

SOUTHEAST EXPRESSWAY RESERVED LANE FOR BUSES AND CARPOOLS

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On May 4, 1977, the existing northbound left lane of Boston's 8-mile, 8-lane, heavily congested Southeast Expressway was reserved on a voluntary, unenforced basis, for buses and 3-or-more-occupant carpools during the morning peak period 6:30-9:30 A.M. This started Phase 1 of an effort to raise the vehicle occupancy of the highest volume roadway in Massachusetts in anticipation of several years of reconstruction of all bridge decks on and over the Expressway. Phase 2 of Reserved Lane operation began June 2, 1977 by carrying the Reserved Lane through a three-lane construction bottleneck and detour at its northern end. Phase 3, in which the 3-or-more-occupant per vehicle requirement was enforced, commenced the morning of October 18, 1977, and continued until the termination of the Lane on November 2, 1977. The operation of the voluntary lane in Phase 1 increased carpooling on the Expressway by 38 and 72 percent in the 3 hour A.M. peak period and peak hour respectively. In the peak hour, 184 more people were carried in 429 fewer vehicles. Fifty percent of the peak hour persons using the Expressway during Phase 2 were carried in the free flowing Reserved Lane. The entire Expressway operated in Phases 1 and 2 with less congestion than before, no increase in accidents and no measurable impact on alternate surface street traffic attributable to the Lane itself. During the Phase 1 peak period, over 50 percent of the reduction in autos on the Expressway was accounted for by increased vehicle occupancy on the Expressway itself. Rail transit ridership in the corridor increased, accounting for 25 percent of the peak period reduction in autos during Phase 1, indicating the complementarity of alternative high occupancy modes in a high volume corridor. Express bus ridership increased only slightly during all phases of operation. During the only two weeks of operation of Phase 3, travel times in the general-purpose lanes increased and varied from day to day. There was not a significant increase in the number of accidents on the Expressway. Despite continually increasing shifts to alternate modes (a greater than 10 percent shift of all autos on the expressway to carpools and public transportation), the public outcry and concern of public officials regarding the deteriorated travel conditions in the general-purpose

travel lanes led to a decision to terminate the project after two weeks of enforced operation. Phase 3 results are presented in the paper, but are not felt to represent equilibrium results.

On May 4, 1977, the Massachusetts Department of Public Works (MDPW) reserved the existing left lane of Boston's Southeast Expressway for buses and three-or-more-occupant carpools. This started Phase 1 of an effort to increase the vehicle occupancy of the highest volume roadway in Massachusetts in anticipation of several years of reconstruction of bridge decks along the entire eight-mile length of the Expressway. Phase 2 of Reserved Lane operation began the morning of June 2, 1977 by carrying the Reserved Lane through a three-lane construction bottleneck at the northerly end of the eight-mile Reserved Lane. Phase 3, in which the three-or-more-occupant per vehicle requirement was enforced, commenced the morning of October 18, 1977 and continued until the termination of the Lane on November 2, 1977.

The Reserved Lane, called the Downtown Express Lane locally and in this paper, was an experimental cooperative effort between several Massachusetts transportation agencies and was the key element in a program for traffic maintenance during the Southeast Expressway reconstruction. Two aspects of the Lane are vitally important to consider when comparing this project to other preferential lane demonstrations:

1. The Lane removed an existing general-purpose traffic lane.
2. The Lane through Phases 1 and 2 reported on in this paper was a *voluntary* lane. Violators of the Lane were *not* ticketed.

Project Description

The Southeast Expressway is one of only three radial limited access highways penetrating all the way to the Boston CBD from the Route 128 limited-access circumferential highway about twelve miles out from Boston (with a metropolitan population of

3.5 million). Average daily traffic on this heavily congested Expressway has experienced only slow growth over the last several years and was 126,000 vehicles a day just south of the Massachusetts Avenue interchange at Southampton Street in 1976, making it the most heavily traveled highway in the State.

The Reserved Lane for buses and 3-or-more-occupant carpools extended over an 8-mile section of the Southeast Expressway between a point 1500 feet north of its intersection with Route 128 in Quincy to the Massachusetts Avenue interchange in Boston.

The Reserved Lane was the far left lane in the northbound direction and operated only on weekdays between 6:30 and 9:30 A.M. By reserving the Express Lane for high-occupancy vehicles only, these vehicles would be the recipients of substantially reduced travel times. These reduced travel times were intended to encourage the use of express buses and the formation of carpools to improve the "people-moving" capacity of the Southeast Expressway during the morning peak period.

Daily Operation of Express Lane

During the morning peak period, the Downtown Express Lane was separated from the three general lanes of traffic by yellow 19" high plastic posts which were inserted into 8" metal sleeves embedded in the roadway. The posts were spaced 20 feet apart in some heavily congested areas of the Expressway and 40 feet apart along the remaining length. They were inserted daily beginning at approximately 5 A.M. and removed after 9:30 A.M. (Setup and pickup times were each about 75 minutes using two truck crews.)

Phases of Operation

The results of three distinct phases of Downtown Express Lane operation are described in this paper. Phase 1 began May 4, 1977 and provided four weeks of Express Lane operation prior to actual Southeast Expressway reconstruction. These four weeks were intended to allow time for carpool formation, a massive publicity campaign (which actually started one month prior to Phase 1), and buildup of express bus ridership prior to the bottleneck caused by reconstruction of the bridge decks at the Massachusetts Avenue interchange.

At midday June 1, 1977, the four travel lanes in the northbound direction in the vicinity of the Massachusetts Avenue interchange at the northern end of the Express Lane were shifted over to a temporary three-lane detour roadway. The far left Reserved Lane was carried all the way through the three-lane bottleneck section. Phase 2 of the Lane's operation (with the detour through the three-lane bottleneck section) commenced on the morning of June 2, 1977.

Phase 3, the enforcement phase, began on October 18, 1977. Vehicles with less than three occupants traveling in the Lane were subjected to a fine of \$20.00.

Enforcement

As noted in the introduction, the Downtown Express Lane was a voluntary lane for Phases 1 and 2. This means one- and two-occupant vehicles using the Lane were not ticketed.

The decision to operate the Express Lane with compliance on a voluntary basis during Phases 1 and 2 was made for several reasons.

1. The voluntary approach simplified the legal

requirements for implementation and enforcement of the Express Lane project. (No federal money was involved in the operation of the Lane which removed the NEPA EIS requirements.)

2. Public acceptance of a voluntary lane would be greater and the concept could be proven without alienating those opposed to the project at the start. The responsibility for the success or failure of the project was, therefore, shifted to the general public (and each commuter then using the Expressway) and away from a focus on the police's ability or right to enforce the three-occupant carpool requirement.

