CAMBRIDGE VEHICLE TRIP REDUCTION ORDINANCE

PROPOSED SIP AMENDMENT

TECHNICAL APPENDIX

Prepared for:

Foley, Hoag & Eliot
One Post Office Square
Boston, MA 02109

Prepared by:

Cambridge Systematics, Inc.
American Twine Building
222 Third Street
Cambridge, MA 02142

February, 1992

TECHNICAL APPENDIX

TABLE OF CONTENTS

Introduction

1. Transportation Demand Logit Model
2. Evaluation of Plan Measures - Work Sheets
3. Cambridge-Based Transportation Statistics from CTPS
4. Testing of Alternate Parking Conditions
5. Historical Growth Patterns in Cambridge

INTRODUCTION

This Technical Appendix is intended to provide technical support for the analysis of the transportation/air quality measures included in the Cambridge Vehicle Trip Reduction Ordinance. It describes the assumptions and techniques used to analyze the impacts of the individual measures and provides a basis for understanding the way in which these measures can affect travel behavior in the City of Cambridge to achieve the objective of improved air quality within Cambridge and the Region as a whole.

The Technical Appendix is organized into the following five sections:

Section 1: Transportation Demand Logit Model

This section describes the "pivot point" model used to quantify changes in travel behavior resulting from the implementation of the measures included in the Vehicle Trip Reduction Ordinance. The model quantifies these changes both in terms of mode share and vehicle miles of travel (VMT).

Section 2: Evaluation of Plan Measures - Work Sheets

This section includes the work sheets, developed from the pivot point model, which quantify the transportation impacts associated with the proposed measures in the Vehicle Trip Reduction Ordinance.

Section 3: Cambridge-Based Transportation Statistics from CTPS

This section provides base data relevant to Cambridge and regional travel behavior, provided by the Central Transportation Planning Staff. These data were used in conjunction with the pivot point model to determine existing and future travel characteristics. Included are statistics on daily vehicle miles of travel, trip length and through-trips on Cambridge roadways.

Section 4: Programs Affecting the Supply of Parking

This section analyzes two types of parking freezes to determine their potential impacts on commuter mode share, and to compare their potential impacts with baseline conditions and with the proposed vehicle trip reduction ordinance.

Five conditions were tested. These included:

1. A baseline condition.
2. Future parking based on prevailing mode share trends.
3. A parking freeze at the 1990 inventory.
4. A parking freeze with an increment of additional parking.
5. Selected elements of the proposed vehicle trip reduction ordinance.

The purpose of these tests was to calculate by how much travel behavior, in terms of the percentage mode shares used to commute to work in Cambridge, would need to change to reflect the constraints imposed by two types of parking freezes as compared with the proposed vehicle trip reduction ordinance. While the results of the analysis provide useful information concerning the hypothetical impact of various parking programs, the analytic approach used in this investigation was necessarily limited.

The parking conditions tested again involved the use of the pivot point model as discussed in Section 1. However, the tests were set-up to "observe" what the mode shares would need to be to reflect the parking constraints imposed on the model by the test. In other words, the model provides an output of travel behavior without determining whether the observed mode shifts are practical or doable, or could be supported by the existing transit infrastructure. The model only presented a forecast of the degree to which travel behavior or mode shares would need to change to reflect the conditions mandated by the parking program tested.

The proposed vehicle trip reduction ordinance is not subject to the same analytical constraints because it is broader-based than a parking freeze and contains components designed to create a support structure for educating and assisting affected populations to achieve the intended mode shifts.

As indicated by the analysis and discussion in the following sections, the proposed vehicle trip reduction ordinance is a better transportation control instrument for changing driving behavior and achieving air quality benefits than is a parking freeze. Significant impacts can be achieved from the proposed ordinance within two years of its enactment. A parking freeze will not achieve any air quality benefits, absent substantial future development in Cambridge. A parking freeze in Cambridge could cause future development and associated traffic to locate in other cities instead, thereby causing a potential increase in regional VMT and worsening of air quality. Thus, in the short term, the proposed ordinance will achieve superior results; in the long term it would produce equivalent, if not superior, results.

Section 5: Historical Growth Patterns in Cambridge

The preceding section examined a variety of alternative levels of development in Cambridge ranging between zero and 8 million square feet of new development over ten years (and up to 16 million square feet over twenty years). The purpose of this section is to provide an historical context relevant to past patterns of growth in Cambridge to better comprehend the potential for new development into the future and better assess whether the very high growth patterns of the 1980's are likely to continue through to the 21st century.

SECTION 1

TRANSPORTATION DEMAND LOGIT MODEL

1.0 TRANSPORTATION DEMAND PIVOT POINT MODEL

The transportation demand model is an incremental, pivot point logit model developed by Cambridge Systematics that calculates changes in mode shares and vehicle occupancy for a range of policies and facilities that affect travel times or travel costs. As applied to this study, the model estimates these effects for commuter trips segregated into several modes:

- drive-alone auto,
- carpool,
- transit,
- walk and
- other

The model also includes a carpool submodel that predicts the changes in the relative shares of two-person and three-plus-person carpools.

The model used in the study is designed to analyze up to ten market segments and to aggregate all the modal volumes by market segment. The analysis structure used to investigate the various programs in Cambridge essentially involves an aggregated zone structure of "several to one", or several communities or zones of origin to Cambridge (counted as one destination zone). Basically this approach represents a sketch planning level of analysis that employs the pivot point model.

Alternate evaluation approaches that could have been employed, such as the use of network-based disaggregate modeling, are very costly, data intensive, and time consuming. And as we have discerned in our recent research for the U.S. EPA, the more refined analytic approaches to measure TDM effectiveness do not lead to results that are appreciably different from the simpler methods. ("Three Cities TCM Investigations", Technical Services Grant for the U.S.EPA, Cambridge Systematics, Inc., April 1991)

The calculation of estimated changes in transportation modal shares incorporated into the model is based on the incremental form of the multinomial logit model. Background on the theory and derivation of this model is presented in:

- Richard, Martin G. and Moshe E. Ben-Akiva, **A Disaggregate Travel Demand Model** (Westmead, Farnborough, Hants, U.K.: Saxon House/Lexington Books), 1975.)

- Cambridge Systematics, Inc., "Guidelines for Travel Demand Analyses of Program Measures to Promote Carpools, Vanpools, and Public Transportation," prepared for the Federal Energy Administration, November 1976 (Appendix E).

- Ruiter, Earl R., "Sketch Planning Method to Forecast HOV Facility Usage," memorandum submitted by Cambridge Systematics, Inc. to the Central Artery Project Staff, Bechtel/Parsons Brinckerhoff, November 4, 1987 (Memo No. CS-9).

Based on probabilistic choice theory, the model form is used to pivot about an existing situation. The approach predicts revised travel behavior based on existing travel behavior and changes in level of service rather than employing a full transportation demand model system to recalculate modal shares based on detailed household, zonal, and level-of-service data. By employing a pivot point approach, data requirements are greatly reduced: no knowledge of detailed socioeconomic and level-of-service data for each household or zone is required. Only existing estimates of modal shares (probabilities) and proposed changes in level of service are necessary.

The logit model predicts the probability that a behavioral unit will make choice i from the set of alternatives A, expressed in the following exponential form:

$$P(i\&A) = \frac{e^{U_i}}{\sum_{m \in A} e^{U_m}}$$

where:

m, i = travel mode alternatives;

A = the set of possible choices;

P(i&A) = the probability of choosing alternative i out of the set of the available alternatives A; and

U_m, U_i = the utility of alternatives m and i.

This particular model form exhibits many favorable properties that make it desirable to use. First, the exponential form is in agreement with consumer behavior theory (i.e., if an alternative begins with a choice probability of 0.5 or greater, the initial response to an increment of utility improvement is greater than the response to a later increment of utility improvement of the same magnitude). Second, the probabilities necessarily sum to one as they should. Third, the curve of P(i&A) versus U_i has the general shape of the curve of "diminishing returns" at both ends. This reflects known travel behavior nicely; i.e., no matter how good (or bad) a service is, all of the ridership is never captured (or lost), and ridership is most susceptible to diversion to some other alternative in the highly competitive middle range. Fourth, the logit model is capable of extension to any number of travel alternatives. Finally, the logit form is mathematically straight-forward, leading to simplicity in calibration, transformation and application.

Any change in transportation will result in a change in the level of service, X_{ij}, and therefore a change in the utility function as expressed by the weighted sum of transportation and socioeconomic variables; that is,

$$U_i = S_j J_{ij} X_{ij}.$$

The revised probability resulting from changes in modal utilities is given by:

$$P'(i\&A) = \frac{e^{U_i + DU_i}}{\sum_{m \in A} e^{U_m + DU_m}}$$

where:

DU_i = the change in utility for alternative i, = $S_j J_{ij} X_{ij}$;

J_{ij} = a calibrated model coefficient;

DX_{ij} = a change in an independent variable X for attribute j;

$P'(i\&A)$ = the predicted probability of choosing alternative i when U_i changes by DU_i.

Equation (2) can be represented by:

$$P'(i\&A) = \frac{e^{U_i} \cdot e^{DU_i}}{\sum_{m \in A} e^{U_m} \cdot e^{DU_m}}$$

Dividing both the numerator and denominator of Equation (3) by $S_{m \in A} \exp(U_m)$ yields:

$$P'(i\&A) = \frac{[e^{U_i} / \sum_{m \in A} e^{U_m}] \cdot e^{DU_i}}{\sum_{m \in A} [e^{U_m} / \sum_{m \in A} e^{U_m}] \cdot e^{DU_m}}$$

which can be written as:

$$P'(i\&A) = \frac{P(i\&A) \cdot e^{DU_i}}{\sum_{m \in A} P(m\&A) \cdot e^{DU_m}}$$

Note that whenever P(i&A) equals zero, $P'(i\&A)$ will equal zero regardless of the change in utility or probabilities of other modes.

To be completed, the probabilities obtained from this equation must be expanded into an aggregate forecast of travel behavior. A straightforward and simple approach is to use average values of existing choice probabilities and of changes in level of service for a given population

subgroup. The incremental model form expressed in the program then simply replaces P(i&A), the probability of an individual choosing alternative i with the base modal share for that alternative, and X_{ij}, the change in transportation level of service for an individual, with the average change in that variable for all trips. Thus, aggregate or population subgroup modal shares become the basic units for which transportation-related impacts are predicted.

The coefficients, or elasticities, are what determine the weight given to each level-of-service variable. These coefficients are derived from the data sources from several previous Cambridge Systematics projects and verified for consistency using available information from the CTPS. The previous projects include TCM and transit related studies for the San Francisco Bay Area, Cincinnati and state of Connecticut.

The coefficients used in the model are listed below. All reflect changes in vehicle trip travel times and costs. Time is expressed in minutes and cost is expressed in 1980 dollars.

In-vehicle travel time		
auto	IVTT	-.02543
transit	IVTT	-.02543
Out-of-vehicle travel time	OVTT	-.05849
Out-of-pocket costs	COST	-.00387

The relationships of these coefficients of in-vehicle and out-of-vehicle travel time and out-of-pocket cost are expressed in the following forms as:

$$\text{VoT (in-vehicle)} = \frac{\text{s in-vehicle time}}{\text{s cost}} \times K$$

$$\text{VoT (out-of-vehicle)} = \frac{\text{s out-of-vehicle}}{\text{s cost}} \times K$$

where:

Vot = Value of time, expressed as $ per hour

s = coefficient, expressed in minutes for time and cents for cost

K = a constant factor of 0.60 to convert to $ per hour

The values of time that are derived from these coefficients are:

In-vehicle travel time	IVTT = $3.94
Out-of-vehicle travel time	OVTT = $9.07

These values of time are very consistent with the time value data that has been used locally in related transportation studies for the MBTA for alternatives analysis and found to be consistent by the UMTA and FHWA for cost-effectiveness determinations.

SECTION 2

EVALUATION OF PLAN MEASURES - WORK SHEETS

Measure

A.1 Commuter Mobility Program

B.1 Parking Restrictions on Currently Unregulated Spaces

B.2 Increase Off-Street Municipal Parking Fees

D.1 Residential Zone Parking Sticker Program

E.2 Local Employment Incentives

E.3 Cambridge Baseline Commuting Conditions

E.4 Employer Based Trip Reduction Plan

F.1 Development Based Trip Reduction Plan

2.0 EVALUATION OF PLAN MEASURES - WORK SHEET CALCULATIONS

Introduction

This section includes the work sheets used to quantify the impact associated with several of the proposed measures in the Cambridge plan. See Section 2 of the Appendix for a more detailed outline of the analytic methodology used in the evaluation.

Measure:

A.1 Commuter Mobility Program

Based on a voluntary and areawide application of commuter mobility measures, including community education programs on alternative modes of travel and implementation of shuttle services linking the MBTA and major employment centers, Cambridge-based vehicle miles of travel could be reduced by an estimated 0.41 percent or 13,500 daily VMT.

B.1 Parking Restrictions on Currently Unregulated Streets

Approximately 4,700 on-street parking spaces in Cambridge are currently unrestricted. For the purpose of analysis, it was assumed that this measure would apply to the entire supply of currently unregulated on-street spaces and that restrictions would be applied in the form of residential parking permit requirements.

Two scenarios were tested to determine the potential impact of this measure. For the first scenario tested, it was assumed that all available spaces are currently used for long term commuter parking (or would be used for long-term parking as a result of other measures in the ordinance). In this case, this measure could reduce Cambridge-based vehicle miles of travel by an estimated 2.67 percent or 88,000 daily VMT.

For the second scenario tested, it was assumed that 60 percent of the currently unregulated spaces are used for long-term commuter parking and that, as a result of the new restrictions, 33 percent of these commuters would continue to drive but would find alternative parking. In this case, Cambridge-based vehicle miles of travel would be reduced by 1.07 percent or 35,000 daily VMT.

B.2 Increase Off-Street Municipal Parking Fees

The City of Cambridge currently operates two off-street parking garages. The Green Street garage in Central Square provides 290 spaces and the East Cambridge garage (55 First St.) provides 1110 spaces.

An analysis of a 25 percent increase in the price of parking at these facilities was conducted which assumed that the rates at non-municipal facilities in the vicinity of these garages would be unchanged and that any spaces made available at these facilities as a result of the rate increases would not be subsequently filled as a result of latent damand. Based on these assumptions, this strategy would result in an estimated 0.13 percent reduction in the current daily total Cambridge-based vehicle miles of travel, equal to 4,000 daily vehicle miles of travel (VMT).

D.1 Residential Parking Permit Sticker Zones

A zoned parking program would restrict use of parking stickers to the designated zone where the vehicle is registered.

Four (4) zones are established for the purpose of implementing this measure and are defined as follows:

- Zone 1: Cambridge-Somerville border to north, Cambridge-Arlington-Belmont border to west, Concord Avenue to south, Kirkland Street to east (includes Cambridge Common)
- Zone 2: Concord Avenue to north, JFK Boulevard to east, Charles River/Watertown-Belmont border to south and west
- Zone 3: Massachusetts Avenue to north, JFK Boulevard to west, Charles River to south and east
- Zone 4: Massachusetts Avenue to south, Kirkland Street to west, Somerville-Charlestown-Cambridge border to north, Charles River to east

The strategy will reduce intra-Cambridge home-based work and non-work trips on weekdays. Based on data available from the CTPS on trip making within Cambridge (see Attachment 3 - Section 4 of the Appendix), and travel and parking characteristics observed throughout the metropolitan area, it is estimated that this measure could reduce internal Cambridge average weekday home-based work and home-based other vehicle miles of travel by 8.7 percent. This would result in an estimated 0.21 percent reduction in the current daily total Cambridge-based vehicle miles of travel, equal to 7,000 daily vehicle miles of travel (VMT).

E.2 Local Employment Opportunities

As of 1989, Cambridge employers provided jobs for over 102,000 employees, accounting for nearly 6 percent of the total employment in the Boston SMSA. Approximately 28 percent of Cambridge's employment base is composed of Cambridge residents. The employment base of other major job centers such as Waltham, Bedford, Framingham and Lynn is composed of 35 percent or more local residents. The City of Boston has a 40 percent local resident employee population.

To determine the potential effectiveness of this measure, an analysis was performed which assumed a growth in Cambridge-based job share to 31 percent of total employment. The results of this analysis indicated that Cambridge home-based work vehicle miles of travel could be reduced by an estimated 3.4 percent or 33,000 daily VMT. This would produce an estimated 1.0 percent reduction in total Cambridge-based vehicle miles of travel.

E.3 Baseline on Employee Commuting Characteristics:

A Citywide Auto Efficiency Rate (AER) goal will be established to provide a basis for progressive reductions in vehicle trips and vehicle miles of travel compared to baseline travel characteristics. The current AER for Cambridge ("Base AER") shall be derived from 1990 U.S. Census modal share data and travel statistics, which are expected to be available shortly. The work sheet included in this section indicates the Cambridge AER based on 1980 census modal share data.

E.4 Employer-Based Vehicle Trip Reduction Plan

All Cambridge employers of 50 or more employees at a single worksite (including institutions and City of Cambridge departments) who cannot certify and demonstrate achievement of the Citywide Auto Efficiency Rate Goal will be required to submit and implement a Vehicle Trip Reduction Plan as an element of the Annual Employer Survey Response.

It is estimated that there are approximately 240 firms within the City of Cambridge that employ 50 or more employees. As a result, this program is estimated to apply to approximately 65,000 employees based on 1990 employment records.

(An analysis of program impacts if applied to firms of 25 or more employees was also conducted to determine what the potential for additional effectiveness would be if program coverage was expanded. An additional 270 firms would be covered by the ordinance if applied to firms with between 25 and 49 employees. However, in Cambridge, these firms employ an estimated total of only 9450 employees. As a result, although the number of firms covered would increase by 112 percent, the number of employees covered would increase by only 15 percent, causing a disproportionate administrative burden and expense.)

Based on a 2.5 percent annual improvement in AER compared to current Cambridge travel characteristics (based on available information) and, assuming all employers with AERs below the Citywide AER Goal implement programs which produce the intended vehicle trip reductions, total daily Cambridge-based vehicle miles of travel (VMT) would be reduced by an estimated 0.3 percent or 12,000 daily VMT in the first year and by 0.7 percent or 25,000 by the second year.

F.1 Development-Based Trip Reduction Plan

The measure will reduce the growth in vehicle trips and miles of travel that will be generated by all new development of either 50,000 square feet or greater or 50 or more residential units. An analysis was performed to determine the impact of this measure as it would apply to non-residential development in Cambridge, based on a potential for 7 million square feet of new non-residential development.

For the purpose of this analysis, it was assumed that all tenants of the proposed new non-residential development would be subject to the Citywide AER Goal and that these tenants consist of new Cambridge employers, rather than employers who have relocated from other Cambridge facilities. The data show that this measure would reduce Cambridge-based vehicle miles of travel by an estimated 27,000 daily VMT compared to the VMT otherwise generated by this new development in the absence of a Transportation Management Plan and/or Vehicle Trip Reduction Plan. This is equivalent to an 10.6 percent reduction in VMT that would otherwise be generated by the new development.

CAMBRIDGE SIP PROJECT

Policy: A.1 Commuter Mobility Program

(Voluntary and Community-wide Application)
(Jitney/Shuttle Bus Service Assessment)
(Total Cambridge Employment Base)

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	TOTALS
	Cambridge	Boston	Somerville	Arlington	Belmont	Medford	Watertown	Newton	Other	
Trips To Cambridge:	28,458	14,382	9,792	7,038	3,774	3,060	2.550	2,244	30.702	102.000
Base Modal Shares										
Drive Alone:	6.261	4,415	4,005	2.915	2.019	1,756	1.023	1.562	19.281	43.137
Shared Ride:	2.590	1.812	1,782	1,436	645	679	467	368	7,768	17,547
Transit:	4.439	5.868	2,321	2.710	1.038	618	854	242	2.825	20.915
Other(93% non-veh.trips):	15,168	2,297	1,684	77	72	6	207	72	829	20,402
Ave Carpool Size:	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	102,000

Strategy Test - Change in trip level of service

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	
Drive Alone: IVTT:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Drive Alone: OVTT:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Drive Alone: OPTC:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2-Carpool: IVTT:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2-Carpool: OVTT:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2-Carpool: OPTC:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
3+Carpool: IVTT:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
3+Carpool: OVTT:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
3+Carpool: OPTC:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Vanpool: IVTT:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Vanpool: OVTT:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Vanpool: OPTC:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Transit: IVTT:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Transit: OVTT:	-8.00	-4.00	-4.00	-4.00	-4.00	-4.00	-4.00	-4.00	0.00	
Transit: OPTC:	-20.00	-10.00	-10.00	-10.00	0.00	0.00	0.00	0.00	0.00	
CP3SIZE	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	
CP2 share of CP	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669	
CP3 share of CP	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	

2CP Delta-U:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3CP Delta-U:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CP2 Base Share of CP	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669
CP3 Base Share of CP	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331
CP2 Dummy	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669
CP3 Dummy	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331
CP2 Revised Share	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669
CP3 Revised Share	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331
NewCPsize	2.300	2.300	2.300	2.300	2.300	2.300	2.300	2.300	2.300
AveCPIVTT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AveCPOVTT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AveCPOPTC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DA Delta-U	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CP Delta-U	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
VP Delta-U									
Tr Delta-U	0.273	0.136	0.136	0.136	0.117	0.117	0.117	0.117	0.000
Base * EXP DA	6260.76	4415.27	4004.93	2815.20	2019.09	1756.44	1022.55	1561.82	19280.86
Base * EXP CP	2589.68	1812.13	1782.14	1435.75	645.35	679.32	466.65	368.02	7767.61
Base * EXP VP									
Base * EXP TR	5831.07	6724.95	2659.68	3105.41	1166.64	694.83	960.26	272.43	2824.58
Base * EXP Other	15168.11	2286.74	1694.22	77.42	71.71	6.12	206.55	71.81	828.95
Revised Share DA	0.210	0.290	0.395	0.379	0.517	0.560	0.385	0.687	0.628
Revised Share CP	0.087	0.119	0.176	0.193	0.165	0.217	0.176	0.162	0.253
Revised Share VP									
Revised Share TR	0.195	0.441	0.263	0.418	0.299	0.222	0.362	0.120	0.092
Revised Share Other	0.508	0.150	0.166	0.010	0.018	0.002	0.078	0.032	0.027

Change in percent of mode share

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I
Drive Alone:	-1.03%	-1.73%	-1.37%	-2.13%	-1.77%	-1.40%	-1.80%	-0.92%	0.00%
Carpool:	-0.42%	-0.71%	-0.61%	-1.09%	-0.56%	-0.54%	-0.73%	-0.22%	0.00%
Vanpool									
Transit:	3.93%	3.33%	2.55%	3.27%	2.39%	1.95%	2.65%	1.18%	0.00%
Other:	-2.48%	-0.89%	-0.58%	-0.06%	-0.06%	0.00%	-0.32%	-0.04%	0.00%

AGE IN PERSON TRIPS

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Drive Alone:	-291.88	-248.33	-134.00	-149.88	-66.63	-42.95	-40.81	-20.66	0.00	-995.15
Carpool:	-120.73	-101.92	-59.63	-76.44	-21.30	-16.61	-18.63	-4.87	0.00	-420.13
Vanpool										
Transit:	1119.77	478.86	249.98	230.45	90.29	59.72	67.68	26.47	0.00	2323.23
Other:	-707.15	-128.61	-56.35	-4.12	-2.37	-0.15	-8.24	-0.95	0.00	-907.95

CHANGE IN VEHICLE TRIPS

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Original Auto Trips	8448	5363	4898	3445	2305	2052	1240	1727	22716	52194
-Change in Auto Trips	-344	-293	-160	-183	-76	-50	-49	-23	0	-1178
New Auto Trips	8104	5071	4738	3262	2229	2002	1191	1704	22716	51016
Percent Change Auto Trips	-4.65%	-5.61%	-3.34%	-5.31%	-3.29%	-2.44%	-3.98%	-1.32%	0.00%	-2.32%
Change in Transit Trips	1120	479	250	230	90	60	68	26	0	2323

AUTO EFFICIENCY

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Person Trips to Cambridge	28458	14382	9792	7038	3774	3060	2550	2244	30702	102000
Existing Auto Trips	8449	5363	4898	3445	2305	2052	1240	1727	22716	52194
Person To Auto Trip Ratio	3.37	2.68	2.00	2.04	1.64	1.49	2.06	1.30	1.35	1.95
Auto Trips After Strategy	8104	5071	4738	3262	2229	2002	1191	1704	22716	51016
Person To Auto Trip Ratio	3.51	2.84	2.07	2.16	1.69	1.53	2.14	1.32	1.35	2.00

VEHICLE MILES OF TRAVEL IMPACT (VMT)

Existing Auto VMT	50691	91175	53874	41338	25352	26679	16119	27630	636051	969908
Auto VMT after Strategy	48625	86200	52115	39141	24517	26027	15483	27265	636051	955423
-VMT Reduction	-2066	-4975	-1759	-2197	-835	-652	-636	-364	0	-13485
Reduction from Market VMT	-4.1%	-5.5%	-3.3%	-5.3%	-3.3%	-2.4%	-3.9%	-1.3%	0.0%	-1.39%
Percent Reduction from Current Total Cambridge VMT										-0.41%

CAMBRIDGE SIP PROJECT

Policy: B.1 Parking Restrictions on Currently Unregulated Spaces

Scenario 1 (Assumes Current Spaces Are Long-Term Commuter)
(Assumes Daily Current Turnover Rate =1.00)
(Assumes Spaces to be Restricted to Resident Only Parking)

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	TOTALS
	Cambridge	Boston	Somerville	Arlington	Belmont	Medford	Watertown	Newton	Other	
Trips To Cambridge:	2,583	1,305	889	639	343	278	231	204	2,786	9,257
Base Modal Shares										
Drive Alone:	568	401	363	255	183	159	93	142	1,750	3,915
Shared Ride:	235	164	162	130	59	62	42	33	705	1,592
Transit:	403	533	211	244	94	56	78	22	256	1,898
Other(93% non-veh.trips):	1,377	208	153	7	7	1	19	7	75	1,852
Ave Carpool Size:	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	9,257
CPSIZE	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	
CP2 share of CP	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669	
CP3 share of CP	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	

AUTO EFFICIENCY

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Person Trips to Cambridge	2583	1305	889	639	343	278	231	204	2786	9257
Existing Auto Trips	767	487	444	313	209	186	113	157	2062	4737
Person To Auto Trip Ratio	3.37	2.68	2.00	2.04	1.64	1.49	2.06	1.30	1.35	1.95

VEHICLE MILES OF TRAVEL IMPACT (VMT)

Reduction in Auto VMT	4600	8275	4889	3752	2301	2421	1463	2508	57725	-87933
Percent Reduction from Current Total Cambridge VMT										-2.67%

Scenario 2 (Assumes 60 Percent Current Spaces Are Long-Term)

(Daily Turnover of Long-Term Spaces =1.00)
(To Be Restricted to Resident Only Parking)
(33 Percent Of Commuters Park Elsewhere)

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	TOTALS
	Cambridge	Boston	Somerville	Arlington	Belmont	Medford	Watertown	Newton	Other	
Trips To Cambridge:	1,032	522	355	255	137	111	93	81	1,114	3,700
Base Modal Shares										
Drive Alone:	227	160	145	102	73	64	37	57	699	1,565
Shared Ride:	94	66	65	32	23	25	17	13	282	636
Transit:	161	213	84	98	38	22	31	9	102	759
Other(93% non-veh.trips):	550	83	61	3	3	0	7	3	30	740
Ave Carpool Size:	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	3,700
CP3SIZE	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	
CP2 share of CP	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669	
CP3 share of CP	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	

