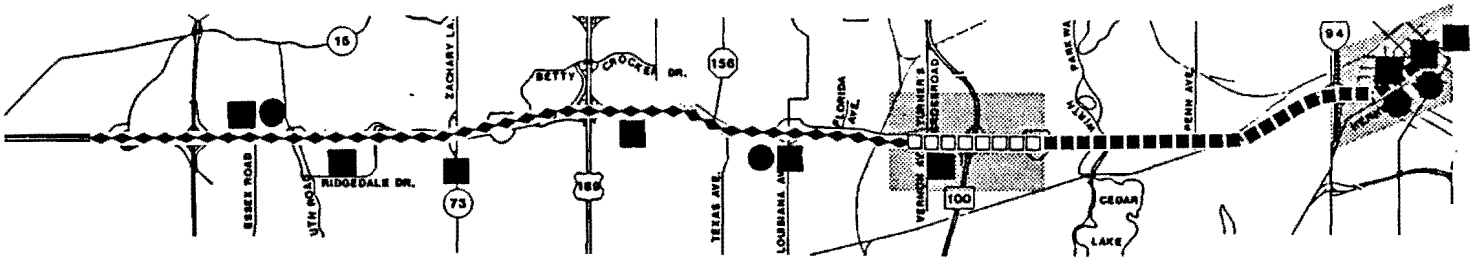
1990 CONSTRUCTION SEASON



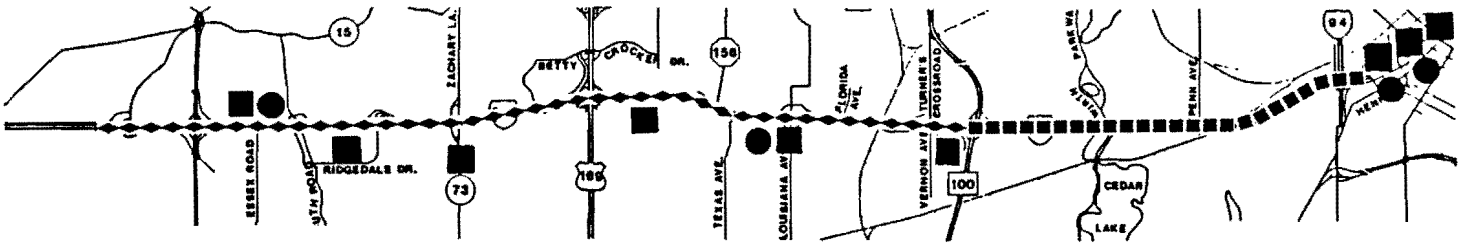
1991CONSTRUCTION SEASON



1992 CONSTRUCTION SEASON



1993



LEGEND

ROADWAY CONSTRUCTION WITH TRAFFIC BYPASS

PERMANENT REVERSIBLE HOV LANE

INTERIM HOV LANE

PERMANENT HOV DIAMOND LANE

INTERIM HOV DIAMOND LANE

■ PARKING

● TRANSIT CENTERS

III. I-394 PROJECT HISTORY/INSTITUTIONAL ARRANGEMENTS

Early History

Historical records indicate that a roadway existed from downtown Minneapolis to Wayzata in the late 1800's and early 1900's[1]. The road provided an important transportation link between Minneapolis and the Lake Minnetonka area around Wayzata. In 1921 the existing 14 to 16 foot roadway was designated as U.S. Highway 12.

Between 1921 and 1952 a variety of improvements were made to the facility. In 1921, the segment from Minneapolis to County Road 18 was widened to 27 feet. This was followed in 1926 by the widening to 28 feet of the western segment from County Road 18 to Wayzata. In 1936, the eastern portion of Highway 12 underwent major reconstruction, resulting in a four lane divided roadway. The remaining western segment to Wayzata was upgraded to a four lane divided highway in 1952. Additional improvements, such as the addition of turn lanes and signals at selected intersections, and the addition of a third lane between Minneapolis and Wirth Parkway, occurred during the 1950's, 1960's and 1970's.

During the 1960's the growing traffic volumes, which resulted from the increases in population and employment levels in the corridor, lead to the recognization by the Minnesota Highway Department[2] and the Communities that improvements to the facility would be needed. At the same time, funding limitations were also recognized as a major concern. In 1968, Highway 12 was added to the Federal Aid Interstate System as I-394.

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[1]The historical information contained in this section was obtained from a variety of sources. The most complete description is continued in the "Final Environmental Impact Statement and Final Section 4(f) Evaluation; US-12/I-394", Minnesota Department of Transportation, May 1982.

[2]The Minnesota Highway Department was established in 1927 by the Minnesota State Legislature. In 1977 the Highway Department was merged with other state transportation divisions and the Minnesota Department of Transportation (MN/DOT) was created.

Planning and Design of I-394

Initial Activities

The addition of I-394 to the Interstate system in 1968 began the planning and design process which would ultimately result in the facility currently under construction. However, the design process would not be completed until the early 1980's, and construction would not start until 1985. The history of this period is one of neighborhood and community opposition to the freeway facility, the Minnesota State Legislature stopping the Highway Department from working on the project and ultimately restricting the design of the facility, the involvement of the regional planning agency to help resolve many of these issues, the active participation of local officials and citizens in the planning process and the Minnesota Department of Transportation's (MN/DOT) incorporation of High Occupancy Vehicle (HOV) lanes to handle the projected demand within the limitations imposed by the legislature.

In 1970, the Highway Department initiated the planning efforts on I-394 by hiring the consulting firm of Howard, Needles, Tammen and Bergendoff (HNTB) to examine the need for improvements in the facility. An initial comprehensive program direction report lead to a further locational study by HNTB. This report, "Corridor Location Study: Trunk Highway 394 - Stage 1 - Feasibility Corridors"[3] was submitted to the Highway Department in March of 1971. The report examined a total of eight alternatives for improvements from downtown Minneapolis to I-494. Four alternatives were dismissed and four were recommended for further examination.

The four alternatives which were dropped involved major variations from the existing Trunk Highway (TH) 12 alignment. Three of the four alternatives included all or partially new alignments. All four would have involved major new right-of-way acquisitions, including, in

[3]Howard, Needles, Tammen and Bergendoff, Inc., "Corridor Location Study: Trunk Highway 394-Stage 1 - Feasibility Corridors," prepared for the Minnesota Highway Department, March, 1971.

one case, the taking of more than 200 homes. In addition, all four alternatives would have adversely affected major park lands, streams and lakes in the area.

Two of the remaining four alternatives involved variations of the existing TH 12 alignment. These would have required significant additional right-of-way in the western section of Minneapolis and portions of Golden Valley and St. Louis Park. The final two alternatives involved utilizing the existing TH 12 alignment. One of these included a wider freeway facility on the existing alignment, and the last was the no-build alternative.

The Highway Department had established two advisory committees in 1970 to provide direction and technical input to the planning process. A Technical Advisory Committee (TAC) was comprised of representatives from the Highway Department, the Federal Highway Administration (FHWA), the Metropolitan Council, the Metropolitan Transit Commission (MTC), the Hennepin County Highway Department and the Hennepin County League of Municipalities. A second committee, the Administration Committee, was comprised of members from the Highway Department, FHWA, Metropolitan Council and the MTC. A listing of the agencies involved in the I-394 process, and a brief description of their roles and responsibilities, is provided in Appendix A.

Based on growing concerns from the communities, neighborhoods and local organizations along the corridor, the Administration Committee recommended the formation of a Citizens Advisory Committee (CAC). These concerns were based on the potential impacts the different alternatives under consideration would have on neighborhoods and environmentally sensitive areas in the corridor. The Transportation Department followed this recommendation and established the committee in mid 1971. The CAC was comprised of representatives from the cities of Minneapolis, St. Louis Park, Golden Valley, Minnetonka, Plymouth, and Wayzata and the Greater Metropolitan Federation, a metropolitan-wide organization of citizens groups. The Committee undertook a review of the work conducted to date and the alternatives under study at the time.

The CAC's initial review lead to two recommendations, both of which were acted upon. First, based on concerns that the planning process did not have adequate participation by local representatives, the CAC recommended that the Administration Committee be reorganized. In March of 1972, the Administration Committee was reorganized as the Project Management Board, with membership comprised of representatives from the Highway Department, the Metropolitan Council, the MTC, and the CAC. This group was involved in reviewing the key elements of the planning process. The CAC's second recommendation, which related to concerns about the number of lanes being considered under some of the alternatives and the desire to examine alternatives which may require less right-of-way, was that a supplemental transit study be conducted in the I-394 Corridor. The consulting firm of Simpson and Curtin was retained to conduct this study, which was coordinated with the highway planning activities.

The transit study[4] attempted to define a "multi-modal transportation solution for the corridor" that would meet the "long-range accessibility needs within the area as well as satisfying other goals and aspirations of residents." Three alternative long-range transit systems were examined and evaluated for the corridor. However, the exact mode of these exclusive transit facilities was not specified. Rather the system characteristics were identified in a general way. This was done because it was felt that the mode question should be resolved at the regional, rather than local or corridor level.

The three long-range transit systems evaluated for the corridor incorporated the use of both exclusive transit facilities and conventional buses in mixed traffic. The three systems examined included the following.

- Case One. Case One consisted of two radial exclusive transit facilities in the corridor. Neither of these facilities would be located on I-394. One facility was to

[4]Simpson and Curtin, Inc., "A Long Range Transit Improvement Program for the Study Area", August, 1973. The same consulting firm also examined the short term transit needs in the I-394 corridor. The results of this study, which included an evaluation of a transit origin-destination survey and the assessment of the adequacy of existing service, were contained in the report by Simpson and Curtin, Inc., "A Short Range Transit Improvement Program for the Corridor," December, 1972.

the south of I-394, generally following Nicollet Avenue, Hennepin Avenue and Lake Street to the Chicago and Northwestern railway right-of-way. This route would terminate in Hopkins. The second exclusive transit facility was to the north of I-394, on TH 55. This facility would operate on TH 55 from downtown Minneapolis to County Road 18. The two elements considered in Case One encompassed a total of 14.6 miles of exclusive transit facilities and 10 stations.

- Case Two. Case Two consisted of an exclusive transit facility on I-394 from downtown Minneapolis to I-494. Case Two also included a north-south transit facility, from TH 52 to I-494, utilizing the Minneapolis Northfield and Southern Railroad right-of-way. The elements in Case Two encompassed a total of 24.5 miles of exclusive transit facilities and 16 stations.

- Case Three. Case Three did not include any exclusive transit facilities. Rather it included two elements which would provide some priority treatment for transit vehicles. The first element included preferential treatments for buses along TH 55, from downtown Minneapolis to County Road 18. In addition, under Case Three, I-394 would be constructed as an eight lane facility, with the center two lanes being reversible lanes for use by transit vehicles and other traffic. Case Three consisted of 15.8 miles of mixed-used facilities and 11 interface points.

Each of the three alternatives were evaluated based on an analysis of the physical components, the attributes of the test networks, patronage estimates and an examination of the environmental considerations. The results of this analysis indicated that Case One, the alternative with the exclusive transit facilities in the southwest corridor and along TH 55, ranked the highest based on the evaluation criteria. It is interesting to note that this analysis dismissed Case Three as being "unfeasible since the proposed facilities for U.S. 12 would be incapable of accommodating projected bus volumes at a reasonable level-of-service."[5] In addition to recommending the two exclusive transit facilities in the Southwest Corridor and along TH 55, the report also recommended other improvements to support these facilities. These included the surface transit lines, comprised of radial route networks similar to the existing route structure, a new system of pulse-scheduled transit lines focusing on the six suburban communities and two express lines, and capital improvements such as the guideway, stations, vehicles, park-and-ride lots and shelters.

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[5]Simpson and Curtin, Inc., "A Long-Range Transit Improvement Program for the Study Area," August 1973, page 34.

A number of elements of this report are interesting to note. First, the recommended facilities were not the alternatives incorporated into the final design for I-394. However, the Southwest Corridor was examined further by the Hennepin County Regional Railroad Authority, the Metropolitan Council and the Regional Transit Board in subsequent studies and is currently one of the corridors under consideration for the development of Light Rail Transit (LRT).[6] Second, the report appears to provide the first identification of the concept of reversible lanes on I-394. While the concept under consideration in the analysis involved two reversible lanes for general traffic, not solely for high occupancy vehicles, it appears to be the first discussion of this concept in the planning process for I-394.

While the Simpson and Curtin report recommended the Case One transit improvements, the exclusive facilities on the Southwest Corridor and TH 55, the Highway Department did not include these in the Draft Environmental Impact Statement (DEIS). In fact, there was not uniform agreement on the recommendations by the other metropolitan agencies. The Metropolitan Transit Commission (MTC), the transit operating agency, supported the two exclusive transit facilities outlined in Case One, while the Metropolitan Council, the MPO, supported the preferential treatment of buses and reversible lanes described in Case Three.[7] This difference reflected an ongoing lack of agreement between the MTC and the Council over the role exclusive transit facilities, primarily some type of rail system, should play in the Twin Cities area. In general, the MTC was supportive of, and promoting the development of, a rail system for the area, while the Council did not favor the development of a rail system. This difference of opinion over rail continued in the 1970's and early 1980's. This lack of consensus

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[6]In 1980 the Minnesota State Legislature passed legislation authorizing the creation of Regional Railroad Authorities. Enacted initially to provide rural counties with the opportunity, either acting individually or together, to purchase rail lines being considered for abandonment in order to maintain rail service to rural communities, the law has been used by Metropolitan counties desiring to pursue the development of Light Rail Transit. Hennepin County was the first county to form a Regional Railroad Authority under this new law. In 1980 the Hennepin County Regional Railroad Authority (HCRRA) was formed. Shortly thereafter the HCRRA purchased the abandoned rail line in the Southwest Corridor for potential future development of LRT.

[7]Metropolitan Council of the Twin Cities, "Recommendations on the Uncompleted Interstate Segments in the Twin Cities Metropolitan Area," January, 1976, page 23.

over the role rail transit should play in the metropolitan area appears to have been a contributing factor to the discussions of the transit component for I-394 and the ultimate design of the facility.

The Draft Environmental Impact Statement (DEIS) was completed in December of 1973. The DEIS included four alternatives; two involved variations of the existing TH 12 alignment, one involved a wider freeway facility in the existing TH 12 alignment, and one reflected the no-build option. The first three alternatives included three lanes in each direction and, due to the unresolved debate concerning the transit element, the recommendation that a 50-foot corridor be reserved within the right-of-way for future transit development. Under most of the designs, this transit corridor was identified in the median of the facility.

Public hearings were held on the DEIS in February of 1974. It was at this time that public opposition, which had been growing during the early 1970's, reached its strongest point. Led by citizens in the neighborhoods most affected by the proposed alignment, especially those in the Tryol Hills area of Golden Valley, public opposition to the project became very vocal and visible. "STOP-394" bumper stickers were seen throughout the metropolitan area, and the neighborhood groups used a variety of other techniques to voice their opposition.

Legislative and Metropolitan Review

The controversy continued and, in May of 1975, the Minnesota State Legislature passed a bill halting all work on I-394 and several other uncompleted interstate segments in the Twin Cities area. The legislation[8] placed specific limitations on the Highway Department relating to I-394 and directed the Metropolitan Council, the Metropolitan Planning Organization (MPO) for

[8]Minnesota State Statutes, "Section 10, Chapter 534, Section 5, Subdivision 3, Section 15 [161.123] HIGHWAY CONSTRUCTION; PROHIBITIONS," as amended in 1975. This bill is commonly referred to as the Gas Tax Law. In addition, to I-394, the bill also stopped construction and placed limitations on other uncompleted freeway segments, including I-335, portions of I-35E, the Dartmouth interchange in I-94, and I-35W in Duluth.

the Seven County Twin Cities Metropolitan area, to conduct an analysis of these uncompleted freeway segments. Specifically the legislation directed the following.

> "Following the effective date of this act the department of highways shall not cause any construction on, nor shall any lands be acquired for any of the trunk highways designated as .... proposed I-394 between I-494 and the Hawthorne interchange; ... provided, that nothing in this section shall be construed to prohibit the department from taking the following actions:
>
> (2) Construction of not more than six lanes of travel on Legislative Routes No. 10 and No. 107 marked TH 12 between I-494 and the Hawthorne interchange in the city of Minneapolis, provided that no additional lands shall be acquired for any such purpose except which is necessary for construction of six lanes of travel on said highway."[9]

The Metropolitan Council, working with its Transportation Advisory Board (TAB) and the city councils of the affected cities, was directed to review the uncompleted freeway segments identified in the legislation. This analysis was required to include an examination of the financial and social impacts of alternative interstate route designations or transit substitutes, while maintaining the integrity of the interstate system.

The Metropolitan Council undertook this review in the second half of 1975 and, in early 1976, submitted its report "Recommendations on the Uncompleted Interstate Segments in the Twin Cities Metropolitan Area[10] to the legislature. In conducting the analysis the Council and the TAB established an Interstate Study Committee (ISC), comprised of representatives from city councils of affected communities, the TAB and the Council (as non-voting members), to oversee the review and the development of recommendations. The ISC split into two subcommittees; the Minneapolis Subcommittee studied I-94 north, I-394 and I-335, and the St. Paul subcommittee studied I-494, I-94 and I-35E. The process utilized in the study included an examination of the goals and objectives of the Interstate system, the identification of issues

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[9]Minnesota State Statutes, "Section 10, Chapter 534 Section 5, Subdivision 3, Section 15 [161.123] HIGHWAY CONSTRUCTION; PROHIBITIONS," as amended in 1975.

[10]Metropolitan Council of the Twin Cities, "Recommendations on the Uncompleted Interstate Segments in the Twin Cities Metropolitan Area," January, 1976.

associated with each segment, a review of alternatives, an evaluation of these based on adopted criteria which focused on the Metropolitan Council's Metropolitan Development Framework Plan, and the completion of the final recommendations and report. Due to time and cost limitations, the process relied on existing information and agency resources.

The recommendations of the ISC were forwarded to the TAB, which held two public hearings prior to developing its final recommendations, which were submitted to the Council. The Metropolitan Council in turn reviewed the report and finalized its recommendations to the legislature. In only two cases, I-394 and I-35E, were the recommendations of the ISC modified by the TAB and the Council. In addition, only on I-394 was a minority report submitted by members of the TAB.

The full resolution on I-394 contained in the report is provided in Appendix B. the major findings and recommendations relating to I-394 are summarized below.

Major Findings:

- There is a need for improved accessibility for both goods and people in the corridor.
- The construction of an Interstate freeway in this corridor is consistent with the Transportation Policy Plan of the Metropolitan Council.
- The DEIS did not adequately address all environmental impacts of the proposed freeway.
- Review of the travel forecasts show that a six-lane facility would not handle the traffic unless very strong measures are taken to increase vehicle occupancy rates in the corridor.

Recommendations:

- The Highway Department should complete the EIS and subsequent design alternatives based on a six fluid lane freeway along the U.S. 12 corridor.
- The study of design alternatives should include the following considerations:
    - o The safe and efficient movement of people and goods;
    - o Preferential treatment for public transit and multi-passenger vehicles including metering, reversible lanes and peak hour exclusive lanes - within the six fluid lane required right-of-way;

- Incorporation of park-and-ride facilities;
- Current noise and air quality standards;
- The impact of the freeway upon residential neighborhoods, the business community and local streets and arterials;
- Ample opportunity for the participation and involvement of affected neighborhoods and business groups and municipalities in the determination and evaluation of alternatives.

- The present right-of-way restrictions in item 2 of section 15 of the state law should be modified to permit the acquisition of sufficient land necessary to address safety and appropriate environmental considerations.

- Due to the right-of-way restrictions emposed by the legislature, the 50-foot median strip which had been identified to be reserved for future transit systems should be eliminated.[11]

The report also recommended that the Third Avenue Distributor (TAD) portion of I-394 should be completed, with the incorporation of the three fringe parking ramps. The background to the TAD and the TAD garages is discussed at the end of this section.

The TAB minority report on I-394 agreed with the general findings of the ISC study, but disagreed with the recommendations. The minority resolution, which failed on an 11 to 8 vote by the TAB,[12] supported the completion of the EIS for a six-lane facility with design considerations for preferential treatment for buses and HOVs, and other elements similar to the adopted resolution. However, the minority resolution supported the construction of I-394 in conjunction with exclusive transit facilities in other nearby corridors, such as the Southwest Corridor, and the development of a financing strategy to maximize the use of federal assistance from all available highway and transit funding options for the total transportation system.

Two Communities, St. Louis Park and Golden Valley, presented their concerns as part of the ISC process. St. Louis Park's position acknowledged the need for the improvements to

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[11]Metropolitan Council of the Twin Cities, "Recommendations on the Uncompleted Interstate Segments in the Twin Cities Metropolitan Area", January 1976, pages 5, 6, 7 and II-6.

[12]Doug Kelm, MTC Chair, "Memorandum to the Metropolitan Council; TAB Minority Resolution on I-394", December 31, 1975.

TH 12, but stressed that these improvements must be accompanied by a decision to construct automated transit in the Southwest Corridor. The city also raised concerns about environmental impacts and the impact I-394 would have on local roads. Golden Valley opposed the construction of interstate freeways within developed areas, and I-394 in particular. The city felt an effective transit alternative should be provided instead.[13]

The Metropolitan Council's review also examined the legislation's impact on the Highway Departments ability to continue work on the EIS for I-394, given the restrictions contained in the bill. FHWA had raised concerns that the legislative restrictions identified the final design for the project and thus, prohibited the Department from further work on the EIS. However, the Highway Department legal counsel ruled that the legislation, while placing certain restrictions on the Department by preselecting alternatives, did not prohibit the Department from completing the EIS.

The Council submitted its report to the legislature in January of 1976. The legislature considered the Council's recommendations during the 1976 session and, in April of 1976, a bill was passed which modified many of the restrictions of the earlier legislation. The 1976 bill maintained the earlier limitation on the construction of not more than six lanes on I-394, but allowed the Highway Department to prepare the EIS and complete other federal and state requirements. In the preparation of the EIS and other documents, the legislation directed the Department to specifically address design modifications which may mitigate any adverse environmental impacts and to consider the recommendations of the Metropolitan Council report.[14]

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[13]Metropolitan Council of the Twin Cities, "Recommendations on the Uncompleted Interstate Segments in the Twin Cities Metropolitan Area," January 1976, page 15.

[14]Minnesota State Statutes, "Section 10, Chapter 534, Section 5, Subdivision 3, Section 15 [161.123] HIGHWAY CONSTRUCTION; ENVIRONMENTAL IMPACT STATEMENTS; PROHIBITIONS," as amended in 1976. It is interesting to note that of the highway projects identified under the initial legislation two; I-335 in Minneapolis and I-35W in Duluth, (from 24th Avenue east to 64th Avenue East), were withdrawn from the Interstate system; one I-35E in St. Paul was redesigned and constructed as a parkway; and one I-394, was ultimately designed and constructed based on the legislative restriction of six lanes.

Based on the 1976 legislation, the Highway Department resumed work on I-394. In 1978 MN/DOT began preparing new geometric layouts for I-394. Given the limitations imposed by the legislature, MN/DOT continued to examine different ways to increase the carrying capacity of the facility. The use of high occupancy vehicle (HOV) lanes was identified as the most feasible approach. At the time MN/DOT was examining these alternatives, the experience with HOV lanes around the country was very limited. The Shirley Highway in Washington, D.C. was used as the major example for comparison. Individuals interviewed as part of this research effort indicated that then MN/DOT Commissioner Richard Braun was instrumental in promoting the use of HOV lanes for I-394.

In preparing new geometric layouts, MN/DOT utilized the assistance of four task forces, comprised of citizen representatives and staff from Minneapolis, Golden Valley, Saint Louis Park, Minnetonka, Plymouth, Wayzata, the Minneapolis Park and Recreation Board, and Hennepin County. Each Task Force examined the segment of the facility in their area. The task forces examined a variety of ideas relating to the design of the facility and provided a link between MN/DOT and the general public. In addition, MN/DOT held a series of a dozen public meetings throughout the corridor to obtain public comments and to explain the different alternatives. While a number of designs were still being considered, MN/DOT was focusing on an alternative that included two mixed traffic lanes in each direction and a two-lane, barrier-separated, reversible HOV lane in the median for the full eleven-mile facility.

The MN/DOT staff responsible for the project characterized this as a very intense period. They noted that, while some communities and neighborhood groups were opposed to the facility, the leadership of these groups, both elected officials and community representatives, were willing to work with MN/DOT to try to reach an agreeable solution.

However, even with this intense examination of alternatives, no consensus was reached on the design of the facility. Differences remained between MN/DOT and many of the communities, and between the different communities. The communities in the corridor had different ideas on the configuration of the freeway and were not in agreement on any one approach. The major issues of disagreement related to the width of the facility, interchange

locations and access treatments, and the public transit component of the design, including the use of HOV lanes. Many of these concerns were so strong that the City of Golden Valley threatened to file a law suit against MN/DOT on behalf of the Tryol Hills neighborhood to stop the freeway.

Realizing that no agreement was forthcoming, in December of 1980 MN/DOT Commissioner Richard Braun referred the I-394 issue to the Metropolitan Council for resolution. The Commissioner made this request under Minnesota State Statutes Chapter 161.17 (Approval of Plans), Subdivision 2 (Interstate System). This law requires the Commissioner to submit the preliminary plans for construction, reconstruction, or improvement of any route on the interstate system lying within a city to its governing body before proceeding with the preparation of final plans. If the governing body does not approve the plans within three months, the Commissioner may refer the plans to the Metropolitan Council for study and resolution.[15]

In his December 5, 1980 letter, Commissioner Braun cited recent resolutions from the Cities of Golden Valley, St. Louis Park and Minneapolis indicating their opposition to different aspects of the project. The Commissioner noted that, while the resolutions were not in response to a specific MN/DOT request for plan approval, "we believe an official request for layout approval would yield the same position". Citing that "these actions leave no clear consensus on I-394", the commissioner requested the Council to initiate the process described in the statutes to provide direction to MN/DOT's planning on the I-394 project.[16]

The Metropolitan Council responded to this request and initiated a study of the issues associated with I-394. As requested by the Commissioner, the Council's study focused on two major issues, access to I-394 between TH 100 and Penn Avenue and the transit/HOV element of the freeway design.

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[15]Minnesota State Statutes, "Chapter 161.17 [Approval of Plans], Subdivision 2 [Interstate System].

[16]Letter from Richard Braun, MN/DOT Commissioner to Charles Weaver, Metropolitan Council Chairman, December 5, 1980.

The issue of access between TH 100 and Penn Avenue, which was a concern to the City of Minneapolis, was resolved first. In February of 1981 the Council recommended to the commissioner that no access be provided between Penn Avenue and TH 100.[17]

The second issue, which related to the overall design of the facility, took longer to examine and resolve. The council examined a total of six transit/highway alternatives for the corridor. These are shown in Figure 4.

Figure 4. Transit and Highway Alternatives

• TH 12	Maintain the current level of service on TH 12, which may include some spot improvements.
• Metered Freeway	Upgrade TH 12 to freeway with metered access and preferential bypass lanes for buses, vanpools and carpools.
• Freeway plus Light Rail Transit (West)	Upgrade TH 12 to freeway with LRT in the median.
• Freeway plus Light Rail Transit (SW)	Upgrade TH 12 to freeway with LRT in the Southwest Corridor.
• Freeway plus High Occupancy Vehicle (HOV) Lane	Upgrade TH 12 to freeway with HOV lanes in the median.
• Freeway plus two LRT Lines	Upgrade TH 12 to freeway with LRT lines to the north (TH 55 corridor) and in the southwest corridor.

[17]Kozlak, Connie, "I-394 Access Between TH 100 and Penn Avenue", Metropolitan Council Memorandum, February 1981.

The Metropolitan Council conducted a detailed examination of these alternatives, including an analysis of existing conditions, anticipated employment and population changes, and travel demand. Major findings from the Councils' analysis[18] included the following.

- The destinations of persons using I-394 are widely dispersed, with approximately 32% in the Minneapolis CBD.
- Of those persons traveling to the Minneapolis CBD, about 35% are auto drivers and approximately 65% are passengers, with approximately 50% using public transit.
- The origins of persons using I-394 are widely dispersed.
- All three transit alternatives would satisfy in a very similar manner the transit demand on the TH 12 corridor.
- An LRT line on the southwest alignment or two lines, one the southwest alignment and one along TH 55, would not serve the transit demand on the TH 12 corridor better than any of the three transit alternatives located directly on the I-394 alignment.
- None of the transit alternatives considered would have a large enough impact on automobile travel to significantly affect the roadway capacity requirements.
- The HOV alternative could alter the number of lanes required in certain links of the facility because it diverts a larger number of auto drivers to multi-passenger modes than the other transit options when carpool and vanpool passengers are added to transit ridership.
- The number of lanes required varied by alternative. The Highway 12 alternative required the most lanes, followed by the metered freeway, LRT and HOV alternatives.
- The implementation of the HOV lane plan provides a solution for the capacity problem at the Lowry tunnel (I-94) by giving direct tunnel access from the HOV lanes, and by metering the I-394 to southbound I-94 mixed traffic freeway lanes.
- Inducements to carpool and transit use are incorporated in the HOV lane option through increased operating speeds, available capacity east of TH 100, preferential treatment at freeway entrances, special uncongested access to the CBD distributor and the I-94 tunnel.

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[18]Kozlak, Connie and Larry Dallam, "I-394: Highway/Transit Design Referral #9310-1," Metropolitan Council Memorandum, May 12, 1981.

- The LRT alternatives do not reduce the basic eight-lane freeway demand east of TH 100, nor do they resolve the capacity problem at the I-94 tunnel.[19]

The council report further indicated that the HOV alternative "best satisfies the forecasted travel demand, in the least amount of right-of-way, best resolves the problems at the I-94 tunnel, and provides the greatest incentives for people to change from driving to riding. In addition, the HOV alternative would cost significantly less than any of the LRT alternatives while satisfying the transit demand equally well."[20] While supporting the HOV design concept, the Metropolitan Council did, however, suggest a change to the use of diamond lanes, rather than barrier HOV lanes west of TH 100, while maintaining the two-lane reversible barrier separated HOV lanes east of TH 100. The Council made this recommendation based on the forecasted directional split west of TH 100. The directional split in this area was forecast at an almost 50-50 split, while to the east of TH 100 the split favored CBD bound traffic.

Recommended Approach

In May of 1981 the Metropolitan Council approved the following recommendations concerning I-394 and transmitted them to the Minnesota Department of Transportation.

A. That the design treatment between I-494 and TH 100 be a six-lane freeway section with the inside lanes identified as standard diamond lanes for buses, carpools, and vanpools during rush hours; and the design treatment between TH 100 and I-94 be a six-lane section with two lanes being reversible lanes. The cross-section of the project should be based upon the federally-approved standards that will minimize the amount of right-of-way needed to accommodate the projected traffic safely and efficiently. The traffic should be managed as follows.

1. The traffic shall be managed to achieve a safe, efficient, and balanced traffic situation while maintaining a level of service of "C" or above (as defined by the 1965 Highway Capacity Manual) on the center two reversible lanes.

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[19]Kozlak, Connie and Larry Dallam, "I-394 Highway/Transit Design Referral #93101," Metropolitan Council Memorandum, May 12, 1981.

[20]Kozlak, Connie and Larry Dallam, "I-394 Highway/Transit Design Referral #93101," Metropolitan Council Memorandum, May 12, 1981.

2. The first priority for use of the reversible lanes shall be buses, carpools, and vanpools in order to encourage people to share rides rather than driving to their destinations.

3. In addition, various operational strategies, such as allowing single-occupant vehicles to and from northbound and southbound TH 100 access to the reversible lanes, shall be implemented while maintaining a level of service "C" or better on the reversible lanes.

4. MN/DOT shall be responsible for the development, evaluation, and implementation of the alternative operational strategies within the overall policy context defined above.

B. That there be no change in the February, 1981 Council action recommending to Commissioner Braun that no access between TH 100 and Penn Avenue be provided on I-394.

C. That all reasonable measures to minimize negative effects on neighborhoods and communities along the route be addressed. Furthermore, that the affected cities along I-394 prepare plans in cooperation with MN/DOT for the subregional local arterial streets that access the freeway. These plans should include design measures which resolve or minimize any potential adverse traffic impacts resulting from the closure of streets and interchanges that currently permit access to TH 12.

D. That MN/DOT coordinate the completion of the remaining non-freeway segment in Wayzata and Minnetonka with the construction of I-394.

E. That MN/DOT, the affected cities and the MTC work together on the preliminary plan and design details of I-394 to: (1) assure the serviceability of I-394 from the transit perspective; and (2) to assure the local communities can be served with bus transit service.

The Metropolitan Council further recommended the following.

A. That the alternative for a Cedar Lake Road extension be deleted as a recommendation on I-394.

B. That the Metropolitan Council participate in the development of a new public/private ridesharing management plan in the metropolitan area, especially soliciting commitment to an employee ridesharing program from employers in the I-394 corridor as an essential component of the success of the highway design.

C. That the Metropolitan Council and the MTC continue their studies of transit alternatives relative to energy, multi-mode benefits, and long-term economic benefits for the region.[21]

It is interesting to note that there appeared to be some concern on the part of the Metropolitan Council relating to the use of the HOV lane, specifically whether there would be adequate use of the facility by carpools, vanpools and buses. By identifying carpools, vanpools and buses as the first priority for use of the lane, but providing for the possible use of the reversible lanes by single-occupant automobiles, the Council appeared to be keeping open the option of general purpose use of the lanes if the HOV demand was not adequate.

The recommendation by the Metropolitan Council brought the major conflicts over the design of I-394 to an end.[22] In 1982, the Minnesota Department of Transportation completed and published the "Final Environmental Impact Statement and Final Section 4(f) Evaluation US-12/I-394". Activities relating to the planning for I-394 did not stop at this point however. Realizing that a good deal of planning and work would be needed to insure the success of the final design, MN/DOT and the regional agencies undertook a variety of additional activities. Two major efforts were the Rideshare Market Potential Study, undertaken by the Metropolitan Transit Commission (MTC), and the development of the I-394 Transportation System Management Plan, initiated by MN/DOT.

Rideshare Market Potential Study

The Rideshare Market Potential Study was initiated by the MTC, in coordination with MN/DOT and Metropolitan Council, in 1983. The study was undertaken to identify additional incentives and strategies to encourage more commuters in the I-394 corridor to rideshare. The

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[21]Letter from Charles Weaver, Metropolitan Council Chairman to Richard Braun, MN/DOT Commissioner, June 26, 1981.

[22]While the Council's recommendation brought the major overall design issues related to I-394 to an end, there have been lawsuits brought against MN/DOT on I-394 issues by individuals and neighborhood groups.

analysis included an examination of rideshare programs in other areas, a survey of current users in the study area, and the evaluation of potential strategies. The following four strategies were recommended in the study.

- Encouraging the development of self-created carpools and vanpools.
- Establishment of a corridor employer and community program to encourage ridesharing.
- Creation of a study area commuter club to promote ridesharing.
- Interim HOV lanes/treatments on TH 12 before I-394 construction[23]

While all of these recommendations were utilized in the development of other aspects of the I-394 plan, the recommendation on the use of an interim HOV lane had the biggest impact. At the same time the MTC was conducting the Rideshare Market Potential Study, MN/DOT had initiated the development of the Transportation System Management Plan for I-394.

Transportation System Management Plan

This plan was developed by MN/DOT, in cooperation with other federal, state and regional agencies, and local jurisdictions, to address all aspects of the I-394 program. The TSM plan was developed by MN/DOT and their consultants Strgar-Roscoe-Fausch, Inc., under the overall direction of the Corridor Management Team and the I-394 Policy Committee. The Policy Committee was comprised of policy or top staff representatives, while the Management Team was comprised of technical staff. Representatives from the agencies and jurisdictions identified in Figure 5 served on these two committees.

[23]Metropolitan Transit Commission, "Rideshare Market Potential Study", September 1984.

Figure 5. Agencies and Organizations Participating in the I-394 Corridor Management Team and Policy Committee

- MN/DOT
- Metropolitan Council
- Regional Transit Board (RTB)[24]
- Metropolitan Transit Commission (MTC)
- Minnesota Rideshare
- Federal Highway Administration (FHWA)
- Minnesota State Patrol
- City of Minneapolis
- Hennepin County

The I-394 TSM Plan was developed during 1984 and 1985. A series of technical memoranda[25] were developed on a variety of topics related to the plan. These included "before" vehicle and auto occupancy counts and travel time information, the development of TSM policies, a cost-benefit analysis of the use of interim HOV lanes and specific analysis relating to the different elements of the program. During the development of the TSM plan, these technical memoranda were presented to, and discussed by, the appropriate agency policy groups. In many cases this led to the endorsement of specific elements prior to the completion of the overall plan. For example, the policies to guide the development and implementation of the I-394 TSM plan were adopted by the regional agencies as part of the process.

The I-394 TSM plan contained the following eight major elements relating to the different components of the overall program.

- I-394 TSM Policies. Ten policies were outlined to guide the development of the plan and the ultimate operation of the facility. A listing of these policies is provided in Figure 6.

[24]The Regional Transit Board (RTB) was added to the committees after its creation by the Minnesota State Legislature in 1984.

[25]A complete listing of the Technical Memoranda prepared during the development of the I-394 TSM Plan is provided in Appendix C.

Figure 6. I-394 TSM Plan Policies

- The movement of people will be given priority over the movement of vehicles on I-394.

- Actions will be taken which will encourage optimum use of the I-394 HOV express lanes.

- Traffic will be managed on I-394 to maintain an optimum balance among the HOV express lanes, the mixed traffic lanes and the traffic backup on local access streets.

- The design of I-394 will be flexible enough to implement alternative operational strategies after the start-up period if the operational or safety objectives of I-394 are not met.

- Reasonable traffic flow will be maintained along TH 12 during construction.

- The third avenue distributor garages will be designed, funded and operated as an integral part of I-394.

- Pedestrian facilities will be provided where needed to support HOV facilities along the I-394 corridor.

- Public support for the I-394 HOV lane/parking garage/transportation system management concept will be actively sought.

- A coordinated means of operating and evaluating the I-394 transportation system will be developed.

- Actions will be taken by the implementing agencies to assure the availability of funds to support the successful implementation of HOV strategies.

- Traffic Operations Plan. This portion of the plan addresses the operation of the HOV lanes and supporting freeway and traffic management elements. It includes the vehicle occupancy requirements (2+), signing, traffic control, operation of lanes, ramp metering and overall monitoring by MN/DOTs Traffic Management Center.

- Parking Facilities Plan. This portion of the plan addresses the three parking garages being constructed in downtown Minneapolis. The three Third Avenue Distributor (TAD) garages will include approximately 5,400 federally-funded parking spaces.[26] First priority for use of the garages will be for HOV's using I-394. Second priority will be give to other vehicles using I-394. As space is available, the garages will be open other non I-394 vehicles. Pricing for registered HOV's will be kept low, while single occupant vehicles (SOV's) will be charged the market rate.[27] A more detailed operation and maintenance plan for the TAD garages was developed in 1988.[28]

- Bus Service and Facilities Plan. The recommended bus service concept for the I-394 corridor is a full timed-transfer system for both peak and off-peak periods. The timed-transfer concept focuses on routing and scheduling buses so that connections between buses at specified transfer stations can be guaranteed. The timed-transfer network will greatly improve service to the Minneapolis CBD and between communities in the corridor. Two major transit stations and seven park-and-ride lots will be located adjacent to I-394. Smaller transit stations and additional park-and-ride lots are located throughout the corridor. This represents a major restructuring of service in the corridor. The location of the transit support facilities along the corridor were designed to match the timed-transfer service concept.

- Rideshare Plan. The ridesharing plan for I-394 contains four major elements; an employer outreach program, a vanpool program, a computerized matching service and the experimentation with innovative techniques, such as a ridematching newspaper and one-on-one direct matching. The plan identifies areas and business along the corridor for heavy promotional and out reach activities. It is anticipated that the rideshare plan will continue to evolve and experiment with new approaches.

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[26]When totally complete the TAD garages will include approximately 6,000 parking spaces. However, under the funding agreement with FHWA, only those spaces needed to meet the projected demand from I-394 were eligible for Federal funding.

[27]In accordance with Federal law the TAD garages will be operated without a profit. Pricing for both HOV's and SOV's will be set to assure that revenues are adequate to cover the operating and maintenance costs of the garages, and other appropriate costs, but not make a profit.

[28]"Minnesota Department of Transportation Maintenance and Operation Plan for the I-394 Third Avenue Distributor Garage A, Garage B, Garage C." Prepared by Strgar-Roscoe-Fausch, Inc. for the Minnesota Department of Transportation and the Federal Highway Administration, November, 1988.

- Marketing and Public Information Plan. Realizing that introducing HOV lanes for the first time in the metropolitan area would be a challenge, a marketing and public information plan was developed. The purposes of this element are to let people know how to use the HOV lane, parking garages, and transit and rideshare services, to encourage use and to gain support of decision makers and the general public for the I-394 transportation system concept. To accomplish this, the plan focuses on a variety of approaches, including newspaper, radio and billboard advertising, direct mail, media relations, special meetings, special events and the initial use of a telephone information number.

- Enforcement Plan. Realizing that enforcement of the occupancy requirements and assuring safe operation of both the HOV lanes and the mixed traffic lanes were critical to the success of the I-394 project, MN/DOT, working with the State Patrol, developed an enforcement plan for the facility. The plan addresses the anticipated approach and level of enforcement for the lanes and identifies the coordination needed between the State Patrol, local law enforcement agencies, the courts and MN/DOT.

- Implementation Plan. This portion of the plan identifies the roles and responsibilities of the different agencies in three general areas; construction and service implementation, coordination and scheduling and funding. In addition, it outlines the continuing roles of the Corridor Management Team and the I-394 Policy Committee.

Additional Information Activities

As the TSM plan was being completed in 1985 other activities related to the transit, rideshare, and interim HOV lane were being conducted. In addition, a new regional agency, the Regional Transit Board (RTB), became an active participant in the process. The RTB, which was created by the Minnesota Legislature in 1984, is responsible for transit planning, policy formulation and administration in the Seven County Twin Cities Metropolitan area. In May of 1985 the RTB approved a set of four recommendations relating to the implementation of the transit elements of I-394. These recommendations included the endorsement of the transit elements of the I-394 TSM Plan, support for coordinating funding of the transit elements, identification of the RTB as the responsible agency for ensuring implementation of the transit elements, and authorizing staff to work on the different activities.

In addition, in a letter[29] from the Chairman of the RTB to the MN/DOT Commissioner, a series of recommendations were made to insure the successful implementation of the I-394 project. Specifically the RTB Chairman requested MN/DOT to take the overall responsibility for both the highway and the transit elements of the I-394 plan. This request was made to ensure the orderly completion of all aspects of I-394 and to best utilize limited staff resources. The RTB Chairman also requested that the Commissioner appoint an overall MN/DOT Corridor Manager for the I-394 project to coordinate all aspects of the project within MN/DOT and with other agencies. MN/DOT had previously identified the possibility of utilizing an overall corridor manager, but had not taken any action to create this position. The letter further suggested the appropriate roles for the various agencies on the different elements of the I-394 project.

Both of the major recommendations made by the RTB Chairman were acted upon by the Commissioner. MN/DOT agreed to take the overall lead responsibility for the planning, design and construction of the highway and transit elements of I-394. MN/DOT also created and staffed a new position, that of the I-394 Corridor Manager. This represented the first time MN/DOT had utilized such a position. By appointing a Corridor Manager, MN/DOT provided a focal point, not only for the diverse activities being conducted within the Department, but also for ensuring coordination with other agencies and the communities in the corridor. In addition the Corridor Manager provided a central focus for the dissemination of information on the project.

In 1985 the Corridor Management Team, and the Marketing Subcommittee, focused their efforts primarily on the planning and implementation of the interim HOV lane, or Sane Lane. The development of an interim facility had first been recommended in the MTC's "Market Potential Study". The concept, initially identified as a shoulder HOV lane, had been further refined and modified by MN/DOT into an interim HOV lane in the median. A benefit/cost analysis was completed for FHWA that indicated the interim HOV lane was cost effective. The

[29]Letter from Elliott Perovich, RTB Chairman, to Richard Braun, MN/DOT Commissioner, May 28, 1985.

first segments of the interim HOV lane were constructed during 1985 and opened to traffic in November 1985.

During 1984 and 1985 MN/DOT, and their marketing consultants Colle and McVoy, researched a number of issues associated with the introduction and use of the interim and final HOV lanes. This research included an examination of the experiences with other HOV facilities around the country, and focus groups with residents in the corridor. The results led to a marketing plan for the corridor that included the use of a telephone hot line, newspaper and radio advertising, billboards, bus signs, a corridor newsletter and other promotional activities.

At the same time additional rideshare outreach efforts were being planned and implemented. These included the more traditional rideshare promotional activities, such as employer based programs and computer matching, and also included the use of other techniques such as the "Big Ride Guide", a rideshare matching newspaper for the corridor, and the "Helping Hand" program which was a one-on-one telephone matching service.

The initial segments of the Sane Lane were open in November 1985. While the vehicle utilizations rates are detailed in a later section, the a.m. peak hour volumes have averaged between 405 and 554 since 1985.

From 1986 through 1989 planning, design and construction activities continued on the highway, transit and parking elements of I-394 and on the transit and rideshare services. Bus service was restructured in 1986 with the introduction of addition express service to utilize the Sane Lane. In addition, planning and design of the two major transit stations, at Louisiana Avenue and Plymouth Road, continued. The siting of these facilities both involved some controversy. In the case of the Plymouth Road facility, a commercial establishment which was renting space that would be taken for the station, raised concerns. In the case of the Louisiana Avenue station, neighbors in the area and the city of St. Louis Park identified concerns. These issues were resolved, and work on the transit stations is progressing with the corresponding freeway segments.

Planning and Design of the Third Avenue Distributor (TAD) and the TAD Parking Garages

As noted at different points in the previous discussion of I-394, the Third Avenue Distributor (TAD) and the TAD parking garages represent important elements of the I-394 project. However, the planning and design of these facilities have a different background than the I-394 project. Given the importance of these facilities a brief review of their development is warranted.

The location of the Third Avenue Distributor and the three parking garages is shown in Figure 7. While the city of Minneapolis had prepared the original layouts for the TAD at an earlier date, it was not until 1968 that the TAD was added to the Interstate system, thus becoming eligible for interstate funding. The initial design layouts addressed only the Distributor.

The idea of linking the TAD to fringe parking garages was first identified in a 1969 report prepared by Barton-Aschman Associates for the city of Minneapolis.[30] The concept was further refined by the city in their "Metro Center '85" report,[31] which showed three parking garages located next to the Distributor. These were linked to the core downtown area by a people mover system. The plan identified the need for 8,000 to 10,000 parking spaces in the garages.

In 1970 the Minneapolis City Council approved the Highway Department layouts for the TAD. The location of the TAD was initially approved by FHWA on December 6, 1971, but on December 23, 1971 this approval was rescinded pending approval of the EIS. In 1972 and 1973 the EIS on the TAD, including the TAD Garages, was completed and reviewed by the Metropolitan Council and the Council on Environmental Quality. In 1973 the location was approved by FHWA. At issue during this period were air quality concerns, especially the city's plan to meet CO ambient air quality standards in the downtown area.

