LIGHT RAIL IN MILWAUKEE: AN ANALYSIS OF THE POTENTIAL IMPACT ON ECONOMIC DEVELOPMENT

Center for Economic Development
University of Wisconsin-Milwaukee
May 1992

ACKNOWLEDGMENTS

This study was produced at the University of Wisconsin-Milwaukee Center for Economic Development (UWMCED), a unit of the College of Letters and Science at the University of Wisconsin-Milwaukee. UWMCED was established by the College in 1990, with the assistance of a grant from the U.S. Department of Commerce, Economic Development Administration's (EDA) "University Center" program, to contribute to the retention and expansion of Milwaukee's employment base by providing university research and technical assistance to community organizations and units of government. The majority of the funding for this project has come from the EDA grant and College of Letters and Science support. Additional financial support was provided by the City of Milwaukee, Department of Public Works. The analysis and conclusions presented in this report, however, are solely those of UWMCED and do not necessarily reflect the views or opinions of the funding sources for this project.

The author of this study is Dr. Marc V. Levine, Director of UWMCED. Principal research assistance was provided by UWMCED project assistant Kathleen Foss-Mollan. Professor Sunwoong Kim of the Department of Economics, UW-Milwaukee, assisted in portions of the input-output analysis. Printing and design were expertly handled by UWMCED staff assistant Suellen Martinson. The author and researchers on this project especially appreciate the assistance they received from mass transit officials and transit researchers from around the country who cooperated with us at every stage of the project.

UWMCED strongly believes that informed public debate is vital to the development of good public policy. In providing background on the economic development record of fixed rail systems in other cities, and by furnishing concrete forecasts regarding the potential impact of LRT in Milwaukee, UWMCED hopes to contribute to informed discussion as policymakers and the general public consider the merits of plans for a light rail system in the region.

EXECUTIVE SUMMARY

Researchers at the University of Wisconsin-Milwaukee Center for Economic Development (UWMCED) have studied the potential economic consequences of a light rail transit (LRT) system in the Milwaukee region. We examined the available evidence on the economic development arid land-use impact of fixed rail systems in cities such as Portland, Buffalo, Toronto, Baltimore, St. Louis, Atlanta, and San Francisco, and have reviewed public policies used in various cities to encourage economic benefits from urban rail investments. In addition, UWMCED used an input-output model to estimate the impact of the proposed LRT system on regional employment, earnings, and output.

The UWMCED study concludes that, although the economic benefits of LRT should not be oversold and will require supportive public policies to be fully realized, a light rail system could contribute significantly to economic development in the city of Milwaukee and in the entire region. Our chief findings:

Employment, Output, and Income Impact

LRT will provide an important public works stimulus to the regional economy. Using an input-output model of the regional economy, UWMCED estimates that during the four or five year construction phase of the project, 6,041 jobs will be created. This total includes jobs directly created in construction and related employment, as well as the employment that occurs as the initial expenditures for LRT ripple through the regional economy.

UWMCED estimates an increase of $365 million (in 1990 dollars) in total output in the Milwaukee region as an LRT system is constructed. Total wages would increase by $179 million, with state and local governments receiving an increased $44 million in taxes.

Operating and maintaining the LRT system could generate an estimated 625 permanent jobs in the Milwaukee region.

The long-term economic impact of LRT can be augmented by creative local procurement and industrial policies. Cities such as Montreal have used rail investments to spin-off several mass transit-related industries, and Los Angeles is considering a similar strategy by attempting the local production of rail vehicles heretofore imported from Japan.

UWMCED estimates that if light rail vehicles for the Milwaukee system were produced locally, an additional 959, mostly family-supporting jobs could be created in the region, producing $80.8 million in additional output, and $29.0 million in wages in the four county Milwaukee metropolitan area.

In light of this potential, UWMCED recommends that the City of Milwaukee and State of Wisconsin strongly explore the possibility of using LRT investments as a strategic linchpin for the development of a Milwaukee-based mass transit manufacturing industry.

Land Use and Neighborhood Development Impacts

There is little evidence that fixed-rail systems have meaningfully altered patterns of employment decentralization and residential sprawl in North American metropolitan areas.

On the other hand, cities such as Atlanta, Portland, and Toronto provide good examples of development activity around system routes and station locations. UWMCED concludes that light rail can have a modest, but positive impact on neighborhood development and land use.

Fixed rail transit offers the *opportunity* for development, but, in itself, is usually not sufficient to spur significant spin-off development around routes and stations. The experience of cities examined by UWMCED suggests that transit-related development requires coordination of transit planning, economic development, and land use policies. The "Field of Dreams" approach to transit and economic development --"if we build a station, developers will come" -- is rarely successful.

One of the lessons learned from other cities is that decisive and active public policy may be required to achieve even modest development impacts of LRT, especially in station-areas located in neighborhoods with weak private investment markets.

Therefore, UWMCED concludes that city, county, and state governments should take an active approach toward stimulating development around the LRT routes in this region. In addition, a broad, participatory process should be established at an early stage in the planning process, so that neighborhood development issues are considered in route alignment and station location decisions. LRT will be one of the largest public infrastructure investments ever undertaken in Milwaukee. As such, it is imperative that local policies and complementary redevelopment resources be coordinated to maximize its economic impact.

Light Rail, the Inner City, and Minority Economic Development

The record in urban America on using rail transit investments to revitalize inner city neighborhoods or promote minority economic development is not a strong one. However, given the magnitude of the economic problems facing Milwaukee's inner city and the rare opportunity offered by a major public works investment such as LRT to inject resources from the federal government into the central city, UWMCED believes it is essential that Milwaukee develop a strategy to successfully link LRT to inner city revitalization.

UWMCED concludes that if inner city and minority concerns are properly considered in transit planning, building a light rail system could yield significant economic Benefits for the inner city and for minorities. Specifically, we recommend the following policies:

1. Explicit minority hiring and contracting requirements in the construction and operation of LRT;

2. Implementation of reindustrialization strategies around mass transit manufacturing in Milwaukee;

3. Creation of public-private partnerships for development around inner city LRT station-areas;

4. Public investment to enhance the market for investment around inner city stations;

5. Routing of light rail lines to improve access of inner city residents to industrial parks and suburban employment locations.

No city has ever implemented all these approaches in building fixed rail systems, and as a result there have been limited economic benefits for inner city residents. Milwaukee has an opportunity, with this major public investment, to establish new and productive links between mass transit and minority economic development.

Therefore, UWMCED recommends the formation of an Inner City-Light Rail Task Force whose purpose would be to develop concrete and explicit plans to maximize the economic benefits of LRT for Milwaukee's inner city.

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF TABLES

INTRODUCTION

Serious planning is now underway for what could become a $417 million, 18.4 mile light rail transit system (LRT) in Milwaukee. In 1991, a team of transit consultants prepared an LRT feasibility study for the City of Milwaukee, Department of Public Works. In their report, the *Southeastern Wisconsin Transit Corridor Study,* the consultants recommended an initial 18.4 mile LRT alignment that would be anchored in downtown Milwaukee, with three main spurs: northeast, to the campus of the University of Wisconsin-Milwaukee; west, to the Milwaukee County Grounds; and northwest, to Mill Road. Future extensions could occur south, linking downtown to Mitchell International Airport, extending the system an additional 7.4 miles at an estimated cost of $165 million, and further west from the County Grounds to Waukesha (an additional 10.4 miles at an estimated cost of $190 million). The configuration analyzed in this study, however, is the initial 18.4 mile alignment deemed feasible in the June 1991 *Southeastern Wisconsin Transit Corridor Study* (BRW, Inc. et al., 1991,95).

In the fall of 1991, the Federal Transportation Act authorized $200 million to be spent on the "East-West" corridor, running from the County Grounds through downtown Milwaukee to UWM; once state and local officials agree on the project. The State of Wisconsin Department of Transportation is now overseeing another team of consultants --Milwaukee Transit Associates-- who are conducting a $2 million "alternatives analysis" to examine in detail the costs and benefits of light rail, compared to other mass transit options, in this East-West corridor.

There are numerous reasons to consider the construction of light rail transit in Milwaukee, or any major city for that matter. The exigencies of the Clean Air Act, the desirability of energy conservation, and the economic inefficiencies caused by traffic congestion in high-growth corridors all provide compelling reasons to seriously analyze new transit alternatives that will attract riders and ease environmental, energy, and transportation problems in the region. All of these issues presumably will be studied in depth in the Milwaukee transit alternatives analysis scheduled for completion in early 1993.

Researchers at the University of Wisconsin-Milwaukee Center for Economic Development (UWMCED), however, have focused on a different matter: the potential economic development impact of a light rail system on the city of Milwaukee and, indeed, the entire four county regional economy. This expanded view of the objectives of rail transit became an element of federal policy in 1978:

> In particular, rail transit should be viewed as part of a strategy to promote broader national purposes. Its effectiveness should be measured not just in terms of its ability to move people, but in terms of its positive influence on the long-term patterns of urban growth. Specifically, rail transit can help our in nation's efforts to revitalize distressed cities ...(Skinner and Deen, 1982,270-271).

Today, transportation planners regularly argue that rail transit investments can potentially playa major role in shaping patterns of development and influencing the economic vitality of cities and regions.

UWMCED has extensively examined the experiences of other communities with fixed rail systems to forecast how a proposed light rail system might affect the Milwaukee economy, as well as influence patterns of land use and neighborhood development here. Our analysis concludes that there could indeed be substantial economic benefits for Milwaukee in developing a light rail system, but that these benefits are neither certain nor automatic.

Particularly in economically distressed neighborhoods in the region, with weak private investment markets, LRT will not spontaneously stimulate economic growth or neighborhood redevelopment. Although the immediate stimulus of public works expenditures from LRT will create jobs and output in the Milwaukee economy, maximizing the long-term economic development potential from LRT requires the extensive coordination of transit planning and economic development initiatives, and innovative and active local government policies.

Milwaukee currently faces daunting economic challenges, particularly in the impoverished, predominantly African American neighborhoods of its inner-city. As one of the largest investments in public works ever undertaken in the Milwaukee area, there rightfully will be high expectations that light rail make a substantial contribution toward alleviating these problems. The burden placed on LRT should not be too heavy: it is by no means the panacea to all economic problems facing the Milwaukee region. Nor should light rail be oversold; in no city examined by UWMCED have recent rail transit investments magically or comprehensively reshaped the local economy or patterns of land use. However, as a major expenditure of taxpayers' money that could significantly influence land use and economic development in this region, public authorities who will plan and build this system have a fundamental obligation to ensure that maximum economic benefits are derived from this investment, particularly for those communities in the Milwaukee region in the greatest need. In providing background on the economic development record of fixed rail systems in other cities, and by furnishing concrete forecasts regarding the potential impact of LRT in Milwaukee, UWMCED hopes to contribute to informed discussion as policymakers and the general public consider the merits of plans for a light rail system in the region.

The plan of this study is as follows: Section I provides an overview of light rail transit, including basic characteristics of recently built systems in U.S. cities, and a brief discussion of some recent controversies regarding ridership and cost forecasts. Section II explores the potential impact of the construction and operation of an LRT system on employment, output, and wages in the Milwaukee region. Section III provides an extensive comparative overview of the land use and neighborhood development impacts of fixed rail investments in cities such as Atlanta, Baltimore, St. Louis, San Francisco, Portland, and Toronto, and attempts to identify some policy implications from those experiences. Section IV examines how cities have used rail transit investments in conjunction with tools of industrial policy to promote transit-related industries and employment. Finally, Section V focuses explicitly on the potential connections between LRT and inner-city revitalization.

SECTION I:

LIGHT RAIL TRANSIT: AN OVERVIEW

Before proceeding with an analysis of the potential economic impact of light rail transit in Milwaukee, it would be useful to identify the chief characteristics of such systems. Light rail transit has been defined by the Transportation Research Board as follows:

> Light rail transit is a mode of urban transportation that uses predominantly reserved, but not necessarily grade-separated rights-of-way. Electrically propelled vehicles operate singly or in trains. Light rail transit provides a wide range of passenger capacities and performance characteristics at moderate costs (Schumann, 1989, 9).

"Heavy rail" or rapid rail transit systems, like those in Atlanta, San Francisco, Montreal, or Washington, D.C., operate with high-platform vehicles, driven by power from an electrified third rail. These systems typically operate on exclusive rights-of-way (in tunnels or elevated structures), and ordinarily with trains of several cars. On the other hand, modern LRT operates more flexibly, *either* on separated rights-of-way or in highly urban, "streetcar-style" settings, with one or several railcars. The capital costs of LRT are generally much less per mile than for rapid rail transit because of the limited use of grade-separated rights-of-way in LRT, and because less tunneling and neighborhood disruption is typically required in LRT.

Given their substantial capital costs, to even approach financial feasibility rapid rail systems require extremely high population densities, major concentrations of economic activity downtown, and extremely high daily passenger volumes (Pushkarev and Zupan, 1982, 341-342). Few medium sized cities contain the necessary densities, which is one reason why LRT became increasingly viewed as the only viable fixed rail transit alternative for cities currently contemplating rail transit. Viewed simply from the criterion of requisite densities, Pushkarev and Zupan concluded in 1977 that LRT might be feasible in around 30 mid-sized U.S. cities, of which Milwaukee would be one.

As John W. Schumann points out, LRT systems can be developed to serve three main categories of urban travel:

> * Line haul transit from city and suburban residential areas to central business districts and other employment zones;
>
> * Feeder service to rapid transit or commuter rail;
>
> * Local area transit within a portion of an urbanized area or activity (Schumann, 1989, 11).

Schumann claims that "the ability to perform multiple transit functions is an advantage of LRT, which combines some operational characteristics of both bus and rapid transit modes. LRT can approach rapid transit commercial speeds to attract line

haul traffic; but ease of access to simple at-grade stations and typically shorter station spacings also allow LRT to attract local ridership" (Schumann, 1989, 11).

This flexibility can be seen in recently built systems --such as Portland's MAX-- as well as LRT systems under construction such as St. Louis' Metro Link or Baltimore's Central Light Rail Line. All of these systems were designed to carry suburban commuters to downtown; to provide some service for local passengers between suburban origins and destinations; and to offer "short hop" service within the downtown core and city neighborhoods. In addition, the St. Louis and Baltimore systems were designed with at least some attention to so-called "reverse commuting," in which city residents utilize transit for access to growing employment centers in the suburbs.

Flexibility, when compared to heavy rail, is at the heart of LRT's cost advantage. LRT can run automated on segregated right-of-way, then use a driver to operate over less expensive, non-exclusive alignments. In areas lacking exclusive rights-of-way, light rail can run on a street or bypass an historic or otherwise valuable building, avoiding in many cases the high expense of property acquisition, destruction, and reassembly. Particularly in areas with multiple property owners, such a process can be time-consuming and expensive, which has been one contributor to the high costs of building heavy rail systems (Parkinson, 1989, 67-68).

Tables 1 and 2 provide some data on the characteristics of recent light rail systems in U.S. cities. These data reveal the different configurations that LRT can have in different urban settings. Capital costs vary, depending, among other factors, on the amount of separate, or newly created right-of-way used, whether a subway component is required, and what mix of elaborate stations or bare-bones transit "shelters" are constructed.

Ridership on, and the costs of, LRT have become controversial topics since the publication in October 1990 of a study conducted for the U.S. Department of Transportation by Don H. Pickrell. The report, *Urban Rail Transit Projects: Forecast Versus Actual Ridership and Cost,* reveals significant disparities between ridership and cost forecasts for recent light rail systems in Buffalo, Pittsburgh, Portland, and Sacramento, and actual ridership and cost figures. According to Pickrell, the actual weekday passengers riding these LRT systems ranges from 54 percent (Portland) to 71 percent (Sacramento) below their forecast levels (U.S. Department of Transportation, 1990, xi). Moreover, Pickrell argues that these figures "actually *understate* the gap between forecasts and actual ridership on the four light rail lines. The actual passenger data for Buffalo, Portland, and Sacramento include as many as 20 percent who are traveling within free or reduced-fare zones within these cities' downtowns, but who were not included in forecasts of ridership" (Pickrell, 1992, 160; emphasis in original).

On the subject of costs, with the exception of Pittsburgh's South Hills LRT reconstruction project, which actually cost 11 percent *less* than forecast, actual capital expenditures for Sacramento (13 percent), Buffalo (51 percent), and Portland (55 percent) were significantly higher than originally forecast. Annual operating expenses also exceeded original forecasts in Buffalo and Portland, while falling 10 percent below forecast levels in Sacramento. Although some of these disparities are striking, it should be pointed out that they are substantially lower than comparable figures for heavy rail systems.

Pickrell's findings have been disputed by many transit planners. For example, Portland's Tri-Met, the authority operating the MAX light rail system, claims that

MAX's construction costs were $7.5 million *under* the budget established in its 1982 final funding agreement with the Urban Mass Transit Administration (UMTA), and that Pickrell based his conclusion of "cost overruns" on earlier estimates

Table 1:

Characteristics of Recent Light Rail Transit Systems:

Size and Ridership

City	Line Length Miles	LRVS Number	Stations Number	Weekday Ridership
Portland	15.1	26	29	24,000
Sacramento	18.3	26	29	24,400
Buffalo	6.4	27	14	29,000
Pittsburgh	22.5	60	34	27,300
San Jose	20.4	50	33	13,000
Baltimore*	22.5**	31	24	33,000
St. Louis*	18.1	31	20	37,000
Milwaukee*	18.4	NA	NA	68,000

*Forecasts for systems not yet operating

**Extensions already planned will increase length to 25.0 miles and the number of stations to 30 by 1994

Sources: Schumann (1989); U.S. Department of Transportation (1990); BRW, Inc. et al., (1991); local transit authorities

made before the final scope of MAX was determined (Tri-Met, 1990). Similarly, Portland officials criticize the Pickrell study for unfairly "holding them" to ridership forecasts made in 1978, but later revised when economic assumptions underpinning these forecasts changed. Indeed, in a recent article, Pickrell acknowledges that "forecasts of ridership and operating statistics for Portland's light rail line both apply to the year 1990, by which time the line was anticipated to be in its seventh year of operation. Yet, because operation did not begin until September 1986, the most recent actual data apply to a period beginning only four years after its completion" (Pickrell, 1992, 173).

Table 2:

Characteristics of Recent Light Rail Transit Systems:

Comparative Costs

City	Year Opened	Capital Costs/Mile (in original$) (in millions)		Operating Costs/Mile (in millions $)	
Portland	1986	214	14.2	6.4	.424
Sacramento	1987	176	9.6	7.6	.420
Buffalo	1985	535	83.6	12.8	2.000
Pittsburgh	1987	842	37.4	8.9	.396
San Jose	1991	552	27.2	16.5	.808
Baltimore	1992	446	20.3	14.7	.668*
St. Louis	1993	342	19.0	9.8	.541*
Milwaukee	NA	417	22.7	15.3	.832*

*Baltimore's and St. Louis' operating costs are estimates; all Milwaukee data are forecasts from BRW, Inc, report

Sources: See Table 1

Although some transit planners with whom UWMCED has spoken privately admitted to some inflation in ridership forecasts submitted to UMTA in transit system planning, these local planners complained that the Pickrell/UMTA report unfairly held cities accountable for forecasts that UMTA at least tacitly understood and implicitly expected would be on the optimistic side. Pickrell himself, in a recent article, contends that the current structure of transit grant programs "increasingly leads officials to encourage their planning staffs and consultants to underestimate rail transit projects' costs and overestimate their prospective benefits ..." (Pickrell, 1992, 169).

The economic importance of LRT system costs is obvious, as is the importance of accurate forecasts. If LRT is prone to substantial cost overruns, or if operating costs are significantly greater than forecast, then the prospects for recovering a respectable portion of system costs from farebox revenues will diminish, and the burden on local taxpayers commensurately increase. However, the evidence on cost overruns from LRT is more ambiguous than the anti-LRT factions who have seized upon the Pickrell study have suggested. Although Buffalo's LRT unquestionably cost much more than previewed, recent systems in Sacramento, San Diego, Pittsburgh, Portland (if Tri-Met's arguments are accepted), and Baltimore have all come in under, at, or very close to forecast. Similarly, there is no consistent pattern regarding operating expenses. At a minimum, unlike the nearly uniform record of major cost overruns associated with

heavy rail systems in the 1960s and 1970s, LRT cannot be assumed, *a priori,* to be a transit investment that will cost taxpayers more than advertised.

Although it is a central transportation issue, ridership is also a factor in gauging the economic impact of transit investments: The volume of ridership is obviously crucial to the success of LRT systems in defraying some of their costs through farebox revenues. Moreover, the extent to which regions derive increases in productivity from more efficient commuting patterns on mass transit will, by definition, be contingent on how many commuters actually patronage an LRT system. Finally, as we explore in section III of this report, daily ridership volume is the cornerstone of rail transit-generated development around stations and in transit corridors.

Since our emphasis is on economic development analysis, not transportation planning, UWMCED did not attempt to forecast daily ridership levels on a potential Milwaukee LRT system. However, we have provided, in Table 2, data from other LRT systems to permit some comparative perspective as forecasts for Milwaukee are produced. An early ridership prognostication, in the *Southeast Wisconsin Transit Corridor Study,* estimated 68,000 daily weekday passengers for an 18.4 mile sysfem configuration in Milwaukee. Although we have not attempted to verify the reliability of this estimate, we do note that it is almost triple the current actual ridership levels on similar length systems in San Jose, Portland, and Sacramento, and much higher than the ridership projections for the new Baltimore and St. Louis LRT routes. It is even higher than the overly optimistic forecasts that were produced for Portland; in fact, the only LRT forecast that was higher was the wildly off-the-mark 92,000 daily riders forecast for Buffalo's LRT. System proponents in Milwaukee should be careful in estimating potential LRT ridership; forecasts that are found to be significantly inaccurate, or strongly at odds with the experience in other communities, can only undermine support for transit investments in Milwaukee.

