THE ECONOMIC BENEFITS OF PUBLIC TRANSPORTATION IN ANCHORAGE

BY

Scott Goldsmith
Mary Killorin
Eric Larson

PREPARED FOR

Public Transportation Department
Municipality of Anchorage

May 2006

Institute of Social and Economic Research
University of Alaska Anchorage
3211 Providence Drive
Anchorage, AK 99508
907-786-7710
www.iser.uaa.alaska.edu

The Economic Benefits of Public Transportation in Anchorage

Table of Contents

THE ECONOMIC BENEFITS OF PUBLIC TRANSPORTATION IN ANCHORAGE

EXECUTIVE SUMMARY

At the 2004 level of operations, the People Mover System produced benefits for the Anchorage community each year valued at $14.155 million. These benefits are shared among three groups—residents who use transit instead of driving their own cars or using a taxi (user benefits); residents for whom transit is the only alternative for giving them access outside their homes (access or social benefits); and all community residents who share in the savings from having fewer cars on the roads (community benefits).

Table A: Anchorage People Mover Economic Benefits in 2004 (million $)	
Total Benefits	**$14.155**
User Benefits	$8.428
Social Benefits	$2.896
Community Benefits	$2.832

User Benefits: Riders who substitute transit for their cars, a taxi, or other modes of travel get benefits totaling $8.428 million.[1] Most of these benefits—$6.772 million—accrue to People Mover bus riders, but Van Pool riders get $ 1.281 million, Share-a-Ride accounts for $.221 million, and $.154 million accrues to AnchorRIDES clients. These benefits include savings from reduced vehicle-operating and ownership costs (including parking), reduced taxi fares, and the reduced likelihood of injury in a traffic accident. The calculation of these benefits takes into account and nets out the cost associated with the longer elapsed time of many of the trips using the People Mover system.

Social Benefits: For residents without alternative transport options, the transit system provides access to jobs, medical services, social services, educational opportunities, recreation, and other events. The value of this access totals $2.896 million, primarily attributable to the People Mover bus system ($2.666 million), but with contributions of $.182 million from AnchorRIDES, $.044 million from the Van Pool program, and $.004 million from Share-a-Ride. Most of this benefit accrues to riders, but employers benefit because the labor pool is larger and more stable, and taxpayers benefit because social service costs are lower when access is enhanced.

Community Benefits: Transit reduces the number of cars on the road, creating saving of $2.832 million for the community in reduced costs for providing parking and

[1] This total is net of the transit fares they pay.

other transportation-related services, reduced costs associated with congestion and traffic accidents, and reduced pollution-related costs. These reduced costs are mostly in the form of lower taxes. In addition, the community benefits from the option, for residents who do not regularly use public transit, of using the bus system on occasions when their private transportation is unavailable. The bus system produces most of these benefits ($2.092 million). The Van Pool service accounts for $.602 million; Share-a-Ride, $.132 million; and AnchorRIDES, $.006 million.

Benefit-to-Cost Ratio: These benefits are considerably more than the public property tax support provided to the People Mover system, which in 2004 was $8.256 million. Since this local public support provides $14.155 in benefits, the return for each dollar of property taxes invested in the system is $1.71—a benefit-to-cost ratio of 1.71.[2]

Table B: Anchorage People Mover: Benefit Cost Analysis in 2004

Economic Benefits (million $)	**$14.155**
Property Tax Support (million $)	**$8.256**
Benefit/Cost Ratio	**1.71**

The People Mover bus system alone has a benefit-to-cost ratio of 1.97, and the combined ratio of the bus system, including the heavily subsidized AnchorRIDES program, is 1.44. The Van Pool system involves very little public funding and, consequently, has a benefit-to-cost ratio calculated in this way of 101[3].

System Growth: The economic benefits of the People Mover system will increase as ridership grows, and because the system can absorb additional ridership at very little additional cost, the benefit-to-cost ratio is likely to increase as ridership grows.

For example, a 10 percent increase in ridership from residents switching from cars and taxis to the bus system (about 300 thousand rides) would increase total benefits by $.983 million at no additional system cost. The benefits would mostly be in the form of savings for these new riders—$.765 million—but there would also be savings for the community of $.218 million from fewer cars on the road. This would increase the benefit-cost ratio for the transit system to 1.83.

An increase in the price of gasoline with no change in ridership has only a modest positive effect on total transit system benefits because the additional savings for riders is modest due to the fact that the cost of gasoline is only between 10 percent and 20 percent of the total cost of owning and operating a car.[4] But if the rise in the price of gasoline

[2] We exclude federal spending that supports the Anchorage Transit System from these calculations since it is not a cost to Anchorage residents. Likewise, we exclude any benefits of the People Mover system that accrue outside the Anchorage municipality.
[3] This is the ratio of net benefits to the tax support.
[4] Furthermore, because of the relatively low load factor on the transit system, the fuel consumed on a transit passenger trip is not much less than on a private vehicle trip.

leads to an increase in ridership as well, then the benefit increase is greater than from an increase in ridership alone.

An increase of 10 percent in the number of riders who would otherwise be without access to work, medical services, and other activities (about 70 thousand rides), could increase total benefits by $.137 million even though there is no savings in this case from having fewer cars on the road.

Finally, an increase in transit service, as reflected in the People Mover Blueprint for 2007, would increase system benefits to current riders by an estimated $893 thousand. It would also increase the number of trips, and if that increase were 11 percent or more (about 325 thousand) and the average trip duration fell below twice that of a private trip, benefits would increase by more than the increase in the cost of service estimated to be $2.000 million.[5]

Transit as an Economic Enterprise: If instead of calculating the value of the output of the transit system, we look at the jobs and income created by the inputs into operating the system, we get a picture of the transit system as an economic enterprise. Total spending on the operation of the transit system, including both operating and capital spending was about $22.9 million in 2004. The People Mover system directly employed 155 workers and contracted for an additional 81 to operate the AnchorRIDEs system.

Local spending by transit system employees for goods and services; spending by the department for fuel, vehicle parts, bus stop materials, and services; and spending from the Municipal capital budget created an additional 118 jobs in the Anchorage economy. Consequently, spending associated with the People Mover system generated a total of 354 jobs and a payroll of $15.6 million.

Table C: Anchorage People Mover Employment and Income Generation in 2004

	Employment	Payroll (million $)
People Mover	155	$8.6
Total Private	199	$7.0
AnchorRIDEs	81	
Other Private	118	
Total	**354**	**$15.6**

If the transit system were eliminated, the economy would lose 191 of these 354 jobs. This is because some of the money now spent to operate the transit system, such as bus fares and local property taxes, would be available to spend on other things. But some of the money spent to operate the transit system, because it comes from the federal government specifically for transit, would no longer come into the Anchorage economy.

[5] People Mover Blueprint, RLS and Associates (2001), Page VII-4. Not all of these phases of the expanded services may be implemented by 2007. Personal communication with People Mover staff, September 2005.

THE ECONOMIC BENEFITS OF PUBLIC TRANSPORTATION IN ANCHORAGE

I. INTRODUCTION

Public transportation in Anchorage benefits transit riders and the entire community in many different ways: All forms of transit provide access to jobs, medical services, social services, shopping, recreation, and participation in the community. This enables more people to work and to spend more in the local economy. The bus system, AnchorRIDES, and Share-A-Ride (including the Van Pool) programs enable many car owners to use these alternatives instead of driving. This reduces the number of vehicles on the roads and, consequently, the costs of traffic congestion, pollution, traffic collisions, parking, and traffic services. People Mover and AnchorRIDES buses also provide essential low-cost transportation services for workers, students, tourists, low-income residents, people with disabilities, and elderly residents. This improves the quality of life and economic well-being of these groups. Public transit also contributes to economic development, improved environmental quality, better public health, land use, and improved quality of life.

This report describes and quantifies many types of public transit benefits. Sections II and III provide an overview of the current level of transit services. Sections IV, V, and VI present the estimation of benefits to users, society, and the community. Section VII discusses how benefits would increase as a result of different types of ridership increases. Section VIII presents a calculation of the economic significance of the inputs used in the operation of the transit system.

In order to describe and quantify the benefits of transit, we relied on methodologies from previous studies. Todd Litman's *Evaluating Public Transit Benefits and Costs: Best Practices Guidebook*, a systematic collection of existing studies of transit benefits, presents the best available methods and parameters. We used Litman's analysis of transit benefits as the basis for organizing and describing the benefits in this report.[6]

We also consulted a number of other Litman publications including *Transportation Cost and Benefit Analysis: Techniques, Estimates, and Implications* (March 2005), *Online Transportation Demand Management Encyclopedia*, Victoria, British Columbia (July 2005), and *Transportation Cost Analysis Spreadsheets.*

In addition, we relied upon the ECONorthwest and PBQD's report, *Estimating the Benefits and Costs of Public Transit Projects: A Guidebook for Practitioners, a Transportation Cooperative Research Program Report 78, (2002).* It is another recent

[6] Litman (2004).

comprehensive survey of methods for estimating all types of benefits of transit with recommended methods and parameters.[7]

We augmented this with several other publications and studies to assess their relevance for estimating transit benefits in Anchorage.[8] Finally, we collected local information about Anchorage conditions from government agencies and local businesses. We used this data to apply the methodologies developed in these studies to Anchorage. The remainder of this report describes these methodologies in more detail, the relevant data we collected, and our best estimates of each type of transit benefit.

[7] ECONorthwest and PBQD (2002).
[8] In addition to Litman's publications and the ECONorthwest TCRP report, we also evaluated methods, estimates, and recommendations in the following publications: American Public Transportation Association (2002), Beimborn (1993), Cambridge Systematics, Inc (1996), HLB Decision Economics, Inc (2004), HLB Decision Economics, Inc. (2003), Housatonic Area Regional Transit District, Jack Faucett Associates, Inc., The KFH Group, Inc (1997).

II. PUBLIC TRANSIT OVERVIEW

The People Mover currently runs 46 buses on 15 fixed routes and 4 DART (dial-a-ride transit) routes. In addition to the People Mover bus system that follows particular routes and schedules, the People Mover also runs the AnchorRIDES, Share-A-Ride, and Van Pool programs. The AnchorRIDES program provides rides, funded largely through property taxes, to individuals with disabilities who meet certain eligibility criteria as mandated by the Americans With Disabilities Act of 1990. In 2004, AnchorRIDES operated 29 vehicles during peak hours and provided 191,000 trips (see Table II-1).The Share-A-Ride program is a clearinghouse for automobile drivers to find other drivers who want to share the expense of driving to work. (In 2000, the Share-A-Ride program had 423 active car pools and 860 active participants.) The Van Pool program operates 19 vans during peak hours and carried 88 thousand passengers in 2004, many between the Matanuska Susitna Borough and Anchorage.[9]

Table II.1. Public Transit Ridership and Vehicles

	People Mover Bus		AnchorRIDES		Van Pool	
Year	**Peak Hour Buses**	**Passenger Trips**	**Peak Hour Vans**	**Passenger Trips**	**Peak Hour Vans**	**Passenger Trips**
1995	38	3,019,765	NA	65,416	NA	NA
1996	38	3,052,690	NA	71,783	NA	NA
1997	42	3,161,658	NA	84,204	NA	NA
1998	42	3,220,524	NA	152,973	NA	NA
1999	39	3,316,060	29	173,475	13	48,122
2000	40	3,356,982	29	172,972	17	61,050
2001	40	3,339,940	32	180,663	18	73,298
2002	40	3,120,567	32	192,883	18	68,588
2003	43	3,339,451	29	196,021	18	83,579
2004	46	3,536,059	29	190,875	19	88,151
2005		3,975,074				

Source: People Mover Financial Records, May 2005. Historical data on Share-A-Ride trips and vehicles is not available.

In 2002, the People Mover Blueprint proposed a number of changes to the system with the intent of improving service area coverage, adding routes, increasing the frequency of service, and extending the hours of operation. People Mover has aggressively implemented several of the proposed changes in the Blueprint:

- Added a cross-town route providing direct service between East Anchorage and South Anchorage;
- Resumed service to Ted Stevens Anchorage International Airport;

[9] People Mover Operations records, May 2005.

- Introduced DART (dial-a-ride transit, deviated fixed route service) in Southeast Anchorage and Eagle River;
- Extended and expanded houses of service. Major routes now run until 11 PM on weekdays, until 8 PM on Saturday, and until 6 PM on Sunday;
- Implemented "memory" headways so that buses come every thirty (or sixty) minutes at the same time every hour;
- Coordinated transfer points and hubs making it easier to transfer between routes.[10]

With these improvements, the bus system has successfully attracted more passenger trips and, in spite of three fare increases since 2001, both ridership and total revenues from fares have continued to increase.[11]

Table II.2. People Mover Bus System Revenues from Fares and Total Trips

Year	Farebox Revenues	Total Trips	Average Fare per Trip
1995	$1,723,444	3,019,765	$0.57
1996	$1,752,912	3,052,690	$0.57
1997	$1,767,022	3,161,658	$0.56
1998	$1,788,103	3,220,524	$0.56
1999	$1,733,118	3,316,060	$0.52
2000	$1,700,173	3,356,982	$0.51
2001	$1,591,587	3,339,940	$0.48
2002	$2,173,942	3,120,567	$0.70
2003	$2,248,025	3,339,451	$0.67
2004	$2,663,894	3,536,059	$0.75
2005		3,975,074	

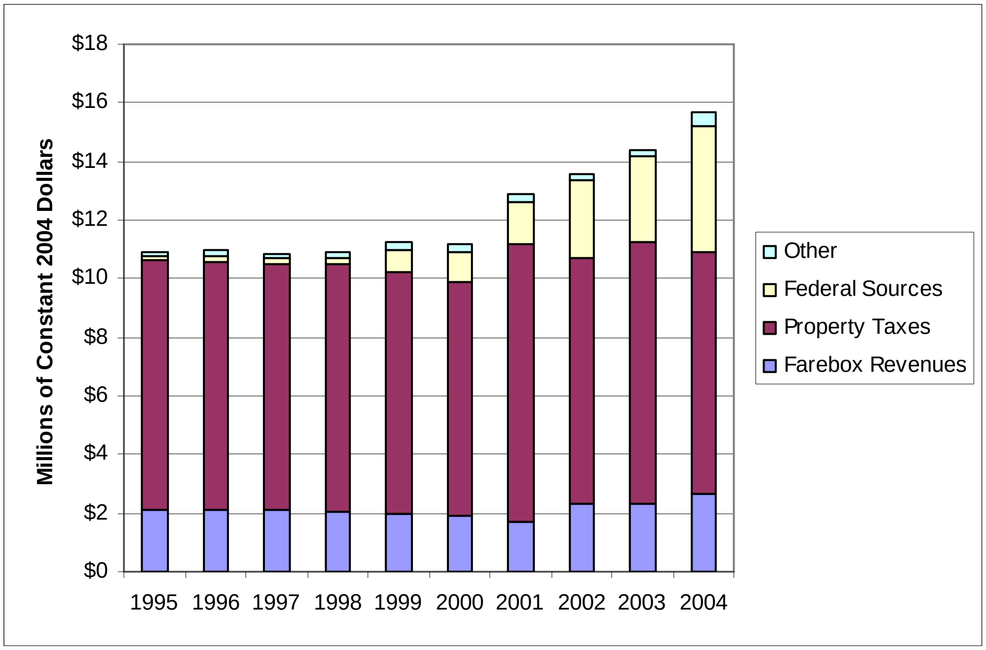
Source: People Mover Financial Records, May 2005.
Note: Farebox revenues include only the bus system.