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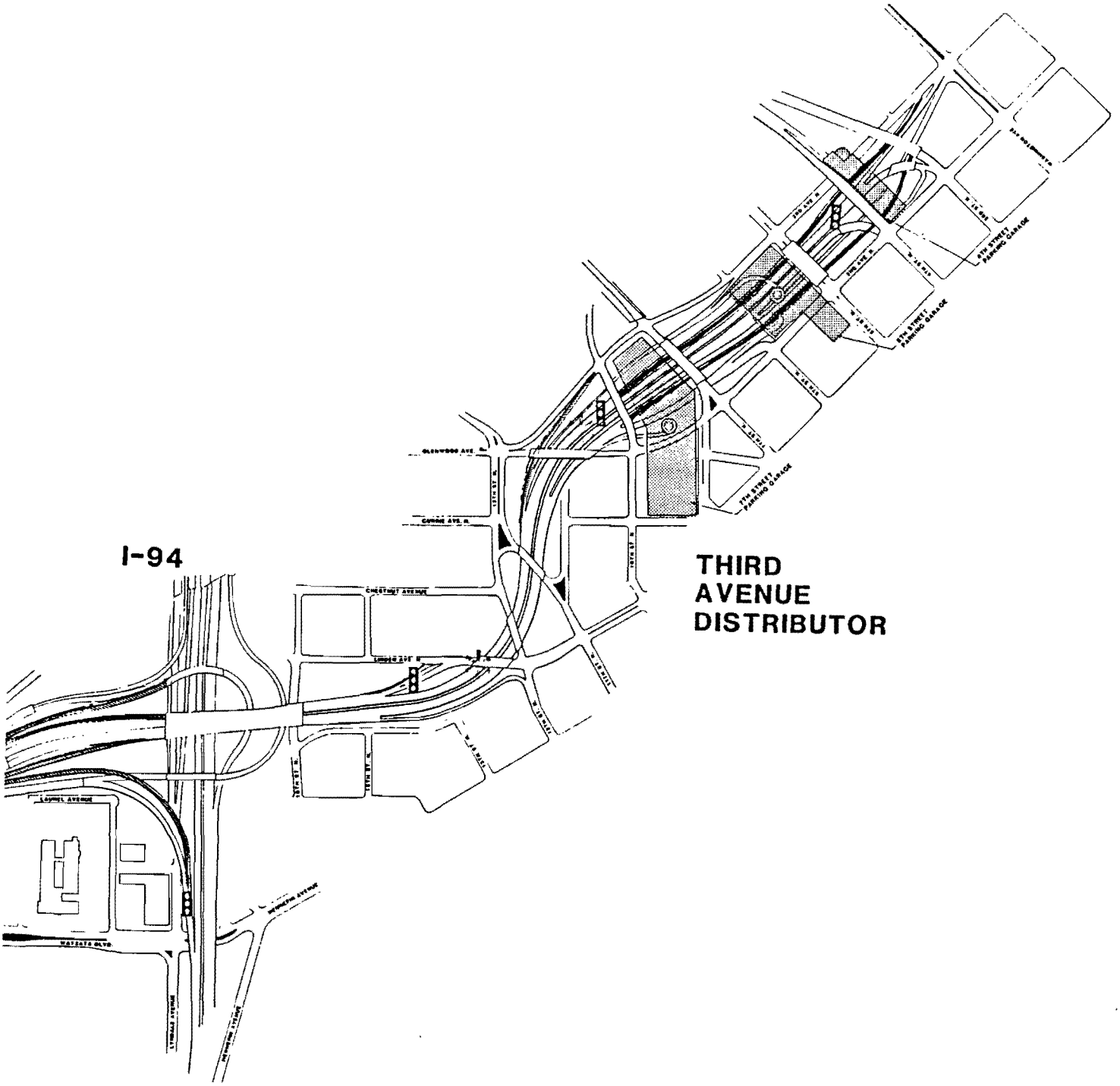
[30]Barton-Aschman Associates, "Parking and Circulation in Downtown Minneapolis," April, 1969.

[31]Minneapolis Planning Department, "Metro Center '85", March, 1970.



Source: I-394 TSM Plan, MN/DOT

Figure 7 - Location of Third Avenue Distributor (TAD) and TAD Parking Garages

Between 1973 and 1975 more detailed studies were completed by the city and the Department on the design of the parking garages.[32] In 1982, the Design Study Report (DSR) for the TAD project was approved. The sizing of the three garages was modified slightly in subsequent design to the following configuration:

5th Street Garage - 1,600 spaces
4th Street Garage - 1,330 spaces
7th Street Garage - 3,050 spaces

All three garages will be linked to the skyway system, providing pedestrian access to the downtown area. Two of the garages will have bus transfer and waiting areas, and all three garages will have bus service within the downtown "dime zone". As noted previously, the garages will provide low cost parking to HOV's using I-394, with higher rates for SOV's.

The three garages are being funded through federal interstate funding as part of the I-394 project. Funding for the garages was included in special Congressional Legislation passed in 1982. This legislation amended the Federal-Aid Highway Act of 1956 to include the cost of "parking garage ramps in conjunction with high occupancy vehicle lanes which flow into a distributor system emptying directly into ramps for off-street parking with preferential parking for carpools, vanpools and buses and the ramps are part of an environmental mitigation effort and are designed to feed into an aerial walkway system"[33]

The actual financing for the garages includes a combination of local, state and federal funds. Local and state funds are being used not only to match federal monies, but also to provide up front financing to advance the construction schedule. Interstate funding covers 90% of the cost of the garages, with the remaining 10% split evenly between the City of Minneapolis and MN/DOT. The City of Minneapolis obtained special state legislation to allow for the

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[32]The two major reports completed during this period were: Barton-Aschman Associates, "Design Considerations of Fringe Parking Facilities and the Third Avenue North Distributor," 1974 and Minnesota Highway Department, "Third Avenue North Distributor Parking Feasibility Study," 1976.

[33]Congressional Record - Hase, September 21, 1982, H 10787.

issuance of bonds to advance funds to MN/DOT to begin construction of the 5th Street Garage. MN/DOT is repaying the city for the use of these funds. Both interstate and state funding was available for the 7th Street Garage, so the city just provided its 5% share. However, with the 4th Street Garage, the City of Minneapolis again advanced funding to MN/DOT to initiate construction. The city will be reimbursed by MN/DOT for the use of these funds.[34]

The 5th Street Garage was initially opened in August 1989. The use of the garage has increased from an average of 397 daily parkers in August, 1989 to 1245 in December 1989. Of these, approximately 36% to 40% have been HOV's from I-394.

[34]Telephone interview with Michael Monahan, City of Minneapolis Engineering Department, February 9, 1990.

IV. SUMMARY OF KEY ELEMENTS

Individuals involved with the process indicated that the involvement of the different agencies and jurisdictions was a critical factor in the development of the plan and with the success of the Sane Lane to date. The diverse nature of the different elements of the plan and activities critical to making the overall project a success made the need for ongoing communication and cooperation very important. While those interviewed indicated that historically the different agencies in the metropolitan area have generally enjoyed good working relationships, and thus the cooperation on the I-394 plan was not new, the use of the Project Management Team and other coordination mechanisms did represent one of the best processes and examples of coordination on a transportation project in the Twin Cities area. In fact, many noted that it has been used as a model for other subsequent projects.

When asked to identify the key elements of the planning process, especially those that led to the final design and ultimately made the process work, individuals identified the following:

- Strong support and commitment from the top levels and key individuals within the different agencies. Most often noted was the strong leadership from the MN/DOT Commissioners and other top MN/DOT staff, the support of FHWA administrators, and the support of the regional agencies (Metropolitan Council and Regional Transit Board) and the city of Minneapolis.

- Good working relationship among the technical staff of the different agencies and jurisdictions, and the high level of interaction between the staff and the consultants on the project.

- The lack of agreement at the metropolitan level concerning the future role for transit, especially rail transit, in the area. This resulted in a lack of agreement on the role for transit in the I-394 corridor.

- The continued involvement of the public, neighborhood groups and local communities in the process. Even with the vocal and often strong opposition by many community groups, residents and local elected officials were willing to continue to work with MN/DOT and other agencies to try to reach a plan acceptable to all.

- The involvement of the Minnesota Legislature in stopping work on I-394 planning, and ultimately restricting the width and design of the facility.

- Once the final decision had been made in 1981, the early involvement of affected agencies and organizations in the planning process was important. For example, the State Patrol, which would be responsible for enforcement of both the Sane Lane and the permanent HOV lanes, was brought into the process early to insure that the lanes were designed and operated to accommodate safe and efficient enforcement.

While obviously not all groups were always in agreement on every issue throughout the development of the plan, the process provided for the open discussion of issues and resolutions of conflicting points of view in such a manner that the ongoing coordination and communication was not jeopardized.

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APPENDIX A

Agencies, Organizations and Communities Involved in the I-394 Planning and Design Process

The following is a listing of the agencies, organizations and communities involved in the I-394 planning and design process. A brief description of the roles and responsibilities of each is noted.

Administration Committee. This was one of two committees formed by the Minnesota Highway Department in 1970 to assist with the development of the planning of I-394. The Administration Committee was comprised of representatives from the Highway Department, the Federal Highway Administration, the Metropolitan Council and the Metropolitan Transit Commission.

Citizens Advisory Committee (CAC). This committee was formed by the Highway Department in 1971 at the recommendation of the Administration Committee. The CAC was formed to provide input into the planning process by citizens and community groups in the corridor. The CAC was comprised of representatives from the cities of Minneapolis, St. Louis Park, Golden Valley, Minnetonka, Plymouth and Wayzata and the Greater Metropolitan Federation.

Corridor Management Team. The Corridor Management Team is comprised of staff representatives from the Minnesota Department of Transportation, Metropolitan Council, Regional Transit Board, Metropolitan Transit Commission, Minnesota Rideshare, Federal Highway Administration, Minnesota State Patrol, City of Minneapolis and Hennepin County. It was formed by MN/DOT during the development of the Transportation Systems Management Plan and continues to function during implementation of the I-394 project.

Federal Highway Administration (FHWA). FHWA is part of the United States Department of Transportation and is the agency responsible for the federal highway system. This includes financing and approval over planning and design activities. The FHWA Division office in St. Paul was actively involved throughout the I-394 process.

Golden Valley. The City of Golden Valley is located along the north side of TH 12/I-394, directly to the west of Minneapolis.

Greater Metropolitan Federation. The Greater Metropolitan Federation was a metropolitan-wide organization of citizens groups. Representatives from the Federation served on the Citizens Advisory Committee in the early 1970's.

Hennepin County. Hennepin County is the largest county in the Twin Cities metropolitan area, it includes the city of Minneapolis and the western, southern and northwestern suburban communities. The I-394 corridor is within Hennepin County. Representatives from the County Highway Department were actively involved in many aspects of the I-394 process.

Hennepin County League of Municipalities. The League represents municipalities in Hennepin County. A representative from the League served on the Highway Department's Technical Advisory Committee (TAC) in the early 1970's.

Interstate Study Committee (ISC). The ISC was formed by the Metropolitan Council and its Transportation Advisory Board (TAB) to assist with the examination of the uncompleted interstate segments in the Twin Cities as directed by legislation approved in 1975. The ISC was comprised of representatives from the city councils of affected communities, the TAB and the Metro Council (non-voting).

Metropolitan Council of the Twin Cities. The Metropolitan Council is the Metropolitan Planning Organization (MPO) for the seven county Twin Cities metropolitan area. In addition to the normal responsibilities of an MPO, the Council has additional responsibilities based on state legislation. These encompass primarily the areas of sewer, transportation, land use, parks and open space and arts planning. The Metro Council conducted the legislative directed review of uncompleted freeway segments and the MN/DOT requested review of I-394 plans in 1980. In addition, Metro Council Staff participated on the Project Management Team and coordinated other activities.

Metropolitan Transit Commission (MTC). The MTC is the public transit operator in the Twin Cities. As such, it operates approximately 95% of the regular route service. The MTC, which includes Minnesota Rideshare, participated in the Project Management Team and directed some of the transit and rideshare studies. The MTC, along with the private operator, in the corridor, Medicine Lake lines, continues to be participate in the planning and implementation of the transit elements of the project.

Minneapolis. Minneapolis is the largest city in the Twin Cities area and the Minneapolis CBD is the largest employment center. The TAD garages are located on the edge of downtown Minneapolis. Representatives from the city assisted MN/DOT in the planning and design of I-394 and the TAD garages. The city also assisted in the financing of the garages.

Minnesota Department of Transportation (MN/DOT). MN/DOT was created by the Minnesota State Legislature in 1977 with the merging of the Highway Department and other state transportation departments. MN/DOT is responsible for highway, ports, rail, aviation, and non-Twin Cities public transit. MN/DOT and the Highway Department have been and continue to be the lead agency on the I-394 project.

Minnesota Highway Department. The Highway Department was created in 1927. In 1977 it was merged with other state transportation departments to form the Minnesota Department of Transportation. The Department was the lead agency on the I-394 project in the 1970's.

Minnesota Rideshare. Minnesota Rideshare, which is operated by the Metropolitan Transit Commission under contract to the Regional Transit Board, is responsible for rideshare matching, promotional activities and outreach programs in the Twin Cities. It has been an active participant in many of the I-394 project activities.

Minnesota State Patrol. The State Patrol is responsible for traffic enforcement activities on the state highway system. The State Patrol became involved in the I-394 project during the development of the Transportation System Management Plan and remains active as the enforcement agency responsible for I-394.

Minnentonka. The city of Minnentonka is located in the I-394 Corridor to the west of St. Louis Park. It is one of the fastest growing communities in the corridor, with major increases in office, commercial and retail developments.

Plymouth. The City of Plymouth is located in the northern portion of the I-394 corridor to the west of Golden Valley.

Policy Committee. The Policy Committee was formed by MN/DOT during the development of the I-394 TSM plan. It continues to meet periodically during the implementation of the project. The committee is comprised of top staff and policy representatives from MN/DOT, the Metropolitan Council, RTB, MTC, FHWA, State patrol, City of Minneapolis and Hennepin County.

Regional Transit Board (RTB). The Regional Transit Board was created by the Minnesota State Legislature in 1984 and charged with the responsibility for transit planning, policy development and administration in the seven county metropolitan area. Since 1985 the RTB has been an active participant in the I-394 project, with responsibility for ensuring the implementation and coordination of the transit elements.

St. Louis Park. The city of St. Louis Park is located in the I-394 corridor directly to the west of Minneapolis, along the south side of I-394.

Technical Advisory Committee (TAC). The TAC was formed by the Highway Department in 1970 to assist with the development of the I-394 plan. It was comprised of representatives from the Highway Department, FHWA, the Metropolitan Council, the MTC, the Hennepin County Highway Department and the Hennepin County League of Municipalities.

Transportation Advisory Board (TAB). The TAB is an advisory board to the Metropolitan Council on transportation issues. It is comprised of officials and representatives from the different municipalities, counties and other jurisdictions, and the metropolitan and state agencies. The TAB played an active role in the development of the recommendations to the legislature on the uncompleted freeway segments in the Twin Cities and on other aspects of the I-394 project.

Urban Mass Transportation Administration (UMTA). UMTA is part of the United States Department of Transportation. UMTA is the transit counterpart to FHWA. UMTA is the agency responsible for financing public transit systems, including planning activities, operating costs and capital elements. UMTA was not heavily involved in the development of the I-394 project. UMTA funds are not being used for the major transit capital elements in the corridor.

Wayzata. The City of Wayzata is located at the western end of I-394.

APPENDIX B

Resolution on I-394 From the Metropolitan Council's "Recommendations on the Uncompleted Interstate Segments in the Twin Cities Metropolitan Area", January 1976

WHEREAS, the previously completed reports on examination of alternative corridors were reviewed and that many of the options were already precluded by decisions made in the past; and

WHEREAS, traffic volume projections from earlier reports and from a recently completed report were reviewed and indicated an unrestrained forecast ranging from 103,000 to 158,000 (depending on assumptions) vehicle trips per day for the year 2000 on the segment east of T.H. 100; and

WHEREAS, the current volumes exceed capacity resulting in congestion and unsafe conditions; and

WHEREAS, there are strong concerns about providing access to the highway facility from adjacent land uses so as to benefit the adjoining communities while meeting the design requirements qualifying for interstate funding; and

WHEREAS, mass transit studies presented showed that the U.S. 12 corridor did not maximize access to the transit market; and

WHEREAS, a six-lane facility has been proposed and a facility requiring substantial additional right-of-way is unacceptable; and

WHEREAS, review of the forecasts showed that a six-lane facility would not handle the traffic unless very strong measures are taken to increase vehicle occupancy rates in the corridor; and

WHEREAS, additional concerns have been expressed about the environment including such items as noise control, air pollution control and water runoff.

WHEREAS, that portion of the proposed facility east of I-94 is not involved in controversy, has received federal location approval and EIS acceptance, is consistent with local comprehensive plans, and is, together with three fringe parking ramps, a part of the Transportation Control Plan of the Minnesota Pollution Control Agency's Air Implementation Plan.

BE IT THEREFORE RESOLVED BY THE TRANSPORTATION ADVISORY BOARD:

1. That the Minnesota Highway Department should complete the EIS based on a six fluid lane facility on U.S. 12 that meets freeway standards. This environmental impact statement should consider all prudent design alternatives to provide for the safe and efficient movement of traffic.

2. That access to adjoining property is a complex problem that should be resolved by the Minnesota Highway Department working closely with the appropriate cities and applicable neighborhood and business associations to provide safe and appropriate access.

3. That the present right-of-way restriction placed on the Minnesota Highway Department by the State Legislature in its 1975 session should be changed to permit limited acquisition for the six lane facility with the advice of the appropriate city in order to provide: a) safe design and b) proper environmental considerations.

4. That because of the above right-of-way limitation the proposed 50' median strip to be reserved exclusively for future mass transit should be eliminated.

5. That in order for this freeway route to function efficiently, the design should consider reversible lanes and provide preferential treatment for buses and multiple occupancy vehicles, such as metered ramps with by-passes and other procedures used on I-35W, from all access points including Highway 100, County Road 18 and I-494, with consideration given to providing peak hour exclusive lanes within the six fluid lane facility.

6. That consideration be given within the final environmental impact statement to such environmental concerns as: meeting of current noise and air pollution standards, and the secondary impact of the freeway on residential neighborhoods which would occur if traffic is permitted to by-pass freeway congestion through the use of neighborhood streets and local arterials.

7. That consideration be given to linkage improvements to TH 55 and TH 7 preferably along existing expressway and freeway corridors as part of the interstate design.

8. That consideration be given to park and ride transit facilities as part of the interstate design.

9. That it supports the completion of the facility east of I-94 including incorporation of the three proposed fringe parking ramps as part of the Interstate project.

APPENDIX C

Listing of the I-394 TSM Plan Technical Memorandums

TABLE OF CONTENTS

TECHNICAL NOTEBOOK
I-394 TRANSPORTATION SYSTEM MANAGEMENT PLAN

REVISED 11/29/84

HISTORY AND INSTITUTIONAL ARRANGEMENTS: HIGH-OCCUPANCY VEHICLE FACILITIES IN ORANGE COUNTY, CAIIFORNIA

Charles Fuhs

I. INTRODUCTION

This technical report presents the Orange County, California case study. Information is provided on the background and development of institutional arrangements made for various HOV projects in Orange County with particular focus on the Route 55 project. Operating policies, designs, and general before-and-after impacts are also presented.

The information presented in this report was obtained from a variety of sources. These included published reports and documents from local and state agencies, information provided by agency staff, and interviews with key individuals who were responsible for decisions affecting the implementation of various HOV projects. In particular, the following individuals are thanked for their contributions to this case study effort:

Mr. Dave Roper, Deputy Director, California Department of Transportation, District 7, Los Angeles.

Mr. Sid Elicks, Former Deputy Director, California Department of Transportation, District 12, Orange County.

Mr. Joe El-Harake, HOV Coordinator, California Department of Transportation, Districts 7 and 12, Orange County.

Mr. Kia Mortazavi, Orange County Transportation Commission.

II. BACKGROUND

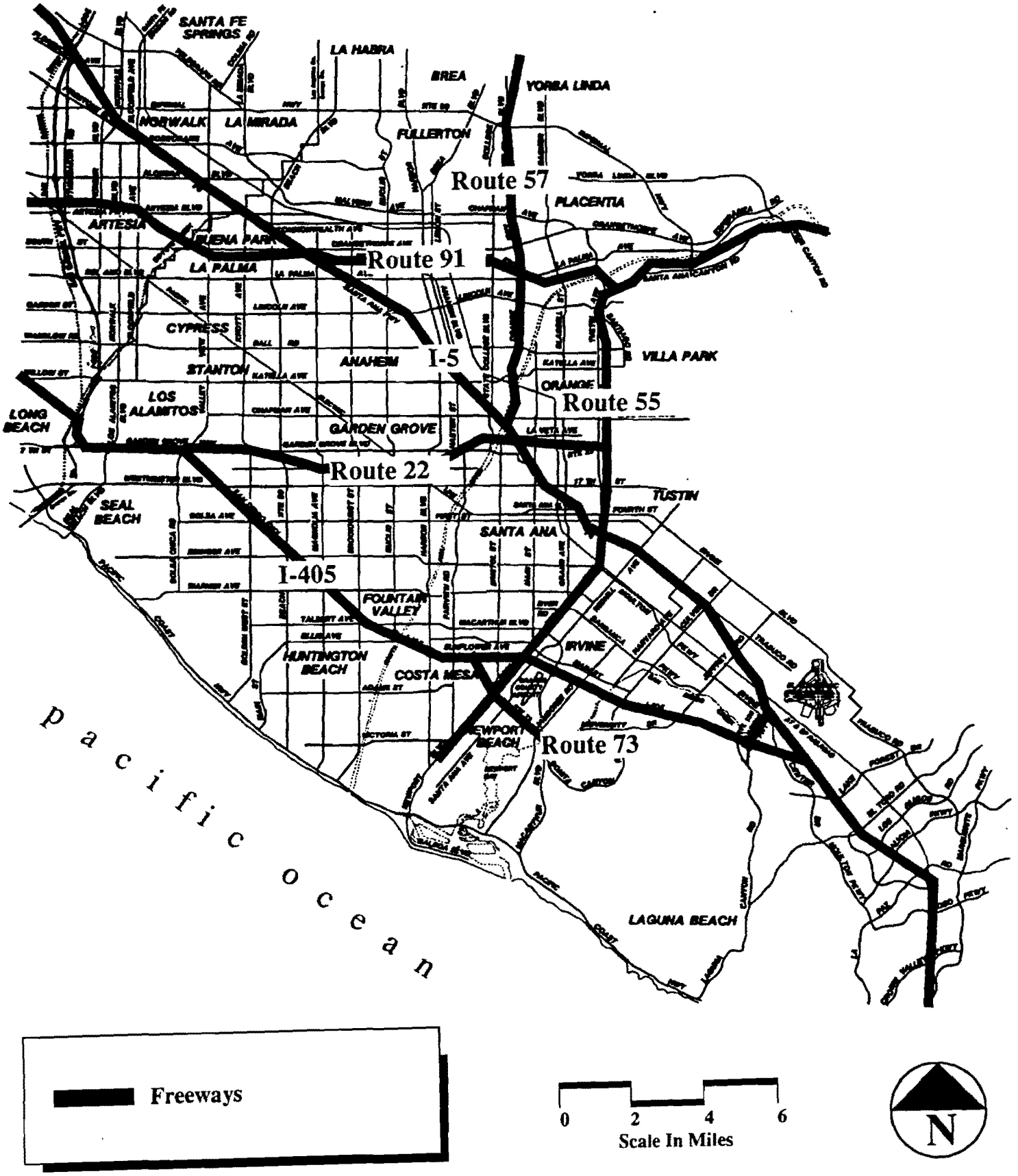
Orange County is located between Los Angeles and San Diego Counties and is composed of approximately 30 incorporated cities comprising a population of over two million (Figure 1). Much of this population growth has occurred relatively recently, creating a significant burden on the existing transportation system. Today, traffic congestion on Orange County's freeways rivals any other major U.S. city, including Los Angeles to the north. As an example, average commute trips on the Route 91 corridor in 1989 were in excess of 94 minutes with an average trip speed of less than 25 mph.

Early HOV Plans in Southern California

Traffic congestion is not new to southern California. The Los Angeles area was one of the first areas in the country to implement HOV facilities in the early 1970s. The California Department of Transportation (Caltrans) began a series of HOV experiments on various freeways in Los Angeles County, including the application of HOV preferential lanes as bottleneck bypasses around metered freeway on-ramps and line-haul treatments along freeways.

The bypasses were tested at metered on-ramps where queuing space could be made available to allow for segregation of HOVs from general purpose traffic. Providing a separate bypass lane reduced ramp wait times and helped improve trip reliability. Bypass lanes were operational during the commensurate periods when ramps were metered, usually during the peak-periods only. Such facilities were restricted to HOVs with two or more occupants. Ramp bypasses saved from one to ten minutes depending on the location and amount of queuing. This concept was found to be relatively economical to install and enforce, and by 1976 there were 46 on-ramps in the Los Angeles area which provided HOV bypass lanes. Ten years later, over 250 on-ramps throughout Los Angeles and Orange Counties have been retrofitted with HOV ramp bypass lanes.

FIGURE 1
REGION MAP OF ORANGE COUNTY



Several line-haul concepts for bus only use on reserved freeway lanes were studied in the early 1970s. These included a contraflow bus lane on the southbound side of the Hollywood Freeway, concurrent flow HOV lanes in the medians of the San Diego, Long Beach and Artesia Freeways, concurrent flow lanes created by taking away lanes on the Santa Monica Freeway, and a barrier and buffer-separated HOV facility on the San Bernardino Freeway. The selection of concepts and locations for trials was not a random process, but rather, was related to an understanding of the traffic operation and geometric limitations of each freeway.

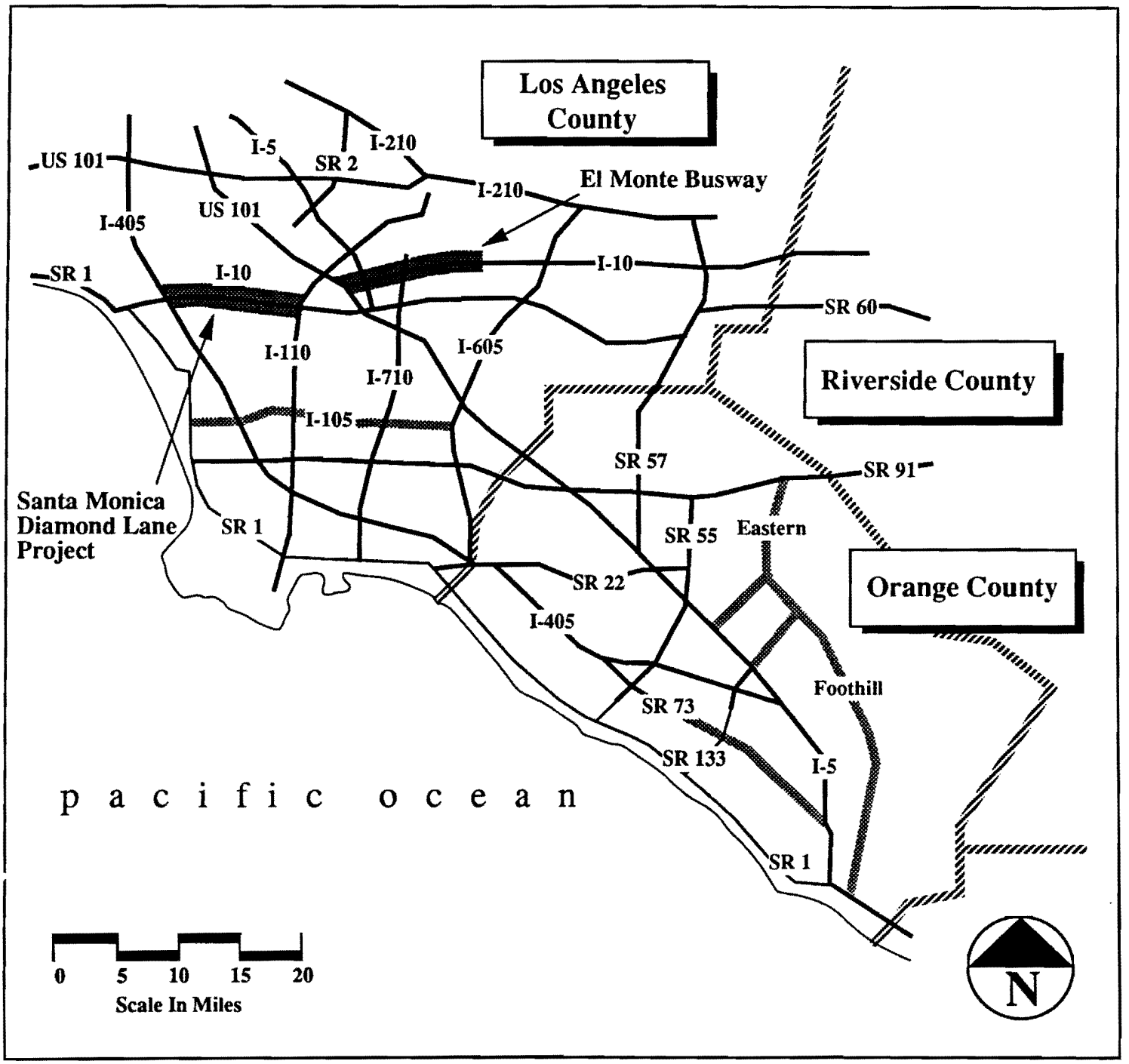
El Monte Busway

The Southern California Rapid Transit District (SCRTD) became jointly involved in implementing an HOV facility from downtown Los Angeles eastward along the San Bernardino Freeway to the community of El Monte in 1970 (Figure 2). As part of a freeway widening project, a dedicated busway was constructed in the freeway median along the eastern half and closer to downtown, alongside the widened freeway within a railroad right-of-way. It included special access ramps from local streets and freeways and "on-line" bus stations, allowing buses to pick-up and drop-off passengers at platforms constructed alongside the HOV facility. Caltrans and the SCRTD shared sponsorship of the project, which involved UMTA and FWHA funding.

Following an SCRTD bus strike in 1975, that affected approximately 5600 bus commuters, the facility was opened to authorized carpools of three or more occupants who obtained and displayed an operation permit. Subsequent to settling the strike, the permitting process was dropped and carpools of three or more persons were considered eligible.

Since the mid 1970s, SCRTD has continued to rely on the El Monte busway to handle 15,000 daily bus commuter trips via a myriad of bus routes radiating from downtown to the east, but the agency has withdrawn from being involved in operating or maintaining the HOV facility. Caltrans manages the project and is vested with setting the operational policy. Caltrans has also constructed a 0.5 mile extension into the downtown street system and has plans to extend the facility further eastward as funding becomes available.

FIGURE 2
EARLY HOV PROJECTS ON THE SAN BERNARDINO AND SANTA MONICA FREEWAYS



Development of the First Areawide HOV Program

At about this same point in time, the U.S. Environmental Protection Agency (EPA) promulgated its Transportation Control Plan for southern California, based on measures mandated in the 1970 Clean Air Act. This plan included somewhat controversial limitations on the use of gasoline which, if implemented, could have curtailed individual auto usage by up to 80 percent in the Los Angeles and Orange County basin. This plan resulted in local agencies examining different approaches to addressing air quality standards. Caltrans responded with a proposal that, among other elements, included widespread use of HOV facilities to reduce vehicle miles of travel. The previously proposed demonstrations became the backbone of a region-wide HOV program in 1974.

Santa Monica Diamond Lanes

Implementation of HOV facilities had to be substantially completed by the mandated deadlines in the Transportation Control Plan. To meet these requirements, Caltrans set forth on the easiest of the strategies first -- to take existing general purpose lanes on the Santa Monica Freeway and restrict them for HOVs (Figure 2). This was the first time such an approach was tried. HOVs at the time were envisioned as a minimum of three or more persons per vehicle, and on opening day, there were too few of these to give the appearance of adequate usage. This overnight transition simultaneously removed about 25 percent of the general purpose capacity previously provided in one of the four lanes, causing significant traffic congestion on the remaining lanes.

Perceptions of HOV lane underutilization, and reaction to increased local traffic, resulted in a strong public outcry and news media event. Local politicians became vocally critical of Caltrans and the HOV concept, termed "diamond lanes" on this project. After about 15 weeks of operation, the Santa Monica HOV lanes were moving more people than the same lanes had moved before the restriction was imposed, and at significantly higher speeds. However, because there were still relatively few vehicles traveling in the HOV lanes, public sentiment had not changed. A City Councilman led a citizens committee in filing a federal court suit to terminate

the project. After only 21 weeks of operation, a federal judge ordered the project halted until additional environmental impact studies were conducted.

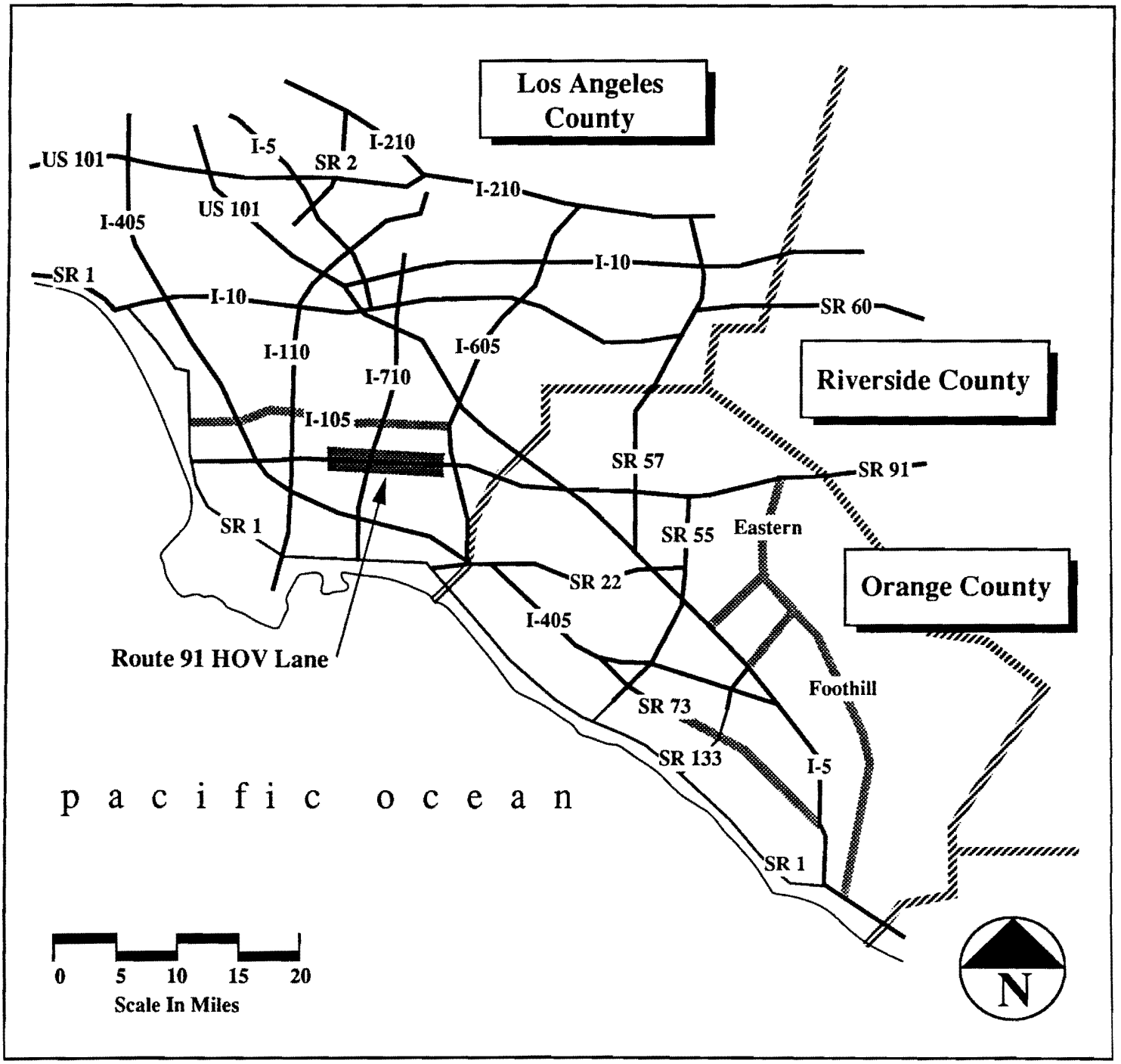
The results of the Santa Monica project appear to have had a major impact on the development of other HOV projects throughout California well into the mid 1980s. This event overshadowed the ongoing success of the El Monte busway and placed proposals for future HOV projects on hold. Even today, the approach state and local officials take toward HOV planning and implementation appears to be tempered by the lessons learned from the Santa Monica project.

Route 91 (Artesia Freeway) HOV Demonstration

In 1984, Caltrans proposed a demonstration HOV project on Route 91 (Artesia Freeway) in Los Angeles (Figure 3). This freeway was heavily congested and had enough two-occupant carpools that if 80 to 90 percent diverted into the newly created lane in the median, the effective vehicle volumes would be high enough to avoid the "empty lane syndrome." Thus, the candidate corridor appeared to make good sense.

Caltrans sought input from a local advisory committee that was assembled for the project. The committee was composed of representatives from local agencies, municipalities, and citizen groups. Meetings were held to communicate the benefits of the proposed concept and to describe the difference in application from the Santa Monica demonstration. There was also an effort undertaken to work closely with elected leaders. Through a series of workshops that provided an education on the benefits of the concept, a local "crusader" emerged who was willing to support the implementation of the concept. In this case, Dave Roper, the Deputy of Traffic Operations for District 7 at Caltrans, led the advisory committee through the evaluation of a number of alternatives. Based on this review, the Committee supported the recommended HOV alternative. This process allowed local representatives to "buy into" the concept and spread the basis of support among a larger constituency.

FIGURE 3
HOV DEMONSTRATION PROJECT ON THE EASTBOUND ARTESIA FREEWAY



The eastbound HOV lane was implemented in the median shoulder in a relatively short period of time. Various informational brochures associated with this project and the reintroduction of the HOV concept in southern California are shown in Figure 4. Operation of the facility was modified over time to meet usage needs. The initial peak-only operating period was extended to 24 hours in order to meet growing off-peak demand, reduce confusion, and make the project more consistent with other HOV facilities. Today, plans are underway to add a companion lane in the westbound direction along this stretch of Route 91.

The Route 91 HOV demonstration project set the stage for other projects to be implemented in the region, including the Orange County projects described in following sections of this report. Caltrans staff interviewed in this study indicated that Dave Roper played a key role in convincing the Caltrans staff at all levels to again pursue HOV strategies. To the extent that Route 91 paved the way for future HOV opportunities, both the selection of the project site and the individuals involved were integral to the successful reintroduction of the concept.

Figure 4: Regional HOV Brochures

Meeting the Challenge

The New Route 91 COMMUTER LANE

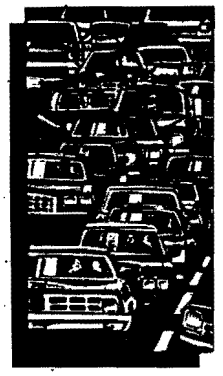
One is a crowd. Because most of us d our cars are crowding the freeways.

Southern Californians produce more than million trips every day, and the number is growing.

That's why a new type of lane is being added to our existing freeway lanes. These new commuter lanes make driving easier for everyone.

A commuter lane carries the same number of people in half as many cars as a general-use lane.

1 is a crowd.

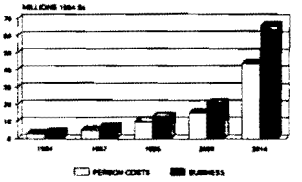


What Are Commuter Lanes?

Commuter lanes, which may also be called carpool lanes, are special lanes added to existing freeways or built on new freeways for carpools, vanpools, and buses. During the next 5 to 20 years, a region-wide commuter lane system will be added to Southern California's freeways.

Most of these lanes will allow carpools of two persons or more per vehicle. Transitways, like the El Monte Busway, may require at least three persons per vehicle.

DAILY RECURRENT CONGESTION COSTS FOR BUSINESS AND PERSONAL TRIPS

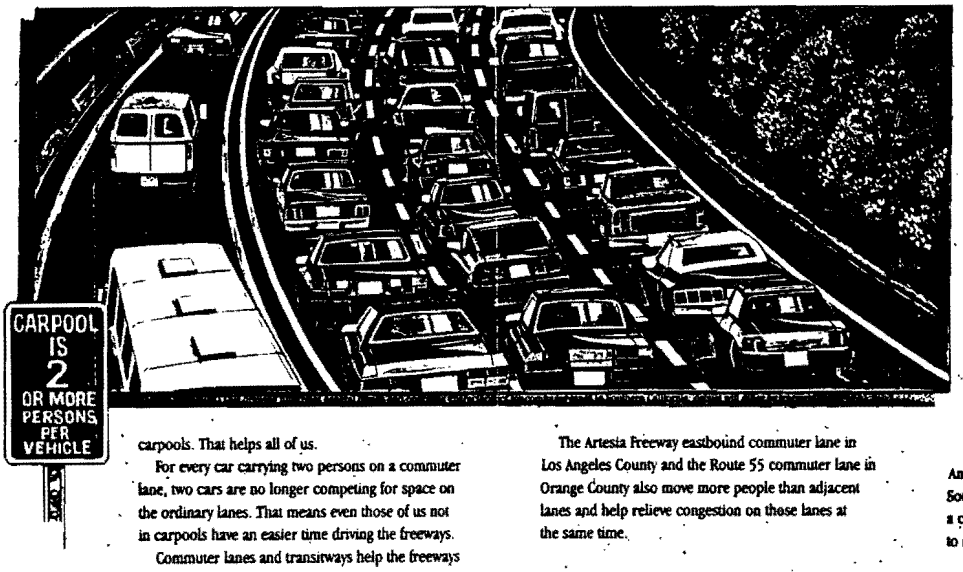


Not Everyone Can Use Commuter Lanes, But Every Freeway User Benefits From Them.

Commuter lanes encourage people to form carpools. That helps all of us.

For every car carrying two persons on a commuter lane, two cars are no longer competing for space on the ordinary lanes. That means even those of us not in carpools have an easier time driving the freeways.

Commuter lanes and transitways help the freeways move more people by encouraging ridesharing during peak travel times.



Commuter Lanes Work.

Commuter lanes work successfully in many of the nation's cities, including Washington, D.C., Seattle, Houston, and Honolulu.

Commuter lanes are also successful in Southern California. During peak rush hours, the region's three commuter lanes carry from 50 to 150 percent more people than an adjacent lane.

The El Monte Busway has been operating since 1973. Today, the busway carries 2½ times as many people as an ordinary lane during the morning peak hour. Those who use the busway save more than 20 minutes per round trip during peak hours.

The Artesia Freeway eastbound commuter lane in Los Angeles County and the Route 55 commuter lane in Orange County also move more people than adjacent lanes and help relieve congestion on those lanes at the same time.

Why Do We Need A Commuter Lane System?

Southern California is growing fast. By the year 2010, the region's population will increase by six million people to more than 18 million. This population will produce a total of 57 million trips every day.

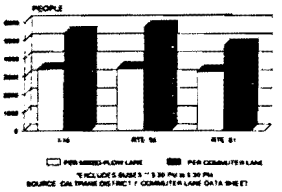
We clearly need more freeway capacity. But constructing freeway lanes costs roughly $11 million per mile, and we haven't the money to build enough freeway lanes to meet our growing needs. Obtaining land for freeway widening in built-up areas is also difficult and expensive.

Commuter lanes are a cost-effective way of increasing freeway capacity.

Part Of An Overall Transportation Solution.

Commuter lanes are only one part of the solution. An integrated system of bus, rail, and other transportation system improvements will be needed to keep the region moving.

PEOPLE CARRIED PER LANE * P.M. PEAK PERIOD**



The Federal Highway Administration, the California and County Transportation Commissions, Caltrans, and the Southern California Association of Governments support commuter lanes as an important part of the solution to meeting Southern California's mobility needs. And SCAG, the California Air Resources Board, and the South Coast Air Quality Management District support a commuter lane system as part of the region's efforts to reduce air pollution.

Commuter Lanes: An Alternative To Sitting Alone In The Crowd.

One is a crowd when millions of drivers sit alone in their cars every morning and afternoon fighting freeway traffic.

There is an alternative. By encouraging increased carpooling, commuter lanes help us all save time, gas, and money. A commuter lane system will also help to improve air quality in Southern California.

III. ROUTE 55 HOV PROJECT DESCRIPTION

Project Description

Route 55 (Newport-Costa Mesa Freeway) was originally a two-lane state highway that was upgraded to a six-lane freeway in the early 1960's. It is a key link between inland residential areas in eastern Orange and Riverside Counties and employment centers in central Orange County (Figure 5). The freeway carried over 140,000 vehicles per day in 1985 and was considered one of the most congested corridors in the county.

The Route 55 HOV lanes (locally termed "commuter lanes") operate along a 12-mile section of this freeway from Route 91 to I-405. The project includes one HOV lane in each direction separated from the general purpose traffic by a narrow buffer (Figure 6). The original HOV demonstration project included a one-foot buffer. There were no inside shoulders along most of the length of the facility. However, the freeway was widened in several locations to provide for enforcement areas in the median. A portion of the project has been recently upgraded to include a continuous eight-foot inside shoulder. Access is via designated breaks in the pavement markings where at-grade ingress and egress is allowed with adjacent general purpose freeway traffic. Spacing between access locations is every one to two miles.

The Route 55 commuter lanes operate on a 24-hour basis and are restricted to two or more persons per vehicle and motorcycles. Each directional lane carries in excess of 1500 vehicles per lane (VPH) during peak commuting periods, and up to 1200 VPH have been experienced in the mid-day period. These peak volumes have not appreciably changed since the first year of operation.

Planning and Constituency Building

The Route 55 commuter lanes were not conceived in a traditional planning sense, involving the study of alternatives. There was no regional HOV plan prior to the conception of this project. The only HOV planning that had occurred prior to this date had been performed

FIGURE 5
ROUTE 55 COMMUTER LANE PROJECT LIMITS

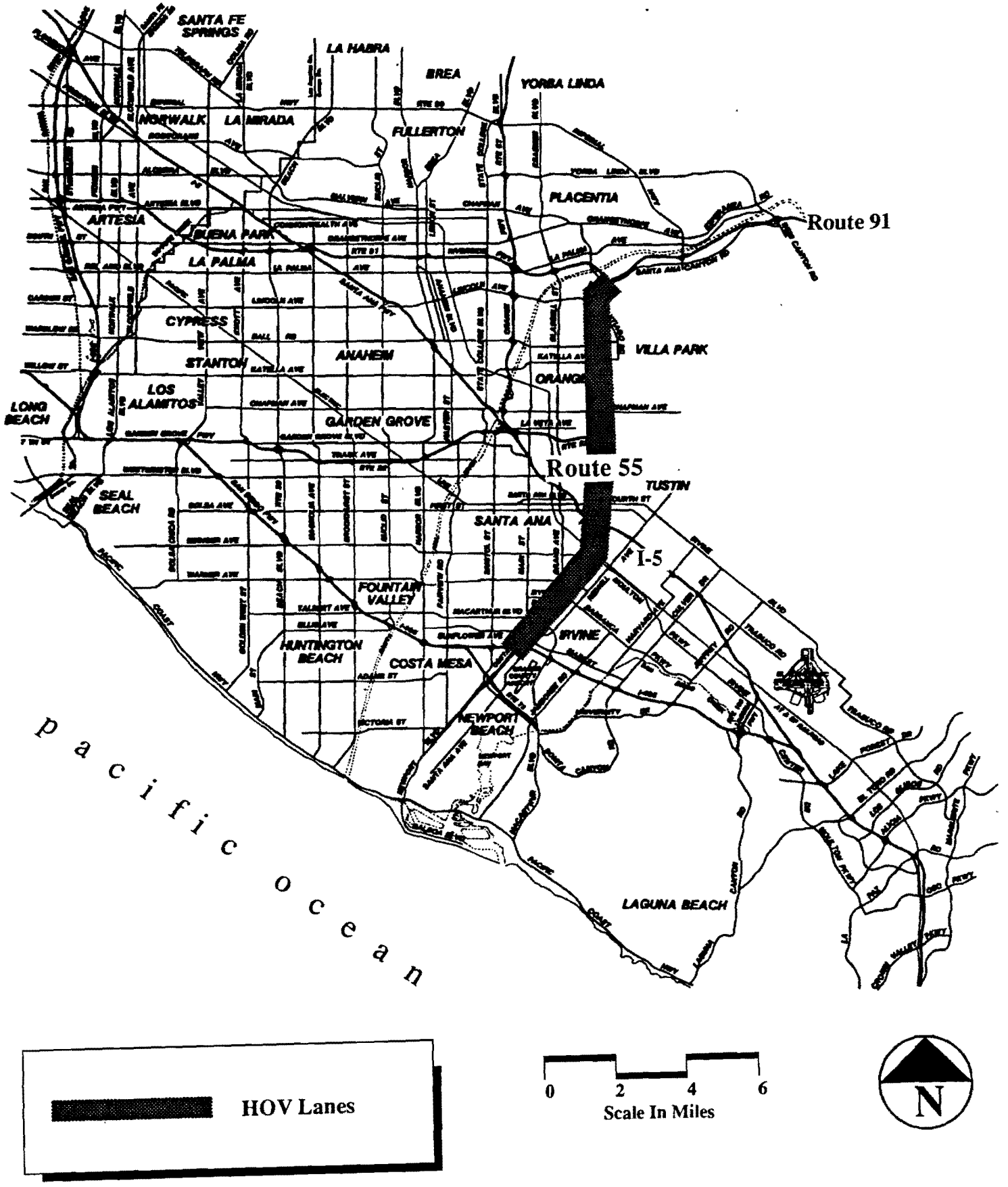
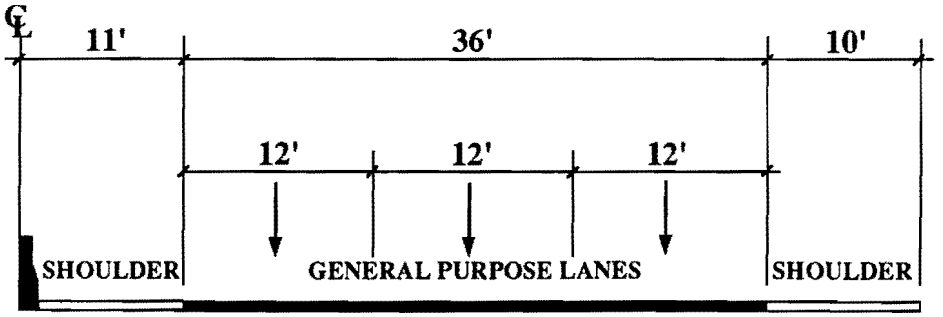
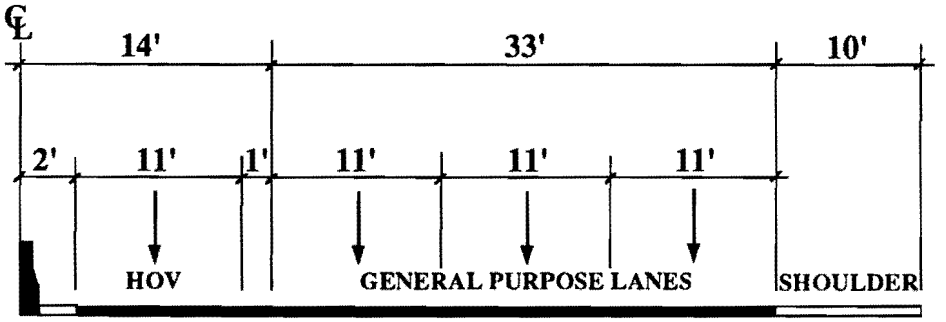


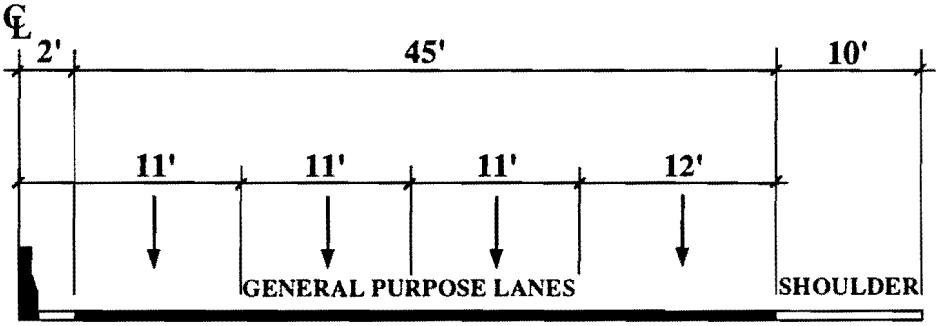
FIGURE 6
COMPARITIVE CROSS-SECTIONS CONSIDERED FOR ROUTE 55



Before HOV Lane Was Implemented



With HOV Lane Demonstration Project Added



With General Purpose Lane Added

by Caltrans in the Route 91 demonstration project, I-5 (Santa Ana Freeway), I-105 (Century Freeway), and I-110 (Harbor Freeway) corridors in support of a commitment to implement HOV lanes as a part of these major corridor upgrades.