The Phase 3 enforcement of the three-person-per-vehicle minimum requirement for use of the Express Lane began on October 18, 1977, after more than five months of voluntary operation. A regulation to enforce the Lane was issued by the Massachusetts Department of Public Works (MDPW). The MDPW regulation provided for a maximum fine of \$20 for the owner of a vehicle cited for traveling in the Downtown Express Lane in violation of the posted signs. The police assured the MDPW that they would enforce such a regulation and, therefore, would issue citations by mail. The basic premise of enforcement was that the owner of the vehicle would be liable for the use of a vehicle in violation of the three-or-more-person requirement. The officer was not required to stop and cite the violator on the spot because of safety considerations, but simply noted the vehicle's license plate number. This procedure is similar to that for a parking ticket and allowed the direct mailing of the citation to the vehicle owner. A similar regulation, which provides for mailing of citations by the State Police upon observation of a toll evader on the Massachusetts Turnpike, has been in effect for many years and was upheld by the Massachusetts Supreme Judicial Court as within the normal police powers of the Commonwealth. (See *Commonwealth v. Pauley*, 331 NE 2d 901, 1975).

Cost of the Express Lane Project

The cost of implementing the Downtown Express Lane project consisted of a minor capital expenditure and a regular operating expense. Approximately \$40,000 was expended for the publicity campaign including the special carpool matching effort. The 1500 plastic post inserts needed to separate the Express Lane from general traffic cost \$11 each, totaling about \$16,000. Two thousand replacement posts (approximately 15-18 posts needed replacement daily) cost \$22,000. Signing and pavement markings for the Lane cost approximately \$7,500. Approximately \$5,500 was expended for labor and equipment to install the post sleeves, erect the signs and paint the pavement markings in anticipation of the start of the Lane. The total capital cost of the project therefore was approximately \$92,000.

Operating cost of the Lane includes expenditures for MDPW crews to set down and pick up the plastic post inserts daily, and police protection for the crews performing these tasks. Weekly MDPW crew costs averaged \$3,200 and weekly State Police overtime costs were \$540. If the Lane were to operate year-round in this manner, yearly operating costs for the project would total approximately \$195,000.

Phase 3 enforcement costs were not estimated due to the short duration of the Phase 3 operation. About five police officers in vehicles were assigned over the three-hour period per day. The fact that tickets did not have to be issued on the spot allowed increased productivity from a minimum number of officers. If necessary, hundreds of citations could have been issued.

Alternative Commuting Facilities to the Southeast Expressway

Alternatives Prior to the Reserved Lane Project

Before detailing the results of the Reserved Lane project, it is important to describe the travel choices available to South Shore commuters before and during the project.

The extensive public transportation system has four components: MBTA rail rapid transit with feeder bus, private carrier express buses, commuter rail trains and commuter boat. The importance of this network is illustrated by the high percentage of peak period trips from the South Shore to the CBD (approximately 60 percent) which are made by transit.

Rail rapid transit service between Boston and the South Shore is provided by two branches of the Red Line operating at 5-minute headways during peak periods on each line. Each weekday morning, 8,750 riders boarded at the three Quincy stations on the Quincy branch of the Red Line during the 6:30-9:30 A.M. peak period during March and April 1977 before Phase 1. Extensive feeder bus service is provided from many South Shore communities to Red Line stations in Quincy and Dorchester (Boston).

Express bus service direct to Boston's CBD is provided from a large number of communities south of Boston by four private carriers: Plymouth and Brockton (P&B), Almeida, Hudson and Bonanza. All express buses use the entire 8-mile length of the Southeast Expressway on which the Lane is located. Each weekday during the 6:30-9:30 A.M. peak period, approximately 100 bus-runs are made in the northbound direction on the Southeast Expressway carrying a total of 3,400 passengers.

Commuter rail service is provided to an adjacent (southwest) corridor as far south as Providence, R.I. Frequent service is provided only during peak periods, with weekday peak period inbound ridership totaling approximately 2,600 passengers.

Commuter boat service prior to the start of the Downtown Express Lane consisted of one trip each way each day from Hull, Massachusetts to Rowe's Wharf in downtown Boston. This service accommodates approximately 125 riders each way during the summer months.

In addition, the dense highway network in Boston and the South Shore provides many alternative surface street and arterial routes to the Boston CBD. Morrissey Boulevard is a six-lane arterial running approximately four miles between the Neponset River and the Massachusetts Avenue interchange. Other routes consist of many lesser streets and roadways which drivers connect up in almost infinite variety. Some Southeast Expressway users have origins and destinations far enough to the west of Boston and the South Shore that the large limited access circumferential Route 128 and radial highways to the southwest and west of Boston, including the limited access Massachusetts Turnpike are convenient alternate routes.

Transportation Services Provided for the Reserved Lane Project

A number of transportation improvements were provided for Southeast Expressway commuters in addition to the Downtown Express Lane as part of the traffic maintenance plan for Southeast Expressway bridge deck reconstruction. These transportation services were all aimed at using high occupancy vehicles, on or off the Expressway, and were aggressively promoted during the publicity campaign which preceded Phase 1. The service improvements included:

- Providing maximum service levels on the MBTA

rapid transit Red Line serving the South Shore by increasing the number of transit cars available for service from 88 to 104, and providing some additional feeder bus service to Red Line stations.

- A completely new express bus route from two major commuter parking areas on Route 128 began May 9, 1977 providing service at 20-minute headways for the peak period to Boston's Government Center in the northern part of the CBD.

- The major private bus company promised to provide up to a 30 percent increase in numbers of bus runs consisting principally of extra sections on high-density portions of their extensive route system. The other smaller private carriers generally felt they had sufficient empty seats to serve up to a 50 percent increase in ridership.

- Seven existing and two new fringe parking lots were expanded and upgraded by the MDPW, MBTA and the Metropolitan District Commission (MDC) prior to, or during, Phase 1 of the Lane.

- Carpool matching assistance was provided to South Shore commuters through a variety of high visibility mechanisms.

- Additional one-round-trip-each-day commuter boat services were initiated in May 1977 from two South Shore locations to downtown Boston.

In addition to the new South Shore transportation services listed above, substantial increase in police patrols on the Expressway and additional emergency highway equipment including tow trucks and push bar equipped police vehicles were provided for quick removal of disabled vehicles in order to keep traffic flowing smoothly.

Results of Phase 1 and Phase 2 Operations

Introduction

The results of the Southeast Expressway Reserved Lane for buses and carpools are organized by four major categories of information:

1. General public acceptance.
2. Impact on travel and travel conditions on the Southeast Expressway.
3. Impact on travel and travel conditions on other modes and highways (i.e., off the Expressway).
4. Summary of where the cars "went."

These results are presented in this section for Phases 1 and 2, the five month voluntary period of Lane operation. The next section presents these results for the brief two-week period of enforced Phase 3 operation. A more detailed account of the methodology employed in the monitoring and evaluation program for the Downtown Express Lane is given in the first part of that section. (Central Transportation Planning Staff, *Southeast Expressway Evaluation of Downtown Express Lane*, December 1977.)