II.A Operating Revenues

The Municipality pays for the operation of public transportation in Anchorage from several different sources (see Table II.3.) Just over one-half of the revenues come from local property taxes (53%). Another 27% come from grants and capital assistance from the state and federal governments. About 14% come from farebox revenues (system users). Starting in 2000 and continuing through 2005, federal grants have provided a growing share of the revenues for operating the bus system. This is primarily the Congestion Mitigation and Air Quality grant (CMAQ).

[10] People Mover Blueprint, RLS and Associates (2001) page VII-2 and personal communications with People Mover staff, September 2005.
[11] Personal communication with People Mover staff, September 2005. At the time of this report, People Mover was considering an increase in the fare from $1.50 to $1.75 to cover the higher costs of fuel.

Figure II.1. Composition of Operating Revenues for Public Transit (Million 2004 dollars)



Source: Public Transportation Department, financial records, May 2005.

Table II.3. Public Transit Operating Revenues: 2004

Revenue Source	All Services	Bus	AnchorRIDES	Vanpool
Total	**$15,688,726**	**$12,640,734**	**$2,933,811**	**$114,181**
Property Taxes	$8,256,518	$5,839,017	$2,398,013	$19,488
Farebox Revenues	$2,663,894	$2,663,894	$0	$0
Advertising Revenues	$197,318	$197,318	$0	$0
Other Program Revenues	$302,384	$301,050	$1,334	$0
Capital Assistance for Operations*	$782,183	$782,183	$0	$0
Other Program Grants*	$3,486,429	$2,857,272	$534,464	$94,693
Percent of Total				
Property Taxes	53%	46%	82%	17%
Farebox Revenues	17%	21%	0%	0%
Advertising Revenues	1%	2%	0%	0%
Other Program Revenues	2%	2%	0%	0%
Capital Assistance for Operations *	5%	6%	0%	0%
Other Program Grants*	22%	23%	18%	83%

Source: Anchorage Municipality Public Transportation Department financial records, May 2005.
Notes: These tabulations include only the revenues used for direct operating costs by the Public Transportation Department.
* The two lines "capital assistance for operations" and "other program grants" includes funding from state and federal sources from AMATS for operations of public transit. These lines do not include the capital expenditures for vehicles, facilities, or transit improvements summarized later in this Section.

II.B. Operating Costs

To provide these transportation services, the Public Transportation Department spent a total of $15.7 million in 2004 including debt service (see Table II.4.). Most of this ($12.6 million) was spent to operate the People Mover bus system. Another $2.9 million paid for the AnchorRIDES and $114,000 paid for the Van Pool program. The Department operates AnchorRIDES and Van Pool services through contractual service arrangements with nonprofit transportation service providers. The largest expense for operations was pay for drivers, mechanics, administrators, parts, and fuel. It employed 149 people in 2004 and 165 people in 2005, primarily as drivers (99) and as vehicle maintenance workers (34).[12] After adjusting for inflation, local operations spending for public transportation remained nearly constant from 1995 through 2000 at about $11 million (2004 dollars). From 2001 through 2004, spending on public transit increased by about $1.1 million each year. A three-year federal Congestion Mitigation and Air Quality grant (CMAQ) funded these increases.

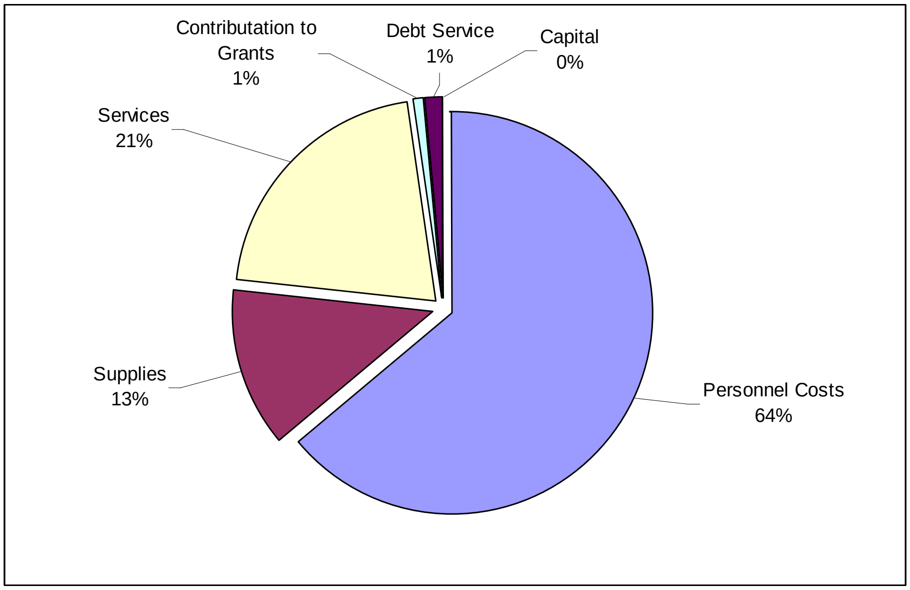
Table II.4. Composition of Operating Expenditures by Public Transportation Department in Anchorage in 2004

Total Expenditures	**Total**	**Bus**	**AnchorRIDES**	**Van Pool**
Personnel Costs	$10,015,464	$9,913,748	$71,018	$30,698
Supplies	$2,001,523	$1,671,108	$322,797	$7,618
Services*	$3,335,382	$781,521	$2,477,996	$75,865
Contribution to Grants	$135,049	$73,049	$62,000	$0
Debt Service	$199,245	$199,245	$0	$0
Capital for operations**	$2,063	$2,063	$0	$0
Total Direct Organizational Costs:	**$15,688,726**	**$12,640,734**	**$2,933,811**	**$114,181**
Percent of Total Expenditures				
Personnel Costs	64%	78%	2%	27%
Supplies	13%	13%	11%	7%
Services*	21%	6%	84%	66%
Contribution to Grants	1%	1%	2%	0%
Debt Service	1%	2%	0%	0%
Capital for operations**	0%	0%	0%	0%
Total Direct Organizational Costs:	100%	100%	100%	100%

Source: Anchorage Municipality Public Transportation Department financial records, May 2005.
* Services include contracted transportation services for AnchorRIDES and vanpool program.
** Capital for operations does not include capital expenditures for facilities, vehicles, and system improvements. Later tables summarize these capital expenditures.

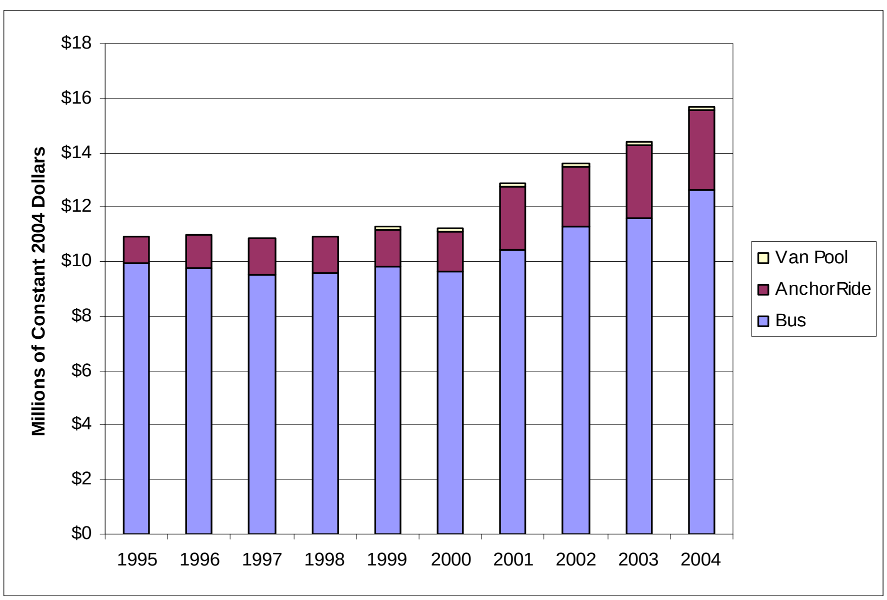
[12] Personal communication with People Mover staff, September 2005.

Figure II.2: Composition of Public Transportation Department Operating Expenditures in 2004



Source: Public Transportation Department financial records, May 2005.

Figure II.3: Operating Expenditures for Public Transportation in Anchorage (Million 2004 dollars)



Source: Public Transportation Department financial records, May 2005.

II.C. Capital Costs

Expenditures for capital improvements and system maintenance come from federal, state, and local sources. Local government bonds supplement state and federal funds administered by AMATS (Anchorage Metropolitan Area Transportation Solutions). The Municipality of Anchorage Capital Improvement program provides a detailed breakdown by source (Table II.5).

The ***local*** contribution to transit capital costs varies from year to year. According to the Municipal Capital Improvement Program, local government bonds for transit totaled $2 million in 2004; local bonds totaled $1.6 million in 2005; and local bonds are expected to be zero in 2006 and 2007. For the entire Municipal Capital Improvement Program planning period from 2004 to 2010, the average local government bonds for transit are expected to be about $760,000 annually. These local government bonds—in conjunction with state and federal money—pay for bus stop improvements, overhaul vehicles, provide improvements to the existing fleet, and paratransit vehicles.[13]

The AMATS (Anchorage Metropolitan Area Transportation Solutions) federal and state grant-funded transit expenditures vary considerably from year to year and are expected to range between $5 and $12 million dollars over the next several years (Table II.6). The Municipality of Anchorage receives a direct appropriation of about $4 million annually from the FTA (Federal Transit Administration) 5307 funding. Funding from FHWA (Federal Highway Administration) annually pays for capital improvements such as new buses and, in recent years, service expansions. In particular, starting in 2001 a grant from the Congestion Mitigation and Air Quality (CMAQ) program provided the funding to expand operations. This federal CMAQ grant funding for the expanded services will end in 2006.

[13] See Appendix B for a detailed listing of capital expenditures in the AMATS TIP and the Municipality of Anchorage Capital Improvement program.

Table II.5. Municipal Capital Improvement Program for Public Transit Including Both AMATS Funding and Local Government Bonds (current dollars)

Category	Source	2004	2005	2006	2007	2008	2009	2010
Transit Improvements / Facilities								
	Go Bond	$1,355,000	$875,000	$0	$0	$893,000	$0	$0
	Federal Grant	$0	$516,000	$5,089,000	$1,489,000	$596,000	$1,489,000	$1,489,000
	State Grant	$0	$0	$400,000	$0	$0	$0	$0
	Other	$3,671,000	$0	$0	$0	$0	$0	$0
	Total	$5,026,000	$1,391,000	$5,489,000	$1,489,000	$1,489,000	$1,489,000	$1,489,000
Transit Vehicles and Upgrade								
	Go Bond	$208,000	$190,000	$0	$0	$189,000	$0	$0
	Federal Grant	$0	$1,116,000	$1,305,000	$6,255,000	$126,000	$5,355,000	$5,355,000
	State Grant	$0	$0	$0	$0	$0	$0	$0
	Other	$1,037,000	$110,000	$110,000	$660,000	$0	$560,000	$560,000
	Total	$1,245,000	$1,416,000	$1,415,000	$6,915,000	$315,000	$5,915,000	$5,915,000
Paratransit and Van Pool Vehicles								
	Go Bond	$502,000	$565,000	$0	$0	$570,000	$0	$0
	Federal Grant	$0	$356,000	$950,000	$950,000	$380,000	$950,000	$950,000
	State Grant	$0	$0	$0	$0	$0	$0	$0
	Other	$418,000	$0	$0	$0	$0	$0	$0
	Total	$920,000	$921,000	$950,000	$950,000	$950,000	$950,000	$950,000
All Types of Capital Expenditures								
	Go Bond	$2,065,000	$1,630,000	$0	$0	$1,652,000	$0	$0
	Federal Grant	$0	$1,988,000	$7,344,000	$8,694,000	$1,102,000	$7,794,000	$7,794,000
	State Grant	$0	$0	$400,000	$0	$0	$0	$0
	Other	$5,126,000	$110,000	$110,000	$660,000	$0	$560,000	$560,000
	Total	**$7,191,000**	**$3,728,000**	**$7,854,000**	**$9,354,000**	**$2,754,000**	**$8,354,000**	**$8,354,000**

Source: Municipality of Anchorage, Capital Improvement Budget, Capital Improvement Program 2005 and 2002. Appendix B lists more details about each o f these programs.

