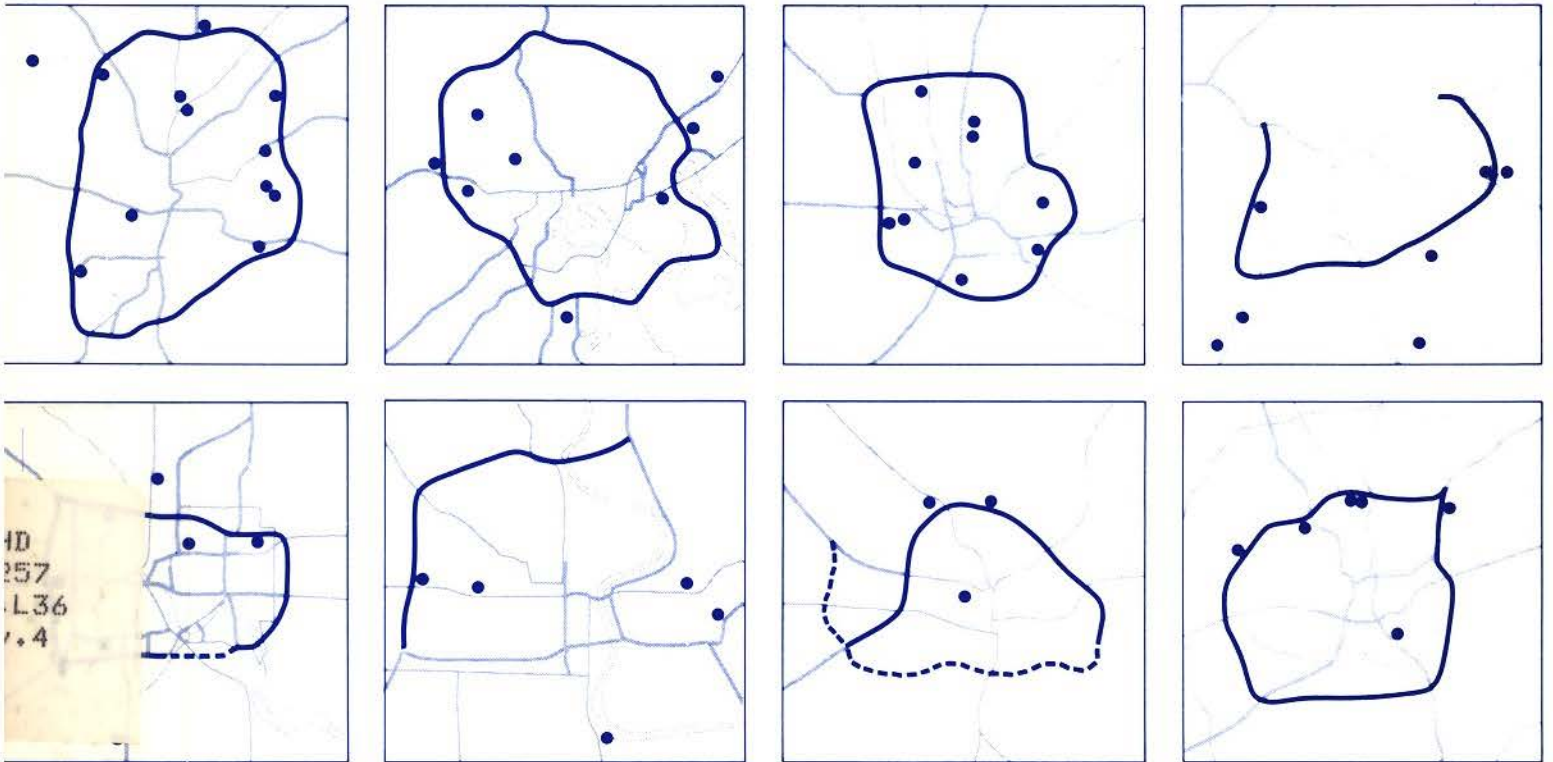


Summary
October 1980

THE LAND USE AND URBAN DEVELOPMENT IMPACTS OF BELTWAYS



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**THE LAND USE AND URBAN
DEVELOPMENT IMPACTS OF BELTWAYS
EXECUTIVE SUMMARY**

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INTRODUCTION

OVERVIEW

Beltways—limited access highways partially or completely circling cities—are integral components in many urban transportation systems, but their effects on land use and urban development and the economies of regions and central cities are not well understood. When the Interstate Highway System was planned in the 1940s and 1950s, beltways were viewed primarily as bypass highways, carrying through traffic around central cities. With dramatic, post-war suburbanization of housing and employment, beltways have become important links between suburban centers and subcenters. As such, they have played an increasingly critical role in the movement of people and goods within metropolitan areas and have affected location and development decisions. Research to date has concentrated on impacts on retail and industrial location, but no consistent evidence exists as to beltways' effects on urban form and their socio-economic, fiscal and environmental implications, though such information is crucial for understanding the effects of existing beltways and evaluating current proposals to construct beltways in approximately 30 metropolitan areas.

The relationship between beltways and other forces shaping our cities also is not well understood. These factors include the nature of the radial highway network, the age and structure of the central city, land availability, real estate market trends, local zoning and land use policy, annexation law, utilities extension policies, and environmental constraints.

This study, jointly commissioned by the U.S. Department of Transportation and the U.S. Department of Housing and Urban Development, presents an assessment of beltways' land use and urban development impacts and describes the urban and transportation policy implications. Prior research and the findings of a comparative statistical analysis and detailed case studies were examined to determine (1) what effects beltways have had, (2) why beltway-induced changes have occurred, (3) who was affected by such changes, and (4) how federal and local government agencies can work with business and community groups to capitalize upon the potential benefits offered by beltways and to minimize or eliminate their anticipated adverse effects. Of particular concern to the federal government is the possibility that beltways may undermine central city revitalization efforts and attempts to achieve compact, energy-conserving and environmentally sound land use patterns.