AUTO EFFICIENCY

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Person Trips to Cambridge	1032	522	355	255	137	111	93	81	1114	3700
Existing Auto Trips	306	195	178	125	84	74	45	63	824	1893
Person To Auto Trip Ratio	3.37	2.68	2.00	2.04	1.64	1.49	2.06	1.30	1.35	1.95

VEHICLE MILES OF TRAVEL IMPACT (VMT)

Reduction in Auto VMT	1839	3307	1954	1500	920	766	585	1002	23072	-35147
Percent Reduction from Current Total Cambridge VMT										-1.07%

CAMBRIDGE SIP PROJECT

Policy: B.2 Increase Rates at City-Owned Parking Facilities by 25 Percent

(Assumes No Latent Demand For Parking)
(Rates for Private Garages Remain Unchanged)

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	TOTALS
	Cambridge	Boston	Somerville	Arlington	Belmont	Medford	Watertown	Newton	Other	
Trips To Cambridge:	753	381	259	186	100	81	68	59	813	2.700
Base Modal Shares										
Drive Alone:	166	117	106	75	53	46	27	41	510	1.142
Shared Ride:	69	48	47	38	17	18	12	10	206	464
Transit:	118	155	61	72	27	16	23	6	75	554
Other(93% non-veh.trips):	402	61	45	2	2	0	5	2	22	540
Ave Carpool Size:	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.700
Strategy Test - Change in trip level of service										
	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	
Drive Alone: IVTT:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Drive Alone: OVTT:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Drive Alone: OPTC:	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	
2-Carpool: IVTT:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2-Carpool: OVTT:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2-Carpool: OPTC:	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	
3+Carpool: IVTT:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
3+Carpool: OVTT:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
3+Carpool: OPTC:	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	
Vanpool: IVTT:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Vanpool: OVTT:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Vanpool: OPTC:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Transit: IVTT:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Transit: OVTT:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Transit: OPTC:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
CP3SIZE	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	
CP2 share of CP	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669	
CP3 share of CP	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	

Change in carpool size									
2CP Delta-U:	-0.310	-0.310	-0.310	-0.310	-0.310	-0.310	-0.310	-0.310	-0.310
3CP Delta-U:	-0.188	-0.188	-0.188	-0.188	-0.188	-0.188	-0.188	-0.188	-0.188
CP2 Base Share of CP	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669
CP3 Base Share of CP	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331
CP2 Dummy	0.491	0.491	0.491	0.491	0.491	0.491	0.491	0.491	0.491
CP3 Dummy	0.274	0.274	0.274	0.274	0.274	0.274	0.274	0.274	0.274
CP2 Revised Share	0.641	0.641	0.641	0.641	0.641	0.641	0.641	0.641	0.641
CP3 Revised Share	0.359	0.359	0.359	0.359	0.359	0.359	0.359	0.359	0.359
NewCPsize	2.329	2.329	2.329	2.329	2.329	2.329	2.329	2.329	2.329
AveCPIVTT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AveCPOVTT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AveCPOPTC	68.70	68.70	68.70	68.70	68.70	68.70	68.70	68.70	68.70
DA Delta-U	-0.619	-0.619	-0.619	-0.619	-0.619	-0.619	-0.619	-0.619	-0.619
CP Delta-U	-0.266	-0.266	-0.266	-0.266	-0.266	-0.266	-0.266	-0.266	-0.266
VP Delta-U									
Tr Delta-U	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Base * EXP DA	89.21	62.91	57.07	40.11	29.77	25.03	14.57	22.25	274.73
Base * EXP CP	52.54	36.77	36.16	29.13	13.09	13.78	9.47	7.47	157.60
Base * EXP VP									
Base * EXP TR	117.51	155.33	61.43	71.73	27.47	16.36	22.61	6.42	74.77
Base * EXP Other	401.51	60.53	44.59	2.05	1.90	0.16	5.47	1.90	21.94
Revised Share DA	0.135	0.199	0.286	0.280	0.404	0.452	0.290	0.565	0.519
Revised Share CP	0.080	0.117	0.181	0.204	0.184	0.249	0.182	0.196	0.298
Revised Share VP									
Revised Share TR	0.178	0.492	0.308	0.502	0.386	0.276	0.434	0.169	0.141
Revised Share Other	0.608	0.192	0.224	0.014	0.027	0.003	0.103	0.050	0.041

Change in percent of mode share

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I
Drive Alone:	-8.50%	-10.76%	-12.26%	-11.93%	-13.11%	-12.17%	-12.14%	-11.09%	-10.87%
Carpool:	-1.15%	-0.95%	-0.05%	-0.03%	1.28%	2.71%	-0.13%	3.23%	4.49%
Vanpool									
Transit:	2.18%	8.43%	7.13%	11.65%	11.07%	9.37%	9.89%	6.07%	4.93%
Other:	7.46%	3.28%	5.18%	0.33%	0.76%	0.09%	2.39%	1.80%	1.45%

CHANGE IN PERSON TRIPS

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	To
Drive Alone:	-64.03	-40.97	-31.77	-22.27	-13.10	-9.86	-8.20	-6.59	-88.34	-
Carpool:	-8.65	-3.61	-0.13	-0.06	1.28	2.19	-0.09	1.92	36.49	
Vanpool										
Transit:	16.45	32.08	18.49	21.71	11.06	7.59	6.67	3.60	40.09	
Other:	56.22	12.50	13.42	0.62	0.76	0.08	1.61	1.07	11.77	

CHANGE IN VEHICLE TRIPS

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	To
Original Auto Trips	224	142	130	91	61	54	33	46	801	
-Change in Auto Trips	-68	-43	-32	-22	-13	-9	-8	-6	-74	
New Auto Trips	156	99	98	69	48	45	25	40	528	
Percent Change Auto Trips	-34.76%	-31.00%	-25.31%	-24.65%	-20.73%	-16.57%	-25.54%	-12.75%	-12.28%	
Change in Transit Trips	16	32	18	22	11	6	7	4	40	

CHANGE IN VEHICLE MILES OF TRAVEL

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	To
VMT Reduction	-409	-727	-353	-270	-139	-117	-108	-93	-2066	

Percent Reduction from Current Total JTW VMT

Percent Reduction from Current Total Cambridge VMT

CAMBRIDGE SIP PROJECT

Policy: D.1 Residential Zone Parking Sticker Program

(Assumes Four City-wide Zones)

Internal Home Based Work Vehicle Trips

	Zone 1	Zone 2	Zone 3	Zone 4	Totals
Zone 1	0	1400	1660	1100	4160
Zone 2	2020	0	1800	2400	6220
Zone 3	1400	1400	0	1000	3800
Zone 4	1300	1100	1100	0	3500
Totals	4720	3900	4560	4500	17680

Internal Home Based Non-Work Vehicle Trips

	Zone 1	Zone 2	Zone 3	Zone 4	Totals
Zone 1	0	900	1000	940	2840
Zone 2	1700	0	1400	1350	4450
Zone 3	1100	1000	0	1100	3200
Zone 4	600	900	700	0	2200
Totals	3400	2800	3100	3390	12690

Internal Daily Vehicle Miles of Travel (VMT)

	Zone 1	Zone 2	Zone 3	Zone 4	Totals
Home-Based Work	14632	12090	14136	13950	54808
Home-Based Non-Work	6970	5740	6355	6950	26015
Totals	21602	17830	20491	20900	80823

Program Impacts on Vehicle Miles of Travel **

	Zone 1	Zone 2	Zone 3	Zone 4	Totals
Home-Based Work	1550	1550	620	1550	5270
Home-Based Non-Work	513	513	205	513	1743
Totals	2063	2063	825	2063	7013
Percent Reduction from Internal Cambridge HBW & HBO					-8.68%
Percent Reduction from Current Total Cambridge VMT					-0.21%

**Source: "City of Boston Strategic Parking Plan", Boston Property Department, June 1989
--Surveys of Neighborhood and Commercial Center parking on and off-street, including place of of parked vehicles.

CAMBRIDGE SIP PROJECT

Policy: E.2 Local Employment Incentives

Increase Local Share to 31 Percent
(28 Percent Currently)

Fill in this data table:

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	TOTALS
	Cambridge	Boston	Somerville	Arlington	Belmont	Medford	Watertown	Newton	Other	
Trips To Cambridge:	31,620	13,770	9,180	6,630	3,672	2,958	2,550	2,244	29,376	102,000
Base Modal Shares										
Drive Alone:	6,988	4,227	3,755	2,652	1,965	1,698	1,023	1,362	18,448	42,317
Shared Ride:	2,877	1,735	1,671	1,353	629	657	467	368	7,432	17,197
Transit:	4,933	5,618	2,176	2,553	1,010	598	854	242	2,703	20,686
Other(93% non-veh.trips):	16,822	2,189	1,579	73	70	6	207	72	793	21,810
Ave Carpool Size:	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	102,000

CHANGE IN VEHICLE TRIPS

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Original Auto Trips	8448	5363	4898	3445	2305	2052	1240	1727	22716	52194
New Auto Trips	9417	5135	4592	3245	2242	1984	1240	1727	21735	51317
Percent Change Auto Trips	11.47%	-4.25%	-6.26%	-5.80%	-2.71%	-3.32%	-0.01%	-0.01%	-4.32%	-1.68%

AUTO EFFICIENCY

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Person Trips to Cambridge	31620	13770	9180	6630	3672	2958	2550	2244	29376	102000
Existing Auto Trips	8448	5363	4898	3445	2305	2052	1240	1727	22716	52194
Person To Auto Trip Ratio	3.74	2.57	1.87	1.92	1.59	1.44	2.06	1.30	1.29	1.95
Auto Trips After Strategy	9417	5135	4592	3245	2242	1984	1240	1727	21735	51317
Person To Auto Trip Ratio	3.36	2.68	2.00	2.04	1.64	1.49	2.06	1.30	1.35	1.99

VEHICLE MILES OF TRAVEL IMPACT (VMT)

Existing Auto VMT	50688	91171	53878	41340	25333	26676	16120	27632	636049	966906
Auto VMT after Strategy	56500	87296	50508	38942	24667	25790	16119	27630	608584	936035
-VMT Reduction	5812	-3875	-3370	-2398	-688	-886	-1	-2	-27464	-32873
Percent JTW VMT Reduction	11.5%	-4.3%	-6.3%	-5.8%	-2.7%	-3.3%	0.0%	0.0%	-4.3%	-3.39%
Percent Reduction From Current Total Cambridge VMT										-1.00%

(Assumes 1980 Modal & Journey to Work Data)/c
(Assumes 1990 Employment)

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	TOTALS
	Cambridge	Boston	Somerville	Arlington	Belmont	Medford	Watertown	Newton	Other	
Trips To Cambridge:	28,458	14,382	9,792	7,038	3,774	3,060	2,550	2,244	30,702	102,000
Base Modal Shares										
Drive Alone:	6,261	4,415	4,005	2,815	2,019	1,756	1,023	1,562	19,281	43,137
Shared Ride:	2,590	1,812	1,782	1,436	645	679	467	368	7,768	17,547
Transit:	4,439	5,868	2,321	2,710	1,038	618	854	242	2,825	20,915
Other(93% non-veh.trips):	15,168	2,287	1,684	77	72	6	207	72	829	20,402
Ave Carpool Size:	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	102,000
CP3SIZE	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	
CP2 share of CP	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669	
CP3 share of CP	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	
AUTO TRIPS	8448	5363	4898	3445	2305	2052	1240	1727	22716	
VEHICLE MILES OF TRAVEL	50691	91175	53874	41338	25352	26679	16119	27630	636051	968908
AUTO EFFICIENCY										
-Person Trips to Cambridge	28458	14382	9792	7038	3774	3060	2550	2244	30702	102000
-Existing Auto Trips	8448	5363	4898	3445	2305	2052	1240	1727	22716	52194
-Person To Auto Trip Ratio	3.37	2.68	2.00	2.04	1.64	1.49	2.06	1.30	1.35	1.95

CAMBRIDGE SIP PROJECT

Policy: E.4 Employer Based Trip Reduction Plan

(Applies to Firms of 50 or More Employees)
(First Year Impacts- AER Plus 2.5 Percent)

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	CURRENT TOTALS
	Cambridge	Boston	Somerville	Arlington	Belmont	Medford	Watertown	Newton	Other	Total Employment
										102000
Trips To Cambridge:	18,099	9,147	6,228	4,476	2,400	1,946	1,622	1,427	19,526	50+ Employ. 64,872
Base Modal Shares										
Drive Alone:	3,982	2,808	2,547	1,790	1,284	1,117	650	993	12,263	27.435
Shared Ride:	1,647	1,153	1,133	913	410	432	297	234	4,940	11.160
Transit:	2,823	3,732	1,476	1,723	660	393	543	134	1,796	13.302
Other (walk, cab, bike):	9,647	1,454	1,071	49	46	4	131	46	527	12.975
Ave Carpool Size:	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	64.872

Strategy Test - Change in trip level of service

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I
Drive Alone: IVTT:									
Drive Alone: OVTT:									
Drive Alone: OPTC:	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
2-Carpool: IVTT:									
2-Carpool: OVTT:									
2-Carpool: OPTC:									
3+Carpool: IVTT:									
3+Carpool: OVTT:									
3+Carpool: OPTC:									
Vanpool: IVTT:									
Vanpool: OVTT:									
Vanpool: OPTC:									
Transit: IVTT:									
Transit: OVTT:									
Transit: OPTC:									
CP3SIZE	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30
CP2 share of CP	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669
CP3 share of CP	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331

2CP Delta-U:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3CP Delta-U:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2P2 Base Share of CP	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669
2P3 Base Share of CP	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331
2P2 Dummy	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669
2P3 Dummy	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331
2P2 Revised Share	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669
2P3 Revised Share	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331
ewCPsize	2.300	2.300	2.300	2.300	2.300	2.300	2.300	2.300	2.300
veCPIVTT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
veCPOVTT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
veCPOPTC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

****

A Delta-U	-0.068	-0.068	-0.068	-0.068	-0.068	-0.068	-0.068	-0.068	-0.068
P Delta-U	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
P Delta-U									
r Delta-U	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ase + EXP DA	3721.04	2624.19	2380.30	1673.19	1200.03	1043.93	607.75	928.26	11459.44
ase + EXP CP	1647.04	1152.52	1133.44	913.14	410.45	432.05	296.79	234.06	4940.20
ase + EXP VP									
ase + EXP TR	2823.49	3731.96	1475.97	1723.32	660.07	393.12	543.30	134.14	1796.44
ase + EXP Other	9646.92	1454.37	1071.17	49.24	45.61	3.89	131.37	45.67	527.21
evised Share DA	0.209	0.293	0.393	0.384	0.516	0.337	0.383	0.681	0.612
evised Share CP	0.092	0.129	0.187	0.209	0.177	0.231	0.188	0.172	0.264
evised Share VP									
evised Share TR	0.158	0.416	0.244	0.395	0.285	0.210	0.344	0.113	0.096
evised Share Other	0.541	0.162	0.177	0.011	0.020	0.002	0.083	0.034	0.028

****

ange in percent of trip reduction program mode share

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I
ive Alone:	-1.14%	-1.42%	-1.63%	-1.61%	-1.69%	-1.66%	-1.62%	-1.45%	-1.60%
rpool:	0.13%	0.26%	0.50%	0.55%	0.62%	0.67%	0.49%	0.78%	1.09%
npool									
ansit:	0.23%	0.84%	0.65%	1.04%	1.00%	0.79%	0.90%	0.52%	0.39%
her:	0.78%	0.33%	0.47%	0.03%	0.07%	0.01%	0.22%	0.15%	0.12%

ANGE IN PERSON TRIPS

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Drive Alone:	-206.40	-130.08	-101.31	-72.26	-40.53	-32.39	-26.20	-20.72	-311.60	-941.50
Carpool:	24.08	23.65	31.20	24.57	14.91	16.88	8.01	11.18	211.92	366.39
Vanpool										
Transit:	41.28	76.58	40.63	46.37	23.97	15.36	14.65	7.36	77.06	343.26
Other:	141.04	29.84	29.49	1.32	1.66	0.15	3.54	2.18	22.62	231.85

CHANGE IN VEHICLE TRIPS

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Total Employment Auto Trips										52194
Trip Reduction Auto Trips	5373	3411	3115	2191	1466	1305	789	1098	14447	33195
-Change in Auto Trips	-196	-120	-88	-62	-34	-25	-23	-16	-219	-783
New Trip Reduction Trips	5177	3291	3027	2129	1432	1280	766	1082	14228	32413
Percent Change Auto Trips	-4.16%	-3.61%	-2.88%	-2.81%	-2.32%	-1.92%	-2.91%	-1.45%	-1.52%	-2.42
Change in Transit Trips	41	77	41	46	24	15	15	7	77	343

AUTO EFFICIENCY

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Total Person Trips										102000
Trip Reduction Person Trips	10099	9147	6228	4476	2400	1946	1622	1427	17526	64872
Existing TRD Auto Trips	5373	3411	3115	2191	1466	1305	789	1098	14447	33195
Person To Auto Trip Ratio	3.37	2.68	2.00	2.04	1.64	1.49	2.06	1.30	1.35	1.95
TRD Trips After Strategy	5177	3291	3027	2129	1432	1280	766	1082	14228	32413
Person To Auto Trip Ratio	3.50	2.78	2.06	2.10	1.68	1.52	2.12	1.32	1.37	2.00

VEHICLE MILES OF TRAVEL IMPACT (VMT)

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Total Cambridge Auto JTW VMT										968908
Trip Reduction Auto VMT	32239	57987	34264	26291	16124	16968	10251	17573	404528	616226
TRD Auto VMT after Strategy	31064	55951	33299	25552	15749	16642	9956	17319	398383	603915
-VMT Reduction	-1176	-2037	-965	-739	-375	-326	-295	-254	-6145	-12311
- % Reduction of 50+ Empl.	-3.6%	-3.5%	-2.8%	-2.8%	-2.3%	-1.9%	-2.9%	-1.4%	-1.5%	-2.0%
Percent Reduction From Current Total JTW VMT										-1.3%
Percent Reduction From Current Total Cambridge VMT										-0.3%

CHANGE IN MODE SHARE

	Current Conditions		Effects of Auto Efficiency Standard		
	Existing Trips	Percent Share	Revised Trips	Percent Share	Changes in Trips
Drive Alone:	27435	42.2%	26484	40.8%	-2%

Transit:	13302	20.5%	13640	21.0%	338	
Other (walk, cab, bike):	12975	20.0%	13207	20.4%	232	
Totals	64872	100.0%	64872	100.0%	0	

Keyboard Macros

CAMBRIDGE SIP PROJECT

Policy: F.1 Development Based Trip Reduction Plan

(Assumes Potential Cambridge Development of 7 Million Square Feet)

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	FORECAST TOTALS
	Cambridge	Boston	Somerville	Arlington	Belmont	Medford	Watertown	Newton	Other	Total Employment 129000 New Empl.
Trips To Cambridge:	8,370	3,645	2,430	1,863	999	810	675	594	7,614	27,000
Base Modal Shares										
Drive Alone:	2,930	1,484	994	745	534	465	271	413	4,792	12,617
Shared Ride:	1,256	459	442	380	171	180	124	97	1,926	5,035
Transit:	2,930	1,123	576	717	275	164	226	64	876	6,950
Other(93% non-veh.trips):	1,256	580	418	20	19	2	55	19	30	2,398
Ave Carpool Size:	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	27,000
Strategy Test - Change in trip level of service										
	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	
Drive Alone: IVTT:										
Drive Alone: OVTT:										
Drive Alone: OPTC:	185.00	185.00	185.00	185.00	185.00	185.00	185.00	185.00	185.00	
2-Carpool: IVTT:										
2-Carpool: OVTT:										
2-Carpool: OPTC:										
3+Carpool: IVTT:										
3+Carpool: OVTT:										
3+Carpool: OPTC:										
Vanpool: IVTT:										
Vanpool: OVTT:										
Vanpool: OPTC:										
Transit: IVTT:										
Transit: OVTT:										
Transit: OPTC:										
CP3SIZE	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	
CP2 share of CP	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669	
CP3 share of CP	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	

2CP Delta-U:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3CP Delta-U:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CP2 Base Share of CP	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669
CP3 Base Share of CP	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331
CP2 Dummy	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669
CP3 Dummy	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331
CP2 Revised Share	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669	0.669
CP3 Revised Share	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331
NewCPsize	2.300	2.300	2.300	2.300	2.300	2.300	2.300	2.300	2.300
AveCPIVTT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AveCPOVTT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AveCPOPTC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
**********									
DA Delta-U	-0.358	-0.358	-0.358	-0.358	-0.358	-0.358	-0.358	-0.358	-0.358
CP Delta-U	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
VP Delta-U									
Tr Delta-U	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Base * EXP DA	2047.80	1037.02	694.74	520.92	373.61	325.01	189.21	288.00	3342.47
Base * EXP CP	1255.51	459.27	442.26	380.05	170.83	179.82	123.33	97.42	1926.33
Base * EXP VP									
Base * EXP TR	2929.51	1122.66	575.91	717.26	274.73	163.62	226.13	64.13	870.81
Base * EXP Other	1255.51	579.56	417.96	20.49	18.98	1.62	54.68	16.01	30.46
Revised Share DA	0.273	0.324	0.326	0.318	0.446	0.495	0.319	0.613	0.341

Revised Share CP	0.168	0.144	0.208	0.232	0.204	0.268	0.208	0.207	0.312
Revised Share VP									
Revised Share TR	0.391	0.351	0.270	0.438	0.328	0.244	0.381	0.137	0.142
Revised Share Other	0.168	0.181	0.196	0.013	0.023	0.002	0.092	0.040	0.005
**********									
Change in percent of trip reduction program mode share									
	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I
Drive Alone:	-7.65%	-8.28%	-8.30%	-8.21%	-8.92%	-8.90%	-8.22%	-8.06%	-8.67%
Carpool:	1.77%	1.76%	2.55%	2.79%	3.28%	4.64%	2.51%	4.35%	5.90%
Vanpool									
Transit:	4.12%	4.30%	3.33%	5.27%	5.28%	4.22%	4.60%	2.86%	2.68%
Other:	1.77%	2.22%	2.41%	0.15%	0.36%	0.04%	1.11%	0.85%	0.09%

CHANGE IN PERSON TRIPS									

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Drive Alone:	-640.59	-301.74	-201.60	-152.99	-89.16	-72.06	-55.50	-47.85	-660.13	-2221.62
Carpool:	147.83	64.11	42.08	52.02	32.79	37.55	16.95	25.81	448.96	888.11
Vanpool										
Transit:	344.93	156.72	80.85	98.17	52.73	34.17	31.04	17.00	204.07	1019.68
Other:	147.83	80.90	58.67	2.80	3.64	0.34	7.50	5.04	7.10	313.83

CHANGE IN VEHICLE TRIPS

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Total Employment Auto Trips										66486
Trip Reduction Auto Trips	3563	1724	1215	912	610	543	328	457	3621	14974
-Change in Auto Trips	-576	-274	-175	-130	-75	-56	-48	-37	-469	-1835
New Trip Reduction Trips	2987	1450	1041	782	535	488	280	420	3136	13139
Percent Change Auto Trips	-16.55%	-16.24%	-14.69%	-14.29%	-12.28%	-10.24%	-14.80%	-8.03%	-8.26%	-12.37%
Change in Transit Trips	345	157	81	98	53	34	31	17	204	1020

AUTO EFFICIENCY

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Total Camb. Person Trips										129000
Trip Reduction Person Trips	8370	3645	2430	1863	999	810	673	394	7814	27000
Existing TRD Auto Trips	3563	1724	1215	912	610	543	328	457	3621	14974
Person To Auto Trip Ratio	2.35	2.11	2.00	2.04	1.64	1.49	2.06	1.30	1.35	1.80
TRD Trips After Strategy	2987	1450	1041	782	535	488	280	420	3136	13139
Person To Auto Trip Ratio	2.80	2.51	2.33	2.38	1.87	1.66	2.41	1.41	1.48	2.05
Efficiency Improvement										14.0%

VEHICLE MILES OF TRAVEL IMPACT (VMT)

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Total Cambridge Auto JTW VMT										1266634
Trip Reduction Auto VMT	21380	29304	13370	10943	6711	7062	4267	7314	157396	257745
TRD Auto VMT after Strategy	17922	24648	11449	9378	5887	6338	3641	6728	144378	230368
-VMT Reduction	-3458	-4656	-1921	-1564	-824	-725	-626	-586	-13018	-27377
-Percent Reduction	-16.2%	-15.9%	-14.4%	-14.3%	-12.3%	-10.3%	-14.7%	-8.0%	-8.3%	-10.6%
Percent Reduction From Forecast Total JTW VMT										-2.2%
Percent Reduction From Forecast Total Cambridge VMT										-0.6%

CHANGE IN MODE SHARE

	Conditions Without Strategy: Trips	Conditions Without Strategy: Percent Share	Effects of Strategy: Revised Trips	Effects of Strategy: Percent Share
Drive Alone:	12617	46.7%	10396	38.5%

Transit	6750	25.0%	7287	27.0%	
Other (walk, cab, bike)	2398	8.9%	2712	10.0%	
Totals	27000	100.0%	27000	100.0%	

JMMARY OF PROGRAM IMPACTS

MEASURE		VMT REDUCTION	% CHANGE IN VMT (1)	REDUCED VOCs (2) TONS/DAY	REDUCED CO (3) TONS/DAY	REDUCED NOx (4) TONS/DAY
A.1	Expanded Commuter Mob. Program	13,500	0.41	0.06	0.50	0.02
A.2	Bicycle Incentive Program	NA				
B.1	Park Restrictions on Unreg. Streets					
	Scenario 1	88.000	2.67	0.38	3.23	0.15
	Scenario 2	35.000	1.07	0.15	1.28	0.06
C.1	Universal Visitor Passes	NA				
D.1	Resident Parking Zones	7.000	0.21	0.03	0.26	0.01
D.2	Progressive Res. Parking Fees	NA				
E.1	Regional Trip Reduction Prog.	NA				
E.2	Local Employment Opportunities	33,000	1.0	0.14	1.21	0.06
E.3	Annual Employer Survey	NA				
E.4	Vehicle Trip Reduction Plan					
	Year 1	12.000	0.3	0.05	0.44	0.02
	Year 2	25.000	0.7	0.11	0.92	0.04
E.5	Credits for Excess Trip Reduct.	NA				
F.1	New Devel. Trip Reduction Plan	27.000	(5)	0.12	0.99	0.05
F.2	Modification of Parking Rates	NA				
G.1	Clean Fuel Study	NA				
G.2	Clean Fuel Incentives	NA				

NOTES:
NA: No direct impacts or impacts are unmeasureable
(1): % Change based on current (1987) VMT only
(2): Assumes rate of 3.88 g. of VOCs per mile at 19.6 mph. 78.1 (F)
(3): Assumes rate of 33.27 g. of CO per mile at 19.6 mph. 30.0 (F)
(4): Assumes rate of 1.54 g. of NOx per mile at 19.6 mph. 78.1 (F)
(5): Based on projected new development of 7 mil. sq. ft.