Table II.6. Federal Capital and Operating Funding of Transit Program Administered by AMATS

Source	Item	2005	2006	2007	2008	2009
Federal Highway Administration/ CMAQ						
	Transit Centers	$4,000,000	$0	$0	$0	$0
	Transit Stop Enhancement Program	$165,000	$170,000	$175,000	$180,000	$185,000
	Share-A-Ride	$640,000	$670,000	$670,000	$670,000	$670,000
	Transit Operations Expansion	$1,970,000	$0	$0	$0	$0
	Fleet Expansion and Replacement	$300,000	$1,100,000	$6,600,000	$0	$5,600,000
	Total FHWA funding	**$7,075,000**	**$1,940,000**	**$7,445,000**	**$850,000**	**$6,455,000**
Federal Transit Administration—Section 5307						
	1% Transit Enhancement:	$39,000	$39,000	$39,000	$39,000	$39,000
	Bus Stop Improvement:	$750,000	$750,000	$750,000	$750,000	$750,000
	Transit Center Planning:	$0	$0	$0	$0	$0
	Transit Planning Program	$50,000	$50,000	$50,000	$50,000	$50,000
	Automated Operating System	$100,000	$200,000	$200,000	$200,000	$200,000
	ADA Complementary Paratransit Services	$310,000	$310,000	$310,000	$310,000	$310,000
	Management Information System	$150,000	$150,000	$150,000	$150,000	$150,000
	Preventive Maintenance	$1,200,000	$1,200,000	$1,200,000	$1,200,000	$1,200,000
	Fleet Improvement and Support Equipment	$350,000	$350,000	$350,000	$350,000	$350,000
	Support Vehicles	$100,000	$100,000	$100,000	$100,000	$100,000
	Paratransit Vehicles and Maintenance Equipment	$920,000	$950,000	$950,000	$950,000	$950,000
	Total FTA funding	**$3,969,000**	**$4,099,000**	**$4,099,000**	**$4,099,000**	**$4,099,000**
Total		**$11,044,000**	**$6,039,000**	**$11,544,000**	**$4,949,000**	**$10,554,000**

Source: AMATS FFY 2004-2006 Transportation Improvement Program. Appendix B lists more details about each of these programs

II.D. Total Costs

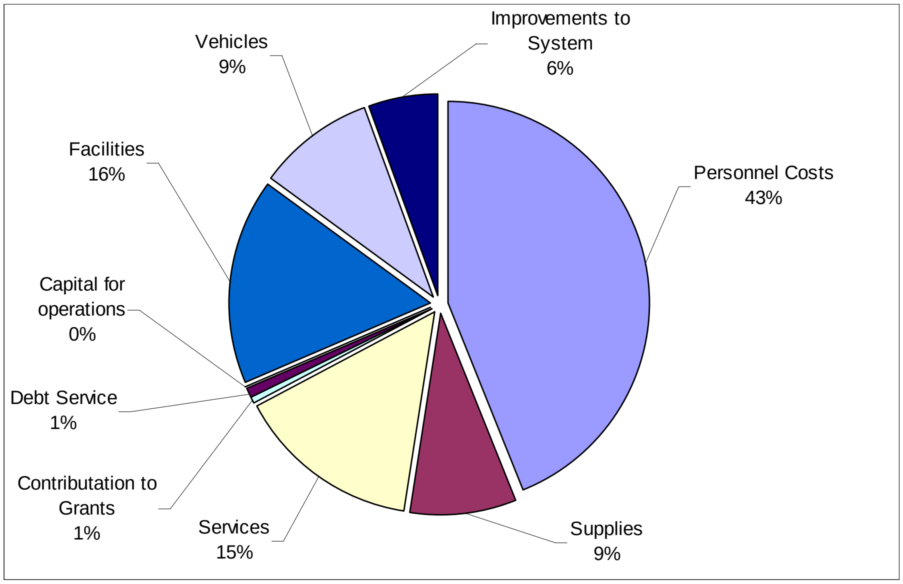
Table II.7. and Figure II.4. show that when capital and operating costs are combined, the largest component of total costs is personnel (44%) while vehicles and facilities amount to 25% of costs for the transit system. Service costs are mostly for operating the AnchorRIDES program. The Public Transportation Department contracts all of the operations and maintenance for this program to a private transportation service company. The total revenues for operations and capital expenditures come primarily from state and federal grants (41%) and from property taxes (36%). Farebox revenues contribute about 12% to total operating and capital costs (Figure 5).

Table II.7. Transit Operating and Capital Expenditures: 2004

	Total	**Bus**	**AnchorRIDES**	**Van Pool**
TOTAL	**$22,879,726**	**$18,911,734**	NA	NA
Operating Expenditures				
Total	$15,688,726	$12,640,734	$2,933,811	$114,181
Personnel	$10,015,464	$9,913,748	$71,018	$30,698
Supplies	$2,001,523	$1,671,108	$322,797	$7,618
Services	$3,335,382	$781,521	$2,477,996	$75,865
Contribution to Grants	$135,049	$73,049	$62,000	$0
Debt Service	$199,245	$199,245	$0	$0
Capital for operations	$2,063	$2,063	$0	$0
Capital Expenditures				
Total	$7,191,000	$6,271,000	NA	NA
Facilities	$3,750,000	$3,750,000	NA	NA
Vehicles	$2,165,000	$1,245,000	NA	NA
Improvements to System	$1,276,000	$1,276,000	NA	NA
Percent of Total				
Personnel	44%	52%	NA	NA
Supplies	9%	9%	NA	NA
Services	15%	4%	NA	NA
Contribution to Grants	1%	0%	NA	NA
Debt Service	1%	1%	NA	NA
Capital for operations	0%	0%	NA	NA
Facilities	16%	20%	NA	NA
Vehicles	9%	7%	NA	NA
Improvements to System	6%	7%	NA	NA

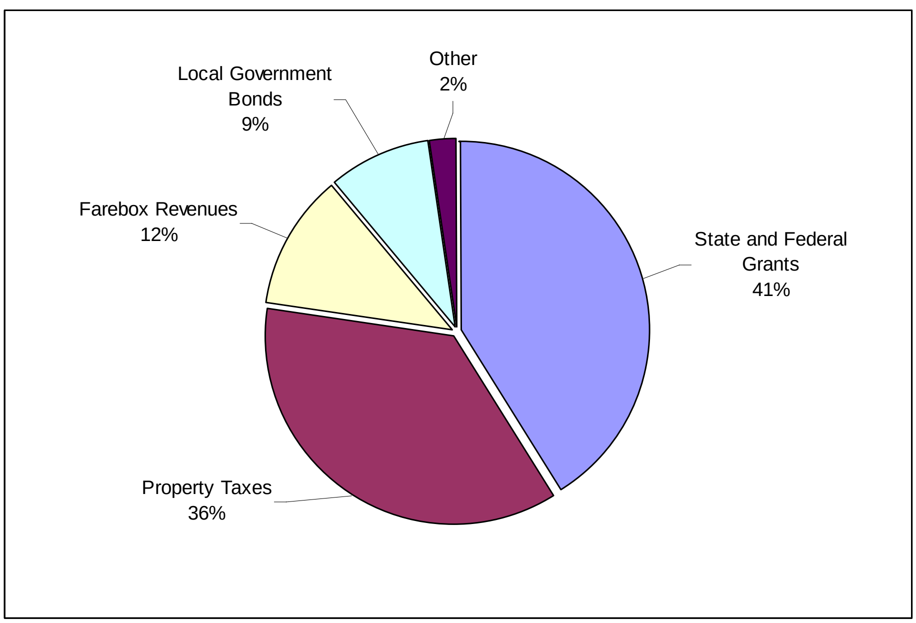
Source: Operating expenditure from Public Transportation Department Financial Records, May 2005 and capital expenditures from Municipality of Anchorage Capital Improvement Program for Public Transportation, 2005.

Figure II.4: Composition of Public Transportation Operating and Capital Expenditures in 2004



Source: Public Transportation Department financial records, May 2005 and Municipality of Anchorage Capital Improvement Program for Public Transportation, 2005.

Figure II.5: Composition of Total Public Transportation Operating and Capital Revenues in 2004



Source: Public Transportation Department financial records, May 200, Municipality of Anchorage Capital Improvement Program for Public Transportation 2005.

III. TRANSIT TRIPS

In 2004 there were about 4 million People Mover trips. Most of these trips—about 3.5 million—were made using the bus system, but AnchorRIDES contributed .2 million; Van Pools, .1 million; and the Share-A-Ride program, .2 million. Average trip length varied among these programs and total passenger miles was 21.39 million miles. The average number of passengers also varied by program, and total vehicle miles traveled (VMT) by the system was 3.06 million miles[14].

Table III.1 People Mover Trips, Passenger Miles and Vehicle Miles in 2004

	People Mover Trips in 2004 (million)	Average Trip Length (miles per trip)	Passenger Miles (million miles)	Occupancy (passengers per vehicle)	Vehicle Miles Traveled (VMT) (million miles)
Total	4.000	–	21.390	–	3.060
Bus	3.500	4.7	16.450	8.0	2.060
AnchorRIDES	.200	4.7	.940	3.0	.310
Van Pools	.100	31.0	3.100	8.0	.390
Share-A-Ride	.200	4.5	.900	3.0	.300

According to the 2001 On-Board survey of bus riders in Anchorage, over half of all the bus trips are to or from work. Another 11% of all trips are to or from shopping, 9% are to hospitals or doctors' offices, and 3% are going to or from college or vocational school.[15]

About 73% of bus riders are "transit-dependent," meaning that they either have no vehicle and no licensed driver in their household, a driver but no vehicle, or more riders than vehicles.[16] "Riders-by-choice," bus riders who have their own vehicles, comprise

[14] We estimate average trip length based on estimates of the average trip duration from survey responses from the 2002 Anchorage Household Travel Survey, NuStats and the average speed of travel on major corridors from Anchorage Congestion Management System "Status of the System Report," Cambridge Systematics et al. (2000), page 3-31. Average occupancies are from 2002 Anchorage Household Travel Survey, NuStats (2002), page 12.

[15] 2001 On Board Survey Results in People Mover Blueprint, RLS and Associates (2001), page III-12. These estimates of trips are "round-trips" that assume that a bus rider makes a single trip to a particular destination (like work) and a single return trip from the same destination. Riders actually combine trips so that a single trip on the bus may be for work and school, or work and shopping, or other multiple purposes. We do not have sufficient detailed information about how bus riders combine their trips to estimate how many trips are for multiple purposes. For this reason, these estimates of the number of round trips by purpose are only approximate.

[16] People Mover Blueprint, page III-19. The Blueprint notes, "It is important not to exaggerate the degree of choice available to the rider-by-choice market. Typically these are people with regular but modest incomes who have been able to afford cars, but who do not have reliable vehicles or vehicles always available. For example, in the focus groups of riders that occurred as part of this study, those with vehicles available, comprised only a small number. In one case the vehicle was not operating. In another, the driver had found it too costly to operate. In two cases, licenses had apparently been suspended.

27% of the total. This share for "riders-by-choice" is within the norms we find in most systems where this figure usually varies between 25% and 30%."[17]

Table III.2. Anchorage Population : Access to Cars		
Category	**Adult Population**	**Bus Riders**
Transit-Dependent	**18%**	**73%**
No vehicle / no driver	3%	23%
No vehicle	2%	34%
More drivers than vehicles	13%	15%
Rider-by-Choice	**83%**	**27%**
Same number vehicles and drivers	64%	20%
More cars than drivers	19%	7%
Source: People Mover Blueprint, Page III-19. Includes population in households.		

We assume that the distribution of bus trips between "transit-dependent" and "riders-by-choice" riders is also 73% and 27%. The 27% of total bus trips by "riders-by-choice" all replace trips by car. We assume that 57% of choice riders substitute transit for a single occupancy vehicle and 43% substitute transit for a high occupancy vehicle.[18]

The 73% of total bus trips by "transit-dependent" riders replaces a combination of trips by car, taxi, walking, and bicycling. Furthermore, some of the bus trips made by "transit-dependent" riders would not have occurred at all without the availability of the transit system.

To estimate the number of the transit trips that substitute for other trips by "transit-dependent" riders, we relied on survey results from other cities that asked bus riders what mode of transportation they would have taken in the absence of the bus system.[19] Although these estimates are for all riders, we assume the modal distribution of foregone trips for "transit-dependent" riders to be similar to the survey results for large cities shown in Table III.3.[20] This results in the substitution assumptions by mode of travel for each component of the People Mover system shown in Table III.4.

[17] People Mover Blueprint, Page III-19.
[18] 2002 Anchorage Household Travel Survey.
[19] McCollom Management Consulting, N. Davis and Company, NuStats International, Dr. Peter Furth, *Transit Performance Monitoring System (TPMS) Results, Summary Report, Phases I and II*, prepared for American Public Transportation Association, Federal Transit Administration, February 2002.
[20] A similar survey conducted in Wisconsin found that 13% to 25% of riders would not make trips without access to the bus depending on the purpose of the trip. Respondents reported that they would not take 19% of their work trips, 13% of their school trips, and 24% of their medical trips. Since this percentage is the most crucial component of the estimates, we investigated the sensitivity of the results if this percentage is higher or lower. These results are summarized in Section VII of this report.

Table III.3. Survey Results of Transit Systems Ridership Travel Option if Bus Unavailable

	All Size Systems	**Small** (Population <500,000)	**Medium** (population 500,001 to 1,250,000)	**Large** (population >1,250,000)	**Large Suburban**
Drive	24%	13%	26%	28%	15%
Taxi	12%	12%	8%	14%	21%
Ride with Someone	22%	23%	22%	21%	23%
Walk	18%	27%	18%	13%	17%
Bicycle	4%	5%	5%	3%	2%
Not Make Trip	21%	22%	21%	22%	23%

Source: Transit Performance Monitoring System, Summary Report, Phase I and II, (McCollom 2002), page 16 and 34. The following cities are in each group: Small: Juneau, Alaska; Corpus Christi, Texas; Grand Rapids, Michigan; Kenosha, Wisconsin; Lincoln, Nebraska; Huntington, West Virginia. Medium: Austin, Texas; Portland, Oregon; Sacramento, California; Louisville, Kentucky; Buffalo, New York. Large: Phoenix, Arizona; North San Diego, California; Chicago, Illinois; Cleveland, Ohio; Pittsburgh, Pennsylvania; Washington, DC; Prince George's County, Maryland; Montgomery County, Maryland. Large Suburban: North San Diego, California; Prince George's County, Maryland; Montgomery County, Maryland.

We assumed that nearly all (95%) of Share-A-Ride riders and all Van Pool riders are "riders-by-choice." They would use either their own cars or a high-occupancy vehicle if transit were not available. In contrast, we assume that all AnchorRIDES riders are "transit-dependent" riders who do not have access to a car. We assume that AnchorRIDES riders would not use a car, walk, or bicycle if transit were not available. We also assume that a much higher percent of AnchorRIDES users (66%) would not make their trips if transit were not available.

Table III.4. People Mover System Rider Travel Options if Transit were Not Available			
	Rider-by-Choice	**Transit-Dependent**	**All Riders**
People Mover Bus	**27%**	**73%**	**100%**
Auto	57%	28%	36%
Taxi	0%	14%	10%
High Occupancy Vehicle	43%	21%	27%
Walk	0%	13%	9%
Bicycle	0%	2%	1%
No Trip	0%	22%	16%
AnchorRIDES	**0%**	**100%**	**100%**
Auto	Na	0%	0%
Taxi	Na	12%	12%
High Occupancy Vehicle	Na	22%	22%
Walk	Na	0%	0%
Bicycle	Na	0%	0%
No Trip	Na	66%	66%
Van Pool	**95%**	**5%**	**100%**
Auto	57%	24%	55%
Taxi	0%	0%	0%
High Occupancy Vehicle	43%	21%	42%
Walk	0%	0%	0%
Bicycle	0%	0%	0%
No Trip	0%	55%	3%
Share-A-Ride	**95%**	**5%**	**100%**
Auto	57%	18%	55%
Taxi	0%	17%	1%
High Occupancy Vehicle	43%	22%	42%
Walk	0%	18%	1%
Bicycle	0%	4%	0%
No Trip	0%	21%	1%

Source: page III-19 of RLS and Associates (2001). Percentages for AnchorRIDES, Van Pool, and Share-A-Ride based on assumptions about how many of each type of riders are choice and transit-dependent and percentages for bus riders.

We used the shares from Table III.4. together with the total number of transit trips by type (bus, Share-A-Ride, Van Pool, and AnchorRIDES) to calculate the total number of private trips displaced by transit by mode (Table III.5). Transit displaces 3.3 million private trips and 16.13 million passenger miles. The number of vehicle miles traveled (VMT) that are displaced by transit is 12.560. The transit system thus reduces the number of total vehicle miles traveled by 9.06 million[21].

