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BENEFIT-COST ANALYSIS OF INTEGRATED PARATRANSIT SYSTEMS
Volume 3:
Scenario Analyses

Multisystems, Inc.
Cambridge MA 02138

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FINAL REPORT

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16. Abstract

This study systematically estimates potential impacts of a range of integrated transit/paratransit options and policies in a variety of settings and compares them with impacts of transportation alternatives.

The study concludes that, in general, integrated paratransit with fares closer to fixed-route transit than exclusive-ride taxi will result in net paratransit operating deficits. However, in some instances, the benefits of integrated paratransit options in terms of improved service levels and mobility, reduced auto expenditures and other impacts appear to offset these operating deficits. Necessary factors for this include high paratransit productivities, possibly achieved by implementing hybrid, fixed-route/demand responsive service; and low operating costs, possibly achieved by contracting with private operators. Integrated paratransit was found to have a positive but insignificant impact in reducing automobile usage and ownership, but no measurable impact on vehicle miles travelled, fuel consumption, or emissions. Promising locations for paratransit implementation are those areas with population densities between 3,000 and 6,000 persons per square mile and limited existing transit service. The most promising paratransit concepts appear to be checkpoint many-to-many service, route deviation service, automated doorstop service with high vehicle densities and vanpool service. The results of the study further suggest that paratransit service demand is sensitive to fare; fare increases above $.25 were determined to be counterproductive, while free transfers from feeder services to line haul became an inducement to use paratransit. The study also concluded that digital communications and automated dispatching systems are potentially cost-effective technological innovations.

This is the third volume of the six volume series documenting this study. This volume describes the scenario analyses of the integrated paratransit options and alternatives and provides the resulting conclusions.

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PREFACE

Integrated paratransit (IP) service is a concept which involves the integration of conventional fixed-route transit services with flexible, demand-responsive services in order to best serve emerging urban development patterns. Despite the emphasis that has been placed on the analysis and demonstration of paratransit concepts in recent years, there is still considerable confusion and disagreement concerning the impact of paratransit service deployment. To learn more about the capability of IP to meet the transit needs in the urban/suburban environment, the Urban Mass Transportation Administration sponsored a study to identify and define the benefits due to and the costs associated with the deployment of various hypothetical IP systems. The work was performed by Multisystems, Inc. in association with Cambridge Systematics, Inc., and Applied Resource Integration Ltd. under contract to the Research and Special Programs Administration's Transportation Systems Center. Richard Gundersen was Technical Monitor of the study. The Final Report was edited by Larry Levine.

The results of the study are documented in a Final Report which consists of the following six volumes:

- Volume 1 - Executive Summary
- Volume 2 - Introduction and Framework for Analysis
- Volume 3 - Scenario Analyses
- Volume 4 - Issues in Community Acceptance and IP Implementation
- Volume 5 - The Impacts of Technological Innovation
- Volume 6 - Technical Appendices.

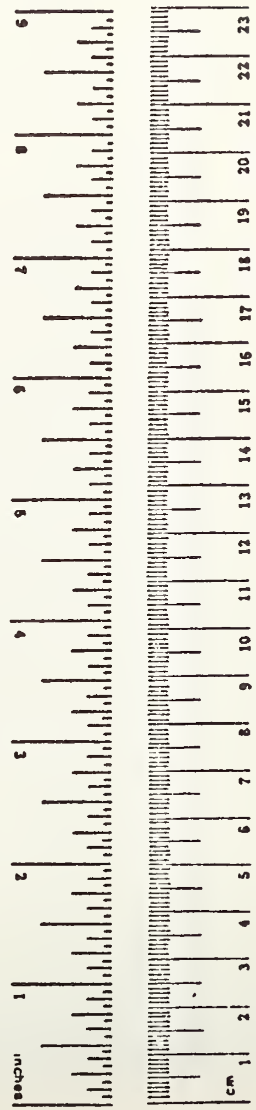
This is Volume 3 - Scenario Analysis. Multisystems, Inc. had primary responsibility for the work which let to this volume, with considerable support throughout from Cambridge Systematics, Inc. This volume describes the scenario analyses of the integrated paratransit options and provides the resulting conclusions. A Bibliography is included in this volume.

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

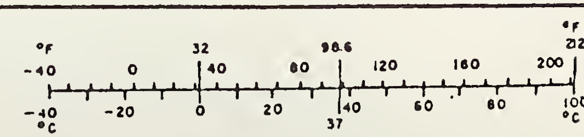
Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures. Price $2.25, SD Catalog No. C13.10:286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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Overview

INTRODUCTION

This is the third volume of a six-volume report documenting the results of a study entitled "Benefit-Cost Analysis of Integrated Paratransit Systems." This volume provides detailed results of a series of scenario analyses designed to determine the impacts of various integrated paratransit (IP) configurations and other, more conventional, alternatives in a variety of settings. These transportation options are analyzed for the year 1980; the IP scenarios are also analyzed for the year 2000.

THE SETTINGS

A total of seven settings were selected for the scenario analysis. Each setting is intended to be prototypical of a larger group of urban areas which share some basic similarities. The groups of similar urban areas were grouped together in a city classification task, using a cluster analysis approach. Essentially, this approach groups together areas which display similarities along a set of dimensions represented by input factors. (This task is described fully in Volume 2.) The seven selected settings are, combined, intended to be representative of all SMSAs[1] (urbanized areas with populations greater than 50,000) in the United States, with the exception of New York City. This structure enables the impacts of IP in a variety of different types of areas to be considered and, at the same time, provides a mechanism for aggregating impacts to the national level. The general characteristics of the seven groups of urban areas are described in Exhibit 1.

In keeping with the concept of each setting representing a prototypical urban area, the settings are not identified. Instead, a set of pseudonyms have been adopted. These names are intended to convey some information about one of the characteristics which

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[1] Standard Metropolitan Statistical Area

Exhibit 1

Characteristics of Urban Area Groups

Group	General Characteristics
Group 1	Moderately small, mostly southern cities, with low central city density; high concentration of single-family housing in urban area, and low income. "Most representative": Augusta, Georgia.
Group 2	Small city, with a moderately low central city density but also a low percentage of single-family dwellings, very low elderly population, high auto ownership, and low transit use. Many of the cities are college towns. "Most Representative": Reno, Nevada.
Group 3	Small to medium-size cities, predominately southern and southwestern, with low central city density, high percentage of single-family dwellings, high central city population and employment, high auto ownership, and low transit usage. "Most representative": Albuquerque, New Mexico.
Group 4	Medium-size cities, with low to medium central city population and high percentage of single-family dwellings, high auto ownership, and low transit usage. Very "average" characteristics in general. "Most representative": Grand Rapids, Michigan.
Group 5	Moderately small, mostly northeastern manufacturing cities, with a low percentage of single-family dwellings, very high elderly population, low auto ownership, relatively low income, and relatively high transit use. "Most representative": Portland, Maine.
Group 6	Fairly large, primarily midwestern and northeastern older cities with high central city family density, low central city population (as percent of total), fairly large elderly population, fairly low central city employment, and relatively high transit usage. "Most representative": Cincinnati, Ohio.
Group 7	Major metropolitan areas with large population, high density, moderately low single-family dwellings, low auto ownership, and high transit use. "Most representative": San Francisco, California.

is common to many, or all, of the urban areas in the represented group. Thus, for example, since virtually all of the cities in Group #1 are located in the South, this setting has been named "Southern Belle."

Despite the use of pseudonyms, all site descriptive data utilized were real data. In addition, the base case transit system described for each setting is the actual system in place in that setting. The data sources used for each setting are listed in the Bibliography at the end of this volume, and the data are included in Appendix B. Some key characteristics of each of the settings are presented in Exhibit 2. Note that the settings are not presented in any particular order.

IP SCENARIO DEVELOPMENT

A minimum of two IP scenarios were developed for each setting for the year 1980. System design was based on rough guidelines concerning population density, the nature and extent of fixed route transit service, and the location of employment and other major activity centers. However, the motivating force guiding the development of the scenarios was the necessity to test different IP service concepts and configurations. Each of the scenarios developed are "reasonable," in the sense that the levels of coverage, vehicle densities, service concepts, etc., are not too dissimilar from those of existing or proposed services. No attempt was made to develop "best" or optimum systems for each setting. In the first place, such a development effort would have required intimate familiarity with the service area and sufficient resources to test a wide range of options, neither of which could be achieved within the context of this study. In the second place, it is unclear whether the development of "optimum" systems would have resulted in realistic projections of impacts since, in all likelihood, many of the systems which actually would be implemented in a given city would not prove to be the best possible design. Moreover, the intention of the study was to assess the impact of different IP system designs and policies and not to design the best IP system.

Exhibit 2

Key Setting Characteristics

Setting	Projected 1980 Central City Population	Central City Pop. Density (persons/sq mi)	Projected 1980 Urban Area Population	Urban Area Pop. Density (persons/sq mi)	1980 % Elderly (Urban Area)	Annual Transit Ridership (1976)
1: "Southern Belle"	55,300	5530	177,000	3210	8	1,910,000
2: "College Town"	100,000	5260	142,000	3260	5	1,815,000
3: "Sun City"	408,442	4300	460,800	3460	6	3,720,000
4: "Mid-American City"	202,447	4509	339,000	3025	12	2,920,000
5: "Mill Town"	93,850	6900	118,730	4240	13.5	2,860,000
6: "Large City"	586,000	7720	1,577,300	3535	13	92,944,578
7: "Metropolis"	609,000	13200	2,408,000	4816	10	140,000,000

Bear in mind that at least two IP scenarios were considered for each setting, and that the dominant alternative has been identified. Furthermore, comparisons across settings will allow additional conclusions to be drawn regarding the types of services which may make more sense in portions of a given area; e.g., comparisons may be made between different areas with similar population densities. Thus, although no explicit attempt is made to develop optimum alternatives, the analyses do identify preferable options for each setting.

In Volume 2, an IP classification scheme which categorized IP systems according to a few major factors was developed. The extent to which different categories and subcategories of IP systems have been considered in the analysis is illustrated in Exhibit 3. Each of the scenarios is briefly characterized in Exhibits 4 and 5.

ALTERNATIVES TO IP

In addition to comparing the impacts of different IP services, the study compared the impacts of IP systems with the impacts of more conventional fixed route and exclusive-ride taxi services. The fixed route bus alternatives were introduced in the service areas in which paratransit service was analyzed. Extended fixed-route bus options range from fairly low coverage and frequency to fairly high coverage and frequency, in an attempt to emulate IP service quality. The intention of the analyses is to help identify the circumstances in which fixed route service is superior to IP and the circumstance in which IP is superior. In most cases, the fixed route alternatives are compared to the "best" of the IP scenarios considered. The extended taxi options included alternatives with no public involvement (e.g., expanded vehicle fleet size) as well as alternatives with some public involvement (e.g., user-side subsidy, capital grants). The alternatives developed for all settings are characterized briefly in Exhibit 6.

The impacts of the extended fixed route and taxi alternatives are presented in the identical format to the IP alternatives. Certain taxi impacts, however, were omitted because of the following

Exhibit 3

IP Systems Considered

FACTOR	CATEGORY	SETTING/SCENARIO
SERVICE PATTERN	Many-to-many	1B,2B,2C,3A,3B,4A,4B,4C 4D,5B,6A,6B,7A,7B
	Checkpoint many-to-many	1A
	Limited doorstep	2A
	Limited checkpoint	5A
	Hybrid doorstep/fixed route	1B,3A,3B
	Hybrid checkpoint/fixed route	1A
DISPATCH STRATEGY	Dynamic Dispatch	1A,1B,2B,2C,3A,3B,4A,4B, 5B,6A,6B,7A,7B
	Discrete Run Time	2A,5A
	Subscription	1A,7A,7B
OPERATING ENTITY	Public	1A,1B,2A,2B,3A,3B,4A,4B, 4C,4D,5A,5B,6A,6B,7B
	Private	2C,3B,4A,4B,4C,4D,6A,6B, 7A
TARGET MARKET	General Population	All
	Special Groups	2A,2B,2C,4A,4B,4C,4D,7A, 7B
SERVICE MIX	Single Paratransit with Fixed Route	2B,2C,5A,5B
	Multiple Paratransit with Fixed Route	1A,1B,2A,4A-D,6A,6B
MODULARITY	Single Zone	2A,2B,5B
	Multiple Zone	1A,1B,2A,3A,3B,4A-D,5A, 6A,6B,7A,7B
INTEGRATION	Uncoordinated Transfer	1B,2B,2C,3A,3B,4A-D,5B, 6A,6B
	Coordinated Transfer	1A,2A,5A,7B
ADMINISTRATION	Public: Single Operator	1A,1B,2A,2B,3A,5A,5B
	Public: Multiple Operator	2C,3B,4A-D,6A,6B,7A,7B

Note: 1B = Setting 1, Scenario B, etc.

Setting 1 - "Southern Belle"
Setting 2 - "College Town
Setting 3 - "Sun City"
Setting 4 = "Mid-American City"
Setting 5 = "Mill Town"
Setting 6 = "Large City"
Setting 7 = "Metropolis"

Exhibit 4

Comparison of 1980 IP Setting/Scenario Characteristics

	1980 Urban Area Population	1980 Population of Paratransit Service Areas	Area of Paratransit Service Areas (sq. mi.)	Service Area Population Density	Number of Paratransit Vehicles
"Southern Belle"	177,000				
Scenarios A, B		100,700	31.6*	3,111	46*
"College Town"	142,000				
Scenarios A, B, C		78,000	16.5**	4,730**	42**
"Sun City"	460,800				
Scenario A		100,000	26.7	3,745	16
Scenario B		100,000	26.7	3,745	19
"Mid-American City"	339,000				
A, B, C, D Peak		54,000	26.1**	2,070**	26**
A, B, C Off-peak		151,000	55.2	2,735	31
D Off-peak		304,000	84.3	3,606	53
"Mill Town"					
Scenario A	118,730	18,400	14.1	1,305	6
Scenario B		12,500	9.8	1,275	4
"Large City"	1,577,300				
Scenarios A, B		1,577,300	434.8	3,627	229
"Metropolis"	2,408,000				
Scenario A		85,926***	52.0	5,265	38
Scenario B		156,044***	108.0	4,913	70

* Vanpool excluded

** Special areawide TH service excluded

***Includes only eligible population (i.e., TH in one zone)

Exhibit 5

Characteristics of 1980 IP Scenarios

Setting	IP Scenarios
1: "Southern Belle"	A: Checkpoint many-to-may service in 3 suburban zones. Checkpoint route deviation service in fourth zone. Publicly operated. B: Doorstep many-to-many service in 3 suburban zones. Doorstep route deviation service in fourth zone. Publicly operated. Vanpool to major employers in A and B.
2: "College Town"	A: Cycled many-to-one service in 14 zones throughout central city, feeding four fixed routes. Publicly operated. B: Doorstep many-to-many system (flat fare) overlaid on fixed route. Publicly operated. C: Doorstep many-to-many system (mileage based fare) overlaid on fixed route. Privately operated.
3: "Sun City"	A: Route deviation replacing 6 parallel fixed routes in 1 zone. Doorstep many-to-many replacing some fixed routes in 2nd. Publicly operated. B: Services same as in A. Many-to-many service privately operated.
4: "Mid-American City"	A: Peak hour cycled many-to-one feeder service in 4 suburban zones. Some fixed routes shortened. Off-peak many-to-many service in expanded zones. Fixed routes cut back. 25¢ paratransit fares. Publicly operated. Privately operated areawide door-to-door service for TH. B: Services same as A. Paratransit fare increased to 75¢. C: Services same as A. Paratransit fare increased to $1.25. D: Peak hour service and fare as in B. Off-peak DRT service expanded throughout area, fixed route substantially cut back.

Exhibit 5 (Cont.)

Characteristics of 1980 IP Scenarios

Setting	IP Scenarios
5: "Mill Town"	A: Checkpoint cycled many-to-one feeder service in four suburban zones. Jitney shuttle replaces 1 fixed route. Publicly operated. B: Doorstep many-to-many in 1 large suburban zone. Jitney service as in A.
6: "Large City"	A: Doorstep many-to-many service overlaid on fixed routes in many zones throughout urban area. Inner zones publicly operated, outer zones privately operated. No free transfer. B: Service same as in A, but free transfer allowed.
7: "Metropolis"	A: Various DRT services in two suburban zones. TH subscription service in inner-city area. All privately operated. B: Expansion of A, including: Privately operated feeder to commuter rail in two suburban zones, with off-peak circulator service in one. Publicly operated rapid transit feeder and off-peak circulator in one inner suburban zone. Taxi company operated shared-ride feeder to express bus in one inner suburban zone.

Exhibit 6

Characteristics of Alternatives to IP

Setting	Extended Fixed Route	Extended Exclusive-Ride Taxi
1: "Southern Belle"	Radial routes extended to suburbs.	Area wide user-side subsidy. General public fare reduced 25%; elderly fare reduced 75%.
2: "College Town"	Extensive city-wide net work. Radial and crosstown.	Capital subsidy for taxi fleet expansion.
3: "Sun City"	Extensive coverage in two service areas.	Effective user-side subsidy in two service areas. Fare reduced to 35¢.
4: "Mid-American City"	Expanded coverage in suburban areas, including crosstown routes.	Low-interest loans used to aid industry in expanding fleet.
5: "Mill Town"	Expanded coverage into portion of suburban areas.	Subsidized taxi feeder service in three suburban zones.
6: "Large City"	Expanded service in suburban areas. Expanded frequency in central city.	User-side subsidy. Fare 25% within community zones.
7: "Metropolis"	Expanded service in suburban portions of urban area.	User side subsidy to provide feeder service to major rail transit and express bus service for a 25¢ fare.

considerations:

1. The "change in transit trip" impact, which excluded the impact on taxi trips in other scenarios, is omitted in these analyses. In its place, the total increment in taxi trips is presented.

2. It is assumed that no transit employees lose their jobs because of diversion of passengers to taxis.

3. The change in automobile expenditures is computed only in instances where the taxi fare is reduced, since it is assumed that changes in taxi service levels will not impact auto ownership.

4. The impacts on parking lot operators and social service agencies were assumed to be relatively minimal, and, thus, these impacts have been ignored.

YEAR 2000 SCENARIOS

In addition to the year 1980 analyses a number of IP scenarios were specified for each setting for the year 2000. These analyses were intended to consider the potential impact of IP in the near future, when population density, household characteristics, age characteristics, and transportation costs can be expected to change. In some cases, the year 2000 IP scenario was assumed to be a continuation of the 1980 system. The intention behind these scenarios was to test whether the same IP concept will have different impacts under future conditions. In other cases, the systems were changed slightly in response to projected development patterns and/or the ability of paratransit to stimulate transit demand leading to the need for a higher capacity system. Basic year 2000 setting and scenario characteristics are presented in Exhibit 7.

The analysis of year 2000 scenarios required many assumptions about future conditions. To the fullest extent possible, other studies which focused on future conditions were used to estimate the extent of changes that will occur by the year 2000. Local projections of demographic characteristics were used for each setting, although, in some cases, out-of-date projections were updated. Data sources are listed in the Bibliography, and all assumptions regarding the year 2000 analyses are summarized in Appendix B.

Exhibit 7

Comparison of IP Setting/Scenario Characteristics, Year 2000

	Urban Area Population	Avg. Autos per Household Level 1	Level 2	Population of Paratransit Service Areas	Area of Paratransit Service Areas (sq. mi.)	Population Density	Number of Paratransit Vehicles
"Southern Belle"	226,000	1.20	1.10	85,800	37.2*	2,306*	33*
"College Town"	177,000	1.67	1.60	122,000	22.5**	5,420**	65**
"Sun City"	692,690	1.61	1.47				
Scenario A				195,000	41.9	4,650	40 (58 in A-2)
Scenario B				68,000	21.5	3,160	36 (42 in B-2)
"Mid-American City"	389,000	1.29	1.18				
Peak				74,000	26.1**	2,835**	26**
Off-Peak				184,000	55.2	3,333	31
"Mill Town"	127,736	.98	.89	27,300	18.5	1,475	8
"Large City"	1,623,100	1.17	1.07	1,029,000	361.1	2,850	100
"Metropolis"	2,690,000	1.12	1.03	135,000	27.5	4,900	28

* Vanpool service excluded
**Specialized transportation handicapped (TH) service excluded

Because of the particular uncertainty about future energy availability and its influence on automobile costs and ownership, two different alternative futures are considered for each setting. The first, or base case, assumes that auto ownership patterns do not change dramatically between the present and 2000. The second, "reduced auto ownership" case, assumes that energy supply constraints and/or auto use disincentives increase the relative cost of automobile operations by 40 percent. Projections for both of these alternatives are taken from a report prepared for the Office of Technology Assessment of the U.S. Congress, as described in Appendix B.[1]

The analysis of year 2000 scenarios should be viewed in the proper context; this analysis represents an attempt to predict the future. While an attempt was made to be as realistic as possible, the results are clearly based on a variety of assumptions, some of which may prove to be inaccurate. Furthermore, it must be recognized that the procedures used for estimating consumer responses to transportation changes are based on techniques developed in the 1970s. It is unclear whether people in the year 2000 can be expected to react to transportation system characteristics in the same way as they do in the 1970s. The results are offered as a first cut attempt at assessing how changes in demographic characteristics may change the impacts of transportation systems. Note that essentially the same impacts considered in 1980 have been predicted for 2000, even in cases where projecting even the base case is tenuous at best (e.g., the impact in the taxi industry).

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[1] Systems Design Concepts (1977) Technology Assessment of Changes in the Use and Characteristics of the Automobile: Draft Final Report, prepared for the Office of Technology Assessment, U.S. Congress.

SUMMARY OF SCENARIO ANALYSIS RESULTS

The impacts considered for each scenario are shown in Exhibit 8.[1] Key impacts of each of the 1980 IP scenarios are compared in Exhibit 9, while the impacts of the alternatives to IP are summarized in Exhibit 10 and the impacts of the year 2000 IP scenarios are listed in Exhibit 11. Although single values are presented, these should be interpreted as representing a range around the value shown.[2] All economic impacts shown are in 1977 dollars. The major results for each setting are summarized very briefly below.

Setting #1: "Southern Belle"

The checkpoint many-to-many service considered in IP Scenario A appears to have greater positive impacts than the doorstep service provided in IP Scenario B (e.g., a $322,000 reduction in auto expenditures in Scenario A vs. a $226,000 reduction in Scenario B). From the viewpoint of the public sector, given the few negative impacts, the deficit generated by IP Scenario A ($559,000) may be justified by the positive impacts. The alternative has a small but positive impact on energy consumption (-64,000 gallons) but reduces taxi industry revenue by 10%.

The fixed route alternative was unable to generate the same transit ridership increase as IP (607,400 vs. 1,280,000 new trips), had less of an impact on consumer surplus (+ $152,376 vs. + $734,754), and automobile ownership (-11 autos vs. -77) resulted in a slight increase in fuel consumption. In general, the fixed route alternative appeared to be less effective than IP Scenario A.

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[1] The one exception to this was that the impact on social service agency providers was not computed for the year 2000. Very small impacts were projected for 1980 and, given the uncertainties regarding agency transportation and coordination efforts, it was felt to be reasonable to ignore this impact group in 2000.

[2] The sensitivity of the results to variations of certain key impacts is discussed in Volume 6.

Exhibit 8

Impact-Incidence Matrix Cells

IMPACT GROUP: USERS • Mobility (by market segment) New transit trips Induced trips • Change in consumer surplus (by market segment)
IMPACT GROUP: COMMUNITY • Coverage (by market segment) Spatial Temporal • VMT • Fuel consumption • Emissions • Employment opportunities (by employment sector) Jobs Payroll • Automobile expenditures • Chauffeur trips eliminated
IMPACT GROUP: IP OPERATOR • Costs (by operator) Gross operating Net operating Gross capital Net total (subsidy) Management fee (for private operators only)
IMPACT GROUP: COMPETING TRANSPORTATION PROVIDERS (taxi industry, parking lot operators, social service agencies) • Passengers (where appropriate) • Revenue (where appropriate) • Profit (where appropriate) • Opportunity cost (where appropriate)
IMPACT GROUP: MAJOR EMPLOYEES • Parking requirements • Cost • Opportunity cost
IMPACT GROUP: LOCAL GOVERNMENT • Operating subsidy • Capital subsidy • Parking revenue lost
IMPACT GROUP: FEDERAL GOVERNMENT • Operating subsidy • Capital subsidy • Total subsidy

Exhibit 9

Comparison of Year 1980 Scenario Results

Impact/Measure	"Southern Belle" A	"Southern Belle" B	"College Town" A	"College Town" B	"College Town" C	"Sun City" A	"Sun City" B	"Mid-American City" A	"Mid-American City" B	"Mid-American City" C	"Mid-American City" D	"Mill Town" A	"Mill Town" B	"Large City" A	"Large City" B	"Metropolis" A	"Metropolis" B
Change In Consumer Surplus ($000)	+734.8	+493.2	+160.5	+186.4	+149.3	+114.1	+114.1	+224.8	+167.6	+144.6	+267.7	+33.1	+13.1	+2,719.1	+2,772	+185	+660
New Transit Trips (000)/% increase	1280/ +67 (+251 vp)	1140/ +59.7 (+251 vp)	487/ +34.3	880/ +62	689/ +48.5	186.8/ +5.8	186.8/ +5.8	761/ +26	675.2/ +23	634.5/ +22	875/ +30	143/ +5.0	72.3/ +2.6	4,205.1/ +4.6	4,253/ +4.6	234/ +0.2	808/ +0.6
Induced Trips (000)	131	81	97	176	138	26.6	26.6	166.2	146.8	137.8	171.7	37	22.4	846.1	820.9	84	112
VMT (000 mi)/% change	-2498/ -0.8	-2172/ -0.7	+568/ +0.6	+220/ +0.2	+350/ +0.4	-352/ -0.04	-216/ -0.02	-95/ +0.01	+86/ +0.01	+167/ +0.02	+114/ +0.02	+10/ +0.01	+10/ +0.01	-3,064/ -0.06	-3,228/ -0.07	+538/ +.0007	+755/ +.015
Fuel Consumption (000 gal.)	-64.4	-41.7	+102.2	+79.9	+87.6	-33.8	-27.4	+48.6	+62.7	+67.5	+83.7	+7.5	+3.9	+131.9	+125.7	+87.9	+165
Employment: Jobs/Payroll ($000)	+70/ +568	+81/ +642.8	+77/ +920.6	+85/ +1000	+86/ +473.7	+8/ +91.5	+10/ +60	+61/ +671.3	+71/ +688.6	+72/ +695.1	+91/ +984.5	+7/ +93.8	+5/ +74.5	+316/ +3,907.8	+320/ +3,933.7	+47/ +533	+119/ +1675
Auto Expenditures ($000)	-322	-226	-380.6	-692.6	-590.7	-182	-182	-369	-299	-153	-738	-51	-23	-3,330	-3,687	-173.1	-319
Transit Operating Cost ($000)	+934	+1,002	+2,498	+2,698	+878	+128	+138	+1,140	+1,140	+1,140	+1,540	+172	+121	+9,376	+9,376	+692	+2,165
Net Transit Operating Cost ($000)	+279	+426	+2,377	+2,152	+270	+89	+162	+933	+842	+784	+1,140	+146	+114	+7,640	+7,887	+526	+1,780
Net Transit Total Cost ($000)	+559	+706	+2,686	+2,486	+604	+145	+172	+1,206	+1,115	+1,057	+1,566	+174	+132	+8,280	+8,527	+753	+2,250
Net Operating Cost/Net Total Cost per New Transit Trip	.22/ .44	.37/ .62	4.88/ 5.52	2.45/ 2.83	.39/ .88	.48/ .77	.87/ .92	1.23/ 1.58	1.25/ 1.65	1.24/ 1.67	1.31/ 1.79	1.02/ 1.22	1.58/ 1.83	1.82/ 1.96	1.85/ 2.00	2.25/ 3.22	2.20/ 2.78
Net Total Cost per Induced Trip	4.27	8.72	27.69	14.13	4.38	5.45	6.46	7.26	7.60	7.67	9.12	4.70	5.89	9.79	10.39	8.96	20.09
Taxi Industry Revenue ($000)/ % Change	-241/ -10.7	-190/ -9.5	-86.3/ -10.1	-101.7/ -11.9	+787.5/ +92.2	-75/ -7.4	+235/ +23.2	+41.8/ +3.4	+70.6/ +5.7	+81.5/ +6.6	+18.6/ +1.5	-60.1/ -6.3	-27.6/ -2.9	+3,439.2 +46.4	+3,482.7/ +47.0	-50/ -0.05	-100/ -0.1
Taxi Industry Profit ($000)/ % Change	-38.3/ -40.2	-34.1/ -35.8	-15.4/ -37.9	-18.2/ -44.7	+63.6/ +156.2	-13.4/ -27.8	+49.6/ +102.9	-15.2/ -25.6	-10.1/ -17.1	-8.1 -13.7	-19.4/ -32.8	-10.7/ -23.6	-4.9/ -10.8	+713/ +203	+720.7/ +205.2	-9/ -0.2	-17.9/ -0.4
Parking Spaces Required	-650	-605	-67	-92	-70	-25	-25	-162	-141	-133	-208	-17	-8	-175	-185	-63	-375

vp = vanpool

Note: All results represent annual change from the base case.

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16. Abstract

Integrated paratransit (IP) service is a concept which involves the integration of conventional fixed-route transit services with flexible, demand-responsive services in order to best serve emerging urban development patterns. To learn more about the capability of IP to meet the transit needs in the urban/suburban environment, the Urban Mass Transportation Administration sponsored a study to identify and define the benefits due to and the costs associated with the deployment of various hypothetical IP systems. This study systematically estimates potential impacts of a range of integrated transit/paratransit options and policies in a variety of settings and compares them with impacts of transportation alternatives. This study concludes that, in general, IP with fares closer to fixed-route transit than exclusive-ride taxi will result in net paratransit operating deficits. However, in some instances, the benefits of IP options in terms of improved service levels and mobility, reduced auto expenditures and other impacts appear to offset these operating deficits. Necessary factors for this include high paratransit productivities, possibly achieved by implementing hybrid, fixed-route/demand responsive service; and low operating costs, possibly achieved by contracting with private operators. IP was found to have a positive but insignificant impact in reducing automobile usage and ownership, but no measurable impact on vehicle miles traveled, fuel consumption, or emissions. Promising locations for paratransit implementation are those areas with population densities between 3,000 and 6,000 persons per square mile and limited transit service. The most promising paratransit concepts appear to be checkpoint many-to-many service, route deviation service, automated doorstop service with high vehicle densities, and vanpool service. The results of the study further suggest that paratransit service is sensitive to fare. Fare increases above $.25 were determined to be counterproductive, while free transfers from feeder services to line haul became an inducement to use paratransit. The study also concluded that digital communications and automated dispatching systems are potentially cost-effective technological innovations.

This volume, Volume 3, describes the scenario analyses of the integrated paratransit options and alternatives and provides the resulting conclusions.

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Exhibit 10

Comparison of 1980 Alternatives to IP

Impact/Measure	"Southern Belle" Extended Fixed Route	"Southern Belle" Extended Taxi	"College Town" Extended Fixed Route	"College Town" Extended Taxi	"Sun City" Extended Fixed Route	"Sun City" Extended Taxi	"Mid-American City" Extended Fixed Route	"Mid-American City" Extended Taxi	"Mill Town" Extended Fixed Route	"Mill Town" Extended Taxi	"Large City" Extended Fixed Route	"Large City" Extended Taxi	"Metropolis" Extended Fixed Route	"Metropolis" Extended Taxi
Change in Consumer Surplus ($000)	+152.4	+13.3	+117	+39	+117.1	+53.8	+439.5	+378.9	+38.5	+11	+3,996	+1,194	+383	+373
New Transit Trips (000)/% increase	607.4	NA	712.4/ +50.2	NA	194.5/ +6.0	NA	+1,143.6/ +39.2	NA	61.5/ +2.2	NA	6,449.7/ +7.1	NA	+416/ +0.4	NA
Induced Trips (000)	54.7	20.4	106.9	5.0	17.6	12.8	171.4	27.1	10.5	10.3	838.5	325.8	25	22
VMT (000 mi)/% change	-263/ -0.08	+602/ +0,02	+980/ +1.1	+1000/ +1.1	+113/ +0.01	+178/ +0.02	-704/ -0.1	+1900/ +0.3	+35/ +0.02	+61/ +0.05	+4000/ -0.08	+4200/ +0.08	+191/ +0.004	+1,644/ +0.02
Fuel Consumption (000 gal.)	+75.8	+69	+250.6	+101.9	+63.5	+20.6	+130.9	+210.9	+10.3	+7.6	+203.8	+453.6	+56.7	+171.3
Employment: Jobs/Payroll ($000)	+56/ +435.6	+23/ +314	+156/ +176.7	+31/ +53.5	+25/ +238.9	+13/ +88.6	+68/ +820.9	+74/ +583.8	+6/ +77.1	+6/+45	+312/ +5950	+218/ +1200	+42/ +840	+75/ +644
Auto Expenditures ($000)	-49.1	-94.8	-496	0	-44.7	-43	-170.1	0	-49	-5.8	-2460	-115	-523	-46
Transit Operating Cost ($000)	+789	NA	+2,574	NC	+507	NC	+1,791	NA	+129.4	NC	+9660	NC	+1,450	NC
Net Transit Operating Cost ($000)	+637	NA	+2,390	NC	+446	NC	+1,414	+40	+121.3	NC	+8150	NC	+1,316	NC
Net Transit Total Cost ($000)	+858	+1,211.7	+2,900	+52	+527	+128	+1,798	+40,000	+166.4	+49.9	+9280	+2820	+1,583	+957
Net Operating Cost/Net Total Cost per New Transit Trip	1.05/ 1.41	NA	4.07	NA	2.29/ 2.71	NC	1.24/ 1.57	NA	1.97/ 2.71	NA	1.26/ 1.44	NA	3.16/ 3.80	NA
Net Total Cost per Induced Trip	15.69	59.40	27.13	10.48	29.88	10.04	10.49	1.48	15.80	4.84	11.06	8.64	63.32	43.50
Taxi Industry Revenue ($000)/ % change	-66.4/ -3.3	-542/ +26.2	-94.8/ -11.1	+89/ +10.4	-63/ -6.2	+147.7/ +14.5	-244.7/ -19.6	+972/ +66.3	-16.5/ -1.7	+55.8/ +5.8	-1870/ -25.3	+3420/ +44	-51.8/ -0.1	+1,083/ +1.2
Taxi Industry Profit ($000)/ % change	-11,900/ -12.5	+131.6/ +138	-17/ -41.8	-16/ -30.2	-11.3/ -23.4	+35/ +72.5	-43/ -73.9	+45/ +61.6	-3/ -6.6	+2.6/ +5.7	-334/ -95.1	+128/ +32.2	-9.3/ -0.2	+25/ +0.6

NA = Not Applicable
NC = Not Calculated

Note; All results represent annual change from the base case.

Exhibit 11

Comparison of Year 2000 Scenario Results

Impact/Measure	"Southern Belle"		"College Town"		"Sun City"				"Mid-American City"		"Mill Town"		"Large City"		"Metropolis"	
	A-1	A-2	A-1	A-2	A-1	A-2	B-1	B-2	A-1	A-2	A-1	A-2	A-1	A-2	A-1	A-2
Change in Consumer Surplus ($000)	+607.0	+632.7	+564.8	+605.3	+556.5	+622.4	+492.4	+721.6	+49.9	+13.1	+36.2	+46			+490.5	+672.3
New Transit Trips (000)/% increase	940.5/ +38	+1,069/ +43	1,680.5/ +72	1,788.1/ +76	570.1/ +12.1	786.6/ +15.5	484.9/ +10.8	701.3/ +13.8	870/ +30	982/ +34	174.1/ +5.9	170.9/ +5.8	1,590.6/ +1.7	1,579.3/ +1.6	289.4/ +0.2	361.8/ +0.3
Induced Trips (000)	104.9	+120.7	362	370	65.2	95.3	58.2	92.8	141	164	41.5	37.1	261.8	307.7	10.6	13.2
VMT (000 mi)/% change	-2,592/ -0.5	-3,200/ -0.7	-1,544/ -0.5	-1,711/ -0.6	-2.2/ 0.1	-2.7/ -0.1	-2.0/ 0.1	-2.8/ -0.07	-2000/ -0.2	-2000/ -0.2	-391/ -0.2	-259/ -0.1	-2360/ -0.04	-2110/ -0.04	-1269/ -0.01	-6961/ -0.007
Fuel Consumption	-53	-55.5	-10.8	-4.9	-60.7	-56.1	-54.4	-57.5	-35.1	-26.4	+5.1	+9.8	-40.5	-20.2	-10.5	+16.8
Employment: Jobs/Payroll ($000)	+65/ +499.5	+61/ +469.5	+100/ +886.2	+98/ +871.9	+71/ +222.4	+25/ +321.2	+14/ +169.2	+22/ +275	+93/ +1,028	+90/ +993.8	+10/ +120.7	+9/ +117.6	+99/ +1,048.4	+86/ +915.9	+40/ +706.2	+49/ +866
Auto Expenditures ($000)	-326	-481	-696.6	-804	-463.1	-630.9	-486.6	-688	-733	-756	-132	-94	-1,110	-1,070	-462.8	-288.8
Transit Operating Cost ($000)	+769	+796	+1,827	+1,827	+669	+877	+524	+750	+1,574	+1,574	+231	+231	+3,018	+3,018	+584	+725
Net Transit Operating Cost ($000)	+402	+351	+987	+964	+441	+563	+330	+470	+1,167	+1,040	+198	+192	+2,130	+2,113	+432	+519
Net Transit Total Cost ($000)	+629	+578	+1,387	+1,364	+419	+541	+316	+456	+1,438	+1,311	+256	+250	+2,357	+2,340	+576	+679
Net Operating Cost/Net Total Cost per New Transit Trip	.43/ .67	.33/ .54	.60/ .80	.52/ .74	.77/ .73	.72/ .69	.68/ .65	.67/ .65	1.34/ 1.65	1.06/ 1.34	1.14/ 1.47	1.12/ 1.46	1.34/ 1.48	1.34/ 1.48	1.49/ 1.99	1.43/ 1.88
New Total Cost per Induced Trip	6.00	4.79	3.83	3.69	6.42	5.68	5.43	4.91	10.20	7.97	6.17	6.74	9.00	7.60	54.34	51.44
Taxi Industry Revenue ($000)/ % change	-186.9/ -4.8	-215/ -5.5	+1,556/ +126	+1,533/ +124	+565.4/ +23.1	+753/ +30.6	+434.4/ +17.4	+622.7/ +25.5	-12.7/ -0.7	-69.9/ +3.9	-90.7/ -7.7	-102.3/ -8.6	+2,064/ +20.2	+1,843.5/ +18.5	-35.2/ -0.03	-55.5/ -0.05
Taxi Industry Profit ($000)/ % change	-33.5/ -18.0	-38.5/ -20.7	+117.7/ +200	+113.4/ +193	+195.4/ +167.7	+296.1/ +255.1	+161.8/ +139.2	+260.1/ +224.4	-28.6/ -33.6	-38.8/ -47.7	-16.2/ -28.8	-18.3/ -32.5	+419.3/ +88.0	+379.8/ +79.8	-6.3/ -0.1	-9.9/ -0.2
Parking Spaces Required	-510	-570	-278	-275	-52	-52	-38	-37	-148	-175	-16	-16	-71	-65	-35	-44

Note: All results represent annual change from the base case.

Scenarios numbered 1 (i.e., A-1, B-1) represent base auto ownership cases.

Scenarios numbered 2 represent reduced auto ownership case.

The user-side taxi subsidy generated many fewer trips than either IP or fixed route, and proved to be extremely expensive ($59.40 per induced trip).

Finally, the impacts of IP in the year 2000 did not appear to vary markedly from the impacts in 1980. The impacts were generally greater under the reduced auto ownership scenario, but even then no significant differences emerged.

Setting #2: "College Town"

In this setting, areawide doorstep many-to-many service was shown to be a more effective alternative than cycled many-to-one service serving as feeders to a fixed route network (e.g., the net marginal operating cost per new transit rider decreased from $5.52 to $2.83 from Scenario A to B). The elimination of the transfer requirement served to increase both effective vehicle speeds and ridership (new transit trips increased from 487,000 to 880,000 from A to B). These results occurred in a relatively small service area (17 square miles), where a large number of DRT vehicles (32) were in operation. The extensiveness of the system made it extremely expensive, except under conditions of private operation (Scenario C). In the latter case, the positive benefits (such as the $590,700 reduction in auto expenditure and the $149,268 increase in consumer surplus) can probably be interpreted as offsetting the total deficit of $604,000 in the absence of other real costs.

An equally extensive fixed route alternative appeared to be able to generate comparable ridership (712,400 new transit trips under fixed route, 689,000 under IP Scenario C) and has impacts generally comparable to those of IP. The net operating costs were approximately the same as in the publicly operated IP case, ($2,574,000 vs. $2,152,000).

The extended taxi alternative, in which a capital subsidy only was introduced, was projected to have only minor impacts (e.g., induce a total of 4960 trips). The taxi industry was projected to actually lose money in the short run because of overexpansion, although this impact would probably be negligible once the system reached an equilibium state.

As was the case in "Southern Belle," the impacts of IP are not projected to change markedly by the year 2000, even under the reduced auto ownership case.

Setting #3: "Sun City"

In this setting, route deviation seemed to be an extremely effective alternative in one area; the replacement of six, tightly spaced fixed routes with route deviation service reduced costs and increased ridership. The replacement of underutilized fixed route service by many-to-many DRT service in another area also increased ridership, but at an increase in cost. Overall, the positive impacts of this relatively small scale IP system (e.g., $182,000 reduction in auto expenditures) appeared to justify the total deficit of $145,000. Private operation in this case did not appear to be less expensive than public operation, partly because the public system has a relatively low hourly operating cost, and partly because the demand levels made the 5-passenger vehicles used by the private operator less productive than the 12-passenger vans used by the public operator.

Expanded fixed route service in this setting was able to attract the same ridership as IP (194,000 vs. 186,800 new trips), but at significantly higher cost ($527,000 for fixed route, $145,000 for IP).

The limited area user-side taxi alternative was not as expensive (even on a "per induced passenger" basis) as the areawide user-side subsidy in "Southern Belle" ($10.04 per induced trip in this setting), but this alternative was still relatively more expensive than the IP scenario ($5.45 per induced trip).

In this setting, at least one component of the IP system, the route deviation portion, was found to be less effective in the year 2000. The increase in population density to 6200 persons per square mile (in the service zone) made fixed route service less expensive to provide than route deviation service. Many-to-many service continued to be less expensive than fixed route, on a cost per passenger basis, in a second service area with a projected density of 4600 persons per square mile.

Setting #4: "Mid-American City"

In this setting, providing extensive paratransit service in suburban areas, particularly during off-peak hours, proved to be very expensive. In the case of maximum off-peak coverage (Scenario D), the net cost per marginal transit passenger was the highest of the scenarios ($1.79), although this alternative also had the greatest impact on auto ownership, a reduction of $738,000 per year in auto expenditures. The benefits of IP in this setting, for any scenario considered, do not appear to be able to justify the fairly expensive deficit, which, in Scenario D, for example, totalled $1,566,000. The analyses showed clearly that paratransit ridership will decrease with increasing fare. The results seem to suggest, however, that, given the overall impacts of IP, increasing the paratransit fare beyond 25¢ in this setting was counterproductive.

The impacts of the fixed route alternative appear fairly comparable to those of IP in this setting; the deficit of fixed route alternative ($1,798,000) also appears to be unjustified by the associated benefits. Both the extended fixed route and the IP scenarios are projected to have a significant impact on the relatively weak taxi industry in this setting. The fixed route alternative is projected to decrease taxi revenue and profit by 19.6 percent and 79.9 percent respectively; in the IP case, this negative impact is offset by a contract with the industry to provide part of the IP service.

The extended taxi alternative in this setting is an extremely low cost option, with a transit revenue decrease of $40,000 the only public cost. The overall impacts of the alternative are correspondingly small. Nevertheless, the alternative suggests that, in areas with low taxi availability, public action to increase the taxi supply may prove beneficial to both the users (who experience improved service levels) and the taxi industry (which may experience some economies of scale).

The results of the year 2000 analysis suggest again that fixed route service is more effective than paratransit service beyond a certain density level. In this case, consumer surplus for non-work trips actually declines when the fixed route service is replaced by paratransit in relatively dense inner city areas during off-peak hours.

Setting #5: "Mill Town"

The primary conclusion from this setting is that, in service areas with very low population density (1300 persons per square mile in the 1980 scenarios) no relatively high quality transit service can be readily justified from a benefit-cost standpoint. Checkpoint many-to-one service proved more effective than either many-to-many service or exclusive-ride taxi feeder, and all of these proved "superior" to fixed route service. In all cases, however, the net cost per marginal transit passenger was relatively high. The net costs per induced trip for the four scenarios were $4.70 (IPA), $5.89 (IPB), $4.84 (taxi), and $15.80 (fixed route). The situation was projected to improve somewhat, but not substantially, by the year 2000, when the population density will be 1600 persons per square mile.

Setting #6: "Large City"

In this setting, the expansion of a paratransit system for the elderly and handicapped (serving approximately 190,000 persons) into a system for the general public in the same 434 square mile area (serving over 1.5 million persons) was found to be able to sharply reduce the cost per passenger (from an average operating cost of $4.22 per passenger to a marginal cost per new passenger of $1.82), and significantly increase elderly and handicapped ridership (by 3,139,000 trips per year), although the cost per hour to provide the service does not measurably change. The service was able to generate considerable ridership; however, the net benefits do not appear to be able to offset the substantial deficit of $8,280,000.

Overall, the fixed route alternative in this setting appeared to be slightly "better" than the IP alternative; i.e., generated higher ridership (6,449,700 vs. 4,205,170) at roughly the same cost (total net, $9.28 million vs. $8.28 million) and with roughly the same values of other impacts. The taxi alternative in this case was actually an alternative to the base case paratransit system for the elderly and handicapped. The results of that analysis suggest that a user-side taxi subsidy for the elderly and handicapped may prove to be much less costly, on a per passenger basis, than the establishment of a separate paratransit system.

The year 2000 IP scenario in this setting points out that a shift in paratransit service from dense inner city areas (over 8,000 persons per square mile) to less dense (average density under 3000 persons per square mile) suburban areas with less extensive fixed route service can result in a decrease in the IP net cost per marginal transit passenger. (In this case, the cost decreased from $1.96 overall in 1980 to $1.48 in the year 2000).

Setting #7: "Metropolis"

In this setting, paratransit service was provided in only 3 small service areas in Scenario A and 4 additional ones in Scenario B. The resulting impacts of this small scale system were relatively small (total annual ridership increase was 252,000 in Scenario A and 950,000 in Scenario B). Because service was provided in either low density areas or to limited markets (e.g., TH, express bus passengers), productivities were generally low. As a result, revenues accounted for only 16 percent of the operating cost of $2,400,000, and the other positive impacts do not obviously offset the remaining deficit.

The extended fixed route bus alternative proved to be more costly than IP because of transit authority operation. In general, IP appeared to be a more effective alternative in the suburban service areas, all of which had population densities below 4,000 persons per square mile. Paratransit also was seen to be less expensive on a per passenger basis than fully accessible fixed route service ($6.01 vs. $9.02) as a means of serving the transportation handicapped. A user-side taxi subsidy for feeder service once again proved to be relatively expensive, costing $43.50 per induced trip.

By the year 2000, IP service was projected to be relatively more effective in serving one high density (7000 persons per square mile) inner suburban area and some other medium density (4444 persons per square mile) suburbs. Part of the change by the year 2000 can be attributed to the elimination of two high cost service elements (a TH service and a feeder service operated directly by the transit authority) which were offered in 1980.

CONCLUSIONS

The "Benefit-Cost Analysis of Integrated Paratransit Systems" systematically estimates the benefits and costs associated with different IP options in different settings and compares these results with those of other transportation alternatives. Based on the results of the various components of analysis in this study, a variety of conclusions about IP service can be reached.[1] The conclusions suggest that in some circumstances integrated paratransit may be an effective strategy for improving overall mobility. These conclusions are presented as answers to the following fourteen questions about IP service and its alternatives. What follows are abbreviated answers; the complete answers can be found in Chapter 8 of this volume.

[1] The reader is cautioned to recognize that the answers provided are based on a limited set of analyses. Although the study has attempted to consider as wide a range of service and setting types as possible, clearly not all possible permutations have been tried. As a result, some conclusions may not prove true in all cases.

1. Can Break-Even Operation Be Achieved in an IP System?

In most cases, No. Generally, IP with fares closer to transit than exclusive-ride taxi will result in net paratransit operating deficits.

2. Can the Deficit of an IP System Be Justified by the Positive Impacts Generated?

In some instances, Yes. In a number of settings considered, the benefits of IP, such as reduced auto expenditures and increased employment, appear to offset the deficits. However, this result is dependent upon relatively high productivities of at least 9 passengers per vehicle-hour and/or low operating costs of under $11. per vehicle-hour.

3. Which IP Configurations Appear to Be Particularly Promising?

The most promising paratransit concepts appear to be checkpoint many-to-many service, route deviation service, automated doorstep service with high vehicle densities, and vanpool service.

4. What Market Groups are Served by IP?

The elderly and persons from zero-auto households are the major market groups served by IP. Persons with two or more automobiles would receive all of the benefits of reduced auto expenditures if IP were implemented.

5. Are there Certain Population Densities at Which IP is More Advantageous than Fixed Route, or Vice Versa?

At population densities between 3,000 and 5,000 persons per square mile, IP service appears superior to fixed route service. Between 5,000 and 6,000 persons per square mile, the advantages appear to be equal. Below 3,000 persons per square mile, transit cannot be economically provided, in general. Above 6,000 persons per square mile, fixed route service appears to be more cost effective than paratransit service.

6. <u>How do Different "Implementation Strategies" Determine the Impacts of IP?</u>

Implementation of IP service in areas previously unserved by transit is institutionally easy and tends to achieve a significant increase in mobility. Replacement of unproductive fixed routes with IP can be extremely cost-effective but may be institutionally infeasible. The provision of overlay fixed-route/paratransit service results in high quality service but may result in high costs per marginal passenger.

7. <u>What are the Impacts of Different Fare Structures on IP?</u>

Raising fares (probably beyond $.25 per trip) may be counter-productive. Free transfers from feeder services to linehaul services encourage paratransit use, but general provision of free transfer may cause the feeder services to be overutilized.

8. <u>Can IP Service Achieve Significant Modal Shifts from Auto?</u>

Given present population densities and automobile operating costs, IP did not reduce automobile usage by more than 1 or 2 percent. However, IP did substantially increase total transit ridership, by up to 70 percent in some cases.

9. <u>What Impact Does IP Have on VMT, Fuel Consumption, and Air Pollution?</u>

IP will not have a <u>significant</u> effect on vehicle-miles travelled, fuel consumption or air pollution.

10. <u>Can Paratransit/Transit Integration Be Achieved such that Paratransit Service is Used Extensively as a Feeder Mode?</u>

Paratransit can play a significant feeder role in a system with coordinated transfers. Such a service works best with feeder trip lengths which are short as compared to the linehaul trip length.

11. <u>Would the Introduction of IP Have a Significant Impact on the Taxi Industry?</u>

The introduction of IP service may reduce taxi industry revenue (approximately 10 percent) and profit (30-40 percent).

Contracting with the private sector to provide portions of IP service, however, should more than offset this loss of exclusive-ride business in most cases.

12. Are There Low-Cost Methods of Increasing Mobility Through the Use of Exclusive-Ride Taxi Service?

User-side subsidies for exclusive-ride taxi service are generally quite expensive. Such subsidies for the elderly and handicapped, however, may prove less expensive on a per-passenger basis than specialized services exclusively for those groups.

13. In What Areas Are IP Services Most Likely to Be Implemented?

Urban areas with population under 500,000 may be more likely to institute large scale IP systems because of lower wage levels, less severe institutional constraints, and less extensive existing fixed-route service. However, in larger urban areas, IP may be viewed as the best way to equitably serve suburban areas.

14. Will the Impacts of IP Change Considerably by the Year 2000?

Given current economic and demographic projections, the impacts of IP will be very similar to those predicted for 1980.

Chapter 1
Setting #1: "Southern Belle"

1.1 Setting Description

Setting #1 is representative of urban areas in the first group. These areas are moderately small and have a low central city population density. A high percentage of the residential units in the urbanized area consist of single-family dwellings. In comparison with other urban areas in the United States, those in Group 1 display the following characteristics:

- low average income;
- low percentage of the population residing in the central city;
- low percentage of the employment located in the central city;
- average use of transit for work trips; and
- high percentage of households with no car available.

This group consists of twenty cities, including: Greenville, South Carolina; Little Rock, Arkansas; Birmingham, Alabama; Chattanooga, Tennessee; Pensacola, Florida; Charleston, West Virginia; Columbia, South Carolina; and Roanoke, Virginia.

A map of the urban area chosen to represent this group is shown in Figure 1.1. Because many of the cities in the group are southern, the setting has been named "Southern Belle". The urbanized area includes 54 square miles with a projected 1980 population of 177,000. Additional setting information is presented in Table 1.1.

FIGURE 1.1

SETTING #1 "SOUTHERN BELLE"

Table 1.1: Setting #1: Demographic Characteristics

	1980	2000
Population	177,000	226,000
Area, sq. mi.	54	65
Density	3,277	3,476
Employment	62,257	78,539
% Elderly	8	15

The two major employment sectors of the region are manufacturing and services, each of which employs about one-third of the total work force. Both of these sectors are expected to grow substantially in the next two decades, with services showing the largest numerical gains of all sectors. Many of the larger manufacturers are located outside the central city limits. The single largest employer of the area, providing approximately 17,000 jobs, is located over 6 miles south of the central city (somewhat beyond the 1980 urbanized area). The retail and wholesale trade activities, as well as many of the professional services, are still largely concentrated in the downtown area.

During the twenty years following 1980, "Southern Belle" is projected to grow in size and population. By the year 2000, the population will total 226,000 and cover a 65-square-mile urbanized area. Employment is projected to grow at a similar rate, but the large employer of 1980 is still expected to employ 17,000 workers.

Transportation characteristics of this setting are similar to most urban areas with respect to auto travel. The average auto speed is approximately 18 miles per hour throughout the area, dropping to 14 mph within the CBD. Downtown parking charges are set at 25¢ for the first hour plus 20¢ for each additional hour. Municipal parking facilities have no flat daily rate, but private lots provide parking at a monthly rate of $15.

1980 Base Case Public Transportation System

"Southern Belle" owns and operates the public transit system in the area. Ten fixed routes radiate from the central city to the west, south, and southwest, with a total of 26 buses used. These routes, shown in Figure 1.2, offer good coverage for the central business district and many areas of the inner city. However, one large area within the city limits, lying north of the CBD across a river, receives no service.

On the average, the fixed routes extend about 5 miles from the central city. A few cross over the city boundary and serve a limited number of suburban neighborhoods. This system serves 78,000 people within a 17-square-mile area. For the most part, though, the suburbs are not served by public transportation.

The headways vary between fifteen minutes and one hour and, on most routes, the same headway is maintained throughout the day. The level of service on Saturdays is identical to that of weekdays, but no service is provided on Sundays. Six of the routes provide evening service. The basic fare is 25¢, although a few of the longer routes require an additional 5¢ for each zone line crossed. Senior citizens, handicapped persons, and students under the age of 18 travel for half fare.

The drivers on this system, who are not unionized, receive about $3.50 per hour while maintenance workers average about $3.95 per hour. The operating deficit is shared equally by UMTA and the city. A Section 3 grant from UMTA was used to purchase the transit operation from a private operator a few years ago and to make subsequent capital investments.

In addition to fixed route bus service, "Southern Belle" is served by an extensive taxi system. A total of 130 taxis are operated in the area. The largest taxi fleet maintains about 65 cabs; most of the remaining vehicles are owner-operated. The metered taxi rate is 90¢ for the first mile, plus 50¢ for each additional mile.

1.2 1980 IP Scenarios

1.2.1 IP Scenario A

In IP Scenario A, access to public transportation is extended to most of the population in the urbanized area. Three checkpoint

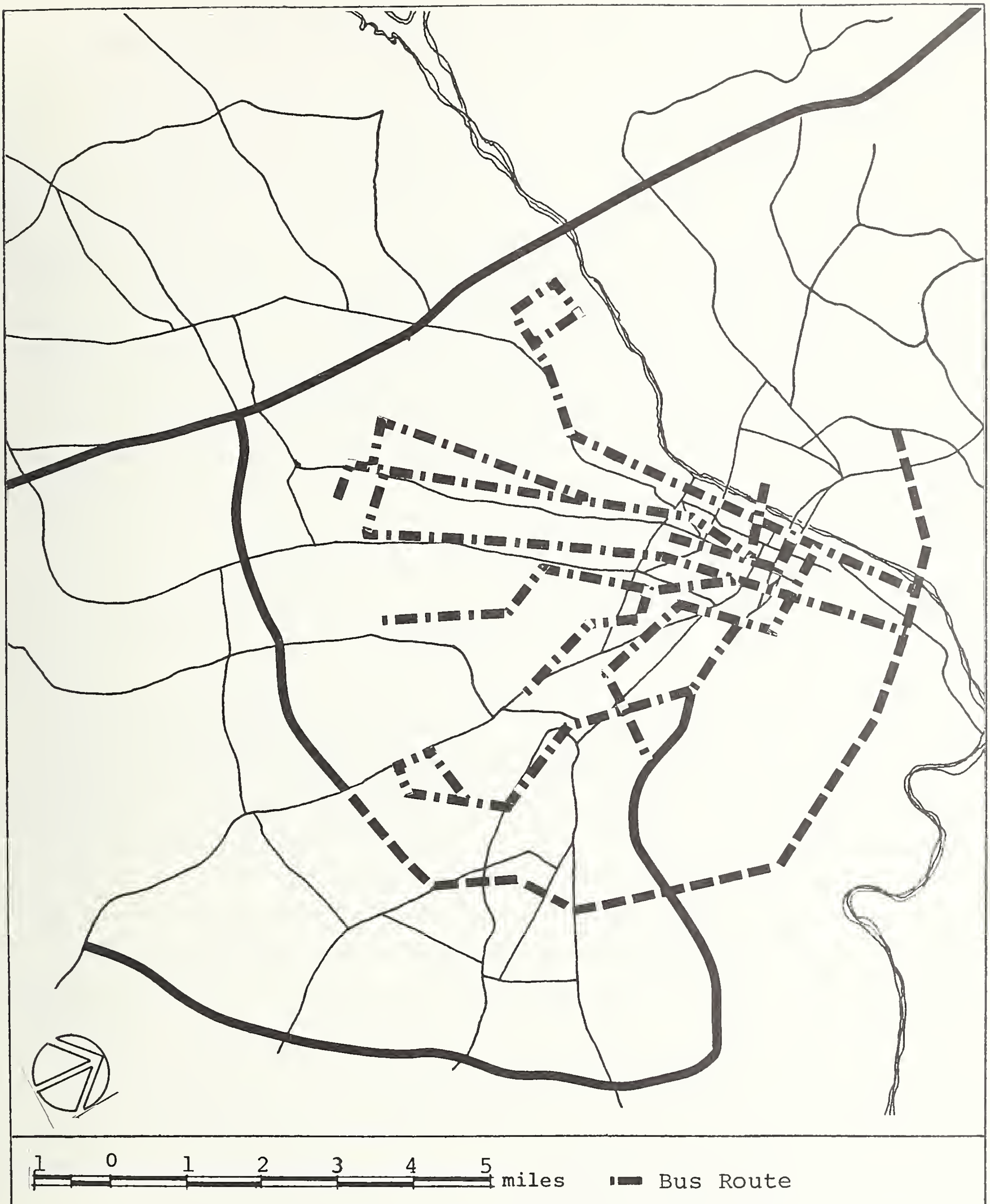
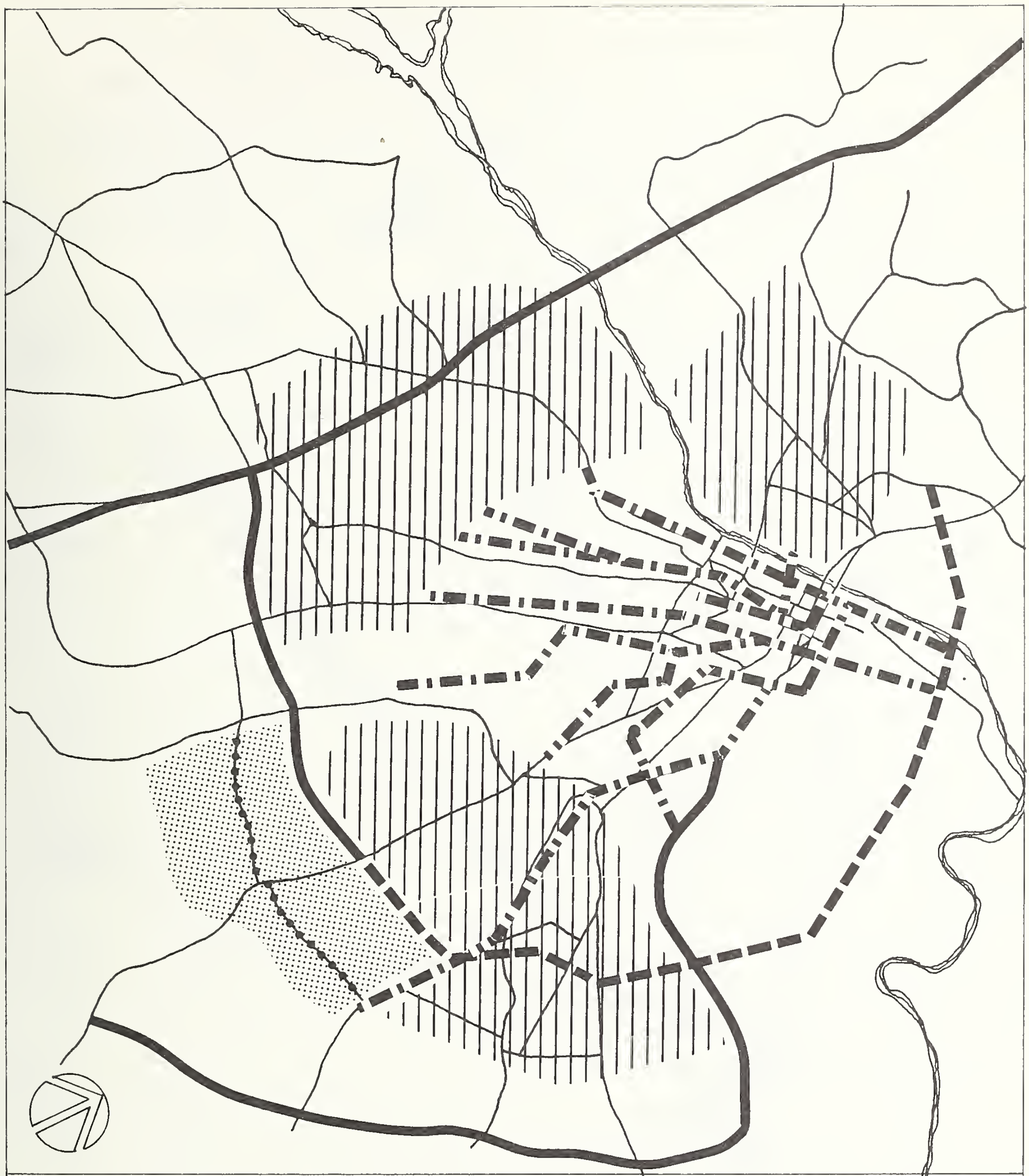


FIGURE 1.2

1980: BASE CASE TRANSIT SYSTEM "SOUTHERN BELLE" many-to-many paratransit service areas are designated to serve regions previously unserved by fixed routes (from 6:30am to 6:30pm on weekdays). Two of these areas are suburban, and the third covers the portion of the city located to the north of the river. In these service areas, passengers desiring service can telephone in their request, and then walk to the nearest designated checkpoint to meet a vehicle. Passengers are then taken to the checkpoint nearest their final destination. Checkpoints are scattered throughout the area, spaced 1/4-1/2 mile apart. The establishment of checkpoints reduces the requirement for a vehicle to stop at "every door"; as such, the vehicles can achieve higher productivities. Checkpoint route deviation service is employed in a fourth area because of the linear physical development pattern of that area. In this service, vehicles follow a fixed route but, upon request from a passenger, will deviate from the route to one of the designated checkpoints located approximately 1/2 mile from the route. Figure 1.3 shows the location of each of the paratransit areas. All four service elements are manually dispatched on an immediate request basis.

The fixed route bus network of the base case is retained in IP Scenario A, with the exception of minor modifications required to facilitate integration with the paratransit services. Two bus routes are extended to meet the paratransit zones at transfer points; all transfers between the two modes of service are coordinated to the fullest extent possible. In one case, the direction of a route is altered and the route is extended to become the checkpoint route deviation service. Checkpoints are spaced every half to three-quarters of a mile parallel to the last 4 miles of the route. Headways on routes linking the paratransit zones with the CBD are reduced to accommodate the increased volumes expected to be generated by the paratransit feeder services. With the implementation of integrated paratransit service, it is possible to access any area from any other area through a combination of fixed-route and paratransit services. (Note that not all origins/destinations in zones serviced only by fixed routes are accessible.) However, the out-of-vehicle travel time incurred by transferring between modes provides a strong



1 0 1 2 3 4 5 miles

Fixed-Route Bus

Checkpoint Route Deviation

Checkpoint many-to-many service area

Checkpoint route deviation service area

FIGURE 1.3

1980 IP SCENARIO A "SOUTHERN BELLE"

disincentive to use transit for many of these trips. The fare for all components of the integrated paratransit system discussed thus far is 50¢, plus 5¢ for each transfer between vehicles. Transfers are allowed between paratransit vehicles and fixed route vehicles and between two paratransit vehicles. There is no additional charge for checkpoint service on the checkpoint deviation system. Elderly passengers ride for half fare.

In addition to the paratransit services described above, the transit system, in conjunction with the region's largest employer, is arranging a vanpooling program. The vanpool program is provided to all employees at the site if sufficient interest is obtained from workers residing in a general area. Administrative support and vehicles are provided by the transit system, while marketing of the program and information is provided to workers by the employer. To receive use of a van, a group of at least ten employees must agree to use the service and pay a monthly charge through payroll deduction. The fare for the vanpool includes operating cost <u>and</u> depreciation of the vehicle. (No deficit is financed for the vanpool operations, except for marketing and administrative staff, and no actual costs, including capital costs, have been estimated). As an incentive to join the vanpool program, priority reserved parking is provided for vans near working areas. Vanpool service is shown schematically in Figure 1.4.

The vehicle fleet for the paratransit service elements (excluding the vanpool) consists of a total of forty-eight 12-passenger vans. Forty-four of the vehicles, six of them lift-equipped, are used regularly during peak hours, while fifteen vehicles are using during the off-peak. The addition of these vehicles more than doubles the size of the existing transit fleet. The population served by the vans is slightly greater than the population served by the fixed routes, but the households served are spread over an area twice as large. An additional 50 vans are purchased for the vanpool service.

1.2.2 <u>IP Scenario B</u>

The second IP scenario for Setting #1 provides more personal service in the paratransit service areas, by allowing individuals to travel directly to and from the doorsteps of their origin and

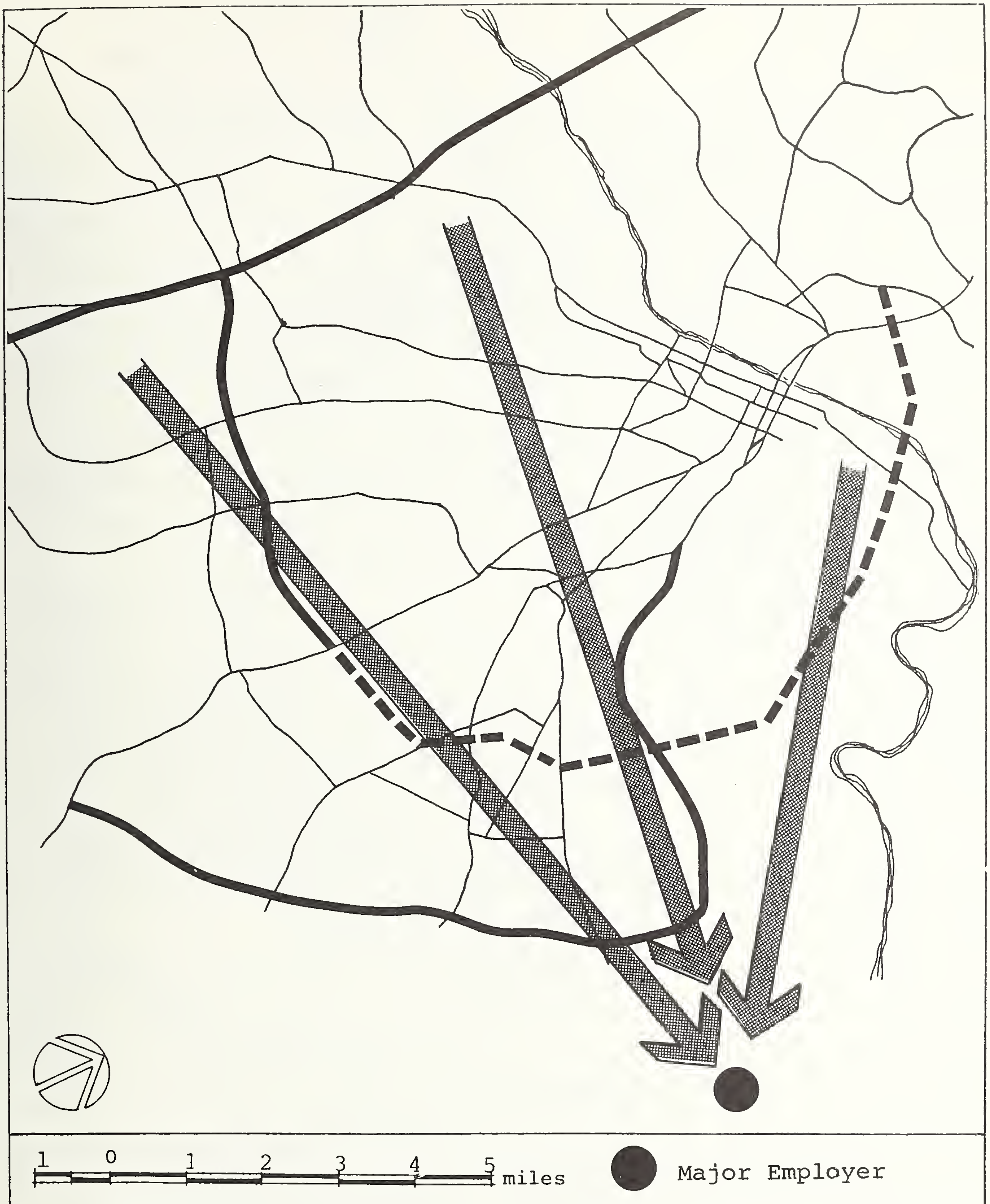


FIGURE 1.4

1980 VAN POOL PROGRAM "SOUTHERN BELLE"

destination within the service zone (i.e., many-to-many service). The fare for paratransit service remains at 50¢. The route-deviation service also is converted from checkpoint to doorstep service; a 10¢ doorstep deviation charge is added for this service.

The cost structure and institutional framework in Scenario B, as well as the existence of a vanpool program, remain the same as in the previous scenario. The service is illustrated in Figure 1.5. The characteristics of both IP scenarios are displayed in Table 1.2.

1.2.3 Benefit-Cost Analysis: IP Scenarios

The benefits and costs of the two IP scenarios for "Southern Belle" are detailed in Tables A.1.1 and A.1.2 respectively, which appear in Appendix A. The reader interested in reviewing the detailed results is directed to that Appendix. A summary and comparison of the results is provided in Table 1.3, where some key impacts and measures based on those impacts are presented for both scenarios. The discussion that follows draws from both the summary table and the more detailed tables in Appendix A. All impacts in these and future tables represent changes from the base (transit) case.

Since this is the first setting to be considered, the results will be discussed in considerable detail. All remaining scenario results will be highlighted only.