Whether people patronize transit depends on numerous factors: the attractiveness, convenience, speed, and efficiency of mass transit versus the ease of commuting by automobile. One crucial variable apparently associated with ridership success is the existence of "activity centers --concentrations of employment or college students, whether they are in a downtown metropolitan core or in fringe areas or suburban activity centers" (Cushman, 1987, 27). Individuals are likely to use transit in commuting to dense activity centers where auto transportation loses some of its convenience advantage, especially if parking regulations in those centers favor transit over automobiles. As Table 3 indicates, Milwaukee appears to have a downtown core at least comparable to other similar sized Frostbelt cities (and cities such as Sacramento and Portland with LRT). UW-Milwaukee and the Milwaukee County Grounds, planned at this time as the East and West terminuses for Milwaukee's LRT system, also seem to constitute the types of activity concentrations likely to attract transit ridership. Thus, although some early ridership forecasts for LRT in Milwaukee seem excessively optimistic, there is reason to believe that Milwaukee's LRT system would attract ridership volume at least comparable to levels achieved in cities such as Portland, Buffalo, and Sacramento, and forecast for Baltimore and St. Louis.

A final overview issue relating to the economics of LRT is system financing. Few U.S. cities attract the kind of daily mass transit patronage found, for example, in Toronto, where ridership is sufficient to permit recovery of over 70 percent of system operations and maintenance expenses from farebox revenues (Pill, 1987, 58). The record of recent LRT systems to date indicates farebox recovery in the 33 to 50 percent range (BRW, pp. 101-104; Tri-Met cited above). Estimates from the *Southeast Wisconsin Transit Corridor Study* forecast an 88 percent annual operating cost recovery through fares in the west corridor of its proposed Milwaukee LRT alignment,

and a 55 percent farebox recovery rate in the UWM corridor (BRW, Inc. et al., 1991, 98), figures that again appear to be on the high side when viewed in comparative perspective.

TABLE 3:

Proportion of Metropolitan Labor Force Employed in Central Business District, Selected Cities, 1980

City	Percentage of SMSA labor force Working in CBD, 1980
Baltimore	5.5
Boston	6.3
Buffalo	7.5
Cincinnati	9.1
Cleveland	10.8
Detroit	4.4
Minneapolis/ St. Paul	10.0
Pittsburgh	10.6
St. Louis	6.6
Portland	6.7
Sacramento	5.7

Source: U.S. Bureau of the Census, *Journey to Work Census, 1980*

In any event, additional local revenues will be required to operate the Milwaukee LRT system --as well as defray some of the capital costs not covered by federal funding-- and how those revenues are raised is an important local economic development consideration. Typically, cities have relied on some forrT) of a sales tax: Buffalo, Sacramento, St. Louis, San Jose, and San Diego are all examples of recent or new LRT systems that have utilized a sales tax to at least partially offset LRT expenses. Baltimore IS 100 percent state-funded system relies on the State of Maryland's Transportation Trust Fund for financing, while Portland has used a payroll tax and special State of Oregon financing to support the construction and operations of MAX.

UWMCED has not systematically studied how these differing funding approaches have affected local economies or residents. However, we do note that, in general, without special tax credits or offsets, a sales tax is a regressive form of taxation that disproportionately burdens lower-income residents in a community. As consideration

of LRT in Milwaukee moves toward concrete discussion of financing alternatives, the impact of various options on local residents needs to be closely scrutinized, to ensure that the burden of funding of LRT is borne fairly and progressively.

SECTION II:

THE EFFECTS OF EXPENDITURES FOR A LIGHT RAIL SYSTEM ON THE MILWAUKEE METROPOLITAN ECONOMY

Transit Investments and Economic Growth

What is the impact of public infrastructure investment such as LRT on local economic development? Recent research has clearly demonstrated that *public* investment in physical infrastructure (roads, bridges, mass transit, etc.) significantly stimulates *private* sector productivity, profitability, and investment (Aschauer, 1991; Munnell, 1990, 1991). A recent study by David A. Aschauer for the Economic Policy Institute concludes, on the national level, that "the pay-off in GNP growth from an extra dollar of public capital is estimated to exceed that of private investment by a factor of between two and five" (Aschauer, 1991,2). Aschauer argues that an important component of declining U.S. productivity growth since the 1970s is attributable to drops in public infrastructure spending, and that, after a short lag-time, "each additional dollar of public investment in infrastructure will *raise* private investmerlt by 45 cents" (Aschauer, 1991, 1). The reason: public infrastructure provides productivity-enhancing services to private firms, such as efficient transportation. "These public facilities," writes Aschauer, "are as necessary to the production process as a firm's own capital equipment" (Aschauer, 1991, 1).

A recent report by David Lewis for the Transportation Research Board, while cautioning against excessive claims on the economic returns of transportation investments, nevertheless notes that the development and maintenance of transportation infrastructure "offers one of the most effective known catalysts of productivity growth" (Lewis, 1992, 11). Lewis concludes that "transportation investment ... can trigger technological innovation in private firms, with important economic gains that extend beyond those previously associated with infrastructure development" (Lewis, 1992, 11). Saving time and energy by efficient commuting and the reduction of traffic congestion, saving environmental clean-up costs by reducing automobile emissions, saving energy by encouraging efficient land-use --all of these transit-related benefits contribute to improved private sector productivity growth.

These potential benefits should not be exaggerated: no studies have yet demonstrated that major rail transit investments have stimulated *structural* (i.e. lasting beyond the immediate stimulus of the construction phase) net increases in a given region's employment, productivity, output, or real-estate development. Typically, transportation policies promote local employment at the expense of job creation elsewhere, refocusing economic activity around transit investments rather than creating net aggregate growth, by making one localized area more "efficient" or otherwise attractive for investment than another (Lewis, 1992, iv, 23).

Nevertheless, the TRB study concludes that employment impact is an important dimension of evaluating transit investments. Even if the main employment gains are redistributional (Le. from one region to another), the study concludes that this

> does not mean that transportation executives need to discard employment as a selling point of their

> programs. For there will always be employment in association with transportation investments even if job-creation is not the grounds of the investment decision. Moreover, employment through redistribution is often regarded as an objective in itself. (Lewis, 1992, 23)

Employment, Output, and Wage Effects of lRT in Milwaukee

Even if assessment of the structural employment gains from transit investments is shrouded in ambiguity, the immediate stimulus provided from a potential investment in light rail in Milwaukee --manifested in gains in employment, output, and wages-- can be identified. Using the "Regional Impact Model" developed by the Regional Science Research Institute (RSRI), UWMCED has estimated the economic impact in the four county Milwaukee metropolitan area of expenditures for a proposed light rail transit system.

The RSRI model is an input-output model; that is, it identifies how all sectors of the regional ecqnomy are related. By identifying interindustry linkages, an input-output model can estimate how an initial change in spending (for a factory, convention center, or light rail system) will produce changes in the employment, output, and income in a region's economy. In this fashion, input-output models estimate not only the *direct* effects of expenditures, but *indirect and induced* effects that ripple through the regional economy. Secondary rounds of spending occur as local producers satisfy the direct demands for goods and services required for the project by making purchases from other local suppliers. These secondary rounds of interindustry activity, called indirect effects, further stimulate the local economy. Further impacts, called induced effects, occur as increased household spending by workers employed to produce goods and services for the project spend their wages on consumer goods. All of these rounds of expenditure produce employment, output, and income growth, and the degree to which an initial direct expenditure produces additional rounds of spending, employment, or output is called a "multiplier" effect: The magnitude of this effect on the local economy is contingent on how much "leakage" occurs from the initial expenditure: that is, how much in the way of materials or services a local project needs purchase from outside the region, or how much local workers "respend" wages earned from project work on goods and services produced outside the region. In general, the less the leakage, the higher the regional multiplier, and the greater the economic impact of a given project.[1]

UWMCED has based its analysis of the economic impact of light rail expenditures on estimates of capital costs and operations/maintenance expenditures provided us by the City of Milwaukee, Department of Public Works, Bureau of Engineers. Items involved in these estimates include the following:

Capital Costs

*Right of way construction, which includes utility relocation, road relocation, railroad relocation, roadbed and track construction, and necessary structures such as bridges and tunnels;

* Support systems, which include electrification systems, signals, crossing protection, communications, and fare collection machines;

* Stations and parking;

* Maintenance facilities and equipment;

* Light rail vehicles;

* Guideways;

* Land acquisition and relocation;

* Insurance, design and engineering fees, project management, and contingencies.

Operating and Maintenance Costs

*Includes staffing, materials, and fuel required to operate and maintain system.

The Department of Public Works provided UWMCED with the following breakdown of capital costs for each of the proposed LRT corridors, cautioning that these estimates are preliminary and, moreover, as specific alignments in each corridor have not yet been chosen, the estimates for each cost category represent an average of all potential alignments within that corridor. All estimates are in millions of dollars:

UWM Corridor:

Right of way construction	12.66
Stations and parking	6.53
Maintenance Facilities/Equipment	7.03
Support systems	10.26
Vehicles	12.25
Right of way	.52
Contingencies	11.30
Engineering and Management	9.85
Total: UWM Corridor	70.40

West Corridor:	
Right of way construction	65.86
Stations and parking	12.91
Maintenance Facilities/Equipment	13.01
Support Systems	23.79
Vehicles	30.45
Right of Way	6.04
Contingencies	37.15
Engineering and Management	30.41
Total: West Corridor	219.62
Northwest Corridor:	
Land Acquisition and Relocation	.64
Guideways and Stations	63.82
Vehicles :	9.50
Yard and Shop Complex	8.27
Percentage Add-Ons	44.27
Total: Northwest Corridor	127.00
TOTAL: PROPOSED INITIAL LRT SYSTEM	417.02

The annual operating expenses for the proposed initial LRT configuration, derived from the *Southeastern Wisconsin Transit Corridor Study* and the *Milwaukee Northwest Corridor Rapid Transit Study,* range from $15.3 million to $19.4 million. UWMCED has made estimates of. the employment, output, and wage impact of both levels of expenditure.

Economic Impact of LRT: The Construction Phase

Using these DPW figures on LRT capital and operations costs, UWMCED estimates that the *construction* of a light rail system would create 6,041 jobs, increase local output by $365,300,300, and increase local wages by $178,719,200 during the construction phase of the project. In addition, we estimate that LRT construction would generate an additional $27,382,500 in state taxes, $16,258,600 in local taxes, and $56,008,600 in federal taxes during this period. The construction phase for recent LRT systems (Portland, Sacramento, San Jose, Baltimore, and St. Louis) has ranged between four and five years. Thus, these Milwaukee figures represent estimates of cumulative impacts to occur over a 4-5 year construction period. [2]

Of the $417.02 million earmarked for the project, our input-output model

suggests that the current production capabilities of the regional economy would lead to $259.5 million in direct expenditures within the four-county Milwaukee metropolitan area, and $157.6 million in direct expenditures in other regions, representing a leakage of almost 38 percent from the original expenditure.

To put this leakage figure in some context, UWMCED used the RSRI input-output model to estimate what would likely occur if the $417 million somehow were magically dropped into the pockets of Milwaukeeans as increased household income. Our calculation is that over two-thirds of the total initial expenditure would "leak" as Milwaukeeans purchased goods and services from outside the region. As a result, we estimate that in this "income hypothesis" about 4,000 jobs would be created, the vast majority likely in low-paying, low value-added sectors such as personal services and retail trade; thus, the output and wage impacts would be much lower in the income hypothesis than those we have estimated for the construction of LRT. As compared to this income example, construction of an LRT system would involve a higher volume of purchases of inputs from local producers. As a result, a much higher proportion of the initial expenditures would remain inside the Milwaukee region, thus generating significant economic benefits here.

Moreover, as we explore in greater detail in section IV of this report, there are public policies that can further reduce the leakage in LRT expenditures, and hence augment the economic impact of LRT in Milwaukee. If, for example, light rail vehicles for the system were produced in Milwaukee instead of imported, UWMCED calculates that the leakage of direct expenditures would be reduced to 26 percent of total expenditures (meaning 74 percent of direct expenditures would remain in the region), and estimated total job creation for the project would jump to 7,000. A long-term advantage of such a local-production requirement would be, perhaps, the development of a new local industry in the manufacture of light rail vehicles that could produce thousands of permanent jobs in the region.

Tables 4,5,6 and 7 outline in more detail some of the dimensions of the economic impact of construction expenditures for LRT in the Milwaukee region. More detailed industry breakdowns of the impact of the proposed LRT system in Milwaukee employment, output, and wages in the four county region is contained in the appendix to this report.

Clearly, the main impact is in the construction sector, where over half the projected jobs would be created during the building of the LRT system (accounting for over 60 percent of the wages generated by LRT construction). Jobs in the construction industry account for almost 80 percent of the *directly* created jobs in the project. Indirect and induced job creation is chiefly in retail trade, services, and FIRE (finance, insurance, and real-estate). In terms of occupational categories, construction craftsmen and laborers represent over one-third of the total job creation in the construction-phase of Milwaukee LRT, with substantial numbers of jobs created for managers and administrators, machine operators, and clerical workers. In short, many of the jobs that would be created by the construction of an LRT system in Milwaukee are in well-paid occupations and sectors.

We underscore that these estimates are *provisional,* not *definitive,* and they should be used carefully. Small shifts in assumptions in an input-output model --for example, if final route alignments result more or less money actually spent on tunneling or right-of-way construction-- might make a big difference in which sectors or occupational categories in the metro Milwaukee economy are most influenced by building an LRT system. However, UWMCED offers these figures as a general guide to the kinds of employment, output, and wage impact likely to be generated by LRT

in this region. In that *sensei* we expect these data should be useful to policymakers and the general public in the discussion of the economic merits of LRT in Milwaukee.

TABLE 4:

The Economic Impact of Light Rail Transit in Milwaukee

Estimated Employment, Output, and Wage Growth
in the Four County Region During System Construction

(Empl'oyment in jobs, not full-time equivalents)
(Dollar figures in thousands)

Sector	Employment	Output	Wages
Construction	3086.2	190461.2	113550.1
Manufacturing	578.2	56014.0	17515.1
TPU*	211.1	19207.7	6553.7
Wholesale Trade	218.9	20153.7	6749.3
Retail Trade	768.5	20267.2	8985.8
FIRE**	261.8	16299.9	5441.2
Services	821.8	38728.7	18201.5
Government	70.8	2320.5	1094.9
Others	23.6	1875.4	627.6
DIRECT EFFECTS	3886.2	259452.4	138536.6
INDIRECT AND INDUCED EFFECTS	2154.3	105876.0	40182.6
TOTAL EFFECTS	6040.5	365328.3	178719.2
MULTIPLIERS	1.6	1.4	1.3

DIRECT EXPENDITURES WITHIN REGION	$259.4
DIRECT EXPENDITURES OUTSIDE REGION	157.6
TOTAL INITIAL EXPENDITURE	417.0

*Transportation and Public Utilities
**Finance, Insurance, Real Estate

Source: UWMCED estimates, using RSRI input-ouput model

TABLE 5:

Sectoral Distribution of Employment Effects of Construction of Light Rail System in Milwaukee

Total LRT-related employment, by sector

Sector	Direct	Indirect Induced	Total
Construction	3047	39	3086
Manufacturing	413	165	578
TUP	93	118	233
Wholesale Trade	94	125	219
Retail Trade	0	769	769
FIRE	0	262	262
Services	224	597	821
Others	15	80	95
All Sectors	3886	2155	. 6041

Percentage Distribution

Sector	Direct	Indirect Induced	Total
Construction	78.4	1.8	51.0
Manufacturing	10.6	7.7	9.6
TUP	2.4	5.5	3.5
Wholesale Trade	2.5	5.8	3.5
Retail Trade	0.0	35.7	12.8
FIRE	0.0	12.2	4.3
Services	5.8	27.7	13.6
Others	0.4	3.7	1.6
All Sectors	100.0	100.0	100.0

Source: Same as Table 4

TABLE 6:

Occupational Distribution of Employment Effects of Construction of a Light Rail System in Milwaukee

Total LRT-related employment, by occupation

Occupation	Direct	Indirect Induced	Total
ProfessionalfTechnical	292	216	508
Managers/Administrators	447	300	747
Sales Workers	38	248	286
Clerical Workers	327	457	784
Construction Crafts	1372	53	1425
Craftsmen/Kindred	380	169	549
Operatives	515	240	755
Laborers	484	94	578
Personal Services	32	377	409
All Occupations	3886	2155	6041

Percentage Distribution

Occupation	Direct	Indirect Induced	Total
ProfessionalfTechnical	7.1	10.0	8.4
Managers/Administrators	11.5	13.9	12.4
Sales Workers	1.0	11.5	4.7
Clerical Workers	8.4	21.2	13.0
Construction Crafts	35.3	2.5	23.6
Craftsmen/Kindred	9.8	7.8	9.1
Operatives	13.2	11 .1	12.5
Laborers	12.5	4.4	9.6
Personal Services	0.8	17.4	6.7
All Occupations	100.0	100.0	100.0

Sources: Same as Table 4

TABLE 7:

Construction Generated Employment Impact Estimates for Recently Built Light Rail Transit Systems

City	Actual Capital Costs in million dollars	Employment	Jobs per per million $ spent
Milwaukee	417.0*	6,041	14.48
Sacramento	176.0	2,000	11.36
St. Louis	341.7*	5,188	15.18
Portland	295.0**	10,605	35.95

* Estimates

** Total for entire Banfield Transitway Project of which $80 million was for highway

Sources: Milwaukee: UWMCED estimates, using RSRI model; Sacramento: West, 1986; St. Louis: U.S. Department of Transportation, 1987; and Portland: Strathman, 1983.

As Table 7 indicates, in the aggregate these estimated impacts for Milwaukee are generally consistent with the forecasts made in other cities. The one exception is Portland, where the estimated employment impact of construction of the Banfield Transitway seems inflated, especially since an exceptionally high regional employment multiplier of 4.47 was derived in the input-output model used there. Our estimates produce a much more modest ---and, we think, more realistic-- employment multiplier of 1.55 (compared to 2.0 in the St. Louis estimates and 2.6 in Sacramento).

Economic Impact of LRT: The Operations Phase

UWMCED has also estimated the potential impact on employment, output, and wages in metropolitan Milwaukee of the operations and maintenance of a light rail transit system. Based on the DPW estimates of. $15.3 million in annual operations and

maintenance expenditures, UWMCED estimates that this aspect of LRT would generate in the four county region 624 jobs (508 direct in transit employment, 116 by indirect and induced effects), $20.9 million in regional output, and $10.3 million in wages in the region. This estimate is generally in the same range as the actual experience in Portland and Sacramento, (when accounting for the higher level of projected expenditures in Milwaukee), although our estimate is much lower than the projections made for the St. Louis Metro Link.[3]

Sacramento's RT Metro is staffed by 101 people, including light rail administration, train operators and supervisors, vehicle and right of way maintenance, and fare inspection (Matott, 1989, 10). Assuming a multiplier of 2.0, RT Metro would appear to generate around 200 jobs in Sacramento, for a system somewhat smaller in scale and more bare-bones than the one envisioned for Milwaukee.

Similarly, Portland's MAX system, also smaller than the LRT system sketched in the 1991 transit corridor study in Milwaukee, employs 36 drivers and 46 maintenance employees. Related administrative employment for LRT may raise total system-related operations employment to near 100 --comparable to Sacramento (Tri-County Metropolitan Transportation District of Oregon, 1990).

Finally, the final environmental impact statement (EIS) for St. Louis' Metro Link offers employment impact estimates for LRT operations far higher than UWMCED's for Milwaukee. The St. Louis scenario envisions 2,089 direct jobs created by LRT, and, with indirect and induced effects, total employment of 4,198 generated by Metro Link operations (U.S. Department of Transportation et al., 1987, 5-32).

In sum, operating and maintaining the proposed LRT system will probably create around 625 jobs in metro Milwaukee, although this estimate may be slightly high when viewed in comparison with the experiences of Sacramento's RT Metro and Portland's MAX, or low when compared to the estimates for St. Louis' Metro Link.

Employment and Investment from Transit Corridor and Station-Area Redevelopment

A final potential source of long-term employment and investment growth from LRT will come from office, retail, residential, and industrial developments stimulated in st.ation areas and along route alignments of the system.

We explore in Section III of this report the record of fixed rail investments in promoting redevelopment in various cities. However, we were unable to discover any studies offering precise or definitive estimates on the number of jobs or the level of investment generated in transit-related development projects. Because precise route alignments and station locations have not yet been determined for the proposed Milwaukee LRT system, UWMCED could not make estimates regarding the potential investment, real estate development, and job creation that might occur from station-area redevelopment in specific Milwaukee-area neighborhoods. However, as we argue in Section III, the evidence suggests that well-coordinated economic development/transit planning can produce significant investment around fixed rail systems. These investments, if not necessarily producing net new employment, can nevertheless help rechannel regional development in a manner that may create employment in corridors suffering from severe unemployment or underemployment.

The final environmental impact statement for St. Louis Metro Link project did

produce estimates of job creation and capital investment around LRT station-area development projects. These estimates are reproduced in Table 8. These data should be viewed cautiously; in our view, they represent extraordinarily roseate estimates of the potential employment and investment impact of Metro Link-related development projects. Nevertheless, we offer these estimates as guideposts for Milwaukeeans in gauging the employment and investment-generating *potential* of redevelopment projects around LRT routes and stations.

TABLE 8:

Capital Investment and Employment Associated With Economic Development At or Near LRT Stations:

Estimates for St. Louis' Metro Link

Type of Development	Capital Investment (in millions $)	Employment (perm. jobs)
Development contingent on LRT	23.0	965
Near-term adjacent development by LRT authority	59.7	2,200
Long-term adjacent development	102.5	4,130
Other possible walk-access development	346.9	19,545
Total LRT-Related development	532.1	26,840

Source: U.S. Department of Transportation et al., 1987, 5-26, 5-27

TABLE 9:

Summary of Estimated Employment, Output, and Wage Effects of Light Rail Transit in Milwaukee

Estimated Employment, Output, and Wage Growth in the Four County Region

(Employment in jobs, not full-time equivalents)
(Dollar figures in thousands)

Construction Phase (4-5 years)

Effect	Employment	Output	Wages
Direct	3886.2	259452.4	138536.6
Indirect/Induced	2154.2	105876.0	40182.6
Total	6040.5	365328.3	178719.2
Operations Phase			
Direct	524.0	15300.0	8232.4
Indirect/Induced	149.5	7717.4	3075.5
Total Effects	673.5	23017.4	11398.9

Source: UWMCED calculations, from RSRI input-output model

Summary

As Table 9 summarizes, there are important benefits in increased regional employment, output, and wages from the construction and operations of a light rail transit system. Like any major public works project, there is an immediate economic benefit from LRT: a pump-priming of the local economy that will result in short-term job growth.