Public Acceptance

The response of the general public to the Downtown Express Lane before and during implementation of (voluntary) Phases 1 and 2 was generally positive and without major controversy. The justification of the project as the critical element in the traffic maintenance plan during Southeast Expressway reconstruction seemed to diffuse opposition to the concept. It is clear that the fact that the Lane was voluntary and not mandatory quieted an important segment of the population who otherwise would have vehemently objected to the Lane.

Editorial comments in the newspapers generally were favorable and expanded on the news reporting

theme of "it's for everyone's good." Public meetings in the affected communities produced only a few interested citizens whose ideas would generally make the Lane's operation more complex. Legislators from the South Shore area were vocal that complementary actions such as securing additional fringe parking sites and providing additional public transportation service had not gone far enough.

Public response to a newly established C-A-R-P-O-O-L phone number to obtain matching information and a temporary information booth at a Howard Johnson's Restaurant on the Expressway was mixed. Large numbers of commuters requested information on the Express Lane project and related construction activity, but few of these commuters requested carpool matching assistance. In May and June, the first two months of operation of the Lane, a maximum of 120 calls per day was received at the C-A-R-P-O-O-L number, with average daily calls being far less than this number. At the Howard Johnson's information booth on the south-bound side of the Expressway, a total of 640 inquiries were made by commuters during the eight-week period (April 11, 1977 through June 2, 1977) the booth was open. Out of all these requests for information over a two and one-half month period, only about 430 were requests for carpool matching information. About a third of these resulted in a match with at least one other person and the mailing of a carpool matching list.

Changes in Travel and Travel Conditions on the Expressway

The results of the Downtown Express Lane on travel at Southampton Street on the Expressway for the three reporting periods ("Before," Phase 1, and Phase 2) are presented in Table 1. Southampton Street is a cross street near the northern end of the Lane, a point where the highest volumes on the Expressway are generally observed.

There is no clear and consistent monthly variation in Southeast Expressway travel volumes between March, April, May and June. Therefore, the data are not "seasonally adjusted" for month or year. However, morning peak period travel for the 6:30 to 9:30 A.M. period that the Lane was in operation declined substantially in July and August. Also, travel on Mondays and Fridays in this corridor is distinctly different from Tuesday, Wednesday and Thursday travel due to a carry-over of weekend travel to Mondays and Fridays in this corridor leading to the South Shore and Cape Cod. For these reasons, very little data were collected on Mondays and Fridays and during the months of July and August.

Travel on the Entire Expressway. As may be seen in Table 1, the number of carpools on the Expressway during the peak period (6:30-9:30 A.M.) grew by 38 percent or 331 carpools during Phase 1. This increase dipped to 15 percent or 133 carpools in Phase 2 relative to the "Before" condition. For the peak hour, the corresponding growths in carpooling were 72 percent or 268 vehicles for Phase 1 and 34 percent or 129 vehicles for Phase 2 relative to the "Before" condition. The table shows corresponding growths in the percent of total persons in cars carried in carpools and buses. Although the number of carpools declines in absolute terms between Phase 1 and Phase 2 of the Lane's operation, the percent of persons carried in carpools declined far less, and the percent of persons carried in carpools and buses increases because of the drop in numbers of persons and vehicles carried on the Expressway during the Phase 2 bottleneck. That is, carpooling in relative terms dips

only slightly between Phase 1 and Phase 2. During the latter part of June 1977, vacations started and this caused more difficulty in carpooling which was reflected in the data. The Phase 2 data are average for the entire month.

Express bus ridership increased by only approximately 100 riders during the peak period and 65 riders during the peak hour, or about a 3 percent increase in both cases. The increases appear to have been solely due to the reduction in travel time in the reserved Lane, and not due to the new service provided during the Lane's operation. Ridership did not change between Phase 1 and Phase 2. These somewhat disappointing increases for the first two months of the Lane's operation match the experience of the contraflow lane provided on the Southeast Expressway during morning peak periods of daylight savings time months for the previous six years. It is also consistent with work purpose direct elasticities for line haul transit travel time of $-.3$ to $-.4$ (i.e., the approximate 10 percent decrease in line haul travel time has produced a 3 percent increase in ridership).

Table 1 shows that during Phase 1, 2,010 fewer autos used the Expressway, but only 1,130 fewer persons were accommodated on the Expressway during the peak period, and for the peak hour, 184 more persons were accommodated and there were fewer autos. This shows the significant effect of the Lane itself in increasing the average occupancy of autos (from 1.31 to 1.40 during the peak period, and from 1.34 to 1.49 during the peak hour for Phase 1), and in preparing the Expressway to accommodate passengers in higher occupancy vehicles during the Phase 2 Expressway reconstruction.

Shift in Time of Travel. Between 6:00 and 6:30 A.M., the number of vehicles using the Southeast Expressway during Phase 1 decreased in the same proportion as the reductions in 6:30 to 9:30 A.M. volumes shown in Table 1. During Phase 2, the 6:00 to 6:30 A.M. decrease was only one-third the 6:30 to 9:30 A.M. decrease, while during Phase 2, the post-peak decrease was one-half the peak period decrease. Person travel shifted by similar amounts due to the similar auto occupancy results for the peak and post-peak periods. There did not appear to be any shifting of travel within the three-hour peak period. The range of autos shifting to the post-peak period was 0-250 for Phase 1 and 100-500 for Phase 2.

Express Lane Utilization and Compliance. Table 1 shows the percent of total persons, vehicles and persons carried in cars in the Express Lane at Southampton Street for both the peak period (6:30 to 9:30 A.M.) and the peak hour (7:00 to 8:00 A.M.) for Phases 1 and 2. For the peak period, the Lane carried 37 percent and 46 percent of the total persons on the Expressway during Phase 1 and Phase 2 respectively. For the peak hour, the figures increased to 43 percent and 50 percent during Phase 1 and 2 respectively. These figures include persons carried in one- and two-occupant vehicles which "violated" the Lane restriction. Nevertheless, it is impressive that during the peak hour up to half the persons on the Expressway experienced a smooth and congestion-free ride (as will be shown in the next section) on the one Reserved Lane.

A significant result is that during the peak hour, the Lane carried a proportionate number of vehicles to the number of lanes available in each phase (i.e., 25.1 percent of the vehicles in 1 of 4 lanes and 31.2 percent of the vehicles in 1 of 3

lanes available). That the Express Lane moved freely is due to the lack of weaving in the Lane, and the fact that the right lane carries relatively few vehicles due to its high number of weaving movements near the frequent ramps.