First, consider the user impacts. (See Tables A.1.1 and A.1.2). The change in consumer surplus, a measure of changes in travel cost and time, is projected to be +\$734,754 in Scenario A and +\$493,194 in Scenario B. (Recall that, while consumer surplus is given an economic interpretation, a dollar in consumer surplus cannot be considered equivalent to an actual cash dollar). Clearly Scenario A has the more significant impact on consumer surplus. The reasons for this are twofold: 1) Scenario A attracts a higher ridership, in part because a checkpoint many-to-many service has a higher capacity than a doorstep service; and 2) the checkpoint many-to-many system achieved a higher service quality than the doorstep many-to-many system.

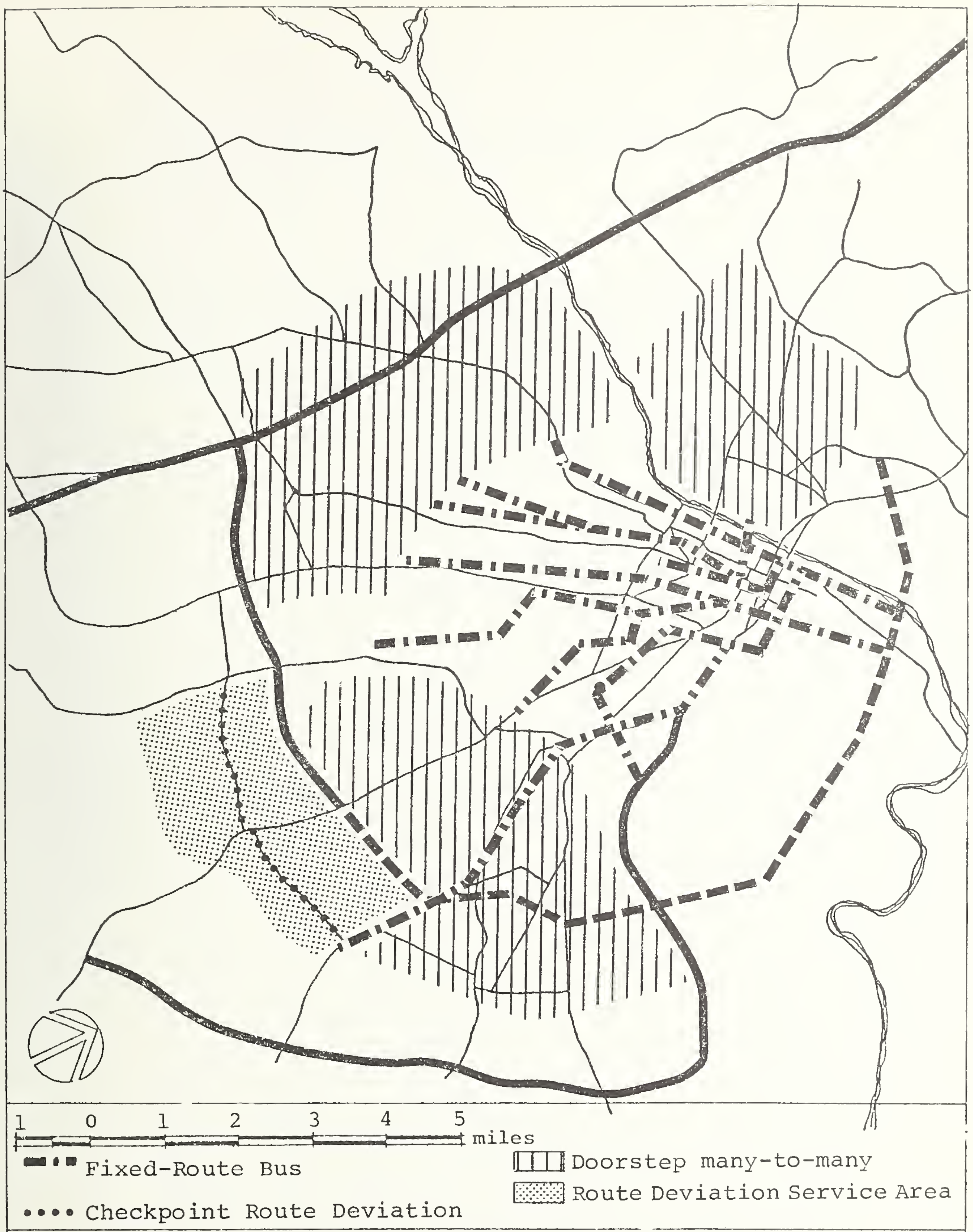


FIGURE 1.5

1980 IP SCENARIO B "SOUTHERN BELLE"

Table 1.2

Characteristics of 1980 IP Scenarios for "Southern Belle"

Scenario	Module	Eligible Population (Paratransit Service only)	Area, (sq.mi.)	Population Density	Service Type	Operating Entity	Paratransit Vehicles	Paratransit Fare*
1980A	1	14,000	7.5	1,870		M	48 (6 lift equipped)	50¢ + 5¢ transfer
	2	38,000	9.0	4,220	Checkpoint MTM			
	3	35,000	11.3	3,100				
	4	13,700	3.75	3,650	Checkpoint Rt. Deviation	M	2	50¢ + 5¢ transfer
	Total	100,700	31.55	3,191				
	5	20,000	-	-	Vanpool	Major Employer	50	-
1980B	1	14,000	7.5	1,870				
	2	38,000	9.0	4,220	Doorstep MTM	M	48 (6 lift equipped)	50¢ + 5¢ transfer
	3	35,000	11.3	3,100				
	4	13,700	3.75	3,650	Doorstep Rt. Deviation	M	2	
	Total	100,700	31.55	3,191				
	5	20,000	-		Vanpool	Major Employer	50	-

Abbreviations

M = municipally operated
MTM = Many-to-Many

*Half fare for elderly

Table 1.3

Selected Annual Impacts: Setting #1: "Southern Belle"

1980 IP Scenarios, A, B

Impact/Measure	Scenario A	Scenario B
Change in Consumer Surplus	+734,754	+493,194
New Transit Trips/% increase	1.28 mil/+67% (+251,000 vanpool)	1.14 mil/+59.7% (+251,000 vanpool)
Induced Trips	131,000	81,000
VMT/% change	-2.5 mil. mi/-0.7%	-2.17 mil. mi./-0.6%
Fuel Consumption	-64,400 gal.	-41,700 gal.
Employment: Jobs/Payroll	+70/+$568,000	+81/+$642,800
Auto Expenditures	-$322,000	-$226,000
Transit Operating Cost	+$934,000	+$1,002,000
Net Transit Operating Cost	+$279,000	+$426,000
Net Transit Total Cost	+$559,000	+706,000
Net Operating Cost/Net Total Cost per New Transit Trip	$.22/$.44	$.37/$.62
Net Total Cost per Induced Trip	$4.27	$8.72
Taxi Industry Revenue/% change	-$241,000/-10.7%	-$190,400/-9.5%
Taxi Industry Profit/% change	-$38,300/40.2%	-34,100/-35.8%
Parking Spaces Required	-650	-605

k = 1,000 units

mil = 1,000,000 units

A review of the breakdown of consumer surplus is informative. Work trips account for the major proportion of consumer surplus in both scenarios, since time is typically valued more heavily for the work trip. Note that persons without automobiles, who comprise only 18% of the service area population, receive 25.8% of the consumer surplus work trip benefit in Scenario A and 29.9% in Scenario B. This should not be surprising, since persons without automobiles typically stand to benefit the most from expanded transit service. Finally, note that the elderly, who comprise only 4% of the service area population[1], also are overrepresented in the consumer surplus benefit. The elderly benefit, however, is primarily for non-work trips. The elderly are also projected to receive greater benefit from Scenario B; this is a result of the fact that door-to-door service is provided in the second scenario.

Next consider the change in mobility. A total of 1,280,000 new transit (fixed route plus paratransit) trips per year are projected for Scenario A. This represents a 67% increase in transit ridership for the area. For Scenario B the increase is slightly less, 1,137,300 trips. In addition to these trips, a total of 251,000 vanpool trips per year is projected, for both scenarios, based on a vanpool market of 500 persons. Given the very limited amount of transit service previously available to the employment center, all of these latter trips represent "new" transit trips.

One interesting statistic not shown in any of the tables relates to feeder service. In Scenario A, 27.5% of the paratransit passengers are projected to transfer to or from fixed route service. From another perspective, 16% of all fixed route passengers use paratransit feeder/distributor service. In Scenario B the statistics are 24.5% and 13% respectively. Thus, in this setting, paratransit and transit service are truly integrated. Note that this relatively extensive amount of feeder service can be attributed to the establishment of service areas that are relatively close to, and hence probably oriented towards the CBD, and from which there are no "through route" services.

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[1] This statistic does not appear in any of the tables.

Of the new transit trips, it is projected that 131,000 in Scenario A and 81,000 in Scenario B represent trips that would not have been made at all prior to the initiation of IP service. Persons with the least mobility, the elderly, transportation handicapped, and persons from 0-car hourseholds comprise a significant proportion of this, formerly "latent", demand in both scenarios.

Next, consider impacts on the overall community. In Scenario A, public transit coverage is provided for the first time to 600 transportation handicapped persons, 3,300 elderly persons, and 84,800 others. Of the latter group, 7,500 persons come from households with no automobiles available. The corresponding figures for Scenario B are 1,100, 4,100, 84,800, and 7,500 persons respectively. Because of the tight checkpoint spacing in Scenario A, only elderly and transportation handicapped persons receive greater coverage from the door-to-door service available in Scenario B.

Overall, VMT in the area is projected to decrease by 2,498,000 miles annually in Scenario A. While this figure seems significant, it must be taken in perspective. It represents only 0.7% of total (auto plus bus, <u>excluding</u> truck) VMT in the area. Thus the decline in VMT is relatively <u>insignificant</u>, with the impact of Scenario B even smaller. The related impacts on energy consumption are equally small.

The impact of IP on employment is also relatively small, but positive. A total of 70 new jobs are effectively created by Scenario A, while 81 jobs are created by Scenario B. The annual impact on total payroll is $568,000 in Scenario A and $642,800 in Scenario B. Note that these statistics incorporate both jobs gained in the transit industry and jobs lost in the taxi industry.

The final community impact is the change in automobile ownership and cost. In Scenario A, it is projected that 77 multi-car owning households per year would be willing to eliminate an automobile because of increased availability of public transit service. This represents a reduction of $310,000 in annual capital expenses, and a further reduction of $12,000 per year in operating expenses. The comparable figures are somewhat lower for Scenario B.

Next, consider the impacts on the IP operator which, in this case, is the central city itself. Annual operating cost is expected to increase by $934,000 in Scenario A, and $1,002,000 in Scenario B. These cost increases are offset somewhat by revenue increases, which bring the marginal net operating costs down to $279,000 in Scenario A and $426,000 in Scenario B. Net total costs for the two scenarios are $559,000 and $706,000 respectively. As measures of effectiveness, the net operating cost per new transit passenger and the net total cost per new transit passenger and per induced trip have been calculated for each scenario. The figures are $ .22, $ .44, and $4.27 for Scenario A, and $ .37, $ .62, and $8.72 for Scenario B.

Local competing transportation providers include the taxi industry, private parking lot operators, and a number of social service agencies. The taxi industry is projected to lose $241,000 per year in revenue in Scenario A, a decrease of 10.7%. The decrease for Scenario B is computed at $190,400 or 9.5%. The decrease in profit is computed as $38,300, or 40.2% in Scenario A, and $34,100 or 35.8% in Scenario B. Note that these impacts are industry-wide; the impact on individual operators will vary from operator to operator.

Local private parking lot operators are estimated to lose about $40,000 in Scenario A and $33,000 in Scenario B. No data were available to allow the estimation of the change in revenue.

Finally, local social service agencies are expected to see an annual ridership decrease of about 2,666 trips, and a net opportunity cost savings of $8,000 per year.

The major employer which is served by the vanpool system sees a net reduction of 350 parking spaces required, for both scenarios, which results in an opportunity cost savings of $2,100 per year. Employers in the CBD who currently subsidize parking are estimated to save $54,000 per year, and an additional 300 spaces in Scenario A, and $46,000 and 255 spaces in Scenario B. The city itself is projected to lose $20,000 per year in parking revenue in Scenario A and $17,000 in Scenario B.

The other impacts on the municipality relate to subsidies, which are computed as 50% of net operating cost and 20% of capital cost. The remaining deficits are assumed to be borne by the Federal government.

Given the many different impact groups and impacts, it becomes very difficult to categorize the IP options as "cost-effective" or not, or as "good" or "bad". Clearly the taxi industry will have a different viewpoint on this than will the users of the service. Nevertheless, using some of the impacts and measures, it is possible to begin to address this issue. Furthermore, once other alternatives and settings are discussed, many conclusions can be drawn based on comparisons, rather than absolute values. Note that this, and all following discussions, will be from the <u>public sector's</u> perspective, although this does not imply that the impact on the private sector will not be addressed.

First of all, it is apparent from the comparison that Scenario A dominates over Scenario B. In this context, checkpoint many-to-many service appears to be a more effective alternative than doorstep many-to-many service. The apparent reason for this is that, by effectively limiting the total number of stops a vehicle must make and increasing the number of pick-ups or drop-offs per stop, the vehicle can maintain a higher effective speed. This, in turn, results in shorter wait and ride times, which serves to attract more passengers. In addition, a higher vehicle speed results in increased productivity and hence capacity. The analysis performed for this setting suggests that these advantages more than outweigh the disadvantage of requiring passengers to walk to a checkpoint, if the checkpoint spacings are fairly tight (and hence walk times very short). It would appear that this concept should be explored further in a demonstration. Note that because of the limited utilization of the route deviation services, no conclusions can be drawn as to whether checkpoint service is preferable to doorstep service.

The results of Scenario A only will be used in the remainder of this discussion.

The net cost per new transit passenger is a key measure, since it allows a comparison of the marginal impacts of IP with the base transit system. The resulting figure of $ .44 is fairly low; since the average fare per trip including transfers was $ .49, (and thus the total cost per trip $ .93), it can be seen that this IP alternative is able to cover over 50% of all costs from the fare-box. This revenue-to-cost ratio is reasonably high for the current state of the transit industry.

The question still remains as to whether the remaining impacts of IP compensate for the subsidy portion of total cost. The $559,000 in transit subsidy is offset, in part, by $322,000 in direct auto expenditure savings to the community. If one also considers the $734,754 in consumer surplus benefits, and the $568,000 in new jobs, it begins to appear that the IP system can be justified from a benefits perspective. Of course, this depends on the value placed on non-direct monetary impacts, as well as on other costs of the service. Nevertheless, the IP option certainly has beneficial impacts that go far beyond the revenue generated.

The only major negative cost is the impact on the taxi industry. The sizeable impact on profits is serious, given the precarious nature of the taxi industry. Instead of using the impact to inhibit the implementation of IP service, however, methods should be sought to minimize the impact. One option would be to contract with the taxi industry for all or part of the paratransit service. This option will be explored in other scenarios.

Major conclusions cannot be drawn about IP from a single scenario. Nevertheless, the major conclusions that can be reached about this particular setting may be summarized as follows:

1. Checkpoint many-to-many service can be a more effective option than doorstep many-to-many service, and is worthy of further study.

2. Vanpool service to a single very large employer can account for a reasonable number of trips, and is a virtual "no cost" option.
3. Given the relatively high revenue-to-cost ratio, the benefits of IP in this setting may be considered to offset the costs.
4. IP can have a positive impact on VMT and energy reduction (i.e., result in a decrease); however, this impact is virtually insignificant.
5. IP can have a fairly significant impact on taxi revenues and profits, and methods should be sought to minimize this impact.

1.3 1980: Alternatives to IP

1.3.1 Extended Fixed Route Bus Alternative

The extended conventional fixed route bus alternative for "Southern Belle" is shown in Figure 1.6. It was developed by extending most of the fixed routes radiating to the south and west of the CBD into the suburban areas. The newly served areas are the ones served by paratransit in the IP alternative. Seven of the original nine fixed routes have been lengthened. In addition to the extensions, a number of new routes have been added to the network. Three of these serve the region located across the river to the north of the city. Two crosstown routes have been included in the design to offer direct access between outlying sections. These routes traverse areas located approximately 4 miles and 6 miles, respectively, from the CBD. (In the base case, all crosstown travel was required to pass through the CBD, due to the radial configuration of the fixed routes.)

In designing the expanded conventional fixed route alternative for this setting, the goal was to serve the previously identified IP zones with a rational fixed route system. This criteria resulted in less extensive coverage than was offered with an IP system, but a high percentage of the urbanized population lives within the areas served by the proposed routes. The headways in this alternative have been reduced so that all routes have a maximum headway of 30 minutes. The increased frequencies, extensions, and additions require the service of 27 additional buses. The fare, hours, and operating entity remain the same as in the base case.

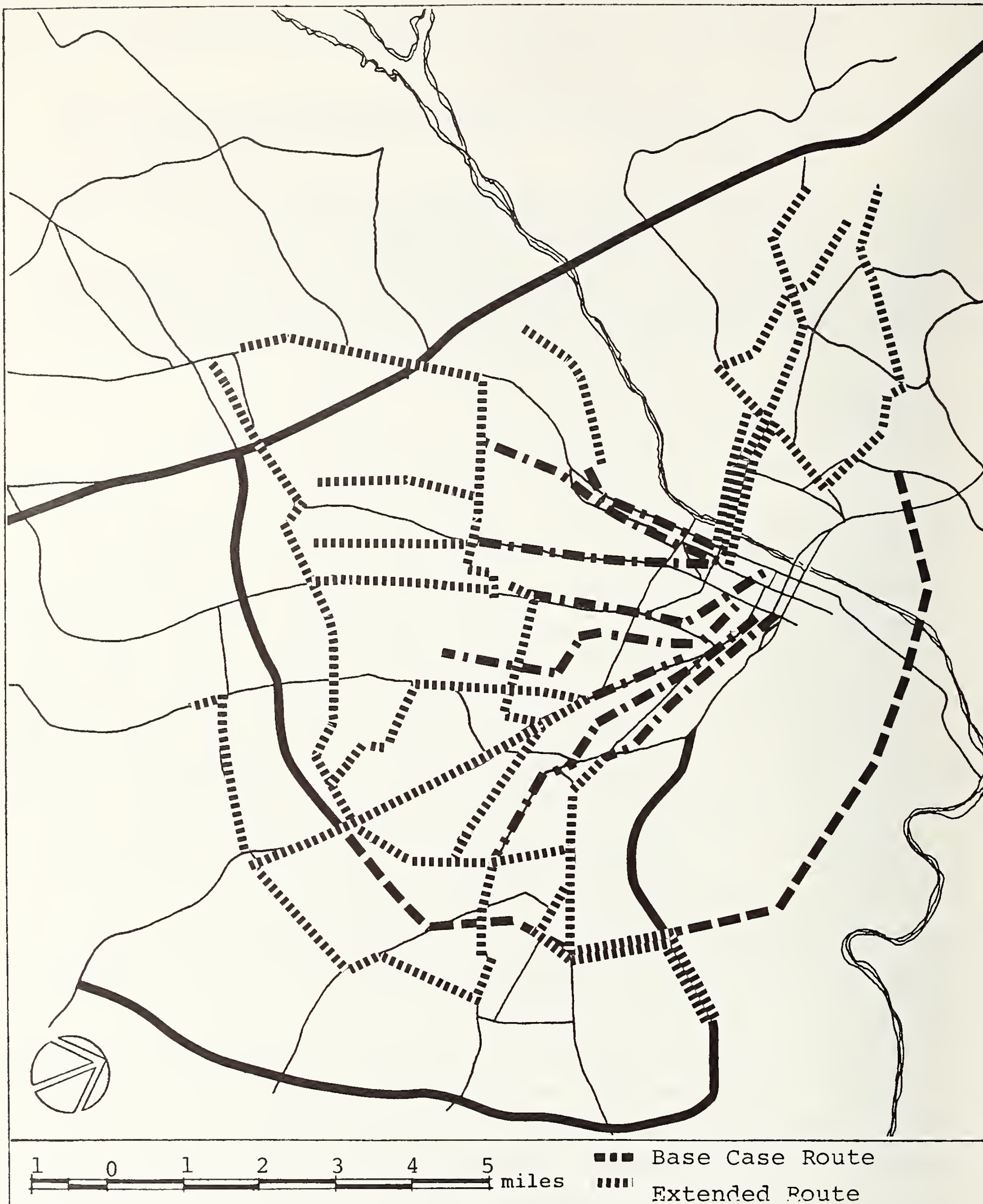

FIGURE 1.6

1980 EXTENDED FIXED ROUTE ALTERNATIVE "SOUTHERN BELLE"

1.3.2 Extended Exclusive-Ride Taxi Alternative

The extended taxi alternative in this setting involves the provision of a user-side subsidy throughout the urbanized area. With this user-side subsidy, the fare for taxi service is effectively reduced from the base case (90¢ for the first mile plus 50¢ for each additional mile) to 70¢ for the first mile plus 40¢ for each additional mile. An additional subsidy is provided to the elderly such that the fare for their trip is only one-third of what it would be for a member of the general public.

The user-side subsidy is administered through the transit operator, which makes up the difference in fare. Because the local governments feel that a sufficient number of taxis is currently operating within the urbanized area, no change in the licensed taxi fleets is allowed.

1.3.3 Benefit-Cost Analysis of Alternatives to IP

Detailed breakdowns of the benefits and costs of the alternatives to IP are included in Appendix A, in Tables A.1.3 and A.1.4 respectively. Once again, key impacts of these alternatives have been summarized, and are compared with the impacts of IP Scenario A in Table 1.4. Impacts not calculated for the taxi alternative are so-indicated in this table.

Consider first the IP/extended fixed route comparison. New transit ridership generated by the route extensions is projected at 607,000 per year, bringing the total transit ridership in the area to 2,500,000. Note that this is considerably lower than the new transit ridership of 1,280,000 (plus 251,000 on the vanpool system) projected for the IP alternative. Thus, the extended bus alternative is clearly less effective in attracting new transit riders. This is partly a result of poorer coverage offered by the fixed route option (fewer than 70,000 persons first served by transit as opposed to over 90,000 in the IP case) and partly a result of poorer quality of service.

The fixed route alternative utilizes fewer resources and hence is less expensive to operate than the IP option; however,

Table 1.4

Selected Annual Impacts: Setting # 1: "Southern Belle"

1980 IP Scenario A Extended Fixed Route, Extended Taxi

Impact/Measure	IP Scenario A	Extended Fixed Route	Extended Taxi
Change in Consumer Surplus	+734,754	+152,376	+13,265
New Transit Trips/% increase	1.28 mil/+67%*	607,400/+32%	NA
Induced Trips	131,000	54,700	20,400
VMT/% change	-2.5 mil mi/-0.7%	-263k mi/-0.08%	+602k mi/+0.02%
Fuel Consumption	-64.4K gal.	+75.8K gal	+69.1 gal.
Employment: Jobs/Payroll	+70/+$568,500	+56/+435,600	+23/+314,000
Auto Expenditures	-$322,000	-$49,100	-$94,800
Transit Operating Cost	+$934,000	+$789,000	NA
Net Transit Operating Cost	$279,000	+$637,000	NA
Net Transit Total Cost	+ $559,000	+858,000	+$1,211,700
Net Operating Cost/Net Total Cost per New Transit Trip	$.22/$.44	$1.05/$1.41	NA
Net Total Cost per Induced Trip	$4.27	$15.69	$59.40
Taxi Industry Revenue/% change	-$241,000/-10%	-$66,400/-3.3%	+$542,000/+26.2%
Taxi Industry Profit/% change	-38,300/-40.2%	-$11,900/12.5%	+$131,600/+138%
Parking Spaces Required	-650	NC	NC

NA = Not Applicable   k = 1,000 units

NC = Not Calculated   mil = 1,000,000 units

*Excludes vanpool.

the lower ridership levels and fare generate significantly less revenue in the fixed route case. As a result, the total net annual cost is actually higher in the extended fixed route alternative. While gross operating cost per marginal passenger is not dramatically different in the two cases (73¢ for IP, $1.30 for fixed route), net total cost per marginal passenger is markedly different ($.44 for IP vs. $1.41 for fixed route).

Other benefits (e.g. change in consumer surplus, change in auto expenditures) are also much lower under the extended fixed route scenario. Again, it is the difference in coverage and level of service that is largely responsible. In addition, fuel consumption is projected to increase slightly under this alternative, as compared to a decrease under the IP scenario. Thus, in this setting, the extended fixed route option is considerably less effective than the IP option. While one must be careful about over-generalizing these results, the implications are that relatively high capacity paratransit services (such as checkpoint service) may be more effective than fixed route service in medium density (4,000 persons/mile^2) suburban areas with travel patterns oriented towards intra-community trips.

Next, consider the extended taxi alternative. Recall that in this scenario, the transit authority elected to make better utilization of the large number of taxis operating in the area by providing a 25% user-side subsidy for general public and a 67% subsidy for the elderly. This was done without any accompanying increase in taxi licenses. The results suggest that the existing fleet was able to absorb a sizeable ridership increase. Taxi ridership in the area was projected to increase by over 20%, or 278,032 trips per year. Most of the new taxi riders are elderly persons. The change in ridership, with no comparable increase in taxi company fixed costs, is projected to result in a 138% increase ($131,600) in taxi company profit.[1]

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[1] In actuality, the taxi companies may incur some additional fixed costs to handle the additional passengers and billing requirements. Thus, this estimate may be slightly on the high side.

One interesting result is the change in consumer surplus. The increase in ridership decreased taxi service quality, given the constant vehicle fleet size. As a result, the number of work trips, which are more sensitive to service levels than fares, actually decreased, resulting in a net decrease in work trip consumer surplus. Overall, consumer surplus did increase slightly.

Because the taxi fare decrease was instituted, a decrease of 22.8 automobiles per year was projected, for a total savings of $94,800 per year. Reductions in auto ownership and diversion from automobile, however, do not make up for the increase in taxi mileage; the result of the alternative is a net increase of VMT of 602,000 per year, with a resulting increase in fuel consumption and emissions.

Note that the costs of the user-side subsidy have been allocated to the public transit operator. Annual cost of the subsidy is estimated at $1,196,000; in addition, the transit operator is estimated to lose $15,700 per year in revenue from passengers diverted to taxi.

It is clear that the taxi option has markedly different impacts than either of the other alternatives. On the benefits side, the change in consumer surplus and the number of induced trips are significantly lower in the case of taxi. VMT increases in the taxi alternative, as compared to decreases in each of the other scenarios. In addition, the cost of the taxi alternative is substantially higher. The user-side subsidy for all persons is clearly an expensive method for generating new (induced) trips. The public cost per new trip is estimated at $59.40, as compared to $4.27 for the IP alternative.

This is not to say that a user-side subsidy makes no sense under any circumstances. For example, consider that a user-side subsidy for elderly persons only in this setting would have resulted in a cost of only $760,300, and yet still have generated about 90% of the induced ridership projected for this scenario. Thus, a user-side subsidy may be more effective at increasing the mobility of the elderly. However, it is clearly an expensive way to increase the mobility of the overall public.

A major benefit of the user-side subsidy accrues to the taxi industry. Perhaps one way to improve the overall impacts of the alternative would be to somehow require the taxi industry to "share" the benefit with the general public, either by a slight (further) decrease in fares, or through a return of some of the extra profits to the transit operator. In any event, however, the impacts of such sharing would be minimal in comparison to the overall cost.

Although, from the taxi industry perspective, the extended taxi alternative is the best and the IP alternative is the worst for "Southern Belle", it should be clear from Table 1.4 that, from the public's perspective, the IP option is the dominant alternative for 1980.

1.4 Year 2000 Analysis

1.4.1 Base Case Transit System

The base case transit system for "Southern Belle" in the year 2000 includes a significantly expanded fixed-route transit network, shown in Figure 1.7. The population within the circumferential highway located beyond the central city boundary is projected to grow considerably; thus, it is assumed that a more extensive conventional transit network can be supported. Fixed bus routes are extended beyond this area to several areas projected to experience significant growth, although population densities in these outlying areas are not expected to grow to the point where frequent service or extensive coverage can be provided. A total of the 40 vehicles, all equipped with wheelchair lifts in response to federal mandates, are used to provide the service.

With the expansion of service, the number of transit employees increases substantially. As a result, it is assumed that the employees unionize and receive moderate increases in wages and benefits. In contrast to the national trend of no transit cost increases beyond inflation that has been projected for the 1980-2000 period, operating costs in Setting #1 increase by 5% over 1980 levels.

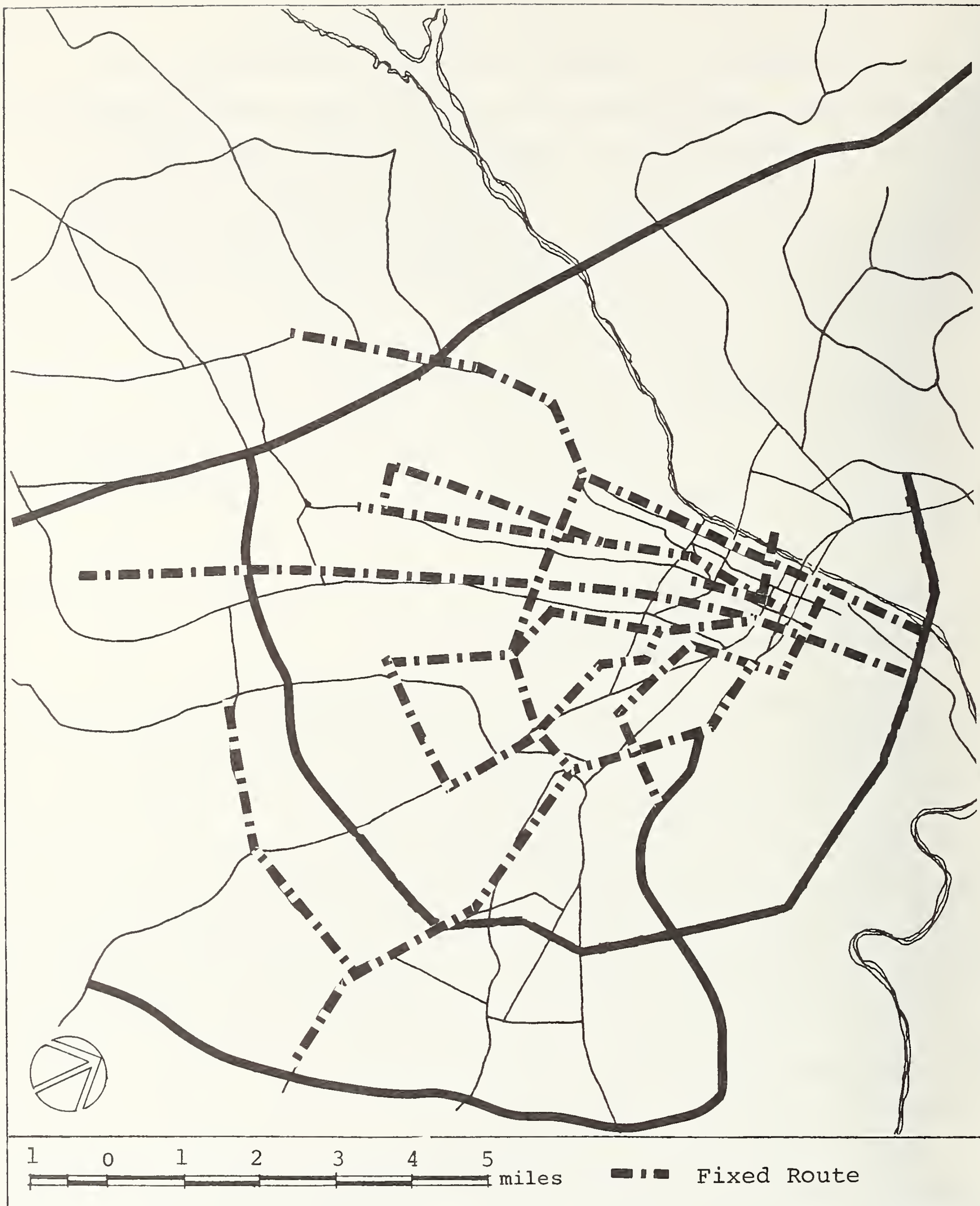

FIGURE 1.7

2000 BASE CASE TRANSIT SYSTEM "SOUTHERN BELLE"

Other characteristics of the year 2000 base case are not significantly different from those of the 1980 situation. Fare remains constant with respect to inflation, and there are assumed to be gradual subsidy increases to cover all expenses. Vehicle operating speeds, are projected to decrease 5% in response to an increased number of vehicles on the road. The local taxi industry grows in proportion to the population increase. However, in keeping with national trends in the taxi industry, the owner-operator is all but eliminated. Merger and growth result in two major taxi fleets one with 90 cabs and one with 63 cabs, while only two owner-operators remain in business.

1.4.2 2000 IP Scenario

The 1980 IP Scenario A for "Southern Belle", which included checkpoint many-to-many and checkpoint route deviation services, serves as the basis for the year 2000 system. It is assumed that in the year 2000 much of the area previously served by paratransit can be provided relatively good conventional transit in a cost-effective manner. Paratransit service is expanded into the more suburban rings on the outskirts of the urban area. Figure 1.8 indicates the location of four checkpoint many-to-many service modules and one checkpoint route deviation module in place by 2000. The route deviation service is the same as that which existed in 1980; despite minor population increase in this area, deviation service is still desirable because of the nature of the street network. The vanpool service, begun in 1980, is still in operation.

As noted in the introduction to this volume, each year 2000 scenario will be analyzed twice, under two different auto ownership/auto cost assumptions. Thus, there are actually two scenarios for Setting #1, termed A-1 and A-2. Auto ownership and other relevant scenario characteristics are summarized in Table 1.5.

1.4.3 Benefit-Cost Analysis: Year 2000 IP Scenarios

Detailed breakdowns of the benefits and costs of the year 2000 IP scenarios for "Southern Belle" can be found in Tables A.1.5 and A.1.6. The results are summarized and compared in Table 1.6.

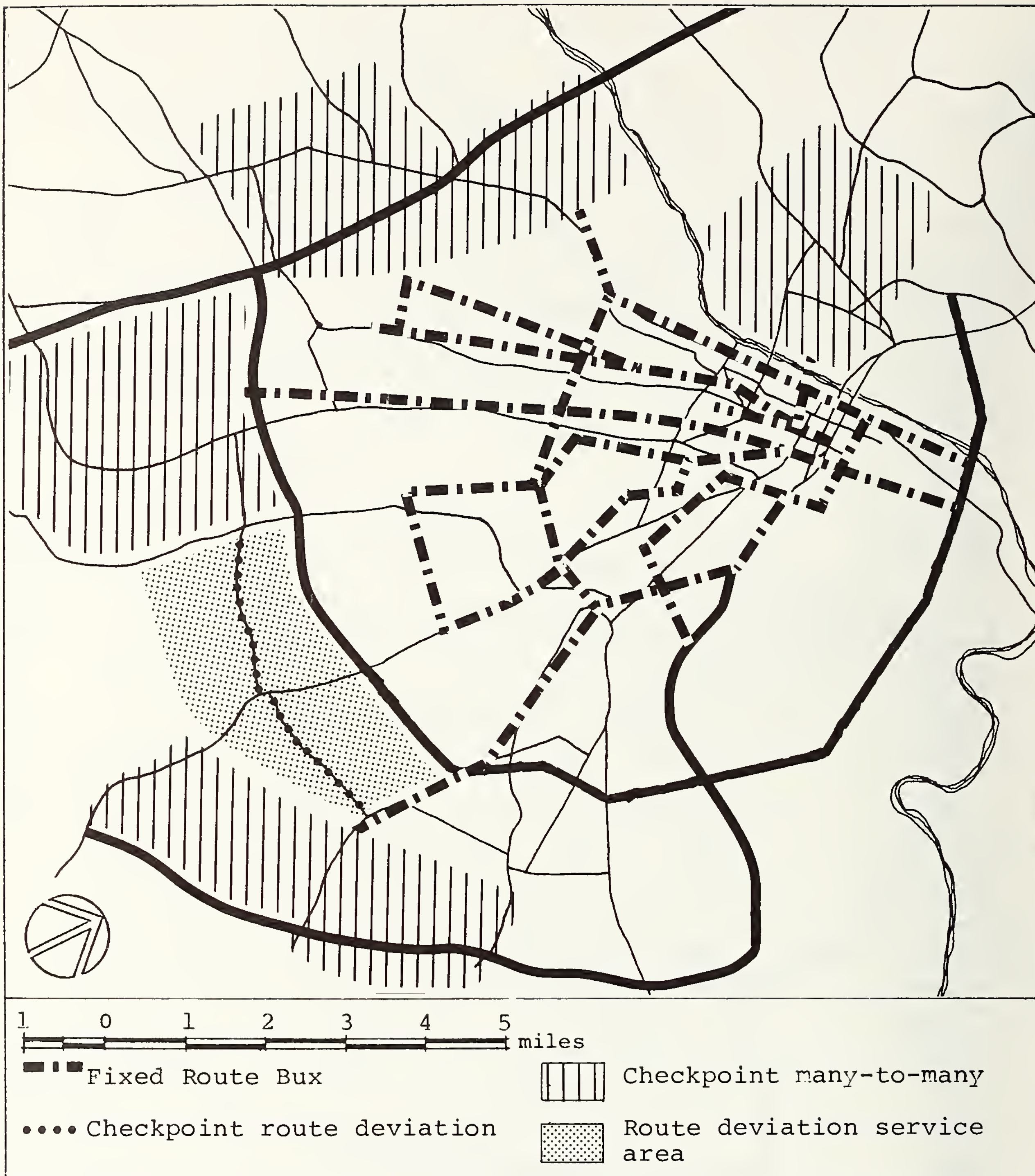

FIGURE 1.8

YEAR 2000 IP SCENARIO "SOUTHERN BELLE"

Table 1.5

Characteristics of Year 2000 IP Scenarios: "Southern Belle"

Scenario	Module	Eligible Population (Paratransit Service only)	Area, (sq. mi.)	Population Density	Service Type	Operating Entity	Para-transit Vehicles	Para-transit Fare	Urban Area Auto Ownership	A-1	A-2
2000 A-1 and A-2	1	20,600	7.5	2,750	Checkpoint MTM	M	30	50¢ + 5¢ transfer	0	20%	23%
	2	11,300	6.5	1,738					1	45%	47%
	3	24,000	9.4	2,553					2+	35%	30%
	4	11,500	8.6	1,337					Avg. Autos per H.H.	1.20	1.10
	5	18,400	5.2	3,538	Checkpoint Rt. Deviation	M	3	50¢ + 5¢ transfer			
	Total	85,800	37.2	2,306			33				
	6	20,000	95		Vanpool	Major Employer	55				

Abbreviations: MTM = many-to-many
M = municipally operated
HH = household

Table 1.6

Selected Annual Impacts: Setting # 1: "Southern Belle"

2000 IP Scenarios A-1 and A-2

Impact/Measure	Scenario A-1	Scenario A-2
Change in Consumer Surplus	+607,002	+632,698
New Transit Trips/% increase	940,500/+38%	1,069,000/+43%
Induced Trips	104,900	120,700
VMT/% change	-2,592,000 mi/-0.5%	-3,200,000 mi/-0.7%
Fuel Consumption	-53,000 gal.	-55,500 gal.
Employment: Jobs/Payrool	+65/+$499,500	+61/+$469,500
Auto Expenditures	-$326,000	-$481,000
Transit Operating Cost	+$769,000	+$796,000
Net Transit Operating Cost	+$402,000	+$351,000
Net Transit Total Cost	+$629,000	+578,000
Net Operating Cost/Net Total Cost per New Transit Trip	$.43/$.67	$.33/$.54
Net Total Cost per Induced Trip	$6.00	$4.79
Taxi Industry Revenue/% change	-$186,900/-4.8%	-$215,000/-5.5%
Taxi Industry Profit/% change	-$33,500/-18.0%	-$38,500/-20.7%
Parking Spaces Required	-510	-570

The results of Scenario A-1 suggest that, given the demographic changes projected for the next 20 years, an IP system cannot be expected to have radically different impacts in 2000 than in 1980. The 2000 service, designed to serve outer suburban areas, offers less total coverage than the 1980 scenario. The result is lower ridership and correspondingly lower cost. The net cost per marginal passenger is low and very comparable to that of 1980. The deficit is fairly small and can probably still be justified by the other benefits. Note that the impact of IP on VMT still remains small. Note also that, with the growth of the taxi industry and the contraction of IP service, the impact of IP on the taxi industry became less severe.

Scenario A-2 suggests that the impact of IP cannot be expected to vary markedly, even under very different auto ownership and cost conditions. To be sure, the difference in auto ownership does have some impact. For example, the increase in transit ridership is 13% higher in Scenario A-2, while auto expenditure savings alone more than offset net operating cost and offset 83% of net total cost. Thus, there could conceivably be cases where the difference in automobile ownership will make a difference in how the impacts of IP are perceived on a local level. However, the net impact of reduced automobile ownership does not appear to be dramatic, based on the analysis for "Southern Belle".

Chapter 2

Setting #2: "College Town"

2.1 Setting Description

The second setting analyzed represents the second cluster of SMSA's developed in the city classification task. This cluster is characterized as containing small to medium-sized SMSA's with a low percentage of single-family dwellings in the central city and high average income. Other notable descriptors of this area include:

- high percentage of employment in the central city;
- high percentage of population living in the central city;
- high auto ownership;
- low elderly population; and
- low central city family density.

Twenty SMSA's are represented by this cluster, including: Ann Arbor, Michigan; Champaign-Urbana, Illinois; Honolulu, Hawaii; Madison, Wisconsin; Nashua, New Hampshire; and Reno, Nevada.

The setting chosen to represent this cluster, pictured in Figure 2.1, is a midwestern area with a projected 1980 population of approximately 140,000 in a 40-mile square area. Because of the fact that many (but not all) of the cities in this cluster have major universities, we have named the setting"College Town". The setting consists of two communities located ten miles apart. The larger of the communities has 71% of the population and 59% of the employment of the urban area. The two communities are surrounded primarily by agricultural land with only a few small towns in the area. The nearest SMSA is considerably larger and is located 50 miles away. The primary impact of this neighboring city is to draw a portion of the labor force away from the setting. Other characteristics of Setting #1 are listed in Table 2.1.

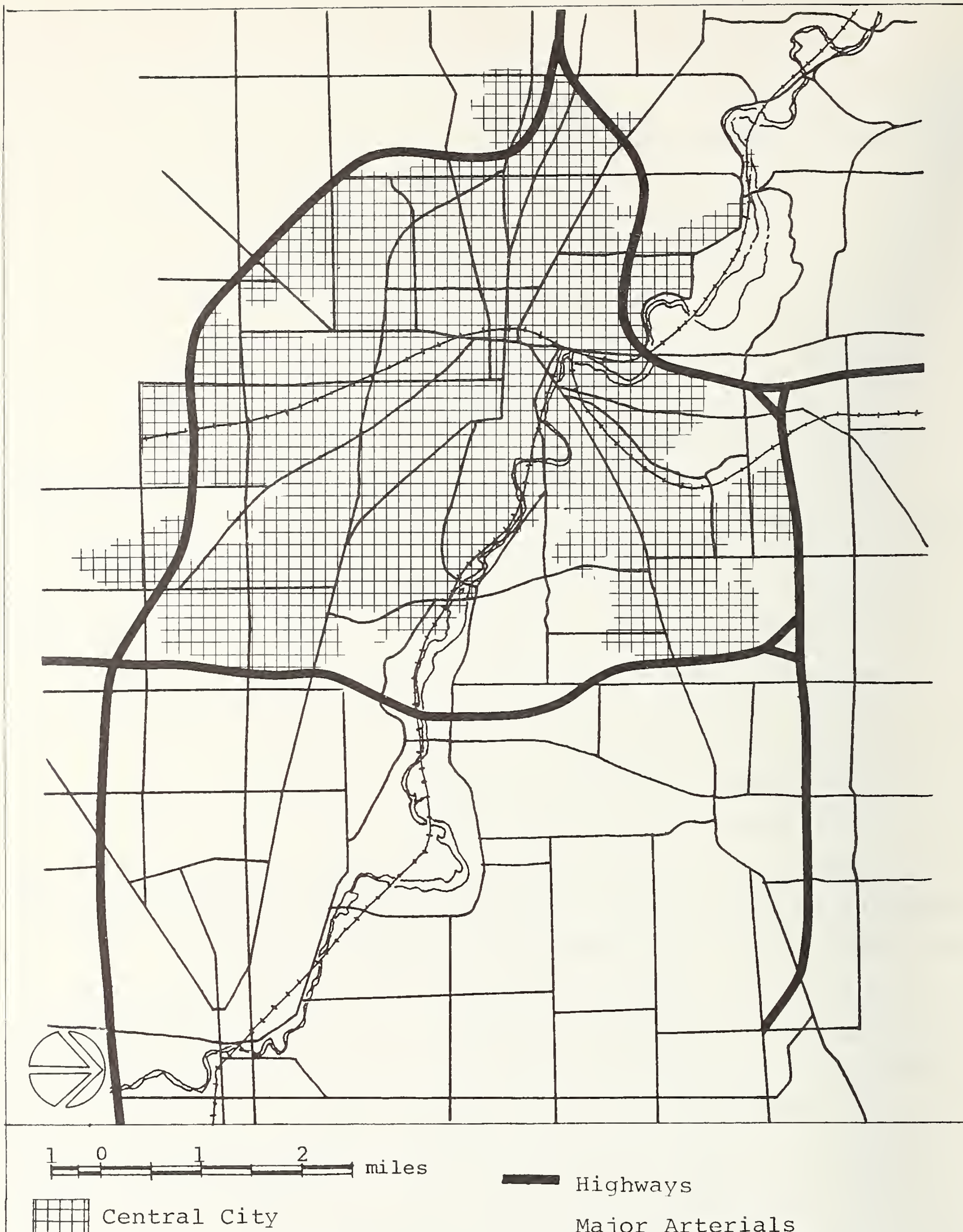

FIGURE 2.1

SETTING #2: "COLLEGE TOWN"

Table 2.1: Setting #2: Demographic Characteristics

	1980	2000
Population	142,000	177,000
Area, sq. mi.	43.5	53.5
Density	3,264	4,007
Employment	78,000	103,000
% Elderly	5	6

For the purposes of the scenario analysis, only the larger of the two cities will actually be considered further, although total urban area statistics will be presented.

1980 Base Case Transit System

The base transit system for "College Town" in 1980 consists of four fixed routes in the larger of the two communities, one of which extends to provide service to the smaller one, as indicated in Figure 2.2. Thirty-two 28- to 35-passenger transit buses are used on the routes, with headways ranging between 15 and 30 minutes during peak periods. These routes place nearly 80% of the population of the city within 1/4 mile of a bus route, but most travel requires a transfer to reach a desired destination other than the CBD. The service is provided from 6:30 a.m. to 6:30 p.m. on weekdays only. Weekend and evening service is not provided. Fares on all routes are 25¢, with free transfers provided between routes.

The cost structure of the base case is that of a typical small transit authority with unionized labor. Wage rate for drivers is $5.40 per hour plus fringe benefits. Because of union regulations concerning working hours and split shifts, approximately 10% of paid person-hours are non-productive. Maintenance workers receive an hourly wage of $6 plus fringe benefits.

The transit authority in "College Town" receives subsidies for both capital and operating costs from federal and local sources. The federal subsidy amounts to 80% of capital expenditures and 50% of the operating deficit. State funds cover 15% of capital and 10%

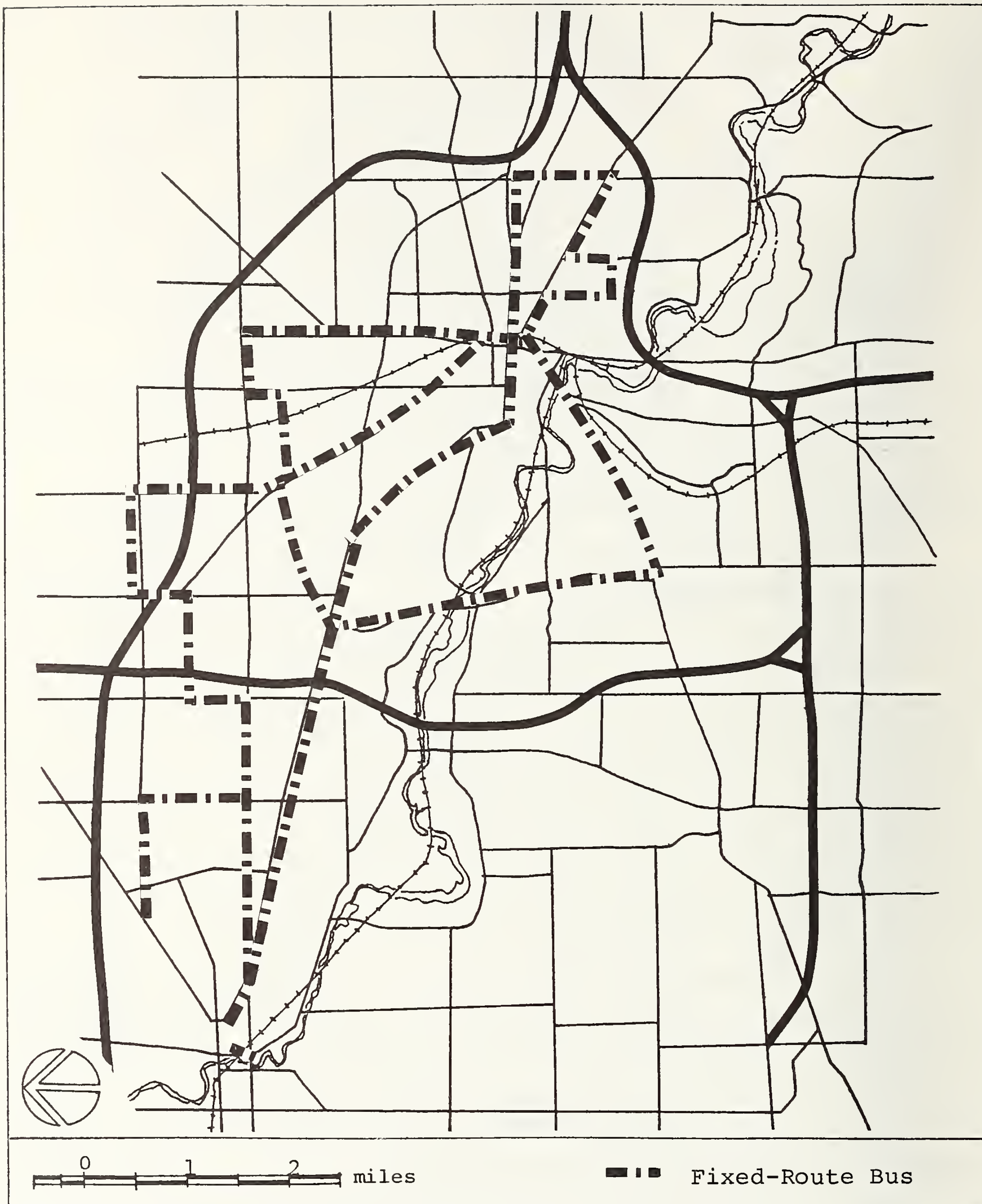

FIGURE 2.2

1980 BASE CASE TRANSIT SYSTEM "COLLEGE TOWN" of the operating deficit. The remainder of the capital costs and operating deficits are funded through property taxes within the communities in the transit authority.

Exclusive-ride taxi service is provided by four taxi companies which operate 65 vehicles within the two communities. A fare of $1.10 plus 60¢ per mile is charged for taxi trips.

A prime incentive to use non-auto modes for travel to the CBD in the larger community is a steep (on- and off-street) parking charge. Municipal parking rates are 20¢ for the first hour, 25¢ for the second hour, and 35¢ for each additional hour with no limit. No flat full-day parking fares are available.

2.2 1980: IP Scenarios

2.2.1 IP Scenario A

In Scenario A, ten demand-responsive (DRT) paratransit service zones have been added to supplement the base case fixed routes between 6:30am and 6:30pm on weekdays. These ten zones, illustrated in Figure 2.3, provide coverage to all except two areas of the city. (The areas not covered either have good fixed route service or extremely low population and thus have not received high priority in the paratransit implementation). Service in the smaller community is unchanged. To provide the best access to the fixed routes, service within the DRT zones includes regularly scheduled coordinated transfers between DRT and fixed route vehicles at designated transfer points.

The paratransit service provides a range of travel options. An individual traveling between two points located in the same DRT service area can be picked up at his/her origin and let off at his/her destination by the same vehicle. For trips between DRT service areas, at least one transfer is required. The transfer may be between a DRT vehicle and fixed route vehicle, or between two DRT vehicles. In some cases two or even three transfers are required to travel between selected origins and destinations. A 25¢ fare (half-fare for the elderly) is charged for any component of the service. Transfers between a DRT vehicle and another vehicle, or between fixed route vehicles are

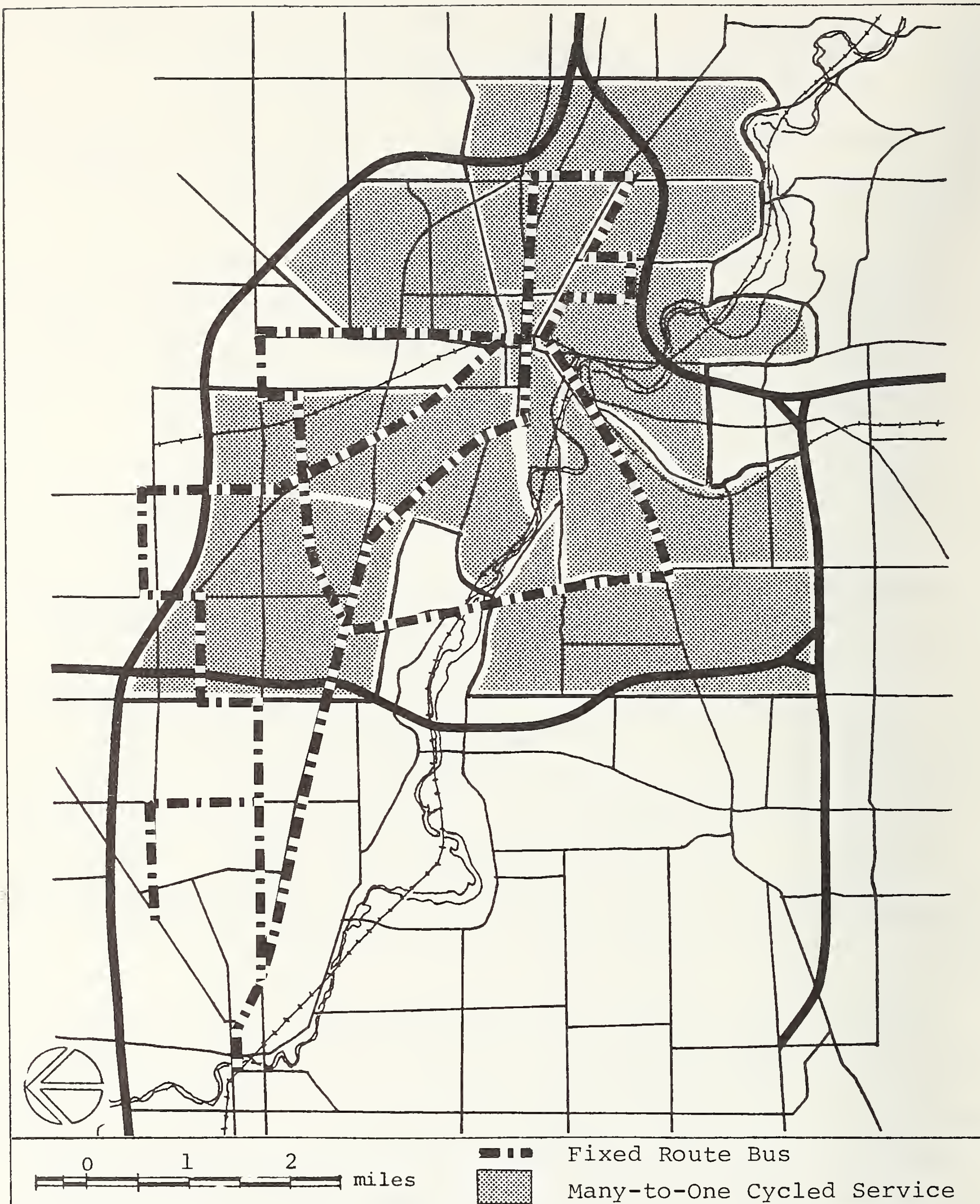

FIGURE 2.3

1980 IP SCENARIO A - WEEKDAY SERVICE

"COLLEGE TOWN"

free of charge. Since these transfers are pre-scheduled, transfer time is minimal, averaging under four minutes.

The vehicle fleet for the supplemental DRT service is comprised of forty-four 12-passenger vans. From one to five of these vehicles are assigned to each service area depending on time of day and demand level of the service area. The vehicle trips are manually pre-scheduled by a central dispatcher, with the help of a minicomputer system. These tours are transmitted to vehicles by digital communications while the vehicle is waiting at the transfer point. In addition to the persons indicated by the dispatcher's schedule, some unscheduled "walk-ons" can be accommodated at the transfer station.

During weekends and evenings, the fixed route system is contracted, and the paratransit zones are expanded to provide full coverage. Weekend and evening DRT service areas are illustrated in Figures 2.4 and 2.5 respectively. Two vans operate in each DRT

In addition to the regular service, service for the transportation handicapped is provided during all hours of operation. Door-to-door service is provided with four lift-equipped vehicles, anywhere in the urban area. Because of the limited number of vehicles and difficulties in scheduling doorstep service, patrons of handicapped service must request service several hours in advance. Eligible transportation handicapped individuals are charged the same fare as regular passengers, 25¢, for each trip.

The paratransit services provided in Scenario A are provided by the same regional transit authority as the fixed routes. Wages of paratransit drivers and mechanics, are the same as those on the fixed route service. The control staff (including dispatcher and telephone operators) receive $5.40/hour plus fringe benefits. Subsidy from federal, state, and local sources are provided on the same basis as in the Base Case.

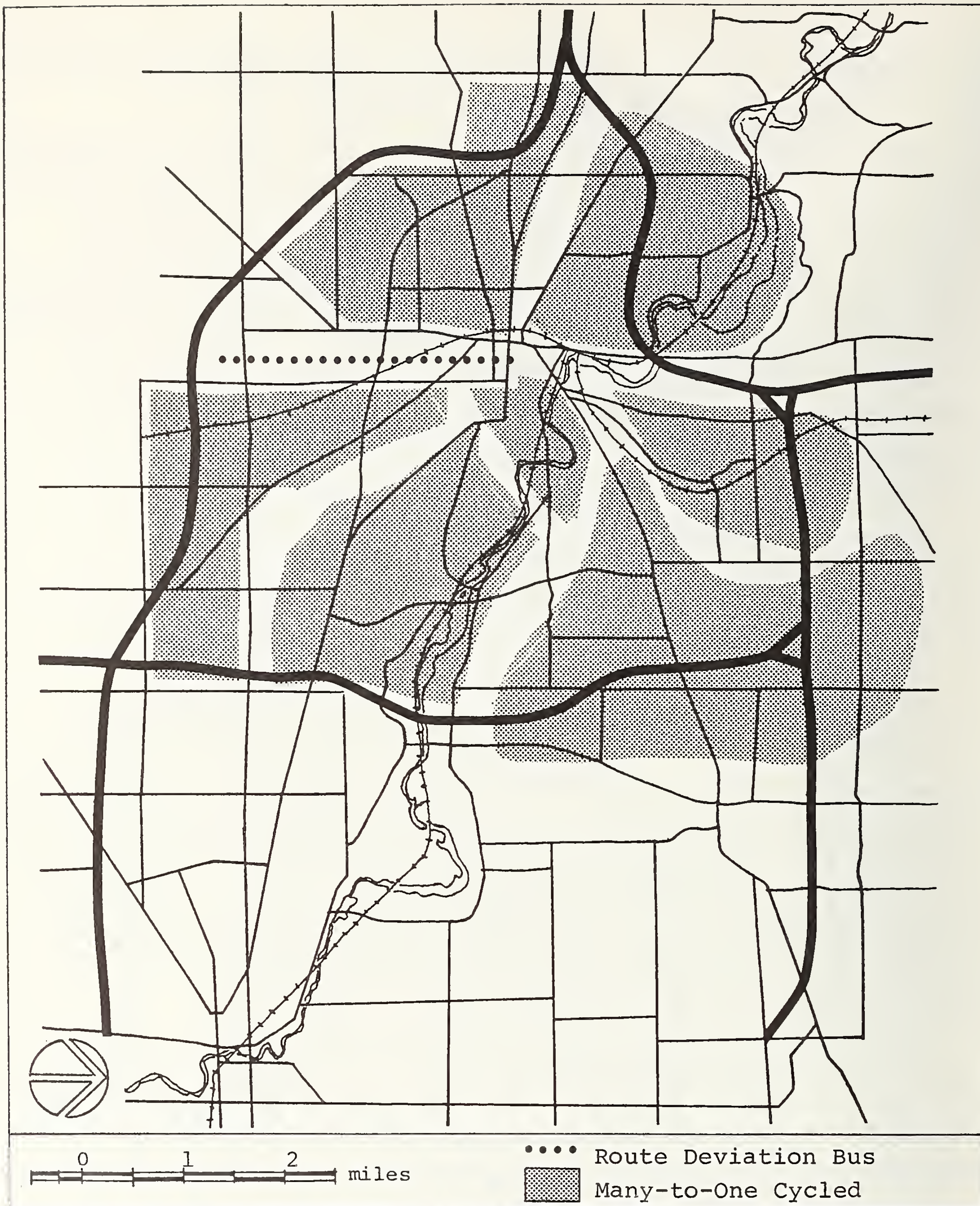

FIGURE 2.4

1980 IP SCENARIO A - EVENING SERVICE

"COLLEGE TOWN"

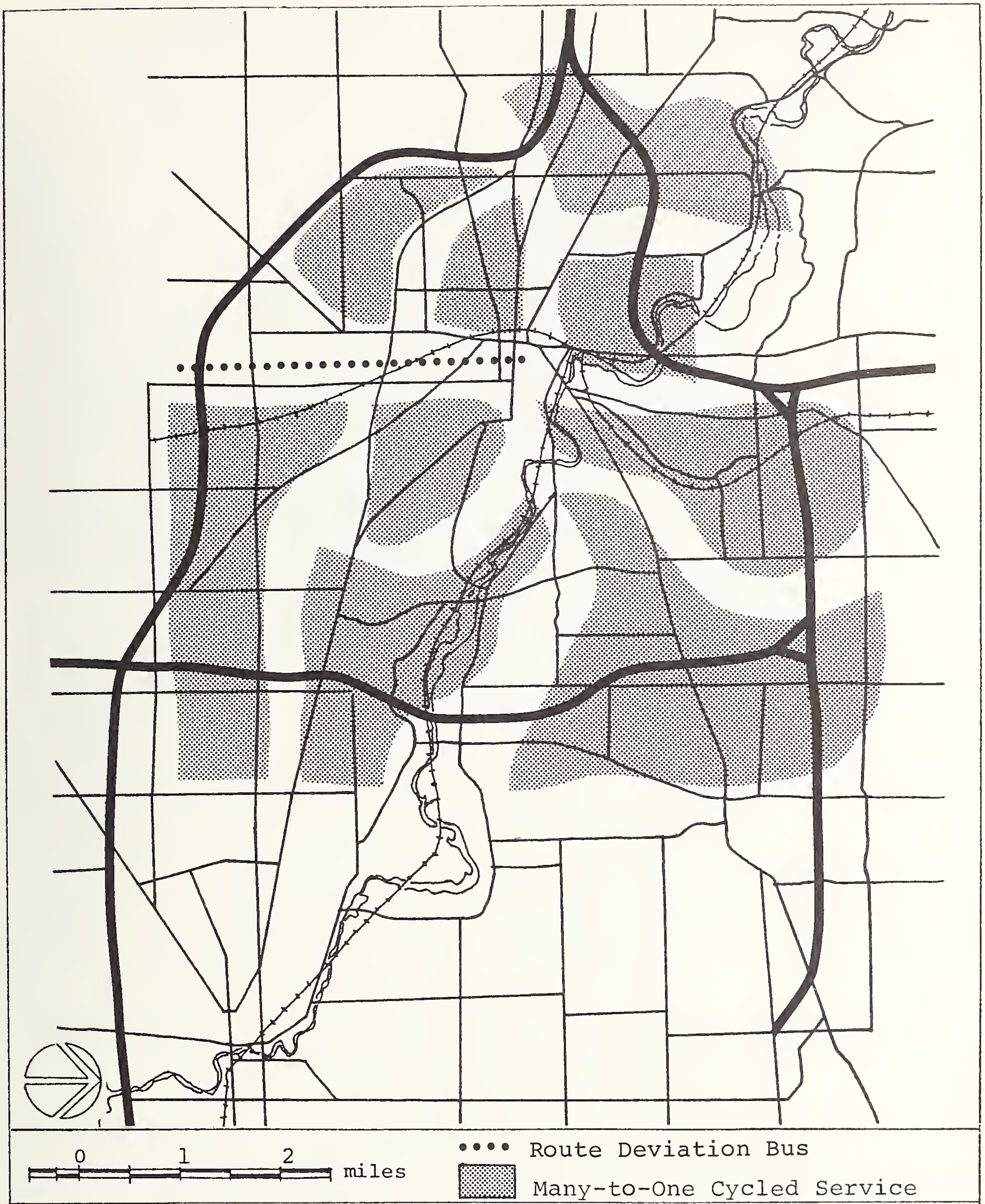

FIGURE 2.5

1980 IP SCENARIO A - WEEKEND SERVICE

"COLLEGE TOWN"

2.2.2 IP Scenario B: Description

Scenario B for "College Town", illustrated in Figure 2.6, represents an alternative method of providing complete coverage in the city. This scenario consists of a single large DRT zone, in which many-to-many doorstep service is offered on an immediate request basis for a fare of 50¢ (25¢ for elderly and transportation handicapped). This system eliminates the tranfer requirements of Scenario A for most trips, but coordinated transfers (which remain free) are still provided to allow travelers to access areas not directly served by the many-to-many operation. The same number of vehicles used in Scenario A is used in Scenario B. To control the large number of vehicles, dispatching is fully automated. A larger minicomputer than that used in Scenario A is utilized in this scenario.

Service for the transportation handicapped is provided with a subset of the vehicle fleet, which consists of wheelchair lift-equipped vehicles. Service is provided for these persons at 25¢ a trip.

2.2.3 IP Scenario C: Description

Scenario C differs from Scenario B in two major ways. First and foremost, the paratransit component of the IP service is operated by a private operator under contract to the public transit authority. The authority is responsible for acquiring the vehicles and leasing them to the operator at $1 per year. The private operator is responsible for all other facets of operation. The contract is on a cost plus fixed fee basis, with a 10% management fee allowed, but all revenues returning to the transit authority. The estimated cost per hour of the service is $8.

The second major difference between Scenarios B and C is the fare structure. To make the service more equitable, a mileage basis is employed in fare determination. The fare is 25¢ for the first 1/2 mile, plus 15¢ for each additional mile. The fare is calculated by the computer, which is also leased to the private operator by the transit authority.[1]

The characteristics of the three IP scenarios are summarized in Table 2.2.

[1]The hardware and software necessary to estimate fares in this manner have already been developed. See Baumann (1976).

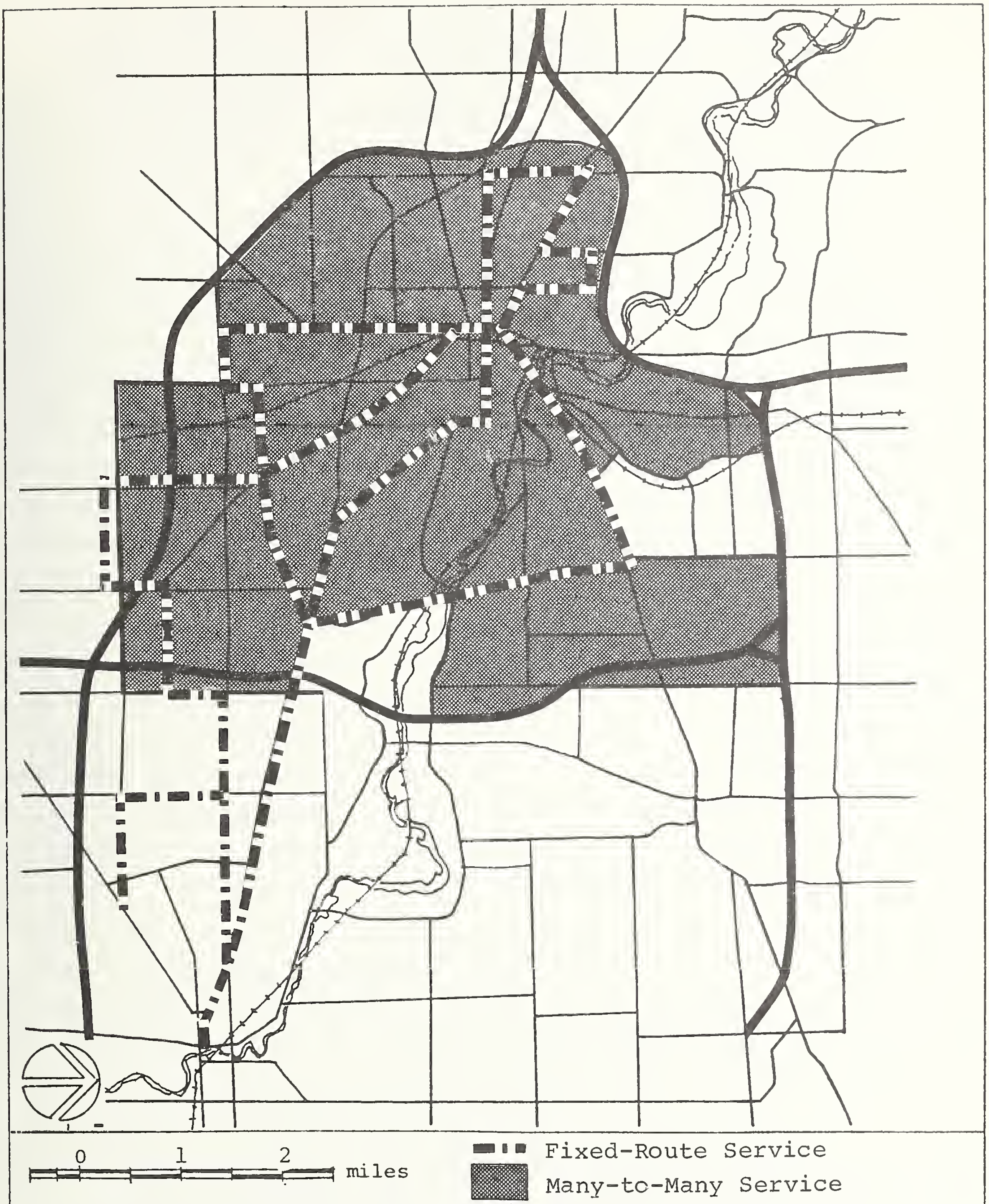

FIGURE 2.6

1980 IP SCENARIO B AND C

SETTING #2

Table 2.2

Characteristics of 1980 IP Scenarios in "College Town"

Scenario	Module	Eligible Population (Paratransit Service only)	Area, (sq.mi.)	Population Density	Service Type	Operating Entity	Paratransit Vehicles	Paratransit Fare*
1980A	1-10	78,000	16.5	4,730	Cycled MTO	TA	42	25¢
	11(TH)	3,200	42.5	75	MTM	TA	3	25¢
1980B	1	78,000	16.5	4,730	MTM	TA	42	50¢
		3,200	42.5	75	MTM	TA	3	25¢
1980C	1	78,000	16.5	4,510	MTM	Taxi Operator	42	25¢ + 15¢/ half mile
		3,200	42.5	75	MTM	Taxi Operator	3	25¢

Abbreviations

MTO = Many-to-one

TH = Transportation handicapped

TA = Transportation Authority

*Half fare for elderly, except on TH service

2.2.4 Benefit-Cost Analysis: IP Scenarios

Complete breakdowns of the benefits and costs of these IP scenarios are provided in Tables A.2.1 - A.2.3. Key impacts are summarized and compared in Table 2.3. To help identify the dominant alternative, the "best" value of each measure has been enclosed in a box.

Consider first Scenario A. This scenario, which consists of small paratransit feeder zones integrated with the base fixed route network, results in a 34.3% increase in overall transit ridership. Because of the smallness of the paratransit zones, 65% of all paratransit trips involve a transfer to the line-haul network. Thus, in this case, the design of the system dictates that the fixed route and paratransit services be totally integrated. Apparently, the scheduled transfer coordination serves to minimize the burden of transferring sufficiently, such that a large number of passengers are willing to transfer.