These short-term benefits are not insignificant: as the Social Development Commission recently pointed out, the number of available jobs in Milwaukee is much

lower than the number of potential job seekers (i.e. officially unemployed, discouraged workers, and the able-bodied on public assistance). The SOC's most recent estimate pegged this gap at over 35,000 jobs (Social Development Commission, 1991,7). Thus,. any job creation associated with LRT in Milwaukee, especially jobs with solid wage levels, will be welcome.

In the long-term, LRT may offer structural benefits in improved productivity --and, eventually, output, and employment.:- in the Milwaukee economy. Although there is no solid evidence to "prove" that rail transit has such effects, there are good reasons to believe that LRT, like public infrastructure investments generally, will improve the return on private capital in the Milwaukee area.

Finally, as we examine in detail in Section IV of this report, if creative local industrial policies are deployed to strategically use LRT expenditures in the development or restructuring of local industries, the long-term employment, output, and wage impacts of light rail in Milwaukee may be significantly enhanced.

SECTION III:

THE IMPACT OF FIXED RAIL TRANSIT ON LAND USE AND NEIGHBORHOOD DEVELOPMENT

Overview

Proponents of fixed rail transit systems argue that one of the long-term economic benefits of such systems is that they promote efficient patterns of land use and stimulate neighborhood development, investment, and employment along system routes and around transit stations.

To provide some comparative perspective that might assist Milwaukeeans in assessing the potential redevelopment impact of a light rail system here, UWMCED has closely examined the available evidence regarding the impact of fixed rail systems on land use and neighborhood development in several cities. Unfortunately, there are few systematic or conclusive "before and after" studies on the redevelopment effects of transit investments. Nevertheless, from a growing literature of descriptive case studies, we have been able to assemble sufficient information on the "transit-development connection" to draw at least some provisional conclusions regarding the redevelopment potential of LRT investments.

Although our main concern in Milwaukee is with the potential redevelopment impact of *light rail systems,* UWMCED has also examined evidence on the investment and development impacts of post-1950 heavy rail systems in cities such as Atlanta, Baltimore, Miami, San Francisco, and Toronto. We have examined these heavy rail systems for two main reasons. First, although many of these subway and metrorail systems are still relatively new, they nevertheless have been in existence longer than the more recently constructed light rail systems in Buffalo, Pittsburgh, Portland, and Sacramento. Thus, transit-related redevelopment effects should be more discernible in the heavy rail cities, particularly in cities such as Atlanta, San Francisco, Montreal, and Toronto whose systems have been in operation for more than a decade. [4]

Second, because of their typically higher levels of ridership and generally more elaborate station structures, heavy rail systems represent the "best-case scenario" for transit-induced redevelopment impacts. Put another way, if we *do not* find significant redevelopment associated with *heavy rail* systems that have been operating for several years, then, all things being equal, the likelihood is not particularly high that newer, less elaborate *light rail systems* will stimulate substantial redevelopment activity. On the other hand, although we cannot assume that the redevelopment impacts of heavy rail systems would necessarily be repeated in cities with LRT, findings that development activity has been stimulated by heavy rail would at least suggest potentially positive impacts in cities such as Milwaukee considering an LRT investment.

UWMCED's review of the transit-related redevelopment record in cities with fixed rail systems of all types has produced three main findings:

Fixed Rail Systems Have a Positive, But Moderate Development Impact

Properly implemented and coordinated with other public and private investments, fixed rail transit appears to stimulate some redevelopment and to have a moderate influence in channeling urban land use into more efficient, compact patterns. As we explore below, there is ample evidence of transit-related redevelopment in the cities we examined, although the extensiveness of these redevelopment impacts varies considerably from city to city. Investments in rail transit can make specific areas attractive for development because they:

1. Increase the accessibility of an area to a region's population and employment centers;

2. Provide concentrations of potential clientele for development through high daily passenger traffic through station areas;

3. Permit high-density development by reducing parking requirements in the area;

4. Demonstrate a long-term commitment to an area by making a substantial public infrastructure capital investment in transit facilities (U.S. Department of Transportation et al., 1987, 5-32).

However, the redevelopment record of fixed rail systems should not be oversold. The impacts typically are modest, and there appears to be substantial lag time for developments to occur, as private investors need to gain confidence in transit areas as viable markets. By itself, fixed rail transit is not a "quick fix" for urban redevelopment or central city revitalization. As Robert L. Knight, who conducted a decade ago one of the most systematic analyses of the impact of rail transit on urban land use, concluded:

> Available evidence does not show that recent American and Canadian rail rapid transit Investments have had major effects on urban structure, as determined by activity locations, resulting patterns of travel, and related secondary effects. Within our ability to identify such effects, they simply do not seem to have occurred within the ten to twenty year period we have had to observe modern transit systems such as San Francisco's BART, the Toronto subway, the Montreal Metro, and the major new extensions of older systems elsewhere. This seems to be the case even under the best of circumstances, such as in Toronto, in which the transit investment is fortuitously coordinated with other forces such as an expanding local economy, land available and attractive for development around the transit stations, other nearby public investments, zoning incentives, and a supportive community (Knight, 1982, 110).

Moreover, transit-related redevelopment typically has represented a small percentage of the overall development occurring even within metropolitan regions containing fixed rail systems; thus, the ability of fixed rail to combat such phenomena as suburban sprawl or the decentralization of employment should not be overstated.

Even the most elaborate and celebrated recent fixed rail systems --in cities such as Atlanta, Montreal, Portland, San Francisco, Toronto, or Washington, D.C. where ridership is generally considered strong and where there are visible signs of transit-related redevelopment-- provide no support for the notion that implementing fixed rail transit systems will fundamentally alter market trends or other forces promoting the decentralization of population and employment. Table 10 provides at least some indication of how the deconcentration of population in metropolitan areas in Canada and the United States has generally proceeded apace, even in cities that have implemented rail transit systems. To again quote Robert L. Knight:

> [T]he amount of development induced to concentrate around rapid transit stations has been only a very small fraction of all new regional development occurring in the decade or two following construction of modern rail transit systems, and an even smaller fraction of any region's total building stock. This is true even for Toronto, where high rise buildings around some stations have been widely cited as evidence of transit's potential for shaping urban development (Knight, 1982, 111).

Given this overall record, UWMCED concludes that proponents of LRT, in Milwaukee and elsewhere, would be ill-advised to "sell" such systems as antidotes to suburbanization or as the linchpin of a trend back to the compact, denser patterns of urban land use that existed earlier in the twentieth century. There can be important development benefits from rail transit, but they should not be exaggerated.

Ridership is a crucial determinant of private sector development interest near transit stations.

The attractiveness of areas around transit stations as sites for private development is integrally linked to levels of system ridership. Well-used transit stations bring together thousands of potential clients daily for any number of development possibilities in the commercial, residential, office-work sectors. However, the volume of passengers utilizing specific transit stations or transit centers must be impressive to attract the interest of private investors (Cushman, 1987, 179-180), As we explore below, there is much that the public sector can do to stimulate station-area development, but the bottom line is that the chief *market* for such projects will be the clientele of the transit system. Self-evidently, if few commuters are patronizing a transit system, there would appear to be little incentive for private investors to develop real-estate around under-utilized transit facilities, particularly retail activities that require continuous and substantial "walk-up" clientele. Thus, ridership is not only a transportation-planning issue; it is also important in assessing the economic development potential of a given transit investment.

Unfortunately, there appear to be no universally accepted figures on the daily ridership that would constitute a "minimum threshold to attract private commercial interests who will find it beneficial to invest in areas in and around transit stations" (Cushman, 1987, 180). King Cushman, the director of development and community affairs for Pierce Transit in Tacoma estimates the development-attractiveness threshold at around 100,000 daily riders (Cushman, 1987, 180). His figure may be somewhat high, but clearly it suggests that LRT systems, which generally handle daily ridership in range of 15,000 to 40,000 passengers, are likely to exert, at best, a modest stimulus

on private sector redevelopment.

TABLE 10:

Recent Fixed Rail Investments and Suburban Sprawl

% of metropolitan area population living in selected central cities, 1970-1990

City	1970	1980	1990
Atlanta	29.4	19.9	13.5
Baltimore	43.3	35.8	30.9
Buffalo	41.6	35.3	33.8
Miami	26.4	21.3	18.5
Pittsburgh	22.1	19.1	18.0
Portland	41.3	33.3	35.2
Sacramento	30.3	25.1	24.9
Washington, D.C.	24.9	19.6	15.5
Milwaukee	51.1	45.5	43.9
Montreal	45.9	35.4	33.9
Toronto	34.1	28.0	25.0

Sources: *Statistical Abstract of the United States,* 1991, tables 36 and 40; Statistics Canada, *Census of Canada,* various years

Coordinated public investments and station-area planning are necessary to generate neighborhood revitalization benefits from rail transit investments

There is, as King Cushman notes, nothing "certain or automatic" about redevelopment around transit station sites (Cushman, 1987, 179). This is particularly true in neighborhoods with relatively weak private investment markets, although, as the Knight study in the 1970s showed, the evidence seems compelling that even in robust private markets, extensive public development and land-use planning is essential to maximize the "transit-development connection."

Fixed rail transit offers the *opportunity* for development, but, in itself, is not sufficient to spur significant spin-off development around routes and stations. The experience of other cities suggests that several supporting conditions are necessary to derive economic development and land use benefits from rail transit: the availability of land and relative ease in assembling it for development; generally favorable economic

conditions; complementary public land use policies; and widespread community support.

Particularly in the fragile economies of central city neighborhoods, the "field of Dreams" approach to redevelopment --"if we build a transit station, developers will come"-- is not likely to work. This observation seems especially pertinent in the context of light rail systems where, outside of downtown settings, LRT stations often consist of nothing more elaborate than tracks running next to a structure resembling an extended bus shelter. By itself, such an unassuming physical structure, especially if accompanied by modest levels of ridership, is unlikely to stimulate substantial spin-off development.

In general, there are three types of government strategies regarding transit investment and redevelopment:

1. Passive Development: A "field of dreams" strategy that essentially assumes private markets will automatically develop around transit investments. No special effort is made by local government to guide, let alone control, private development around stations;

2. Seed Development: Local government incentives --tax abatements, low-cost loans or gap financing, zoning incentives-- that will encourage developers to invest around station sites;

3. Active Development: Strategic, public intervention in the development marketplace that coordinates transit planning and economic development initiatives. Intervention of this type includes joint public-private development projects around transit stations, as well as major public investments such as government offices, cultural amenities, or substantial infrastructure improvements that would augment the development prospects around rail stations (Witherspoon, 1982, 348).

Based on the experience of other communities, UWMCED concludes that if city neighborhoods in Milwaukee are to fully benefit from a major public investment in light rail, local government needs to pursue an active development strategy in stimulating investment around the LRT stations and routes. In their important study of the development impacts of "second generation" U.S. rail transit systems, Skinner and Dean conclude:

> [R]ail transit may be a necessary but insufficient condition for encouraging efficient land use patterns and economic development. Thus, the ultimate success or failure of the second generation rail systems . . . will depend on the nature and extent of additional actions which are taken to complement the rail system . . . One of the lessons learned from earlier experiences is that decisive and strong local actions may be required to achieve even a modest shift in established trends (Skinner and Dean, 1982, 273-274).

These observations are especially trenchant when applied to the potential impact of rail transit on distressed, inner city economies. As we examine, the record of rail transit in other cities in alleviating inner city economic distress has been exceedingly modest.

UWMCED concludes that decisive, complementary public policies are absolutely essential if a light rail investment is to leverage private investment in the depressed market of Milwaukee's Inner City.

Case Studies: The Fixed Rail Transit/Urban Redevelopment Connection

In the following section, we present short, descriptive analyses of the land-use and urban redevelopment impact of fixed rail transit systems in selected cities. These are not offered as anything approaching exhaustive or definitive impact studies of the fixed rail experience in these cities. Although UWMCED researchers visited several of these cities and observed their fixed rail systems, our analysis is based chiefly on the existing literature on these cities (and thus is limited by the general lack of systematic "before and after" studies of the development impact of rail transit systems). Our intent is to review these cases to develop a general sense of how fixed rail systems have affected land use and community development in various cities, to focus on lessons to be learned and pitfalls to be avoided from the experiences of other cities.

Even without definitive impact studies, it is vital to bring at least some comparative perspective to the analysis of important public investment decisions, to observe how similar decisions have worked out in other communities. Too often, important public decisions are made on the basis of local "feasibility studies" that are invariably based on highly judgmental assumptions that, at a minimum, could benefit from "reality testing" from the experiences of comparable communities. For example, researchers can develop plausible scenarios, based on internally consistent assumptions, regarding the amount of development likely to occur around proposed rail routes in a given city, and the amount of employment likely to be generated by that development. At a minimum, however, it would be useful to find out whether such levels of employment or development have been generated in other cities, under what conditions, and whether, in the context of experiences elsewhere, the seemingly reasonable assumptions used to produce such estimates make sense.

In short, even lacking definitive impact studies, we do think that descriptive reviews of the record of other cities might prove instructive to Milwaukee area residents and policymakers as we consider the merits of a proposed light rail system for this region. It is for that purpose that we offer the following case studies as illustrative of the state of research knowledge about the development/land use impact of fixed rail investments in selected cities.

Heavy Rail City Case Studies

Atlanta

The Metropolitan Atlanta Rapid Transit Authority (MARTA) began operations in 1979. MARTA is a 32 mile, 29 station heavy rail system whose construction cost to date has been approximately $2.3 billion (about half funded by the federal government). By the end of the 1980s, MARTA had a daily ridership of approximately 185,000 which, although substantially less than the 395,000 passengers projected by

MARTA's planners, has been steadily climbing in the 1980s. There is a general perception among analysts that "Atlanta's rapid transit system is one of the major [recent] success stories in urban transit" (Ryan, 1989, 18; Tefft, 1979, 45).

To perhaps an unprecedented degree among U.S. cities, land use and urban redevelopment issues were paramount in planning Atlanta's rapid rail system. In the words of one study, MARTA was conceptualized as nothing less than "an urban transportation system that will modify the Atlanta metropolitan area structure" (Potter, 1982, 353). Planners sought to use MARTA "to transform a number of key Atlanta areas into healthier, more productive centers" (Potter, 1982,357). In addition, Atlanta's Regional Commission (ARC) explicitly viewed MARTA as a transportation *and* development policy that would produce benefits for the city through "value capture" on transit-area development projects. "A central assumption of value capture policy," stated the ARC in 1978, "is that rapid transit systems such as MARTA should not be viewed solely as transportation improvements" (Tefft, 1979, 46).

Specifically, there were three explicit development objectives associated with MARTA:

> (1) $tabilizing and revitalizing Atlanta's downtown business district;
>
> (2) Encouraging commercial development around certain passenger stations, creating nodes or employment centers that commuters could reach easily without personal transportation;
>
> (3) Slowing down suburban sprawl, and stimulating a larger share of the region's future growth within the central city (Potter, 1982, 353).

According to Paul E. Potter, MARTA's planners hoped that this restructuring would occur in the following way:

> When the new transit system is completed and many Atlantans have changed their commuting habits, the flow of commuter traffic to and from MARTA stations will be heavy. Some people are expected to seek residences closer to the transit stations, so that station areas will become logical centers for some types of commercial activity. Finally, the business community will probably construct new office buildings near some stations, creating new employment centers at these locations. In these ways, a number of the MARTA stations will become logical nuclei for future urban development (Potter, 1982, 353).

This scenario, of course, is what all rail system proponents hope for, but Atlanta's planners did not passively wait for markets to develop around transit nodes. Rather, the ARC and the City of Atlanta, supported by $1 million in Urban Mass Transit Administration (UMTA) planning assistance, conducted detailed "Transit Station Area Development Studies" (TSADS) to provide "not only a scenario for development at each site, but deliberate public actions to produce such developments" (Potter, 1982, 353). MARTA stations were classified as to their development potential and the type of neighborhood environment desired in the station-area (high density commercial or

offices, mixed use, residential, etc.). MARTA Special Public Interest Districts were created around the stations to expedite changes in city zoning ordinances that would allow higher-intensity "nodal development" around certain stations.

Through joint development, the leasing by MARTA of publicly-controlled "air rights" to corporations or private developers at certain MARTA stations, and city infrastructure expenditures around station sites, development has occurred at MARTA routes, although not nearly at the level envisioned in the various plans of the late 1960s and early 1970s. "The opening of three MARTA stations in the Midtown area of Atlanta helped make it a target for intensified development," writes Clarence Stone in his 1989 study of urban redevelopment in Atlanta (Stone, 1989, 18). King Cushman observes that "companies now want to be near direct transit system access so MARTA has been able to obtain a great deal of commercial space activity around a number of its stations" (Cushman, 1987, 183). Georgia Pacific and IBM high-rise offices are atop MARTA air rights, and there are now numerous structures --such as the Georgia state office complex, Peachtree Summit building, and Southern Bell's headquarters-- whose development is directly connected to MARTA. Some joint development activity is beginning to generate "respectable" income for MARTA. Lease income for 1987 was estimated at $700,000 in 1987, and long range projections by MARTA peg annual income from joint development at a very optimistic $10 million annually (Cushman, 1987, 183). It is clear that some important development benefit value has been captured by MARTA, particularly around its downtown stations.

Nevertheless, there are critics regarding how efficaciously MARTA has been used in Atlanta to maximize its development and redevelopment potential. Some analysts, such as Leon S. Eplan, argue that "the handful of examples of transit-stimulated benefits pale beside the opportunities lost, probably irrevocably. Especially in regard to the ability of transit to help shape the urban area to become more efficient, more satisfying and less wasteful --to direct land uses, jobs, public resources, and social policies: few attempts have been made which would utilize transit in this way, although these types of benefits were among the earliest recognized as transit's greatest potentialities" (Eplan, 1979, 138-139). Although certainly not conclusive in this regard, the population data in Table 10 nevertheless suggest that MARTA has had a negligible impact in reconcentrating metropolitan Atlanta's population in the central city.

This limited regional impact is understandable in view of the refusal of Cobb and Gwinnett counties --rapidly growing areas north of Atlanta-- to participate in MARTA, a refusal that many observers attribute to racial politics. Gary Orfield and Carole Ashkinaze argue that Atlanta's suburban politicians sought to increase socio-economic separation and maintain racial boundaries between the city and suburbs, and one way was for northern suburbs to reject participation in MARTA (Orfield and Ashkinaze, 1991,53).

Eplan also maintains that, with the exception of a few examples, "most of the substantial development now adjacent to stations would probably have been undertaken in these locations regardless of MARTA" (Eplan, 1979, 138). This conclusion was echoed by Andrew Hamer, an economist at Georgia State University, who claimed that "the conventional wisdom is that there is not a heck of a lot happening that wouldn't have happened without MARTA ... It has done a little real estate rearrangement, but they can't show that it wouldn't have been done in the first place" (Tefft, 1979,44-45). Given the concentration of MARTA-related development downtown, where office and commercial development markets were strong nationally throughout the 1980s in major cities *with* and *without* fixed rail systems, this criticism appears plausible.

Concomitantly, very little evidence has been presented that MARTA was used --in tandem with other public powers-- to fundamentally revive Atlanta's distressed neighborhoods, or, in any systematic way, serve the economic needs of the city's poor. Eplan criticizes Atlanta for failing to create a land assembly or development agency that could coordinate station-area development; instead, he argues, developers "continue to deal with MARTA on a one-on-one basis, which sometimes has been successful, often not successful, but simply too limited a process to realize a wide range of benefits" (Eplan, 1979, 139). The broader mixed-use and residential projects originally planned around several MARTA stations have generally not been realized, in part because many supportive public improvements such as libraries and community centers were not built because of public fiscal pressures, and in part because the private investment climate in these station-areas was insufficiently enticing (Cushman, 1987,185).

More seriously, critic Clarence Stone, a professor of political science at the University of Maryland and the author of a prize-winning study of Atlanta's governance between 1946-1988, has characterized MARTA as a system that has promoted downtown revitalization and the gentrification of certain neighborhoods, but has not been used as a lever to revive Atlanta's economically distressed city neighborhoods. As an example, he cites the lack of any coordinated "affordable housing" strategy in conjunction with station-area planning in Midtown, the result being a gentrification-oriented redevelopment process.

Stone argues that, in its final form, MARTA was a system that fit the goals of Atlanta's downtown elite while providing elusive benefits for the city's black community. The first MARTA proposal was defeated in a 1968 referendum. In order to secure black community support in the 1971 MARTA referendum, promises were made that major black residential areas and public housing projects would be served by MARTA lines. This issue of the Proctor Creek spur took on enormous political significance in the black community, especially as the line was continually delayed and, in 1986, a proposal was even made to substitute a bus line for the MARTA spur. (The bus proposal withdrawn under intense pressure but as of 1989, the Proctor Creek spur remained unbuilt). These limited benefits of MARTA for Atlanta's black community have been exacerbated by the exclusion of Atlanta's northern suburbs from the system, denying inner city residents efficient mass transit links between their neighborhoods and the region's growing job markets. Although black contractors and some black professionals did benefit from MARTA's affirmative action hiring and minority business enterprise/purchasing provisions, on the whole, argues Stone, MARTA was not planned or implemented in a manner that meaningfully benefited Atlanta's black community.

Despite its reputation for a strong black middle class, like so many metropolitan areas in the United States there are "two Atlantas": one prosperous, primarily suburban and white; the other, poor, predominantly black, and disproportionately concentrated in the urban core. The problem is so serious that former President Jimmy Carter's newest crusade is the "Atlanta project": a major public-private initiative to solve the city's increasingly alarming problems in housing, education, and employment (Smothers, 1992). MARTA certainly did not create the "two Atlantas," but there is little evidence that this multi-billion dollar mass transit investment has been used as creatively as it might have been to tackle the city's most vexing social and economic problems.

Atlanta avoided the "Field of Dreams" approach to transit planning, and consciously attempted to link transit and economic development planning. Yet, the evidence

suggests that MARTA's potential as a tool of economic development in Atlanta has not been fully realized.