Phases 1 and 2 of the Downtown Express Lane, as noted often above, were a voluntary lane which gave preference to high-occupancy vehicles. The most disappointing aspect of the Lane, therefore, in view of its high people-carrying capacity, and what will be shown below to be its safe operation and lessening of congestion for all Expressway users, was the high violation rate during Phase 1 and Phase 2 operation. The compliance rate (percent of total vehicles in the Lane which are buses and 3-or-more-occupant autos) at the beginning of the Lane for both Phase 1 and Phase 2 ranged between 23 percent and 53 percent and averaged about 36 percent. The compliance rate is highest during the peak hour when there are more carpools available to fill the Lane. The compliance rate at the northern end (Southampton Street) ranged between 16 percent and 24 percent during both Phase 1 and Phase 2. On the average, however, the Phase 1 compliance rate was 21 percent and for Phase 2, it dropped to 19 percent. These statistics indicate there are substantial numbers of violators weaving into the Downtown Express Lane along its length. However, police cruisers located at the beginning of the Lane did have an effect in dissuading non-carpool vehicles from entering the Lane at its beginning.

Travel Conditions on the Expressway and in the Lane.

Travel Times. Table 2 shows travel times for the entire length of the Southeast Expressway for the "Before," Phase 1, and Phase 2 periods at half-hourly intervals from 6:30 A.M. to 9:00 A.M. through June 1977.

In general, and in particular during the time of peak congestion between 7:30 and 8:00 A.M., it can be seen that the travel times during Phase 1 and Phase 2 were shorter for all lanes than before the implementation of the Downtown Express Lane. The fears of tie-ups from "taking away a lane" were unfounded. During the times of greatest congestion before the Lane, namely between 7:30 and 8:00 A.M., users of the Express Lane experienced travel time savings of 9 minutes, while general purpose lane users had time savings of between 4 and 8 minutes. These time savings for all lanes even increased slightly during Phase 2.

The possible slight increase in travel times at 6:30 A.M. during Phases 1 and 2 was not due to additional congestion in the normal sense. The time increases were caused by the dampening effect on speed of the presence of the lines of posts delineating the Lane and the barrier at the beginning of the Lane. This apparently had a positive safety effect.

An important probable cause for the decreased travel times on all lanes of the Expressway during Phases 1 and 2 was the metering effect of reducing the Expressway from four to three lanes at the start of the Lane (the Lane "started empty"). Also, the presence of the reserved Lane reduced weaving movements on the entire length of the Expressway. This resulted in smoother traffic flow downstream. (The travel times in Table 2 include the time to pass through the often congested area at the start of the Lane where the metering took place.)

Waiting Times at On-Ramps. Most morning peak period volumes on the four major on-ramps to the northbound roadway of the Southeast Expressway decreased in proportion to the decreased traffic on the

Expressway itself during Phases 1 and 2. More importantly, and in line with the decreased congestion on the "main line," the average and maximum waiting times for these on-ramps decreased between the "Before" condition and Phases 1 and 2. For example, at the high-volume Neponset Avenue on-ramp, which has about 43 percent of the total on-ramp traffic of the four ramps combined, average and maximum wait times were reduced to about one-half their "Before" values during Phase 1, and to about one-quarter of their "Before" values during Phase 2.

Safety. Personal injury accidents on the Southeast Expressway for the months of May and June from 1970 through 1976 ranged from 0-9 with a 3.0 average for May, and 1-4 with a 2.3 average for June. Property damage accidents ranged between 2-8 with a 4.7 average for May, and 4-12 with a 6.7 average for June over the same seven years.

For better or worse, more careful accident reporting characterized the first two months of operation of the Downtown Express Lane than previous Mays and Junes. As noted before, police patrols were greatly increased on the Expressway which substantially improved the detection and reporting of accidents during the Lane's operation. It must be assumed that "fender-benders" and similar property damage accidents are included in the accident statistics for Phase 1 and Phase 2 in addition to the more major rear-end, head-on, and other accidents included in the standard reporting. The reporting of personal injury accidents would be less affected by the increased police patrolling during 1977.

During the entire month of May 1977, including the Lane's Phase 1 operation from May 4 on, there were 6 personal injury accidents and 6 property damage accidents. During all of June 1977 (Phase 2), there were 3 personal injury accidents and 10 property damage accidents. Both months' figures fall within the range of accidents reported by the normal police patrols between the years 1970 and 1976. In addition, only two of the May 1977 accidents occurred in or could be associated with the Express Lane. The corresponding figure for June was 1 of the 13 accidents. There were no fatalities on the Expressway in May or June 1977.

Changes in Travel and Travel Conditions Off the Expressway

Rail Rapid Transit (Red Line). Seasonally adjusted ridership counts during the 6:30 to 9:30 A.M. peak period at the three Quincy stations on the Quincy Branch of the Red Line showed an increase in weekday peak period boarding of 600 persons for both Phase 1 and Phase 2 over the "Before" number of 8,750 boarders.

Ridership on the Ashmont Branch of the Red Line was not perceptibly affected. This branch, further from the impacted area, would have had any increases in ridership distributed over many stations.

Commuter Rail. Commuter rail from the Southwest Corridor experienced no significant increase in ridership during Phase 1. However, in June 1977 (Phase 2), seasonally adjusted commuter rail ridership increased by approximately 100 riders to 2,650 inbound boardings during the 6:30 to 9:30 A.M. peak period.

Commuter Boat. During Phases 1 and 2, in May and June 1977, total ridership on all three commuter boats

Table 1. Vehicles and Persons Traveling on the Southeast Expressway and in the Downtown Express Lane at Southampton Street

	Before March	Phase 1 May			Phase 2 June		
		Number	Change	% Change from Before	Number	Change	% Change from Before
Peak Period (6:30-9:30 A.M.)							
• All Lanes							
No. of Carpools (3 or more occupants)	877	1208	331	37.7%	1010	133	15.2%
% of Persons (in Cars) in Carpools	12.8%	18.3%	5.5%	43.0%	16.7%	3.9%	30.5%
% of Total Persons in Carpools & Buses	23.4%	28.9%	5.8%	22.2%	32.6%	9.2%	39.3%
No. of Bus Passengers	3400	3500	100	2.9%	3500	100	2.9%
Total No. of Persons in Autos & Buses	27916	26780	-1136	-4.0%	21800	-6116	-21.9%
Total No. of Vehicles	19429	17537	-1892	-9.7%	13740	-5689	-29.3%
Total No. of Autos	18677	16668	-2009	-10.8%	13010	-5667	-30.4%
Total No. of Single-Occupant Autos	14223	12018	-2205	-15.5%	9334	-4889	-34.4%
Total No. of Two-Occupant Autos	3577	3442	-135	-3.8%	2666	-911	-25.5%
Average Auto Occupancy	1.31	1.40	0.09	6.9%	1.41	0.1	7.6%
• Traveling in Downtown Express Lane							
% of Total Persons on Expressway	---	37.0%	---	---	46.0%	---	---
% of Autos on Expressway	---	28.6%	---	---	36.6%	---	---
% of Vehicles on Expressway	---	22.2%	---	---	30.7%	---	---
Peak Hour (7:00-8:00 A.M.)							
• All Lanes							
No. of Carpools	373	641	268	71.8%	502	129	34.6%
% of Persons (in Cars) in Carpools	14.5%	24.4%	9.9%	68.3%	21.2%	6.7%	46.2%
% of Total Persons in Carpools & Buses	23.4%	38.3%	14.9%	63.7%	45.3%	21.9%	93.6%
No. of Bus Passengers	2000	2065	65	3.3%	2065	65	3.3%
Total No. of Persons in Autos & Buses	11008	11257	249	2.3%	8542	-2466	-22.4%
Total No. of Vehicles	6902	6473	-429	-6.2%	4698	-2204	-31.9%
Total No. of Autos	6704	6185	-519	-7.7%	4490	-2214	-33.0%
Total No. of Single-Occupant Autos	4960	4140	-820	-16.5%	3048	-1912	-38.5%
Total No. of Two-Occupant Autos	1371	1404	33	2.4%	941	-430	-31.4%
Average Auto Occupancy	1.34	1.49	0.15	11.2%	1.50	0.16	11.9%
• Traveling in Downtown Express Lane							
% of Total Persons on Expressway	---	42.6%	---	---	50.3%	---	---
% of Autos on Expressway	---	25.5%	---	---	31.7%	---	---
% of Vehicles on Expressway	---	25.1%	---	---	31.2%	---	---