[21] This is total transit VMT of 3.06 million minus replaced automobile travel of 12.12 million. The Anchorage Congestion Management Plan "Status of the System" report (page 3-18) estimates that the bus displaces about 14 million vehicle miles traveled of automobile travel each year. The Congestion Management Plan estimates are higher for several reasons. Their estimate assumes that *every* bus trip displaces a single occupancy car trip. Their calculations do not account for substitution to high occupancy

Table III.5. Private Trips and Miles Displaced by Transit in 2004					
	Trips (million)	**Average Trip Length (miles per trip)**	**Passenger Miles (million miles)**	**Occupancy (passengers per vehicle)**	**Vehicle Miles Traveled (VMT) (million miles)**
Displaced Trips	**-3.300**	–	**-16.130**	–	**-12.560**
Automobile Travel*	-2.920		-15.690	–	-12.120
Single-Occupancy Vehicle	-1.420	4.5	-7.840	1.0	-7.840
Taxi	-.380	4.5	-1.730	1.0	-1.730
High Occupancy Vehicle	-1.110	4.5	-6.120	2.4	-2.550
Non-Motorized Travel	-.380		-.430		-.430
Walk	-.330	1.0	-.330	1.0	-.330
Bicycle	-.050	2.0	-.100	1.0	-.100

* The average trip length for a foregone Van Pool trip is 31 miles. Average Trip length for automobile, van, and HOV derived from trip duration from Anchorage Household Transport Survey, average trip length for transit from March 2005 On-Off survey. Passenger miles traveled = Number of Trips * Average Trip Length.

The bus system replaces most private vehicle miles traveled.

Table III.6 Displaced Vehicle Miles Traveled by Type of Transit Used (million VMT)				
	Bus	**AnchorRIDES**	**Van Pool**	**Share-A-Ride**
Replaced VMT	**-9.460**	**-.190**	**-2.250**	**-.660**
Automobile Travel*	-9.020	-.190	-2.250	-.660
Single Occupancy Vehicle	-5.640	0	-1.710	-.500
Taxi	-1.610	-.110	0	-.010
High Occupancy Vehicle	-1.770	-.080	-.540	-.160
Non-Motorized Travel				
Walk	-.330	0	0	0
Bicycle	-.100	0	0	0

Some People Mover trips would not have taken place without transit because these riders could not afford a car or taxi, or because a physical disability prevented them from using an alternative mode of travel. These "Access" trips amounted to 18% of total trips—.699 million trips. All of these trips were made by "transit-dependent" riders.

vehicles (like taxis, shared rides, or van rides). In addition, their estimates do not include displaced trips involving walking or bicycling. Most importantly, their calculations do not account for some transit trips that would not occur by any mode of transport if transit were not available.

Table III.7. People Mover System Total Trips and Trips due to Access (million)					
	Total	**Transit Dependent**		**Access**	
	Number of Trips	**Share**	**Number of Trips**	**Share of Transit Dependent**	**Number of Trips**
Total	4.0		2.770		.699
Bus	3.5	73%	2.555	22%	.562
Share-A-Ride	.2	5%	.010	21%	.002
Van Pool	.1	5%	.005	55%	.003
AnchorRIDE	.2	100%	.200	66%	.132

IV. USER BENEFITS

Riders who substitute transit for their cars, a taxi, or other modes of travel get benefits totaling $8.428 million[22]. Most of these benefits—$6.772 million—accrue to People Mover bus riders, but Van Pool riders get $ 1.281 million; Share-a-Ride users get $.221 million; and $.154 million accrues to AnchorRIDES clients. These benefits include savings from reduced vehicle-operating and ownership costs (including parking), reduced taxi fares, reduced cost of providing rides to family members and others (chauffeuring) and the reduced likelihood of injury in a traffic accident. The calculation of these benefits takes into account and nets out the cost associated with the longer elapsed time of many of the trips using the People Mover system.

Table IV.1. Anchorage People Mover: User Benefits in 2004 (million $)

	Total	Bus	Anchor-RIDES	Van Pool	Share-A-Ride
Total	**$8.428**	**$6.772**	**$.154**	**$1.281**	**$.221**
Vehicle cost savings	$3.929	$2.829	0	$.853	$.248
Chauffeuring savings	$1.481	$1.061	0	$.326	$.095
Taxi fare savings	$3.880	$3.670	$.189	0	$.021
Parking cost savings	$.654	$.466	$.006	$.141	$.041
Traffic accident savings	$.064	$.046	-$.001	$.019	-$.001
Pain and suffering savings	$.940	$.682	-$.015	$.276	-$.003
Added time cost	-$2.519	-$1.982	-$.025	-$.333	-$.179

IV.A. Vehicle Owning and Operating Cost Savings

The People Mover bus fare at the time of this report was $1.50 for a single ride and $3 for a day pass of unlimited trips.[23] The Public Transportation Department also sells monthly passes and discounted passes to seniors and people with disabilities. Employee incentive programs and the U-Pass program also offer discounted fares. After accounting for these discounts, the average fare paid by users of the bus amounts to about 16 cents per passenger mile.[24]

If not using the transit system, riders traveling in single-occupancy vehicles would be incurring vehicle owning and operating expenses (both “riders by choice” and “transit-dependent”). Their savings from using transit are calculated as the savings per vehicle

[22] This is the total after netting out the transit fares that passengers pay.
[23] At the time of this report, the fare for a single ride was about to be increased to $1.75 to reflect the higher costs of diesel fuel.
[24] People Mover Operations Records, May 2005 and estimates of average trip length from March 2005 On-and-Off Survey (see Table 21).

mile of avoided private vehicle travel times the number of vehicle miles of avoided travel.

The American Automobile Association provides a detailed breakdown of vehicle ownership and operating costs by type of vehicle and miles driven. The average cost of operating a car in 2005 varied between 12 cents to 17 cents per vehicle mile. The average ownership cost was between 36 cents to 48 cents per vehicle mile. The combined total varied from 48 cents to 64 cents. We combined the figures for average cars and for SUVs in this analysis to reflect the prevalence of SUVs and trucks in Anchorage. The average of these two categories was 16 cents per mile for operating costs and 44 cents per mile for ownership costs—a total of 60 cents per mile. We adjusted this average upward by 10 percent to reflect the higher cost of living in Anchorage compared to the U.S. average.[25]

Table IV.2. 2005 Vehicle Operating and Ownership Costs

	Medium Car (a)	Large Car (b)	Luxury Car (c)	Average Car (d)	SUV (e)	Van (f)
Total Cost per Mile (cents per mile)	**47.6**	**57.2**	**63.4**	**56.1**	**63.8**	**55.3**
Operating costs	**12.1**	**15.0**	**15.2**	**14.1**	**17.0**	**15.2**
Gas and oil	6.9	8.5	9.3	8.2	10.8	8.9
Maintenance	4.7	5.8	5.4	5.3	5.3	5.7
Tires	0.5	0.7	0.5	0.6	0.9	0.6
Ownership costs	**35.5**	**42.2**	**48.2**	**42.0**	**46.8**	**40.1**
Annual Cost	$7,142	$8,580	$9,509	$8,410	$9,574	$8,293
Ownership cost	$5,327	$6,330	$7,229	$6,295	$7,024	$6,013
Full-coverage insurance	$1,456	$1,195	$1,212	$1,288	$1,389	$1,130
License, registration, taxes	$333	$390	$445	$389	$435	$389
Depreciation (15,000 miles annually)	$2,985	$4,005	$4,647	$3,879	$4,300	$3,755
Financing (10% down; loan @ 6% for 5 years)	$553	$740	$925	$739	$891	$739
Operating cost	$1,815	$2,250	$2,280	$2,115	$2,550	$2,280

Notes: Ownership cost per mile based on 15,000 miles per year.
(a) 2004 Chevrolet Cavalier LS
(b) 2004 Ford Taurus SEL Deluxe
(c) 2004 Mercury Grand Marquis LS
(d) Average for medium, large, and luxury car
(e) 2004 Chevrolet TrailBlazer LS6-cyl. (4.3 liter) 2WD 4-door sport utility
(f) 2004 Dodge Caravan SE6-cyl. (3.0 liter) passenger van

Source: American Automobile Association, Your Driving Costs in 2005
http://www.aaawa.com/news_safety/pdf/Driving_Costs_2005.pdf

A partial offset to the vehicle ownership and operating costs for riders is the transit fare. After accounting for the fare and adjusting for vehicle occupancy and length of trip, the net savings per vehicle mile traveled varies by type of transit chosen and the

[25] At prevailing gas prices in 2005, the share of the total cost of owning and operating a car that could be attributed to gasoline was only between 10 and 15 percent of the total.

mode of travel that it replaces. The savings is 50 cents per mile traveled for a bus rider switching from a single-occupancy car.

Table IV.3. User Cost Savings (per vehicle mile traveled)

	Cost by Mode		Net Saving from Switch to Transit		
	Total Cost		**Bus**	**Van Pool**	**AnchorRIDE**
Taxi	$2.44		$2.28	$2.30	$1.77
Car	$ .66		$ .50	$ .52	-$ .01
Bus	$ .16			$ .02	-$ .51
Van	$ .14		-$ .02		-$ .53
AnchorRIDE	$ .67		$ .51	$ .53	

Net savings is the difference in cost before and after switch to transit.

IV.B. Avoided Chauffeuring Costs

We estimate that, without the bus system, riders would make about .940 million trips in a car with others (a high-occupancy vehicle averaging 2.4 persons per trip). Many of these trips are chauffeuring trips where the driver is providing a ride to children, other relatives, friends, and others. If we assume that half of these high-occupancy trips are chauffeured trips,[26] then the bus system would be displacing about .470 million chauffeuring trips involving a driver and a passenger. If each of those cars had made a trip of 4.5 miles, the total avoided vehicle miles from reduced chauffeured trips would be 2.1 million vehicle miles.

The savings from fewer chauffeuring trips is the same per vehicle mile traveled as the user savings for transit users replacing trips in single-occupancy cars.

For trips on the van pool system that replace trips in high-occupancy vehicles, we assume that half of those trips still occur.

IV.C. Taxi Fare Savings

Transit replaced .358 thousand trips by taxi which cost $2 for the flag drop and $2 for each additional mile.[27] This equals $2.44 per passenger mile for an average 4.5-mile trip compared to $.16 cents for the bus for a savings of $2.28 per vehicle mile traveled. Multiplying this vehicle-mile-traveled figure by the number of miles of taxi travel substituted for transit results in a saving of $3.7 million for the bus system.

[26] Litman (2004), page 25.
[27] At the time of this report, taxi companies in Anchorage had proposed a fare increase to cover the increasing cost of gasoline.

IV.D. Parking Cost Savings for Users

Fewer cars on the road reduce the need for infrastructure devoted to parking. There are many types of parking facilities in Anchorage that collectively cost about $400 million each year in land costs as well as construction, operations, and maintenance. These facilities include everything from multi-level parking garages downtown, to parking lots in shopping malls, and residential driveways and garages. Most downtown streets, residential streets, and non-arterial streets have on-street parking along the sides of the road.

Land costs include the cost of buying, leasing, or renting the land for parking as well as the opportunity cost of public and private land devoted to parking. The cost varies substantially across areas of the city depending on zoning, density of development, and surrounding commercial and residential development.

Construction costs include the costs of designing and planning parking structures and other facilities as well as the costs of materials and labor for building parking structures. Multi-leveled parking structures are the most expensive and on-street surface parking is the least costly.

Maintenance and operations costs include a variety of activities dependent on the type of facility. On-street parking requires street sweeping and snow removal. Parking lots and parking garages have costs associated with security, electricity, salaries for cashiers, insurance, structural maintenance, and management of the facilities.

Table IV.4. shows that land, construction, and operations and maintenance costs per parking space vary by facility type and location from a low of $256 per space for on-street parking to as much as $2,632 per space for underground parking. Typical downtown parking costs can vary from $1,200 per space for an on-street parking space to more than $1,700 per space for a multi-level parking structure.[28]

[28] Litman (March 2005), page 5.4-2 and Victoria Transportation Policy Institute, Parking Cost, Revenue, and Pricing Model, 2002.

Type of Facility	Annualized Land Cost	Annualized Construction Costs	Annual O & M Costs	Annual Property Taxes	Total
Suburban, On-Street	$20	$149	$105	$2	$276
Suburban, Surface, Free Land	$0	$149	$105	$2	$256
Suburban, Surface	$45	$149	$105	$2	$301
Suburban, 2-Level Structure	$23	$595	$210	$9	$836
Urban, On-Street	$99	$198	$158	$3	$458
Urban, Surface	$206	$198	$158	$3	$565
Urban, 3-Level Structure	$69	$793	$263	$12	$1,136
Urban, Underground	$0	$1,982	$368	$29	$2,379
CBD (central business district), On-Street	$793	$248	$210	$4	$1,254
CBD, Surface	$1,525	$248	$210	$4	$1,986
CBD, 4-Level Structure	$381	$991	$315	$14	$1,702
CBD, Underground	$0	$2,181	$420	$32	$2,632

Table IV.4. Estimates of Annual Cost per Parking Space (2004 dollars)

Source: Litman (March 2005), page 5.4-2 and VTPI online Transportation Demand Management Model Parking Cost Model. See Appendix E for detailed description of these calculations.

We have approximated the number of parking spaces in Anchorage to be 1.144 million, based on the number of private automobiles and pickup trucks in the city—.229 thousand—and several national studies that relate the number of vehicles to the number of parking spaces.[29] Our estimate includes about 230 thousand off-street parking spaces at residences, including driveways and residential garages. There are another 460 thousand off-street parking spaces at malls, schools, businesses, and government buildings. In addition, there are about 460 thousand on-street parking places along the streets of the city. If Anchorage has about one million parking spaces city wide, then the total acreage devoted to parking is approximately eight thousand to nine thousand acres of land, based on estimates of 130 parking spaces per acre in downtown areas, 120 in urban areas, and 110 in suburban areas.

Total vehicle miles traveled in Anchorage each day is 4.667 million. Spreading the total cost of parking over the total number of vehicle miles traveled for a year yields an estimate of 24 cents as the average annual cost of parking per vehicle mile traveled (VMT).

The bus system reduces the number of vehicle miles traveled in a year (excluding taxis) by 7.76 million.

[29] Delucchi (1991), the National Research Bureau Shopping Center Database (1986), and Litman (2005). Litman (2005) estimates there are currently about three off-street parking spaces per vehicle in suburban areas of the country, consisting of two non-residential parking places and one residential place. In addition, he estimates about two on-street parking spaces per vehicle in urban areas. The number of urban parking spaces per vehicle is lower because more vehicles share parking spaces in urban areas.