The Route 55 HOV project was the result of state and local agency sponsorship and involvement. A listing of the involved agencies is provided in Appendix A.

Project Development

The HOV lanes on Route 55 were proposed from a window of opportunity provided by a pavement rehabilitation project. This opportunity was identified within Caltrans during the project development process. The Caltrans District 7 Deputy in charge of designing a pavement overlay along eight miles of Route 55, identified a possibility to provide some interim capacity relief by taking the median shoulders and restiping the freeway for one additional lane in each direction. The additional lane could either be a general purpose lane or an HOV lane. The comparative cross sections for each approach are shown in Figure 6. There was a strong desire to add capacity to the facility, since no other major improvements were programmed to be completed in the near term to mitigate substantial increases in travel demand. The 22-foot median appeared wide enough in conjunction with narrowing the lane widths, and sufficiently strong enough to support traffic. The real question was which alternative should be pursued.

A state statute was in effect (Appendix B) that directed Caltrans to consider HOV facilities on the existing state highway system. Statute 149, approved by the California Transportation Commission, provided consideration of HOV lanes on any of the state's urban freeway system and endorsed the use of federal aid funds for design and construction of such facilities. This statute had been in effect since the early 1980s, and was the basis for including HOV lanes on several long range highway improvement projects. But, for a variety of reasons, no previous restriping or widening project had included an HOV facility as the recommended alternative. Most planning reports (locally termed Project Study Reports) had included the HOV alternative alongside various general purpose concepts, but each study had found a variety of justifications for withdrawing HOV concepts from further consideration.

Reflections from Caltrans senior staff on this point revealed that there was considerable internal apprehension toward HOV facilities. It appears that Caltrans' staff overall reaction was somewhat ambivalent, and not inclined toward another uphill effort at trying to validate the HOV concept. The negative reaction from the Santa Monica diamond lanes and general feeling that building more general purpose lanes was the solution appear to have contributed to this apprehension.

The idea of designating the additional lane on Route 55 as an HOV lane or general purpose lane was discussed internally within Caltrans District 7. The key to obtaining local support for an HOV project inclusion was that it had to be implemented quickly and its inclusion could not substantially disrupt the committed schedule for pavement improvements. Initially, the concept moved forward as a general purpose lane improvement.

Several Caltrans deputies were critical in obtaining an internal consensus to pursue an HOV alternative and in promoting this alternative to headquarters staff in Sacramento. FHWA staff also were involved in this discussion. At first, it appears that FHWA staff were mildly supportive. However, they later became extremely supportive of Caltrans' HOV activities. As a backdrop to this internal decision making process, it should be noted that these actions followed closely behind the decision to try an HOV lane demonstration on Route 91 (Artesia Freeway).

Dave Roper was clearly instrumental in garnering internal Caltrans support for the Route 55 HOV proposal. The general purpose concept was easier to pursue, and this meant that staff perceptions had to be changed. Although the District office had a policy that Caltrans should recommend an HOV lane when the demand indicated greater use would come from this approach than a general purpose lane, it appears that many Caltrans staff were still reluctant to support the use of HOV lanes.

It also appears that there was a misunderstanding even within Caltrans staff over the merits of HOV facilities. One staff comment reflected the perceptions that existed when it was noted that "we don't need an HOV lane out there; we need some real capacity." The implication

was that more general purpose lanes offered the only means of meeting demand. It took peer convincing up and down the Caltrans chain of command to move the project forward. To assist in the effort, discussion boards and other information were developed to show how person movement could be improved with an HOV lane.

For Caltrans upper management in District 7 and in their Sacramento counterparts, two points had to be communicated. First, local staff would have to demonstrate that an HOV concept would technically work. Second, they would have to convince local politicians and agencies that the concept would work. Based on prior experiences, Caltrans staff went into the Route 55 project knowing that HOV lanes were a sensitive issue to some people. Thus, a good deal of time and effort was spent explaining the project to different groups and building local support.

Caltrans staff next approached local agencies with their recommendation. A proposal was presented to Orange County Transit Commission (OCTC) staff, as the Commission is responsible for programing highway and transit projects in the area. Originally, OCTC staff were apprehensive about getting involved with an HOV project. The discussion boards used with Caltrans staff were again used to help inform local technical staff of the merits of the HOV concept. OCTC staff then presented the concept to OCTC administration and the Commission. Key OCTC staff were instrumental in advancing the project through the planning and subsequent implementation process, especially in managing the public participation and evaluation efforts.

Two local politicians, the mayor of Orange, who also served on the OCTC, and a commissioner, who also served on the California Transportation Commission (CTC) were approached with the concept. Caltrans and local staff worked closely with these representatives, providing information the HOV concept and reviewing the benefits of the Route 55 project. This close dialogue provided both an education for these individuals and a means of testing the political viability of a formal proposal to the OCTC. These individuals supported the project and helped in a number of ways to advance the project.

Caltrans staff felt strongly about this education process. According to one deputy, once local agency staff were convinced of the merits of the project, they actively supported it. This was exactly what was needed to move the project forward. OCTC's underlying support was the key to the success of the project.

With this local staff support, Caltrans and the OCTC staff made a formal proposal to the Commission. Recollections indicate that the Commission was not given the choice of considering an HOV or general purpose alternative. Caltrans position was that the corridor needed an HOV lane and that a Corridor Advisory Committee would be formed to study the merits of this approach further. Caltrans' proposal included relocating capital funds which were already programmed to this project, which was estimated at $400,000. There would be no substantive delays to the existing project schedule and ongoing construction activity.

The initial response from some OCTC commissioners was "Who would benefit from this project?" A perception existed that Riverside County commuters would be the primary beneficiaries. Thus, staff were requested to conduct a survey of Route 55 users. The oversight of this survey was vested with an Advisory Committee. With this question pursued, the Commission was willing to endorse further study of this project as long as it was called a demonstration.

Implementation

Formation of the Advisory Committee

The Corridor Advisory Committee was formed November 26, 1984, to evaluate the technical merits of adding HOV lanes to Route 55. This committee, also called the Technical Committee, was the primary means of public and agency participation in the planning process. It was charged with the responsibility of investigating the technical, operational, and attitudinal aspects of the HOV concept. The committee formulated an evaluation plan and met for several months prior to the opening of the new lanes to define operational and safety features. It was chaired by the Mayor of Orange, who was also an OCTC Commissioner. The chair was in a

very unique position, in that his municipality of Orange was the most affected by the proposal. Representative members of the committee included:

City of Orange
City of Anaheim
City of Santa Ana
City of Costa Mesa
City of Tustin
City of Irvine
Orange County Board of Supervisors
California Highway Patrol (CHP)
Industrial League
Association of Commuter Transportation
Automobile Club of Southern California
Chamber of Commerce
Orange County Transportation Commission
Orange County Transit District
Southern California Association of Governments, and
Area legislators

City representatives included one elected representative and one representative from their respective public works department. The focus of the advisory group was contained to the HOV project. A number of technical recommendations made by this group became the framework for the operation plan. These included:

- Minimum Use. To avoid the appearance of the "empty lane syndrome," the committee felt that a certain minimum carpool use would be needed from the day the demonstration opened. They eventually compromised on 500 vehicles in the peak-hour (per direction). It was recognized that this was a locally significant value to the members of the group and not necessarily a value that translated to any other regional HOV project. No regular route bus service used the facility and there were no plans for future service.

- Eligibility. A determination of minimum use helped set the baseline criteria for defining eligibility. The group recommended a minimum eligibility of two or more persons per vehicle. More than 15 percent of the users on the freeway met this requirement, so was generally felt that the lanes would be adequately used on opening day.

- Hours of Operation. The Route 91 HOV demonstration project involved the part-time use of a shoulder, open only during the peak-period in the eastbound direction. To determine the appropriate hours of operation on this demonstration, the group requested that congestion diagrams be provided. These diagrams revealed a pattern of recurrent congestion during peak-periods as well as the off-peak. As a result of this, the committe favored 24-hour operation. CHP, the enforcing agency for the project, also preferred 24-hour operation to simplify signing and enforcement.

- Signing and Markings. To keep the project from being called another "Diamond Lane" by the media in reference to the old Santa Monica project, the group recommended that no diamond symbols appear on the signs or pavement markings, at least initially. The HOV facility would be called a "commuter lane" for the same reason.

- Demonstration Period. The advisory group did not agree with the Caltrans recommendation for a one-year test period. The committee was only willing to support a 90-day demonstration period. The committee did not want to commit to a longer test period for a variety of reasons. This position essentially required more attention to ensuring that initial operation would provide early net benefits to the corridor.

- Evaluation Plan. To be able to measure these benefits, a rather rigorous evaluation plan was proposed by the committee. It included weekly status reports for the first month and bi-weekly reports for the balance of the 90-day test period. When the project passed the 90-day test, quarterly reports were to be issued thereafter. Reports were to contain overall freeway and HOV usage, level-of-service, accident records, violations, and public attitudes.

Two other advisory groups were formed. These included a Public Awareness Committee and Criteria and Assessment Committee. The Public Awareness Committee rarely met during the course of planning and implementing the project. The Criteria and Assessment Committee provided oversight on the evaluation plan set up by the Advisory Committee.

Implementation Activities

Implementation activities involved parallel functions. While Caltrans pursued engineering and environmental concept design approval for the proposal with their superiors and FHWA, OCTC staff conducted a number of studies to satisfy specific concerns expressed by the advisory group and Commission. These included a survey of origins and destinations in the corridor, a survey of commuter attitudes, and establishment of an evaluation plan as noted above. The origins and destinations verified that the project would benefit both Orange and Riverside County commuters and that the trip characteristics were conducive to an HOV facility. The survey of attitudes provided assurance that the public understood and would favorably respond to the project if adequate information was disseminated. The survey found that 75 percent of the respondents would favor the project. The evaluation plan provided the structure to measure changes in travel characteristics and public attitudes after the project opened.

Caltrans was required to document the change in project scope and obtain approval for a number of non-standard design features the HOV project was creating. Getting non-standard approval was not as big an issue as it could have been, but it did require a close dialogue with the reviewing geometricians within Caltrans and FHWA. Retrofit projects of this sort could not be considered where full compliance to standards will make the project either financially or environmentally infeasible. In this case, design exceptions were permitted due to the demonstration status of the project. In order to add the additional lanes, 11-foot lanes were substituted for 12-foot lanes, the median shoulders were consumed and the resulting lateral clearance to the median barrier was reduced to about 4 feet (Figure 6).

The District Environmental Branch fast-tracked an environmental effort for the proposal. This was really a responsive undertaking, given the shortened implementation schedule. There was no organized opposition when the HOV project was presented in a public hearing on September 19, 1985.

California Highway Patrol input and concurrence to the design plans also had to be obtained. It appears that CHP did not want to get pulled into the controversy and staffing

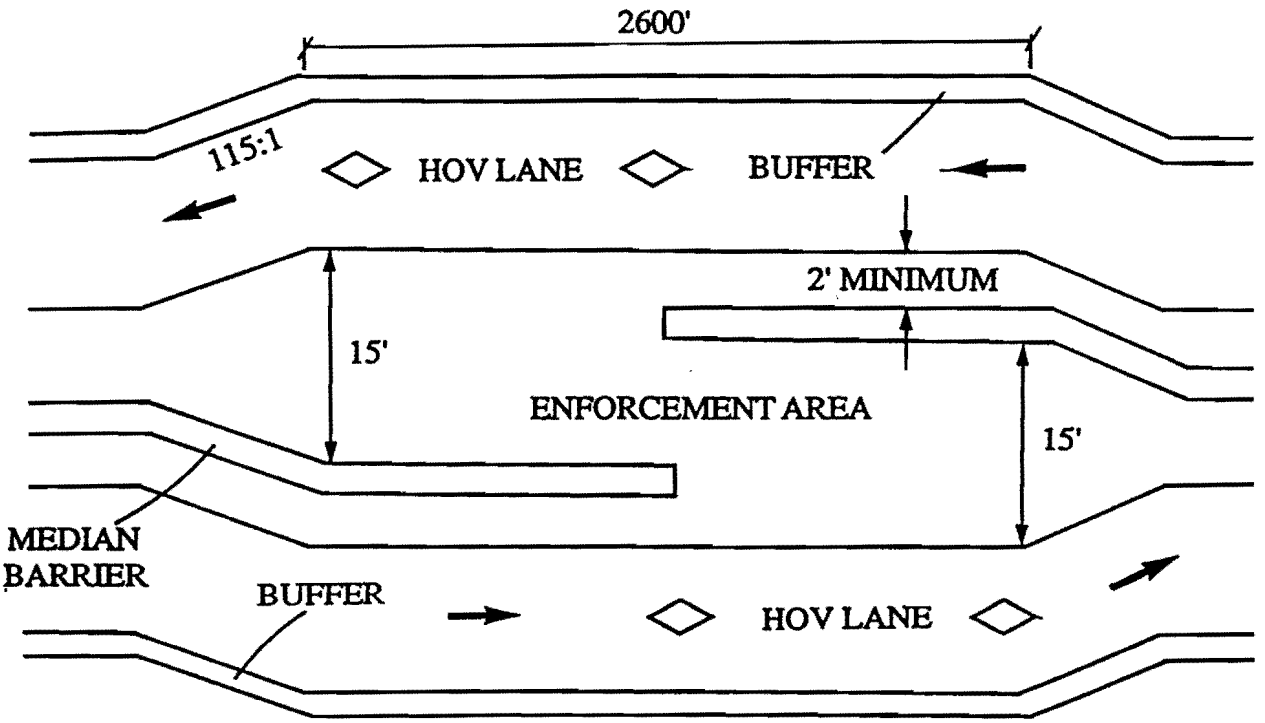
requirements that could be associated with an HOV project. While there was close coordination with the California Highway Patrol on the advisory committee, there was apparently some lack of communication on the project.

The project design included two designated enforcement areas for CHP along its 11-mile length. These enforcement areas were designed and approved by the CHP and allowed officers to park in the refuge and stop violators in the adjacent lane. The median barrier opening was provided to allow motorcycle officers to turn around and pursue violators in either direction (Figure 7). Once the project opened, the CHP raised concerns that the enforcement areas were not wide or long enough to provide adequate enforcement, and thus the enforcement areas were not used.

Other operational issues were raised within Caltrans during the project development phase. These included demand estimation and a lot of "what ifs" raised by the various functional branches reviewing the project. Demand was a very sensitive issue on Route 55. The question raised was "Show me where it will be efficient (to operate an HOV lane) in the very, very near future." The basis for demand estimation was largely an educated guess, as no established programs or models were available to estimate demand. The best estimates were for 800 vehicles per hour initially and 1,200 to 1,400 after a year or so.

Essentially Caltrans took existing traffic counts and vehicle occupancy counts and assumed that 80 or 90 percent of current vehicles carrying two or more people would divert into an HOV lane. The resulting occupancy in the HOV lane was estimated at about 2.1. For the vehicle mix on Route 55, it was possible to show person carrying equivalency on the first day. In addition, there was potential for future growth. Caltrans completed the project design activities within the scope of the pavement overlay project. Caltrans modified the overlay contract and managed stripping and signing activities. OCTC sponsored the marketing and surveying activities noted earlier.

FIGURE 7
UNI-DIRECTIONAL ENFORCEMENT AREA



NOT TO SCALE

The First Three Months of Operation

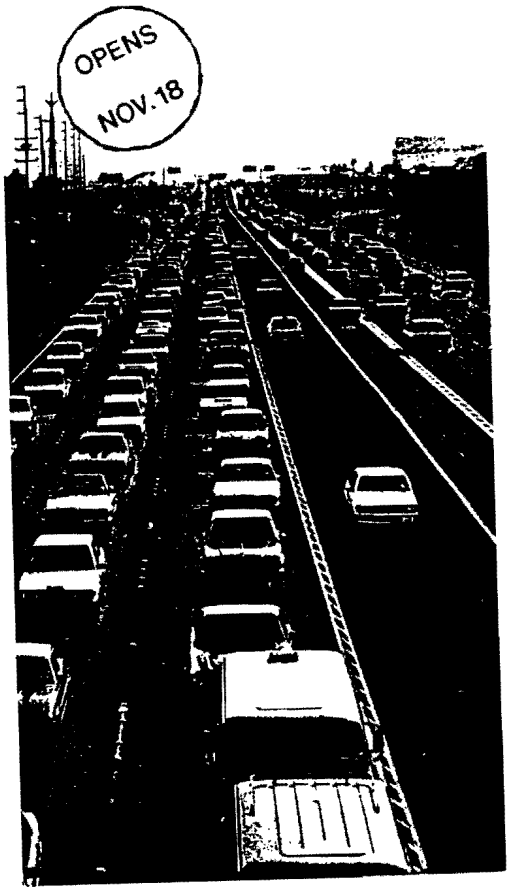
The decision to open the Route 55 commuter lanes was made by OCTC on October 14, 1985. OCTC recommended that Caltrans proceed with a 90-day test. The Commission's action relied heavily on a similar recommendation from the Route 55 Corridor Advisory Committee. HOV operation began November 18, 1985. A brochure issued to Route 55 commuters during the opening is shown in Figure 8. The Advisory Committee continued to meet following the opening to monitor the performance of the demonstration.

The first week of operation experienced heavier than anticipated usage among eligible vehicles and a commensurate improvement in the level-of-service in the general purpose lanes. Average peak-direction peak-hour use approached or exceeded 1,000 vehicles. Volumes in the p.m. peak-hour exceeded 1,400 vehicles by the ninth week of operation. This represented up to a 43 percent increase in carpools over the "before" condition in the a.m. peak-hour. The freeway level-of-service improvement was most noticeable in the first few weeks following the opening. But even after three months, the congestion pattern remained improved, with the length and duration of freeway congestion (travel speeds under 20 mph) reduced. Violation rates ranged from six to nine percent of the total vehicle flow on the commuter lanes. After 90 days of operation, the HOV facility in the peak-hour was moving approximately the same number of persons as if the lanes had been opened to general purpose traffic, but the lanes afforded capacity for future growth and greater reliability for faster travel speeds.

The first three months also saw the advent of a small but rather outspoken citizen group, called Drivers for Highway Safety (DHS), which was composed largely of private commuters. Although the DHS group made no comments at the public hearing on the Route 55 project, their appearance was evident following the opening of the HOV lanes. Peak participation in their meetings represented from 30 to 50 individuals. They voiced concern about safety on the HOV lanes in an attempt to opened them to general purpose use. They pointed to the lack of separation between the rather fast moving HOV traffic and the slow moving general purpose traffic. They were able to get substantial media coverage, since they were the only outspoken group associated with the project and their tactics for staging media events were effective.

Figure 8: Route 55 HOV Brochure

How to go 55 on the 55



The 55 Freeway commuter lane will be a demonstration project used to measure the effectiveness of future commuter lanes in Orange County. A similar commuter lane on the Artesia Freeway (91) in Los Angeles County is currently operating well and with public support.

How The Commuter Lane Will Work.

There will be lanes for northbound and southbound traffic extending between the San Diego (405) and Riverside (91) Freeways. You will be able to enter and exit at locations on both the southbound and northbound traffic lanes. Monitored by the California Highway Patrol, these lanes will have signs indicating where carpools may enter and exit (see map). The commuter lanes have been added to the middle of the freeway.

What The Commuter Lane Can Accomplish.

Apart from significantly reducing personal driving time, the lane can carry as many people as two or three regular freeway lanes during peak hours (this is based on the experience of the El Monte busway, a highly successful project in Los Angeles County). Using the median for the lane, rather than constructing a new lane, saves taxpayers tens of millions of dollars.

How You Can Use The Commuter Lane.

Just join a carpool of two or more people, or a vanpool or buspool. The Orange County Transit District's Commuter Network can help you with carpool matching services.

Need More Information?

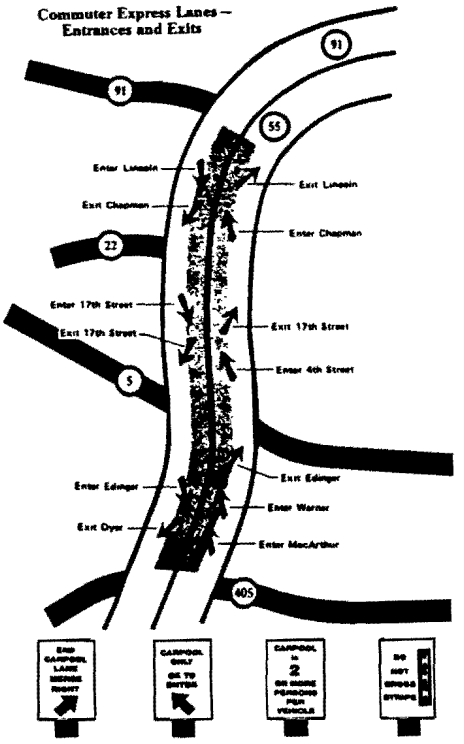
To see how easy it is to take advantage of the commuter lane, contact OCTD at (714) 636-RIDE, or fill out the attached card.

The Problem.

Nearly 172,000 cars use the 55 Freeway every day. It probably comes as no surprise to you that 44% of those cars choke this freeway during peak hours. In fact, traffic is stop and go on the average of six hours a day. But new freeways to solve the problem are costly and there is not enough space available to build them.

The Solution.

Two ways of solving this problem work hand-in-hand: carpooling and commuter lanes. Carpools—two or more people commuting in a car (as well as vanpools and buses)—can drastically cut driving time when used with commuter lanes specifically designed for ridesharing.



Yes, I want to go 55 on the 55.

☐ I am interested in carpooling on a regular basis

☐ I would only in case of emergency, such as a smog alert, gasoline shortage or personal emergency.

Last Name

First Name Middle Initial

I want to go from

Number and Street (include Dr., St., or Ave. etc.)

Apt. or Space

City Zip Code

At

Major Street or Blvd. intersection nearest your home (example: Euclid at First Street)

Going to:

Name of Company or School

Number and Street (include Dr., St., or Ave. etc.) Suite

City Zip Code

I want to arrive at ___:___ AM/PM (Circle one)
Start Time

and leave at ___:___ AM/PM (Circle one)
End Time

Check Phone Number(s) You Wish To Appear On Matchlists.

___ Home Phone (___) _____

___ Work Phone (___) _____ Ext. ___

In a CARPOOL I would prefer to: Drive___ Ride___ Either___

I am interested in information on VANPOOLS in my area:

___Yes ___No

This information is for RIDESHARE purposes only.

Your address WILL NOT appear on matchlists.

Signature_____ Date_____

Commuter Network

Caltrans

ORANGE COUNTY TRANSPORTATION COMMISSION

Ridesharing information provided by
Orange County Transit District
P.O. Box 3005 • Garden Grove, California 92642-9990

These tactics involved holding news conferences, passing out information flyers at freeway on-ramps, obtaining public documents associated with the project, attending and speaking at every public meeting, and communicating with local news reporters. They also spent a significant amount of effort meeting with Caltrans and OCTC project representatives.

DHS petitioned to be admitted to the Corridor Advisory Group. They were admitted prior to the end of the 90-day test and petitioned to have the project opened to all drivers. When the vote was needed to either extend the demonstration beyond 90 days, they kept the committee from reaching a unanimous decision. Caltrans staff defended the local position to include their participant in this instance because it helped sanction the public participation process for the politicians and media.

On March 10, 1986, the Advisory Committee passed their recommendation on to the OCTC and, aside from comments by the dissenting ranks of DHS members in the Commission meeting, the committee recommendation was accepted. OCTC requested Caltrans to extend the demonstration for a full year.

The First Year of Operation

Caltrans and OCTC continued to file quarterly reports on the HOV project for the remainder of the first year. Based on highlights from the One Year Report of Commuter Lane Use, the HOV lanes were carrying about 1,500 more commuters than the mixed flow lane alternative would have. This was being accomplished with 33 percent fewer vehicles. The overall level-of-service on the freeway was improved and violations remained at between 6 and 10 percent of total HOV flow.

The most important indicator that the evaluators, DHS, and media were watching was accident rates. Over the course of the first year of operation, accident rates had increased commensurately with the increase in lane-miles of facility. OCTC and Caltrans were reporting this absolute number on a before-and-after basis and since there were more lane-miles associated with the HOV lane addition, it would be expected that the number of accidents would increase.

Another Caltrans source was reporting the rate based on a rather complicated model that attempted to calibrate the accidents against vehicle miles of travel (VMT). This basis would have been sound if a good "before" data base had been established. However, this base had been extrapolated from 1981 data and was lower than it should have been. The evaluation team was aware of this shortcoming. Perception played a significant role in the confusion that followed from multiple reports being issued from different agencies.

DHS had raised concerns among some elected officials regarding irregularities in accident reporting on Route 55. Commissioners and at least one state senator become concerned enough to publicly question this element of the Route 55 evaluation process. A resolution supported by the Advisory Committee was to turn this portion of the evaluation over to the Institute of Transportation Studies, University of California at Irvine, (UCI) because it was felt that they would not be biased. This approach gained a lot of respect with the politicians and media, and as a result, OCTC funded UCI for this study as a grant.

An initial three-month accident study and audit of Caltrans' accident data was undertaken in August 1986. This initial study indicated that the type of accidents had changed, providing more questions than answers. More grant funds were made available from OCTC, Caltrans, the Southern California Association of Governments (SCAG) and Los Angeles Transportation Commission (LACTC). These latter groups became involved because it was felt that the UCI study might shed some light on accident reporting regionwide and this information might be of benefit to an upcoming HOV planning study on the Ventura Freeway. The second phase study findings indicated that there was essentially no increase in accident rates on Route 55 resulting from the commuter lanes.

The Corridor Advisory Committee closed out their involvement by recommending that the Route 55 HOV demonstration be made permanent in January 1987. Based on the Committee's recommendation, results from the One Year Report, and having met all evaluation criteria set forth, OCTC recommended to Caltrans that the commuter lanes be made permanent on January 27, 1987.

Senate Bill 699

Despite the results of these studies, DHS continued to raise the concerns that the non-standard lane widths and narrow buffer separation were not safe. Partially as a result, state legislation was introduced that would require Caltrans to bring the freeway back into conformance on design standards or open the HOV lanes to general purpose traffic. In an effort to head-off such legislation Caltrans offered to develop safer buffer treatments. Caltrans, OCTC, and CHP staff examined different alternatives and reached agreement on a four-foot buffer. It was felt this width was wide enough to be noticeable, but not wide enough to be misconstrued as a breakdown refuge or shoulder.

Legislation was approved and Senate Bill 699 required Caltrans to take steps toward implementing the wider buffer on Route 55 within 18 months of its passage. A copy of the legislation is provided in Appendix A.

Changes Made After Operation Began

With the completion of the Route 5/55 interchange Stage 1 rehabilitation project in January 1990, a widened four-foot buffer was provided along a three-mile section of Route 55 from Dyer Road to I-5. Design activities are currently being pursued to provide a four-foot buffer for the balance of the project north of McFadden Avenue. In addition to commuter lane buffers, there were other design and operational changes undertaken that were not as prominent. Following is a list of these:

- Motorcycles. After the first three months of test operation, motorcycles were allowed on the HOV lanes. The basis for this change was to conform to the requirements of the 1982 federal Surface Transportation Act.

- Ingress/Egress. Initially, each designated opening between the HOV lane and general purpose lane permitted either an ingress or egress maneuver. After the 90-day trial, signing was modified to permit ingress or egress from each opening. The interval between openings was maintained at about 2 miles.

- Pylons. In an attempt to discourage illegal crossing over the buffer except at designated ingress/egress locations, 12-inch permanently placed pylons were tried. This resulted in a high loss of pylons and difficulty in replacing them. Thus, the pylon experiment was terminated. Also tried was placement of double rows of pavement delineators. This experiment also was terminated due to loss of delineators.

- Guide Signing and Diamond Markings. As part of a freeway widening project along one portion of Route 55, FHWA eventually requested that standard HOV diamond markings be added to Route 55 in 1989. Guide signing for selected ingress/egress locations was also added.

- Posting of Fines. In 1989 the fines for HOV offenders went up substantially as a result of state legislation that was passed. Caltrans began posting this information adjacent freeway entrance ramps along Route 55 in April 1990. The minimum fine is now $264.

- Expanded Enforcement Areas. As part of the above construction project, one of the two enforcement areas was improved to the new adopted design standards, consisting of a 1,300-foot long and 14-foot wide segment in each direction. The other enforcement area will be upgraded within the next three years.

Significant Milestones

Following is a summary of significant milestones affecting the Route 55 HOV project through May 1990:

- November 26, 1984. OCTC forms the Route 55 Advisory Committee to evaluate the addition of commuter lanes to Route 55. One of the early tasks was to conduct a survey of freeway users.

- August 12, 1985. A survey of Route 55 users is completed, indicating 75 percent support a commuter lane on a trial basis.

- September 19, 1985. Caltrans conducts a public hearing with regard to the Route 55 environmental document. The majority of those in attendance express concerns about freeway noise.

- September 24, 1985. The Route 55 Advisory Committee develops an evaluation plan along with thresholds for minimum use and recommends a 90-day trial of the commuter lanes on Route 55. The group requests bi-weekly updates on project status during the demonstration period.

- October 14, 1985. OCTC requests Caltrans to implement the 90-day demonstration project and prepare periodic status reports.

- November 18, 1985. The Route 55 commuter lanes are opened.

- March 10, 1986. The Route 55 90-day demonstration report is presented to the Commission. OCTC requests Caltrans to extend the demonstration for a full year consistent with the direction of the Advisory Committee.

- August 26, 1986. OCTC retains the Institute of Transportation Studies (ITS) at the University of California, Irvine to analyze the safety aspects of commuter lane operation on Route 55. This study supplements the ongoing evaluation of the project.

- November 10, 1986. The preliminary study of safety by ITS is completed. It found that the accident levels were consistent with historic trends, but the type of accidents had changed. Overall, the results were inconclusive and more analysis was recommended. OCTC, in conjunction with Caltrans, SCAG and LACTC, requests a follow-on study of safety the following month.

- January 27, 1987. Based on the Caltrans 1-Year Report, the recommendation of the Route 55 Advisory Committee, and having met all evaluation criteria, OCTC recommends Caltrans make the lanes permanent.

- July 23, 1987. The California Transportation Commission adopts a policy regarding HOV lanes. This policy requires that HOV lanes be included in planning for additional freeway lanes and regional planning agencies develop an HOV lane network.

- September 11, 1987. Working closely with Caltrans and OCTC, a bill (SB 699) is introduced requiring a four-foot buffer separation between the commuter lane and the general purpose travel lanes. SB 699 is signed by the Governor on this date.

- September 28, 1987. OCTC, in cooperation with Caltrans, engages a consulting firm to perform the preliminary engineering of a four foot buffer on Route 55 commuter lanes.

- October 12, 1987. ITS completes the in-depth safety analysis. The report finds the primary impact of the Route 55 commuter lanes has been on the distribution of accidents and the project has had little (maximum of two percent) to no affect on safety.

- December 15, 1987. Federal Highway Administration region office in San Francisco adopts an HOV policy to be applied to all urban areas in California. The policy requires that HOV lanes be an essential alternative when considering

any additional lanes on urban freeways in California. According to this policy, exceptions from design standards (i.e., in case of restriping the center shoulder for use as a lane) will be considered if the lane is designated for HOVs.

- September 12, 1988. OCTC, in cooperation with Caltrans, hires a consultant to prepare design plans to construct a four-foot buffer on Route 55.

- August 25, 1988. The California Senate approved and sent to the governor a bill that effectively raises fines for HOV violations statewide. First offenses were raised from $100 to $150 ($264 including court costs). Third offenses were raised from $250 to $500 (over $1000 including court costs). The governor signed the bill in early September and the law went into effect January 1, 1989.

- October 1988. Caltrans begins the first stage of the Route 5/55 interchange reconstruction project. When completed, this project will add four-foot buffers, an improved enforcement area, and an extra general purpose travel lane in each direction along three miles of Route 55. The project is part of a broader long range program to improve the flow of traffic between these two freeways and alleviate congestion.

- April 12, 1990. Drivers for Highway Safety (DHS), a group opposed to HOV lanes, sued the state in an effort to lift restrictions on Route 55 and a companion HOV operation slated to open on I-405. The basis of the suit was that Caltrans had failed conduct a study o: safety, congestion, and freeway capacity required by the Lockyer bill passed after the Santa Monica project.

- April 19, 1990. A lawsuit filed by DHS is dismissed. Caltrans is requested to prepare a safety study of all pending and operating HOV projects. The I-405 HOV lanes open the following day.

IV. OTHER PROJECTS

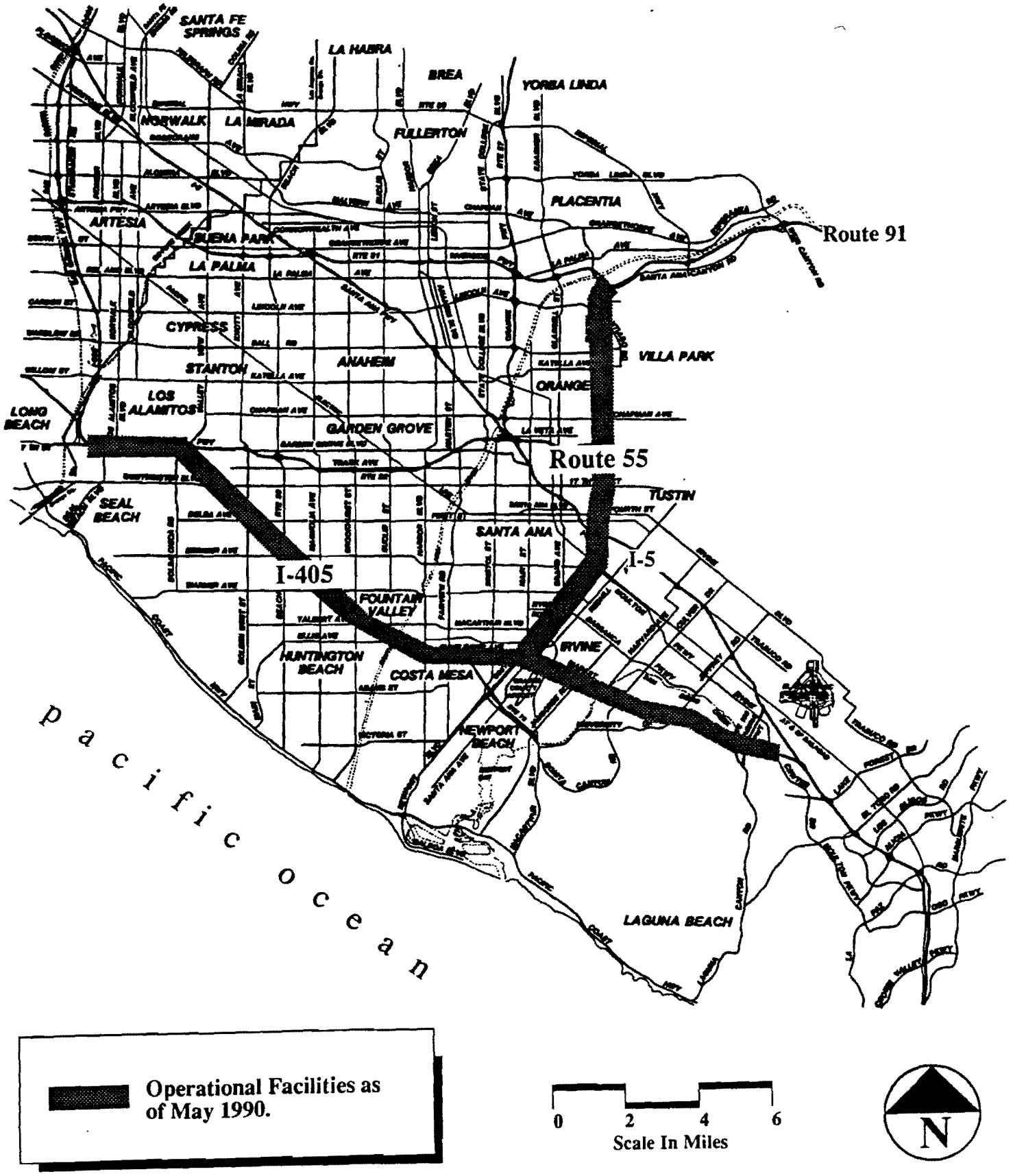
Although the Route 55 commuter lanes were the first HOV operation in Orange County, a number of other projects have been developed since. One additional project is now operational on I-405, a companion freeway that joins Route 55 near its southern terminus (Figure 9). Route 55 has become an integral part of the emerging HOV system in Orange County. Selective upgrading of the Route 55 project is envisioned with the addition of direct HOV connectors to local streets and other HOV facilities. The Orange County Transit District (OCTD) developed a transitway plan for the core of Orange County. This effort was initiated after a rail referendum was defeated by the voters in Orange County in 1984. As a result of this vote, OCTD became much more active in transitway and HOV planning activities. This plan includes direct access connections between the Route 55 HOV lanes and Route 5 (to/from the north), Route 405 (north and south), Sunflower Avenue, Alton Avenue and Warner Avenue. These and other elements of the evolving Orange County HOV system are briefly highlighted in this section.

I-5 (Santa Ana Freeway)

Prior to the HOV proposal on Route 55, the Santa Ana corridor rehabilitation project considered HOV lanes on this centrally located facility that has the highest demand of any freeway in the county (Figure 10). This long range, $1.4 billion, upgrade of Orange County's oldest freeway represented a complete reconstruction of the existing facility and substantial widening. The approved EIS for this project included a recommended cross section which included a buffer-separated HOV lane in each direction. Portions of this project were being designed at the time the Route 55 HOV project was adopted and implemented. Route 55 had the effect of changing the I-5 project to include the four-foot buffer eventually adopted on all Orange County HOV facilities. The I-5 project was also modified to include better enforcement areas.

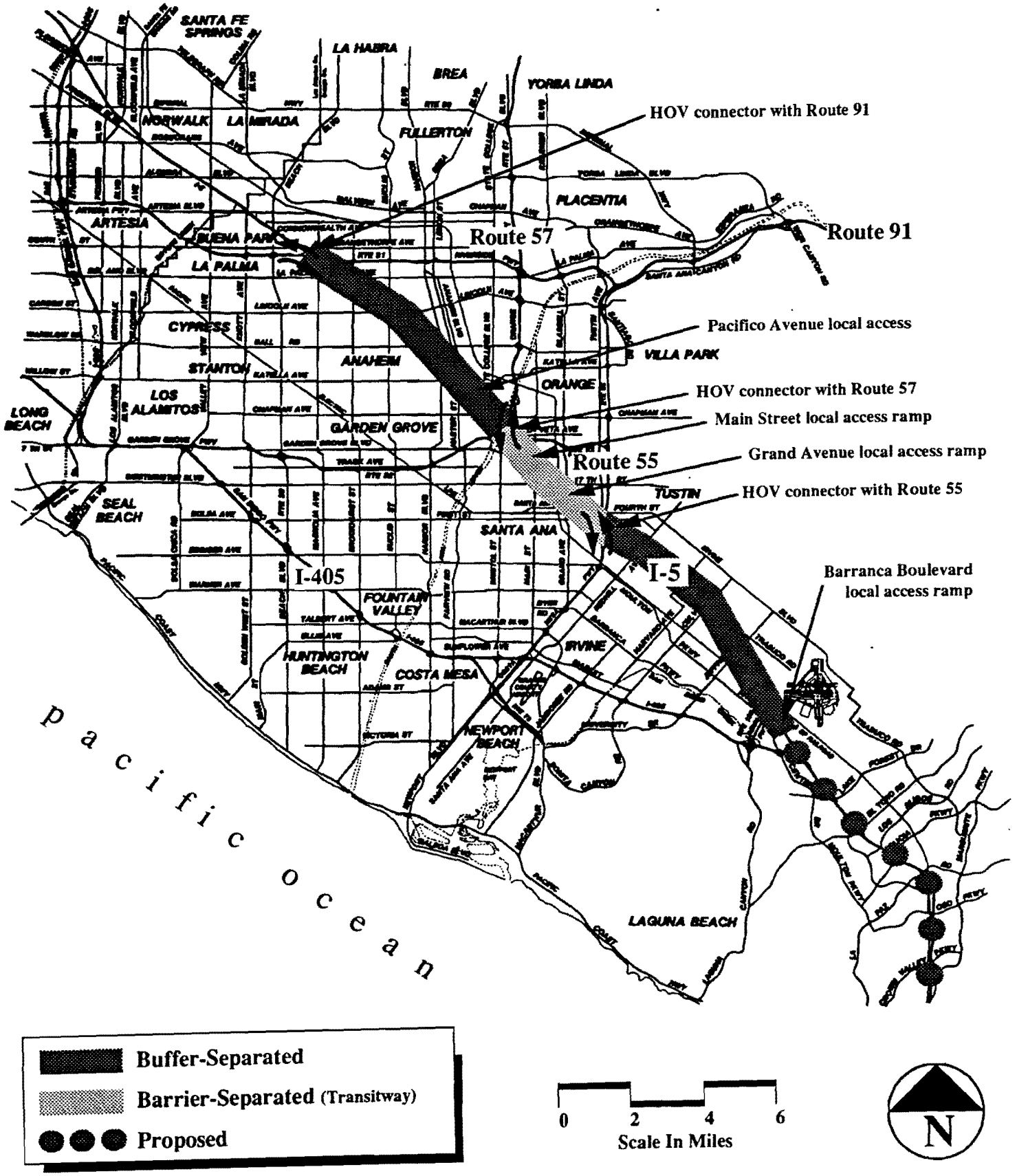
On the south end of I-5 near the I-405 interchange, OCTD committed to fund a direct HOV access ramp with Barranca Boulevard in an emerging activity center. Within the core of

FIGURE 9
CURRENTLY OPERATIONAL HOV FACILITIES IN ORANGE COUNTY



NOTE: Both facilities are two-way buffer-separated HOV lanes opened to 2+ occupant HOVs 24 hours.

FIGURE 10
I-5 (SANTA ANA FREEWAY) HOV PROJECT



NOTE: The proposed facility will be two-way opened to 2+ occupant HOVs 24 hours.

the county, OCTD conducted a transitway concept design study and committed local funding to upgrade a five-mile section of the previous buffer-separated HOV lanes between Route 55 and Route 57 to full barrier separation. This portion also included high-speed HOV connections to Routes 57 and 55 and local access ramps to Grand Avenue and Main Street.

The OCTD commitment to HOV upgrades along I-5 represent a commitment in excess of $150 million. It is not certain how much of the cost of the Caltrans/FHWA sponsored freeway upgrade is associated with the HOV lanes. The extent of committed HOV lanes along I-5 represent 19 route miles from I-405 to Route 91. Additional HOV connections are proposed at Route 91 and I-405. A study is also currently underway by OCTC to extend HOV lanes southward along I-5 from I-405 to Route 1 (Pacific Coast Highway) near San Clemente, effectively encompassing most of I-5 within the County.

Currently I-5 construction is underway along a seven-mile portion between I-405 and Route 55. HOV lane operation on this portion should occur by 1993.

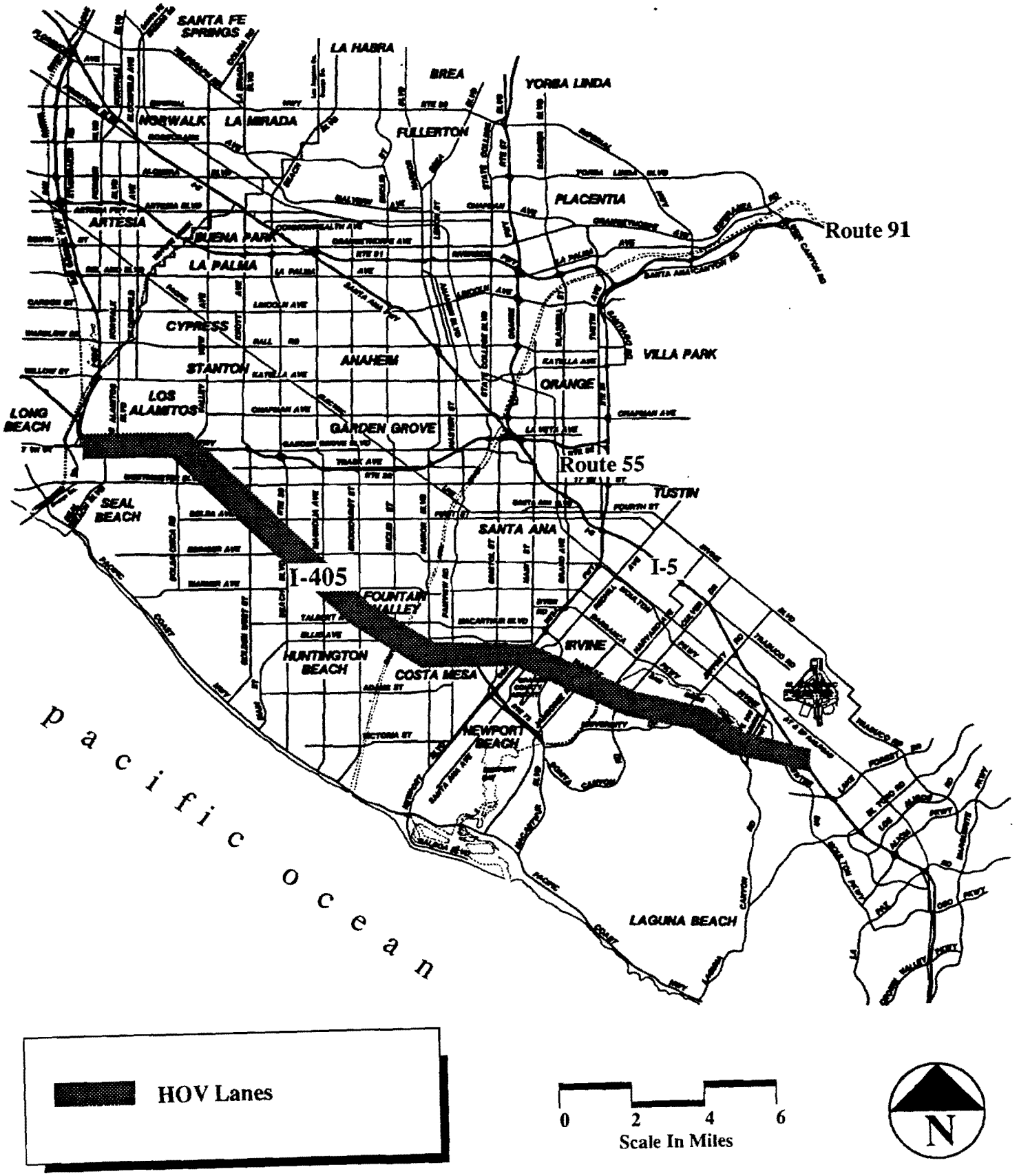
I-405 (San Diego Freeway)

The I-405 corridor roughly parallels I-5 closer to the ocean, intersecting I-5 at the south end of the county (Figure 11). The entire 28-mile length of this freeway was slated to have a lane added in the median when the Route 55 HOV lanes were conceived. After much technical discussion, Caltrans agreed to recommend an HOV alternative. Unlike the Route 55 and 91 projects, a full environmental evaluation was performed on this project. All options were kept open. In the public hearing, Caltrans presented the HOV option as the preferred alternative.