The findings and conclusions of this study should be of interest to and usable by a broad spectrum of individuals and groups, including federal decision makers, local land use and transportation planners, members of business, community and civic organizations, academics, and environmentalists. The study produced four publications on the land use and urban development impacts of beltways, one or more of which may serve the purposes of the reader not interested in the entire research effort. Available are The **Final Report**, **Case Studies**, and **Guidebook**, as well as this volume, the **Executive Summary**.

METHODOLOGY

The study consists of three major components: a survey of pertinent literature, a comparative statistical analysis of 54 metropolitan areas, 27 with beltways and 27 without, and eight detailed case studies of beltway cities. Several bodies of writing and research were reviewed, including land use and location theory, beltway impact studies, other highway impact studies, foreign experience with highway impacts, and sources on methodology.

The second major element of the study, the comparative statistical analysis, consists of a sample of 27 American "beltway" cities, defined as cities of over 100,000 people, partially or completely encircled by a limited access, non-toll, circumferential highway, and 27 non-beltway cities meeting the same initial criteria, but averaging somewhat smaller, younger, and more likely to be located in the "sunbelt." This is because most older, Northeastern cities are surrounded by beltways, built in the 1950s and 1960s to serve through traffic, and few non-beltway cities remain. A large data base was assembled and a multivariate analysis undertaken to determine beltway influences on population, employment, trade, residential movement, vehicle miles traveled and the relationship between beltways and other factors on urban development by type of beltway. Cities included in the comparative statistical analysis are listed in Table 1.

From the 27 beltway cities in the comparative statistical analysis, which represent nearly the universe of American beltway cities, eight cities were chosen for detailed case studies—Atlanta, Baltimore, Columbus, Louisville, Minneapolis/St. Paul, Omaha, Raleigh, and San Antonio. Several criteria determined this choice, including the size of the SMSA, the growth rate of the central city population, the city's geographic location, and its degree of economic distress and retail health. Finally, the beltways themselves were examined, to ensure that highways of different ages, lengths, distances from downtown, jurisdictional locations, capacities, and traffic volumes were studied. Some of the most important characteristics of the case study areas are summarized in Table 2.

TABLE 1. METROPOLITAN AREAS INCLUDED IN COMPARATIVE STATISTICAL ANALYSIS

<u>Beltway</u>		<u>Non-beltway</u>	
Atlanta, GA	Memphis, TN	Akron, OH	Phoenix, AR
Baltimore, MD	Milwaukee, WI	Albuquerque, NM	Pittsburgh, PA
Boston, MA	Minneapolis-St.	Birmingham, AL	Portland, OR
Buffalo, NY	Paul, MN	Charlotte, NC	Richmond, VA
Cleveland, OH	Nashville, TN	Chattanooga, TN	Sacramento, CA
Cincinnati, OH	Oklahoma City, OK	Dayton, OH	Salt Lake City, UT
Columbus, OH	Omaha, NE	Fresno, CA	San Diego, CA
Dallas-Ft. Worth, TX	Raleigh, NC	Grand Rapids, MI	Seattle, WA
Denver, CO	Rochester, NY	Jacksonville, FL	Spokane, WA
Houston, TX	San Antonio, TX	Kansas City, KA	Syracuse, NY
Indianapolis, IN	St. Louis, MO	Knoxville, TN	Tampa-St. Peters-
Lexington, KY	Toledo, OH	Little Rock, AK	burg, FL
Louisville, KY	Washington, DC	Madison, WI	Tucson, AR
Lubbock, TX	Wichita, KA	New Orleans, LA	Tulsa, OK

Two-day site visits were conducted in January and February 1980 in each metropolitan area. Interviews with 104 local informants—including officials in the city, county, and regional governments and state transportation departments as well as academics, realtors, bankers, developers, retailers, and representatives of civic organizations and community groups—provided invaluable and contrasting perspectives on local beltway planning and the beltway's regional effects. Drafts of the case studies were critically reviewed by several local informants in each area and by the federal sponsors of the project.

Highlights of the study's findings on beltway characteristics and effects are summarized here, as are the policy implications of these findings for federal, regional and local government officials and others concerned with the highway's role in influencing land use and urban development patterns.

TABLE 2. CHARACTERISTICS OF CASE STUDY AREAS

	Population, 1975		Beltway Mileage	Year of Initial Segment Opening	Percent of Beltway in Suburbs
	Metropolitan Area	Central City			
Atlanta	1,790,000	430,000	64	1962	80
Baltimore	2,150,000	850,000	51	1955	100
Columbus	1,070,000	540,000	56	1968	55
Louisville	890,000	360,000	23	1949	40
Minneapolis/St. Paul	2,010,000	660,000	54	1951	100
Omaha	570,000	370,000	13	1965	0
Raleigh	460,000	130,000	14	1961	0
San Antonio	980,000	770,000	64	1957	10

Sources: U.S. Bureau of the Census, U.S. Department of Housing and Urban Development, Blayney-Dyett from information provided by state highway departments.

ISSUES AND BACKGROUND

ISSUES

This study examines several of the issues of greatest concern to those evaluating and potentially affected by the construction of urban beltways. These include the following questions:

Transportation Policy Issues

1. Are beltways essential components of a regional highway system? Will they serve the travel markets for which they were designed better than alternatives?
2. Beltways may relieve congestion on radial highways and local streets. Is there any evidence that they do this more efficiently than alternative transportation improvements?
3. Do beltways support or hinder efforts to increase transit ridership and reduce total travel?
4. Are differences in beltways' impacts, both on travel and on land use and urban development, attributable to differences in beltway characteristics: partial versus complete, inner versus outer? Are there threshold effects?