Nevertheless, a comparison of Scenarios A and B (the two publicly operated scenarios) reveals that Scenario B is clearly superior. Scenario B results in a greater increase in transit ridership, despite the higher fare for paratransit service. Ridership on both the paratransit and fixed route service elements is higher in Scenario B; the latter occurred because some passengers who were diverted from fixed route to paratransit in Scenario A would choose to remain on fixed route in Scenario B because of the fare differential.[1]

The higher level of ridership projected for Scenario B suggests that the transfer requirement for most trips in Scenario A does, in fact, serve as a disincentive to travel. In addition, the idle time built into the system in Scenario A to facilitate coordinated transfers is eliminated in Scenario B, thus increasing the effective vehicle speed, resulting in higher service levels.

[1]Note that the fare policy in Scenario A, which allows free transfers, could present a problem. Passengers who might be able to easily walk to a bus stop are encouraged to use the feeder service since it is effectively free. While the addition of marginal passengers to fixed route service poses no difficulty, in a paratransit service the demand influences level of service. Thus the generation of "unnecessary" demand could result in poorer service, and thus act to discourage other demand. The same fare structure played a role in the over-demand/under-supply situation which helped stop integrated transit/paratransit service in Santa Clara County, California.

Table 2.3

Selected Annual Impacts: Setting #2: "College Town"

1980 IP Scenarios A, B, C

Impact/Measure	Scenario A	Scenario B	Scenario C
Change in Consumer Surplus	+160,548	**+186,351**	+149,268
New Transit Trips/ * % increase	487,000/+34.3%	**880,000/+62%**	689,000/+48.5%
Induced Trips	97,000	**176,000**	138,000
VMT/% change	+568k mi/+0.6%	**+220k mi/+0.2**	+350k mi/+0.4%
Fuel Consumption (gallons)	+102,200	**+79,900**	+87,600
Employment: Jobs/ Payroll	+77/+$920.6k	**+85/+$1 mil.**	+86/+$473.7k
Auto Expenditures	-$380,600	**-$692,000**	-$590,700
Transit Operating Cost	+$2,498,000	+$2,698,000	**+$878,000**
Net Transit Operating Cost	+$2,377,000	+$2,152,000	**+$270,000**
Net Transit Total Cost	+$2,686,000	+$2,486,000	**+$604,000**
Net Operating Cost/ Net Total Cost per New Transit Trip	$4.88/$5.52	$2.45/$2.83	**$.39/$.88**
Net Total Cost per Induced Trip	$27.69	$14.13	**$4.38**
Taxi Industry Revenue/% change	**-$86,300/-10.1%**	-$101,700/-11.9%	+$787,500/+92.2%
Taxi Industry Profit/% change	**-$15,400/-37.9%**	-$18,200/-44.7%	+$63,600/+156.2%
Parking Spaces Required	-67	-92	-70

*Increase over transit ridership in major city in setting only.
Boxes indicate best scenario for given impact
k = 1,000 units
mil = 1,000,000 units

The result appears to run counter to present thinking, given the relative success of some integrated feeder/line haul system, and the relative failure of a number of many-to-many systems. It must be noted, however, that no many-to-many system to date has operated with the large number of vehicles (32 peak), or the high vehicle density (1.8 vehicles per square mile) of Scenario B. Thus, no existing system has been able to approach the level of service projected for "College Town". It is true that one of the major problems effecting many-to-many systems is unreliability, and that reliability has not been considered in this analysis. However, Scenario B is assumed to be computerized, and experiments to date suggest that computerization does significantly improve reliability.

This result should not be taken as a conclusion regarding the general effectiveness of the maximum integration strategy represented by Scenario A. Perhaps the key element at play here is the small size of the area (19 square miles). Apparently, the area is too small to generate the full potential benefits of a feeder/line haul system, and sufficiently small to enable a many-to-many system to operate effectively. Feeder/line haul integration may still be the most effective strategy in larger urban areas with longer average trip lengths.

Although Scenario B is superior to Scenario A, it is still a very expensive option. Net total cost per new transit passenger is estimated at $2.83, which is significantly higher than the cost projected for "Southern Belle", and is certainly out of the range of the costs of most transit operations. Part of the high cost can be attributed to the existence of low productivity evening and weekend service. Part of it can be attributed to the fact that the paratransit service is overlaid on the fixed route service and has an extremely high vehicle density. Finally, part of the high cost can be attributed to the relatively high wages of the unionized labor.

This latter point is dealt with in Scenario C, where the paratransit component of the service is contracted out to a private operator. Although total ridership is projected to be lower than in Scenario B, the net result of private operation is to reduce the cost per marginal passenger to $.88 Note that this contract also reverses the negative impact on the taxi industry; instead of a 12% decrease in industry revenue projected for Scenario B, a 92% increase in revenue (and a corresponding 156% increase in profit) is projected for Scenario C.

Once again the question of whether the other benefits of IP conpensate for the deficit can be asked. In the case of "College Town" the answer is somewhat easier: the $604,000 annual transit deficit is almost entirely offset by $590,700 in reduced automobile expenditures alone. Since there are no other major costs attributed to IP, it appears that Scenario C is an effective alternative.

Note that the auto expenditure savings for this scenario are greater than those projected in Setting #1, despite the lower ridership levels. This is probably a result of the fact that direct, areawide transit service is provided throughout "College Town", while the service was somewhat less extensive in "Southern Belle". The availability of areawide service may make households more willing to do without a second or third automobile.

Another interesting observation can be made by comparing the change in consumer surplus predicted for "College Town" and "Southern Belle". A significantly smaller change[1] is projected for "College Town". This is a result of the fact that paratransit service is overlaid on an existing, fairly extensive fixed route network in this setting, while paratransit service represents an extension of service to new areas in "Southern Belle". Thus the difference in service quality perceived by passengers in "Southern Belle", when paratransit service is introduced, is significantly greater than the difference in "College Town".

In summary, the major conclusions to be drawn from this setting are:

1. Areawide many-to-many service is a more effective IP strategy than integrated feeder/line haul service in small urban areas when a higher paratransit vehicle density is possible.

[1]The difference is not proportional to the difference in ridership.

2. Contracting the paratransit service element to a private taxi operator will have a significant impact on the overall economics of the service, and will also result in a net beneficial impact to the taxi industry.

3. Consumer surplus can be expected to increase much more substantially when paratransit is implemented in an area previously unserved by transit.

4. The willingness of households to eliminate an automobile is highly dependent upon the extent to which transit service is truly areawide.

2.3 1980: Alternatives to IP

2.3.1 Extended Fixed Route Bus Alternative

The extended fixed-route bus alternative attempts to provide direct non-transfer routings between all sections of the city. This goal is achieved by providing twelve new city routes, illustrated in Figure 2.7, replacing the four routes operating in the base case. Service along the extended and expanded bus routes is offered on 15-minute headways throughout the day, increasing to 30 minutes on evenings and weekends. With this new system, a level of service comparable to paratransit service can be provided to almost all persons in the area. An additional 33 vehicles are required to expand the fixed-route service.

2.3.2 Extended Exclusive-Ride Taxi Alternative

In this alternative, the Transit Authority seeks to obtain expanded taxi service, through the purchase of 25 new taxis to be leased (at $1 per year) to the operators in the larger city in the setting. The capital subsidy is expected to allow the operators to continue to provide service, even if the improved service level does not generate sufficient ridership to continue to operate at the same productivity level.

2.3.3 Benefit-Cost Analysis of Alternatives to IP

Breakdowns of the benefits and costs of the extended fixed route and extended taxi alternatives can be found in Tables A.2.4 and A.2.5 respectively. Key impacts are summarized and compared with the impacts of IP Scenario C in Table 2.4.

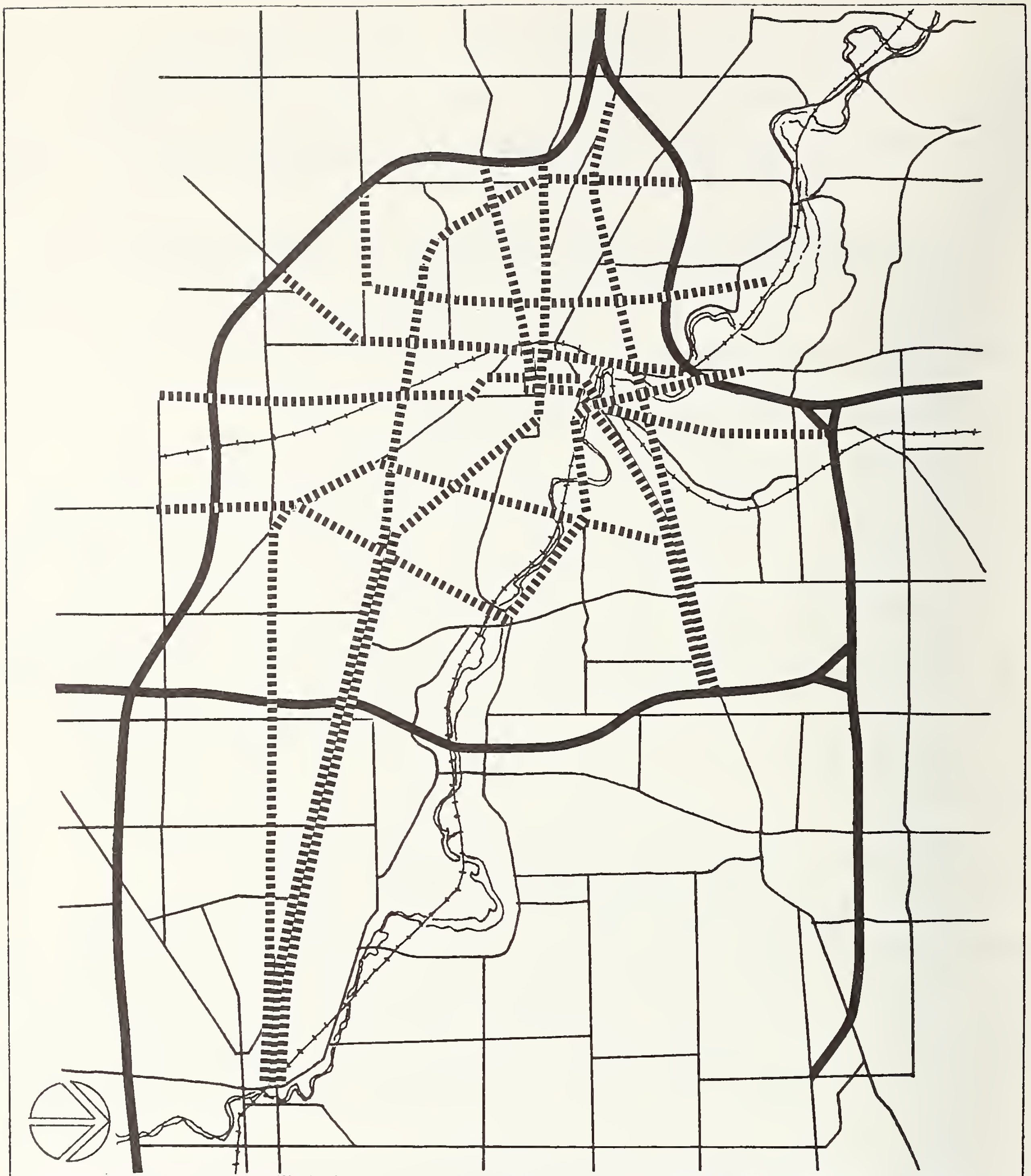

FIGURE 2.7

1980 EXTENDED FIXED ROUTE ALTERNATIVE

"COLLEGE TOWN"

Table 2.4

Selected Annual Impacts: Setting # 2: "College Town"

1980 IP Scenario C, Extended Fixed Route, Extended Taxi

Impact/Measure	IP Scenario C	Extended Fixed Route	Extended Taxi
Change in Consumer Surplus	+149,268	+117,032	+38,997
New Transit Trips/ % increase	689,000/+48.5%	712,400/+50.2%	NA
Induced Trips	138,000	106,900	4,960
VMT/% change	+350k mi/+0.4%	+980k mi/+1.1%	+1 mil. mi/+1.1%
Fuel Consumption (gallons)	+87.6k	$250.6k	+101.9k
Employment: Jobs/ Payroll	+86/+$473.7k	+156/+$176.73k	+31/$53,500
Auto Expenditures	-$590,700	-$496,000	0
Transit Operating Cost	+$878,000	+$2,574,000	NC
Net Transit Operating Cost	+$270,000	+$2,390,000	NC
Net Transit Total Cost	+$604,000	+$2,900,000	+$52,000
Net Operating Cost/ Net Total Cost per New Transit Trip	$.39/$.88	$4.07	NA
Net Total Cost per Induced Trip	$4.38	$27.13	$10.48
Taxi Industry Revenue/% change	+$787,500/+92.2%	-$94,800/-11.1%	$89,000/+10.4%
Taxi Industry Profit/% change	+63,600/+156.2%	-$17,000/-41.8%	-$16,000/-30.2%
Parking Spaces Required	-70	NC	NC

NA = Not applicable
NC = Not calculated
k = 1,000 units
mil = 1,000,000 units

Consider first the fixed route alternative. As noted earlier, an attempt was made in this scenario to provide a fixed route network with comparable service levels to the IP system. Based on the results, this was achieved. The number of new transit trips is approximately the same in the two scenarios, while other ridership/level of service dependent impacts (e.g., consumer surplus; automobile expenditures) are also reasonably similar. The major differences are in costs. The cost of providing the fixed route service is significantly higher than the cost of providing IP service in Scenario C. However, bear in mind that the paratransit alternative was privately operated, while the fixed route service is publicly operated. A comparison of the extended fixed route option with IP Scenario B (which had public operation) reveals that the fixed route alternative is not that different in cost from the IP option. The change in operating cost of the IP is, in fact, slightly greater ($2,698,000 vs. $2,574,000). However, when revenue and capital cost are considered the IP option becomes slightly less expensive ($2,486,000 vs. $2,900,000).

The implications of this are rather interesting. It appears that in a city with the population density of "College Town" (5,200 persons/ square mile), either fixed route or IP can be used to achieve comparable service and ridership levels. However, the fixed route design that was used (refer back to Figure 2.7) was probably much more extensive than any transit operator would ever implement. The marginal total cost per passenger ($4.07) is certainly not a level that most operators would willingly assume. Similarly, the IP alternative probably utilizes many more vehicles than most operators would be willing to use. Under private operation, the cost implications are not dramatic. Under public operation, however, with the wage levels that prevail in this setting, the costs of the service appear out of line with the ridership levels achieved.

It should be recognized that, in practice, it is probably more feasible to contract a paratransit component of an overall service to a private taxi operator than it would be to contract part, or all of a fixed route service. Thus the IP alternative may, in fact, be more practical than the fixed route alternative, despite the similarity in operating statistics.

As an aside, note that the fixed route alternative also results in a significantly higher increase in fuel consumption than did the IP alternative.

Next, consider the impacts of the extended taxi alternative. Taxi ridership in the urban area is projected to increase by some 82,782 trips, or 29.2%. However, the new trips have a shorter average trip length, resulting in a revenue increase of only 10.4%. Despite the capital subsidy (which amounted to $48,000 per year), because the taxi industry's revenue per mile decreases, the industry is projected to incur a $16,000 per year, or 30.2%, profit decrease.

Bear in mind, however, that this result does not represent the final steady state situation. The taxi industry normally maintains a delicate balance between supply and demand. If the demand increase does not eventually parallel the increase in supply, vehicles would be taken out of operation. While we have not attempted to determine the equilibrium point, in all likelihood the final system would have fewer vehicles than the analyzed system, and the taxi industry would, at worst, be in the same economic position as before the expansion.

Note that the taxi alternative results in a much smaller increase in consumer surplus than either of the other two alternatives and has no impact on auto expenditures. The total cost to the public is very small, but so are the returns. The net cost per induced trip of the taxi option is considerably lower than the cost of the extended fixed-route option, but less than 5% of the number of trips are induced. Finally, note that the contract with the taxi industry to provide service in the IP case more positively impacts the private operators than does the capital subsidy and expanded service in the extended taxi alternative.

2.4 Year 2000 Analysis

2.4.1 Year 2000: Base Case Transit System

The year 2000 base case transit system for "College Town" is assumed to be very similar to the system in place in 1980. Most population growth is expected within one mile of the 1980 transit system; thus, no expansion of service was felt to be necessary. The major service change initiated is an increase of frequency on some routes. Routes with peak headways of 30 minutes and those with off-peak headways of 60 minutes have their frequency doubled. All transit vehicles in the year 2000 are equipped with wheelchair lifts.

Another operating characteristic which is assumed to change is the base vehicle operating speed. The speeds on the overall street network are assumed to decrease by 5%, with a greater decrease within 2 miles of the CBD. Line haul speeds between the two communities that comprise the setting are assumed to remain constant. Effective transit speeds are reduced further by increased patronage. Despite slower vehicle speeds, it is assumed to be possible to operate all routes on previously existing schedules, with some degradation of reliability.

2.4.2 Year 2000 IP Scenario

The IP scenario in the year 2000 is similar to 1980 Scenario C. The fixed-route network remains essentially unchanged. The paratransit system operates in a many-to-many mode, with the service area extended to cover the two small sections of the community which were not served in 1980. To handle the increased demand resulting from increased population and greater service area, twenty vehicles are added to the base fleet of 42 operated in 1980. Seven of these are equipped with wheelchair lifts, bringing to ten the number available to serve the handicapped.

As in 1980, the paratransit service elements are operated by a consortium of local taxi companies. Because the private operators have a long relationship with the public sector, private sector costs are assumed to increase by 20% over the rate of inflation, bring the service contract cost to $9.60 (1977 dollars) plus a 10% fee.

Scenario A-2 incorporates the same service structure, with different assumptions about auto ownership and costs. Characteristics of the scenarios are shown in Table 2.5.

2.4.3 Benefit-Cost Analysis of Year 2000 IP Scenarios

Detailed breakdowns of the benefits and costs of the year 2000 IP scenarios can be found in Tables A.2.6 and A.2.7. The results are summarized and compared in Table 2.6.

The increase in population projected for this area, combined with an increased vehicle fleet size, result in a substantial increase in transit ridership; the annual increase of almost 1.7 million passengers in Scenario A-1 is more than twice the increase projected for the same system in 1980. All other impacts are comparably larger; note that the net cost per new transit trip decreases only slightly. Thus, while the total impact of this scenario is greater, the relative impact of various benefits and costs remains approximately the same.

As was the case in Setting #1, Scenario A-2 for "College Town" suggests that a change in auto ownership will not be a major influence in determining the impacts of IP.

Table 2.5

Characteristics of Year 2000 IP Scenarios for "College Town"

Scenario	Module	Eligible Population (Paratransit Service only)	Area, (sq. mi.)	Population Density	Service Type	Operating Entity	Para-transit Vehicles	Para-transit Fare	Urban Area Auto Ownership	A-1	A-2
2000, A-1, A-2	1-12	122,000	22.5	5,420	Doorstep MTM	Taxi Co.	65	50¢	0 autos	4%	5%
	13(th)	5,000	42.5	120	Doorstep MTM	Taxi Co.	10	25¢	1	38%	39%
									2+	58%	56%
									avg/HH	1.67	1.60

Abbreviations:

MTM = Many-to-Many

HH = Households

Table 2.6

Selected Annual Impacts: Setting #2: "College Town"

2000 IP Scenarios A-1 and A-2

Impact/Measure	Scenario A-1	Scenario A-2
Change in Consumer Surplus	+564,813	+605,344
New Transit Trips/% Increase	1,680,500/+72%	1,788,100/+76%
Induced Trips	362,000	370,000
VMT/% Change	-1,544,000 mi/-0.5%	-1,711,000 mi/-0.6%
Fuel Consumption, gallons	-10,800	-4,900
Employment: Jobs/Payroll	+100/+$886,200	+98/+$871,900
Auto Expenditures	-$696,600	-$804,000
Transit Operating Cost	+$1,827,000	+$1,827,000
Net Transit Operating Cost	+$987,000	+$964,000
Net Transit Total Cost	+$1,387,000	+$1,364,000
Net Operating Cost/New Total Cost per New Transit Trip	$.60/$.80	$.52/$.74
Net Total Cost per Induced Trip	$3.83	$3.69
Taxi Industry Revenue/% Change	+$1,556,900/+126%	+$1,533,000/+124%
Taxi Industry Profit/% Change	+$117,700/+200%	+$113,400/+193%
Parking Spaces Required	-278	-275

k = 1,000 units
mil = 1,000,000 units

Chapter 3

Setting #3: "Sun City"

3.1 Setting Description

The third setting analyzed represents the third group of urban areas developed in the city classification task. This group is characterized as having "average" populations, with a large percentage of the population living and working in the central city. It is notable that the majority of these urban areas are located in the south and southwest. Other notable characteristics of the group include:

- high auto ownership;
- low elderly population;
- high percentage of families living in single-family dwellings;
- low income;
- low central city residential density, and;
- low transit use for the work trip.

There are forty-one cities in this cluster, including: Albuquerque, New Mexico; Boise, Idaho; Columbus, Georgia; Huntsville, Alabama; Salinas, California; and fourteen Texas cities.

The site selected to serve as Setting #3 is shown in Figure 3.1. Because most of the areas in this cluster are in the southwest or other parts of the Sun Belt, the setting has been named "Sun City". This community has a projected 1980 population of 460,805 and is expected to grow in size to 692,690 by year 2000. Because of geographical considerations, virtually all of this population is located in the central city. The principal characteristics of "Sun City" are presented in Table 3.1. Another interesting facet of this

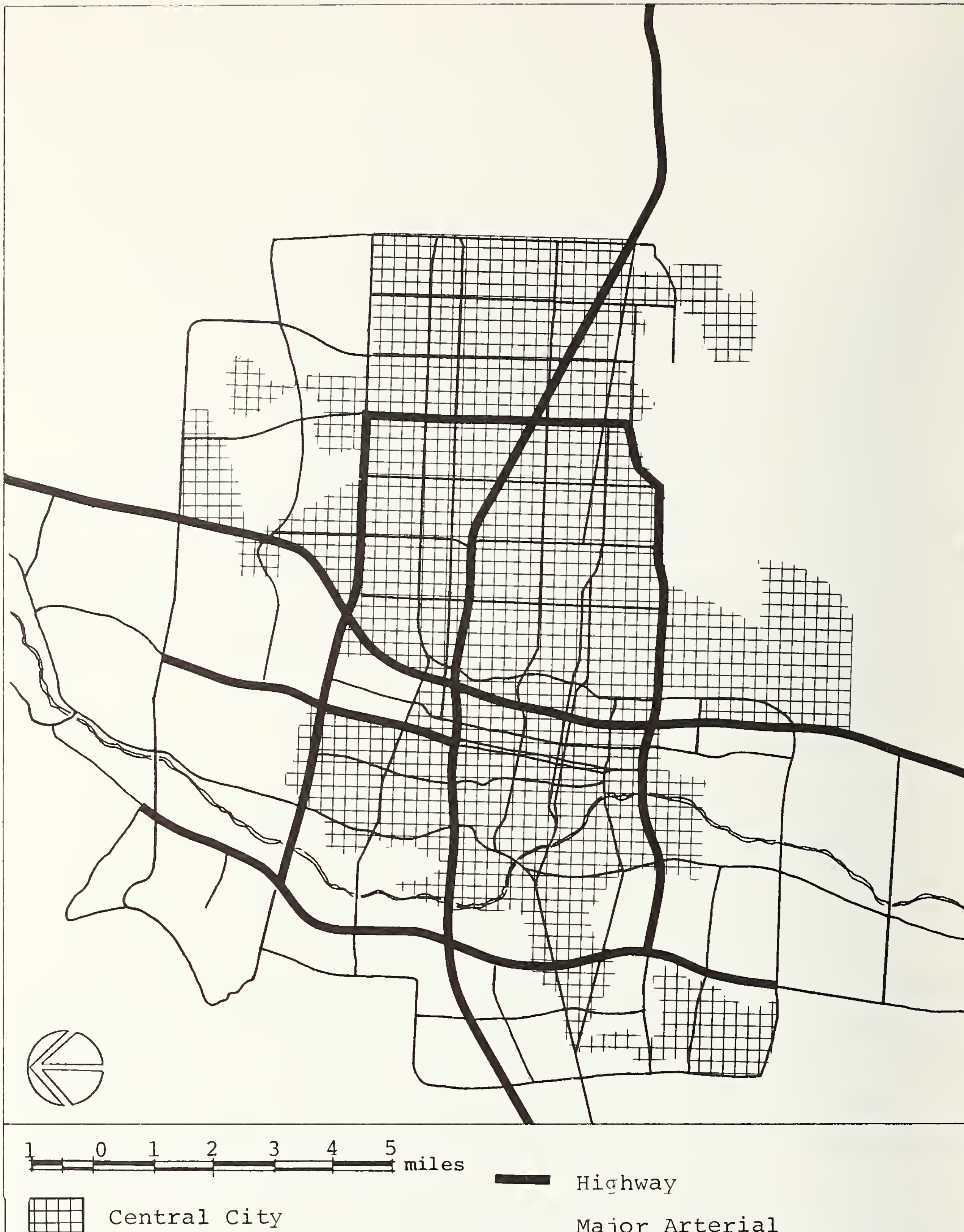

FIGURE 3.1

SETTING #3 "SUN CITY"

community is the relatively high average auto speeds, characteristic of many southwestern cities. The average speed for the entire urban area is 22.3 mph. Within the CBD, this average speed drops to 12.3 mph, which is still more than 50% greater than the speed in most northeastern cities.

Table 3.1: Setting #3: Demographic Characteristics

	1980	2000
Population	460,805	692,690
Area, sq. mi.	133.2	244.3
Density	3,459	5,200
Employment	186,342	320,700
% Elderly	9	9

1980 Base Case Transit System

The base transit case for "Sun City" consists of the extensive fixed-route network shown in Figure 3.2. These fixed routes operate with sixty-seven 30- to 40-foot transit buses on 15- to 60-minute headways during both the peak and off-peak. Only a few vehicles have higher peak frequencies than off-peak frequencies, and some lightly used routes run on 2-hour headways all day. As indicated by the map, the average spacing between routes is approximately 1/2 mile on the outskirts of the central city and 1/4 mile in the CBD. Many of the CBD routes run along the same streets, thereby producing lower effective headways. Only five crosstown routes are operated, primarily in the eastern portion of the city. (One crosstown route travels from the northwest corner to the northeast corner of the city.) Most travel which is not CBD-oriented requires a transfer. This represents approximately 30% of all transit trips made.

The western edge of the city receives poor transit service in the base case. In the northwest, there are two residential areas with virtually no service. One area has service from a bus route which runs every two hours and requires a transfer to reach the CBD. The other area is a full mile from the nearest bus route. These areas

FIGURE 3.2

1980 BASE CASE TRANSIT SYSTEM

"SUN CITY"

presently have very small populations, but they are expected to grow significantly over the next twenty years.

In the southwestern portion of the setting, fixed routes operate in a relatively dense, fairly low-income area. Headways are one hour during the peak and off-peak. Route spacing is nearly 1 mile on the average, and routes include many one-way loops. There is relatively little demand generated by the 45,000 persons living in this area.

Service is provided seven days a week by the Regional Transit Authority. A flat fare of 35¢ is charged, with free transfers provided. Senior citizens and the transportation handicapped are charged half fares. During the evening, the majority of routes do not continue to operate; evening service (from 7:00 p.m. to 10:30 p.m.) is provided on a few heavily utilized routes on approximately one-hour headways. On Sunday, service is provided between 10:00 a.m. and 6:00 p.m. on hourly schedules only on these heavily scheduled routes.

The system is unionized and drivers receive $4.60 per hour <u>including</u> fringe benefits. In this setting, union contracts result in only 85% of driver-hours being converted into revenue-hours as a result of split shift restrictions and full-time employment criteria.

Federal funds cover 80% of capital expenditures for this system, plus 50% of the operating deficit, as long as the local share of the operating deficit is at least $856,000 and the federal share does not exceed $1.8 million per year. There is no state transit assistance program. The source of the local share of the transit authority's deficit is not restricted. Some funding sources that can be used are: property tax; bond issue; city sales tax; city income tax; gasoline tax; residential head tax. Currently, the <u>general fund</u> is used to cover the local share.

Taxi service in the area is provided by two companies which operate a total of 44 taxis. The fare structure is $1.40 for the first mile, 70¢ for each additional mile, and 25¢ for each additional passenger.

3.2 1980: IP Scenarios

3.2.1 IP Scenario A

IP Scenario A involves the implementation of paratransit service in two areas, shown in Figure 3.3. Since the easternmost portion of the city has half the total city population, it was felt to be appropriate to replace the six fixed routes which operated in the area in in the base case with three (doorstep) route deviation services. These routes continue on to downtown as regular fixed routes, requiring no transfers. This allows the coverage to increase slightly, and the frequency to increase considerably. The route deviation services can be provided at half the base case headways during peak hours. A 10¢ fare above the base fare of 35¢ is charged for a deviation. To implement this service effectively, the full-size vehicles presently being used in these routes are replaced (on a one-to-one basis) by 25-passenger vehicles capable of negotiating residential streets. This change is feasible, given the peak hour load factors of under .5 on these routes in the base case.

The western service zone is a reasonably dense area (3900 persons/sq. mile), with travel oriented more internally and less to the CBD than in the eastern zone. The implementation of paratransit service enables two underutilized fixed routes to be shortened. Service to the CBD and other portions of the city require transfers from the paratransit system, which operates in the doorstep many-to-many mode. The line haul service leaving the area operates on 15-minute headways. Because of the many-to-many nature of the service, coordinated transfers are not arranged. The charge for the paratransit service is 35¢, with a 10¢ transfer for trips to or from the zone. A total of 8 vehicles are assigned to this service, with only 6 used during off-peak hours.

Both paratransit services are operated by the Transit Authority between 5:00 a.m. and 7:00 p.m. The cost structure in this scenario is basically the same as in the Base Case, with drivers and maintenance personnel receiving salaries equivalent to those throughout the Transit Authority. Additional costs are incurred to hire telephone operators and dispatchers for the demand-responsive elements of service. Deficits resulting from the paratransit implementation are supported from the same sources previously described.

FIGURE 3.3
1980 IP SCENARIOS A AND B
"SUN CITY"

3.2.2 IP Scenario B

As an alternative to Scenario A in "Sun City", in Scenario B the many-to-many portion of the paratransit service is operated by a private taxi operator under contract to the transit authority. Privately owned 5-passenger taxis are used to provide the service. Because of vehicle capacity limitations, more vehicles are necessary to maintain the same level of service as in Scenario A; a total of 11 vehicles are used. This service is provided at a flat rate of $7/vehicle-hour, with all revenue generated paid to the taxi operator as an incentive. In addition to the vehicles, the taxi operator provides drivers, maintenance, and dispatching service for the many-to-many system. The taxi operator also provides dispatching capabilities for the route deviation portion of the IP service, but that service continues to be operated by the transit authority.

Characteristics of the two IP scenarios are shown in Table 3.2.

3.2.3 Benefit-Cost Analysis of IP Scenarios

Breakdowns of the benefits and costs of IP Scenarios A and B are provided in Tables A.3.1 and A.3.2 respectively. The results are summarized and compared in Table 3.3.

One of the first impressions is that the net impacts of these Scenarios are fairly small. Transit ridership in the area is projected to increase by only 5.8%, or 186,800 trips per year in both cases.[1] This is considerably less of an impact than that projected in Settings 1 and 2, and is directly the result of the limitted coverage of the new paratransit elements. Note that the net operating cost of the service is fairly low, particularly in Scenario A ($89,000), and the net total cost per new transit trip of $.77 is reasonable low. Also, in Scenario A, the decrease in auto expenditure cost alone more than offsets the total transit deficit. Thus, a fairly small scale IP system may prove to be fairly effective overall, particularly if it replaces some portions of unproductive fixed routes. Note, however, that such an implementation strategy may not always be feasible. For example, the reduction in fixed route service in the western

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[1]Scenario B was designed to result in the same level of ridership and service quality as Scenario A.

Table 3.2

Characteristics of 1980 IP Scenarios for "Sun City"

Scenario	Module	Eligible Population (Paratransit Service only)	Area, (sq.mi.)	Population Density	Service Type	Operating Entity	Paratransit Vehicles	Paratransit Fare *
1980A	1	45,000	11.5	3,910	MTM	TA	8	35¢ + 10¢ transfer
	2	55,000	15.2	3,620	Route Deviation	TA	8	35¢ + 10¢/ deviation
	Total	100,000	26.7	3,750			16	
1980B	1	45,000	11.5	3,910	MTM	Taxi Operator	11	35¢ + 10¢ transfer
	2	55,000	15.2	3,620	Route Deviation	TA	8	35¢ + 10¢/ deviation
	Total	100,000	26.7	3,750			19	

* Half fare for elderly

Abbreviations:

MTM = Many-to-many

TA = Transit Authority

Table 3.3

Selected Annual Impacts: Setting #3: "Sun City"

1980 IP Scenarios A, B

Impact/Measure	Scenario A	Scenario B
Change in Consumer Surplus	+114,103	+114,103
New Transit Trips/% Increase	186,800/+5.8%	186,800/+5.8%
Induced Trips	26,600	26,600
VMT/% Change	-352,000 mi/-0.04%	-216,000 mi/-0.02%
Fuel Consumption, gallons	-33,800	-27,400
Employment: Jobs/Payroll	+8/+$91,500	+10/+$60,000
Auto Expenditures	-$182,000	-$182,000
Transit Operating Cost	+$128,000	+$138,000*
Net Transit Operating Cost	+$89,000	+$162,000
Net Transit Total Cost	+$145,000	+$172,000
Net Operating Cost/New Total Cost per New Transit Trip	$.48/$.77	$.87/$.92
Net Total Cost per Induced Trip	$5.45	$6.46
Taxi Industry Revenue/% Change	-$75,000/-7.4%	+$235,000/+23.2%
Taxi Industry Profit/% Change	-$13,400/-27.8%	+$49,600/+102.9%
Parking Spaces Required	-25	-25

* Includes capital cost

paratransit zone might be feasible in Scenario A, where the transit operators get the opportunity to provide the paratransit service. In Scenario B, however, where the paratransit service is operated by the taxi industry, the cutback in fixed route service may not be institutionally feasible.

In looking at the two paratransit elements separately (not shown in any table), it was found that the route deviation service actually resulted in a net cost reduction, because of a higher fare and a higher ridership level (resulting from increased frequency and coverage). This suggests that route deviation service offers an alternative to fixed route in areas with closely spaced parallel fixed routes. The other paratransit service element replaced some unproductive fixed routes but, nevertheless, ran at a deficit.

Note that the change in consumer surplus in this setting is fairly close to the change predicted for Setting #2, despite the fact that a significantly higher ridership was projected for that setting. This apparently confusing result can be understood by looking at the coverage statistics (Table A.2.3, A.3.1). Despite the fact that paratransit service was implemented in a smaller portion of the urban area in "Sun City", the number of new persons served by transit (over 50,000) was significantly greater than the number of new persons served in "College Town" (under 20,000), which had extensive transit coverage in the base case. However, because truly areawide service is not introduced in Setting #3, the impact on auto ownership is significantly less than predicted for Setting #2.

The comparison of Scenario B and A was designed to test the impact of private operation on total system cost given no major differences in service. The results in the case suggest a higher cost under private operation. While the private operator did have a lower cost structure than the public operator, it was required to operate more 5-passenger vehicles in order to be able to carry the same number of passengers. Note that this may not have occurred if the publicly operated system had not operated at productivities of 9 passengers per vehicle per hour. At lower productivities (about 6), taxi vehicles can carry the same number of passengers as larger vehicles.

Note the sharp contrast between these results and those of "College Town" (Scenario C), where private operation greatly reduced overall cost. The terms of the contracts with the private operators were partly responsible for the difference; the decision to allow the private operator to retain all revenues in "Sun City" resulted in a very high percentage profit for the operator. The key difference between the two settings, however, is the transit cost structure. In "College Town" the transit system costs almost $20 per hour; in "Sun City" the cost (even with unionization) is approximately $11 per hour. Thus, in situations where the prevailing transit costs are fairly low, the use of a private operator does not present significant savings.

The impact on the taxi industry of contracting even a portion of a small scale paratransit system is significant; taxi revenues increase by 23.2%, instead of decreasing by -1.4% while, more significantly, taxi industry profits increase over 100%, rather than decrease by 27.8% as in Scenario A.

In summary, the major conclusions of this setting are:

1. Route deviation service may be a reasonable alternative to closely spaced parallel fixed routes.
2. A small scale paratransit service may be quite effective, particularly if it replaces some underutilized fixed routes.
3. The increase in coverage plays a major role in determining the change in consumer surplus.
4. The impact of contracts with taxi operators to provide some paratransit service may be insignificant if the prevailing transit costs are relatively low.
5. Contracts with the private operator, for even a portion of a paratransit system, can make a major difference in the overall impact of the system on the private operator.

3.3 1980: Alternatives to IP

3.3.1 Extended Fixed Route Bus Alternative

The areas of this setting which were provided with paratransit services in the previous analysis are provided extensive conventional bus service serving intra-community, crosstown, and CBD-oriented trips. To ensure high quality service within these areas, new routes are placed such that virtually all of the residents of these areas are within 1/4 mile of a bus stop. Furthermore, both north-south and east-west routes are provided to attract most of the existing multi-directional trips. The new routes, illustrated in Figure 3.4, are run on short headways of approximately 15 minutes from 6:00 a.m. to 7:00 p.m. Since the majority of the new routes operate almost entirely within the previous paratransit areas, little impact is noted on the remainder of the system.

The fixed routes illustrated in this scenario require the acquisition of an additional 17 vehicles. Most of these vehicles are 25-passenger transit coaches, since ridership levels are not expected to require full-size buses. The operation of these services requires an additional 22 drivers plus a number of additional maintenance and support personnel.

3.3.2 Extended Exclusive-Ride Taxi Alternative

To provide less expensive door-to-door travel in areas poorly served by transit, the Regional Transit Authority in this scenario has agreed to subsidize local taxi operations within these areas such that fare level for all patrons is reduced by 50%. Due to budgetary constraints, however, the amount of this subsidy is limited to $250,000, which is approximately 50% higher than the subsidy provided under the IP options. Taxi companies are assumed to use vehicle deployment strategies to ensure that they do not provide too many trips within these areas, and thus lose money (i.e., because of the subsidy maximum). By providing only a limited number of vehicles in these areas, the demand for service is limited by the level of service provided.

An additional impact of this system is the increased level of effort which must be placed on the dispatching functions of the organizations providing taxi service. Segregation of the vehicle fleets has resulted in each of the two taxi companies increasing their dispatching work force by one. Furthermore, an additional dispatching frequency, and thus an additional base radio station, has been obtained by each company.

FIGURE 3.4

EXTENDED FIXED ROUTE ALTERNATIVE

"SUN CITY"

3.3.3 Benefit-Cost Analysis of Alternatives to IP

Breakdowns of the benefits and costs of the extended fixed route and the extended taxi alternatives can be found in Tables A.3.3 and A.3.4 respectively. Summary statistics and provided and compared with IP Scenario A in Table 3.4.

Consider first the extended fixed route alternative. In this case, the extended fixed route alternative results in a greater increase in transit ridership than did the IP scenario. However, the cost associated with obtaining this ridership increase is substantially higher in the extended fixed route case. Many more vehicles were needed to provide a quality of intra-community service comparable to that in the IP case. As a result, the net cost per marginal transit rider is more than 3 times higher ($2.71 vs. $.77) in the extended fixed route case. Table 3.4 clearly suggests that IP service is more effective in this setting.

The taxi alternative is directly comparable to the IP and fixed route alternatives in that it focuses directly on the same service areas. (Assume that the user-side taxi subsidy is introduced in these areas as a pilot program.) The results indicate that total taxi ridership in the two areas increases by 103,400 trips per year. In comparison, the IP and fixed route alternatives generated 186,800 and 194,500 new transit trips respectively. (A sizeable percentage of new transit riders in the IP and fixed route scenarios are diverted from taxi.) The net cost (subsidy) per induced trip in the taxi alternative is about double the cost in the IP scenario. However, the net cost of both taxi and IP are considerably less than the cost in the extended fixed route alternative.

In comparing the IP and taxi alternatives further, by looking at impacts such as consumer surplus and auto ownership, it appears that the IP service is definitely more effective overall. The taxi alternative does have a positive, rather than negative impact on the taxi industry. However, recall that the IP system was also analyzed under partial private operation. In that case (Scenario B), the net impact on the taxi industry was a net increase in revenue of $235,000,

Table 3.4

Selected Annual Impacts: Setting # 3: "Sun City"

1980 IP Scenario A, Extended Fixed Route, Extended Taxi

Impact/Measure	Scenario A	Extended Fixed Route	Extended Taxi
Change in Consumer Surplus	+114,103	+117,112	+53,833
New Transit Trips/ % increase	186,800/+5.8%	194,500/+6.0%	NA
Induced Trips	26,600	17,600	12,800
VMT/% change	-352,000 mi/-0.04%	+113,000 mi/0.01%	+178,000 mi/0.02%
Fuel Consumption (gallons)	-33,800	+63,500	+20,600
Employment: Jobs/ Payroll	+8/+$91,500	+25/+$238,900	+13/$88,600
Auto Expenditures	-$182,000	-$44,700	-$43,000
Transit Operating Cost	+$128,000	+$507,000	NC
Net Transit Operating Cost	+$89,000	+$446,000	NC
Net Transit Total Cost	+$145,000	+$527,000	+$128,000
Net Operating Cost/ Net Total Cost per New Transit Trip	$.48/$.77	$2.29/$2.71	NC
Net Total Cost per Induced Trip	$5.45	$29.88	$10.04
Taxi Industry Revenue/% change	-$75,000/-7.4%	-$63,000/-6.2%	+$147,700/+14.5%
Taxi Industry Profit/% change	-$13,400/-27.8%	-$11,300/-23.4%	+$35,000/+72.5%
Parking Spaces Required	-25	NC	NC

which is even higher than the increase in the taxi alternative. The impact on the private operator may be considered less a function of the mode of service than the operator of the service.

3.4 Year 2000 Analysis

3.4.1 Year 2000: Base Case Transit System

The year 2000 base case transit system for "Sun City" represents an expanded conventional fixed-route system over 1980. Spatially, the transit system spreads to include newly populated areas in the far western portion of the city. In addition, crosstown routes are added in heavily populated areas. The resulting fixed-route network is illustrated in Figure 3.5. In another move to increase service to rapidly growing areas, routes which previously operated only once every one or two hours provide service on 40-minute frequencies. The net impact of these changes is to increase annual route miles by nearly twenty percent. As in the two previous settings, all vehicles are assumed to be equipped with wheelchair lifts. Temporal coverage of the transit system remains virtually unchanged.

3.4.2 Year 2000 IP Scenarios

IP Scenario A

The first year 2000 IP scenario for this setting is a continuation of service as provided in 1980 Scenario B, with the addition of two new service zones. The new areas, shown in Figure 3.6, are residential areas projected to have a total of 30,000 residents by 2000. A second change in service is the inclusion of one fixed route which partially competes with the many-to-many service in the southwestern service area. This area is expected to become sufficiently dense to justify provision of fixed-route service to the CBD.

As in 1980 Scenario B, the many-to-many services are provided under the contract by private taxi operators. Two private operators are used to operate these services. One operates both new residential services, while the other operates service in the older service area. Dispatching of <u>both</u> of these services, as well as route deviation service operated in the eastern portion of the city, is performed by one of two taxi operators. The route deviation service continues to

FIGURE 3.5
YEAR 2000 BASE CASE TRANSIT SYSTEM
"SUN CITY"

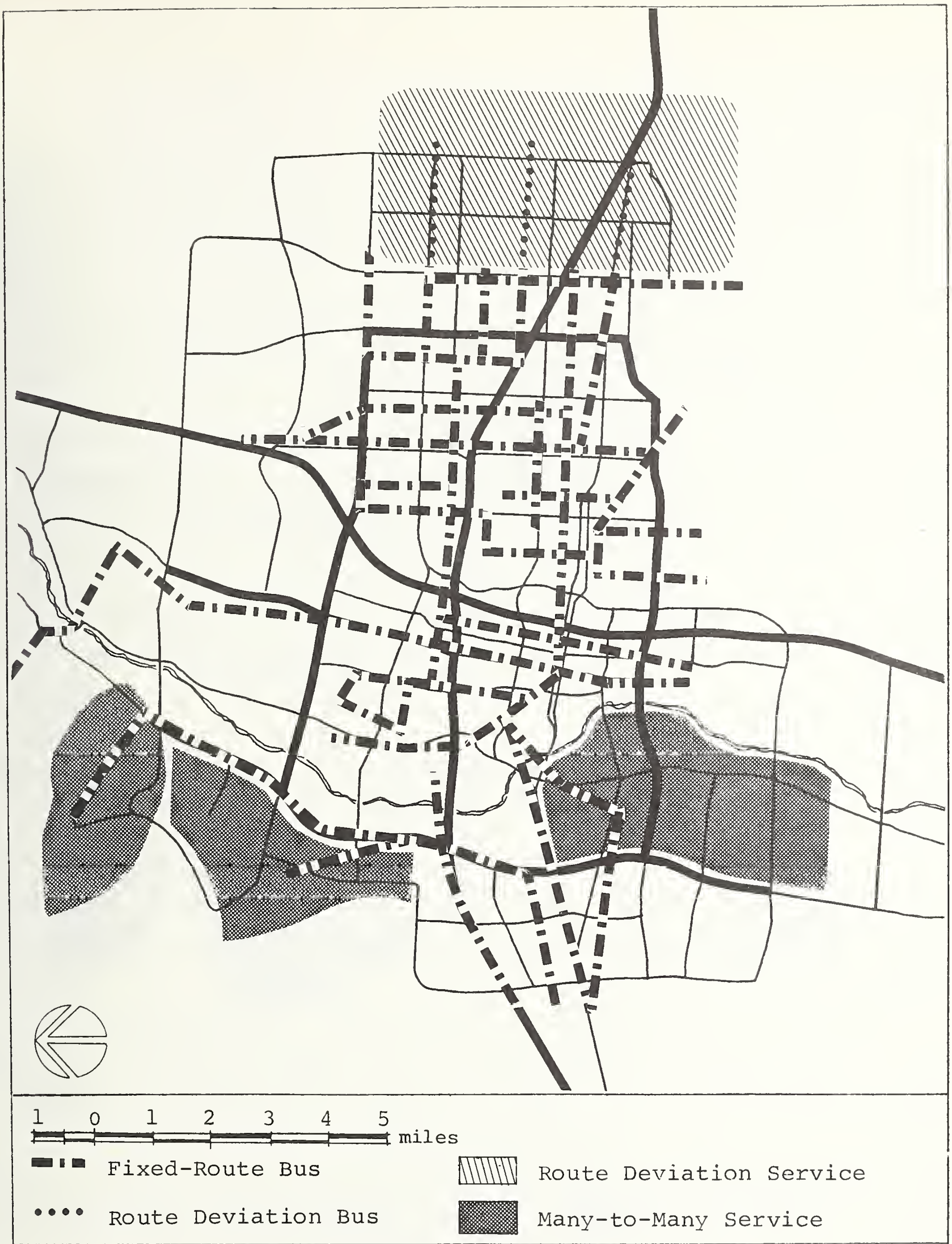

FIGURE 3.6

YEAR 2000 IP SCENARIO A
"SUN CITY"

operate exactly as in 1980.

The cost of the contract services is expected to increase 20% faster than the rate of inflation. This raises the contract cost to \$8.40 per hour for the operator providing dispatch service and to \$8 per hour for the other operator. As in 1980, the private operator retains all revenues.

Two auto ownership cases, Scenarios A-1 and A-2, are analyzed.

Year 2000: Scenario B

IP Scenario B exhibits the same cost and fare characteristics of Scenario A, but incorporates changes in paratransit coverage. The resulting IP structure is presented in Figure 3.7. The route deviation system is eliminated and replaced by fixed routes. The southwestern paratransit zone is contracted, and fixed-route service is expanded. In both cases, these changes are made in response to the paratransit system's ability to generate sufficient riders over time to make fixed route both feasible and cost-effective.

Two auto-ownership cases for Scenario B are considered. The characteristics of all four year 2000 scenarios for this setting are displayed in Table 3.5.

3.4.3 Benefit-Cost Analysis of Year 2000 IP Scenarios

Detailed breakdowns of the year 2000 IP scenarios for "Sun City" can be found in Tables A.3.5 - A.3.8. The results are summarized and compared in Table 3.6.

Consider first Scenario A. The increase in coverage in this case is substantially greater than in 1980 (approximately 70,000 new persons served in 2000 vs. 30,000 in 1980). The result is a sharp increase in ridership and all other impacts. Once again, however, the net cost per marginal passenger remains roughly the same. In addition, the direct savings in auto expenditure cost still more than offsets the total deficit. The net "benefit" of IP is even more evident in the reduced auto ownership case.

The position of IP improves even further under Scenario B. Total ridership decreases under this scenario, but the replacement of

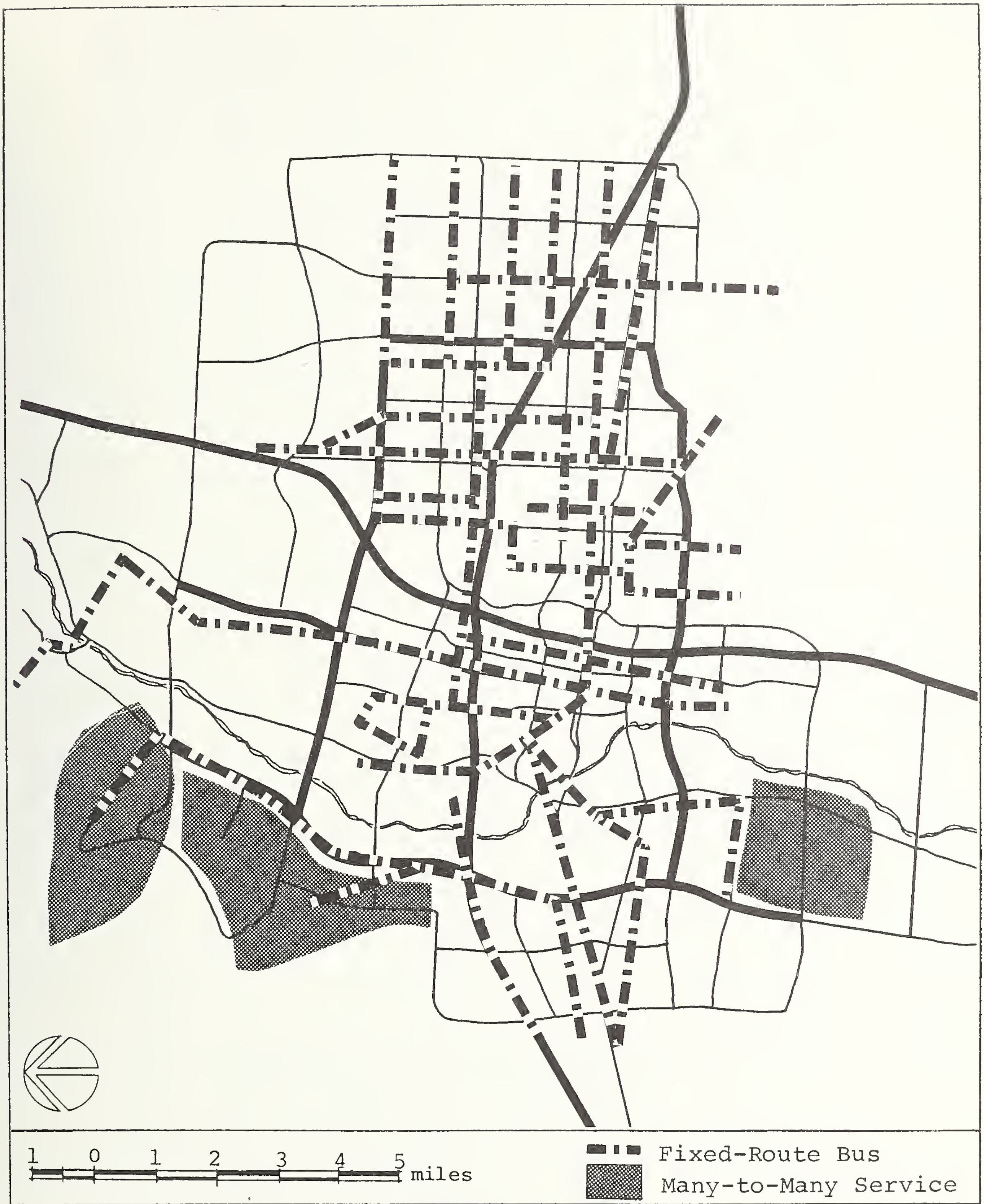

FIGURE 3.7
YEAR 2000 IP SCENARIO B
"SUN CITY"

Table 3.5

Characteristics of Year 2000 IP Scenarios for "Sun City"

Scenario	Module	Eligible Population (Paratransit Service only)	Area, (sq. mi.)	Population Density	Service Type	Operating Entity	Para-transit Vehicles	Para-transit Fare	Urban Area Auto Ownership	
2000 A-1	1	68,000	11.5	5,650	MTM	Taxi	18	35¢ + 10¢	0-Auto	4%
	2	13,000	7.2	1,810	MTM	Taxi	8	transfer	1	43%
	3	23,000	8.0	2,880	MTM	Taxi	8	35¢ + 10¢	2	53%
	4	94,000	15.2	6,184	Rt. Dev.	TA	10	deviation	Auto/HH	1.61
	Total	195,000	41.9	4,650			36			
2000 A-2	1	68,000	11.5	5,650	MTM	Taxi	22	35¢ + 10¢	0-Auto	7%
	2	13,000	7.2	1,810	MTM	Taxi	10	transfer	1	47%
	3	23,000	8.0	2,880	MTM	Taxi	10	35¢ + 10¢	2	46%
	4	94,000	15.2	6,184	Rt. Dev.	TA	10	deviation	Auto/HH	1.47
	Total	195,000	41.9	4,650			52			
2000 B-1	1	32,000	6.3	5,080	MTM	Taxi	13	35¢ + 10¢	0-Auto	4%
	2	13,000	7.2	1,810	MTM	Taxi	9	transfer	1	43%
	3	23,000	8.0	6,184	MTM	Taxi	10		2	53%
	Total	68,000	21.5	3,160			32		Auto/HH	1.61
2000 B-2	1	32,000	6.3	5,080	MTM	Taxi	19	35¢ + 10¢	0-Auto	7%
	2	13,000	7.2	1,810	MTM	Taxi	9	transfer	1	43%
	3	23,000	8.0	6,184	MTM	Taxi	10		2	53%
	Total	68,000	21.5	3,160			38		Auto/HH	1.47

Abbreviations: MTM = Many-to-many
HH = Household

Table 3.6

Selected Annual Impacts: Setting # 3: "Sun City"

2000 IP Scenarios A-1, A-2, B-1, and B-2

Impact/Measure	Scenario A-1	Scenario A-2	Scenario B-1	Scenario B-2
Change in Consumer Surplus	+556,532	+622,432	+492,446	+721,567
New Transit Trips/ % increase	570,100/+12.7%	786,600/+15.5%	484,900/+10.8%	701,300/+13.8%
Induced Trips	65,200	95,300	58,200	92,800
VMT/% change	-2.2/-0.1%	-2.7/-0.1%	-2.0/-0.1%	-2.8/-0.07%
Fuel Consumption (gallons)	-60.7k	-56.1k	-54.4k	-57.5k
Employment: Jobs/ Payroll	+17/+$222,400	+25/+$321,200	+14/+$169,200	+22/+$275,000
Auto Expenditures	-$463,100	-$630,900	-$486,600	-$688,000
Transit Operating Cost	+$669,000*	+$877,000*	+$524,000*	+$750,000*
Net Transit Operating Cost	+$441,000	+$563,000	+$330,000	+$470,000
Net Transit Total Cost	+$419,000**	+$541,000**	+$316,000**	+$456,000**
Net Operating Cost/ Net Total Cost per New Transit Trip	$.77/$.73	$.72/$.69	$.68/$.65	$.67/$.65
Net Total Cost per Induced Trip	$6.42	$5.68	$5.43	$4.91
Taxi Industry Revenue/% change	+$565,400/ +23.1%	+$753,000/ +30.6%	+$434,400/ +17.4%	+$622,700/ +25.5%
Taxi Industry Profit/% change	+$195,400/ +167.7%	+$296,100/ +255.1%	+$161,800/ +139.2%	+$260,100/ +224.4%
Parking Spaces Required	-52	-52	-38	-37

*Includes cost of new taxi vehicles

**Note that net operating cost is higher than net total cost, since the taxi companies' capital costs are effectively included in the operating cost, while the transit authorities' own capital cost decrease.

some paratransit elements with fixed-route service serves to decrease net cost per marginal passenger by over 10% in the base auto ownership case. A breakdown of the data (not shown in any table) determined that the entire ridership loss could be attributed to the southwestern zone, with the replacement of route deviation service with fixed-route service actually resulting in an increase in ridership. The population density of 6,200 persons per square mile in the eastern (route deviation zone) is apparently beyond the point where fixed-route service begins to attract more passengers and operate at a lower cost per passenger than paratransit service. The population density in this area in 1980, when route deviation was more cost-effective than fixed-route service, was 3,600 persons per square mile.

CHAPTER 4

SETTING #4 : "MID-AMERICAN CITY"

4.1 Setting Description

The fourth setting represents cities in group #4. The cities in this group display very average characteristics. Included in the group are: Akron, Ohio; Sacramento, California; Forth Worth, Texas; Tacoma, Washington; Springfield, Illinois; Fort Wayne, Indiana; Topeka, Kansas; Raleigh, North Carolina; and Omaha, Nebraska.

The setting chosen to represent this group is shown in Figure 4.1. Because of the nature of the cluster, the city has been named "Mid-American City". The urbanized area consists of 112 square miles with a projected 1980 population of 339,000. Included in this urbanized area are six cities, one of which encompasses approximately half the land area and three quarters of the population and serves as the central city. Demographic characteristics of the urbanized area are presented in Table 4.1.

Table 4.1: Setting #4: Demographic Characteristics

	1980	2000
Population	339,000	389,000
Area, sq. mi.	112	112
Density	3,026	3,473
Employment	136,000	171,000
% Elderly	9	10.4

This setting is very automobile oriented. It has an extensive freeway system, which results in generally faster auto speeds than

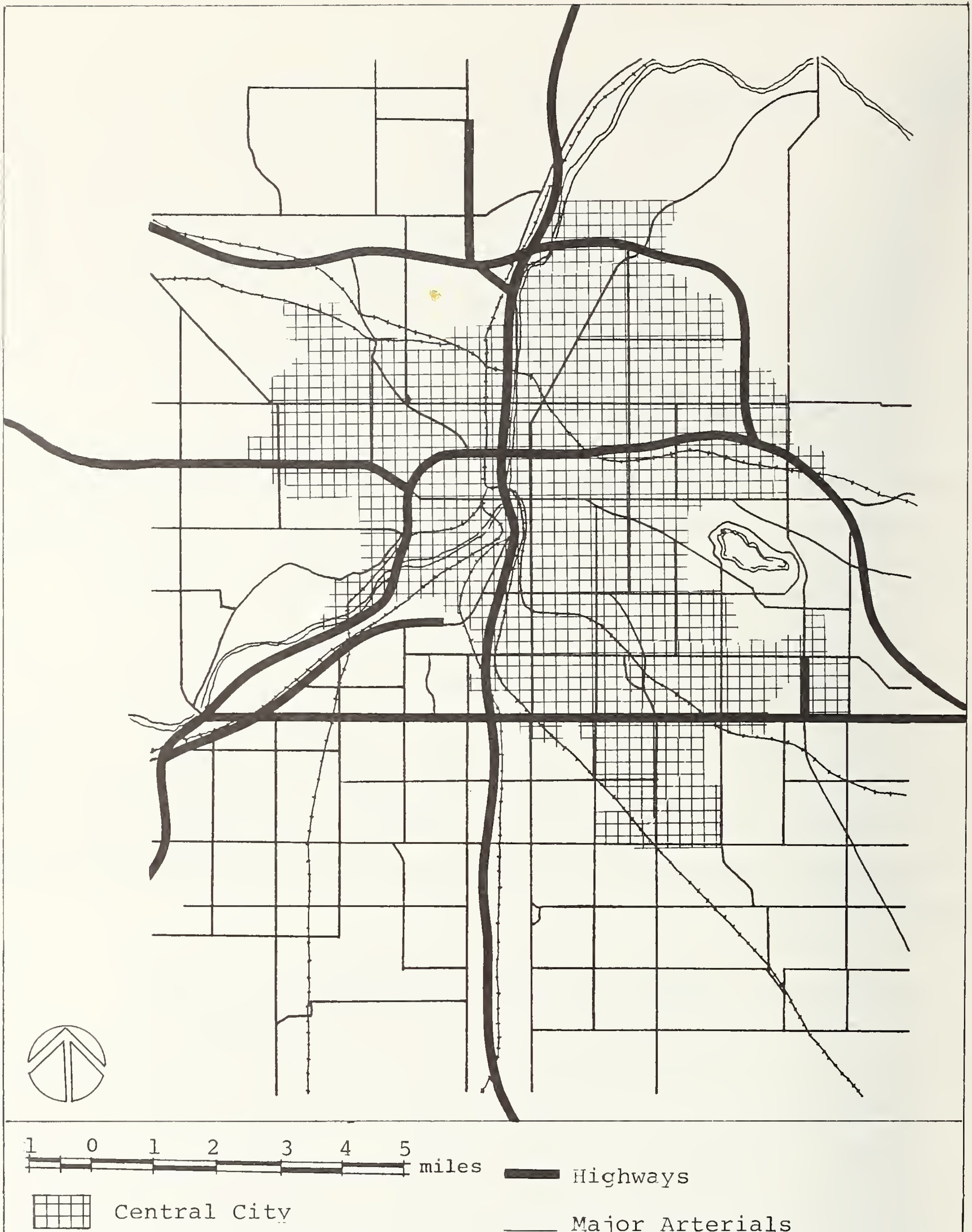

FIGURE 4.1

SETTING #4: "MID-AMERICAN CITY"

in the other settings. Low CBD parking charges of 25¢ per hour with a $1 maximum result in few automobile disincentives for downtown travel. The low CBD parking rates are a result, in part, of the even distribution of employment; only 20% of the total employment is located in this area. Another impact of the auto-oriented characteristics is a low level of taxi service. For the entire urbanized area, there are only two taxi operators owning a total of 53 vehicles. The exclusive-ride taxi fare is $1.30 for the first mile plus 60¢ for each additional mile.

By the year 2000, the urban area population is projected to increase by 15%. This growth is projected to occur largely within the current boundaries of the urbanized area, primarily in the less densely populated area approximately 5 to 10 miles from the CBD.

1980 Base Case Transit System

The base case transit system in "Mid-American City" consists of the ten fixed routes presented in Figure 4.2. These fixed routes provide good coverage for CBD-oriented trips, since eight routes travel through the downtown area. Only two routes provide crosstown service; thus, travel within and between suburban communities is not well served. Throughout the urban area, approximately 60% of the population lives within a quarter mile of the bus route. This service is also limited in its temporal coverage. Service is not offered after 9:00 p.m., on weekdays, or at all on Sundays.

Weekday service is operated on 30-minute headways with a few routes running more frequently during the peak periods. After 6:00 p.m., headways on all routes are increased to one hour. Fares on the transit system are 35¢ for adults, 25¢ for students, and 15¢ for senior citizens and transportation handicapped persons. Free transfers are allowed between buses, and a free fare zone covers the entire CBD.

The cost structure of the base case is comparable to that of most unionized transit operations in similar sized cities. Drivers and mechanics receive $5.35 per hour plus 15% fringe benefits. Total cost per vehicle hour is $14.57 per hour. Annual operating costs for the system total $2.1 million, with $625,000 returned in revenue. The $1.5 million operating deficit is supported 50% by the federal

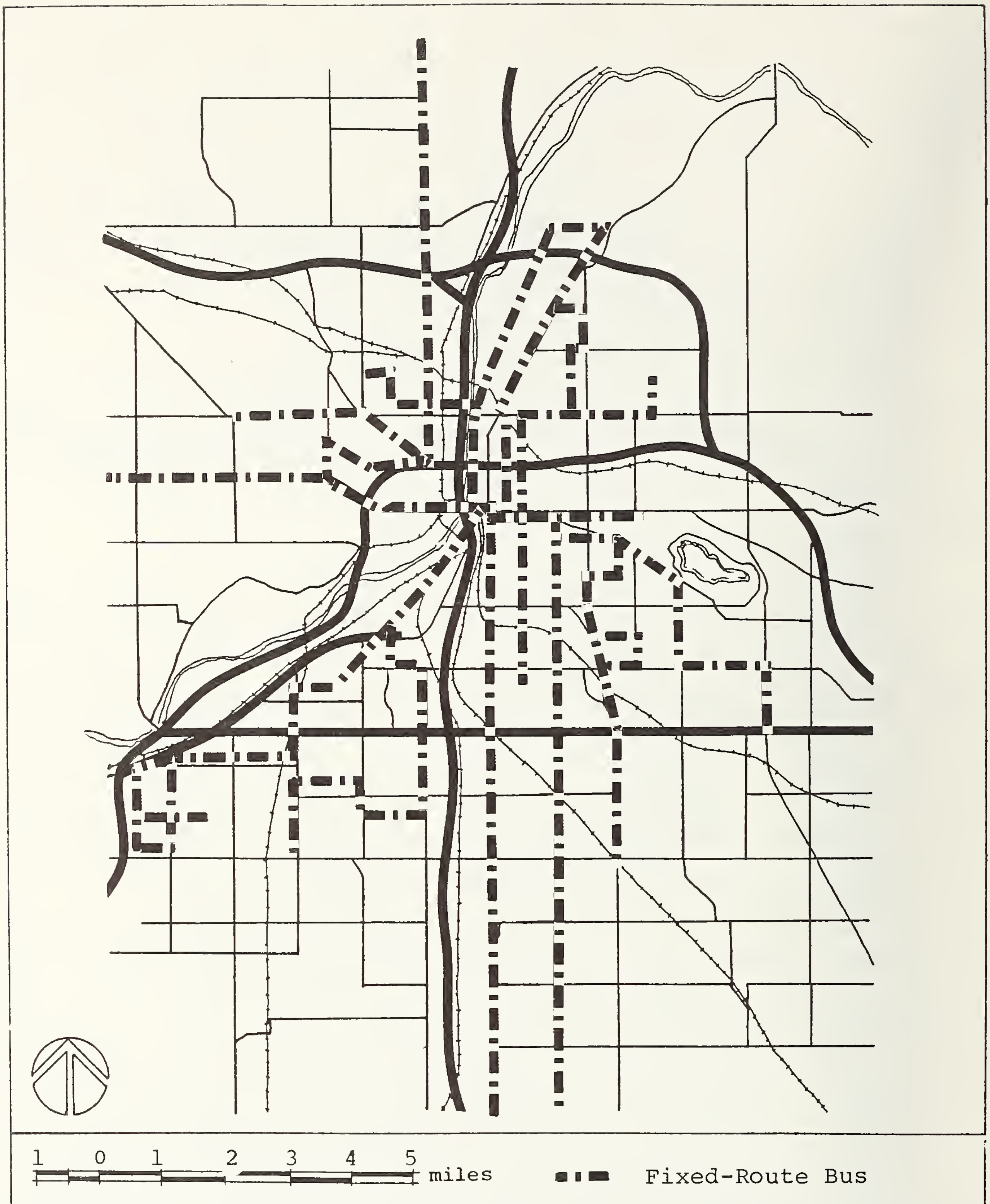

FIGURE 4.2

1980 BASE CASE TRANSIT SYSTEM

"MID-AMERICAN CITY"

government and 50% by state and local sources. Eighty percent of all capital expenditure is obtained from the federal government. The local deficit is apportioned to members of the transit authority in accordance with the services provided in that community.

4.2 1980 IP Scenarios

4.2.1 IP Scenario A

Two distinct integrated paratransit service configurations were designed for this scenario: one operates during the peak period, and the other during the off-peak. Five DRT service areas offering basically many-to-one service are added to the existing fixed route system of the peak period, as shown in Figure 4.3. The major function of the paratransit service during these hours is to feed the fixed route lines, although limited requests for other destinations will be accommodated. Minor alternations are made to a few bus routes to avoid duplication of service; routes which formerly extended into the paratransit areas service zone are terminated at transfer points. The vehicle-mile savings are used to decrease the headways on these routes; this provides a higher level of service, and allows increased volumes caused by feeder service to be accommodated.

During off-peak, the paratransit service areas are enlarged to roughly four times the size of the peak period service areas, and extended to a point closer to the CBD. Commensurately, the fixed routes are shortened to terminate at the paratransit zone boundaries. This configuration is shown in Figure 4.4. The service pattern during this time period is many-to-many dynamic dispatch. Transfer points were designated not only to interface with fixed route service, but also to facilitate travel between contiguous paratransit zones. By transferring, it is possible to travel between any two points located in the paratransit zones or to access any points served by fixed route bus. This design improves the ability to travel by transit in directions not oriented toward the CBD.