The public participation process was refined to suit the specific requirements of this project. For the I-405 project, public input was obtained through a single committee and a limited scoping process.

Because the I-405 project had more available space, there were more design trade-offs to consider. Some sections were designed with a wider 14-foot buffer that doubled as a parallel

FIGURE 11
I-405 (SAN DIEGO FREEWAY) HOV LANES



NOTE: Lanes are two-way buffer-separated HOV lanes opened to 2+ occupant HOVs 24 hours.

acceleration/deceleration lane at designated access points. Much of the project has inside shoulders and enforcement areas approximately every three miles.

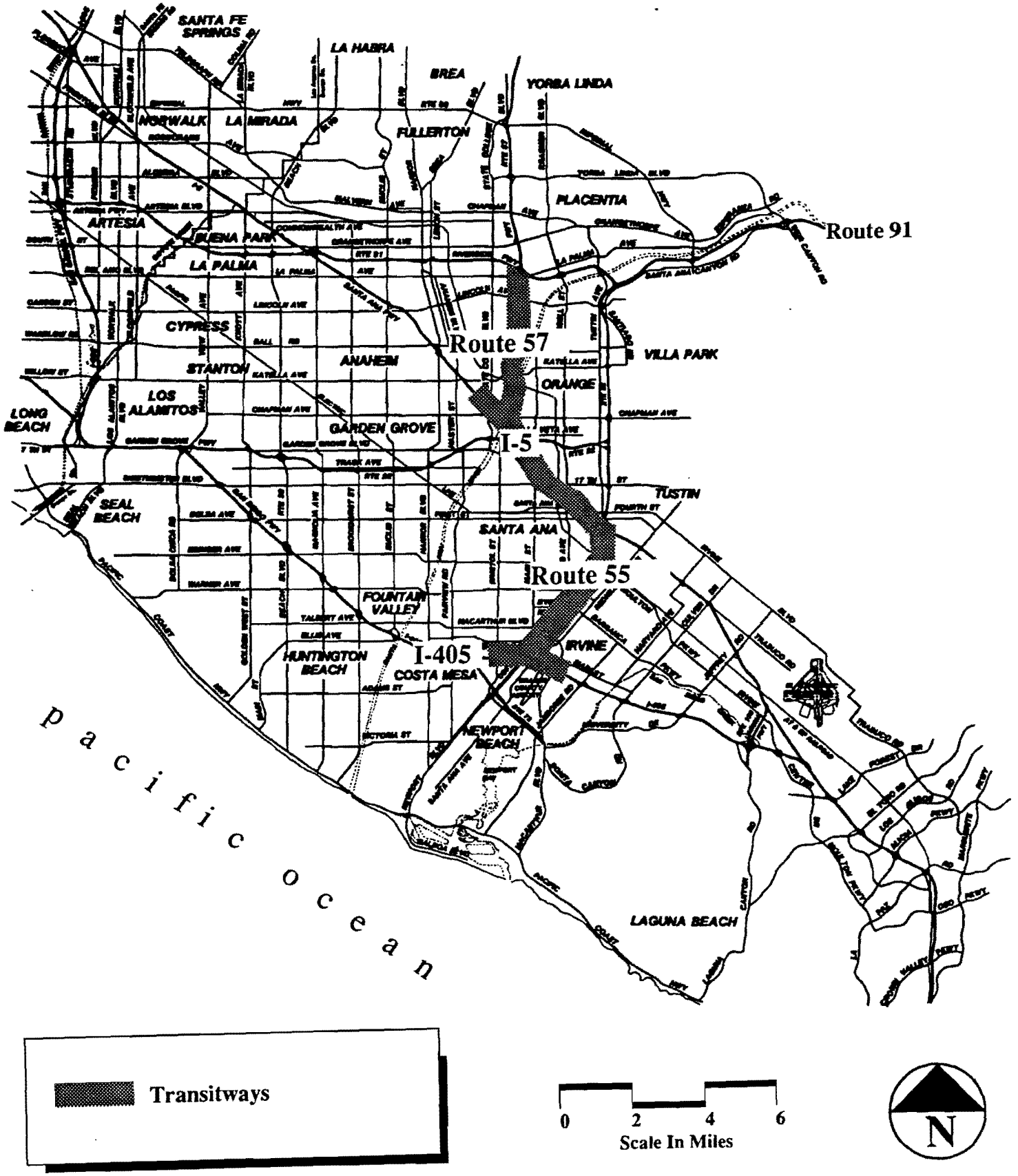
The northern portion of the I-405 HOV lanes opened in November 1988. The final southern portion was delayed in opening until after a lawsuit filed by Drivers for Highway Safety could receive a hearing. This final portion opened in April 1990. In addition, OCTD is working on an Alternatives Analysis for the SR 55/I-405 interchange area. It is expected that funding from UMTA will be requested for this project.

Orange County Transitway System

In 1984 OCTD adopted the development of an HOV program as its transit development strategy. This approach was partially the result of the defeat of the rail referendum in 1984. A consultant was hired to complete a transitway concept design study for the freeway system in central Orange County in March 1985. This study culminated in a transitway plan that recommended barrier-separated HOV treatments along 20-miles of freeways, including the provision of direct connection ramps between HOV facilities and local streets (Figure 12). This plan was the first attempt to tie together the various HOV linkages and improve access with primary activity centers in the county. The plan represented a $330 million commitment to HOV facilities. The two-way lanes are proposed for HOVs with two or more occupants. Caltrans would construct the lanes using OCTD and other agency funds and Caltrans/CHP would operate and maintain these facilities as part of the overall HOV system. The countywide HOV plan was approved by the OCTC in February 1987.

The OCTD promptly entered preliminary engineering for the initial transitway segment along I-5 and assisted Caltrans in preparing a Supplemental Environmental Impact Statement and designing this portion of I-5. OCTD also enhanced the project by incorporating additional general purpose improvements for non-HOV users. Currently, the first five-mile section of the transitway along I-5 and Route 55 is in final design. Additional transitway elements are being evaluated as part of an UMTA sponsored alternatives analysis and environmental assessment

FIGURE 12
ORANGE COUNTY TRANSITWAY SYSTEM



NOTE: Transitways are two-way barrier-separated or substantially buffer-separated HOV lanes opened to 2+ occupant HOVs 24 hours. Numerous direct access ramps are provided.

process in the vicinity of the Route 55/I-405 interchange. Portions of the transitway system are slated to be operational in 1996.

Route 57 (Orange Freeway)

At approximately the first anniversary of the Route 55 HOV project, an OCTC Commissioner submitted a proposal on the Route 57 freeway, which passed through local jurisdiction in north Orange County. Route 57 was already earmarked by OCTD as part of the transitway system to include an HOV facility to Route 91. This study ultimately culminated in a project proposal to extend HOV lanes from I-5 to Lambert Road near the Orange County line, a distance of 10 miles (Figure 13). OCTD transitway funding was applied to this project.

The design of the Route 57 HOV lanes was similar to the Route 55 lanes, with a proposed four-foot buffer and no shoulder. Design is currently underway on this project. The lanes will require approximately one year to construct and should be operational by 1992.

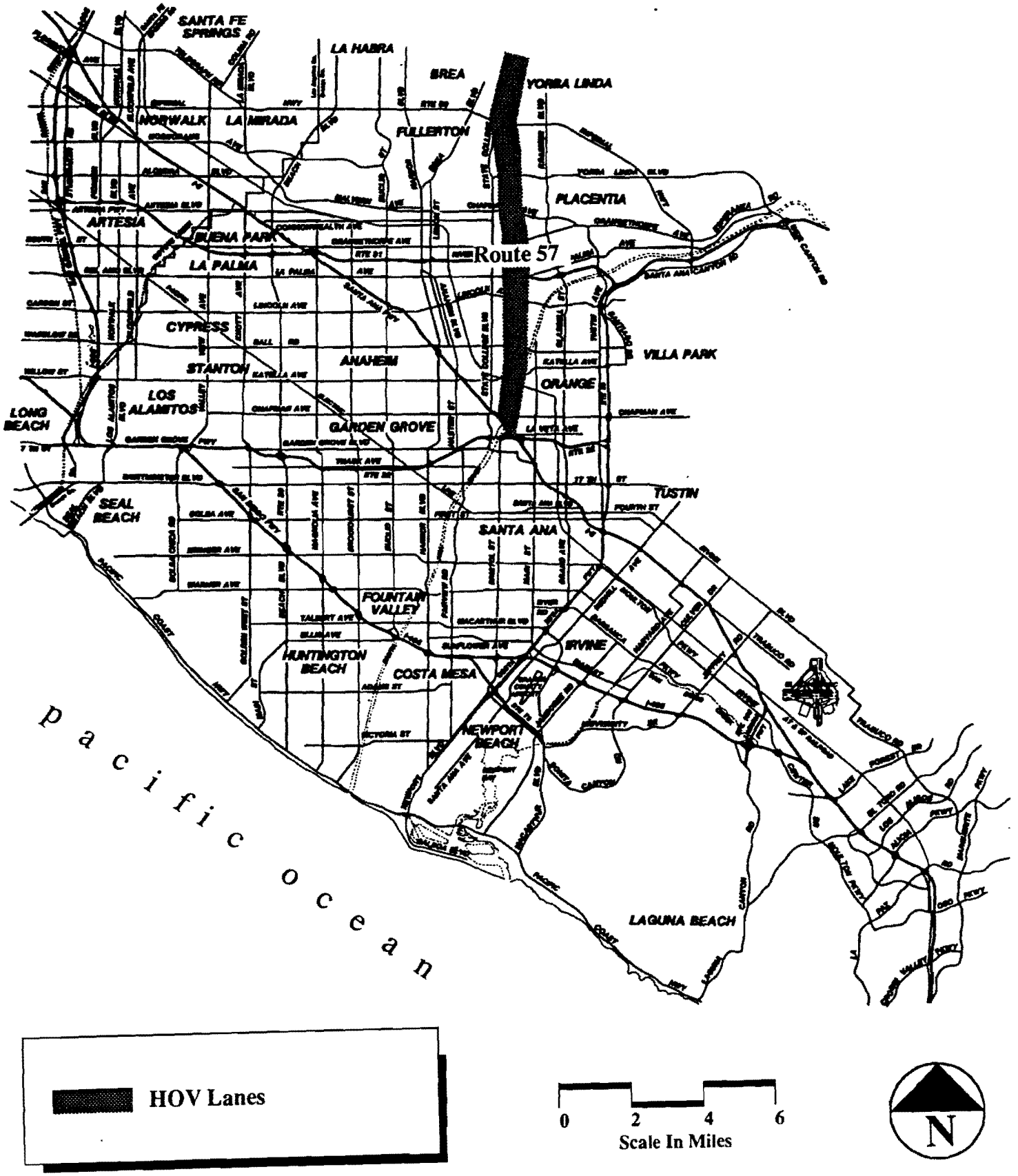
Route 91 Freeway

In 1988, Riverside County passed a local sales tax referendum dedicated to implementing a number of transportation improvements, including HOV lanes on Route 91. The Riverside County Transportation Commission (RCTC) plans to implement HOV lanes along a segment of Route 91 from Route 57 to Magnolia Boulevard in Riverside County (Figure 14). All segments of this project are currently being designed. Construction on the Riverside County portion is scheduled to begin in 1991. The Orange County portion was designated as a toll road demonstration project, anticipated to be operational by 1989.

Defining a Regional HOV System for Orange County

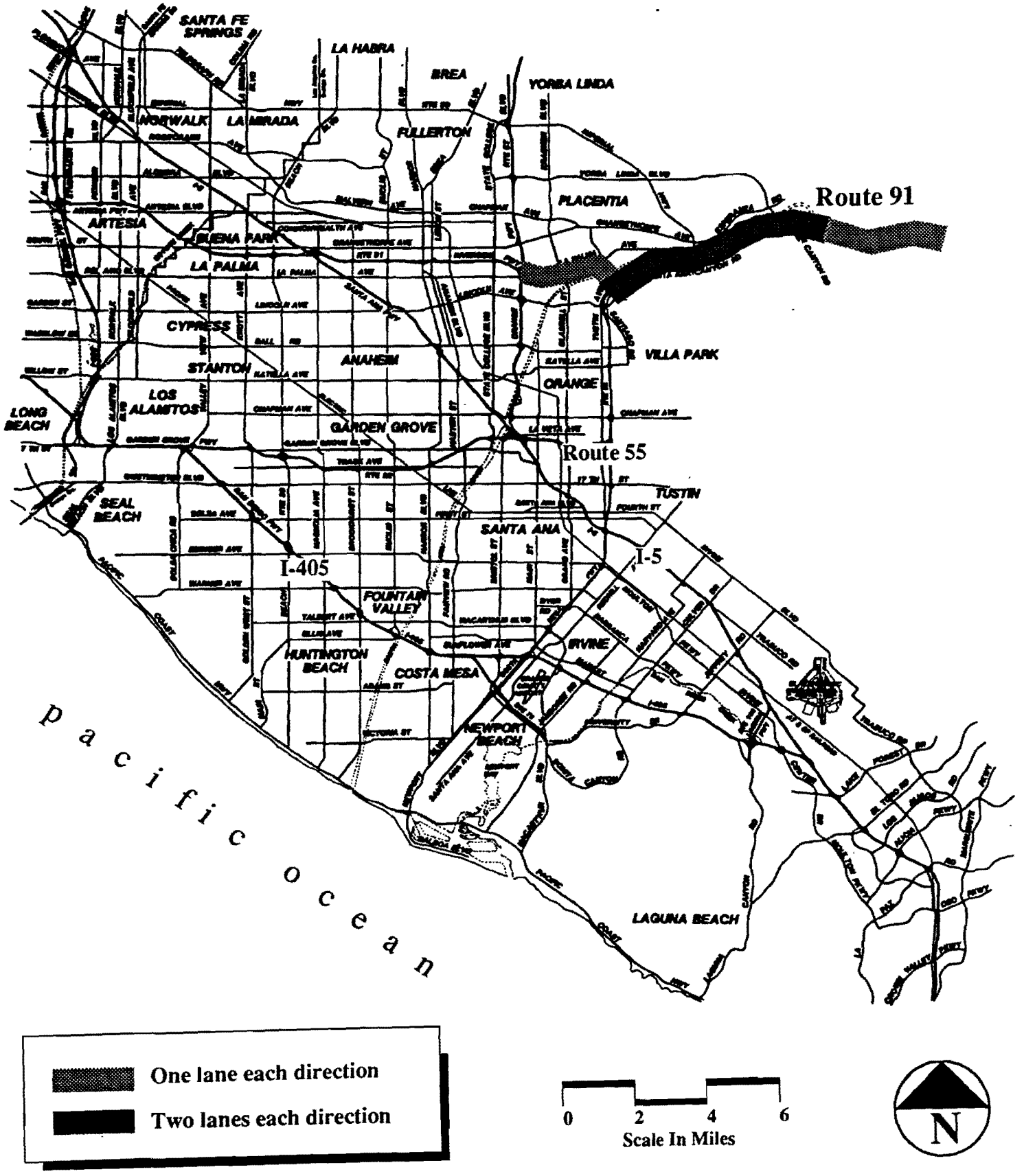
Through the efforts of a variety of agencies, an HOV system for Orange County has evolved to become one of the largest in the country (Figure 15). Issues have shifted from isolated HOV demonstrations to a broader focus on system connectivity, staging, funding, and

FIGURE 13
ROUTE 57 (ORANGE FREEWAY) HOV PROJECT



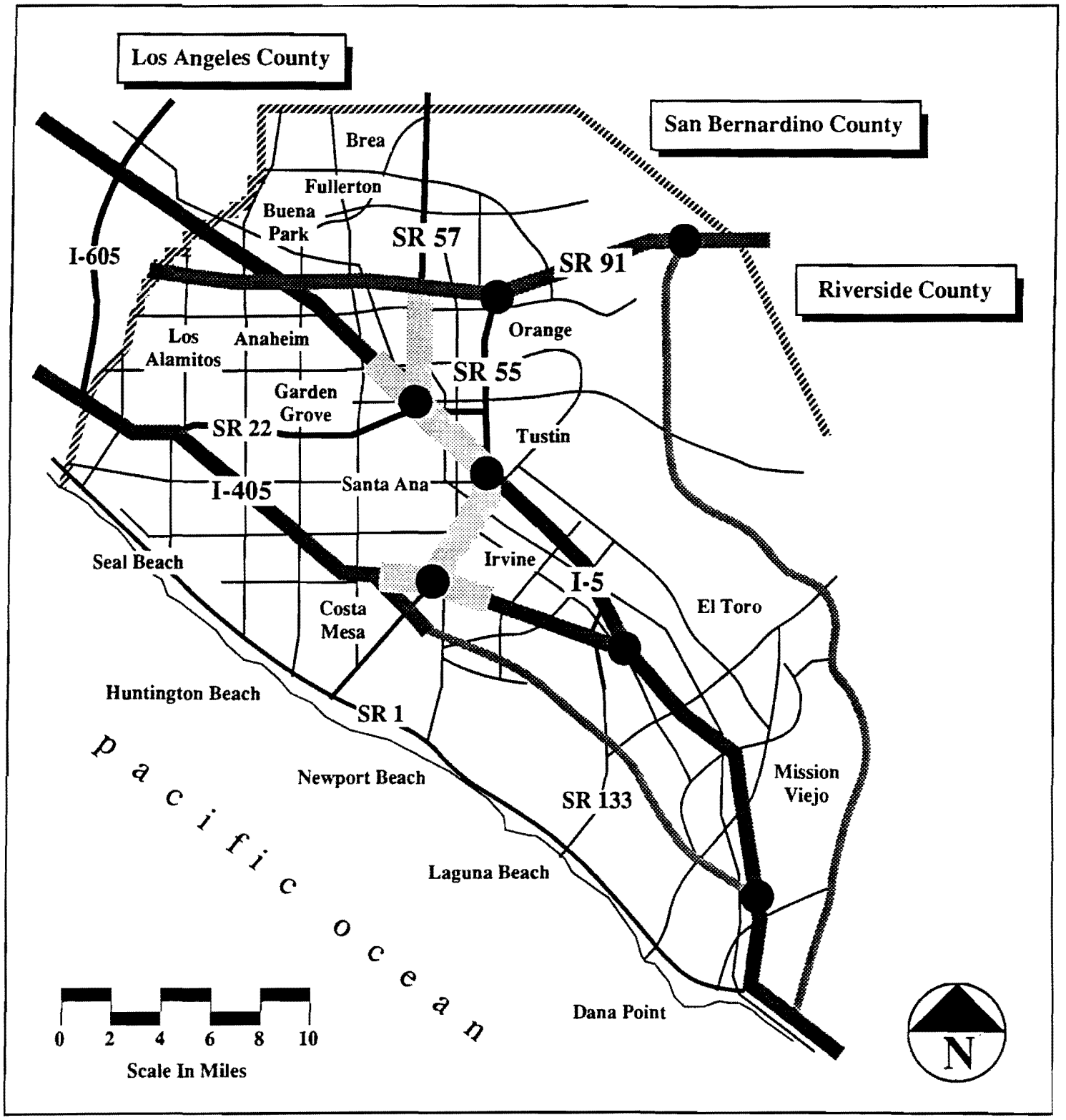
NOTE: Facility is two-way buffer-separated HOV lanes opened to 2+ occupant HOVs 24 hours.

FIGURE 14
ROUTE 91 (RIVERSIDE FREEWAY) HOV PROJECT



NOTE: Lanes are two-way buffer-separated opened to 2+ occupant HOVs 24 hours.

FIGURE 15
ORANGE COUNTY HOV SYSTEM



integration with a broader range of proposed urban transportation improvements that include such diverse elements as super streets, smart corridors, commuter trains, high speed trains, and monorails.

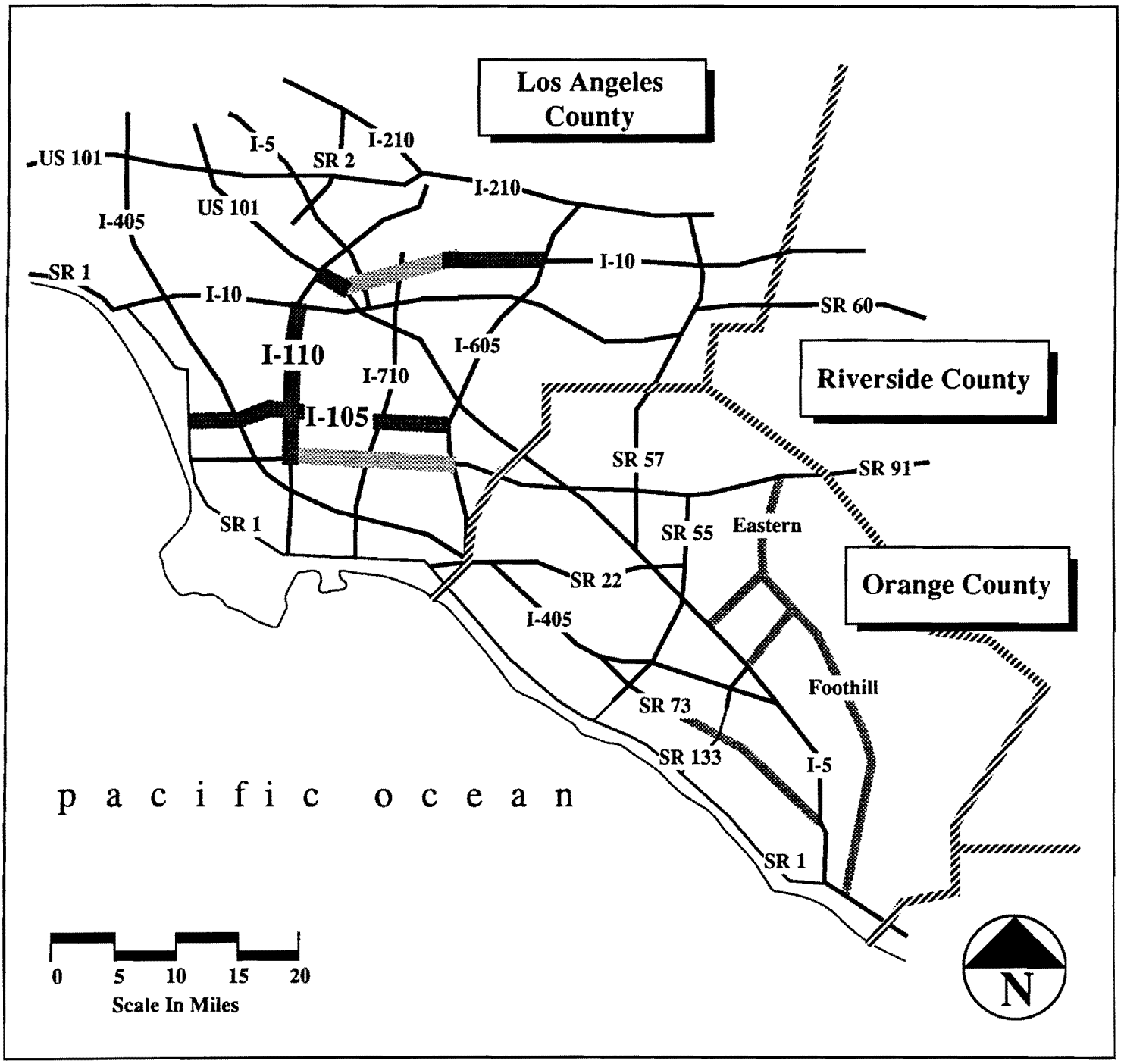
Caltrans is in the process of adopting statewide guidelines for the design of HOV facilities. Many of these guidelines are based on the experiences of the Route 55 demonstration project and current design treatments on I-405. FHWA has become more involved in reviewing HOV designs and in advocating system connectivity through greater emphasis on direct connections. Such connections can be the most expensive elements of an HOV system, but have generally been recognized as one of the most important elements in sustaining travel time savings. Although some local access connections are being implemented for less than $2 million, major freeway-to-freeway connections, like the I-5 to Route 55 connection, represent a capital commitment of over $40 million.

A total of 39 route miles of HOV facilities are currently in operation in Orange County. This system mileage is expected to double within the next four years. Conceivably, this mileage could double again in the following ten years. Even the county's 65 miles of toll roads now being designed must consider median space envelopes capable of accommodating HOV lanes with direct connections to other HOV facilities.

Defining a Regional System for the Los Angeles Basin

Various other regional transportation agencies have proposed HOV plans for adjoining Los Angeles and Riverside Counties within the last five years. Agencies including Caltrans, LACTC, and SCAG have published regionwide plans that coordinate with the Orange County HOV lane commitments. The most capital intensive of these include the I-105 (Century Freeway) and I-110 Harbor Transitway on the Harbor Freeway (Figure 16). Both projects involve buffer-separated HOV lanes and both are currently under construction, with completion estimated in 1994.

FIGURE 16
OTHER HOV PROJECTS IN LOS ANGELES COUNTY



Other ongoing commitments include extending the El Monte busway eastward along I-10 to Route 605 and adding a companion westbound HOV lane on Route 91 (Artesia Freeway), alongside the existing eastbound operation. These projects are highlighted in Figure 16.

Although a number of other freeway corridors have been approved for HOV project planning within the last five years, not all planning efforts have been successful. Events that led to a failed attempt at local consensus on the US 101 Ventura Freeway were indirectly related to the Route 55 demonstration project. At about the time that Drivers for Highway Safety were most visible on the Route 55 project in late 1986, Caltrans was working with local agencies in the San Fernando Valley to recommend an HOV facility along 12 miles of the Ventura Freeway. Funds for this project had already been approved for a lane addition in each direction, and the EIS recommended an HOV alternative. Caltrans staff considered the Ventura Freeway a good candidate for HOV lanes following successes on Routes 55 and 91.

A project advisory committee was used on the project. According to Caltrans staff, it appeared that the committee may have been too large, with groups unrelated to the project involved. The committee seems to have been a forum to voice concerns on issues unrelated to the project decision-making process. The committee did agree with the Caltrans recommendation, with the HOV alternative receiving a slight majority. However, several key votes were negative, ultimately affecting the Caltrans decision to proceed. While the LACTC voted for the HOV recommendation, the Los Angeles County Board of Supervisors voted five to four against. Drivers for Highway Safety was also active in supporting the removal of the HOV alternative from consideration. Faced with significant elements of opposition, Caltrans reversed the recommendation in the EIS and converted the project to a general purpose lane addition.

The South Coast Air Quality Management District (SCAQMD) subsequently filed a lawsuit to uphold the original recommendation and the Federal Highway Administration withdrew federal funding from the project. FHWA also filed an HOV policy memorandum with the state immediately following this action, setting planning criteria for the consideration and

determination of future HOV facilities. The Ventura widening project was eventually implemented as general purpose lanes with sole funding from the state.

V. SUGGESTED CONCLUSIONS

Fundamentally, the institutional arrangements that made HOV lanes happen in Orange County are probably not very different from any other location where similar projects have been implemented. The following observations highlight some of the more important elements that seem to have made a difference in this setting.

- Strategic Planning. Based on prior experiences from the 1970s, candidate HOV projects were carefully selected, based on some assurances of success. The Route 91 and 55 projects were initially referred to as "demonstrations" until they were accepted by the public.

- Key Individuals. In each case there were several influential staff-level people who were champions of the concept. They worked closely together to overcome internal and external obstacles in seeing the project implemented.

- Multi-Agency Sponsorship. Support and sponsorship came from several agencies at the state and local level that jointly shared implementation burdens. This joint role also strengthened the decision-making framework through the critical period of initial lane operation.

- Informed Consent. Education and consent from the local political power structure is important. HOV information needs to be communicated to local political leaders before asking for consent.

- Public/Local Agency Involvement. Through a carefully defined organizational structure called a Corridor Advisory Committee, affected municipalities, agencies and representative groups can have a role in supporting and endorsing the recommended HOV concept and in determining how the facility will operate and be evaluated. Such a Committee should include the agencies responsible for

planning, designing, funding, constructing, operating, and enforcing the HOV facilities. In addition, other interested agencies and municipalities should be included.

- Enabling Statutes and Policies. Caltrans has a statute, Number 149, and Vehicle Code 21655.5 that provides the state with the role of developing HOV facilities. The FHWA region office has a policy memorandum to this effect. The South Coast Air Quality Management District later implemented Regulation 15 endorsing strong consideration of HOV facilities. Without these statutes, Caltrans would not have been authorized to implement HOV lanes.

- Public and Media Awareness. The public and media can be very important in maintaining project support, since benefits may only be perceived by a minority of the motorists. Political cartoons adversely affected the Santa Monica Diamond Lanes. Every project implemented since has employed a public awareness campaign, including advertising, brochures, media events and other activities to educate the public of the project's benefit.

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APPENDIX A

LIST OF AGENCIES AND ORGANIZATIONS INVOLVED IN THE ROUTE 55 PLANNING AND DESIGN PROCESS

The following is a listing of agencies, organizations and communities that were involved in the Route 55 Newport-Cost Mesa commuter lane planning and implementation process. A brief description of the roles and responsibilities of each is noted.

Anaheim. The City of Anaheim includes within its jurisdiction the northern limits of the Route 55 commuter lanes.

Automobile Club of Southern California. The Auto Club represents a diverse group of automobile drivers in California. During the course of planning for the Route 55 project, the Auto Club supported the ramp metering alternative with HOV bypass lanes as the best means of alleviating corridor congestion.

California Department of Transportation - District 7 (Caltrans D-7). District 7 includes the Los Angeles area and when the Route 55 project was proposed, had jurisdiction over all state transportation improvements in Orange County. Subsequent to legislation in 1987, this jurisdiction was transferred to a newly created District in Orange County in 1988.

California Department of Transportation - District 12 (Caltrans D-12). This Caltrans District Office absorbed the responsibility for operating and overseeing design upgrades to the Route 55 project from District 7 in January 1988. District 12 also has the responsibility for overseeing implementation and operation of all other HOV facilities in Orange County.

California Highway Patrol (CHP). The CHP, the state policing function in California, are charged with enforcing the state highway system, including all regional freeways and HOV lanes. They also provide day-to-day operation of HOV lanes. The CHP local and headquarters offices have been involved in operational and design decision of all HOV projects and have been influential in the establishment of state-wide design guidelines for HOV facilities.

California Transportation Commission (CTC). The CTC is the governing commission for the California Department of Transportation (Caltrans). They approve all state expenditures for transportation projects. Members of the CTC are appointed by the governor.

Corridor Advisory Committee. This committee (also called the technical committee) was one of three public participation committees formed for the Route 55 HOV project. It was charged with the responsibility of investigating the technical, operational and attitudinal aspects of the HOV concept. The committee formulated an evaluation plan

and met for several months prior to the opening of the new lanes to define operational and safety features of the demonstration project. The group acted as the catalyst for recommending the demonstration project and for later recommending that the demonstration project be made permanent.

Costa Mesa. The City of Costa Mesa is located at the far southern extremity of the Route 55 commuter lanes.

Criteria and Assessment Committee. this was one of three public participation committees formed for the Route 55 HOV project. It served the function of preparing the evaluation plan. This plan included a rigorous before and after data collection during the demonstration period and surveys of users and nonusers. Participants included the sponsoring agencies.

Drivers for Highway Safety. This citizen coalition was formed following the opening of the commuter lanes. The group petitioned to be on the Technical Advisory Committee, and were allowed on prior to a determination of making the lanes permanent. The group initially raised concerns about the safety of the HOV lanes and continues to be active in opposing the use of HOV facilities.

Federal Highway Administration (FHWA). FHWA is part of the U.S. Department of Transportation and is the agency responsible for the federal highway system. This includes financing and approval over planning and design activities. The FHWA regional office in San Francisco and division office in Sacramento were active and supportive throughout the Route 55 implementation process.

Irvine. The City of Irvine is located adjacent the Route 55 commuter lanes along the southern extremity of the project.

Los Angeles Transportation Commission (LACTC). The Commission's responsibility is programming and prioritizing funding for transportation projects in Los Angeles County. They have developed an HOV plan for their jurisdiction and were involved in voting on consideration of an HOV facility on the Ventura Freeway (US 101).

Orange. The City of Orange is located along the Route 55 commuter lanes. About 40 percent of the 11-mile project is located within the City's jurisdiction.

Orange County Board of Supervisors. The Board of Supervisors approves County commitments to all forms of public works, including water and sewer projects, storm drainage, schools, parks, airports, hospital and emergency services and transportation improvements. The members of the Board of Supervisors are elected by the public at-large.

Orange County Transportation Commission (OCTC). The Commission's responsibility is programming and prioritizing funding for transportation projects in Orange County. This agency was the first approached by Caltrans when a proposal to

add HOV lanes to Route 55 was made. Subsequent to the Route 55 implementation, OCTC took on the role of sponsoring HOV planning and design activities on other freeways in the county and in funding upgrade improvements to the Route 55 project. Members of the Commission Board are appointed by the Board of Supervisors based on representative area, and each must be an elected official.

Orange County Transit District (OCTD). The OCTD is charged with operating public transit facilities in Orange County, including the county-wide rideshare matching services. OCTD's defined role has been to promote all forms of transit, including carpooling. The OCTD has also been involved in pursuing guideways for the various transit modes including light rail and HOV alternatives. In 1987 the OCTD Board approved a 20-mile HOV transitway plan, which became part of the larger county-wide HOV system. Members of the Board of appointed by various county groups, including the cities, OCTC and the County Board of Supervisors.

Project Development Team. Once a project commitment is affirmed, this development team concept is applied to all Caltrans projects, including all of the HOV projects implemented in Orange County. The team is largely comprised of the various functional design disciplines (Caltrans and/or consultants) during the development of the project design, although team members have also included affected municipalities. Regularity of team meetings during the design process varied from four to six weeks.

Public Awareness Committee. This was one of three public participation committees formed for the Route 55 HOV project. It served the function of assessing public attitudes during and following implementation of the commuter lane demonstration on Route 55. The committee met irregularly during the course of the demonstration.

Santa Ana. The City of Santa Ana is located along the Route 55 commuter lanes. About 50 percent of the 11-mile project is located within or adjacent to this City's jurisdiction.

Southern California Association of Governments (SCAG). The agency serves as the metropolitan planning organization for the southern California basin, including Ventura, Los Angeles, San Bernardino, Riverside and Orange Counties. General growth and transportation planning forecasts and policy guidance is generated by this agency.

Tustin. The City of Tustin includes within its jurisdiction the central limits of the Route 55 commuter lanes from Warner Avenue to Fairhaven Avenue.

Urban Mass Transportation Administration (UMTA). UMTA is part of the U.S. Department of Transportation. UMTA is a transit counterpart to FHWA and is the agency responsible for funding public transit improvements, including busways and HOV facilities, bus acquisition, and other capital and operating assistance. UMTA was not involved in the development of the Route 55 commuter lanes and other projects subsequently adopted on I-5, I-405, Route 57 and Route 91. UMTA participation may occur in the future on selected transitways proposed in Orange County.

Transit-Related Highway Facilities

148. The department may construct and maintain transit related highway facilities along the state highway system. Those facilities may include, but are not limited to, bus turn-outs, passenger loading areas, passenger benches and shelters, and special traffic control devices. For purposes of this code, those facilities are part of the state highway.

Facilities estimated to cost two hundred fifty thousand dollars ($250,000) or more and located in an urbanized area shall be limited to those facilities included by transportation planning agencies in a regional transportation improvement program prepared pursuant to Section 14527 of the Government Code. Not more than one million dollars ($1,000,000) of the state funds appropriated by the Legislature each year for state highway construction may be used for the purpose of constructing those facilities. In addition, for projects estimated to cost thirty thousand dollars ($30,000) or more, the state funds may be used only to match federal or local funds, or both.

Exclusive Use of Freeway Lanes for Buses

149. The department may construct exclusive or preferential lanes for buses only or for buses and other high-occupancy vehicles, and may authorize or permit such exclusive or preferential use of designated lanes on existing highways that are part of the State Highway System. Prior to constructing such lanes, the department shall conduct competent engineering estimates of the effect of such lanes on safety, congestion, and highway capacity.

To the extent they are available, the department may apply for and use federal aid funds appropriated for the design, construction, and use of such exclusive or preferential lanes, but may also use other State Highway Account funds, including other federal aid funds, for those purposes where proper and desirable.

This section shall be known and may be cited as the Carrell Act.

Note: Section 1 of Chapter 703, Statutes of 1969, as amended by Section 1 of Chapter 621, Statutes of 1980, provides:

Section 1. One of the primary methods of moving people in the urban areas of this state is the freeway system. The investment made in this system requires that it be used as effectively as possible to provide an efficient transit method. Thus, experimentation in the use of the freeway lanes is essential. By the enactment of this act, the Legislature intends to authorize and encourage the Department of Transportation to study and experiment with various methods of freeway use to discover the manner in which the freeway system in urban areas can be most effectively utilized.

Note: Streets and Highways Code Section 27178, relating to the Golden Gate Bridge, Highway and Transportation District, as amended by Section 125 of Chapter 777 of the Statutes of 1980, provides:

27178. Within the district, the Department of Transportation may restrict any portion of a state highway to a particular mode of vehicular transportation during such hours as the department, upon the basis of an engineering and traffic investigation, determines such restriction would expedite the flow of traffic.

Note: Vehicle Code Section 21655.3, as added by Chapter 538, Statutes of 1987, provides:

21655.3. (a) A high-occupancy vehicle lane on a state highway which has been given permanent operational status as a high-occupancy lane by the department on or after January 1, 1987, but before December 31, 1987, in conjunction with a transportation planning agency, and which is operated as a high-occupancy vehicle lane on a 24-hour basis after that date, shall be separated from adjacent mixed-flow lanes by a buffer area of at least four feet in width.

(b) The transportation planning agency having within its area of jurisdiction a high-occupancy vehicle lane meeting the operational requirements of subdivision (a) and having no buffer or a buffer less than four feet in width shall, by July 1, 1988, do one of the following:

(1) Enter into an agreement with the department to provide a four-foot buffer between the high-occupancy vehicle lane and the adjacent lanes and agree to pay any costs for the buffer not programmed by the department.

(2) Submit to the department a written request that the high-occupancy vehicle lane be changed to a mixed-flow lane.

(c) Upon receipt of notification by the transportation planning agency of its request that the high-occupancy vehicle lane become a mixed-flow lane, the department shall proceed with the work necessary to change the high-occupancy lane to a mixed-flow lane.

(d) The width of a buffer between a high-occupancy vehicle lane and adjacent lanes may be less than four feet at locations where a four-foot buffer would require the removal, relocation, or reconstruction of any existing bridge support structures or where part of the buffer space is required for enforcement refuge areas.

Note: Vehicle Code Section 21655.6, as amended by Chapter 25, Statutes of 1984, provides:

21655.6. Whenever the Department of Transportation authorizes or permits exclusive or preferential use of highway lanes for high-occupancy vehicles on any highway located within the territory of a transportation planning agency, as defined in Section 99214 of the Public Utilities Code, or a county transportation commission, the department shall obtain the approval of the transportation planning agency or county transportation commission prior to establishing the exclusive or preferential use of the highway lanes.

If the department authorizes or permits additional exclusive or preferential use of highway lanes for high-occupancy vehicles on that portion of State Highway Route 101 located within the boundaries of the City of Los Angeles, the department shall obtain the approval of the Los Angeles County Transportation Commission by at least a two-thirds majority vote of the entire membership eligible to vote prior to establishing the additional exclusion or preferential use of the highway lanes. For purposes of this section, eight of the 11 voting members constitute a two-thirds majority of the commission.

Pursuant to Section 146 of the federal Surface Transportation Assistance Act of 1982 (P.L. 97-424), the department shall not restrict or require the restriction of the use of any lane on any federal-aid highway in the unincorporated areas of Alameda County to high-occupancy vehicles, exclusive of approaches to controlled access highways, toll roads, or bridges.

Cooperative Agreement for Preferential Lanes

149.3. The department may undertake the construction of exclusive or preferential lane facilities pursuant to a cooperative agreement with any public or private agency that provides mass transit services. Such cooperative agreement shall establish such geometric design standards, scheduling, reservations, restrictions, and conditions as the department deems necessary or desirable. Provision may also be made for electrification or use of other power sources under such terms and conditions as the department deems necessary to accomplish the objectives of this section. Additionally, any such agreement shall provide for the payment of compensation where required by other provisions of law or where otherwise deemed appropriate.

Use of Mass Transportation Corridors in Freeways

150. When the department, in cooperation with rapid transit districts as provided under Section 75.8 and as a part of its planning coordination with local agencies under Article 6 (commencing with Section 210), recommends that mass public transportation facilities should be located along a proposed freeway corridor in order to establish a planned balanced transportation system, the commission shall consider such recommendation in making its decision as to the location of the freeway.

Permanent High-Occupancy Vehicle Lanes

21655.3. (a) A high-occupancy vehicle lane on a state highway which has been given permanent operational status as a high-occupancy lane by the department on or after January 1, 1987, but before December 31, 1987, in conjunction with a transportation planning agency, and which is operated as a high-occupancy vehicle lane on a 24-hour basis after that date, shall be separated from adjacent mixed-flow lanes by a buffer area of at least four feet in width.

(b) The transportation planning agency having within its area of jurisdiction a high-occupancy vehicle lane meeting the operational requirements of subdivision (a) and having no buffer or a buffer less than four feet in width shall, by July 1, 1988, do one of the following:

(1) Enter into an agreement with the department to provide a four-foot buffer between the high-occupancy vehicle lane and the adjacent lanes and agree to pay any costs for the buffer not programmed by the department.

(2) Submit to the department a written request that the high-occupancy vehicle lane be changed to a mixed-flow lane.

(c) Upon receipt of notification by the transportation planning agency of its request that the high-occupancy vehicle lane become a mixed-flow lane, the department shall proceed with the work necessary to change the high-occupancy lane to a mixed-flow lane.

(d) The width of a buffer between a high-occupancy vehicle lane and adjacent lanes may be less than four feet at locations where a four-foot buffer would require the removal, relocation, or reconstruction of any existing bridge support structures or where part of the buffer space is required for enforcement refuge areas.

Added Ch. 538, Stats. 1987. Effective January 1, 1988.

Exclusive or Preferential-Use Lanes for High Occupancy Vehicles

21655.5. The Department of Transportation and local authorities, with respect to highways under their respective jurisdictions, may authorize or permit exclusive or preferential use of highway lanes for high-occupancy vehicles. Prior to establishing the lanes, competent engineering estimates shall be made of the effect of the lanes on safety, congestion, and highway capacity.

The Department of Transportation and local authorities, with respect to highways under their respective jurisdictions, shall place and maintain, or cause to be placed and maintained, signs and other official traffic control devices to designate the exclusive or preferential lanes, to advise motorists of the applicable vehicle occupancy levels, and, except where ramp metering and bypass lanes are regulated with the activation of traffic signals, to advise motorists of the hours of high-occupancy vehicle usage No person shall drive a vehicle upon those lanes except in conformity with the instructions imparted by the official traffic control devices.

It is the intent of the Legislature, in amending this section, to stimulate and encourage the development of ways and means of relieving traffic congestion on California highways and, at the same time, to encourage individual citizens to pool their vehicular resources and thereby conserve fuel and lessen emission of air pollutants.

Added Ch. 1295, Stats. 1970. Effective November 23, 1970.
Amended Ch. 773, Stats. 1974. Effective January 1, 1975. Supersedes Ch. 545.
Amended Ch. 466, Stats. 1982. Effective January 1, 1983.
Amended Ch. 826, Stats. 1984. Effective August 31, 1984, by terms of an urgency clause.

Approval of Transportation Planning Agency or County Transportation Commission

21655.6. Whenever the Department of Transportation authorizes or permits exclusive or preferential use of highway lanes for high-occupancy vehicles on any highway located within the territory of a transportation planning agency, as defined in Section 99214 of the Public Utilities Code, or a county transportation commission, the department shall obtain the approval of the transportation planning agency or county transportation commission prior to establishing the exclusive or preferential use of the highway lanes. If the department authorizes or permits additional exclusive or preferential use of highway lanes for high-occupancy vehicles on that portion of State Highway Route 101 located within the boundaries of the City of Los Angeles, the department shall obtain the approval of the Los Angeles County Transportation Commission by at least a two-thirds majority vote of the entire membership eligible to vote prior to establishing the additional exclusion or preferential use of the highway lanes. For purposes of this section, eight of the 11 voting members constitute a two-thirds majority of the commission.

Pursuant to Section 146 of the federal Surface Transportation Assistance Act of 1982 (P.L. 97-424), the department shall not restrict or require the restriction of the use of any lane on any federal-aid highway in the unincorporated areas of Alameda County to high-occupancy vehicles, exclusive of approaches to controlled access highways, toll roads, or bridges.

Added Ch. 588, Stats. 1982. Effective August 25, 1982, by terms of an urgency clause.
Repealed Ch. 588, Stats. 1982. Effective July 1, 1984.
Amended Ch. 25, Stats. 1984. Effective January 1, 1985.

Use of Highway; Public Mass Transit Guideway

21655.7. A local authority, with respect to any highway under its jurisdiction, may authorize or permit a portion of the highway to be used exclusively for a public mass transit guideway.

Added Ch. 1055, Stats. 1981. Effective January 1, 1982.

Entering or Exiting Exclusive or Preferential Use Lanes

21655.8. When exclusive or preferential use lanes for high-occupancy vehicles are established pursuant to Section 21655.5 and double parallel solid lines are in place to the right thereof, no person driving a vehicle may cross over these double lines to enter into or exit from the exclusive or preferential use lanes. Entrance or exit may be made only in areas designated for these purposes or where a single broken line is in place to the right of the exclusive or preferential use lanes.

Raised pavement markers may be used to simulate painted lines described in this section.

Added Ch. 1054, Stats. 1988. Effective January 1, 1989.

CHAPTER 538

An act to add Section 21655.3 to the Vehicle Code, relating to highways.

[Approved by Governor September 11, 1987. Filed with Secretary of State September 11, 1987.]

LEGISLATIVE COUNSEL'S DIGEST

SB 699, Seymour. Highways: high-occupancy vehicle lanes.

(1) Existing law authorizes the Department of Transportation and local authorities, with respect to highways under their respective jurisdictions, to authorize or permit exclusive or preferential use of highway lanes for high-occupancy vehicles.

This bill would require specified high-occupancy vehicle lanes to be separated from adjacent mixed-flow lanes by a buffer area of at least 4 feet in width.

The bill would impose a state-mandated local program by requiring a transportation planning agency having a specified high-occupancy vehicle lane within its jurisdiction to either enter into an agreement with the department to provide and pay the costs for the buffer or to request that the high-occupancy lane be changed to a mixed-flow lane. Upon receipt of such a request, the bill would require the department to proceed with the work necessary to change the lane to a mixed-flow lane.

The bill would only become operative if SB 622 becomes operative.

(2) The California Constitution requires the state to reimburse local agencies and school districts for certain costs mandated by the state. Statutory provisions establish procedures for making that reimbursement.

This bill would provide that no reimbursement is required by this act for a specified reason.

The people of the State of California do enact as follows:

SECTION 1. Section 21655.3 is added to the Vehicle Code, to read:

21655.3. (a) A high-occupancy vehicle lane on a state highway which has been given permanent operational status as a high-occupancy lane by the department on or after January 1, 1987, but before December 31, 1987, in conjunction with a transportation planning agency, and which is operated as a high-occupancy vehicle lane on a 24-hour basis after that date, shall be separated from adjacent mixed-flow lanes by a buffer area of at least four feet in width.

(b) The transportation planning agency having within its area of

jurisdiction a high-occupancy vehicle lane meeting the operational requirements of subdivision (a) and having no buffer or a buffer less than four feet in width shall, by July 1, 1988, do one of the following:

(1) Enter into an agreement with the department to provide a four-foot buffer between the high-occupancy vehicle lane and the adjacent lanes and agree to pay any costs for the buffer not programmed by the department.

(2) Submit to the department a written request that the high-occupany vehicle lane be changed to a mixed-flow lane.

(c) Upon receipt of notification by the transportation planning agency of its request that the high-occupancy vehicle lane become a mixed-flow lane, the department shall proceed with the work necessary to change the high-occupancy lane to a mixed-flow lane.

(d) The width of a buffer between a high-occupancy vehicle lane and adjacent lanes may be less than four feet at locations where a four-foot buffer would require the removal, relocation, or reconstruction of any existing bridge support structures or where part of the buffer space is required for enforcement refuge areas.