SECTION 3

CAMBRIDGE-BASED TRANSPORTATION STATISTICS FROM CTPS

1. Daily Vehicle Miles by Type of Trip and Year

2. Vehicle Trip Length by Type of Trip

3. Cambridge Through-Trips on Selected Roadways

4. Vehicle Trip-Making Within Cambridge Only

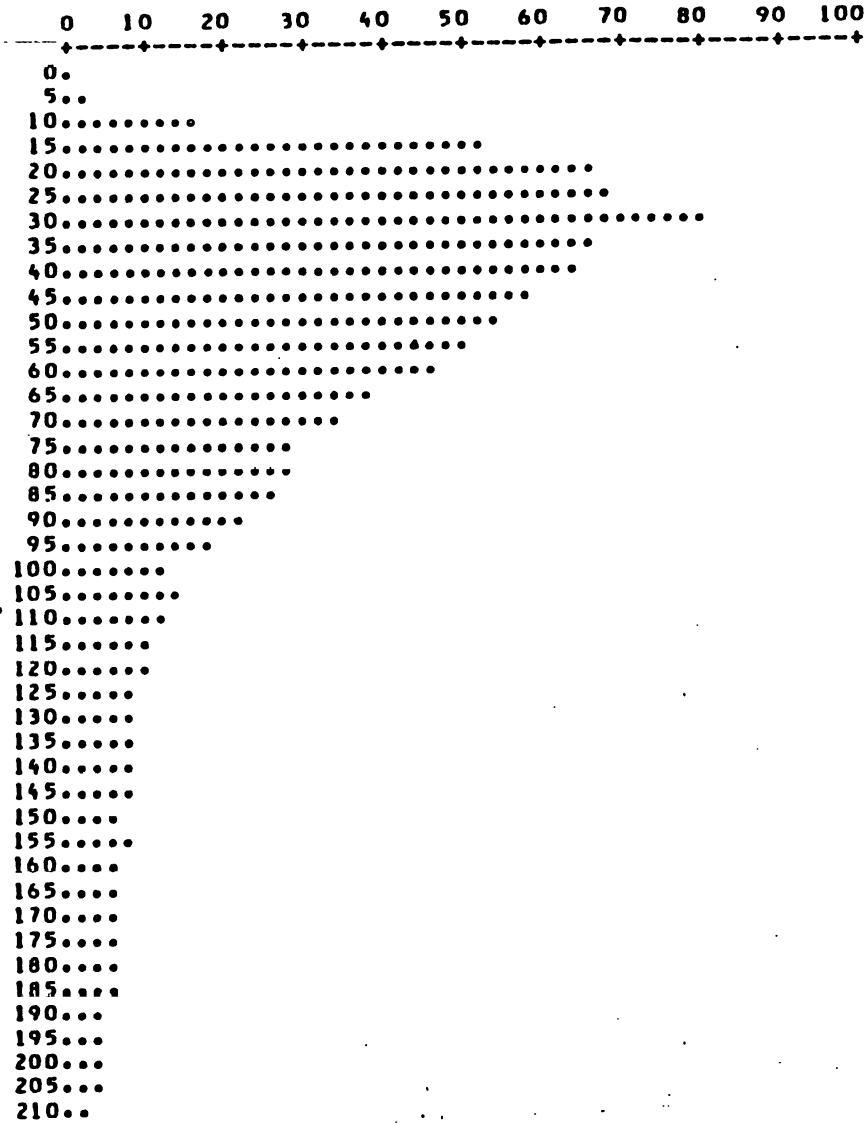
    - Trip Length by Purpose
    - Origin Zone to Destination Zone by Purpose

1. Daily Vehicle Miles by Type of Trip and Year

1987 VHCL MILES BY PURP	HOME BASED WORK	HOME BASED OTHER	NON-HOME BASED	ALL VHCLS (INC. OTHER)
CAMBRIDGE TO CAMBRIDGE	24,092	25,641	24,491	101,952
CAMBRIDGE TO EXTERNAL	925,283	436,020	216,989	1,715,540
EXTERNAL TO CAMBRIDGE	925,305	435,286	271,966	1,797,055
TOTAL CAMBRIDGE VMT	1,874,680	896,947	513,447	3,614,546
TOTAL VMT	34,562,384	21,507,019	7,912,970	71,319,164
2010 VHCL MILES BY PURP				
CAMBRIDGE TO CAMBRIDGE	28,304	29,166	33,876	121,247
CAMBRIDGE TO EXTERNAL	1,285,318	552,520	242,606	2,242,891
EXTERNAL TO CAMBRIDGE	1,299,328	550,029	277,353	2,332,038
TOTAL CAMBRIDGE VMT	2,612,950	1,139,715	553,835	4,696,175
TOTAL VMT	47,575,458	31,858,615	9,030,983	97,966,193
1987 AUTO OCCUPANCY	1.21	1.61	1.27	1.35

2. Vehicle Trip Length by Type of Trip

1987 HOME BASED WORK
TRIP LENGTH DISTRIBUTION
IMPEDANCE = DST87H12 (TABLE 1002)
TRIPS = HBWDYVEH (TABLE 2001)



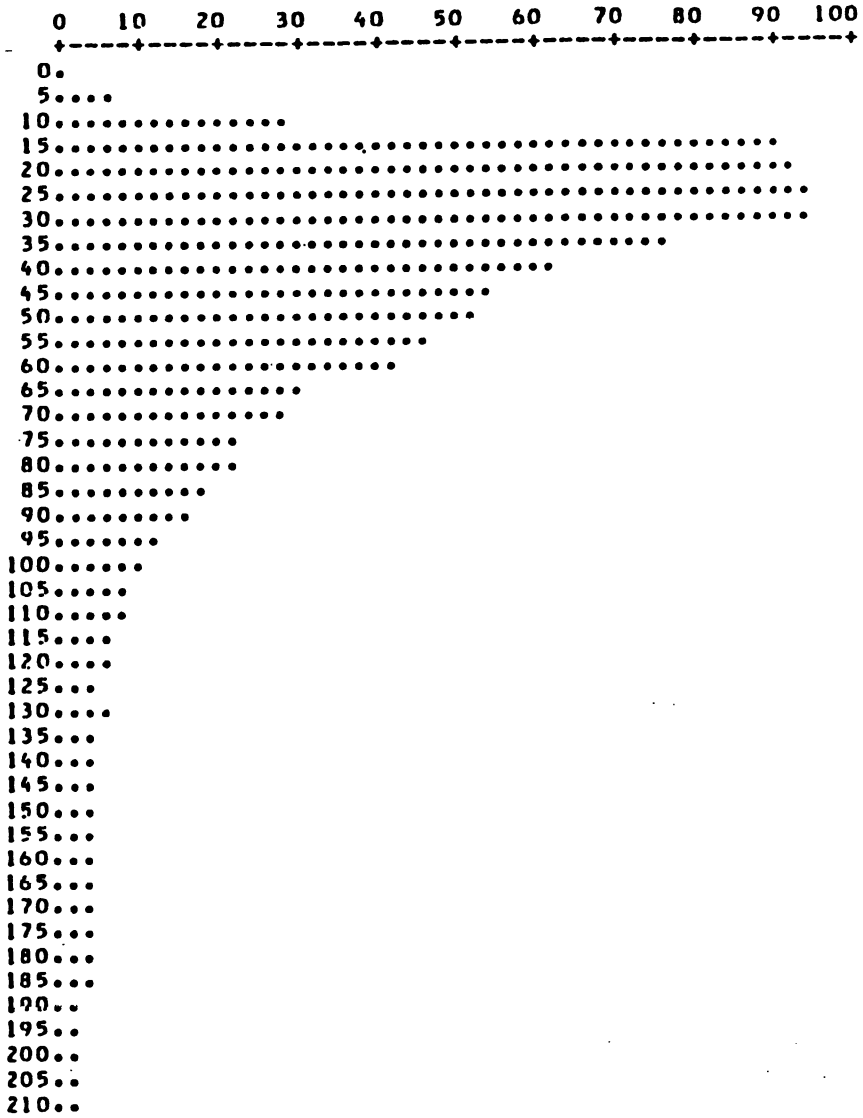
%	CUM%	COUNT
0.0	0.0	0
0.3	0.3	352
1.7	2.0	2099
5.1	7.1	6362
6.5	13.6	8107
6.8	20.4	8491
8.0	28.4	9988
6.7	35.1	8302
6.3	41.4	7845
5.7	47.1	7125
5.5	52.6	6789
4.9	57.5	6125
4.6	62.1	5698
3.8	65.9	4707
3.3	69.2	4154
2.9	72.1	3606
2.8	74.9	3435
2.5	77.4	3137
2.2	79.6	2695
1.8	81.3	2186
1.3	82.6	1561
1.3	83.9	1653
1.2	85.1	1440
0.9	86.0	1149
0.9	86.9	1157
0.8	87.7	1019
0.8	88.5	958
0.7	89.2	893
0.7	89.9	880
0.8	90.7	936
0.7	91.4	854
0.7	92.1	878
0.6	92.6	687
0.5	93.2	655
0.5	93.7	653
0.5	94.2	670
0.7	94.9	831
0.6	95.5	766
0.5	96.0	602
0.4	96.4	512
0.4	96.8	493
0.3	97.1	422
0.3	97.4	350

1987 HOME BASED WORK
TRIP LENGTH DISTRIBUTION
IMPEDANCE = DST87H12 (TABLE 1002)
TRIPS = HBWDYVEH (TABLE 2001)

	0 10 20 30 40 50 60 70 80 90 100	%	CUM%	COUNT
215	•••	0.3	97.7	378
220	•••	0.3	98.0	374
225	•••	0.3	98.3	374
230	••	0.2	98.6	305
235	••	0.3	98.9	371
240	••	0.3	99.1	332
245	•••	0.3	99.4	390
250	••	0.3	99.7	334
255	••	0.3	100.0	363

MEAN	VARIANCE	STD DEV	SUM(COUNT(I))	SUM(I*COUNT(I))
63.519	2616.601	51.153	124443.	7904492.

1987 HOME BASED NON-WORK
TRIP LENGTH DISTRIBUTION
IMPEDANCE = DST87H12 (TABLE 1002)
TRIPS = HBODYVEH (TABLE 2002)



%	CUM%	COUNT
0.0	0.0	0
0.5	0.5	541
2.8	3.3	2797
9.0	12.3	9086
9.2	21.6	9317
9.4	30.9	9427
9.4	40.3	9463
7.5	47.9	7593
6.3	54.2	6341
5.5	59.6	5498
5.2	64.8	5246
4.5	69.4	4580
4.1	73.5	4179
3.0	76.5	2994
2.7	79.2	2756
2.1	81.4	2149
2.1	83.5	2119
1.8	85.3	1814
1.6	86.9	1656
1.2	88.1	1201
1.0	89.1	958
0.9	89.9	895
0.7	90.7	748
0.6	91.3	605
0.6	91.9	569
0.5	92.3	474
0.5	92.8	507
0.4	93.3	431
0.5	93.7	460
0.5	94.2	467
0.4	94.6	410
0.5	95.0	474
0.4	95.4	385
0.3	95.8	333
0.3	96.1	318
0.4	96.4	368
0.4	96.8	386
0.4	97.2	400
0.3	97.5	266
0.2	97.7	248
0.2	98.0	245
0.2	98.2	205
0.2	98.4	175

1987 HOME BASED NON-WORK
TRIP LENGTH DISTRIBUTION
IMPEDANCE = DST87H12 (TABLE 1002)
TRIPS = HBODYVEH (TABLE 2002)

```
   0   10   20   30   40   50   60   70   80   90  100
   +----+----+----+----+----+----+----+----+----+----+
215..                                                    0.2  98.6   218
220..                                                    0.2  98.8   216
225..                                                    0.2  99.0   168
230..                                                    0.2  99.1   182
235..                                                    0.2  99.3   203
240..                                                    0.2  99.5   169
245..                                                    0.2  99.7   182
250..                                                    0.1  99.8   139
255..                                                    0.2 100.0   181
```

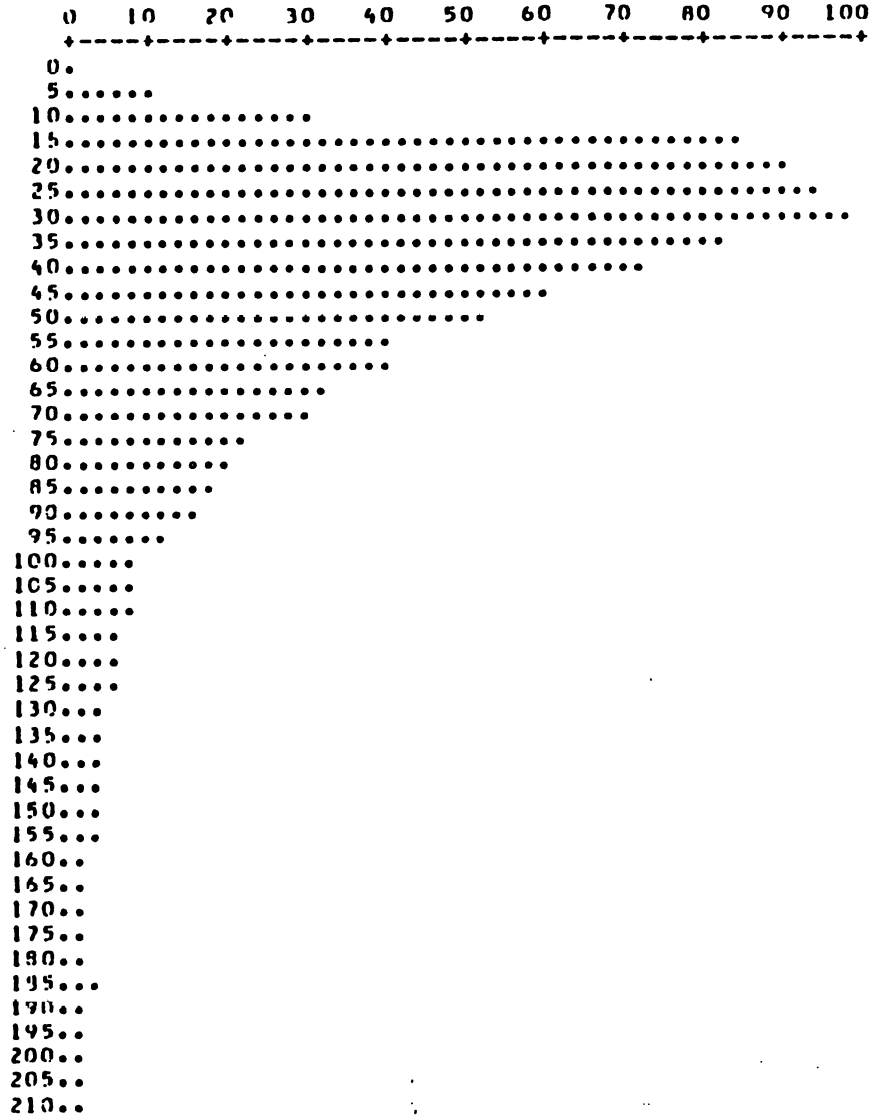
MEAN	VARIANCE	STD DEV	SUM(COUNT(I))	SUM(I*COUNT(I))
51.037	2016.833	44.909	100742.	5141610.

1987 NON-HOME BASED

TRIP LENGTH DISTRIBUTION

IMPEDANCE = DST87H12 (TABLE 1002)

TRIPS = NHBOYVEH (TABLE 2003)



	%	CUM%	COUNT
0.	0.0	0.0	0
5.	1.0	1.0	828
10.	3.0	4.0	2532
15.	8.4	12.3	7137
20.	9.0	21.4	7680
25.	9.4	30.8	7979
30.	9.8	40.6	8322
35.	8.3	48.8	7020
40.	7.2	56.0	6153
45.	6.1	62.1	5145
50.	5.1	67.2	4342
55.	4.0	71.2	3361
60.	3.9	75.1	3335
65.	3.1	78.2	2645
70.	2.9	81.1	2466
75.	2.2	83.3	1893
80.	2.1	85.4	1780
85.	1.8	87.2	1534
90.	1.6	88.8	1333
95.	1.3	90.0	1068
100.	0.9	90.9	762
105.	0.9	91.8	738
110.	0.7	92.5	625
115.	0.6	93.2	536
120.	0.6	93.8	523
125.	0.5	94.3	433
130.	0.5	94.7	388
135.	0.4	95.2	356
140.	0.4	95.5	305
145.	0.4	95.9	309
150.	0.3	96.2	280
155.	0.4	96.6	304
160.	0.2	96.8	188
165.	0.3	97.0	215
170.	0.3	97.3	220
175.	0.3	97.6	237
180.	0.3	97.9	252
195.	0.3	98.2	256
190.	0.2	98.4	188
195.	0.2	98.6	153
200.	0.2	98.8	158
205.	0.2	98.9	136
210.	0.1	99.1	111

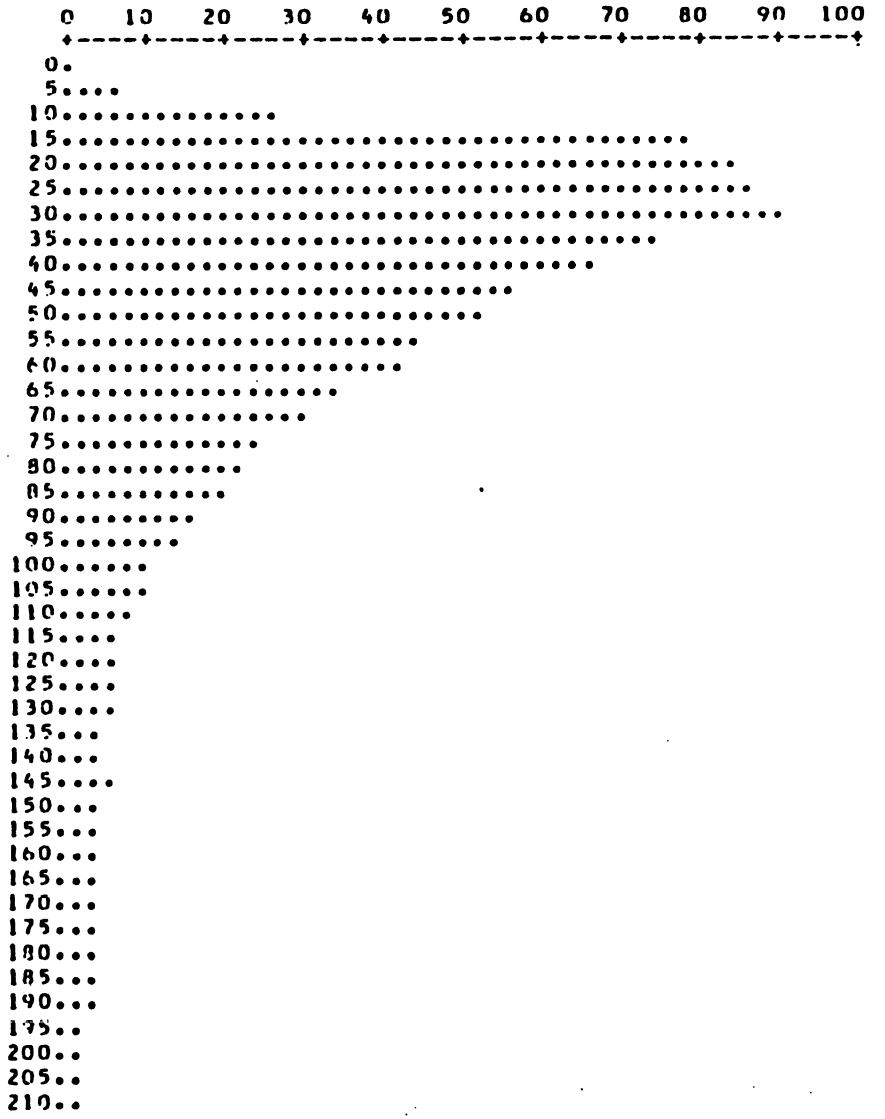
1987 NON-HOME BASED
TRIP LENGTH DISTRIBUTION
IMPEDANCE = DST87H12 (TABLE 1002)
TRIPS = NHBDYVEH (TABLE 2003)

```
   0   10   20   30   40   50   60   70   80   90  100
   +----+----+----+----+----+----+----+----+----+----+
215..
220..
225..
230.
235..
240.
245..
250.
255.
```

	%	CUM%	COUNT
215..	0.1	99.2	114
220..	0.1	99.3	111
225..	0.1	99.4	91
230.	0.1	99.5	73
235..	0.1	99.6	105
240.	0.1	99.7	69
245..	0.1	99.8	99
250.	0.1	99.9	80
255.	0.1	100.0	56

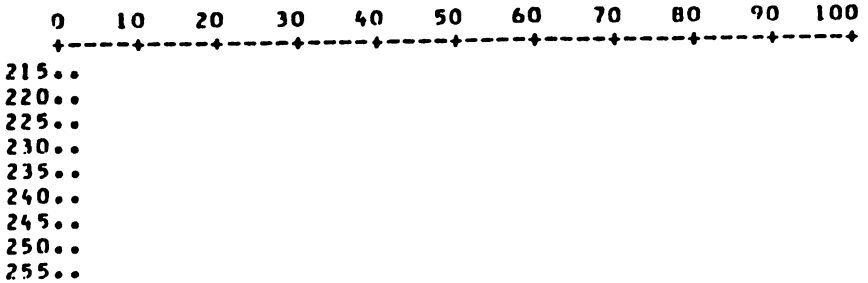
MEAN	VARIANCE	STD DEV	SUM(COUNT(I))	SUM(I*COUNT(I))
47.991	1616.258	40.203	85024.	4080369.

1987 ALL PURPS +TRUCKS +TAXIS
TRIP LENGTH DISTRIBUTION
IMPEDANCE = DST87H12 (TABLE 1002)
TRIPS = TOTDYVEH (TABLE 2004)



	%	CUM%	COUNT
0.	0.0	0.0	0
5....	0.6	0.6	2224
10.....	2.6	3.2	9777
15.....	7.9	11.1	29401
20.....	8.4	19.5	31114
25.....	8.7	28.2	32324
30.....	9.1	37.2	33809
35.....	7.5	44.7	27842
40.....	6.6	51.3	24425
45.....	5.7	56.9	21043
50.....	5.2	62.1	19426
55.....	4.3	66.5	16108
60.....	4.2	70.7	15774
65.....	3.5	74.2	12880
70.....	3.0	77.1	11140
75.....	2.4	79.5	8943
80.....	2.2	81.8	8359
85.....	2.0	83.8	7412
90.....	1.7	85.5	6299
95.....	1.3	86.8	5019
100.....	1.0	87.8	3779
105.....	1.0	88.9	3771
110.....	0.8	89.7	3134
115....	0.7	90.4	2541
120....	0.7	91.0	2506
125....	0.6	91.6	2128
130....	0.6	92.2	2057
135...	0.5	92.7	1856
140...	0.5	93.2	1797
145....	0.5	93.7	1912
150...	0.5	94.1	1704
155...	0.5	94.6	1817
160...	0.4	95.0	1383
165...	0.4	95.3	1334
170...	0.4	95.7	1328
175...	0.4	96.1	1447
180...	0.4	96.5	1635
185...	0.4	97.0	1613
190...	0.3	97.3	1191
195..	0.3	97.6	1031
200..	0.3	97.8	1035
205..	0.2	98.1	892
210..	0.2	98.3	732

1987 ALL PURPS +TRUCKS +TAXIS
TRIP LENGTH DISTRIBUTION
IMPEDANCE = DST87H12 (TABLE 1002)
TRIPS = TOTDYVEH (TABLE 2004)



%	CUM%	COUNT
0.2	98.5	790
0.2	98.7	823
0.2	98.9	731
0.2	99.1	628
0.2	99.3	776
0.2	99.5	652
0.2	99.7	747
0.2	99.8	645
0.2	100.0	653

MEAN	VARIANCE	STD DEV	SUM(COUNT(I))	SUM(I*COUNT(I))
53.575	2119.081	46.033	372387.	19950752.

3. Cambridge Through-Trips on Selected Roadways

Cambridge Related Selected Trip Analysis

Street Name:		Locale:	Volume:	Thru:	P.C.
Fresh Pond Pkwy	SB	S. of Rte. 2	34,825	20,873	60%
Memorial Drive	EB	E. of Frsh Pond Pkwy	3,000	1,087	36%
Mass Ave	SB	S. of Rte. 16	20,078	6,644	33%
Mass. Ave	EB	W. of Hancock	12,620	302	2%
McGrath Hwy	WB	W. of Prison Pt. Bridge	23,116	14,335	62%
Mass Ave	WB	W. of Memorial Dr.	18,066	2,096	12%
Beacon St.	SB	N. of Kirkland St.	9,676	3,036	31%
Concord Ave	EB	E. of Huron Ave.	9,847	273	3%
Main Street	WB	W. of Memorial Dr.	18,349	1,437	8%
Brookline St.	NB	N. of Memorial Dr.	4,235	950	22%
Totals:			153,812	51,033	33%

CAMBRIDGE RELATED SELECTED LINK TRIPS

2MAR91 13.15.34 UFMTR REPORT 4 PAGE 7

FRSHPOND DATA SET J1 TABLE 1

I/J	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217
199	20873	0	0	30	120	2	0	0	4	4	413	594	79	71	129	101	0	519	271
200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
205	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
206	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
215	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
226	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
227	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
229	457	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	21350	0	0	30	120	2	0	0	4	4	413	594	79	71	129	101	0	519	271

CAMBRIDGE RELATED SELECTED LINK TRIPS

FRSHPOND DATA SET J1 TABLE 1

I/J	218	219	220	221	222	223	224	225	226	227	228	229	ROW TOTAL
199	224	91	570	1509	822	475	390	2813	0	8	3915	0	34027
200	0	0	0	0	0	0	0	0	0	0	3	0	3
201	0	0	0	0	0	0	0	0	0	0	1	0	1
205	0	0	0	0	0	0	0	0	0	0	1	0	1
206	0	0	0	0	0	0	0	0	0	0	1	0	1
215	0	0	0	0	0	0	0	0	0	0	18	0	18
226	0	0	0	0	0	0	0	0	0	0	8	0	8
227	0	0	0	3	2	1	0	0	0	0	0	0	26
229	0	0	0	51	37	13	0	73	0	0	109	0	740
	224	91	570	1563	861	489	390	2886	0	8	4056	0	34825

CAMBRIDGE RELATED SELECTED LINK TRIPS

2MA491 13.15.34 UFMTR REPORT 4 PAGE 9

MEMDRIVE DATA SET J1 TABLE 2

I/J	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217
199	1087	66	2	17	23	7	4	4	7	14	34	118	148	185	301	31	61	77	36
221	234	19	0	0	0	0	0	0	0	0	0	20	22	29	52	0	0	0	0
222	147	13	0	1	2	0	0	0	0	0	0	13	13	17	23	0	0	0	0
223	16	1	0	0	0	0	0	0	0	0	0	0	4	3	9	0	0	0	0
225	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
228	22	0	0	0	0	0	0	0	0	0	0	0	9	11	15	0	0	0	0
	1506	99	2	18	25	7	4	4	7	14	34	151	196	246	400	31	61	77	36

CAMBRIDGE RELATED SELECTED LINK TRIPS

MEMORIVE DATA SET J1 TABLE 2

I/J	218	219	220	221	222	223	224	225	226	227	228	229	ROW TOTAL
199	55	27	0	0	0	0	0	0	0	0	0	0	2304
221	0	0	0	0	0	0	0	0	0	0	0	0	376
222	0	0	0	0	0	0	0	0	0	0	0	0	229
223	0	0	0	0	0	0	0	0	0	0	0	0	33
225	0	0	0	0	0	0	0	0	0	0	0	0	1
228	0	0	0	0	0	0	0	0	0	0	0	0	57
	55		0		0		0		0		0		
		27		0		0		0		0		0	3000

CAMBRIDGE RELATED SELECTED LINK TRIPS

21MAR91 13.15.34 UEMTR REPORT 4 PAGE 11

MASS_P16 DATA SET J1 TABLE 3

I/J	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217
199	6644	241	79	271	559	119	123	132	137	418	706	1178	77	74	154	172	2471	842	500
221	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
222	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
223	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
228	109	3	1	0	0	0	1	1	1	0	0	0	0	0	0	0	19	0	0
	6791		80		559		124		138		706		77		154		2490		500
		244		271		119		133		418		1178		74		172		842	

CAMBRIDGE RELATED SELECTED LINK TRIPS

MASS_R16 DATA SET J1 TABLE 3

I/J	218	219	220	221	222	223	224	225	226	227	228	229	ROW TOTAL
199	366	982	562	0	0	0	468	189	724	852	0	951	19891
221	0	0	0	0	0	0	0	0	0	3	0	0	16
222	0	0	0	0	0	0	0	0	0	2	0	0	18
223	0	0	0	0	0	0	0	0	0	1	0	0	10
228	0	0	0	0	0	0	0	0	8	0	0	0	143
	356		562		0		468		732		0		
		882		0		0		189		859		951	20078