The total vehicle fleet for these paratransit services consists of 31 sixteen-passenger buses. During peak hours, 26 of these

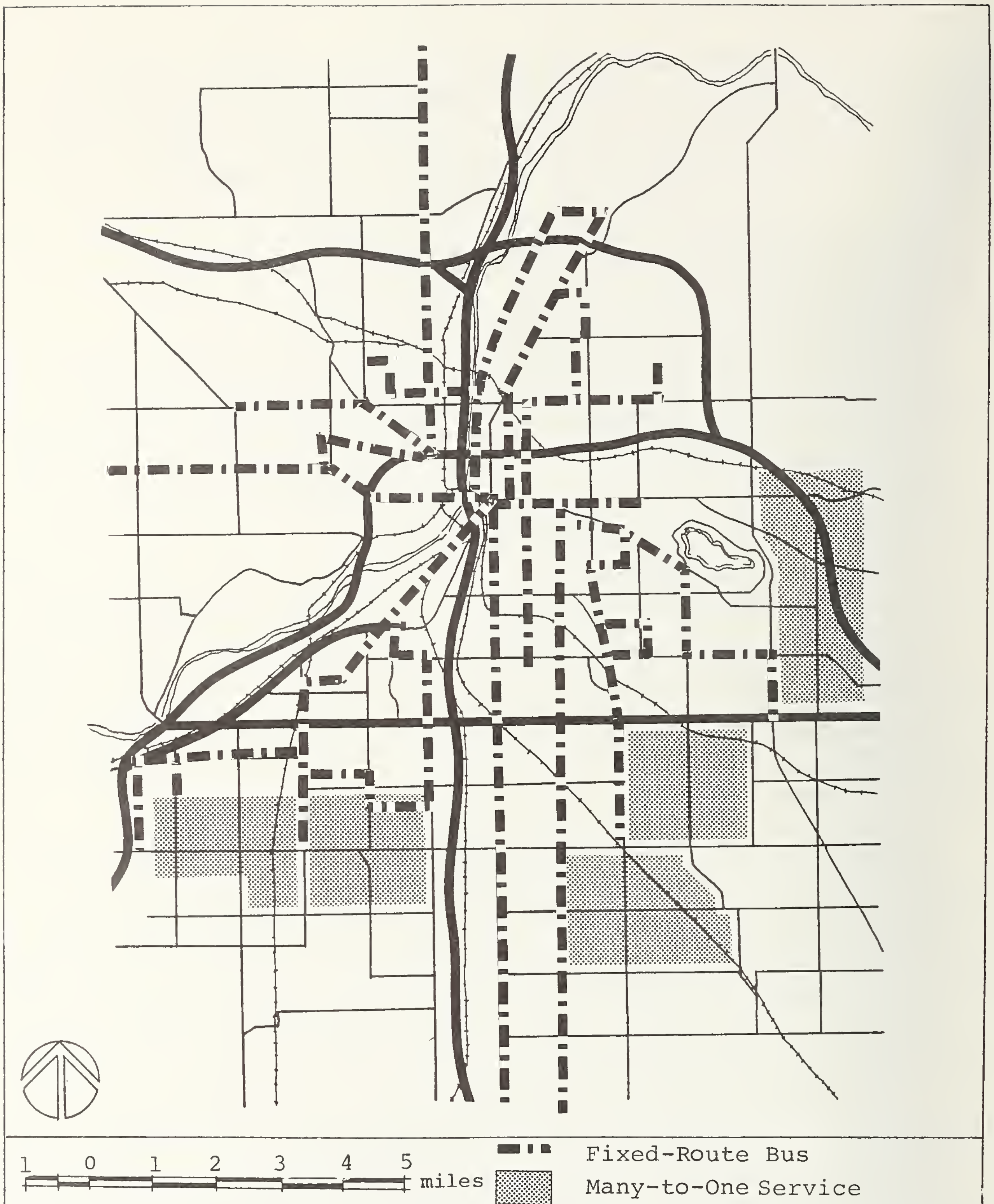

FIGURE 4.3

1980 IP SCENARIOS A, B, C, D: PEAK PERIOD

"MID-AMERICAN CITY"

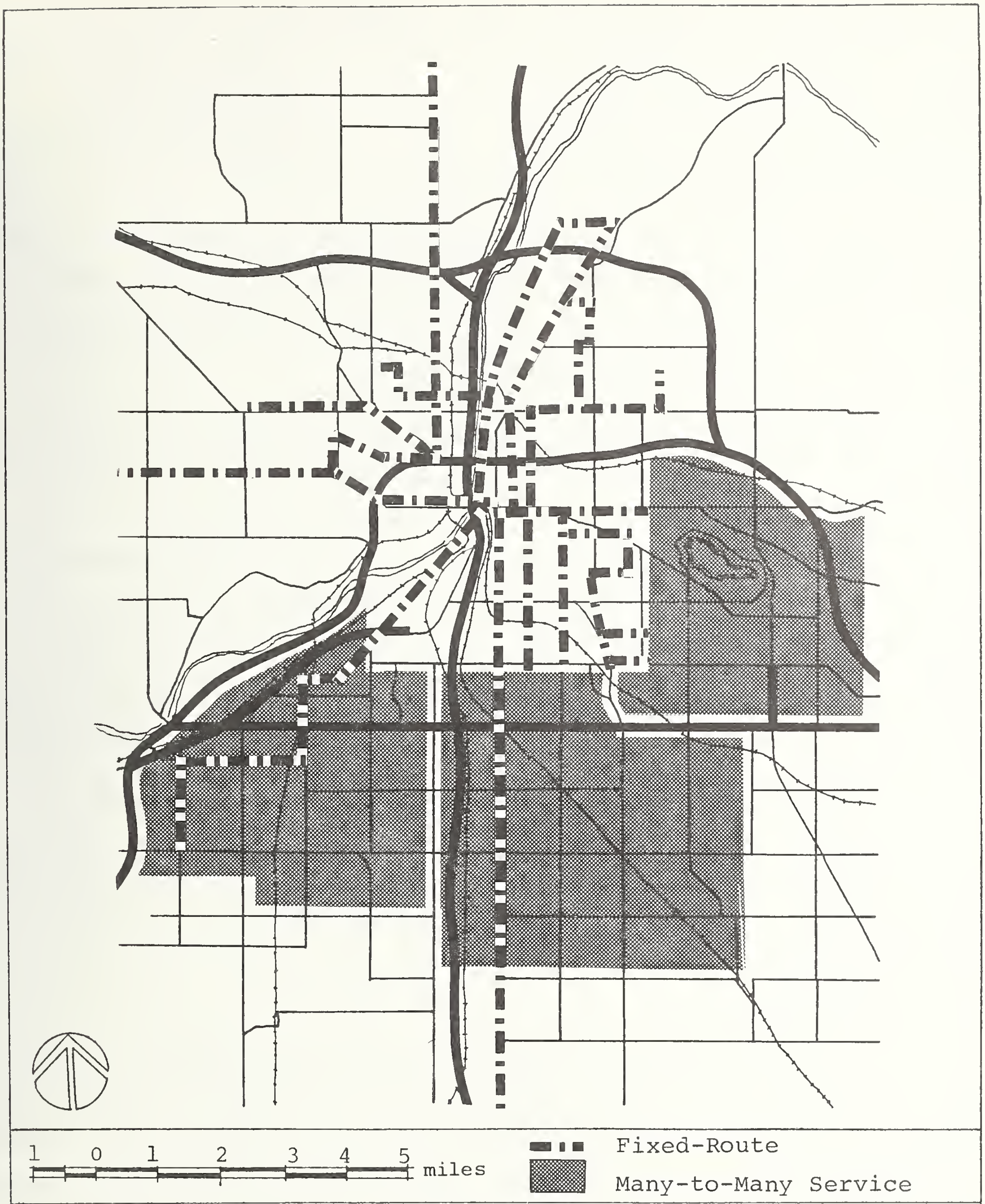

FIGURE 4.4

1980 IP SCENARIOS A, B, C: OFF-PEAK

"MID-AMERICAN CITY"

vehicles serve a 26 square mile area encompassing 54,000 people; during off-peak all 31 vehicles are utilized in the expanded paratransit service area which covers 55 square miles and serves 152,000 people. The five peak vehicles not used in paratransit service operate on the lighter fixed-route lines. Note that this design results in even utilization of resources throughout the day.

Because of the integration of vehicles in both paratransit and fixed-route service, all paratransit service is provided by the transit authority directly. As a result, full union driver wages must be paid. Dispatchers receive $4.80 per hour, and telephone operators are paid $3.50 per hour.

The fare for all paratransit services is 25¢, with no free transfers provided. Senior citizens are charged half fare at all times.

In addition to the basic service, an areawide, advanced request, many-to-many service is provided for the transportation handicapped. This service is operated under contract by a private taxi company at a rate of $8 per hour (including fee), using eleven lift-equipped vans purchased by the transit authority. Service is provided free of charge to all persons who cannot use the other components of the IP system.

4.2.2 IP Scenario B

Scenario B is exactly the same as the previous scenario, except that, during the off-peak, a fare of 75¢ is charged on the many-to-many paratransit services for the general public. Half price is charged to elderly patrons.

4.2.3 IP Scenario C

Scenario C is exactly the same as the previous scenario except that, during the off-peak, a fare of $1.25 is charged on the many-to-many paratransit service for the general public. Half price is charged to elderly patrons.

4.2.4 IP Scenario D

This scenario investigates the impacts of more complete paratransit coverage. During peak periods, frequent fixed route service and adequate coverage indicates that additional paratransit coverage is not required.

During off-peak hours, however, paratransit modules are implemented throughout the urbanized area, except for the CBD. In conjunction with this implementation, the extent of coverage by the fixed routes is reduced to the skeleton routes illustrated in Figure 4.5. In this "complete coverage" case, the off-peak fare structure consists of a 75¢ first fare on the paratransit service plus a 10¢ transfer to fixed routes and a 25¢ transfer to other paratransit modules. If the first fare is paid on the fixed-route service, transfer to DRT can be made for 50¢. The fare structure during the peak period is the same as in previous scenarios.

The transit services in this scenario continue to be provided by the transit authority using union employees, with the exception of the taxi company operated service for the transportation handicapped.

The characteristics of this and the other three scenarios are summarized in Table 4.2.

4.2.5 Benefit-Cost Analysis of IP Scenarios

Detailed breakdowns of the benefits and costs of the four IP scenarios for "Mid-American City" can be found in Tables A.4.1 - A.4.4. The results are summarized and compared in Table 4.3. To assist in this four-way comparison, the "best" value for each impact is enclosed in a box.

First, consider that these scenarios involved the concept of changing service patterns in response to changing demand patterns over the course of the day. The way in which this works is, perhaps, best illustrated by some statistics not included in the summary table. For example, in Scenario A, the majority (65%) of peak hour, general public paratransit trips are feeder trips, reflecting the dominance of the work trip headed away from the residential communities during this time period. During the off-peak, the percentage of trips which are feeder trips is reduced to 15%, reflecting the importance of community based shopping and other non-work trips (as well as the impact of enlarged service areas). In Scenario D, where the paratransit zones are enlarged further during the off-peak, feeder trips constitute an insignificant portion of off-peak ridership. As an aside, note that the special service for the TH generates a substantial portion of the new transit trips, accounting for as much as 17% of those trips in Scenario C.

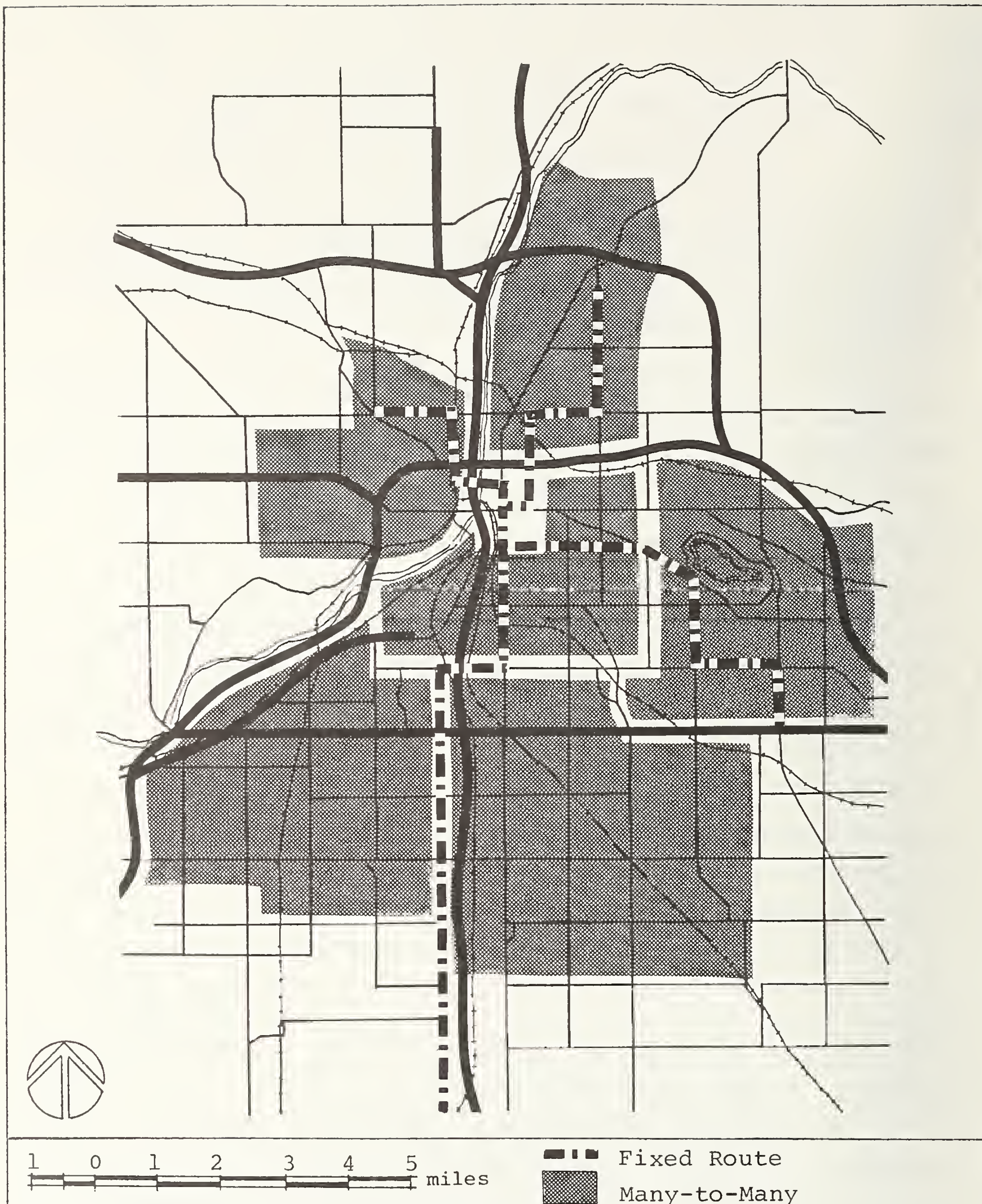

FIGURE 4.5

1980 IP SCENARIO D: OFF-PEAK

"MID-AMERICAN CITY"

Table 4.2

Characteristics of 1980 IP Scenarios for "Mid-American City"

Scenario	Module	Eligible Population (Paratransit Service only)	Area, (sq.mi.)	Population Density	Service Type	Operating Entity	Paratransit Vehicles	Paratransit Fare
1980A	1-5 Peak	54,000	26.1	2,070	MTO	TA	26	25¢
	6-8 Off-Peak	151,000	55.2	2,735	MTM	TA	31	25¢
	9(TH)	9,000	108		MTM	Taxi Operator	12	Free
1980B	1-5 Peak	54,000	26.1	2,070	MTO	TA	26	25¢
	6-8 Off-Peak	151,000	55.2	2,735	MTM	TA	31	75¢
	9(TH)	9,000	108		MTM	Taxi Operator	12	Free
1980C	1-5 Peak	54,000	26.1	2,070	MTO	TA	26	25¢
	6-8 Off-Peak	151,000	55.2	2,735	MTM	TA	31	$1.25
		9,000	108		MTM	Taxi Operator	12	Free
1980D	1-5 Peak	54,000	26.1	2,070	MTO	TA	26	25¢
	6-12 Off-Peak	304,000	84.3	3,606	MTM	TA	53	75¢
	13(TH)	9,000	108		MTM	Taxi Operator	12	Free

Abbreviations: MTO = Many-to-one (doorstep)
MTM = Many-to-many (doorstep)
TA = Transit operator
TH = Transportation handicapped

Table 4.3

Selected Annual Impacts: Setting #4: "Mid-American City"

1980 IP Scenarios A,B,C,D

Impact/Measure	Scenario A	Scenario B	Scenario C	Scenario D
Change in Consumer Surplus	+224,825	+167,554	+144,614	+267,731
New Transit Trips/ % increase	761,000/+26%	675,200/+23%	634,500/+22%	875,000/+30%
Induced Trips	166,200	146,800	137,800	171,700
VMT/% change	-95k mi/+0.01%	+86k mi/+0.01%	+167k mi/+0.02%	+114k mi/+0.02%
Fuel Consumption (gallons)	+48.6k	+62.7k	67.5k	+83.7k
Employment: Jobs/ Payroll	+61/+$671,300	+71/+$688,600	+72/+$695,100	+91/+$984,500
Auto Expenditures	-$369,000	-$299,000	-$153,000	-$738,000
Transit Operating Cost	+$1,140,000	+$1,140,000	+$1,140,000	+$1,540,000
Net Transit Operating Cost	+$933,000	+$842,000	+$784,000	+$1,144,000
Net Transit Total Cost	+$1,206,000	+$1,115,000	+$1,057,000	+$1,566,000
Net Operating Cost/ Net Total Cost Per New Transit Trip	$1.23/$1.58	$1.25/$1.65	$1.24/$1.67	$1.31/$1.79
Net Total Cost per Induced Trip	$7.26	$7.60	$7.67	$9.12
Taxi Industry Revenue/% change	+$41,800/-3.4%	+$70,600/+5.7%	+$81,500/+6.6%	+$18,600/+1.5%
Taxi Industry Profit/% change	-$15,200/-25.6%	-$10,100/-17.1%	-$8,100/-13.7%	-$19,409/-32.8%
Parking Spaces Required	-162	-141	-133	-208

*The number of new transit trips generated by the TH service is 110,400 for all scenarios

Boxes indicate best scenario for each measure.

Next, consider that Scenarios A-C are designed to test the impact of a fare increase on overall IP performance. As expected, ridership decreases with increasing fares. From Scenario A to Scenario B, the 200% off-peak fare increase results in a 26.3% decline in (off-peak, general public) ridership, while the 66.7% fare increase from Scenario B to Scenario C results in a further 16.5% reduction. In both cases, revenue does increase. However, in both cases cost per passenger actually increases, suggesting that the lowest fare is the most cost-effective. This surprising result is made even more clearly if one were to "subtract" other benefits (such as the change in consumer surplus and the change in auto expenditures) from the net cost. The resulting "net cost" per new transit rider would increase from $.80 in Scenario A to $.98 in Scenario B and, even more sharply, to $1.21 in Scenario C. This clearly suggests that raising fares to increase revenues may, in fact, prove counterproductive when other impacts are taken into account, with this effect getting stronger at fares above $.75.

As an aside, note that the cost per passenger is for the total system, including the special service for the TH. The net <u>operating</u> cost per passenger for the latter service (more readily calculated than net total cost per passenger from the tables in Appendix A since the operating cost of the TH service is separated out) is $2.62. The net operating cost per general public passenger ranges from $.94 in Scenario C to $.99 in Scenario A and $1.12 in Scenario D. Thus, the separate TH service is clearly an expensive component of the overall IP system.

Determining which is the "best" alternative is somewhat difficult. Scenario D, the full coverage case, results in the greatest increase in ridership and consumer surplus. Note that this scenario also has a major impact on auto expenditures, supporting the earlier contention that the availability of true areawide IP service is a major factor in convincing households to eliminate an automobile. If one were to attempt the same type of analysis described above, namely computing the "net cost minus change in consumer surplus and change in auto expenditure" per new transit rider, it would be found that the value for Scenario D, \$.64, is considerably lower than the value for the other scenarios. On the negative side, Scenario D has the highest net cost per marginal and induced passenger, as well as the most negative impact on the taxi industry.

Perhaps a more reasonable question to ask than "which is the best alternative?" is "are any of the alternatives effective?". Consider that the net cost per marginal passenger is quite high for each alternative, significantly higher than the promising alternatives identified for the previous scenarios. In Scenario D, which has the largest benefits, the direct auto expenditure savings plus the consumer surplus benefit do not even come close to offsetting the 1.5 million dollar deficit. While there are other benefits associated with IP, including the creation of new jobs, it is not clear that these benefits can be considered to offset the cost. There are also other costs to consider, including an <u>increase</u> in VMT and energy consumption, and a decrease in taxi industry profits.

This latter point is worth following for a moment. The results of all scenarios suggest that the taxi industry, despite the contract for part of the paratransit service, may actually see reduced profits in this setting after the introduction of IP service. This is the result of the very weak position of the taxi industry in this setting.

Once again this suggests that the condition of the local taxi industry must be considered carefully when designing an IP system.

The net result is that none of the scenarios designed for this setting can be readily classified as being desirable to implement. Each was apparently too extensive, resulting in extremely high deficits that are hard to justify on the basis of the other benefits and costs.

The conclusions that can be reached from this setting are:

1. The costs of IP may not always be justified on the basis of other impacts.
2. The condition of the local taxi industry must be considered closely in designing IP systems.
3. The demand for IP service is relatively price inelastic, but raising fares beyond some point (25% in this set of scenarios) may prove to be counterproductive when other impacts are considered.
4. The availability of areaside service is a key determinant of auto expenditure savings.

4.3 1980: Alternatives to IP

4.3.1 Extended Fixed Route Bus Alternative

The extended fixed route bus alternative for "Mid-American City" was developed by expanding the fixed route network to the south and east of the CBD. In the base case, routes connect the most populated outer areas to the central city. Few crosstown routes are available, although most routes pass through the CBD and continue to areas on the opposite side of the city. This design eliminates a transfer for those passengers whose destination coincides with the path of the route serving their neighborhood. In the extended fixed route system, the coverage is expanded to serve the low-density areas which had been served by the demand-responsive buses in the off-peak design of the IP alternative. The grid-like street pattern of Setting #4 produces a systematic network of routes which run parallel to one another at 1-mile spacings in both the north-south and east-west directions. Figure 4.6 displays the extended bus configuration. Easier crosstown travel is permitted by this design. Also, the comprehensive network provides more direct access between any origin-destination pair in the service area.

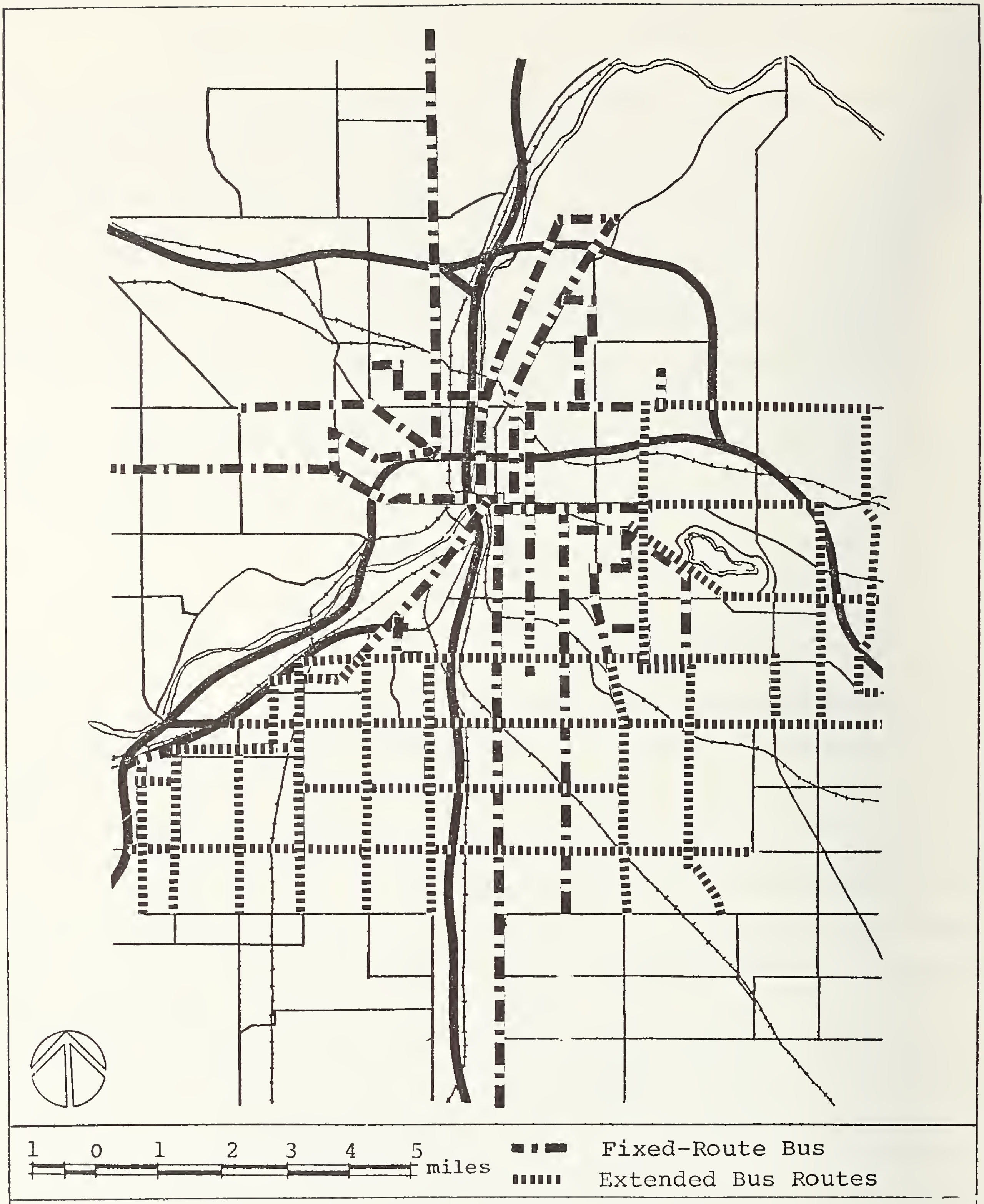

FIGURE 4.6

EXTENDED FIXED ROUTE BUS ALTERNATIVE

"MID-AMERICAN CITY"

On the average, the half-hour headways which characterized the base network have been retained in the extended bus alternative. The additional routes and extensions require the purchase of 54 new buses. The fare, hours, and operating entity remain unchanged from the base case.

4.3.2 Extended Exclusive-Ride Taxi Alternative

In this setting, there are only 53 taxis operating in the base case. The local government decides that additional service is needed, and encourages the taxi industry to obtain additional licenses and expand their fleets, offering low interest loans to help finance new vehicles. The operators respond and increase the overall fleet to 90 vehicles. The fare structure and all else remains the same.

4.3.3 Benefit-Cost Analysis of Alternatives to IP

Detailed breakdowns of the benefits and costs of the extended fixed route and extended taxi alternatives can be found in Tables A.4.5 and A.4.6 respectively. The results are summarized and compared with IP Scenario D[1] in Table 4.4.

Consider first the impacts of the extended fixed route alternative. Table 4.4 suggests that the two alternatives are quite comparable. The fixed route alternative appears to be able to attract more new transit trips, but at almost a proportionately higher cost. Because of the door-to-door, 100% coverage of paratransit service, however, the IP alternative was projected to generate a comparable number of induced trips. The area-wide nature of IP service results in a greater willingness to eliminate automobiles and, hence, a greater decrease in auto expenditures; on the other hand, the fixed route alternative generated more new passengers at comparable or better service levels, thus resulting in a greater increase in consumer surplus. The fixed route alternative clearly costs more, even if all the economic savings are deducted. Given the relatively high cost per additional passenger in both cases ($1.79 IP, $1.57 extended fixed route), as compared to the net cost per passenger

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[1] Scenario D has been selected as possibly the "best" of the IP scenarios for comparative purposes.

Table 4.4

Selected Annual Impacts: Setting # 4: "Mid-American City"

1980 IP Scenario D, Extended Fixed Route, Extended Taxi

Impact/Measure	IP Scenario D	Extended Fixed Route	Extended Taxi
Change in Consumer Surplus	+267,731	+439,491	+378,940
New Transit Trips/ % increase	875,000/+30%	+1,143,600/+39.2%	NA
Induced Trips	171,700	171,400	27,100
VMT/% change	+114k mi/+0.02%	-704k mi/-0.1%	+1.9 mil mi/+0.3%
Fuel Consumption (gallons)	+83.7k	+130.9k	210.9k
Employment: Jobs/ Payroll	+91/+$984,500	+68/+$820,900	+74/+$583,760
Auto Expenditures	-$738,000	-$170,100	0
Transit Operating Cost	+$1,540,000	+$1,791,000	NA
Net Transit Operating Cost	+$1,144,000	+$1,414,000	+$40,000
Net Transit Total Cost	+$1,566,000	+$1,798,000	+$40,000
Net Operating Cost/ Net Total Cost per New Transit Trip	$1.31/$1.79	$1.24/$1.57	NA
Net Total Cost per Induced Trip	$9.12	$10.49	$1.48
Taxi Industry Revenue/% change	$18,600/+1.5%	-$244,700/-19.6%	+$972,000/+66.3%
Taxi Industry Profit/% change	-$19,400/-32.8%	-$43,000/-73.9%	+$45,000/+61.6%
Parking Spaces Required	-208	NC	NC

k = 1,000 units
mil = 1,000,000 units

in the base case system ($.75), it would appear that neither the IP nor the fixed route options are particularly cost-effective.

Next consider the extended taxi alternative, which was designed in response to the area's low ratio of .16 cabs per 1,000 population. Presumably, that low ratio was in part the result of financial problems of the local taxi industry, which frequently leads to a vicious cycle of reduced revenue and subsequent reductions in service. In this scenario, the public sector is not assumed to provide any of its own resources to the taxi operation.

The intention behind the expansion of taxi service was to improve level of service, therefore generating more ridership, which in turn would support the expanded vehicle fleet and allow the operators to realize some economies of scale. The results suggest that this can be achieved. Taxi ridership is projected to increase by over 60%, or 404,898 trips, for the 75% increase in vehicle-hours. As a result, total revenue of the taxi industry increases by $972,000, while profit increases by $45,000 per year, which is estimated to represent a 61.6% increase. Note that no attempt was made to look at other vehicle fleet size increase, which might yield slightly better percentage increases.

The change in level of service and ridership is projected to result in a fairly sizeable increase in consumer surplus. However, VMT is projected to rise by 1,873,000 miles per year, resulting in increases in fuel consumption and emissions. Also, diversions from transit to taxi are projected to decrease transit revenue (and, hence, increase net transit cost) by $40,000. The taxi alternative is projected to result in a greater change in consumer surplus than the IP alternative; bear in mind, however, that the taxi service impacts 100% of the population of the area, while the IP service impacts only about 80% during peak hours.

The taxi alternative is not directly comparable to the other two alternatives, because of the significant difference in numbers of persons impacted. Nevertheless, unlike the other scenarios, the taxi alternative appears to represent an effective, inexpensive method for achieving some increase in public transportation service in this setting.

4.4 Year 2000 Analysis

4.4.1 Year 2000 Base Case Transit System

The year 2000 base case transit network for "Mid-American City" is assumed to be identical to the 1980 transit system: no major changes are made in the transit network despite changes in population. The only change is a replacement of the entire bus fleet with wheelchair-equipped vehicles. In addition, in response to a 5% decrease in vehicle operating speeds, because of increased congestion and an increase in passenger loading, the vehicle fleet size is increased by 5%, and headways are held constant.

The local taxi industry, which was in poor shape in 1980 with only 52 vehicles, is assumed to remain in existence, at about the same level. The total vehicle fleet increases to 62 because of the increase in population.

4.4.2 Year 2000 IP Scenario

The IP scenario in the year 2000 is identical to Scenario B in the year 1980. See the discussion of that scenario for all pertinent details. An exception is the terms of the contract with the private operator, which allows an increase in the rate to $9.60 per hour, (10% of which is a management fee). Vehicle speeds, as in the base case, are assumed to be 5% lower than in 1980.

Characteristics of the scenario under both auto ownership conditions are summarized in Table 4.5.

4.4.3 Benefit-Cost Analysis of Year 2000 IP Scenarios

Detailed breakdowns of the benefits and costs of the year 2000 IP scenarios can be found in Tables A.4.7 and A.4.8. The results are summarized in Table 4.6.

These results indicate an increase in paratransit patronage by the year 2000; the transit ridership increase in Scenario A-1 is 29% higher than the ridership in 1980. Because of the impact

Table 4.5

Characteristics of Year 2000 IP Scenarios for "Mid-American City"

Scenario	Module	Eligible Population (Paratransit Service only)	Area, (sq. mi.)	Population Density	Service Type	Operating Entity	Para-transit Vehicles	Para-transit Fare	Urban Area Auto Ownership	A-1	A-2
2000 A-1, A-2	1-5 Peak	74,000	26.1	2,835	MTO	TA	26	25¢	0-Autos	11%	12%
	6-8 Off-Peak	184,000	55.2	3,333	MTM	TA	31	75¢	1	53%	62%
	9 (TH)	12,000	108	111	MTM	Taxi Operator	12	Free	2+	36%	26%
									Avg/HH	1.29	1.18

Abbreviations:
MTO = Many-to-one
MTM = Many-to-many
TA = Transportation Authority
TH = Transportation handicapped
HH = Household

Table 4.6

Selected Annual Impacts: Setting # 4: "Mid-American City"

2000 IP Scenarios A-1 and A-2

Impact/Measure	Scenario A-1	Scenario A-2
Change in Consumer Surplus	+49,906	+13,090
New Transit Trips/% Increase	870,000/+30%	982,000/+34%
Induced Trips	141,000	164,000
VMT/% Change	-2.0 mil mi/-0.2%	-2.0 mil mi/-0.2%
Fuel Consumption (gallons)	-35,100	-26,400
Employment: Jobs/Payroll	+93/+$1,028,000	+90/+$993,800
Auto Expenditures	-$733,000	-$756,000
Transit Operating Cost	+$1,574,000	+$1,574,000
Net Transit Operating Cost	+$1,167,000	+$1,040,000
Net Transit Total Cost	+$1,438,000	+$1,311,000
Net Operating Cost/New Total Cost per New Transit Trip	$1.34/$1.65	$1.06/$1.34
Net Total Cost per Induced Trip	$10.20	$7.97
Taxi Industry Revenue/% Change	-$12,700/-0.7%	-$69,900/-3.9%
Taxi Industry Profit/% Change	-$28,600/-33.6%	-$38,800/-47.7%
Parking Spaces Required	-148	-175

of paratransit demand on supply characteristics, however, the number of vehicles needed to provide this service increases almost proportionately. Given the increase in the cost of the contract with the private operator, the net result is no change in the cost per marginal transit passenger.

One interesting result is the very small change in consumer surplus. This is caused by a decrease in non-work trip consumer surplus. The reduction in fixed route service and replacement with paratransit service during this time period apparently served to reduce overall service levels.

As was the case in the other settings, the reduced auto ownership in Scenario A-2 does not result in major differences in the impacts.

Chapter 5

Setting #5: "Mill Town"

5.1 Setting Description

Setting #5 represents the fifth group of cities. Many of the fifth cluster cities are moderately small northeastern manufacturing cities, characterized by high elderly population, low average income, and low auto ownership. Only a small percentage of the population of these cities, in general, resides in single-family dwellings. These socioeconomic conditions contribute to fairly high transit usage. Examples of cities in this cluster are: Lawrence-Haverhill, Massachusetts; Manchester, New Hampshire; Waterbury, Connecticut; and Wheeling, West Virginia.

The setting chosen to represent the sixth cluster is pictured in Figure 5.1. Because of the nature of many of the areas in this cluster, the setting has been named "Mill Town". This urbanized area covers about 28 square miles and has a projected 1980 population of 119,000. Seventy-nine percent of the residents live within the city limits which enclose about half (14 square miles) of the total area shown. The remaining population (25,000) is distributed among three surrounding towns. Additional demographic characteristics for the urbanized area are presented in Table 5.1.

1980 Base Case Transit System

The base case urban transportation system for Setting #5 consists of fourteen fixed routes, most of which have prescheduled deviations, extensions, or alternate routings. Areas within the city limits receive good coverage, with a high percentage of the population living within a quarter mile of a bus route. Figure 5.2

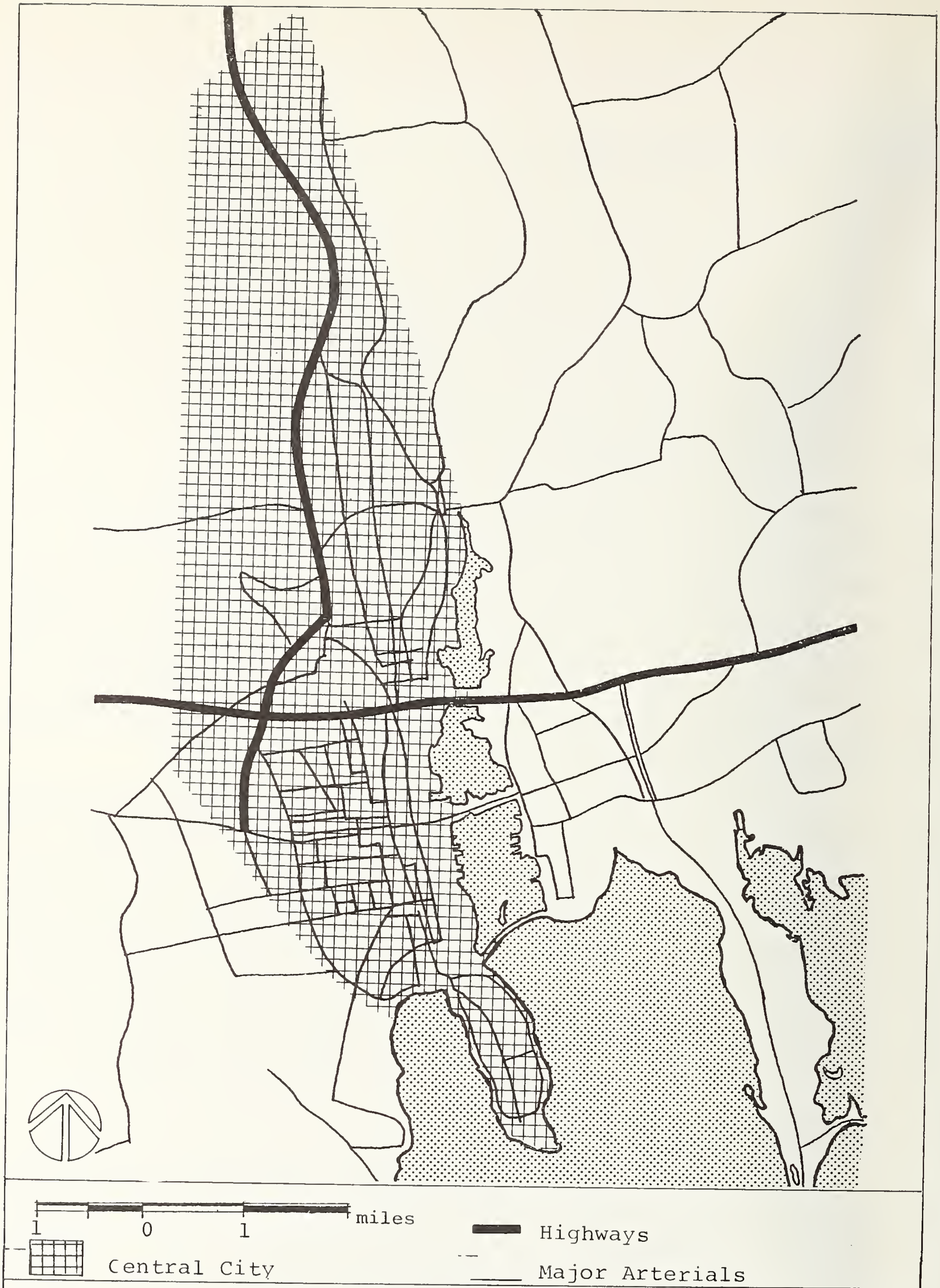

FIGURE 5.1

SETTING #5: "MILL TOWN"

Table 5.1: Setting #5: Demographic Characteristics

	1980	2000
Population	118,731	127,736
Area, sq. mi.	28	32
Density	4,240	3,992
Employment	59,850	60,650
% Elderly	13.5	15.5

displays the bus network. Headways vary depending on time of day but, during peak hours, headways on most routes are ten to fifteen minutes. Because of the deviations and alternate routes allowed for portions of most routes, not all residents served by a given route receive as frequent service as these headways suggest. Beyond the city boundaries, limited service is offered to the most dense sections of the three towns included in the urbanized area. Two routes are operated only three times a day; others have headways of one or two hours.

Regular service throughout the city is provided six days a week from 5:30 a.m. to 6:30 p.m.; however, the frequency of service is reduced along some routes on Saturdays. A few of the most densely populated areas are also served on Sundays. The base fare is 30¢, but handicapped persons and children pay half fare, and senior citizens ride for free. Lift-equipped buses provide special demand-responsive service to handicapped persons in the area. This curb-to-curb service is available six days a week between 7:00 a.m. and 6:00 p.m. The fare is 60¢ per ride.

There are a total of 70 vehicles in the fleet, including 63 new 35-foot transit vehicles. Since the local transit authority is prohibited by law from directly operating its equipment, the service is provided under a contract with a private operator. The drivers are unionized, and they earn $5.51 per hour.

Federal funds have been used to finance 80% of capital investments and 50% of operating costs. The state subsidizes 50% of the

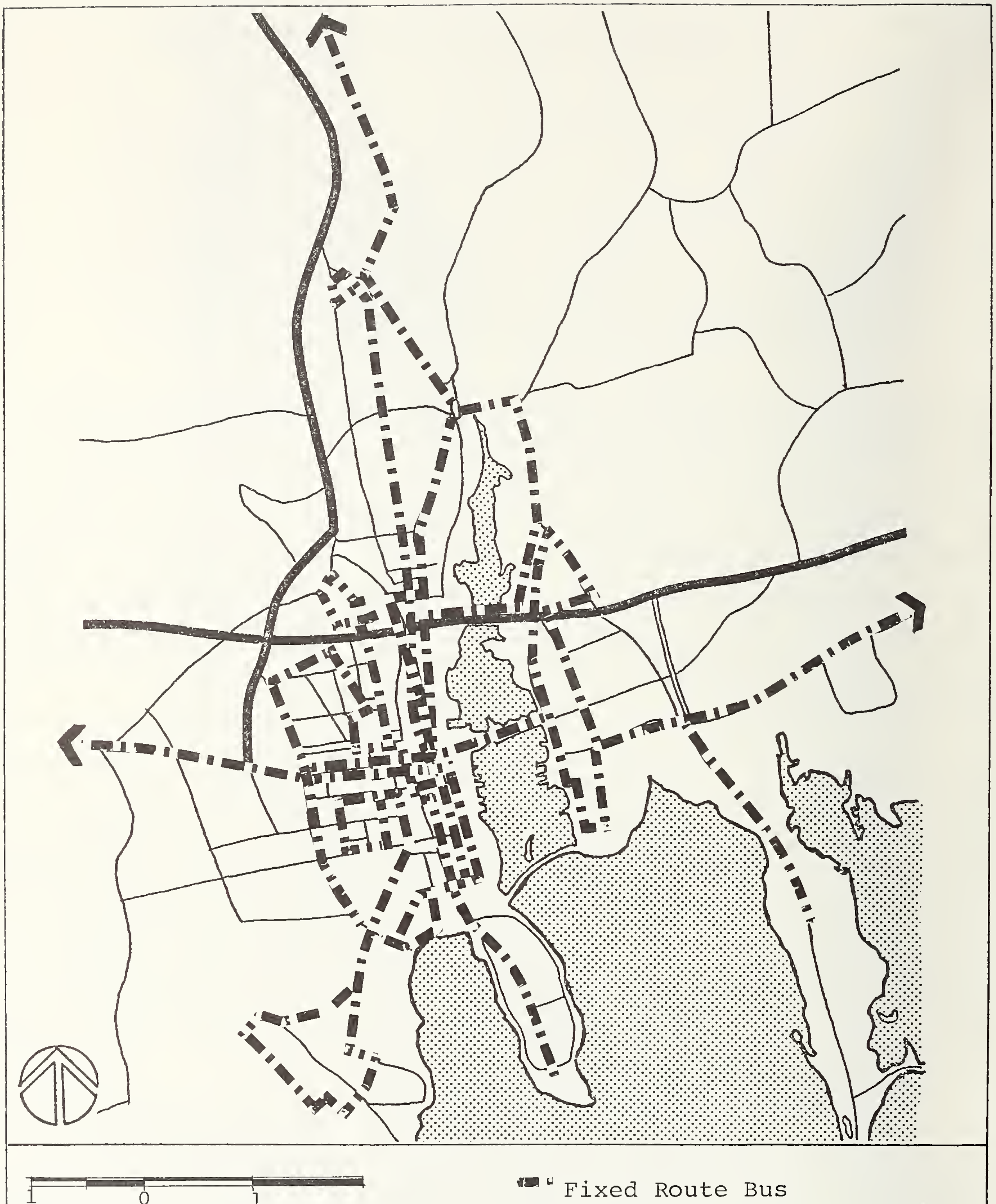

FIGURE 5.2

1980 BASE CASE TRANSIT SYSTEM
"MILL TOWN"

remaining net deficit, and the local communities served by the system share the other half.

Exclusive-ride taxi service is provided by 58 cabs which are operated by three taxi companies and a few owner-operators. The rate structure is 65¢ for the first one-seventh of a mile and 10¢ for each additional one-seventh of a mile.

5.2 1980: IP Scenarios

5.2.1 IP Scenario A

Four demand-responsive service areas with checkpoint cycled service were designed for Scenario A. This service is a cross between the checkpoint many-to-many service, considered in "Southern Belle" (Scenario A) and the cycled many-to-one service considered in "College Town" (Scenario B). The vehicles are scheduled to depart from the designated transfer points at regular intervals (every 30 minutes). They then cycle around the service area, stopping only at designated checkpoints to which persons requesting pick-ups have been directed, or at which passengers wish to be dropped off. These services are located in three outlying towns where the demand is insufficient to support conventional fixed route. In three of these service areas, the infrequent existing fixed routes were eliminated. All other routes were left unmodified. The fourth zone is located in an area which was not previously traversed by transit lines. However, the fixed routes which border the demand-responsive zone serve as access links to the CBD. Figure 5.3 shows the service configuration for Scenario A.

In addition to the cycled service zones, a "jitney" shuttle service is implemented to connect the two service zones lying to the east of the city with the CBD. The major purpose of the jitney service is to offer access to the CBD for the region located across the harbor to the east, a region which includes a densely populated town center. In the base case, this link was served by the two very low frequency bus routes which were eliminated in Scenario A.

The jitney route was designed to make a 3.5-mile loop around the densely populated area to the east of the harbor. Two transfer

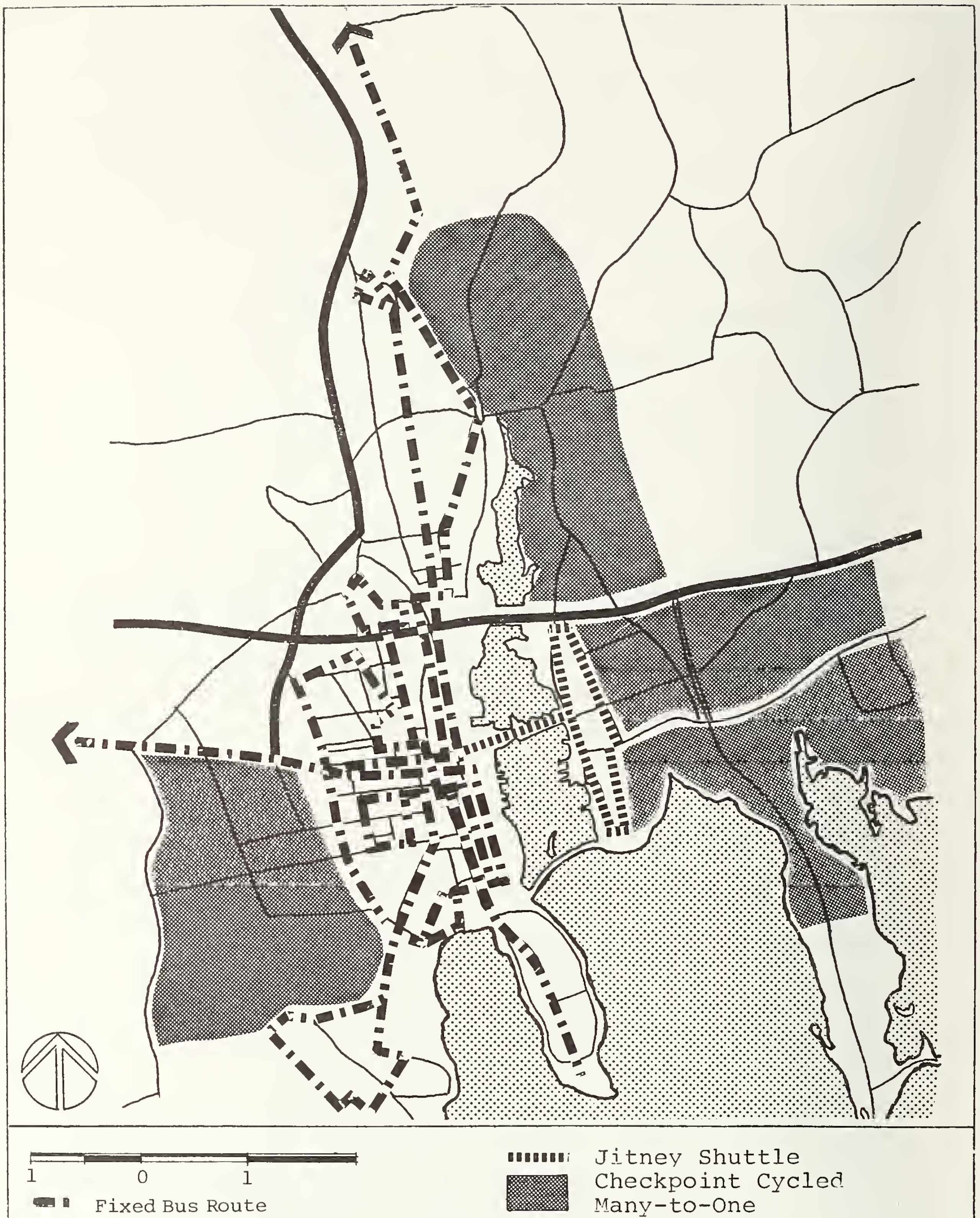

FIGURE 5.3
1980 IP SCENARIO A
"MILL TOWN"

points for the cycled service zones are located on this loop. The combination of the jitney service and the cycled services replace the coverage previously offered by the fixed routes. The level of service, however, has been greatly improved in the integrated paratransit design. Whereas six trips a day were scheduled on the conventional fixed routes, the jitney was planned to operate on 30-minute headways.

The fare structure for the paratransit services is identical to that charged for transit trips. The base fare is 30¢, and all transfers between two paratransit vehicles or between paratransit vehicles and fixed-route vehicles are 5¢. Senior citizens ride for free.

Service is offered seven days a week between 7:00 a.m. and 6:00 p.m. The vehicle fleet consists of six 12-passenger vans, which are employed in the cycled service, and one 16-passenger van which provides the shuttle service. It was assumed that the vehicles would be operated by the same private operator who manages the fixed-route fleet.

5.2.2 IP Scenario B

In the second scenario for "Mill Town", the three contiguous paratransit zones to the east and northeast of the central city, described in Scenario A, have been combined into one large doorstep many-to-many service zone, as shown in Figure 5.4. As in the previous scenario, the fixed routes to this area which operated in the base case have been eliminated. The jitney service which was set up to replace the fixed routes has been retained. Because of extremely low ridership projected for the western paratransit zone in Scenario A, no paratransit service was planned for that zone in Scenario B.

The fare for the doorstep service is increased to 75¢ per trip to reflect the added convenience offered the traveller (i.e., no transfers for trips within the service area). Transfers from one paratransit vehicle to another or from paratransit to bus cost 5¢. Elderly passengers continue to travel for free. Transfers from fixed-route service to paratransit services cost 50¢.

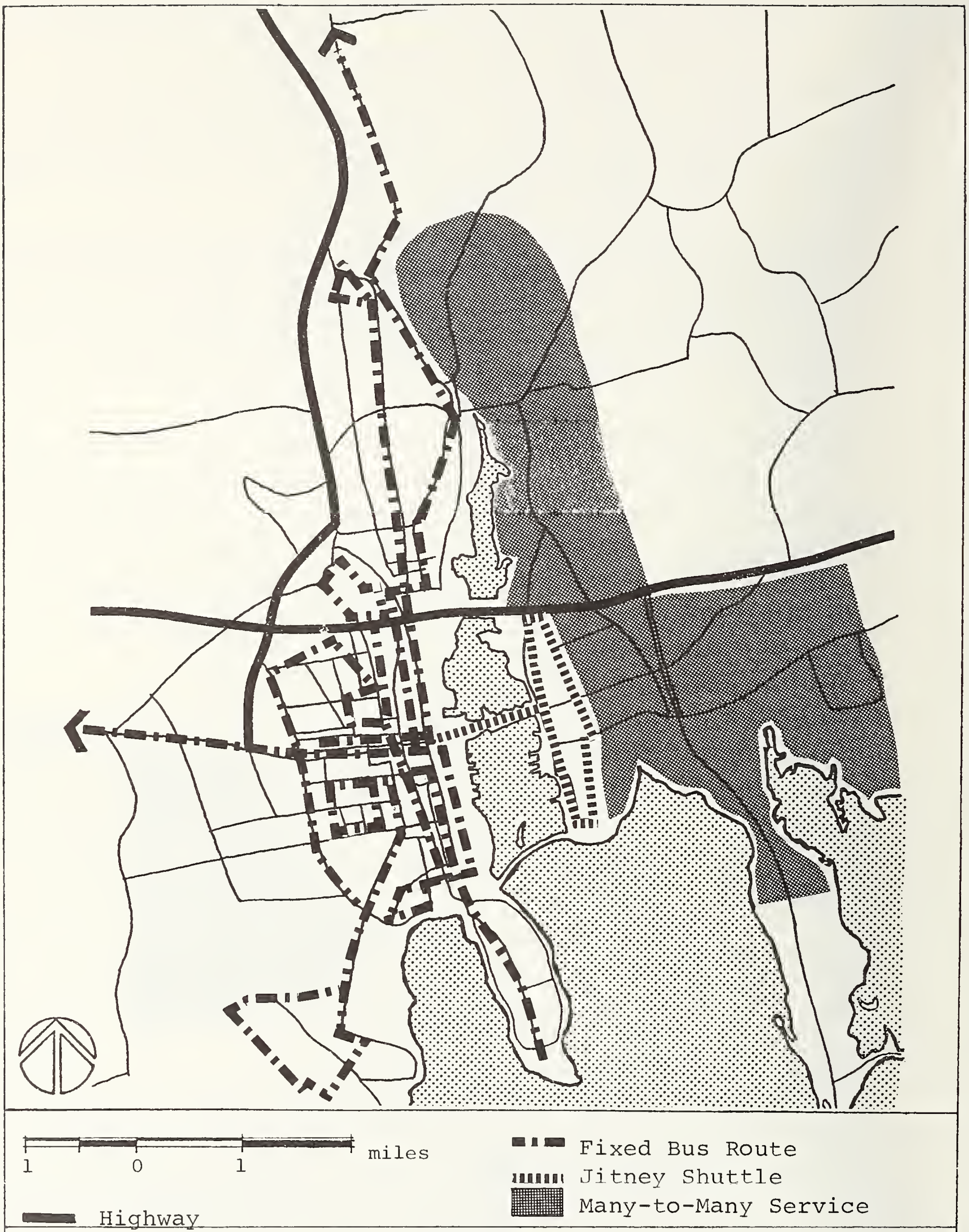

FIGURE 5.4
1980 IP SCENARIO B
"MILL TOWN"

The characteristics of both IP scenarios are summarized in Table 5.2.

5.2.3 Benefit-Cost Analysis: IP Scenarios

Detailed breakdowns of the benefits and costs of the IP scenarios in this setting can be found in Tables A.5.1 and A.5.2. The impacts are summarized and compared in Table 5.3.

First, compare the two alternatives. Scenario A results in substantially greater new transit ridership and, although it is more expensive, it results in a lower net cost per new transit trip. Since other benefits of Scenario A are also greater, it appears that the checkpoint cycled service is more effective than the many-to-many service in this setting. As an aside, note that the characteristics of the services also impact the way in which they are used. In the cycled service (Scenario A), which focuses on the transfer point and ensures coordinated transfers, 32.2% of all paratransit passengers transfer to or from fixed routes. In the many-to-many service, only 11.3% of the passengers are feeder/distributor passengers.

In absolute terms however, Scenario A does not have major impacts; i.e., ridership and all related impacts are significantly lower than that projected for all other settings. This can be traced to the fact that the paratransit services have been placed in very low density suburban areas, and fewer than 10,000 receive transit service for the first time because of IP. Also, note that the base case transit ridership in this community is already very high.

The net cost of the service is also fairly low compared to the costs projected for the previous settings. However, the net cost per new transit rider of $1.22 is higher than the costs projected for all of the other settings with the exception of "Mid-American City". As was the case for that setting, in this setting the direct monetary benefits (reduction in auto expenditures) does not come close to offsetting the $174,000 marginal transit deficit. This may in part be the result of the free fare policy for the elderly. However, again it appears that the IP deficit in this setting cannot be justified by other impacts. In this case it suggests that IP service cannot be readily supported in areas with

Table 5.2

<u>Characteristics of 1980 IP Scenarios for "Mill Town"</u>

Scenario	Module	Eligible Population (Paratransit Service only)	Area, (sq.mi.)	Population Density	Service Type	Operating Entity	Paratransit Vehicles	Paratransit Fare *
1980A	1	4,500	2.8	1,607	Ckpt. Cycled	TA	1	30¢ + 5¢ transfer
	2	2,900	2.5	1,160			1	
	3	5,100	4.5	1,133			2	
	4	5,900	4.3	1,372			2	
	Total	18,400	14.1	1,305			6	
1980B	1	12,500	9.8	1,275	MTM	TA	4	75¢ + 5¢ transfer

Abbreviations: TA = Transit Authority
Ckpt.= Checkpoint
MTM = Many-to-many

* Elderly ride for free.

Table 5.3

Selected Annual Impacts: Setting # 5: "Mill Town"

1980 IP Scenarios A and B

Impact/Measure	Scenario A	Scenario B
Change in Consumer Surplus	+33,111	+13,086
New Transit Trips/% Increase	143,000/+5.0%	72,300/+2.6%
Induced Trips	37,000	22,400
VMT/% Change	+10,000 mi/+0.01%	+10,000 mi/+0.01%
Fuel Consumption (gallons)	+7,500	+3,900
Employment: Jobs/Payroll	+7/$93,800	+5/+$74,500
Auto Expenditures	-$51,000	-$23,000
Transit Operating Cost	+$172,000	+$121,000
Net Transit Operating Cost	+$146,000	+$114,000
Net Transit Total Cost	+$174,000	+$132,000
Net Operating Cost/New Total Cost per New Transit Trip	$1.02/$1.22	$1.58/$1.83
Net Total Cost per Induced Trip	$4.70	$5.89
Taxi Industry Revenue/% Change	-$60,100/-6.3%	-$27,600/-2.9%
Taxi Industry Profit/% Change	-$10,700/-23.6%	$4,900/-10.8%
Parking Spaces Required	-17	-8

population densities as low as that of the areas served (1300 persons per square mile).

There are, however, some other interesting results of this scenario. One of the most striking results is the impact on the elderly population. Recall that one of the characteristics of the cluster of cities represented by this setting is a high elderly population. In the suburban portions of this urban area, the elderly comprise just over 10% of the population, approximately twice the percentage of comparable portions of most of the other settings considered. Because of this and the fact that there is no fare for the elderly,[1] over 60% of the projected ridership is elderly.

Note that, because there is a paratransit service for the handicapped in the area in the base case, it was assumed that no TH persons would use the new components of the IP system, and there would be no impact on social service agency providers.

Another interesting result relates to the "jitney" service introduced in this scenario, the first consideration of that service concept within this study. The term jitney has been used to imply many different (but related) service concepts. The service as envisioned here is basically a fixed-route shuttle service, with no deviations served. Although jitney services such as the one in Atlantic City, New Jersey, typically have no schedules, the one in this setting operates sufficiently infrequently (30-minute headways) to require that a schedule be maintained. Thus, this jitney service is basically a fixed route system, similar to the one it replaced, except that the headway is reduced, smaller vehicles are used, and the route is shorter and "fed" by paratransit services. A daily ridership level of 242 is projected for this service, with 43% of these passengers transferring to or from the paratransit services. This implies a productivity of 22 passenger-trips per hour, considerably higher than that obtained by most paratransit services.

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[1] Note that the model system which was used to project ridership cannot readily predict for a free fare. The results are based on a 1¢ fare, which is also probably beyond the range of model calibration. Therefore, the projected elderly ridership must be viewed as an approximation.

Key conclusions of this setting may be summarized as follows:

1. A population density of 1300 persons per square mile is probably too low to support IP service.
2. Even at this low population density, cycled checkpoint service may be more effective than doorstep many-to-many service.

5.3 1980: Alternatives to IP

5.3.1 Extended Fixed Route Bus Alternative

The extended fixed route alternative for "Mill Town" was generated by modifying the base case network to offer better coverage and frequency in the four zones previously outlined for paratransit service. Because of the limited population in these areas, only minor changes were necessary. The three fixed routes which were eliminated in the paratransit design are retained in this alternative; however, the service each offers has been improved. Portions of two of these routes have been replaced by the "jitney" shuttle service which was described in the integrated paratransit analysis. The remaining parts of these two routes are covered by a bus which serves as a feeder to the jitney. A third feeder route was added to serve areas to the east of the city which were previously unserved in the base case. One bus rotates between these three short routes offering service on each route once per hour. The jitney is planned to operate on half-hour headways. The jitney and the feeder bus together offer slightly better coverage and more than twice the frequency of the service supplied to this area in the base case system. The level of service, however, is not comparable to that available under a demand-responsive system.

The area to the northeast of the city is served in this alternative by extensions of two fixed routes. The headway on one of these routes has been reduced from two hours to one-half hour. The other route operates on 10- to 20-minute headways to the edge of the zone; the extension is served every half-hour.

An entirely new route, which operates on one-hour headways, was added to serve the fourth IP zone to the west of the city.

The modifications to the base case described above require the addition of five buses. The fare, hours, and operating authority remain the same as in the base case. The new routes and modifications to existing routes are illustrated in Figure 5.5.

5.3.2 Extended Exclusive-Ride Taxi Alternative

Because the Transit Authority is only able to provide infrequent service within the far eastern and far western portions of the urbanized area, the RTA in this scenario has contracted with the local taxi companies to provide feeder services to the transit lines adjacent to these areas. The contract calls for the general public to receive feeder service at 25¢ and the elderly to receive this service for 10¢. The operation of the vehicles used to provide this service (including capital cost) is directly subsidized at 100% by the transit authority. The taxi company is allowed to retain all revenue generated. The vehicles obtained for this service are allowed to be used only for the feeder service.

5.3.3 Benefit-Cost Analysis of Alternatives to IP

Detailed breakdowns of the benefits and costs associated with the extended fixed route and extended taxi alternatives can be found in Tables A.5.3 and A.5.4 respectively. The results are summarized and compared with the results of IP Scenario A in Table 5.4.

Recall that the results of the IP analysis suggested that the population densities in the area served (approximately 1,300 persons per square mile) were too low to support paratransit service. It is not surprising to discover in this scenario that fixed route service fares more poorly. Less than half the number of new transit trips are generated by the fixed route option, with the net total cost only marginally different. Apparently, this area is not readily servable by any form of transit.

In the extended taxi alternative, exclusive-ride taxi is used instead of paratransit as a feeder service in 3 of the 4 areas served in IP Scenario A. Given roughly the same number of vehicles, the taxi service can be offered at significantly lower cost to the public sector, and at a gain, rather than loss to the private operator. However, because of the limited capacity of exclusive-

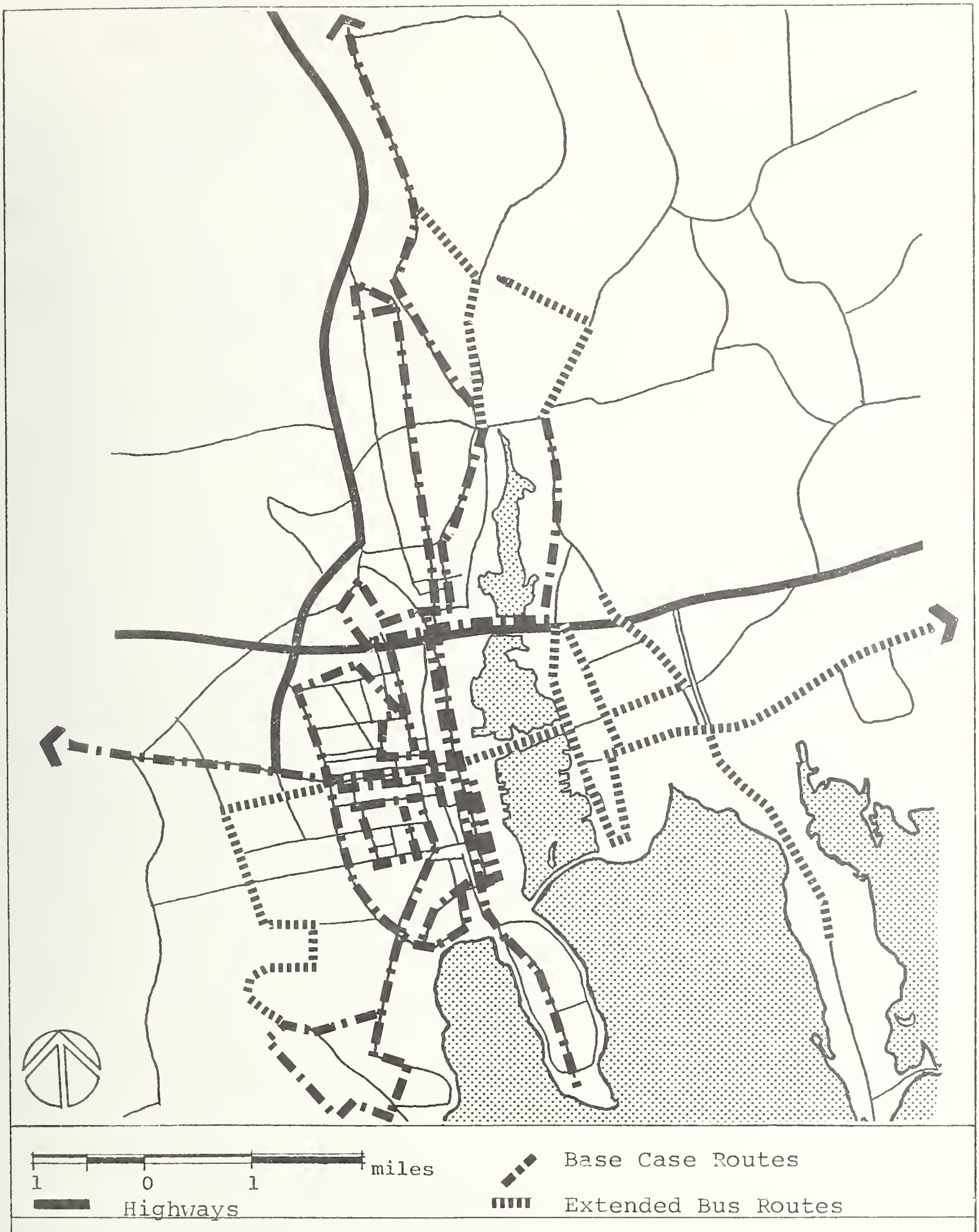


FIGURE 5.5
EXTENDED FIXED ROUTE BUS ALTERNATIVE
"MILL TOWN"

Table 5.4

Selected Annual Impacts: Setting # 5: "Mill Town"

1980 IP Scenario A, Extended Fixed Route, Extended Taxi

Impact/Measure	IP Scenario A	Extended Fixed Route	Extended Taxi
Change in Consumer Surplus	+33,111	+38,478	+11,042
New Transit Trips/% increase	143,000/+5.0%	61,500/+2.2%	NA
Induced Trips	37,000	10,500	10,300
VMT/% change	+10,000 mi/+0.01%	+35,000 mi/+0.02%	+61,000 mi/+0.05%
Fuel Consumption	+7,500 gal.	+10,300 gal.	+7,600 gal.
Employment: Jobs/Payroll	+7/+$93,800	+6/+$77,100	+6/+$45,000
Auto Expenditures	-$51,000	-$49,000	-$5,800
Transit Operating Cost	+$172,000	+$129,400	NC
Net Transit Operating Cost	+$146,000	+$121,300	NC
Net Transit Total Cost	+$174,000	+$166,400	+$49,900
Net Operating Cost/Net Total Cost per New Transit Trip	$1.02/$1.22	$1.97/$2.71	NA
Net Total Cost per Induced Trip	$4.70	$15.80	$4.84
Taxi Industry Revenue/% change	-$60,100/-6.3%	-$16,500/-1.7%	+$55,800/+5.8%
Taxi Industry Profit/% change	-$10,700/-23.6%	- $3,000/-6.6%	+$2,600/+5.7%
Parking Spaces Required	-17	NC	NC

ride taxis, many fewer trips can be served. The result is a total cost to induced trip ratio which is the same for both IP and taxi.

It is conceivable that the taxi service could have been provided at less cost, if the vehicles had not been dedicated to this service. The dedication of vehicles resulted in lower than usual productivities, given the relative low demand for the service. Given these low productivities, the taxi option proved to be no less costly than the IP option, even though the population density of the area is probably too low to support IP service. Taxi service also had less of an impact on consumer surplus and auto ownership. Note, however, that the exclusive-ride taxi option was clearly more effective than the fixed route option in these low density areas.

5.4 Year 2000 Analysis

5.4.1 Year 2000 Base Case Transit System

The population within the city limits of Setting #5 has been decreasing in recent years. This trend is expected to continue until around 1990 before it is reversed. Projections indicate that, by the year 2000, the city will have regained population lost during the 1980's and returned to the 1980 population level. The situation differs slightly in the area surrounding the city. The three suburban towns included in the urbanized area are expected to grow slowly during the twenty-year period, resulting in a suburban population increase of 13% over 1980 levels. The net growth for the entire urbanized area is only 2%.

Due to the lack of a substantial change in the population figures , the transit network for the year 2000 is assumed to remain similar to the one for the 1980 Base Case. Because of the slight population shift expected from the more dense southern sections of the city to the northern area, the headways are adjusted to reflect the shift in demand. The operating costs are estimated to remain the same, discounting the effects of inflation, while revenue is assumed to increase by 2%, reflecting the increase in population. The annual capital costs increase since, by the year 2000, all vehicles are assumed to be equipped with wheelchair lifts.

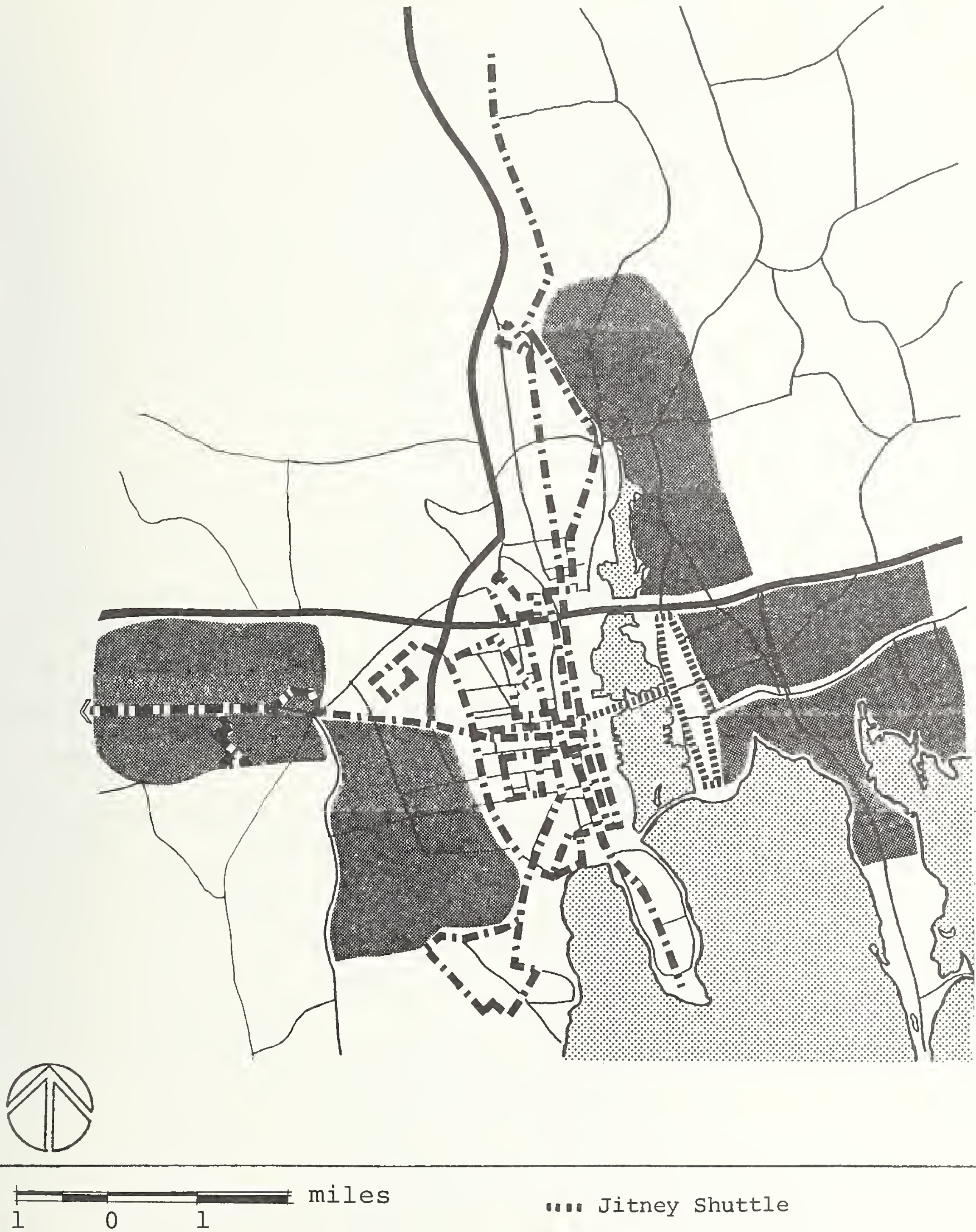
5.4.2 Year 2000 IP Scenario

The small population growth predicted for the suburban areas in "Mill Town" is not sufficient to support the extension or addition of fixed routes in the service areas previously designated for paratransit. Therefore, the four service areas identified in Scenario A for 1980 remain unchanged in the future scenario. However, a fifth service zone to the west of the city has been added to serve a region which is expected to expand. Changes to the fixed bus network are identical to those in the 1980 scenario. Checkpoint cycled service continues to operate in the year 2000 along the route described in the 1980 scenario. The year 2000 scenario is illustrated in Figure 5.6. The characteristics of both auto ownership scenarios are described in Table 5.5.