Table 2. Travel Times (in Minutes) on the Southeast Expressway Northbound from Union Street (Braintree) to Kneeland Street (Boston)

Start Time	Before (March)	Voluntary				Enforced Phase 3 (October)	
		Phase 1 (May)		Phase 2 (June)		General Lanes Average 3 Days	Express Lane
	All Lanes	General Lanes	Express Lane	General Lanes	Express Lane		
6:30 A.M.	16 (14-17)*	17 (16-18)	18	17 (15-20)	17	22 (17-25)	15
7:00 A.M.	20 (18-22)	20 (19-22)	20	18 (16-19)	15	28 (22-32)	14
7:30 A.M.	28 (25-31)	24 (23-25)	23	24 (19-27)	17	40 (35-43)	18
8:00 A.M.	28 (25-30)	22 (21-22)	21	21 (17-25)	19	36 (30-42)	18
8:30 A.M.	23 (20-26)	17 (16-18)	16	17 (15-19)	14	30 (25-35)	16
9:00 A.M.	17 (14-20)	16 (15-16)	16	17 (14-20)	14	21 (17-26)	14

*Numbers in parentheses are absolute ranges with the exception of the "Before" numbers, which denote the likely range based on a 95 percent confidence interval and a t-distribution.

including the two new services accompanying the start of the Lane, was 295 persons inbound to Boston, a seasonally adjusted increase in riders of 170 persons. A special survey indicated approximately one-third of the new commuter boat users were former auto drivers. This accounts for a seasonally adjusted removal of an estimated 50 automobiles from the Southeast Expressway as a result of improved commuter boat service.

Fringe Parking. No change in the utilization of the major fringe parking lots was observed during Phases 1 and 2, with the exception of one new surface lot serving the MBTA rapid transit Red Line in Quincy which opened during Phase 2. This lot was utilized by 224 cars during Phase 2, but served to relieve the capacity constraint of the three Red Line parking lots in Quincy. This indicates that new carpoolers found it more convenient to collect their friends and neighbors at their homes or at small widely scattered parking places. The presence of additional fringe parking appears also not to have significantly affected express bus use.

Alternative Highway Routes. Diversion of automobiles to alternative routes made up of local and major streets and arterials is difficult to measure in the South Shore corridor because of the presence of the dense road network. In addition, traffic from the south and southwest headed to points west and north of downtown Boston can use Route 128 and radial arterials from 128 to these destinations as an alternative to the Southeast Expressway. Numerous peak period volume counts during Phase 1 and 2 were made on 14 alternative major streets and highways including Route 128, and travel time runs were made on 10 different alternate routes. It is clear from the volume counts in Table 1 that traffic was substantially reduced on the Expressway, particularly during Phase 2. The next section will attempt to summarize what happened to the cars that "disappeared." Meanwhile, the complexity of the network and the highly variable traffic volumes in this corridor made it very difficult to measure the exact number of automobiles diverted to surface streets or even to detect any locations where statistically significant increases in traffic volumes occurred, particularly in Phase 1.

Travel time studies on the alternative routes showed no deterioration in service. This indicates that the shifted traffic did not concentrate on a small number of streets and that the volume increases were small compared to the available capacity. This was the case even for Phase 2 for which substantial reductions in automobile volumes on the Expressway were observed.

Summary of Where the Cars "Went"

As has been repeatedly stated, the overall purpose of the Downtown Express Lane was to minimize the impact of Southeast Expressway reconstruction on both Expressway travelers and highway travel in general in the corridor. Table 3 summarizes the estimates of the reduction in auto travel on the Southeast Expressway between 6:30 and 9:30 A.M. accounted for by diversions to the transportation alternatives described above.

The peak period increase in numbers of persons carpooling on the Expressway of 1200 and 500 during Phases 1 and 2 respectively, divided by the "Before" condition auto occupancy of 1.31 at Southampton Street, yields the diversion of 920 and 380 autos to carpools on the Expressway during Phases 1 and 2 respectively.

Alternatively, the increase in peak period car occupancy at Southampton Street during Phase 1 of 1.40 represents a 6.9 percent increase over the "Before" occupancy of 1.31. This means that the same number of people could be carried in approximately 6.9 percent fewer autos or approximately 1,140 fewer autos. The similar result for Phase 2 is 970 fewer autos. The entries in Table 3 reflect the decrease in carpooling from Phase 1 to Phase 2 based on a combination of the two methods.

The increased weekday peak period Red Line boardings of 600 persons, divided by the "Before" auto occupancy of 1.31, yields the 460 auto diversion to the Red Line shown in Table 3. The 50 automobile diversion to commuter boats was described above. The express bus ridership increase on the Southeast Expressway of 100 persons during both phases is divided by 1.31 to obtain the 75-car figure shown in the table. Similarly, the 100-passenger commuter rail increase during Phase 2 is noted in the table as diverting 75 cars.

Three important conclusions can be drawn from Table 3. First, the results for Phase 1 show that, by itself, the reservation of an existing Expressway Lane on a voluntary basis for buses and carpools did not increase traffic on alternative surface streets and highways, much less affect congestion on these alternative roads. Between 75 percent and 90 percent of the reduction in automobiles on the Expressway is accounted for by modal shifts, with over 50 percent of the auto reduction accounted for by increases in vehicle occupancy on the Expressway itself. The usefulness and complementarity of the parallel public transportation service on its own right-of-way in the same corridor (the Red Line), which accounted for about 25 percent of the reduced number of cars in Phase 1, should also be highlighted in planning for similar reserved lanes.