Table IV.5. Estimates of Parking Costs in Anchorage (2004 dollars)

Type of Parking	Spaces per Vehicle	Total parking Spaces	Average Cost per Parking Space	Total Annual Costs of Parking Spaces	Cost per Annual VMT
Residential off-street in driveway or garage	1	228,861	$256	$58,550,212	$0.03
Off-street surface parking at malls, commercial, and government buildings	2	457,722	$301	$137,721,881	$0.08
On-Street parking in down town urban areas and residential streets	2	457,722	$458	$209,511,451	$0.12
Total	**5**	**1,144,305**	**$355**	**$405,783,543**	**$0.24**

Delucchi (1991), Mark Delucchi, Annualized Social Cost of Motor-Vehicle Use in the U.S. 1990-1991, Vol. 6, Institute of Transportation Studies, 1997, Table 6-A.1, quoted in Litman (March 2005), p 5.4-5. Costs per space from Litman, page 5.4-6 and Victoria Transportation Policy Institute, online Transportation Demand Management Model.

Note: This table assumes there are 228,861 private autos and pickup trucks in Anchorage and there are 4,667,000 vehicle miles traveled per day.

Drivers rarely recognize the full cost associated with the provision of parking facilities because most of the costs are not "out of pocket" expenditures, and a large share of the costs are paid by the community as a whole (external to the users). This is explained by Donald Shoup in "High Cost of Free Parking" (Shoup 2005):

> "If drivers don't pay for parking, who does? Everyone does, even if they don't drive. Initially the developer pays for the required parking, but soon the tenants do, and then their customers, and so on, until the cost of parking has diffused everywhere in the economy. When we shop in a store, eat in a restaurant, or see a movie, we pay for parking indirectly because its cost is included in the prices of merchandise, meals, and theater tickets. We unknowingly support our cars with almost every commercial transaction we make because a small share of the money changing hands pays for parking. Residents pay for parking through higher prices for housing. Businesses pay for parking through higher rents for their premises. Shoppers pay for parking through higher prices for everything they buy. We don't pay for parking in our role as motorists, but in all our other roles—as consumers, investors, workers, residents, and taxpayers. Even people who don't own a car have to pay for "free parking."[30]

[30]Shoup (2005), page 2.

The parking costs borne directly by users (internal costs) include fees at parking meters and parking garages as well as the less obvious costs of construction of garages attached to residences. One study suggests that between 10% and 50% of parking costs are borne directly by users.[31] Another estimates the share at between 29% and 56%.[32] We assume users pay 25% of the costs associated with parking and that the community at large pays the remaining 75%. The savings to users is reported in this chapter while the savings to the community is presented with other community benefits.

IV.E. Traffic Accident Costs Savings for Users

Fewer cars on the road reduce the number of traffic accidents and the many costs associated with those accidents, summarized in Table IV.6.

Table IV.6. Components of Traffic Accident Costs

Type of Cost	Definition
Medical Costs	The cost of all medical treatment associated with motor vehicle injuries including that given during ambulance transport. Medical costs include emergency room and inpatient costs, follow-up visits, physical therapy, rehabilitation, prescriptions, prosthetic devices, and home modifications.
Emergency Services	Police and fire department response costs.
Vocational Rehabilitation	The cost of job or career retraining required because of disability caused by motor vehicle injuries.
Market Productivity	The present discounted value (using 4 percent discount rate for 2000 dollars) of the lost wages and benefits over the victim's remaining life span.
Household Productivity	The present value of lost productive household activity, valued at the market price for hiring a person to accomplish the same tasks.
Insurance Administration	The administrative costs associated with processing insurance claims resulting from motor vehicle crashes and defense attorney costs.
Workplace Costs	The costs of workplace disruption that is due to the loss or absence of an employee. This includes the cost of retraining new employees, overtime required to accomplish work of the injured employee, and the administrative costs of processing personnel changes.
Legal Costs	The legal fees and court costs associated with civil litigation resulting from traffic crashes.
Travel Time	The value of travel time delay for persons not involved in traffic crashes, but delayed in the resulting traffic congestion from these crashes.
Property Damage	The value of vehicles, cargo, roadways, and other items damaged in traffic crashes.

Source: L. Blincoe, A. Seay, E. Zaloshnja, T. Miller, E. Romano, S. Luchter, R. Spicer, *The Economic Impact of Motor Vehicle Crashes*, National Highway Traffic Safety Administration, U.S. Department of Transportation, 2002.

---

[31] ECONorthwest and PBQD (2002), page II-52.

[32] Litman (March 2005), page 5.4-13. Litman estimates residential parking costs of $100 to $1000 per vehicle per year (page 5.1-12) and he estimates internal parking costs at about 5 cents per vehicle mile. This is based on an average automobile residential parking space estimated to cost $600 per year, or 5 cents per mile for a vehicle driven 12,000 miles per year. One of these off street parking spaces is assumed to exist for each automobile. This is the cost of building and paying for a garage as part of a house. Litman offers the range of 3 cents to 8 cents per vehicle mile traveled for internal parking costs.

According to the Alaska Traffic Crash Annual Report, Anchorage experienced about 8,600 traffic accidents in 2002, involving 16,000 vehicles and 25,000 people.[33] Using national estimates of costs per accident, the total cost of traffic accidents in Anchorage amounted to about $51 million that year.

Table IV.7. Number and Average Cost of Traffic Accidents in Anchorage

	Type of Collision				
	Property Damage	**Minor Injury**	**Major Injury**	**Fatal**	**Total**
Number of Collisions					
Total	5,908	2,357	288	32	8,585
Vehicles Involved	13,329	2,811	294	33	16,467
Persons Involved	20,959	3,615	343	34	24,951
Cost per Collision	**Cost per vehicle**	**Cost per person**	**Cost per person**	**Cost per person**	
Medical	$0	$1	$2,611	$17,140	
Emergency Services	$34	$24	$106	$233	
Market Productivity	$0	$0	$1,919	$27,443	
Household Productivity	$52	$36	$627	$8,032	
Insurance Administration	$127	$88	$813	$7,579	
Workplace Costs	$56	$37	$276	$2,142	
Legal / Court	$0	$0	$165	$5,464	
Travel Delay	$881	$848	$852	$928	
Property Damage	$1,628	$1,118	$4,217	$4,337	
Total	$2,778	$2,152	$11,586	$73,299	

Sources: Cost per person and cost per vehicle from Blincoe et al (2002), adjusted to 2004 dollars using the U.S. CPI. Total persons and vehicles (the count of "vehicles" includes bicycles and pedestrians) involved in accidents from 2002 Alaska Traffic Collisions from Alaska Department of Transportation and Public Facilities.

Spread out over all the vehicle miles traveled that year, this was a cost of about $0.03 per vehicle mile traveled (VMT).[34]

Both cars and buses are involved in traffic accidents, and because a bus is larger than a car, the cost of an accident involving a bus can be greater than a car even if it is moving more slowly. On the other hand, because buses are larger, they can potentially protect passengers better than cars in the event of an accident.

[33] Alaska Department of Transportation and Public Facilities, *2002 Alaska Traffic Collisions*, 2004.
[34] This estimate does not include the regular costs associated with traffic control which are included in the community chapter as part of traffic services.

Table IV.8. Total Cost of Traffic Accidents in Anchorage					
	Type of Collision				
	Property Damage	**Minor Injury**	**Major Injury**	**Fatal**	**All Types**
Total	**$36,988,687**	**$7,780,475**	**$3,974,103**	**$2,492,170**	**$51,235,435**
Medical	$0	$3,966	$895,509	$582,771	$1,482,245
Emergency Services	$452,863	$87,243	$36,498	$7,907	$584,511
Market Productivity	$0	$0	$658,086	$933,067	$1,591,153
Household Productivity	$686,599	$130,864	$215,223	$273,091	$1,305,777
Insurance Administration	$1,694,584	$317,247	$278,812	$257,687	$2,548,330
Workplace Costs	$745,033	$134,830	$94,819	$72,842	$1,047,523
Legal / Court	$0	$0	$56,440	$185,778	$242,218
Travel Delay	$11,730,614	$3,065,396	$292,357	$31,554	$15,119,921
Property Damage	$21,678,993	$4,040,930	$1,446,360	$147,474	$27,313,756
Average Cost per Vehicle Mile Traveled	$0.023	$0.005	$0.002	$0.002	**$0.032**
Sources: Vehicle Miles Traveled (VMT) from Alaska Traffic Volume Monitoring System Annual Traffic Volume Report 2001-2003. Total VMT from this report for Anchorage is about 1.6 billion. VMT on major arterials is less than 300 million VMT annually according to the Texas Transportation Institute, 2004 Urban Mobility Report.					

Table IV.9. compares the fatality rates for different types of transport. The fatality rate per vehicle mile traveled is greater for bus than for automobile, but because buses generally carry more passengers, the fatality rate per passenger mile traveled by bus is half that of automobiles.

Table IV.9. U.S. Nationwide Transport Fatalities in 2001									
	Fatalities				**Occupants**		**Fatalities Rate per Billion Miles Traveled**		
User	**User**	**Others**	**Total**	**Vehicle Miles Traveled (billions)**	**Average Occupants per Vehicle**	**Passenger Miles Traveled (billions of miles)**	**User**	**Others**	**Total**
Automobiles	**20,320**	**3,279**	**23,599**	**1,628**	**1.59**	**2,589**	**7.9**	**1.3**	**9.1**
Motorcycle	3,197	19	3,216	9.6	1.1	10.6	303.0	1.8	303.4
Light Trucks	11,723	3,368	15,091	943	1.52	1,433	8.2	2.3	10.5
Heavy Trucks	708	4,189	4,897	209	1.2	251	2.8	16.7	19.5
Intercity Bus		45	45	7.1	20	142	0.3	NA	0.3
Commercial Air	NA	NA	NA	NA	NA	NA	0.3	NA	NA
Transit Bus	**11**	**85**	**96**	**1.8**	**10.8**	**19**	**0.6**	**4.4**	**5.1**
Heavy Rail	25	6	31	0.591	24	14	1.8	0.4	2.2
Commuter Rail	1	77	78	0.253	37.7	9.5	0.1	8.1	8.2
Light Rail	1	21	22	0.053	26.8	1.4	0.7	14.8	15.7
Pedestrians	4,901	0	4,901	24.7	1	25	198.0	NA	196.0
Cyclists	732	0	732	8.9	1	8.9	82.2	NA	82.2
Source: Quoted by Litman (2004) page 35 from BTS Tables 2-1 and 2-4 and APTA and TRB (2002).									

Another report on traffic accident costs also finds that the total cost of a bus accident is higher, with a higher external cost overriding a lower internal cost (Table IV.10.).[35] The average cost of a traffic accident per vehicle mile for automobiles from this model—$0.13—is higher than estimates of the average collision costs per vehicle mile for all vehicles calculated for Anchorage as a whole ($0.03 per VMT). This report estimates that a diesel bus imposes about six times greater external costs than an individual car. In contrast, the internal costs of bus collisions are only one-third the internal costs of the automobile.

Table IV.10. Traffic Accident Costs Per Vehicle Mile Traveled (VMT) (2004 dollars)

Source	Automobiles	Diesel Bus
Litman		
Internal Crash Peak Travel Time	$0.09	$0.03
External Crash Peak Travel Time	$0.04	$0.24
Total Peak Travel Time	$0.13	$0.27
Based on Anchorage Traffic Crashes	$0.03	NA

Source Litman (March 2005) page, 5.3-28, Victoria Transportation Policy Institute online TDM model.

If we extrapolate to injuries and property damage, we can estimate that the traffic accident cost per VMT for buses are between 2 and 3.6 times that of automobiles. We assume 2.5. This figure is used to generate an estimate of the savings in reduced traffic accidents net of the increase due to bus traffic.

The savings from reduced traffic-accident costs is shared between transit users and the overall community. Table IV.11. shows that drivers and passengers bear most of the costs of lost productivity attributable to crashes. Many of the other costs of crashes are borne by federal and state governments and insurance policy holders. We assume one-third of the savings accrues to users and the rest to the community. The community savings is included in the analysis in the chapter on community benefits.

[35] Litman (March 2005), page 5-3-1 through 5-3-31 and Victoria Transportation Policy Institute, Transportation Demand Model.

Table IV.11. Source of Payment for Traffic Collisions by Cost Category

	Community				Users
Category	**Federal**	**State**	**Insurer**	**Other**	
Medical	14%	10%	55%	6%	15%
Emergency Services	4%	76%	15%	2%	4%
Market Productivity	16%	3%	41%	2%	38%
Household Productivity	0%	0%	41%	2%	57%
Insurance Administration	1%	1%	99%	0%	0%
Workplace Costs	0%	0%	0%	100%	0%
Legal/Court	0%	0%	100%	0%	0%
Travel Delay	0%	0%	0%	100%	0%
Property Damage	0%	0%	65%	0%	35%

Source: Blincoe et al., 2002.

IV.F. Pain and Suffering

In addition to their direct economic costs, traffic accidents also cause pain and suffering for the victims. A national study, *Economic Costs of Vehicle Crashes 2000*, prepared for the National Highway Traffic Safety Administration, presents a method for valuing the pain and suffering and loss of life associated with traffic accident injuries and fatalities based on "quality-of-life years" (QALY) lost.[36] That study determined the loss of QALYs based on the duration and severity of health problems resulting from accidents. The dollar cost of the loss is based on the amount that individuals would be willing to pay to avoid the associated pain, suffering, and loss of life. Based on these estimates, minor injuries have a cost to individuals and their families of about $4,000 per person, major injuries cost $383 thousand per person on average, and loss of life imposes costs of pain and suffering of $2 million.

If we apply those estimates to the number of injuries and fatalities due to traffic accidents in Anchorage, we calculate the total cost of loss of quality of life associated with injures is about $147 million annually and the cost of loss of life is about $81 million for a total of $229 million, or 14 cents per vehicle mile traveled.

Table IV.12. Pain and Suffering Cost of Traffic Accidents in Anchorage

	Minor Injury	**Major Injury**	**Fatal**	**Total**
Persons involved	3,615	343	34	24,951
Costs per person	$4,455	$383,446	$2,389,179	$9,172
Total Cost	$16,104,825	$131,521,978	$81,232,086	$228,858,889
Cost per VMT	$0.010	$0.082	$0.050	$0.142

Sources: Cost per person and cost per vehicle from Blincoe et al (2002). Total persons involved in accidents from Alaska Traffic Collisions 2002. Total Vehicle Miles Traveled of 1.612 from Alaska Traffic Volume Monitoring System.

[36] Blincoe et al (2002). The "QALY" method they use is similar to that used to estimate the cost of different diseases, cancers, and physical disabilities to degradation in quality of life.

IV.G. Cost of Time

Riding the bus takes longer than driving a car to the same destination and this is a cost of transit to users that must be subtracted from other categories of user benefits. We measure this cost to users as the amount they would be willing to pay to avoid the additional time spent on travel when taking transit compared to their best, and quicker, alternative. This amount varies by trip type, congestion conditions, mode of travel, and the attitudes of individual riders.