5.4.3 Benefit-Cost Analysis of Year 2000 IP Scenarios

Breakdowns of the benefits and costs of the year 2000 IP scenarios can be found in Tables A.5.5 and A.5.6. The results are summarized in Table 5.6.

These results suggest that the increase in population density of the areas served, from about 1300 persons per square mile in 1980 to 1500 in the year 2000 does little to change the overall impacts of the scenario. While ridership increases, the cost of service expansion increases the cost per passenger. All other benefits of the IP system remain fairly small.



miles

1 0 1

Fixed Bus Route

Jitney Shuttle

DRT Service Areas

FIGURE 5.6
2000 IP SCENARIO
"MILL TOWN"

Table 5.5

Characteristics of Year 2000 IP Scenarios for "Mill Town"

Scenario	Module	Eligible Population (Paratransit Service only)	Area, (sq. mi.)	Population Density	Service Type	Operating Entity	Para-transit Vehicles	Para-transit Fare	Urban Area Auto Ownership	A-1	A-2
2000 A-1	1	5,300	2.8	1,893			1		0-auto	22%	23%
	2	3,400	2.5	1,360			1		1	60%	68%
	3	5,700	4.5	1,267	Checkpoint cycled	Transit Authority	2	30¢ + 5¢ transfer	2+	18%	9%
	4	6,300	4.3	1,465			2		Avg/HH	.98	.89
	5	6,600	4.4	1,500			2				
	Total	27,300	18.5	1,476			8				

Table 5.6

Selected Annual Impacts: Setting # 5: "Mill Town"

2000 IP Scenarios A-1 and A-2

Impact/Measure	Scenario A-1	Scenario A-2
Change in Consumer Surplus	+36,162	+46,000
New Transit Trips/% increase	174,100/+5.9%	170,900/+5.8%
Induced Trips	41,500	37,100
VMT/% change	-391,000 mi/-0.2%	-259,000 mi/-0.1%
Fuel Consumption	+5,100 gal.	+9,800 gal.
Employment: Jobs/Payroll	+10/+$120,675	+9/+$117,600
Auto Expenditures	-$132,000	-$94,000
Transit Operating Cost	+$231,000	+$231,000
Net Transit Operating Cost	+$198,000	+$192,000
Net Transit Total Cost	+$256,000	+$250,000
Net Operating Cost/Net Total Cost per New Transit Trip	$1.14/$1.47	$1.12/$1.46
Net Total Cost per Induced Trip	$6.17	$6.74
Taxi Industry Revenue/% change	-$90,700/-7.7%	-$102,300/-8.6%
Taxi Industry Profit/% change	-$16,200/-28.8%	-$18,300/-32.5%
Parking Spaces Required	-16	-16

Chapter 6

Setting #6: "Large City"

6.1 Setting Description

The sixth setting analyzed represents the sixth group of urban areas developed in the city classification task. This cluster consists of 29 urban areas located primarily in the northeast. The cities in this cluster have the following general characteristics:

- high urban area population;
- high central city family density;
- high percentage of urban area workers using transit for work trips, and;
- low percentage of urban area population and density located in central city.

Urban areas represented by this cluster include Albany, New York; Cincinnati, Ohio; Louisville, Kentucky; Pittsburgh, Pennsylvania; and Trenton, New Jersey.

The setting chosen to represent this cluster, shown in Figure 6.1, is a northeastern city with a projected 1980 population of approximately 1,577,300 in over 350 square miles. The setting consists of one large central city (population 550,000) and a number of suburbs located within the same county. Because of the characteristics of the cluster, this setting has been named "Large City". Over the past ten years, there has been a notable reduction in the population of the central city, while the population of urbanized areas as a whole has not changed much. This trend is not expected to continue, as the central city is projected to grow slightly over the next twenty years, although not as fast as the surrounding area. Demographic data are presented in Table 6.1.

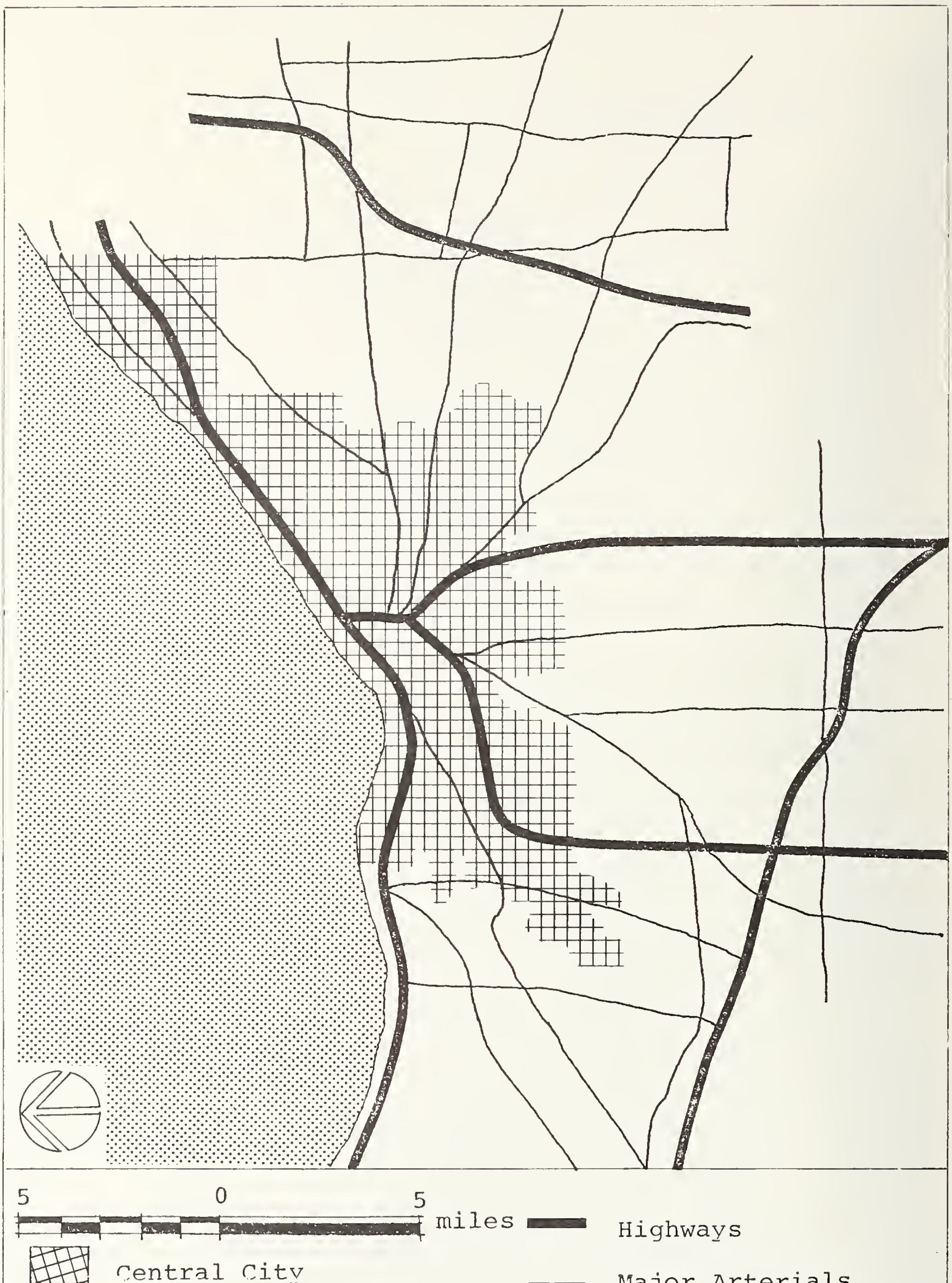


FIGURE 6.1

SETTING #6: LARGE CITY

Table 6.1: Setting #6: Demographic Characteristics

	1980	2000
Population	1,577,300	1,623,100
Area, sq. mi.	440	440
Density	3,585	3,688
Employment	797,050	831,500
% Elderly	13	17

Another important characteristic of this setting is the relatively slow average auto speed, particularly within the central city. The area has relatively few freeway miles, with only four freeways travelling into the CBD. The average auto speeds range from 8 mph in the CBD to 22 mph in the suburban areas.

1980 Base Case Transit System

The base case transit system for "Large City" consists of an extensive network of fixed-route bus lines, plus some heavy rail and light rail transit lines. It is impossible to illustrate the full extent of the transit system on the accompanying map, but Figure 6.2 indicates the location of existing rail transit lines. The extent of conventional fixed-route bus lines is indicated by the fact that 70% of those living within the central city and adjacent suburbs live within a quarter-mile of a bus route, while 24% of the residents of the more distant suburbs live within a quarter-mile of a route. In general, the transit network is oriented radially toward the CBD. Crosstown routes are provided in the east and west portions of the SMSA, but they are spaced much farther apart than those routes directed toward the CBD.

Service is provided approximately nineteen hours per day, seven days per week. The weekday bus service has average headways of approximately 15 minutes during the peak periods and 30 minutes during the off-peak, although headways vary significantly from route to route. Fares on the fixed-route network are 25¢ for all travel within the central city and adjacent suburbs. Free transfers are also allowed between routes. A zonal surcharge of 5¢ is added

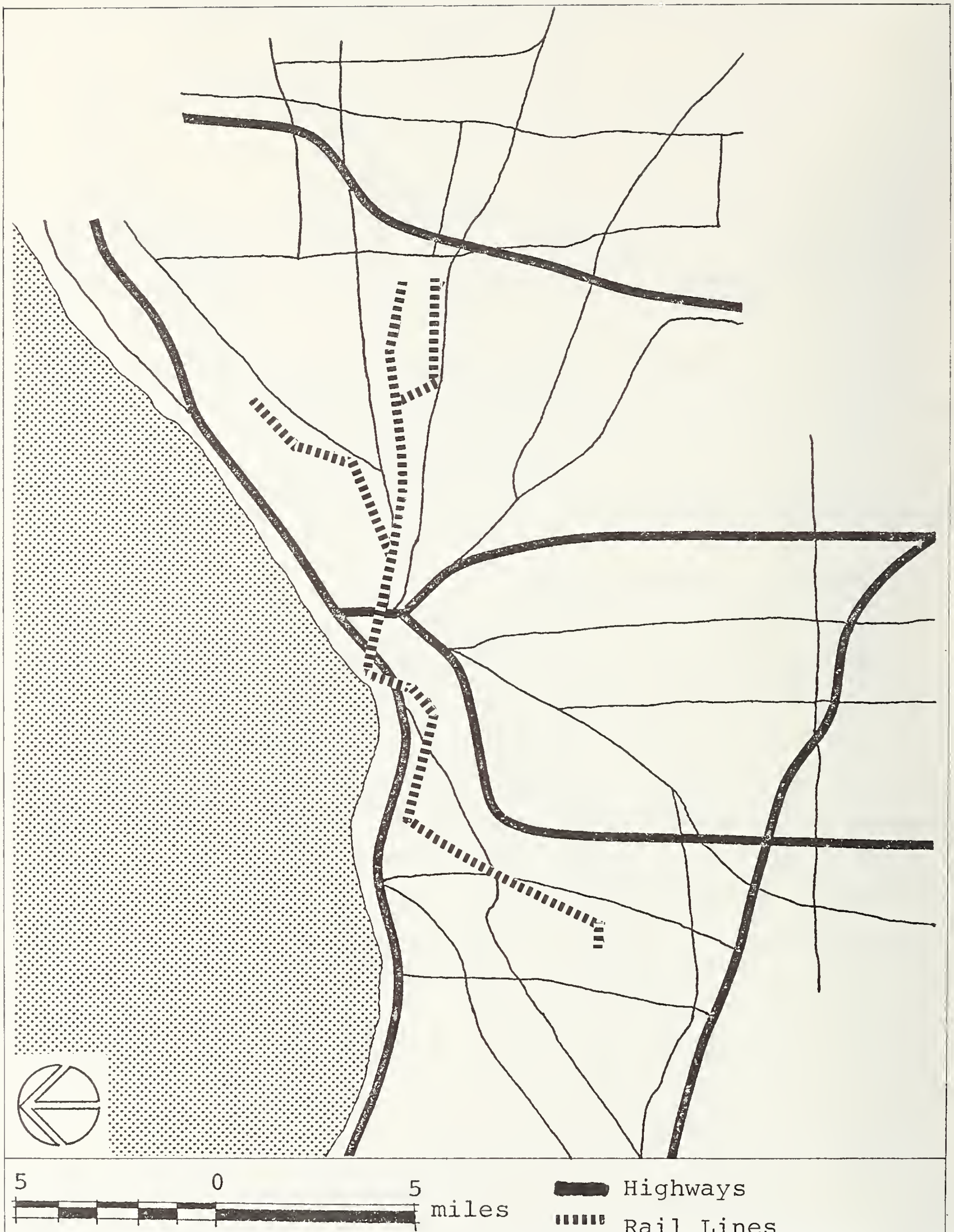


FIGURE 6.2

BASE CASE RAIL TRANSIT

"LARGE CITY"

to the basic fare when a passenger crosses from the central city and suburbs to the more distant suburbs. All service is operated by the Regional Transit Authority.

As part of the effort undertaken to convince the communities to form a transit authority, a special service for elderly and handicapped persons was established. This demand-responsive service consists of fourteen service areas, within which elderly and handicapped persons may travel door-to-door from their origin to destination. While no fare is charged for this service, the requirement to request service in advance, and the relatively few vehicles available in each service area, limit the number of demands served by this system. Each service area is served by up to two vehicles at a time. In total, there are 21 vehicles providing service. Approximately half of this service (the service in those areas outside the central city) is operated by the largest local taxi company using nine vehicles. The remainder of the service is provided by the Transit Authority.

The overall Transit Authority operating cost averages $17.63 per vehicle-hour. Driver wages of $7.68 plus 25% fringe benefits account for a large portion of this cost. Operation of the elderly and handicapped service is somewhat less expensive, since drivers on this service receive only $5.15 per hour plus 25% fringe benefits. Dispatching and order taking expenses counteract some of the savings from driver wages. A computer is used to aid in dispatching. Contract services operated by the taxi company cost the Transit Authority approximately $16 per vehicle-hour, including the dispatching functions which are performed by the Authority. The taxi company receives $12.75 per vehicle-hour to provide service.

Other transportation available to the general public in "Large City" is provided by five taxi companies. These operators own 312 vehicles, of which 240 operate within the central city and are owned by a single company. The remaining 72 vehicles operate both within the CBD and throughout the remainder of the SMSA. Taxi rates, on an average, are $1.40 for the first mile plus 70¢ for each additional mile.

6.2 1980: IP Scenarios

6.2.1 IP Scenario A

Scenario A for "Large City" provides an example of expanding an existing elderly and handicapped (E&H) paratransit system such that it can also serve the general public. In this instance, the expansion is performed by increasing the vehicle fleets in all service areas (shown in Figure 6.3) and supplying sufficient dispatching capabilities (including an upgraded computer system) to allow immediate requests to be accommodated. Up to 20 vehicles are placed in operation in each zone, with a total of 229 operated by the Transit Authority and the taxi company. Service hours were also extended from 9 a.m. to 6 p.m. for the general public system. Transfers between paratransit zones, not allowed under the E&H system, are allowed under this system.

The cost structure of the new paratransit service is the same as that of the special service for elderly and handicapped. Drivers for the Transit Authority receive $5.15/hr. and the taxi company's contract calls for a $12.75 charge per hour. Other Transit Authority employees working with this new service receive wages equivalent to those for similar jobs in the conventional portion of the Authority.

The new paratransit service is intended primarily for intra-community travel which is not well served by the existing fixed route. No attempt is made to reduce the existing coverage of the fixed route system. Furthermore, due to the extensive coverage of the existing fixed route system and its radial nature, there are no special transfer fares between the two systems. In keeping with the previous paratransit service for the elderly and handicapped, the free fare was continued for all those previously receiving paratransit service. For other members of the general public, a 75¢ fare was felt to be reasonable for the high quality of service to be provided.

6.2.2 1980: Scenario B

The only difference between Scenario A and Scenario B is the fare structure. In the previous scenario, an individual using the DRT system to access a fixed route had to pay a full fare on each service. In this scenario, a combined fare of 80¢ allows an

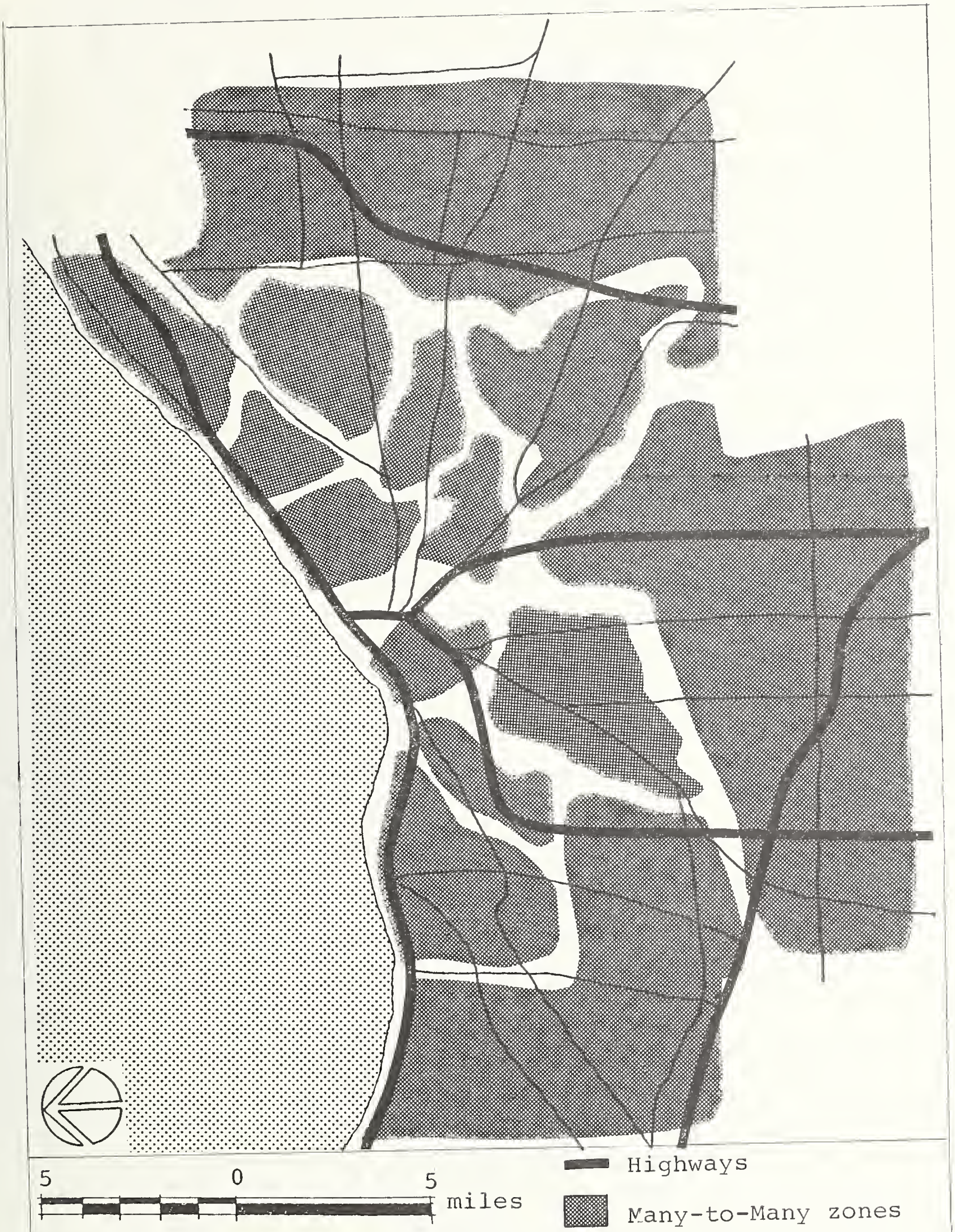


FIGURE 6.3

1980 IP SCENARIOS A AND B

"LARGE CITY"

individual to transfer from the fixed routes to the paratransit service for only 5¢ above the paratransit fare. The elderly and handicapped now may use both services for only 5¢, as opposed to the 12.5¢ which they previously had to pay to use the conventional transit system.

The characteristics of both scenarios are summarized in Table 6.2.

6.2.3 Benefit-Cost Analysis of IP Scenarios

Breakdowns of the benefits and costs of the IP scenarios can be found in Tables A.6.1 and A.6.2. These results are summarized and compared in Table 6.3.

First of all, note that, befitting a setting of this size, on an absolute level the impacts of these scenarios are significantly greater than the impacts of any of the other scenarios considered thus far.

Next, consider the differences between Scenarios A and B. Given the marginal difference between the Scenarios A and B, only a marginal difference in impacts should be anticipated. Indeed, new transit ridership under Scenario B is projected to be only 1.1% greater (47,995 more trips a year). All other impacts are, similarly, only marginally different. Note that the net cost per new transit rider is actually greater under Scenario B, suggesting that the change in fare structure over Scenario A is not cost-effective.

One interesting result is that the ridership by the elderly is projected to decrease slightly under Scenario B. This counter-intuitive result appears to be caused by the fact that work trips were more sensitive to the fare structure change (probably because more work trips are likely to require a transfer). The increase in work trips actually causes a decrease in non-work trips (since there is a limited capacity in each vehicle), the majority of which are made by the elderly.[1] This also results in a decrease in the total number of induced trips.

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[1]While the explanation above is feasible, the result may also have been caused by the structure of the model system, in which passengers effectively "compete" for limited space in the vehicles. The magnitude of the changes are so small that, in fact, it should probably be assumed that there was no change at all.

Table 6.2

Characteristics of 1980 IP Scenarios for "Large City"

Scenario	Module	Eligible Population (Paratransit Service only)	Area, (sq.mi.)	Population Density	Service Type	Operating Entity	Paratransit Vehicles	Paratransit Fare
1980A	1-7	731,900	88.4	8,280	MTM	TA	100	75¢
	8-14	845,400	346.4	2,440		Taxi	129	No transfer
	Total	1,577,300	434.8	3,627		Operator	229	provided
1980B	1-7	731,900	88.4	8,280	MTM	TA	100	75¢
	8-14	845,400	346.4	2,440		Taxi	129	No transfer
	Total	1,577,300	434.0	3,627		Operator	229	provided

Abbreviations: TA = Transit authority
MTM = Many-to-many

Table 6.3

Selected Annual Impacts: Setting # 6: "Large City"

1980 IP Scenarios A, B

Impact/Measure	Scenario A	Scenario B
Change in Consumer Surplus	+2,719,106	+2,772,010
New Transit Trips/% Increase	4,205,170/+4.6%	4,253,165/+4.6%
Induced Trips	846,150	820,900
VMT/% Change	-3,064k mi/-0.06%	-3,228k mi/-0.07%
Fuel Consumption, gallons	+131,900	+125,700
Employment: Jobs/Payroll	+316/+$3,907,800	+320/+$3,933,700
Auto Expenditures	-$3,330,000	-$3,687,000
Transit Operating Cost	+$9,376,000	+$9,376,000
Net Transit Operating Cost	+$7,640,000	+$7,887,000
Net Transit Total Cost	+$8,280,000	+$8,527,000
Net Operating Cost/New Total Cost per New Transit Trip	$1.82/$1.96	$1.85/$2.00
Net Total Cost per Induced Trip	$9.79	$10.39
Taxi Industry Revenue/% Change	+$3,439,200/+46.4%	+$3,482,700/+47.0%
Taxi Industry Profit/% Change	+$713,000/+203%	+$720,700/+205.2%
Parking Spaces Required	-175	-185

Next consider the extent to which the marginal expansion of an existing paratransit system for the elderly and handicapped resulted in any economies of scale. On one level, the answer to that question is no. There are some economies of scale, to be sure. In particular, it is assumed that the central dispatch staff need be expanded only seven-fold despite a ten-fold increase in vehicle fleet size. However, this component of the total cost is very small, particularly given the extent of the expansion. The cost per hour to provide the service goes down somewhat further because of the spread of the other fixed costs over a greater number of hours, but the overall change is fairly small.

Economies do enter into the picture in that the productivity of the new paratransit service (passengers per vehicle-hour) is significantly higher than that of the original service. Expansion of the vehicle fleet, and the increase in the demand density caused by allowing all persons to use the service, greatly increases the number of passengers per hour carried. As a result, the net operating cost per <u>new</u> transit passenger is $1.82, compared to an <u>average</u> operating cost per passenger of $4.22 on the original service. The elderly and handicapped continue to be served by the new service; in fact, a significantly greater number use the service since service levels are better, there are no supply constraints, transfers are allowed, and immediate requests are accepted. Simultaneously, the cost per passenger to serve these persons drops markedly. From this standpoint, the expansion of the service appears to achieve desirable economies.

As an aside, note that, as was the case in "Mill Town", service is provided free of charge to the elderly. Once again, the elderly are projected to comprise a majority of the ridership. As a result, the marginal revenue-to-marginal cost ratio is extremely low (10.9%), despite the 75¢ fare for the general public.

The marginal cost per new transit rider of $1.82, as noted above, is the <u>highest</u> value of any of the scenarios considered thus far. In this case the total annual deficit amounts to over $8,000,000, and again the question must be asked as to whether this deficit can be justified by the other impacts of IP. Once again the direct economic benefits do not offset the deficit, even if consumer surplus is treated as an economic impact. The ability to justify the alternative is dependent upon the values placed on the remaining impacts, such as VMT reduction, employment increase, and taxi industry revenue increase.

The overall impact on the taxi industry is enormous. Industry profit is projected to increase by over 200%, despite the fact that over $1,000,000 in exclusive-ride taxi revenue is expected to be lost. The major impact on profit can be traced to the terms of the contract with the taxi operator: the $12.75 per hour rate for service (which excludes dispatching) is projected to allow the operator to retain at least a 20% "management fee" or profit. While a reasonable rate of return for the taxi operation is justified (particularly given the risk associated with acquiring new taxi vehicles), nevertheless, the profit margin appears excessive, and the IP system may have been able to achieve a slightly better revenue to cost ratio with revised contract terms.

A major difference of this scenario is that it is the first considered for a large city; it is also one of two (the other in Setting #2) in which paratransit service is provided virtually throughout the urban area during both peak and non-peak hours. The results suggest that there may be substantial demand for paratransit service, even in a major metropolitan area with extensive fixed route service. Despite this extensive fixed-route service, an estimated 366,500 persons would first be served by transit after the implementation of IP. This in part explains why the service is able to draw as many riders as it does. Clearly, the free fare for the elderly also plays a role in generating a significant ridership.

The very high density, particularly in inner city areas, also helps the service maintain high productivities. Higher ridership and productivity levels are projected for those service zones located in denser portions of the area. On the other hand, a greater change in consumer surplus (per capita) was predicted in less dense zones with poorer fixed route service. This is consistent with the findings of earlier scenarios, where the change in consumer surplus (which is a function of overall transit accessibility) was noted to be higher in areas formerly unserved by transit. The areawide IP strategy considered here is very different from the integrated IP strategy more commonly considered for major metropolitan areas, in which paratransit systems are viewed largely as feeder services in low density areas. The overlay of transit and paratransit in this setting may be another one of the reasons that the IP service resulted in an extremely high net cost per marginal transit rider.

There would undoubtedly be serious institutional barriers to the implementation of a system of this size in most areas. The agreement with the transit labor union, allowing part of the service to be contracted out and calling for lower wages for paratransit drivers, and the contract with the the taxi industry allow the service to be implemented on this scale in this setting.

The key conclusions of this setting may be summarized as follows:

1. There may be substantial demand for paratransit service even in large cities, and even in cases where the paratransit service is overlaid on the fixed route network. However, such a system may have very high costs per passenger.
2. Expansion of a paratransit service designed for the elderly and handicapped into a general public system does not greatly reduce cost per hour (and will typically increase total cost), but it should substantially reduce the cost per elderly and handicapped passenger.
3. Care should be taken in drafting contracts with private operators to provide paratransit service, to ensure that the public sector achieves all possible economies while the private sector receives a sufficient rate of return, given the level of effort and risk.

6.3 1980: Alternatives to IP

6.3.1 Extended Fixed-Route Bus Alternative

The extended fixed-route bus alternative in "Large City" is designed to provide better coverage within the suburban portions of the urbanized area at approximately the same cost as the paratransit alternatives. Approximately 30 new feeder bus routes have been added at half-hour headways during the peak and one-hour headways during the off-peak hours. Figure 6.4 illustrates the regions in which these feeder routes have been added. The large area covered by this part of the extended bus alternative implies that these routes are still widely spaced. The average walk distance to fixed routes in this area is almost 1.5 miles.

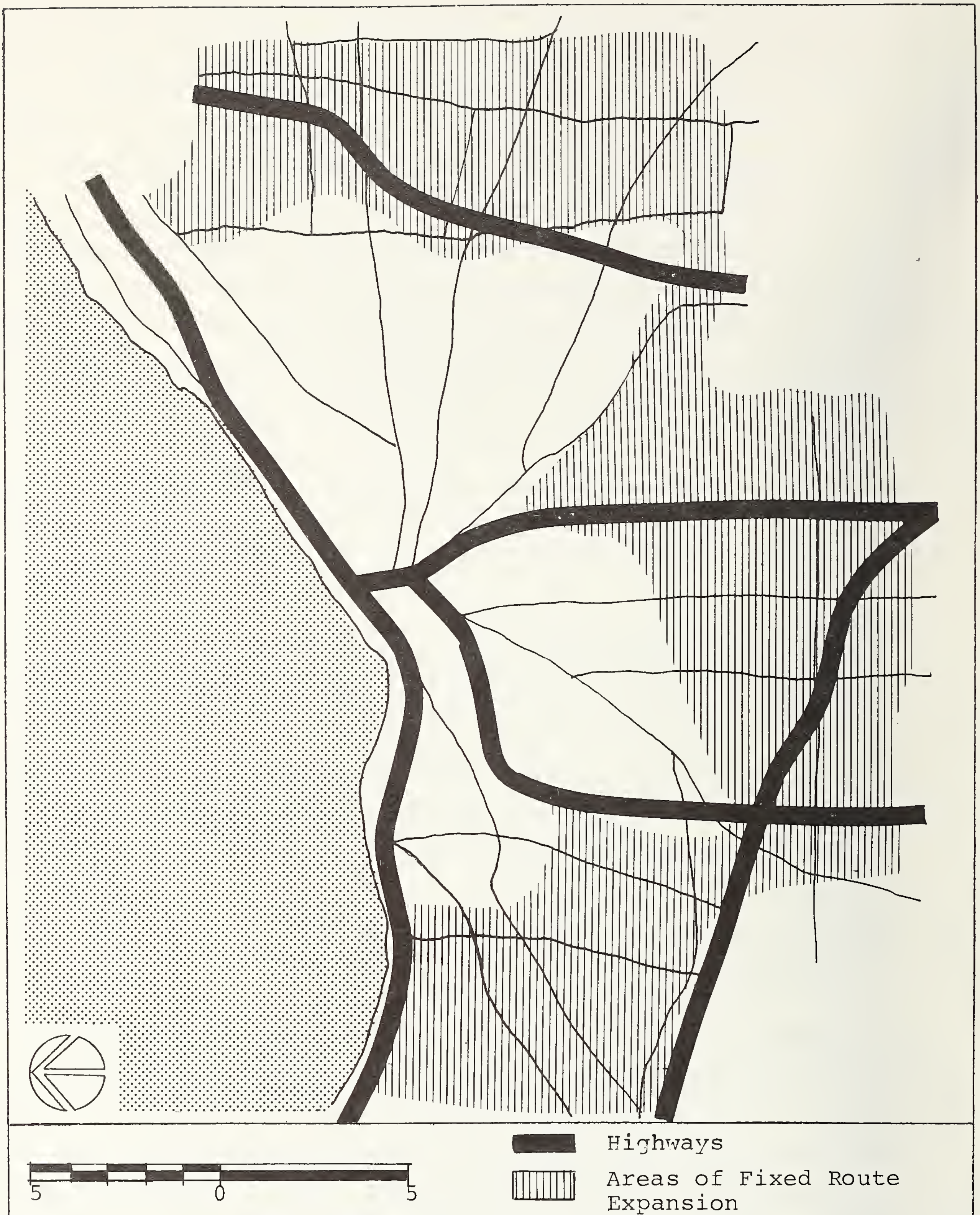

FIGURE 6.4

EXTENDED FIXED ROUTE BUS ALTERNATIVE

"LARGE CITY"

In addition to the feeder routes provided in suburban areas, additional service in the form of decreased headways is provided along existing routes within the heavily urbanized areas. On average, the frequencies of these services are increased between five and ten percent. No additional coverage through new routes is created within the heavily urbanized areas. All extended service is provided with full-size transit vehicles. A total of 238 new vehicles is required, bringing the total bus fleet to 1,388.

6.3.2 Extended Exclusive-Ride Taxi Alternative

In this scenario, the Transit Authority decides to replace their base case community paratransit services for the elderly and handicapped with a user-side taxi subsidy for those groups. The subsidy is administered through the use of scrip, distributed by the local Area on Aging. Scrip is used so that the total subsidy can be limited to the amount which was spent on the IP option. The subsidy reduces the taxi fare for the elderly and handicapped to 25¢ for trips within the designated service zones which existed in the base case community service.

In anticipation of increased demand, the local taxi operators increase their fleet from 312 vehicles to 499 vehicles. All other operating characteristics remain the same.[1]

6.3.3 Benefit-Cost Analysis of Alternatives to IP

Detailed breakdowns of the benefits and costs of the extended fixed route and the extended taxi alternatives can be found in Tables A.6.3 and A.6.4 respectively. The results are summarized and compared with IP Scenario A in Table 6.4.

First, compare the IP and extended fixed route scenarios. As can be seen from Table 6.4, the two alternatives appear to have very similar impacts. On the basis of net total cost per new transit rider, however, the fixed route alternative appears to be more effective. The fixed route extension attracts more new transit riders, at only marginally higher costs. There are two probable reasons for this:

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[1]Clearly, the taxi subsidy would be of no use to persons in wheelchairs or users of other aids who cannot transfer to a taxi, unless lift-equipped vehicles could be obtained.

Table 6.4

Selected Annual Impacts: Setting # 6: "Large City"

1980 IP Scenario A, Extended Fixed Route, Extended Taxi

Impact/Measure	IP Scenario A	Extended Fixed Route	Extended Taxi
Change in Consumer Surplus	+2,719,106	+3,996,559	+1,194,583
New Transit Trips/ % increase	4,205,170/+4.6%	6,449,700/+7.1%	NA
Induced Trips	846,150	838,500	325,786
VMT/% change	-3.1 mil mi/-0.06%	-4.0 mil mi/-0.08%	+4.2 mil mi/+0.08%
Fuel Consumption, gallons	+131,900	+203,800	+453,600
Employment: Jobs/ Payroll	+316/+$3.9 mil.	+312/+$5.95 mil.	+218/+$1.2 mil.
Auto Expenditures	-$3.33 mil.	-$2.46 mil.	-$115,000
Transit Operating Cost	+$9.38 mil.	+$9.66 mil.	NC
Net Transit Operating Cost	+$7.64 mil.	+$8.15 mil.	NC
Net Transit Total Cost	+$8.28 mil.	+$9.28 mil.	+$2.82 mil.
Net Operating Cost/ Net Total Cost per New Transit Trip	$1.82/$1.96	$1.26/$1.44	NA
Net Total Cost per Induced Trip	$9.76	$11.06	$8.64
Taxi Industry Revenue/% change	$3.43 mil/+46.4%	-$1.87 mil/-25.3%	+$3.42 mil/+44%
Taxi Industry Profit/% change	+$713,000/+203%	-$334,000/-95.1%	+$128,000/+32.2%
Parking Spaces Required	-175	NC	NC

NA = Not Available
NC = Not Calculated

(1) fixed-route service may be more effective than paratransit service in high density areas such as "Large City" and (2) the paratransit service is overlaid on the base fixed-route system, thus diverting passengers from that service.

Note that these results do not imply that fixed-route service is more effective than paratransit service in all parts of an area the size of Setting #6. It is possible that (non-competing) paratransit service would be more cost-effective than fixed route in some lower density portions of the area.

As an aside, note that the IP system is projected to have a greater impact on auto ownership than the fixed-route system, despite lower ridership. This is presumably the result of the more extensive, areawide nature of the IP service.

Also note that, although fixed route results in a greater decrease in VMT, energy consumption increases to a greater extent. This is because of the use of larger vehicles in the fixed route system. The use of diesel vehicles does result in a significant decline in carbon monoxide emissions, however.

Next, consider the impacts of the extended taxi alternative. This analysis represents a slight departure from previous analyses, in that the taxi option is more of an alternative to a part of the base system than an alternative to the IP system. In this scenario, the taxi service replaces the paratransit service which had been offered for the transportation handicapped. Comparisons of the extended taxi alternative will therefore be made with the IP and extended fixed route alternatives and, to the extent possible, with the base paratransit system. The latter comparison appears in Table 6.5.

The user-side subsidy for the elderly and handicapped is projected to result in 2,035,000 new taxi trips. Over 800,000 of these are diverted from either fixed route transit service or the former TH paratransit service. The net result is an increase of taxi industry revenue of $3,424,000. This increase is lower than what might have been expected, since the taxi industry also loses its lucrative contract with the Transit Authority for paratransit service. Thus, the taxi industry

TABLE 6.5

Comparison of Extended Taxi Alternative and Base Case Community Paratransit Service for Elderly and Handicapped

	Extended Taxi	Base Case
Passengers (total)*	2,713,000	237,700
Total Subsidy by Transit* Authority[1]	$4,071,000	$1,200,000
Subsidy per Passenger*	$1.50	$5.04
Change in Taxi Company* Revenue	+$3,598,000	+$175,000
Change in Taxi Company* Profit	+$181,000	+$53,000

*Absolute rather than marginal values.

profit is projected to increase only 32.2%, or $128,000 overall. The Transit Authority subsidy for the portion of the TH service it operated decreases by over 1.5 million dollars. Overall, however, the Transit Authority's subsidy increases by some $2,820,000.

Comparison of this alternative with the IP and extended fixed route alternatives is somewhat difficult, since the taxi alternative serves only the elderly and handicapped. The overall cost and cost per passenger of the taxi alternative is significantly lower than either of the other two alternatives. As a method for improving the mobility of the elderly and handicapped, the taxi alternative is clearly superior, since all induced trips are by elderly and handicapped persons. However, the comparison is somewhat unfair, since the IP and extended fixed route alternatives are added to the base TH paratransit system, while the taxi alternative replaces it.

A more interesting comparison is between the taxi alternative and the base TH paratransit service as methods for increasing the mobility of the handicapped and elderly. The analysis cannot be fully complete, since the base paratransit system was not modelled on its own, and there are no projections of change in consumer surplus or automobile ownership. However, other important impacts can be computed, as shown in Table 6.5. It is clear that the extended taxi alternative results in a much higher ridership level. It does so at higher cost,[1] but the cost per passenger is substantially lower. Clearly, a user-side taxi subsidy appears to be a much more effective method for increasing the mobility of the elderly and handicapped than the type of system currently in place in "Large City". It is true that the extended taxi alternative called for a 25¢ user charge, but even with that charge eliminated the extended taxi service would be superior. Note, however, that the taxi industry does better percentage-wise in the base case option, since the hourly contract enables them to take a higher percentage profit.

[1] Note that the total cost turned out to be much below the amount the transit district was willing to pay.

6.4 Year 2000 Analysis

6.4.1 Year 2000: Base Case Transit System

The year 2000 base case transit system for "Large City" is assumed to be very similar to that which existed in 1980. Projected population shifts from the central city to the suburban areas will produce some minor changes in the route structure, but only a 0.7% increase in route mileage is projected. Virtually all of the new route coverage is in the outer suburban rings, placing 5% more of the population of this area within one-quarter mile of a bus stop. Additional modifications to the fixed-route system have been made to hold level of service relatively stable, while overall vehicle speeds decrease by 5% because of increased congestion.

Despite the efforts of the Transit Authority, the shift in population location is projected to result in a small reduction of ridership and, thus, revenue. As a result of the increased service (being provided under virtually the same cost structure) and decreasing ridership, the community has had to subsidize a slowly growing transit deficit. As in 1980, a special E&H paratransit service operates throughout the county. Service in the outlying suburbs has been extended from one day per week to five days per week.

6.4.2 Year 2000 IP Scenario

The year 2000 paratransit scenario is based on 1980 Scenario A; however, the level of expenditure has been curtailed due to financial concerns. Paratransit service has been eliminated for the general public in areas which are well covered by the fixed route system. Only in those service areas shown in Figure 6.5 is paratransit service provided to the general public. In the central city zones, in which over three-quarters of the population lives within .25 mile of a bus route, the number of vehicles has been reduced to half the number used in 1980. On the other hand, the far external zones have been supplied with an extra 21 vehicles to handle the demand from the growing population. Service for the elderly and handicapped is retained in all 1980 zones.

The characteristics of the two auto ownership scenarios are displayed in Table 6.6.

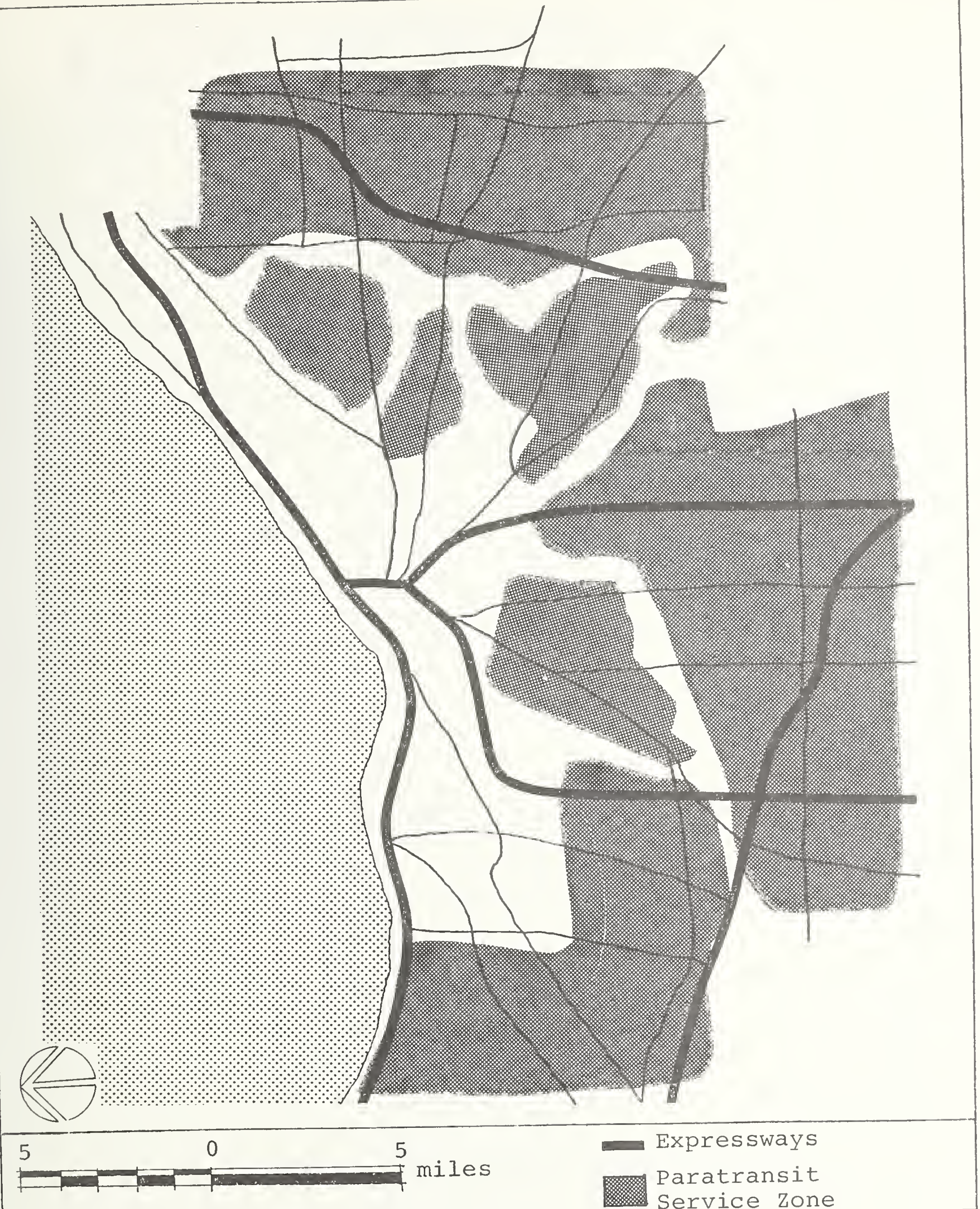

FIGURE 6.5
YEAR 2000 IP SCENARIO
"LARGE CITY"

Table 6.6

Characteristics of Year 2000 IP Scenarios for "Large City"

Scenario	Module	Eligible Population (Paratransit Service only)	Area, (sq. mi.)	Population Density	Service Type	Operating Entity	Para-transit Vehicles	Para-transit Fare	Urban Area Auto Ownership	A-1	A-2
2000 A-1, A-2	1	150,100	20.8	7,210	Many-to-Many	RTA	15	75¢ No transfer provided	0-Auto	16%	17%
	2-7	879,100	340.3	2,583		Taxi Operator	85		1	54%	63%
	Total	1,029,200	361.1	2,850					2+	30%	20%
									Avg/HH	1.17	1.07

RTA = Regional Transit Authority

6.4.3 Benefit-Cost Analysis of Year 2000 IP Scenarios

Breakdowns of the benefits and costs of the year 2000 IP scenarios for "Large City" can be found in Tables A.6.5 and A.6.6. The results are summarized in Table 6.7.

As would be expected, ridership is projected to be significantly lower than in 1980, because of the contraction of the system. All other impacts vary accordingly. Note, however, that the change in population covered is extremely similar in the 1980 and the 2000 scenarios. The difference in ridership levels is caused by: (1) providing fewer vehicles and (2) shifting service to suburban areas where auto ownership is higher and the propensity to use transit is lower.

In the year 2000 case, the net cost per marginal transit rider is $1.49, somewhat lower than in 1980 ($1.96). The major reason for this lies in the shift in service to the suburban areas. A smaller percentage of passengers in these areas is diverted from fixed routes; as a result, the cost per marginal transit rider is lower.

Table 6.7

Selected Annual Impacts: Setting # 6: "Large City"

2000 IP Scenarios A-1, A-2

Impact/Measure	Scenario A-1	Scenario A-2
Change in Consumer Surplus	434,405	521,287
New Transit Trips/% Increase	1,590,600/+1.7%	1,579,300/+1.6%
Induced Trips	261,800	307,700
VMT/% Change	-2.36 mil mi/-0.04%	-2.11 mil mi/-0.04%
Fuel Consumption, gallons	-40,500	-20,200
Employment: Jobs/Payroll	+99/+$1,048,400	+86/+$915,900
Auto Expenditures	-$1,110,000	-$1,070,000
Transit Operating Cost	+$3,018,000	+$3,018,000
Net Transit Operating Cost	+2,130,000	+$2,113,000
Net Transit Total Cost	+$2,357,000	+$2,340,000
Net Operating Cost/New Total Cost per New Transit Trip	$1.34/$1.48	$1.34/$1.48
Net Total Cost per Induced Trip	$9.00	$7.60
Taxi Industry Revenue/% Change	+$2,064,000/+20.2%	+$1,843,500/+18.5%
Taxi Industry Profit/% Change	+$419,300/+88.0%	+$379,800/+79.8%
Parking Spaces Required	-71	-65

Chapter 7

Setting #7: "Metropolis"

7.1 Setting Description

The seventh setting analyzed represents the seventh group of urban areas developed in the city classification task. This group consists of seven large urban areas located throughout the country. The major commonality among these urban areas is the large population and the high family density within the central city. Other major descriptors of this cluster are:

- low percentage of population in single-family dwellings;
- low percentage of population and employment within boundaries of central city;
- high median family income;
- high percentage of families with no auto available; and
- high transit usage for work trips.

Urban areas represented by this cluster are Boston, Chicago, Detroit, Los Angeles, Philadelphia, San Francisco, and Washington, D.C.

The setting chosen to represent this cluster, shown in Figure 7.1, is a northeastern urban area with a projected 1980 population of 2,408,085. The setting consists of one large central city and a number of suburbs located within 20 miles of the central city to the north, west, and south. The central city and its surrounding urbanized area cover approximately 500 square miles. Not all of the densely populated portions of the area are located within the central city. Many inner suburbs and some other suburban communities along major transit lines record population densities above

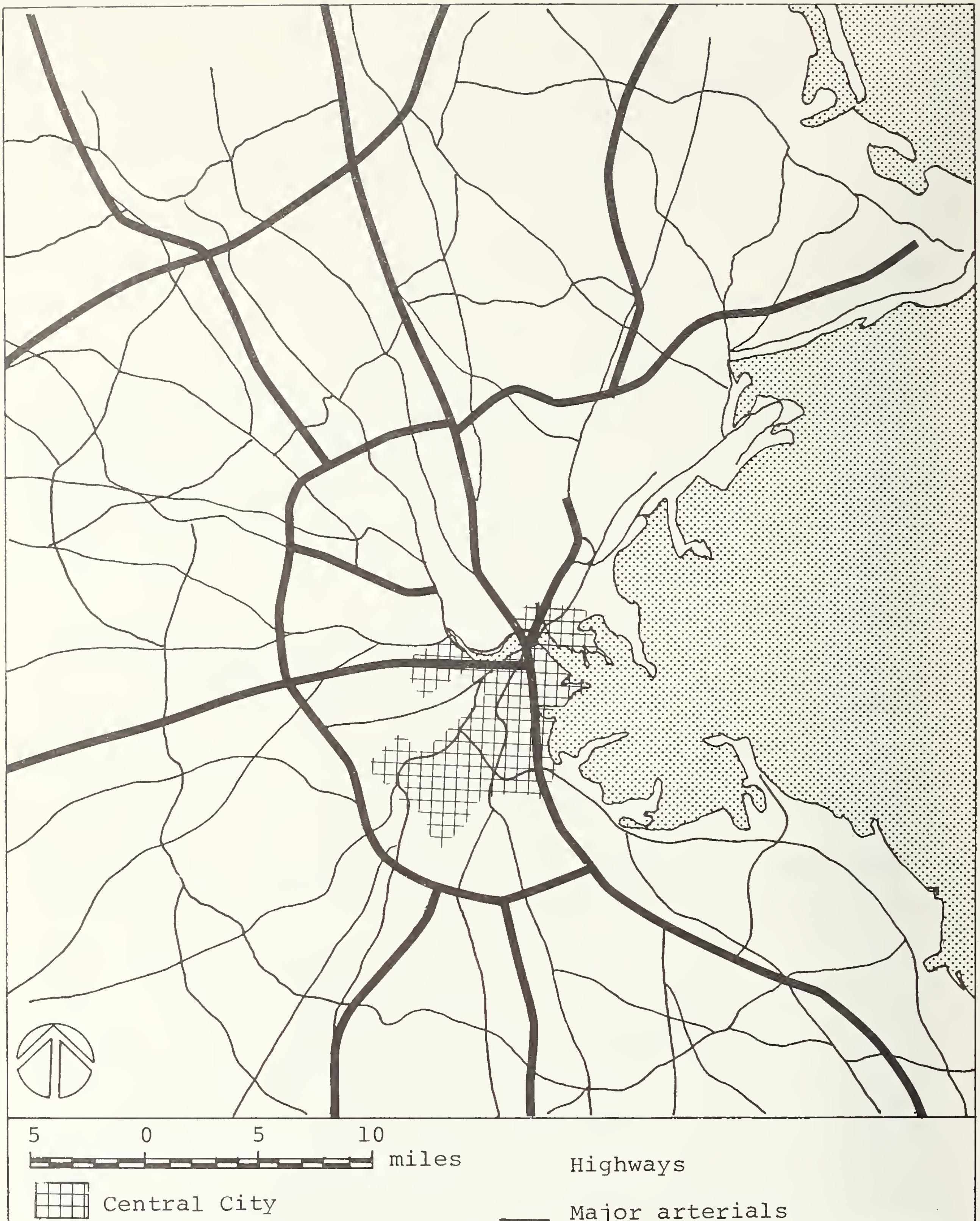

FIGURE 7.1

SETTING #7: "METROPOLIS"

9,000 persons per square mile. The nature of the representative city, along with all other urban areas represented by this cluster, gives rise to the name "Metropolis." Table 7.1 presents the demographic profile of this representative setting.

Table 7.1: Setting #7: Demographic Characteristics

	1980	2000
Population	2,408,085	2,689,885
Area, sq. mi.	500	500
Density	4,800	5,390
Employment	1,200,000	1,450,000
% Elderly	11	13

1980 Base Case Transit System

The base case transit system for "Metropolis" consists of an extensive network of fixed route bus lines, light rail lines, heavy rail (above and below ground), and commuter rail services. The Regional Transit Authority operates all of the local rail services of the area in addition to the majority of the conventional motor bus lines. Some private operators provide service during peak hours between the central city and population centers on the fringes and outside the urban area. Figure 7.2 illustrates the extensive coverage provided by fixed guideway modes. Again, it is impossible to illustrate on the map the extent of coverage provided by motor bus routes, but approximately 70% of those living in the entire urban area live within 1/4 mile of a public transit route.

The transit authority operates vehicles seven days a week from the hours of 5:00 a.m. until 1:00 a.m. the following morning. Frequencies along routes vary from once every two minutes (during the peak on rapid rail and some conventional bus services) to once every two hours (at night and on weekends). Approximately

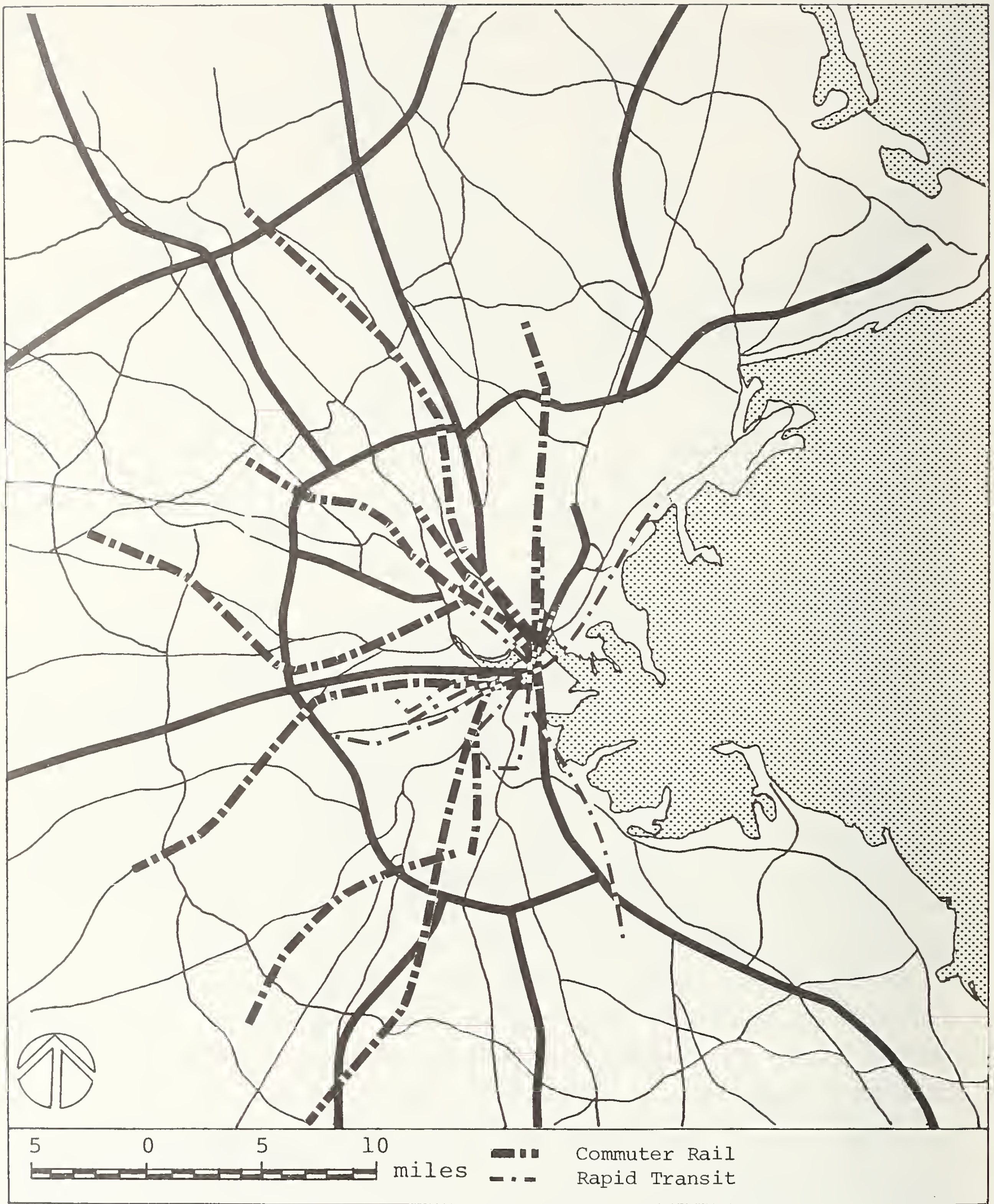

FIGURE 7.2

BASE CASE RAIL SYSTEM
"METROPOLIS"

ten percent of the routes are discontinued during midday of weekdays, while 50% and 20% are discontinued nights and Saturdays, respectively. The basic fare on most bus and rapid rail routes is 25¢, although 50¢ is charged for some longer rapid transit trips. The bus fare can vary, however, from 30¢ to 90¢ for bus routes in the suburbs and peak period express routes. The elderly and transportation handicapped are given special half price fares ranging from 10¢ to 45¢. Fares along the commuter rail lines vary, depending on origin and destination, from 75¢ to $1.50.

A small pilot program for the transportation handicapped is also being run by the transit authority in the base case. This system provides doorstep-to-doorstep service on a subscription basis for handicapped residents of a small, relatively densely populated portion of the inner (although not exclusively central) city area. In its pilot form, the service transports approximately 13,000 trips per year including some human service agency nutritional program clients. The fare charged on this system varies depending on type of trip taken, but averages approximately 83¢ per trip. An important aspect of this service is that it is being provided by a private contractor to the transit authority. This has significantly reduced the cost of this service when compared to the use of the authority's union drivers and maintenance personnel. It has also set a precedent for proposed services in areas presently not adequately served by conventional transit.

The cost of service provided by union employees of the transit authority is much higher than the average throughout the country. Drivers and maintenance personnel average over $25,000 per year including 30% fringe benefits. These high costs are also noted for other categories of authority employees. This high wage rate results in vehicle costs per hour of nearly $30.

Other transportation available to the general public in "Metropolis" is that provided by over 2,400 taxis operating throughout the urban area. Sixty percent of these cabs are licensed in the central city and charge a fare of $1.40 for the first mile plus 70¢ for each additional mile. The remainder are located in many of the suburban communities and offer fares as low as $1.10 for the first mile plus 60¢ for each additional mile. This number of taxis per capita is far greater than the national average.

7.2 1980: IP Scenarios

7.2.1 IP Scenario A

In Scenario A, the transit authority has decided to test the use of paratransit to help serve the needs of the transportation handicapped and those living in areas where little transit service exists. The entire paratransit program consists of three modules: an expanded transportation-handicapped service and two low-density areas in the suburbs. These service areas are illustrated in Figure 7.3

The major differences between the service to the transportation handicapped in the base case and in this scenario are the number of vehicles providing service and the ability of individuals to request service on demand rather than on a subscription basis. This service, which is provided using 29 vehicles, can fulfill the demand of all transportation handicapped who wish to use the service. The private contractor who supplies vehicles, drivers, and support personnel in the base case continues to operate the expanded service. Both the fare structure and the cost characteristics of the service are the same as in the base case.

The two suburban systems are also operated (on a cost plus fixed fee basis) by private contractors. In the northern service area, six 19-passenger vehicles provide a variety of services, including doorstep many-to-few subscription services to major employment areas in the community, doorstep many-to-many dynamically dispatched service, and a jitney service between two major shopping areas. Fares for these services range from 50¢ per trip for doorstep services to 30¢ per trip for the jitney shuttle. Senior citizens and the handicapped pay only half fare. Service in the other service areas is provided by three 19-passenger vehicles from 8:30 a.m. to 6:00 p.m. During the morning, vehicles provide

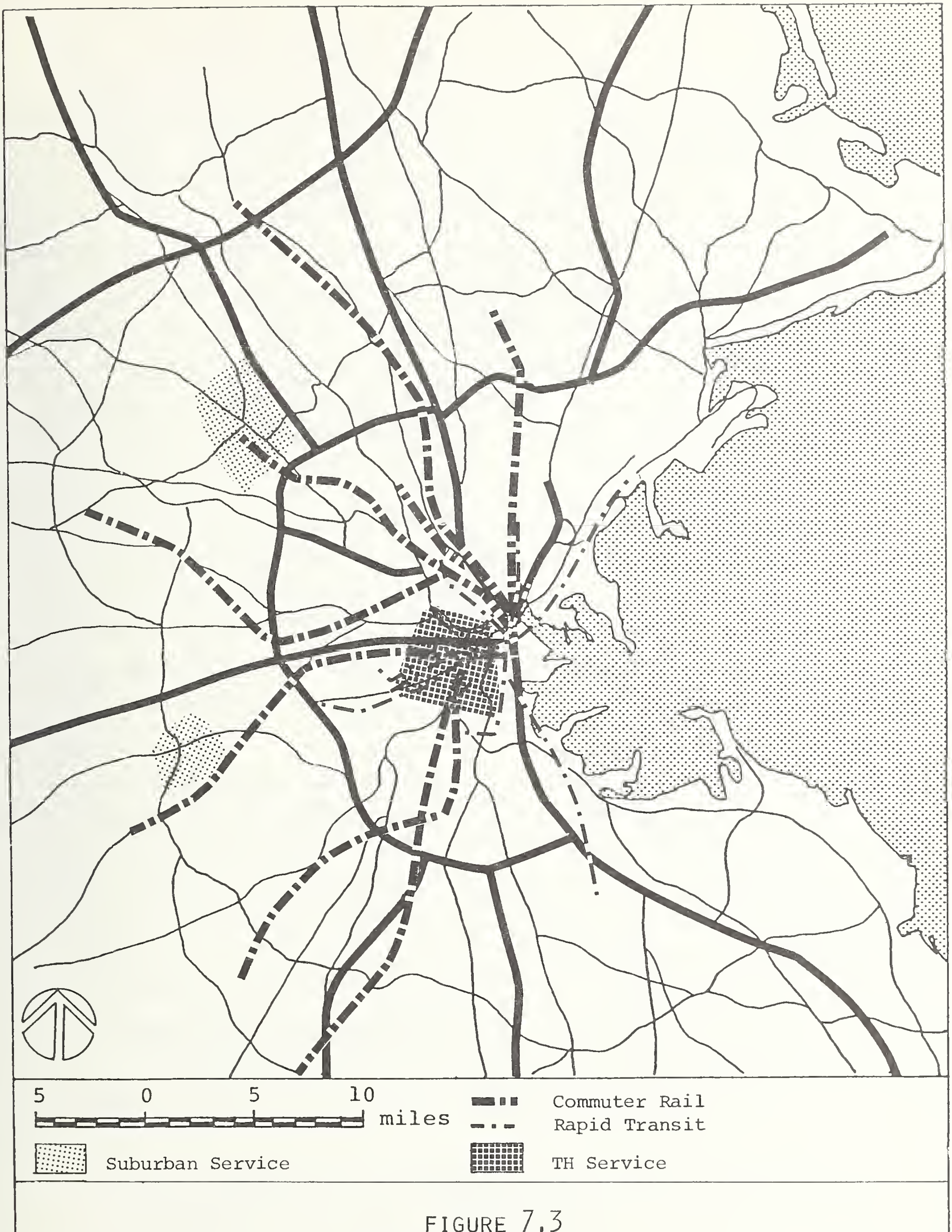

FIGURE 7.3

1980 IP SCENARIO A

"METROPOLIS"

doorstep many-to-many service. Afternoon service consists of a point deviation service in which vehicles always stop at several major travel generators and provide doorstep service in between these points. This service is offered six days a week at a fare of 50¢ for the general public and 25¢ for the elderly and handicapped.

The cost of these two services is much lower than that of the other transit authority services because of the use of smaller vehicles and (private) non-union employees. Operating cost per vehicle-hour amounts to approximately $13.50 as compared to the average transit authority costs of nearly $30 per hour.

7.2.2 IP Scenario B

The second scenario for "Metropolis" is an expansion of Scenario A. In this setting, additional emphasis is placed on serving the work trip by providing feeder service to and from a number of rapid rail and commuter stations. In addition, circulation service during the midday is provided in two of the new areas receiving feeder services. The locations of these new services are presented in Figure 7.4.

The new service area to the north receives both feeder service to its commuter rail station during the peak and doorstep many-to-many dynamic dispatch paratransit service during off-peak hours. A fare of 25¢ is paid for the feeder service, while many-to many passengers are charged 50¢. Elderly and handicapped persons receive a 50% discount on fares. This service is contracted out to a private transportation company by the transit authority. Six small buses are used throughout the day, with total cost (including capital) per vehicle hour amounting to approximately $12.50 per hour. Service is provided 12-1/2 hours per day, five days per week.

The southwestern service area receives only feeder service to three of its commuter rail stations. A private contractor operates the service, using seven small buses. The fare structure is similar to that described in the previous service area. The lack of a midday service results in somewhat higher total costs

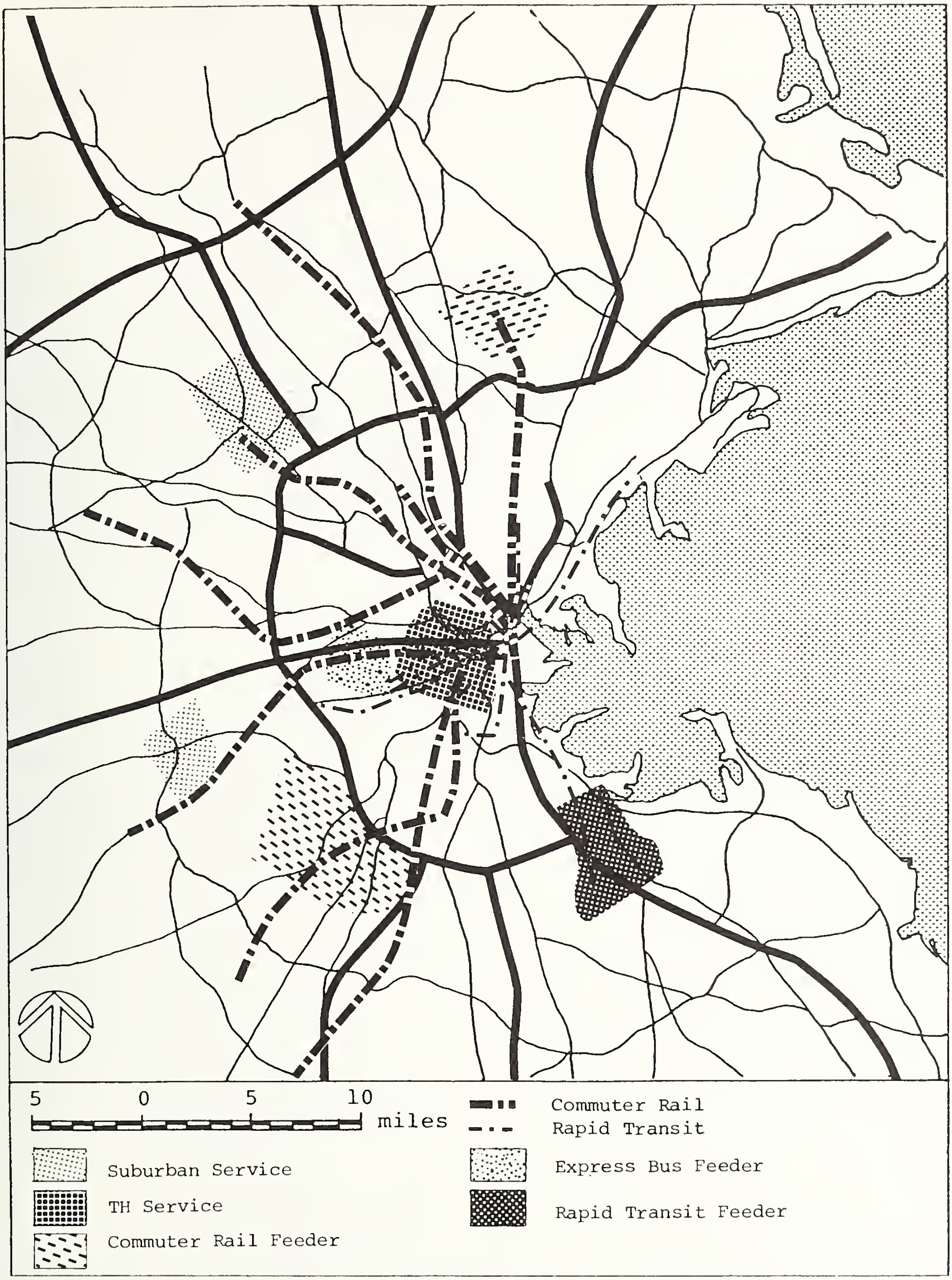

FIGURE 7.4
1980 IP SCENARIO B
"METROPOLIS"

per vehicle-hour. The cost to the transit authority for this service is around $15 per vehicle-hour.

In the southeastern zone, feeder service is provided to the newly opened stations on a rapid rail line extension. Intra-area many-to-many service is also provided. Because facilities (i.e., the transfer station) which are also served by union bus drivers are used, and because of the extent of conventional transit already in this area, non-union contract service was deemed infeasible. Thus, this service is provided directly by the Transit Authority. Twenty-eight vans are used to provide both services at an average operating cost of $25.50 per vehicle-hour. Capital cost of vehicles adds another $3 per vehicle-hour to the total cost of the service. The structure of services and fares is comparable to that in the northeast service area.

In the service area located in the inner suburbs, a private taxi company has been contracted to provide feeder service during the peak periods to a local, very heavily utilized express bus route. The taxi company is responsible for owning and operating the vehicles and charges the transit authority $10 per vehicle-hour and returns all revenue from the 25¢ fare to the transit authority. During the six hours of service per day, the taxi company uses an average of fourteen vehicles. These vehicles are mostly vans (10-passenger), but some regular taxis are used. During other hours, the taxi company uses these vans as part of its normal fleet. The fare to or from the transfer point is 25¢.

The characteristics of the two scenarios are displayed in Table 7.2.

7.2.3 Benefit-Cost Analysis: 1980 IP Scenarios

Detailed breakdowns of the benefits and costs of IP Scenarios A and B can be found in Tables A.7.1 and A.7.2, respectively. The results are summarized and compared in Table 7.3.

First, note that despite the fact that "Metropolis" is significantly larger than "Large City," all impacts are predicted

Table 7.2

Characteristics of 1980 IP Scenarios for "Metropolis"

Scenario	Module	Eligible Population (Paratransit Service Only)	Area (sq. mi.)	Population Density*	Service Type	Operating Entity	Paratransit Vehicles	Paratransit Fare
A	1	10,566	22	9,000	E&H doorstep many-to-many	Private Bus Co.	29	83¢ Avg.
	2	12,600	14	900	Doorstep many-to-many & jitney shuttle	Private Bus Co.	7	50¢/30¢
	3	31,200	16	1,950	Doorstep many-to-many & point deviation	Private Bus Co.	4	50¢
B	1	10,566	22	9,000	E&H doorstep many-to-many	Private Bus Co.	29	83¢ Avg.
	2	12,600	14	900	Doorstep many-to-many & jitney shuttle	Private Bus Co.	7	50¢/30¢
	3	31,200	16	1,950	Doorstep many-to-many & point deviation	Private Bus Co.	4	50¢
	4	32,000	5.0	6,400	Many-to-one feeder	Taxi Co.	14	25¢
	5	28,000	7.5	3,733	Many-to-one feeder & doorstep many-to-many	Transit Authority	24	25¢/50¢
	7	25,000	7.5	3,333	Many-to-one feeder & doorstep many-to-many	Private Bus Co.	7	25¢/50¢
	8	38,500	11	3,500	Many-to-one feeder	Private Bus Co.	7	25¢

Table 7.3

Selected Annual Impacts: Setting # 7: "Metropolis"

1980 IP Scenarios A and B

Impact/Measure	IP Scenario A	IP Scenario B
Change in Consumer Surplus	+ 185,000	+ 660,000
New Transit Trips/% Increase	+234,000/+0.2%	+808,000/+0.7%
Induced Trips	+ 84,000	+ 112,000
VMT/% Change	+538,000/+0.007%	+755,000/+0.015%
Fuel Consumption	+ 87,900	+ 165,000
Employment: Jobs/Payroll	+47/+$533,000	+119/+$1,675,000
Auto Expenditures	- 173,100	- $ 319,000
Transit Operating Cost	+$692,000	+$2,429,000
Net Transit Operating Cost	+$526,000	+$2,044,000
Net Transit Total Cost	+$753,000	+$2,514,000
Net Operating Cost, Net Total Costs per New Transit Trip	$2.25/$3.22	$2.53/$3.11
Net Total Cost per Induced Trip	$8.96	$22.45
Taxi Industry Revenue/% Change	-$50,000/-0.05%	-$100,000/-0.1%
Taxi Industry Profit/% Change	-$9,000/-0.2%	-$17,900/-0.4%
Parking Spaces Required	-62.5	-375

to be considerably smaller in "Metropolis." This is a direct result of the differences in IP implementation "philosophies" in the two settings. In "Large City," paratransit was implemented throughout the area to improve overall mobility, with particular emphasis on the elderly and handicapped. In "Metropolis," paratransit is viewed as a method of serving low-density suburban areas and of increasing commuter ridership. The TH are also a target market, but service is only offered to them in a dense area with very high concentrations of elderly and handicapped persons. "Metropolis" has an extensive fixed route transit network, and paratransit service is provided in only a small portion of the area.