SEC. 2. Section 1 of this act shall become operative only if, and at the same time as, Senate Bill 622 becomes operative.

SEC. 3. No reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution because this act is in accordance with the request of a local agency or school district which desired legislative authority to carry out the program specified in this act.

SENATE BILL 699

State of California — Business, Transportation and Housing Agency

CHP Enforcement Input

Memorandum

To : All Field Divisions

Date : October 6, 1987

File No. : 2.A0431.A7808.4464L

Subject : INTERIM HOV STANDARDS AND GUIDELINES

From : Department of California Highway Patrol
Assistant Commissioner, Field

The Department, together with Caltrans and others, is continuing to acquire operational data from experience with the existing types of High Occupancy Vehicle (HOV) lane facilities in California.

Caltrans is sponsoring an ongoing study by the University of California to develop a consensus of HOV design guidelines based on an accumulation of currently available HOV data nationwide. The Department together with Caltrans and the Federal Highway Administration are represented on the study advisory committee.

Plans are still being made by Caltrans and the Department to conduct a joint study concerning California design standards and enforcement deployment requirements for mainline HOV lanes.

Meanwhile, pending the outcome of these developments in concert with the evolving political environment for transportation systems management (TSM) strategies, we have adopted certain interim HOV standards and guidelines for statewide application. These interim standards and guidelines are based on the joint CHP/Caltrans effort of Border Division and District 07 in the Santa Ana and Westminster Areas. They are as follows:

(a) Minimum width of enforcement refuge areas: 14 feet, plus space for Jersey Barrier, plus 3 feet.

(b) Length of enforcement refuge area: 2,000 feet which includes a 400 foot taper. These length figures should be considered minimums; however, some flexibility on length may be allowed so the enforcement facility can be adapted to fit within a proposed or an existing environment.

(c) Minimum distance between Jersey Barrier and the HOV lane: 3 feet

(d) Law enforcement turn-through openings: Enforcement turn-through openings should be incorporated into the HOV enforcement refuge areas whenever possible.

(e) Certain physical, environmental, political or other unexpected factors could impact the recommended design standards. When one or more of these factors are encountered, design modifications are to be negotiated on a case-by-case basis between the local CHP Area and the appropriate Caltrans representatives. Such design variance will require approval by higher levels within each department to ensure ongoing CHP/Caltrans statewide policy consistency and understanding.

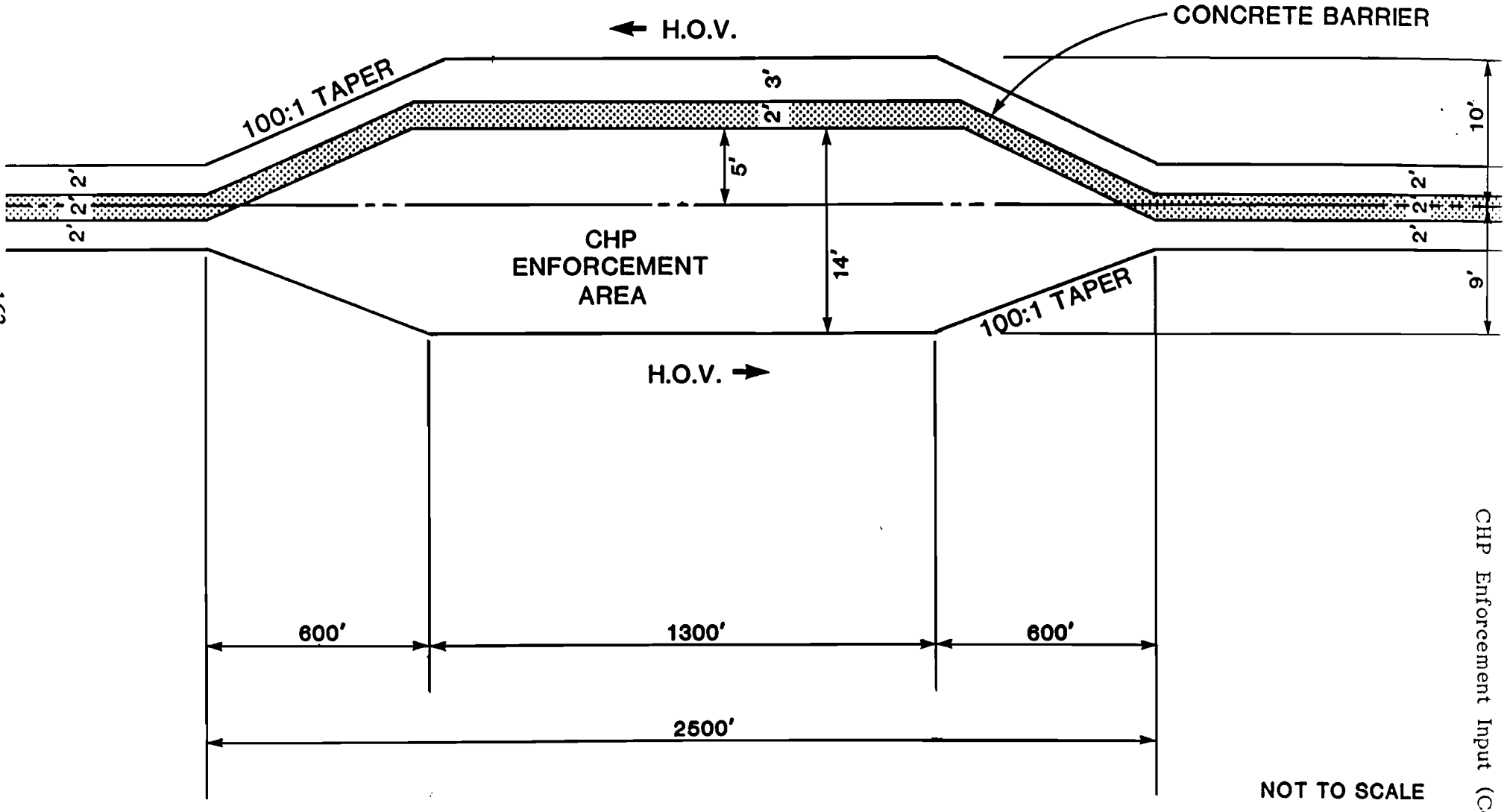
If you have questions concerning these interim standards and guidelines or their application please contact Lieutenant Ron Phulps at (916) 445-1981.

L. A. Watkins

L. A. WATKINS
Assistant Commissioner

CHP 51 (Rev. 3-81)

PROPOSED ENFORCEMENT AREAS ALONG ROUTE 55



FEDERAL HIGHWAY ADMINISTRATION
CALIFORNIA DIVISION OFFICE
PROCEDURE MEMORANDUM

SUBJECT:	
Urban Freeway Reconstruction and HOV Policy	D6103
	June 26, 1987

BACKGROUND

As our freeway systems mature, traffic increase has caused a continued reduction in the level of service. Professional transportation planners and engineers have found that there is no practical way to provide sufficient freeways to accomodate demand. In most urbanized areas, no freeway corridors are proposed or available, except at extremely high cost. We, therefore, must operate our existing system as efficiently as possible considering the collective publics. One method of increasing existing freeway people-carrying capacity is to increase vehicle occupancy rate. We are thus able to move more people with less energy and less air pollution while saving overall trip time. HOV lanes on urban freeways increase occupancy rates, commonly double the person-trip usage of the freeway in peak hours, and often relieve overall congestion on the freeway.

POLICY

When considering an additional freeway lane either by restriping or widening on freeways with 3 or more freeway lanes in one direction, providing an HOV lane shall be an essential alternative. If it is shown that within 5 years, at the peak commute hour, the HOV lane will carry the equivalent number of person-trips a mixed-flow lane could carry, the HOV lane option should be selected. Potential for connection to existing or planned HOV facilities shall also be a consideration.

Support by the public and local and regional agencies is an essential factor for a successful HOV facility. It is therefore desirable that a public relations program be incorporated into the project development process for sensitive HOV facilities. This public relations program is necessary to create public awareness and acceptance of the positive attributes of the HOV option.

If the option of a mixed-flow lane is selected, the mixed-flow lane, and all other adjacent lanes and shoulders, shall be constructed to full AASHTO geometric standards. This will preserve the future option of providing an HOV lane should system conderations require it.

FHWA has established a minimum vehicle occupancy criteria of 3 persons per vehicle for HOV facilities. Exceptions to this criteria require FHWA approval.

DESIGN STANDARDS

The AASHTO publication "Guide for the Design of High Occupancy Vehicle and Public Transfer Facilities" gives guidance for design standards on HOV lanes. In general, lane width should be 12 feet. A buffer width of 4 feet minimum to 12 feet desirable should be provided between the mixed-flow lane and the HOV lane. A 10-foot inside shoulder is appropriate. Additional width within the median is desirable at locations designated for enforcement. Configurations which use substandard lane and shoulder widths require design exceptions. HOV facilities requiring design exceptions are considered staged development and serve as an interim means to relieve existing traffic congestion. When demonstrated effective, plans should be made to provide a standard cross-section to enhance safety and operational characteristics.

Bruce Cannon

Bruce E. Cannon
Division Administrator

July 23, 1987

CALIFORNIA TRANSPORTATION COMMISSION
Bus and Carpool Lane Facilities
Resolution G-87-8

WHEREAS, Fiscal and environmental resources necessary for the continuing development of freeway facilities are increasingly constrained; and

WHEREAS, The costs of owning and operating a private passenger vehicle are generally out-pacing the consumer price index; and

WHEREAS, In most of California's metropolitan areas, occupancy of private passenger vehicles averages no more than 1.2 persons; and

WHEREAS, Bus and carpool lanes offer demonstrated benefit in time and cost savings to those individuals already choosing to use transit, carpools, or vanpools for home-to-work commute trips; and

WHEREAS, Bus and carpool lanes also offer an incentive to individuals to commence use of these modes, and maximum incentive results with effective operation and enforcement; and

WHEREAS, Vehicles eligible to use bus and carpool lanes often result in reduced emissions per person trip, reduced fuel consumption per person trip, and more efficient use of publicly financed capital facilities;

NOW, THEREFORE, BE IT RESOLVED, That in the planning of any new freeway facility or freeway capacity addition in and around a metropolitan area, the Department of Transportation and/or the regional transportation planning agency shall examine and report to the California Transportation Commission on the feasibility and potential benefits -- both short term and long term of the new project's operation -- of designating bus and carpool lane operation within that project, for at least peak, week-day commute hours; and

BE IT FURTHER RESOLVED, That such examinations should consider the possible extension of bus and carpool lane operation into existing, adjacent facilities to determine their contribution to the feasibility and beneficial operation of the bus and carpool lane facility within the new project; and

BE IT FURTHER RESOLVED, That in considering the approval of such projects, the California Transportation Commission shall also consider the aforementioned bus and carpool lane facility reports; and

BE IT FURTHER RESOLVED, That the Commission shall give serious consideration to the inclusion of at least a commute hour bus and carpool facility in every new freeway facility or freeway capacity addition in and around a metropolitan area when it is demonstrated to be both feasible and of likely benefit within either the short or long term; and

BE IT FURTHER RESOLVED, That the Commission shall also give serious consideration to extending such a bus and carpool facility to existing adjacent facilities when it is demonstrated to be feasible and of likely benefit and to contribute to the operation of the bus and carpool facility within the new project.

BE IT FURTHER RESOLVED, That in the metropolitan Districts the Department of Transportation shall work with the regional transportation agencies to plan region-wide bus and carpool lane systems and to include these systems in the regional transportation plans.

BE IT FURTHER RESOLVED, That the Commission shall continue to consider the inclusion of bus and carpool facilities in new metropolitan freeway construction and in metropolitan freeway capacity additions on a case by case basis until such time as acceptable bus and carpool lane systems for all major metropolitan areas are incorporated in regional transportation plans; thereafter, the Commission shall only determine whether such proposed urban freeway projects are included in the regional plans.

BE IT FURTHER RESOLVED, That it is the intent of the Commission to pursue all reasonable opportunities to support the concept of bus and carpool lanes and bus and carpool lane projects in general and particularly when meeting with elected officials, representatives of public and private organizations and the general public.

FINAL 1989

AIR QUALITY MANAGEMENT PLAN

EXECUTIVE SUMMARY

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS

2.f. HOV FACILITIES

SUMMARY

SOURCE CATEGORY: Light Duty Auto/Light and Medium Duty Trucks

CONTROL METHODS: TIER I

- o Implement the constrained HOV Element of the adopted Regional Mobility Plan, and provide HOV by-pass lanes at metered ramps, where feasible.
- o Obtain funding for unconstrained improvements and implement remaining program.

  Those actions, facilities, and programs, which will be constructed or completed under existing or present funding capabilities, are called the "Constrained Program." Those actions, facilities, and programs, which require additional sources of revenue to be implemented, are called the "Unconstrained Program."

IMPLEMENTING AGENCIES: CALTRANS.

IMPLEMENTATION ASSUMPTIONS:

Please see the cover page for this group of measures.

PRIMARY BENEFITS:

Please see the cover page for this group of measures.

DESCRIPTION OF SOURCE CATEGORY AND CONTROL MEASURE

Background

It has long been recognized that increased carpooling could provide significant air quality and congestion relief benefits, as well as a reduction in infrastructure needs. Despite continued marketing efforts by public and private agencies to promote ridesharing, observed vehicle occupancies on freeways has continued to decline. With the exception of periods of gasoline shortages, the only exceptions to the general trend have occurred in those corridors with available High Occupancy Vehicle (HOV) Lanes (Rte 91 in L.A. Co., Rte 55 in Orange County, and I-10 in L.A. Co.). Average vehicle occupancies are markedly higher on those facilities with HOV lanes than on other freeway facilities in the region. Recent survey information strongly suggests that the time savings afforded by HOV lanes is an effective inducement to ridesharing.

Regulatory History

The 1979 AQMP contained measure #H-85, mandating the construction of HOV facilities on the Harbor, Santa Ana, and Century Freeways, as well as a 2-mile extension of the El Monte Busway to Union Station. Although this measure was not included in the 1982 update to the AQMP, all four projects are currently either under construction or programmed for construction in the next few years. No other regulations address the implementation of HOV lanes.

CONTROL METHODS

The proposed method of control is to support the programming and implementation of the HOV facilities identified in the 1989 Regional Mobility Plan. Full implementation of all HOV lane provisions is assumed in estimating changes in transportation activity. The 1989 RMP calls for the construction of 1285 lane-miles of HOV facilities.

(Refer to the Regional Mobility Plan for a list of HOV facilities.)

The implementing agencies would require that baseline HOV and vehicle occupancy data be generated. Upon implementation, the agencies would be required to monitor the progress and effectiveness of the strategy and report results and baseline data annually to SCAG for incorporation into the RFP Report.

Those actions, facilities, and programs, which will be constructed or completed under existing or present funding capabilities, are called the "Constrained Program." Those actions, facilities, and programs, which require additional sources of revenue to be implemented, are called the "Unconstrained Program."

IMPLEMENTATION ISSUES

Potential public and public official opposition to HOV lanes in specific corridors may present a significant obstacle to implementation. Significant engineering difficulties can be anticipated.

LEGISLATIVE/RESEARCH NEEDS

Continued research into the effectiveness of HOV lanes at including and facilitating increased carpooling and transit use will be necessary, as well as quantification of emission benefits.

Action will be necessary to established/preserve a favorable state legislative climate for HOV lane implementation.

Legislative action may be required to provide CHP enforcement budget.

Action will be required to implement financial strategies developed through the Regional Mobility Plan.

OTHER IMPACTS

Implementation of the HOV Element of the Regional Mobility Plan will contribute significant to ridesharing, because HOV lanes provide a time advantage to car-and van-pools; this, in turn, enhances mobility in the form of reduced vehicle trips, reduced vehicle miles of travel, and reduced travel time and delay. Some negative environmental impacts will be associated with the construction of the HOV projects, such as dust, noise, energy consumption, short-term traffic disruption. Some negative visual and noise impacts may result from project implementation.

HIGH OCCUPANCY VEHICLE PROGRAM

High Occupancy Vehicle (HOV) lanes have been implemented to provide additional incentives to increased ridesharing and transit usage. The provision of a separate lane for the exclusive use of carpools, vanpools, or transit vehicles provides valuable time savings in contrast to the travel times of single occupant vehicles in congested general use lanes. The time savings thus afforded has been widely recognized as a powerful incentive in the promotion of ridesharing and the reduction of vehicle trips and vehicle miles of travel.

In the context of the Plan, HOV lanes can be seen not simply as the inducement to increased ridesharing, but as accommodating the increased carpool and bus transit demand that will follow from the measures contained in the Transportation Demand Management element.

The HOV element, presented in Figure V-5, provides for an eventual system of about 1,258 miles of exclusive lanes, but does not distinguish among the various types of HOV facilities such as transit ways, commuter lanes, or simple restriping projects. Specific use and design designations must be made during the project development phases. HOV facilities have been provided in the Plan for every new corridor under development in the region and on existing high demand freeways such as the Santa Ana (I-5), the San Bernardino (I-10) and the Riverside (Route 91) Freeways.

The actions necessary to implement the HOV element are listed below:

Agency	Action	Date
SCAG, Caltrans, County Commissions	Implement AB 84 provisions to develop lists of priority improvements for Project Study Report development.	1989-1990
RCTC, Caltrans	Implement Park-n-Ride facilities for commuter bus and HOVs on Routes 15, 215, 91, and 60.	1989-1993
Caltrans, County Commissions, SCAG	Program Constrained System of HOV projects. (See Figure V-5.)	1989-2005
Caltrans	Implement Constrained System of HOV projects.	1989-2010
Caltrans 7, 12, SCAG	Implement generic HOV outreach program.	1989-1990
SCAG, all agencies	Develop and implement program to provide additional funding.	1989-2005
SCAG, Caltrans, County Commissions	When new revenues are raised, program Unconstrained System of HOV projects.	1989-2010

HISTORY AND INSTITUTIONAL ARRANGEMENTS: I-279/I-579 HOV FACILITY, PITTSBURGH, PENNSYLVANIA

Kilareski and Mason, P.C.

John M. Mason Jr., Ph.D., P.E.
Joseph P. Tarris, P.E.
Walter P. Kilareski, Ph.D., P.E.

I. INTRODUCTION

The purpose of this report is to present the history and institutional arrangements associated with the planning, design, and construction of a High Occupancy Vehicle (HOV) facility for I-279 and I-579, Allegheny County, Pennsylvania. Specifically, this report provides:

- History and background of the planning, design, implementation, and operation of the I-279/I-579 HOV facility.
- Institutional arrangements between the different agencies responsible for the planning, design, and operation of the I-279/I-579 HOV facility.
- Identification of the major reasons leading to the decision to build the HOV facility initially.

Information presented in this document was obtained from published reports and interviews with related agency staff and other individuals responsible for various aspects of the project. The document contains six sections:

I. Introduction
II. Project Description
III. I-279/I-579 Project History/Institutional Arrangements
IV. Other Pittsburgh-Allegheny County HOV-Related Facilities
V. Observations
VI. Agencies, Organizations, and Communities Involved in the I-279/I-579 HOV Facility

Section II provides a description of the I-279 and I-579 expressways and the associated HOV facility as constructed. The I-279/I-579 HOV facility exists within what were originally approved as four separate expressway segments. These segments are locally referred to as:

- The Crosstown Boulevard (I-579)
- The North Shore Expressway (I-279)
- The East Street Valley Expressway (I-279)
- The North Hills Expressway (I-279)

Section II describes the location of each segment within the Pittsburgh-Allegheny County region.

Section III traces the project history and identifies the institutional arrangements that brought the four I-279 and I-579 expressway segments to completion. The history of these expressway segments extends back to the mid-1950's. However, the initiation to incorporate HOV lanes into their design did not occur until the late 1970's. This section contains a historical overview, a description of the associated institutional arrangements, and a detailed discussion of the planning and design phases of the I-279/I-579 HOV facility.

The Pittsburgh-Allegheny County region has other HOV facilities including two exclusive busways. Section IV provides a description of these and other HOV facilities in the region. Section V summarizes the major events and reasons that led to the decision to build the HOV facility initially. Section VI identifies and describes the major agencies and organizations involved in the planning, design, and operation of the I-279/I-579 HOV facility.

II. PROJECT DESCRIPTION

The I-279/I-579 HOV facility was designed and constructed as part of the latest four Interstate expressway segments constructed in the Pittsburgh-Allegheny County region. These four expressway segments include:

- The Crosstown Boulevard (I-579). Legislative Route 1026, Sections 2, 3, and 4 approved November 9, 1981.(FHWA-PA-EIS-78-01-F)[1]
- The North Shore Expressway and the East Street Interchange (I-279). Legislative Routes 1021, Sections 1 and 2; 1040, Sections 1 and 2; 1039, Section 1 and Spur 246 approved October 16, 1981. (FHWA-PA-EIS-77-06-F)[2]
- The East Street Valley Expressway (I-279). Legislative Route 1021, Section 3 approved June 7, 1976. Final EIS Reevaluation approved November 23, 1979. (FHWA-PA-EIS-72-02-F)[3]
- The North Hills Expressway (I-279). Legislative Route 1021, Sections 4, 5, 6, and 7 approved September 28, 1981. (FHWA-PA-EIS-77-010-F)[4]

The location of these expressway segments to the Pittsburgh-Allegheny County region is depicted in Figure 1. The location of these expressways relative to each other is presented in Figure 2.

As originally approved, the design of these expressway segments did not include the HOV facility. In response to funding limitations, discussed further in Section III of this report, the project scope for these expressways was revised in the early 1980's. The new project scope included provisions for HOV facilities. Since the planned HOV facility and other design modifications affected all four approved expressways, a Supplemental Environmental Impact Statement (EIS) describing the revised four-expressway network with the HOV lanes was issued and subsequently approved.[5] The HOV facility was opened in September 1989. The relationship of the HOV facility to these four expressways is presented in Figure 3. The following describes the expressways and associated HOV facilities.

The Crosstown Boulevard (I-579) is a north-south roadway originating at its southern limit with a four-lane arterial in Pittsburgh's downtown central business district. Continuing

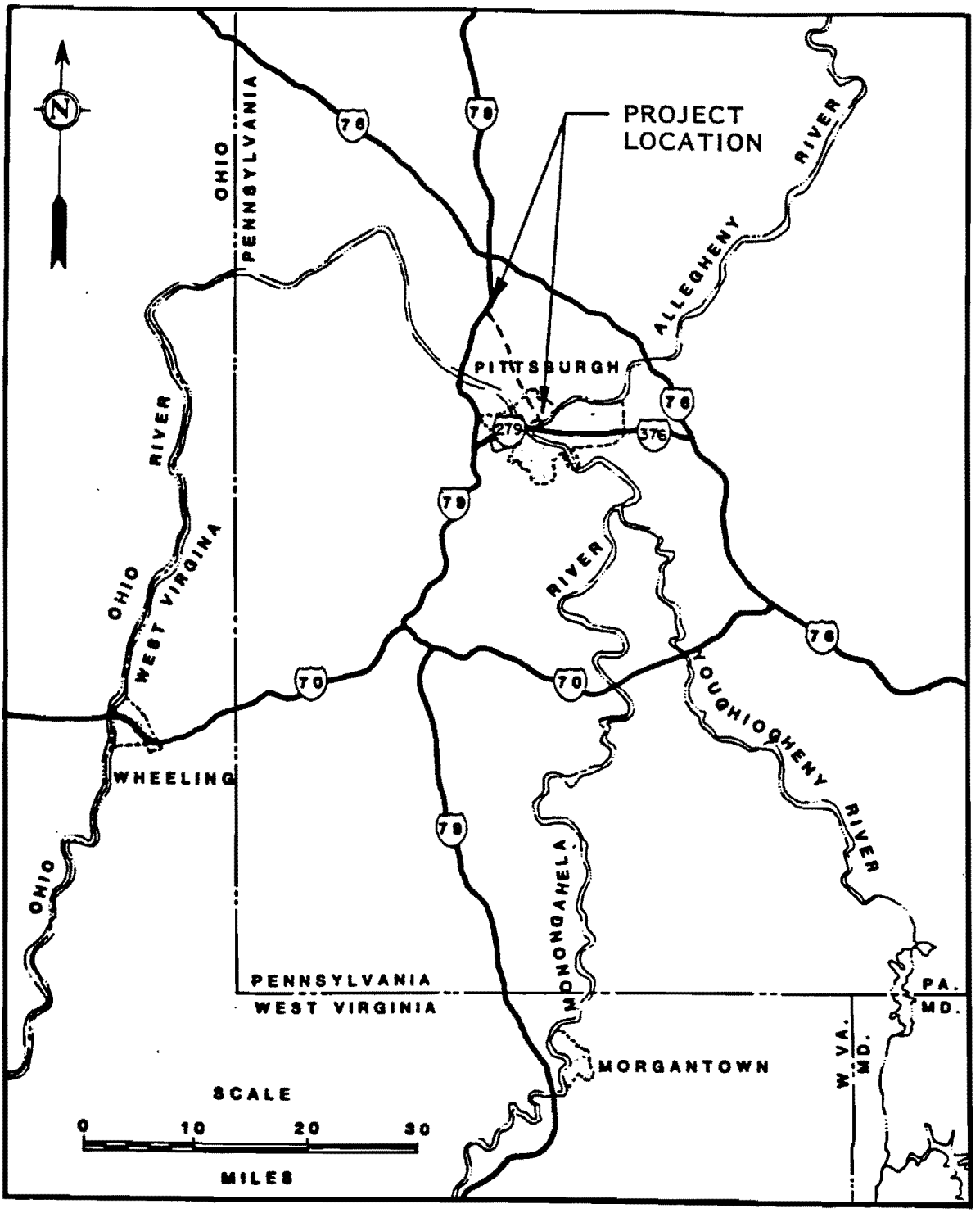


Figure 1. Location of the four expressway segments to the Pittsburgh-Allegheny County region

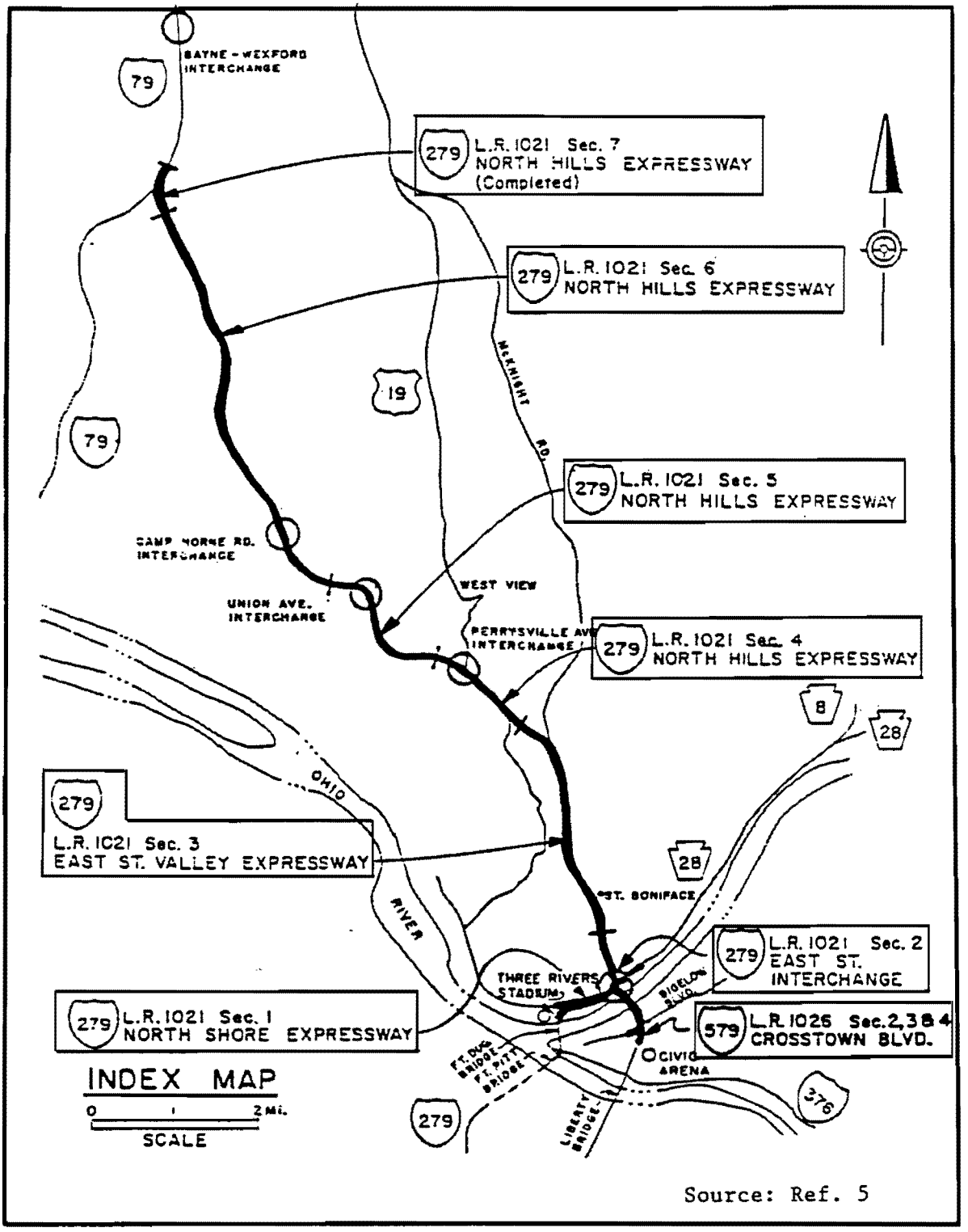


Figure 2. Relationship between the four expressway segments

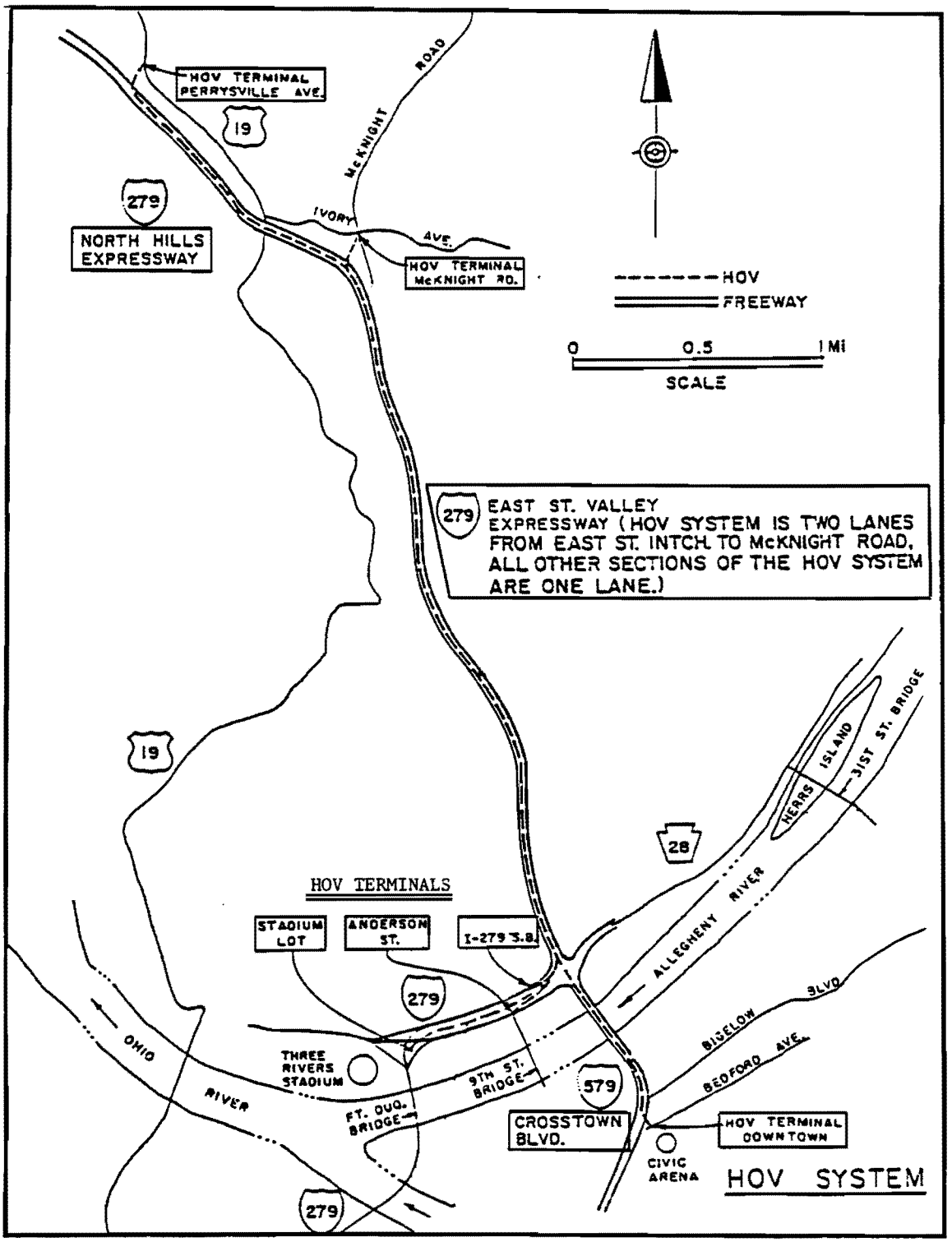


Figure 3. Relationship of the HOV facility to the four expressway segments

north, this expressway crosses the Allegheny River and connects to the East Street Valley Expressway (I-279). The Crosstown Boulevard is a four-lane (2 northbound, 2 southbound) interstate freeway. A single dedicated HOV lane is provided in the median area. Access to and from this HOV lane is via the intersection of Bedford Street and Auditorium Place located near the Civic Arena. This HOV lane connects in the north with the HOV lanes of the East Street Valley Expressway (I-279).

The North Shore Expressway (I-279) serves the downtown Pittsburgh area north of the Allegheny River and connects the East Street Valley Expressway (I-279) in the north to the previously constructed segment of I-279 in the south at the Ft. Duquesne Bridge. This expressway is also a four-lane (2 northbound, 2 southbound) interstate freeway and includes a dedicated HOV lane in the median area. Access to and from the HOV lane is provided at two intermediate points. These access points occur at the intersection with Stadium Drive East and Reedsdale Street (permitting access to the parking facilities associated with Three Rivers Stadium) and the intersection with Anderson Street and Lacock Street. The HOV lane also has access to the I-279 southbound mainline west of the I-279/I-579 interchange.

The East Street Valley Expressway (I-279) is approximately 2 1/2 miles long and connects the downtown area [Crosstown Boulevard (I-579) and North Shore Expressway (I-279)] with the northern suburbs. This arterial has five lanes (3 northbound, 2 southbound) plus two dedicated HOV lanes located in the median area. One of these three northbound lanes serves as an auxiliary climbing lane. At the northern end of the expressway, a ramp connects an HOV lane to McKnight Road near Evergreen Road. North of McKnight Road, the HOV facility continues as a single lane joining with the HOV lane associated with the North Hills Expressway (I-279).

The North Hills Expressway (I-279) extends approximately 7 3/4 miles from the East Street Valley Expressway north to I-79. This arterial is a four-lane facility (2 northbound, 2 southbound). Auxiliary climbing lanes are provided in two locations. A single dedicated HOV lane is located in the median area for approximately 1/2 mile north of its connection with the East Street Valley HOV lane. A ramp connects this HOV lane to a Park-and-Ride lot at

Perrysville Avenue. This HOV lane also connects (and terminates) with the I-279 mainline just north of the Perrysville Park-and-Ride lot.

Characteristics of the HOV Facility

The I-279/I-579 HOV is approximately 4.1 miles long, one or two lane reversible facility, located within the boundaries of the City of Pittsburgh to the south and Ross Township to the north. Located in the I-279/I-579 median, the HOV lanes are separated from the mainline lanes by concrete traffic barriers. Entrance to and exit from the HOV facility is provided at seven locations. Three locations are located in Ross Township and four in the City of Pittsburgh (Figure 3).

The HOV lanes serve three traffic conditions:

- A.M. and P.M. peak hour flows
- Scheduled special events
- Traffic diversions from I-279

The HOV facility operates on weekend and weekday schedules as shown in Table 1. As observed from Table 1, this facility is not exclusively used for HOV purposes. During weekends and late p.m. and early a.m. hours during the weekdays, the facility operates outbound with no occupancy restrictions. As a HOV facility, carpools, vans, and buses with three or more people per vehicle are authorized to use the facility. Traffic reversal of the HOV lanes is accomplished during the two hour closures after noon and during the pre-dawn hours.

Table 1. Operating schedule for the I-279/I-579 HOV facilities.

Schedule	Operation
Weekend	
8:00 p.m. Friday - 3:00 a.m. Monday	Outbound, no restrictions
Monday thru Friday	
5:00 a.m. - 12 noon	Inbound, 3 or more people per vehicle
12:00 noon - 2:00 p.m.	Closed
2:00 p.m. - 8:00 p.m.	Outbound, 3 or more people per vehicle
8:00 p.m. - 3:00 a.m.	Outbound, no restrictions
3:00 a.m. - 5:00 a.m.	Closed

III. I-279/I-579 PROJECT HISTORY/INSTITUTIONAL ARRANGEMENTS

Early Planning and Design of I-279/I-579 (1955-1981)

Though the four expressway segments described earlier were opened to traffic during the late 1980's, the history of these segments date back to the mid-1950's. On September 15, 1955, the Bureau of Public Roads approved the Pittsburgh Interstate Network. Included was a roadway extending north from the City of Pittsburgh to connect with the Pennsylvania Turnpike near Warrendale.

Planning for this roadway began immediately. Richardson, Gordon, and Associates were contracted with and, in 1957, issued a reconnaissance report, "Limited Access Highway, Interstate Highway System Route 34."[6] This report noted that the topography of the region limited the route of the proposed highway out of the city to the East Street Valley. North of this valley, two corridors were evaluated. Corridor A turned to the northwest following the undeveloped Bear Run Valley while Corridor B followed a generally northern route paralleling the existing McKnight Road/Traffic Route 19 corridor. Corridor A was selected as most desirable.

By 1962, in response to objections from the Allegheny Planning Commission and the Pittsburgh Regional Planning Association, these two corridors were reevaluated by Richardson, Gordon, and Associates.[7] This reevaluation was part of the Pittsburgh Area Transportation Study to develop a total, integrated transportation network for the region.[8] Corridor A (Bear Run Valley) was selected as best fulfilling the needs identified in the regional study.

Final approvals for the planned route (north through the East Street Valley and northwest along the Bear Run Valley) were not obtained until 1981. This 17 year period was characterized by design work and engineering studies, public hearings, realignments and adjustments, and Draft and Final Environmental Impact Statements (EIS). A summary of the primary activities during this time follows.

In May 1964, a public hearing was held regarding the alignment of the I-279 North Hills Expressway.[4] Objections were raised by the Sisters of the Holy Family of Nazareth. The proposed right of way encroached within 220 feet of the Mt. Nazareth Academy and within 70 feet of a planned infirmary. The alignment was revised in 1965 to minimize encroachment on the Academy. However, in 1972, the alignment was again revised to avoid encroachment of Bellevue Memorial Park also located near Mt. Nazareth Academy. The alignment in this area was revised a third time to minimize potential noise impacts on the Mt. Nazareth Academy.

In 1971, Rummel, Klepper and Kahl completed a study for the Pennsylvania Department of Transportation (PennDOT) entitled "Report of Engineering Study, Highway Design and Construction in Unstable Redbed Slope Area."[9] The proposed alignment was modified per the recommendations of this report to avoid the landslide prone Pittsburgh Redbed areas.

As previously discussed, the Final EIS for the East Street Valley Expressway was approved in June 1976. At this point, a ten-lane arterial to connect the Pittsburgh CBD with the northern suburbs was proposed. Concern over funding limitations resulted in the expressway design to be reevaluated by the Pennsylvania Department of Transportation. The reevaluation resulted in a down-sized project to include a six-lane mainline.[10] The reevaluation was completed and approved in November 1979. The 1976 approved plan required the acquisition and demolition of the St. Boniface Church complex. However, in 1978, the St. Boniface Church was added to the National Register of Historical Places. The proposed highway alignment was moved west to avoid the church and church grounds. A Memorandum of Agreement between the Federal Highway Administration and the Advisory Council on Historic Preservation regarding the construction of the East Street Valley Expressway and the St. Boniface Church complex was executed on September 4, 1979.[11]

The incorporation of mass transit features to the East Street Valley Expressway was considered during the design process.[12] The Regional Transportational Plan, dated April 1974, by the Southwestern Pennsylvania Regional Planning Commission (SPRPC) showed a future busway to be located within the median of the proposed East Street Valley Expressway (I-279, Section 3).[13] In accord with the future plans of the regional planning agency, the design for the

East Street Valley Expressway, as described in the Final Environmental Impact Statement (EIS) approved June 1976, called for a facility with provision that the median area could be used for future HOV's, mass transit, or two general purpose lanes.

As discussed in Section II, an EIS for each of the four expressway segments was prepared, reviewed, revised, and, by November 1981, all four segments had been approved. The traffic volumes used to prepare the plans for these segments were provided by the SPRPC. These volumes were based upon the SPRPC's year 2000 adopted highway plan and their Cycle II Network Analysis prepared in October of 1975.[14] The design represented by the four EIS followed the planning studies conducted by SPRPC. A brief summary of the attributes of these four segments, as approved by November 1981, is presented in Table 2.

Table 2. Summary of the attributes of the four expressway segments as approved by November 1981.

Crosstown Expressway

- 4 Lane (2 northbound, 2 southbound)
- Full Interchanges:
  - Bigelow Boulevard -- Downtown
  - I-279 and Traffic Route 28 -- Northside

North Shore Expressway

- 4 Lane (2 northbound, 2 southbound)
- 2 Lane ramp to and from Ohio River Boulevard
- Full Interchanges:
  - Where I-279 and I-579 and Traffic Route 28 converge

East Street Valley Expressway

- 6 Lane (3 northbound, 3 southbound)
- Parallel service road
- Full Interchange:
  - McKnight Road

North Hills Expressway

- 6 Lanes from McKnight to Lowries Run Interchange
- 4 Lanes from Lowries Run Interchange to I-79
- Full Interchanges:
  - Perrysville Avenue
  - Union Avenue
  - Camp Horne Road

Planning and Design of the I-279/I-579 HOV Facilities

The consideration to construct an HOV facility in conjunction with these four expressways was initiated in 1977. In February 1977, the Draft EIS for the North Hills Expressway (I-279, Sections 4, 5, 6, and 7) was distributed to local, state, and federal agencies and public and private organizations for comment. On November 7, 1979, the regional office of the Urban Mass Transportation Administration (UMTA) forwarded its comments regarding the Draft EIS to the Federal Highway Administration (FHWA).[15] The following comments were offered:

(1) The document should describe the existing public transit service in the corridor.

(2) The document should describe the history and current status of planning for major transit capital investments in the North Hills corridor.

(3) The document should consider mass transit components to the project such as high-occupancy vehicle lanes, fringe parking, etc.

(4) The document should consider the impacts of the proposed action on existing transit service in the corridor both during and after construction. Also, no loss of access to transit due to the proposed action should be considered.

In response to the UMTA comments, PennDOT contracted with the consulting firm of Gannett Fleming Corddry & Carpenter to evaluate the feasibility and potential benefits of an HOV facility. The analysis performed was comprehensive in that it examined the potential of HOV laness in the 12 mile corridor comprised of the four expressway segments as defined in their Final or Draft EIS's. This analysis was completed in June 1981.[16] The findings of the study were:

- Right-of-way limitations do not permit HOV lanes in the Crosstown Expressway and the I-279/I-579 Interchange.

- HOV lanes could be provided within the East Street Valley Expressway, but would have to terminate in the area of North Avenue, approximately 1 1/2 miles north of the Pittsburgh CBD, because of the previous limitation.

- The addition of HOV lanes to the East Street Valley Expressway (approximately 2 miles in length) would result in some improvement in the level of service. The magnitude of this improvement would be a function of the transfer of ridership to carpools, vanpools, and transit service.

- The addition of HOV lanes to the East Street Valley Expressway would result in minimal time savings to the southbound (a.m.) peak hour traffic.

- The addition of HOV lanes to the East Street Valley Expressway would result in a time savings of 1 to 2 minutes to the northbound (p.m.) peak hour traffic.

- Adequate levels of service are provided by the North Hills Expressway. However, if HOV lanes are to be provided in the East Street Expressway, consideration should be given to extending HOV lanes north into the North Hills Expressway to Perrysville Avenue.

- The provision for HOV lanes could result in an annual savings of 200,000 to 300,000 gallons of fuel by comparing the annual fuel consumption of buses with the equivalent passenger vehicles.

- To construct separate HOV lanes in the median of the East Street Valley Expressway from the McKnight Road interchange to North Avenue would cost an estimated $12 million (1981 dollars).

- To extend the HOV lanes to the Perrysville Interchange of the North Hills Expressway would cost an estimated $4.5 million (1981 dollars).

As the findings of the study became available, meetings were held on March 5, 10, 30, and May 21, 1981 between PennDOT, UMTA, SPRPC, and the Port Authority of Allegheny County (PAT) to review the findings and reach a consensus. The consensus, as incorporated into the Final EIS for the North Hills Expressway (I-279 Sections 4, 5, 6, and 7), was:

> "...the study determined that HOV lanes cannot be provided within L.R. 1026 (Crosstown Boulevard) and L.R. 1021, Section 2 [I-279/I-579 Interchange] as currently designed. Levels of service and potential energy savings do not warrant HOV lanes within L.R. 1021 Sections 4, 5, 6, and 7 [North Hills Expressway], north of Perrysville Avenue. Present design, however, does not preclude future consideration of HOV lanes on this section. The potential for HOV lanes does exist for L.R. 1021 Section 3 [East Street Valley Expressway] and the half mile section of L.R. 1021 Section 4 [North Hills Expressway] between McKnight Road and Perrysville Avenue. This potential and the feasibility of providing HOV lanes in all Sections will be reassessed during the final design of these projects, in

consultation with UMTA, the Port Authority of Allegheny County, and the Southwestern Pennsylvania Regional Planning Commission."[4]

The Final EIS for the North Hills Expressway (I-279 Sections 4, 5, 6, and 7) was approved on September 28, 1981.

Also during 1981, the Construction Cost Estimate for the four remaining expressways was completed by PennDOT. The estimated cost to complete the projects as proposed was approximately $550 million.[5] PennDOT determined that adequate funding would not be available to complete the four expressways as proposed. To assist in establishing priorities for the region with respect to spending the available funding, a task force, known as "The Pittsburgh Interstate Highway Committee Policy Group," was assembled.[10] Local, state, and federal officials and concerns were represented on this task force as shown in Table 3. The mission of this task force was to examine the four expressways as proposed, and recommend that they be built, revised, and/or eliminated.

Table 3. Pittsburgh Interstate Highway Committee Policy Group.

Committee Membership
Department of City Planning, Pittsburgh
Department of Planning, Allegheny County
Pennsylvania Department of Transportation
Port Authority of Allegheny County
Southwestern Pennsylvania Regional Planning Commission
The Federal Highway Administration
Greater Pittsburgh Chamber of Commerce
Allegheny Conference
Urban Mass Transportation Administration

In March 1981, the findings of Gannett Fleming Corddry & Carpenter were presented to the task force. These findings were incorporated by PennDOT into the Final EIS for the North Hills Expressway (I-279 Sections 4, 5, 6, and 7) as described earlier. On May 5, 1981, PAT forwarded a memorandum to the Interstate Highway Committee.[17] This memorandum cited information that supported PAT's position that HOV lanes in the I-279 Corridor would provide an opportunity to improve the level of service, while additionally promoting the use of transit,

carpools, and vanpools. Their analysis, in contrast to Gannett Fleming Corddry & Carpenter, showed a marked improvement in the level of service of the East Street Valley Expressway in the year 2000 from an E or F to a C or D.

To assist the Interstate Highway Committee in completing its mission, PennDOT contracted with Patrick J. Athol & Associates in 1981 to advise the Committee on recommendations that would be compatible with agency priorities and available funding for western Pennsylvania. Athol & Associates began their study in May 1981 and in December 1982 released "Implementation Assessment of Interstate 279 and 579 in Western Pennsylvania."[18]

The study approach pursued by Athol & Associates was to use the design presented in the four EIS's as their basis, and to modify this design only where improvement in operations could be traded for reduced capital costs. With respect to HOV lanes, the final report notes that, "The issue of HOV operations was brought into the design concept to provide preferential treatment of High Occupancy Vehicles (HOV), thereby encouraging commuter traffic and minimizing vehicular travel, fuel consumption, and emissions." In performing their study, Athol & Associates reviewed the prior studies, met with the members of the Interstate Highway Committee and their staffs, considered additional traffic assignments performed by SPRPC, and performed an operational critique of the EIS designs.