Miami

Miami's Metrorail is a 21.5 mile, 20 station system that began operations in 1985. It cost approximately $1.3 billion to build. Although Metrorail planners forecast a daily ridership of almost 240,000 passengers, the system currently carries approximately 35,000 passengers each weekday, well below the threshold of 100,000 daily riders suggested by some as necessary for transit-stimulated redevelopment (U.S. Department of Transportation, 1990, xi).

The Miami system has the unenviable distinction of being characterized with near-unversality by mass transit analysts as an example of an unsuccessful system, from both a transportation perspective (achieving satisfactory ridership levels, easing traffic congestion etc.) as well as from a land use and economic development standpoint. Miami did have a Station Area Design and Development (SADD) program, ostensibly designed to insure that Metrorail fully realized its potential to influence "the future development of the metropolitan area" (Dyer,Spillman, and Lambert, 1979, 147). Some station-area planning, with citizen involvement, was done.

Nevertheless, critics characterize Miami Metrorail as a "classic example of a significant lack of comprehensive transit and land use planning" (Cushman, 1987, 31). There are, apparently, still a considerable number of subsidized parking spaces available downtown, thus limiting incentives for Metrorail ridership; low patronage of the system, in turn, has severely limited its development impact. Moreover, there was little consideration of using the system to *shape* land use or economic development by explicitly including such criteria in the *design* of system routes and station locations; in that sense, station-area development planning was almost an after-thought, limited to making the best of the development potential of areas where stations happened to be located. As Anthony James Catanese has pointed out, Miami's mistake was that planners were "far more concerned with using existing rail rights-of-way than with trying to shape urban form. The priority there was to reduce costs by using rights-of-way already assembled by the railroad. Consequently, the rapid transit system is in the wrong place ... and that is the major reason for the failure of rapid transit in Miami. The system does not serve the needs of the elderly, the poor, and children --the major markets." (Catanese, 1987, 191).

In short, the Miami case suggests that rail system planners need to closely consider the trade-off between: 1) capital cost savings from use of existing rights-of-way versus 2) potential economic development benefits from locating transit lines and stations where development should and, in some cases, needs to occur.

Baltimore

Baltimore's heavy rail system, the Metro, began operations in 1983. It is currently a 14 mile, 11 station system, running from the heart of downtown, through the city's Northwest corridor, into suburban Baltimore County and the rapidly growing suburb of Owings Mills. An additional 1.5 mile spur from downtown to the Johns Hopkins University hospital in East Baltimore is currently under construction. Daily ridership on the Metro is approximately 45,000, respectable compared to other cities and given the

size of the system, but nonetheless substantially below the pre-construction forecasts of 103,000 and markedly below the ridership levels generally believed to produce significant transit-related development and redevelopment. The capital costs of the system to date have been approximately $1.3 billion (U.S. Department of Transportation, 1990, vi).

Baltimore's Metro represents a considerably scaled back version of the city's original rapid rail plan, unveiled in 1965, which called for a 72 mile, six leg system with spurs radiating in all four directions. Nevertheless, city planners viewed even the diminished Metro as an important development tool, "a new element in the structure of the city" that offered developers "a greater degree of access to more parcels of land" (Hill, 1983,31). The Baltimore City Department of Planning, in conjunction with the Maryland Mass Transit Administration did conduct studies of the development possibilities around Metro's stations, although the planning was not nearly as elaborate as Atlanta's, nor was there substantial public participation in the process.

The city designated urban renewal areas around stations needing such plans to encourage development, and incorporated plans for infrastructure improvements around the stations in the city's capital improvement budget. In addition, the city looked for opportunities to acquire land and package it for development. Said the city planning director: "It was done around the Inner Harbor and Charles Center redevelopment areas, Why not do it around the transit stations?" Around several of the stations in marginal market areas, the city received $10 million from UMTA's "Urban Initiatives" program to finance joint development projects involving land acquisition and the development of commercial, retail, and residential parcels. The goal was not only to promote development in these weak-market areas, but also to stimulate sufficient, revenue-producing development for the city to "value capture" some of the benefits (Gunts, 1983, 41).

However, early studies suggest limited economic development impact of the Metro, either along its lines or around its stations. The bulk of development near the Metro has occurred downtown, and this development is undoubtedly more attributable to the general downtown boom experienced by Baltimore in the 1980s rather than any dramatic Metro impact. As one analyst put it, "with no cross-lines to link riders to other sections of the city, developers don't see a payoff in the subway --yet. That may change slightly [when the Hopkins spur is completed] but can never match the development that occurs on larger systems" (Hill, 1985,45). This development impact may also change with the opening of the 27 mile Central Light Rail Line (CLRL) in 1992-93, effectively adding a North-South rail route to the Metro's East-West line, but any transit-induced development impacts from the interaction of the CLRL and Metro systems remains well in the future.

In 1987, Baltimore's Regional Planning Council conducted a limited" before and after" study of Metro's impact in Baltimore's Northwest corridor. The studY7 although clearly preliminary, concluded that no clear, systematic pattern of increased economic or real estate development seems to have followed Metro in the Northwest Corridor (Regional Planning Council, 1987).

This modest impact is not surprising. First, the study was done in 1987, before the opening of Section B of the Metro, extending it to the suburban growth center of Owings Mills. Impressionistic evidence suggests that the presence of Metro in the Owings Mills corridor has at least somewhat influenced land use patterns in that area.

Second, although city planners were attentive to development possibilities around transit stations in Baltimore City, they were not particularly aggressive in making the

kinds of massive investments required to support station-area redevelopment. At least three of Metro's stations were in the heart of West Baltimore's deeply impoverished black neighborhoods, requiring a major, complementary program of neighborhood reinvestment that the city was unable to finance as it pursued its ballyhooed Inner Harbor, downtown renaissance. Although city officials may have hoped for subway-stimulated revitalization in these neighborhoods, the Baltimore case represents a clear lesson regarding how much is required, beyond investment in transit and some urban renewal activity, for rail systems to contribute to economic development in distressed inner city neighborhoods.

San Francisco

San Francisco's Bay Area Rapid Transit System (BART) was built in the 1960s, and heralded as this country's first major regional rapid rail system in over fifty years. BART opened in 1972, providing 71 miles of service in the San Francisco Bay Area. Although bedeviled by early problems with mechanical malfunctions and uncertain commuter interest, BART has settled into a consistent daily ridership pattern of approximately 200,000 passengers, clearly enough volume to attract some interest from the private sector (Cushman, 1987, 183-184).

BART is also one of the few systems whose impact on economic development and land use has been systematically studied. Studies have been conducted by the Department of Transportation, the BART Impact Studies project at the University of California, Berkeley, and several private consultants and academic researchers (Altshuler, 1979, 398-402).

On the whole, these analyses reveal surprisingly little evidence of major impacts on regional land use or economic revitalization resulting from BART. San Francisco's downtown boom coincided with BART's construction, and there has been considerable development involving BART stations in downtown San Francisco. Some of these are joint development projects that have produced revenue for BART, and some leasing arrangements may generate a consistent income stream for BART.

However, researchers discount BART as a major cause of the downtown boom, pointing out that San Francisco's CBD was growing rapidly prior to BART's construction and that proponents of BART argued that it was necessary to *accommodate* forecasts of major downtown office employment growth rather than generate such growth. As a headquarters gateway to growing trade with the Pacific Rim, downtown San Francisco was an attractive location for corporate offices and redevelopment activity, whether serviced by BART or some other form of mass transit. There is no evidence that BART stimulated downtown growth at any faster rate than market forces were pushing such development; at best, BART can be sajd to have been one of many factors fueling San Francisco's downtown redevelopment in the 1960s and 1970s.

Even as downtown San Francisco boomed, however, there was no evidence that BART helped reconcentrate metropolitan area population and employment in the central city. The city has continued to decline as an employment center in the Bay Area region, and there is little evidence of an employment surge in the BART corridor (compared with other areas in the region). Moreover, even on a regional basis, between 1965-1975 the BART counties experienced a 13 percent growth in employment, compared with 49 percent growth in the remainder of the region. Even on the criterion of office construction and building rehabilitation, Dyett and Escudero

found:

> According to building permit data, neither San Francisco nor Oakland have increased their share of regional office construction during any portion of the BART period. Informants identified four office buildings which might have located in a different part of the Bay Area except for BART, but none were in San Francisco (Altshuler, 1979, 399).

Although BART has failed to staunch the dispersed pattern of land use that exists in the Bay Area, it does appear to have promoted clustered development along the BART corridor in downtown San Francisco. According to Dyett and Escudero, "San Francisco's business district has experienced a definite redirection of office building to Market Street (location of the BART line) and the south of Market area" (Altshuler, 1979, 400; Hartman, 1984). This result confirms the notion that rail transit can help rechannel development activity in strong market settings, especially downtQwn settings where high-density already is the norm.

However, outside of downtown San Francisco, the clustering impact of BART has been minuscule. As Melvin M. Webber reports:

> Most suburban stations stand in virtual isolation from urban development activity in their subregions, seemingly ignored by all except commuters who park their cars in BART's extensive lots. A few apartment buildings have been built within one-mile radii of a few stations ... [and] two modest-sized office buildings were erected, in Berkeley and Walnut Creek, close to the stations ... In general, however, the transit stations have not attracted higher density suburban developments (Altshuler, 1979,401).

In sum, as noted transportation scholar Alan A. Altshuler concludes, "the San Francisco experience provides no support for those who would use rapid transit as a primary technique for the 'revitalization' of core areas that are currently stagnant or declining" (Altshuler, 1979, 400). In a growth area, like San Francisco's downtowo, new development may cluster around downtown stations, but that is very different than claiming such development was *caused* by the rail system, or asserting much regional economic benefit from such station-area concentrations. Little clustered development appears to have occurred at outlying stations in the Bay Area, limiting any land-use efficiencies attributable to the system, and mitigating the effectiveness of BART in transporting inner city residents to the centers of employment growth increasingly dispersed throughout the region.

Even more serious criticisms concerning BART's social and economic impact have been leveled by sociologist J. Allen Whitt and urban planner Chester Hartman. In his award-winning book on BART, *Urban Elites and Mass Transportation,* Whitt conciudes:

> BART will not challenge the dominance of the private automobile, for it was not designed to do so. BART will not increase the mobility of the poor and thus help to redistribute life chances, for it was not designed to do so. BART was the creation of the large businesses in downtown San Francisco, and the

> principal aim of these businesses ... was to promote urban development in predictable and profitable ways and to defend property values in the central business district (Whitt, 1982, 76).

"BART," claims Whitt, "was designed to serve ... the preservation and growth of the central city and the protection of corporate investments there." In addition, BART appears to have merely "redistributed growth instead of generating new growth," in turn setting off a "speculative environment in the land market of the region," rather than promoting a rational, efficient metropolitan land-use strategy (Whitt, 1982, 71).

As to which segments of the Bay Area population benefited the most from BART, Whitt quotes a Berkeley geographer who characterized BART as an expensive, "high class commuting system for ... that minute fraction of the population that were in ... administrative and fiscal activities in downtown San Francisco. It didn't provide useful transportation in minor parts of the city." (Whitt, 1982, 74).

Despite the assurances of BART officials that the system would serve low-income residents, BART does not go near the largest black neighborhood in San Francisco, Hunter's Point. In fact, within San Francisco BART has only four stations outside downtown and does not serve vast areas of the city, including most of its lower-income population (Hartman, 1984, 6). "The function of BART," flatly states Chester Hartman, "is to bring suburban workers from Contra Costa, Alameda, and San Mateo counties into the downtown center" (Hartman, 1984, 6). As Martin Wohl argues:

> Downtown is increasingly becoming the headquarters for the more prosperous workers, and it seems that BART was especially designed to serve these workers, not the poor who probably need it the most, and not the masses who represent the bulk of San Francisco and Oakland's population" (Whitt, 1982, 75).

Certainly, the system's "radial" and opposed to "cross-haul" route alignment, marked by long-distance, high-speed runs instead of neighborhood-oriented, "urban-style" transit routing, favored more prosperous outlying communities rather than city neighborhoods outside of downtown. Thus, while BART avoids Hunter's Point, there are stations in the small, upper-middle income suburban communities of Lafayette and Orinda.

Whitt, Hartman and other BART critics argue that, in part, the system failed to serve the interests of the Bay Area's lower- and moderate-income communities because there was insufficient public control over BART planning and implementation. "The decision of the BART board to allow private firms to manage the system," writes Whitt, "also extended the influence of members of such business groups as the Bay Area Council directly into the 'nuts and bolts' of BART's design and construction" (Whitt, 1982, 78).

In short, the extensive studies of BART reveal significant questions regarding the land use and community development impacts of the system. Although some development has clearly spun-off, particularly around BART's downtown stations, it is unclear how much is attributable to BART. Moreover, there is little evidence that BART was used to rationally restructure metropolitan land use and employment locations in the Bay Area in ways that would bolster access of low-income city residents to suburban jobs or provide a stimulus to inner city economic development.

Nor is there much evidence that BART has provided much of an impetus to urban redevelopment anywhere, except perhaps in downtown San Francisco. Critics maintain that BART's planning was elitist and lacked the broad, public participation that might have resulted in a transit-based development plan promising more salutary urban redevelopment impacts and greater benefits to San Francisco neighborhoods.

Toronto

"It is generally agreed in the transit industry," begins a recent report, "that Toronto has one of the finest examples of mass transportation on the North American continent" (Young, 1980, 6). Toronto's 35 mile subway system, the first leg of which was constructed in 1954, carries a daily ridership of 720,000. Streetcar lines operate throughout the metro area, and there are light rail spurs connecting the subway to such suburban "nodal centers" as Scarborough in Toronto's rapidly expanding metropolitan region. All told, there are 72.8 miles of LRT route in Toronto, with an estimated daily ridership of 200,000 (Cervero, 1984, 135). This combination of system types probably gives Toronto the most flexible fixed rail transit system in North America, and undoubtedly explains why mass transit in Toronto attracts sufficient ridership to defray 70 percent of its operating expenses from farebox revenues (Pill, 1987, 58).

In addition, among recent fixed rail systems in North America, Toronto's is almost universally considered the best example of integrated transit and development planning. Zoning incentives and other development policies by Toronto's metropolitan government since the 1950s were coordinated with transit planning, for example, to concentrate high-density office employment areas at subway locations, and to encourage apartment development at station-areas and suburban nodes accessible to the subway by efficient bus routes (Bower, 1979, 23). At many stations, larger sites than actually needed "were acquired to allow for maximum use of joint development and cluster growth opportunities" (Stokes, 1979, 210). Joint development and "value capture" policies have been implemented so that, for example, private developers and property owners pay substantial sums for the right of direct connections to the Toronto subway; this value capture also helps offset the system's operating expenses.

Evidence suggests that these policies have borne fruit: unlike U.S. rail transit, where minimal transit-connected redevelopment has occurred outside of downtown locations, intensive high-rise apartment and mixed-use development occurred at many outlying stations in metro Toronto (Knight, 1982, 111). As one summary of the Toronto experience put it:

> Between 1959-1969, 90 percent of all office construction occurred in the planning districts through which the initial subway segment ran. Additionally, almost 50 percent of all high-rise apartment development also occurred in those areas. Through today, the subway's influence on growth has persisted. Major urban complexes continue to be built downtown, many of them linked to rail transit. Eaton Centre ... connects to two major downtown stations. Toronto's subway has also led to the construction of a maze of underground concourses and tunnels, which provides an almost weather-proof downtown that further enhances the central city.

> Farther out, apartment and commercial centers cluster around stations (Stokes, 1979, 210).

This transit-related development did not occur overnight; for example, at the intersection of the two major subways --the Yonge Line (opened in 1954) and the Bloor-Danforth Line (opened in 1966)-- it took about 20 years for significant development to occur. Even today, only two of the four corners have been developed to high intensity (Pill, 1987, 59). The Toronto experience reinforces the conclusion that planners must be patient in nurturing transit-related development impacts.

There are some claims that the subway *caused* development in Toronto, particularly along the rapidly growing Yonge Street route, but these assertions appear highly exaggerated (Altshuler, 1979, 397). Careful research indicates that "the subway construction cannot be said to have created growth or economic activity of itself," (Bower, 1979, 22) and, while some studies have shown that property values did increase more rapidly along subway routes than elsewhere in the city of Toronto, "none have shown that the line attracted any development to the city --let alone to the region-- that would not otherwise have occurred there" (Altshuler, 1979, 397).

Clearly, however, the subway significantly influenced the *patterns* of growth in the Toronto region. Implemented during a period of dramatic economic and population growth in Toronto (the population of metro Toronto has tripled since the 1950s), "the subway system was the key factor in ensuring that the new development strengthened and enriched the central area and selected nodes on the subway corridors" (Bowers, 1979,22).

On balance, Toronto represents perhaps the best case of transit/development planning, but while there is much to emulate from the Toronto experience, its relevance to urban settings such as Milwaukee may be limited. Mass transit investments coincided with the beginning of Toronto's major economic and demographic growth spurt; thus, with a still-compact central city and minimal decentralization of population and industry, rail transit could *shape* development patterns rather than accomplish the much more difficult task of *reshaping* already established patterns of sprawl. In addition, transit development in Toronto was facilitated by strong community support, historical traditions of mass transit patronage combined with an already sound transit system, and a readiness to use public policy to intervene in local real-estate markets for comprehensive land-use planning --all factors generally absent from U.S. metropolitan settings. The establishment of metropolitan government helped coordinate transit investments with development plans *throughout* the Toronto region, so that suburban locations developed around nodes, and these clusters were linked by public transportation to the city center. The policies of various levels of government in the Toronto region led to orderly and relatively compact urban expansion at reasonable densities. Again, this kind of metropolitan political integration is very difficult to achieve in Armerican cities.

Finally, as its transit system was under development, Toronto did not face the problems of inner city disinvestment and employment contraction that must be paramount concerns in rail transit planning in Milwaukee. The transit-related development possibilities are very different in a region experiencing rapid growth, with healthy expansion in the central city and very little inner city poverty, compared to a slowly growing region such as Milwaukee's, with a static central city, and significant inner city poverty and unemployment.

However, in sum, Toronto's experience does illustrate the positive land use and development returns that can be derived from transit investments when supported by

well-designed public policies.

Light Rail Systems

Buffalo

"Perhaps no city," writes historian Jon Teaford, "placed greater faith in the miracle-working propensities of rail transit than did Buffalo" (Teaford, 1990, 300). From the early 1970s, local advocates of rail transit in Buffalo "envisioned it as the stimulus for a resurgent city" (Teaford, 1990, 301).

However, perhaps no city has had as disappointing an experience with the contribution of light rail to urban redevelopment as Buffalo. In the early 1970s, the Buffalo rail project was planned as an ambitious regional system that would link downtown Buffalo to the expanding northern suburb of Amherst, presumably connecting two major activity centers: downtown and the new SUNY Buffalo campus. However, cost-overruns, planning snafus, and construction delays forced a paring back of the system to a light rail line running 6.4 miles up and down Main Street. Completed over 15 years after the initial planning began, the light rail line falls 6 miles short of Amherst, its original terminus, does not even reach the new SUNY campus and is, in the eyes of some cynics, a "line that leads nowhere." Moreover, with suburban sprawl proceeding rapidly in the 1970s, in the words of one critic, "a rapid transit system for Buffalo had lost its rationale long before construction was ever begun" (Goldman, 1990, 237). By the time the light rail system was completed in 1985, the suburbs in general and Amherst in particular were the true business centers of metropolitan Buffalo; thus, rail transit could hardly playa major role in reviving either downtown Buffalo or the rest of the central city.

The construction of the light rail line, begun in 1979 and completed in 1985, was a fiasco. As Mark Goldman points out,

> Construction of the line proceeded apace for more than six years and Main Street was inaccessible to pedestrian and vehicular traffic for the bulk of that time. When the system finally opened, Main Street's retail core, whose revitalization was the primary purpose of the project, had been all but destroyed by the long, forced hibernation. The central business district the new subway was supposed to save. was gone (Goldman, 1990, 237).

Confronted by budget woes as Buffalo's economy suffered through deindustrialization, the continued outflow of activity to the suburbs, and the devastating recession of 1981-82, transit officials were forced to delay completion of the downtown pedestrian mall that was expected to be the capstone of their transit-development "plan" (Teaford, 1990, 300). In that sense, as one report put it, "the subway was opened before it was finished" (Desmond, 1986, 28). In a memorable characterization, the executive director of the Buffalo's Niagara Frontier Transportation Authority called downtown Buffalo "Beirut" because of continuing pedestrian mall construction while trains ran through it (Desmond, 1986, 28).

Its redevelopment potential squandered by poor planning and a rapidly deteriorating local economy, Buffalo's light rail system also experienced almost immediate financial

difficulties. Daily ridership in 1988 was 29,500, a respectable total compared to other light rail systems (see Table 1 above), but substantially below the pre-construction forecasts ranging from 45,000 to 90,000 (Teaford, 1990, 300; U.S. Department of Transportation, 1990, vi). The *New York Times* reported in 1986 that "Buffalo's year-old rapid transit line might be forced to shut down unless a new source of revenue is found to cover its operating deficits" (Teaford, 1990, 300). In 1992, NAFTA continued to face daunting fiscal problems and the ever-present specter of system shut-down.

Not all reports on Buffalo's LRT are entirely negative. Lyndon Henry summarizes several transportation publication reports asserting that "LRT has been directly associated with downtown revitalization; over $200 million in private downtown construction was committed during the first year of construction; adjacent downtown office space is expected to increase by one-third; over $100 million in private development has occurred near one station alone; an extensive Theater District boom is associated with the new LRT" (Henry, 1989, 174). However, downtown redevelopment occurred in numerous cities in the 1980s without fixed rail systems (such as Milwaukee, for example). No evidence has been presented that this downtown construction was directly stimulated by Buffalo's light rail investment. Moreover, compared to other cities, Buffalo's downtown revitalization in the 1980s was quite modest.

Numerous factors contributed to the unrealized promise of Buffalo's fixed rail system, now labeled a "white elephant" by considerable numbers of Buffalo-area residents. Unrealistic, haphazard planning, inadequate community mobilization, and disastrous overall economic conditions contributed to the difficulties. According to Goldman, Buffalo's policy-makers treated the $500 million in federal funds provided for the system as a "windfall" to be spent, rather than as an opportunity to creatively and comprehensively plan a transit-led economic development strategy. "As long as someone else was paying," writes Goldman, "there was no reason, it seemed, not to build the subway" (Goldman, 1990, 238). As State University of New York-Buffalo political scientist David C. Perry has written, Buffalo suffered from a general lack of creative public and private sector leadership in the 1970s, and this leadership "vacuum" manifested itself not only in poor transit planning, but in the overall lack of innovative "urban regeneration" strategies for the city (Perry, 1991, 258-277).