Part of this implementation strategy could involve an incremental expansion of the service. Scenario A and Scenario B may be thought of as representing this approach, with other expansions possible in later years. Thus, Scenario B logically has more extensive impacts than Scenario A. On a cost per (new) transit passenger basis, Scenario B is less expensive. This is because the low productivity TH service represents a major proportion of Scenario A. Interestingly, for the <u>same</u> reason, Scenario A has a lower cost per induced trip. That is, the TH system is projected to serve a considerable amount of latent demand, while the suburban services are projected to divert persons mainly from the automobile.

Note that these scenarios differ from all others considered, not only in that feeder service is provided to rail lines, but also in that some service is provided by private bus as well as taxi operators. The result of this is that the paratransit operating costs are substantially below those of the base system.

The most effective service, in terms of lowest net cost per transit rider, is the shared-ride taxi feeder to express bus service in the inner suburban area, which is provided at a net cost of $1.18 per passenger. (Key results for individual services are provided in Table 7.4.) This service is projected to attract 127,800 trips annually, of which 25,000 would not previously have been made by express bus. (The latter figure represents a 4% increase in express bus patronage.) A more effective service is that provided by a bus operator in the northeast service area. Despite a cost per hour more than 25% higher than that of the taxi service, this bus service has a net cost of only $1.05 per passenger (capital cost included). The reasons for this are: (1) the "bus" service operates over a longer day; (1) the bus service is able to attract a greater share of all trips because there is no fixed-route service at all available in the area, unlike the case in the taxi zone; and (3) the bus service is able to attain higher productivities because a train must be met only every 40 minutes, while the taxi (which meets every *third* bus) must cycle on 15-minute headways.

It is probably not at all surprising that the most expensive service, aside from the TH service, is the one operated directly by the Transit Authority. Despite the fact that this service attracts the highest ridership and attains the highest productivity, the net cost per passenger is $3.56. The TH service, which operates at extremely low productivities, averages $4.67 per passenger in net cost.

Overall, Scenario A results in an annual deficit of $753,000, while Scenario B results in a deficit of $2,514,000. In neither case is it apparent that the positive impacts outweigh the deficit. This is true despite the relatively low hourly operating costs for most of the services. The apparent reason for this is that most of the services are provided in low-density suburban areas with high auto ownership, and thus cannot generate high ridership. The three exceptions to this are the inner-city TH service, the inner-suburban taxi feeder service, and the inner-suburban rapid transit feeder service. However, the former two serve restricted markets, while the latter is operated by the (high cost) transit authority and competes with fixed route service. Thus, even these services cannot be expected to generate a significant amount of trips and/or to have a low cost per trip.

The fact that these scenarios do not appear effective even under the condition of private operation suggests that publicly operated IP service in large metropolitan areas will be extremely

Table 7.4

Setting #7: Metropolis - Key Impacts on a Service Area Basis

Service Area and Type		Annual Ridership	Annual Total Cost	Annual Revenue[1]	Net Cost Per Passenger
1	Local circulation	62,900	$ 119,900	$ 21,400	$1.57
2	Local circulation	49,000	106,300	19,700	1.77
3	TH	153,000	842,200	127,000	4.67
4	Rail feeder	73,900	196,500	18,100	1.05
4	Local circulation	67,700		29,900	
5	Transit feeder	286,900	1,342,900	70,500	3.56
5	Local circulation	62,800		27,700	
6	Rail feeder	83,600	100,000	20,500	.95
7	Express bus feeder	127,800	182,000	31,400	1.18

[1] This excludes revenue generated by induced line haul demand. That revenue is included in the systemwide totals appearing in Table 7.3.

expensive.[1] While transit authorities may view paratransit service as an effective way of providing equitable service to suburban areas which may be requesting service, it is likely that such services would prove to be very expensive, unless they are operated by a private operator.

7.3 Alternatives to IP

7.3.1 Extended Fixed-Route Bus Alternative

The extended fixed-route bus alternative includes additional coverage in many of the service areas in IP Scenario B. In addition, a number of lift-equipped conventional buses have been added to the fleet such that all routes traveling through the TH service area of the IP scenarios are accessible to the handicapped. The regions receiving new services in this scenario are illustrated in Figure 7.5.

The service provided in the suburban areas by additional route mileage is partially oriented towards feeder trips to the line-haul transit stations in these areas. The resulting routes increase coverage such that no point in any area is more than 1/2 mile from a bus route. The standard suburban fare of 30¢ is charged in these areas. All additional suburban fixed route service is provided using union labor. A total of 41 additional vehicles are required to provide these services.

The addition of lift-equipped vehicles on routes travelling through the TH service area is performed without eliminating the special paratransit service which was offered in the base case. Delays resulting from loading and unloading of handicapped passengers is not sufficient to have an impact on overall level of service provided on fixed routes in the area; as a result, the non-handicapped users do not note any degregation of service. The conversion of existing vehicles and acquisition of new lift-equipped vehicles for

[1] Indeed, the paratransit services offered by AC Transit in the San Francisco/Oakland metropolitan area cost over $5 per passenger, as discussed in Volume 4 of this series of reports.

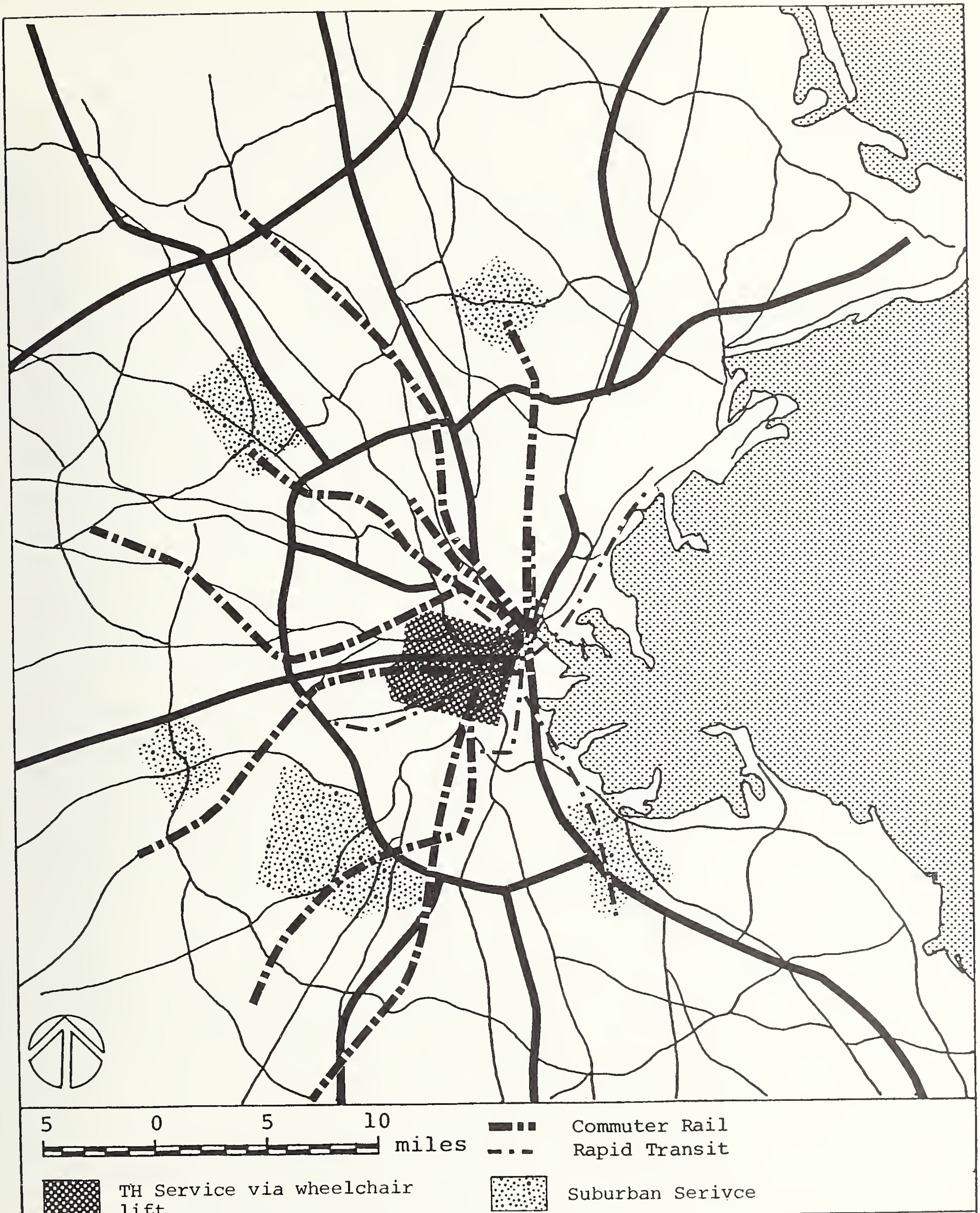

FIGURE 7.5
EXTENDED FIXED ROUTE BUS ALTERNATIVE
"METROPOLIS"

the routes which serve this area involves over 100 of the 1100 vehicles in the conventional bus fleet. The only expected increase in operating cost resulting from the use of lift-equipped vehicles is a $2,000 per year per vehicle cost associated with lift maintenance.

7.3.2 Extended Exclusive-Ride Taxi Alternative

In this scenario, the Regional Transit Authority provides a user-side subsidy for feeder service to major rapid rail, commuter rail, and express bus stations in four communities (See Figure 7.6). The user-side subsidy allows any individual to travel between their home and the station for only 25¢. Elderly and handicapped patrons may travel for half fare. Users must purchase scrip, or coupons, at the transit stations to which this service is directed. The taxi companies turn the coupons in to the RTA to collect the full metered fare for each trip, as recorded by the drivers.

Service in each zone is provided by the same fleet of vehicles used for regular taxi service in the local communities. No priority is given to those receiving the subsidy. In order to maintain their quality of service, the taxi companies in each area are allowed to expand their fleets as necessary. As a result, no change in service is noted by other patrons of the taxi service.

7.3.3 Benefit-Cost Analysis of Alternatives to IP

Detailed breakdowns of the benefits and costs of the extended fixed route and extended taxi alternatives can be found in Tables A.7.3 and A.7.4 respectively. The results are summarized and compared with IP Scenario B in Table 7.5.

On an overall basis, the extended taxi alternative is the least expensive and the IP alternative the most. On a cost per passenger basis, however, the IP alternative dominates. Because all of the suburban fixed route services are operated by the transit authority rather than private operators, the expanded fixed route alternative costs more per passenger than the lower productivity IP alternative. The IP option generated significantly more new

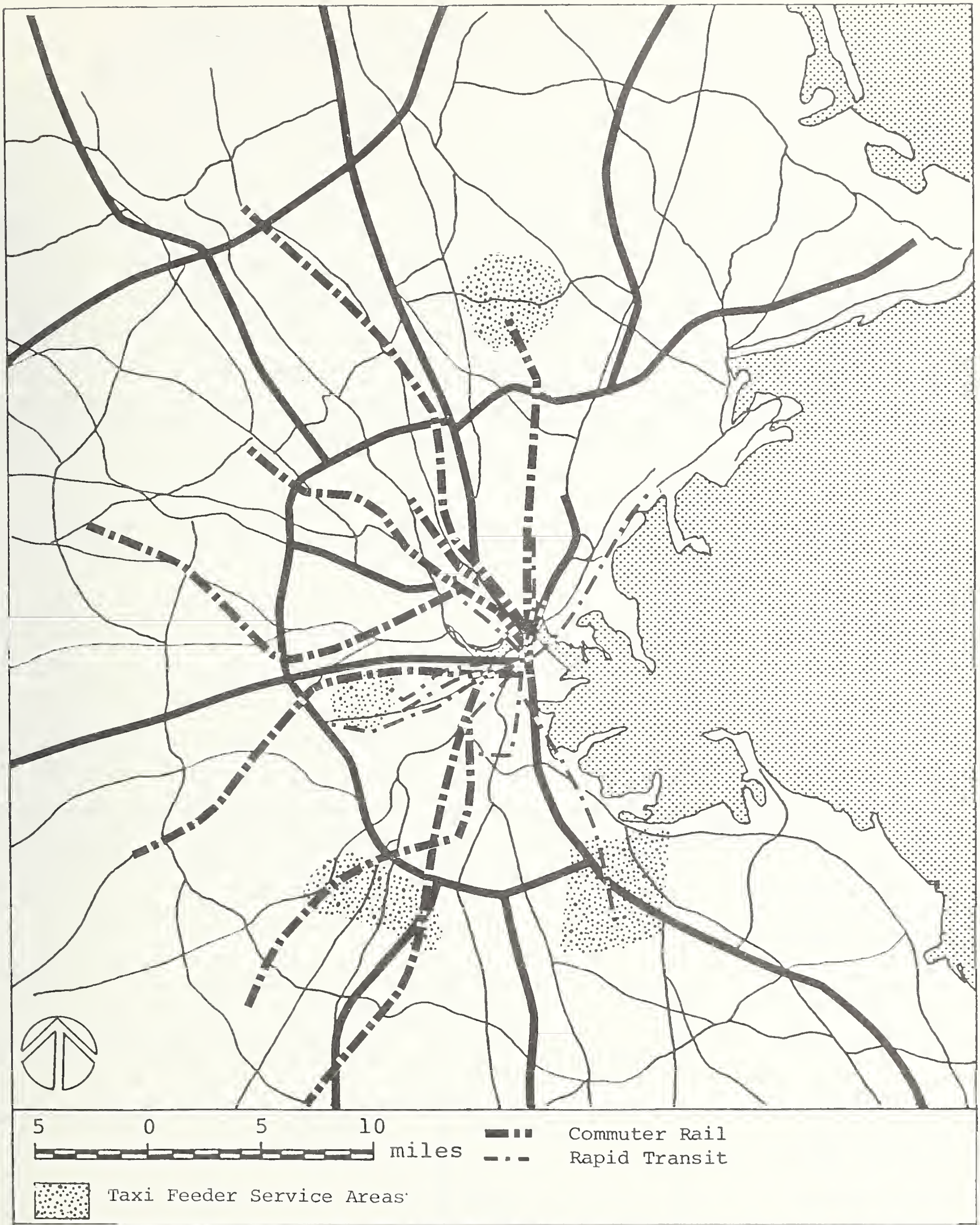

FIGURE 7.6
EXTENDED EXCLUSIVE-RIDE TAXI ALTERNATIVES
"METROPOLIS"

Table 7.5

Selected Annual Impacts: Setting #7, "Metropolis"

1980 IP Scenario B, Extended Fixed Route, Extended Taxi

Impact/Measure	IP Scenario B	Extended Fixed Route	Extended Taxi
Change in Consumer Surplus	+660,000	+383,000	+373,000
New Transit Trips/ % increase	+808,000/+0.7%	+416,000/+0.4%	NA
Induced Trips	+112,000	+25,000	+22,000
VMT/% change	+755,000/+0.015%	+191,000/+0.004%	+1,644,000/0.02%
Fuel Consumption (gallons)	+165,000	+56,700	+171,300
Employment: Jobs/ Payroll	+119/+$1,675,000	+42/+$840,000	+75/+$644,000
Auto Expenditures	-$319,000	-$523,000	-$46,000
Transit Operating Cost	+$2,165,000	+$1,450,000	NC
Net Transit Operating Cost	+$1,780,000	+$1,316,000	NC
Net Transit Total Cost	+$2,250,000	+$1,583,000	+$957,000
Net Operating Cost/ Net Total Cost per New Transit Trip	$2.20/$2.78	$3.16/$3.80	NA
Net Total Cost per Induced Trip	$20.09	$63.32	$43.50
Taxi Industry Revenue/% change	-$100,000/-0.1%	-$51,800/-0.1%	+$1,083,000/+1.2%
Taxi Industry Profit/% change	-$17,900/-0.4%	-$9,300/-0.2%	+$25,000/+0.6%
Parking Spaces Required	-375	NC	NC

NA = Not Applicable
NC = Not Calculated

transit trips than the extended fixed route option. Apparently, the population density of the service areas (all under 4,000 persons per square mile) are more suitable for IP operation. The extended fixed route alternative did, however, have a greater impact on auto ownership, since fixed route service was assumed to be available all day, while IP service in some zones was available during peak hours only. Note that the taxi alternative focussed on peak hour trips, and thus had almost a comparable change in consumer surplus as the extended fixed route alternative, although it has significantly smaller impact an auto ownership.

The only comparison considered in this setting that has not been explicitly considered in previous settings is that between paratransit service for the TH and fixed route service using accessible buses. The former alternative, (actually an expansion of a small scale paratransit system), considered in IP Scenarios A and B, resulted in 140,000 annual transit trips by the TH, at an annual total cost of $842,000 (capital plus operating), or $6.01 per trip. The fixed route alternative is projected to result in 44,000 trips, at a cost of $397,000, or $9.02 per trip. Thus, while the fixed route option is less expensive, it results in significantly lower ridership and a higher cost per new transit trip.

7.4 Year 2000 Analysis

7.4.1 Year 2000: Base Case Transit System

The base case transit system for "Metropolis" is very similar to that which existed in 1980. Three major differences have occurred in that 1) the special elderly and handicapped service provided in the central city and neighboring communities has been eliminated, 2) transportation for the handicapped is now provided solely by the conventional fixed route fleet which is totally accessible, and 3) an increased commitment has been made in the commuter rail service in terms of increased frequency. The net impact of these changes has been an increase in operating costs of approximately 5% and a smaller increase in ridership. Coverage by the coventional fixed-route bus system has decreased by 3% as a result of increased growth in the suburban ring, without additional service provided to these areas.

7.4.2 Year 2000: IP Scenario

The year 2000 IP scenario primarily addresses the service needs of the external suburban regions lying along the commuter rail lines. Three communities were chosen to receive service which feeds the rail linehaul service during the peak and provides circulation service within the communities during off peak periods. In addition one inner suburban community receives just feeder service to express bus service destined for the CBD. These four regions are illustrated in Figure 7.7. The fare structure for all feeder services is 25¢ each way, with 50¢ being charged for local circulation service.

The service described above is operated by a private transportation company so that costs could be kept reasonably low. All services are provided using small buses owned by the transit authority. A total of 31 vehicles are used including spares. Table 7.5 presents the characteristics of the base auto ownership and reduced auto ownershop scenarios.

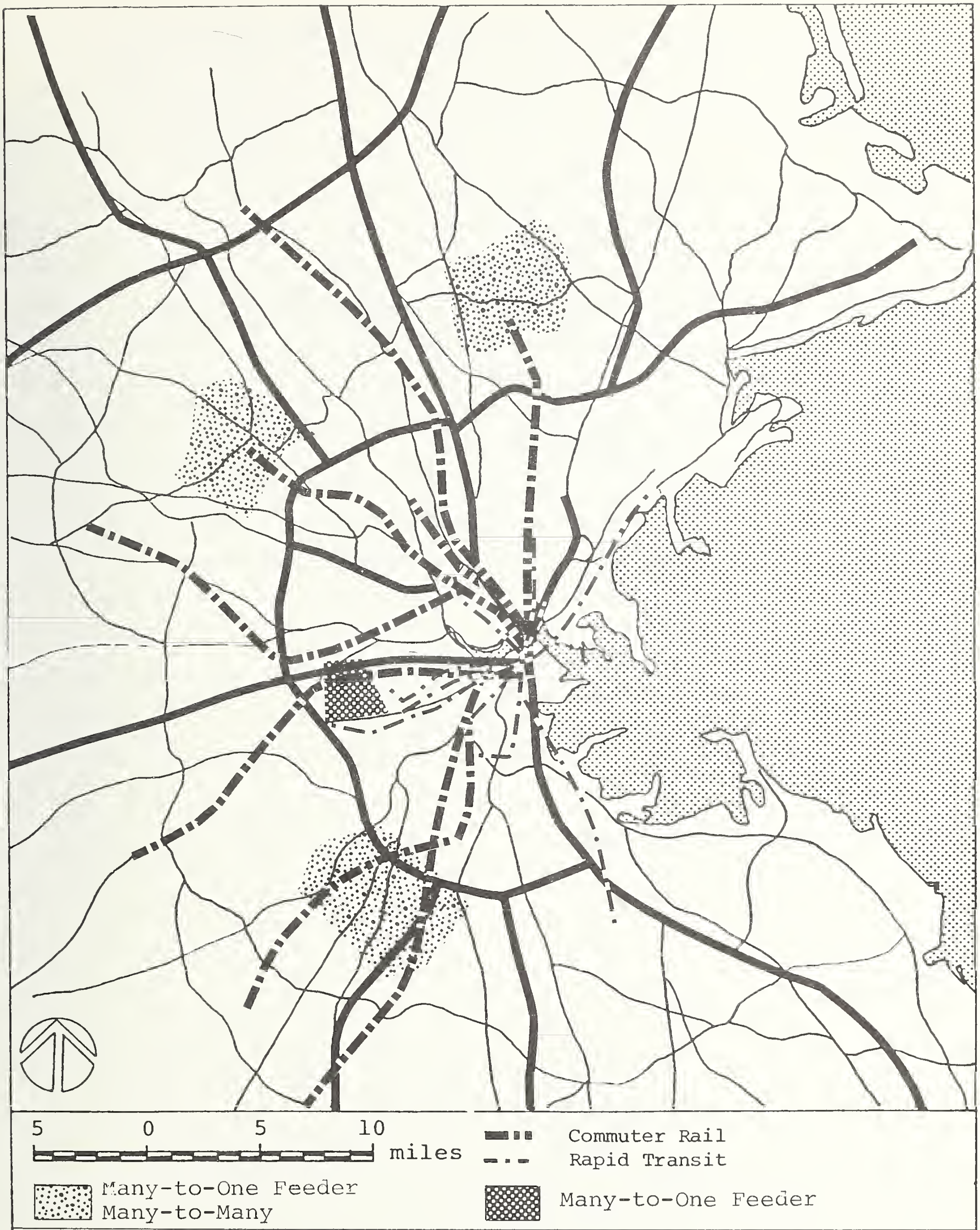

FIGURE 7.7
2000 IP SCENARIO A
"METROPOLIS"

Table 7.6

Characteristics of Year 2000 IP Scenarios for "Metropolis"

Scenario	Module	Eligible Population (Paratransit Service only)	Area, (sq. mi.)	Population Density	Service Type	Operating Entity	Para-transit Vehicles	Para-transit Fare	Urban Area Auto Ownership	A-1	A-2
A-1	1-3	100,000	22.5	4,444	Many-to-One Feeder + Many-to Many	Private Transport. Company	14	25¢ feeder 50¢ circulation	0-Auto 1 2+ Avg/HH	14 60 26 1.12	21 55 24 1.03
	4	35,000	5.0	7,000	Many-to-One Feeder		14	25¢ feeder			
A-2	1-3	100,000	22.5	4,444	Many-to-One Feeder + Many-to Many	Private Transport. Company	17	25¢ feeder 50¢ circulation			
	4	35,000	5.0	7,000	Many-to-One Feeder		14	25¢ feeder			

7.4.3 Benefit-Cost Analysis of Year 2000 IP Scenarios

Breakdowns of the benefits and costs of the year 2000 IP scenarios for "Metropolis" can be found in Tables A.7.5 and A.7.6. The results are summarized in Table 7.7.

New transit ridership in the year 2000 operated by IP is projected to be between the levels predicted for 1980 IP Scenario A and 1980 IP Scenario B; this is consistent with the intermediate level of coverage being offered. In the 2000 case, however, the positive impacts, such as change in auto expenditures and change in consumer surplus, along with a decrease in VMT may actually be considered on a local level to have offset the deficit. The reason for this change from the 1980 scenarios can probably be traced to the differences in density of the areas served. By the year 2000, the population density for the inner suburb served is projected at 7000 persons per square mile, while the average density of the other service areas is 4444. Apparently, the IP service can be provided more effectively at these levels. Another very important factor is the elimination of the high cost of TH and transit authority services by the year 2000.

Table 7.7

Selected Annual Impacts: Setting # 7: "Metropolis"

2000 IP Scenarios A-1 and A-2

Impact/Measure	Scenario A-1	Scenario A-2
Change in Consumer Surplus	+490,500	+672,300
New Transit Trips/% Increase	289,400/+0.2%	361,800/+0.3%
Induced Trips	10,600	13,200
VMT/% Change	-1,269,000/-0.01%	-969,000/-0.007%
Fuel Consumption (gallons)	-10,500	+16,800
Employment: Jobs/Payroll	+40/+$706,200	+49/+$866,000
Auto Expenditures	-$462,800	-$288,800
Transit Operating Cost	+$584,000	+$725,000
Net Transit Operating Cost	+$432,000	+$519,000
Net Transit Total Cost	+$576,000	+$679,000
Net Operating Cost/New Total Cost per New Transit Trip	$1.49/$1.99	$1.43/$1.88
Net Total Cost per Induced Trip	$54.34	$51.44
Taxi Industry Revenue/% Change	-$35,200/-0.03%	-$55,500/-0.05%
Taxi Industry Profit/% Change	-$6,300/-0.1%	-$9,900/-0.2%
Parking Spaces Required	-35	-44

Chapter 8
Conclusions

The "Benefit-Cost Analysis of Integrated Paratransit Systems" systematically estimates the benefits and costs associated with different IP options in different settings and compares these results with those of other transportation alternatives. Based on the results of the various components of analysis in this study, a variety of conclusions about IP service can be reached.[1] The conclusions suggest that in some circumstances integrated paratransit may be an effective strategy for improving overall mobility. These conclusions are presented as answers to the following fourteen questions about IP service and its alternatives.

1. <u>Can Break-Even Operation Be Achieved in an IP System?</u>

The answer to this question in most cases is <u>no</u>. In certain circumstances, the replacement of fixed route service with paratransit in one area may actually reduce costs (e.g., "Sun City"). Furthermore, some paratransit services (e.g., vanpool) can be initiated with no public deficit, while high fare, privately operated services, such as shared-ride taxi, may still achieve break even. In general, however, one must expect that IP systems with fares closer to transit than exclusive-ride taxi fares will result in a net increase in transit deficit.

2. <u>Can the Deficit of an IP System be Justified by the Positive Impacts Generated?</u>

The answer to this question, in some instances, is <u>yes</u>. In a number of the settings considered, the net positive impacts of IP, such as the reduction in auto expenditures, the increase in consumer surplus, and the increase in employment, appeared to be able

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[1] The reader is cautioned to recognize that the answers provided are based on a limited set of analyses. Although the study has attempted to consider as wide a range of service and setting types as possible, clearly not all possible permutations have been tried. As a result, some conclusions may not prove true in all cases.

to offset the deficit.[1] In these cases the total net cost per marginal transit passenger was relatively low (under $.80) and, correspondingly, the revenue-to-cost ratio relatively high. This was the result of either, or both, of two factors: (1) relatively high productivities and (2) relatively low hourly operating costs of under $11.00 per vehicle hour.

High productivities can be achieved in one, or both, of two ways. First, "hybrid" services, such as checkpoint or route deviation, yield higher productivities than doorstep services. Second, vehicle density significantly impacts achievable productivity for most paratransit service; vehicle densities of more than one vehicle per square mile would help achieve high productivities.

Relatively low operating costs can be achieved in those urban areas with low prevailing wage rates and in all urban areas through contracts with the private sector. It should be noted that the costs of both public and privately operated transit services have been increasing rapidly in recent years. If the private sector continues to become involved in contract services for the public sector, there is a chance that pressures will be brought to bear by labor to begin to close the gap between private and public wage levels. Thus, it may become increasingly difficult to keep operating cost levels below $11.00 per hour.

3. Which IP Configurations Appear to Be Particularly Promising?

The results suggest that hybrid services, which combine the characteristics of fixed route and paratransit and thus have relatively high capacities, are among the most promising. Check-point many-to-many service, in which pick-ups and drop-offs are made on demand only at designated checkpoints scattered throughout the service area, appeared to offer higher service levels and productivities (and therefore generate greater demand) than a comparable

[1] In these cases, there appeared to be no significant negative impacts of IP, other than cost, except, in some cases, a reduction in taxi industry revenue and profit. That negative impact could be alleviated or reversed through contracting with private operators for IP service. See the answer to question 11 for further discussion of taxi industry impacts.

doorstep service. This concept should now be demonstrated to determine whether, in fact, passengers are willing to walk short distances to a checkpoint. The results of the "Southern Belle" analysis suggest that one good location to demonstrate checkpoint many-to-many service would be a relatively dense (3500-5000 persons per square mile) inner suburban area with minimal existing transit service and a number of dispersed activity centers. Route deviation service seemed to be potentially more cost-effective than tightly spaced parallel fixed routes in areas with moderate population densities (4000-5000 per square mile). Doorstep many-to-many service may have greater impacts than demonstrations to date would suggest, if high vehicle densities (over 1.5 vehicles per square mile) and greater reliability (perhaps through computer dispatching) can be achieved.

Ride sharing services such as vanpools received less consideration in the analysis, partly because they do not represent public service in the same sense as demand-responsive modes, and partly because of the lack of equivalently tested demand projection techniques. The analysis that was performed suggested that vanpools have potential for attracting a significant portion (10 percent or more) of work trips to major employment sectors. Vanpools serving a single large employer, in which the employer is active in vanpool administration and promotion, appear to offer the greatest potential for attracting large market shares.

4. What Market Groups are Served by IP?

Persons from zero-car households and the elderly clearly are among the primary market groups served by IP. The type of service does not influence the extent to which non-elderly persons from zero-car households use IP. In all cases, persons from zero-car households were overrepresented in ridership (i.e., were a higher percent of riders than population). For example, in "Mid-American City," where zero-car households represent only 14.3 percent of service area households, and all persons from zero-car households represent only 11 percent of the total persons, this latter group accounted for 30 percent of all new transit trips in Scenario D.

Persons from zero-car households are even more overrepresented in the consumer surplus benefit since many persons in this group depend on transit to get to work. For example, in "Mid-American City" (Scenario D), persons from zero-car households receive 39 percent of the overall consumer surplus benefit.

The elderly are overrepresented in ridership figures, although, because of reduced overall tripmaking, not always to the same extent as persons from zero-car households. In "Mid-American City" (Scenario D) for example, the elderly comprised 28 percent of total new transit ridership and only 9 percent of the popluation. This overrepresentation increases dramatically in instances where service is provided free of charge. In "Mill Town," the elderly comprised 62 percent of total ridership in Scenario A and only 16 percent of the population. Because of mobility problems, the elderly are also particularly overrepresented in the induced trip category; in "Mid-American City" (Scenario D) the elderly represented 42 percent of all formerly latent demand.

Since the elderly are overrepresented in ridership, they are generally overrepresented in the consumer surplus benefit. However, since only a small percentage (20 percent on the average) of elderly persons work and the majority of consumer surplus benefit is accululated on work trips, they are not overrepresented to the same extent as persons from zero-car households.

Service type will influence benefit to the elderly. This was shown in "Southern Belle," where the change in consumer surplus for the elderly was greater in the doorstep service scenario than in the checkpoint service scenario, despite higher overall ridership in the latter. Unfortunately, the hypothesis that elderly persons are much more reluctant to transfer, introduced in Volume 2 and supported by some empirical data, could not be substantiated because of a lack of sensitivity to this component of travel time on the part of the model system used.

Persons from households owning two or more automobiles were underrepresented in all ridership projections. Bear in mind, however, that these persons receive <u>all</u> of the savings in automobile expenditures.

The transportation handicapped (TH) were projected to make only limited use of the IP services. Ridership by the TH was considerably higher in situations with a separate, areawide service for the TH, particularly in cases of unconstrained vehicle fleet size. For example, in one such case ("Mid-American City"), the TH comprised almost 17 percent of total new transit ridership in a system with a $1.25 fare for the general public and no fare for the TH. Even in that case, however, the net operating cost per TH passenger was $2.62 compared to a net operating cost per induced general public passenger of $.94, even though the former was privately operated and the latter was publicly operated. Thus, a separate service for the TH can prove to be extremely expensive on a per passenger basis. Note that a separate service for the elderly and handicapped in "Large City" was found to be much more expensive on a per passenger basis than a general public service. Other than these analyses, the issue of special services for the elderly and handicapped versus accessible general public services was not addressed in this study. That issue, and the related issue of the role of human service agencies vis a vis IP, introduce many questions beyond the scope of this study.

Youth represent another group often cited as receiving major benefit from paratransit service. Youth (typically defined as persons below driving age) comprise a very small component of paratransit ridership in some cases, and a very large component (up to 50) in others. The level depends on a variety of factors, including fare, the availability of service to school, and the availability of alternative school services. Because of a lack of an adequate data base, youth could not be separated out in the analysis framework used (see Volume 6, Appendix 1). As such, no new definitive statements can be made about the youth market; this is area for future research.

Finally, it should be pointed out that it need not be only "special" markets which benefit from IP. For example, in "Southern Belle," where checkpoint service is provided in fairly dense inner suburban areas and vanpool service is offered to one major employer, work trips constitute a significant portion (60 percent) of all IP trips. Thus, workers, including those from 1-, 2-, and 3-car owning households, receive a substantial portion of the benefit from IP services.

5. Are There Certain Population Densities at Which IP is More Advantageous Than Fixed Route, or Vice Versa?

Although the differences between scenarios reflected differences in service type and scale as well as setting size, some patterns relating service type to population density seemed to emerge. At population densities below 3000 persons per sq mi (e.g., 1500 persons per sq mi in "Mill Town") no transit service appeared to make sense from a financial standpoint. At a population density range of 3000-5000 persons per sq mi ("Southern Belle" and "Sun City") IP service appeared feasible and more cost-effective than fixed route. At population densities of 5000-6000 persons per sq mi ("College Town") there are trade-offs between fixed route and IP service, and neither option seemed to dominate. At population deisnties above 6000 persons per sq mi ("Large City" and "Sun City" year 2000), fixed route service became more cost-effective than paratransit service. These results tend to confirm the conventional wisdom about the population densities at which paratransit service is most cost-effective. This analysis, however, represents one of the first attempts to systematically identify the actual numerical ranges. It should be noted that population density on its own is not the sole determinant of system type. The location of major activity centers, the existence travel corridors and the demographic characteristics of the population are also key factors in determining what type of system is most advantageous.

6. How Do Different "Implementation Strategies" Determine the Impacts of IP?

A variety of IP "implementation strategies" were considered in the analysis. The results suggest that the implementation of service in areas previously unserved by transit tends to maximize the change in mobility and consumer surplus. If the density in a new service area is high enough, as it was in "Southern Belle," an IP system might prove to be extremely "cost-effective." Furthermore, the lack of any existing service might make the implementation of the service very easy since there are not likely to be vested interests in maintaining the status quo transportation system and since the local residents are likely to desire service. It is unclear, however, how many areas remain in the country with sufficiently high densities that are unserved by public transportation.

A second strategy involves the replacement of ineffective fixed route service with paratransit. This approach utilized in "Sun City," may result in only small net cost increases if the paratransit system offers better service than the fixed route system. However, the elimination of existing services may be extremely difficult. Transit labor may object if they view the change as a possible threat to jobs; this is a particular problem if a private operator is to be involved in the service. In addition, residents of the area who were able to use the fixed route service may protest if they perceive the new system as decreasing their service levels. As will be seen in Volume 4, protests such as these were instrumental in stopping IP service in Santa Clara County, and in reinstating fixed route service in Rochester, N.Y.

A third strategy, which involved the augmentation of fixed route service with overlay paratransit service (utilized in both "College Town" and "Large City"), tends to maximize coverage, level of service, and the reduction in automobile ownership. However, this approach is likely to have relatively small impacts on mobility and change in consumer surplus. It will also generally result in the greatest diversion of fixed route passengers. While the results do suggest that many new transit trips will be generated, the cost per passenger can be very high because of "competition" between the transit modes.

Other, "opposite" implementation strategies considered were implementation of paratransit service on a very limited basis ("Sun City" and "Metropolis") and implementation of paratransit service on an areawide basis ("College Town" and "Mid-American City"). The former allows for the selection of service areas where paratransit service can be most effectively utilized. The latter allows no such distinctions and, as the scenarios for "Mid-American City" suggest, can result in very high costs per passenger.

As will be discussed in Volume 4, the areawide approach may be dictated by political concerns in some cases. If the "equitable" provision of paratransit service is an issue in a region in which the suburbs are taxed to support regional transit, some form of transit may need to be implemented in all areas. While paratransit may be more cost-effective than fixed-route service in some low density areas, it is conceivable that service will need to be provided even in areas where no service makes sense. In "offering" service to suburban areas, a regional transit authority may find that 100 percent coverage paratransit service is the simplest way of achieving, or seeming to achieve, equitable service.

While the need for an equitable distribution of service may, in some cases, make initial implementation and subsequent expansion of a pilot project difficult, there is no reason to believe that this approach cannot be followed. In terms of generating operating experience, fine tuning system design, and gaining continued community acceptance, the review of existing services strongly points to the advantages of the staged implementation approach.

A final implementation strategy worth noting is the use of paratransit service as a pilot project to serve as a generator of transit demand and to identify travel corridors which may be more effectively served by fixed routes. This strategy has been discussed in the literature but has seen little experimentation to date.[1] This approach may make most sense in growing areas, where paratransit service can be used until the population and demand densities are great enough to support fixed-route service.

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[1]Ann Arbor tried instituting fixed routes in corridors identified by their DRT service. However, since the DRT service was not eliminated and the DRT and fixed-route fares were the same, the fixed routes attracted little ridership.

7. What Are the Impacts of Different Fare Structures on IP?

A variety of IP fare structures was tested in the scenario analyses. The results of the analysis of fares ranging from \$.25 to \$1.25 suggest that paratransit service is sensitive to fare. Despite greater revenues at higher fares, increasing fares beyond a certain level (probably \$.25) may be counterproductive. Such factors as the change in consumer surplus and the change in auto expenditures are also sensitive to fare. Under some circumstances, the decrease in these benefits may more than offset the increase in revenue.

Free fares were considered in two settings ("Mill Town" and "Large City") but only for elderly and handicapped persons. In both cases, extremely high patronage by these groups was projected. In "Mill Town" (Scenario A), the elderly accounted for 62 percent of all trips; in "Large City" elderly ridership comprised 66.7 percent of the ridership.

In "College Town," a \$.25 fare and free transfer were offered between paratransit feeder service and fixed route in one scenario. A \$.50 fare for "overlay" paratransit service was offered in an-ther. The results suggest that the free transfer priviliege in other. The results suggest that the free transfer privilege in vice even when they could readily use the fixed route service alone (as they do in the second scenario). This type of fare structure could result in excessive demand on the paratransit component of an IP system, in which service quality is highly dependent upon demand levels. This is exactly what occurred in the Santa Clara County system, which had the identical fare structure as "College Town" Scenario A.

8. Can IP Service Achieve Significant Modal Shifts From Auto?

On an absolute level, the answer to this question is no. In none of the cases analyzed did IP reduce automobile usage by more than 1-2 percent. The capacities (i.e., achievable productivities) of the paratransit systems are too low to result in significant diversion from auto at any reasonable vehicle fleet size, given present population densities and automobile operating costs. On a relative level, however, IP could substantially increase total transit ridership. In some cases considered, transit ridership increased by over 70 percent with the initiation of IP service.

9. What Impact Does IP Have on VMT, Fuel Consumption, and Air Pollution?

Previous studies have suggested that paratransit has a negative impact on VMT and fuel consumption.[1] This study, which is the first to consider large scale systems and the impact on auto ownership, does not lead to the same conclusion. In most, but not all, cases, IP was projected to decrease VMT and fuel consumption. However, in no case was the impact more than 0.7 percent of the area's VMT and fuel consumption. Emissions of carbon monoxide (CO), hydrocarbons (HC), and nitrogen oxides (NO_x) increased in some cases and decreased in others; again, however, the percentage changes were well under 1 percent. (Note that the fixed route alternatives generally increased VMT and fuel consumption, although by less than 1 percent, and decreased some emissions. The exclusive-ride taxi alternatives resulted in the highest increase of all three categories.) Thus, for all practical purposes, one must conclude that IP will have no noticeable effect on VMT, fuel consumption, and air pollution.

10. Can Paratransit/Transit Integration Be Achieved Such that Paratransit Service Is Used Extensively as a Feeder Mode?

There have been questions asked about the ability of paratransit services to act as a feeder to line haul. The data suggested that, depending upon system design, paratransit can function in a feeder mode to an extent greater than that experienced in most systems to date. The key factors in determining the extent of feeder service are the service configuration and the extent of transfer coordination. For example, in "College Town," over 60 percent of the paratransit passengers were feeder/distributor

[1] See, for example, Hensley (1976) and Congressional Budget Office (1977).

passengers in the cycled many-to-one service option. Passengers had to use the feeder option in order to make all but very short trips on the paratransit service. In the "Mill Town" scenario with cycled (e.g., scheduled) many-to-one service and coordinated transfers, 32 percent of paratransit passengers transferred to or from line haul service. In the many-to-many scenario, without coordinated transfers (which served many fewer passengers in total), only 11 percent of the passengers were feeder passengers. However, a large number of transfers is not necessarily a positive achievement; as seen in "College Town," the many-to-many service, which did not require transfers, resulted in higher overall ridership. Coordinated transfers are most appropriate in large areas, where short feeder trips can tie in to much longer line haul trips.

11. Would the Introduction of IP Have a Significant Impact On the Taxi Industry?

Most of the publicly operated IP scenarios considered resulted in a decrease of taxi revenues of around 10 percent, and (because of diseconomies of scale) a decrease in profits of 30-40 percent.[1] Clearly, this is a significant impact on an industry which is only marginally viable at this time. The extent of the impact will vary from company to company within a given setting, and the overall impact will depend on the local state of the industry. For example, in "Mid-American City," where the taxi industry was very weak in the base case, the profit from the exclusive-ride taxi service was projected to decrease by over 70 percent.

One obvious way to deal with this problem is to contract with the taxi industry to operate all, or portions, of the paratransit system. The analyses suggested that this would more than offset the loss of exclusive-ride taxi revenue, in most cases, while at the same time reducing the cost of the IP service.[2] However, it

[1] Note that the impact on profit might be very different in fleets with lease drivers. It was assumed that all drivers in each setting are commission drivers.

[2] The existence of possible economies of scale resulting from the operation of both exclusive-ride taxi and IP service was not considered in the analysis.

may not always be possible to contract with a private operator. For example, a taxi operator may not be the appropriate provider of route deviation or other "hybrid" fixed route/demand-responsive systems. Also, in cases where some fixed route service is curtailed, labor provisions (e.g., Section 13(c) of the UMTAct of 1964) may make it impossible to provide paratransit service other than with unionized transit labor.[1]

If contracts with the private taxi sector are to be instituted, a number of factors must be considered. First, there is the potential that drivers will not be of the same quality or reliability as public sector labor, because of the lower prevailing wage rates and general characteristics of some individuals attracted to the taxi industry. This may be viewed as a particular problem when providing services for the elderly and handicapped. If a concerted attempt is made to hire more reliable drivers, the wage rates may be forced up. Second, in cases of integrated services, it may be more difficult to achieve coordinated transfers between fixed route and paratransit service if different groups of employees are involved.

The terms of the contracts are important to both parties. The private sector must be ensured of a return sufficient enough to make their participation worthwhile. The public sector, for its part, should be provided with the ability to receive a part of any system economies which may be achieved. Some mechanism offering incentives to operators to maximize productivity while at the same time allowing the public sector to benefit from increased productivities is required.

12. <u>Are There Low-Cost Methods of Increasing Mobility Through the Use of Exclusive Ride Taxi Service?</u>

Because of their limited productivities, exclusive-ride taxi generally cannot be provided as inexpensively as shared-ride

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[1] Other potential institutional problems exist as well. For a more complete discussion of how the institutional environment impacts the use of the taxi industry as paratransit providers, the reader is directed to: Multisystems, Inc. (1978) <u>Taxis, the Public and Paratransit: A Coordination Primer</u>. Draft Final Report prepared for the International Taxicab Association.

services. However, some low cost options may sometimes be possible. For example, in areas where there is an undersupply of taxi vehicles, the public sector may be able to encourage the taxi industry to expand service. If financing of vehicles is a problem, the public sector may wish to offer low cost loans. If the taxi industry feels that there is not enough demand to justify new vehicles, a capital subsidy may be considered to help reduce total costs and allow the industry to achieve any possible economies of scale through expansion. In some instances, however, taxi fleet expansion may not be possible in an area; in others, it may be possible but will have only marginal impacts. In any case, the net cost to the public sector for subsidizing exclusive-ride taxi service will be fairly low.

User-side subsidies for the general public represent an extremely expensive alternative. The cost can be reduced if the subsidies are targeted for just marginal trips (e.g., for expanded feeder service in one area). Nevertheless, the cost per passenger will remain higher than the costs for a comparable shared-ride service. A user-side subsidy for the elderly and handicapped, however, could prove to be significantly less expensive (on a per passenger basis) than a separate paratransit service established just for those groups.

13. <u>In What Areas Are IP Services Most Likely to Be Implemented?</u>

Urban areas with population under 500,000 may be more likely to institute large scale IP systems because of lower wage levels, less severe institutional constraints, and less extensive existing fixed-route service. However, in larger urban areas, IP may be viewed as the best way to equitably serve suburban areas. It should be noted that the decision to implement IP must be made on the local level, based on local objectives, conditions, and institutional arrangements, and an understanding of the potential range of IP impacts.

14. Will the Impacts of IP Change Considerably by the Year 2000?

The results suggest that the impacts of IP in the year 2000 will be very similar to those predicted for 1980, given present demographic projections. Even in the case where auto operating costs are projected to increase by 40 percent (in 1977 dollars) and total auto ownership decline, the overall impacts of IP are not significantly different. Continued high auto ownership, even under the reduced auto ownership scenario, and the limited capacity of paratransit service are factors which will inhibit IP from having significantly different impacts from those projected for 1980.

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Appendix A
Impact-Incidence Tables

This appendix contains the complete results of the benefit-cost analyses which were summarized in chapters 1-7 of this volume. One impact-incidence table is included here for each scenario; the tables are grouped by settings.

The description of the methodology used in generating these impacts is contained in Appendices 1 and 2 of Volume 6. Appendix 3 of Volume 6 contains a sample application of the methodology; it illustrates the derivation of the entries in the first impact-incidence matrix included in this Appendix. All estimates are in 1977 dollars.

SETTING 1: 'SOUTHERN BELLE'

TABLE A.1.1 ANNUAL IMPACTS

SETTING # 1 : 'SOUTHERN BELLE'

YEAR 1980

SCENARIO IPA : Checkpoint Many-to-Many Service

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TRANSIT TRIPS	INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	140.8	42.3	+18.0	+28.4	+46.4
Transportation Handicapped	10.2	3.1			
Persons from 0-car H.H.'s	217.6	65.3	+162.7	-12.5	+150.2
All Persons	1,531.0*	130.6	+631.0	+103.8	+734.8

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	36	59	+3.3
Transportation Handicapped	15	29	+ .6
Others	36	86	+84.8
Persons from 0-car H.H.'s	60	86	+7.5

TEMPORAL COVERAGE

SERVICE DAYS Mon - Fri.

SERVICE HOURS 6:30am - 6:30pm

VMT/FUEL/EMISSIONS

IMPACT	CHANGE (PCT. CHANGE)
Transit VMT (000 mi)	+1,542 (+170)
Taxi VMT (000 mi)	-588 (-10.8)
Auto VMT (000 mi)	-3,452 (- 1.0)
Total VMT (000 mi)	-2,498 (-0.7)
Fuel Cons. (000 gal)	-64.4 (-0.3)
CO Emissions (000 kg)	-73.4 (-0.5)
HC Emissions (000 kg)	- 7.7 (-0.4)
NO_x Emissions (000 kg)	- 4.0 (-0.4)

EMPLOYMENT Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+91	+697.0
IP Operation Private	-	-
Exclusive-Ride Taxi	-21	-128.0

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-310	(-0.8)
Operating	- 12	(-0.02)
Total	-322	(-0.4)

*Of these trips 95.0 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.1.1 ANNUAL IMPACTS

SETTING # 1 : 'SOUTHERN BELLE'

YEAR 1980

SCENARIO IP A : Checkpoint Many-to-Many Service

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	881	1,815	+934			
Revenue	440	1,095	+655			
Net Operating Cost	441	720	+279			
Annual Capital Cost	159	439	+280			
Total Net Cost	600	1,159	+559			
Total Subsidy	600	1,159	+559			
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-156.7	(-10.7)	Revenue ($000)	-40	Passengers (000)	-2.7
Revenue ($000)	-214.1	(-10.7)			Opportunity Cost Savings ($000)	+8.0
Profit ($000)	- 38.3	(-40.2)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-650
Annual Opportunity Cost Savings ($000)	+2.1
Annual Space Rental Cost ($000)	-54.0

VI. LOCAL GOVERNMENT IMPACTS / VII. FEDERAL GOVERNMENT IMPACTS

COST ($000)	VI. BEFORE	VI. AFTER	VI. CHANGE	VII. BEFORE	VII. AFTER	VII. CHANGE
Operating Subsidy	220.5	360.0	+139.5	220.5	360.0	+139.5
Capital Subsidy	31.8	87.8	+ 56.0	127.2	351.2	+224.0
Total Subsidy	252.3	447.8	+195.5	347.7	711.2	+363.5
Parking Revenue (Change Only)	-	-	- 20.0	-	-	-

TABLE A.1.2 ANNUAL IMPACTS

SETTING # 1 : 'SOUTHERN BELLE'
YEAR 1980
SCENARIO IPB : Many-to-Many Service

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TRANSIT TRIPS	INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	85.6	36.0	+12.3	+60.4	+72.7
Transportation Handicapped	20.0	6.5	--	--	--
Persons from 0-car H.H.'s	136.3	56.0	+91.0	+16.0	+107.0
All Persons	1388.3 *	81.0	+304.5	+188.7	+493.2

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	36	65	+4.1
Transportation Handicapped	15	40	+1.1
Others	36	86	+84.8
Persons from 0-car H.H.'s	60	86	+7.5

TEMPORAL COVERAGE

SERVICE DAYS Mon.-Fri.

SERVICE HOURS 6:30AM-6:30PM

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+1542	(+170)
Taxi VMT (000 mi)	-504	(-9.2)
Auto VMT (000 mi)	-3210	(-1.0)
Total VMT (000 mi)	-2172	(-0.6)
Fuel Cons. (000 gal)	-41.7	(-0.2)
CO Emissions (000 kg)	-56.6	(-0.4)
HC Emissions (000 kg)	-5.4	(-0.3)
NO_x Emissions (000 kg)	-2.9	(-0.3)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+99	+757.0
IP Operation Private	--	--
Exclusive-Ride Taxi	-18	-114.2

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-217	(-0.5)
Operating	-9	(-0.02)
Total	-226	(-0.3)

*Of these trips 80.0 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.1.2 ANNUAL IMPACTS

SETTING # 1 : 'SOUTHERN BELLE'

YEAR 1980

SCENARIO IPB : Many-to-Many Service

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	881	1,883	+1,002			
Revenue	440	1,016	+576			
Net Operating Cost	441	867	+426			
Annual Capital Cost	159	439	+280			
Total Net Cost	600	1,306	+706			
Total Subsidy	600	1,306	+706			
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-139.3	(-9.5)	Revenue ($000)	-33	Passengers (000)	-2.4
Revenue ($000)	-190.4	(-9.5)			Opportunity Cost Savings ($000)	+7.3
Profit ($000)	-34.1	(-35.8)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-605
Annual Opportunity Cost Savings ($000)	+2.1
Annual Space Rental Cost ($000)	-46.0

VI. LOCAL GOVERNMENT IMPACTS / VII. FEDERAL GOVERNMENT IMPACTS

COST ($000)	VI. BEFORE	VI. AFTER	VI. CHANGE	VII. BEFORE	VII. AFTER	VII. CHANGE
Operating Subsidy	220.5	433.5	+213.0	220.5	433.5	+213.0
Capital Subsidy	31.8	87.8	+56.0	127.2	351.2	+224.0
Total Subsidy	252.3	521.3	+269.0	347.7	784.7	+437.0
Parking Revenue (Change Only)	-	-	-17.0	-	-	

TABLE A.1.3 ANNUAL IMPACTS

SETTING # 1 : 'Southern Belle'
YEAR 1980
SCENARIO : Extended Fixed Route Bus Alternative

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TRANSIT TRIPS	INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	79.1	18.9	+1.3	+68.6	+69.9
Transportation Handicapped	10.8	2.5	--	--	--
Persons from 0-car H.H.'s	139.8	33.4	+15.8	+47.5	+63.3
All Persons	607.4 *	54.7	+39.0	+113.3	+152.3

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	36	49	+1.9
Transportation Handicapped	15	20	+.2
Others	36	74	+64.3
Persons from 0-car H.H.'s	60	78	+5.2

TEMPORAL COVERAGE

SERVICE DAYS Mon-Fri

SERVICE HOURS 6:30AM-6:30PM

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+872	(+96.0)
Taxi VMT (000 mi)	-168	(-3.1)
Auto VMT (000 mi)	-967	(-0.3)
Total VMT (000 mi)	-263	(-0.1)
Fuel Cons. (000 gal)	+71.8	(+0.4)
CO Emissions (000 kg)	-45.7	(-0.3)
HC Emissions (000 kg)	+5.6	(+0.3)
NO_x Emissions (000 kg)	+8.6	(+0.8)

EMPLOYMENT Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+63	+481.9
IP Operation Private	--	--
Exclusive-Ride Taxi	-7	-46.3

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-47.2	(-0.1)
Operating	-1.9	--
Total	-49.1	(-0.05)

*Of these trips 48.0 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.1.3 ANNUAL IMPACTS

SETTING # 1 : 'Southern Belle'

YEAR 1980

SCENARIO : Extended Fixed Route Bus Alternative

III. IP OPERATOR IMPACTS ($000)	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	881	1670	+789			
Revenue	440	592	+152			
Net Operating Cost	441	1078	+637			
Annual Capital Cost	159	380	+221			
Total Net Cost	600	1458	+858			
Total Subsidy	600	1458	+858			
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-48.6	(-3.3)	Revenue ($000)	--	Passengers (000)	--
Revenue ($000)	-66.4	(-3.3)			Opportunity Cost Savings ($000)	--
Profit ($000)	-11.9	(-12.5)				

V. MAJOR EMPLOYER IMPACTS	
IMPACT	CHANGE
Parking Spaces Required/Subsidized	--
Annual Opportunity Cost Savings ($000)	--
Annual Space Rental Cost ($000)	--

COST ($000)	VI. LOCAL GOVERNMENT IMPACTS BEFORE	AFTER	CHANGE	VII. FEDERAL GOVERNMENT IMPACTS BEFORE	AFTER	CHANGE
Operating Subsidy	220.5	539.0	+318.5	220.5	539.0	+318.5
Capital Subsidy	31.8	76.0	+44.2	127.2	304.0	+176.8
Total Subsidy	252.3	615.0	+362.7	347.7	843.0	+495.3
Parking Revenue (Change Only)	-	-		-	-	-

TABLE A.1.4 ANNUAL IMPACTS

SETTING # 1 : 'Southern Belle'
YEAR 1980
SCENARIO : Extended Exclusive-Ride Taxi Alternative

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TAXI PASSENGERS	INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	286.5	18.3	-14.4	+23.6	+9.2
Transportation Handicapped	30.9	3.7	--	--	--
Persons from 0-car H.H.'s	162.3	10.2	-37.2	+31.8	-5.4
All Persons	316.8 *	20.4	-51.7	+65.0	+13.3

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	Coverage (000 Pers) BEFORE	AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	14.2	14.2	0
Transportation Handicapped	4.5	4.5	0
Others	135.6	135.6	0
Persons from 0-car H.H.'s	33.6	33.6	0

TEMPORAL COVERAGE

SERVICE DAYS 7 days/week

SERVICE HOURS 24 hours/day

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	0	(0)
Taxi VMT (000 mi)	+819	(+15.0)
Auto VMT (000 mi)	-217	(-0.1)
Total VMT (000 mi)	+602	(+0.2)
Fuel Cons. (000 gal)	+68.1	(+0.3)
CO Emissions (000 kg)	+47.6	(+0.3)
HC Emissions (000 kg)	+6.9	(+0.3)
NO_x Emissions (000 kg)	+2.8	(+0.3)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	--	--
IP Operation Private	--	--
Exclusive-Ride Taxi	+23	+314.0

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-91	(-0.2)
Operating	-4	(-0.01)
Total	-95	(-0.1)

*Of these trips 11.2 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.1.4 ANNUAL IMPACTS

SETTING # 1 : 'Southern Belle'

YEAR 1980

SCENARIO Extended Exclusive-Ride Taxi Alternative

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	881	881	0			
Revenue	440	424	-16.0			
Net Operating Cost	441	457	+16.0			
Annual Capital Cost	159	159	0			
Total Net Cost	600	616	+16.0			
Total Subsidy	600	616	+16.0		1196	+1196
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)	
Impact	CHANGE	(PCT. CHANGE)
Passengers (000)	+316.8	(+21.6)
Revenue ($000)	+524.2	(+26.2)
Profit ($000)	+131.6	(+138.0)

VI. LOCAL GOVERNMENT IMPACTS

COST ($000)	BEFORE	AFTER	CHANGE
Operating Subsidy	220.5	826.5	+606.0
Capital Subsidy	31.8	31.8	0
Total Subsidy	252.3	858.3	+606.0
Parking Revenue (Change Only)	-	-	

VII. FEDERAL GOVERNMENT IMPACTS

	BEFORE	AFTER	CHANGE
Operating Subsidy	220.5	826.5	+606.0
Capital Subsidy	127.2	127.2	0
Total Subsidy	347.7	953.7	+606.0
Parking Revenue (Change Only)	-	-	-

TABLE A.1.5 ANNUAL IMPACTS

SETTING # 1 : 'Southern Belle'
YEAR 2000
SCENARIO A-1 : Base Auto Ownership

I. USER IMPACTS	MOBILITY (000 trips)**		CHANGE IN CONSUMER SURPLUS ($000)**		
MARKET GROUP	NEW TRANSIT TRIPS	INDUCED TRIPS	WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	56.2	+28.6	+20.6	+20.2	+40.8
Transportation Handicapped	3.0	+1.8	---	---	---
Persons from 0-car H.H.'s	131.5	+64.3	+198.8	+17.4	+216.2
All Persons	940.5 *	+1,104.9	+557.7	+49.3	+607.0

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	20	34	+2.8
Transportation Handicapped	11	17	+.5
Others	40	69	+64.2
Persons from 0-car H.H.'s	40	49	+4.0

TEMPORAL COVERAGE

SERVICE DAYS Mon-Fri.

SERVICE HOURS 6:30AM-6:30PM

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+1001	(+96)
Taxi VMT (000 mi)	-279	(-4.5)
Auto VMT (000 mi)	-3314	(-0.7)
Total VMT (000 mi)	-2592	(-0.5)
Fuel Cons. (000 gal)	-53.0	(-0.4)
CO Emissions (000 kg)	-0.2	(-0.01)
HC Emissions (000 kg)	-0.1	(-0.05)
NO_x Emissions (000 kg)	-1.2	(-0.2)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+75	+598.5
IP Operation Private	--	--
Exclusive-Ride Taxi	-11	-99.0

AUTOMOBILE EXPENDITURE
($000)

	CHANGE	(PCT. CHANGE)
Capital	-236	(-0.4)
Operating	-90	(-0.1)
Total	-326	(-0.3)

*Of these trips 45.0 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.1.5 ANNUAL IMPACTS

SETTING # 1 : 'Southern Belle'

YEAR 2000

SCENARIO A-1 : Base Auto Ownership

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	1,152	1,921	+769			
Revenue	518	885	+367			
Net Operating Cost	634	1,036	+402			
Annual Capital Cost	319	546	+227			
Total Net Cost	953	1,582	+629			
Total Subsidy	953	1,582	+629			
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-112.4	(-4.8)	Revenue ($000)	-23	Passengers (000)	--
Revenue ($000)	-186.9	(-4.8)			Opportunity Cost Savings ($000)	--
Profit ($000)	-33.5	(-18.0)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-510
Annual Opportunity Cost Savings ($000)	+2.1
Annual Space Rental Cost ($000)	-32.0

VI. LOCAL GOVERNMENT IMPACTS / VII. FEDERAL GOVERNMENT IMPACTS

COST ($000)	VI. BEFORE	VI. AFTER	VI. CHANGE	VII. BEFORE	VII. AFTER	VII. CHANGE
Operating Subsidy	317.0	518.0	+201.0	317.0	518.0	+201.0
Capital Subsidy	63.8	109.2	+45.4	255.2	436.8	+181.6
Total Subsidy	380.8	627.2	+246.4	572.2	954.8	+382.6
Parking Revenue (Change Only)	-	-		-	-	-

TABLE A.1.6 ANNUAL IMPACTS

SETTING # 1 : 'Southern Belle'
YEAR 2000
SCENARIO A-2 : Reduced Auto Ownership

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TRANSIT TRIPS	INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	44.7	20.8	+40.7	+4.9	+45.6
Transportation Handicapped	3.0	1.5	--	--	--
Persons from 0-car H.H.'s	161.9	71.5	+296.5	-3.3	+293.2
All Persons	1069.9 *	120.7	+614.1	+18.6	+632.7

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	20	34	+2.8
Transportation Handicapped	11	17	+ .5
Others	40	69	+64.2
Persons from 0-car H.H.'s	40	52	+6.1

TEMPORAL COVERAGE

SERVICE DAYS Mon-Fri

SERVICE HOURS 6:30AM-6:30PM

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+1026	(+98.6)
Taxi VMT (000 mi)	-359	(-5.8)
Auto VMT (000 mi)	-3867	(-0.9)
Total VMT (000 mi)	-3200	(-0.7)
Fuel Cons. (000 gal)	-55.5	(-0.5)
CO Emissions (000 kg)	-2.4	(-0.2)
HC Emissions (000 kg)	-0.3	(-0.2)
NO_x Emissions (000 kg)	-1.9	(-0.4)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+75	+598.5
IP Operation Private	--	--
Exclusive-Ride Taxi	-14	-129.0

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-308	(-0.6)
Operating	-173	(-0.2)
Total	-481	(-0.3)

*Of these trips 52.0 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.1.6 ANNUAL IMPACTS

SETTING # 1 : 'Southern Belle'

YEAR 2000

SCENARIO A-2 : Reduced Auto Ownership

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	1,152	1,921	+769			
Revenue	518	935	+418			
Net Operating Cost	634	986	+351			
Annual Capital Cost	319	546	+227			
Total Net Cost	953	1,532	+578			
Total Subsidy	953	1,532	+578			
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-129.3	(-5.5)	Revenue ($000)	-26	Passengers (000)	--
Revenue ($000)	-215.0	(-5.5)			Opportunity Cost Savings ($000)	--
Profit ($000)	-38.5	(-20.7)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-570
Annual Opportunity Cost Savings ($000)	+2.3
Annual Space Rental Cost ($000)	-37.0

VI. LOCAL GOVERNMENT IMPACTS / VII. FEDERAL GOVERNMENT IMPACTS

COST ($000)	VI. BEFORE	VI. AFTER	VI. CHANGE	VII. BEFORE	VII. AFTER	VII. CHANGE
Operating Subsidy	317.0	492.5	+175.5	317.0	492.5	+175.5
Capital Subsidy	63.8	109.2	+45.4	255.2	436.8	+181.6
Total Subsidy	380.8	601.7	+220.9	572.2	929.3	+357.1
Parking Revenue (Change Only)	-	-		-	-	-

SETTING 2: 'COLLEGE TOWN'

<u>Year 1980 Results</u>

Table A.2.1 - IP Scenario A

Table A.2.2 - IP Scenario B

Table A.2.3 - IP Scenario C

Table A.2.4 - Extended Fixed-Route Bus Scenario

Table A.2.5 - Extended Exclusive Ride Taxi Scenario

<u>Year 2000 Results</u>

Table A.2.6 - Scenario A-1: Base Auto Ownership

Table A.2.7 - Scenario A-2: Reduced Auto Ownership

TABLE A.2.1 ANNUAL IMPACTS

SETTING # 2 : 'College Town'
YEAR 1980
SCENARIO IPA : Multi-Zone Cycled Service

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TRANSIT TRIPS	INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	73.0	24.0	+4.0	+35.8	+39.8
Transportation Handicapped	8.8	3.5	---	---	---
Persons from 0-car H.H.'s	89.0	44.0	+29.2	+24.3	+53.5
All Persons	487.0 *	97.0	+80.2	+80.3	+160.5

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	50	89	+3.0
Transportation Handicapped	25	100	+2.4
Others	83	94	+13.3
Persons from 0-car H.H.'s	83	94	+1.2

TEMPORAL COVERAGE

SERVICE DAYS Mon-Fri / Sat-Sun

SERVICE HOURS 6:30AM-12Midngt / 8AM-6PM

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+1,197	(+138)
Taxi VMT (000 mi)	-252	(-9.2)
Auto VMT (000 mi)	-377	(-0.4)
Total VMT (000 mi)	+568	(+0.6)
Fuel Cons. (000 gal)	+102.2	(+1.8)
CO Emissions (000 kg)	+68.3	(+1.6)
HC Emissions (000 kg)	+9.6	(+1.7)
NO_x Emissions (000 kg)	+3.8	(+1.3)

EMPLOYMENT Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+85	+972.4
IP Operation Private	--	--
Exclusive-Ride Taxi	-8	-51.8

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-366	(-1.5)
Operating	-15	(-0.1)
Total	-381	(-0.7)

*Of these trips 26.4 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.2.1 ANNUAL IMPACTS

SETTING # 2 : 'College Town'

YEAR 1980

SCENARIO IPA : Multi-Zone Cycled Service

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	1,217	3,715	+2,498			
Revenue	356	477	+121			
Net Operating Cost	861	3,238	+2,377			
Annual Capital Cost	220	529	+309			
Total Net Cost	1,081	3,767	+2,686			
Total Subsidy	1,081	3,767	+2,686			
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-64.9	(-10.1)	Revenue ($000)	-40	Passengers (000)	-2
Revenue ($000)	-86.3	(-10.1)			Opportunity Cost Savings ($000)	+6
Profit ($000)	-15.4	(-37.9)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-67
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-16.1

VI. LOCAL GOVERNMENT IMPACTS / VII. FEDERAL GOVERNMENT IMPACTS

COST ($000)	VI. BEFORE	VI. AFTER	VI. CHANGE	VII. BEFORE	VII. AFTER	VII. CHANGE
Operating Subsidy	430.5	1619.0	+1188.5	430.5	1619.0	+1188.5
Capital Subsidy	44.0	105.8	+61.8	176.0	423.2	+247.2
Total Subsidy	474.5	1724.8	+1250.3	606.5	2042.2	+1435.7
Parking Revenue (Change Only)	-	-	+2.6	-	-	-

TABLE A.2.2 ANNUAL IMPACTS

SETTING # 2 : 'College Town'
YEAR 1980
SCENARIO IPB : Areawide Many-to-Many Service

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TRANSIT TRIPS	INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	125.0	53.0	+5.7	+37.9	+43.6
Transportation Handicapped	8.8	3.5	--	--	--
Persons from 0-car H.H.'s	163.0	70.0	+36.8	+24.4	+61.2
All Persons	880.0 *	176.0	+101.9	+84.4	+186.3

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	50	89	+3.0
Transportation Handicapped	25	100	+2.4
Others	83	94	+13.3
Persons from 0-car H.H.'s	83	94	+1.2

TEMPORAL COVERAGE

	SERVICE DAYS	SERVICE HOURS
	Mon-Fri	6:30AM-12 Midnght
	Sat-Sun	8AM - 6PM

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+1,197	(+138)
Taxi VMT (000 mi)	-294	(-10.8)
Auto VMT (000 mi)	-683	(-0.8)
Total VMT (000 mi)	+220	(+0.2)
Fuel Cons. (000 gal)	+79.9	(+1.4)
CO Emissions (000 kg)	+51.6	(-1.2)
HC Emissions (000 kg)	+7.3	(-1.3)
NO_x Emissions (000 kg)	+2.7	(-0.9)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+95	+1086.8
IP Operation Private		
Exclusive-Ride Taxi	-10	-61

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-666	(-2.8)
Operating	-27	(-0.1)
Total	-693	(-1.3)

*Of these trips 52.6 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.2.2 ANNUAL IMPACTS

SETTING # 2 : 'College Town'

YEAR 1980

SCENARIO IPB : Areawide Many-to-Many Service

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	1,217	3,915	+2,698			
Revenue	356	902	+546			
Net Operating Cost	861	3,013	+2,152			
Annual Capital Cost	220	554	+334			
Total Net Cost	1,081	3,567	+2,486			
Total Subsidy	1,081	3,567	+2,486			
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-76.5	(-11.9)	Revenue ($000)	-4.9	Passengers (000)	-2.2
Revenue ($000)	-101.7	(-11.9)			Opportunity Cost Savings ($000)	+6.6
Profit ($000)	-18.2	(-44.7)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-92
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-22.2

VI. LOCAL GOVERNMENT IMPACTS

COST ($000)	BEFORE	AFTER	CHANGE
Operating Subsidy	430.5	1506.5	+1076.0
Capital Subsidy	44.0	110.8	+66.8
Total Subsidy	474.5	1617.3	+1142.8
Parking Revenue (Change Only)	-	-	-4.9

VII. FEDERAL GOVERNMENT IMPACTS

	BEFORE	AFTER	CHANGE
Operating Subsidy	430.5	1506.5	+1076.0
Capital Subsidy	176.0	443.2	+267.2
Total Subsidy	606.5	1949.7	+1343.2
Parking Revenue (Change Only)	-	-	-

TABLE A.2.3 ANNUAL IMPACTS

SETTING # 2 : 'College Town'
YEAR 1980
SCENARIO IPC : Private Paratransit Operator

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)**		CHANGE IN CONSUMER SURPLUS ($000)**		
	NEW TRANSIT TRIPS	INDUCED TRIPS	WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	99.0	20.0	+5.8	+27.2	+33.0
Transportation Handicapped	8.8	3.5	--	--	--
Persons from 0-car H.H.'s	140.0	28.0	+32.7	+17.4	+50.1
All Persons	689.0 *	138.0	+89.1	+60.2	+149.3

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	50	89	+3
Transportation Handicapped	25	100	+2.4
Others	83	94	+13.3
Persons from 0-car H.H.'s	83	94	+ 1.2

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+1,197	(+138)
Taxi VMT (000 mi)	-294	(-10.8)
Auto VMT (000 mi)	-553	(-0.6)
Total VMT (000 mi)	+350	(-0.4)
Fuel Cons. (000 gal)	+87.6	(+1.6)
CO Emissions (000 kg)	+57.5	(+1.4)
HC Emissions (000 kg)	+8.1	(+1.4)
NO_x Emissions (000 kg)	+3.1	(+1.1)

TEMPORAL COVERAGE

SERVICE DAYS	SERVICE HOURS
Mon-Fri	6:30AM-12 Midnght
Sat-Sun	8AM-6PM

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	0	0
IP Operation Private	+75	+528.0
Exclusive-Ride Taxi	-9	-54.3

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-568	(-2.3)
Operating	-23	(-0.1)
Total	-591	(-1.1)

*Of these trips 45.3 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.2.3 ANNUAL IMPACTS

SETTING # 2 : 'College Town'

YEAR 1980

SCENARIO IPC : Private Paratransit Operator

III. IP OPERATOR IMPACTS ($000)	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	1,217	1,217	0	0	878	+878
Revenue	356	964	+608	0	0	0
Net Operating Cost	861	253	-608	0	878	+878
Annual Capital Cost	220	554	+334	0	0	0
Total Net Cost	1,081	807	-274	0	878	+878
Total Subsidy	1,081	807	-274	0	878	+878
Total Mgmt. Fee					80	+80

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-68.1	(-10.6)	Revenue ($000)	-2.5	Passengers (000)	-1.7
Revenue ($000)	-90.5	(-10.6)			Opportunity Cost Savings ($000)	+5.2
Profit ($000)	-16.2	(-39.8)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-70
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-16.8

VI. LOCAL GOVERNMENT IMPACTS COST ($000)	BEFORE	AFTER	CHANGE	VII. FEDERAL GOVERNMENT IMPACTS BEFORE	AFTER	CHANGE
Operating Subsidy	430.5	570.0	+139.5	430.5	570.0	+139.5
Capital Subsidy	44.0	110.8	+66.8	176.0	443.2	+267.2
Total Subsidy	474.5	680.8	+206.3	606.5	1013.2	+406.7
Parking Revenue (Change Only)	-	-	-2.5	-	-	-

TABLE A.2.4 ANNUAL IMPACTS

SETTING # 2 : 'College Town'
YEAR 1980
SCENARIO : Extended Bus Fixed Route Alternative

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)**		CHANGE IN CONSUMER SURPLUS ($000) **		
	NEW TRANSIT TRIPS	INDUCED TRIPS	WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	121.1	41.3	+7.9	+26.3	+34.2
Transportation Handicapped	10.4	3.5	--	--	--
Persons from 0-car H.H.'s	113.3	38.7	+28.1	+6.9	+35.0
All Persons	712.4 *	106.9	+75.0	+42.0	+117.0

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	50	60	+.8
Transportation Handicapped	25	30	+.1
Others	83	94	+13.3
Persons from 0-car H.H.'s	83	94	+1.2

TEMPORAL COVERAGE

SERVICE DAYS Mon-Fri; Sat-Sun.