Urban Policy Issues

1. Do beltways affect the economic and fiscal health of central cities?
2. Do beltways affect the demand for other, federally financed infrastructure investments?
3. Do beltways affect the distribution of employment or overall employment growth?
4. Does beltway-related industrial and commercial development reduce accessibility to employment opportunity for central city residents, particularly low income and minority?
5. Do beltways contribute to scattered suburban development, or do they provide compact, high density development in already suburbanizing areas?
6. Do beltways contribute to increased energy consumption by inducing travel or by creating longer trips?
7. Do beltways contribute to environmental degradation through increased air pollution, consumption of agricultural land, or disruption of sensitive environments?
8. Is beltway-related development compatible with regional and local planning objectives, and are planning tools available to deal with the effects of the beltway?
9. What are the local metropolitan effects of alternative transportation improvements?
10. Are there benefits for the metropolitan area as a whole that outweigh detrimental effects on particular jurisdictions?

PRIOR RESEARCH

Since the 1950s, numerous case studies have addressed the impacts of Interstate highways on urban growth and development patterns. Nearly all of these concluded that radial highways and beltways affected travel patterns and urban land use, but the magnitude and extent of impact found varied greatly. The 1968 Maryland-Capital Beltway study, for example, estimated that the beltway increased average trip length by 13 percent and drew households and workers out of the District of Columbia in part because of the improved accessibility offered. However, a 1968 report of the University of Virginia determined that few people living in apartments along the Capital Beltway worked in nearby industries. Some researchers concluded that beltways affected the location of new shopping centers, to the detriment of downtowns, while others disagreed because they found that a beltway had little effect on the overall distribution of population and, therefore, of consumer demand. Effects on housing development decisions, documented in four studies, showed that beltways attract medium and high density projects, but whether this meant that the overall rate of suburbanization was affected was not demonstrated. None of the studies investigated fiscal or environmental effects in much detail, and impacts on employment opportunities were judged negative.

Taken together, this body of work provides a useful historical perspective, but several limitations circumscribe its usefulness today. First, older studies focused on a narrow set of objectives to be met by construction of the beltway which rarely included policy issues now judged important, such as the facility's effect on central city health, the distribution of housing and employment opportunities, or the environment. Second, this work does not provide any evidence on the long-term effects on beltways in urban areas. Third, the analytical procedures used by researchers are not readily adaptable or transferable to current planning efforts. Finally, previous studies of beltway impacts include little information for planners attempting to enhance or mitigate potential effects of beltway construction.

HISTORY OF BELTWAYS IN THE UNITED STATES

Most of the limited access, non-toll, circumferential highways in the United States were constructed under the auspices of the Interstate Highway System, established by Congress in 1944. The Federal-Aid Highway Act which created the Interstate Highway System reserved 2,300 of the 40,000 miles authorized for construction for urban circumferential routes, or beltways. Oriented to engineering, the Interstate program initially did not include rigorous planning requirements. As first conceived, highway departments were to analyze the relationship of the highway to land use and urban planning; in 1956 they were instructed to hold a public hearing considering the economic effects of the proposed beltway alignment.

Substantive planning requirements, the "3C" process requiring continuing, coordinated, and comprehensive planning, were first mandated in 1962 and expanded in 1970. These required consultation with responsible local public officials. The 1970 Act also required evaluation of social, economic and environmental impacts of proposed highway projects. Not until the Federal-Aid Highway Act of 1978 was legislated were transportation planners forcefully encouraged to tie their planning to land use planning and to recognize the socioeconomic, environmental and energy implications of particular transportation projects.

As a result, beltway planning in the 1940s and 1950s mainly involved coordination with local agencies and little analysis of the effects of highways on urban areas: alternatives rarely were evaluated comprehensively, and land use and infrastructure impacts for the most part were given little attention. Further, effects on central cities and urban revitalization programs were not examined, nor were impacts on development patterns assessed. Thus, the planning of most existing beltways, provides little in the way of example for current planning.

BUILDING THE BELTWAYS

The creation of the Interstate Highway System with its special provisions for beltways is responsible for their prevalence in American cities. In areas such as Minneapolis/St. Paul and San Antonio, where beltways had already been built, existing facilities were substantially improved and expanded; the beltway was established as a major component of the regional highway network. In most cities, however, beltways were constructed through open land and integrated into a roadway system based on radials or a grid pattern. Few federal standards guided belt construction, and local officials generally approached the project from a technical standpoint. Although the social and economic effects of different beltway designs were not considered, particular attributes were found to influence a beltway's effects on the surrounding community. Table 3 summarizes the characteristics of the beltways studied in the comparative analysis.

- A complete loop beltway does not have marked different impacts or exhibit higher traffic volumes than a partial circumferential highway; location and interchange spacing are more important design features affecting land use and urban development in the belt corridors and in the metropolitan area at large.
- Closely spaced interchanges and frontage roads attract more development to a beltway corridor than widely spaced interchanges and no frontage roads simply because of the increased accessibility they provide.
- Distance from downtown was not found to be significant either in the comparative statistical analysis or in the detailed case studies.
- Without coordinated land use and transportation planning, a beltway can increase traffic on intersecting local streets and radial highways in the corridors they serve because of their effects on development patterns and the accessibility they offer. However, at a system-level of analysis they provide a more even distribution of traffic.
- Interchange location and corridor land use policies should be carefully evaluated in order to avoid unexpected land use impacts with adverse socioeconomic, fiscal, and environmental consequences. Highly accessible interchange areas offer attractive opportunities for commercial and industrial development; transportation planners should recognize this effect and plan accordingly, land use planners should coordinate with transportation planners to avoid creating opportunities for development which would conflict with local or regional policies or harm older business districts.