There is also little sign that Buffalo's leaders thought much about how the new rail system might contribute to alleviating inner city problems. During the 1970s, as 100,000 whites left Buffalo for the suburbs, the city's black community grew to almost 30% of the central city population and, with a declining local economy, inner city Buffalo became an area of severe socio-economic distress. The Buffalo light rail line has not played any discernible role in alleviating these conditions.

In sum, Buffalo appears to be a classic example of the perils of "Field of Dreams" transit planning. Little connection was made between transit investments and wider community needs. Facing a new global economic realities, wrenching regional decline, and growing inner city distress, more than building a short single-line, 14 station light rail route was required to produce significant land use or economic development impacts.

Portland

Portland's light rail system is a 15 mile, 29 station line known as the Metropolitan Area Express, or MAX. Running between downtown Portland and the eastern suburb

of Gresham, MAX was the centerpiece of the Banfield Transitway Project --a joint highway-transit project that included LRT and reconstruction of portions of the Banfield Freeway-- that was under construction between 1982 and 1986. The light rail component cost $214 million, 83% of which was financed by the federal government.

Ridership on MAX has been solid and growing, with recent figures on daily passengers over 24,000. Although this ridership is much lower than the projection of 42,000 daily passengers made in the 1970s, Tri-Met, the transit authority that runs MAX, points out that the economic assumptions on which the 1970s forecasts were based have also changed. In short, although ridership on MAX is not spectacular --it is, for example, less than on Buffalo's line, which is not considered a major LRT success story-- it nevertheless is a system with slowly growing patronage and the promise of ridership growth.

There has been much publicity in the transit industry about LRT "reshaping" Portland (Middleton, 1990, LR2). G.B. Arrington, Jr., director of the public services division of Tri-Met, makes the following analysis:

> Portland is demonstrating that light rail can be linked with land use and development planning to have a dramatic effect on shaping regional growth ... The impact of the line is being felt from end to end ... [although] development activity is greatest in the downtown and Lloyd Center ...
>
> Based on the Portland experience, it's clear that light rail may have a greater development impact than heavy rail --certainly on a dollar-for-dollar basis ... Light rail penetrates the community and is not separated from it like heavy rail ... [and] is part of the urban experience --an amenity, a signature for the area. You can put light rail right into the middle of the action (Arrington, 1989).

Arrington cites 44 projects worth over $690 million, immediately adjacent to MAX that are either under construction or have been completed since the decision to construct MAX in 1979. Another $440 million worth of projects along the MAX line are on the drawing boards. In Arrington's analysis, four key factors have enabled local governments to fruitfully coordinate transit and land use planning in Portland:

1. Downtown Planning. Beginning with its 1973 Downtown Plan, mass transit has been at the heart of Portland's downtown redevelopment plans. Indeed, the detailed 1973 plan, which established clearly defined development corridors in and around downtown, explicitly called for promotion of "a mass transit system that will carry 75% of the passenger trips to and through the core; and which provides the viable alternative to the private vehicle" (City of Portland, 1989, 13).

The construction of a five-block transit mall in the late 1970s (Dueker, Pendleton, and Luder, 1982) helped anchor mass transit/land use planning downtown, and recent planning documents --such as the Central City Plan adopted in 1988-- continue to emphasize transit in redeveloping downtown Portland and its periphery. Transit corridors are viewed as the "spine for future growth," where high-intensity development is planned. The 1989 *Downtown Portland Light Rail Alignment Study* declares that "the backbone of [metropolitan Portland's] transportation system will be a regional light rail system. Downtown Portland, as the hub of the rail system, will

need light rail to operate quickly, provide convenient access to many destinations, and be developed as a total integrated system if it is to meet these challenges" (City of Portland, 1989, 1). The document called for consideration of an underground component for future additions to MAX downtown.

2. Limits on Downtown Parking. Since the early 1970s, the City of Portland has severely limited the availability of parking spaces downtown --unlike Miami, for example, whose easy downtown parking policies effectively undermined potential ridership for the Metrorail. As Arrington points out, a "partial effect of the lid is to automatically create a market for transit. [Thus], while the downtown has grown by over 30,000 jobs since the 1970s, the number of cars entering the downtown has stayed the same" (Arrington, 1989, n.p.).

3. Transit Station Area Planning Program. Portland established a $1.2 million planning program to develop comprehensive land-use plans around LRT stations. Extensive public consultation was conducted, with an active "Citizen Advisory Committee" helping define local concerns and identify development priorities. Meetings with neighborhood groups and local merchant associations were an ongoing process during the construction phase of the project (Post, 1987, 70). Market analyses around station-areas were conducted and rezoning plans, contoured to light rail, were implemented (City of Portland, 1983).

4. Balanced Transportation System. Since the early 1970s, beginning with the transit-oriented leadership of Mayor Neal Goldschmidt, Portland has consciously pursued "transit-friendly" transportation planning. Wherever possible, highway expansion projects have been shelved in favor of mass transit; in fact, conversion of funds originally earmarked for highways was the chief source of financing the LRT system. A pro-transit "culture" has therefore begun to develop in Portland --notwithstanding some of the early opposition to LRT, particularly in the suburb of Gresham-- and this public support for transit augurs well for future positive linkages between transit investments and land use planning.

There is little question that light rail has become an important infrastructure investment in Portland in shaping and accommodating growth, and there is much, particularly in Portland's integrated planning process, that Milwaukee and other cities contemplating LRT would do well to emulate. However, the claims made by Arrington and others concerning the development impact of MAX should not be taken too literally. Certainly, for example, Arrington's claim regarding the development potential of LRT versus heavy rail is unsupported. As Robert Cervero has pointed out:

> Since light rail transit generally has poorer performance characteristics (e.g. in terms of speed, regional access, etc.) than heavy rail, its urban development potential also could be expected to be less. Whereas heavy rail transit's 'sphere of influence' might encompass a radius of 2,000 feet (three or four city blocks) or more, light rail transit's seems to be somewhat less, perhaps one or two city blocks at most. That, of course, is simply because the lower performance of light rail means fewer land parcels can turn gains in accessibility into higher land values (Cervero, 1984, 134).

On the whole, the long-run prospects for joint development at several LRT stations

in Portland seem promising, given the city's strong commitment to growth management and extensive public land use planning. However, the results to date are decidedly more modest than Arrington claims. The bulk of development adjacent to MAX has occurred in and around downtown Portland, and is difficult to directly attribute to MAX; certainly, downtown investment picked up in virtually all major cities in the 1980s, including cities such as Milwaukee without any fixed rail system. In addition, consistent with the record of other fixed rail cities, transit-related development outside the central business district in Portland has been rather modest.

Portland's planners clearly view LRT as the linchpin of a reshaping of metropolitan land use and a *revaluing* of downtown as the regional economic hub, and are pushing for extensions of MAX to help accomplish that goal. Table 10 does suggest that, at least in terms of population, the City of Portland may have been stabilized, after a decade of decline, as the regional center in the 1980s: It is impossible at this stage to determine how much of this population shift is attributable to LRT --either directly or perhaps as a broad public symbol of renewed commitment to the central city.

TABLE 11:

Office Construction in Portland, 1970-1991

% of metropolitan area office space in central city, by period of office construction

Period	Percentage
Pre-1970	89.0
1970-1979	41 :5
1980-1985	43.6
1986-1988	16.7
1989-1991	36.5
Total (all Portland office space)	52.7

Source: 1990 Portland Metropolitan Office Guide

However, as Table 11 suggests, the evidence is not particularly persuasive that LRT has consolidated the position of Portland's central city as a regional economic hub. The central city proportion of metropolitan area office space, a good barometer of economic vitality in an economy increasingly based on services, has declined dramatically in Portland since the early 1970s. 89.0 percent of the office space built in metropolitan Portland before 1970 is located in the central city. By contrast, even between 1989-91, well into MAX's operations and almost 20 years after the adoption of Portland's downtown plan, only 36.5 percent of office space constructed in

metropolitan Portland during this period was built in the central city. This hardly bespeaks a transit-induced *reconcentration* of economic activity in the region. Similarly, although some have claimed that transit investments boosted the downtown share of regional retail sales from "7% to 30% in a dozen years," (Baldwin, 1987, 76), census data reveals a more modest increase in the CBD portion of metropolitan area retail sales from 4.0 percent in 1977 to 4.3 percent in 1982 (the most recent CBD retail sales census data available). By way of comparison, Milwaukee's CBD held 3.8 percent of metro area retail sales in 1977, and declined to 3.1 percent in 1982. Other cities of similar size --such as Baltimore, Cincinnati, Minneapolis, and Pittsburgh-- experienced declines comparable to that of Milwaukee.

To summarize, Portland's experience with light rail, while not as roseate as some of its publicists might argue, is nevertheless a good, solid example of U.S. urban transit/development planning. Clearly, unlike some other cases of transit "planning," the LRT system was not developed in an *ad hoc* or isolated fashion; rather, it was consciously planned as a central element in Portland's economic development and land-use strategies. Nor was LRT developed with a "Field of Dreams" mentality: complementary public policies were implemented to draw out the potential economic and land-use benefits of mass transit investments.

There has been some development associated with light rail, but these benefits, emerging just a few years after the completion of the MAX system, should not be oversold. Light rail has not restructured metropolitan Portland or reversed the decentralization tendencies in the regional economy. Nor is there any direct evidence that MAX *caused* significant development to occur that would not otherwise have happened. MAX does appear to have contributed to a revaluation of downtown that has been underway in Portland since the 1970s, but Portland-'s downtown renaissance owes at least as much to market trends and other supportive public policies as it does to mass transit investments.

Nevertheless, on the whole, the land-use effects of MAX to date appear to be modestly positive and, given greater Portland's commitment to aggressively orient land use planning around transit investments in the future, the potentially positive development effects are likely to grow. Milwaukee could do much worse than follow the scenario unfolding around light rail in Portland.

Systems Under Construction: Baltimore and St. Louis

Baltimore is preparing, in May 1992, to formally open the next leg of its regional rail transit system: what eventually will be a 25 mile, 30 station "Central Light Rail Line" (CLRL). Built at the cost of $446.3 million, the CLRL will run North-South, from the rapidly growing northern Baltimore County suburbs of Hunt Valley and Timonium, through Baltimore's extensively redeveloped central business district, eventually to its southern terminus at Baltimore-Washington International Airport (BWI). Transit planners are projecting a daily ridership of 33,000 passengers, which seems a modest and appropriate figure when placed in the context of Baltimore's transit history (with the heavy rail Metro) and the light rail ridership figures in other cities (State of Maryland, 1991).

The CLRL is notable for the speed with which it was planned and built: five years from initial environmental impact and alternatives studies to the first run of light rail vehicles from Timonium to downtown Baltimore. This speedy implementation owes much to the legendary leadership of Maryland Governor William Donald Schaefer,

whose maxim when spearheading Baltimore's Inner Harbor revitalization as that city's dynamic mayor was: "Do it *now."* Schaefer's commitment to the CLRL concept generated entirely local funding for the project, which immeasurably accelerated the pace of system development.

The advantage of this rapid implementation pace, of course, was efficiency, limited disruption to city life, and minimized cost-overruns due to delays. This smooth process in Baltimore has been dramatically different than the major cost-overruns and disruption to business downtown experienced, say, in Buffalo.

The downside of Baltimore's speedy process is that little systematic planning or public consultation was done to maximize the potential economic development and neighborhood revitalization contribution of the CLRL. By way of contrast, Portland's MAX involved a ten year planninglimplementation period which, although partially slowed by the pace of federal decision-making, was also slowed by the deliberate pace of local decisions and consultations on the project. However, as John R. Post maintains, this was "regarded as time well spent in making a milestone community decision" (Post, 1987, 67).

Thus, unlike in Portland, Baltimore did not produce detailed station-area development plans for CLRL, nor is there any blueprint for a set of complementary public policies to reinforce or nurture the potential economic development impact of CLRL.

Nevertheless, there are some *general* economic and community development goals that planners have sketched for Baltimore's light rail:

1. Improve access for employees to the rapidly growing suburban employment centers in Hunt Valley and the aWl Airport area. Historically, the bulk of commuting in the Baltimore region has mainly involved workers traveling to the central city. "Now," as Maryland's Mass Transit Administration points out, "with the proliferation and expansion of large suburban employment centers, traffic is significant both toward and away from the downtown area. Outlying businesses are finding it increasingly difficult to obtain workers while many within Baltimore City experience inconvenience in commuting to suburban jobs."

For the Hunt Valley spur, the AA/DEIS explicitly raises so-called "reverse commuting" as a light rail benefit. Hunt Valley is a rapidly developing, regional commercial center and a designated growth area in Baltimore County's master plan. The AA/DEIS estimates that the Hunt Valley extension of the CLRL would carry approximately 1,500 daily reverse commuters to Hunt Valley, presumably many low-income city residents to work in Hunt Valley's expanding commercial centers (U.S. Department of Transportation, et al., 1990).

Similarly, the AA/DEIS for the BWI spur mentions reverse commuting as a light rail benefit: "It can be expected that businesses choosing to locate or expand in BWI, particularly in the commercial and service sectors, will need to draw a significant proportion of their employees from Baltimore City, many of whom will be heavily reliant on public transportation to reach their jobs. As competition increases among areas for service and blue collar workers; and as the housing supply for lower-income households in the BWI area is limited, the availability of efficient transit linkages between Baltimore City and BWI will be an increasingly important factor in the desirability of BWI as a place to work, and a place to do business" (U.S. Department of Transportation, et al., 1991).

2. Provide efficient mass transit links to the new Orioles Park at Camden Yards baseball stadium in downtown Baltimore. This spectacular new stadium is the core of Baltimore's latest burst of downtown revitalization. The CLRL runs directly to the refurbished Camden Station in front of the new stadium, efficiently connecting it to suburban population centers in the central corridor. Indeed, local media have already heralded the stadium-LRT connection as "a centerpiece for Baltimore's new emphasis on mass transit" (Baltimore *Sun* 1992). In any event, light rail was clearly envisioned as an important component of stadium planning in downtown Baltimore.

3. Contribute to revitalization efforts in Baltimore's traditional downtown retail district. Although Baltimore's Inner Harbor rebirth has received national acclaim, the northwest sector of downtown Baltimore --the so-called Howard Street retail area-- has continued the decline that began in the 1960s. Once the central shopping district in the Baltimore region, the Howard Street area has been deserted by major department stores and is now filled with vacant buildings and numerous vendors of low-price merchandise.

The city's revitalization efforts in the area --creating an outdoor commercial mall, building up the Lexington Market-- have not significantly improved the retail market, nor has the location of a Metro station at Lexington Market. However, the CLRL will run down Howard Street as it winds its way to Camden Yards, and retailers hope that the location of five light rail stops along Howard Street, including three in the heart of the traditional shopping district, will help jump-start retail trade in the area.

In summary, Baltimore's light rail system was conceived to serve the region's central corridor, where land development is already substantial, and where significant employment growth is occurring. It is designed to accommodate and channel growth in the northern and southern suburbs, and reinforce the downtown revitalization efforts begun in the 1970s.

It is, however, not a system that appears designed to stimulate development in Baltimore's distressed inner city areas; unlike the heavy rail Metro system, for example, there are no CLRL stops in predominantly black, low-income neighborhoods in Baltimore (with perhaps the exception of the Howard Street area that has establishments catering disproportionately to low-income and minority clientele). Through its links to the heavy rail system (transfer points will occur downtown), the CLRL may improve neighborhood development prospects as well as employment mobility for residents in predominantly black, low-income areas of Baltimore. However, such benefits remain highly speculative, and, unfortunately, there is little evidence that Baltimore has embarked upon the extensive planning that would be necessary to realize such benefits.

St. Louis is another city, similar in size to Milwaukee, that is moving ahead with a light rail system. The St. Louis Metro Link will be an 18 mile, 20 station system, running from Lambert-St. Louis International Airport, through a northwest and central-west corridor, and across the Mississippi River to depressed East St. Louis. The system will be anchored with a cluster of stations in downtown St. Louis. Taking advantage of existing railroad, highway, and other public rights-of-way, Metro Link will make maximum use of existing infrastructure and will require very little real estate acquisition or property dislocation (Campion and Wischmeyer, 1989, 206). The estimated capital costs of Metro Link are $341.7 million (1990 dollars), and the daily ridership is forecast at 37,000 passengers by the year 2000.

Unlike the Baltimore CLRL, explicit economic development and land use

considerations have figured prominently in planning Metro Link. As the final environmental impact study of Metro Link concluded:

> Unlike bus routes, LRT is perceived by the developer/investor as a "bankable" permanent (fixed) investment and a public-sector commitment to long-term CBO viability. The convention/hotel market, entertainment attractions, specialty-retail shopping facilities, and office and residential developments are image-sensitive for both the user and the developer/investor. The latter perceives LRT as a positive factor in promoting St. Louis' "image," which in turn influences the community's investment climate and the success of area development.
>
> LRT's positive perception in the development/banking community and its potential to strengthen St. Louis' national image and investment perception are among its strongest economic development advantages ...
>
> The priority corridor in St. Louis has been the focus of considerable publicly-supported private development aimed at reversing the effects of long-term disinvestment ... Considerable investment in infrastructure has also been made in the corridor. The consideration of a major transit investment in the St. Louis priority corridor is clearly consistent with past public policy. The existence of these policies enhances the ability to derive economic benefit from a transit investment (U.S. 0epartment 0f Transportation et al., 1987,5-4, 5-5).

The St. Louis study then identifies in detail the transit-related factors likely to influence development in LRT station-areas: accessibility of sites for development and redevelopment; concentrations of passenger volumes; parking requirements; and evidence of long-term commitment. Based on these criteria, LRT station-areas were categorized into four classes, reflecting evaluation of their economic development potential:

> 1. Stations Generating No Significant Development Impact (One station);
>
> 2. Stations Enhancing Existing or Planned Development (Ten Stations, including four around the CBD);
>
> 3. Stations Potentially Stimulating Nearby Development (Seven Stations);
>
> 4. Stations Yielding Potential Joint DevelopmentNalue Capture opportunities (Ten stations with immediate potential as a result of strong

market forces, available land for development or redevelopment and existing or planned public-private redevelopment activities).

In this final category, St. Louis' planners envision important public opportunities to reap financial benefits, and potentially offset some of the costs of operating the LRT system, from the transit-related investment returns that may be realized by private investors around LRT stations. Special assessments, joint development partnerships, or leasing/fee arrangements may enable St. Louis to "value capture" some of the transit-stimulated benefits accruing to private investors from:

a. land value value increases;

b. retail sales increases or growth in commercial activity;

c. employee/employer travel cost savings;

The final EIS for Metro Link estimates a potential for $21.9 million in one-time joint development revenues for the public sector from light rail station development, and a potential $1.1 million annual revenue stream from fees, leasing, and public shares in income from transit-area joint development projects.

As a result of this preliminary station-location analysis, the St. Louis final environmental impact statement offered concrete forecasts regarding the investment, tax base, and employment impact around LRT stations in the St. Louis region: $532.1 million ($347.7 million in the city of St. Louis) in estimated capital investment associated with economic development at or near LRT stations (in 1986 dollars); $5.6 million in estimated annual tax revenues in the city of St. Louis and $3.5 in East St. Louis associated with economic development at or near LRT stations; and over 26,000 permanent jobs and 6,700 temporary jobs connected with such station-area development, the vast majority of which would be created in the city of St. Louis.

These forecasts must be regarded as highly speculative as well as incomplete. Although, for example, they attempt to systematically disentangle the LRT effects in station locations from development currently underway or planned that might proceed even without light rail, such distinctions are difficult to make with assurance. Moreover, the projected development impacts and benefits are heaviest in strong market areas such as the central business district; thus, there is some question regarding how strongly these development benefits will accrue to St. Louis' disadvantaged population and distressed neighborhoods. Finally, these estimates seem high, given the daily ridership concentrations generally assumed to be required to promote development around transit stations. St. Louis' projected daily ridership of 37,000 is, for example, far below the "significant development" threshold of 100,000 daily passengers suggested by King Cushman. While the concentration of riders around certain stations (i.e., in the CBD) may be sufficient to induce ridership-generated redevelopment, it is difficult to envision a system with 37,000 daily riders generating the kind of development sketched in the Metro Link EIS. Although situations vary between cities, certainly there is no evidence that Baltimore's heavy rail Metro, with daily ridership now approaching 45,000, has produced the scale of development sketched for St. Louis.

Nevertheless, although the numbers in the St. Louis EIS should not be taken literally, in the broadest sense these projections do give some idea of the substantial

economic development potential associated with light rail in St. Louis.

Like most other cities with fixed rail transit systems, the bulk of development around St. Louis' LRT system is anticipated downtown, where the strongest development market exists and where the most extensive redevelopment activities and plans are completed, underway, or contemplated. Similar to other rail systems UWMCED examined, the St. Louis Metro Link does not appear to have been designed or planned with inner city revitalization as a primary consideration. The inner city is not avoided by LRT: as the system route alignment turns northwest toward the airport, three stations --Delmar, Page, and St. Charles Rock Rd.-- serve primarily low-income and minority populations. Moreover, there are two stations east of the riverfront, one at Fifth and Missouri in downtown East St. Louis, perhaps the most distressed small city in the United States. The existing market forces at all of these stations are characterized as "weak," with either vacant or underutilized land-use the predominant pattern. Presumably, one expectation in St. Louis is that LRT will permit the predominantly minority residents of these high unemployment neighborhoods to gain better transit access to employment downtown, as well as jobs in the northwest corridor approaching the airport. But it remains to be seen how extensively the city of St. Louis, as well as other public development entities with authority along the LRT route, will implement the complementary development policies necessary to stimulate transit-led neighborhood revitalization.