Most travel time is spent in a vehicle, and the distance of travel and the average speed of the vehicle are the main determinants of the time spent traveling.[37] Transit typically moves more slowly than cars due to bus stops to let passengers on and off the bus. The average speed of buses on Anchorage streets is about 19 miles per hour.[38] However, these travel speeds vary substantially across different areas of the Municipality depending on speed limits and traffic conditions. The Anchorage Congestion Management "Status of the System" reports travel speeds by automobiles along major bus routes range from 25 to 35 miles per hour. We assume the average speed for automobiles along the routes commonly used by buses to be 30 miles per hour.

When riding the fixed-route bus system, riders are often diverted from the direct route to their destination. Depending on the route and the desired destinations, these diversion times vary substantially.

Waiting time includes the time that users wait at bus stops, wait for transfers between bus routes, wait for taxis, and wait for Van Pools or car pools to arrive. Waiting time is most substantial for bus riders who need to transfer between bus routes to get to their final destination. The improved transit services have coordinated bus trips at the downtown, Muldoon, and Dimond transit centers. This has reduced the waiting time for transfers at the bus center. Reduced headway times have also decreased the waiting time at bus stops and for transfers.

Finally, all modes of transport require some walking time. We assume that the average walking time per trip for automobiles is about one minute at start and finish. Walking times for bus trips are substantially longer. The 2001 People Mover On-Board survey estimates the median walking time is five minutes to reach the bus stop.[39] We assume that the walking time to the destination after disembarking from the bus is half as long. These walking times convert to a little more than one minute per passenger mile traveled for an average transit trip.[40]

---

[37] We assume the average speed for bicycle trips is 4.9 mph and the average speed for walking trips is 3.1 mph. These estimates are from the 2001 National Household Travel Survey, which reports a mean travel distance of 1.94 miles for bicycle trips and 0.71 miles for walking trips. The survey also reports average trip duration for bicycles of 23.8 minutes and average trip duration for walking at 16.34 minutes.

[38] The average speed is the ratio of total fleet miles divided by total revenue hours from People Mover Operations records, May 2005

[39] 2001 People Mover On-Board Survey results in People Mover Blueprint, RLS and Associates (2001), page III-10.

[40] March 2005 On-Off People Mover Bus Survey tabulations.

The People Mover On-Board Survey of 2005 found that the average time for a bus trip was 42 minutes compared to 22 minutes for a comparable trip by car.[41] The "Status of the System" Anchorage Congestion Management Study also estimated the time of a bus trip compared to auto for selected origins and destinations (Table IV.13.).[42] The ratio of bus travel time to auto travel time in that study varied from as low as 1.3 to a high of 4.5 depending on the origin, destination, and level of bus service.

Table IV.13. Comparison of Trip Duration for Bus and Automobile Trips in Anchorage (minutes)

Destination	Origin	Auto-mobile	Bus	Bus / Automobile
6th and G (Downtown)	Jewel Lake and Dimond (Southwest)	18	24	1.3
6th and G (Downtown)	Northern Lights and Aero (Northwest)	12	17	1.4
6th and G (Downtown)	Bragaw and Parsons (Mountain View)	14	20	1.4
36th and C (Midtown)	Independence and Abbott (Southeast)	11	18	1.6
36th and C (Midtown)	DeBarr and Muldoon (East)	17	28	1.6
Providence Ave and UAA Drive	Northern Lights and Aero (Northwest)	16	27	1.7
6th and G (Downtown)	Independence and Abbott (Southeast)	18	31	1.7
36th and C (Midtown)	Bragaw and Parsons (Mountain View)	17	31	1.8
Providence Ave and UAA Drive	Johns and Klatt (South)	16	30	1.9
36th and C (Midtown)	Business Boulevard Transit Center (Eagle River)	27	51	1.9
Providence Ave and UAA Drive	Jewel Lake and Dimond (Southwest)	19	36	1.9
Providence Ave and UAA Drive	Business Boulevard Transit Center (Eagle River)	21	41	2.0
Providence Ave and UAA Drive	Bragaw and Parsons (Mountain View)	11	22	2.0
Anchorage International Airport	DeBarr and Muldoon (East)	29	59	2.0
36th and C (Midtown)	Jewel Lake and Dimond (Southwest)	13	27	2.1
6th and G (Downtown)	Johns and Klatt (South)	18	39	2.2
6th and G (Downtown)	Business Boulevard Transit Center (Eagle River)	24	52	2.2
Anchorage International Airport	Business Boulevard Transit Center (Eagle River)	39	85	2.2
Anchorage International Airport	Bragaw and Parsons (Mountain View)	29	67	2.3
6th and G (Downtown)	DeBarr and Muldoon (East)	17	42	2.5
Providence Ave and UAA Drive	Independence and Abbott (Southeast)	11	29	2.6
Anchorage International Airport	Northern Lights and Aero (Northwest)	13	39	3.0
36th and C (Midtown)	Johns and Klatt (South)	13	47	3.6
Anchorage International Airport	Jewel Lake and Dimond (Southwest)	6	25	4.2
Providence Ave and UAA Drive	DeBarr and Muldoon (East)	5	21	4.2
Anchorage International Airport	Independence and Abbott (Southeast)	16	72	4.5

Includes in-vehicle times for cars and in-vehicle and transfer times for bus.

Source: Municipality of Anchorage Transportation Planning Division, Cambridge Systematics, and Rader Econometrics and Engineering (2000), page 3-21.

According to these estimates, the bus is almost as fast as a car between downtown and midtown and the immediately adjacent neighborhoods, like Turnagain, and Mountain View. Cross-town travel takes much longer on the bus than by car. The Anchorage

[41] People Mover On Board Survey, CRG Research, December 2005, p.11.
[42] Municipality of Anchorage Transportation Planning Division, Cambridge Systematics, and Rader Econometrics and Engineering (2000), Page 3-21.

"Status of the System Report" noted that "traveling by bus to the airport appears to be the most difficult." On average, it takes about 44 additional minutes to travel by bus to the airport compared to the automobile. This is due in large part to the fact that there is only one route to the airport and transfers are usually required to get there. The other major employment centers are much easier to access by bus with the downtown transit center taking an average of 16 minutes longer to access by bus; midtown, 13 minutes; and the University area, 15 minutes. On average, it takes about twice as long to travel by bus to midtown, downtown, and the University area than by automobile. The industry standard for bus travel time is 1.5 times the auto travel time."[43]

Table IV.14. summarizes our estimate of the travel time per passenger mile for different modes of transportation. We assume that on average the combined in-vehicle time, diversion time, waiting and walking time while traveling by bus is 2.5 times that of an automobile. We assume that the travel time for a Van Pool is 1.5 times that of an automobile.

Table IV.14. Trip Time by Mode of Travel (minutes per mile)

Single Occupancy Vehicle	Taxi	High Occupancy Vehicle	Walking	Bicycle	Bus
2.1	2.3	2.1	19.4	12.3	5.25

People assign a cost to time spent traveling differently, depending on the mode of travel, purpose of travel, and many other factors. Two studies reviewed the findings of various analyses as follows:[44]

- People with full-time jobs tend to be willing to pay more to reduce their time spent in travel.
- Children, retirees, and unemployed persons tend to assign a lower cost to travel time.
- The cost per minute of commuter travel time tends to increase for commutes longer than twenty minutes.
- The cost of travel time tends to be higher for driving under congested conditions.
- The cost of travel time tends to be higher for passengers under uncomfortable conditions—such as crowding or standing.
- The cost of travel time tends to be particularly high for unexpected delays.
- The cost of travel time varies by mode across individuals. Some people assign a higher cost to time spent driving and a lower cost to time spent as a transit passenger. Others have the opposite preference.

[43] Municipality of Anchorage Transportation Planning Division, Cambridge Systematics, and Rader Econometrics and Engineering (2000), Page 3-22.
[44] Litman (2005) page 5.2-2 and EcoNorthwest (2004), page II-9

- Under pleasant conditions, time spent walking, cycling, and waiting can have a low cost or even a positive value.
- Under unpleasant conditions, the cost of walking or waiting can be two to three times that of in-vehicle time.
- The cost of travel time for personal trips is between one-quarter and one-half the prevailing wage rate.

One reason the cost of time varies substantially across modes of travel and traveling conditions is that travelers perceive time spent with few restrictions on their activities at a lower cost than time spent with many restrictions. For example, an automobile driver needs to pay attention to the road and operation of the car, and this limits other tasks he could be doing. This tends to increase the perceived cost of time spent driving. Passengers have fewer restrictions on their time, and this tends to reduce the perceived cost of travel time.

"Strategies that increase transit speeds and reliability provide direct benefits to users, particularly if they provide an alternative to driving in congested conditions. Strategies that increase transit user comfort, security, and prestige can reduce perceived time costs even if they do not reduce the amount of time actually spent in travel, because they reduce travel time costs. Strategies that improve access to transit, for example, making it easier to walk or bicycle to transit stops, also reduce time costs."[45]

According to the methodologies developed in previous studies: "Estimates of the cost of time are typically linked to wage rates on the assumption that time spent traveling could be spent at work instead. This assumption is relevant to non-work as well as work trips because the implicit value of all non-work (leisure) time is affected by the opportunity to work instead. Depending on the amenities and dis-amenities associated with travel of various kinds, however, the implicit [cost] of travel time may be greater than or less than the wage."[46]

Table IV.15. summarizes alternative estimates of the scaling factors used to adjust the prevailing wage rate to measure the perceived costs of time. For this analysis we used 35% of the average wage to value time for both "transit-dependent" and "riders-by-choice" riders.[47] This results in an estimate of the cost of time spent traveling by any mode of 7 and 11 cents per minute for these two categories of rider.

Using these costs per minute of travel and the times required to travel a mile by different modes of transit, we estimate that the time cost per passenger mile for travel by bus is 26 cents greater than for travel by car.

[45] Litman (2004), page 44.
[46] EcoNorthwest (2004), page II-7
[47] People Mover On-Board Survey, CRG Research, December 2005, page 27. These average wages are $12 and $19 respectively.

Table IV.15. Alternative Estimates of Recommended Cost of Travel Time		
Time Component	**Reference**	**Value**
EcoNorthwest (2004)		
In Vehicle Personal (local)	Wage	50%
In Vehicle Personal (Intercity)	Wage	70%
In Vehicle Business	Total Compensation	100%
Excess Personal (including waiting, walking, and transfer time)	Wage	100%
Excess Business (including waiting, walking, and transfer time)	Total Compensation	100%
Litman (2004)		
Commercial Vehicle Driver	Total compensation	100%
Personal Vehicle Driver	Wage	50%
Adult Car or Bus Passenger	Wage	35%
Child Passenger under 16 years	Wage	25%
Congested travel type D		x1.33
Congested travel type E		x1.67
Congested travel type F		x2.0
Walking, cycling, or using transit in unpleasant or insecure conditions		x2 to x3

Source: Litman (2005) page 5.2-8 and EcoNorthwest (2004), and Litman (2004), page 45.
Type D represents high-density, but stable, flow. Speed and freedom to maneuver are severely restricted, and the driver or pedestrian experiences a generally poor level of comfort and convenience.
Type E represents operating conditions at or near the capacity level. All speeds are reduced to a low, but relatively uniform value.
Type F is forced or breakdown flow. This condition exists wherever the amount of traffic approaching a point exceeds the amount which can traverse it. Queues begin to form.

This additional cost to travel by bus is partially offset because the bus system allows some chauffeurs to save the time they would have spent providing rides to others.

V. SOCIAL BENEFITS

Transit is an integral component of the city's economic infrastructure and provides access to jobs, education, medical services, social services, tourist destinations, community meetings, voting, special events, and recreation that would otherwise not occur. In 2004 transit provided for nearly .700 million trips (.350 million round trips) that would not have otherwise occurred. The value of this access is $2.896 million. The transit riders who make these trips value them at $1.454 million, and the value to employers and taxpayers is $1.442 million in reduced costs associated with social safety net.

Table V.1. Anchorage People Mover: Social Benefits in 2004 (million $)

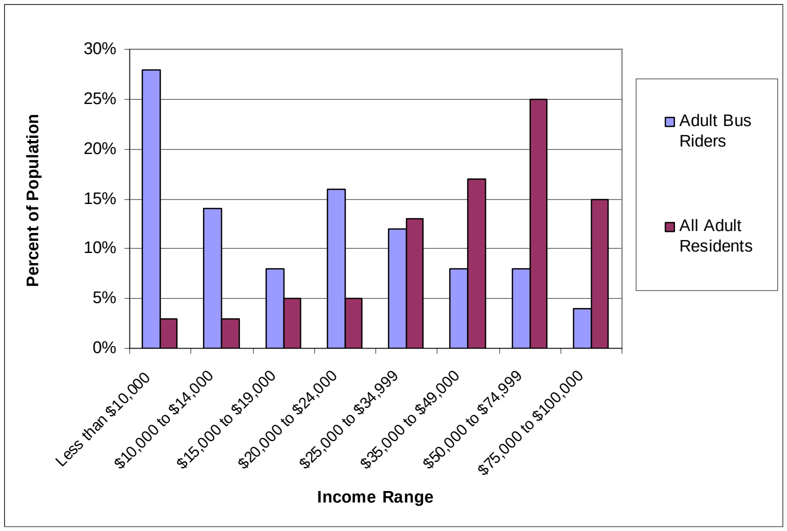
	Total	Bus	AnchorRIDES	Van Pool	Share-A-Ride
Total	**$2.896**	**$2.666**	**$.182**	**$.044**	**$.004**
Access	$1.454	$1.224	$.182	**$.044**	**$.004**
Work	NA	NA	NA	NA	NA
Social Safety Net	$1.442	$1.442	0	**0**	**0**

Transit riders on average have a lower income than the population as a whole (Figure V.1.). Many transit riders are disabled or part of the growing senior population in Anchorage. According to the American Public Transportation Association, "For America's aging population, isolation is a growing problem that severely affects this group's ability to take care of basic needs and function as contributing members of society. In addition, studies show that, as people grow older, isolation—in the form of lack of transportation access and mobility—becomes increasingly acute."[48]

"This growing elderly population also includes an increasing number of people, particularly among those over 85, with widely varying health and medical conditions that preclude driving and dramatically reduce mobility. A 2002 AARP study found that compared to people ages 50 to 74, nearly four times as many people over 85 (41% vs. 12%) had not left home the previous day. The percentage of those 85 and over who do not leave their homes at all is three times greater than in the 80-to-84 age group. Studies also demonstrate a growing dependency on transportation assistance among older individuals. Sixty percent of older Americans expect to depend on rides from friends and family when they can no longer drive. Lack of options and mobility can contribute to isolation and a lower quality of life."[49]

[48] American Public Transportation Association, *The Benefits of Public Transportation: Mobility for the Aging Population*, page 2.
[49] American Public Transportation Association, *Benefits of Transit.*

Figure V.1: Income Distribution of Residents and Adult Bus Riders



Source: People Mover 2001 Household Survey results in People Mover Blueprint, RLS and Associates (2001), page III-28

Transit provides access to a variety of community facilities and services to these and other population groups as listed in Table V.2.