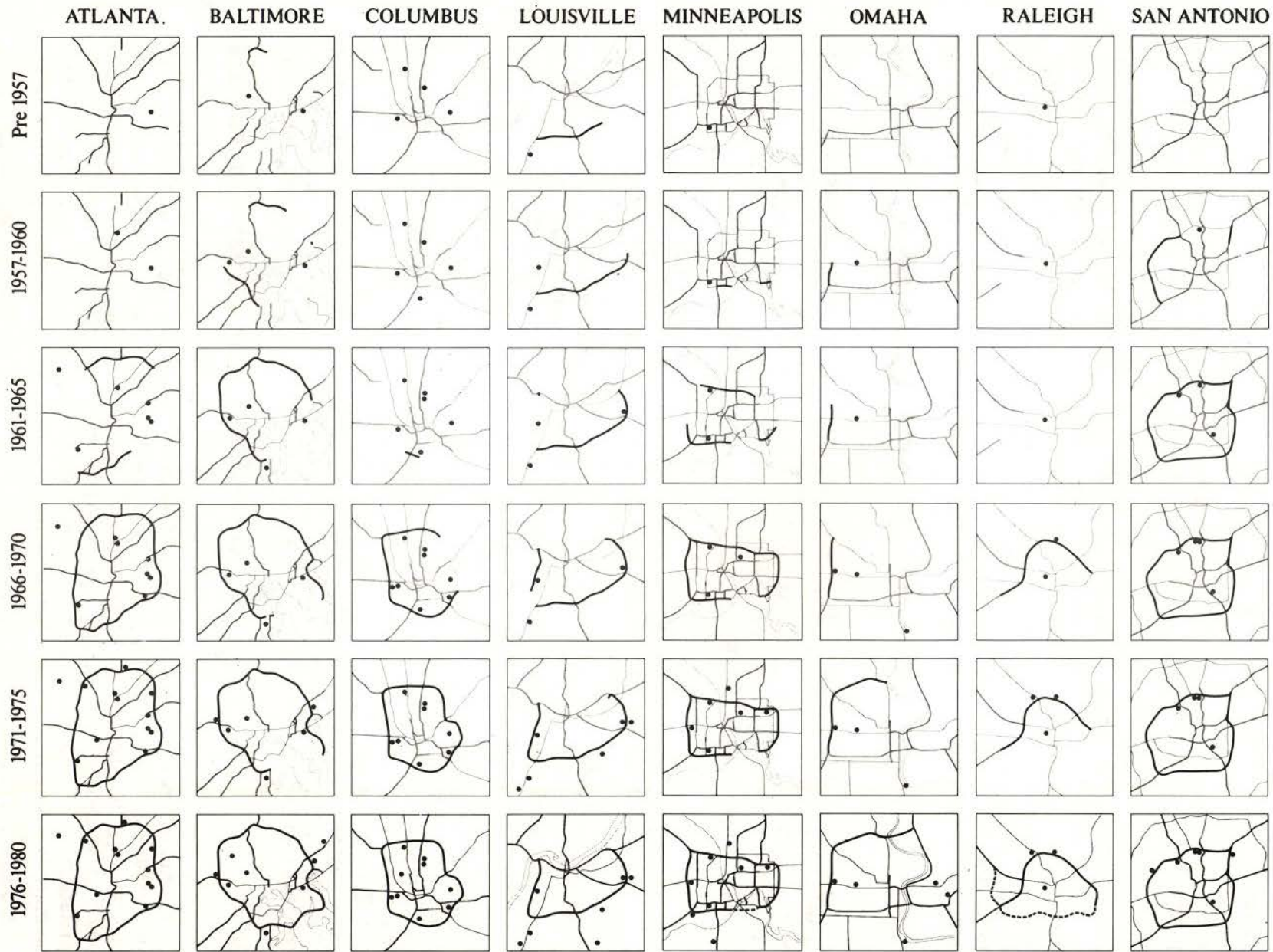
- A beltway can be an important component of an urban highway system, providing an improved network for non-downtown oriented trips and for through traffic. Beltways offer cross-town connections between suburban communities that work particularly well where the radial highway networks mainly serve those working downtown or at outlying employment sites.

The foregoing findings contain implications for policy which will guide the construction of future beltways. First, local officials and transportation and land use planners need guidance on how to evaluate the effects of proposed beltways on urban development patterns and the economies of central cities. The **Guidebook** responds to this need by proposing a specific assessment methodology and showing how beltways can be a positive element in community development and urban revitalization efforts. Second, greater coordination with land use planning should be encouraged by affirming requirements for conformance with local plans and objectives, and integrating planning requirements with national urban policy. Third, the location of beltway interchanges should be carefully studied, and requests for additional interchanges should undergo stringent review process to ensure that feasible measures are implemented to minimize potential adverse effects, particularly on older urban areas.

TABLE 3. BELTWAY CHARACTERISTICS BY LOCATION

Central City	Location (Percent in Suburban Areas)	Distance from Central Business District (Miles)	Percent of Potential Arc Built	Length (Miles)	Interchanges per Mile
Houston	5	5	100	44	1.25
Indianapolis	5	8	100	58	.50
Lexington	0	5	80	23	.35
Lubbock	0	6	100	26	.88
Memphis	0	8	59	15	.87
Oklahoma City	0	5	100	20	1.70
Raleigh	0	4	55	14	.64
San Antonio	10	9	100	64	.64
Average		6.3 (1.83)	85.6 (21.6)	33 (19.7)	0.85 (0.44)
Mixed Jurisdiction					
Columbus	55	10	100	56	.43
Dallas-Ft. Worth	40	10	95	110	.80
Denver	60	9	80	39	.95
Louisville	40	5	65	23	1.22
Nashville	70	5	50	16	.81
Omaha ^a	50	5	100	22	1.27
Toledo	50	6	75	36	.72
Rochester	70	3	80	21	1.38
Average		6.6 (2.7)	80.6 (17.6)	40.4 (30)	.95 (.32)
Suburban					
Atlanta	80	9	100	64	.71
Baltimore	95	7	100	51	.90
Boston	100	11	90	42	.93
Buffalo	100	8	90	19	.68
Cincinnati	100	12	95	77	.49
Cleveland	100	16	60	26	.73
Milwaukee	85	7	70	17	1.41
Minneapolis-St. Paul	100	11	100	54	1.00
St. Louis	99	12	65	54	.63
Washington, D.C.	100	9	100	66	.68
Wichita	100	7	75	30	.33
Average		9.9 (2.8)	85.9 (15.4)	45.5 (20.2)	(.77) (.29)

^a The city has annexed the beltway right of way, but large unincorporated areas remain inside the beltway. For this reason, Omaha was classified initially as a "mixed jurisdiction" beltway. The mileage includes I-80, a radial highway.