CAMBRIDGE RELATED SELECTED LINK TRIPS

MASS_HNK DATA SET J1 TABLE 4

I/J	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217
199	302	38	46	181	419	80	67	76	79	212	524	1556	67	8	0	0	0	9	1393
213	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
214	453	28	7	32	57	20	14	19	15	59	134	141	0	0	0	0	0	8	108
215	191	5	2	4	7	2	3	3	3	8	17	18	3	2	0	0	0	0	12
218	1086	41	10	50	75	22	19	16	22	53	144	187	0	0	0	0	0	13	138
219	319	2	1	2	3	1	1	1	1	4	6	80	23	2	0	0	0	0	4
220	1151	44	17	42	73	27	21	30	34	55	146	244	36	2	0	0	0	10	150
221	11	14	5	25	45	7	5	10	6	17	67	144	0	0	0	0	0	5	77
222	17	10	4	17	31	5	6	8	9	24	52	88	0	0	0	0	0	3	50
223	4	0	0	1	5	0	0	0	1	0	1	36	0	0	0	0	0	2	14
224	119	1	0	1	2	0	0	0	1	2	3	70	12	2	0	0	0	0	37
225	140	2	1	2	21	1	1	1	1	3	6	153	29	2	0	0	0	8	82
226	40	1	0	1	1	1	0	0	0	0	1	7	4	0	0	0	0	0	1
227	34	0	0	1	1	0	0	0	0	0	1	4	3	0	0	0	0	0	1
228	1	1	0	1	2	1	0	0	0	0	2	58	3	0	0	0	0	0	19
229	22	0	0	0	1	0	0	0	0	0	2	6	4	0	0	0	0	0	2
	3039	197	93	340	743	167	136	144	172	437	1106	2792	184	18	0	0	0	58	2114

CAMBRIDGE RELATED SELECTED LINK TRIPS

MASS_HNK DATA SET J1 TABLE 4

I/J	218	219	220	221	222	223	224	225	226	227	228	229	ROW TOTAL
199	0	0	0	0	0	0	0	0	0	0	0	0	5057
213	0	0	0	0	0	0	0	0	0	0	0	0	26
214	0	0	0	0	0	0	0	0	0	0	0	0	1095
215	0	0	0	0	0	0	0	0	0	0	0	0	280
218	0	0	0	0	0	0	0	0	0	0	0	0	1875
219	0	0	0	0	0	0	0	0	0	0	0	0	449
220	0	0	0	0	0	0	0	0	0	0	0	0	2082
221	0	0	0	0	0	0	0	0	0	0	0	0	438
222	0	0	0	0	0	0	0	0	0	0	0	0	324
223	0	0	0	0	0	0	0	0	0	0	0	0	64
224	0	0	0	0	0	0	0	0	0	0	0	0	250
225	0	0	0	0	0	0	0	0	0	0	0	0	453
226	0	0	0	0	0	0	0	0	0	0	0	0	57
227	0	0	0	0	0	0	0	0	0	0	0	0	45
228	0	0	0	0	0	0	0	0	0	0	0	0	88
229	0	0	0	0	0	0	0	0	0	0	0	0	37
	0		0		0		0		0		0		
		0		0		0		0		0		0	12620

CAMBRIDGE RELATED SELECTED LINK TRIPS

MCGRATHH DATA SET J1 TABLE 5

I/J	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217
199	14335	351	497	1036	0	208	400	518	277	623	405	0	0	0	9	8	1182	1685	375
212	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
213	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
222	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	14352	351	497	1036	0	208	400	518	277	623	405	0	0	0	9	8	1182	1685	375

CAMBRIDGE RELATED SELECTED LINK TRIPS

2MAR91 13.15.34 UFMTR REPORT 4 PAGE 16

MCGRATHH DATA SET J1 TABLE 5

I/J	218	219	220	221	222	223	224	225	226	227	228	229	ROW TOTAL
199	16	244	62	7	3	23	210	140	141	110	131	103	23099
212	0	0	0	0	0	0	0	0	0	0	0	0	11
213	0	0	0	0	0	0	0	0	0	0	0	0	4
222	0	0	0	0	0	0	0	0	0	0	0	0	2
	16		62		3		210		141		131		
		244		7		23		140		110		103	23116

SIGOFF 6700 (INFORMATION): UFMTR ENDED AT 13.16.27 (RETURN CODE= 0)

SIGOFF 7000 (WARNING): LOG FILE IS NOT AVAILABLE OR IS DEFECTIVE

CAMBRIDGE RELATED SELECTED LINK TRIPS

2MAR91 13.16.29 UFMTR REPORT 4 PAGE 7

MASS_MEM DATA SET J1 TABLE 1

I/J	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217
199	2096	0	146	611	1133	245	287	209	305	559	1591	5523	722	0	82	351	559	959	953
200	12	0	0	0	0	0	0	0	0	0	0	0	24	0	1	5	5	0	0
	2108		146		1133		287		305		1591		746		83		564		953
		0		611		245		209		559		5523		0		356		959	

CAMBRIDGE RELATED SELECTED LINK TRIPS

MASS_MEM DATA SET J1 TABLE 1

I/J	218	219	220	221	222	223	224	225	226	227	228	229	ROW TOTAL
199	412	348	358	21	18	5	194	112	70	68	1	64	18002
200	7	2	3	2	1	0	0	2	0	0	0	0	64
	419		361		19		194		70		1		
		350		23		5		114		68		64	18066

CAMBRIDGE RELATED SELECTED LINK TRIPS

2MAR91 13.16.29 UFHTR REPORT 4 PAGE 9

BEACONST DATA SET J1 TABLE 2

I/J	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217
199	3036	267	96	300	594	142	143	196	171	629	149	1235	55	24	2	2	0	411	7
224	505	26	6	12	12	7	8	14	10	33	0	6	1	0	0	0	0	4	0
226	347	17	5	13	21	6	6	6	10	19	0	51	3	0	0	0	0	6	0
227	237	12	3	14	13	3	4	5	4	15	0	31	2	0	0	0	0	4	0
228	215	32	6	18	24	7	7	12	12	28	0	25	0	0	0	0	0	9	0
229	166	18	2	18	19	5	4	7	9	17	0	48	3	0	0	0	0	5	0
	4506	372	118	375	683	170	172	240	216	741	149	1396	64	24	2	2	0	439	7

CAMBRIDGE RELATED SELECTED LINK TRIPS

BEACONST DATA SET J1 TABLE 2

I/J	218	219	220	221	222	223	224	225	226	227	228	229	ROW TOTAL
199	0	0	0	0	0	0	0	0	0	0	0	0	7459
224	0	0	0	0	0	0	0	0	0	0	0	0	644
226	0	0	0	0	0	0	0	0	0	0	0	0	510
227	0	0	0	0	0	0	0	0	0	0	0	0	347
228	0	0	0	0	0	0	0	0	0	0	0	0	395
229	0	0	0	0	0	0	0	0	0	0	0	0	321
	0		0		0		0		0		0		
		0		0		0		0		0		0	9676

CAMBRIDGE RELATED SELECTED LINK TRIPS

2MAR91 13.16.29 UFMTR REPORT 4 PAGE 11

CHCRDAVE DATA SET J1 TABLE 3

I/J	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217
199	776	47	10	80	182	17	14	20	21	68	546	810	25	5	25	135	349	705	334
221	187	0	2	3	0	4	3	5	3	35	8	0	0	0	0	0	142	88	0
222	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	65	4	0
223	83	7	1	10	14	5	2	2	4	10	23	41	0	0	0	9	42	30	17
224	496	0	0	7	9	0	0	0	0	0	37	66	11	12	12	20	0	46	41
225	1517	38	14	43	55	22	17	22	22	59	126	174	27	24	38	50	299	158	98
228	17	0	0	2	4	1	0	0	0	3	29	49	1	2	2	18	0	37	23
	3076	92	27	145	264	49	36	49	50	175	769	1140	64	43	77	232	897	1068	513

CAMBRIDGE RELATED SELECTED LINK TRIPS

CNCRDAVE DATA SET J1 TABLE 3

I/J	218	219	220	221	222	223	224	225	226	227	228	229	ROW TOTAL
199	273	292	0	0	0	0	0	0	0	0	0	0	4734
221	0	79	0	0	0	0	0	0	0	0	0	0	558
222	0	42	0	0	0	0	0	0	0	0	0	0	111
223	6	26	0	0	0	0	0	0	0	0	0	0	332
224	35	0	12	0	0	0	0	0	0	0	0	0	804
225	77	185	20	0	0	0	0	0	0	0	0	0	3085
229	28	7	0	0	0	0	0	0	0	0	0	0	223
	419		32		0		0		0		0		
		630		0		0		0		0		0	9847

CAMBRIDGE RELATED SELECTED LINK TRIPS

MAINSTRT DATA SET J1 TABLE 4

I/J	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217
199	1437	3	121	1378	4800	237	199	117	203	398	722	4651	192	23	35	222	562	674	609
200	0	0	0	0	137	0	0	0	0	0	0	49	0	0	0	0	0	0	0
	1437		121		4937		199		203		722		192		35		562		609
		3		1379		237		117		398		4700		23		222		674	

CAMBRIDGE RELATED SELECTED LINK TRIPS

MAINSTRT DATA SET J1 TABLE 4

I/J	218	219	220	221	222	223	224	225	226	227	228	229	ROW TOTAL
199	355	281	392	0	0	21	97	232	57	50	50	45	18163
200	0	0	0	0	0	0	0	0	0	0	0	0	186
	355		392		0		97		57		50		
		281		0		21		232		50		45	18349

CAMBRIDGE RELATED SELECTED LINK TRIPS

2MAR91 13.16.29 UFMTR REPORT 4 PAGE 15

BRKLINST DATA SET J1 TABLE 5

I/J	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217
199	950	0	0	0	0	136	0	113	145	284	776	0	1050	0	0	0	0	365	367
221	0	0	0	0	0	0	0	0	0	0	0	0	22	0	0	0	0	0	0
222	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0
223	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0
228	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0
	950	0	0	0	0	136	0	113	145	284	776	0	1099	0	0	0	0	365	367

CAMBRIDGE RELATED SELECTED LINK TRIPS

TRKLINST DATA SET J1 TABLE 5

I/J	218	219	220	221	222	223	224	225	226	227	228	229	ROW TOTAL
199	0	0	0	0	0	0	0	0	0	0	0	0	4186
221	0	0	0	0	0	0	0	0	0	0	0	0	22
222	0	0	0	0	0	0	0	0	0	0	0	0	13
223	0	0	0	0	0	0	0	0	0	0	0	0	5
228	0	0	0	0	0	0	0	0	0	0	0	0	9
	0	0	0	0	0	0	0	0	0	0	0	0	4235

SIMOFF 6700 (INFORMATION): UFMTR ENDED AT 13.17.20 (RETURN CODE= 0)

SIMOFF 7000 (WARNING): LOG FILE IS NOT AVAILABLE OR IS DEFECTIVE

4. Vehicle Trip-Making Within Cambridge Only

- Trip Length by Purpose
- Origin Zone to Destination Zone by Purpose

lists of attribute values

	zlhhw871v	zlhbo871v	zlnhb871v	zltot871v
199	127	87	69	96
200	122	67	47	85
201	71	56	41	55
202	117	55	42	85
203	119	68	38	90
204	69	50	40	54
205	56	57	43	54
206	71	56	41	53
207	68	55	43	55
208	100	62	42	60
209	127	80	45	79
210	127	86	47	80
211	103	50	45	72
212	63	61	47	56
213	106	69	49	75
214	94	66	48	64
215	125	79	48	79
216	125	80	48	81
217	102	71	45	68
218	96	75	48	70
219	105	70	47	71
220	118	78	50	80
221	105	69	54	72
222	106	66	52	74
223	81	60	50	63
224	101	70	50	69
225	116	68	51	84
226	86	58	44	62
227	87	60	47	65
228	109	64	55	81
229	98	58	51	72

summary of selected cells

sum	3100.000	2051.000	1467.000	2204.000
mean	100.000	66.161	47.323	71.097
stddev	20.914	9.984	5.747	11.646
counts	31	31	31	31
mv's	0	0	0	0

summary of all cells

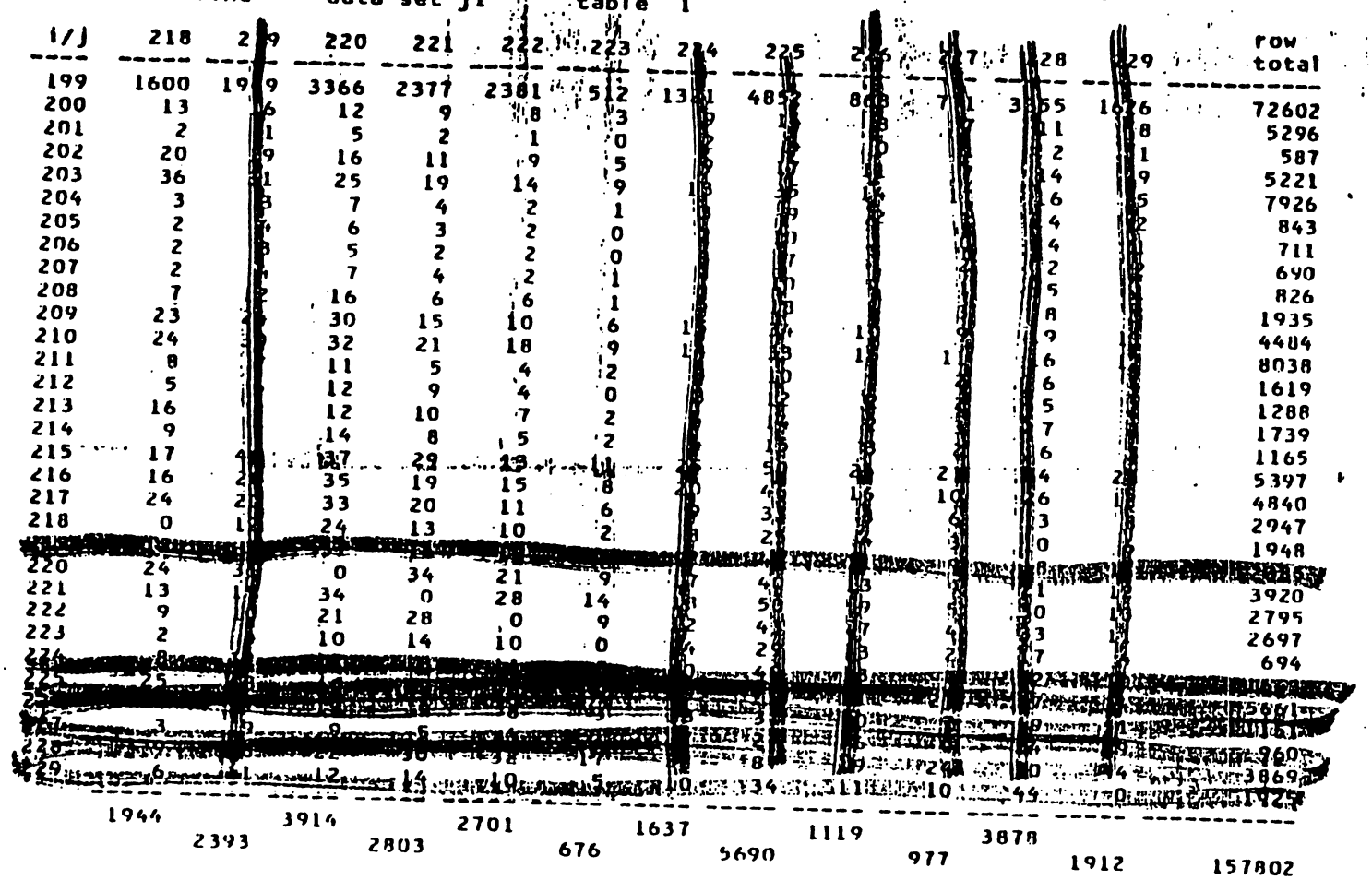
sum	3100.000	2051.000	1467.000	2204.000
mean	100.000	66.161	47.323	71.097
stddev	20.914	9.984	5.747	11.646
counts	229	229	229	229
mv's	198	198	198	198

Cambridge related vhcl trips by purpose for 1987 and 2010

4dec90 9:19:39 ufmtr report 4 page 22

hbw87vhc data set j1 table 1

I/J	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217
199	0	4791	440	4605	6999	595	491	512	619	1566	3852	7129	1371	1012	1467	922	4695	4155	2403
200	4796	0	14	49	38	15	22	17	16	16	25	51	13	21	12	9	24	20	20
201	441	15	0	23	28	2	2	2	1	3	6	20	2	2	3	1	5	6	4
202	4597	49	23	0	41	26	29	18	17	29	35	71	15	21	12	13	25	27	27
203	7003	38	28	40	0	11	39	27	39	35	35	124	29	38	21	21	35	47	48
204	609	15	2	26	41	0	1	3	3	6	20	28	4	3	4	2	9	17	9
205	479	22	2	28	39	1	0	2	1	9	12	35	5	0	4	3	12	13	9
206	521	16	2	18	27	3	2	0	1	7	9	19	2	2	3	2	10	9	6
207	616	16	2	16	39	3	1	2	0	9	14	27	4	1	3	3	11	11	9
208	1551	16	4	29	35	7	8	7	9	0	28	34	9	6	9	7	20	48	17
209	3864	24	6	34	36	20	12	9	14	28	0	39	19	23	19	15	39	35	42
210	7130	51	20	71	124	27	36	19	27	34	39	0	36	33	21	19	33	42	41
211	1360	13	2	16	29	4	5	3	4	9	18	36	0	9	7	4	13	13	10
212	1018	21	1	21	39	2	1	1	1	7	23	33	9	0	9	6	13	12	9
213	1474	12	2	13	21	4	4	3	3	9	19	20	7	9	0	10	14	14	13
214	928	9	1	13	20	3	2	2	3	6	16	19	5	5	9	0	18	15	13
215	4688	23	5	25	35	10	13	10	11	20	38	33	13	13	14	18	0	62	43
216	4160	20	7	26	47	17	13	9	11	48	36	41	13	12	14	14	62	0	39
217	2393	20	4	28	48	9	8	7	8	17	41	41	10	9	14	13	43	39	0
218	1600	14	1	21	35	3	3	2	2	8	24	24	8	5	15	9	17	16	24
[illegible]																			
220	3370	13	4	16	26	7	6	6	7	17	30	32	12	12	13	14	47	35	32
221	2374	8	2	11	19	4	2	3	3	6	14	21	5	8	10	8	29	20	19
222	2375	8	1	10	14	2	2	1	2	6	11	18	4	4	7	5	13	15	12
223	530	4	0	5	8	1	0	0	2	1	6	9	1	1	1	2	11	8	5
[illegible]																			
[illegible]																			
[illegible]																			
[illegible]																			
[illegible]																			
	72610		585		7923		723		828		4472		1628		1732		5403		2955
		5289		5229		832		682		1950		8036		1281		1161		4839	



I/J	218	219	220	221	222	223	224	225	226	227	228	229	row total
199	1600	19	3366	2377	2381	512	131	485	80	71	355	1626	72602
200	13	6	12	9	8	3	9	1	8	7	11	8	5296
201	2	1	5	2	1	0	2	0	0	1	2	1	587
202	20	9	16	11	9	5	2	1	1	1	4	9	5221
203	36	1	25	19	14	9	1	3	1	1	6	5	7926
204	3	3	7	4	2	1	1	0	0	0	4	2	843
205	2	0	6	3	2	0	0	0	0	0	4	0	711
206	2	3	5	2	2	0	0	0	0	0	2	0	690
207	2	0	7	4	2	1	0	0	0	0	5	0	826
208	7	0	16	6	6	1	0	1	0	0	8	0	1935
209	23	2	30	15	10	6	1	1	1	0	9	1	4484
210	24	3	32	21	18	9	1	3	1	1	6	1	8038
211	8	0	11	5	4	2	0	0	0	0	6	0	1619
212	5	0	12	9	4	0	0	0	0	0	5	0	1288
213	16	0	12	10	7	2	0	0	0	0	7	0	1739
214	9	0	14	8	5	2	0	0	0	0	6	0	1165
215	17	4	37	29	19	11	2	5	2	2	4	2	5397
216	16	2	35	19	15	8	2	4	1	1	6	1	4840
217	24	2	33	20	11	6	0	3	0	0	3	0	2947
218	0	1	24	13	10	2	3	2	0	0	0	0	1948
219	[illegible]												[illegible]
220	24	3	0	34	21	9	1	4	0	0	1	1	[illegible]
221	13	1	34	0	28	14	1	5	0	0	0	1	3920
222	9	0	21	28	0	9	2	4	0	0	3	1	2795
223	2	0	10	14	10	0	0	2	0	0	7	1	2697
224	[illegible]												694
225	[illegible]												[illegible]
226	[illegible]												[illegible]
227	[illegible]												[illegible]
228	[illegible]												[illegible]
229	[illegible]												[illegible]
	1944	2393	3914	2803	2701	676	1637	5690	1119	977	3878	1912	157802

Cambridge Related Vhcl Trips by purpose for 1987 and 2010

Adec90 9.19.39 ufmtr report 4 page 24

hbo87vhc data set jl table 3

I/J	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217
199	0	2138	795	1061	1818	828	1239	969	989	962	2156	11188	697	1021	787	667	3141	2887	1716
200	2129	0	20	42	26	15	26	22	19	11	21	103	10	11	6	5	18	14	13
201	801	20	0	21	20	10	19	13	15	8	11	95	5	4	4	4	10	17	11
202	1066	42	21	0	27	13	21	17	11	12	22	137	7	6	6	4	14	16	12
203	1814	26	21	26	0	28	31	19	27	14	15	144	17	13	9	6	13	18	19
204	823	14	11	13	28	0	16	14	18	13	36	136	6	6	8	8	19	41	22
205	1231	26	19	20	31	16	0	26	16	22	24	167	10	6	7	6	25	32	26
206	981	22	14	18	18	15	26	0	20	17	18	88	6	7	5	6	25	23	16
207	971	19	14	11	27	17	16	19	0	23	25	123	7	7	6	8	25	28	23
208	970	11	7	12	13	14	23	17	22	0	31	70	9	9	10	6	20	67	19
209	2163	21	11	23	15	35	24	19	25	31	0	79	28	21	18	17	36	38	48
210	11200	103	95	138	143	136	167	88	123	70	80	0	133	75	41	45	61	87	97
211	693	10	5	6	18	6	10	6	7	9	28	132	0	10	6	6	18	19	13
212	1006	12	4	6	13	7	6	7	7	9	22	75	9	0	13	9	12	14	14
213	801	6	3	6	8	8	6	5	6	9	19	41	6	12	0	10	12	13	14
214	566	5	4	5	7	8	6	5	9	6	16	45	7	9	10	0	22	18	18
215	3132	17	10	14	12	19	25	25	24	20	37	60	18	12	12	22	0	78	57
216	2889	15	17	16	18	41	33	23	28	67	38	88	19	13	13	18	78	0	52
217	1701	13	10	12	19	22	26	16	23	19	48	97	13	14	14	19	57	51	0
218	1475	9	4	10	13	10	9	6	11	11	28	64	8	13	19	16	27	27	41
219	1580	8	4	7	9	10	9	8	8	13	25	68	7	8	8	12	57	40	28
220	1941	8	7	9	9	12	10	11	12	15	27	57	14	13	11	15	37	38	37
221	1581	4	4	3	7	5	6	3	5	6	11	35	5	8	9	8	27	20	21
222	1422	3	1	3	4	1	3	2	3	4	7	29	2	4	5	3	11	15	9
223	492	1	1	1	2	2	2	1	2	2	4	16	1	2	2	2	12	9	6
224	887	4	2	2	4	5	4	5	4	4	13	22	2	3	4	5	29	27	9
225	1845	5	5	5	10	9	10	7	10	9	22	45	6	7	7	9	37	36	30
226	689	4	2	3	3	4	4	4	5	4	7	26	2	2	2	4	30	20	9
227	663	4	2	2	1	3	3	2	3	3	8	19	1	3	1	3	25	11	7
228	1365	4	2	3	3	3	4	5	3	5	12	21	3	2	3	3	25	23	9
229	922	3	1	2	4	2	3	2	3	3	7	17	1	1	2	3	19	10	7
	49898	2577	1116	1500	2330	1304	1787	1366	1458	1401	2818	13287	1059	1322	1048	949	3942	3737	2402

hholl7vhc data set jl table 3

I/J	218	219	220	221	222	223	224	225	226	227	228	229	row total
199	1457	1585	1948	1578	1403	499	885	1835	690	674	1362	927	49902
200	9	7	8	4	3	1	5	5	4	4	3	3	2566
201	5	4	8	4	1	1	1	5	2	2	2	1	1124
202	10	6	8	3	3	1	2	6	2	2	3	1	1501
203	13	9	10	7	4	2	4	11	3	2	4	4	2333
204	10	10	12	5	1	2	5	9	4	2	3	2	1297
205	9	9	10	6	2	2	4	9	4	3	4	3	1775
206	7	8	11	3	2	1	5	7	4	2	4	2	1381
207	11	9	12	4	3	2	5	9	5	3	4	3	1439
208	10	13	15	7	4	1	4	10	4	3	5	3	1409
209	28	25	27	11	7	4	14	21	8	9	11	8	2825
210	63	67	57	35	29	17	22	45	26	18	22	16	13299
211	9	7	13	5	3	1	2	5	2	2	2	2	1055
212	13	9	12	8	4	2	3	7	2	2	2	2	1311
213	19	8	12	8	4	2	4	8	2	2	3	2	1059
214	16	12	15	8	4	2	4	9	5	2	3	2	948
215	26	58	37	27	11	11	30	36	30	26	25	19	3930
216	27	40	39	19	15	9	27	36	20	11	23	10	3741
217	41	28	37	21	9	7	9	30	9	7	7	7	2386
218	0	25	32	15	9	4	10	18	7	5	7	6	1939
219	25	0	36	17	10	7	20	39	16	14	16	12	2121
220	32	36	0	41	16	10	16	30	12	8	15	10	2509
221	14	17	40	0	28	23	22	40	10	4	23	12	2001
222	10	10	16	28	0	10	9	28	6	3	20	6	1677
223	4	7	9	24	10	0	8	27	5	2	16	4	676
224	11	19	17	21	9	8	0	39	19	9	15	11	1213
225	18	39	30	40	28	27	39	0	24	19	48	20	2446
226	7	16	12	11	6	5	19	24	0	13	14	13	964
227	5	14	8	4	2	3	9	19	14	0	22	13	877
228	7	16	15	23	20	15	15	48	14	22	0	30	1722
229	7	11	10	11	6	5	11	19	13	13	30	0	1148
	1923	2124	2515	1998	1656	684	1213	2434	966	888	1718	1154	114574