Two alternatives, commensurate with the available funding, were initially considered. The first was to drop high cost links in the system. However, when applied to the Pittsburgh network, insurmountable problems occurred in the other links. The other alternative, and the one pursued, was to provide a minimum cost highway network adequate to meet the projected traffic demands in the area. As discussed previously, the four expressway segments were designed in conformance with the planning activities performed by the SPRPC using traffic volumes projections prepared in 1975. To assist Athol & Associates and the Interstate Highway Committee, SPRPC had prepared new projected traffic volumes estimates (March, 1982) for a Pittsburgh roadway network comprised of the existing roadways, the roadways as shown on the 1980 to 1986 Transportation Improvement Program (TIP), and those projects listed on the PennDOT Twelve-Year Program -- Stage I and Stage II.[18] Furthermore, SPRPC additionally

considered the impact of HOV lanes on the traffic assignments. In general, the revised traffic volumes were 20 to 30 percent lower than the volumes in the Final EIS's.[5] In August 1982, the regional TIP was adopted by SPRPC.[19] The TIP continued to promote the construction of all four proposed expressways.

The final report prepared by Athol & Associates offered recommendations regarding the network as a whole, and addressed several individual components of the network. These recommendations included:

- A complete interstate network as described in the four EIS documents should be provided. Capital cost reductions can be realized through changes in the design features, ramps, and cross-sections of the system.

- Design the I-279/I-579 interchange as a half interchange. Omit the Convention Center and Crosstown Boulevard Bridge interchange. Revise the Bigelow Boulevard and Crosstown Boulevard Bridge interchange.

- Provide a two-lane, separated, and reversable HOV roadway on the East Street Valley Expressway and the Crosstown Boulevard Bridge with connections to the North Shore Expressway. Also provide for direct HOV access to the Ninth Street Bridge, and HOV ramps to the Civic Arena and the Three Rivers Stadium parking areas.

- Design the HOV lanes with flexibility to respond to changes in traffic demand. Design the cross-sections on the basis of 12 foot modules which will allow for the interchange of shoulders and lanes. It would only require moving the median barriers to implement these changes.

- Design the East Street Valley Expressway with two lanes southbound and three lanes northbound.

The study also noted the need to develop an operating plan for the HOV lanes (during the design phase) to allow sufficient time for control equipment and instrumentation to be included in the final construction documents.

The recommendations of Athol & Associates resulted in a preliminary estimated reduction in capital expenditures of $150 million (1981 dollars) to construct the four expressways. The

recommendations of the Athol & Associates study were accepted by the Interstate Highway Committee and on December 13, 1982, PennDOT released a Draft Supplemental Environmental Impact Statement for comment. This Draft was a supplement to the previously approved EIS's for the four expressway segments. It included the HOV system, per the recommendations presented by Athol & Associates, and presented the four remaining interstate expressways in the Pittsburgh region as a single comprehensive project.

The Draft Supplemental Environmental Impact Statement was distributed to more than 50 agencies and organizations (Table 4) representing local, state, and federal concerns.[5] Several agencies provided written comments regarding the incorporation of HOV lanes into the I-279/I-579 project. The Pennsylvania Department of Community Affairs commented that the HOV lanes would not be as effective as planned.[20] However, UMTA provided support for the HOV plan, though they noted that the parking components needed further definition.[21] The Port Authority of Allegheny County (PAT), which participated in the Interstate Highway Committee Policy Group, also provided support for the HOV concept.[22] However, they also called for an additional Park-and-Ride facility, preferably near the McKnight Road Interchange, in addition to the proposed Perrysville facility.

A public hearing on the Draft Supplemental EIS was held on February 3, 1983, with over 24 agencies and individuals giving testimony. Following the public hearing, PennDOT conducted additional meetings with the groups listed in Table 5 to explain and/or resolve outstanding issues. Of these groups, those associated with the Three Rivers Stadium and the Civic Arena expressed concern regarding the revised design's access to and from these facilities. PennDOT responded that the use of the HOV lanes for events being held at these facilities would be considered.

Table 4. Distribution list of agencies and organizations for the Draft Supplemental Environmental Impact Statement.

*U.S. Department of Transportation
*U.S. Coast Guard
*U.S. Department of Agriculture Soil Conservation District
*Environmental Protection Agency
*U.S. Department of Housing and Urban Development
*U.S. Department of Interior
U.S. Department of Energy
*U.S. Fish and Wildlife Service
*Urban Mass Transportation Administration
*U.S. Army Corps of Engineers
U.S. Department of Commerce
*Federal Emergency Management Agency
*Pennsylvania State Clearinghouse
*Pennsylvania Department of Agriculture
*Pennsylvania Department of Community Affairs
Pennsylvania Fish Commission
*Pennsylvania Game Commission
*Pennsylvania Historical and Museum Commission
*Pennsylvania Department of Environmental Resources
Pennsylvania Human Relations Commission
Pennsylvania Council of the Arts
*Pennsylvania Department of Aging
*Southwestern Pennsylvania Regional Planning Commission
Appalachia Regional Commission
Southwestern Pennsylvania Economic Development District
*City of Pittsburgh
*Allegheny County Department of Planning and Development
*Allegheny County Port Authority
North Hills Council of Governments
Borough of West View
Borough of Franklin Park
*Ross Township
Town of McCandless
Ohio Township
Pittsburgh History and Landmarks Foundation
Ohio River Basin Commission
North Area Environmental Council

* Provided written comments and/or presented testimony at the February 3, 1983 Public Hearing

Table 4. Distribution list of agencies and organizations for the Draft Supplemental Environmental Impact Statement (continued).

Audubon Society of Western Pennsylvania
Council on Environmental Quality
Consolidated Rail Corporation
Western Pennsylvania Conservancy
Western Pennsylvania Wheelmen Ltd.
St. Boniface Church Council
*League of Women Voters
*GASP (Group Against Smog and Pollution)
*CRUSH (Citizens Resisting Unnecessary & Senseless Highways)
Hill District Project Area Committee, Inc.
*East Allegheny Community Council
Energy Impact Associates
Schweigert and Associates
Luke and Anthony Law Offices
Allegheny Branch of the Carnegie Library
Jackson Seay Association
TRW Energy
Eight Individuals
* Provided written comments and/or presented testimony at the February 3, 1983 Public Hearing

Table 5. Organizations and agencies that the Pennsylvania Department of Transportation conducted additional meetings with following the February 3, 1983 Public Hearing.

Pittsburgh Steelers, Pirates, and Stadium Authority
Pittsburgh Penguins
East Allegheny Community Council
City of Pittsburgh
Mt. Nazareth Academy
League of Women Voters
Pennsylvania Game Commission

The Final Supplemental Environmental Impact Statement was subsequently approved. Though the HOV lanes were to terminate just north of the Perrysville exit, the design of I-279 continuing north has no median piers so HOV lanes could be extended at some point in the future.[10] The I-279/I-579 HOV facility was placed in service in September 1989.

Operation of the I-279/I-579 HOV Facilities

With the approval of the Draft Supplemental Impact Statement, design work for the four expressway segments was able to proceed. Athol & Associates was retained to prepare the functional design and operating plan for the HOV portion of the project. On October 15, 1984, Athol & Associates released the report, "Interstate 279 HOV Operations" to the Pennsylvania Department of Transportation.[23] The purpose of the report was to "establish an operating plan by identifying control measures and enforcement procedures required to ensure safe and efficient operations of the HOV lanes." The report recommended that the HOV lanes be operated in the following manner:

- Schedule/Implementation Strategy:

    1. Peak-Period Operation

        Morning: 7:00 to 9:00 a.m.
        Evening: 4:00 to 6:00 p.m.

    2. HOV lanes closed to HOV and non-HOV traffic at all other times.

    3. After three months experience with the HOV lane operation, to use the HOV lane for traffic diversion around major incidents causing severe congestion and genuine hazards on the mainline roadway.

    4. After three months successful operation of the HOV lane, to use the HOV lanes for HOV traffic only to and from special pre-planned events.

- Vehicle type: Buses, carpools.

- Occupancy: Minimum of three per vehicle.

The occupancy recommendation was based on local car occupancy patterns and future considerations. Athol & Associates noted that, in general, when car occupancy patterns are low (<1.2), two occupants per vehicle for HOV operations are recommended. Where the car occupancy is 1.4 or greater, four occupants per vehicle are recommended. The report notes that for the Pittsburgh area, two occupants per vehicle would be appropriate for the HOV operation. However, the final HOV occupancy criterion recommendation of three was based on Athol & Associates' opinion that this criterion would serve the Pittsburgh area well into the future.

The report also presented an examination of alternative operational plans for the HOV lanes including a manual system, a fully automated system, and a mixed system. Athol & Associates recommendation to PennDOT was to install an electronic control system for the HOV lanes including gate control, an electronic surveillance system, and a staffed, control center facility.

With respect to implementation of the control system, the report outlined a two-staged implementation plan. In Stage I, the HOV lanes would be operated using manual procedures to allow completion of the expressway system and to permit PennDOT time to monitor and adjust the operation of the HOV system time. Once the system had stabilized, Stage II, the fully automated control system, would be implemented.

Athol & Associates continued refinement of the operational plan for the HOV lanes. By November 1986, Athol & Associates released two reports to the Pennsylvania Department of Transportation. The first report, "Interstate 279 HOV Lanes - Functional Design," was an extension of the previous report, "Interstate 279 HOV Operations," released in 1984.[24] This report addressed "the Stage I implementation of manual HOV lanes control incorporating cost effective design provisions made for the Stage II automatic HOV lane control operations."

The second report, "Interstate 279 HOV Lanes - Operating Plan," was to "serve as a guideline to the Department in the steps needed to operate the manual control system, the training of Department personnel, and to identify agreements with other operating groups."[25] Included in this report were discussions on construction management, start-up, operations,

enforcement, maintenance, and institutional requirements. The hours of proposed operation of the HOV lanes, the limitations on vehicle type, and occupancy requirements, were as recommended in the 1984 report. With respect to the Stage I manual operation, the plan called for three individuals to operate (open, close) the system. These three consisted of one supervisor and two operators. The operators would each be equipped with a tow truck to facilitate removal of disabled vehicles.

The report also identified groups with which the Department of Transportation should meet to establish interagency relations regarding the operation of the HOV. These groups were:

- Pennsylvania State Police
  - -- Carnegie District
- Allegheny County Commissioners
  - -- Highway Department
- City of Pittsburgh
  - -- Police Department
  - -- Public Works Department
  - -- Paramedic Services
  - -- Emergency Services
- Ross Township
  - -- Police Department
  - -- Emergency Services
- Port Authority of Allegheny County
  - -- Operations and Schedules
  - -- Towing Services

- News and Information Media

  -- Television Stations
  -- Radio Station
  -- Newspapers
  -- Community Groups

The Operating Plan and Functional Design reports were submitted by PennDOT to the FHWA on January 6, 1987. These reports were accepted by FHWA on April 1, 1987, with comments.[26] The FHWA comments included the need for PennDOT to identify procedures to operate the HOV after special events, and the need for an agreement with the State Police to provide enforcement and patrol of the HOV facilities.

With submittal of the Operating Plan and Functional Design to the FHWA, increased interest and involvement by PennDOT maintenance and traffic operations personnel became evident. On March 3 and 4, 1987, the PennDOT District Engineer for Maintenance, the District Traffic Engineer, the County Maintenance Manager, and the Tunnel Supervisor visited the Shirley Highway, Virginia to observe the HOV operation of this highway.[27] On April 10, 1987, PennDOT called for a meeting between PennDOT and local organizations to discuss HOV operations. This meeting was held on May 8, 1987. The organizations and agencies represented are summarized in Table 6. The major points agreed upon were:[28]

- Usage of the HOV lanes for special events is much more critical and important for the outbound movement than the inbound movement.
- A consistent weekly schedule should be agreed upon and adhered to.
- Preference to operate the HOV lanes for 20 out of 24 hours with closure only due to the reversal of direction twice a day. This operation is similar to the operation used on the Shirley Highway in Washington D.C.
- Appeared to be general agreement that the HOV lanes would be used in an a.m. peak-hour period of 7 to 9 and a p.m. peak-hour period of 4 to 6.

Table 6. Agencies and organizations that participated in a review of HOV operations.

Allegheny County Department of Maintenance
Stadium Authority of the City of Pittsburgh
Pittsburgh Chamber of Commerce
Pittsburgh Pirates
Pittsburgh Steelers
City of Pittsburgh, Department of Public Works
City of Pittsburgh, Department of City Planning
Civic Arena Corporation
Port Authority of Allegheny County
Golden Triangle Association
City of Pittsburgh, Department of Engineering & Construction
GAI Consultants
Pennsylvania Department of Transportation

On September 16, 1988, a second meeting with these organizations and agencies was conducted to reach a consensus regarding the operation of the HOV lanes. The major points discussed were:[29]

- The Pittsburgh Pirates indicated that to use the HOV lanes in an unrestricted fashion inbound for special events presented no major advantage. However, they did indicate that the unrestricted usage of the HOV lanes following special events was advantageous. The general consensus of the group was in agreement with this proposal. It was agreed that the HOV would not be used inbound for special events unless an advanced 30-day written notice to PennDOT was provided.

- PennDOT noted that the HOV would need to be closed for two hours to facilitate traffic reversal. The discussions regarding the operating schedule for HOV concluded that the HOV lanes would operate from 5:00 a.m. to noon inbound, and from 2:00 p.m. to 3:00 a.m. outbound.

- Additional discussion, with input particularly from the Pittsburgh Pirates, resulted in agreement that the HOV lanes would operate in an unrestricted manner from 8:00 p.m. to 3:00 a.m.

- Further discussion resulted in agreement that the HOV lanes would operate in an unrestricted, outbound only, manner during the weekends.

With respect to providing enforcement capabilities on the HOV lanes, on November 7, 1988, PennDOT held a meeting with the Pennsylvania State Police. At this meeting, the position taken by the State Police was that the enforcement activities would be performed by the local police and not State Police.[27] On November 30, 1988, Athol & Associates released a Draft Incident Management Procedures report.[30] This report defined the State Police having overall enforcement responsibility for the HOV lanes. The report called for the Ross Township Police Department to provide patrols of the Perrysville Park-and-Ride facility.

On January 4, 1989, a meeting was held between PennDOT and the State Police, Ross Township police, and the City of Pittsburgh police to review incident management and occupancy enforcement.[31] All three police groups cited lack of funding to provide patrols of the HOV lanes. Ross Township noted no objections to provide patrols of the Perrysville Park and Ride lot. On January, 24, 1989, PennDOT forwarded a letter to the State Police expressing the opinion that since the HOV lanes are limited access highway, the State Police should be the agency providing enforcement.[32] The State Police currently patrol the HOV facilities.

On April 18, 1989, PennDOT forwarded a revised operating plan to the FHWA for approval.[33] The revised operating plan reflected the operating schedule developed during the meetings PennDOT held with the various local agencies and organizations. The revised plan stressed the importance of these meetings in developing a spirit of cooperation necessary for the success of the HOV lanes. Specifically, the report noted the following aspects that strongly influenced PennDOT's revision of the operating schedule:

- To use the HOV for four hours of the day, as originally proposed, versus the revised 20 hours per day would appear to the public to be a waste since these lanes would be idle most of the day.

- The Pittsburgh Pirates belief that the unrestricted use of HOV following a baseball game is an important factor in drawing sufficient spectators to the games in order to maintain the team in Pittsburgh.

The second major change as presented in the revised operating plan dealt with the manner of operation of the HOV lanes. The original plan stressed the necessity of a fully automated

system. The revised plan noted that the need for implementation of Stage II (automatic HOV control system) would only follow evaluation of the effectiveness of the manual system. Revisions to the manual system were also addressed in this revised plan. The original plan called for three individuals being required to reverse the HOV lanes operation. The revised plan called for the following personnel and equipment:

- One full-time employee (with necessary backups) for two hours (total of 4 hours) to reverse the HOV lanes.
- Additional personnel to provide assistance as needed for:
  - -- Supervision and assignment of operation personnel
  - -- Traffic engineering reviews and related decisions
  - -- Tow truck maintenance
  - -- Administration of maintenance contracts
  - -- Roadway maintenance
  - -- Public information program
- PennDOT will provide one radio equipped tow truck for four hours each day for the reversing of the HOV lanes.

The revised manual system resulted in a net decrease in two individuals and one tow truck to facilitate the reversal of the HOV lanes as compared to the originally proposed manual plan.

The revised operating plan was approved by FHWA on August 16, 1989. The HOV lanes were placed in service in September 1989.

IV. OTHER PITTSBURGH-ALLEGHENY COUNTY HOV FACILITIES

The I-279/I-579 High Occupancy Vehicle (HOV) facility was the first multi-modal HOV facility for the Pittsburgh-Allegheny County region. Its purpose was to encourage carpooling, vanpooling, and mass transit ridership. Though the region does not have other multi-modal HOV facilities, several other facilities to encourage transit ridership do exist. These facilities include two exclusive busways and several lanes in the downtown area reserved exclusively for buses. The two busways are referred to as the Martin Luther King, Jr. East Busway and the South Busway (see Figure 4).

The busways were the result of the rapid transit planning activities of the mid-to-late 1960's.[34] Both busways are operated by the Port Authority of Allegheny County (PAT). They exist as separate facilities from the highway network. They are intended for bus service exclusively, though emergency vehicles are permitted to use the facilities. Enforcement is provided by PAT, which also has a contract for enforcement with the Allegheny County Sheriff's Office.

The Martin Luther King, Jr. East Busway was opened in February 1983 and serves the downtown Pittsburgh area, the East End, and the Eastern suburbs of Allegheny County. The mainline of the busway extends in the east from Wilkinsburg to the Pittsburgh CBD. The busway mainline was constructed within one-half of a Conrail right-of-way and is 6.8 miles in length. Conrail still has track facilities within the other half of this right-of-way. Along the busway mainline, six stations are located to pick-up and discharge passengers. Beyond the mainline at Wilkinsburg, 20 park-and-ride lots are dispersed and served by express bus routes. The bus ride from the Pittsburgh CBD to Wilkinsburg is approximately 9 minutes for express trips and 13 minutes for local trips. During peak-hour, a non-bus trip from the Pittsburgh CBD to Wilkinsburg via the highway network requires approximately 45 minutes. This facility currently carries 31,500 weekday riders.

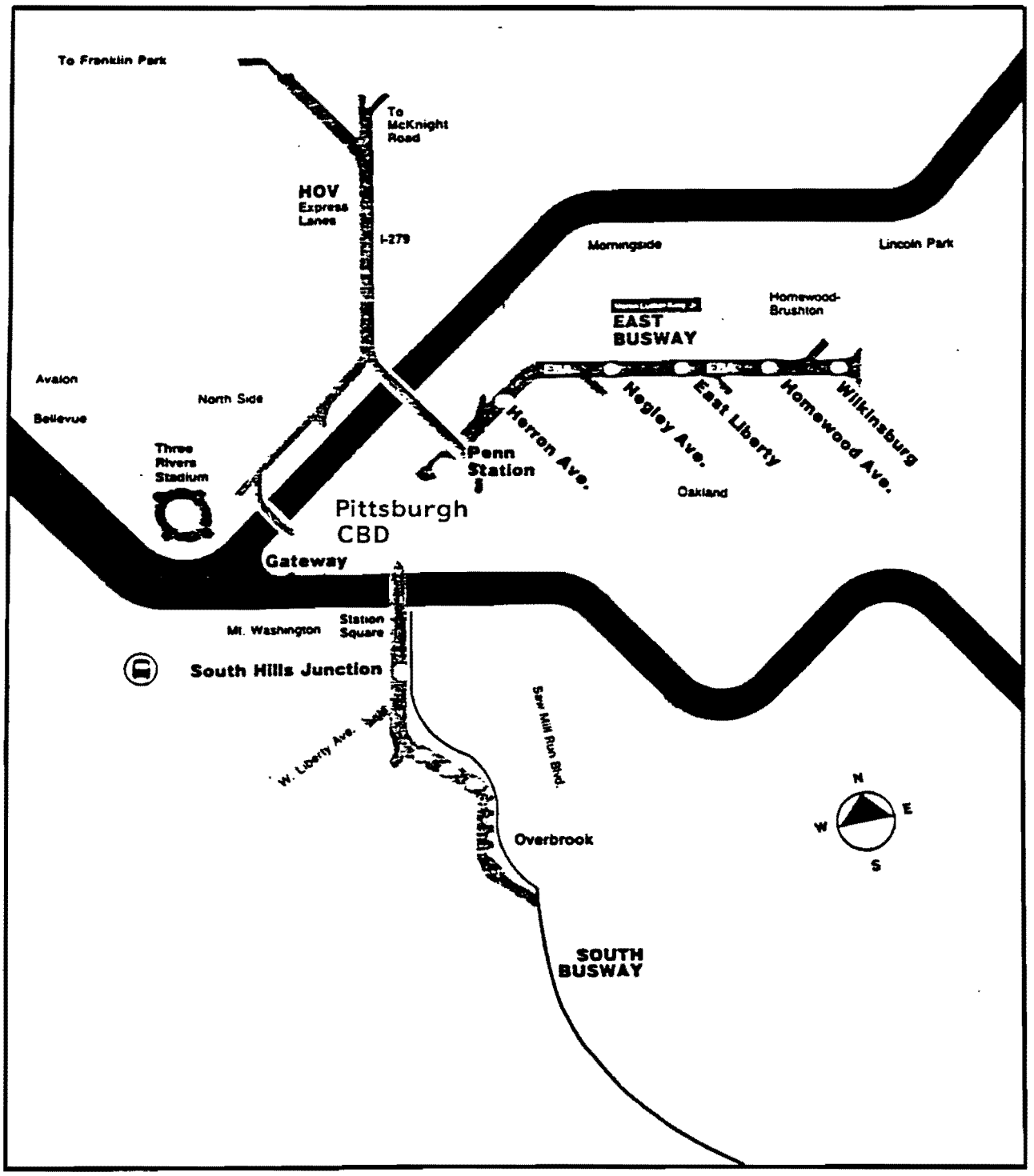


Figure 4. Relationship of the East and South Busway to the Pittsburgh-Allegheny County region

The South Busway opened in December 1977 and serves downtown Pittsburgh and the South Hills neighborhoods and suburbs. There are 11 stations along its route to facilitate the pick-up and discharge of passengers. The busway is approximately 4.0 miles in length and currently carries 16,000 weekday riders.

In addition to the busways, an additional feature to assist transit are several exclusive buslanes along the local street network. The first buslane was designated in 1972. To date, exclusive buslanes exist on five streets, four of which are in the downtown Pittsburgh area. Enforcement activities are performed by the City of Pittsburgh police.

V. OBSERVATIONS

The four expressways required nearly 35 years of planning, design, hearings, redesign, and approvals before the public was able to derive a benefit. Approximately 25 years had past before the inclusion of HOV lanes became a reality. A time line of the major events of the I-279/I-579 project is presented in figure 5. The thrust to include HOV lanes appears attributed to all levels including local, state, and federal. The initial push for HOV lanes came from UMTA in the late 1970's by way of their comments on a Draft Environmental Impact Statement. Their comments reflected the policies at the time that programs and projects to promote ridesharing and mass transit can decrease expressway traffic, travel time, energy consumption, and create the potential for improved air quality.

During the early 1980's, PennDOT realized that inadequate funding existed to finance the expressways as proposed. A need to redefine or rescope the expressways was required. A task force of local, state, and federal agencies and organizations was formed. With additional study of the problem and potential solutions, a compromise was defined for a downscaled project that still included all four expressways but also included HOV lanes.

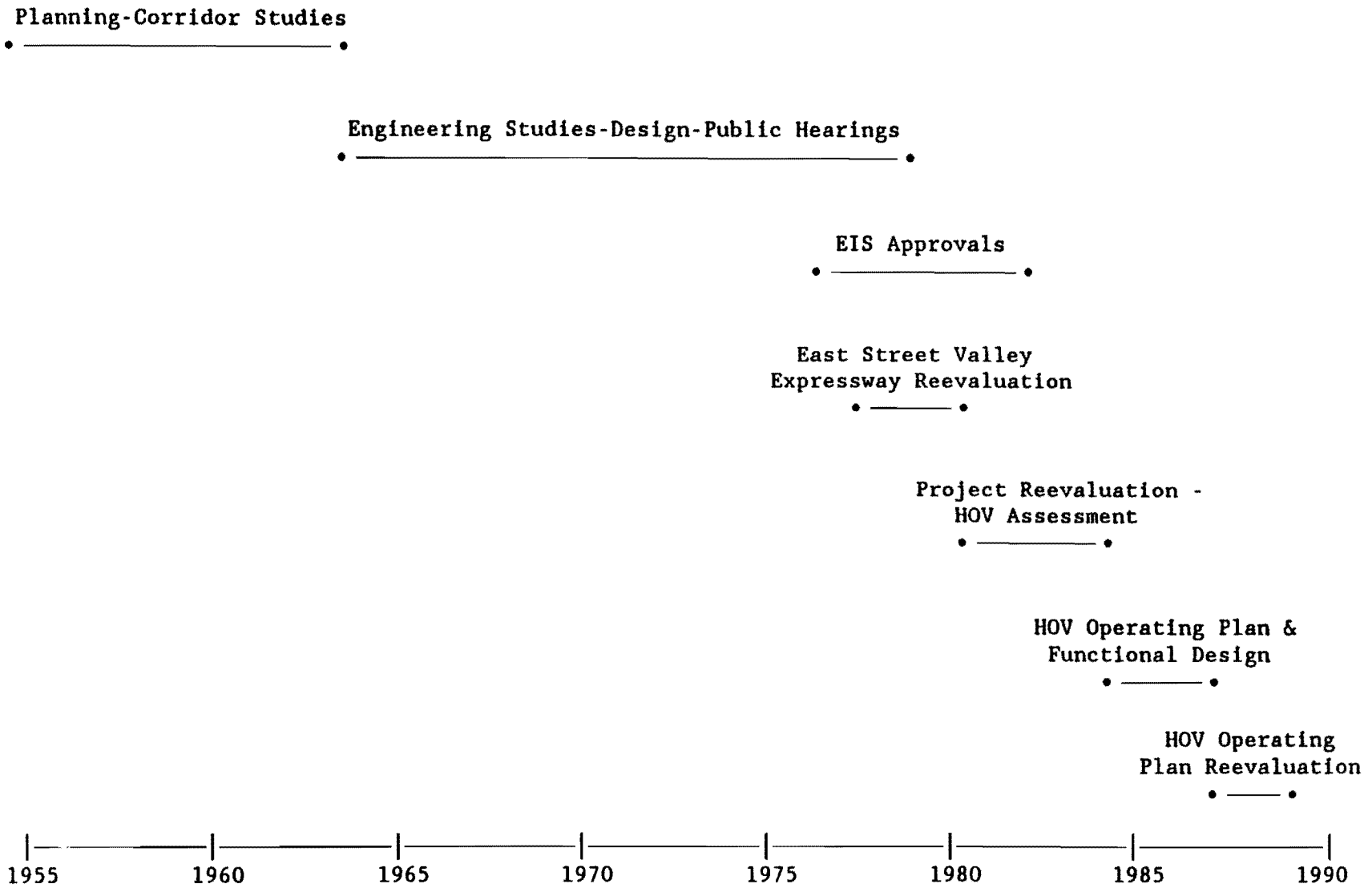


Figure 5. Time line of the major events of the I-279/I-579 project.

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APPENDIX A

AGENCIES, ORGANIZATIONS, AND COMMUNITIES INVOLVED IN THE I-279/I-579 HOV FACILITY

The following is a listing of the agencies, organizations, and communities involved in the I-279/I-579 planning and design process. A brief description of the roles and responsibilities of each is noted.

Allegheny County. The North Shore, Crosstown, East Street Valley, and North Hills Expressways are all located within this county. Representatives from the Department of County Planning and the Department of Maintenance were involved in various aspects of the project.

City of Pittsburgh. Second only in Pennsylvania to Philadelphia in population, most of the HOV system resides within its borders. Representatives from the Department of City Planning, the Department of Public Works, and the Department of Engineering and Construction were involved in various aspects of the I-279/I-579 project.

Federal Highway Administration (FHWA). FHWA is part of the U.S. Department of Transportation and is the agency responsible for the federal highway system.

Pennsylvania Department of Transportation (PennDOT). PennDOT was created by the State Legislature in 1969 with the merging of the Department of Highways with other state transportation departments. PennDOT and the former Department of Highways were the lead agency for the I-279/I-579 project.

Pennsylvania State Police. The Pennsylvania State Police is responsible for traffic enforcement activities on the state highway system. The State Police became involved in the I-279/I-579 project during the development of the Incident Management Procedures and remains active as the enforcement agency responsible for I-279/I-579.

Pittsburgh Interstate Highway Committee Policy Group. Task force created in 1981 consisting of representatives of PennDOT, FHWA, UMTA, Pittsburgh Department of City Planning, Allegheny County Department of Planning, Port Authority of Allegheny County, Pittsburgh Chamber of Commerce, the Allegheny Conference on Community Development, and the Southwestern Pennsylvania Regional Planning Commission. The purpose of this task force was to review the expressway designs as proposed and recommend they be built, revised, and/or eliminated.

Port Authority of Allegheny County (PAT). PAT is the public transit operator in the Pittsburgh/Allegheny County area. Representatives of PAT were actively involved in various aspects of the project. PAT also has constructed and currently operates two exclusive busways in the Pittsburgh/Allegheny County region.

Ross Township. Ross township is located along the I-279 corridor. The northern fringe of the HOV resides within the township. Ross Township Police Department provides police patrols of the Perrysville Park and Ride facility.

Southwestern Pennsylvania Regional Planning Commission (SPRPC). Established in 1962, SPRPC is the designated Metropolitan Planning Organization (MPO) for the six-county southwestern Pennsylvania area. This organization develops and updates a comprehensive transportation plan and Transportation Improvement Program (TIP) for the area. The SPRPC was active in the I-279/I-579 project providing traffic forecasts and assisting in the overall planning process.

Urban Mass Transportation Administration (UMTA). UMTA is part of the U.S. Department of Transportation. UMTA is the transit counterpart to FHWA. UMTA is the agency responsible for financing public transit systems, including planning activities, operating costs, and capital elements. UMTA's comments regarding the need to consider HOV for I-279/I-579 in the late 1970's was instrumental in the initiation of the HOV initiative.

HISTORY AND INSTITUTIONAL ARRANGEMENTS:
HOV Facilities in the Seattle Area

G. Scott Rutherford, Ph.D.

I. DESCRIPTION OF EXISTING HOV LANES

Overview

Since 1968 and 1970, when Puget Sound area voters turned down ballot measures to fund the development of rapid rail transportation, high occupancy vehicle (HOV) transportation has become an integral part of the Puget Sound region's transportation system plans. The HOV lanes and system components such as park-and-ride lots and HOV ramps promise near-term mobility for an increasingly congested urban area. A recent report by a multi-agency HOV task force published in February of 1990 provides an excellent overview of the existing high occupancy vehicle system in the Puget Sound Region. (1) Much of this report is summarized in the following paragraphs.

HOV Lanes

Figure 1 shows the currently implemented and planned HOV lanes in the Puget Sound region. Approximately 49 lane-miles are now open to the public, 49 miles are under construction, and another 181 lane-miles are envisioned to serve the region by the year 2000 if funding permits. These lanes are on most major freeway facilities, and they are also on several important arterial roadways to help complete the HOV network.

Park-and-Ride Lots

Park-and-ride and park-and-pool lots currently provide space for 20,200 vehicles in the Puget Sound area. These spaces are in 128 lots, as shown in Figure 2. Plans call for another 12,500 spaces by the year 2000.

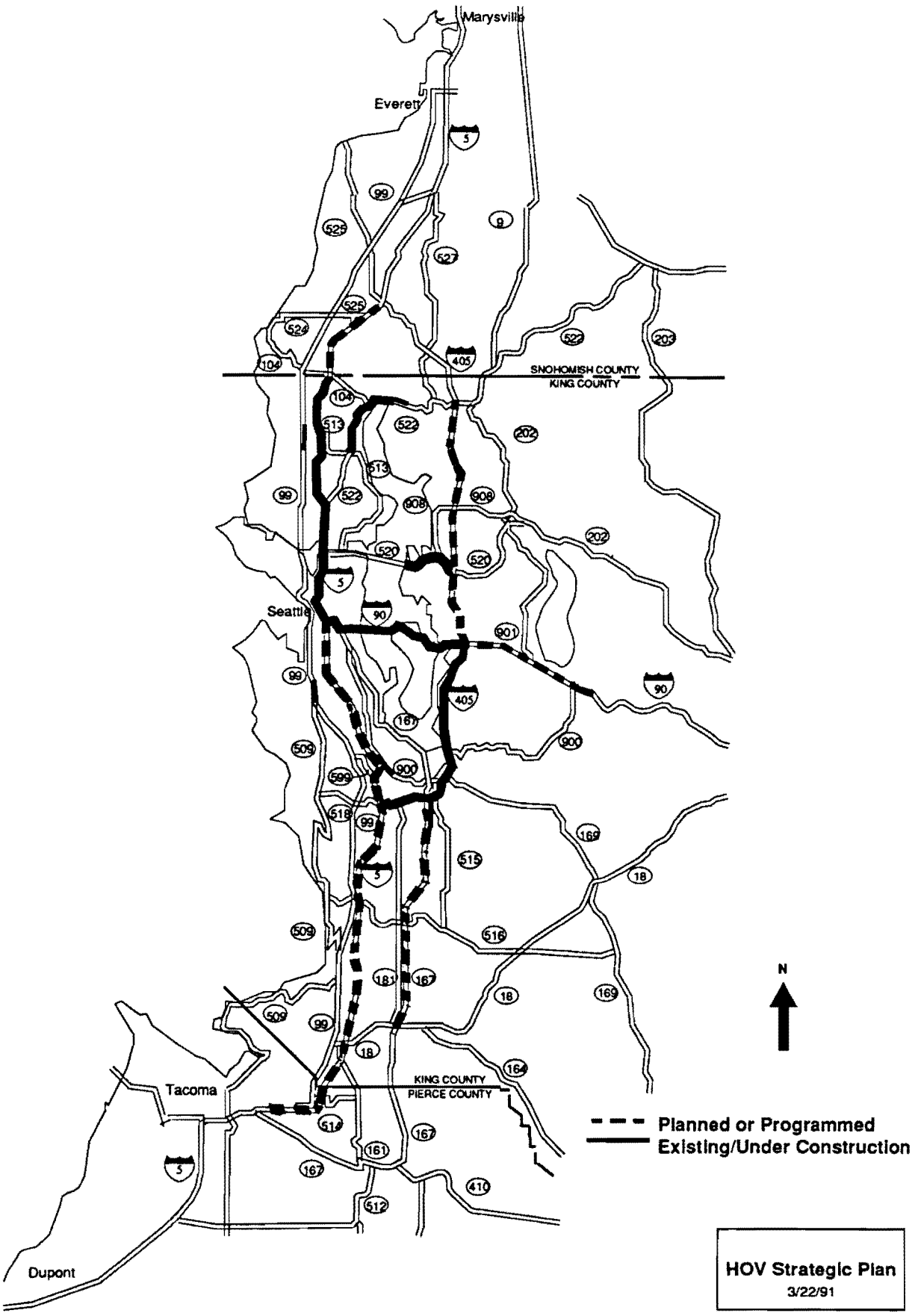

Marysville
Everett
SNOHOMISH COUNTY
KING COUNTY
Seattle
Tacoma
KING COUNTY
PIERCE COUNTY
Dupont
N
Planned or Programmed
Existing/Under Construction
HOV Strategic Plan
3/22/91

Figure 1

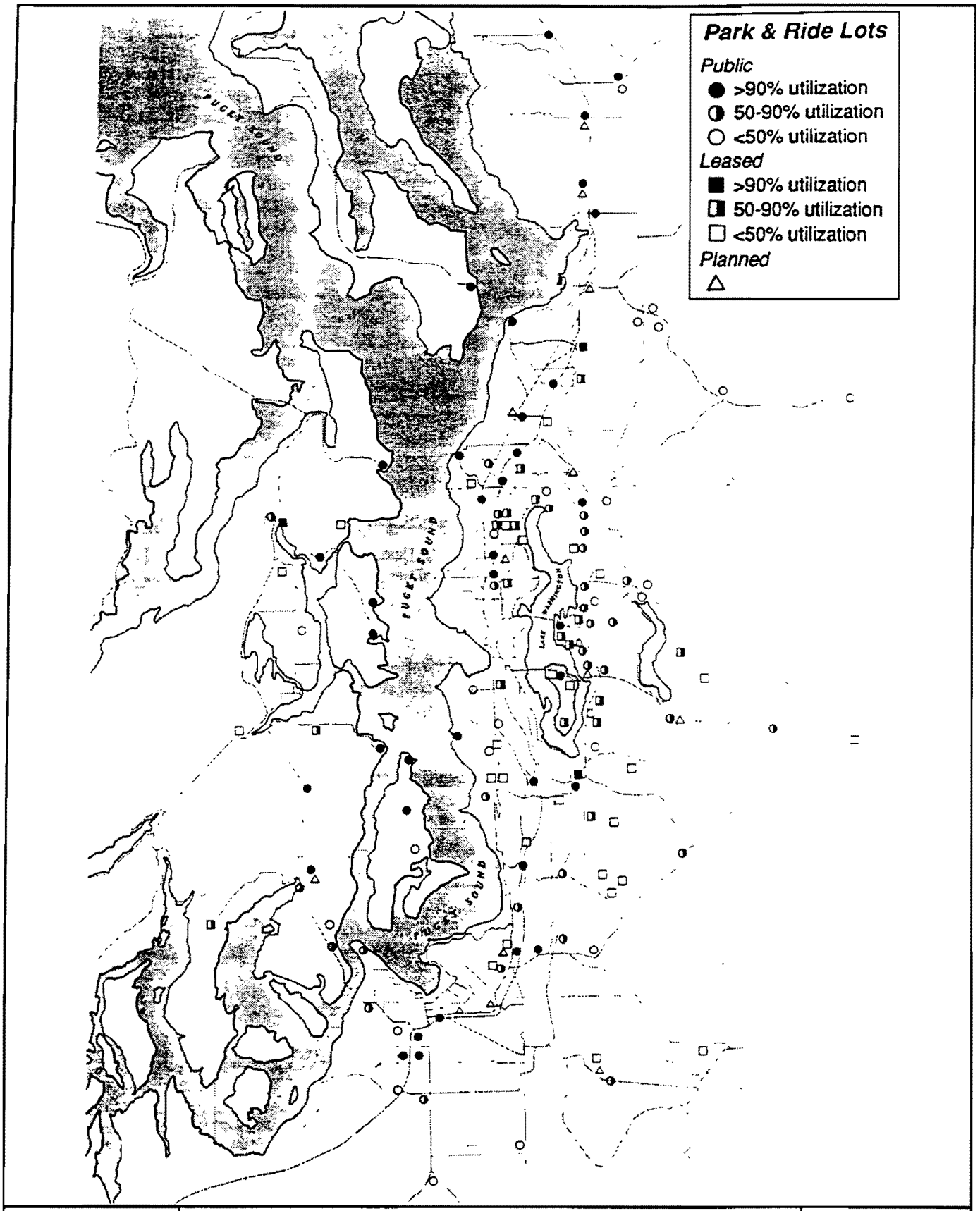


Figure 2 (Reference 1)

Transit/Carpool Ramps

Special transit carpool ramps serve several freeways in the region, including I-5 in downtown Seattle, I-405 in downtown Bellevue, and SR 520. These are shown in Figure 3. Additional HOV ramps are planned for I-5 and I-90.

Meter Bypass Ramps

Ramp meters on the region's freeways provide an excellent opportunity for HOV bypasses. As shown in Figure 3, twelve such bypass ramps now exist, and the Washington State Department of Transportation (WSDOT) plans to provide additional metered bypasses on I-5 and SR 520.

Flyer Stops

Special pullouts on freeways allow buses to quickly pick up and drop off passengers on I-5, I-405, SR 520, and SR 525. These facilities are shown in Figure 4.

Transit Centers

Numerous transit centers provide convenient locations for buses operating on coordinated schedules to transfer patrons. Many more are proposed. Figure 4 identifies the location of existing and proposed transit centers.

Dedicated Interchanges

In 1989 WSDOT completed a diamond interchange along I-405 near downtown Bellevue that has provisions for HOV vehicles with two or more passengers for all turning movements. This interchange serves Metro's Bellevue transit center and will ultimately be solely for HOV use when HOV demand warrants that action.

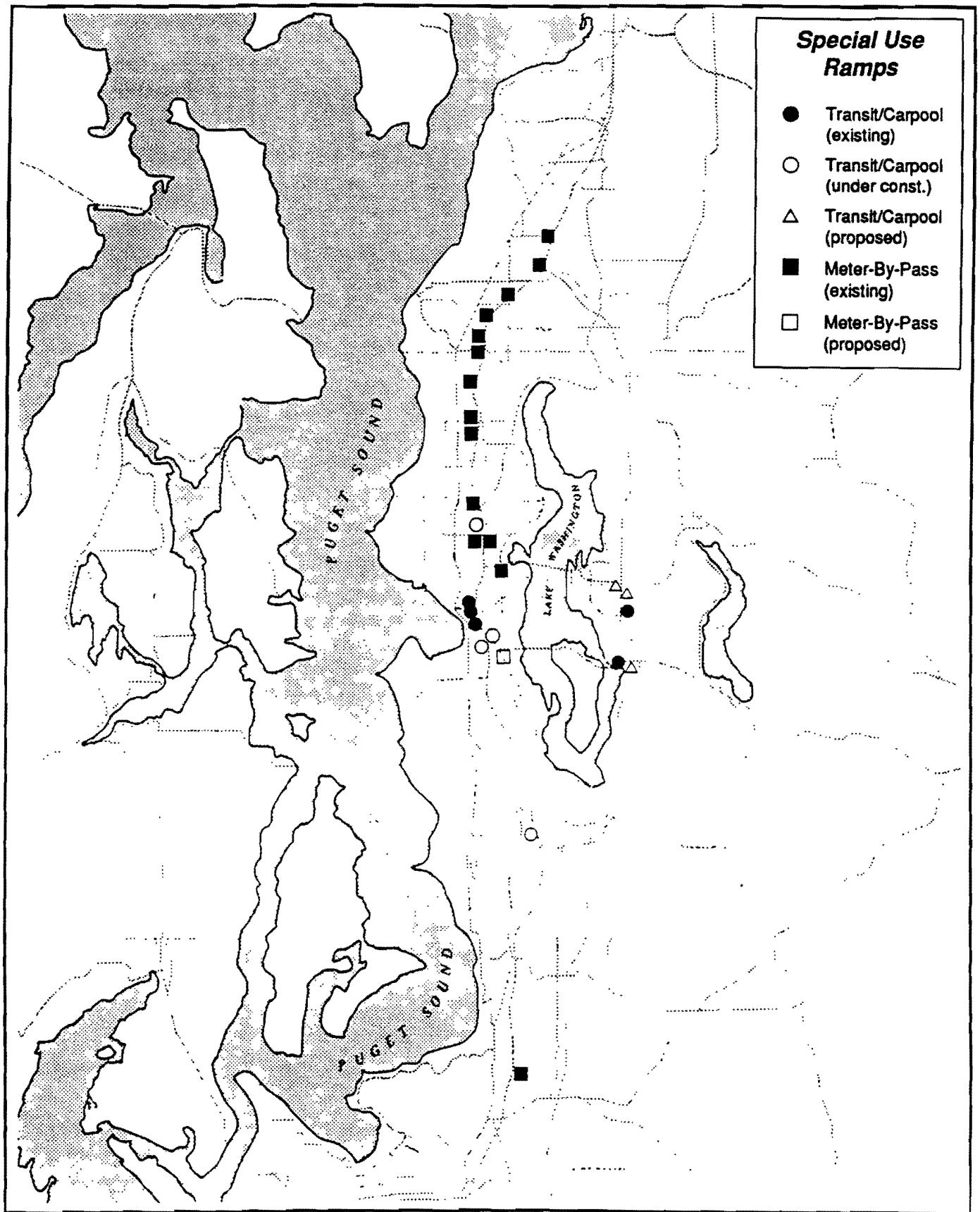


Figure 3 (Reference 1)

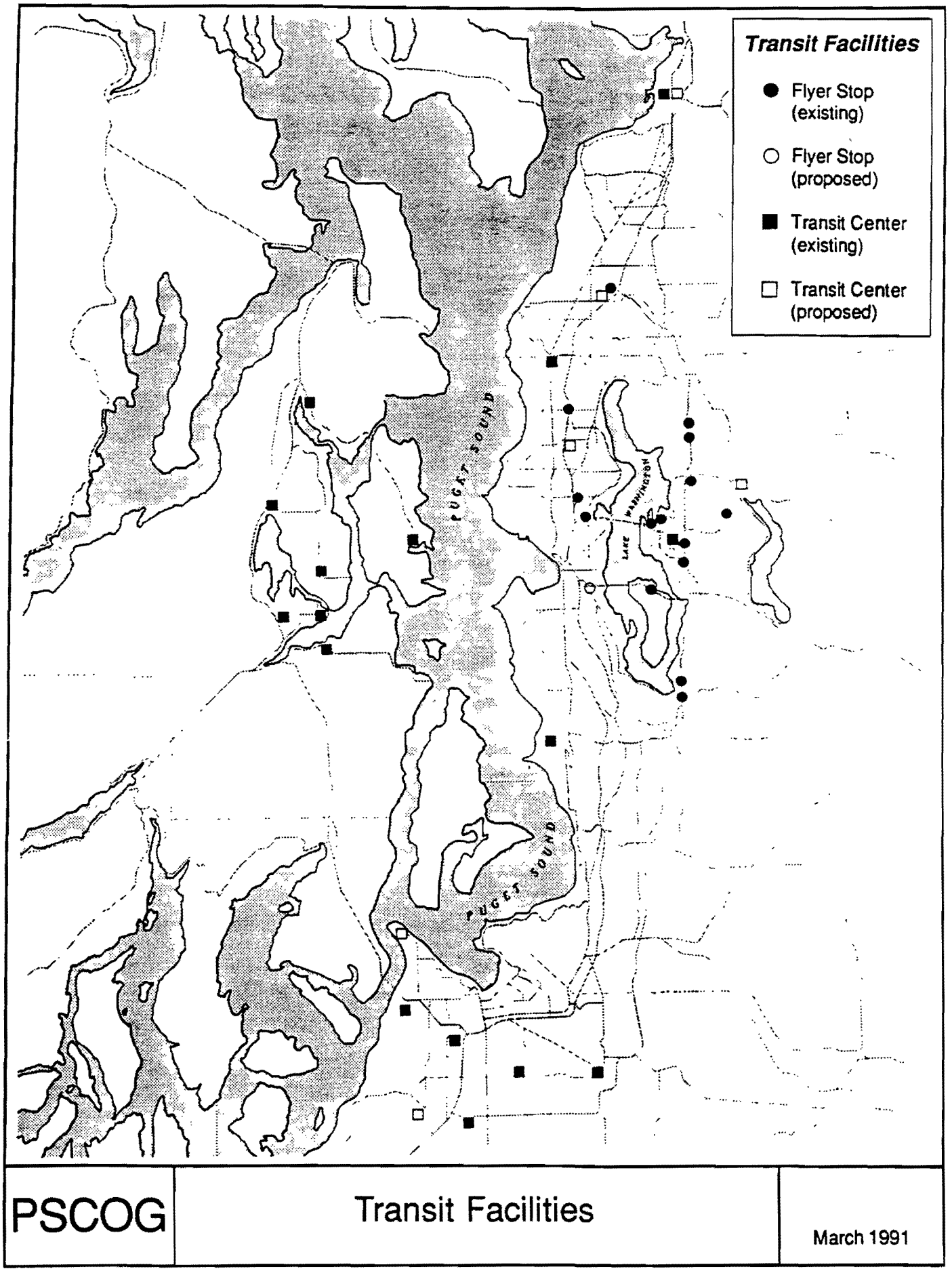


Figure 4 (Reference 1)

Transit Tunnel

In September 1990, Seattle Metro opened its 1.3-mile bus tunnel beneath downtown Seattle. The tunnel is designed to accommodate approximately 40 percent of the buses that travel through downtown and will allow them to bypass the severe congestion that currently restricts city streets.

Ferry Fast Lane

Special boarding lanes at ferry terminals allow HOV users to be first on and first off the ferry as it crosses Puget Sound. HOV lanes connecting ferry terminals to surrounding urban areas are now being considered.

Current HOV Lane Segments

Route	Description
Interstate 5	14.6 lane-miles on the mainline and in the Express Lanes, from 236th S.W. in Snohomish County, to the Cherry/ Columbia exit.
Interstate 405	11.4 lane-miles between Coal Creek and Renton.
Interstate 90	4 lane-miles of interim HOV westbound.
State Route 167	1.1 miles northbound from S. 180th Street to I-405.
State Route 509	.84 miles northbound from SW Cloverdale Street to the First Avenue S. Bridge.
State Route 520	2.3 miles westbound from 108th Avenue N.E. to the east end of the Albert D. Rosellini Evergreen Point Floating Bridge.
State Route 522	.62 lane-miles between N.E. 135th Street and N.E. 147th Street. 3.27 lane-miles from N.E. 147th to 80th Avenue N.E., a transit-only westbound shoulder lane.
State Route 99	1.5 miles northbound, from N. 115th Street to N. 145th Street.
State Route 16	A short, westbound segment just west of the Tacoma Narrows Bridge.