EVOLUTION OF THE BELTWAYS

● Regional Shopping Center

FINDINGS

The principal findings of the study are organized by subject, starting with effects on regional economic growth and then summarizing effects on location and development decisions, central cities, land use policy and capital improvement programming and the political, social, and environmental consequences of these impacts. This section closes with an assessment of other factors, working together with beltways, that have caused many of the differences in development patterns in metropolitan areas.

EFFECTS ON REGIONAL ECONOMIC GROWTH

Proponents of specific beltway projects prophesied an enhanced competitive position for the region and greater prosperity. Theory supports this possibility, for beltway construction could provide increased development opportunities and encourage the growth of industries requiring excellent highway access, such as wholesaling and distribution. However, the comparative statistical analysis uncovered no increase in economic well-being stemming from beltway construction. The short-term boost to the local economy deriving from expenditures on highway construction was too small to detect, even after multiplier effects. Further, this short-term gain would be achieved by most investments in the transportation system.

- No strong evidence exists demonstrating that beltways improve a metropolitan area's competitive advantage. Weak statistical relationships suggest a small, positive effect on population growth during the 1960s but not the 1970s. No statistically significant relationship between the presence of a beltway and above average increases in manufacturing employment in the 1960s or 1970s was found.

The policy implication of this finding is obvious: a proposed beltway only rarely can be justified on the even partial basis that it will enhance the region's economic position. Further, because any net gains are likely to be small, potential adverse impacts of beltway construction probably cannot be balanced by beltway-induced regional economic growth.

EFFECTS ON LOCATION AND DEVELOPMENT DECISIONS

Though beltways do not appear to stimulate greater growth in the areas in which they are located, one would expect that they would affect the distribution of commercial, residential and industrial development within the region. A beltway interchange provides access and visibility to the suburbs for retail outlets; by improving intra-regional accessibility, a beltway may allow commuters to live further from their jobs without increasing work trip times and firms to locate on relatively inexpensive outlying sites while retaining contact with markets and suppliers.

This potential distributive impact of a metropolitan beltway is of the greatest concern to policy makers and community groups. If a beltway does spur suburbanization of activity which would otherwise locate within or closer to the central city, housing and employment opportunities may be lost by those in greatest need of them, cities may lose valuable fiscal resources, and excessive amounts of land and energy may be consumed in a wasteful pattern of land use. Thus, the attractiveness of beltway sites for new development is a crucial topic for research.

Investigation of several existing beltways' effects on development revealed a pattern in several cities of a short-lived shift of office space construction to beltway sites and a clustering of garden apartments adjacent to the highway. Impacts on other types of development were weak or non-existent. In general, however, beltway construction appeared to stimulate development in growth areas but to be incapable of inducing development in an area with a poor image; in each of the case study cities vacant land is available along portions of the beltway, while other beltway sites command premium prices.

- A beltway can increase development opportunities in its corridor, reinforce prevailing urbanization patterns, and facilitate compact development. However, it is not a sufficient inducement to counteract the effect of an area's poor image or to create a market for land, housing, or commercial and industrial space where none historically existed.
- Beltway interchanges are favored locations for regional shopping center development, but many of these centers would be built in suburban market areas if the beltway had not been constructed. Beltways appear to affect the timing, location, size, and initial success of these centers but are not critical in determining their overall feasibility.
- Industrial and office park developers are willing to pay a premium for corridor and interchange area sites with accessibility to and visibility from the beltway. However, the presence of a beltway is less important than the availability of developable land and the accessibility to a skilled labor force. In most communities, radial highway sites with rail access were preferred over beltway sites for industrial park development.
- A beltway may have a locational effect on multi-family housing; single family residential development patterns rarely are affected over the long run. Differences in housing patterns between beltway and non-beltway cities are not statistically significant.

The most significant policy implication of the findings on beltway impacts on development is that a coherent and effective land use policy is required to control beltway-induced development in growth areas and to enforce conformance with local land use plans and objectives. Also, planners should not rely upon the allure of the beltway to draw new investment into areas previously of little interest to developers or to the business community.

EFFECTS ON CENTRAL CITIES

Beltways, particularly those located outside the boundaries of the central city, may adversely affect the economic health of the central city if beltway sites prove attractive to retail establishments, offices or industries which would have located

inside the city in the absence of the beltway. If the beltway is within city limits, the central business district is still vulnerable to losing its mainstays to beltway sites.

Research has shown that in an area with permissive land use policies, construction of a beltway may indeed harm the central city and downtown, undermining revitalization efforts by attracting developers of office space and retail centers. However, suburbanization of these uses is a nationwide phenomenon; the beltway may have served as a focus for development which would have occurred in another suburban location if the belt had not been built. Further, beltway impacts on downtown may be more than compensated for by energetic and cooperative efforts by the local business community and planning officials to bolster the downtown.

- Historically, central cities surrounded by suburban beltways posted lower gains in retail sales and employment than those with beltways within their jurisdiction or those where no beltway was built. Changes in the central city population and work force were the most important determinants of central city retail sales.
- Beltways can have a "one time" effect on the distribution of new office space in a metropolitan area that may weaken the downtown office space market, drawing some employment out to suburban locations that might have stayed downtown had the beltway not been built. This effect is short-run in nature and need not harm central city revitalization efforts.