nhb"/vnc data set j1 table 5

I/J	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217
199	0	1748	280	1176	1457	143	224	500	264	1248	2844	6677	176	395	633	644	3779	2475	1586
200	1675	0	9	74	45	2	4	10	5	17	47	108	2	5	5	6	39	25	16
201	269	10	0	11	9	1	1	4	1	4	8	28	0	2	1	1	7	7	5
202	1142	58	11	0	41	2	6	19	2	22	38	125	2	3	7	7	30	26	16
203	1370	34	10	40	0	5	5	12	5	26	45	349	4	5	8	14	35	31	27
204	145	2	1	4	4	0	1	1	1	4	6	14	0	1	1	2	5	6	3
205	181	4	2	4	6	0	0	3	0	7	6	16	0	1	1	2	5	6	4
206	415	16	4	12	10	1	2	0	3	19	13	32	0	1	3	3	19	13	8
207	237	5	2	3	5	1	1	3	0	6	9	21	0	1	1	3	9	8	5
208	1100	16	4	27	22	3	5	11	6	0	68	77	3	4	10	14	46	107	28
209	2594	35	8	52	43	8	6	15	12	73	0	165	8	12	24	42	101	85	80
210	6586	113	19	128	230	21	20	37	17	122	184	0	17	22	32	67	146	131	104
211	166	3	0	2	4	0	0	1	1	2	9	17	0	1	1	1	6	4	4
212	356	4	1	3	4	0	0	2	1	4	11	19	1	0	5	4	6	5	5
213	615	6	1	5	9	0	1	2	1	14	26	31	1	4	0	7	15	13	11
214	617	5	2	4	6	2	0	3	2	7	20	33	1	3	10	0	37	18	17
215	3458	36	9	28	35	6	6	23	10	53	140	142	3	8	25	29	0	176	81
216	2471	24	10	25	32	6	6	20	8	63	96	129	3	9	13	20	171	0	72
217	1441	15	5	15	25	4	3	9	7	29	79	95	3	7	13	17	106	54	0
218	953	7	2	9	11	1	1	3	2	13	34	46	1	5	10	14	34	23	36
219	1060	8	2	9	12	0	2	5	2	17	33	56	1	3	6	13	76	40	25
220	2058	14	3	14	22	2	2	9	3	27	71	93	3	8	12	19	95	66	53
221	1657	7	2	7	10	1	2	2	2	13	25	45	2	3	10	9	58	29	32
222	1447	4	2	4	6	0	1	2	1	9	14	32	1	2	5	5	24	23	12
223	252	2	0	1	1	0	1	0	1	1	5	6	1	0	2	1	10	5	5
224	895	5	2	6	6	0	2	4	1	8	30	25	0	3	4	5	51	35	13
225	1588	8	2	8	16	1	2	4	4	15	39	52	2	3	9	10	70	48	39
226	354	3	1	3	2	1	0	1	2	3	7	14	0	1	1	2	27	14	5
227	345	2	0	3	2	0	1	0	1	3	9	10	0	1	1	2	27	7	5
228	1026	3	1	4	4	0	0	3	1	6	17	15	0	2	3	3	30	21	8
229	576	2	1	2	3	0	1	2	0	4	10	10	0	1	1	1	22	9	5
	37049		396		2082		306		366		3943		235		857		5086		2310
		2199		1685		211		710		1839		8482		516		967		3510	

nhb87vhc data set j1 table 5

I/J	218	219	220	221	222	223	224	225	226	227	228	229	row total
199	1095	1097	2095	1780	1599	282	1000	1651	376	394	1043	626	39287
200	10	8	15	8	4	1	6	7	3	2	4	2	2166
201	1	1	5	2	1	0	1	3	0	1	0	1	385
202	10	6	15	8	3	2	5	9	1	2	3	2	1623
203	12	10	24	15	6	1	5	13	2	3	3	3	2122
204	2	1	3	1	0	0	2	2	0	1	0	0	213
205	1	2	2	1	1	0	1	2	0	1	0	1	260
206	2	4	6	3	1	1	2	5	1	1	2	1	603
207	3	1	4	2	1	1	1	3	1	1	0	1	339
208	13	13	33	13	6	1	8	16	4	3	6	2	1669
209	36	40	68	34	20	4	22	47	9	6	17	8	3674
210	52	54	98	49	28	6	34	52	12	10	16	11	8418
211	1	2	4	1	2	0	0	2	0	1	1	0	236
212	4	3	5	5	2	0	2	3	0	1	1	1	458
213	9	7	12	11	5	2	5	6	2	2	2	2	827
214	12	9	18	12	4	1	6	10	3	1	4	1	868
215	40	105	96	63	26	11	72	67	28	19	38	22	4855
216	28	40	65	34	19	7	28	46	10	9	16	9	3489
217	27	24	54	26	13	4	13	27	5	6	7	5	2138
218	0	13	30	16	10	2	12	17	3	2	5	5	1320
219	21	0	40	20	10	4	16	41	8	7	8	10	1555
220	32	37	0	118	35	6	26	42	10	7	13	11	2911
221	15	17	53	0	40	21	39	52	8	4	20	12	2197
222	8	13	26	50	0	9	14	35	6	3	20	5	1783
223	1	3	6	20	9	0	5	15	3	1	9	1	367
224	11	19	27	33	15	6	0	54	18	7	20	9	1314
225	19	29	48	67	39	17	58	0	25	15	42	15	2294
226	4	8	9	9	5	2	17	15	0	5	9	7	531
227	3	8	6	5	2	1	9	14	6	0	18	6	497
228	6	12	15	26	21	10	14	42	9	12	0	27	1341
229	4	6	9	10	5	3	11	15	7	8	19	0	747
	1482	1592	2891	2442	1932	405	1434	2313	560	535	1346	806	90487

totflvnc data set j1 table 7

i/j	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217
199	0	9782	1677	7549	10950	1805	2038	2268	2111	4761	10308	28198	2621	2822	3414	2840	13633	10907	6599
200	9643	0	51	200	123	36	54	56	47	66	119	323	29	42	30	28	108	83	66
201	1693	51	0	61	70	14	24	21	24	24	36	156	8	10	8	9	26	38	24
202	7445	190	65	0	148	53	60	68	41	93	140	425	35	36	30	42	91	101	71
203	10827	116	72	135	0	82	89	70	90	99	156	706	61	63	47	51	117	126	120
204	1776	34	15	61	85	0	19	22	25	44	81	201	12	13	16	20	40	81	40
205	2001	55	24	62	88	19	0	33	20	41	55	231	15	11	12	11	49	57	41
206	2190	68	22	63	62	26	34	0	32	77	68	170	11	13	14	22	70	64	43
207	2062	50	22	43	81	25	18	39	0	79	72	196	14	13	12	24	55	65	49
208	4545	58	31	93	108	35	41	55	68	0	277	240	32	26	47	72	150	274	164
209	10055	116	39	153	174	84	54	72	88	227	0	418	75	78	87	127	282	257	255
210	27855	330	147	409	588	206	237	173	187	309	468	0	235	196	136	213	340	368	299
211	2577	31	9	35	57	14	16	13	15	27	71	276	0	34	23	20	49	52	33
212	2775	40	9	35	64	10	8	11	12	26	87	161	37	0	47	33	47	42	41
213	3330	31	8	31	46	15	12	16	12	50	92	155	24	47	0	51	58	56	50
214	2848	28	10	32	48	19	11	18	18	51	124	147	22	29	45	0	111	67	95
215	13190	103	32	91	122	40	49	70	63	155	333	347	50	48	73	92	0	414	258
216	10731	84	40	101	125	76	56	73	65	244	264	342	48	44	55	71	450	0	225
217	6453	61	25	70	116	44	43	36	55	126	291	291	36	38	56	85	282	187	0
218	4983	39	9	49	76	16	15	15	22	49	142	192	35	36	64	56	121	89	138
219	5311	40	10	42	60	18	14	27	14	77	109	186	21	21	29	47	239	182	89
220	8388	50	19	50	74	26	20	35	27	106	170	246	37	43	47	67	298	190	152
221	6694	33	11	30	45	14	10	15	12	52	83	165	18	28	48	36	173	105	92
222	6182	27	4	26	31	6	6	9	9	32	53	126	12	16	22	13	81	75	49
223	1564	9	2	9	14	5	2	2	5	9	24	42	5	3	8	10	44	34	20
224	3911	27	5	23	28	11	7	14	11	32	72	87	10	12	15	21	132	111	43
225	9202	42	13	42	73	24	21	25	26	58	126	188	24	26	40	43	229	164	128
226	2260	20	3	21	21	7	6	7	11	19	32	65	6	5	9	11	100	59	29
227	2087	13	4	14	17	3	4	4	6	12	34	47	5	5	8	7	87	32	23
228	6596	29	6	27	33	9	8	14	12	32	66	91	12	13	18	20	124	96	42
229	3664	16	5	17	27	5	5	8	7	17	37	58	7	6	9	9	82	40	28
	182838	11573	2389	9574	13554	2747	2979	3289	3135	6984	13990	34476	3557	3777	4469	4151	17668	14416	9305

tot97vhc data set jl table 7

I/J	218	219	220	221	222	223	224	225	226	227	228	229	row total
199	5209	5446	8563	6979	6415	1621	4016	9340	2289	2132	6685	3746	186724
200	43	38	58	29	29	6	28	41	18	15	26	21	11456
201	12	8	20	9	4	3	6	13	4	4	6	6	2392
202	51	40	51	30	23	9	25	39	19	12	20	15	9476
203	70	60	70	52	32	12	32	68	23	18	31	25	13519
204	20	17	25	12	9	2	10	23	6	5	9	5	2727
205	14	16	21	11	4	2	8	22	8	5	8	5	2949
206	19	17	31	12	9	4	9	25	9	6	10	8	3208
207	22	15	31	14	9	5	10	25	9	6	10	7	3073
208	54	59	86	41	32	10	29	57	17	16	27	17	6760
209	126	115	163	88	61	20	77	128	35	31	65	37	13587
210	199	184	252	163	111	42	100	183	64	48	91	57	34189
211	30	19	37	19	11	5	10	22	5	7	13	6	3536
212	34	21	38	27	15	4	12	25	6	7	10	6	3690
213	77	26	53	41	21	7	19	35	11	6	19	9	4407
214	61	40	57	43	21	6	22	43	12	8	17	10	4063
215	123	305	246	182	74	55	159	225	94	80	137	77	17287
216	93	188	211	106	71	39	94	174	55	41	89	43	14298
217	120	97	151	91	46	26	39	111	30	22	40	25	9093
218	0	64	121	72	39	10	44	73	18	14	32	19	6652
219	79	0	160	75	52	23	80	148	56	37	61	43	7350
220	125	143	0	234	110	47	98	167	49	29	97	42	11186
221	75	67	186	0	163	77	103	174	39	20	112	47	8727
222	36	51	102	146	0	45	62	161	26	13	109	34	7564
223	11	24	47	73	56	0	37	92	15	6	61	13	2246
224	40	68	115	87	65	36	0	198	65	32	94	36	5408
225	74	156	154	201	152	107	204	0	92	75	228	96	12033
226	19	53	42	37	26	14	57	95	0	36	51	41	3161
227	10	42	28	19	14	7	35	71	32	0	71	38	2779
228	34	60	93	107	111	55	85	256	57	69	0	119	8294
229	21	42	43	41	38	14	42	88	37	40	111	0	4564
	6901	7481	11255	9041	7823	2313	5551	12122	3200	2840	8347	4653	426398

SECTION 4

TESTING OF ALTERNATE PARKING CONDITIONS

4.0 TESTING OF ALTERNATE PARKING CONDITIONS

4.1 Introduction

As part of the analysis undertaken for the Cambridge vehicle trip reduction program, several parking conditions were tested to determine their potential impacts on commuter mode share, and to compare their potential impacts with baseline conditions and with the proposed vehicle trip reduction ordinance.

Five conditions were tested. The purpose of these tests was to glean by how much travel behavior, in terms of the percentage mode shares used to commute to work in Cambridge, would need to change to reflect the constraints imposed by two types of parking freezes as compared with the proposed ordinance. While the results of the analysis provide useful information concerning the hypothetical impact of various parking programs, the analytic approach used in this investigation was necessarily limited and needs to be described.

Following this narrative discussion of the test runs and results are a series of figures that depict the results and demonstrate the comparative impact of the five parking conditions tested under varying development scenarios.

4.2 Analytic Approach

The parking conditions identified for testing again involved the use of the pivot point model, as discussed in Section 1. However, the tests were set-up to "observe" what the mode shares would need to be to reflect the parking constraints imposed on the model by the test. In other words, the model would provide an output of travel behavior without determining whether the observed mode shifts are practical or doable, or could be supported by the existing transit infrastructure. The model only presented a forecast of the degree to which travel behavior or mode shares would need to change to reflect the conditions mandated by the parking program tested.

The journey to work (JTW) mode share data that was used in the model reflected information from the 1980 census. The more recent 1990 federal census mode share data is not yet available. (The employment and travel elasticity or coefficient information was based on recent 1990 surveys.) Therefore, the baseline parking conditions that were defined for Cambridge may not reflect current and actual 1991 travel behavior.

With the exception of the baseline or current condition scenario, each parking condition was assessed under a future condition involving the construction of between zero and 8 million square feet of development over a ten year period (zero and 16 million square feet of development over a twenty year period), and includes office, retail, research and light industrial uses. This level of development is based on about 7 million square feet of new development that has been proposed for Cambridge, in addition to the approximately 1 million square feet of development that has been under construction or completed since 1990. Eight million square

feet of development over ten years represents an historical high for development in Cambridge as described in Section 5.

4.3 The Parking Conditions Tested

As mentioned above, five parking conditions were tested. These included:

1. A baseline condition
2. Future parking based on prevailing mode share trends, i.e., current trends
3. A parking freeze at the year 1990 (or current) inventory
4. A parking freeze at the 1990 inventory plus a 20 percent increment of additional parking
5. The proposed Cambridge vehicle trip reduction ordinance

Following is a further discussion of each of the five programs and the results of the analysis performed.

4.3.1 A Baseline Condition

A baseline condition was established with the available data to develop the baseline mode shares for the journey to work trips in Cambridge. As discussed in the analytic section, the available data were comprised of information from 1980 and 1990. For example, the journey to work (JTW) mode share data that was used in the model reflected information from the 1980 census. The employment and travel elasticity or coefficient information was based on recent 1990 surveys. The baseline parking conditions that are reflected in the analysis therefore may not reflect current and actual 1991 travel behavior.

With a total employment base that is estimated at 102,000, the results of the test are shown on the attached Table 1.

The commuter mode shares indicated in the analysis include 42.3 percent for drive alone commuters, 17.2 percent for drive with others (carpooling or vanpooling), 20.5 percent using transit and 20.5 percent using "other" (predominantly walking with some bicycle).

The test also estimated the VMT at 969,000 vehicle miles per day (VMT) travelled by commuters who work in Cambridge. (This baseline represents VMT that is generated by workers who are employed in Cambridge and which reflects 30 percent of the total VMT (3,285,000) generated in Cambridge by all types of trip-making. These other types of Cambridge trips include Cambridge residents who work outside of Cambridge, Cambridge home- based non-work trips and Cambridge non-home based work trips.) The test run also estimated the number of commuter vehicles at 52,200, which would presumably represent long-term parking and the number of spaces required. (This estimate compares very closely with the 1990 inventory of off-street parking in Cambridge which listed the number of spaces at 51,830.) These data reflect a commuter to vehicle ratio of 1.95.

4.3.2 Future Parking Based On Prevailing Mode Share Trends - Current Trends

This parking condition represents the first assessment of a future test case under which an additional construction of 8 million square feet of new development over ten years (and 16 million square feet over twenty years) is assumed. As discussed in the analytic section, the development includes office, retail, research and light industrial uses. This level of development is based on about 7 million square feet of new development that has been proposed for Cambridge, in addition to the approximately 1 million square feet of development that has been under construction or completed since 1990. The potential amount of new development and the type of development that are expected were based on forecasts by the Cambridge Community Development Department. However, it is important to note that the schedule for the implementation of this development cannot be specified, particularly given the current uncertainties in the real estate industry and the economic recession. Therefore, the tests were performed with three different development rates: 4 million square feet over 20 years, 8 million square feet over 20 years, and 16 million square feet over 20 years. The figures following this text illustrate all three scenarios and also include a no development scenario, as well.

The discussion below summarizes travel conditions following the construction of 8 million square feet of new development. The test assumes that the mode shares exhibited in the Baseline Condition would not change considerably, and generally reflect modes of travel that now include the proposed new development.

The results of this analysis are shown on Table 2. Cambridge employment would increase to about 129,000 or an increase of 27 percent from the 1990 employment. This estimate is based on standard employment generation factors for the type and amount of development forecasted.

The mode share values are somewhat different from the Baseline Condition. This is due to the relatively higher number of new employees (of the 27,000 employees generated by the new development) who originate outside Cambridge and other inner metropolitan core communities, and who have higher drive alone mode shares. The commuter mode shares that result from this test include 43.9 percent drive alone (a change of 1.9 % from the baseline condition), 17.4 percent drive with others (up 0.2 %), 22.4 percent using transit (up 1.9 %) and 16.3 percent use other (down 3.7 %).

Along with these mode share results, the model estimated the number of long-term parking spaces, i.e., commuter related long-term parked vehicles, at about 67,900. This reflects an increase of 16,100 spaces over the Baseline Condition (which uses the current 1990 off-street parking inventory), or about two new spaces for each additional 1,000 square feet of development.

The vehicle miles per day (VMT) travelled by commuters who work in Cambridge was estimated at 1,203,000; this estimate represents a 24 percent increase in VMT over the baseline conditions. This estimate is consistent with the CTPS year 2010 forecast of a 26 percent increase in Cambridge VMT over current levels. The data reflect a commuter to automobile ratio of 1.90.

4.3.3 A Parking Freeze At The 1990 or Current Inventory

Unlike the previous test condition that assumed no transportation management controls, so that current Baseline trends would continue into the future, this parking condition tests the modal shift impacts associated with a parking cap or freeze that is fixed at the current 1990 inventory of off-street parking spaces in Cambridge, which represents a supply of 51,830 spaces. Similar to the previous test, this parking condition was tested under three different development rates: 4 million square feet, 8 million square feet, and 16 million square feet, each over a 20 year period. The figures following this text illustrate all three results and also include a no development scenario, as well.

The discussion below focuses only on the conditions represented by an additional construction of 8 million square feet of new development, which reflects an employment base of 129,000.

The results of this test must be interpreted with care. As discussed in the introduction, the purpose of testing alternate parking conditions is to glean by how much mode shares in Cambridge would need to change to reflect the parking constraints that were imposed on the model. For instance, the model was "instructed" to accept an input of 8 million square feet of new development and to calculate the necessary mode shares required with a parking cap of 51,830 spaces without determining if these mode shifts could actually be achieved, or could be supported by the existing transit infrastructure. The model only presented a forecast of the degree to which travel behavior would need to be adjusted to reflect the parking constraints.

The results of a test of 8 million square feet of development are shown on Table 3 and demonstrate that mode shares would need to change considerably. For example, drive alone commuting would need to drop to 29.9 percent (down 14.0 % from the Future Condition Under Prevailing Trends condition). The other modes of commuting would necessarily have to change upwards. Driving with others was estimated to increase to 20.9 percent of commuters (up 3.5 %), transit use was estimated to increase to 31.5 percent (up 9.1 %) and "other" would represent 17.7 percent (up 1.4 %).

As shown on the table, these percentage changes would represent a fundamental shift in commuting behavior as compared to either the Baseline Condition or Future Condition Under Prevailing Trends. Large numbers of commuters would have to change modes. Based on this test, almost 18,000 additional commuters in Cambridge could not drive alone, with about 11,800 commuters estimated changing to transit, 4,500 changing to some form of ridesharing and 1,700 commuters using some "other" mode such as walking or bicycling.

The model also estimated VMT under this parking condition and amount of development, with the vehicle miles per day (VMT) travelled by commuters working in Cambridge estimated at 952,000. This estimate is considerably lower than the Future Condition Under Prevailing Trends (1,203,000 VMT), and even lower than the Baseline Condition (969,000 VMT).

To achieve the magnitude of commuting changes reflected in the above data would be unprecedented and highly unlikely. The likelihood that an absolute parking freeze would substantially curtail or even freeze future development in Cambridge is strong, as evidenced by the extremely high commuter to automobile ratio that is reflected in this parking test (2.49). In the absence of 8 million square feet of development in 10 years (or 16 million square feet of development in 20 years), the observed impacts of a parking freeze would not be realized.

Furthermore, a parking freeze that deters development in Cambridge and causes such development to locate elsewhere in the region would likely result in an overall net increase in regional VMT.

4.3.4 A Parking Freeze At 1990 Levels Plus An Increment Of Additional Parking

Under this parking test, a parking cap or freeze would allow for some increase in the supply of off-street parking beyond the Baseline Condition. The parking test assumed a 20 percent increment to the Baseline inventory. The 20 percent factor was taken from the proposed South Boston parking cap plan. This assumption resulted in a parking freeze of 62,200 spaces. This would represent 10,400 spaces more than the Baseline Condition and the previous absolute parking freeze condition tested.

As before, three different development rates were tested. All three are shown in the figures following this text and again include a no development condition, as well. The discussion below focuses on the conditions that would exist under this parking freeze option with an additional 8 million square feet of new development. Again exercising the same care in interpreting the results as discussed previously, Table 4 summarizes the test results.

Drive-alone commuting would need to drop to 39.2 percent; a decrease of 4.7 percent from the Future Condition Under Prevailing Trends that was tested. This modal change would reflect almost 6,100 Cambridge drive-alone commuters having to switch to another mode. The number of commuters who rideshare was estimated to increase to 18.1 percent, or an increase of 0.7 percent or 930 commuters. Commuters using transit was estimated to increase to 26.2 percent, or an increase of 3.8 percent or 4,950 commuters compared to the Future Condition Under Prevailing Trends that was tested.

The model also estimated the vehicle miles per day (VMT) travelled by commuters working in Cambridge at 1,116,000. This estimate falls between the Future Condition Under Prevailing Trends (1,203,000 VMT) and the Parking Freeze At The 1990 Inventory (952,000 VMT).

The commuter to automobile ratio reflected in these test data is 2.07. The mode changes that are required under this test are considerably less dramatic than the previous parking cap condition.

The two parking freezes that were tested indicate that under very controlled computer test conditions, commuter mode shares would need to change considerably if future development were to occur. However, the computer model is unable to resolve several significant issues raised by the 1990 Clean Air Act Amendments.

- How and by what degree would these or any other type of parking freeze affect future development in Cambridge?
- How and by what degree would a parking freeze in Cambridge cause some additional development to divert to another community in the region without a freeze?
- If additional development were to occur in other communities because of a Cambridge parking freeze, by how much would regional VMT actually increase, thereby compromising the goals of the parking freeze to control VMT and improve air quality?

- At what level should a parking cap be set, and what transportation and development objectives is it trying to meet?

Parking caps are compelling because they are conceptually simple. However, while a parking cap may be simple to comprehend or explain, as indicated by the issues listed above, its effectiveness to achieve real air quality benefits is questionable. This is due to the likelihood that a parking freeze could cause development to relocate to other areas in the region, thereby increasing VMT and compromising air quality, and also due to the uncertainty that the existing public transportation infrastructure in these areas could accommodate the necessary mode shifts.

4.3.5 The Proposed Cambridge Vehicle Trip Reduction Ordinance or VTRO

The proposed Cambridge Vehicle Trip Reduction Ordinance was developed as a comprehensive program of transportation measures that would equitably manage existing and future vehicle miles of travel (VMT) in Cambridge and at the same time improve the support structure for educating and assisting affected populations to achieve the intended mode shifts. The proposed ordinance was designed to improve air quality by implementing a series of measures that reduce or control the growth of VMT by primarily promoting the use of alternate modes to single occupant use of an automobile and improving opportunities for local employment. The measures constituting the ordinance are equitable and broad-based because they directly affect all the travel markets and land uses in Cambridge. By contrast, conventional parking freezes are directed at commercial and/or employee parking demand without affecting residential parking demand or driving behaviors and without providing support systems necessary to achieve the intended mode shifts.

The ordinance addresses travel produced by the following Cambridge travel markets:

- Residents
- Existing employees
- Future development, and
- The City of Cambridge (official city business)

The ordinance also includes measures that address general private and public sector mobility issues within the City, in addition to measures that rely on the use of clean fuels.

A critical feature of the ordinance and one of its primary goals is the ability of the ordinance to achieve trip reduction and air quality benefits immediately upon the effective date of the ordinance. (A parking freeze is dependent upon additional development to achieve beneficial impacts on VMT or air quality.) Many of the measures in the ordinance along with their implementation schedule lend themselves to achieving quick results, with the ordinance's effectiveness further improving over time as additional measures in the program are phased-in.

Following is a list of ordinance measures and daily VMT reductions that are expected to occur within several years of the ordinance becoming effective. The Vehicle Trip Reduction or VTR measure of the ordinance is discussed separately.

Measure	Daily VMT Reduction
A.1 Community Mobility Program	13,500 (by year two)
B.1 Unregulated On-Street Parking	35,000 (by year two)
D.1 Resident Parking Zones	7,000 (by year two)
E.2 Local Employment Opportunity	17,000 (by year five)
	34,000 (by year ten)

The ordinance's ability to generate immediate and progressively greater reductions in vehicle travel (i.e., daily reductions in VMT of 55,000 immediately to 89,000 by year 10, exclusive of the Vehicle Trip Reduction Measure or VTR also included in the Ordinance) make it superior to the highly uncertain results derived from a parking freeze program. As discussed in the preceding two sections, parking freezes are targeted at new development or expansions of existing development, and then only after the freeze threshold is reached, sometimes many years after the freeze is implemented. Contrast this highly limited, all or nothing approach of the parking freeze to the broad-based application of the ordinance.

Following is a more analytical discussion of the Vehicle Trip Reduction measure (VTR) of the ordinance which demonstrates the superiority of the ordinance to a city-wide parking freeze.

- The VTR Measure of the Ordinance

  The VTR Measure reflects an employer based (existing and future employers) trip reduction program that relies on the individual employers in Cambridge to develop their own transportation management plan to reach a community-wide mobility standard. The measure tested and included in the Cambridge Ordinance is discussed in detail under Measures E.4 and F.1 of the ordinance.

  The measure that was tested was an annual-based program that requires employers (firms of 50 or more employees) to develop and implement vehicle trip reduction plans designed to meet a commuter mobility standard that was structured on an employee to vehicle ratio calculated for journey to work trips only. The standard, once defined, could remain fixed, or it could be adjusted upwards (or downwards) based on the prevailing transportation and market information that would be generated annually as part of the measure.

  Again, three different development rates were tested. All three are depicted on the figures following this text and also include a no development condition, as well. The discussion below focuses on the conditions that would exist with the VTR measure in the first two years of the ordinance, and to this was added a pro rated amount of new development over the first two years of the program (based on an additional 8 million square feet of new development in ten years). The VTR measure also reflects an

annualized increase in the commuter mobility standard of 2.5 percent in the first two years. The Baseline Condition was used to set the initial mode shares and level of employment involvement.

The results of the analysis indicate that the measure would achieve immediate reductions in VMT that represent a daily savings of 24,000 miles of travel from existing development and 27,000 miles of travel from new development (see Table 5) by the second year of the measure.

At first glance, this reduction may appear modest in comparison with the parking freeze scenarios. It is important to note that it represents only the first two years of the program, and unlike the parking freezes, it is not dependent on new development to achieve reductions in VMT. In contrast to parking freezes, the VTR measure will achieve immediate results because it is addressed both to existing and new development.

Table 6 indicates the potential effectiveness of the Vehicle Trip Reduction measure if the VTR commuter mobility standard continued to increase by 2.5 percent annually each of the first five years and by 1.0 percent annually thereafter. Table 6 reflects prevailing conditions after ten years of the VTR measure. The mode shares reflect a considerable change over the ten year period. The drive alone share would drop to 34.1 percent Other modes would correspondingly increase. Driving with others was estimated to increase by 3.2 percent, transit users was estimated to increase to 27.3 percent (up by 4.9 percent). The model also estimated the vehicle miles per day (VMT) travelled by commuters working in Cambridge under the VTR measure at 1,085,000.

As discussed above, the VTR measure would result in a daily VMT of 1,085,000 by year ten or a savings of 118,000 daily VMT relative to the Current Trends scenario. Yet, the VTR measure is only one element of a comprehensive, broad-based ordinance. The other measures in the ordinance regulate currently unregulated parking spaces, discourage cross-town vehicle trips during the work week, facilitate opportunities for residents to find jobs in the City, expand the Commuter Mobility Program, and create a Bicycle Mobility Program. (Notably, the measures in the ordinance are largely self-funding).