SERVICE HOURS 6:30AM-12Midnght; 8AM-6PM

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+1881	(+217)
Taxi VMT (000 mi)	-252	(-9.2)
Auto VMT (000 mi)	-649	(-0.7)
Total VMT (000 mi)	+980	(+1.1)
Fuel Cons. (000 gal)	+250.6	(+4.5)
CO Emissions (000 kg)	-26.2	(-0.6)
HC Emissions (000 kg)	+21.8	(+3.8)
NO_x Emissions (000 kg)	+23.3	(+8.1)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+165	+1824.0
IP Operation Private	--	--
Exclusive-Ride Taxi	-9	-56.7

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-477	(-2.0)
Operating	-19	(-0.1)
Total	-496	(-1.0)

*Of these trips 43.0 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.2.4 ANNUAL IMPACTS

SETTING # 2 : 'College Town'

YEAR 1980

SCENARIO : Extended Fixed Route Bus Alternative

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	1217	3791	+2574			
Revenue	356	540	+184			
Net Operating Cost	861	3251	+2390			
Annual Capital Cost	220	730	+510			
Total Net Cost	1081	3981	+2900			
Total Subsidy	1081	3981	+2900			
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-71.2	(-11.1)	Revenue ($000)		Passengers (000)	--
Revenue ($000)	-94.6	(-11.1)			Opportunity Cost Savings ($000)	--
Profit ($000)	-17.0	(-41.8)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	--
Annual Opportunity Cost Savings ($000)	--
Annual Space Rental Cost ($000)	--

VI. LOCAL GOVERNMENT IMPACTS / VII. FEDERAL GOVERNMENT IMPACTS

	VI. LOCAL GOVERNMENT IMPACTS			VII. FEDERAL GOVERNMENT IMPACTS		
COST ($000)	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Subsidy	430.5	1625.5	+1195.0	430.5	1625.5	+1195.0
Capital Subsidy	44.0	146.0	+102.0	176.0	584.0	+408.0
Total Subsidy	474.5	1771.5	+1297.0	606.5	2209.5	+1603.0
Parking Revenue (Change Only)	-	-		-	-	-

TABLE A.2.5 ANNUAL IMPACTS

SETTING # 2 : 'College Town'
YEAR 1980
SCENARIO : Extended Exclusive-Ride Taxi Alternative

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips) ** NEW TAXI PASSENGERS	INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000) ** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	9.5	0.3	+2.6	+15.9	+18.5
Transportation Handicapped	.8	0.03	--	--	--
Persons from 0-car H.H.'s	26.5	1.0	+5.5	+4.6	+10.1
All Persons	82.8 *	5.0	+13.0	+26.0	+39.0

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	Coverage (000 Pers) BEFORE	AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	7.1	7.1	0
Transportation Handicapped	3.3	3.3	0
Others	127.9	127.9	0
Persons from 0-car H.H.'s	7.1	7.1	0

TEMPORAL COVERAGE

SERVICE DAYS 7 days/week

SERVICE HOURS 24 hours/day

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	0	(0)
Taxi VMT (000 mi)	+1045	(+38.3)
Auto VMT (000 mi)	-44	(-0.05)
Total VMT (000 mi)	+1001	(+1.1)
Fuel Cons. (000 gal)	+101.9	(+1.8)
CO Emissions (000 kg)	+71.2	(+1.7)
HC Emissions (000 kg)	+10.2	(+1.8)
NO_x Emissions (000 kg)	+4.3	(+1.5)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	--	--
IP Operation Private	--	--
Exclusive-Ride Taxi	+31	+53.5

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	0	--
Operating	0	--
Total	0	--

*Of these trips 5.0 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.2.5 ANNUAL IMPACTS

SETTING # 2 : 'College Town'

YEAR 1980

SCENARIO Extended Exclusive-Ride Taxi Alternative

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	1217	1217	0			
Revenue	356	352	-4			
Net Operating Cost	861	865	+4			
Annual Capital Cost	220	268	+48			
Total Net Cost	1081	1133	+52			
Total Subsidy	1081	1133	+52			
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)	
Impact	CHANGE	(PCT. CHANGE)
Passengers (000)	+82.8	(+12.9)
Revenue ($000)	+89.2	(+10.4)
Profit ($000)	-16.0	(-30.2)

VI. LOCAL GOVERNMENT IMPACTS

COST ($000)	BEFORE	AFTER	CHANGE
Operating Subsidy	430.5	432.5	+2.0
Capital Subsidy	44.0	53.6	+9.6
Total Subsidy	474.5	486.1	+11.6
Parking Revenue (Change Only)	-	-	

VII. FEDERAL GOVERNMENT IMPACTS

BEFORE	AFTER	CHANGE
430.5	432.5	+2.0
176.0	214.4	+38.4
606.5	646.9	+40.4
-	-	-

TABLE A.2.6 ANNUAL IMPACTS

SETTING # 2 : 'College Town'

YEAR 2000

SCENARIO A-1 : Base Auto Ownership

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)**		CHANGE IN CONSUMER SURPLUS ($000)**		
	NEW TRANSIT TRIPS	INDUCED TRIPS	WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	226.4	79.2	+34.5	+68.8	+103.3
Transportation Handicapped	65.0	23.0	---	---	---
Persons from 0-car H.H.'s	233.6	70.1	+101.9	+17.8	+119.7
All Persons	1,680.5 *	333.0	+421.2	+143.6	+564.8

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	50	93	+6.0
Transportation Handicapped	35	93	+2.4
Others	83	98	+23.8
Persons from 0-car H.H.'s	83	98	+1.1

TEMPORAL COVERAGE

SERVICE DAYS	SERVICE HOURS
Mon-Fri	6:30AM-12Midnight
Sat-Sun	8AM-6PM

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+1,972	(+175)
Taxi VMT (000 mi)	-678	(-21.2)
Auto VMT (000 mi)	-2,838	(-0.9)
Total VMT (000 mi)	-1544	(-0.5)
Fuel Cons. (000 gal)	-10.8	(-0.1)
CO Emissions (000 kg)	+12.5	(+1.1)
HC Emissions (000 kg)	+1.0	(+0.7)
NO_x Emissions (000 kg)	-0.3	(-0.1)

EMPLOYMENT Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	--	--
IP Operation Private	+120	+1048.3
Exclusive-Ride Taxi	-20	-162.1

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-498	(-0.7)
Operating	-199	(-0.2)
Total	-697	(-0.5)

*Of these trips 106.1 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.2.6 ANNUAL IMPACTS

SETTING # 2 : 'College Town'

YEAR 2000

SCENARIO A-1 : Base Auto Ownership

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	1,582	1,582	0	0	1,827	+1,827
Revenue	587	1,427	+840	0	0	--
Net Operating Cost	995	155	-840	0	1,827	+1,827
Annual Capital Cost	364	764	+400	0	0	0
Total Net Cost	1,359	919	-440	0	1,827	+1,827
Total Subsidy	1,359	919	-440	0	1,827	+1,827
Total Mgmt. Fee					166	+166

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-173	(-21.9)	Revenue ($000)	-6.7	Passengers (000)	--
Revenue ($000)	-270.1	(-21.9)			Opportunity Cost Savings ($000)	--
Profit ($000)	-48.3	(-82.2)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-278
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-66.7

VI. LOCAL GOVERNMENT IMPACTS / VII. FEDERAL GOVERNMENT IMPACTS

COST ($000)	VI. BEFORE	VI. AFTER	VI. CHANGE	VII. BEFORE	VII. AFTER	VII. CHANGE
Operating Subsidy	463.0	956.5	+493.5	463.0	956.5	+493.5
Capital Subsidy	72.8	272.8	+200.0	291.2	491.2	+200.0
Total Subsidy	535.8	1,229.3	+693.5	754.2	1,447.7	+693.5
Parking Revenue (Change Only)	-	-		-	-	-

TABLE A.2.7 ANNUAL IMPACTS

SETTING # 2 : 'College Town'

YEAR 2000

SCENARIO A-2 : Reduced Auto Ownership

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TRANSIT TRIPS	INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	313.5	109.7	+36.5	+85.1	+121.6
Transportation Handicapped	65.0	23.0	--	--	--
Persons from 0-car H.H.'s	248.0	74.5	+128.6	+29.5	+158.1
All Persons	1,788.1 *	341.0	+464.9	+140.4	+605.3

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	50	93	+6.0
Transportation Handicapped	35	93	+2.4
Others	83	98	+23.6
Persons from 0-car H.H.'s	83	98	+1.5

TEMPORAL COVERAGE

SERVICE DAYS	SERVICE HOURS
Mon-Fri	6:30AM-12Midnght
Sat-Sun	8AM-6PM

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+1,972	(+175)
Taxi VMT (000 mi)	-758	(-23.8)
Auto VMT (000 mi)	-2,925	(-1.0)
Total VMT (000 mi)	-1,711	(-0.6)
Fuel Cons. (000 gal)	-4.9	(-0.1)
CO Emissions (000 kg)	+11.3	(+1.1)
HC Emissions (000 kg)	+0.8	(+0.6)
NO_x Emissions (000 kg)	-0.5	(-0.2)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	--	--
IP Operation Private	+120	+1,048.3
Exclusive-Ride Taxi	-22	-176.4

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-515	(-0.8)
Operating	-289	(-0.3)
Total	-804	(-0.4)

*Of these trips 105.6 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.2.7 ANNUAL IMPACTS

SETTING # 2 : 'College Town'

YEAR 2000

SCENARIO A-2 : Reduced Auto Ownership

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	1,582	1,582	0	0	1,827	+1,827
Revenue	656	1,519	863	0	0	0
Net Operating Cost	926	63	-863	0	1,827	+1,827
Annual Capital Cost	364	764	+400	0	0	0
Total Net Cost	1,290	827	-463	0	1,827	+1,827
Total Subsidy	1,290	827	-463	0	1,827	+1,827
Total Mgmt. Fee					166	+166

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-188.3	(-23.8)	Revenue ($000)	-6.6	Passengers (000)	---
Revenue ($000)	-294.0	(-23.8)			Opportunity Cost Savings ($000)	---
Profit ($000)	-52.6	(-89.5)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-275
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-66

VI. LOCAL GOVERNMENT IMPACTS / VII. FEDERAL GOVERNMENT IMPACTS

COST ($000)	VI. Local BEFORE	VI. Local AFTER	VI. Local CHANGE	VII. Federal BEFORE	VII. Federal AFTER	VII. Federal CHANGE
Operating Subsidy	463.0	945.0	+482.0	463.0	945.0	+482.0
Capital Subsidy	72.8	152.8	+80.0	291.2	611.2	+320.0
Total Subsidy	535.8	1,097.8	+562.0	754.2	1,556.2	+802.0
Parking Revenue (Change Only)	-	-		-	-	-

SETTING 3: 'SUN CITY'

Year 1980 Results

Table A.3.1 - IP Scenario A

Table A.3.2 - IP Scenario B

Table A.3.3 - Extended Fixed-Route Bus Scenario

Table A.3.4 - Extended Exclusive Ride Taxi Scenario

Year 2000 Results

Table A.3.5 - Scenario A-1: Base Auto Ownership

Table A.3.6 - Scenario A-2: Reduced Auto Ownership

Table A.3.7 - Scenario B-1: Base Auto Ownership

Table A.3.8 - Scenario B-2: Reduced Auto Ownership

TABLE A.3.1 ANNUAL IMPACTS

SETTING # 3 : 'Sun City'

YEAR 1980

SCENARIO IPA : Paratransit Replacement: Public Operator

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)**		CHANGE IN CONSUMER SURPLUS ($000)**		
	NEW TRANSIT TRIPS	INDUCED TRIPS	WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	37.8	10.5	+4.6	+24.7	+29.3
Transportation Handicapped	7.6	2.0	-	-	-
Persons from 0-car H.H.'s	48.0	13.3	+24.4	+10.4	+34.8
All Persons	186.8 *	26.6	+73.4	+40.7	+114.1

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	32	48	+4.6
Transportation Handicapped	16	36	+2.6
Others	60	71	+46.8
Persons from 0-car H.H.'s	62	73	+2.6

TEMPORAL COVERAGE

SERVICE DAYS Mon. - Fri.

SERVICE HOURS 5 am - 7 pm

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+104	(+4.0)
Taxi VMT (000 mi)	-168	(-9.1)
Auto VMT (000 mi)	-288	(-0.03)
Total VMT (000 mi)	-352	(-0.04)
Fuel Cons. (000 gal)	- 33.8	(-0.1)
CO Emissions (000 kg)	+15.3	(+0.03)
HC Emissions (000 kg)	- 2.4	(-0.04)
NO_x Emissions (000 kg)	- 3.7	(-0.1)

EMPLOYMENT Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+14	+136.5
IP Operation Private	-	-
Exclusive-Ride Taxi	- 6	- 45.0

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-175	(-0.1)
Operating	-7	-
Total	-182	(-0.1)

*Of these trips 12.9 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.3.1 ANNUAL IMPACTS

SETTING # 3 : 'Sun City'

YEAR 1980

SCENARIO IPA : Paratransit Replacement: Public Operator

III. IP OPERATOR IMPACTS ($000)	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	2,284	2,412	+128			
Revenue	972	1,011	+ 39			
Net Operating Cost	1,312	1,401	+ 89			
Annual Capital Cost	403	459	+ 56			
Total Net Cost	1,715	1,860	+145			
Total Subsidy						
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-34.7	(-7.4)	Revenue ($000)	-3	Passengers (000)	-2.7
Revenue ($000)	-75	(-7.4)			Opportunity Cost Savings ($000)	+8
Profit ($000)	-13.4	(-27.8)				

V. MAJOR EMPLOYER IMPACTS	
IMPACT	CHANGE
Parking Spaces Required/Subsidized	-25
Annual Opportunity Cost Savings ($000)	-
Annual Space Rental Cost ($000)	- 6

VI. LOCAL GOVERNMENT IMPACTS				VII. FEDERAL GOVERNMENT IMPACTS		
COST ($000)	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Subsidy	656.0	700.5	+44.5	656.0	700.5	+44.5
Capital Subsidy	80.6	91.8	+11.2	322.4	367.2	+44.8
Total Subsidy	736.6	792.3	+55.7	978.4	1,067.7	+89.3
Parking Revenue (Change Only)	-	-	- 6.0	-	-	-

TABLE A.3.2 ANNUAL IMPACTS

SETTING # 3 : 'Sun City'

YEAR 1980

SCENARIO IPB : Paratransit Replacement: Private Operator

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TRANSIT TRIPS	INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	37.8	10.5	+4.6	+24.7	+29.3
Transportation Handicapped	7.6	2.0	-	-	-
Persons from 0-car H.H.'s	48.0	13.3	+24.4	+10.4	+34.8
All Persons	186.8 *	26.6	+73.4	+40.7	+114.1

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	32	48	+4.6
Transportation Handicapped	16	36	+2.6
Others	60	71	+46.8
Persons from 0-car H.H.'s	62	73	+2.6

TEMPORAL COVERAGE

SERVICE DAYS Mon. - Fri.

SERVICE HOURS 5 am - 7 pm

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+240	(+9.2)
Taxi VMT (000 mi)	-168	(-9.1)
Auto VMT (000 mi)	-288	(-.03)
Total VMT (000 mi)	-216	(-0.2)
Fuel Cons. (000 gal)	-27.4	(-.05)
CO Emissions (000 kg)	+20.2	(+.05)
HC Emissions (000 kg)	- 1.6	(-.03)
NO_x Emissions (000 kg)	- 3.3	(-.1)

EMPLOYMENT Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	-5	-43.0
IP Operation Private	+21	+148.0
Exclusive-Ride Taxi	-6	-45.0

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-175	(-.1)
Operating	- 7	-
Total	-182	(-.1)

*Of these trips 12.9 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.3.2 ANNUAL IMPACTS

SETTING # 3 : 'Sun City'

YEAR 1980

SCENARIO IPB : Paratransit Replacement: Private Operator

III. IP OPERATOR IMPACTS ($000)	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	2,284	2,175	-109	0	247*	+247
Revenue	972	948	- 24	0	63	+ 63
Net Operating Cost	1,312	1,227	- 85	0	184	+184
Annual Capital Cost	403	413	+ 10	0	0	0
Total Net Cost	1,715	1,640	- 75	0	184	+184
Total Subsidy	1,715	1,640	- 75	0	247	+247
Total Mgmt. Fee				0	63	+ 63

IV. LOCAL COMPETING PROVIDER IMPACTS	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-34.7	(-7.4)	Revenue ($000)	-3	Passengers (000)	-2.7
Revenue ($000)	-75	(-7.4)			Opportunity Cost Savings ($000)	+8
Profit ($000)	-13.4	(-27.8)				

V. MAJOR EMPLOYER IMPACTS	
IMPACT	CHANGE
Parking Spaces Required/Subsidized	-25
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	- 6

VI. LOCAL GOVERNMENT IMPACTS COST ($000)	BEFORE	AFTER	CHANGE	VII. FEDERAL GOVERNMENT IMPACTS BEFORE	AFTER	CHANGE
Operating Subsidy	656.0	737.0	+81.0	656.0	737.0	+81.0
Capital Subsidy	80.6	82.6	+ 2.0	322.4	330.4	+ 8.0
Total Subsidy	736.6	819.6	+83.0	978.4	1,076.4	+89.0
Parking Revenue (Change Only)	-	-	- 6.0	-	-	-

*Note: In this case, the cost collected by the private operator (subsidy) is considered his/her operating cost. This includes the capital cost.

TABLE A.3.3 ANNUAL IMPACTS

SETTING # 3 : 'Sun City'

YEAR 1980

SCENARIO : Extended Fixed Route Bus Alternative

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TRANSIT TRIPS	INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	63.3	8.3	+7.9	+26.3	+34.2
Transportation Handicapped	10.0	1.3	--	--	--
Persons from 0-car H.H.'s	76.6	10.3	+28.1	+6.9	+35.0
All Persons	194.5*	17.6	+75.0	+42.1	+117.1

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	32	38	+1.7
Transportation Handicapped	16	19	+.4
Others	60	70	+42.0
Persons from 0-car H.H.'s	62	71	+2.0

TEMPORAL COVERAGE

SERVICE DAYS Mon-Fri

SERVICE HOURS 5AM-7PM

VMT/FUEL/EMISSIONS

IMPACT	CHANGE (PCT. CHANGE)
Transit VMT (000 mi)	+590 (+22.6)
Taxi VMT (000 mi)	-168 (-9.1)
Auto VMT (000 mi)	-309 (-0.03)
Total VMT (000 mi)	+113 (+0.01)
Fuel Cons. (000 gal)	+63.5 (+0.1)
CO Emissions (000 kg)	-19.2 (-0.04)
HC Emissions (000 kg)	+5.3 (+0.1)
NO_x Emissions (000 kg)	+6.6 (+0.2)

EMPLOYMENT Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+31	+282.3
IP Operation Private	--	--
Exclusive-Ride Taxi	-6	-43.4

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-43.0	(-0.03)
Operating	-1.7	--
Total	-44.7	(-0.01)

*Of these trips 14.3 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.3.3 ANNUAL IMPACTS

SETTING # 3 : 'Sun City'

YEAR 1980

SCENARIO : Extended Fixed Route Bus Alternative

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	2284	2791	+507			
Revenue	972	1033	+61			
Net Operating Cost	1312	1758	+446			
Annual Capital Cost	403	484	+81			
Total Net Cost	1715	2242	+527			
Total Subsidy	1715	2242	+527			
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-29.2	(-6.2)	Revenue ($000)		Passengers (000)	
Revenue ($000)	-63.0	(-6.2)			Opportunity Cost Savings ($000)	
Profit ($000)	-11.3	(-23.5)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	--
Annual Opportunity Cost Savings ($000)	--
Annual Space Rental Cost ($000)	--

VI. LOCAL GOVERNMENT IMPACTS				VII. FEDERAL GOVERNMENT IMPACTS		
COST ($000)	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Subsidy	656.0	879.0	+223.0	656.0	879.0	+223.0
Capital Subsidy	80.6	96.8	+16.2	322.4	387.2	+64.8
Total Subsidy	736.6	975.8	+239.2	978.4	1266.2	+287.8
Parking Revenue (Change Only)	-	-		-	-	-

TABLE A.3.4 ANNUAL IMPACTS

SETTING # 3 : 'Sun City'
YEAR 1980
SCENARIO : Extended Exclusive-Ride Taxi Alternative

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TAXI PASSENGERS	INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	44.5	8.0	-.4	+3.2	+2.8
Transportation Handicapped	20.0	3.6	--	--	--
Persons from 0-car H.H.'s	35.2	6.9	+18.4	+2.9	+21.3
All Persons	103.4 *	12.8	+49.6	+4.2	+53.8

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	Coverage (000 Pers) BEFORE	AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	41.5	41.5	0
Transportation Handicapped	12.8	12.8	0
Others	404.1	404.1	0
Persons from 0-car H.H.'s	23.0	23.0	0

TEMPORAL COVERAGE

SERVICE DAYS 7 days/week

SERVICE HOURS 5AM-7PM

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	0	(0.00)
Taxi VMT (000 mi)	+264	(+14.3)
Auto VMT (000 mi)	-68	(-0.01)
Total VMT (000 mi)	+178	(+0.02)
Fuel Cons. (000 gal)	+20.6	(+0.04)
CO Emissions (000 kg)	+14.2	(+0.03)
HC Emissions (000 kg)	+ 2.1	(+0.04)
NO_x Emissions (000 kg)	+ 0.8	(+0.03)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	--	--
IP Operation Private	--	--
Exclusive-Ride Taxi	+13	+88.6

AUTOMOBILE EXPENDITURE
($000)

	CHANGE	(PCT. CHANGE)
Capital	-41	(-0.03)
Operating	-2	--
Total	-43	(-0.01)

*Of these trips 5.0 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.3.4 ANNUAL IMPACTS

SETTING # 3 : 'Sun City'

YEAR 1980

SCENARIO Extended Exclusive-Ride Taxi Alternative

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	2284	2284	0			
Revenue	972	963	-9.0			
Net Operating Cost	1312	1321	+9.0			
Annual Capital Cost	403	403	0			
Total Net Cost	1715	1724	+9.0			
Total Subsidy	1715	1724	+9.0		119.5	+119.5
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)	
Impact	CHANGE	(PCT. CHANGE)
Passengers (000)	+103.4	(+22.1)
Revenue ($000)	+147.7	(+14.6)
Profit ($000)	+ 35.0	(+72.6)

VI. LOCAL GOVERNMENT IMPACTS / VII. FEDERAL GOVERNMENT IMPACTS

COST ($000)	VI. BEFORE	VI. AFTER	VI. CHANGE	VII. BEFORE	VII. AFTER	VII. CHANGE
Operating Subsidy	656.0	720.3	+64.3	656.0	720.3	+64.3
Capital Subsidy	80.6	80.6	0	322.4	322.4	0
Total Subsidy	736.6	800.9	+64.3	978.4	1042.7	+64.3
Parking Revenue (Change Only)	-	-		-	-	-

TABLE A.3.5 ANNUAL IMPACTS

SETTING # 3 : 'Sun City'

YEAR 2000

SCENARIO A-1 : Base Auto Ownership

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TRANSIT TRIPS	INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	82.6	26.5	+49.9	-15.0	+34.9
Transportation Handicapped	-	-	-	-	-
Persons from 0-car H.H.'s	100.9	32.6	+175.0	+ 8.0	+183.0
All Persons	570.1 *	65.2	+589.4	-32.8	+556.6

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	25	39	+12.5
Transportation Handicapped	16	16	0
Others	65	75	+63.4
Persons from 0-car H.H.'s	68	78	+ 3.0

TEMPORAL COVERAGE

SERVICE DAYS Mon-Fri

SERVICE HOURS 5am - 7pm

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+853	(+27.0)
Taxi VMT (000 mi)	-439	(-15.8)
Auto VMT (000 mi)	-2650	(-0.1)
Total VMT (000 mi)	-2236	(-0.1)
Fuel Cons. (000 gal)	- 60.7	(-0.1)
CO Emissions (000 kg)	+ 0.7	(+0.01)
HC Emissions (000 kg)	- 0.7	(-0.1)
NO_x Emissions (000 kg)	- 3.2	(-0.2)

EMPLOYMENT

Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	-8	-90.0
IP Operation Private	+42	+467.0
Exclusive-Ride Taxi	-17	-154.6

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-331	(-0.1)
Operating	-132	(-0.05)
Total	-463	(-0.1)

*Of these trips 49.8 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.3.5 ANNUAL IMPACTS

SETTING # 3 : 'Sun City'

YEAR 2000

SCENARIO A-1 : Base Auto Ownership

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	2,763	2,609	-154	0	823	+823
Revenue	1,360	1,346	- 14	0	242	+242
Net Operating Cost	1,403	1,263	-140	0	581	+581
Annual Capital Cost	597	575	- 22	0	0	0
Total Net Cost	2,000	1,838	-162	0	581	+581
Total Subsidy	2,000	1,838	-162	0	823	+823
Total Mgmt. Fee				0	242	+242

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	- 89.5	(-10.5)	Revenue ($000)	-18.7	Passengers (000)	
Revenue ($000)	-257.6	(-10.5)			Opportunity Cost Savings ($000)	
Profit ($000)	- 46.6	(-40.1)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-52
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-12.5

VI. LOCAL GOVERNMENT IMPACTS

COST ($000)	BEFORE	AFTER	CHANGE
Operating Subsidy	701.5	1,043.0	+341.5
Capital Subsidy	119.4	115.0	- 4.4
Total Subsidy	820.9	1,158.0	+337.1
Parking Revenue (Change Only)	-	-	- 12.5

VII. FEDERAL GOVERNMENT IMPACTS

BEFORE	AFTER	CHANGE
701.5	1,043.0	+341.5
477.6	460.0	- 17.6
1,179.1	1,503.0	+323.9
-	-	-

TABLE A.3.6 ANNUAL IMPACTS

SETTING # 3 : 'Sun City'
YEAR 2000
SCENARIO A-2 : Reduced Auto Ownership

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)**		CHANGE IN CONSUMER SURPLUS ($000)**		
	NEW TRANSIT TRIPS	INDUCED TRIPS	WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	121.1	37.9	+54.0	-25.2	+28.8
Transportation Handicapped			-	-	-
Persons from 0-car H.H.'s	154.2	48.0	+226.5	+ 7.0	+233.5
All Persons	786.6 *	95.3	+683.4	-60.9	+622.5

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	25	39	+12.5
Transportation Handicapped	16	16	0
Others	65	75	+63.4
Persons from 0-car H.H.'s	68	78	+ 3.0

TEMPORAL COVERAGE

SERVICE DAYS Mon. - Fri.

SERVICE HOURS 5 am - 7 pm

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+1108	(+35.0)
Taxi VMT (000 mi)	- 439	(-15.8)
Auto VMT (000 mi)	-3400	(- 0.2)
Total VMT (000 mi)	-2731	(-0.1)
Fuel Cons. (000 gal)	-56.1	(-0.1)
CO Emissions (000 kg)	+2.0	(+0.03)
HC Emissions (000 kg)	-0.6	(-0.1)
NO_x Emissions (000 kg)	-3.5	(-0.2)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	-8	-90.0
IP Operation Private	+51	+578.0
Exclusive-Ride Taxi	-18	-166.8

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-404	(-0.2)
Operating	-227	(-0.1)
Total	-631	(-0.1)

*Of these trips 50.2 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.3.6 ANNUAL IMPACTS

SETTING # 3 : 'Sun City'

YEAR 2000

SCENARIO A-2 : Reduced Auto Ownership

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	2,736	2,609	-154	0	1,031	+1,031
Revenue	1,536	1,504	- 32	0	346	+ 346
Net Operating Cost	1,227	1,105	-122	0	685	+ 685
Annual Capital Cost	597	575	- 22	0	-	-
Total Net Cost	1,824	1,680	-144	0	685	+ 685
Total Subsidy	1,824	1,680	-144	0	1,031	+1,031
Total Mgmt. Fee				0	346	+ 346

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-96.6	(-11.3)	Revenue ($000)	-9.3	Passengers (000)	
Revenue ($000)	-278.0	(-11.3)			Opportunity Cost Savings ($000)	
Profit ($000)	- 49.9	(-42.9)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-52
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-12.4

VI. LOCAL GOVERNMENT IMPACTS / VII. FEDERAL GOVERNMENT IMPACTS

COST ($000)	VI. BEFORE	VI. AFTER	VI. CHANGE	VII. BEFORE	VII. AFTER	VII. CHANGE
Operating Subsidy	613.5	1,068.0	+454.5	613.5	1,068.0	+454.5
Capital Subsidy	119.4	115.0	- 4.4	477.6	460.0	- 17.6
Total Subsidy	732.9	1,183.0	+450.1	1,091.1	1,528.0	+436.9
Parking Revenue (Change Only)	-	-	-12.4	-	-	-

TABLE A.3.7 ANNUAL IMPACTS

SETTING # 3 : 'Sun City'
YEAR 2000 Base Auto Ownership:
SCENARIO B-1 : Partial Conversion to Fixed Routes

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TRANSIT TRIPS	MOBILITY (000 trips)** INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** NON-WORK TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** TOTAL
Elderly	88.7	26.1	+40.3	+12.2	+52.5
Transportation Handicapped			-	-	-
Persons from 0-car H.H.'s	90.2	26.7	+150.3	+11.8	+162.1
All Persons	484.9 *	58.2	+469.9	+22.5	+492.4

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	25	35	+8.9
Transportation Handicapped	16	16	0
Others	65	63	+50.1
Persons from 0-car H.H.'s	68	74	+ 2.7

TEMPORAL COVERAGE

SERVICE DAYS Mon. - Fri.　　SERVICE HOURS 5 am - 7 pm

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+702	(+22.2)
Taxi VMT (000 mi)	-359	(-13.0)
Auto VMT (000 mi)	-2,370	(- 0.1)
Total VMT (000 mi)	-2,027	(- 0.1)
Fuel Cons. (000 gal)	-54.4	(-0.1)
CO Emissions (000 kg)	- 0.2	-
HC Emissions (000 kg)	- 0.6	(-0.1)
NO_x Emissions (000 kg)	- 2.7	(-0.1)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	-5	-66.0
IP Operation Private	+32	+355.0
Exclusive-Ride Taxi	-13	-119.8

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-348	(-0.2)
Operating	-139	(-0.1)
Total	-487	(-0.1)

*Of these trips 29.0 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.3.7 ANNUAL IMPACTS

SETTING # 3 : 'Sun City'

YEAR 2000 Base Auto Ownership:

SCENARIO B-1 : Partial Conversion to Fixed Routes

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	2,763	2,653	-110	0	634	+634
Revenue	1,360	1,356	- 4	0	198	+198
Net Operating Cost	1,403	1,297	-106	0	436	+436
Annual Capital Cost	597	583	- 14	0	0	0
Total Net Cost	2,000	1,880	-120	0	436	+436
Total Subsidy	2,000	1,880	-120	0	+634	+634
Total Mgmt. Fee				0	+198	+198

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-69.4	(-8.1)	Revenue ($000)	-9.4	Passengers (000)	
Revenue ($000)	-199.6	(-8.1)			Opportunity Cost Savings ($000)	
Profit ($000)	- 36.2	(-31.2)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-38
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	- 9

VI. LOCAL GOVERNMENT IMPACTS

COST ($000)	BEFORE	AFTER	CHANGE
Operating Subsidy	701.5	965.5	+264.0
Capital Subsidy	119.4	116.6	- 2.8
Total Subsidy	820.9	1,082.1	+261.2
Parking Revenue (Change Only)	-	-	- 9.0

VII. FEDERAL GOVERNMENT IMPACTS

BEFORE	AFTER	CHANGE
701.5	965.5	+264.0
477.6	466.4	- 11.2
1,179.1	1,431.9	+252.8
-	-	-

TABLE A.3.8 ANNUAL IMPACTS

SETTING # 3 : 'Sun City'

YEAR 2000 Reduced Auto Ownership:

SCENARIO B-2 : Partial Conversion to Fixed Routes

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)**		CHANGE IN CONSUMER SURPLUS ($000)**		
	NEW TRANSIT TRIPS	INDUCED TRIPS	WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	120.6	36.9	+56.4	+12.5	+68.9
Transportation Handicapped			-	-	-
Persons from 0-car H.H.'s	153.6	47.0	+238.7	+12.1	+250.8
All Persons	701.3 *	92.8	+705.2	+16.4	+721.6

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	25	35	+ 8.9
Transportation Handicapped	16	16	0
Others	65	63	+50.1
Persons from 0-car H.H.'s	65	74	+ 2.7

TEMPORAL COVERAGE

SERVICE DAYS Mon - Fri.

SERVICE HOURS 5 am - 7 pm

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+978	(+30.9)
Taxi VMT (000 mi)	-399	(-14.4)
Auto VMT (000 mi)	-3,363	(- 0.2)
Total VMT (000 mi)	-2,784	(- 0.2)
Fuel Cons. (000 gal)	- 57.5	(- 0.1)
CO Emissions (000 kg)	+0.1	-
HC Emissions (000 kg)	-0.6	(- 0.1)
NO_x Emissions (000 kg)	-3.2	(- 0.2)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	-5	-66.0
IP Operation Private	+43	+483.0
Exclusive-Ride Taxi	-16	-142.0

AUTOMOBILE EXPENDITURE
($000)

	CHANGE	(PCT. CHANGE)
Capital	-441	(-0.2)
Operating	-247	(-0.1)
Total	-688	(-0.2)

*Of these trips 43.1 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.3.8 ANNUAL IMPACTS

SETTING # 3 : 'Sun City'

YEAR 2000

SCENARIO B-2 : Reduced Auto Ownership: Partial Conversion to Fixed Routes

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	2,763	2,653	-110	0	860	+860
Revenue	1,536	1,513	- 23	0	303	+303
Net Operating Cost	1,227	1,140	- 87	0	557	+557
Annual Capital Cost	597	583	- 14	0		
Total Net Cost	1,824	1,723	-101	0	557	+557
Total Subsidy	1,824	1,723	-101	0	860	+860
Total Mgmt. Fee				0	303	+303

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-82.5	(-9.6)	Revenue ($000)	-9.3	Passengers (000)	
Revenue ($000)	-237.3	(-9.7)			Opportunity Cost Savings ($000)	
Profit ($000)	- 42.9	(-37.0)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-37
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-8.8

VI. LOCAL GOVERNMENT IMPACTS

COST ($000)	BEFORE	AFTER	CHANGE
Operating Subsidy	613.5	1000.0	+386.5
Capital Subsidy	119.4	116.6	-2.8
Total Subsidy	732.9	1116.6	+383.7
Parking Revenue (Change Only)	-	-	-8.8

VII. FEDERAL GOVERNMENT IMPACTS

BEFORE	AFTER	CHANGE
613.5	1000.0	+386.5
477.6	466.4	- 11.2
1091.1	1466.4	+375.3
-	-	-

SETTING 4: 'MID-AMERICAN CITY'

Year 1980 Results

Year 2000 Results

TABLE A.4.1 ANNUAL IMPACTS

SETTING # 4 : 'Mid-American City'

YEAR 1980

SCENARIO IPA : Limited Peak, Expanded Off-Peak 25¢ Fare

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TRANSIT TRIPS	MOBILITY (000 trips)** INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	174.9	66.3	+4.3	+41.1	+45.4
Transportation Handicapped	110.4	33.6	--	--	--
Persons from 0-car H.H.'s	223.9	84.8	+55.7	+29.1	+84.8
All Persons	761.0 *	166.2	+149.6	+75.2	+224.8

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% Covered Before	% Covered After Peak	% Covered After Off-Pk	Change in Pop (000 persons) Peak	Change in Pop (000 persons) Off-Pk
Elderly	30	41	58	+3.3	+8.5
Transportation Handicapped	15	100	100	+9.2	+9.2
Others	60	76	93	+49.4	+99.5
Persons from 0-car H.H.'s	65	73	83	+3.8	+8.7

TEMPORAL COVERAGE

SERVICE DAYS Mon-Fri

SERVICE HOURS Peak: 6-9AM, 3:30-6:30PM
Off-Peak: 9AM-3:30PM

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+1115	(+61.9)
Taxi VMT (000 mi)	-462	(-20.8)
Auto VMT (000 mi)	-748	(-0.1)
Total VMT (000 mi)	-95	(-0.01)
Fuel Cons (000 gal)	+48.6	(+0.1)
CO Emissions (000 kg)	+30.7	(+0.1)
HC Emissions (000 kg)	+4.2	(+0.1)
NO_x Emissions (000 kg)	+1.3	(+0.1)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+62	+675.6
IP Operation Private	+18	+114.0
Exclusive-Ride Taxi	-19	-148.3

AUTOMOBILE EXPENDITURE
($000)

	CHANGE	(PCT. CHANGE)
Capital	-355	(-0.4)
Operating	-14	(-0.01)
Total	-369	(-0.2)

*Of these trips 37.6 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.4.1 ANNUAL IMPACTS

SETTING # 4 : 'Mid-American City'

YEAR 1980

SCENARIO IPA : Limited Peak, Expanded Off-Peak; 25¢ Fare

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	2,100	2,951	+851	0	289	+289
Revenue	625	832	+207	0	0	0
Net Operating Cost	1,475	2,119	+644	0	289	+289
Annual Capital Cost	391	664	+273	0	0	0
Total Net Cost	1,866	2,783	+917	0	289	+289
Total Subsidy	1,866	2,783	+917	0	289	+289
Total Mgmt. Fee				0	29	+29

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-138.6	(-19.5)	Revenue ($000)	-22.5	Passengers (000)	-9.7
Revenue ($000)	-247.2	(-19.8)			Opportunity Cost Savings ($000)	+29
Profit ($000)	-44.2	(-74.5)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-162
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-39

VI. LOCAL GOVERNMENT IMPACTS / VII. FEDERAL GOVERNMENT IMPACTS

COST ($000)	LOCAL BEFORE	LOCAL AFTER	LOCAL CHANGE	FEDERAL BEFORE	FEDERAL AFTER	FEDERAL CHANGE
Operating Subsidy	737.5	1204.0	+466.5	737.5	1204.0	+466.5
Capital Subsidy	78.2	132.8	+54.6	312.8	531.2	+218.4
Total Subsidy	815.7	1336.8	+521.1	1050.3	1735.2	+684.9
Parking Revenue (Change Only)	-	-	-22.5	-	-	-

TABLE A.4.2 ANNUAL IMPACTS

SETTING # 4 : 'Mid-American City'
YEAR 1980
SCENARIO IPB : Limited Peak, Expanded Off-Peak, 75¢ Fare

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TRANSIT TRIPS	INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	147.1	52.7	+4.3	+10.0	+14.3
Transportation Handicapped	110.4	31.6	--	--	--
Persons from 0-car H.H.'s	206.8	74.0	+55.7	+10.3	+66.0
All Persons	675.2 *	146.8	+149.6	+18.0	+167.6

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% Covered Before	% Covered After Peak	% Covered After Off-Pk	Change in Pop (000 persons) Peak	Change in Pop (000 persons) Off-Pk
Elderly	30	41	58	+3.3	+8.5
Transportation Handicapped	15	100	100	+9.2	+9.2
Others	60	76	93	+49.4	+99.5
Persons from 0-car H.H.'s	65	73	83	+3.8	+8.7

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+1115	(+61.9)
Taxi VMT (000 mi)	-378	(-17.0)
Auto VMT (000 mi)	-651	(-0.1)
Total VMT (000 mi)	+86.	(+0.01)
Fuel Cons. (000 gal)	+62.7	(+0.2)
CO Emissions (000 kg)	+41.0	(+0.1)
HC Emissions (000 kg)	+5.7	(+0.1)
NO_x Emissions (000 kg)	+1.9	(+0.1)

TEMPORAL COVERAGE

SERVICE DAYS Mon-Fri

SERVICE HOURS Peak: 6-9AM, 3:30-6:30PM; Off-Peak: 9AM-3:30PM

EMPLOYMENT Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+62	+675.6
IP Operation Private	+18	+144.0
Exclusive-Ride Taxi	-9	-131.0

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-287	(-0.3)
Operating	-12	(-.01)
Total	-299	(-0.2)

*Of these trips 33.2 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.4.2 ANNUAL IMPACTS

SETTING # 4 : 'Mid-American City

YEAR 1980

SCENARIO IPB : Limited Peak, Expanded Off-Peak: 75¢ Fare

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	2,100	2,951	+851	0	289	+289
Revenue	625	923	+298	0	0	0
Net Operating Cost	1,475	2,028	+553	0	289	+289
Annual Capital Cost	391	664	+273	0	0	0
Total Net Cost	1,866	2,692	+826	0	289	+289
Total Subsidy	1,866	2,692	+826	0	289	+289
Total Mgmt. Fee				0	29	+29

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-122.4	(-17.2)	Revenue ($000)	-19.5	Passengers (000)	-9.0
Revenue ($000)	-218.4	(-17.5)			Opportunity Cost Savings ($000)	+27
Profit ($000)	-39.1	(-66.0)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-141
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-34

VI. LOCAL GOVERNMENT IMPACTS / VII. FEDERAL GOVERNMENT IMPACTS

COST ($000)	VI. BEFORE	VI. AFTER	VI. CHANGE	VII. BEFORE	VII. AFTER	VII. CHANGE
Operating Subsidy	737.5	1,158.5	+421.0	737.5	1,158.5	421.0
Capital Subsidy	78.2	132.8	+54.6	312.8	531.2	218.4
Total Subsidy	815.7	1,291.3	+475.6	1,050.3	1,689.7	639.4
Parking Revenue (Change Only)	-	-	-19.5	-	-	-

TABLE A.4.3 ANNUAL IMPACTS

SETTING # 4 : 'Mid-American City'
YEAR 1980
SCENARIO IPC : Limited Peak, Expanded Off-Peak: $1.25 Fare

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TRANSIT TRIPS	INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	138.8	49.2	+4.3	-2.6	+1.7
Transportation Handicapped	110.4	31.4	--	--	--
Persons from 0-car H.H.'s	119.8	70.8	+55.7	+2.9	+58.6
All Persons	634.5 *	137.8	+149.6	-5.0	+144.6

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% Covered Before	After Peak	After Off-Pk	Change in Pop (000 persons) Peak	Off-Pk
Elderly	30	41	58	+3.3	+8.5
Transportation Handicapped	15	100	100	+9.2	+9.2
Others	60	76	93	+49.4	+99.5
Persons from 0-car H.H.'s	65	73	83	+3.8	+8.7

TEMPORAL COVERAGE

SERVICE DAYS Mon-Fri

SERVICE HOURS Peak: 6-9AM, 3:30-6:30PM Off-Peak: 9AM-3:30PM

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+1,115	(+61.9)
Taxi VMT (000 mi)	-378	(-17.0)
Auto VMT (000 mi)	-570	(-0.1)
Total VMT (000 mi)	+167	(+0.02)
Fuel Cons. (000 gal)	+67.5	(+0.2)
CO Emissions (000 kg)	+44.6	(+0.1)
HC Emissions (000 kg)	+6.1	(+0.2)
NO_x Emissions (000 kg)	+2.2	(+0.1)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+62	+675.6
IP Operation Private	+18	+144.0
Exclusive-Ride Taxi	-8	-124.5

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-147	(-0.2)
Operating	-6	(-0.01)
Total	-153	(-0.1)

*Of these trips 31.6 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.4.3 ANNUAL IMPACTS

SETTING # 4 : 'Mid-American City'

YEAR 1980

SCENARIO IPC : Limited Peak, Expanded Off-Peak: $1.25 Fare

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	2,100	2,951	+851	0	289	+289
Revenue	625	981	+356	0	0	0
Net Operating Cost	1,475	1,970	+495	0	289	+289
Annual Capital Cost	391	664	+273	0	0	0
Total Net Cost	1,866	2,634	+768	0	289	+289
Total Subsidy	1,866	2,634	+768	0	289	+289
Total Mgmt. Fee				0	29	+29

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-116.3	(-16.4)	Revenue ($000)	-18.5	Passengers (000)	-8.67
Revenue ($000)	-207.5	(-16.6)			Opportunity Cost Savings ($000)	+26
Profit ($000)	-37.1	(-62.2)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-133
Annual Opportunity Cost Savings ($000)	--
Annual Space Rental Cost ($000)	-32

VI. LOCAL GOVERNMENT IMPACTS

COST ($000)	BEFORE	AFTER	CHANGE
Operating Subsidy	737.5	1129.5	+392.0
Capital Subsidy	78.2	132.8	+54.6
Total Subsidy	815.7	1262.3	+446.6
Parking Revenue (Change Only)	-	-	-18.5

VII. FEDERAL GOVERNMENT IMPACTS

	BEFORE	AFTER	CHANGE
Operating Subsidy	737.5	1,129.5	+392.0
Capital Subsidy	312.8	531.2	+218.4
Total Subsidy	1050.3	1,660.7	+610.4
Parking Revenue (Change Only)	-	-	-

TABLE A.4.4 ANNUAL IMPACTS

SETTING # 4 : 'Mid-American City'
YEAR 1980
SCENARIO IPD : Complete Off-Peak Coverage: 75¢ Fare

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TRANSIT TRIPS	INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	247.1	72.8	+4.3	+73.6	+77.9
Transportation Handicapped	110.4	11.6	--	--	--
Persons from 0-car H.H.'s	266.0	85.6	+55.7	+49.7	+105.4
All Persons	875.1 *	171.7	+149.6	+118.1	+267.8

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% Covered Before	After Peak	After Off-Pk	Change in Pop (000 persons) Peak	Off-Pk
Elderly	30	41	89	+3.3	+17.0
Transportation Handicapped	15	100	100	+9.2	+9.2
Others	60	76	98	+49.4	+114.6
Persons from 0-car H.H.'s	65	73	96	+3.8	+12.2

TEMPORAL COVERAGE

SERVICE DAYS Mon-Fri

SERVICE HOURS Peak: 6-9AM, 3:30-6:30PM; Off-Peak: 9AM-3:30PM

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+1595	(+88.6)
Taxi VMT (000 mi)	-504	(-22.6)
Auto VMT (000 mi)	-977	(-0.1)
Total VMT (000 mi)	+114	(+0.02)
Fuel Cons. (000 gal)	+83.7	(+0.2)
CO Emissions (000 kg)	+71.5	(+0.2)
HC Emissions (000 kg)	+7.7	(+0.2)
NO_x Emissions (000 kg)	+1.3	(+0.1)

EMPLOYMENT Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+93	+1002.7
IP Operation Private	+18	+144.0
Exclusive-Ride Taxi	-20	-162.2

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-710	(-0.9)
Operating	-28	(-0.03)
Total	-738	(-0.4)

*Of these trips 42.9 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.4.4 ANNUAL IMPACTS

SETTING # 4 : 'Mid-American City'

YEAR 1980

SCENARIO IPD : Complete Off-Peak Coverage: 75¢ Fare

III. IP OPERATOR IMPACTS ($000)	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	2,100	3,351	+1,251	0	289	+289
Revenue	625	1,021	+396	0	0	0
Net Operating Cost	1,475	2,330	+855	0	289	+289
Annual Capital Cost	391	813	+422	0	0	0
Total Net Cost	1,866	3,143	+1,277	0	289	+289
Total Subsidy	1,866	3,143	+1,277	0	289	+289
Total Mgmt. Fee				0	29	+29

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-151.6	(-21.3)	Revenue ($000)	-21.5	Passengers (000)	-10.3
Revenue ($000)	-270.4	(-21.7)			Opportunity Cost Savings ($000)	+31.0
Profit ($000)	-48.4	(-81.6)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-208
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-50

VI. LOCAL GOVERNMENT IMPACTS				VII. FEDERAL GOVERNMENT IMPACTS		
COST ($000)	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Subsidy	737.5	1309.5	+572.0	737.5	1309.5	+572.0
Capital Subsidy	78.2	162.6	+84.4	312.8	650.4	+337.6
Total Subsidy	815.7	1472.1	+656.4	1050.3	1959.9	+909.6
Parking Revenue (Change Only)	-	-	-21.5	-	-	-

TABLE A.4.5 ANNUAL IMPACTS

SETTING # 4 : 'Mid-American City'

YEAR 1980

SCENARIO : Extended Fixed Route Bus Alternative

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)**		CHANGE IN CONSUMER SURPLUS ($000)**		
	NEW TRANSIT TRIPS	INDUCED TRIPS	WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	+111.9	33.1	+3.9	+155.1	+159.0
Transportation Handicapped	+11.5	3.5	--	--	--
Persons from 0-car H.H.'s	+366.0	108.4	+51.7	+124.7	+176.4
All Persons	+1143.6 *	171.4	+103.5	+336.0	+439.5

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	30	40	+3.1
Transportation Handicapped	15	21	+.5
Others	60	80	+60.0
Persons from 0-car H.H.'s	65	80	+8.7

TEMPORAL COVERAGE

SERVICE DAYS Mon-Fri

SERVICE HOURS 6AM-6:30PM

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+1756	(+97.6)
Taxi VMT (000 mi)	-420	(-18.9)
Auto VMT (000 mi)	-2040	(-0.3)
Total VMT (000 mi)	-704	(-0.1)
Fuel Cons. (000 gal)	+130.9	(+0.3)
CO Emissions (000 kg)	+101.9	(-0.3)
HC Emissions (000 kg)	+9.9	(+0.2)
NO_x Emissions (000 kg)	+16.7	(+0.8)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+84	+923.9
IP Operation Private	--	--
Exclusive-Ride Taxi	-16	-103.0

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-163.6	(-0.2)
Operating	-6.5	(-0.01)
Total	-170.1	(-0.1)

*Of these trips 78.0 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.4.5 ANNUAL IMPACTS

SETTING # 4 : 'Mid-American City'

YEAR 1980

SCENARIO : Extended Fixed Route Bus Alternative

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	2100	3891	+1791			
Revenue	625	1002	+377			
Net Operating Cost	1475	2889	+1414			
Annual Capital Cost	391	775	+384			
Total Net Cost	1866	3664	+1798			
Total Subsidy	1866	3664	+1798			
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-137.2	(-19.6)	Revenue ($000)	--	Passengers (000)	--
Revenue($000)	-244.7	(-19.6)			Opportunity Cost Savings ($000)	--
Profit($000)	-43.8	(-73.9)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	--
Annual Opportunity Cost Savings ($000)	--
Annual Space Rental Cost ($000)	--

VI. LOCAL GOVERNMENT IMPACTS / VII. FEDERAL GOVERNMENT IMPACTS

COST ($000)	VI. BEFORE	VI. AFTER	VI. CHANGE	VII. BEFORE	VII. AFTER	VII. CHANGE
Operating Subsidy	737.5	1444.5	+707.0	737.5	1444.5	+707.0
Capital Subsidy	78.2	155.0	+76.8	312.8	620.0	+307.2
Total Subsidy	815.7	1599.5	+783.8	1050.3	2064.5	+1014.2
Parking Revenue (Change Only)	-	-		-	-	-

TABLE A.4.6 ANNUAL IMPACTS

SETTING # 4 : 'Mid-American City'

YEAR 1980

SCENARIO : Extended Exclusive-Ride Taxi Alternative

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TAXI PASSENGERS	INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	205.8	7.1	+20.8	+102.2	+123.0
Transportation Handicapped	6.0	.2	--	--	--
Persons from 0-car H.H.'s	178.8	6.2	+93.4	+62.5	+155.9
All Persons	541.7 *	27.1	+188.1	+190.8	+378.9

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	Coverage (000 Pers) BEFORE	AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	30.5	30.5	0
Transportation Handicapped	9.2	9.2	0
Others	270.4	270.4	0
Persons from 0-car H.H.'s	44.1	44.1	0

TEMPORAL COVERAGE

SERVICE DAYS 7 days/week

SERVICE HOURS 24 hour/day

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	0	(0)
Taxi VMT (000 mi)	+2448	(+110)
Auto VMT (000 mi)	-575	(-0.1)
Total VMT (000 mi)	+1873	(+0.3)
Fuel Cons. (000 gal)	+210.9	(+0.5)
CO Emissions (000 kg)	+145.5	(+0.5)
HC Emissions (000 kg)	+21.0	(+0.5)
NO_x Emissions (000 kg)	+8.6	(+0.4)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	--	--
IP Operation Private	--	--
Exclusive-Ride Taxi	+74	+583.8

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	0	(0)
Operating	0	(0)
Total	0	(0)

*Of these trips 35.1 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.4.6 ANNUAL IMPACTS

SETTING # 4 : 'Mid-American City'

YEAR 1980

SCENARIO Extended Exclusive-Ride Taxi Alternative

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	2100	2100	0			
Revenue	625	585	-40			
Net Operating Cost	1475	1515	+40			
Annual Capital Cost	391	391	0			
Total Net Cost	1866	1906	+40			
Total Subsidy	1866	1906	+40			
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)	
Impact	CHANGE	(PCT. CHANGE)
Passengers (000)	+541.7	(+77.5)
Revenue($000)	972.0	(+66.3)
Profit($000)	45.0	(+61.6)

VI. LOCAL GOVERNMENT IMPACTS

COST ($000)	BEFORE	AFTER	CHANGE
Operating Subsidy	737.5	757.5	+20
Capital Subsidy	78.2	78.2	0
Total Subsidy	815.7	835.7	+20
Parking Revenue (Change Only)	-	-	

VII. FEDERAL GOVERNMENT IMPACTS

	BEFORE	AFTER	CHANGE
Operating Subsidy	737.5	757.5	+20
Capital Subsidy	312.8	312.8	0
Total Subsidy	1050.3	1070.3	+20
Parking Revenue (Change Only)	-	-	-

TABLE A.4.7 ANNUAL IMPACTS

SETTING # 4 : 'Mid-American City'
YEAR 2000
SCENARIO A-1 : Base Auto Ownership

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)**		CHANGE IN CONSUMER SURPLUS ($000)**		
	NEW TRANSIT TRIPS	INDUCED TRIPS	WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	180.7	+44.4	+13.4	-108.1	-94.7
Transportation Handicapped	116.7	+23.0	--	--	--
Persons from 0-car H.H.'s	274.8	+73.3	+102.2	-50.2	+52.0
All Persons	870.0 *	+141.3	+245.5	-195.6	+49.9

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% Covered Before	% Covered After Peak	% Covered After Off-Pk	Change in Pop (000 persons) Peak	Change in Pop (000 persons) Off-Pk
Elderly	30	41	89	+4.5	+23.9
Transportation Handicapped	15	100	100	+9.1	+9.1
Others	60	76	93	+55.0	+113.4
Persons from 0-car H.H.'s	65	73	96	+3.4	+13.3

TEMPORAL COVERAGE

SERVICE DAYS Mon-Fri

SERVICE HOURS Peak: 6-9AM, 3:30-6:30PM
Off-Peak: 9AM-3:30PM

VMT/FUEL/EMISSIONS

IMPACT	CHANGE (PCT. CHANGE)
Transit VMT (000 mi)	+1319 (+73.3)
Taxi VMT (000 mi)	-479 (-19.4)
Auto VMT (000 mi)	-2805 (-0.3)
Total VMT (000 mi)	-1965 (-0.2)
Fuel Cons. (000 gal)	-35.1 (-0.1)
CO Emissions (000 kg)	+5.1 (+0.1)
HC Emissions (000 kg)	+0.3 (+0.1)
NO_x Emissions (000 kg)	-1.2 (-0.1)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+94	+1028.0
IP Operation Private	+21	+210.0
Exclusive-Ride Taxi	-22	-209.8

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-524	(-0.4)
Operating	-209	(-0.1)
Total	-733	(-0.3)

*Of these trips 47.9 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.4.7 ANNUAL IMPACTS

SETTING # 4 : 'Mid-American City'

YEAR 2000

SCENARIO A-1 : Base Auto Ownership

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	2,205	3,442	+1,237	0	337	+337
Revenue	625	1,032	+407	0	0	0
Net Operating Cost	1,580	2,410	+830	0	337	+337
Annual Capital Cost	552	823	+271	0	0	0
Total Net Cost	2,132	3,233	+1,101	0	337	+337
Total Subsidy	2,132	3,233	+1,101	0	337	+337
Total Mgmt. Fee				0	34	+34

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-163.1	(-19.6)	Revenue ($000)	-21.4	Passengers (000)	--
Revenue ($000)	-349.7	(-19.6)			Opportunity Cost Savings ($000)	--
Profit ($000)	-62.6	(-73.6)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-148
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-35.4

VI. LOCAL GOVERNMENT IMPACTS

COST ($000)	BEFORE	AFTER	CHANGE
Operating Subsidy	790.0	1373.5	+583.5
Capital Subsidy	110.4	164.6	+54.2
Total Subsidy	900.4	1538.1	+637.7
Parking Revenue (Change Only)	-	-	-21.4

VII. FEDERAL GOVERNMENT IMPACTS

BEFORE	AFTER	CHANGE
790.0	1373.5	+583.5
441.6	658.4	+216.8
1,231.6	2031.9	+800.3
-	-	-

TABLE A.4.8 ANNUAL IMPACTS

SETTING # 4 : 'Mid-American City'
YEAR 2000
SCENARIO A-2 : Reduced Auto Ownership

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)**		CHANGE IN CONSUMER SURPLUS ($000)**		
	NEW TRANSIT TRIPS	INDUCED TRIPS	WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	165.7	45.7	+12.8	-108.5	-95.7
Transportation Handicapped	116.7	24.1	--	--	--
Persons from 0-car H.H.'s	385.3	101.6	+120.3	-55.7	+64.6
All Persons	982.7 *	164.4	+264.2	-251.1	+13.1

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% Covered Before	After: Peak	After: Off-Pk	Change in Pop (000 persons): Peak	Change in Pop (000 persons): Off-Pk
Elderly	30	41	89	+4.5	+23.9
Transportation Handicapped	15	100	100	+9.1	+9.1
Others	60	76	93	+55.0	+113.4
Persons from 0-car H.H.'s	65	73	96	+3.7	+14.5

TEMPORAL COVERAGE

SERVICE DAYS Mon-Fri

SERVICE HOURS Peak: 6-9AM, 3:30-6:30PM; Off-Peak: 9AM-3:30PM

VMT/FUEL/EMISSIONS

IMPACT	CHANGE (PCT. CHANGE)
Transit VMT (000 mi)	+1319 (+73.3)
Taxi VMT (000 mi)	-559 (-22.6)
Auto VMT (000 mi)	-2783 (-0.3)
Total VMT (000 mi)	-2023 (-0.2)
Fuel Cons. (000 gal)	-26.4 (-0.1)
CO Emissions (000 kg)	+4.3 (+0.1)
HC Emissions (000 kg)	+0.1 (+0.03)
NO_x Emissions (000 kg)	-1.3 (-0.1)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+94	+1028.0
IP Operation Private	+21	+210.0
Exclusive-Ride Taxi	-25	-244.2

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-484	(-0.4)
Operating	-272	(-0.1)
Total	-756	(-0.3)

*Of these trips 55.7 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.4.8 ANNUAL IMPACTS

SETTING # 4 : 'Mid-American City'

YEAR 2000

SCENARIO A-2 : Reduced Auto Ownership

III. IP OPERATOR IMPACTS ($000)	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	2,205	3,442	+1,237	0	337	+337
Revenue	625	1,159	+534	0	0	0
Net Operating Cost	1,580	2,283	+703	0	337	+337
Annual Capital Cost	552	823	+271	0	0	0
Total Net Cost	2,132	3,106	+974	0	337	+337
Total Subsidy	2,132	3,106	+974	0	337	+337
Total Mgmt. Fee				0	34	+34

IV. LOCAL COMPETING PROVIDER IMPACTS	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-189.8	(-22.8)	Revenue ($000)	-25	Passengers (000)	--
Revenue ($000)	-406.9	(-22.8)			Opportunity Cost Savings ($000)	--
Profit ($000)	-72.8	(-85.7)				

V. MAJOR EMPLOYER IMPACTS	
IMPACT	CHANGE
Parking Spaces Required/Subsidized	-175
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-42

VI. LOCAL GOVERNMENT IMPACTS COST ($000)	BEFORE	AFTER	CHANGE	VII. FEDERAL GOVERNMENT IMPACTS BEFORE	AFTER	CHANGE
Operating Subsidy	790.0	1310.0	+520.0	790.0	1310.0	+520.0
Capital Subsidy	110.4	164.6	+54.2	441.6	658.4	+216.8
Total Subsidy	900.4	1474.6	+574.2	1,231.6	1968.4	+736.8
Parking Revenue (Change Only)	-	-	-25.0	-	-	-

SETTING 5: 'MILL TOWN'

Year 1980 Results

Table A.5.1 - IP Scenario A

Table A.5.2 - IP Scenario B

Table A.5.3 - Extended Fixed-Route Bus Scenario

Table A.5.4 - Extended Exclusive Ride Taxi Scenario

Year 2000 Results

Table A.5.5 - Scenario A-1: Base Auto Ownership

Table A.5.6 - Scenario A-2: Reduced Auto Ownership

TABLE A.5.1 ANNUAL IMPACTS

SETTING # 5 : 'Mill Town'

YEAR 1980

SCENARIO IPA : Cycled Service

I. USER IMPACTS	MOBILITY (000 trips)**		CHANGE IN CONSUMER SURPLUS ($000)**		
MARKET GROUP	NEW TRANSIT TRIPS	INDUCED TRIPS	WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	88.6	26.4	+1.6	+2.3	+3.9
Transportation Handicapped	-	-	-	-	-
Persons from 0-car H.H.'s	51.6	14.0	+13.8	+1.3	+15.1
All Persons	143.0 *	37.0	+32.3	+0.8	+33.1

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	56	62	+1.3
Transportation Handicapped	100	100	-
Others	75	83	+8.5
Persons from 0-car H.H.'s	78	81	+1.0

TEMPORAL COVERAGE

SERVICE DAYS Mon. - Fri.

SERVICE HOURS 6 am - 6:30 pm

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+204	(+12.4)
Taxi VMT (000 mi)	-126	(- 5.2)
Auto VMT (000 mi)	- 68	(-0.04)
Total VMT (000 mi)	+ 10	(+0.01)
Fuel Cons. (000 gal)	+7.5	(+0 .1)
CO Emissions (000 kg)	+8.2	(+0.1)
HC Emissions (000 kg)	+0.7	(+0.1)
NO_x Emissions (000 kg)	0	-

EMPLOYMENT

Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+13	+131.1
IP Operation Private		
Exclusive-Ride Taxi	- 6	- 37.3

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-49	(-0.2)
Operating	- 2	(-0.01)
Total	-51	(-0.1)

*Of these trips 4.3 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.5.1 ANNUAL IMPACTS

SETTING # 5 : 'Mill Town'

YEAR 1980

SCENARIO IPA : Cycled Service

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	1,581	1,753	+172			
Revenue	552	578	+ 26			
Net Operating Cost	1,029	1,175	+146			
Annual Capital Cost	328	356	+ 28			
Total Net Cost	1,357	1,531	+174			
Total Subsidy	1,357	1,531	+174			
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-42.4	(-6.3)	Revenue ($000)	-1.3	Passengers (000)	
Revenue ($000)	-60.1	(-6.3)			Opportunity Cost Savings ($000)	
Profit ($000)	-10.7	(-23.6)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-17
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-1.6

VI. LOCAL GOVERNMENT IMPACTS

COST ($000)	BEFORE	AFTER	CHANGE
Operating Subsidy	514.5	587.5	+73.0
Capital Subsidy	65.6	71.2	+ 5.6
Total Subsidy	580.1	658.7	+78.6
Parking Revenue (Change Only)	-	-	- 1.3

VII. FEDERAL GOVERNMENT IMPACTS

	BEFORE	AFTER	CHANGE
Operating Subsidy	514.5	587.5	+73.0
Capital Subsidy	262.4	284.8	+22.4
Total Subsidy	776.9	872.3	+95.4
Parking Revenue (Change Only)	-	-	-

TABLE A.5.2 ANNUAL IMPACTS

SETTING # 5 : 'Mill Town'

YEAR 1980

SCENARIO IPB : Many-to-Many Service

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TRANSIT TRIPS	INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	58.7	17.5	+0.8	+4.0	+4.8
Transportation Handicapped	-	-	-	-	-
Persons from 0-car H.H.'s	25.5	7.6	+4.8	+1.2	+6.0
All Persons	72.3 *	22.4	+10.6	+2.4	+13.0

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	56	61	+.8
Transportation Handicapped	100	100	-
Others	75	80	+4.8
Persons from 0-car H.H.'s	78	80	+ .6

TEMPORAL COVERAGE

SERVICE DAYS Mon. - Fri.

SERVICE HOURS 6 am - 6:30 pm

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+116	(+7.0)
Taxi VMT (000 mi)	-72	(-3.0)
Auto VMT (000 mi)	-34	(-0.02)
Total VMT (000 mi)	+10	(+0.01)
Fuel Cons. (000 gal)	+3.9	(+0.04)
CO Emissions (000 kg)	+6.0	(+0.1)
HC Emissions (000 kg)	+0.4	(+0.04)
NO_x Emissions (000 kg)	-0.1	(-0.02)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+8	+97.0
IP Operation Private		
Exclusive-Ride Taxi	-3	-22.5

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-22	(-0.1)
Operating	- 1	-
Total	-23	(-0.04)

*Of these trips 1.8 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.5.2 ANNUAL IMPACTS

SETTING # 5 : 'Mill Town'

YEAR 1980

SCENARIO IPB : Many-to-Many Service

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	1,581	1,702	+121			
Revenue	522	559	+ 7			
Net Operating Cost	1,029	1,143	+114			
Annual Capital Cost	328	346	+ 18			
Total Net Cost	1,357	1,489	+132			
Total Subsidy	1,357	1,489	+132			
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-20.7	(-2.9)	Revenue ($000)	-0.6	Passengers (000)	-0.5
Revenue ($000)	-27.6	(-2.9)			Opportunity Cost Savings ($000)	+1.6
Profit ($000)	- 4.9	(-10.8)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-8
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-0.8

VI. LOCAL GOVERNMENT IMPACTS / VII. FEDERAL GOVERNMENT IMPACTS

COST ($000)	VI. BEFORE	VI. AFTER	VI. CHANGE	VII. BEFORE	VII. AFTER	VII. CHANGE
Operating Subsidy	514.5	571.5	+57.0	514.5	571.5	+57.0
Capital Subsidy	65.6	69.2	+ 3.6	262.4	276.8	+14.4
Total Subsidy	580.1	640.7	+60.6	776.9	848.3	+71.4
Parking Revenue (Change Only)	-	-	- 0.6	-	-	-

TABLE A.5.3 ANNUAL IMPACTS

SETTING # 5 : 'Mill Town'
YEAR 1980
SCENARIO : Extended Fixed Route Bus Alternative

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)**		CHANGE IN CONSUMER SURPLUS ($000)**		
	NEW TRANSIT TRIPS	INDUCED TRIPS	WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	+36.4	5.3	+0.4	+23.0	+23.4
Transportation Handicapped	--	--	--	--	--
Persons from 0-car H.H.'s	+30.9	4.5	+4.8	+21.1	+25.9
All Persons	+61.5 *	10.5	+9.3	+29.2	+38.5

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	56	57	+0.2
Transportation Handicapped	100	100	--
Others	75	77	+2.4
Persons from 0-car H.H.'s	78	79	+0.4

TEMPORAL COVERAGE

SERVICE DAYS Mon. - Fri.

SERVICE HOURS 6 am - 6:30 pm

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+133	(+8.1)
Taxi VMT (000 mi)	- 42	(-1.7)
Auto VMT (000 mi)	- 56	(-0.04)
Total VMT (000 mi)	+ 35	(+0.02)
Fuel Cons. (000 gal)	+ 10.3	(+0.1)
CO Emissions (000 kg)	+ 10.5	(+0.1)
HC Emissions (000 kg)	+ 1.5	(+0.2)
NO_x Emissions (000 kg)	+ 0.7	(+0.1)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+8	+92.0
IP Operation Private	-	--
Exclusive-Ride Taxi	-2	-14.9

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-47	(-0.2)
Operating	- 2	(-0.01)
Total	-49	(-0.1)

*Of these trips 3.1 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.5.3 ANNUAL IMPACTS

SETTING # 5 : 'Mill Town'

YEAR 1980

SCENARIO : Extended Fixed Route Bus Alternative

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	1,581	1,710	+129			
Revenue	552	560	+ 8			
Net Operating Cost	1,029	1,150	+121			
Annual Capital Cost	328	373	+ 45			
Total Net Cost	1,357	1,523	+166			
Total Subsidy	1,357	1,523	+166			
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-11.7	(-1.7)	Revenue ($000)	--	Passengers (000)	--
Revenue ($000)	-16.5	(-1.7)			Opportunity Cost Savings ($000)	
Profit ($000)	- 3.0	(-6.6)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	--
Annual Opportunity Cost Savings ($000)	--
Annual Space Rental Cost ($000)	--

VI. LOCAL GOVERNMENT IMPACTS / VII. FEDERAL GOVERNMENT IMPACTS

COST ($000)	VI. BEFORE	VI. AFTER	VI. CHANGE	VII. BEFORE	VII. AFTER	VII. CHANGE
Operating Subsidy	514.5	575.0	+60.5	514.5	575.0	+60.5
Capital Subsidy	65.6	74.6	+ 9.0	262.4	298.4	+36.0
Total Subsidy	580.1	649.6	+69.5	776.9	873.4	+96.5
Parking Revenue (Change Only)	-	-		-	-	-

TABLE A.5.4 ANNUAL IMPACTS

SETTING # 5 : 'Mill Town'

YEAR 1980

SCENARIO : Extended Exclusive-Ride Taxi Alternative

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TAXI PASSENGERS	INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	13.7	6.9	+ .3	+3.3	+3.6
Transportation Handicapped	--	--	--	--	--
Persons from 0-car H.H.'s	13.4	4.1	+2.9	+2.2	+5.1
All Persons	34.7 *	10.3	+6.0	+5.0	+11.0

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	Coverage (000 Pers) BEFORE	AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	16.0	16.0	0
Transportation Handicapped	4.1	4.1	0
Others	79.4	79.4	0
Persons from 0-car H.H.'s	30.0	30.0	0

TEMPORAL COVERAGE

SERVICE DAYS Mon. - Sat.