Table V.2. Types of Access

Type of Access	Beneficiaries
Work	Workers benefit from increased income and improved quality of life from access to the jobs. Employers benefit from access to a larger labor pool, decreased turnover, reduced absenteeism, and reduced parking costs. The entire economy benefits from having more people working and fewer people collecting public support payments.
Social Services	Clients of social service agencies rely on the bus to get to agencies to apply for benefits, to receive services, or to collect food or aid. This improves quality of life and reduces the long-term need for higher-cost social services. The costs to these social service agencies of providing transportation would be much higher if the bus were not available.
Medical Services	Residents and visitors benefit from access to medical care. This improves quality of life and reduces long-term medical costs. The entire community benefits from improved public health. Access to hospitals and doctors' offices also reduces the costs of medical care because hospitals and doctors' offices can provide health care services at lower cost than at home health care.
Education	Students benefit from better access to schools and universities. The entire economy benefits from having more educated residents with skills to perform higher valued work in the economy. Families benefit from broader choices in which schools their children can attend.
Shopping	Residents, tourists, and instate visitors can access shopping. This improves the quality of life or the quality of their visit to city by broadening the range of shopping choices. The entire economy benefits from their spending in the local economy.
Tourism Destinations	Tourists and instate visitors use the bus to visit destinations in Anchorage.

V.A. Access

According to the 2001 On-Board survey of bus riders in Anchorage, over half of all the bus trips involve work. Another 11% of all trips involve shopping; 9% are to hospitals or doctors' offices; and 3% are going to or from college or vocational school.

According to a Wisconsin survey, trips for medical care and working are more likely to be "lost" without transit than education and shopping trips.[50] We used the results of this survey to calculate how many of the .350 million access round trips were made for different purposes and determined that the largest share was work related (Table V.4.).

Table V.3. Choice in Absence of Transit

Trip Purpose	Travel Choice	Percent of Trips
Work		
	Not be able to work	**19%**
	Adjust working hours	5%
	Work at home	3%
	Look for other job	22%
	Use alternate transportation	48%
	Other	3%
Medical		
	Not Seek Medical Assistance	**24%**
	Receive home care	6%
	Select another physician or care provider	17%
	Use alternate transportation	48%
	Other	5%
Education		
	Not be able to attend school or college	**13%**
	Miss more school or school activities	22%
	Choose another school	15%
	Use alternate transportation	48%
	Other	3%
Shopping		
	Not Shop	**0%**
	Make fewer shopping trips	37%
	Go to a different shopping center	19%
	Shop online or by catalogue	9%
	Use alternate transportation	33%
	Other	3%
Source: HLB Decision Economics, Inc. p. 9-12		

[50] HLB Decision Economics, *The Socio Economic Benefits of Transit in Wisconsin* (2003).

Table V.4. People Mover System Access Round Trips by Purpose (thousand)

				Access Trips	
	All Trips by Purpose	**Share of Trips Lost by Purpose**	**Normalized Share of Trips Lost**	**Total**	**Round Trips**
Total				**698.950**	**349.475**
Work	54%	19%	75.8%	530.024	265.012
Social Services	3%	24%	5.3%	37.195	18.597
Medical Services	9%	24%	16.0%	111.584	55.792
Education	3%	13%	2.9%	20.147	10.074
Shopping	11%	0%	0%	0	0
Tourism		0%	0%	0	0
Other	**20%**	**0%**	**0%**	**0**	**0**

2001 On Board Survey Results in People Mover Blueprint, RLS and Associates (2001), page III-12. These estimates of trips are "round-trips" that assume that a bus rider makes a single trip to a particular destination (like work) and a single return trip from the same destination. Riders actually combine trips so that a single trip on the bus may be for work and school, or work and shopping, or other multiple purposes. We do not have sufficient detailed information about how bus riders combine their trips to estimate how many trips are for multiple purposes. For this reason, these estimates of the number of round trips by purpose are only approximate.

Riders value these trips at least as much as the fare they paid to make them. Many riders value them more highly, but none value them as high as the cost of making the same trip by taxi (or car), or they would have used the taxi to make the trip in the absence of transit. The value of a trip for the average access user will be about half the difference between the bus and the taxi fare (or car cost). This is known as the "50% rule."[51]

The cost for the average bus trip is about 16 cents per passenger mile. The next-best alternative would be either auto or taxi. Assuming equal likelihood for either alternative for these riders, the weighted average cost per passenger mile over and above the bus would be $1.39, or $.70 after applying the "50 %" rule. Assuming that the best alternative for some riders would involve sharing a ride with others (1.5 passengers per vehicle), the total value of these trips to the riders above their cost is $1.224 million for bus riders. A similar calculation yields a value of $.182 million for AnchorRIDES, $.004 million for Share-a-Ride, and $.044 million for the Van Pool. This measure of "willingness to pay" is a small share of the total monetary transactions represented by these access trips—about $29 million (Table V.5.).

[51]See The Economic Benefit of Laketran Transit System on Lake County, page 14 for a full explanation. Basically the rule assumes that the average rider is willing to pay half the difference between the bus fare and the more expensive alternative.

Table V.5. Total Value of Transactions Associated with Access Trips			
	Round Trips (thousand)	**Trip Transaction Value**	**Total Transaction Value**
			$28.9
Work	225.0	$96	$25.4
Social Services	18.6	$25	$.5
Medical Services	55.8	$50	$2.8
Education	10.0	$16	$.2
Source: ISER. Education based on University tuition, medical and social services based on author's estimate.			

V.B. Work

About 76 percent all access trips by transit are work related—the equivalent of about 1,325 full time employees.[52] We have calculated the value of transit to these workers as a part of the access benefits. But employers also benefit from the use of transit by these workers.

Transit allows employers to hold down their personnel costs in several ways that they share with the community through lower prices. A larger labor pool minimizes the cost of searching for and hiring workers. Access reduces turnover, absenteeism, and the costs associated with training workers. Employees that ride the bus free up parking spaces for customers. Employers who provide transit passes to workers (in lieu of wage increases) can reduce their overall labor costs through reductions in their income tax liability.

We have not been able to quantify employer willingness to pay for these transit benefits. However, the fact that many employers provide subsidies to employees to ride the bus suggests that these benefits are real and significant. Below are some examples of the ways that particular employers—public, nonprofit, and private—value the transit system.

> **HMS Host.** This private firm provides many of the food services at the airport. Several years ago, they had problems recruiting enough workers for these airport jobs. Part of the reason was there was no regular bus service to the airport. Having a bus route to the airport has become a good selling point at job fairs to recruit new employees to fill the jobs at the airport. However, the airport is open 24 hours/day and HMS Host has many different shifts. The bus does not run late enough to accommodate late night shifts, so they arrange shifts around when employees can get there by bus. They hope they can expand some of the bus service so that

[52] The average worker rides to work 4.2 times per week. Results from 2001 On-Board Survey in People Mover Blueprint, RLS and Associates (2001), page III-30.

employees can work other shifts. For HMS Host employees, the bus is becoming an important alternative to driving to work at the airport because parking is limited and expensive at the airport. [53]

The Dimond Center Mall. An informal survey to merchants in this mall found that about 25% of employees rode the bus to work. Many of the employees at the mall are young and there is a lot of turnover in the low-wage retail jobs at the mall. The mall would like to encourage workers to use the bus because parking is limited—especially during the Christmas shopping season. However, many of the employees said they could not do this because the bus schedules do not work with the hours they need to work at the mall. [54]

The Cook Inlet Tribal Council Job Training Program. This program provides bus passes for their clients in the “Welfare to Work” and “Temporary Aid to Needy Families” programs. According to the experience of administrators in the Job Training Program, these bus passes are critical for people who are trying to get or keep jobs. Many participants in the Cook Inlet Tribal Council programs are Alaska Natives who have moved from rural areas and have no driver’s license. Having a bus pass to get to jobs, medical care, and shopping is a critical piece of helping rural Natives to adapt and to live in the urban environment. Many of their clients cannot afford a vehicle. Not having transit would be a huge barrier to their ever being able to break out of poverty. The Cook Inlet Tribal Council also does substance-abuse treatment and a percentage of that population has lost their licenses. Without transport to work, they would not be employable or able to stay employed.

Many people in their programs are single parents with children. Sometimes it is hard for these single parents to use the bus, but it is often their only option. Their clients have to take children to day care and then go to jobs using the bus. This can be very time-consuming. Taxis are not a good alternative because of their high cost. For all of these reasons, transit is an important source of transportation to their clients to get to jobs. Many of their clients look explicitly for jobs that are on the bus routes since they would not be able to get to their jobs otherwise. [55]

The Nine Star Program. This program is another good example of a job-training program that relies extensively on local public transportation. Nine Star serves about 5,000 people every year. The program provides training and tutoring in basic job skills so that their

[53] Telephone interview, Sherri Fessenden, General Manager, HMS Host, July 2005.
[54] Telephone interview, Mary Fairbanks, Marketing Promotions Director, Dimond Center, and People Mover Board Member, July 2005.
[55] Telephone interview, Molly Meritt-Duran, Director of Job Training Program, Cook Inlet Tribal Council, July 2005.

clients are able to work. They also provide job-placement services and are part of the state job center network. They work with the Division of Vocational Rehabilitation, local businesses, and the Alaska Department of Labor job center to place local residents in jobs. They also work with local employers such as Carrs-Safeway, HMS Host, Providence Hospital, Alaska Regional Hospital, and local hotels to recruit employers and match their jobs with available workers.

The Nine Star program has several groups of people who ride the bus on a regular basis. They have students relying on transit to come to nine different training centers in the Municipality. They also have clients going to jobs at the airport—Host Marriott, Sky Chefs, and Alaska Airlines. They also work with seniors (who often have a physical disability) to help them use the bus and find the appropriate route to take to work, shopping, or medical services. They work extensively with AnchorRIDES to shuttle clients to the Nine Star locations and to get clients to jobs. Nine Star spent about $56,000 in 2004 to provide bus passes to clients. [56]

Division of Vocational Rehabilitation in the Alaska Department of Labor. This agency trains and counsels people so that they have the job skills to work in the local economy. In 2004, they helped put 517 people to work and worked with over 400 employers. Many of their client referrals come from physicians, job centers, mental health centers, treatment centers, VA, and word of mouth. Most of their clients are low-wage workers ($12.72 per hour is the average for all their clients). The Division of Vocational Rehabilitation buys bus passes for many of their clients who do not have a driver's license or cannot afford a car or the cost of taxis to get to work. In 2005, the division spent about $20,000 to buy bus passes for 166 clients. [57]

V.C. The Social Safety Net

Transit reduces the public service costs associated with unemployment. Without bus service, workers that rely on the bus to get to work would be jobless and impose costs on the community in the form of unemployment insurance payments and various forms of public assistance. We estimate the local savings in reduced public service costs to be $1.442 million based on the savings in unemployment insurance payments because transit allows these individuals to be working.

[56] Telephone interview, David Alexander, President, Nine Star, July 2005.
[57] Telephone interview, Jane McIntosh, Chief of Research and Program Evalulation, State of Alaska, Division of Vocational Rehabilitation, July 2005.

The average unemployment benefit is about $2,176 per year.[58] This cost is borne by employers and passed on to consumers as higher prices. We assume the benefit for transit riders with no options for getting to work to be half that amount.

Food stamp payments, a federal program, pays about $1,770 per person annually to a family of four in urban areas of Alaska.[59] Adult public assistance, a state funded program, provides benefits to the average client family of four of about $3,640 a year.[60] The Temporary Assistance for Needy Families Program (TANF), which is a joint federal state funded program, also provides assistance to needy families with children.

Savings from reduced payments for food stamps accrues to the federal government. Savings from reduced payments for adult public assistance and temporary assistance to needy families accrues to the state. Because these benefits are not captured locally in Anchorage as reduced taxes, we do not include them in our benefits calculation. Some of these benefits may indirectly return to the community as lower state and federal taxes or increased service levels for other programs.

V.D. Other Social Benefits not Quantified

Public Service Agencies

Public service agencies rely on the transit system to provide transportation for clients to get to services and jobs. Without transit, these agencies would, in some instances, rely on higher-cost transportation, like taxis, private vans, or automobiles to provide the same transportation to their clients. This benefit from the availability of the lower cost transit alternative has been captured in the calculation of the access benefits already presented above. However the access also reduces the long-term need for these services by increasing the availability of preventive services and early interventions. We have not attached a value to this benefit.

Health Care

Improvements to access to health care providers tends to reduce the total cost to the community of health care because interventions occur earlier, thus reducing the total ultimate cost of some medical conditions. Much of this savings accrues to Medicare, Medicaid, and the Indian Health Service, and indirectly to state and federal taxpayers. We have not attached a value to this benefit.

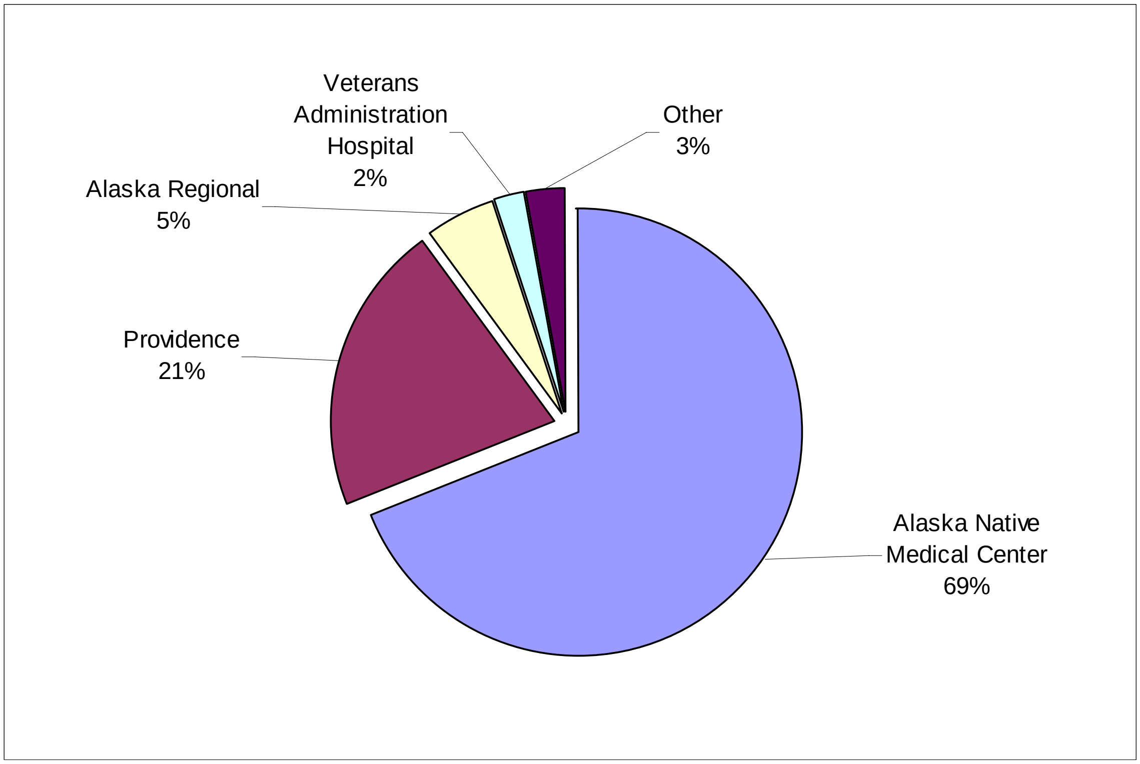
---

[58] According to the Alaska Department of Labor, March 2003 Trends article, “Unemployment Insurance Claimants,” the State of Alaska paid out $117.5 million in unemployment claims in 2001 to 53,999 claimants. This amounts to an average of $2,176 per claimant in 2001. The Department of Labor has not published more recent information.