City Streets	In Seattle, Second Avenue (southbound) and Fourth Avenue (northbound) have transit-only lanes that run between Jackson and Stewart Streets. Fifth Avenue has a transit-only lane that runs between Terrace and Cherry Streets (northbound). In Bellevue, N.E. 4th Street has an HOV lane between 108th Avenue N.E. and I-405 (eastbound).

Source: Ref (1)

Note: Where direction is indicated (e.g., northbound), HOV lane is in one direction; otherwise, lane-miles refer to HOV lanes in both directions.

Major HOV Facilities

Interstate 5

The HOV facilities north of downtown Seattle on Interstate 5 were identified previously in Figure 1. The facility begins with exclusive reversible HOV ramps (2+) in downtown Seattle that feed into the reversible express lanes in the center of Interstate 5. These were opened in 1970. An HOV lane on the reversible roadway operates as an HOV lane only in the morning, southbound direction for approximately 2.5 miles north of the reversible ramps. In the evening, volumes do not require an HOV lane; however, the reversible HOV ramps are used in the afternoon. Ridesharing vehicles pick up the HOV lane (3+) again on the reversible roadway 5.5 miles north of downtown, and then make a transition to an inside HOV lane on the mainlane portion of I-5 as the reversible roadway terminates 7 miles north of downtown Seattle at Northgate Way. The lane continues in the northbound direction to N.E. 185th Street. An HOV lane begins in the southbound direction at 236th Street and joins the reversible lane at Northgate Way. The southbound HOV terminates at the entrance to the express lanes. This HOV facility north of Northgate was opened in 1983.

Also important to the I-5 HOV system are ramp meters and HOV bypasses at several on-ramps in the I-5 corridor. These meters and bypasses compose the "FLOW system". They

consist of 21 ramp meters and HOV bypasses at 11 of these ramp meters. Nine of the HOV bypasses are in the southbound direction and one is in the northbound direction.

Interstate 405

South of I-90, Interstate 405 has 11.4 miles of shoulder HOV lane between Coal Creek Parkway and the City of Renton. This lane operates as a two-plus occupancy system. This HOV lane was constructed in 1984. A 5.9 mile expansion of this lane was opened in November of 1990.

Interstate 90

The Interstate 90 project was designed to accommodate two reversible HOV transit lanes in the center of its 3-2T-3 design. The complete facility is not yet open; however, a temporary westbound HOV lane approximately 4 miles long has been operating as a 3+ facility since June 1989.

SR 520

State Route 520 has 2.3 miles of westbound HOV lane from 108th Avenue N.E. to the east end of the Rosellini Evergreen Point Floating Bridge. This lane (3+) allows westbound traffic to bypass the substantial congestion that occurs at the entrance to the floating bridge. This lane began operating as bus-only in 1973, changed to 3+ HOV in 1975, and was improved in 1982 and 1983. In addition, a westbound ramp meter bypass began operation in 1986.

SR 167

A 1.2 mile HOV lane is in operation on northbound SR 167. This lane was opened in 1988.

II. HISTORY AND BACKGROUND OF HOV PLANNING IN THE CENTRAL PUGET SOUND AREA

OVERVIEW

The HOV system as it exists today was not, until recently, a major part of the Puget Sound region's primary comprehensive planning effort. The system evolved to address specific congestion problems. However, this is not to say that HOV systems were not parts of previous planning efforts. Below, the development of HOV planning is traced from the initial transportation planning study in the mid-1960s.

The 1960s

In August of 1966, a consultant's report suggested that express bus operations on exclusive freeway lanes might be justified in the Interstate 5 corridor from the south between Corson Avenue and the Seattle central business district (CBD) and from the north between Lake City Way and the Seattle CBD. (5) The suggestions were offered as alternatives and were not subsequently mentioned in the Puget Sound Regional Transportation Study published in 1967, which was oriented to highways rather than transit. (6)

The Puget Sound Regional Transportation Study not only excluded any mention of busways, it did not even consider other types of HOV facilities. (6) During this period, transportation planning in the Puget Sound area was split between advocates of a heavy rail system and advocates for expanding the existing freeway system. The rail planning effort was being pushed by a large, influential group of civic leaders and downtown business interests. The Puget Sound Regional Transportation Study felt that the proposed rail system was not appropriate and that its claimed benefits were beyond reason, so it continued to push for additional highways with the backing of the state highway department. Neither side prevailed. In 1968, an ambitious rail plan was narrowly rejected by the voters in King County.

The 1970s

In May of 1970, King County voters were asked once again to vote on a bond issue to support the construction of a substantial rapid rail system, along with expansion of local bus routes. This $1.3 billion effort was not approved, receiving only 46 percent of a required 60 percent vote. The economy of the Puget Sound area at that time was quickly declining and was blamed for the poor results of the vote. This was the second defeat for rapid transit in the region within two years, and local officials scrambled for options to sustain public transportation. (7)

In September of 1970 the Seattle Transit System (pre-Seattle Metro) began an Urban Mass Transportation Administration demonstration project, called Blue Streak, to demonstrate improved express bus service. The project involved eight Seattle routes, a park-and-ride lot at Northgate, eight miles of express service on the reversible lanes of I-5, and exclusive use of the Cherry/Columbia ramps in downtown Seattle. This demonstration was considered a success and offered some encouragement for public transportation following the bond defeat in May.

The Blue Streak project was important not only for its technical success but also for its institutional success. Three agencies worked on Blue Streak. Seattle Transit obtained a grant from the U.S. Department of Housing and Urban Development to purchase 70 new buses, build a park-and-ride lot, and cover operating expenses for the demonstration period. In addition, Seattle Transit redesigned eight routes, collected ridership data, and operated the service. Seattle's traffic engineers contributed to initial planning, helped prepare the grant application, and made numerous alterations to streets and arterials to accommodate the new service. The State Department of Highways contracted for a consultant to evaluate the demonstration project and assisted in data collection efforts. The success of the Blue Streak demonstration project helped provide the technical and institutional basis for expansion of the HOV systems in the future.

In 1972, the Puget Sound Governmental Conference, in concert with Seattle Metro, published a short-term bus transportation plan. (8) This $95 million proposal did not require issuance of bonds for financing and therefore only needed 50 percent of the voters to approve

it. The need for a regional transit system was recognized, and the voters supported Metro as the responsible agency. The voters at this time were not ready for a major rail investment. In September of 1972, 58 percent of King County voters approved the adoption of a comprehensive transportation plan and authorized Seattle Metro to develop and operate a county-wide transportation system. Before this time, Seattle Metro, formed in September of 1958, had been responsible only for regional water quality. Metro had become highly regarded because of visible improvements to the waters of Lake Washington. Prior to that time, public transit in the King County area had been operated by numerous smaller operators, including the Seattle Transit System. (7) (8)

The 1972 transit plan included the following locations for exclusive or preferential lanes. (8)

- I-90. Two lanes of the third Lake Washington bridge would be dedicated to exclusive transit use for at least seven years after completion of the project.
- SR 522. An exclusive reversible lane was recommended for inclusion in the final highway improvements to the facility, at least from Bothell to Northgate Way in Seattle.
- SR 520. A reversible lane was also recommended for this corridor from a park-and-ride lot near 104th Avenue N.E. to a point just west of the toll plaza. The Department of Highways was considering a reversible lane from this same point near 104th Avenue N.E., across the lake, and under I-5 to Eastlake Avenue for carpools and transit. That proposal, if implemented, would replace the recommended bus lane.
- Seattle CBD. A major recommendation for handling transit in the Seattle central business district was the introduction of bus-only lanes that would operate in the reverse of traffic flow on 2nd and 4th avenues.

In 1974, the Puget Sound Governmental Conference published its 1990 transportation system plan. (9) Several HOV-related features were included in this plan. Under the Conference's 1990 recommended system, one of four major findings stated:

> "The addition of exclusive carpool lanes to increase occupancy of private cars will further reduce vehicle-miles of travel and associated air pollution, noise pollution, fuel consumption, and congestion." (9)

Significant features of the highway plan included the following:

1. completion of future freeways to major transportation corridors, with adequate provisions for high occupancy vehicles, and

2. preservation of existing highway lanes for peak-hour high occupancy vehicle use in corridors where forecasted auto demand exceeded corridor capacity.

The transit element of the plan had the following design:

> "Reservation of existing highway lanes and/or the development of new lanes for the exclusive use of high occupancy vehicles in the major transportation corridors. This includes approximately 90 miles of exclusive transit lanes and another 38 miles of lanes reserved for the exclusive use of transit and carpools . . . ." (9)

In 1976, Seattle Metro, King County, and the City of Seattle combined efforts to review the Puget Sound Governmental Conference's 1990 transit plan. This review concluded, among other things, the following:

> "The current long-range plan depends heavily on exclusive transit lanes in major corridors, yet it may be possible that a region wide scheme of ramp metering; surveillance, control and driver information (SC&DI); with preferential transit access, may offer an adequate level of transit priority. Thus, it is important to Metro to encourage the development of the proposed SC&DI scheme in the I-5 corridor as soon as possible so that the impact can be evaluated for use in other corridors. (10)

The reviewers also determined that some of the more important highway modifications would probably not occur under current policies, priorities, and expected funding levels. They recommended that the long-range plan be modified to more closely conform to practical realities.

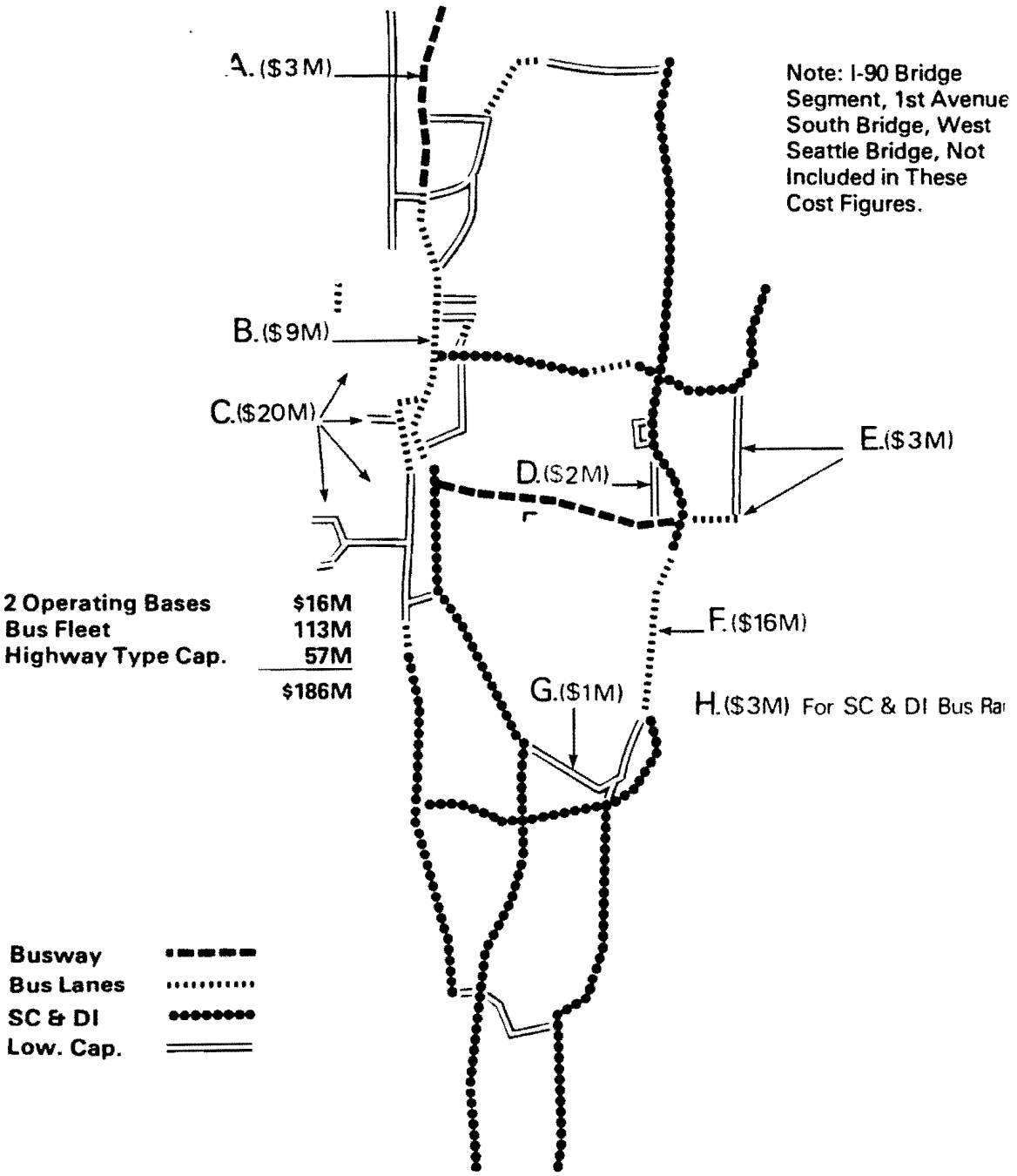
In retrospect, this review was fairly accurate in its assessment of how quickly the region could implement an HOV system. Primarily because of funding constraints, the Puget Sound Governmental Conference 1990 Transit Plan was much too ambitious.

Seattle Metro also published an information document in 1976 that reviewed some of the major transit alternatives, such as HOV, rail, and people movers in the Seattle region for Metro's decision-makers. (11) Among the alternatives considered were limited all-bus options and major all-bus options. These alternatives are depicted as Figures 5 and 6. These plans called for a reduced level of HOV facilities, but in the view of Metro staff the reduction was more reasonably in line with available funding. More capital intensive options such as rail were not seriously considered because of funding and the recent votes regarding rail, and the need for short-term improvements.

The most important event that impacted the development of HOV lanes in the Puget Sound region occurred in 1976 when the state highway department, City of Seattle, King County, Seattle Metro, Mercer Island, and Bellevue signed a memorandum of agreement regarding the construction of Interstate 90 across Lake Washington. The City of Seattle was concerned with environmental issues, neighborhood disruption, and traffic problems. To satisfy its concerns, a 1,500-foot bored tunnel, instead of a cut and cover, was designed through Mt. Baker along Lake Washington. In addition, to cover the freeway that emerged from the tunnel, a 2,300-foot lid was designed with a landscaped park on the top. A planned exit was eliminated because of community concerns regarding traffic.

The city of Mercer Island was facing substantial environmental impacts and another landscaped lid (2,900 feet) was designed for the Mercer Island side of the I-90 bridge that placed the entire freeway section below the surface. When I-90 is complete, Mercer Island residents will be allowed to use the reversible carpool lanes with only one occupant.

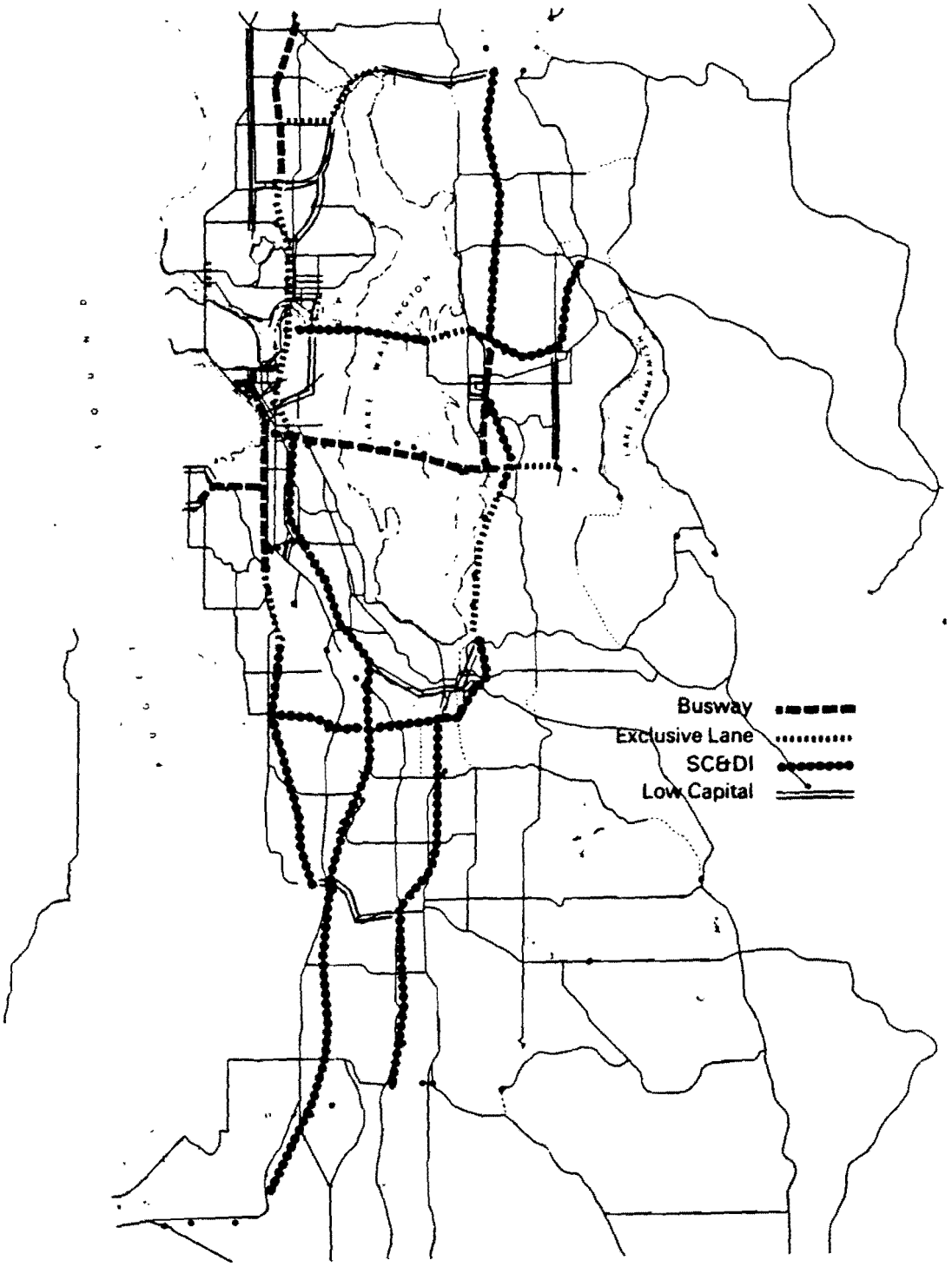
Bellevue and King County had less at stake but were important participants in the negotiations, since the mobility of their citizens was of concern. Seattle Metro was concerned with the operation of the transit lanes, location of park-and-ride lots, and transit stops.



Highway Type Cost Elements Include:

A. Sno-Ho County Line Transit Lane to 145th	$3M
B. I-5 Reversibles For Transit	9M
C. Seattle Various Low-Capital Improvements	20M
D. Bus Lane I-90 to SR-520	2M
E. East Side Low Capital Improvements	3M
F. 2 Lanes I-405 to N. Renton	16M
G. Renton Low Capital Improvements	1M
H. SC & DI Bus Ramps	3M
	$57M

Figure 5 - Limited Bus Option (Reference 11)



Major All Bus Alternative

Figure 6 (Reference 11)

Construction of this facility, whose design was begun in 1957, was held up because of numerous lawsuits and disagreements between various jurisdictions. The completion of I-90 and its configuration impacted highway and transit planning in the Seattle area for years. The following chronology helps one understand the impacts:

1957	Engineering study began.
1963	Public hearing on location.
1963-1970	Travel demand projections changed; regional rail rapid transit system proposed and incorporated in plan; design study teams and citizen advisory committees created; increasing public and legislative concern over social and environmental impacts of I-90 project.
1970	Citizens' suit filed in the United States District Court regarding the need for an environmental impact statement). Public hearing on design.
1971	Basic configuration proposed plan agreed to by WSDH and local governments: 4-2-4. Four freeway lanes in each direction and two reversible transit lanes. 9th Circuit Court of Appeals orders preparation of environmental impact statement in compliance with National Environmental Policy Act.
1972	United States District Court finds environmental impact statement insufficient (statement has been rewritten; court must yet consider legal sufficiency of new statement).
1973	Suit filed in United States District Court - relating to EIS, shoreline permit, coast guard permit, air quality impacts.Amendments to Federal-Aid Highway Act permitting substitution of nonhighway public mass transit projects for interstate agreements.
1974	9th Circuit Court of Appeals ruling results in decision to hold new public hearings in 1976.
1976	Memorandum of Agreement signed between Seattle, Bellevue, Mercer Island, King County and Washington State Department of Transportation that allows construction to begin. Alignment is 3-2-3.

The WSDOT was finally able to begin construction after providing about $400 million in mitigation for lids and related improvements.

To demonstrate regional commitment to transit, the 1976 Memorandum of Agreement listed specific transit/carpool lanes and/or SC&DI treatment for Interstate 5, SR 99, SR 509, SR 520, I-405, and associated facilities such as park-and-ride lots. The specific language was as follows:

Para. 8. The parties hereto agree that they will proceed under established legal processes, including regional transportation planning procedures of PSCOG and consistent with the approved Regional Development Plan of PSCOG, to determine those projects which are of highest priority in the Transportation System Plan and the Transportation Improvement Program as the Plan and Program apply to the King County subregion. The parties hereby agree that projects (a) through (g) listed below are of highest priority and shall so indicate in the process of establishing the King County Subregional Transportation Improvement Program, the Regional 1990 Transportation System Plan, and Metro's Comprehensive Public Transportation Plan. The Commission and Metro shall work with the local jurisdictions in undertaking location and design studies for these projects at the earliest possible date commensurate with state, regional, metro-political and local planning and priority programming practices. Projects to be considered through these processes shall include, but not be limited to, the following regional components of PSCOG 1990 Transportation Plan:

(a) Transit/carpool lanes and/or Surveillance Control and Driver Information Systems (SC&DI) on I-5 from I-405 at Tukwila to the King County Snohomish County line;

(b) The park-and-ride lots and flyer stops contained in the approved 1980 Plan as may be modified by Metro;

(c) Provision for a busway or exclusive transit/carpool lane(s) as a part of the SR 99 and SR 509 corridor including a crossing of the First Avenue South Bridge, consistent with Metro's transition planning for this corridor;

(d) Provision for a busway or exclusive transit/carpool lane(s) and/or SC&DI as a part of SR 520 from I-5 to I-405;

(e) Redesign, in a manner acceptable to the City of Seattle, of the lanes where SR 520 meets I-5 at the Mercer Street egress from I-5 in order to improve transit flow and reduce the congestion between Mercer Street and Roanoke Street;

(f) Provision for a busway or exclusive transit/carpool lane(s) and/or SC&DI as a part of I-405 from Bothell to Renton;

(g) Provision for exclusive transit lane(s) on I-405 through Bellevue which shall also include provision for a freeway flyer stop and a park-and-ride facility on I-405 between Main Street and N.E. 8th in Bellevue and provision for I-405 access improvements to the Bellevue central business district as determined by the Joint State Legislative/Highway Commission and City of Bellevue I-405 Access Study. (12)

During the second half of the 1970s, Seattle Metro engaged in a major continuing planning effort known as MetroTRANSITion. The goal of MetroTRANSITion was to develop an overall plan for transit improvements in the metropolitan area. By definition, MetroTRANSITion was not to be a grand, long-range plan but a short-term plan that adapted to rapidly changing conditions. This planning effort continued throughout the 1970s, and its major findings were published in the early 1980s. The WSDOT played a coordination role but was not actively involved in study efforts.

The 1980s

In August 1980, the Phase 4 MetroTRANSITion technical report (13) was published, followed shortly by a draft environmental impact statement. The MetroTRANSITion report called for a number of improvements in the HOV system. This included 113 lane-miles of HOV treatments on freeways and 85 lane-miles of HOV lanes on arterials and other highways. The plan also projected a transit ridership of 138.5 million riders per year, approximately half of what has been realized. This ambitious program, which included many transit centers, park-and-ride lots, maintenance bases, and other facilities, was scaled back as ridership failed to materialize in the 1980s.

In September of 1982 the Puget Sound Council of Governments updated the Regional Transportation Plan. (14) This plan reflected a renewed interest by policy makers in rail transportation. No HOV plan was specified in 1982; however, numerous HOV improvements were listed along with other corridor improvements.

In April of 1987, Metro published an amendment to the 1990 transit plan and assessed how the 1987 situation compared to what had been expected in the 1980 MetroTRANSITion recommendations. (15) This reassessment noted that the ridership forecast for 1990 had fallen from 138.5 million riders in 1980 to 75 million in 1986. Metro also reviewed many of the other recommendations from the MetroTRANSITion plan, including the establishment of HOV lanes on freeways and arterials. The assessment noted,

> "The WSDOT HOV program was substantially behind original schedule. One hundred and twenty miles originally planned, 34 built to date; 80 miles expected by 1990, almost all on freeways." (15)

In summary, the 1980s showed little progress toward the implementation of a wide-scale HOV system in the Puget Sound area. No overall strategic plan for HOV priorities, funding, and system operation existed, and budget constraints caused by federal obligation ceilings, other state priorities, and the magnitude of I-90 construction did not allow WSDOT to proceed with implementation plans.

The 1990s

The Washington State Legislature passed and the Governor signed HB 1825 in March of 1990. This bill provides local option funds for high capacity transit and HOV lanes. While these funds have not been utilized thus far, a great deal of activity has begun to implement the HOV system.

In the fall of 1990, the Puget Sound Council of Governments published the region's new land use/transportation plan called VISION 2020. This plan calls for 600 lane-miles of HOV lanes and 20,000 additional park-and-ride spaces. Also, in 1990, the WSDOT issued the state Transportation Policy Plan which emphasizes the movement of people rather than vehicles. Following this, the WSDOT began an intense effort examining policies to speed the development of HOV facilities.

Completion of the Seattle area HOV system is now a top priority with state, regional, and local agencies. The State Legislature is considering new options to expand existing funding sources to include HOV projects. The 1990's have begun on an optimistic note for HOV development.

Operating Issues

The HOV lanes operate 24 hours a day for HOV vehicles. Most facilities require three-plus occupancy. The exceptions to this rule are I-405, which is two-plus, and the reversible entrance and exit ramps at Columbia Street and Cherry Street at the southern end of the I-5 express lanes. The Washington State Department of Transportation has the ultimate responsibility for operating decisions associated with the HOV system. However, these decisions are made in partnership with the other agencies involved with the HOV facilities.

Enforcement is handled by the Washington State Patrol in cooperation with WSDOT and Seattle Metro. In 1984, WSDOT developed a public telephone hotline (HERO) for reporting HOV facility violators in the Seattle area. A study done at that time showed that the HERO hotline reduced violation rates from 30 to between 8 and 15 percent. (16) Seattle Metro now operates the HERO hotline, which records or takes calls from commuters and sends out letters to identified violators. A recent study concluded that from an operational and public relations standpoint, the HERO hotline is successful and should be continued. These surveys also demonstrated that the public is solidly behind this activity. (16)

IV. INSTITUTIONAL ARRANGEMENTS

Seattle Metro and the Washington State Department of Transportation have enjoyed a close working relationship for nearly 20 years. This cooperation was generally informal and driven by the desire to increase mobility in a cost-effective manner. Relationships between middle level professional staff were the catalysts for the success of these activities. These informal contacts were made within the context of the formal structure described below.

Formal Arrangements

General

The WSDOT and Seattle Metro participate in the Puget Sound Council of Governments' (PSCOG) regional transportation planning process. This joint Federal Highway Administration/Urban Mass Transportation Administration process is mandatory for projects supported by federal funding. By policy, all WSDOT projects also follow this process.

For HOV facilities, the WSDOT interacts with Seattle Metro regarding priorities for projects, then proposes projects for the Transportation Improvement Program (TIP) that are consistent with the Regional Transportation Plan.

Seattle Metro provides design reviews, but WSDOT designs, constructs, and maintains the HOV facility. WSDOT also funds the entire HOV facility, and Seattle Metro funds the operation of transit vehicles and related facilities such as passenger shelters. A Memorandum of Agreement exists between Seattle Metro and WSDOT for the construction of flyer stops and park-and-ride lots.

Blue Streak - Early Cooperation

The Blue Streak demonstration discussed in Section 3 addressed a situation in which buses could not attract a share of the commute market because of the buses' operation on congested local streets. The demonstration provided a park-and-ride lot, and eight realigned transit routes operating on the freeway in express service to an exclusive off/on ramp downtown.

This project demonstrated that state, city, and transit agency cooperation could provide a new level of transit service and laid the groundwork for future HOV developments.

I-90 Memorandum of Agreement

As discussed in Section 3, the 1976 Memorandum of Agreement for the construction of I-90 also listed numerous HOV improvements to the region's highways. Agreement on these facilities provided assurance that the signatories were all commited to improving transit facilities in the region. Ironically, the I-90 agreement called for such extensive environmental mitigation (walls, lids, landscaping, etc.) that funds to carry out the HOV portion of the agreement have been limited.

I-5 North HOV

The HOV facilities on north I-5 were the first that resulted from the I-90 Memorandum of Agreement. These improvements were "low profile" and constructed with no significant impacts to motorists or neighbors. WSDOT selected this section of HOV system, with Metro's concurrence, as part of the normal regional planning process. The HOV improvements, opened in 1983, addressed the highest priority need for transit in the region and were funded under FHWA's interstate completion program.

I-405 South HOV

Severe vehicle congestion exists in this corridor, but with little transit service the facility (2+) primarily serves carpools. Since no system HOV plan exists, projects are conducted when funding availability and implementation opportunity coincide. That is, if funds are available, construction takes place where it can be done with the minimum number of obstacles. WSDOT and Metro informally negotiate priorities and generally agree on individual projects. This facility, called for in the I-90 Memorandum of Agreement, was opened in 1984 and used interstate completion funds.

I-90 Center Reversible HOV

The I-90 Memorandum of Agreement required the center two lanes of the 3-2-3 facility to be devoted to transit. Until the region decides on the direction for a regional mass transit

system these two lanes will be HOV (3+). Years of negotiation involving Metro, WSDOT, and the cities of Seattle, Mercer Island, Bellevue, and King County, resulted in this decision to move away from complete auto domination toward a balanced system. An initial temporary section of this HOV facility currently operates as a 4-mile westbound HOV (3+) lane.

Informal Arrangements

General

Formal arrangements are not always effective at providing direction and encouragement for active participation of agency professionals. As mentioned in the introduction, informal contacts that build professional relationships are of primary importance.

Seattle Metro and WSDOT participate on numerous PSCOG committees. These include the Transit Operators Committee, the HOV Task Force, the High Capacity Transit Committee, and various committees related to the regional plan.

In addition to PSCOG committees, WSDOT serves on Seattle Metro committees related to the development of Metro facilities. The WSDOT and Seattle Metro have had monthly meetings for over 10 years to coordinate HOV and park-and-ride facilities. These meetings ensure early input to the project development process to avoid delays and misunderstandings.

SR 520

Congestion across the four-lane floating bridge of SR 520 was having a substantial impact on transit service to downtown Seattle and the University of Washington campus. Metro and WSDOT agreed to allocate the shoulder to transit use, which they accomplished with a weekend paint striping job and no formal hearings or agreements. Tolls were lowered for carpools in 1975 and the bus lane was made into 3+ HOV. Various widening and surface improvements were undertaken in subsequent years. This facility is an excellent example of staff level cooperation between agencies to improve HOV facilities.

APPENDIX A

AGENCY DESCRIPTION AND INVOLVEMENT

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (WSDOT)

In the Puget Sound area, WSDOT's District 1 office in Bellevue and the WSDOT headquarters traffic office are deeply involved in the HOV program for the Puget Sound region. The headquarters office provides guidance on HOV traffic systems issues and helps shape agency policy. The District 1 office plans, designs, constructs, operates, and maintains the HOV facilities and interacts regularly with other affected agencies.

MUNICIPALITY OF METROPOLITAN SEATTLE (METRO)

Metro operates buses in King County that utilize WSDOT HOV facilities and maintains the HERO hotline telephone violator service described previously. Metro provides design review for HOV-related facilities and participates in funding for appropriate portions of related HOV facilities.

COMMUNITY TRANSIT

Community Transit is the Snohomish County transit authority that operates buses along I-5 HOV lanes to the University District and downtown Seattle.

PUGET SOUND COUNCIL OF GOVERNMENTS (PSCOG)*[1]

PSCOG is the metropolitan planning organization for the Puget Sound region. PSCOG updates the regional transportation plan and incorporates HOV facilities as appropriate. The PSCOG also facilitates HOV planning activities such as the HOV Task Force and provides publications services for HOV-related reports.

CITY OF SEATTLE

Key HOV facilities run through the City of Seattle, which takes an active stance on their design and implementation.

CITY OF BELLEVUE

The region's largest transit center is located on the eastern side of downtown Bellevue. Bellevue has the potential to become a major anchor for high capacity transit service and will play a primary role in the design of that service through or near downtown Bellevue.

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*formerly Puget Sound Governmental Conference

APPENDIX B
Resource People

Les Jacobson
FAME Project Manager
Headquarters, WSDOT

Phil Brown
Transportation Planning Engineer
Headquarters, WSDOT
Retired

Kern Jacobson
(Former) Planning and Operations Engineer (now with Washington State Ferries)
Marine Division, WSDOT

Don Tranum
Public Transportation Engineer
District 1, WSDOT
Retired

Dave Glaze
District 1, WSDOT
Retired

George Smith
Public Transportation Manager
Headquarters, WSDOT
Retired

Bill Roach
Market Development Supervisor
Metro

Tony Andreas
Deputy Secretary
Headquarters, WSDOT
Retired

Ron Bockstruck
District 1 Administrator
Retired

Norm Storm
Project Development Engineer
District 1, WSDOT

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HISTORY AND INSTITUTIONAL ARRANGEMENTS: SHIRLEY HIGHWAY HOV LANES

JHK & Associates
Alexandria, VA

I. BACKGROUND AND HISTORY OF THE SHIRLEY HIGHWAY HOV LANES

What became the nation's first busway operation, and later the prime example of a successful high-occupancy-vehicle (HOV) facility, did not begin by aiming at such distinction. The achievement was the result of a coalescing of policies over many years among a variety of Federal, state, and local agencies and some private organizations. The evolution of highway management practice as it occurred over a period of nearly 30 years, is described here. It has been compiled from many sources, mostly engineering studies, published during this time.

History

Initial Stages

The Virginia Department of Highways (VDH), in cooperation with the Bureau of Public Roads (now FHWA), commissioned a study in 1962 to improve the Shirley Highway from a four-lane controlled access highway to an eight-lane facility meeting interstate standards (see Figure 1). The need grew out of increasing traffic growth on a route designated as I-95, the principal north-south interstate highway on the East Coast. The resulting preliminary engineering study proposed a cross-section of two three-lane directional roadways separated by a two-lane reversible roadway (to be used by mixed traffic) leading to a new bridge between the existing 14th Street bridges across the Potomac. This solution was adopted by the Department, and the required planning, design and construction activities were initiated in the 1960's. At the same time, the National Capital Transportation Agency (predecessor of WMATA) was completing its own feasibility study of a regional mass transit system in the Washington area. Their report "...included a recommendation that frequent express lane service be established on the Shirley Highway between Route 236 (Duke Street) and the Pentagon area".[1]

[1] The Operation and Management of the Shirley Highway Express-Bus-On-Freeway Demonstration Project - Final Report, Northern Virginia Transportation Commission, Arlington, Virginia, September, 1976.

Prior to this time, a policy had been evolving within the federal highway agency to recognize the importance of public transportation on urban highways. In 1970, Federal Highway Administrator Francis C. Turner traced this from 1947 through the 1960's, noting the involvement of FHWA and others concerned with the Shirley Highway improvements. "Starting in early 1964, we entered into serious discussions with the District of Columbia and Virginia Dept. of Highways, the Washington Metropolitan Area Transit Authority, the Washington Metropolitan Area Transit Commission, and the bus operators, concerning proposals for incorporating express bus service and bus turnouts into the design for the planned reconstruction of this road."[2] These discussions led to the re-design of three interchanges (Seminary Road, Shirlington, and the Pentagon) to allow exclusive bus access to the reversible lanes that were planned for the reconstructed route.

The next steps were succinctly described in the Northern Virginia Transportation Commission (NVTC) final report on "The Operation and Management of the Shirley Highway Express Bus-On-Freeway Demonstration Project", noted earlier.

> In December 1967, the Bureau of Public Roads, in a report entitled: "Status of Bus Transit Demonstration Projects Throughout the United States," described the continued efforts by organizations concerned with the development of plans for incorporating express bus transit in the Washington area. Enthusiasm was expressed for a bus demonstration project utilizing the reversible lanes of the Shirley Highway. The project would be geared to a staged sequence of implementing new and approved bus service over the reversible lanes consistent with current construction schedules. With this concept remaining as the basis for further evaluation and serving as guidance in the preliminary design of the project, the Transportation Planning Board of the Metropolitan Council of Governments, under a contract with the Bureau of Public Roads, assumed the responsibility for conducting a comprehensive transportation and economic feasibility study of express bus usage in the Shirley Highway Corridor.
>
> The Transportation Planning Board, working with a consultant, was responsible to a Steering Committee consisting of representatives from the Virginia Department of Highways, the District of Columbia Department of

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[2] Francis C. Turner, "Moving People on Urban Highways", Traffic Quarterly, Vol. XXIV, No. 3, July 1970.

> Highways and Traffic, the Washington Metropolitan Area Transit Commission, the Washington Metropolitan Transit Authority, the Alexandria, Barcroft, and Washington Transit Company, and the Washington, Virginia and Maryland Coach Company, and the Northern Virginia Transportation Commission. The Urban Mass Transportation Administration and the Federal Highway Administration were also represented on the committee in an advisory capacity.[3]

Thus, before the opening of the first segment of the exclusive bus roadway, the interests of all concerned parties were represented in a Steering Committee that would continue to play a role through the next two decades in developing and implementing the Bus and HOV system.

Opening the Busway

Interim recommendations of the feasibility study were put into effect on September 22, 1969. On the newly opened reversible lanes between Edsall Road and Shirlington, a distance of 4.8 miles, buses were permitted exclusively during the morning peak period. Each bus saved an estimated 12 to 18 minutes over this section, in comparison to travel time on the regular lanes. Within two months, ridership increased by nearly 20 percent.

"This initial success provided a firm basis for the Steering Committee, in November 1969, to accept the plan to extend a temporary busway over the remaining 4 mile section of highway during the construction of permanent reversible lanes and the major interchanges near the Pentagon. The Steering Committee unanimously adopted a resolution urging each agency represented thereon to accomplish the necessary actions to implement the project. The Virginia Department of Highways (VDH) and the Federal Highway Administration (FHWA) promptly approved action incorporating the temporary bus roadway into the construction plans for the remaining part of the highway. This action required redesign, the revision of three construction contracts, and the renegotiation of one that had already been advertised.

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[3] p. I-2, op. cit.

The 4 mile section of busway was opened in stages, with the 1.6 miles between Shirlington and South 20th Street being completed in September 1970. An estimated additional 5 to 8 minutes were saved by the buses, and about 50 additional trips were routed on to the busway at Shirlington during the morning peak. The last section of the exclusive bus roadway terminates at the Potomac River and connects to a new bridge at 14th Street. This section was opened on April 5, 1971."[4] (See Figure 3.)

During the period of operation from September 1970 through April 1971, the northern sections of this interim busway operated as a single lane temporary roadway through the reconstruction activities taking place in the last 4.5 miles approaching Washington. Temporary wooden trestles and changes in alignment caused by construction made it impractical to consider opening the reversible roadway to other, non-bus traffic. With the opening in April 1971 of the exclusive roadway across the 14th Street Bridge, rush hour bus lanes were designated on 12 blocks of 14th Street as well as sections of H and I Streets, to reduce travel times within the District of Columbia. By May 1973, nine miles of two-lane reversible roadway were opened.

First Demonstration Project

Both UMTA and FHWA, in response to the MWCOG feasibility study and evident success of the initial busway operation, encouraged local application for a demonstration grant. As submitted by NVTC, and approved by UMTA in September 1970, the overall goal was to improve the people-moving capacity of major arterial and cross-corridor roadways in the Shirley Highway Corridor "....through a three element program consisting of highway improvement, transit service improvement, and provision for fringe parking."[5] The original budget of roughly $2 million for two years included $1.2 million for bus purchases.

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[4] The Shirley Highway Express-Bus-On-Freeway Demonstration Project, Interim Report, National Bureau of Standards, August 1971, p.6.

[5] NVTC Final Report, op. cit.

In addition to the NVTC Final Report and NBS Interim Report cited so far, a series of reports for UMTA documented the progress and results of the demonstration project known as the Shirley Highway Express-Bus-on-Freeway Project. The project was also described by R.J. Fisher in TRR 415, "Mass Transportation: Application of Current Technology", and a summary of findings was published in TRR 626, "Bus Service Planning," under the title "Increasing the People-Moving Capability of Shirley Highway." There, the major elements of the project were described as: a) 11-mile reversible roadway plus bus-priority lanes in downtown Washington; b) adding 90 new, special buses with new schedules or new routes; and c) coordinating fringe parking with bus service.

These activities led to dramatic increases in bus ridership and person movement on the Shirley Highway.

Opening the Reversible Roadway to Other Vehicles

In December 1973, the decision was made to open the nine-mile section to carpools and vans with more than four occupants (HOV-4). They were permitted to enter at the two southernmost entrances (Springfield and Turkeycock) only, and required to exit at Washington Boulevard, but not allowed to use what was still temporary busway to the 14th Street Bridge. The NVTC report notes the justification[6]:

"Opening of the buslane to carpools was something that had been considered since the inception of the project, but did not take place until 1973. A number of reasons can be given for this, among them: (1) the desire to truly demonstrate the exclusive busway concept, (2) the limited capacity of the temporary roadway, 3) the safety factor resulting from the ongoing construction and the constantly changing path of the temporary roadway, and finally, (4) because no particular pressure was applied by any advocacy group desiring such action. However, the gasoline shortage problems of late 1973 and early 1974 were sufficiently compelling reasons to open the busway to carpools. The mix of the two modes has occurred

[6] NVTC Final Report, op. cit.

without incident and appears to solidify the exclusive use of the reversible bus lanes for multi-passenger vehicles."

Completion of the last two miles of the reversible roadway made it possible to open all 11 miles and the 14th Street Bridge to HOV-4 use by October, 1975. Subsequently, after analysis and evaluation studies were done, carpools were permitted in 1976 to use the Seminary Road, Eads Street and Shirlington bus ramps to enter and leave the system.

Table 1 summarizes the critical dates up to this point.

Subsequent Studies

Over the next ten years, though no significant changes in the HOV system operation took place, a series of studies were made of the highway operations. The "Shirley Highway Operations Study"[7], prepared by JHK & Associates for the Virginia Department of Highways and Transportation (VDH&T), documented the problems of congestion and capacity-demand imbalances. In addition to physical roadway improvements, the report recommended installation of surveillance and control hardware. For the most part, the problems and recommended solutions were related to the non-HOV aspects of the corridor.

Another study for FHWA focused on the HOV lanes and was reported in "Evaluation of Alternative Traffic Plans for the Commuter Lanes on the Shirley Highway in Virginia".[8] The report recorded the growth and nature of HOV-lane usage, developed and tested a method for forecasting carpool volumes for similar facilities, and evaluated the impact of changing from a four-occupant to three-occupant carpool definition (HOV-4 to HOV-3). The study concluded that such a change to increase vehicle usage would reduce incentives to carpool by lowering the quality of service on the HOV lanes. This element of the study resulted from

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[7] Shirley Highway Operations Study, JHK & Associates for Virginia Department of Highways and Transportation, July 1976.

[8] Evaluation of Alternative Traffic Plans for the Commuter Lanes on the Shirley Highway in Virginia, JHK & Associates for FHWA, Washington, D.C., July 1977.

the continuing (and still continuing) pressure from local groups and political representatives to lower the carpool number requirement.

Table 1

Chronological Listing of Major Events Affecting the Shirley Highway

Date	Event
September 22, 1969	Buses permitted exclusive use of reserved lanes from Edsall Road to south of the Shirlington interchange during peak periods.
September 14, 1970	1.5 mile segment of temporary busway opened from the end of permanent reversible lanes at Shirlington to north of Glebe Road.
April 5, 1971	Final portion of reserved lane opened from Mixing Bowl across the 14th Street Bridge.
December 10, 1973	Reserved lanes opened to 4-person carpools from Keene Mill Road (Springfield Interchange) to Washington Blvd.
	Energy shortage hits peak February - March 1974
May 1974	WMATA on strike
September 1, 1975	WMATA raises fares in Virginia
October 17, 1975	Carpools permitted to use the reserved lanes across the 14th Street Bridge.
February 5, 1976	Carpools permitted to use Seminary Road ramp.
May 3, 1976	Carpools permitted to use Eads Street ramp.
October 15, 1976	Carpools permitted to use Shirlington Circle ramp.

Source: Evaluation of Alternative Traffic Operations Plans for the Commuter Lanes on the Shirley Highway in Virginia, JHK & Associates, Alexandria, VA, July 1977.

Responding to the recommendations of the operations study, VDH&T retained Howard, Needles, Tammen and Bergendoff in 1978 to carry out further work toward implementing a traffic management system. The three-phase project began with a design and operations plan, continued with plans, specifications and estimates, and concluded with an implementation phase. The completed system, placed in service in 1985, combines I-395 and I-66 into one traffic management system. Meanwhile, I-66 had been opened in December, 1982, providing some diversion of traffic from the Shirley Highway corridor.

During this same period, VDH&T studied the feasibility of extending the HOV lanes south from Springfield to Quantico.[9] The study recommended construction of an additional 19 miles of two lanes reversible roadway in the median of I-95. Though approved in concept, funds were not available to start the project. However, responding to local interests, VDH&T did extend the HOV facilities south to woodbridge as an exclusive concurrent flow median lane in each direction. Northbound operation opened December, 1985, and southbound in September, 1986. Public hearings for the entire extension were held in August 1987. Construction began in 1989, with completion of the $200 million project scheduled for the mid-1990's.

A second demonstration project was also designed and implemented in the mid-1980's. Up until this time, the reversible roadway had been used only by HOV-4 vehicles, with northbound operation from 11:00 PM until 11:00 AM, and southbound operation from 1:00 PM - 8:00 PM, and with the roadway closed for maintenance and changeover at other hours. Political pressure generated in Northern Virginia crossed the Potomac and led to a Congressionally-mandated demonstration in the Spring of 1985 to permit "low-occupancy vehicles" (LOV's) on the reversible roadway during off-peak hours in order to relieve congestion on the remaining lanes of the Shirley Highway. An evaluation report, "Transportation and Environmental Studies of the I-66 and I-395 HOV Facilities,"[10]

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[9] I-95 HOV Lanes Extension Study, Technical Memorandum 1, JHK & Associates for VDH&T, June 1981.

[10] Transportation and Environmental Studies of the I-66 and I-395 HOV Facilities, JHK & Associates for VDH&T, November 1986, p. 89.

recommended retaining the 6:00 AM - 9:00 AM HOV hours but extending evening operations by one-half hour, or from 3:30 to 6:30 PM. The report stated also that off-peak usage by LOVs had resulted in greater person movement on the facility.

The most recent change on the Shirley Highway took place in January, 1989, when 3-person carpools were allowed to use the exclusive lanes. This action came about as a result again of political pressure in 1988, following a similar change that had been effected on I-66 in August 1986. Faced with the possibility of further Congressional action (in 1987 Congress had rescinded the state's previous extension of Shirley Highway HOV operations to 6:30 PM), the Commonwealth Transportation Board relaxed the HOV requirement from 4 to 3 persons in the Fall of 1988. The action was combined with the simultaneous adoption and implementation of a HERO program (successfully employed in Seattle) to encourage reporting of HOV-lane violators.

II. DESIGN AND OPERATIONAL CHARACTERISTICS

When the reversible roadway was first proposed in the 1960's for mixed traffic use, its cross-section provided two 12-foot lanes abutted by 10-foot paved shoulders. The design carried forward into the busway cross-section, as shown in Figure 3. Access to the roadway, in addition to the terminal south of Springfield and the northern terminals on 14th Street, Southwest Freeway, and Washington Boulevard, is provided to and from the other I-95 lanes at Turkeycock Run and at the following interchanges: Eads Street, Shirlington Circle, Seminary Road, and Keene Mill Road. There are no stations or stopping places for buses on the system. Overhead signs, part of the traffic management system, indicate the hours of operation. Access points are controlled by gates operated remotely by VDOT staff at the control center at appropriate times.

The eleven-mile roadway is physically separated from the adjacent lanes by concrete barriers surmounted by steel beam guardrails at the edge of the roadway shoulders.