SERVICE HOURS 6 am - 6:30 pm

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	0	0
Taxi VMT (000 mi)	+97	(+4.0)
Auto VMT (000 mi)	-36	(-0.02)
Total VMT (000 mi)	+61	(+0.04)
Fuel Cons. (000 gal)	+7.6	(+0.1)
CO Emissions (000 kg)	+5.2	(+0.1)
HC Emissions (000 kg)	+0.8	(+0.1)
NO_x Emissions (000 kg)	+0.3	(+0.1)

EMPLOYMENT

Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	--	--
IP Operation Private	--	--
Exclusive-Ride Taxi	+6	+45.0

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-5.6	(-.02)
Operating	-0.2	--
Total	-5.8	(-0.01)

*Of these trips 1.6 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.5.4 ANNUAL IMPACTS

SETTING # 5 : 'Mill Town'

YEAR 1980

SCENARIO Extended Exclusive-Ride Taxi Alternative

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	1,581	1,581.0	0			
Revenue	552	558.3	+6.3			
Net Operating Cost	1,029	1,022.7	-6.3			
Annual Capital Cost	328	355.3	+7.3			
Total Net Cost	1,357	1,358.0	+1.0			
Total Subsidy	1,357	1,358.0	+1.0		48.9	+48.9
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)	
Impact	CHANGE	(PCT. CHANGE)
Passengers (000)	+34.7	(+5.2)
Revenue ($000)	+55.0	(+5.8)
Profit ($000)	+ 2.6	(+5.7)

VI. LOCAL GOVERNMENT IMPACTS

COST ($000)	BEFORE	AFTER	CHANGE
Operating Subsidy	514.5	535.8	+21.3
Capital Subsidy	65.6	67.1	+ 1.5
Total Subsidy	580.1	602.9	+22.8
Parking Revenue (Change Only)	-	-	

VII. FEDERAL GOVERNMENT IMPACTS

	BEFORE	AFTER	CHANGE
Operating Subsidy	514.5	535.8	+21.3
Capital Subsidy	262.4	268.2	+ 5.8
Total Subsidy	776.9	804.0	+27.1
Parking Revenue (Change Only)	-	-	-

TABLE A.5.5 ANNUAL IMPACTS

SETTING # 5 : 'Mill Town'
YEAR 2000 Checkpoint Cycled Service;
SCENARIO A-1 : Base Auto Ownership

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TRANSIT TRIPS	INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	107.4	+32.0	+3.5	+3.5	+7.0
Transportation Handicapped	-	-	-	-	-
Persons from 0-car H.H.'s	54.9	+14.9	+14.4	+1.0	+15.4
All Persons	174.1 *	+41.5	+34.7	+1.5	+36.2

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	55	63	+2.6
Transportation Handicapped	100	100	-
Others	72	85	+13.2
Persons from 0-car H.H.'s	77	82	+ 1.2

TEMPORAL COVERAGE

SERVICE DAYS Mon. - Fri.

SERVICE HOURS 6 am - 6:30 pm

VMT/FUEL/EMISSIONS

IMPACT	CHANGE (PCT. CHANGE)
Transit VMT (000 mi)	+257 (+15.6)
Taxi VMT (000 mi)	-160 (- 6.9)
Auto VMT (000 mi)	-488 (- 0.2)
Total VMT (000 mi)	-391 (- 0.2)
Fuel Cons. (000 gal)	+5.1 (+ 0.1)
CO Emissions (000 kg)	-2.1 (- 0.3)
HC Emissions (000 kg)	+0.5 (+ 0.5)
NO_x Emissions (000 kg)	+1.8 (+ 0.7)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+16	+175.1
IP Operation Private		
Exclusive-Ride Taxi	- 6	- 54.4

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-94	(-0.3)
Operating	-38	(-0.1)
Total	-132	(-0.2)

*Of these trips 7.1 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.5.5 ANNUAL IMPACTS

SETTING # 5 : 'Mill Town'

YEAR 2000 Checkpoint Cycled Service;

SCENARIO A-1 : Base Auto Ownership

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	1,581	1,812	+231			
Revenue	563	596	+ 33			
Net Operating Cost	1,018	1,216	+198			
Annual Capital Cost	387	445	+ 58			
Total Net Cost	1,405	1,661	+256			
Total Subsidy	1,405	1,661	+256			
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-51.5	(-7.7)	Revenue ($000)	-1.8	Passengers (000)	
Revenue($000)	-90.7	(-7.7)			Opportunity Cost Savings ($000)	
Profit($000)	-16.2	(-28.8)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-16
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-1.6

VI. LOCAL GOVERNMENT IMPACTS / VII. FEDERAL GOVERNMENT IMPACTS

COST ($000)	VI. BEFORE	VI. AFTER	VI. CHANGE	VII. BEFORE	VII. AFTER	VII. CHANGE
Operating Subsidy	509.0	608.0	+ 99.0	509.0	608.0	+99.0
Capital Subsidy	77.4	89.0	+ 11.6	309.6	356.0	+46.4
Total Subsidy	586.4	697.0	+110.6	818.6	964.0	+145.4
Parking Revenue (Change Only)	-	-	- 1.8	-	-	-

TABLE A.5.6 ANNUAL IMPACTS

SETTING # 5 : 'Mill Town'
YEAR 1980
SCENARIO A-2 : Reduced Auto Ownership

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TRANSIT TRIPS	INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	66.8	22.8	+3.1	+0.9	+4.0
Transportation Handicapped	-	-	-	-	-
Persons from 0-car H.H.'s	30.9	10.5	+11.7	+0.6	+12.3
All Persons	170.9 *	37.1	+47.0	-1.0	+46.0

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	55	63	+2.6
Transportation Handicapped	100	100	-
Others	72	85	+13.2
Persons from 0-car H.H.'s	78	81	+ 0.9

TEMPORAL COVERAGE

SERVICE DAYS Mon. - Fri.

SERVICE HOURS 6 am - 6:30 pm

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+257	(+15.6)
Taxi VMT (000 mi)	-200	(-8.6)
Auto VMT (000 mi)	-316	(-0.1)
Total VMT (000 mi)	-259	(-0.1)
Fuel Cons. (000 gal)	+ 9.8	(+0.2)
CO Emissions (000 kg)	- 2.0	(-0.3)
HC Emissions (000 kg)	+ 0.5	(+0.5)
NO_x Emissions (000 kg)	+ 1.9	(+0.8)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+16	+175.1
IP Operation Private		
Exclusive-Ride Taxi	-7	-57.5

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-60	(-0.2)
Operating	-34	(-0.1)
Total	-94	(-0.1)

*Of these trips 6.4 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.5.6 ANNUAL IMPACTS

SETTING # 5 : 'Mill Town'

YEAR 1980

SCENARIO A-2 : Reduced Auto Ownership

III. IP OPERATOR IMPACTS ($000)	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	1,581	1,812	+231			
Revenue	619	658	+ 39			
Net Operating Cost	962	1,154	+192			
Annual Capital Cost	387	445	+ 58			
Total Net Cost	1,349	1,599	+250			
Total Subsidy	1,349	1,599	+250			
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-58.2	(-8.6)	Revenue ($000)	-1.8	Passengers (000)	
Revenue($000)	-102.3	(-8.6)			Opportunity Cost Savings ($000)	
Profit($000)	- 18.3	(-32.5)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-16
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-1.6

VI. LOCAL GOVERNMENT IMPACTS / VII. FEDERAL GOVERNMENT IMPACTS

COST ($000)	VI. BEFORE	VI. AFTER	VI. CHANGE	VII. BEFORE	VII. AFTER	VII. CHANGE
Operating Subsidy	481.0	577.0	+96.0	481.0	577.0	+96.0
Capital Subsidy	77.4	89.0	+11.6	309.6	356.0	+46.4
Total Subsidy	558.4	666.0	+107.6	790.6	933.0	+142.4
Parking Revenue (Change Only)			-1.8			

SETTING 6: 'LARGE CITY'

Year 1980 Results

Table A.6.1 - IP Scenario A

Table A.6.2 - IP Scenario B

Table A.6.3 - Extended Fixed-Route Bus Scenario

Table A.6.4 - Extended Exclusive Ride Taxi Scenario

Year 2000 Results

Table A.6.5 - Scenario A-1: Base Auto Ownership

Table A.6.6 - Scenario A-2: Reduced Auto Ownership

TABLE A.6.1 ANNUAL IMPACTS

SETTING # 6 : 'Large City'
YEAR 1980
SCENARIO IPA : E&H Service Expanded to General Public

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)**		CHANGE IN CONSUMER SURPLUS ($000) **		
	NEW TRANSIT TRIPS	INDUCED TRIPS	WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	2,843.6	617.7	+166.2	+903.5	+1069.7
Transportation Handicapped	295.7	64.7	-	-	-
Persons from 0-car H.H.'s	1,746.2	381.1	+868.2	+405.1	+1,273.3
All Persons	4,205.2 *	846.2	+1,736.5	+982.6	+2,719.1

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	100	100	0
Transportation Handicapped	100	100	0
Others	69	100	+366.5
Persons from 0-car H.H.'s	81	100	+ 5.8

TEMPORAL COVERAGE

SERVICE DAYS Mon. - Fri.

SERVICE HOURS 6:30 am - 6:30 pm

VMT/FUEL/EMISSIONS

IMPACT	CHANGE (PCT. CHANGE)
Transit VMT (000 mi)	+6,037 (+23.7)
Taxi VMT (000 mi)	-2,142 (-16.3)
Auto VMT (000 mi)	-6,959 (-0.1)
Total VMT (000 mi)	-3,064 (-0.1)
Fuel Cons. (000 gal)	+131.9 (+0.04)
CO Emissions (000 kg)	+ 57.4 (+0.03)
HC Emissions (000 kg)	+ 9.4 (+0.03)
NO_x Emissions (000 kg)	+ 0.4

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+243	+2,967.8
IP Operation Private	+160	+1,664.0
Exclusive-Ride Taxi	- 87	- 724.0

AUTOMOBILE EXPENDITURE ($000)

	CHANGE (PCT. CHANGE)
Capital	-3,173 (-0.7)
Operating	- 127 (-0.02)
Total	-3,300 (-0.3)

*Of these trips 206.7 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.6.1 ANNUAL IMPACTS

SETTING # 6 : 'Large City'

YEAR 1980

SCENARIO IPA : E&H Service Expanded to General Public

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	67,944	72,674	+4,730	307	4,953	+4,646
Revenue	19,826	21,562	+1,736	0	0	0
Net Operating Cost	48,118	51,112	+2,994	307	4,953	+4,646
Annual Capital Cost	17,200	17,840	+ 640	0	0	0
Total Net Cost	65,318	68,952	+3,634	307	4,953	+4,646
Total Subsidy	65,318	68,952	+3,634	307	4,953	+4,646
Total Mgmt. Fee				62	991	+ 929

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-583.4	(-16.3)	Revenue ($000)	-112.4	Passengers (000)	-32.0
Revenue ($000)	-1,206.8	(-16.3)			Opportunity Cost Savings ($000)	+96.0
Profit ($000)	- 216.0	(-61.5)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-175
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-52.5

VI. LOCAL GOVERNMENT IMPACTS / VII. FEDERAL GOVERNMENT IMPACTS

COST ($000)	VI. BEFORE	VI. AFTER	VI. CHANGE	VII. BEFORE	VII. AFTER	VII. CHANGE
Operating Subsidy	24,212.5	28,032.5	+3,820.0	24,212.5	28,032.5	+3,820.0
Capital Subsidy	3,440.0	3,568.0	+ 128.0	13,760.0	14,272.0	+ 512.0
Total Subsidy	27,652.5	31,600.5	+ 3,948.0	37,972.5	42,304.5	+4,332.0
Parking Revenue (Change Only)	-	-	- 67.2	-	-	-

TABLE A.6.2 ANNUAL IMPACTS

SETTING # 6 : 'Large City'
YEAR 1980
SCENARIO IPB : Integrated Fare Structure

I. USER IMPACTS	MOBILITY (000 trips)**		CHANGE IN CONSUMER SURPLUS ($000)**		
MARKET GROUP	NEW TRANSIT TRIPS	INDUCED TRIPS	WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	2,734.8	573.8	+149.8	+910.1	+1,059.9
Transportation Handicapped	269.2	56.4	-	-	-
Persons from 0-car H.H.'s	1,717.7	360.4	+869.4	+408.3	+1,277.7
All Persons	4,253.2 *	820.9	+1,778.0	+994.0	+2,772.0

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	100	100	0
Transportation Handicapped	100	100	0
Others	69	100	+366.5
Persons from 0-car H.H.'s	81	100	+ 5.8

TEMPORAL COVERAGE

SERVICE DAYS Mon. - Fri.

SERVICE HOURS 6:30 am - 6:30 pm

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+6,037	(+23.7)
Taxi VMT (000 mi)	-2,058	(-15.7)
Auto VMT (000 mi)	-7,207	(- 0.1)
Total VMT (000 mi)	-3,228	(- 0.1)
Fuel Cons. (000 gal)	+ 125.7	(+0.04)
CO Emissions (000 kg)	+ 52.1	(+0.02)
HC Emissions (000 kg)	+ 8.8	(+0.03)
NO_x Emissions (000 kg)	0.0	0

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+243	+2,967.8
IP Operation Private	+160	+1,664.0
Exclusive-Ride Taxi	- 83	- 698.1

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-3,545	(-0.8)
Operating	- 142	(-0.03)
Total	-3,687	(-0.4)

*Of these trips 209.7 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.6.2 ANNUAL IMPACTS

SETTING # 6 : 'Large City'

YEAR 1980

SCENARIO IPB : Integrated Fare Structure

III. IP OPERATOR IMPACTS ($000)						
	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	67,944	72,674	+4,730	307	4,953	+4,646
Revenue	19,826	21,315	+1,489	0	0	0
Net Operating Cost	48,118	51,359	+3,241	307	4,953	+4,646
Annual Capital Cost	17,200	17,840	+ 640	0	0	0
Total Net Cost	65,318	69,199	+3,881	307	4,953	+4,646
Total Subsidy	65,318	69,199	+3,881	307	4,953	+4,646
Total Mgmt. Fee				62	991	+ 929

IV. LOCAL COMPETING PROVIDER IMPACTS						
	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-562.3	(-15.8)	Revenue ($000)	-119.3	Passengers (000)	-32.3
Revenue ($000)	-1,163.5	(-15.8)			Opportunity Cost Savings ($000)	+96.9
Profit ($000)	-208.3	(-59.3)				

V. MAJOR EMPLOYER IMPACTS	
IMPACT	CHANGE
Parking Spaces Required/Subsidized	-185
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-55.8

VI. LOCAL GOVERNMENT IMPACTS				VII. FEDERAL GOVERNMENT IMPACTS		
COST ($000)	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Subsidy	24,212.5	28,156.0	+3,943.5	24,212.5	28,156.0	+3,943.5
Capital Subsidy	3,440.0	3,568.0	+ 128.0	13,760.0	14,272.0	+ 512.0
Total Subsidy	27,652.5	31,724.0	+4,071.5	37,972.5	42,428.0	+4,455.5
Parking Revenue (Change Only)	-	-	-71.4	-	-	-

TABLE A.6.3 ANNUAL IMPACTS

SETTING # 6 : 'Large City'
YEAR 1980
SCENARIO : Extended Fixed-Route Bus Alternative

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)**		CHANGE IN CONSUMER SURPLUS ($000)**		
	NEW TRANSIT TRIPS	INDUCED TRIPS	WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	+1,712.9	389.9	+59.8	+2,190.3	+2,250.1
Transportation Handicapped	+ 86.8	19.6	--	--	--
Persons from 0-car H.H.'s	+1,676.9	379.8	+327.3	+ 949.1	+1,276.4
All Persons	+6,449.7 *	838.5	+616.7	+3,379.9	+3,996.6

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	100	100	0
Transportation Handicapped	100	100	0
Others	69	83	+170.3
Persons from 0-car H.H.'s	81	90	+ 2.7

TEMPORAL COVERAGE

SERVICE DAYS Mon. - Fri.

SERVICE HOURS 6:30 am - 6:30 pm

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+4,532	(+17.8)
Taxi VMT (000 mi)	-1,176	(- 9.0)
Auto VMT (000 mi)	-7,381	(- 0.2)
Total VMT (000 mi)	-4,025	(- 0.1)
Fuel Cons. (000 gal)	+203.8	(+0.1)
CO Emissions (000 kg)	-364.6	(-0.2)
HC Emissions (000 kg)	+ 11.9	(+0.04)
NO_x Emissions (000 kg)	+ 36.4	(+0.2)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+354	+6,354.3
IP Operation Private	--	--
Exclusive-Ride Taxi	- 42	- 400.3

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-2,367.6	(-0.5)
Operating	- 94.7	(-0.02)
Total	-2,462.3	(-0.3)

*Of these trips 340.5 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.6.3 ANNUAL IMPACTS

SETTING # 6 : 'Large City'

YEAR 1980

SCENARIO : Extended Fixed Route Bus Alternative

III. IP OPERATOR IMPACTS ($000)						
	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	67,944	77,603	+9,659			
Revenue	19,826	21,322	+1,496			
Net Operating Cost	48,118	56,281	+8,163			
Annual Capital Cost	17,200	18,323	+1,123			
Total Net Cost	65,318	74,604	+9,286			
Total Subsidy	65,318	74,604	+9,286	307	307	0
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS							
	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-903.0	(-25.3)	Revenue ($000)	--	Passengers (000)	--
Revenue ($000)	-1,868.0	(-25.3)		--	Opportunity Cost Savings ($000)	--
Profit ($000)	- 334.0	(-95.2)				

V. MAJOR EMPLOYER IMPACTS	
IMPACT	CHANGE
Parking Spaces Required/Subsidized	--
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	--

VI. LOCAL GOVERNMENT IMPACTS COST ($000)	BEFORE	AFTER	CHANGE
Operating Subsidy	24,212.5	28,294.0	+4,081.5
Capital Subsidy	3,440.0	3,664.6	+ 224.6
Total Subsidy	27,652.5	31,958.6	+4,306.1
Parking Revenue (Change Only)	-	-	

VII. FEDERAL GOVERNMENT IMPACTS	BEFORE	AFTER	CHANGE
Operating Subsidy	24,212.5	28,294.0	+4,081.5
Capital Subsidy	13,760.0	14,658.4	+ 898.4
Total Subsidy	37,972.5	42,952.4	+4,979.9
Parking Revenue (Change Only)	-	-	-

TABLE A.6.4 ANNUAL IMPACTS

SETTING # 6 : 'Large City'
YEAR 1980
SCENARIO : Extended Exclusive-Ride Taxi Alternative

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)**		CHANGE IN CONSUMER SURPLUS ($000)**		
	NEW TAXI PASSENGERS	INDUCED TRIPS	WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	1,872.5	324.6	+101.2	+ 1,093.4	+1,194.6
Transportation Handicapped	325.6	56.4	--	--	--
Persons from 0-car H.H.'s	915.9	158.8	+ 83.0	+ 644.1	+ 727.1
All Persons	2,035.3 *	325.8	+101.2	+ 1,093.4	+1,194.6

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	Coverage (000 Pers) BEFORE	AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	202.3	202.3	0
Transportation Handicapped	72.0	72.0	0
Others	1,107.0	1,107.0	0
Persons from 0-car H.H.'s	295.6	295.6	0

TEMPORAL COVERAGE

SERVICE DAYS 7 days/week

SERVICE HOURS 24 hrs./ day

VMT/FUEL/EMISSIONS

IMPACT	CHANGE (PCT. CHANGE)
Transit VMT (000 mi)	-522 (-2.0)
Taxi VMT (000 mi)	+5,796 (+44.0)
Auto VMT (000 mi)	-1,062 (-0.02)
Total VMT (000 mi)	+4,212 (+0.09)
Fuel Cons. (000 gal)	+453.6 (+0.2)
CO Emissions (000 kg)	+314.4 (+0.1)
HC Emissions (000 kg)	+ 45.5 (+0.2)
NO_x Emissions (000 kg)	+ 18.6 (+0.1)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	-52	-676.0
IP Operation Private		
Exclusive-Ride Taxi	+270	+1,865.8

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-111	(-0.02)
Operating	- 4	--
Total	-115	(-0.01)

*Of these trips 59.7 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.6.4 ANNUAL IMPACTS

SETTING # 6 : 'Large City'

YEAR 1980

SCENARIO Extended Exclusive-Ride Taxi Alternative

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	67,944	67,051	-893			
Revenue	19,826	19,748	- 78			
Net Operating Cost	48,118	47,303	-815			
Annual Capital Cost	17,200	17,068	-132			
Total Net Cost	65,318	64,371	-947			
Total Subsidy	65,318	64,371	-947	307	4,070	+3,763
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)
Impact	CHANGE (PCT. CHANGE)
Passengers (000)	+2,035.3 (+57.1)
Revenue ($000)	+3,424.0 (+44.0)
Profit ($000)	+ 128.0 (+32.2)

VI. LOCAL GOVERNMENT IMPACTS

COST ($000)	BEFORE	AFTER	CHANGE
Operating Subsidy	24,212.5	25,686.5	+1,474.0
Capital Subsidy	3,440.0	3,413.6	- 26.4
Total Subsidy	27,652.5	29,100.1	+1,447.6
Parking Revenue (Change Only)			

VII. FEDERAL GOVERNMENT IMPACTS

	BEFORE	AFTER	CHANGE
Operating Subsidy	24,212.5	26,686.5	+1,474.0
Capital Subsidy	13,760.0	13,654.4	- 105.6
Total Subsidy	37,972.5	39,340.9	+1,368.4
Parking Revenue (Change Only)			

TABLE A.6.5 ANNUAL IMPACTS

SETTING # 6 : 'Large City'
YEAR 2000
SCENARIO A-1 : Expanded TH Service: Base Auto Ownership

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)**		CHANGE IN CONSUMER SURPLUS ($000)**		
	NEW TRANSIT TRIPS	INDUCED TRIPS	WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	864.2	178.2	+73.4	+102.4	+175.8
Transportation Handicapped	66.8	21.3	-	-	-
Persons from 0-car H.H.'s	404.1	83.3	+177.0	+ 17.8	+194.8
All Persons	1,590.6 *	261.8	+329.6	+104.8	+434.4

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	100	100	0
Transportation Handicapped	100	100	0
Others	68	96	+368.3
Persons from 0-car H.H.'s	82	96	+ 38.5

TEMPORAL COVERAGE

SERVICE DAYS Mon. - Fri.   SERVICE HOURS 6:30 am - 6:30 pm

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+2,614	(+10.2)
Taxi VMT (000 mi)	- 439	(-3.3)
Auto VMT (000 mi)	-4,536	(-0.1)
Total VMT (000 mi)	-2,361	(-0.04)
Fuel Cons. (000 gal)	-40.5	(-0.02)
CO Emissions (000 kg)	+10.1	(+0.05)
HC Emissions (000 kg)	+ 0.8	(+0.03)
NO_x Emissions (000 kg)	- 0.2	-

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+44	+464.5
IP Operation Private	+75	+773.9
Exclusive-Ride Taxi	-20	-190.0

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-793	(-0.2)
Operating	-317	(-0.1)
Total	-1,110	(-0.1)

*Of these trips 90.8 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.6.5 ANNUAL IMPACTS

SETTING # 6 : 'Large City'

YEAR 2000

SCENARIO A-1 : Expanded TH Service: Base Auto Ownership

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	70,289	70,926	+637	435	2,816	+2,381
Revenue	19,687	20,575	+888	0	0	0
Net Operating Cost	50,602	50,351	-251	435	2,816	+2,381
Annual Capital Cost	19,329	19,556	+227	0	0	0
Total Net Cost	69,931	69,907	- 24	435	2,816	+2,381
Total Subsidy				435	2,816	+2,381
Total Mgmt. Fee				87	563	+ 476

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-120.8	(-3.1)	Revenue ($000)	-45.2	Passengers (000)	
Revenue ($000)	-316.6	(-3.1)			Opportunity Cost Savings ($000)	
Profit ($000)	-56.7	(-11.9)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-71
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-21.2

VI. LOCAL GOVERNMENT IMPACTS

COST ($000)	BEFORE	AFTER	CHANGE
Operating Subsidy	25,518.5	26,583.5	+1,065.0
Capital Subsidy	3,865.8	3,911.2	+ 45.4
Total Subsidy	29,384.3	30,494.7	+1,110.4
Parking Revenue (Change Only)	-	-	-27,1

VII. FEDERAL GOVERNMENT IMPACTS

	BEFORE	AFTER	CHANGE
Operating Subsidy	25,518.5	26,583.5	+1,065.0
Capital Subsidy	15,463.2	15,644.8	+ 181.6
Total Subsidy	40,981.7	47,228.3	+1,246.6
Parking Revenue (Change Only)	-	-	-

TABLE A.6.6 ANNUAL IMPACTS

SETTING # 6 : 'Large City'

YEAR 2000

SCENARIO A-2 : Expanded TH Service: Reduced Auto Ownership

I. USER IMPACTS	MOBILITY (000 trips)**		CHANGE IN CONSUMER SURPLUS ($000)**		
MARKET GROUP	NEW TRANSIT TRIPS	INDUCED TRIPS	WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	853.3	211.1	+65.5	+97.1	+162.6
Transportation Handicapped	63.3	20.1	-		
Persons from 0-car H.H.'s	581.1	146.8	+155.5	+31.9	+187.4
All Persons	1,579.3 *	307.7	+421.0	+100.3	+521.3

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **			
MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	100	100	0
Transportation Handicapped	100	100	0
Others	68	96	+368.3
Persons from 0-car H.H.'s	82	96	+ 38.1

TEMPORAL COVERAGE

SERVICE DAYS Mon. - Fri.

SERVICE HOURS 6:30 am - 6:30 pm

VMT/FUEL/EMISSIONS		
IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+2,614	(+10.2)
Taxi VMT (000 mi)	- 718	(- 5.4)
Auto VMT (000 mi)	-4,003	(- 0.1)
Total VMT (000 mi)	-2,107	(-0.04)
Fuel Cons. (000 gal)	-20.2	(-0.01)
CO Emissions (000 kg)	+8.9	(+0.05)
HC Emissions (000 kg)	+0.8	(+0.04)
NO_x Emissions (000 kg)	-0.2	-

EMPLOYMENT Change in:	JOBS	PAYROLL ($000)
IP Operation Public	+44	+464.5
IP Operation Private	+75	+773.9
Exclusive-Ride Taxi	-33	-322.5

AUTOMOBILE EXPENDITURE ($000)	CHANGE	(PCT. CHANGE)
Capital	-686	(-0.1)
Operating	-384	(-0.1)
Total	-1,070	(-0.1)

*Of these trips 83.5 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.6.6 ANNUAL IMPACTS

SETTING # 6 : 'Large City'

YEAR 2000

SCENARIO A-2 : Expanded TH Service: Reduced Auto Ownership

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	70,289	70,926	+637	435	2,816	+2,381
Revenue	21,262	22,167	+905	0	0	0
Net Operating Cost	49,027	48,759	-268	435	2,816	+2,381
Annual Capital Cost	19,329	19,556	+227	0	0	0
Total Net Cost	68,356	68,315	- 41	435	2,816	+2,381
Total Subsidy				435	2,816	+2,381
Total Mgmt. Fee				87	536	+476

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-205.1	(-5.4)	Revenue ($000)	-42.6	Passengers (000)	-
Revenue ($000)	-537.5	(-5.4)			Opportunity Cost Savings ($000)	-
Profit ($000)	- 96.2	(-20.2)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-65
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-19.4

VI. LOCAL GOVERNMENT IMPACTS / VII. FEDERAL GOVERNMENT IMPACTS

COST ($000)	VI. BEFORE	VI. AFTER	VI. CHANGE	VII. BEFORE	VII. AFTER	VII. CHANGE
Operating Subsidy	24,731.0	25,787.5	+1,056.5	24,731.0	25,787.5	+1,056.5
Capital Subsidy	3,865.8	3,911.2	+ 45.4	15,463.2	15,644.8	+ 181.6
Total Subsidy	28,596.8	29,698.7	+1,101.9	40,194.2	41,432.3	+1,238.1
Parking Revenue (Change Only)	-	-	-24.8	-	-	-

SETTING 7: 'METROPOLIS'

<u>Year 1980 Results</u>

Table A.7.1 - IP Scenario A

Table A.7.2 - IP Scenario B

Table A.7.3 - Extended Fixed-Route Bus Scenario

Table A.7.4 - Extended Exclusive Ride Taxi Scenario

<u>Year 2000 Results</u>

Table A.7.5 - Scenario A-1: Base Auto Ownership

Table A.7.6 - Scenario A-2: Reduced Atuo Ownership

TABLE A.7.1 ANNUAL IMPACTS

SETTING # 7 , 'Metropolis'
YEAR 1980
SCENARIO IPA : Limited Suburban Service

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TRANSIT TRIPS	INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	97	43	+15	+36	+51
Transportation Handicapped	122	58	--	--	--
Persons from 0-car H.H.'s	109	57	+75	+29	+104
All Persons	234 *	84	+139	+46	+185

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	62.1	65.2	+7.0
Transportation Handicapped	58.8	61.1	+2.8
Others	71.6	72.5	+18.8
Persons from 0-car H.H.'s	71.6	72.5	+5.0

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+825	(+1.1)
Taxi VMT (000 mi)	-126	(-0.1)
Auto VMT (000 mi)	-161	--
Total VMT (000 mi)	+538	(+0.01)
Fuel Cons. (000 gal)	+87.9	(+0.02)
CO Emissions (000 kg)	+65.2	(+0.02)
HC Emissions (000 kg)	+ 9.2	(+0.02)
NO_x Emissions (000 kg)	+ 3.9	(+0.02)

TEMPORAL COVERAGE

For Majority of Services

SERVICE DAYS Mon-Fri

SERVICE HOURS 6AM-6:30PM

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	0	0
IP Operation Private	+51	+563
Exclusive-Ride Taxi	-4	-30

AUTOMOBILE EXPENDITURE
($000)

	CHANGE	(PCT. CHANGE)
Capital	-166.4	(0.0)
Operating	-6.7	(0.0)
Total	-173.1	(0.0)

*Of these trips 7.5 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.7.1 ANNUAL IMPACTS

SETTING # 7 : 'Metropolis'

YEAR 1980

SCENARIO IPA : Limited Suburban Service

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	247,700	247,700	0	130	753	+692
Revenue	61,800	61,966	+166	0	0	0
Net Operating Cost	185,900	185,734	-166	130	753	+692
Annual Capital Cost	83,600	83,600	0	25	252	+227
Total Net Cost	269,500	269,334	-166	155	1,005	+919
Total Subsidy	269,500	269,334	-166	169	1,088	+919
Total Mgmt. Fee				14	83	+ 69

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-29.7	(-0.1)	Revenue ($000)	-1.9	Passengers (000)	-7.7
Revenue ($000)	-50.0	(-0.05)			Opportunity Cost Savings ($000)	+23.1
Profit ($000)	- 9.0	(-0.2)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-63
Annual Opportunity Cost Savings ($000)	+1.9
Annual Space Rental Cost ($000)	-7.5

VI. LOCAL GOVERNMENT IMPACTS

COST ($000)	BEFORE	AFTER	CHANGE
Operating Subsidy	164,000	164,347	+347
Capital Subsidy	24,100	24,146	+ 46
Total Subsidy	188,100	188,493	+393
Parking Revenue (Change Only)	-	-	-3

VII. FEDERAL GOVERNMENT IMPACTS

BEFORE	AFTER	CHANGE
22,189	22,536	+347
59,500	59,682	+182
81,689	82,218	+529
-	-	-

TABLE A.7.2 ANNUAL IMPACTS

SETTING # 7 : 'Metropolis'

YEAR 1980

SCENARIO IPB : Expanded Suburban Coverage

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)**		CHANGE IN CONSUMER SURPLUS ($000)**		
	NEW TRANSIT TRIPS	INDUCED TRIPS	WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	135	50	+34	+190	+224
Transportation Handicapped	127	60	--	--	--
Persons from 0-car H.H.'s	176	67	+125	+126	+251
All Persons	808 *	112	+410	+250	+660

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	62.1	66.3	+12.5
Transportation Handicapped	58.8	62.1	+ 4.0
Others	71.6	73.4	+36.8
Persons from 0-car H.H.'s	71.6	73.4	+10.0

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+1924	(+2.5)
Taxi VMT (000 mi)	- 266	(-0.2)
Auto VMT (000 mi)	- 903	--
Total VMT (000 mi)	+ 755	(+.015)
Fuel Cons. (000 gal)	+ 165	(+0.03)
CO Emissions (000 kg)	+ 122	(+0.03)
HC Emissions (000 kg)	+ 17	(+0.03)
NO_x Emissions (000 kg)	+ 7	(+0.03)

TEMPORAL COVERAGE

For Majority of Services

SERVICE DAYS Mon-Fri

SERVICE HOURS 6AM-6:30PM

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+48	+839
IP Operation Private	+84	+926
Exclusive-Ride Taxi	-13	-90

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-307	(0.0)
Operating	- 12	(0.0)
Total	-319	(0.0)

*Of these trips 22.0 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.7.2 **ANNUAL IMPACTS**

SETTING # 7 : 'Metropolis'

YEAR 1980

SCENARIO IPB : Expanded Suburban Coverage

III. IP OPERATOR IMPACTS ($000)	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	247,700	249,042	+1342	130	1,216	+1086
Revenue	61,800	62,135	+ 385	0	0	0
Net Operating Cost	185,900	186,857	+ 957	130	1,216	+1086
Annual Capital Cost	83,600	84,742	+ 142	25	353	+ 328
Total Net Cost	269,500	270,599	+1099	155	1,569	+1414
Total Subsidy	269,500	270,599	+1099	155	1,569	+1414
Total Mgmt. Fee				14	111	+ 97

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-70.8	(-0.2)	Revenue ($000)	-120	Passengers (000)	-8.1
Revenue ($000)	-100.0	(-0.1)			Opportunity Cost Savings ($000)	+24.3
Profit ($000)	- 17.9	(-0.4)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-375
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-135

VI. LOCAL GOVERNMENT IMPACTS COST ($000)	BEFORE	AFTER	CHANGE	VII. FEDERAL GOVERNMENT IMPACTS BEFORE	AFTER	CHANGE
Operating Subsidy	164,000	164,842	+842	22,189	23,031	+842
Capital Subsidy	24,100	24,194	+ 94	59,500	59,876	+376
Total Subsidy	188,000	189,036	+936	81,689	82,907	+1218
Parking Revenue (Change Only)	-	-	-122	-	-	

TABLE A.7.3 ANNUAL IMPACTS

SETTING # 7 : "Metropolis"

YEAR 1980

SCENARIO : Extended Fixed Route Bus Alternative

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)**		CHANGE IN CONSUMER SURPLUS ($000)**		
	NEW TRANSIT TRIPS	INDUCED TRIPS	WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	89	12	+42	+263	+305
Transportation Handicapped	18	3	+16	+181	+197
Persons from 0-car H.H.'s	176	15	-	-	-
All Persons	416 *	25	+41	+342	+383

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	62.1	63.4	+3K
Transportation Handicapped	58.8	60.0	+0.2K
Others	71.6	72.3	+296K
Persons from 0-car H.H.'s	71.6	72.3	+4K

TEMPORAL COVERAGE

SERVICE DAYS Mon. - Fri.   SERVICE HOURS 6:00 am - 6:30pm

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+655	(+0.9)
Taxi VMT (000 mi)	-90	(-0.1)
Auto VMT (000 mi)	-374	(-0.01)
Total VMT (000 mi)	+191	-
Fuel Cons. (000 gal)	+ 56.7	(+0.01)
CO Emissions (000 kg)	+ 55.5	(+0.01)
HC Emissions (000 kg)	+ 8.0	(+0.01)
NO_x Emissions (000 kg)	+ 3.7	(+0.02)

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+45	+871
IP Operation Private		
Exclusive-Ride Taxi	-3	-31

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-503	(-0.01)
Operating	- 20	(0.0)
Total	-523	(-0.01)

*Of these trips 17.8 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.7.3 ANNUAL IMPACTS

SETTING # 7 : "Metropolis"

YEAR 1980

SCENARIO : Extended Fixed Route Bus Alternative

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	247,700	249,150	+1,450	130	130	0
Revenue	61,800	61,934	+134	0	0	0
Net Operating Cost	185,900	187,016	+1,316	130	130	0
Annual Capital Cost	83,600	83,867	+267	25	25	0
Total Net Cost	269,500	271,332	+1,583	155	155	0
Total Subsidy	269,500	271,332	+1,583	169	169	0
Total Mgmt. Fee				14	14	0

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)	
Impact	CHANGE	(PCT. CHANGE)
Passengers (000)	-44.6	(-0.1)
Revenue ($000)	-51.8	(-0.1)
Profit ($000)	-9.3	(-0.2)

VI. LOCAL GOVERNMENT IMPACTS

COST ($000)	BEFORE	AFTER	CHANGE
Operating Subsidy	164,000	164,658	+658
Capital Subsidy	24,100	24,153	+53
Total Subsidy	188,100	188,811	+711
Parking Revenue (Change Only)	-	-	

VII. FEDERAL GOVERNMENT IMPACTS

	BEFORE	AFTER	CHANGE
Operating Subsidy	22,189	22,847	+658
Capital Subsidy	59,500	59,714	+214
Total Subsidy	81,689	82,561	+872
Parking Revenue (Change Only)	-	-	-

TABLE A.7.4 ANNUAL IMPACTS

SETTING # 7 : "Metropolis"
YEAR 1980
SCENARIO : Extended Exclusive-Ride Taxi Alternative

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)** NEW TAXI PASSENGERS	INDUCED TRIPS	CHANGE IN CONSUMER SURPLUS ($000)** WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	36	3	+21	+15	+36
Transportation Handicapped	7	1	+95	+ 7	+102
Persons from 0-car H.H.'s	72	6	-	-	-
All Persons	719 *	22	+349	+24	+373

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	COVERAGE (000 PERSONS) BEFORE	AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	227.1	227.1	0
Transportation Handicapped	120.4	120.4	0
Others	2408.1	2408.1	0
Persons from 0-car H.H.'s	556.5	556.5	0

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	0	(0.0)
Taxi VMT (000 mi)	+1,811	(+1.8)
Auto VMT (000 mi)	-167	(0.0)
Total VMT (000 mi)	+1,644	(+0.02)
Fuel Cons. (000 gal)	+171.3	(+0.03)
CO Emissions (000 kg)	+119.3	(+0.03)
HC Emissions (000 kg)	+17.1	(+0.03)
NO_x Emissions (000 kg)	+7.1	(+0.03)

TEMPORAL COVERAGE

SERVICE DAYS Mon. - Fri.   SERVICE HOURS 6 am - 6:30pm

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	0	0
IP Operation Private	0	0
Exclusive-Ride Taxi	+75	+644

AUTOMOBILE EXPENDITURE ($000)

	CHANGE	(PCT. CHANGE)
Capital	-44	(0.0)
Operating	- 2	(0.0)
Total	-46	(0.0)

*Of these trips 18.9 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.7.4 ANNUAL IMPACTS

SETTING # 7 : "Metropolis"

YEAR 1980

SCENARIO : Extended Exclusive-Ride Taxi Alternative

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	247,700	248,818	0	130		
Revenue	61,800	61,961	+161	0		
Net Operating Cost	185,900	186,857		130		
Annual Capital Cost	83,600	83,600	0	25		
Total Net Cost	269,500	270,457	-161	155		
Total Subsidy	269,500	270,457	-161	169	1287	+1118
Total Mgmt. Fee						

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)	
Impact	CHANGE	(PCT. CHANGE)
Passengers (000)	+719	(+1.5)
Revenue ($000)	+1083	(+1.2)
Profit ($000)	+25	(+0.6)

VI. LOCAL GOVERNMENT IMPACTS

COST ($000)	BEFORE	AFTER	CHANGE
Operating Subsidy	164,000	164,479	+479
Capital Subsidy	24,100	24,100	0
Total Subsidy	188,100	188,579	+479
Parking Revenue (Change Only)	-	-	-29

VII. FEDERAL GOVERNMENT IMPACTS

	BEFORE	AFTER	CHANGE
Operating Subsidy	22,189	22,668	+479
Capital Subsidy	59,500	59,500	0
Total Subsidy	81,689	82,168	+479
Parking Revenue (Change Only)	-	-	-

TABLE A.7.5 ANNUAL IMPACTS

SETTING # 7 : "Metropolis"

YEAR 2000

SCENARIO A-1 : Base Auto Ownership

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)**		CHANGE IN CONSUMER SURPLUS ($000)**		
	NEW TRANSIT TRIPS	INDUCED TRIPS	WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	25.6	3.8	+20.9	+176.8	+197.7
Transportation Handicapped	.6	.2	-	-	
Persons from 0-car H.H.'s	37.0	6.3	+34.8	+110.3	+145.1
All Persons	289.4*	10.6	+261.7	+228.8	+490.5

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	62.1	62.4	+7.1
Transportation Handicapped	58.8	58.9	+3.4
Others	71.6	75.7	+111.2
Persons from 0-car H.H.'s	71.6	71.9	+7.2

TEMPORAL COVERAGE

SERVICE DAYS Mon-Fri SERVICE HOURS 6am - 6:30pm

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+525	(+0.7)
Taxi VMT (000 mi)	-40	(-0.04)
Auto VMT (000 mi)	-1754	(-0.02)
Total VMT (000 mi)	-1269	(-0.01)
Fuel Cons. (000 gal)	-10.5	-
CO Emissions (000 kg)	+6.7	(+0.02)
HC Emissions (000 kg)	+1.1	(+0.03)
NO_x Emissions (000 kg)	-0.3	-

EMPLOYMENT
Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+42	+726.2
IP Operation Private		
Exclusive-Ride Taxi	-2	-20

AUTOMOBILE EXPENDITURE ($000)

	CHANGE (PCT. CHANGE)
Capital	-330.8
Operating	- 132
Total	-462.8

*Of these trips 29.4 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.7.5 ANNUAL IMPACTS

SETTING # 7 : "Metropolis"

YEAR 2000

SCENARIO A-1 : Base Auto Ownership

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	260,085	260,085	0	0	0	+584
Revenue	63,654	63,806	152	0	0	0
Net Operating Cost	196,431	196,279	-152	0	0	+584
Annual Capital Cost	98,648	98,792	+144	0	0	0
Total Net Cost	295,079	295,071	-8	0	0	+584
Total Subsidy	295,079	295,071	-8	0	0	+584
Total Mgmt. Fee						+53

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-22,2	(-0.03)	Revenue ($000)	-17.8	Passengers (000)	
Revenue ($000)	-35.2	(-0.03)			Opportunity Cost Savings ($000)	
Profit ($000)	-6.3	(-0.1)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-35
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-10.5

VI. LOCAL GOVERNMENT IMPACTS

COST ($000)	BEFORE	AFTER	CHANGE
Operating Subsidy	98,215.5	98.431.5	+216.0
Capital Subsidy	19,729.6	19,758.4	+28.8
Total Subsidy	117,945.1	118,189.9	+244.8
Parking Revenue (Change Only)	-	-	-21.6

VII. FEDERAL GOVERNMENT IMPACTS

BEFORE	AFTER	CHANGE
98,215.5	98,431.5	+216.0
78,918.4	79,033.6	+115.2
177,133.9	177,465.1	+331.2
-	-	-

TABLE A.7.6 ANNUAL IMPACTS

SETTING # 7 : "Metropolis"

YEAR 2000

SCENARIO A-2 : Reduced Auto Ownership

I. USER IMPACTS

MARKET GROUP	MOBILITY (000 trips)**		CHANGE IN CONSUMER SURPLUS ($000)**		
	NEW TRANSIT TRIPS	INDUCED TRIPS	WORK TRIPS	NON-WORK TRIPS	TOTAL
Elderly	34.1	4.9	+25.3	+261.6	+286.9
Transportation Handicapped	.8	.2	-		
Persons from 0-car H.H.'s	47.2	7.8	+105.2	+204.8	+310.0
All Persons	361.8 *	13.2	+356.2	+316.1	+672.3

II. COMMUNITY IMPACTS

SPATIAL COVERAGE **

MARKET GROUP	% COVERED BEFORE	% COVERED AFTER	CHANGE IN POPULATION COVERED (000 PERSONS)
Elderly	62.1	62.4	+7.1
Transportation Handicapped	58.8	58.9	+3.4
Others	71.6	75.7	+111.2
Persons from 0-car H.H.'s	71.6	71.9	+7.2

TEMPORAL COVERAGE

SERVICE DAYS Mon-Fri.

SERVICE HOURS 6 am -6:30pm

VMT/FUEL/EMISSIONS

IMPACT	CHANGE	(PCT. CHANGE)
Transit VMT (000 mi)	+638	(+0.8)
Taxi VMT (000 mi)	-60	(-0.06)
Auto VMT (000 mi)	-1274	(-0.01)
Total VMT (000 mi)	-696	(-0.007)
Fuel Cons. (000 gal)	+16.8	(+0.01)
CO Emissions (000 kg)	+11.0	(+0.03)
HC Emissions (000 kg)	+ 1.6	(+0.04)
NO_x Emissions (000 kg)	+ 0.5	-

EMPLOYMENT

Change in:

	JOBS	PAYROLL ($000)
IP Operation Public	+52	+896
IP Operation Private		
Exclusive-Ride Taxi	-3	-30

AUTOMOBILE EXPENDITURE ($000)

	CHANGE (PCT. CHANGE)
Capital	-184.8
Operating	-104
Total	-288.8

*Of these trips 36.3 were formerly chauffeur trips (000).

**Figures do not add because of overlap between categories.

TABLE A.7.6 ANNUAL IMPACTS

SETTING # 7 : "Metropolis"

YEAR 2000

SCENARIO A-2 : Reduced Auto Ownership

III. IP OPERATOR IMPACTS ($000)

	PUBLIC OPERATOR			PRIVATE OPERATOR		
	BEFORE	AFTER	CHANGE	BEFORE	AFTER	CHANGE
Operating Cost	260,085	260,085	0	0	0	+725
Revenue	64,927	65,133	+206	0	0	0
Net Operating Cost	195,158	194,952	-206	0	0	+725
Annual Capital Cost	98,648	98,808	160	0	0	0
Total Net Cost	293,806	293,760	-46	0	0	+725
Total Subsidy	293,806	293,760	-46	0	0	+725
Total Mgmt. Fee						+66

IV. LOCAL COMPETING PROVIDER IMPACTS

	TAXI (EXCLUSIVE-RIDE SERVICE ONLY)		PRIVATE PARKING LOT OPERATORS		SOCIAL SERVICE AGENCY PROVIDERS	
Impact	CHANGE	(PCT. CHANGE)	IMPACT	CHANGE	IMPACT	CHANGE
Passengers (000)	-35.0	(-0.04)	Revenue ($000)	-22.2	Passengers (000)	
Revenue ($000)	-55.5	(-0.05)			Opportunity Cost Savings ($000)	
Profit ($000)	-9.9	(-0.2)				

V. MAJOR EMPLOYER IMPACTS

IMPACT	CHANGE
Parking Spaces Required/Subsidized	-44
Annual Opportunity Cost Savings ($000)	
Annual Space Rental Cost ($000)	-13.3

VI. LOCAL GOVERNMENT IMPACTS / VII. FEDERAL GOVERNMENT IMPACTS

COST ($000)	VI. BEFORE	VI. AFTER	VI. CHANGE	VII. BEFORE	VII. AFTER	VII. CHANGE
Operating Subsidy	97,579.0	97,838.5	+259.5	97,579.0	97,838.5	+259.5
Capital Subsidy	19,729.5	19,761.5	+ 32.0	78,918.4	79,046.4	+128.0
Total Subsidy	117,308.5	117,600.1	+291.5	176,497.4	176,884.9	+387.5
Parking Revenue (Change Only)	-	-	-26.6	-	-	-

Appendix B
Scenario Data and Assumptions

This appendix summarizes the data which were collected or derived for each specific setting or scenario and used in the generation of the impact-incidence tables. These inputs include items such as cost data for transit operations, taxi fare structures and fleet sizes, parking charges, former mode distributions for trips made on integrated paratransit, and average trip lengths for the various cities. Data and assumptions which remained unchanged across scenarios, such as automobile costs and emission factors, are presented and discussed in Appendices 1 and 2 of Volume 6. The general assumptions for the year 2000, however, are included here.

Appendix B is divided into two major sections. The first (B.1) contains data for the year 1980. It is subdivided into three parts, each of which contains tables orgainized according to a consistent format. The first subpart (B.1.1) presents data for the 1980 IP scenarios, the second (B.1.2) lists similar data for the extended bus alternatives and the third (B.1.3) addresses the extended taxi alternatives. The second major section (B.2) of Appendix B presents general assumptions and setting specific data for the year 2000 analyses.

The categories of data contained within each table of this appendix are ordered to correspond to the presentation of the impacts in the impact-incidence tables.

B.1 YEAR 1980 DATA

B.1.1 DATA FOR IP SCENARIOS: 1980

I. USER IMPACTS

Mobility

Former Mode of Integrated Paratransit Passengers

	Setting 1	Setting 2 Scenario A*	Setting 2 Scenario B	Setting 2 Scenario C	Setting 3	Setting 4 Scenario A,B,C	Setting 4 Scenario D	Setting 5 Scenario A	Setting 5 Scenario B	Setting 6 Scenario A	Setting 6 Scenario B	Setting 7 Scenario A	Setting 7 Scenario B
Auto	66%	28.5%	48.1%	46.6%	44%	37%	36%	17%	16%	29.3%	29.7%	25.6%	51.2%
Bus	2%	42.2%	11.5%	15.0%	30%	20%	21%	37%	47%	34.4%	34.2%	7.5%	14.6%
Taxi	12%	7.7%	7.7%	7.7%	13%	15%	14%	19%	15%	9.1%	8.7%	11.7%	7.2%
Walk	10%	10.1%	15.1%	15.1%	3%	10%	13%	10%	7%	14.0%	14.7%	21.3%	14.7%
No Trip	10%	11.5%	17.7%	15.6%	10%	18%	16%	17%	15%	13.2%	12.7%	34.0%	12.4%

These distributions were derived from survey data on former mode collected from existing demand-responsive systems, estimates of former bus ridership in the service zones, and work/non-work and many-to-many/access profiles produced by the demand model.

Data available reveal that, on an average, 40% of all former auto trips were made by drivers and 60% by passengers. In estimating the change in mobility for induced trips, it was estimated that, on average 70% of all induced trips were made by the elderly, the transportation handicapped, or persons from 0-auto households. This figure was adjusted, based on the percentage of total riders in these categories.

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*In Setting #2, Scenario A, a significant portion of IP users who formerly used transit (92%) continued to do so, changing only their access mode.

DATA FOR IP SCENARIOS: 1980 (continued)

II. COMMUNITY IMPACTS

Coverage

Estimates of the Size of Impact Groups

	Setting 1	Setting 2	Setting 3	Setting 4	Setting 5	Setting 6	Setting 7	
Urbanized Area								
Transportation - handicapped persons	4,500	3,250	12,800	9,200	4,100	72,000	112,400	
% Elderly	8%	5%	9%	9%	13.5%	13%	11%	
% 0-auto households	19%	5%	5%	13%	25.5%	19%	16%	
Service Areas							A	B
% Elderly	4.3%	5%	6%	6.5%	10%	13%	10%	10%
% 0-auto households	8%	5%	5%	8%	10%	19%	14%	8%

The number of transportation-handicapped persons in each setting was calculated using the following incidence rates: <18 years of age, 0.00276; 18-64 years of age, 0.02109; >65 years of age, .16416.[1] The percent elderly and percent 0-auto households are based on 1970 census data.

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[1] These incidence rates identify the population with mobility limitations due to chronic conditions (approximately 2.8% of the total population). The rates were derived from the 1972 National Health Survey.

DATA FOR IP SCENARIOS: 1980 (continued)

Vehicle-Miles Travelled

	Setting 1	Setting 2	Setting 3	Setting 4	Setting 5	Setting 6	Setting 7 A	Setting 7 B
Average auto trip length (miles)	4.7	3.3	5.3	5	3	6.25	6.5	
Average length (miles) of DRT trips formerly made by auto; taxi	3.0	2.6	3.7	3.5	2.4	3.25	2.65	3.9

The average DRT trip length was generated by the demand model. For estimating the change in vehicle-miles for taxicabs, it was assumed that, on an average, a taxicab travels 42,000 miles annually. The before case for auto was based on an auto trip generation rate of 1,275 trips/household/year. (Butke, 1976)

Employment

For exclusive ride taxi operations, it was assumed that between 1.5 and 1.8 persons are employed per cab. The employment dollars lost for exclusive ride taxi were computed as 45% of the cab receipts lost (these varied between settings) plus 15% for tips. These data were based on CDC (1977).

Automobile Costs

	Setting 1 Scenario A	Setting 1 Scenario B	Setting 2 Scenario A	Setting 2 Scenario B	Setting 2 Scenario C	Setting 3	Setting 4 Scenario A	Setting 4 Scenario B	Setting 4 Scenario C	Setting 4 Scenario D	Setting 5 Scenario A	Setting 5 Scenario B	Setting 6 Scenario A	Setting 6 Scenario B	Setting 7 Scenario A	Setting 7 Scenario B
Autos forgone/ year	77.5	54.2	91.5	166.5	142.0	43.8	88.7	71.8	36.8	177.6	12.2	5.5	793.2	886.3	41.9	76.7
Average autos/ household (urbanized areas)	1.24		1.71			1.66	1.33				1.01		1.21		1.31	

Automobile ownership data were taken from the 1970 U.S. Census. Cost assumptions were: (1) New Cars - $7,000 for capital investment and $0.06/mile to operate; (2) Used Cars - $4,000 to purchase and $0.08/mile to operate.

III. IP OPERATOR IMPACTS

Cost Data

Labor Rates[1] (Hourly)

	Setting 1	Setting 2 Scenario A,B	Setting 2 Scenario C	Setting 3 Scenario[2] A	Setting 3 Scenario[2] B	Setting 4	Setting 5	Setting 6	Setting 7 Union*	Setting 7 Non-union
Drivers - Bus	$3.51	$5.43	$3.48	$4.00	$3.50	$5.35	$5.51	$7.19	$8.90	---
Drivers - DRT	3.51	5.43	3.48	4.00	3.50	5.35	5.51	5.15	8.90	$3.50
Maintenance	3.95	6.00	4.00	4.00	3.75	5.35	5.51	7.19	8.90	5.00
Dispatchers	4.00	5.43	3.48	3.63	3.75	4.80	5.30	6.09	7.90	4.00
Order-takers	3.50	5.43	3.48	3.35	3.00	3.50	---	5.50	7.00	3.35
Clerical	3.15	3.60	--	--	--	3.37	---	3.85	---	4.00**
Administrators	5.00	7.00	5.00	---	---	5.85	---	12.00	9.50	8.00

The following non-labor operating costs were used:

Vans - $0.125/vehicle-mile
Bus - $0.248/vehicle-mile - Setting 2; $0.27/vehicle-mile - Setting 1

For Setting 3, the following formula was used to estimate labor and non-labor costs for Scenario A:

$$C = \$7.03\ H + \$0.197\ M + \$37.08\ V$$

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[1] Rates do not include fringe benefits.

[2] Private operator only.

*Average including overtime

**Administrative Assistant

DATA FOR IP SCENARIOS: 1980 (continued)

where:

C = Average daily cost of operations

H = Average daily vehicle-hours of service

M = Average daily vehicle-miles of service

V = Peak vehicle needs

Capital Investment Estimates

Vehicle/Equipment	Unit Cost ($000)	Life (years)
Buses - large	61-65	12
small	35	5
Vans - regular	14.5	3
lift - equipped	18.5	3
Mobile radios	1	20
Central radio	5	20
Fareboxes	2.41	15
Computer	95	4

DATA FOR IP SCENARIOS: 1980 (continued)

IV. LOCAL COMPETING PROVIDER IMPACTS

Taxi Industry Data

	Setting 1	Setting 2	Setting 3	Setting 4	Setting 5	Setting 6	Setting 7
No. of taxi companies	1 taxi company; 65 independently operated cabs	4	2	2	3; 7 owner operated	5	185; 400 owner operated
Taxicabs operated by each company	65 (taxi company)	-	30, 14	42, 11	28, 18, 5	240, 20, 40, 5, 7	2000 total
Total cabs operating in setting	130	65	44	53	58	312	2400
Fare structure	\$.90 1st mile \$.50 2nd etc.	\$1.10 1st mi. \$.60 2nd etc.	\$1.40 1st mi. \$.70 2nd etc. 25¢ each additional passenger	\$1.30 1st mi. \$.60 2nd etc.	\$1.25 1st mile; \$.70 2nd etc.	\$1.40 1st mile; \$.70 2nd etc.	\$1.10-\$1.30 1st mile; \$.60-.70 2nd, etc.
Average taxi trip length (miles)	3.0	2.6	3.7	3.5	2.4	3.25	3.5
Average Fare	\$1.90	\$2.06	\$3.44	\$2.80	\$2.23	\$3.00	\$2.83
Annual taxi trips before IP (000)[1]	1,053.3	414.9	294	445.1	428.6	2,459.9	32,373.2
Average occupancy[1]	1.39	1.55	1.59	1.57	1.57	1.45	1.45

[1] These data were generated from estimates reported in Taxicab Operating Charactertistics, prepared by Control Data Corporation and Wells Research Company for the U.S. Department of Transportation, March 1977. Average annual passengers and occupancy rates were given for different size taxi operations.

DATA FOR IP SCENARIOS: 1980 (continued)

Parking Data

	Setting 1	Setting 2	Setting 3	Setting 4	Setting 5	Setting 6	Setting 7
Average parking rates (hourly)	25¢ 1st hr. 20¢ 2nd etc	20¢ 1st hr. 25¢ 2nd etc	30¢ 1st hr. 25¢ 2nd etc.	25¢ 1st hr. 25¢ 2nd etc	25¢ 1st 2 hours 25¢ 3rd etc	25¢ 1st hr. 25¢ 2nd etc	50¢ 1st hr. 50¢ 2nd etc.
Monthly parking rates (estimated)	$15	$20	$20	$20	$9	$25	$25
Duration of CBD parking for non-work trip (hours)	1.1	1.1	1.2	1.2	1.1	1.1	1.1

Diversion Rates for Former Auto Trips

	Setting 1	Setting 2	Setting 3	Setting 4	Setting 5	Setting 6	Setting 7
% of former auto trips going to CBD	27%	40%	25%	47%	50%	17%	50%
% of above trips going to work	90%	40%	60%	80%	70%	80%	80%

Social Service Diversion

	Setting 1	Setting 2	Setting 3	Setting 4	Setting 5	Setting 6	Setting 7 A	Setting 7 B
% of IP trips diverted from social service providers	.2%	.25%	1%	1.1%	0.0%	0.5%	3.0%	0.9%

These percentages were estimated by taking into account the type of elderly and handicapped service included as part of the scenario and the size of the elderly population.

B.1.2 DATA FOR EXTENDED BUS ALTERNATIVE

I. USER IMPACTS

Mobility

Former Mode of Extended Bus Passengers

	Setting 1	Setting 2	Setting 3	Setting 4	Setting 5	Setting 6	Setting 7
Auto	73%	55%	67%	62%	46%	48%	39%
Taxi	8%	10%	15%	12%	19%	14%	10%
Walk	10%	20%	9%	11%	18%	24%	46%
No Trip	9%	15%	9%	15%	17%	13%	5%

II. COMMUNITY IMPACTS

Coverage

Coverage data for the extended bus alternative is identical to that used for IP 1980. See Section B.1.1.

Vehicle-Miles Travelled

	Setting 1	Setting 2	Setting 3	Setting 4	Setting 5	Setting 6	Setting 7
Average length of auto trips (miles)	4.7	3.3	5.4	5.0	3.0	6.25	6.5
Average length of new bus trips formerly made by auto (miles)	4.2	2.3	4.4	5.5	2.5	4.1	2.3
Average length of new bus trips formerly made by taxi	3.0	2.6	3.7	3.5	2.4	3.25	2.3

DATA FOR EXTENDED BUS ALTERNATIVE (continued)

Automobile Costs

	Setting 1	Setting 2	Setting 3	Setting 4	Setting 5	Setting 6	Setting 7
Autos foregone/ year	11.8	119.3	10.7	40.9	11.7	591.9	125.7
Average autos/ household (urbanized area)	1.24	1.71	1.66	1.33	1.01	1.21	1.31

III. EXTENDED BUS OPERATOR IMPACTS

Cost Data

Labor Rates[1] (Hourly)

	Setting 1	Setting 2	Setting 3	Setting 4	Setting 5	Setting 6	Setting 7
Drivers - Bus	$3.51	$5.43	$4.60	$5.35	$5.51	$7.19	$11.51
Maintenance	3.95	6.00	4.60	5.35	5.51	7.19	11.51
Dispatchers	4.00	5.43	--	4.80	--	6.09	-
Clerical	3.15	3.75	3.50	3.35	--	3.85	-
Administrators	5.00	7.00	5.50	5.85	--	12.00	13.00

Capital Investment Estimates

Vehicle/Equipment	Unit Cost ($000)	Life (years)
Lift-equipped buses - large	78	12
small	42	5
Fareboxes	2.41	15

[1] Rates do not include fringe benefits.

IV. LOCAL COMPETING PROVIDER IMPACTS

All data used in computing local competing provider impacts for the extended bus alternative remain unchanged from the IP 1980 Scenarios. See section B.1.1.

B.1.3 DATA FOR EXTENDED TAXI ALTERNATIVE

I. USER IMPACTS

Mobility

Former Mode of Extended Taxi Passengers

	Setting 1	Setting 2	Setting 3	Setting 4	Setting 5	Setting 6	Setting 7
Auto	32%	55%	35%	59%	40%	20%	23%
Bus	35%	20%	20%	26%	--	30%	25%
Taxi	--	--	20%	--	5%	25%	4%
Walk	15%	19%	15%	10%	25%	12%	45%
No Trip	18%	6%	10%	5%	30%	13%	3%

Coverage

Coverage data remains unchanged from the 1980 IP scenarios. See Section B.1.1.

II. COMMUNITY IMPACTS

Vehicle-Miles Travelled

	Setting 1	Setting 2	Setting 3	Setting 4	Setting 5	Setting 6	Setting 7
Average length of new taxi trips formerly made by auto (miles)	3.5	1.9	2.2	3.5	4.6	3.7	3.9
Average length of new taxi trips (miles)	3.8	2.0	2.2	3.5	1.2	1.5	2.3

DATA FOR EXTENDED TAXI ALTERNATIVE (continued)

Automobile Costs

	Setting 1	Setting 2	Setting 3	Setting 4	Setting 5	Setting 6	Setting 7
Autos foregone/ year	22.8	0	10.2	0	1.4	27.6	1.0
Average autos/ household (urbanized area)	1.24	1.71	1.66	1.33	1.01	1.21	1.31

III. OTHER IMPACTS

Data used for IP Operator Impacts and Local Competing Provider Impacts are identical to that used in the IP 1980 scenarios. See section B.1.1. Additional data are listed below.

Capital Investment Estimates

Vehicle/Equipment	Unit Cost ($000)	Life (years)
Taxicab	5.0	3
Radio	1.0	10
Meter	.6	10

B.2 YEAR 2000 DATA

B.2.1 YEAR 2000: GENERAL ASSUMPTIONS

The analysis of year 2000 scenarios required many assumptions about future conditions. To the fullest extent possible, other studies which focused on future conditions were used to estimate changes that will occur by the year 2000. Because of particular uncertainty about future energy availability and its influence on prviate automobile costs and ownership, two different alternative futures are considered. The first, "base case", assumes that energy costs and automobile ownership patterns will change only slightly by the year 2000. This assumption is based on a study of future automobile usage conducted for the Office of Technology Assessment (Systems Design Concepts, 1977). The second case assumes that strict policies to conserve energy are undertaken, with a resulting impact on automobile operations. The assumption made, and the source and/or rationale for each, is shown below:

1. Population - Local population projections, by census tract where available, were used in each setting.

2. Employment - Local employment projections were used in each setting. Additional assumptions were:

   a. The percent of the working age population employed increases from 55% to 65% on the average, in response to increased participation of women in the work force.

   b. The percent of senior citizens working increases by 15% to 25% on the average, in response to changes in mandatory retirement practices and changes in the Social Security system.

3. Age Characteristics - Local projections were used, and in some cases, adjusted somewhat to reflect more recent national projections.

4. Household Size - Persons per household assumed to decrease from 3.0 (1975) to 2.4. Household size distribution developed by adjusting existing distribution in each setting.

5. Auto Ownership - Two cases were considered:

a. Normal (base) case - Autos per licensed driver increase from .82 in 1980 to .89 in year 2000, an increase of 8.5%. SDC (1977): Median projection.

b. Energy disincentive case - Autos per household decrease from .82 to .81. SDC (1977): Energy disincentives scenario.

6. Automobile Costs - Two cases were considered:

a. Nominal (base) case - Automobile operating cost remains constant, partly in response to shift to smaller cars. SDC (1977).

b. Energy disincentive case - Automobile operating costs increase 40% above cost of living increase (SDC, 1977), energy disincentive case)

In both cases, average automobile capital costs (e.g., purchase price), incorporating changes in vehicle size mix, remain constant vis-a-vis cost of living.

7. Transit Costs/Fare - Both transit cost and fare are assumed to remain constant with respect to cost of living. Historical data suggest that fare does not keep pace, while operating cost increases exceed the increase in cost of living.[1] However, given increased competition for public subsidies, it is likely that farebox revenues in the future will have to cover at least as much of the cost as they do presently. Furthermore, since virtually all public takeovers have already occurred, and since there is increasing interest in keeping costs down, it is likely that transit operating costs will not follow past trends. Thus, the constant fare and cost have been assumed. (In one setting, in which transit labor is not yet unionized, it is assumed that operating cost increases by 5%). Transit capital costs are assumed to rise 20% because of Transbus or accessibility requirements and other federal mandates.

8. Taxi Costs/Fare - Taxi operating costs have been assumed to increase by 20% over the cost of living to account for the impact on labor rates of increased public involvement and public contracts. Taxi fares have been assumed to rise at the same rates as cost to allow the taxi industry to remain profitable.

9. Vehicle Speeds - Average vehicle speeds are assumed to decrease by 5% in response to increases in congestion. (SDC, 1977).

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[1]All costs for year 2000 are in 1977 dollars. Costs expected to rise at a faster or slower rate than the cost of living are treated by their difference from 1977 level.

B.2.2 DATA FOR IP SCENARIOS: YEAR 2000

I. USER IMPACTS

Mobility

Former Mode of Integrated Paratransit Passengers

	Setting 1	Setting 2 Scenario A-1	Setting 2 Scenario A-2	Setting 3 Scenario A-1	Setting 3 Scenario A-2	Setting 3 Scenario B-1	Setting 3 Scenario B-2	Setting 4	Setting 5 Scenario A-1	Setting 5 Scenario A-2	Setting 6 Scenario A-1	Setting 6 Scenario A-2	Setting 7 Scenario A-1	Setting 7 Scenario A-2
Auto	53%	48.8%	45.5%	40%	38%	41%	38%	40%	25%	22%	41%	37%	76%	75%
Bus	8%	11.5%	11.5%	30%	34%	28%	32%	22%	30%	31%	21%	23%	6%	6%
Taxi	15%	7.7%	8.0%	10%	12%	12%	14%	15%	20%	22%	6%	10%	6%	7%
Walk	10%	15.0%	16.0%	8%	8%	9%	8%	10%	10%	10%	19%	15%	9%	9%
No Trip	14%	17.0%	19.0%	11%	8%	11%	8%	13%	15%	15%	13%	15%	3%	3%

These estimates were dervied by adjusting the 1980 distributions to reflect the hypothesized changes in service area characteristics, the availability of public transit in those areas, and auto ownership.

II. COMMUNITY IMPACTS

Coverage

Estimates of the Size of Impact Groups

Urbanized Area	Setting 1 Scenario A-1	Setting 1 Scenario A-2	Setting 2 Scenario A-1	Setting 2 Scenario A-2	Setting 3 Scenario A-1	Setting 3 Scenario A-2	Setting 3 Scenario B-1	Setting 3 Scenario B-2	Setting 4 Scenario A-1	Setting 4 Scenario A-2	Setting 5	Setting 6	Setting 7 Scenario A-1	Setting 7 Scenario A-2
Transportation-handicapped persons	6,900		4,160		18,125				10,750		4,180	77,000	134,500	
% Elderly	9%		6%		9%				10.4%		15.5%	15%	12%	
%0-auto households	20%	23%	4%	6%	4%	6%	4%	6%	11%	12%	23%	17%	14%	18%

Estimates of the Size of Impact Groups (continued)

	Setting 1 Scenario A-1	Setting 1 Scenario A-2	Setting 2 Scenario A-1	Setting 2 Scenario A-2	Setting 3 Scenario A-1	Setting 3 Scenario A-2	Setting 3 Scenario B-1	Setting 3 Scenario B-2	Setting 4 Scenario A-1	Setting 4 Scenario A-2	Setting 5	Setting 6	Setting 7
Service Areas													
% Elderly	4.3%		6%		7%				7.5%		11.5%	15%	6%
% 0-auto households	6%	9%	4%	6%	4%	6%	4%	6%	9%	12%	8%	10%	6%

Vehicle-Miles Travelled

	Setting 1	Setting 2	Setting 3	Setting 4	Setting 5	Setting 6	Setting 7
Average trip length (miles)	4.7	3.3	5.4	5	3.3	6.25	6.5
Average DRT trip length (miles) formerly made by auto	3.6	3.3	3.7	3.5	2.5	3.5	3.4

The "before" case for auto VMT was based on an auto trip generation rate of 1,275 trips/household/year under the base auto ownership case and 1,200 trips/household/year under the reduced auto ownership case.

Automobile Costs

	Setting 1 Scenario A-1	Setting 1 Scenario A-2	Setting 2 Scenario A-1	Setting 2 Scenario A-2	Setting 3 Scenario A-1	Setting 3 Scenario A-2	Setting 3 Scenario B-1	Setting 3 Scenario B-2	Setting 4 Scenario A-1	Setting 4 Scenario A-2	Setting 5	Setting 6	Setting 7 Scenario A-1	Setting 7 Scenario A-2
Autos fore-gone/year	59.1	77.1	124.1	128.9	82.7	101.1	86.9	110.3	130.9	121.3	23.6	198.2	82.7	46.2
Average autos/household (urbanized area)	1.20	1.10	1.67	1.60	1.61	1.47	1.61	1.47	1.29	1.18	0.98	1.17	1.12	1.03

Auto capital costs were retained at 1980 levels. Auto operating costs were estimated at 6¢/mile for new cars and 8¢/mile for all cars under the base auto ownership case and 8.4¢ and 11.2¢ respectively under the reduced auto ownership case.

III. IP OPERATOR IMPACTS

Wage rates for transit authority employees and taxi company employees remain unchanged from 1980 with the exception of Augusta where operating costs were assumed to increase by 5% over the cost of inflation. See section B.1.1 for the 1980 wage rates. As explained in the general assumptions, bus capital costs are assumed to increase by 20% resulting in a cost of $78,000 per large fully accessible bus.

IV. LOCAL COMPETING PROVIDER IMPACTS

Taxi Industry Data

	Setting 1	Setting 2	Setting 3	Setting 4	Setting 5	Setting 6	Setting 7
Number of taxi companies	1 taxi company; 65 independently operated cabs	4	2	2	2; 7 owner-operated	5	-
Taxicabs operated by each company	90 (taxi company)	-	52, 14	49, 13	31, 20	250, 25, 47, 5, 7	-
Total cabs operating in setting	155	80	66	62	58	334	2680
Fare structure	$1.10 1st mile $.60 2nd etc.	$1.30 1st mile; $.70 2nd etc.	$1.70 1st mile; $.85 2nd etc. 25¢ each additional passenger	$1.55 1st mile; $.75 2nd etc.	$1.50 1st mile; $.84 2nd etc.	$1.70 1st mile; $.84 2nd etc.	$1.32-$1.56 1st mile $.72-$.84 2nd, etc.
Average trip length (miles)	3.6	2.6	3.7	3.5	2.5	3.5	2.1
Average fare	$2.66	$2.42	$4.00	$3.43	$2.76	$3.80	$2.30

Diversion Rates for Former Auto Trips

	Setting 1	Setting 2	Setting 3	Setting 4	Setting 5	Setting 6	Setting 7
% of former auto trips going to CBD	32%	40%	25%	36%	25%	15%	21%
% of above trips going to work	95%	40%	75%	75%	50%	80%	92%