Conclusion: The Transit-Development Connection

What are the apparent lessons of these case studies for Milwaukee as this region considers building a light rail transit system? As we noted at the outset, UWMCED has drawn three basic conclusions:

1. Fixed rail investments can have positive, but modest land use and development impacts;

2. Ridership is a crucial ingredient in promoting transit-stimulated economic development;

3. Additional public intervention is required to maximize the development possibilities offered by fixed rail systems. Development does not automatically follow the construction of a fixed rail system. In areas with strong existing development markets, there are a variety of "value capture" and "joint development" techniques that have been deployed in cities such Atlanta, Washington, D.C., Portland, and San Francisco to leverage private investment and defray the costs of mass transit for the pub,lic: leasing of air rights or concessions in or around stations; benefit assessment fees to capture the increased "value" created for private investors by transit; joint public-private development projects; and "connector fees" for physical links between private developments and transit stations.

In neighborhoods with weak markets, public policy incentives for development are essential if fixed rail investments are to produce any economic development benefits.

In addition to these basic conclusions, several more specific lessons seem to stand out from the experiences of the cities we examined:

4. Coordination and cooperation between transit officials and development/land use agencies is essential if the full development benefits of rail transit are to be realized. The transportation and economic development issues in system-planning cannot be considered in isolation from one another. Concomitantly, all relevant public planning bodies in a region must be involved in system-planning, if rational, region-wide development/land use coordination around transit is to be accomplished. The refusal of suburban counties north of Atlanta to participate in MARTA has limited the full realization of economic benefits from that rail system.

5. Complementary transit policies are necessary to promote LRT ridership and contribute to development around LRT stations and corridors. These include appropriate limitations on parking in downtown areas (i.e. avoiding the "Miami syndrome"), and providing adequate parking facilities and feeder-bus service at outlying stations.

6. Participation by neighborhood groups and private developers in transit station area planning should be an explicit element early in system design. Station locations and route alignments should recognize the potential development contribution of LRT, particularly in areas outside of the central business district and in distressed areas of the inner city.

7. System construction costs can be minimized by the use of abandoned railway rights-of-way and other existing infrastructure. Such decisions have been credited with limiting the construction costs of LRT in Sacramento to the lowest in North America ($9.6 million per system mile). However, as the case of Miami seems to show, a balance needs to be struck between this kind of cost-consciousness, and building rail lines where they can do the most good in terms of economic and neighborhood development. Although the "existing rights-of-way" approach may reduce the land acquisition costs for transit corridors, it may also "preclude significant transit station area development because of a weak market or fragmented land ownership" (Witherspoon, 1982, 346).

8. Not only is development not an automatic outcome from fixed rail investments, but it does not occur overnight either. As virtually every case UWMCED examined reveals, development impacts frequently take 10-20 years or more before they are fully realized; this apparently has been the case even in successful transit/development planning settings such as Toronto.

9. On the whole, LRT will likely exert less of an influence on local economic development and land use than heavy rail

> investments. This is because LRT generally carries a lower volume of ridership, involves less elaborate station-areas, and therefore will not produce the same kinds of "gains in accessibility" that promote redevelopment around heavy rail station areas (Cervero, 1984, 134).

On the whole, the record shows that there is much public planners can do to exploit the development opportunities created by light rail. For the most part, however, the planning and design of rail transit systems in U.S. cities has failed to exploit the land use and neighborhood redevelopment potential offered by such investments. In particular, distressed inner city areas of America's central cities have failed to realize significant gains from new transit systems. As Leon S. Eplan points out, taking full advantage of the development and redevelopment opportunities of transit investments requires broad public vision and creative public policy: "Benefits are not worth the time and money being spent to capture them if all that is to be achieved amounts to a building here, a tunnel there, or a direct connection into retail shops" (Eplan, 1979, 143).

Truly significant community development benefits can be realized from transit investments. But transit offers only the *opportunity* to achieve these benefits; much more in the way of public policy will be necessary. As Robert Witherspoon puts it, transit-led development is "the result of hard work and attention to detail by business and government, rather than some invisible hand guiding land use decisions at transit locations" (Witherspoon, 1982, 345).

If the record of other cities is any indicator, light rail in Milwaukee won't fundamentally restructure land use patterns in the region or produce billions of dollars of development that would not otherwise have occurred. But, when combined with other public investments and public-private partnerships, LRT would appear to offer the possibility of stimulating some development in distressed areas of the city, and rechanneling some future growth in more efficient, higher-density location patterns.

Given these possibilities, UWMCED recommends that an explicit and *participatory* land-use/community development planning process be established as part of the LRT planning effort in Milwaukee. Funding should be provided for detailed development planning along proposed routes and around station areas. The process of designating route alignments and station locations, while fundamentally a transportation, environmental, and fiscal decision, should also explicitly include an economic and community development component; that is, cost-benefit analysis should be done to consider the trade-offs between, for example, dollars saved in using a particular right-of-way as opposed to development that might be created by locating stations in a particular Milwaukee neighborhood. Finally, particularly for the weak market conditions around potential inner city station-areas, sources of additional development financing should be identified and packaged to encourage development and job creation around these sites.

SECTION IV:

LIGHT RAIL AND LOCAL REINDUSTRIALIZATION

As we briefly mentioned in section II of this study, one potential long-term economic impact of light rail in Milwaukee is the stimulus LRT could provide to the creation of a mass transit industry in this region. With complementary public policies, the initial public works expenditures for LRT could be strategically used, for example, to encourage the development of new, potential export sectors of the Milwaukee economy --the manufacture of mass transit vehicles is one possibility-- that would help bolster Milwaukee's industrial base and preserve and create good, family-supporting jobs in the community.

This approach of using the construction of a rail transit system as a tool of local industrial policy has received considerable recent attention in Los Angeles. In January 1992, the Los Angeles County Transportation Commission canceled a $122 million contract to purchase 87 rail transit cars from the Japanese Sumitomo Corporation. As *The New York Times* reported: "Transportation officials voted to build their own $49 million factory to build the cars and keep the jobs in Los Angeles with the hope of making Southern California the national center of a reinvigorated American mass transit industry, producing 600 rail cars and 6,000 buses over the next 30 years" (Reinhold, 1992, A8). A local L.A. transit advocate pointed out that construction of the 300-mile Los Angeles rail mass transit system is "the largest public works project in the United States, involving $150 billion over 30 years. Maybe we can bring some industry to this area" (Reinhold, 1992, A8).

One plan calls for conversion of an automobile plant in the Van Nuys area of Los Angeles that General Motors plans to shut down this summer into a mass transit vehicle manufacturing facility. The envisioned plant would initially produce two rail cars a week and create 200 direct jobs, with the Transportation Commission estimating that a 60 percent local content production requirement for mass transit vehicles would create 740 direct jobs in Los Angeles (and 4,445 in the United States). The plant would be owned by LA County but operated by private companies that would produce rail cars for the LA system, but presumably could also export vehicles to other cities with rail systems.

A "Project California" has begun to mobilize California manufacturing and engineering companies to convert from military and aerospace production to mass transit. Transit officials envision a mobilization of industrial know-how, producing technological advances in transit equipment --in the production of lightweight vehicles or improving vehicle acoustics, for example-- that might establish LA-based manufacturers as major players in the world transit-vehicle market *(Metro Magazine,* 1992, 22). As one report put it: "If successful, the [LA] plant could foreshadow the revival of what was once a thriving American industry in mass transit, long since ceded to the Japanese, Italians, and Canadians" (Reinhold, 1992).

If Los Angeles is effective in using rail system investment as a lever for the creation of a local mass transit production industry, it will be following in the spectacularly successful footsteps of Montreal and the Quebec provincial government. In the early 1970s, as the city of Montreal was expanding its Métro subway system, the Montreal Urban Community Transit Commission invited the local manufacturer of the "Ski-Doo" snowmobile, Bombardier, to bid on production of the vehicles necessary for the Metro expansion. Bombardier's $117 million offer was accepted in 1974, and,

even though the company was still at that time mainly a snowmobile manufacturer, it now had a new market niche: mass transit. "Thanks to this first contract, one analyst has written, lithe company could develop a new sector of activity that employs today thousands at its Montreal offices and La Pocatiere factories" (Dagenais, 1987).

This initial Métro contract, along with subsequent public transit system contracts to produce commuter railcars and buses in the Montreal region and elsewhere in Quebec, provided Bombardier with a publicly-created market to develop expertise and export-potential in its new production activities. The role of public market stimulus was crucial for Bombardier, as it was for U.S. aerospace and computer manufacturers who relied for years on the public market created by defense department contracts, before developing their private market potential. Bombardier's retooling to become a world-class mass transit vehicle manufacturer was also significantly aided by public industrial development assistance, with the infusion of low-cost capital in the form of subsidized loans from the Quebec Pension Fund (the Caisse de dépôt et placement) and a Quebec government business development fund (la Société générale de financement) (Levine, 1990, 156-163; Fraser, 1987, 152-163).

Strategically supported by public markets and publicly-subsidized capital, Bombardier has developed into one of the leading mass transit vehicle manufacturers in the world. It has accrued $4 billion in mass transit sales over the past 17 years, and now has plants building railcars and transit rolling stock not only in Quebec, but in Ontario, Vermont, France, Belgium, Britain, Austria, and Mexico. Some of the Bombardier's most notable transit sales: bi-level subway cars for Chicago's METRA, light rail vehicles for Portland's MAX, subway cars for Mexico City, rail transit vehicles in Boston, the monorail in Disneyworld, and, in the Bombardier's most celebrated coup, an 825 vehicle, $1 billion contract in 1982 to manufacture New York City's subway cars. Bombardier has also branched out into the manufacture of high-speed rail vehicles, and is part of consortia bidding for the development of high-speed lines in Texas, in the Chicago-Detroit corridor, and the Quebec City-Windsor corridor in eastern Canada.

All told, Bombardier now has 25,000 employees worldwide, and is a major source of high-quality, industrial employment in Montreal and Quebec. It is important to underscore, however, that all of this success in global markets started in 1974 with a Montreal Métro contract given to a snowmobile manufacturer --and then supported by substantial government industrial policy assistance. In addition, the engineering and transit-system design expertise gained in construction and operation of the Montreal Métro has spun-off economic development beyond simply the success of Bombardier. Several Montreal-based consulting and engineering firms are now successful competitors in world markets for transit system design and engineering: SNC-Lavalin, for example, recently received a $2.6 billion contract to design the Bangkok subway. In short, the creative use of public works expenditure for the Montreal Metro, combined with supportive government industrial policy and private sector entrepreneurialism, generated the development of a mass transit manufacturing, consulting, and engineering complex in the city, with benefits across the entire province of Quebec.

A final example we have examined of creative economic development policy associated with rail transit occurred in the Pittsburgh in the 1980s. Rather than directly import $53.3 million of light rail vehicles (LRVs) for its reconstructed light rail system, Pittsburgh decided to fill the order for Siemens Duewag LRVs by requiring that the vehicles be assembled in the plant of Blaw-Knox Equipment Inc., a specialty railcar and metal fabricating company located in the Pittsburgh suburb of Blaw-Knox. The vehicles' propulsion system and frames are built in Dusseldorf, disassembled, shipped,

and then reassembled at the Blaw-Knox plant. It is estimated that at least 64 percent of the LRV will be composed of American-made products, and that filling the initial LRV order would mean 70 assembly jobs in Pittsburgh. Pittsburgh planners heralded the arrangement as an excellent partnership, giving Siemens a "foothold in the blossoming light rail market," while having the potential of making Pittsburgh "a national center of the light rail industry" (Fisher, 1983).

All three of these examples --from the phenomenal world-class success of Bombardier, to the more modest local-content arrangements of Pittsburgh and Siemens Duewag, to the ambitious plans of the Los Angeles County Transportation Commission and Project California-- offer important lessons for Milwaukee in planning for maximum economic benefits from an investment in light rail. LRT should not be conceived as merely a transportation expenditure, or a one-time public works boost to the local economy. Rather, an investment in LRT can be strategically deployed to stimulate reindustrialization and the development of a Milwaukee-based mass transit industry that could potentially become an important element in the export base of the local economy. There is currently a 1,000 vehicle market for LRVs in North America, with large growth potential as LRT systems are planned in the U.S., Canada, and Europe, and as vehicles are replaced in existing systems (Schumann, 1989, 17; Bayliss, 1989, 43-61). Moreover, as the case of Bombardier demonstrates, truly successful spin-off industries need not be limited to the original product line; in the same fashion that Bombardier moved from producing subway cars, to buses, commuter railcars, light rail vehicles, and high-speed rail equipment, an entrepreneurial and competitive Milwaukee-based LRV manufacturer could conceivably branch out into other lines of mass transit equipment, creating hundreds or thousands of jobs in the process. Finally, the development of a successful mass transit vehicle industry could also result in the blossoming of related industries in engineering, consulting, and design; like the Montreal case, a light rail industry "complex" could be developed in Milwaukee, with the right mixture of strategic planning, public investment, and private venture capital.

Thus, in our judgment, the permanent employment benefits of LRT can be significantly enhanced by creatively using LRT to stimulate sectors of the local economy and nurture new industries. The Milwaukee region currently lacks a railcar manufacturer; thus, the UWMCED-RSRI input-output model of the impact of expenditures for LRT assumes that all LRVs would be imported, and, as we pointed out in section II, would constitute "leakage" from the regional economy of the capital outlays for light rail. However, as Table 12 indicates, UWMCED estimates considerable employment, output, and wage benefits if a local manufacturer --or consortium of manufacturers-- could be retooled to produce the estimated $52 million in LRVs that will be ordered for the proposed Milwaukee light rail system. Almost 1,000 additional jobs could be created through local production of the LRVs, the majority of them well-paying ($30,000+ annually) manufacturing jobs. For the city of Milwaukee, having suffered a severe erosion in manufacturing employment since 1979, such industrial job creation would indeed be welcome.

In addition, UWMCED estimates that if a local rail vehicle manufacturer could be established and prove capable of generating, say $100 million of production contracts annually, this industry could provide around 1,800 permanent jobs, $55.6 million in income, and $12.7 million in state and local taxes for the Milwaukee regional economy. These estimates, incidentally, are in line with estimates that a recent $99 million contract to Bombardier to produce rolling stock for a Montreal suburban commuter line will generate around 1,600 jobs (Authier, 1992, E1).

In light of these estimates, UWMCED recommends that the City of Milwaukee and the State of Wisconsin seriously consider ways to facilitate the local production of

LRVs for the Milwaukee light rail system, and to explore the feasibility of developing a local mass transit vehicle production industry, initially around LRT. A strategic planning process should be established, as design of the LRT system moves forward, to develop a framework in which potential local producers can be identified, and in which various public-sector economic development programs can be coordinated to support such an industry in Milwaukee.

TABLE 12:

The Potential Significance of Local Production of Light Rail Vehicles on the Economic Impact LRT in the Milwaukee Metropolitan Region

(Employment in jobs, not full-time equivalents)
(Dollar figures in thousands)

	Employment	Output	Wages
1. LRT Construction Impact with imported LRVS	6,041	365,328	178,719
2. LRT Construction Impact with local LRV production	7,000	446,113	207,720
Regional Benefits of Local LRV Production (2) - (1)	959	80,785	29,001

Source: UMCED estimate, calculated from RSRI model

SECTION V:

LIGHT RAIL, MINORITY ECONOMIC DEVELOPMENT, AND MILWAUKEE'S INNER CITY

We touched, in section III of this study, on a crucial issue in evaluating the potential economic impact of rail transit: the degree to which rail investments have contributed to inner city revitalization in other cities. In this section, we pull together some of these points in addressing a primary concern for LRT in Milwaukee: how can such a major public investment be utilized to promote inner city revitalization and minority economic development in this region.

The level of need in Milwaukee's distressed, predominantly African American inner city has been well-documented and need not be rehashed here. Sufficed to say, there is nothing short of an economic crisis in Milwaukee's inner city. Official black unemployment rates for metropolitan Milwaukee have been unacceptably high for several years --14.0 percent in 1988,20.1 in 1989, and 16.6 percent in 1990-- and most observers believe the true unemployment rate --including discouraged workers and others not in the labor market-- is much higher. Given these unemployment numbers, as well as data showing growing numbers of the working poor as well, it is small surprise that the Milwaukee County Department of Health and Human Services estimated that in 1987 over 43 percent of total income in Milwaukee County's African-American community was derived from government transfer payments.

In light of this level of economic need, and combined with the fiscal constraints under which local government in Milwaukee now operates, it is imperative that Milwaukee policymakers look closely at how a major public expenditure such as $41 7 million for an LRT can be targeted to yield economic benefits to the inner city and minority communities.

Unfortunately, as the case studies examined in section III indicate, there is not a great deal of encouraging guidance from the experiences of other cities in strategically using fixed rail investments as part of an inner city redevelopment strategy. In fact, the record of other communities suggests that unless concerns of minority economic development and inner city revitalization are explicitly introduced to the rail transit system planning process, concrete economic benefits for minorities may be limited.

In Atlanta, benefits were provided for minority contractors and professionals with MBE and affirmative action requirements in the construction of the MARTA rapid rail system. However, the exclusion of growing northern counties from the system limited the ability of MARTA to transport black city dwellers to expanding employment centers in the metropolitan area. Moreover, station locations and route alignments viewed as important to minority neighborhood development in Atlanta --such as the Proctor Creek spur-- have been delayed, while neighborhoods continue to deteriorate (in much the same fashion, for example, that San Francisco's BART serviced small, predominantly white suburban communities while avoiding Hunter's Point). Finally, MARTA financing was, in part, from a regressive sales tax that disproportionately burdens low-income black residents.

Similarly, in the other cases UWMCED examined, minority community or inner city concerns were not at the top of the transit planning agenda. Even in Baltimore --where the heavy rail Metro runs through predominantly black, inner city-type neighborhoods in West Baltimore, and where the city received UMTA "urban initiatives" money to stimulate development around stations in these distressed neighborhoods-- there has

been inadequate coordination of other economic development resources with the city's transit investments to enable the Baltimore Metro to function as much of a catalyst for inner city redevelopment.

On the other hand, Baltimore's new light rail system, the CLRL, essentially avoids the city's inner-city neighborhoods. Little explicit planning was done on how the CLRL might improve economic conditions in the inner city, and the CLRL is primarily designed as a downtown-anchored system that is connected to suburban corridors. Such a design represents perfectly rational transportation planning and even land-use logic --the CLRL runs through important regional growth corridors-- but does not particularly serve the interests of Baltimore's inner-city. There has been some vague thought --although, again, without much explicit planning or analysis-- that when fully developed to Hunt Valley and Baltimore-Washington International Airport, the CLRL can expand economic opportunities for low-income city residents by permitting "reverse commuting" from the city to expanding employment centers. But this possibility has merely been mentioned as a potential CLRL "economic benefit;" no explicitly transit-linked zoning, development, or training programs have been put into place to achieve these employment goals.

The St. Louis Metro Link light rail system, although clearly envisioned as a regional system anchored in downtown St. Louis, also will have three stops in predominantly black, lOW-Income neighborhoods in St. Louis (one in the city and two in St. Louis County), and a terminus in downtown East St. Louis, a predominantly African-American and deeply impoverished small city just over the Mississippi River. Yet, at this point, there are no systematic or coherent plans to coordinate the vast additional resources that would be necessary to promote development around stations in these neighborhoods. Station-area market studies have been conducted, but no task forces or extensive planning processes have been organized to move the transit-related development process along in these poorer neighborhoods. Given the disastrous social and economic conditions in, for example, East St. Louis, it will take substantially more than building an LRT station at Fifth and Missouri to stimulate economic development, and there are no signs that LRT will be accompanied by the additional massive public-private investments that would be necessary. In fact, jn the minds of some St. Louis transit planners, the East St. Louis stops may be considered as politically necessary to realize their major goal: extension of the LRT as a truly regional system into the other communities in southern Illinois. Such underlying logic hardly bespeaks a major commitment to using LRT to promote economic development in poorer areas.

Although it is not explicitly mentioned in the Metro Link EIS, reverse commuting may also be a potential benefit of LRT in St. Louis, perhaps providing greater access for inner-city residents to jobs in the corridors leading out to the airport. Again, however, no elaborate planning has been put into place to achieve this goal.

In summary, the record in urban America on using rail transit investments to revitalize inner-city neighborhoods or promote minority economic development is not a strong one. However, UWMCED believes that, with inner-city and minority concerns elevated to a primary position in transit planning, that building a light rail system in Milwaukee could yield significant economic benefits for inner-city neighborhoods and minority communities. In particular, five specific approaches could be pursued:

1. Explicit minority hiring and contracting requirements in the construction and operation of LRT in Milwaukee:

Based on UWMCED's input-output estimates of the employment impact of constructing LRT in Milwaukee, a 30 percent minority hiring requirement could yield 1,800 jobs and $56.3 million in wages for Milwaukee minorities during the 4-5 year construction phase of the project. Similar requirements for operating and maintaining the system --and current plans are to locate the LRT maintenance facilities in Milwaukee's inner-city-- could generate 202 jobs and $3.4 million in wages for minorities.

2. Implementation of reindustrialization strategies oriented around mass transit manufacturing in Milwaukee:

Success in using LRT expenditures as a strategic lever to develop a mass transit industry in Milwaukee will provide important economic benefits for minorities. For African-American workers who have been displaced as local manufacturers such as *A.D.* Smith have downsized since the early 1980s, development of a new manufacturing sector in Milwaukee would offer major economic opportunity.

3. Creation of public-private partnerships for development around inner-city LRT station-areas, and

4. Targeted public investment to enhance the market for investment around inner-city stations:

In the fragile and neglected economy of Milwaukee's inner-city, the "Field of Dreams" approach to transit/development planning is completely inappropriate. A major inner-city redevelopment initiative would need to accompany and be coordinated with LRT planning, to stimulate development in areas currently experiencing disinvestment and commercial abandonment, and with weak private development markets.

5. Routing of light rail lines to improve access of inner-city residents to industrial parks and suburban employment locations.

One way light rail could contribute to minority economic development would be by alleviating the well-discussed spatial mismatch in this region: substantial employment growth in suburban areas and outlying areas of the city combined with high unemployment and limited access to job growth areas for minorities in Milwaukee's inner-city. The logic of "reverse commuting" could alleviate this mismatch and provide job access to inner-city residents.