Second, the results for Phase 2 shown in Table 3 must be viewed in the context of the substantial capacity constraint imposed by the construction detour just north of Southampton Street which narrowed the Expressway from four to three lanes. It seems clear that when the bottleneck occurred, the persons who perceived sufficient reason to change their travel behavior simply shifted their travel routes or their time of travel (minor) or decided not to make the trip. The publicity campaign preceding Phase 1 of the Lane and the travel time advantage of the Lane appear to have stimulated all who would carpool to shift modes to have done so during Phase 1.

Finally, it must be concluded that even though Phase 2 did not produce additional carpooling or express bus usage, there were fewer low-occupancy autos "available" to shift to alternate routes. In this sense, the Lane was successful in reducing the highway travel impacts of Expressway reconstruction in the South Shore corridor during Phase 2.

Results of Phase 3 (Enforcement Phase) Operations

Phase 3 of the Lane's operation began on October 18, 1977 with enforcement of the 3-or-more-person per vehicle requirement for use of the Lane and continued until termination of the project on November 2, 1977. The decision to enforce the Lane was based on several factors:

- The fact that violators were being rewarded with a congestion-free ride generated significant public and media demands for enforcement of the carpool requirement.
- The completion of construction at the northern end of the Lane in early October returned the northbound roadway to four lanes. This made it feasible

to enforce the Lane since general lane users would have three lanes along the entire length of the Expressway.

- The concept of the reserved express lane had been demonstrated to be operationally feasible (i.e., the Lane alone during Phase 1 had achieved the goal of increased carpooling and a decreased number of vehicles traveling on the Expressway with reduced travel times of non-Lane users).

- The continuing downward trend in the compliance rate over the summer was jeopardizing the success of the Lane (i.e., as the Lane became filled with autos with less than three occupants, the relative travel time advantage of the Lane decreased).

It must be stressed that the results for the two weeks of Phase 3 operation presented here are an attempt to represent dynamic phenomena. There are indications of favorable trends towards equilibrium, particularly during the Monday to Wednesday (October 31 to November 2), which were the last three days of the Lane's operation. However, great caution should be exercised by anyone seeking to use the results presented below as representative of equilibrium conditions for an enforced reserved lane that "takes away" an existing general purpose lane.

Public Response (Phase 3)

Only modest opposition was voiced when MDPW officials announced their intention to enforce the Lane. The most vehement opposition did not develop until the actual enforcement began.

With the introduction of the police officers on the roadway recording license plate numbers of violators on October 18, 1977, and the resultant traffic delays discussed elsewhere in this section, the opposition to the concept became more vocal and pervasive. The more conservative major Boston daily newspaper began running front-page columns that included a high degree of negative editorializing on the subject, after providing exceptionally objective and complete reporting of the summer's successful Phase 1 and 2 experience. Within a week, the paper called the test "a flop" in their lead editorial and began to run an array of letters in opposition to the enforced lane. The *Boston Globe* and the *Christian Science Monitor* remained editorially neutral and reported only the enforcement statistics of the first few days. The electronic media increased their coverage at the onset of the enforcement period, with television reports generally providing a gloomy picture of the Expressway experiment. Radio reports at first concentrated on warning commuters of the new fine being imposed on violators, but quickly began to take the editorial slant of the station or particular announcer.

Because first-day operations were typically confusing and traffic was snarled badly, commuters began a fairly steady flow of angry phone calls and letters to the MDPW, EOTC, and police agencies, legislative representatives and the Governor. Phone calls to the MDPW totaled between 200 and 300 during the two weeks of enforcement, almost all of which vigorously opposed the Lane. An emergency bill was filed to change the requirement for the Lane to two-person carpools, and a long-dormant bill was reactivated to abandon the Lane entirely. A well-publicized hearing was scheduled for Wednesday evening, November 2, 1977, at 5:00 P.M. to discuss the two bills. During the entire two week enforcement period, hardly a word was heard from new and old carpools, bus users and other supporters of the Express Lane concept.

Changes in Travel and Travel Conditions on the Expressway (Phase 3)

The impact of the Downtown Express Lane on travel during Phase 3 as compared with the "Before" condition (March 1977) is presented in Table 4 at a point near the southern end (or beginning) of the Lane (Furnace Brook Parkway). Since November, travel is very similar to March travel on the Expressway, no seasonal adjustment factors were applied.

Travel on the Entire Expressway. As may be seen from Table 4, the number of carpools at Furnace Brook during the peak period increased by 71 percent, from 681 in the "Before" condition to 1,166 during Phase 3. Approximately 225 of these 485 additional carpools were newly formed during the two-week enforcement period. During the peak hour (7:00-8:00 A.M.) at the same location, the number of carpools increased from 388 in the "Before" condition to 641 in Phase 3 which represents a 65 percent increase. Increases in carpooling at the northern end (Southampton Street) were not quite as large, probably because the impacts of construction activity at the Massachusetts Avenue interchange continued during Phase 3 even though the northbound detour was removed in early October 1977.

The percentage of persons traveling in carpools on the Expressway increased during the peak hour and peak period. At Furnace Brook Parkway in the peak hour, the percentage of persons traveling in carpools increased from 17.3 percent in the "Before" condition to 29.6 percent in Phase 3. During the peak period, the percentage of persons in cars that traveled by carpool more than doubled at Furnace Brook Parkway, from 10.5 percent in the "Before" condition to 22 percent during Phase 3.

Express bus ridership increased by only about 200 riders during the peak period to approximately 3,600 riders. The 200 new riders represent an increase of about 6 percent from the "Before" condition. Bus ridership was showing an upward trend during the two weeks of enforcement, with the largest increases of the entire Downtown Express Lane project occurring during the final week of the enforced operation.

Table 4 shows that at Furnace Brook Parkway, there was a 14.4 percent decrease in travel volume in the peak period (2,333 fewer vehicles), but the number of persons decreased by only 8.2 percent (1,937). This represents an increase in auto occupancy from 1.30 to 1.39 in the peak period. During the peak hour (7:00-8:00 A.M.) at Furnace Brook Parkway, the corresponding percent reductions in total vehicles and total persons were 15.2 percent and 5.8 percent, representing an even greater increase in auto occupancy (from 1.37 to 1.49).

Shift in Time of Travel. As a result of increased travel times for general-purpose lane users on the Expressway during Phase 3, some travelers shifted their time of travel. From counts taken during the hour immediately following the operation of the Lane (9:30-10:30 A.M.), it has been estimated that up to 250 vehicles shifted their travel to this post-peak hour. Because of a lack of data for the half hour preceding the Lane's operation (6:00-6:30 A.M.), a similar analysis could not be completed for that period.

Express Lane Utilization and Compliance. During the Phase 3 peak period, the Downtown Express Lane carried one-third of all commuters on the Expressway in approximately 15 percent of the vehicles, and during the peak hour it carried over 40 percent of

Table 3. Summary of Estimated Changes in Travel Behavior on Southeast Expressway at Southampton Street, 6:30 - 9:30 A.M.