TABLE 4. TRENDS IN CENTRAL BUSINESS DISTRICT RETAIL SALES

		1967-72			
		Increases		Decreases	
Beltway		Atlanta Baltimore Boston Cincinnati	Louisville Lubbock Milwaukee Washington DC	Buffalo Columbus Dallas-Ft. Worth Indianapolis Minneapolis-St. Paul Nashville	Omaha Raleigh Rochester San Antonio Toledo Wichita
Non-Beltway		Charlotte Chattanooga Jacksonville Kansas City New Orleans Pittsburgh	Portland Richmond Salt Lake City Spokane Tampa-St. Pete Tulsa	Akron Albuquerque Dayton Fresno Grand Rapids Knoxville Little Rock	Madison Sacramento San Diego Seattle Syracuse Tucson
		1972-77			
		Increases		Decreases	
Beltway		Boston Cincinnati Dallas-Ft. Worth Houston Indianapolis Wichita	Louisville Milwaukee Minneapolis-St. Paul San Antonio	Atlanta Baltimore Buffalo Columbus Lubbock Nashville	Omaha Raleigh Rochester Toledo Washington DC
Non-Beltway		Fresno Grand Rapids Little Rock Madison Pittsburgh Portland	Sacramento Salt Lake City San Diego Seattle Tulsa	Akron Albuquerque Charlotte Chattanooga Dayton Jacksonville	Kansas City Knoxville Richmond Tampa-St. Petersburg Syracuse Tucson

- Differences in 1967-77 sales trends in central business districts are not significantly different in beltway and non-beltway areas studied, and the existence or location of a beltway is not a statistically significant factor after accounting for other influences, such as primarily changes in resident population and manufacturing employment.
- Beltways showed a small, negative statistically significant effect on employment in the wholesaling and service sectors of central city economies between 1972 and 1977.
- Changes in industrial employment in central cities show a small, but statistically significant negative relationship with the presence of a suburban beltway after accounting for other factors, suggesting that some fraction of the shift of employment within metropolitan areas between 1967-72 could be attributed to beltways.
- A shift of development activity to a suburban beltway corridor can affect the fiscal resources of a central city, especially if it lacks the authority or the willingness to annex developing land or does not have an aggressive revitalization and economic development program underway.
- Downtown revitalization and economic development efforts involving both public and private sector commitments can more than compensate for any negative, short-term effect a beltway may have on the vitality of core areas. Successful convention centers also help as does a strong downtown office market.

The clear policy mandate of these findings is to establish and support urban revitalization programs locally, and to build a cooperative partnership between the many concerned and potentially effective interest groups within the central city, including government officials, the business community, civic organizations and groups promoting economic progress for minorities. Case study research has shown that local partnerships and initiatives can successfully counter many of the forces undermining American cities, including the effects of beltways.

In addition, if potential adverse effects appear to have been ignored in beltway planning, mayors of ailing central cities should take full advantage of procedures established by the President's Community Conservation Guidance of November 1979 to prevent the development of any major shopping center, office or industrial park at a location that would hurt older urban areas.

EFFECTS ON LAND USE POLICY AND CAPITAL IMPROVEMENTS PROGRAMMING

By altering development and land use patterns, a beltway may affect policies and programming both by changing the distribution of fiscal resources among jurisdictions and by modifying the location and need for additional public services

and facilities. Though planners have not historically integrated beltways or their effects into their plans, the greatest opportunities for controlling the influence of a beltway lies in the realm of land use planning. Potential adverse impacts of beltway construction can be largely mitigated, even eliminated, through careful application of land use controls and incentives. Opportunities for compact, nodal development are provided by beltway interchanges with supportive planning policies. Though such policies have rarely been implemented in conjunction with beltway construction, their potential for effecting an energy-efficient pattern of land use is substantial and has been demonstrated elsewhere.

- Most economic and land use effects of beltways represent transfers of activity from one area to another within the same metropolitan area. This can affect the economic and fiscal health of individual jurisdictions unless compensating measures, such as tax revenue sharing, annexation, and growth management strategies are implemented.
- Planners recognize beltways' potential influence on land use and development decisions, but policies proposed to manage corridor and interchange area development did not receive much political support. In part, this was because early planning requirements did not require a commitment to adopt and implement land use policies consistent with the policies and assumptions upon which transportation plans were based.
- In none of the communities studied was the relationship between land use in the beltway corridor and downtown development policies analyzed, or were plans with mitigation measures to compensate for potential adverse effects enacted.
- Water and sewer service extension policies rarely were coordinated with beltway planning efforts. However, increased interest in growth management and the need to minimize infrastructure costs has prompted many of the local governments to delineate development opportunities in beltway corridors with urban service area lines.
- Annexation and infrastructure financing policies and the role of extraterritorial jurisdiction in land use policy have had far greater impacts on suburban development trends in beltway corridors than the mere presence of the beltway.

The strongest recommendation of this study is an urging of local planners to implement coherent and effective land use controls in the proximity of the beltway which are coordinated with the policies and activities of other local agencies to achieve the multiple objectives of (1) encouraging compact, nodal development, (2) supporting revitalization efforts in the central city, (3) protecting the environment, and (4) providing public services in the most efficient manner possible.

POLITICAL AND SOCIAL EFFECTS

As do all highways, Beltways primarily serve relatively affluent suburban residents. If expenditures for beltways are shown to hinder the development of efficient transit systems, they may actually decrease the potential mobility of transit-dependent inner-city residents. Further, by facilitating the suburbanization of housing, employment and shopping opportunities, they serve to lessen their accessibility to the inhabitants of the central city, who are usually disproportionately elderly or members of lower-income groups or ethnic minorities. Suburbanization also reduces the revenue base available for the provision of services to inner-city populations.