Taken together, the other measures under the VTRO will eliminate an additional 89,000 daily VMT over the VTR measure and result in a daily VMT of 996,000 and will not be dependent upon new development. (The impacts of these measures are demonstrated in Section 2 of this Technical Appendix.) Hence, the impacts of the ordinance represent a significant achievement in view of the data which indicate an annual growth in VMT of 3 percent in the Region.

As depicted in the following figures, the Vehicle Trip Reduction measure tested demonstrates the superiority of the Cambridge Trip Reduction Ordinance for achieving reductions in VMT over a parking freeze program for the following reasons.

- The VTR and other measures of the ordinance would achieve results starting in the first year. A parking freeze only begins to generate trip reductions with new development or expansion after the freeze ceiling is reached.

- The VTR measure, as well as many of the other measures, of the ordinance can be implemented incrementally so that its standard could be adjusted based on actual and changing transportation conditions. A parking freeze may be simple, but it is absolute. The ceiling may be too high and do nothing, or it may be too low and freeze or relocate development.

- Many of the measures of the ordinance apply to both existing and future development. A parking freeze primarily impact only the last firms or developers wishing to do business in Cambridge.

- Finally, the proposed ordinance contains a commitment by the City promptly to study revisions to its current zoning ordinance as it applies to minimum and maximum parking space requirements.

The superiority of the proposed Cambridge Trip Reduction Ordinance will be further demonstrated in the following section.

4.4 Comparing the Parking Programs Under Several Levels of Development

The two types of parking freezes are compared with the Cambridge Vehicle Trip Reduction Ordinance (and Measure) and Future Parking Under Current Trends for several alternate rates of development. The results of each of these scenarios tested are shown on several figures, labeled Figures 4.1-4.4.

4.4.1 Development Scenarios and Assumptions

Each of the parking programs was analyzed for four levels of development in Cambridge. The amounts of development assumed included no development, 4, 8 and 16 million square feet of new construction over a twenty year period. (Eight million square feet of new development occurred in Cambridge during the 1980's; a period of unprecedented high growth for the City and region as discussed in Section 5.)

Other technical assumptions assumed in the analysis included:

- Development is assumed to occur evenly over the 20 year period. For example, four million square feet of development over twenty years is assessed at an annualized rate of two hundred thousand square feet.

- Each parking program assumes an initial starting point of 969,000 vehicle miles of travel per day (VMT). This baseline represents VMT that is currently generated by workers who are employed in Cambridge and which reflects 30 percent of the total VMT (3,285,000) generated in Cambridge by all types of trip-making. These other types of Cambridge trips include Cambridge residents who work outside of Cambridge, Cambridge home- based non-work trips and Cambridge non-home based work trips.

- The Parking Freeze at the Current Inventory (F1) is fixed at the 1990 off-street parking inventory of non-residential spaces and is estimated at 51,830 spaces.

- The Parking Freeze at the Current Inventory plus an Increment of 20 percent (F2) option takes the current inventory (F1) and includes an additional 20 percent in the eligible freeze inventory. The parking ceiling that results under this option is estimated at 62,200 spaces.

- The Cambridge Vehicle Trip Reduction measure (VTR) of the ordinance is based on the measure proposed in the proposed Cambridge SIP ordinance program, which is applicable to existing employees and new development and is based on a City-wide auto efficiency rate (AER) or standard. The program tested assumes that the standard increases annually by 2.5 percent each of the first five years and by 1.0 percent annually thereafter.

- The Cambridge Trip Reduction Ordinance option (VTRO) includes the vehicle trip reduction measure (VTR) in addition to the other measures included in the proposed Cambridge SIP ordinance. In addition to the (VTR) measure outlined above, the program includes a range of measures that would take effect at different times as summarized below. (Also see Section 4.3.5.) Each of these programs was added to the VTR option to generate the overall impacts of the VTRO program.

Measure	Daily VMT Reduction	Year Implemented
Community Mobility Program	13,500	1
On-Street Parking Restrictions	35,000	1
Resident Parking Zones	7,000	1
Local Employment	16,500	5
Local Employment	16,500	10

4.4.2 Results of the Analysis

No Development Scenario - Figure 4.1

- The Vehicle Trip Reduction Measure (VTR) and Ordinance (VTRO) options operate to achieve lower VMT than existing conditions because they affect current development and driving behavior.

- The freeze programs only affect new development and therefore have no impact under this no build development condition.

Four Million Square Feet Development Scenario - Figure 4.2

- The Vehicle Trip Reduction Measure (VTR) and Ordinance (VTRO) options still result in lower VMT than existing conditions or either parking

freeze scenario despite the addition of four million square feet of new development over twenty years.

- The Freeze plus 20 percent Increment (F2) option has no affect on VMT as four million square feet of development would generate fewer parking spaces than allowed under the freeze ceiling.

- The Freeze at Current Inventory option (F1) maintains VMT at current conditions (969,000), which is higher than the VTR and VTRO options.

Eight Million Square Feet Development Scenario - Figure 4.3

- The Cambridge Vehicle Trip Reduction Ordinance (VTRO) results in lower overall VMT than all other options over the twenty year period. The VMT under the ordinance is still lower after twenty years than the initial baseline level VMT of 969,000.

- The Vehicle Trip Reduction (VTR) measure alone (i.e. without the other components of the VTRO) and the Freeze at Current Inventory (F1) are comparable over the first ten years, each resulting in VMT similar to current levels. For years eleven through twenty, VMT under the Vehicle Trip Reduction measure rises from 973,000 to 1,025,000, while VMT under the Freeze at Current Inventory (F1) essentially remains unchanged.

- The Freeze plus 20 percent Increment (F2) option has no effect on VMT over the first ten years as four million square feet of development would require fewer parking spaces than allowed under the freeze ceiling. For years eleven through twenty, the freeze option (F2) would lower VMT compared to current trends from 1,203,000 to 1,145,000.

Sixteen Million Square Feet Development Scenario - Figure 4.4

- Without a transportation management program, VMT under Current Trends and over twenty years would increase by 50 percent to 1,454,000.

- The Vehicle Trip Reduction Ordinance (VTRO) would achieve lower VMT than the Freeze plus 20 percent Increment (F2) option over twenty years with VMT estimated at 1,135,000 in year twenty.

- The Vehicle Trip Reduction Measure (VTR) would offer lower VMT than the Freeze plus 20 percent Increment (F2) until year fifteen. After year fifteen, VMT under the Freeze (F2) would remain stable at 1,144,000 while VMT under the VTR program would increase to 1,224,000 in year twenty.

- The Freeze At Current Inventory (F1) would maintain VMT comparable to current trends (969,000) throughout the twenty year period, and result in

lower VMT than achieved under the Vehicle Trip Reduction Ordinance (VTRO) after year eight.

4.4.3 Summary of the Parking Programs Analyzed

The graphs clearly illustrate the superiority of the proposed Cambridge Vehicle Trip Reduction Ordinance (VTRO) over either type of parking freeze. As the figures make apparent, a parking freeze will only result in a reduction in vehicle miles travelled if a substantial amount of development occurs in a community over an extended period of time. Absent that condition, a parking freeze will not reduce vehicle miles travelled or improve air quality. By contrast, the proposed Cambridge Vehicle Trip Reduction Ordinance (VTRO) would achieve substantial reductions in vehicle miles travelled (and improvements in air quality) during the first two years and would continue to achieve reductions over time with and without substantial development in the community.

CAMBRIDGE SIP REVISION STUDY

VMT TESTS OF ALTERNATE PARKING PROGRAMS

Test 1: No Growth over 20 years

Year	1 Baseline/ Current Trends (CT)	2 Freeze At Current Inventory (F1)	3 Freeze Plus 20 % Increment (F2)	4 Cambridge VTR Measure (VTR)	5 Cambridge VTR Ordinance (VTRO)
Year 0	969,000	969,000	969,000	969,000 (1.90)	969,000
Year 2	969,000	969,000	969,000	945,000 (2.00)	890,000
Year 5	969,000	969,000	969,000	907,000 (2.15)	837,000
Year 10	969,000	969,000	969,000	886,000 (2.26)	797,000
Year 20	969,000	969,000	969,000	843,000 (2.49)	754,000

Test 2: 4 Million Square Feet of Development over 20 years

Year	1 Baseline/ Current Trends (CT)	2 Freeze At Current Inventory (F1)	3 Freeze Plus 20 % Increment (F2)	4 Cambridge VTR Measure (VTR)	5 Cambridge VTR Ordinance (VTRO)
Year 0	969,000	969,000	969,000	969,000 (1.90)	969,000
Year 2	981,000	966,000	981,000	956,000 (2.00)	901,000
Year 5	1,001,000	966,000	1,001,000	938,000 (2.15)	866,000
Year 10	1,033,000	964,000	1,033,000	941,000 (2.26)	852,000
Year 20	1,074,000	958,000	1,074,000	922,000 (2.49)	833,000

Test 3: 8 Million Square Feet of Development over 20 years

Year	1 Baseline/ Current Trends (CT)	2 Freeze At Current Inventory (F1)	3 Freeze Plus 20 % Increment (F2)	4 Cambridge VTR Measure (VTR)	5 Cambridge VTR Ordinance (VTRO)
Year 0	969,000	969,000	969,000	969,000 (1.90)	960,000
Year 2	990,000	966,000	976,000	964,000 (2.00)	909,000
Year 5	1,033,000	964,000	1,033,000	967,000 (2.15)	895,000
Year 10	1,074,000	958,000	1,074,000	973,000 (2.26)	884,000
Year 20	1,203,000	952,000	1,145,000	1,025,000 (2.49)	936,000

Test 4: 16 Million Square Feet of Development over 20 years

Year	1 Baseline/ Current Trends (CT)	2 Freeze At Current Inventory (F1)	3 Freeze Plus 20 % Increment (F2)	4 Cambridge VTR Measure (VTR)	5 Cambridge VTR Ordinance (VTRO)
Year 0	969,000	969,000	969,000	969,000 (1.90)	969,000
Year 2	1,001,000	964,000	1,001,000	975,000 (2.00)	920,000
Year 5	1,074,000	958,000	1,074,000	1,001,000 (2.15)	929,000
Year 10	1,203,000	952,000	1,145,000	1,085,000 (2.26)	996,000
Year 20	1,454,000	971,000	1,144,000	1,224,000 (2.49)	1,135,000

Note:

Cambridge VTRO Program Assumes:
Schedule of:

Year 2 : Programs A1,B1,D1 representing 55,000 VMT
Year 5 : Programs A1,B1,D1 & 1/2E2 representing 72,000 VMT
Year 10 : Programs A1,B1,D1 & E2 representing 89,000 VMT

Programs Used in Calculations:

1. Current Trends ----------Files E.3 & Freeze1
2. Freeze Current Inventory--File Freeze 2
3. Freeze Plus 20%----------File Freeze 3
4. Cambridge VTR------------File F.1
5. Cambridge VTRO-----------Program 4 VTR including above note

PERSON TRIP GENERATION

Proposed Development- 8 Million Square Feet over 10 Years

Land Use	Amount SF	Empl/1000	Employees
Office	6188000	4.0	24752
Retail	1010000	1.0	1010
R&D	800000	1.5	1200
Hotel	0		
	7998000		26962

Employment in Year:

0	2	5	10	20
102000	107392	115481	128962	155924

Proposed Development- 4 Million Square Feet over 10 Years

Land Use	Amount SF	Empl/1000	Employees
Office	3094000	4.0	12376
Retail	505000	1.0	505
R&D	400000	1.5	600
Hotel	0		
	3999000		13481

Employment in Year:

0	2	5	10	20
102000	104696	108741	115481	128962

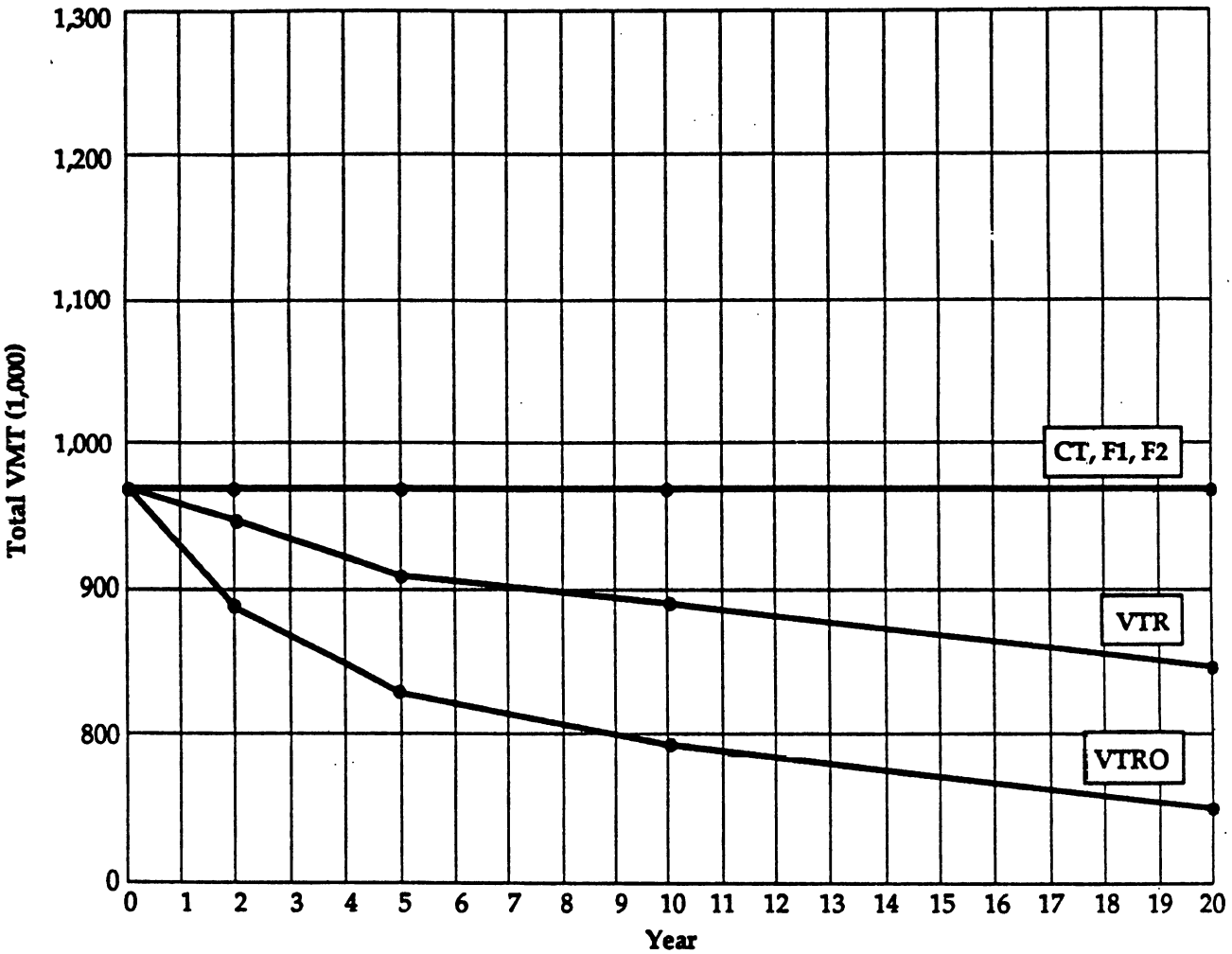
Proposed Development- 2 Million Square Feet over 10 Years

Land Use	Amount SF	Empl/1000	Employees
Office	1547000	4.0	6188
Retail	252500	1.0	253
R&D	200000	1.5	300
Hotel	0		
	1999500		6741

Employment in Year:

0	2	5	10	20
102000	103348	105370	108741	115481

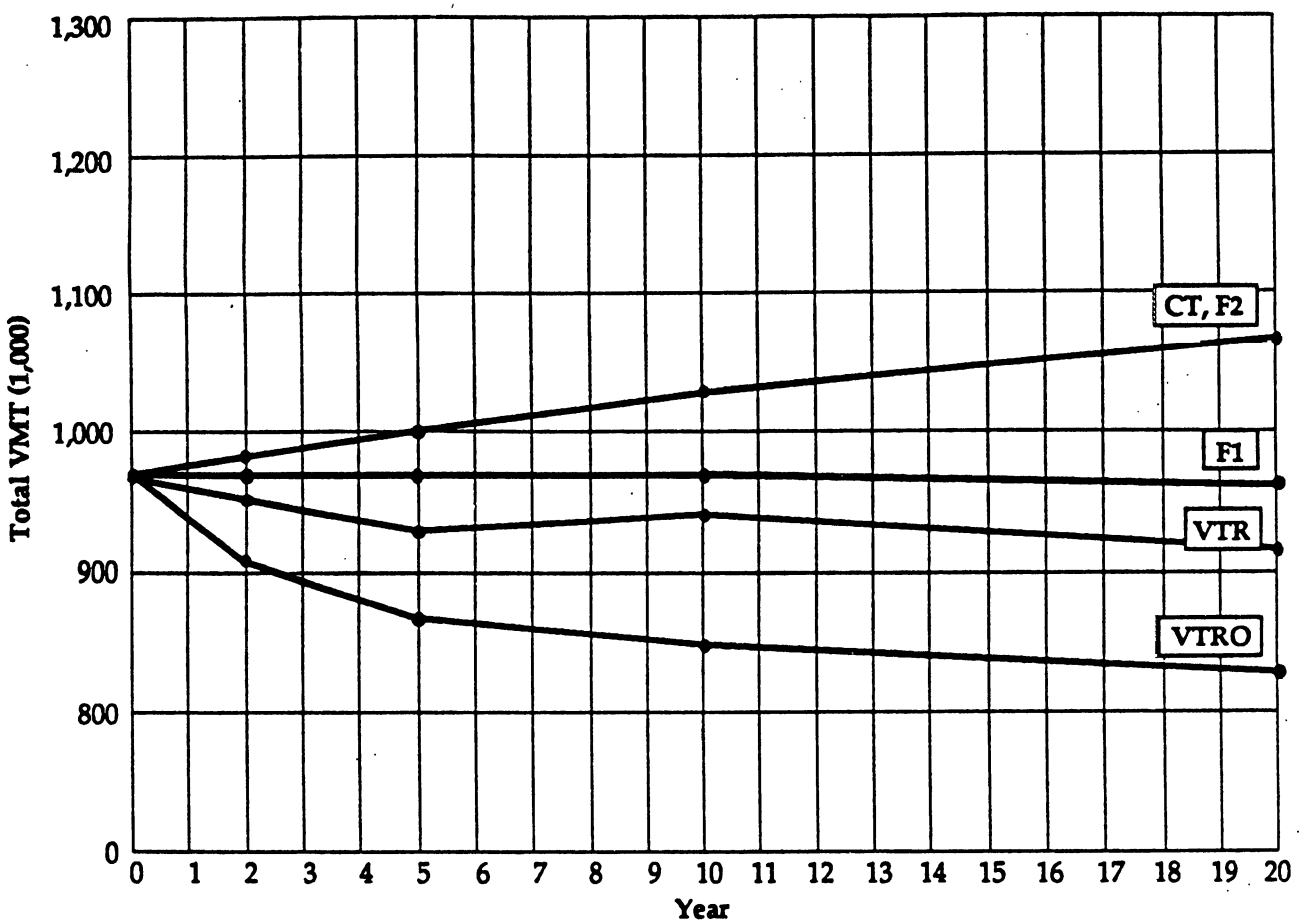
Figure 4.1 No Development In Cambridge Over the Next Twenty Years



Options Assessed

(CT)	Current Trends
(F1)	Freeze at Current Year 1990 Inventory (51,830 Spaces)
(F2)	Freeze (F1) Plus 20% Increment (Guided by S. Boston Freeze)
(VTR)	Cambridge Vehicle Trip Reduction Measure
(VTRO)	Cambridge Trip Reduction Ordinance

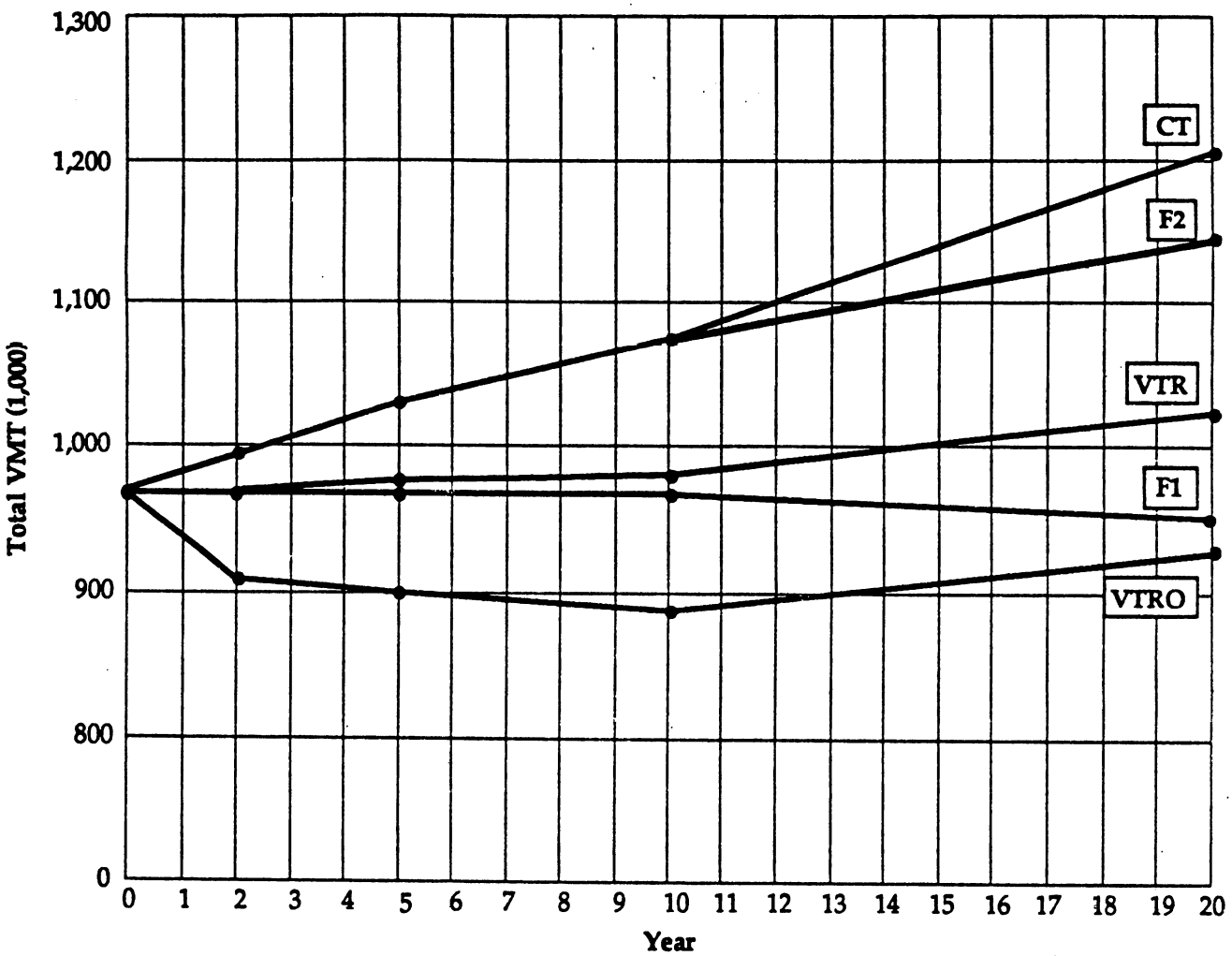
Figure 4.2 Four Million FT² Development In Cambridge Over Twenty Years



Options Assessed

(CT)	Current Trends
(F1)	Freeze at Current Year 1990 Inventory (51,830 Spaces)
(F2)	Freeze (F1) Plus 20% Increment (Guided by S. Boston Freeze)
(VTR)	Cambridge Vehicle Trip Reduction Measure
(VTRO)	Cambridge Trip Reduction Ordinance

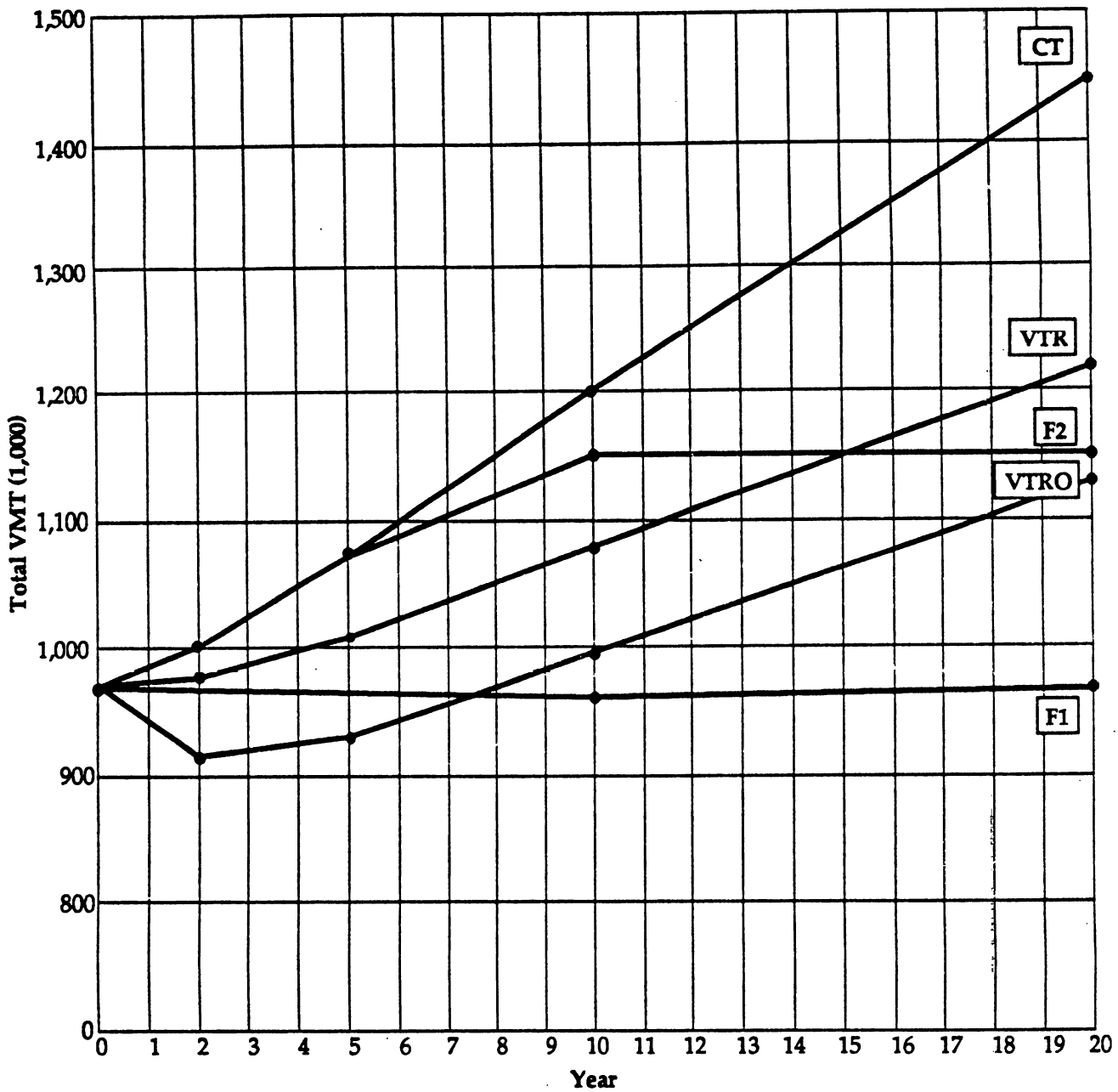
Figure 4.3 Eight Million FT² Development In Cambridge Over Twenty Years