	AUTOS		
	Phase 1	Phase 2	Phase 3 ^a
	(May 1977)	(June 1977)	(October 18- November 2, 1977)
Reduction in Number of Cars on Expressway (from "Before" Condition)	2010	5670	2600-3900 ^b
Where they went:			
• Shifted Mode			
Carpooling (Increased auto occupancy)	920-1140	500-700	900
Red Line (Quincy Stations)	460	460	425 ^b 1000
Commuter Rail	0	75	155
Commuter Boat	50	50	0
Express Bus	75	75	155
Sub-Total	1505-1725	1160-1360	1535 ^b 2210
• Shifted Time (Made trip after 9:30 A.M.)	0-250	100-500	0-250
• Shifted to Alternate Route	125-250	3250-3500	900 ^b 2400
• Did Not Make Trip	-	500-700	-
Total Accounted for (By Estimation)	1730-2225	5010-5760	2435 ^b 4860

^aThese do not represent results at equilibrium.

^bThe bottom of the range is at Furnace Brook Parkway (the Southern end).

Table 4. Vehicles & Persons Traveling Northbound on the Southeast Expressway in the Downtown Express Lane at Furnace Brook Parkway During Phase 3

	Before March	Phase 3 October		
	Number	Number	Change	% Change from Before
Peak Period (6:30-9:30 A.M.)				
• All Lanes				
No. of Carpools (3 or more occupants)	681	1,166	485	71.2%
% of Persons (in cars) in Carpools	10.5%	22.0%	11.5%	109.5%
% of Total Persons in Carpools & Buses	24.9%	35.0%	10.1%	40.6%
No. of Bus Passengers	3,400	3,600	200	5.9%
Total No. of Persons in Autos & Buses	23,580	21,643	-1937	-8.2%
Total No. of Vehicles	16,218	13,885	-2333	-14.4%
Total No. of Autos	15,548	13,021	-2527	-16.3%
Total No. of Single-Occupant Autos	12,026	9,631	-2395	-19.9%
Total No. of Two-Occupant Autos	2,841	2,224	-617	-21.7%
Average Auto Occupancy	1.30	1.39	.09	6.9%
• Traveling in Downtown Express Lane				
% of Total Persons	---	31.7%	---	---
% of Autos on Expressway	---	11.8%	---	---
% of Vehicles on Expressway	---	11.8%	---	---
Peak Hour (7:00-8:00 A.M.)				
• All Lanes				
No. of Carpools	388	641	253	65.2%
% of Persons (in cars) in Carpools	17.3%	29.6%	12.3%	71.1%
% of Total Persons in Carpools & Buses	33.6%	45.4%	11.8%	35.1%
No. of Bus Passengers	2,000	2,124	124	6.2%
Total No. of Persons in Autos & Buses	10,080	9,491	-589	-5.8%
Total No. of Vehicles	6,098	5,171	-927	-15.2%
Total No. of Autos	5,892	4,947	-945	-16.0%
Total No. of Single-Occupant Autos	4,325	3,422	-903	-20.9%
Total No. of Two-Occupant Autos	1,179	884	-295	-25.0%
Average Auto Occupancy	1.37	1.49	.12	8.8%
• Traveling in Downtown Express Lane				
% of Total Persons	---	42.3%	---	---
% of Autos on Expressway	---	9.9%	---	---
% of Vehicles on Expressway	---	10.1%	---	---

the commuters in less than 20 percent of the vehicles. These figures include the relatively few persons in one- and two-occupant vehicles which violated the Lane restriction. Nevertheless, this indicates the efficiency of the Lane in that it moved many more people in fewer vehicles than any of the general lanes of traffic. Despite the high volumes of persons traveling in the Express Lane, these commuters experienced smooth and congestion-free travel over the entire length of the Expressway, as will be shown elsewhere in this section.

Although police enforced the MDPW regulation prohibiting low-occupancy vehicles from entering the Lane during Phase 3, a number of violators chose to travel in the Lane because of the travel time savings. A total of 1,583 citations were mailed out during the two weeks of Phase 3, which averaged 132 citations per day. As a result of the enforcement effort, compliance rates in the Lane improved significantly. At the start of the Lane (near Furnace Brook Parkway), on November 2, the compliance rate was 65 percent during the peak period and over 77 percent during the peak hour, as compared to only a 15 percent peak period compliance rate before Phase 3 commenced.

Travel Conditions on the Expressway and in the Lane

Travel Times. The key to the relative success or failure of the Downtown Express Lane project was the travel times on the Expressway. Table 2 summarizes average travel times for the "Before" condition of March 1977 (presenting the likely range based on a 95 percent confidence interval assuming a t-distribution), and for Phases 1, 2 and 3. As shown in the table, the travel times in the Express Lane in Phase 3 were consistently lower than the lower ranges of the "Before" condition for the 6:30-9:30 A.M. period. However, Phase 3 travel times in the three general-purpose lanes exceeded the upper ranges of the "Before" condition during the same time period. The three-day average in Table 2 should, of course, not be construed to be a reliable estimate of an equilibrium condition on the roadway. Also, the travel times were taken on (only) the last three days of operation of the lane (Monday through Wednesday, October 31-November 2, 1977). As noted earlier, data collection was almost always avoided during Mondays and Fridays on this (in part) recreational route leading to the South Shore and Cape Cod, and "Before" data do not reflect the usually higher than average Monday travel times. As might be expected, travel times on the unreserved lanes decreased from Monday to Wednesday. This trend, and the trends showing increased express bus and rapid transit ridership indicate that equilibrium conditions had not been reached by the end of two weeks of operation of this lane.

Safety. A history of traffic accidents for the two-week period of October 18 through November 2 for the years 1970 through 1976 shows the number of injury accidents ranged from one to three, with a two week average of 1.6. In 1977, during Phase 3 operations, only one accident involving an injury of any sort was reported. For the same time period, from 1970 through 1976, the number of property damage accidents ranged from two to five, with an average of three. A total of eight property damage accidents occurred between October 18 and November 2 in 1977. As noted before, the high number of property damage accidents reported during the two week "enforcement" period in 1977 can be in part attributed to a high rate of reporting resulting from the greatly increased number of police on the Expressway. Prior to

the start of the Lane in Spring 1977, the police avoided cruising the Expressway because their presence tended to cause shock waves to form on the saturated facility. Of the nine accidents that occurred during Phase 3, four involved cars traveling in the Express Lane. Each of these four accidents was caused by an auto traveling in the far left general-purpose lane crossing illegally into the Express Lane.

Changes in Travel and Travel Conditions Off the Expressway

- Rail Rapid Transit.