Environmental Effects

The UMTA Final Report on Express-Bus-on-Freeway Demonstration[11] primarily covers the period of exclusive bus use of the reversible roadway. The report cites the following reductions in auto usage, auto pollutant emissions and gasoline consumption. From a 1971 reduction of over 2,000 autos in the AM peak due to express bus service, the reduction grew to over 7,000 in October, 1974. Carpooling achieved a further reduction of about 350 vehicles. Daily pollutant reductions in October 1974 were estimated at 32,000 pounds of carbon monoxide, 3,800 pounds of hydrocarbons and 2,000 pounds of nitrogen oxides. Total gasoline savings for the period July 1971 to December 1974 were estimated at 6,900,000 gallons.

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[11] The Evaluation of the Shirley Highway Express-Bus-On-Freeway Demonstration Project - Final Report, Urban Mass Transportation Administration, Washington, D.C., August 1975.

The FHWA evaluation of July 1977[12] suggests that with the 1976 levels of usage, the fuel savings annually were slightly over 2 million gallons due to carpooling alone, while carbon monoxide reductions would exceed 131,000 tons.

Enforcement

The 1977 Evaluation Study[13] commented briefly on the enforcement issue, noting that Virginia State Police were supported by Arlington and Fairfax County police. The level of enforcement was reported as significant and active, but no statistics were given. However, the violation rate was cited as being below 3 percent of all carpools using the lanes. Currently, the Shirley Highway violation rate is reported to be 4 percent for the peak hour compared with 21 percent on the concurrent flow lanes of I-95 to the south. The total peak period violation rates are considerably higher, at 14 percent on I-395 and 39 percent on I-95, because violators particularly infringe on the start-up and closing periods. However, both of these 1989 figures show a drop from 1988, from 16 and 56 percent, respectively. The HERO program, costing about $7,500 monthly for the Northern Virginia area, has generated local media publicity as well as a lot of calls and appears to be both effective and well-received.

Utilization Rates

Figure 4 shows the bus usage of the Shirley Highway reversible roadway at early stages in its life. The numbers of passengers at Shirlington, close to Washington, remained almost constant at 2,000 for four years after some initial growth. The Busway's greatest benefits were clearly to longer trips, where ridership grew from 2,000 to over 11,000.

Table 3 summarizes person movements in the morning hours in the unregulated lanes, and by bus and other high-occupancy vehicles on the reversible roadway at different intervals over the past two decades.

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[12] Evaluation of Alternative Traffic Plans, op. cit., pp. 73-74.

[13] Evaluation of Alternative Traffic Plans, op. cit., p. 66.

Table 3

Person Movement - Shirley Highway

Volumes - Persons in AM Peak Period

Date	HOV Lanes Bus	HOV Lanes Car and Vanpool	HOV Total	Other Lanes	Total Persons	Source
1969	4200	--	4200	12500	16700	1. UMTA
1974	16100	4600	20700	16100	37800	1. UMTA
1975 Fall	17800	8000	25800	18200	44000	2. FHWA
1985	14000*	9700	24300	23900	48200	3. JHK
1989	--	--	35400	28200	63600	4. JHK

Sources:

1. Evaluation of the Shirley Highway Express-Bus-on-Freeway Demonstration Project - Final Report, UMTA, August 1975.

2. Evaluation of Alternative Traffic Operation Plans for the Commuter Lanes on the Shirley Highway in Virginia, Final Report, FHWA, July 1977.

3. Transportation and Environmental Studies of the I-66 and I-395 HOV Facilities - The Operation of I-395, JHK & Associates, November 1986.

4. JHK & Associates, 1989, unpublished data.

Note:

The figures shown above do not represent annual average data from a single location and thus are not necessarily entirely comparable from year to year. However, they are reasonably representative of the trends in volume among buses, other HOV's and person movement on the regular lanes of I-395.

* The decline in bus passengers reflects changes in bus routings principally occasioned by Metrorail station openings on the Yellow Line in late 1983.

In addition to regular, routinely formed carpools using the Shirley Highway, the existence of ad hoc, impromptu carpools forming at entry points and bus stop locations has been documented. Known as the "Springfield Underground," this mode of carpooling received considerable media attention when the change from HOV-4 to HOV-3 occurred. Counts made in 1987 indicated that up to 1,700 individuals were making up "instant" carpools in Springfield

during the morning peak.[14] The study concluded that the practice is cost-effective when HOV facilities are in place and it can be coordinated with bus operations.

[14] Evaluation of Springfield Instant Carpooling, The Urban Institute, Washington, D.C., January 1989.

III. SUGGESTED REASONS FOR THE SUCCESS OF THE SHIRLEY HOV LANES

The Shirley Highway HOV lanes have been a success story for over twenty years for a variety of reasons. The reversible roadways represent a solution required by economic necessity that was both technically efficient and socially acceptable. Economic necessity required a solution other than major new facilities, whether highway or transit, to meet peak hour travel demands. Adding lanes within the existing right of way permitted additional vehicle movement, but it was the increased person movement with a better quality of service that was the measure of technical accomplishment. Greater usage of bus transit and growing formation of carpools were acceptable to system users. The people of the Washington urban area historically were more accustomed to and would accept these transportation modes. Because many of them are government workers in the District of Columbia, they share similar working hours, proximity of work places, and perhaps most importantly, a limited supply of parking. These characteristics all work in the direction of commuter support for HOV operations.

The Shirley Highway HOV lanes also work because of the supporting facilities and services incorporated into the system. In the Shirley corridor, abundant, well-situated park-and-ride lots give commuters from low-density residential areas a convenient place to transfer to carpools, vanpools, and buses. Frequent express bus service operates from many origins. Local government ridesharing programs stock carpools and vanpools with new riders to meet HOV occupancy requirements. Police enforcement keeps the reversible lanes flowing freely, with a minimum of violators. At the work-end are large, dense employment sites, with extensive pedestrian-accessible retail services, so that employees do not need a car in the daytime to attend to their basic needs. Market parking rates are high, and many federal buildings have free, priority parking for employee carpools, as an added incentive to pool formation. These components work together to create a successful transportation approach in a congested urban travel corridor.

Frank Turner's article in Transportation Quarterly[15] outlined the following four essentials in meeting urban travel needs: 1) Soundly based analysis--relating possible solutions to the actual conditions being addressed; 2) Involving all elements--getting both public and private agency support in developing the solutions and facilitating their implementation; 3) Incorporating fresh thinking--in this case, encouraging one occupant car users to switch to other modes; 4) Thinking of people rather than vehicle flow.

The development and implementation of the HOV lanes reflected those ingredients, particularly that of "Involving all elements", an accomplishment of the long-lived Steering Committee. It seems appropriate to conclude, therefore, with this excerpt from the Forward to the NVTC report on the bus demonstration project.[16] "Finally, the project succeeded because each of the partners sincerely wanted it to succeed and worked conscientiously and professionally towards that goal. This included the firmness shown by the Virginia Department of Transportation in maintaining the occupancy requirements during the early years when utilization levels were building. Their reward was the satisfaction of having made a meaningful contribution to a growing body of knowledge of the mobility of people through mass transit."

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[15] "Moving People on Urban Highways," op.cit.

[16] "The Operation and Management of the Shirley Highway Express Bus-on-Freeway Demonstration Project--Final Report", Northern Virginia Transportation Commission, Arlington, Virginia, 1976, op. cit.

APPENDIX A

The NVTC report on the bus demonstration project (op. cit.) summarizes the coordination and interaction between different groups that led to the success of the initial transit project.

"The Shirley Highway Express Bus-On-Freeway Demonstration project is a remarkable example of the achievements that can be attained when properly motivated institutional bodies focus their abilities on a common goal. The project has been referred to by many as a 'partnership in transit.' This description is an accurate one because it portrays the varied and sometimes disparate interests that had a role in developing and managing the Shirley Project. With the active participation and encouragement of then Secretary of Transportation John A. Volpe, the partnership saw two modal Administrations of the U.S. Department of Transportation (The Federal Highway Administration and the Urban Mass Transportation Administration) cooperate in an unprecedented manner to demonstrate that highways and mass transit can work together without detriment to each other. This federal level alliance, considered unlikely in 1970, was joined by other partners each of whom brought something to the total endeavor.

The Northern Virginia Transportation Commission as local grantee and project sponsor served as the focal point of all activity once the project was given the authority to proceed by UMTA. The Virginia Department of Highways along with their counterpart, the District of Columbia Department of Highways and Traffic played a major role in keeping the bus roadway, bridge access, and curb lanes opened for mass transit use. The AB&W Transit Company and the WV&M Coach Company gave private enterprise an active role in the partnership. The local Virginia jurisdictions which make up NVTC (Arlington and Fairfax Counties, Fairfax City, the City of Falls Church, and the City of Alexandria) also contributed where it counted the most by providing the local matching funds. The Metropolitan Washington Council of Governments served as early planners for the project as well as playing a valuable role in serving as Secretariat to the project steering committee. The Virginia State Police, Washington Metropolitan Police, police departments of the participating Virginia jurisdictions, and the U.S. Park Police all lent their support to the project's success."

The same organizations, or those that later evolved representing the same interests, operating through the Steering Committee, continued to guide and influence the improvements to the Shirley Highway HOV facilities.

The Steering Committee consisted of the technical representatives of the several involved planning agencies. It was "ad hoc" in nature and met as required but generally once a month. It was guided by Virginia Highway Department staff but the Committee provided a forum for discussing and solving technical issues which would later become the basis for interagency agreements on the planning and operation of the facility. The Steering Committee provided an excellent means for the exchange of ideas and played a major role in the success of the Shirley Highway project.

Organizations Involved in Shirley Highway HOV Development and Operation

Federal Highway Administration, U.S. Department of Transportation.

Role: Key player in initiating the Shirley Highway Busway as a model for demonstrating policy of encouraging bus use on urban highways. Funded construction through normal programs. Advisory Role in SHSC.

Urban Mass Transportation Administration, U.S. Department of Transportation.

Role: Provided demonstration grant for bus acquisition and implementation of phases of busway demonstration subsequent to busway start-up. Funded evaluation study. Advisory role in SHSC.

National Bureau of Standards, U.S. Department of Commerce.

Role: Performed evaluation from early 1971 to 1975 of the Shirley Highway Express-Bus-On-Freeway (EBOF) Demonstration Project.

* Virginia Department of Highways (now Virginia Department of Transportation)

Role: Carried out planning design and evaluation studies from 1962 to date, modified construction plans to facilitate busway implementation, constructed, operated and maintained facilities, co-administered EBOF project.

* D.C. Department of Highways and Traffic (now D.C. Department of Public Works)

Role: Provided 14th St. Bridge improvements and priority bus lanes on arterials within the District of Columbia.

* Northern Virginia Transportation Commission

Role: Manage demonstration grant for EBOF demonstration project.

Virginia Department of State Police

Role: Enforcement of HOV regulations.

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* Participant in Shirley Highway Steering Committee (SHSC).

* Washington Metropolitan Area Transit Commission

  Role: Planning and operational considerations with respect to bus service in the Shirley Highway Corridor.

* Washington Metropolitan Area Transit Authority

  Role: Legal and administration considerations in public transportation.

* Alexandria, Barcroft, and Washington Transit Company

  Role: Private bus company participating in EBOF demo project.

* Washington, Virginia, and Maryland Coach Company

  Role: Private bus company participating in EBOF demo project.

* Metropolitan Washington Council of Governments

  Role: Provided feasibility study and supporting planning data, participant in EBOF project.

U.S. Congress

  Role: Legislated the opening of HOV lanes to LoV's during off-peak period for 12 months demonstration project beginning April 1985. Legislated change in HOV hours, 1987.

Arlington County

  Role: Support enforcement activities.

Fairfax County

  Role: Support enforcement activities.

* City of Alexandria

  Role: Operation of streets leading to several of the Shirley Highway HOV ramps.

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* Participant in Shirley Highway Steering Committee (SHSC).

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HISTORY AND INSTITUTIONAL ARRANGEMENTS: I-66

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I. BACKGROUND AND HISTORY OF I-66

The history of the development of I-66 between the Washington Beltway (I-495) and Rosslyn has been well-documented. The present summary draws heavily on available resources for the history of early stages leading to the opening of the highway, and then reports the significant events of the 1980's based mostly on a review of less readily available materials.

The circumstances that led to the unique character of I-66 operations were briefly summarized by Page, as follows:

"I-66 was conceived and born during the 1950s highway era, characterized by domestic preoccupation with congestion, decay of the central city, and urban sprawl. The highway was promoted as the solution to these urban problems. However, during the late 1960s and 1970s this solution was questioned by social scientists, environmentalists, and others, which delayed the highway construction. The project survived the delay by adapting and changing its role from a Los Angeles [type] freeway to a multi-modal, traffic-managed facility."[1]

History

Initial Planning for I-66

"The present I-66 location (see Figure 1) has always been an important transportation corridor. In 1938 Fairfax Drive was recommended to be constructed to state highway specifications, for the corridor was identified as the principal western connector. This policy, reflected in zoning and highway improvements, evolved during the next 20 years as the urbanized portion of Arlington County pushed westward. In response to this growth, the Commonwealth of Virginia and the Counties of Arlington and Fairfax proposed that the I-66

[1] I-66 Case Study: Evolution Process of Tomorrow's Urban Highways, John H. Page, "Transportation Quarterly," Vol. 37, No. 4, October 1983, 493-510, Westport, Connecticut.

corridor be incorporated into the Interstate System on March 29, 1958. Eight months later the corridor was endorsed as a possible location for an Interstate facility by Arlington and Fairfax Counties. The Virginia Department of Highways and Transportation (VDH&T) forwarded the plan to the U.S. Bureau of Public Roads for their approval. The I-66 location was finalized on June 4, 1959.

Also as a result of Interstate approval, VDH&T started to acquire the necessary right-of-way for the project on June 28, 1962. This process continued throughout the 1960s. By 1968, 93.9 percent of all dwellings were acquired, 98.5 percent of all businesses were acquired, 76.6 percent of all families were relocated, and 84.4 percent of all right-of-way was purchased, at a cost of $28.7 million for right-of-way acquisition."[2]

The USDOT document "Secretary's Decision on Interstate Highway 66, Fairfax and Arlington Counties, Virginia"[3] provides further background.

"Several events between 1962 and 1970 delayed final planning and the initiation of construction along the route. These events included: 1) public controversy and litigation surrounding the Three Sisters Bridge/I-266 project, which was to connect with I-66 and provide an additional crossing of the Potomac River; 2) the protracted legal negotiations by local commuters to keep the Washington and Old Dominion Railroad in operation, segments of which were proposed to be utilized for the I-66 right-of-way; and 3) the need to coordinate I-66 with the planning efforts for the Metro rapid transit system.[4]

During the same period, new Federal legislation and administrative directives were adopted which governed highway planning and construction in general, and which affected I-66

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[2] Page __, op. cit.

[3] "Secretary's Decision on Interstate Highway 66, Fairfax and Arlington Counties, Virginia", Department of Transportation, Washington, D.C., January 5, 1977.

[4] The Washington Metropolitan Area Transit Authority adopted a plan on March 1, 1968, which included a Metro line in the median of I-66 west of Glebe Road in Arlington County to Nutley Street in Fairfax County, near Vienna.

specifically. Section 4(f) of the Department of Transportation Act was enacted in 1966, prohibiting the approval of projects that use parkland unless there is no "feasible and prudent alternative" to such use. The original I-66 project proposed to take parts of several parks for right-of-way.

In 1970, the National Environmental Policy Act (NEPA)[5] was enacted, section 102 of which requires the preparation of environmental impact statements (EIS) for major Federal actions "significantly affecting the quality of the human environment." These and other enactments collectively impacted the highway planning process by adding a new emphasis to the review of projects by the public and by local agencies, and giving greater emphasis to the need to identify the social, economic and environmental impacts of proposed highway projects.

A design public hearing on the segment of I-66 from North Glebe Road to North Lynn Street was held in 1970, followed by reaffirmation of the design approval in January 1971. In early 1971, the Arlington Coalition on Transportation (ACT), and several named individuals filed suit in the U.S. District Court to stop construction of I-66. ACT contended that Federal and State highway officials had not complied with section 4(f) of the DOT Act, section 102 of NEPA, and section 128 of Title 23, U.S.C., governing public hearings for highway projects.

In October 1971, the District Court dismissed the suit filed by ACT, but on April 4, 1972, the U.S. Court of Appeals for the Fourth Circuit reversed the District Court decision. The Court of Appeals enjoined further acquisition of right-of-way and construction for the highway until DOT filed an EIS and determined, pursuant to section 4(f), that there is no "feasible and prudent alternative" to the use of the parklands. The court also ruled that new public hearings must be held to consider the social and environmental impacts of the project, and the economic effects of the proposed location in light of the planned rapid transit service in the I-66 corridor.[6]

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[5] 41 U.S.C., Sec. 4321, et seq. (1970).

[6] Arlington Coalition on Transportation v. Volpe, 458 F.2d 1323 (4th Cir., 1972).

Accordingly, VDHT initiated a study in September 1972, with FHWA involvement, to consider alternatives to the I-66 proposal and to review the social, environmental and economic impacts of the project, pursuant to the Court of Appeals decision. The resulting draft EIS/4(f) determination was released on November 17, 1973. The draft statement, which evaluated five basic options to meet the transportation needs in the I-66 corridor, was distributed for review to approximately 75 Federal, State and local agencies, as well as to 150 individuals and organizations which had participated in the study. A public hearing was conducted by VDHT on December 17-22, 1973, to receive public input and comments regarding the five alternatives studied and their impacts.

A document summarizing public hearing and draft EIS review comments, and evaluating the I-66 corridor transportation requirements, was prepared for use by the Virginia State Highway Commission in reaching its decision. After consideration of the findings contained in the study documents and the public hearing and agency review comments, the State Highway Commission, on February 21, 1974, adopted the Multi-Mode/New Facility Option" for the I-66 corridor (i.e., I-66 with Metro), with certain modifications, and directed the preparation of the Final Environmental/Section 4(f) Statement)."

Changes in the Design Alternative

Page describes in detail the next activities of VDH&T, picking up with the February, 1974 action.[7]

"In the face of all this opposition to the project, on February 21, 1974, the Virginia State Highway Commission adopted the Multi-Mode/New Facility Option that did include METRO in the corridor. It is of some interest to note that the option selected was not the highway option. A combination of the base case, transit and highway options, and the METRO, was included in the corridor. It is quite possible that VDH&T was convinced by the EIS and public testimony that a highway solution was impossible and the best possible

[7] Page, op.cit.

alternative that included a highway was this Multi-Mode/new Facility Option. However, if this move was an attempt to keep the METRO supporters in the I-66 camp, the strategy was dealt a quick death blow when, on the same day, February 21, the Transportation Planning Board (TPB) of COG voted to oppose I-66 and removed the facility from the regional transportation plan. The resolution declared that I-66 is not compatible with the regional goals and objectives."

Page goes on to show that several months later the FHWA was still supporting VDH&T but requesting design changes.[8] FHWA asked VDH&T in September 1974 to reduce environmental impacts by removing two lanes, prohibiting trucks and redesigning the two level structure near Spout Run Park. "In order for VDH&T to make these changes as quickly as possible, a median lane was removed from each direction. This reduction of size allowed the Spout Run area to be redesigned with some minimal lateral shift to accommodate an at-grade section. Finally, the traffic figures were manually adjusted "to provide comparative analysis between travel demand on local radial routes with a six- or eight-lane plan." Trucks were excluded from the project. The VDH&T then provided a supplemental document to the EIS for this new design. The justification for the 6-lane project was:

> In modifying the proposed action, the paramount considerations were reducing roadway capacity, restricting truck traffic, revising project design in the Spout Run Parkway area and identifying the environmental variations associated with these changes. The feasibility of reversing these design actions if a six-lane concept were implemented appears unlikely. Lane elimination is proposed to achieve maximum enhancement of both the communities traversed and the transportation network. The cost of restoring these lanes, especially through the section 4(f) areas, would be enormous in terms of community impact and construction cost. Also no consideration was given to the adaptability of this plan.[9]

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[8] Page, op.cit.

[9] VDH&T, I-66 Corridor Environmental Evaluation for a Six-Lane Roadway Design, Richmond, Va., 1974.

This statement appeared to indicate that the 8-lane plan was a thing of the past and would never again be mentioned. However, the anti-highway forces noted that the design was the same as the 8-lane design, the structures were the same, and the right-of-way was the same. The Environmental Impact Statement for a 6-Lane Roadway Design was submitted to FHWA in November of 1974.

The submission of the revised EIS to the FHWA signaled the beginning of the federal approval process that would culminate with a decision by the Secretary of Transportation. As an aid to the department in developing their position, a public information file was opened for comments. This file contained the positions of various federal, state, and local agencies, as well as special interest groups and civic organizations on the project. A Washington Post article in early June 1974 reported some of these comments, which had been placed in the DOT file.[10]

> "A decision to build I-66 would be inconsistent with the national goal of reducing our reliance on imported petroleum." (Federal Energy Administration)
>
> "Some highways are desirable others are not. This one is not." (Federal Energy Administration)
>
> "A decision to approve I-66 would mean that the administration is not serious about energy and making the most effective use of petroleum resources." (ACT)

In the FEA report, it was estimated that if I-66 was built, there would be an 11 percent increase in gasoline consumption during the rush hour as compared to the adoption of the transit option. The report also suggested that if the project were to be built, it should be restricted to carpools and buses during peak hours as a measure to save energy."

Note that METRO was included in the corridor at this point. Also, two traffic operation considerations had been introduced at this stage of the planning process: first, the

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[10] Ron Shaffer, "EPA Cites Fuel Use in Opposing I-66," Washington Post, 13 June 1974, p. C1.

prohibition of truck traffic; and second, the proposal that peak hour usage be limited to carpools and buses.

The Role of the Secretary of Transportation

The Secretary's report recites the events leading to his 1975 disapproval of the I-66 plan modified to reduce local impacts, and then up to the approval of the four-lane plan on January 5, 1977.

"In September 1974, FHWA requested that additional effort be made to alleviate further the impacts of the proposed project on local communities, particularly Arlington and Fairfax Counties. VDHT subsequently modified the original proposal to reduce the number of highway lanes from eight to six; to prohibit heavy duty trucks from using the facility; and to redesign the segment through the Spout Run Parkway area in order to provide for a ground level roadway rather than the two-level structure which was included in the eight-lane design. These design modifications were submitted to FHWA in November 1974 as the "Environmental Evaluation for a Six Lane Roadway Design", and were subsequently considered by me in my evaluation of I-66 in 1975.

On June 21, 1975, I held a public hearing to hear the positions of elected officials and civic organizations on the proposed project. On August 1, 1975, I disapproved the VDHT and FHWA request to build this segment of I-66, and issued a decision document setting forth the reasons for my decision.[11] I also set forth several follow-up actions dealing with various aspects of transportation in the I-66 corridor.[12]

In response to this decision and the follow-up actions, FHWA and VDHT developed the four-lane multi-mode concept. Following consultation with other State and Federal

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[11] Department of Transportation, "The Secretary of Transportation's Decision on Whether the Department of Transportation Should Approve the Construction of Interstate Route 66 in Arlington and Fairfax Counties, Virginia," August 1, 1975.

[12] Ibid, pp. 15-16.

agencies on this concept, a draft supplemental EIS/4(f) was prepared and circulated for public, State and Federal agency review on June 2, 1976. VDHT conducted a public hearing on the draft on July 10-11, 1976, for the purpose of receiving public comments of the proposed design and traffic management concepts.

Following review of the comments on the draft EIS/4(f), the Virginia Highway and Transportation Commission endorsed the design for the proposed four-lane multi-mode concept, by resolution dated July 29, 1976, and the State concurred in the proposed final EIS/4(f) for the four-lane concept on August 10, 1976. FHWA has now also endorsed the proposal . . . .

Because of the difficulty in making the decision on whether to approve the Virginia application for construction of I-66, because of its potentially significant impact on the Washington, D.C. metropolitan area, and because I personally conducted a public hearing last year before rejecting the six-lane proposal, I decided that it was in the public interest to hold a new public hearing before making a decision on the current proposal. Accordingly, on August 27, 1976, I announced that I would conduct a public hearing on the matter, at which elected officials and citizens representing various jurisdictions and interest groups would be given a final opportunity to make clear their positions and to present their cases directly to me.[13] The hearing was held in Washington on October 2, 1976.

Representatives of State and local governments, other elected officials, civic and business organizations, and interested citizens addressed a series of relevant questions set forth in a statement of issues on the matter prepared by DOT.[14] This issue paper outlined the transportation, environmental, social, economic and legal considerations that would have to be evaluated in reaching a decision. Among the important questions addressed at that time or raised since are whether, and to what extent, I-66 would provide transportation benefits in the

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[13] 41 Federal Register (F.R.) 36536, August 30, 1976.

[14] "Issues Relating to I-66, Arlington and Fairfax Counties, Virginia," September 29, 1976 (41 F.R. 42971).

metropolitan area, including time savings for commuters and a reduction in congestion on local streets and arterials in Virginia; and how important such benefits would be. Other transportation questions concern whether the highway would encourage greater use of Dulles Airport, compete with Metro for riders, or result in increased or decreased numbers of vehicles in the Virginia localities and the District of Columbia. Questions regarding the enforceability of the proposed heavy truck exclusion and peak hour limitation to carpools and buses have also been raised.

Other questions concern the extent and importance of the environmental, social and land use impacts of the proposed highway. These issues relate to, inter alia, impacts on air quality, noise, community disruption, and parklands, and to consistency with the planning goals of the affected jurisdictions.

Legal questions have been raised regarding compliance of the proposal with section 4(f) of the DOT Act, and the legality of conditioning any grant approval in order to prevent future attempts to expand the highway beyond the four lanes now proposed, or to remove the proposed use limitations.

Written presentations were submitted to the public docket, which remained open until October 15, 1976. After October 15, I received correspondence on this matter, which is part of the public file."

An indication of how the input from local agencies and citizen groups was weighed in the decision process is given in Appendix B.

The Decision of the Secretary of Transportation

The 71-page report containing the decision of the Secretary of Transportation became the basis for constructing I-66 inside the Beltway. Approval for construction was subjected to the following conditions, as summarized by Lantz and Arnold:

1. Provide, without cost, right-of-way in the I-66 median for construction of a Metrorail line and complete construction of the median to the point that rails can be placed by the WMATA at minimal construction expense;

2. Transfer from Virginia to WMATA funds previously allocated for the construction of I-266;

3. Restrict the use of I-66 between the Capital Beltway and the Potomac River in the peak direction and peak period to buses, carpool vehicles carrying four or more persons, emergency vehicles, and vehicles bound to or from Dulles Airport;

4. Exclude heavy-duty trucks (two axles, six tires, and larger) from the facility at all times;

5. Submit within 60 days a detailed plan for enforcing these traffic restrictions;

6. Do not construct any highway lanes in the right-of-way beyond the four approved;

7. Include design elements and other features intended to minimize and compensate for adverse social and environmental impacts and develop a facility, as far as possible, similar to the George Washington Parkway; and

8. Provide assurances that minorities and minority-owned enterprises will participate in all construction.[15]

The way was now cleared for construction of the facility. With unique construction features, special environmental characteristics, and with METRO and a traffic management system integrated into the system, the 9.6 mile segment of I-66 took five years and between $275-300 million to complete.

[15] K.E. Lantz, Jr., and E.D. Arnold, Jr., "Summary of Operational Characteristics and Anticipated Evaluation of I-66 HOV Facility," Transportation Research Record No. 906, Transportation Research Board, Washington, D.C., 1983, pp. 26-33.

II. DESIGN AND OPERATIONAL CHARACTERISTICS

Design

The basic roadway cross-section provides two lanes in each direction, with paved full shoulders in the median as well as on the right edge of pavement. Metrorail facilities occupy the median for a little over half the mileage.

Other features of I-66 include continuation of bicycle and pedestrian trails from Rosslyn along I-66 to the East Falls Church Metro Station. Heavy landscaping, multiple use of space, and noise abatement structures are provided to assure compatibility with the surroundings.

During construction, further modifications to the design were made to lessen environmental impacts and provide joint-use facilities for local communities.

The operating restrictions and call for a detailed enforcement plan led to a feasibility study,[16] which led in turn to design studies for a traffic management system. The Traffic Management System, which was integrated with its counterpart on the Shirley Highway, featured an enforcement plan necessitated by the peak-period high-occupancy vehicle (HOV) restrictions, entrance ramp metering, closed circuit television monitoring, electronic surveillance, variable message signs, lighting, and a computerized central control facility to manage both highways.

Initial Operations

When I-66 opened to traffic on December 22, 1982, trucks were excluded at all times and the following peak hour restrictions applied: from 6:30-9:00 AM, inbound, open to buses and HOV-4 only; from 3:30-6:30 PM, outbound open only for HOV-4 and buses. A controversy erupted almost immediately "...over both the occupancy limit and hours of operation. Debated in the political arena and in the media, the issue was split between those

[16] Traffic Management Concepts Study, I-66, JHK & Associates for VDH&T, February, 1977.

favoring easing of the restrictions and those favoring their maintenance."[17] Monitoring and evaluation studies by VDH&T included those by JHK & Associates and the Virginia Highway and Transportation Research Council. The Phase I report from the latter study highlights various operational findings for the first year of operation[18] (see Appendix C). The characteristics shown there, of high volumes just before and after the restricted periods combined with relatively low volumes during the HOV operations clearly fueled the controversy.

These concerns led to Congressional action in December, 1983 requiring a demonstration project lowering the HOV requirement to three persons and changing the hours of operation. Specifically, the hours of HOV operation on I-66 were reduced to 7:00-9:00 AM inbound and 4:00-6:00 PM outbound.

Studies documented the effects of the changed operations.[19] The 12-month period of the demonstration (more or less calendar year 1984), was marked by various events potentially impacting I-66 traffic volumes. Table 1 shows the changes in volumes, the attractiveness of three-person carpools, a slight decline in the transit percentages (though absolute numbers clearly increased), and a gain in the LOV persons (which would be expected from the reduction in HOV time-restriction). The result of the demonstration caused VDH&T to request USDOT approval of the HOV-3 occupancy requirement. However, congested traffic in the "shoulders" of the restricted time periods led to their recommendation to return to the original restricted morning hours of 6:30-9:00 AM and from 4:00-6:30 PM for the evening. These hours were put into effect in August, 1986.

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[17] Transportation and Environmental Studies of the I-66 and I-395 HOV Facilities--The Operation of I-66, JHK & Associates for VDH&T, April, 1985, p.2.

[18] "An Evaluation of I-66 and the Improvements to I-395 Between the Capital Beltway and the District of Columbia", E.D. Arnold, Jr., and K.E. Lantz, Jr., Virginia Highway and Transportation Research Council, Charlottesville, Virginia, April 1982.

[19] Transportation and Environmental Studies of the I-66 High Occupancy Vehicle Facility, Federal Highway Administration, December 1985.

Table 1
Comparison of Volumes by Mode, 1983-1984
Station 103 - I-66

Morning Peak -- 6:00-10:00 AM -- Eastbound

	1983	1984
Total Person Volume	21,400	25,000 (17% increase)
Percent Distribution:		
1 - 2 Persons/Vehicle	39.7	40.3
3 Persons/Vehicle	2.3	17.4
4+ Persons/Vehicle	36.0	23.1
Bus Transit	21.9	19.2

Evening Peak -- 3:00-7:00 PM -- Westbound

Total Person Volume	18,100	27,000 (49% increase)
Percent Distribution:		
1 - 2 Persons/Vehicle	30.5	39.7
3 Persons/Vehicle	2.3	19.0
4+ Persons/Vehicle	42.4	23.5
Bus Transit	24.8	17.8

Note: Based on JHK & Associates, Transportation and Environmental Studies of the I-66 and I-395 HOV Facilities, the Operation of I-66, April 1985.

The success of the modified HOV operations on I-66 inside the Beltway probably contributed to a study of its applicability westward on I-66. The VDH&T, in any case, commissioned an HOV feasibility study for approximately 22 miles of I-66 between the Beltway and Gainesville, an area experiencing rapid development and fast-growing traffic demands. The study[20] recommendations were that a two-lane separated, reversible roadway like that of Shirley Highway should be considered as a solution. The recommendation has been approved, but the $200 million project is as yet unfunded.

Current Operations

As of January, 1989, the HERO program (a volunteer method for reporting violators in the HOV periods) was put into effect. Data show that while violation rates in the peak hour (7-8 AM) were still high at 17 percent, they had dropped from 22 percent in 1988. Total volume in the eastbound peak hour was 2,850, with 3.75 persons/vehicle (including buses), on the western end. Closer to Rosslyn, total peak hour person movement was over 5,800, or 2,900 persons per lane per hour, with a person/vehicle count of 3.24.

[20] HOV Feasibility Study, I-66, Post, Buckley, Schuh & Jernigan, for VDH&T, 1986.

III. SUGGESTED REASONS FOR THE SUCCESS OF THE I-66 FACILITY

If mere existence as an operating facility can be described as success, then a number of reasons can be found to explain the success of I-66 between the Beltway and the Potomac. Because of the difficulties that occurred in finding an acceptable solution to the extension of I-66 in the urban area, first credit should probably be given to a joint technical-political process that eventually hammered out a combined design/operations compromise that could be implemented. The unique directional HOV operations during peak periods (politics even entered into determining those periods) were possible because they were acceptable to the community, both user and non-user. As with the Shirley Highway case, the commuter characteristics were influential in supporting the HOV operation -- a high proportion of government workers with similar destinations, working hours and limited parking supply. The fact that METRO chose the corridor right of way for a rail-transit line made the facility more acceptable. The acceptance by VDOT of the political realities limiting the facility to a four-lane cross-section, the banning of trucks, and the environmental sensitivity displayed by the final design features were all essential to construction approval.

Most recently, "nothing succeeds like success." The HOV solution that is currently operating appears to meet the needs of the commuters as well as those of the communities served. The fact that new HOV facilities are being actively developed in the metropolitan area clearly testifies to the technical, political, and social acceptability of this transportation mode.

APPENDIX A

The evolution of the I-66 design, its eventual construction, and its unique operational techniques were far different from the experiences with Shirley Highway HOV lanes. While the Shirley Highway projects represented the coordinated involvement of many agencies with a common interest in increasing the people-moving capacity of an existing facility, the I-66 HOV solution represented the final compromises among public and private interests that made possible the building of a new urban highway. It seems clear that the investment of nearly $300 million hinged on finding an acceptable way of operating the facility once it was built. So, rather than reflecting the coordinated efforts of a major public-private partnership, I-66 HOV operations show the results of a tortuous, and sometimes tortured, struggle to reach compromises acceptable to all the interested parties. The list below shows most if not all the groups concerned; it does not show their roles. In many cases, agencies reversed their positions, and sometimes more than once.

It seems clear, however, that I-66 would never have been built at all without the perseverance of the Virginia State highway agency over a period of several decades. Support came from FHWA, but ultimately it was VDOT that had to develop physical designs, and operations plans that would respond to not only political realities but also court requirements. In the end, of course, the parameters were specified by the Secretary of Transportation, and the project was built and operated accordingly.

List of Organizations Involved in I-66 Development

A List of Organizations

U.S. Congress

U.S. Department of Transportation, Secretary

U.S. Department of Transportation, Federal Highway Administration

U.S. Department of Transportation, Urban Mass Transportation Administration

U.S. Department of Transportation, Federal Aviation Administration

Department of Housing and Urban Development

Environmental Protection Agency

Federal Energy Administration (DOE)

President's Council on Environmental Quality

U.S. District Court

U.S. Court of Appeal for Fourth Circuit

Governor of Virginia

Virginia Department of Highways and Transportation (VDOT)

D.C. Department of Transportation

Arlington County Board of Supervisors
Fairfax County Board of Supervisors
Fairfax County Park Authority
Metropolitan Washington Council of Governments
Washington Metropolitan Area Transit Authority
Arlington Coalition on Transportation
Arlingtonians for the Preservation of the Potomac Palisades
Citizens for I-66
CONTACT
Arlington County School Board

APPENDIX B
Excerpt from "Secretary's Decision . . ."

A. Elected Representatives and Civic Groups

I must give considerable weight to the views of the affected communities and elected officials representing them. I believe that the views of the affected population must be taken into consideration, and if the views of a heavy preponderance of the population weigh in on one particular direction, that is an important consideration.

On the basis of my recent public hearing, information set forth in the supplemental environmental impact statement, and other material submitted for the record, it is clear that there is both substantial support for and opposition to the application now before me. Accordingly, in this particular instance, the thrust of local views alone would not appear to require my approval or rejection of the VDHT proposal.

Generally, opposition to the revised I-66 proposal is strongest from within the District of Columbia and the closer-in jurisdictions in Virginia, while support for I-66 lies predominantly with the elected officials and community organizations representing the more distant jurisdictions which would be particularly served by I-66. For example, representatives of Arlington County, the City of Falls Church and the District of Columbia, and the Congressman representing Arlington and part of Fairfax, all spoke in opposition to the proposal at the October public hearing. A=The Arlington County Board and the D.C. Department of Transportation are among those having gone on record urging rejection of the Virginia application.

On the other hand, the County Boards of Fairfax and Prince William Counties, and the Councils of the Virginia towns and cities of Herndon, Fairfax, Middletown, Vienna and Manassas all support the new proposal. In addition, the Governor of Virginia and its two United States Senators have entered the record in support of I-66.

Citizens' groups urging rejection of the VDHT application include approximately 45 organizations representing residents of Arlington County and the District of Columbia, and the Washington representatives of two national environmental organizations. On the other hand, at least 38 citizens' groups, including 2 located in the District of Columbia, favor the new I-66 proposal.

The Metropolitan Washington Council of Governments (MWCOG), acting in its capacity as the areawide review agency (under the provisions of Office of Management and Budget Circular A-95), voted narrowly in favor of the current four-lane proposal, in July 1976, as set forth below.

MWCOG Weighted Vote on I-66 (July 1976)

	For	Against
Virginia		
Fairfax County	22	
Arlington County		6
Loudoun County		2
Prince William County	5	
Alexandria		5
Falls Church		1
Fairfax City	1	
District of Columbia		29
Maryland		
Montgomery County	10.5	10.5
Prince George's County	22	
Bowie	2	
Rockville	2	
Gaithersburg	1	
Takoma Park	1	
	—	1
TOTAL	66.5	54.5

B. Consistency with Local Planning

On July 30, 1976, the Transportation Planning Board of MWCOG, which last year had withdrawn I-66 from its long-range and short-range transportation plans for the region, reinstated the four-lane proposal in those plans and determined that the new I-66 proposal was consistent with regional transportation goals, objectives and policies. This vote was also quite close, as set forth below.

Transportation Planning Board Weighted Vote on I-66 (July 1976)

	For	Against
Virginia		
Fairfax County	1.579	
Arlington County		.463
Loudoun County (.139-abstain)		
Prince William County	.395	
Alexandria	.329	
Falls Church		.035
Fairfax City	.060	
VDHT	1.000	
District of Columbia		4.000
Maryland		
Montgomery County		1.161
Prince George's County	1.473	
Bowie	.096	
Rockville	.120	
Gaithersburg	.060	
Takoma Park		.045
Greenbelt		.045
Maryland DOT	1.000	___
TOTAL	6.112	5.749

The Executive Director of the National Capital Planning Commission has stated, in a letter dated June 18, 1976, that the four-lane concept is consistent with the Major Thoroughfare Plan and Mass Transportation Plan elements of the Comprehensive Plan for the National Capital.[1]

[1] Four Lane Supplement, p. 182.

Virginia's State Air Pollution Control Board found the four-lane concept to be conceptually consistent with the objectives of the State Implementation Plan to achieve ambient air quality levels.[1]

The Arlington County Planning Commission, however, on June 15, 1976, determined the four-lane proposal to be inconsistent with Arlington's Master Thoroughfare Plan.[2]

In addition, in as much as WMATA did not present its views at the public hearing which I conducted on I-66, I requested WMATA's views by letter dated October 6, 1976. In its letter of response, WMATA did not take a position on the desirability of the construction of I-66, and stated that "it is not contemplated that the WMATA Board of Directors will formally vote on the question of I-66."[3]

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[1] Ibid., p. 180.

[2] Ibid., p. 173.

[3] Letter to Secretary Coleman from Sterling Tucker, Chairman of the Board of Directors of WMATA, dated October 14, 1976.

APPENDIX C

"An Evaluation of I-66 and the Improvements to I-395 Between the Capital Beltway and the District of Columbia"[1]

Below is a list of the most important findings from the Phase I study effort. Findings concerning the operation of I-66 and the local response to it are, for the most part, based on data obtained in the fall of 1983 and, therefore, reflect operation at the HOV-4 level with restricted hours from 6:30 - 9:00 A.M. and 3:30 to 6:30 P.M. Further, the Dulles Airport Access Road Connector had not been opened to traffic. Findings concerning the impacts are, for the most part, based on a comparison of the above data with the same types of data obtained in the fall of 1982 prior to the opening of I-66. Unless noted, all findings refer to the restricted portion of I-66 between I-495 and Lynn Street.

1. The average weekday traffic was 43,770 vehicles. Traffic volumes were slightly higher on Saturday and about 16% lower on Sunday.

2. Volumes in the peak direction during the restricted periods averaged around 2,100 vehicles, with the afternoon volume being about 3% higher.

3. In both the morning and afternoon, traffic peaked immediately after the restricted period; that is, after 9:00 A.M. and after 6:30 P.M. Hourly traffic volumes in the peak direction for the hours beginning at 9:00 A.M. and 6:30 P.M. were around 2,800, with the afternoon volume being about 3% lower. Thus, the peak-hour volumes were about 33% higher than volumes during the entire restricted period.

4. Traffic patterns in the peak direction were similar for both the morning and afternoon peak periods. Traffic volumes were very heavy just prior to the restricted period, began dropping sharply during the first 15 minutes of the restricted period as illegal vehicles cleared the facility, bottomed out in the middle of the restricted period, and then increased dramatically immediately after the restricted period. Volumes on the fringes of the restricted periods were indicative of capacity flow, and there was often heavy congestion and the resulting slow speeds and stop-and-go traffic. In the middle of the restricted periods traffic moved smoothly at high speeds, and volumes ranged from 16% to 33% of capacity along the section.

5. Reverse commuting was prevalent, and traffic volumes during the restricted periods in the off-peak, unrestricted direction were much higher than the volumes in the peak, restricted direction. Traffic moved smoothly in the off-peak direction, however, as average volumes ranged from 34% to 43% of capacity during the peak hours of flow.

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[1] Arnold and Lantz, op. cit.

6. Traffic on the peak direction on-ramps was generally light, as many commuters traveled the length of the restricted portion from a point outside the Beltway to Washington. Specifically, 1,050 eastbound vehicles entered the restricted portion from I-66 west of the Beltway during the morning restricted period and 1,840 westbound vehicles entered from I-66 east of Lynn Street during the afternoon restricted period.

7. The number of buses traveling in the peak direction between Sycamore Street and Fairfax Drive was about 140 during the morning peak period and 125 during the afternoon peak period. Most were Metrobuses heading toward or coming from the Metrorail station at Ballston.

8. The occupancy of vehicles traveling in the peak direction in the middle of the restricted section of the roadway averaged 4.1 and 3.9 persons per vehicle in the middle of the morning and afternoon restricted periods, respectively. Bus occupancy was about 32 persons per bus.

9. Based on traffic volumes at the point the aforementioned occupancy rates were obtained, it is estimated that about 13,500 persons traversed I-66 between Sycamore Street and Fairfax Drive during each of the morning and afternoon restricted periods.

10. If the occupancy rate of 4.1 persons per vehicle was applied to the previously mentioned high volume of 33% of capacity, then about 5,400 persons were being transported during the middle of the restricted period. It would take about 4,500 vehicles to carry that many persons at the rate of 1.2 persons per vehicle typically found in the area. This number of vehicles exceeds the theoretical capacity of 4,000 vehicles per hour for the facility.

11. A comparison of traffic statistics on major commuter routes at Glebe Road showed that I-66 handled only 4% to 5% of the peak-direction traffic crossing the screenline during each of the morning and afternoon restricted periods. However, it carried between 10% and 11% of the persons.

12. Overall travel speed between I-495 and Washington was 45 mph inbound in the morning peak period and 48 mph outbound in the afternoon. Comparable speeds on the restricted portion only were 46 mph and 51 mph, respectively. These speeds were considerably higher than those observed on other major commuter routes in the area.

13. A comparison of travel times between approximately the same termini on I-66 and Routes 29 and 50 showed time savings of 12 to 15 minutes on I-66, with reductions in travel times of 48% to 56%.

14. The accident rate in 1983 was 42 accidents per 100 million vehicle miles of travel. This rate was 44% lower than the average rate in 1983 for the interstate system in

Virginia and 51% lower than the rate in 1983 on I-66 just west of the Beltway. Many sections of I-395 had rates over 100 in 1983.

15. About half of the accidents occurred at night, whereas statewide on the interstate system in 1983 about 37% occurred at night.

16. In early 1983 an average of about 50 citations per day were issued for violation of the HOV-4 occupancy requirement. Arlington County Police issued approximately three times as many as did the State Police. Although concentrated enforcement on certain days resulted in a large percentage of violators being cited, occupancy studies indicated that many violators did not receive citations. The actual rate varied considerably depending on the location and time for which it was calculated.

17. Essentially all of the carpoolers and bus riders on I-66 during the morning restricted period were going to work. Between 70% and 80% had ultimate destinations in Washington; however, about 70% of the bus riders transferred to Metrorail Stations.

18. About 93% of the carpoolers had been members of a carpool prior to the opening of I-66, with 86% being in pools of 4 or more persons. Forty-one percent had previously commuted on the I-395 HOV lanes, 22% had utilized the George Washington Parkway, and 17% had traveled Route 50.

19. About 78% of the bus riders had made the trip prior to the opening of I-66. Of those, about 79% had ridden the same bus or a different bus, 11% had driven alone.

20. In an area as dynamic as Northern Virginia, it is difficult, if not impossible, to isolate the impacts of a single transportation event such as the opening of I-66. Certainly its opening was the most significant transportation event occurring between the fall of 1982 and fall of 1983. Further, a review of historical data showed that volumes had, in fact, declined slightly in the late 1970's and were increasing by only 1% to 2% in the early 1980's. That same data base showed increases of between 9% and 16% in 1983. Thus, the following findings concerning changes in traffic characteristics between the falls of 1982 and 1983 were due to some extent, and probably a large extent, to the opening of I-66.

    a. Weekday volumes crossing screenlines outside the Beltway, at the Beltway, and at Glebe Road increased between 9% and 10%. If the volume on I-66 was excluded, then the total crossing the screenlines decreased between 1% and 5%. Daily volumes on Route 50 and the George Washington Parkway decreased significantly.

    b. Morning peak-period, peak-directional traffic increased between 3% and 16% at the three aforementioned screenlines. Comparable statistics for the afternoon peak-period, peak-directional traffic were 6% and 8%.

c. Daily and peak-period ramp volumes at the I-495/I-66 interchange decreased.

d. In the Rosslyn area, daily and peak-period volumes on the ramps to and from Lynn Street and Route 110 increased, whereas other ramp volumes generally decreased.

e. Weekday volumes crossing the Potomac River bridges (Chain Bridge to the I-395 bridges) decreased very slightly; however, volumes on the Roosevelt Bridge increased by 15%. Morning peak-period, peak-directional volumes increased by 12%, with an increase of 13% on the Roosevelt Bridge. Afternoon peak-period, peak-directional volumes decreased by 3%; however, the volume on the Roosevelt Bridge increased by 11%.

f. The occupancy of vehicles and the number of buses crossing the aforementioned screenlines changed very little.

g. Generally, overall speeds in the peak direction along eleven major commuter routes increased, ranging from 0.4 to 17.3 mph, or from 2% to 82%. Where decreases occurred, they ranged from 0.6 to 5.6 mph, or from 3% to 12%.

h. The amount of stopped delay in the peak direction generally decreased, with a net decrease over the eleven routes of 20.5 minutes and 12.5 minutes in the morning and afternoon, respectively.

i. Using a procedure based on travel speeds and an assumed composite fleet vehicle, it was estimated that about 668,200 gallons of fuel were saved annually by the peak-directional traffic during the 6 hours of morning and afternoon commuter rush.

j. Similarly, a very crude analysis of vehicle emissions indicated a net decrease of 6% from peak-directional traffic.

k. About half of the residents along I-66 said the noise was moderate and tolerable; however, about a third said it was very loud and intolerable, even with no trucks being allowed.

l. About half of the residents along I-66 who were able to see the light from I-66 termed it very bright but tolerable; however, 15% characterized it as very bright and intolerable. About a third characterized it as dim and insignificant.

m. The accident rate on I-66 between Route 50 at Fairfax City and I-495 increased by 39% between 1982 and 1983.

21. In general, the reaction and attitude of the public toward I-66 was negative. Users were very positive about the facility; neighbors to the facility were generally negative. Most indicated the occupancy requirement should be lowered.

22. Essentially, everyone surveyed was aware of the special operation of I-66; however, the survey was inconclusive as to the effectiveness of the Department's public information program in imparting that knowledge.

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