Beltways have not been shown to have a large impact on the distribution of housing, employment and shopping opportunities, though their effects are not so small as to permit their dismissal from consideration by regional planners. Further, beltways provide nothing for distressed inner-city communities, which is not true of all transportation investments, an important consideration in this era of shrinking public resources.

- By facilitating suburbanization of population and employment, beltways and other infrastructure investments in most instances confer no benefits on the disadvantaged and low income residents, many of whom live in central cities. Further, suburban beltways, by drawing activity out of central cities, affect their tax base and the cities' ability to deliver needed social services.
- By attracting industrial development to outlying areas, beltways may reduce job opportunities for inner city residents. They also can provide access from blue collar neighborhoods to major employment centers particularly if transit service is offered, and can increase housing opportunities by attracting apartment development to the corridors they serve.
- Where multi-use centers are planned in conjunction with beltway construction, subsidized housing should be provided, to offer access to major retail and commercial development for all economic segments of the community.

The policy implications of these findings include a clear mandate to examine all transportation investment options in order to determine whether another project might yield the additional capacity needed while also benefiting inner-city residents. In addition, land use policies should be implemented to encourage nodal development which can be efficiently served by public transit. Local housing policies and assistance programs also should be coordinated with beltway planning to ensure that adequate provision is made for housing all income groups in the beltway corridor. Finally, if a proposed beltway will affect a city's fiscal base, some arrangement should be made to provide adequate funds for social services for those most in need, regardless of the jurisdiction of their residence.

ENVIRONMENTAL EFFECTS

At first glance, beltways appear an environmental nemesis, inviting diffuse development wasteful of energy and land and encouraging exclusive reliance upon the automobile. However, beltways have not been shown to increase the rate of suburbanization; increased vehicle miles traveled in beltway areas may be compensated for by more energy-efficient highway driving speeds; and, nodal development encouraged by a beltway may be more easily served by public transit than the pattern of land use which would evolve in the absence of a beltway.

- Beltways may increase total travel, but their effects on energy consumption are not necessarily negative, since they may provide incentives for nodal development, mixed-use centers for one-stop shopping and better transit.
- Beltways need not increase the rate of outlying residential development. In most communities, since beltways had no effect on overall development patterns, conversion of agricultural land and other environmental effects associated with suburban land development were no different over the long run than if the beltway had not been built. To the degree that beltways promote compact development patterns, they are preferable to other solutions to community land use and transportation needs that would allow scattered development.

Given these findings, policy-makers should encourage further research into the environmental consequences of beltway construction, and seek to promote compact, nodal development through land use controls and incentives. Also, development of reliable public transit should be pursued.

FACTORS CONDITIONING BELTWAY IMPACTS

The foregoing discussion is very general, relating the most representative beltway experience without distinguishing the impacts of beltways of different design in metropolitan areas with different characteristics. Further, despite efforts to create a balanced sample for research, there are statistically significant differences between beltway and non-beltway metropolitan areas in terms of population, density of development, economic health, and recent migration trends, which confuse the evaluation of beltway impacts. Beltway cities are, on average, larger, needier, populated more densely, and less likely to be in the "sunbelt."

Greater discrepancies exist among cities with different types of beltways than between beltway and non-beltway cities. Areas with beltways inside the central city are markedly different from those in which the beltway is primarily outside the central city. Areas with beltways running through the central city tend to be younger, to be physically larger, to contain more people including a smaller percentage of blacks, to include more vacant developable land within city limits, to have a less-developed transit system, to contain a smaller low-income population, and to more often be found in the sunbelt than are cities with suburban beltways.

TABLE 5. KEY DIFFERENCES BETWEEN BELTWAY AND NON-BELTWAY METROPOLITAN AREAS

	<u>No Beltway</u>	<u>Central City Beltway</u>	<u>Mixed Jurisdic- tion Beltway</u>	<u>Suburban Beltway</u>
Central City Land Area 1977 (Square Miles)	134	370	191	77
Percent Change in Central City Land Area, 1970-77	7	15	5	1
Metropolitan Area Population, 1977 (000's)	829	900	1,298	1,975
Central City Population, 1976 (000's)	328	560	499	537
Central City Population, Percent Black, 1970	16	17	17	30
Metropolitan Area Transit Index (Vehicles per 1,000 persons)	.29	.23	.32	.45
Miles of Freeway in Metropolitan Area, 1975	78	84	126	163

Since the recurrent pattern is for older, smaller, northeastern cities to be encircled by a suburban beltway, no conclusions can be made that such a beltway location is responsible for the greater economic distress found in such cities. A multiple regression analysis showed that beltway location determined the development patterns associated with these cities far less than did the factors which distinguish those cities. Beltway location appears to be a result of these factors shaping growth rather than their cause.

GUIDELINES FOR IMPACT ASSESSMENT

Assessing the potential impacts of a proposed beltway in a specific area is a complicated process, requiring an evaluation of both tangible and intangible conditions and consequences, the nature of which are locally determined rather than predicted by a particular type of transportation investment. Existing planning, project review and environmental assessment requirements establish procedures for impact analysis. However, little guidance is available that addresses beltways. To assist planners and officials in analyzing a specific beltway proposal, a five-step approach to impact analysis is proposed:

1. Define local conditions, establish a framework for impact assessment, and identify key actors in the public and private sector who can work together to take advantage of the benefits beltways can offer and implement measures to minimize potential harmful effects.
2. Identify transportation and land use policy options, including the proposed beltway, any alternatives and a no-project option.
3. Evaluate likely consequences of construction of the beltway and alternatives and implementation of different transportation and land use policy options.
4. Determine the potential scope of complementary measures to reduce or enhance the foreseeable effects of the beltway and other options and gauge the costs and benefits of each.
5. Prepare recommendations after weighing benefits and disbenefits of belt construction and those accruing to other options and evaluating who gains and who loses after implementation of all feasible compensative measures.