However, complementary transportation, zoning, and land-use policies will be required as well. Suburban job locations are dispersed; thus, one LRT line will not effectively link the inner-city to outlying pockets of employment. Without adequate feeder bus service or other transit links, LRT will not measurably improve access to

suburban jobs. Moreover, in the future, unless regional planning effectively concentrates employment growth, preferably around LRT routes --through zoning or land-use policies-- the potential efficacy of LRT in efficiently linking city residents and suburban jobs will be vitiated. In other words, like the matter of promoting redevelopment around stations, there is nothing automatic about transit-employment impacts: additional planning and policies will be necessary to achieve this economic benefit of LRT.

Conclusion

The burden of alleviating all of Milwaukee's social and economic problems should not be placed on light rail. LRT is, at root, a transportation system that, we believe, can have significant economic benefits in this region. But LRT is not the "magic bullet" that will enable us to revitalize the inner-city or end poverty and unemployment in Milwaukee.

However, if properly planned and coordinated with a wide range of other economic development policies, LRT can make a significant contribution toward improving economic opportunity for Milwaukee's minority communities. Such considerations need to be placed near the top of the LRT planning process, not viewed as merely a politically expedient after-thought. UWMCED recommends that an Inner City Light Rail Task Force be established, to systematically review the options presented above --as well as others that may be proposed-- as ways of integrating inner-city redevelopment and minority economic development issues with LRT planning.

No city has effectively placed inner city concerns at the top of the planning agenda in building fixed rail systems, and as a result there have been limited economic benefits for inner city resiqents. Milwaukee has an opportunity, with this major public investment, to establish new and productive links between mass transit and minority economic development.

NOTES

1 For further information on the use of input-output models, and on how to interpret conclusions drawn from them, see Coughlin and Mandelbaum (1 991).

2 These employment estimates are in actual jobs, not full-time equivalent employment. The RSRI model does not break employment down into full-time or part-time positions.

3 For the estimate of $19.4 million in annual operations and maintenance expenditures for the Milwaukee LRT, UWMCED estimates the following impacts:

Employment: 791 jobs
Output: $26.6 million
Wages: $13.1 million
State and Local Taxes: $3.02 million

4 We have deliberately excluded from our comparative analysis the older, pre-1960 fixed rail systems such as New York, Chicago, Philadelphia, or Boston, whose systems were built during a much different period in urban development. When initially built, all of these systems had a major impact on land-use: "streetcar" suburbs are a basic part of U.S. urban history that bespeak the land-use and urban development influence of early rail systems. But, clearly, it would be misleading to analyze the experience of these systems as potential indicators of what the impact might be of 1990s fixed rail systems.

It is worth noting, however, that even in these older, more established fixed rail settings; employment decentralization and suburban sprawl have occurred at the same pace as cities without rail systems. In fact, as Table 10 reveals, Milwaukee, a city without fixed rail, has done much better than most U.S. cities in retaining metropolitan area population in the central city.

REFERENCES

Altshuler, Alan A., with Womack, James P., and Pucher, John R. (1979), The Urban Transportation System: Politics and Policy Innovation (Cambridge, Massachusetts: M.I.T. Press).

Arrington, G.B. (1989), "Light Rail and Land Use: A Portland Success Story," (Portland: Tri-Met Public Services).

Aschauer, David A., (1991), Public Investment and Private Sector Growth: The Economic Benefits of Reducing America's "Third Deficit," (Washington, D.C.: Economic Policy Institute)

Authier, Philip (1992), "Point St. Charles plant loses rail contract," The Montreal Gazette, 11 February: E1

Baldwin, Greg (1987), "Portland and its Unique Traditions," in Wayne Attoe, ed., Transit. Land Use, and Urban Form (Austin: Center for the Study of American Architecture): 73-80.

Baltimore Sun, (1992), "Stadium Splendor," 29 March.

Bayliss, David (1989), "What's New in European And Other International Light Rail Projects?," in Transportation Research Board, National Research Council, Light Rail Transit: New System Successes at Affordable Prices (Washington, D.C.: Transportation Research Board, National Research Council): 43-61).

Bower, R.J. (1979), "The Influence of the Subway System on the Growth of Metropolitan Toronto," in United States House of Representatives, Subcommittee on the City of the Committee on Banking, Finance, and Urban Affairs, New Urban Rail Transit: How Can Its Development and Growth Shaping Potential Be Realized? (Washington, D.C.: Government Printing Office): 17-28.

BRW, Inc. et al., (1991) Southeastern Wisconsin Transit Corridor Study.

Bureau of Planning, City of Portland, Oregon, (1983), Banfield Light Rail Transit Station Area Planning Program As Recommended by the Portland City Planning Commission (Portland: Bureau of Planning, City of Portland) 1983).

Campion, Douglas R., and Wischmeyer, Oliver W., Jr. (1989), "Infrastructure Rehabilitation and Technology Sharing in Bringing LRT to St. Louis," in Transportation Research Board, National Research Council, Light Rail Transit: New System Successes at Affordable Prices (Washington, D.C.: Transportation Research Board, National Research Council): 201-221.

Catanese, Anthony James (1987), "Transit, Urban Life, and Development in the Sunbelt," in Wayne Attoe ed., Transit, Land Use, and Urban Form (Austin: Center for the Study of American Architecture): 189-196.

Cervero, Robert, (1984), "Light Rail and Urban Development," American Planning Association Journal (Spring 1984): 133-147.

City of Portland, Office of Transportation, (1989), Downtown Portland Light Rail

Alignment Study: Background Report for the Downtown Rail Alignment Committee (Portland: City of Portland, Office of Transportation).

Coughlin, Cletus C., and Mandelbaum, Thomas (1991), "A Consumer's Guide to Regional Economic Multipliers," Review of Federal Reserve Bank of St. Louis (January/February): 19-32.

Cushman, King, (1987) "Exploring the Land Development and Transit Connection," in Wayne Attoe, ed. Transit, Land Use, and Urban Form, (Austin: Center for the Study of American Architecture): 9-36.

Dagenais, Angele, (1987), "Le Metro de Montreal a 20 ans," Le Devoir 22 aoOt: 1.

Desmond, Michael, (1986) "Trying to Make Buffalo's Ends Meet," Mass Transit, (October) : 28.

Dueker, Kenneth J., Pendleton, Pete, and Luder, Peter (1982), The Portland Mall Impact Study: Final Report (Washington, D.C. : Urban Mass Transit Administration).

Dyer, John A., Spillman, John T., and Lambert, Michael (1979), "The Metro-Dade Station Area Design and Development Program," United States House of Representatives, Subcommittee on the City of the Committee on Banking, Finance, and Urban Affairs, New Urban Rail Transit: How Can Its Development and Growth Shaping Potential Be Realized? (Washington, D.C.: Government Printing Office): 145-156.

Eplan, Leon S. (1979), "Transit and Development in Atlanta," in United States House of Representatives, Subcommittee on the City of the Committee on Banking, Finance, and Urban Affairs, New Urban Rail Transit: How Can Its Development and Growth Shaping Potential Be Realized? (Washington, D.C.: Government Printing Office): 129-144.

Fisher, Ken (1983), "Rejuvenated LRT Part of Pittsburgh Renaissance," Mass Transit, 10:7 (July): 6.

Fraser, Matthew, (1987), Quebec Inc.: French-Canadian Entrepreneurs and the New Business Elite (Toronto: Key Porter Books).

Goldman, Mark (1990), City on the Lake: The Challenge of Change in Buffalo, New York (Buffalo: Prometheus Books).

Gunts, Edward (1983), "The Stations: An Economic Bonanza," Mass Transit (September): 41.

Hartman, Chester (1984), The Transformation of San Francisco (Totowa, New Jersey: Rowman and Allanheld).

Henry, Lyndon, (1989), "Ridership Forecasting Considerations in Comparisons of Light Rail and Motor Bus Modes," in Transportation Research Board, National Research Council, Light Rail Transit: New System Successes at Affordable Prices (Washington, D.C.: Transportation Research Board, National Research Council): 163-189.

Hill, Frederic B. (1983), Baltimore Welcomes New Metro as Vital to Continuing,

Mass Transit (September 1983): 31.

Hill, Fred (1985), "Baltimore Metro: A Blessing in Disguise," Mass Transit (April): 45.

Knight, Robert L. (1982, "The Impact of Rail Transit on Land Use: Evidence and a Change of Perspective," in Herbert S. Levinson and Robert A. Weant, eds., Urban Transportation: Perspectives and Prospects, (Westport, Connecticut: ENO Foundation for Transportation, Inc.): 109-116.

Levine, Marc V. (1990), The Reconquest of Montreal: Language Policy and Social Change in a Bilingual City (Philadelphia: Temple University Press).

Lewis, David B. (1992) Primer on Transportation, Productivity, and Economic Development, (Washington, D.C.: Transportation Research Board, National Research Council).

Matoft, Thomas G., (1989) Sacramento's Light Rail System: A Low Cost Application in a Low Density City, (mimeo).

Metro Magazine, (1992), "Local Jobs Become a Priority for L.A. Transportation Commission," (March/April) : 18-22).

Middleton, William D., (1990), "LRT helps reshape a city," Railway Age, (February): LR2.

Munnell, Alicia H., (1990) "Why Has Productivity Growth Declined? Productivity and Public Investment," New England Economic Review, (January/February): 3-22.

Orfield, Gary, and Ashkinaze, Carole (1991), The Closing Door: Conservative Policy and Black Opportunity (Chicago: University of Chicago Press).

Parkinson, Tom, (1989) "Advocacy for Conventional Light Rail," in Transportation Research Board, National Research Council, Light Rail Transit: New System Successes at Affordable Prices Special Report 221 (Washington: National Research Council): 66-78.

Perry, David (1991), "Recasting Urban Leadership in Buffalo," in Dennis R. Judd and Michael Parkinson, eds., Leadership and Urban Regeneration: Cities in North America and Europe (Newbury Park, California: Sage Publications): 258-277.

Pickrell, Don H., (1992) "A Desire Named Streetcar," Journal of the American Planning Association" 58:2, (Spring): 158-176.

Pill, Juri (1987), "Toronto: Thirty Years of Transit Development," in Wayne Attoe ed. Transit, Land Use, and Urban Form (Austin: Center for the Study of American Architecture): 57-62.

Post, John R. (1987), "The Portland Light Rail Experience," in Wayne Attoe, ed., Transit, Land Use, and Urban Form (Austin: Center for the Study of American Architecture): 63-72.

Potter, Paul E. (1982), "Urban Restructuring: One Goal of the New Atlanta Transit System," in Herbert S. Levinson and Robert A. Weant, eds., Urban Transportation: Perspectives and Prospects, (Westport, Connecticut: ENO Foundation for Transportation, Inc.): 352-357.

Pushkarev, Boris S. and Zupan, Jeffrey M., (1982) "Where Transit Works: Urban Densities for Public Transportation," in Herbert S. Levinson and Robert A. Weant, eds., Urban Transportation: Perspectives and Prospects, (Westport, Connecticut: ENO Foundation for Transportation, Inc.): 341-344.

Regional Planning Council, (1987) Section A Baltimore Metro Impact Study: Before and After Comparison, Staff Paper 54, (September).

Reinhold, Robert, (1992), "Los Angeles Cancels Huge Contract With a Japanese Maker of Rail Cars," New York Times, 23 January: A8).

Ryan, Dede (1989) "Marta Speeds Atlanta's Growth," Mass Transit (September): 18 .

Schumann, John W., (1989) "What's New in North American Light Rail Transit Projects," in Transportation Research Board, National Research Council, Special Report 221, Light Rail Transit: New System Successes at Affordable Prices (Washington, D.C.: Transportation Research Board, National Research Council): 8-42.

Skinner, Robert E., Jr. and Dean, Thomas B. (1982), "Second Generation U.S. Rail Systems: Prospects and Perils," in Herbert S. Levinson and Robert A. Weant, eds., Urban Transportation: Perspectives and Prospects, (Westport, Connecticut: ENO Foundation for Transportation, Inc.): 269-274.

Smothers, Ronald, (1992), "Carter's Civic Crusade Tries to Meld Two Atlanta's," The New York Times, **11** April.

Social Development Commission, (1991), Expected to Work But no Jobs: Job Availability in Milwaukee (Milwaukee: SDC).

State of Maryland, Mass Transit Administration, (1991), "The Central Light Rail Line," (mimeo).

Stokes, B.R. (1979), "Rail Transit Investment and Its Implications for our Cities," in United States House of Representatives, Subcommittee on the City of the Committee on Banking, Finance, and Urban Affairs, New Urban Rail Transit: How Can Its Development and Growth Shaping Potential Be Realized? (Washington, D.C.: Government Printing Office): 205-216.

Stone, Clarence N. (1989), Regime Politics: Governing Atlanta (1946-1988 (Lawrence, Kansas: University Press of Kansas).

Strathman, James G., (1983) "Effects of Banfield Transitway Expenditures on the Portland Metropolitan Economy," Report prepared for the Tri-County Metropolitan Transportation District, Portland, Oregon (September).

Teaford, Jon C. (1990), The Rough Road to Renaissance: Urban Revitalization in America (1940-1985 (Baltimore: The Johns Hopkins University Press).

Tefft, Sheila, (1979) "MARTA: An Economic Booster?" Mass Transit (July): 44-46.

Tri-County Metropolitan District of Oregon, (1990) "Portland's Metropolitan Area Express: Forecast Versus Actual Ridership and Costs," (Public Services Division, June), mimeo.

Tri-County Metropolitan Transportation District of Oregon, (1990a) Fact Sheet (June).

U.S. Department of Transportation, (1990) Urban Rail Transit Projects: Forecast Versus Actual Ridership and Cost (Washington, D.C.: DOT).

U.S. Department of Transportation, et al., (1987) St. Louis Metro Link Project: Final Environmental Impact Statement (September).

U.S. Department of Transportation, et al., (1990), Hunt Valley Extension, Baltimore Central Light Rail Line: Alternatives Analysis/Draft Environmental Impact Statement (September).

U.S. Department of Transportation, et al., (1991), Baltimore Washington International Airport Extension: Baltimore Central Light Rail Line. Alternatives Analysis/Draft Environmental Impact Statement (May).

West, a.E. (1986) Impact on Local Income and Employment Resulting from Sacramento Transit Expenditures.

Whitt, J. Allen (1982), Urban Elites and Mass Transportation: The Dialectics of Power (Princeton, New Jersey: Princeton University Press).

Witherspoon, Robert, (1982), "Transit and Urban Economic Development," in Herbert S. Levinson and Robert A. Weant, eds., Urban Transportation: Perspectives and Prospects, (Westport, Connecticut: END Foundation for Transportation, Inc.): 344-352.

Young, David (1986), "Toronto: Taking the Lead Again," Mass Transit (November): 6.

APPENDICES

LRT ECONOMIC IMPACT ESTIMATE: SYSTEM

(EMPLOYMENT IN JOBS, NOT FULL-TIME EQUIVALENTS)
(DOLLAR FIGURES IN THOUSANDS)

	EMPLOYMENT	OUTPUT	WAGES	VALUE ADDED
AGRICULTURE	.1	44.1	9.5	13.7
AGRI. SERV., FORESTRY, & FISH	6.4	263.7	89.1	111.2
MI.NING	17.1	1567.6	529.0	1034.0
CONSTRUCTION	3086.2	190461.2	113550.1	190461.2
MANUFACTURING	578.2	56014.0	17515.1	23741.1
TRANSPORT. & PUBLIC UTILITIES	211.1	19207.7	6553.7	11209.8
WHOLESALE	218.9	20153.7	6749.3	12108.0
RETAIL TRADE	768.5	20267.2	8985.8	12294.9
FINANCE, INS., & REAL ESTATE	261.8	16299.9	5441.2	9539.2
SERVICES	821.3	38728.7	18201.5	23107.8
GOVERNMENT	70.8	2320.5	1094.9	1120.4
ADMIN. AUXILIARY	•0	•0	•0	•0
DIRECT EFFECTS	3886.2	259452.4	138536.6	224927.3
INDIRECT AND INDUCED EFFECTS	2154.3	105876.0	40182.6	59813.9
TOTAL EFFECTS	6040.5	365328.3	178719.2	284741.2
MULTIPLIERS	1.554	1.408	1.290	1.266

WAGES-NET OF TAXES= 142794.7

ST TAXES-VISITORS - •0
INDIRECT ST TAXES 27382.5
TOTAL STATE TAXES 27382.5

LOC TAXES-VISITORS= .0
INDIRECT LOC TAXES= 16258.6
TOTAL LOCAL TAXES = 16258.6

GEN. FEDERAL TAXES= 32745.2
SOC SECURITY TAXES= 23263.4
TOT. FEDERAL TAXES= 56008.6

OTHER VALUE ADDED 42296.8
TOTAL VALUE ADDED 284741.2

DIRECT EXPENDITURES WITHIN REGION 259452.4
DIRECT EXPENDITURES IN OTHER REGIONS 157675.4
TOTAL INITIAL EXPENDITURE 417127.8

EFFECTS PER MILLION DOLLARS OF INITIAL EXPENDITURE
EMPLOYMENT = 14.5 (JOBS)
INCOME $ 428451.9
STATE TAXES $ 65645.3
LOCAL TAXES $ 38977.5
VALUE ADDED $ 682623.4

LRT ECONOMIC IMPACT ESTIMATE: SYSTEM

(EMPLOYMENT IN JOBS, NOT FULL-TIME EQUIVALENTS)
(DOLLAR FIGURES IN THOUSANDS)

	EMPLOYMENT	OUTPUT	WAGES	VALUE ADDED
AGRICULTURE	.1	44.1	9.5	13.7
DAIRY PROD., POULTRY, & EGGS	.0	34.8	6.5	8.8
MEAT ANIMALS & MISC. LIVESTOCK	.0	.2	.0	.0
COTTON	.0	.0	.0	.0
GRAINS, & MISC. CROPS	.0	8.5	2.7	4.4
TOBACCO	.0	.6	.3	.5
FRUITS, NUTS, & VEGETABLES	.0	.0	.0	.0
FOREST PROD.	.0	.0	.0	.0
GREENHOUSE & NURSERY PROD.	.0	.0	.0	.0
AGRI. SERV., FORESTRY, & FISH	6.4	263.7	89.1	111.2
AGRI. SERVICES (07)	5.5	251.6	87.0	106.3
FORESTRY (08)	.8	10.3	1.2	3.9
FISHING,HUNTING,&TRAPPING (09)	.1	1.8	.9	1.0
MINING	17.1	1567.6	529.0	1034.0
METAL MINING (10)	.0	.0	.0	.0
ANTHRACITE MINING (11)	.0	.0	.0	.0
BITUM. COAL & LIGNITE (12)	.0	.0	.0	.0
OIL & GAS EXTRACTION (13)	.0	.0	.0	.0
NONMETAL MIN.-EX. FUELS (14)	17.1	1567.6	529.0	1034.0
CONSTRUCTION	3086.2	190461.2	113550.1	190461.2
GENERAL BLDG. CONTRACTORS (15)	399.2	21408.5	12376.9	21408.5
HEAVY CONST. CONTRACTORS (16)	680.2	63177.5	39302.0	63177.5
SPECIAL TRADE CONTRACTORS (17)	2006.8	105875.2	61871.2	105875.2
MANUFACTURING	578.2	56014.0	17515.1	23741.1
FOOD & KINDRED PROD. (20)	34.2	5982.4	909.2	1498.9
TOBACCO MANUFACTURES (21)	.0	.3	.1	.1
TEXTILE MILL PROD. (22)	3.4	180.7	57.6	81.9
APPAREL & OTHER PROD. (23)	5.5	322.1	103.2	127.0
LUMBER & WOOD PROD. (24)	5.9	430.1	137.6	145.5
FURNITURE & FIXTURES (25)	1.2	85.1	28.4	35.4
PAPER & ALLIED PROD. (26)	6.9	794.8	217.9	294.5
PRINTING & PUBLISHING (27)	35.4	2341.8	857.9	1062.3
CHEMICALS & ALLIED PROD. (28)	7.2	1419.4	278.3	468.8
PETROLEUM & COAL PROD. (29)	1.6	370.5	78.9	85.8
RUBBER & MISC. PLASTICS (30)	4.0	367.6	106.8	139.0
LEATHER & LEATHER PROD. (31)	.8	65.5	23.0	28.1
STONE, CLAY, & GLASS (32)	96.7	9203.3	3138'-8	3726.6
PRIMARY METAL PROD. (33)	9.4	1185.3	314.2	374.2
FABRICATED METAL PROD. (34)	215.6	19686.5	6429.8	9464.9
MACHINERY, EXCEPT ELEC. (35)	23.6	2388.8	840.6	1171.7
ELECTRIC & ELEC. EQUIP. (36)	95.9	7951.2	2947.3	3378.3
TRANSPORTATION EQUIPMENT (37)	23.0	2686.1	841.8	1369.2
INSTRUMENTS & REL. PROD. (38)	3.3	268.8	101.0	141.4
MISC. MANUFACTURING IND'S (39)	4.4	283.6	102.7	147.5
TRANSPORT. & PUBLIC UTILITIES	211.1	19207.7	6553.7	11209.8
RAILROAD TRANSPORTATION (40)	.0	.0	.0	.0
LOCAL PASS. TRANSIT (41)	28.6	835.9	454.8	552.8
TRUCKING & WAREHOUSING (42)	126.4	8715.4	3915.5	5655.9
WATER TRANSPORTATION (44)	.6	51.4	11.3	18.7
TRANSPORTATION BY AIR (45)	2.8	218.1	90.7	120.9
PIPE LINES-EX. NAT. GAS (46)	.0	.0	.0	.0
TRANSPORTATION SERVICES (47)	4.9	205.6	99.2	132.2