Manual counts at the three stations on the Quincy branch of the Red Line showed an increase of 1300 boardings during the morning peak period for Phase 3, compared to counts during the "Before" condition. These counts, of course, reflect the impact of slight natural ridership growth and somewhat unpredictable seasonal variation, from March through October 1977. An increase of 550 Red Line riders was observed in the two weeks immediately following the start of the enforcement. It appears that Red Line ridership was increasing during Phase 3, with over 10,000 peak period boardings counted on the morning of November 2, 1977. Unfortunately, due to limited resources, similar boarding counts were not taken on the Ashmont branch, which may have experienced similar increases in ridership.

- Commuter Rail.

Inbound boardings on the two affected commuter rail lines for the month of October showed a substantial increase of 200 boardings once enforcement of the Lane began.

- Commuter Boat.

Commuter boat ridership typically declines in the autumn because of cooler weather, and 1977 was no exception. Commuter boat ridership did not increase significantly during Phase 3.

- Fringe Parking.

As in Phases 1 and 2, the only fringe parking lot to show increased use during Phase 3 was the facility at the North Quincy Red Line station, which experienced an increase of 100 parkers per day.

- Alternate Highway Routes.

Alternate highway routes were not as closely monitored during Phase 3 as they were during Phases 1 and 2, because of a lack of resources. However, an estimate of Southeast Expressway users who diverted to local streets can be made from Expressway volume counts. In Phase 3, between 900 and 2,000 vehicles were shifted to alternate routes during the 3-hour peak period instead of traveling on the Expressway at the Furnace Brook Parkway location. Most of these vehicles used Route 128, Route 3A, or Routes 28 and 138 through Dorchester. In addition, between 1,000 and 1,500 vehicles either exited or did not enter the Expressway north of Furnace Brook, largely due to the lingering construction near the Massachusetts Avenue interchange and the relative attractiveness of alternate routes with respect to travel time. Despite the diversion of traffic from the Expressway to various alternate routes, travel times on alternate routes generally were unaffected by the implementation of the Express Lane, voluntary or enforced, with the exception of isolated small increases in travel time (5-10 minutes) during the peak half-hour (7:30-8:00 A.M.) of the two week enforcement period. These delays were encountered in a street parallel to the section of the Expressway which also experienced the greatest congestion.

Summary of Where the Cars "Went" During Phase 3

Table 3 again contains the estimates of the reduction in auto travel on the Southeast Expressway between 6:30 and 9:30 A.M. accounted for by the diversions to transportation alternatives described above for Phase 3. These may be compared with the results of Phases 1 and 2. However, it must be stressed again that these do not represent results at some equilibrium set of conditions.

In summary, the results of the experiment (with the exception of the general-purpose lane travel-time delays) were quite positive. A greater than 10 percent 3-hour peak period mode-choice shift (up to 2210 cars "shifted mode" out of 18,680 total cars at Southampton Street), and a 70 percent increase in the number of three-or-more-occupant carpools could not have been generated by any other type of action in such a short period of time at almost no cost. The generalization that it is impossible to change individual travel behavior through short-term policies clearly was proven wrong, although we are unfortunately unable to say whether the experiment would have provided in the long run an acceptable level of service for general-purpose lane users.

Termination of Phase 3 and Lane Operation

On November 2, 1977, at the Joint Transportation Committee's legislative hearing on the two bills restricting the operation of the Express Lane, MDPW Commissioner John C. Carroll announced the immediate termination of the Downtown Express Lane. He cited the overwhelming public opposition, the travel-time delays for general-purpose lane users, and his own feeling that (despite some significant commuter mode shift), "it just isn't working," as the reasons for his decision.

At the time of the termination, there was little, if any, visible political support for the project from either the commuting public or any elected public officials. Following the announcement and the Lane's demise, however, the MDPW received approximately 50 phone calls and numerous letters expressing great displeasure at discontinuing the Lane. Once again, those who were negatively impacted only reacted when the results of the decision were physically implemented. However, no significant comment was made by any public official in response to this Express Lane user backlash. It can be stated, however, that the feasibility of providing permanently separated reversible lanes on the Expressway, within the existing right-of-way, which could facilitate various vehicle-management options, is now being analyzed.

Conclusions

Conclusions concerning the overall impact of the Downtown Express Lane are as follows:

1. The Downtown Express Lane allowed the Expressway to operate at higher vehicle occupancies and lower total volumes, which accomplished its primary purpose in the view of the responsible public officials.
2. The massive publicity campaign and the coverage and editorializing by the media which preceded the implementation of the voluntary Lane was vital in explaining the purpose of the Lane and obtaining the public's cooperation during Phases 1 and 2. The negative media reaction during Phase 3 (enforcement) contributed to the level and intensity of public opposition to continuation of the project.
3. The results of the Express Lane for Phase 1 (voluntary operation) presented in this paper are more

representative than Phase 2 results for evaluating the impacts of the Lane, because of the construction bottleneck at the northern end of the Expressway during Phase 2.

4. The results of the Express Lane for Phase 3 (enforced operation) are clearly those of a dynamic system in which travel conditions apparently had not yet reached equilibrium.

5. The compliance rate was inversely proportional to the number of carpools available to fill the Lane during the voluntary operation (Phases 1 and 2). However, it appears that compliance with a voluntary reserved lane always will tend to be low. Compliance rates proved much higher (and certainly acceptable) during the two-week enforcement period.

6. During Phase 1 (before the construction bottleneck) over 50 percent of the reduction in autos was accounted for by increased vehicle occupancy on the Expressway itself. Only 10 percent of the reduction in autos was accounted for by shifts to alternate routes or by drivers not making the trip at all. The Phase 3 enforcement results, while not as encouraging in this regard for the short period of operation of the Lane, did have 60 percent of the reduction in autos accounted for by a mode shift (to carpools and transit). This accounted for more than 10 percent of all autos using the expressway during the three-hour peak period.

7. Reserving a lane for buses and carpools did not hurt rapid transit ridership on parallel routes. In fact, rail transit ridership increased substantially, accounting for 25 percent of the reduction in autos during Phase 1 and Phase 3, and reflecting the complementarity of alternative high-occupancy modes in a high-volume corridor.

8. Once the Lane was enforced, travel times decreased in the Express Lane, but increased significantly and were unpredictable in the remaining three lanes, encouraging commuters to use alternate local street routes. However, whether or not these times would have remained unreliable if the enforced Lane operation had continued is unknown.

9. The absence of breakdown lanes and adequate acceleration lanes on the Southeast Expressway during the peak period increased the average time required for recovery from accidents and breakdowns during Phase 3 (the enforcement operation).

10. Finally, operational changes of this kind are difficult to implement. Since travelers who are inconvenienced by such a change (even for a short time) are more vocal than those who benefit by the change, public officials have difficulty responding to the resulting political pressures. The Downtown Express Lane experience shows once again that government is often unable to resolve issues in which short term private interests appear to conflict with the overall public good.

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