Options Assessed

(CT)	Current Trends
(F1)	Freeze at Current Year 1990 Inventory (51,830 Spaces)
(F2)	Freeze (F1) Plus 20% Increment (Guided by S. Boston Freeze)
(VTR)	Cambridge Vehicle Trip Reduction Measure
(VTRO)	Cambridge Trip Reduction Ordinance

Figure 4.4 Sixteen Million FT² Development In Cambridge Over Twenty Years



Options Assessed

(CT)	Current Trends
(F1)	Freeze at Current Year 1990 Inventory (51,830 Spaces)
(F2)	Freeze (F1) Plus 20% Increment (Guided by S. Boston Freeze)
(VTR)	Cambridge Vehicle Trip Reduction Measure
(VTRO)	Cambridge Trip Reduction Ordinance

Parking Test: Table 1
A Baseline Condition

(Assumes 1980 Census JTW and 1990 Employment and Elasticity Data)

CHANGE IN PERSON TRIPS

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Drive Alone:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carpool:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vanpool										
Transit:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

CHANGE IN VEHICLE TRIPS

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Total Employment Parking Demand										52194
Trip Reduction Auto Trips	8448	5363	4898	3445	2305	2052	1240	1727	22716	52194
-Change in Auto Trips	0	0	0	0	0	0	0	0	0	0
New Trip Reduction Trips	8448	5363	4898	3445	2305	2052	1240	1727	22716	52194
Percent Change Auto Trips	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Change in Transit Trips	0	0	0	0	0	0	0	0	0	0

AUTO EFFICIENCY

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Total Person Trips										102000
Trip Reduction Person Trips	28458	14382	9792	7038	3774	3060	2550	2244	30702	102000
Existing TRO Auto Trips	8448	5363	4898	3445	2305	2052	1240	1727	22716	52194
Person To Auto Trip Ratio	3.37	2.68	2.00	2.04	1.64	1.49	2.06	1.30	1.35	1.95
TRO Trips After Strategy	8448	5363	4898	3445	2305	2052	1240	1727	22716	52194
Person To Auto Trip Ratio	3.37	2.68	2.00	2.04	1.64	1.49	2.06	1.30	1.35	1.95
Efficiency Improvement										0.0%

VEHICLE MILES OF TRAVEL IMPACT (VMT)

Total Cambridge Auto JTW VMT										968908
Trip Reduction Auto VMT	50691	91175	53874	41338	25352	26679	16119	27630	636051	968908
TRO Auto VMT after Strategy	50691	91175	53874	41338	25352	26679	16119	27630	636051	968908
-VMT Reduction	0	0	0	0	0	0	0	0	0	0
-Percent Reduction	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Percent Reduction From Current Total JTW VMT										0.0%
Percent Reduction From Current Total Cambridge VMT										0.0%

CHANGE IN MODE SHARE

Current Conditions

	Existing Trips	Percent Share
Drive Alone:	43137	42.3%
Shared Ride:	17547	17.2%
Transit:	20915	20.5%
Other (walk, cab, bike):	20402	20.0%
Totals	102000	100.0%

Keyboard Macros

/FS^R

Parking Option: Table 2

Future Commuter Parking Conditions - Current Trends

(Assumes Post-1990 Construction of 7.988 M of Development)

(Development Data Provide by CCDD)

CHANGE IN PERSON TRIPS

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Drive Alone:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carpool:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vanpool										
Transit:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

COMMUTER AUTO SPACES

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
										0
Auto Spaces -Current Trends	14201	7365	5807	4357	2915	2595	1568	2184	26857	67850
-Change in Auto Spaces	0	0	0	0	0	0	0	0	0	0
Auto Spaces with Program	14201	7365	5807	4357	2915	2595	1568	2184	26857	67850
Percent Change Auto Spaces	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Spaces Over 1990 Inventory										
-Current Trends										16020
-With Program										16020

AUTO EFFICIENCY

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Total Camb. Person Trips										129000
Trip Reduction Person Trips	39990	17415	11610	8901	4773	3870	3225	2838	36378	129000
Existing TRO Auto Trips	14201	7365	5807	4357	2915	2595	1568	2184	26857	67850
Person To Auto Trip Ratio	2.82	2.36	2.00	2.04	1.64	1.49	2.06	1.30	1.35	1.90
TRO Trips After Strategy	14201	7365	5807	4357	2915	2595	1568	2184	26857	67850
Person To Auto Trip Ratio	2.82	2.36	2.00	2.04	1.64	1.49	2.06	1.30	1.35	1.90
Efficiency Improvement										0.0%

VEHICLE MILES OF TRAVEL IMPACT (VMT)

Total Cambridge Auto JTW VMT										1202545
Auto VMT	88049	125205	63877	52281	32062	33741	20385	34943	752000	1202545
Auto VMT after Strategy	88049	125205	63877	52281	32062	33741	20385	34943	752000	1202545

-Percent Reduction	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Percent Reduction From Forecast Total JTW VMT	0.0%
Percent Reduction From Forecast Total Cambridge VMT	0.0%

CHANGE IN MODE SHARE

	1990 Baseline:		Future Conditions Current Trends:	
	Person Trips	Percent Share	Person Trips	Percent Share
Drive Alone:	43137	42.3%	56612	43.9%
Shared Ride:	17547	17.2%	22457	17.4%
Transit:	20915	20.5%	28875	22.4%
Other (walk, cab, bike):	20402	20.0%	21056	16.3%
Totals	102000	100.0%	129000	100.0%
Auto Space Demand	52194		67850	
Current Inventory	51830			
Differential Demand-Inventory			16020	

Parking Cap to 1990 Inventory

(Assumes Post-1990 Construction of 7.988 M of Development)
(Current Off-Street Parking Inventory of 51,830 Spaces)

CHANGE IN PERSON TRIPS

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Drive Alone:	-4387.46	-2437.75	-1691.20	-1367.81	-820.44	-648.35	-485.72	-430.33	-5712.95	-17982.03
Carpool:	317.98	157.59	285.66	155.79	160.51	213.53	59.56	176.41	2965.76	4492.79
Vanpool										
Transit:	2942.11	2081.30	1135.57	1203.62	642.10	432.89	399.80	219.50	2700.30	11757.19
Other:	1127.37	198.86	269.97	8.40	17.83	1.92	26.36	34.42	46.89	1732.04

COMMUTER AUTO SPACES

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Current (1990) Parking Inventory										51830
Auto Spaces - Needed	14201	7365	5807	4357	2915	2595	1568	2184	26857	67850
-Change in Auto Spaces	-4249	-2369	-1567	-1300	-751	-556	-460	-354	-4423	-16029
Auto Spaces with Program	9952	4996	4240	3057	2164	2040	1108	1830	22434	51821
Percent Change Auto Spaces	-32.35%	-32.98%	-27.59%	-29.82%	-25.77%	-21.37%	-29.60%	-16.22%	-16.44%	-24.10%
Spaces Over 1990 Inventory										
-Current Trends										16020
-With Program										-9

AUTO EFFICIENCY

	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Total Camb. Person Trips										129000
Trip Reduction Person Trips	39990	17415	11610	8901	4773	3870	3225	2838	36378	129000
Existing TRO Auto Trips	14201	7365	5807	4357	2915	2595	1568	2184	26857	67850
Person To Auto Trip Ratio	2.82	2.36	2.00	2.04	1.64	1.49	2.06	1.30	1.35	1.90
TRO Trips After Strategy	9952	4996	4240	3057	2164	2040	1108	1830	22434	51821
Person To Auto Trip Ratio	4.02	3.49	2.74	2.91	2.21	1.90	2.91	1.55	1.62	2.49
Efficiency Improvement										30.9%

VEHICLE MILES OF TRAVEL IMPACT (VMT)

Total Cambridge Auto VMT

uto VMT	88049	125205	63877	52281	32062	33741	20385	34943	752000	1202545
uto VMT after Strategy	61704	84928	45640	36680	23805	26519	14408	29285	628142	952112
-VMT Reduction	-26345	-40277	-17237	-15601	-8257	-7222	-5978	-5658	-123858	-250432
-Percent Reduction	-29.9%	-32.2%	-27.0%	-29.8%	-25.8%	-21.4%	-29.3%	-16.2%	-16.5%	-20.8%

ercent Reduction From Forecast Total JTW VMT -20.8%
ercent Reduction From Forecast Total Cambridge VMT -5.3%

HANGE IN MODE SHARE

	1990 Baseline:		Future Conditions Current Trends:		Future Conditions With Absolute Freeze:		
	Person Trips	Percent Share	Person Trips	Percent Share	Person Trips	Percent Share	Use of Alt. Mode
rive Alone:	43137	42.3%	56612	43.9%	38630	29.9%	-17982
ıared Ride:	17547	17.2%	22457	17.4%	26949	20.9%	4493
ransit:	20915	20.5%	28875	22.4%	40633	31.5%	11757
ther (walk, cab, bike):	20402	20.0%	21056	16.3%	22788	17.7%	1732
otals	102000	100.0%	129000	100.0%	129000	100.0%	
ıto Space Demand	52194		67850		51821		
ff. from Current Inventory	364		16020		-9		

Parking Test: Table 4

Parking Cap with Increment of Additional Parking

(Test Assumes Post-1990 Construction of 7.980 M sf Development)
(Current Off-Street Parking Inventory of 51,830 Spaces)
(Increment Includes 20 Percent of Current Inventory or a Total of 62,196 Spaces)

CHANGE IN PERSON TRIPS	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Drive Alone:	-1534.12	-902.51	-583.54	-310.29	-284.94	-213.63	-176.89	-128.63	-1736.39	-6070.94
Carpool:	33.06	-4.40	30.71	0.26	30.36	47.42	4.59	42.56	724.66	929.24
Vanpool										
Transit:	1383.83	912.47	484.90	310.01	231.21	165.78	170.26	77.76	1000.27	4956.48
Other:	117.23	-5.55	47.93	0.01	3.37	0.43	2.03	6.30	11.46	185.21

COMMUTER AUTO SPACES	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Current (1990) Parking Inventory										51830
Proposed Option 3 Parking Ceiling										62196
Auto Spaces - Needed	14201	7365	5807	4357	2913	2595	1568	2184	26857	67850
-Change in Auto Spaces	-1520	-904	-561	-510	-272	-193	-175	-110	-1421	-5667
Auto Spaces with Program	12682	6461	5245	3847	2643	2402	1393	2074	25436	62183
Percent Change Auto Spaces	-11.57%	-12.59%	-9.69%	-11.70%	-9.33%	-7.42%	-11.26%	-5.05%	-5.28%	-8.32%
Spaces Over Proposed Option 3 Inventory										
-Current Trends										0
-With Program										-13

AUTO EFFICIENCY	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Total Cmab. Person Trips										129000
Trip Reduction Person Trips	39990	17413	11610	6901	4773	3870	3225	2638	36378	129000
Existing TRO Auto Trips	14201	7365	5807	4357	2913	2595	1568	2184	26857	67850
Person To Auto Trip Ratio	2.82	2.36	2.00	2.04	1.64	1.49	2.06	1.30	1.35	1.90
TRO Trips After Strategy	12682	6461	5245	3847	2643	2402	1393	2074	25436	62183
Person To Auto Trip Ratio	3.15	2.70	2.21	2.31	1.81	1.61	2.31	1.37	1.43	2.07
Efficiency Improvement										9.1%
VEHICLE MILES OF TRAVEL IMPACT (VMT)										
Total Cambridge Auto JTW VMT										1202545
Auto VMT	88049	125205	63877	32281	32062	33741	20365	34943	752000	1202545
Auto VMT after Strategy	78627	109830	57700	46139	29073	31232	18112	33182	712203	1116118

-VMT Reduction	-9422	-15375	-6176	-6122	-2989	-2509	-2274	-1762	-39797	-86427
-Percent Reduction	-10.7%	-12.3%	-9.7%	-11.7%	-9.3%	-7.4%	-11.2%	-5.0%	-5.3%	-7.2%

Percent Reduction From Forecast Total JTM VMT -7.2%

Percent Reduction From Forecast Total Cambridge VMT -1.8%

CHANGE IN MODE SHARE

	Baseline:		Future Conditions Current Trends:		Future Conditions Modified Freeze:		
	Person Trips	Percent Share	Person Trips	Percent Share	Person Trips	Percent Share	Use of Alt. Mode
Drive Alone:	43137	42.3%	56612	43.9%	50041	39.2%	-6071
Shared Ride:	17547	17.2%	22457	17.4%	23386	18.1%	929
Transit:	20915	20.5%	28873	22.4%	33832	26.2%	4958
Other (walk, cab, bike):	20402	20.0%	21058	16.3%	21741	16.5%	683
Totals	102000	100.0%	129000	100.0%	129000	100.0%	
Auto Spaces	51830		67850		62183		
Differential from Baseline	0		16020		10353		

Parking Test: Table 5

AER Program

(Assumes Post-1990 Construction of 7.988 M of Development)

(Assumes a 2.5 Percent Annualized Adjustment)

CHANGE IN PERSON TRIPS	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Drive Alone:	-537.42	-274.86	-171.36	-149.05	-82.07	-61.52	-51.74	-36.80	-556.79	-1921.61
Carpool:	10.63	13.60	19.29	5.16	10.96	15.70	2.87	13.10	250.42	341.71
Vanpool										
Transit:	516.16	244.09	133.85	143.61	69.90	45.68	47.61	21.15	302.41	1524.46
Other:	10.63	17.16	18.23	0.28	1.22	0.14	1.27	2.56	3.96	55.44

CHANGE IN VEHICLE TRIPS	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Total Employment Auto Trips										66486
Trip Reduction Auto Trips	8347	4486	3163	2373	1588	1414	854	1190	16239	39654
-Change in Auto Trips	-533	-269	-163	-147	-77	-55	-50	-31	-448	-1773
New Trip Reduction Trips	7814	4217	3000	2226	1510	1359	804	1159	15791	37881
Percent Change Auto Trips	-6.53%	-6.13%	-5.27%	-6.18%	-4.87%	-3.86%	-5.97%	-2.62%	-2.75%	-4.51%
Change in Transit Trips	516	244	134	144	70	46	48	21	302	1524

AUTO EFFICIENCY	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Total Comb. Person Trips										129000
Trip Reduction Person Trips	19606	9487	6324	4849	2600	2108	1757	1546	21995	70272
Existing TRO Auto Trips	8347	4486	3163	2373	1588	1414	854	1190	16239	39654
Person To Auto Trip Ratio	2.35	2.11	2.00	2.04	1.64	1.49	2.06	1.30	1.35	1.77
TRO Trips After Strategy	7814	4217	3000	2226	1510	1359	804	1159	15791	37881
Person To Auto Trip Ratio	2.51	2.25	2.11	2.18	1.72	1.55	2.19	1.33	1.39	1.86
Efficiency Improvement										4.7%

VEHICLE MILES OF TRAVEL IMPACT (VMT)										
Total Cambridge Auto JTW VMT										1202545
Trip Reduction Auto VMT	50079	76269	34796	28480	17466	18380	11105	19035	454680	710290
TRD Auto VMT after Strategy	46883	71697	33004	26718	16615	17669	10448	18538	442138	683710
-VMT Reduction	-3197	-4572	-1793	-1762	-850	-711	-656	-498	-12542	-26580
-Percent Reduction	-6.4%	-6.0%	-5.2%	-6.2%	-4.9%	-3.9%	-5.9%	-2.6%	-2.8%	-3.7%
Resulting FTW VMT										1175965
Percent Reduction From Forecast Total JTW VMT										-2.2%
Percent Reduction From Forecast Total Cambridge VMT										-0.6%

CHANGE IN MODE SHARE

	Conditions Without Strategy:		Effects of Strategy		
	Trips	Percent Share	Revised Trips	Percent Share	Diferential
Drive Alone:	33444	47.6%	31522	44.9%	-1922
Shared Ride:	13329	19.0%	13671	19.5%	342
Transit:	17575	25.0%	19100	27.2%	1524
Other (walk, cab, bike):	5924	8.4%	5979	8.5%	55
Totals	70272	100.0%	70272	100.0%	0

Parking Test: Table 6

AER Program

(Assumes Post-1990 Construction of 7.988 M of Development)
(Assumes Annualized Adjustments Of 2.5% in Years 1-5 and 1.0% in Years 6-10)

CHANGE IN PERSON TRIPS	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Drive Alone:	-2285.10	-1210.51	-850.18	-666.56	-390.97	-311.80	-239.12	-205.67	-2797.88	-8957.82
Carpool:	274.85	168.46	212.69	160.13	114.43	137.15	94.13	100.02	1720.40	2942.26
Vanpool										
Transit:	1035.77	829.46	436.48	497.82	263.83	173.41	161.03	86.13	1050.26	4534.21
Other:	974.47	212.59	201.01	8.63	12.71	1.24	23.96	19.52	27.20	1481.33

CHANGE IN VEHICLE TRIPS	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Total Employment Auto Trips										66486
Trip Reduction Auto Trips	10110	5243	4134	3102	2075	1848	1116	1555	19119	48302
-Change in Auto Trips	-2166	-1137	-758	-597	-341	-252	-216	-162	-2050	-7679
New Trip Reduction Trips	7944	4106	3376	2505	1734	1596	901	1393	17070	40623
Percent Change Auto Trips	-23.16%	-22.24%	-18.74%	-19.23%	-16.45%	-13.62%	-19.30%	-10.42%	-10.70%	-16.22
Change in Transit Trips	1036	829	436	498	264	173	161	86	1050	4534

AUTO EFFICIENCY	Subgroup A	Subgroup B	Subgroup C	Subgroup D	Subgroup E	Subgroup F	Subgroup G	Subgroup H	Subgroup I	Total
Total Camb. Person Trips										129000
Trip Reduction Person Trips	28469	12398	8265	6337	3398	2755	2296	2020	25897	91834
Existing TRO Auto Trips	10110	5243	4134	3102	2075	1848	1116	1555	19119	48302
Person To Auto Trip Ratio	2.82	2.36	2.00	2.04	1.64	1.49	2.06	1.30	1.35	1.90
TRO Trips After Strategy	7944	4106	3376	2505	1734	1596	901	1393	17070	40623
Person To Auto Trip Ratio	3.58	3.02	2.45	2.53	1.96	1.73	2.55	1.45	1.52	2.26
Efficiency Improvement										16.9%

VEHICLE MILES OF TRAVEL IMPACT (VMT)										
Total Cambridge Auto JTW VMT										1202545
Trip Reduction Auto VMT	62682	89133	45473	37218	22823	24020	14512	24876	535343	856081
TRO Auto VMT after Strategy	49255	69799	37139	30055	19072	20742	11710	22281	477946	737997
-VMT Reduction	-13427	-19334	-8335	-7164	-3753	-3278	-2803	-2595	-57397	-118084
-Percent Reduction	-21.4%	-21.7%	-18.3%	-19.2%	-16.4%	-13.6%	-19.3%	-10.4%	-10.7%	-13.8%
Resulting FTW VMT										1084461
Percent Reduction From Forecast Total JTW VMT										-9.8%
Percent Reduction From Forecast Total Cambridge VMT										-2.5%

CHANGE IN MODE SHARE

	Conditions Without Strategy:		Effects of Strategy		
	Trips	Percent Share	Revised Trips	Percent Share	Differential
Drive Alone:	40302	43.9%	31344	34.1%	-8958
Shared Ride:	15987	17.4%	18929	20.6%	2942
Transit:	20556	22.4%	25090	27.3%	4534
Other (walk, cab, bike):	14990	16.3%	16471	17.9%	1481
Totals	91834	100.0%	91834	100.0%	0

SECTION 5

HISTORICAL GROWTH PATTERNS IN CAMBRIDGE

5.0 HISTORICAL GROWTH PATTERNS IN CAMBRIDGE

5.1 Introduction

Forecasts of future traffic and vehicle emissions in Cambridge are directly related to expectations of future growth and development within the City. The preceding analysis (Section 4.0) examined a variety of alternative growth scenarios as variations on a future condition involving the construction of between zero and 8 million square feet of development over ten years, including office, retail, research, and light industrial uses. The potential future condition of 8 million square feet of new development accounts for all projects currently planned or permitted for the City of Cambridge, as documented by the Cambridge Community Development Department. A range of zero to 8 million square feet was used in the preceding analysis since there can be no certainty as to how much of the proposed development will actually occur.

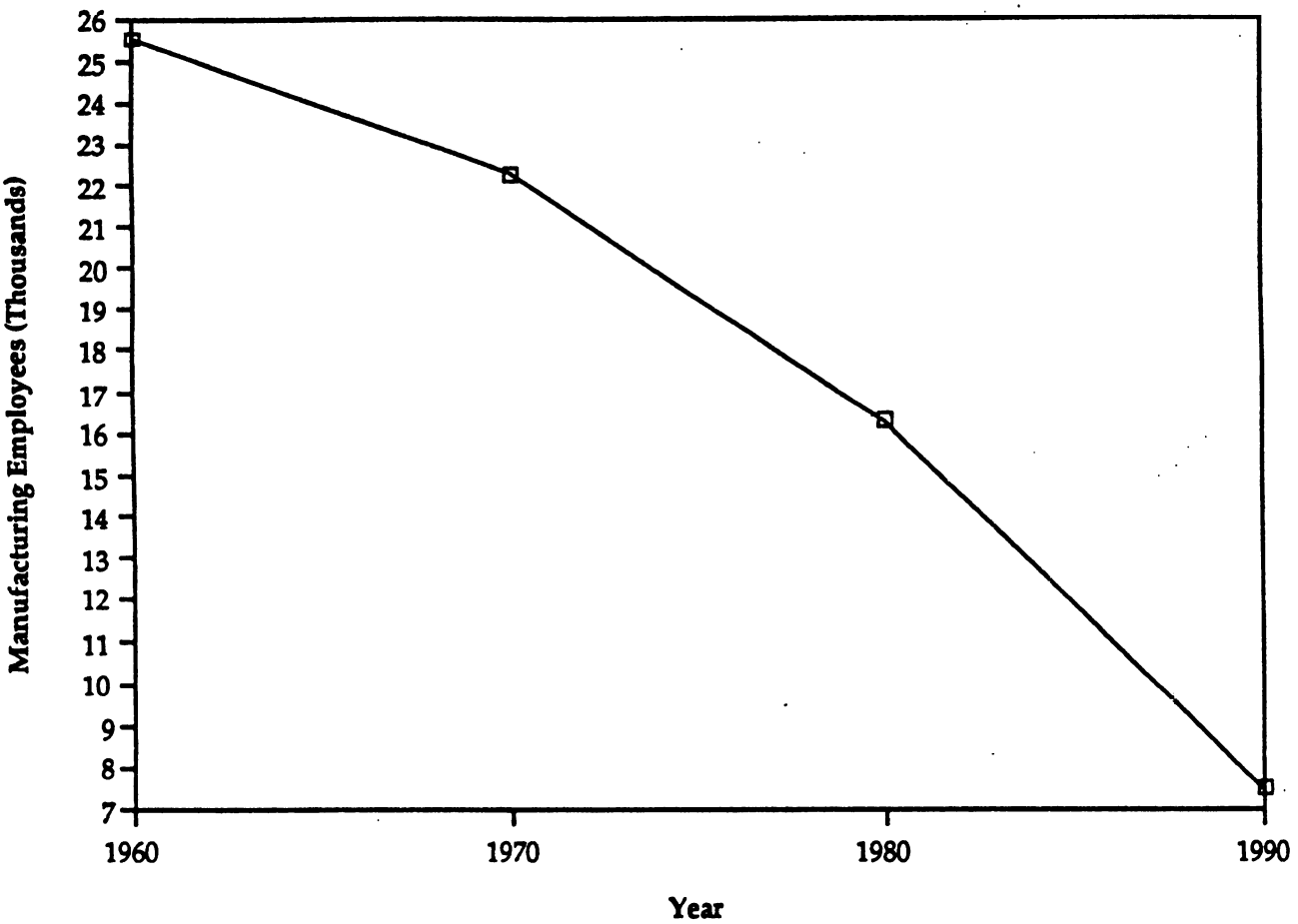
The extent of new development is an important factor used in determining how many people will be working, and, to some extent, living within the City of Cambridge in the foreseeable future. More jobs and/or population means more vehicle travel and more vehicle emissions. The future development scenario based on 8 million square feet of new development is roughly consistent with the amount of development which occurred in Cambridge from 1980 to 1990, and assumes that this level of development would continue unabated over the next 10 year period. In terms of traffic and air quality impacts, this would be considered a "worst-case" scenario. However, it is important to also understand that rate of development which occurred from 1980 to 1990 is unprecedented in the documented history of Cambridge. Therefore, the question of what constitutes reasonable expectations of future development must be addressed.

The purpose of the following discussion is to provide an historical context relevant to past patterns of growth in Cambridge in order to better comprehend the potential for new development into the future and better assess whether the growth patterns of the 1980's will continue through to the 21st century.

5.2 General Trends in Employment

Since World War II, changes in employment in Cambridge have been characterized by a shift from an industrial base to a predominantly service and research base. This shift has resulted in changes in land use which have converted previously industrial areas such as Kendall Square and Alewife to predominantly office uses. Figure 5.1 illustrates the decline in manufacturing employment within Cambridge over the past 30 years, a decline of over 70 percent. These changes began in the 1940's with the expansion of the Massachusetts Institute of Technology's research programs, including the Radiation Laboratory, Draper Laboratory, and other sponsored research activities. These programs produced numerous spin-off businesses which were either products of this research or providers of support services. Evolution of this base was characterized in the 1950's by a growth in defense contracting, in the 1960's by aerospace (NASA) and Department of Transportation programs, in the 1970's by the advent of the bio-technology industry, and in the 1980's by growth in all these areas in addition to expansion of computer-related research and development.

Figure 5.1 City of Cambridge: Manufacturing Employment



Current trends, due in part to a weak economy and reduced public-sector funding for research, indicate stabilization and some reductions in employment in these areas. Consistent with this trend, Cambridge is presently experiencing an office space vacancy rate of 13 percent (Source: CCDD) and no current building activity related to construction of new commercial space.

5.3 Changes in Population and Employment

Population data is available for the City of Cambridge back to the year 1900. These data are shown in Table 5.1 and Figure 5.2. In terms of absolute growth, the City's population experienced its most significant increase between 1900 and 1910 due in large part to an influx of European immigrants. The City's population continued to grow over the next two decades before declining slightly between 1930 and 1940, the period coinciding with the Great Depression. Following World War II, Cambridge population peaked with over 120,000 residents, coinciding with the post-war "baby boom." This was followed by a period of steady population decline over the next 30 years, due in part to urban out-migration and declining household size. Between 1980 and 1990, population stabilized with 96,000 residents in 1990. 1990 population was approximately 20 percent below the peak level of 1950.

Because of changes in coverage under the Massachusetts Employment Security Law (MESL), data available from the Massachusetts Department of Employment and Training (MDET) do not provide a consistent tally of Cambridge employment over time. These data are useful, however, for identifying overall trends in employment. Data are available beginning in 1958. From 1958 through 1971, coverage under MESL was not provided to government employees or employees of non-profit organizations, state institutions of higher learning, and state hospitals. The available data, therefore, do not include these classes of employees. From 1972 through 1979, the data do not include government employees. From 1980 onwards, because of changes in MESL coverage, the data include all government employees.

Because of the inconsistencies in the MDET data, total employment figures for Cambridge are shown in Table 5.2 and Figure 5.3 for 3 periods. Cambridge's total covered employment in 1958 was just over 59,000. By 1971, it was just over 62,000, indicating a growth of 5.2 percent over 14 years. The next data period, which included coverage of employees of non-profit organizations, began in 1972 with total employment of approximately 86,000. 8 years later, coinciding with the recession of the 1970's, employment had dropped to just below 84,000, a decline of 2.5 percent or just over 2,000 employees. The next data period, beginning in 1980, accounts for extension of coverage to government employees. During the 11 years for which data are available, employment grew from 92,000 to over 103,000, a total growth of 12.2 percent. MDET data indicate that the employment sector showing the greatest increase during this period was services, which grew by nearly 44 percent.