COMMUNICATION (48)	27.4	2659.7	1121.0	1893.0
ELEC.,GAS,&SANITARY SERVo (49)	20.4	6521.5	861.3	2836.4
WHOLESALE	218.9	20153.7	6749.3	12108.0
WHLSALE- DURABLE- GOODS (50)	158.1	16475.0	5100.9	9897.9
WHLSALE-NONDURABLE GOODS (51)	60.8	3678.7	1648.5	2210.1
RETAIL TRADE	768.5	20267.2	8985.8	12294.9
BLDG. MAT. - GARDEN SUPPLY (52)	29.9	1062.2	490.6	682.5
GENERAL MERCH. STORES (53)	92.6	3122.5	1132.2	2006.4
FOOD STORES (54)	94.8	2399.2	1119.5	1541.7
AUTO. DEALERS-SERV. STAT. (55)	65.0	2704.1	1361.8	1737.6
APPAREL & ACCESS. STORES (56)	38.1	1083.2	395.5	696.0
FURNITURE & HOME FURNISH. (57)	19.0	785.4	340.1	504.7
EATING & DRINKING PLACES (58)	229.4	5223.9	1903.2	2628.5
MISCELLANEOUS RETAIL (59)	199.7	3886.7	2242.8	2497.5
FINANCE, INS., & REAL ESTATE	261.8	16299.9	5441.2	9539.2
BANKING (60)	81.2	4564.8	2073.6	2650.2
CREDIT AGENCIES EX. BANKS (61)	.0	.0	.0	.0
SECURITY, COMM. BROKERS (62)	9.4	791.2	476.9	387.4
INSURANCE, CARRIERS (63)	45.6	4827.3	1384.2	2047.7
INS. AGENTS, BROKERS (64)	31.7	1490.2	868.2	1099.1
REAL ESTATE (65)	78.2	3951.5	401.0	3113.8
COMB. REAL ESTATE, INS. (66)	1.6	78.8	8.0	62.1
HOLDING-OTH. INV.. OFF'S (67)	14.3	596.0	229.3	178.8
SERVICES	821.3	38728.7	18201.5	23107.8
HOTELS & OTHER LODGING (70)	18.6	431.3	160.4	231.9
PERSONAL SERVICES (72)	85.9	1921.4	949.0	1358.5
BUSINESS SERVICES (73)	145.6	5822.4	2979.4	3842.5
AUTO REPAIR,SERV.,GARAGES (75)	52.0	3381.1	1143.3	1747.4
MISC. REPAIR SERVICES (76)	43.2	1392.1	754.6	910.1
MOTION PICTURES (78)	1.6	43.8	14.3	19.7
AMUSEMENT & RECREATION (79)	23.7	767.2	255.4	311.8
HEALTH SERVICES (80)	67.0	3429.8	1751.4	2357.7
LEGAL SERVICES (81)	11.1	904.7	542.6	667.4
EDUCATIONAL SERVICES (82)	31.1	1012.7	501.1	509.8
SOCIAL SERVICES (83)	34.1	763.0	393.7	468.6
MUSEUMS,BOTAN-ZOO.GARDENS (84)	.6	29.3	13.0	13.5
MEMBERSHIP ORGANIZATIONS (86)	48.9	1692.7	687.3	894.7
MISCELLANEOUS SERVICES (89)	258.0	17137.1	8056.-1	9774.1
GOVERNMENT	70.8	2320.5	1094.9	1120.4
ADMIN. AUXILIARY	.0	.0	.0	.0
TOTAL	6040.5	365328.3	178719.2	284741.2
MULTIPLIERS	1.554	1.408	1.290	1.266

WAGES - NET OF TAXES=	142794.7
TOTAL STATE TAXES	27382.5
TOTAL LOCAL TAXES	16258.6
OTHER VALUE ADDED =	42296.8
TOTAL VALUE ADDED	284741.2

TOTAL INITIAL EXPENDITURE 417127.8

EFFECTS PER MILLION DOLLARS OF INITIAL EXPENDITURE

EMPLOYMENT		14.5(JOBS)
INCOME	$	428451.9
STATE TAXES	$	65645.3
LOCAL TAXES =	$	38977.5
VALUE ADDED	$	682623.4

EMPLOYMENT BY OCCUPATION TABLE

ENGINEERS	87.4
AERONAUT. ENGINEERS	1.3
CHEMICAL ENGINEERS	1.9
CIVIL ENGINEERS	37.2
ELEC. ENGINEERS	15.6
IND. ENGINEERS	8.1
MECH-. ENGINEERS	11.2
METAL & MTRLS ENGNRS	.7
MINING-PETRO ENGNRS	.7
SALES & NEC ENGNRS	10.8
COMPUTER SPECIALISTS	18.9
COMPUTER PROGRAMMERS	10.8
COMPUTER ANALYSTS	6.7
CMPTR SPCLSTS & NEC	1.5
HEALTH PROFESSIONALS	29.9
HEALTH TECHNOLOGISTS	5.5
NURSES, THERPSTS, ...	12.7
PHYS. ,DENT., ...	11.7
ENG. & SCI. TECHS	71.1
AGRI BIO TECHNICIANS	1.6
CHEMICAL TECHNICIANS	2.7
DRAFTSMEN	29.1
ELECTRCL TECHNICIANS	8.3
INDUST ENGNR TECHNCS	.8
MECH. ENG. TECH.	.4
MATH TECHNICIANS	.0
NEC TECHNICIANS	28.2
TEACHERS, EX. COLLEG	16.3
PRE K, K-6 TEACHERS	7.1
7-12 TEACHERS	9.2
WRITERS, & ARTISTS	66.1
EDITORS + REPORTERS	5.9
PUBLIC RELATIONS	5.4
NEC WRITERS & ARTSTS	54.7
RELIG,SOC,TEACH PROF	40.0

RELIGIOUS WORDERS	13.3
SOCIAL SCIENTISTS	8.4
SOC & REC WORKERS	15.8
POST-SEC TEACHERS	2.4

EMPLOYMENT BY OCCUPATION TABLE (CONT.)

PROF., TECH. NEC	179.0
ACCOUNTANTS	69.7
AIRLINE TECHNICIANS	1.9
ARCHITECTS	9.6
FARM AND ENVIRONMENT	1.2
LAWYERS AND JUDGES	51.0
LIBRARIANS	1.9
BIO & PHYS SCIENTSTS	9.6
MATH SPECIALISTS	2.0
SYSTEMS ANALYSTS	4.3
LABOR RELATION WRKRS	17.4
NEC RSRCH WRKRS	4.2
NEC TECHNCS & ENGNRS	4.9
VOCATNL & ED CNSLRS	1.3
MANAGERS & ADMINIST.	747.4
FINANCIAL MANAGERS	28.3
FARM PRODUCTS MANGRS	1.1
WHOLSL & RETL BUYERS	8.1
HEALTH ADMINISTRATRS	1.8
INSPECTORS	1.6
NEC PUBLC ADMNSTRTRS	6.8
RAILROAD CONDUCTORS	.0
RESTAURANT MANAGERS	30.0
SALES MANAGERS	31.1
COLLEGE ADMNSTRTRS	.2
1-12 SCHOOL ADMINS	1.1
NEC ADMINISTRATORS	637.1
SALES WORKERS	286.1
SALES & ADVERT AGNTS	3.9
INSURANCE AGENTS	27.5
REAL ESTATE AGENTS	34.7
STOCK & BOND BROKRS	3.4
NEC SALES WORKERS	216.7
CLERICAL WORKERS	783.8

INSURANCE ADJUSTERS	8.0
INFO PROCESS WRKRS	36.9
SECRETARIES	194.4
NEC CLERICL & KINDRD	544.5
CONST. CRAFTSMEN	1425.2
ELECTRIC LINEMEN	11.7
ELECTRICIANS	154.4
TELEPHONE INSTALLERS	12.6
NEC CONSTRUCTION	1246.5
CRAFTSMEN, EX. CONST	548.8
FORGE- & HAMMER-MEN	1.2
FURNITURE FINISHERS	.8
LOCOMOTIVE ENGINEERS	.1
MACHINISTS	17.3
REPAIR & MECHANICS	218.6
PRINTING TRADES	10.3
SHEET METAL WORKERS	38.1
TOOL AND DIE MAKERS	6.2
: NEC CRAFTSMEN	256.2

EMPLOYMENT BY OCCUPATION TABLE (CONT.)

OPERATIVES, EX. TRAN	482.3
MACHINE OPERATIVES	13.0
TEXTILE OPERATIVES	1.5
NEC OPERATIVES	467.8
TRANSP. EQUIP. OPERe	272.7
MASS TRANSIT WORKERS	17.1
RAILROAD BRAKEMEN	.4
TRUCK DRIVERS	197.1
NEC TRANSIT OPER'S	58.1
LABORERS	578.3
CONSTRUCT LABORERS	436.5
OTHER LABORERS	141.8
PERS. SERVo WORKERS	407.1
CLEANING WORKERS	83.4
FOOD SERVICE WORKERS	182.2
HEALTH ASSTS	20.3
PERSONAL SERVICE	88.8
PROTCTV SRVC	32.4
GOVERN.,UNALLOCABLE	32.4

LRT ECONOMIC IMPACT ESTIMATE: OPERATIONS PHASE ($15.3 m)

(EMPLOYMENT IN JOBS, NOT FULL-TIME EQUIVALENTS)
(DOLLAR FIGURES IN THOUSANDS)

	EMPLOYMENT	OUTPUT	WAGES	VALUE ADDED
AGRICULTURE	.0	2.5	.5	.8
AGRI. SERV., FORESTRY, & FISH	.3	11.0	3.6	4.5
MINING	.0	1.1	.4	.7
CONSTRUCTION	4.0	216.9	126.0	216.9
MANUFACTURING	10.0	1161.4	309.1	455.3
TRANSPORT. & PUBLIC UTILITIES	508.0	15338.0	8160.0	10061.7
WHOLESALE	8.7	698.0	257.2	419.3
RETAIL TRADE	40.8	1099.3	486.5	667.1
FINANCE, INS., & REAL ESTATE	14.7	933.5	298.2	543.8
SERVICES	31.2	1268.7	593.1	766.4
GOVERNMENT	6.3	222.2	94.2	96.6
ADMIN. AUXILIARY	.0	•0	•0	.0
DIRECT EFFECTS	497.9	14536.7	7908.1	9613.5
INDIRECT AND INDUCED EFFECTS	126.2	6415.9	2420.7	3619.5
TOTAL EFFECTS	624.1	20952.6	10328.8	13233.0
MULTIPLIERS	1.253	1.441	1.306	1.376

WAGES-NET OF TAXES=	8252.6
ST TAXES-VISITORS =	.0
INDIRECT ST TAXES =	1483.7
TOTAL STATE TAXES =	1483.7
LOC TAXES-VISITORS=	.0
INDIRECT LOC TAXES=	900.3
TOTAL LOCAL TAXES =	900.3
GEN. FEDERAL TAXES=	1521.8
SOC SECURITY TAXES=	1081.1
TOT. FEDERAL TAXES=	2602.9
OTHER VALUE ADDED	-6.5
TOTAL VALUE ADDED	13233.0

DIRECT EXPENDITURES WITHIN REGION	14536.7
DIRECT EXPENDITURES IN OTHER REGIONS	763.3
TOTAL INITIAL EXPENDITURE	15300.0

EFFECTS PER MILLION DOLLARS OF INITIAL EXPENDITURE

EMPLOYMENT		40.8(JOBS)
INCOME	$	675083.5
STATE TAXES =	$	96972.7
LOCAL TAXES	$	58843.8
VALUE ADDED	$	864900.6

LRT ECONOMIC IMPACT ESTIMATE: OPERATIONS PHASE ($15.3 m)

(EMPLOYMENT IN JOBS, NOT FULL-TIME EQUIVALENTS)
(DOLLAR FIGURES IN THOUSANDS)

	EMPLOYMENT	OUTPUT	WAGES	VALUE ADDED
AGRICULTURE	.0	2.5	.5	.8
DAIRY PROD., POULTRY, & EGGS	.0	2.0	.4	.5
MEAT ANIMALS & MISC. LIVESTOCK	.0	.0	.0	.0
COTTON	.0	.0	.0	.0
GRAINS, & MISC. CROPS	.0	.5	.2	.3
TOBACCO	.0	.0	.0	.0
FRUITS, NUTS, & VEGETABLES	.0	.0	.0	.0
FOREST PROD.	.0	.0	.0	.0
GREENHOUSE & NURSERY PROD.	.0	.0	.0	.0
AGRI. SERV., FORESTRY, & FISH	.3	11.0	3.6	4.5
AGRI. SERVICES (07)	.2	10.4	3.5	4.3
FORESTRY (08)	.0	.5	.1	.2
FISHING,HUNTING,&TRAPPING (09)	.0	.1	.0	.1
MINING	.0	1.1	.4	.7
METAL MINING (10)	.0	.0	.0	.0
ANTHRACITE MINING (11)	.0	.0	.0	.0
BITUM. COAL & LIGNITE (12)	.0	.0	.0	.0
OIL & GAS EXTRACTION (13)	.0	.0	.0	.0
NONMETAL MIN.-EX. FUELS (14)	.0	1.1	.4	.7
CONSTRUCTION	4.0	216.9	126.0	216.9
GENERAL BLDG. CONTRACTORS (15)	1.1	57.3	33.1	57.3
HEAVY. CONST. CONTRACTORS (16)	.3	25.1	14.8	25.1
SPECIAL TRADE CONTRACTORS (17)	2.7	134.5	78.1	134.5
MANUFACTURING	10.0	1161.4	309.1	455.3
FOOD & KINDRED PROD. (20)	2.0	342.7	52.1	85.8
TOBACCO MANUFACTURES (21)	.0	.0	.0	.0
TEXTILE MILL PROD. (22)	.2	11.0	3.5	5.0
APPAREL & OTHER PROD. (23)	.3	19.7	6.3	7.8
LUMBER & WOOD PROD. (24)	.1	10.1	3.4	3.4
FURNITURE & FIXTURES (25)	.1	3.9	1.3	1.5
PAPER & ALLIED PROD. (26)	.3	37.6	10.3	13.9
PRINTING & PUBLISHING (27)	2.4	158.5	58.6	72.5
CHEMICALS & ALLIED PROD. (28)	.3	64.4	12.5	21.1
PETROLEUM & COAL PROD. (29)	.0	6.2	.7	1.1
RUBBER & MISC. PLASTICS (30)	.1	10.3	3.0	3.9
LEATHER & LEATHER PROD. (31)	.0	3.7	1.3	1.6
STONE, CLAY, & GLASS (32)	.4	29.4	10.6	13.1
PRIMARY METAL PROD. (33)	.1	13.0	4.7	4.9
FABRICATED METAL PROD. (34)	1.1	127.6	39.2	63.0
MACHINERY, EXCEPT ELEC. (35)	.7	73.7	24.2	37.1
ELECTRIC & ELEC. EQUIP. (36)	.9	81.8	29.7	40.3
TRANSPORTATION EQUIPMENT (37)	.8	150.8	42.0	70.7
INSTRUMENTS & REL. PROD. (38)	.1	7.2	2.4	3.7
MISC. MANUFACTURING IND'S (39)	.2	9.8	3.3	4.8
TRANSPORT. & PUBLIC UTILITIES	508.0	15338.0	8160.0	10061.7
RAILROAD TRANSPORTATION (40)	.0	.0	.0	.0
LOCAL PASS. TRANSIT (41)	503.5	14700.6	7997.3	9721.9
TRUCKING & WAREHOUSING (42)	1.6	113.6	51.0	73.7
WATER TRANSPORTATION (44)	.0	1.9	.4	.7
TRANSPORTATION BY AIR (45)	.1	6.9	2.9	3.8
PIPE LINES-EX. NAT. GAS (46)	.0	.0	.0	.0
TRANSPORTATION SERVICES (47)	.2	7.1	3.4	4.5

COMMUNICATION (48)	1.3	131.1	55.2	92.9
ELEC.,GAS,&SANITARY SERVo (49)	1.2	376.7	49.8	164.1
WHOLESALE	8.7	698.0	257.2	419.3
WHLSALE-DURABLE-GOODS (50)	3.9	401.6	124.3	241.3
WHLSALE-NONDURABLE GOODS (51)	4.9	296.4	132.8	178.1
RETAIL TRADE	40.8	1099.3	486.5	667.1
BLDG. MAT.-GARDEN SUPPLY (52)	1.4	49.2	22.7	31.6
GENERAL MERCH. STORES (53)	4.8	161.2	58.4	103.6
FOOD STORES (54)	5.0	125.3	58.5	80.5
AUTO. DEALERS-SERV. STAT. (55)	4.5	187.9	94.6	120.7
APPAREL & ACCESS. STORES (56)	2.2	63.3	23.1	40.7
FURNITURE & HOME FURNISH. (57)	1.1	45.5	19.7	29.2
EATING & DRINKING PLACES (58)	12.4	282.0	102.8	141.9
MISCELLANEOUS RETAIL (59)	9.5	184.9	106.7	118.8
FINANCE, INS.,&REAL ESTATE	14.7	933.5	298.2	543.8
BANKING (60)	3.5	196.7	89.4	114.2
CREDIT AGENCIES EX. BANKS (61)	.0	.0	.0	.0
SECURITY, COMM. BROKERS (62)	.4	37.2	22.4	18.2
INSURANCE CARRIERS (63)	3.1	324.7	93.1	137.7
INS. AGENTS, BROKERS (64)	2.0	94.2	54.9	69.5
REAL ESTATE (65)	4.8	240.9	24.4	189.8
COMB. REAL ESTATE, INS. (66)	.1	4.8	.5	3.8
HOLDING-OTH. INV.. OFF'S (67)	.8	35.0	13.5	10.5
SERVICES	31.2	1268.7	593.1	766.4
HOTELS & OTHER LODGING (70)	.9	20.0	7.4	10.5
PERSONAL SERVICES (72)	5.0	113.7	56.0	80.2
BUSINESS SERVICES (73)	5.4	198.3	102.9	133.1
AUTO REPAIR,SERV.,GARAGES (75)	4.7	297.9	102.5	139.8
MISC. REPAIR SERVICES (76)	.6	18.5	9.4	12.3
MOTION PICTURES (78)	.1	2.5	.8	1.1
AMUSEMENT & RECREATION (79)	1.3	43.3	14.4	17.6
HEALTH SERVICES (80)	3.9	198.8	101.5	136.7
LEGAL SERVICES (81)	1.8	145.0	87.0	107.0
EDUCATIONAL SERVICES (82)	1.8	57.2	28.2	28.7
SOCIAL SERVICES (83)	2.0	44.0	22.7	27.0
MUSEUMS,BOTAN-ZOO.GARDENS (84)	.0	1.6	.7	.8
MEMBERSHIP ORGANIZATIONS (86)	2.8	97.6	39.6	51.6
MISCELLANEOUS SERVICES (89)	.8	30.3	19.9	20.1
GOVERNMENT	6.3	222.2	94.2	96.6
ADMIN. AUXILIARY	.0	.0	.0	.0
TOTAL	624.1	20952.6	10328.8	13233.0
MULTIPLIERS	1.253	1.441	1.306	1.376

WAGES-NET OF TAXES=	8252.6
TOTAL STATE TAXES =	1483.7
TOTAL LOCAL TAXES	900.3
OTHER ,VALUE ADDED	-6.5
TOTAL VALUE ADDED	13233.0

TOTAL INITIAL EXPENDITURE 15300.0

EFFECTS PER MILLION DOLLARS OF INITIAL EXPENDITURE

EMPLOYMENT		40.8 (JOBS)
INCOME	$	675083.5
STATE TAXES =	$	96972.7
LOCAL TAXES	$	58843.8
VALUE ADDED	$	864900.6

EMPLOYMENT BY OCCUPATION TABLE

ENGINEERS	1.8
AERONAUT. ENGINEERS	.0
CHEMICAL ENGINEERS	.0
CIVIL ENGINEERS	.5
ELEC. ENGINEERS	.6
IND. ENGINEERS	.2
MECH. ENGINEERS	.2
METAL & MTRLS ENGNRS	.0
MINING-PETRO ENGNRS	.0
SALES & NEC ENGNRS	.2
COMPUTER SPECIALISTS	.7
COMPUTER PROGRAMMERS	.4
COMPUTER ANALYSTS	.2
CMPTR SPCLSTS & NEC	.0
HEALTH PROFESSIONALS	1.7
HEALTH TECHNOLOGISTS	.4
NURSES, THERPSTS,...	.7
PHYS. , DENT. , . . .	.7
ENG. & SCI. TECHS	1.0
AGRI BIO TECHNICIANS	.0
CHEMICAL TECHNICIANS	.0
DRAFTSMEN	.4
ELECTRCL TECHNICIANS	.2
INDUST ENGNR TECHNCS	.0
MECH. ENG. TECH.	.0
MATH TECHNICIANS	.0
NEC TECHNICIANS	.3
TEACHERS, EX. COLLEG	.9
PRE K, K-6 TEACHERS	.4
7-12 TEACHERS	.5
WRITERS, & ARTISTS	2.2
EDITORS + REPORTERS	.4
PUBLIC RELATIONS	.4
NEe WRITERS & ARTSTS	1.5
RELIG,SOC,TEACH PROF	2.1

RELIGIOUS WaRDERS	.8
SOCIAL SCIENTISTS	.3
SOC & REC WORKERS	.9
POST-SEC TEACHERS	.1

EMPLOYMENT BY OCCUPATION TABLE (CaNT.)

PROF., TECH. NEC	6.9
ACCOUNTANTS	2.3
AIRLINE TECHNICIANS	.1
ARCHITECTS	.1
FARM AND ENVIRONMENT	.1
LAWYERS AND JUDGES	1.0
LIBRARIANS	.1
BIO & PHYS SCIENTSTS	.2
MATH SPECIALISTS	.1
SYSTEMS ANALYSTS	.2
LABOR RELATION WRKRS	1.2
NEC RSRCH WRKRS	.1
NEC TECHNCS & ENGNRS	1.4
VOCATNL & ED CNSLRS	.1
MANAGERS & ADMINIST.	29.1
FINANCIAL MANAGERS	1.3
FARM PRODUCTS MANGRS	.0
WHOLSL & RETL BUYERS	.4
HEALTH ADMINISTRATRS	.1
INSPECTORS	.1
NEC PUBLC ADMNSTRTRS	.4
RAILROAD CONDUCTORS	.0
RESTAURANT MANAGERS	1.6
SALES MANAGERS	1.4
COLLEGE ADMNSTRTRS	.0
1-12 SCHOOL ADMINS	.1
NEC ADMINISTRATORS	23.7
SALES WORKERS	14.7
SALES & ADVERT AGNTS	.2
INSURANCE AGENTS	1.8
REAL ESTATE AGENTS	2.1
STOCK & BOND BROKRS	.2
NEC SALES WORKERS	10.4
CLERICAL WORKERS	61.6