Details on how to analyze the land use and urban development impacts of beltways are presented in the **Guidebook**. For each impact area, policy questions are listed and evaluation criteria proposed. Methods for examining mitigation measures and making tradeoffs also are proposed. By using this approach, planners and local elected officials should be able to focus the debate on critical issues and make decisions in an informed manner. When a proposed beltway may have a potential adverse effect on development patterns, revitalization activity, economic and housing opportunities, energy consumption or the environment, ways of reducing or eliminating these impacts should be evaluated. The matrix on the following page shows sixteen mitigation measures and the adverse effects to which they apply. Choice of the appropriate combination of measures should be made after evaluating the cost-effectiveness of each potential candidate, any legal or institutional obstacles to implementation, and potential direct or indirect benefits which might be obtained.

A key factor to keep in mind is that beltways work together with other forces affecting travel, location, and investment decisions, urban development patterns, and the economies of central cities and metropolitan areas. Only rarely will a beltway be the sole causal factor. Where local land use planning and economic development policies are well founded in technical studies, sensitive to economic and

TABLE 6.

MITIGATION MEASURES FOR POTENTIAL ADVERSE EFFECTS OF BELTWAYS

<u>Adverse Effects</u>	<u>Mitigation Measures</u>														
	Change in Capacity	Change in Location	Change in Interchange Spacing in Interchange Areas	Provide Lower Use/Density	Modify Construction or Corridor Development or Boundary	Establish Urban Service Area	Finance Needed Improvements	Implement Joint Development Projects	Promote Joint Use R/W Program	Implement Revitalization Sharing Program	Establish a Tax Base Improvement Program	Annex Access to Older Urban Areas	Annex Developing Areas	Preserve or Salvage Cultural Resources	Pollution Control Measures
Transportation															
Increase trip lengths and total travel (VMT)	•	•	•	•						•					
Increase reliance on auto-travel	•	•		•						•	•	•			
Hinder efforts to promote transit and enhance mobility	•	•		•						•	•	•			
Increase congestion on local streets	•	•	•	•		•		•	•						•
Land Use															
Increase scattered outlying development	•	•	•			•	•	•	•			•			
Decrease infill development	•	•	•	•		•					•	•	•		
Delay redevelopment of older urban areas	•	•		•		•					•	•	•		
Increase conversion of agricultural land to urban use	•	•	•	•		•	•			•					
Increase decentralization of retail, office, and industrial activity	•	•	•	•		•	•	•	•		•	•	•		
Public Facilities Programming															
Increase demand for new infrastructure	•	•	•	•		•	•	•	•	•		•			
Undermine efforts to foster development where capacity exists	•	•	•	•		•	•			•	•	•			
Increase pressure for extension of urban services	•	•	•	•		•	•	•	•		•				•
Revitalization Activity															
Undermine revitalization efforts	•			•		•	•				•	•	•		
Industrial															
Undermine revitalization efforts to revitalize and/or redevelop older industrial areas		•	•	•		•	•				•		•		
Fiscal															
Reduce central city's fiscal base	•	•		•		•	•				•	•	•	•	
Increase local communities public service costs	•	•	•	•		•	•	•	•	•			•		
Employment and Housing Opportunities															
Increase segregation by income and race	•	•			•	•					•		•		
Decrease employment opportunities for minorities and the disadvantaged	•	•	•	•	•	•			•			•			
Energy Consumption															
Increase transportation-related energy use	•	•	•	•		•	•	•	•	•		•			•
Increase building energy use in suburban areas	•			•		•	•			•					
Environment															
Increase exposure to highway noise	•	•		•											•
Encourage development in environmentally sensitive areas	•	•	•	•		•	•			•		•		•	•
Increase air pollution	•	•		•		•		•	•	•		•			•

environmental constraints, and have strong political support, a beltway may have a relatively benign effect on development trends and the vitality of older urban areas. On the other hand, where market forces are relatively unchecked by development regulations and policies on water and sewer extensions, the gains in accessibility a beltway can offer may have a major impact on development patterns. The challenge is to sort out these various influences and to determine how policies can be coordinated for the most beneficial and the fewest adverse effects.

ACTORS IN THE ASSESSMENT PROCESS

As important as thoroughly evaluating each of the factors which will influence the effects of beltway construction in a particular community is the participation of each of several important actors in the assessment process. Most critical are regional and local planners and decision-makers, representatives of community groups likely to be affected by construction of the beltway, and the local business community. These people all need to be involved in the planning process to ensure that a beltway functions as a positive, urban form-giving and energy-conserving element in conjunction with measures to reduce or enhance particular beltway impacts. State and federal agencies can work with local groups, providing assistance by offering technical guidance and financial aid.

CONCLUSION

This study fills a previously restrictive gap in the planning literature on the land use and urban development impacts of beltways. The most important finding stems from combining approaches to the study of current beltway experience, linking theoretical, statistical and case study analyses. Where theory, intuition, and local experience in specific instances indicate the ability of beltways to effect the full range of potential consequences discussed above, the comparative statistical analysis reveals that beltway construction rarely has significant regional consequences. Case studies have shown that where a beltway may be able to alter the character of urban growth, local initiative is required to reduce or eliminate potential adverse impacts of beltway construction on development patterns, on public facilities programming, on central city economic health, on particularly vulnerable segments of the population, and on the metropolitan environment.

For Further Information

Michael V. Dyett, Michael Fajans, Mary King, **Land Use and Urban Development Impacts of Beltways: Final Report**, DOT-OS-90079. Washington, D.C.: U.S. Government Printing Office, 1980.

Michael V. Dyett, Michael Fajans, Mary King, **Land Use and Urban Development Impacts of Beltways: Case Studies**, DOT-OS-90079. Washington, D.C.: U.S. Government Printing Office, 1980.

Michael V. Dyett, Michael Fajans, Mary King, **Land Use and Urban Development Impacts of Beltways: Guidebook**, DOT-OS-90079. Washington, D.C.: U.S. Government Printing Office, 1980.