As shown in Figure 5.4, employment has grown dramatically in the last 5 years for which data are available. By 1985, total employees in Cambridge actually exceeded the total of residents. (Approximately 28 percent of Cambridge employment is held by Cambridge residents.)

5.4 Changes in Growth Rates

In order to discern patterns in growth and development from these data, relative growth rates were examined over time. Figure 5.5 shows relative annual growth rates for population, beginning in the decade from 1900 to 1910. This figure shows a steadily declining rate of growth from 1900 to 1940. Between 1930 and 1940, there was a negative growth rate reflecting a

Table 5.1 Cambridge Population (1900 to 1990)

Year	Population	Annual Growth	10 Year Growth
1900	91,886		
1910	104,839	1.33%	14.1%
1920	109,694	0.45%	4.6%
1930	113,643	0.35%	3.6%
1940	110,879	-0.25%	-2.4%
1950	120,740	0.86%	8.9%
1960	107,716	-1.13%	-10.8%
1970	100,361	-0.70%	-6.8%
1980	95,322	-0.51%	-5.0%
1990	95,802	0.05%	0.5%

Source: "Transportation Facts," CTPS, 1983; MAPC; 1990 U.S. Census.

Figure 5.2 City of Cambridge: Population 1900-1990

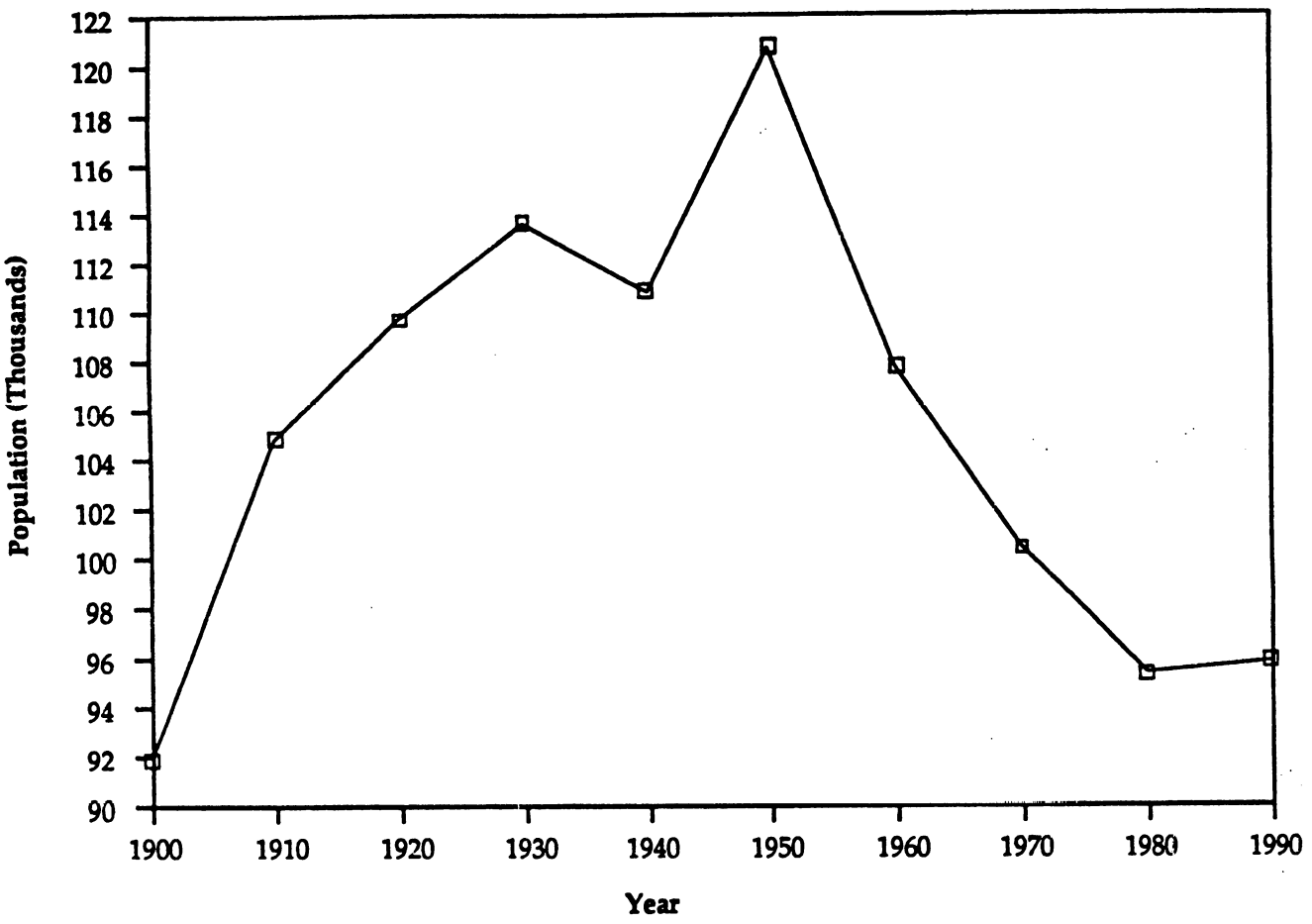


Table 5.2 Cambridge Employment (1958 to 1990)

Year	Covered Employment (1)	(2)	(3)	Annual Growth	Average Annual Growth for Decade
1958	59,270				
1959	60,172			1.52%	
1960	61,196			1.70%	1.6%
1961	60,676			-0.85%	
1962	60,539			-0.23%	
1963	62,865			3.84%	
1964	61,999			-1.38%	
1965	60,409			-2.56%	
1966	63,683			5.42%	
1967	65,798			3.32%	
1968	65,592			-0.31%	
1969	68,162			3.92%	
1970	65,678			-3.64%	0.8%
1971	62,367			-5.04%	
1972		86,153			
1973		86,111		-0.05%	
1974		85,834		-0.32%	
1975		78,471		-8.58%	
1976		80,032		1.99%	
1977		79,094		-1.17%	
1978		83,325		5.35%	
1979		83,976		0.78%	
1980			92,044		-0.9%
1981			92,363	0.35%	
1982			90,602	-1.91%	
1983			90,724	0.13%	
1984			96,192	6.03%	
1985			94,848	-1.40%	
1986			97,073	2.35%	
1987			98,686	1.66%	
1988			100,621	1.96%	
1989			102,043	1.41%	
1990			103,278	1.21%	1.2%

Notes: (1) Excludes government and non-profit organization employees.
(2) Excludes government employees.
(3) Total employees.

Source: Massachusetts Department of Employment and Training.

Figure 5.3 City of Cambridge: Total Employment

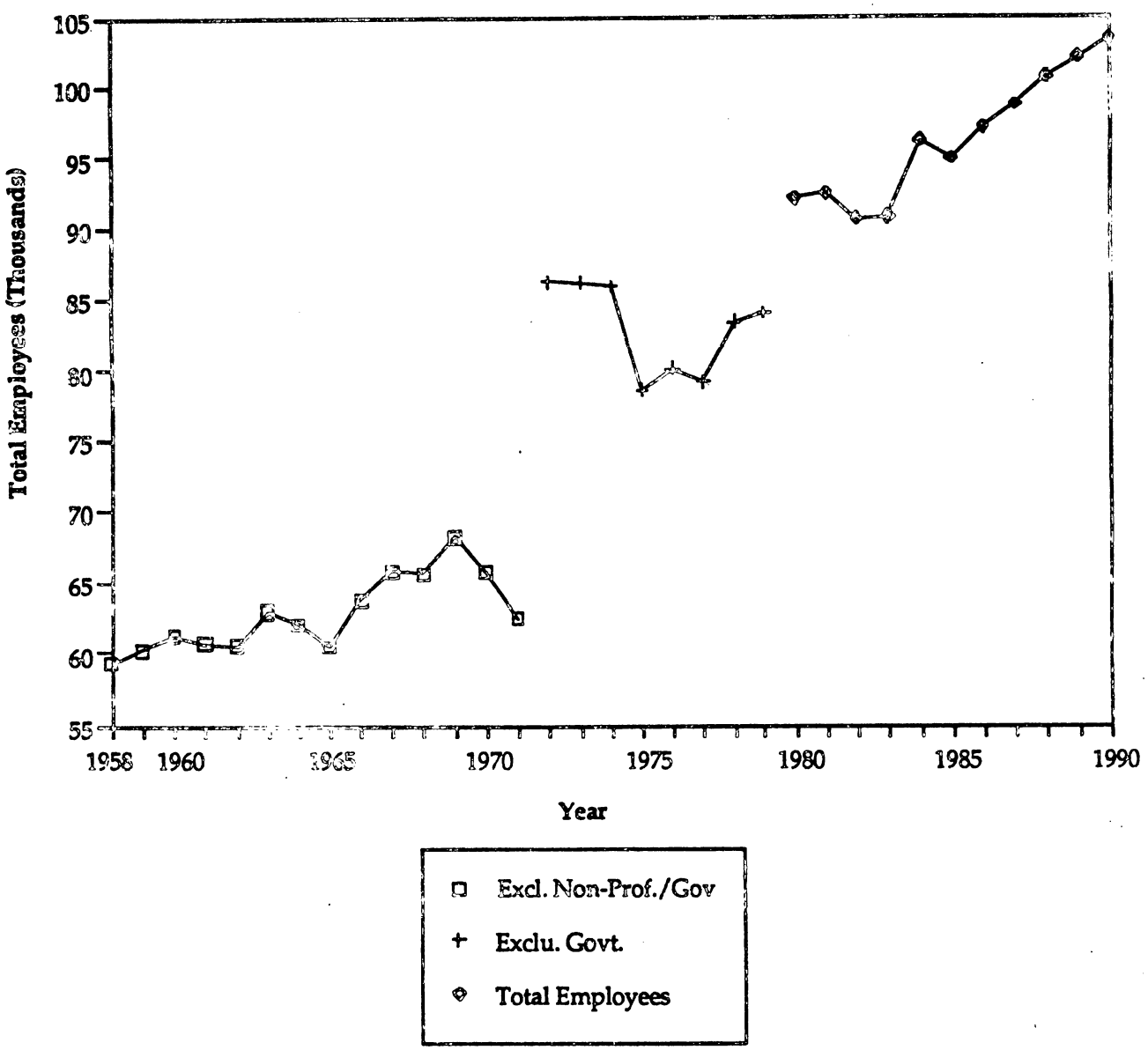


Figure 5.4 City of Cambridge: Population and Employment: 1980-1990

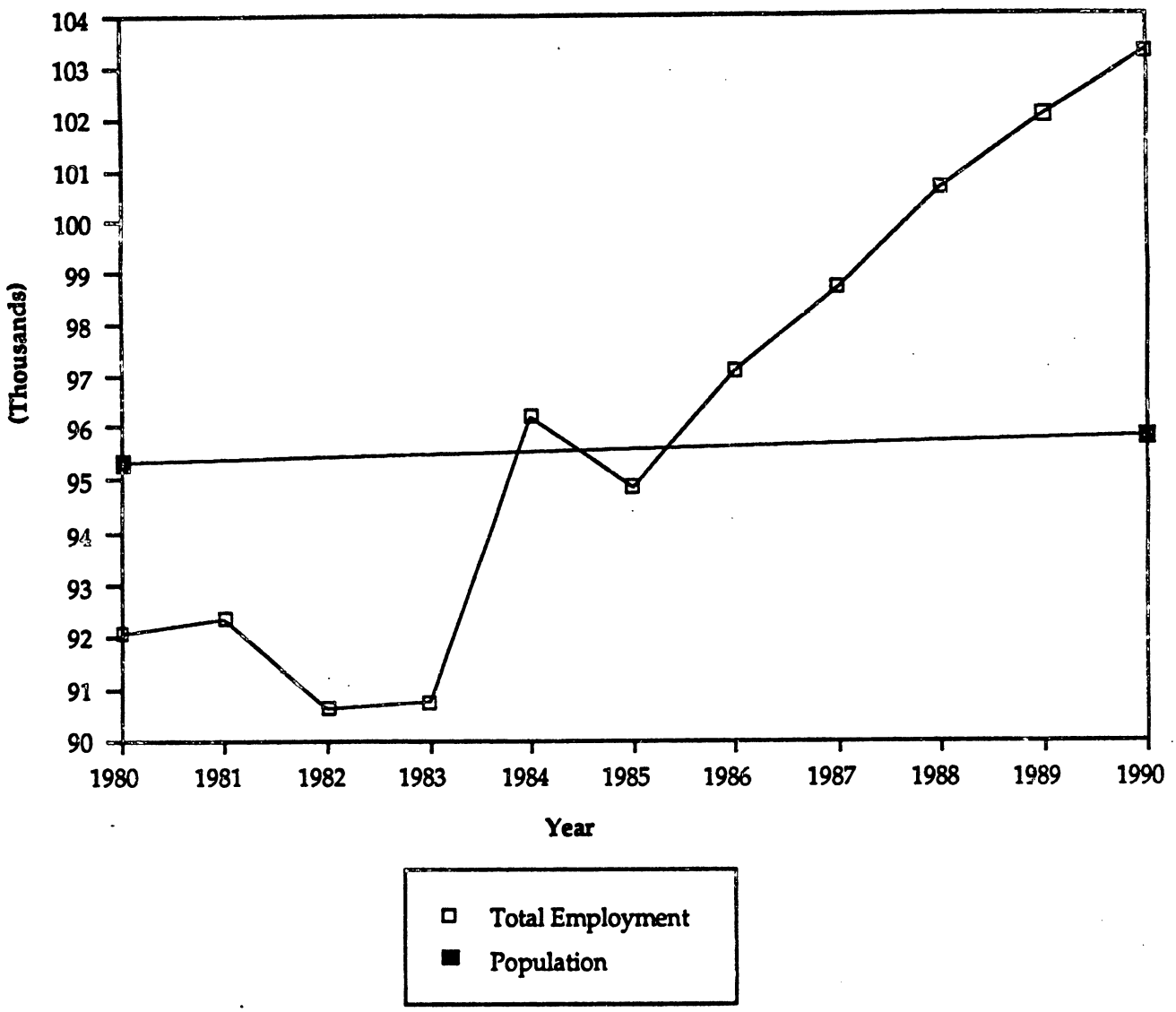
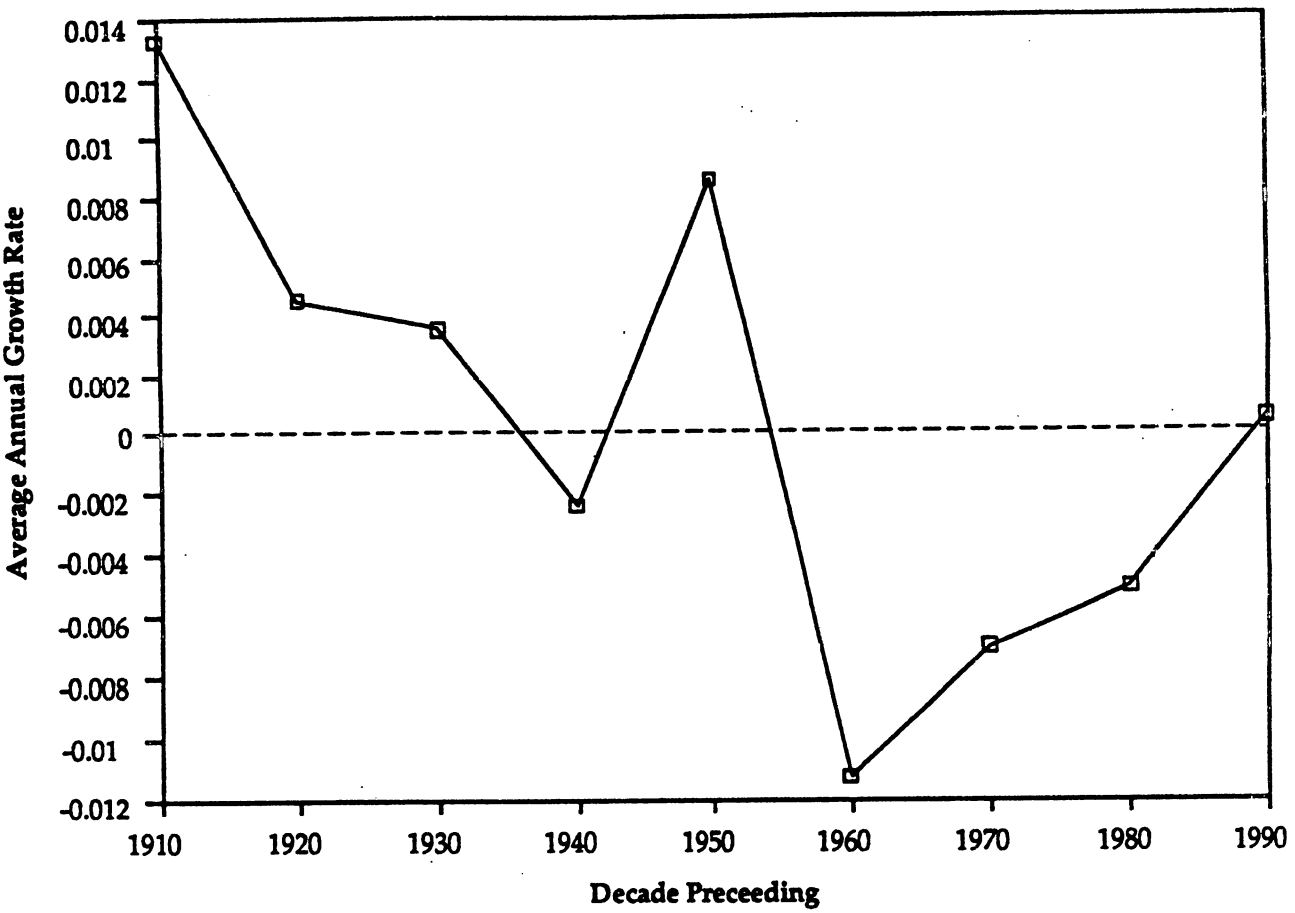


Figure 5.5 City of Cambridge: Average Annual Population Growth Rate



net loss of population. This pattern changed in the decade encompassing World War II when the annual growth rate was nearly 1 percent. This was followed by a thirty year period, from 1950 to 1980, of negative growth. However, the rate of negative growth became less significant over time, so that by 1980, population had stabilized with virtually no growth between 1980 and 1990.

Figure 5.6 illustrates annual growth trends for employment. (It should be noted that the transition periods between different MDET employment coverages are omitted.) As shown in the figure, the annual rate of growth can fluctuate widely, generally varying between a positive rate and a negative rate from year to year. The only period shown in the graph with a consistent rate of positive growth in consecutive years was from 1985 to 1990, the period of greatest overall growth in employment for which data are available. As shown in the figure, this steady rate of growth is unprecedented in the past 32 years. Figure 5.7 summarizes average annual growth rates for 10 year intervals, again illustrating the City's generally declining employment growth rate prior to 1980 and dramatic increase in employment growth from 1980 to 1990.

5.5 Conclusions

Review of historical population and employment growth in the City of Cambridge puts recent growth trends, those occurring in the high growth period of the late 1980's, into context. As indicated, the growth of employment in Cambridge which occurred during this period was atypical and does not represent an overall historic trend for the City. Employment in the preceding decades was characterized by declining growth rates and actually experienced negative growth from 1970 to 1980. Population also experienced steady periods of declining growth rates, with the post-World War II baby-boom period as the primary exception. These trends should also be considered in conjunction with current regional economic conditions and the absence of any new development activity within the City of Cambridge.

In summary, it is reasonable to conclude that the strong growth in employment and development which occurred in the late 1980's is not likely to persist into the 1990's. Furthermore, significant increases in population appear unlikely. As a result, the rate of growth in vehicle miles of travel is likely to decline. Assuming this to occur, expectations of a full build-out of the proposed 8 million square feet of new development in Cambridge is, in fact, a worst-case scenario in terms of VMT growth. It is more likely that increases in VMT during the next 10 to 20 years will occur at a slower rate than what occurred in the 1980's.

Figure 5.6 City of Cambridge: Average Annual Employment Growth Rate

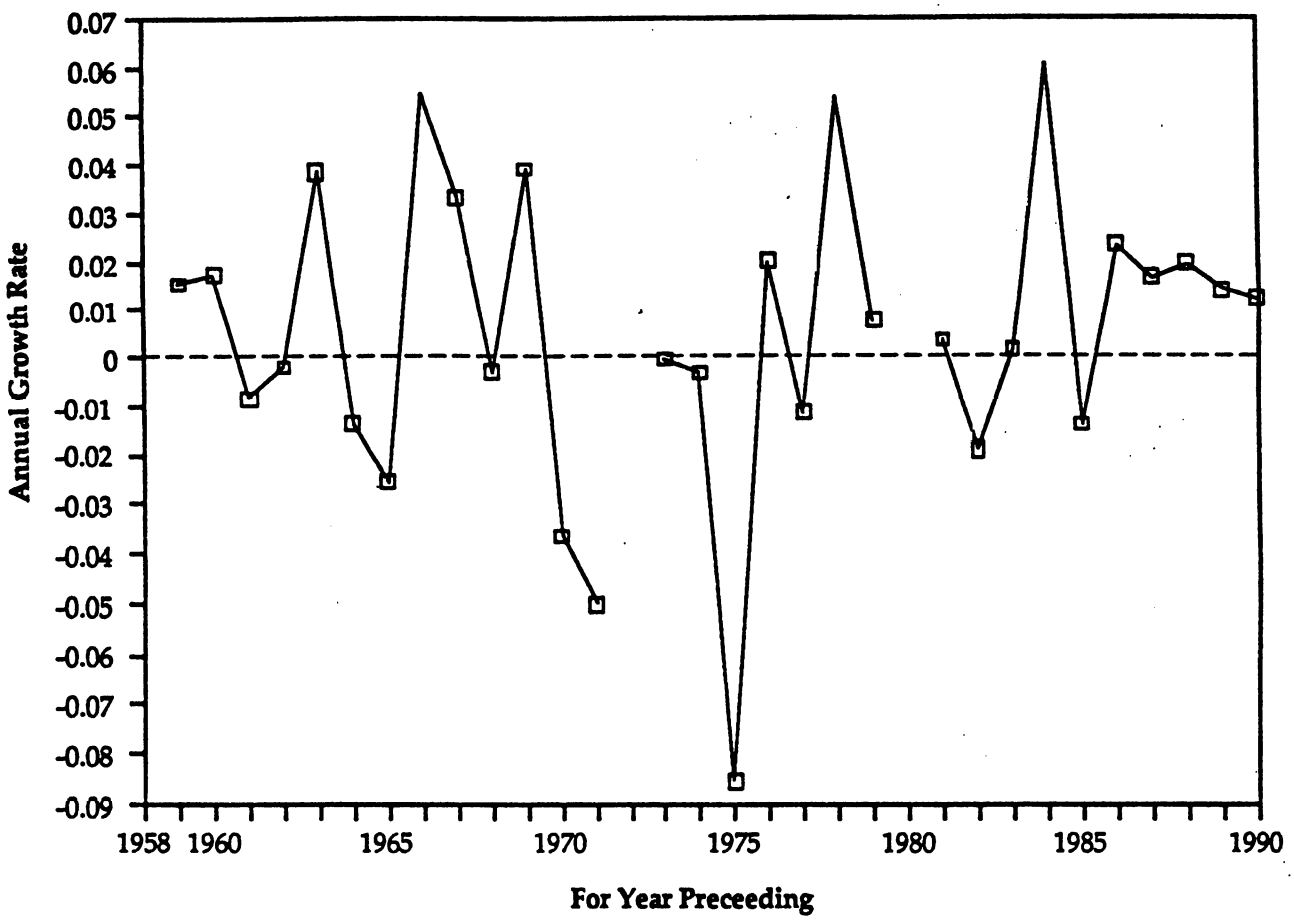
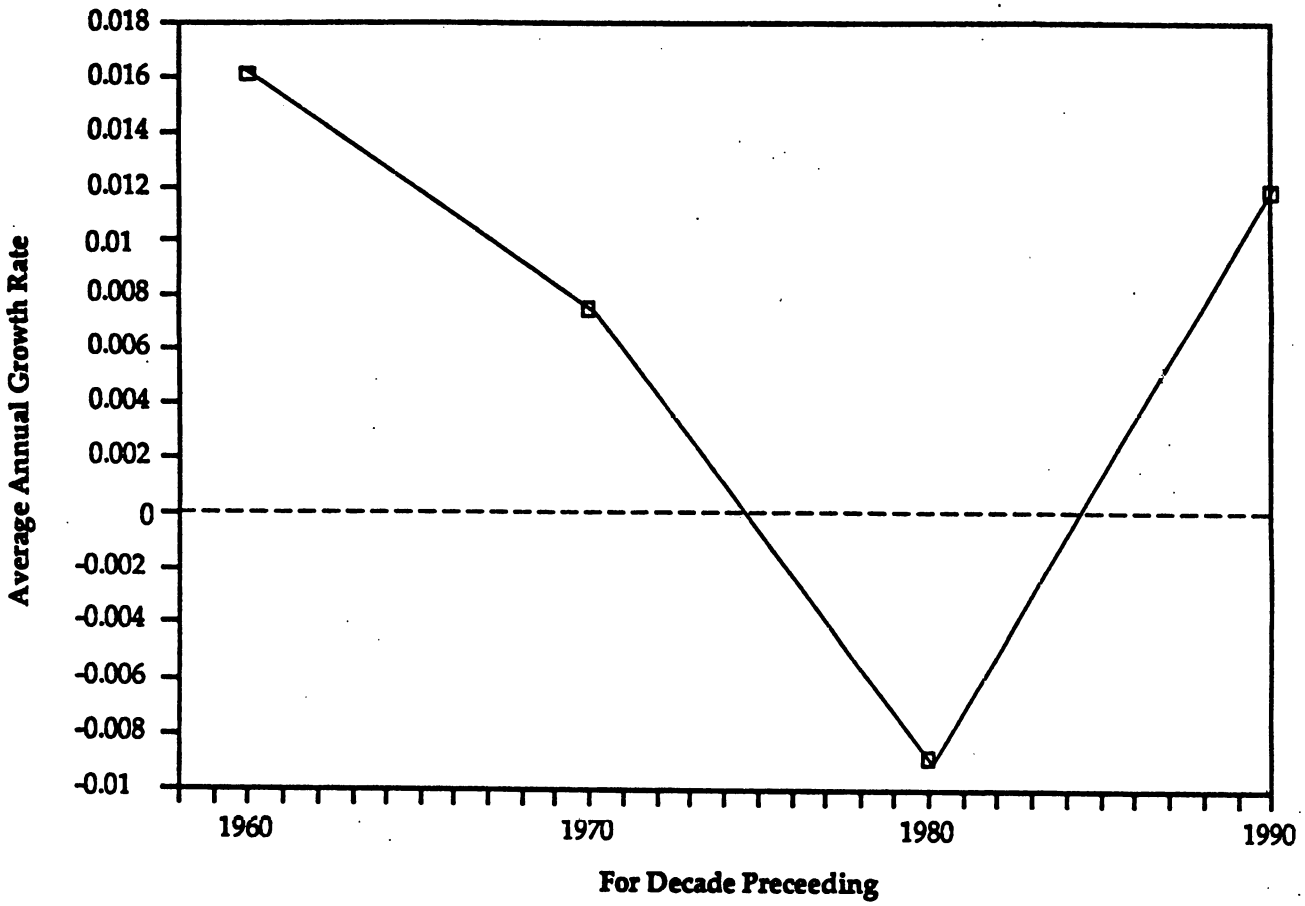


Figure 5.7 City of Cambridge: Average Annual Employment Growth



Vehicle Trip 029

April 27, 1992