[59] The monthly food stamp benefit for a family of four in urban areas of Alaska is $590 per month. (from Alaska Department of Health and Social Services website). The average benefit per person for one year is about $1770 ($1770 = $590 per month * 12 months / 4 people).

[60] According to the Alaska Department of Health and Social Services, the State of Alaska served 15,859 adults per month in the Adult Public Assistance Program in 2004. In that year, they distributed a total of $57.7 million in benefits to these recipients. This averages to about $3,640 per recipient.

Figure V.2: Percent of Hospital Trips to Each Hospital



Source: Results from 2001 On-Board Survey in People Mover Blueprint, RLS and Associates (2001), page III-14.

Education

Better access to educational opportunities also benefits the community through reduced public service costs and a more highly educated work force. In addition, bus service gives parents greater flexibility in school choice since the Anchorage School District does not provide bus service to alternate schools or for students with boundary exemptions. We have not attached a value to this benefit.

As an example, during the 2005 school year at the University of Alaska Anchorage and Alaska Pacific University, about 800 riders per day used the U-Pass program to ride the bus. This amounts to about 48,000 round trips annually.[61] The U-Pass program started about seven years ago and has successfully attracted more students and

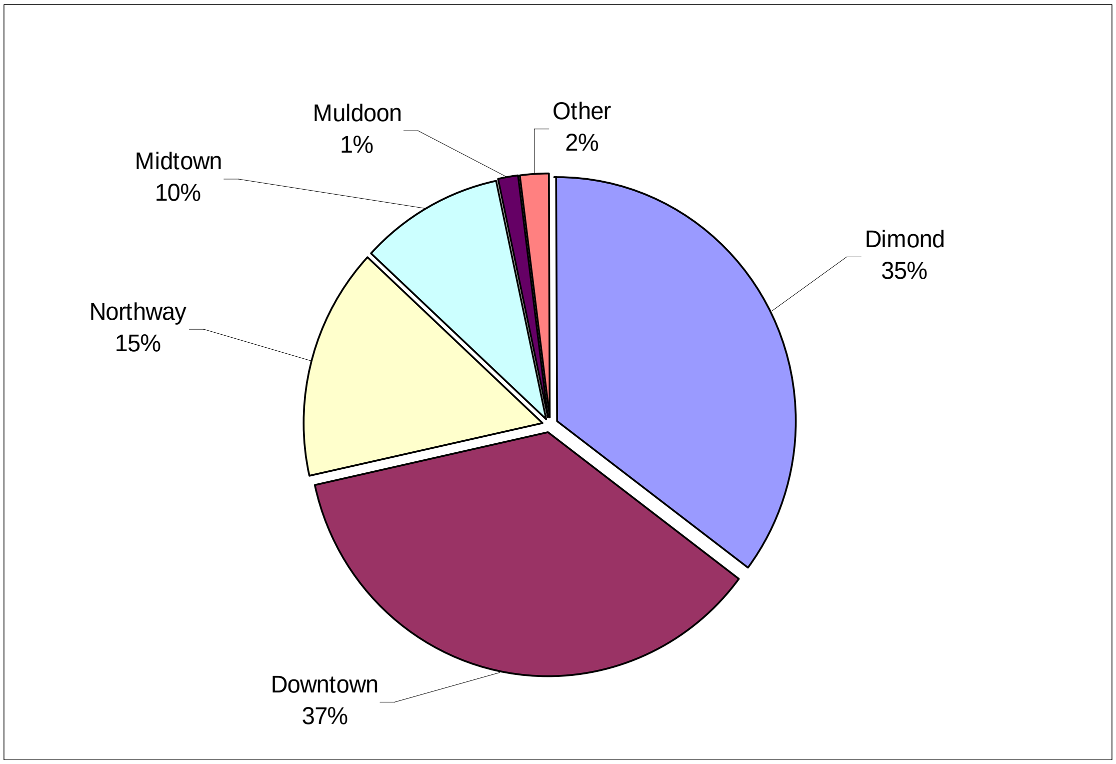
[61] 400 daily round trips = 800 daily trips / 2.
1600 Weekly round trips = 400 daily trips * 4 days of classes (Monday through Thursday).
24,000 round trips per semester = 1600 weekly round trips * 15 weeks per semester.
48,000 round trips per year = 24,000 round trips per semester * 2.

staff to ride the bus. The university hopes to expand the U-Pass system to 1,000 riders per day.[62]

Shopping

Although the data suggest that without the transit system people would continue to make the same number of shopping trips, the transit system does increase the options people have for making those trips.

Figure V.3: Percent of Shopping Trips to Areas of Anchorage



Source: 2001 On-Board survey results in People Mover Blueprint, RLS and Associates (2001), page III-15.

Visitors

Visitors to Anchorage ride the transit system for a variety of reasons including shopping, sight seeing, health care, and visiting friends and relatives. All of these visitors are “transit dependent” but we assume that they would have made just as many trips by other modes if transit were not available. As a result, the benefits they get from transit are included among the user benefits calculated in section IV of this report.

[62] Telephone interview, Ann Soper, Parking Services, UAA, July 2005.

VI. COMMUNITY BENEFITS

Transit reduces the number of cars on the road, saving the community $2.832 million in costs related to traffic crashes, traffic congestion, air pollution, traffic services, and parking facilities. Other benefits we have not quantified include improving public health, reducing energy consumption, fostering more efficient patterns of land use, and improving the quality of life.

Table VI.1. Anchorage People Mover: Community Benefits in 2004 (million $)

	Total	**Bus**	**AnchorRIDES**	**Van Pool**	**Share-A-Ride**
Total	**$2.832**	**$2.092**	**$.006**	**$.602**	**$.132**
Parking cost savings	$1.963	$1.398	$.018	$.424	$.123
Traffic services savings	$.253	$.193	.-$.003	$.052	$.010
Congestion cost savings	$.183	$.134	-$.002	$.046	$.004
Barrier cost savings	$.033	$.026	-$.002	$.008	0
Traffic accident savings	$.130	$.094	-$.002	$.040	-$.001
Air pollution savings	$.069	$.048	-$.003	$.028	-$.003
Noise pollution savings	$.002	-$.002	0	$.005	-$.002
Option value	$.200	$.200	0	0	0

These gains from reduced automobile travel benefit everyone who uses the road system, breathes the air, lives in the city, uses parking facilities, or pays taxes to build parking facilities. These benefits from reduced car trips are *externalities* because everyone in the community benefits even if they do not use the transit system.

Both cars and buses contribute to congestion, air pollution, and traffic accidents. Therefore, in calculating community benefits, we estimate the net benefits of reduced auto trips after adding in the effects of additional transit trips.

The 3.06 million vehicle miles added by the People Mover system replace 12.63 million private vehicle miles of travel every year.[63]

[63]To put these changes in vehicle miles traveled perspective, the total *daily* traffic in the entire Municipality of Anchorage is about 4.7 *million* vehicle miles. The daily volume on principle arterials is about 720,000 vehicle miles. So total annual volume in the Municipality is nearly 1.7 billion vehicle miles and total volume on principle arterials is about 263 million vehicle miles. f the traffic along only the major arterials.

Table VI.2. Vehicle Miles Traveled (VMT)—Transit and Amount Replaced (millions of miles)

	Total	Bus	AnchorRIDES	Van Pool	Share-a-Ride
Total Transit Added	**3.06**	**2.06**	**.31**	**.39**	**.30**
Total Private Replaced	**12.63**	**9.37**	**.21**	**2.36**	**.69**
Single-Occupancy Vehicle	7.48	5.64	0	1.71	.5
Taxi	1.73	1.61	.11	0	.01
High-Occupancy Vehicle	3.06	2.12	.10	.65	.19

VI.A. Parking

Having fewer cars on the road reduces the demand for parking facilities. In Section IV. we estimated that the total annual savings from reduced demand for parking was about $2.617 million. We also estimated that 75% of this savings accrued to the community at large. This savings for businesses and taxpayers from reduced land purchase, construction cost, and operations and maintenance of parking facilities and parking areas on roadways totals about $1.963 million each year.

VI.B. Traffic Services

Transit reduces the costs of traffic services for vehicles using the roadways in the municipality including traffic signals, lighting, street maintenance, ambulances, and police services. Both the Municipality and the State of Alaska provide portions of these services in Anchorage. The Municipality spent a total of $45 million in 2004 on these types of traffic services (Table VI.3.), or about 2.6 cents per vehicle mile traveled.

Table VI.3. Anchorage Traffic Services Expenditures: 2004		
Department	**Item**	**Amount**
Traffic Department		
	Administration	$324,520
	Transportation Planning	$404,530
	Communications	$1,173,710
	Traffic Engineering	$3,116,340
	Operating Cost	$5,019,100
Project Management and Engineering		
	Roads/ Drainage Project Management	$1,450,940
Police Department		
	Total Operating Cost	$56,298,520
	Estimated Road Related (20% of total)	$11,259,704
Maintenance and Operations		
	Street Maintenance Operations	$11,160,040
	Street Lighting	$3,994,010
	Street Maintenance - LRSAs	$6,506,350
Fire Department		
	Total Operating Cost	$48,234,480
	Estimated Road Related (1% of total)	$482,345
Total Traffic Service Expenditures		**$44,891,589**
	Costs per Vehicle mile traveled	**$0.026**

Source: Municipality of Anchorage, 2005 Approved General Government Operating Budget. Cost per vehicle mile traveled assumes 1.7 billion vehicle miles traveled annually from Alaska DOT&PF Annual Travel Volume Report 2004.
Note: Costs related to parking are included in the parking cost section.

This estimate of traffic service costs per vehicle mile traveled is comparable to estimates in national surveys of traffic services costs (Table VI.4) if adjusted upward for the higher cost of living in Anchorage.

Table VI.4.Traffic Services Costs Per Vehicle Mile Traveled (VMT) (2004 dollars)		
Source	**Automobiles**	**Diesel Bus**
Litman		
Peak	$0.018	$0.018
Delucchi		
Low	$0.008	$0.008
High	$0.013	$0.013
Moore and Thomas		
Low	$0.010	NA
High	$0.040	NA

Source: Litman (March 2005) page 5.8-4 and Victoria Transportation Policy Institute, online Transportation Demand Management Model. Delucchi and Moore and Thomas (1994) quoted in ECONorthwest and PBQD (2002), page II-52.

Based on these sources that suggest that the cost per vehicle mile traveled by bus and automobile is equal, we estimate a savings in traffic services (not counting parking and traffic accident savings that are counted elsewhere) of $.253 million.

VI.C. Traffic Congestion

Transit reduces the cost of traffic congestion, particularly where travel is concentrated, where volume is approaching capacity, and during peak travel times of the day.

The Anchorage Congestion Management Plan has identified particular locations where traffic volume is close to or exceeds roadway capacity (Level F).[64] Traffic congestion costs at these locations include additional travel time due to delays (over and above the travel time calculated for transit users), additional vehicle operating costs (such as additional fuel burned while sitting in traffic), and higher pollution costs (from engines idling in traffic). These costs are borne by all travelers.

Reductions in congestion along the roads can also reduce the cost of doing business in the community. Every day, there are 60,000 commercial vehicle trips by trucks, tractor-trailers, and delivery vans. This commercial traffic amounts to about 2.2 million vehicle trips per year, or about 7% of the total traffic on the roadways. We did not explicitly calculate separate commercial traffic in our assessment of benefits since transit does not directly displace commercial trips. However, transit indirectly affects these commercial trips by reducing congestion on the roadways.

[64] Cambridge Systematics (2002), page 4.2

Table VI.5. Congested Locations In Anchorage					
		Morning		Afternoon	
Location	Average Daily Traffic (ADT)	Volume / Capacity Ratio	Level of Service	Volume / Capacity Ratio	Level of Service
New Seward Hwy South of Dowling	61,820	0.55	(C)	0.76	(D)
C Street South of Dowling Rd	17,420	0.62	(C)	0.76	(D)
O'Malley Rd East of New Seward Hwy	17,098	0.52	(C)	0.76	(D)
No Lights Blvd btw UAA Dr. & Bragaw	42,500	0.48	(B)	0.77	(D)
No Lights Blvd btw Lake Otis &UAA Dr	40,526	0.48	(B)	0.77	(D)
DeBarr Rd West of Airport Heights	24,921	0.51	(C)	0.78	(D)
Minnesota Dr North of No. Lights Blvd	31,050	0.58	(C)	0.8	(D)
Tudor Rd West of Lake Otis	21,044	0.6	(C)	0.8	(D)
New Seward btw No Lights and Benson	53,585	0.56	(C)	0.82	(D)
Lake Otis Blvd btw DeBarr and 20th Ave	18,147	0.58	(C)	0.84	(D)
Tudor Rd btw Bragaw and Wesleyan	42,775	0.64	(C)	0.86	(E)
Tudor Rd btw Wesleyan and Boniface	29,770	0.65	(C)	0.87	(E)
New Seward Hwy btw Dowling & Tudor	61,330	0.63	(C)	0.88	(E)
Wisconsin St btw Lakeshore and Spenard	8,650	0.6	(C)	0.93	(E)
C Street North of Potter	17,420	0.64	(C)	0.93	(E)
Tudor Rd East of Lake Otis	50,273	0.72	(C)	0.95	(E)
Old Seward Hwy btw Dimond and 76th	21,044	0.5	(B)	0.96	(E)
Old Seward Hwy South of 68thh	22,180	0.51	(C)	1.02	(F)
Dowling btw New Seward and Lake Otis	18,840	0.74	(C)	1.04	(F)
C Street South of Tudor	23,223	0.75	(C)	1.05	(F)
Dimond Blvd btw Old Seward and King	37,731	0.48	(B)	1.06	(F)
5th Avenue East of Reeve (btw Reeve and Mt View)	38,970	0.83	(D)	1.06	(F)
5th Avenue East of Medfra (where 6th merges with 5th)	45,605	0.84	(D)	1.08	(F)
Spenard Rd North of Int'l Airport Rd	23,822	0.95	(E)	1.11	(F)
Old Seward Hwy North of Klatt	22,293	0.75	(C)	1.15	(F)

Table VI.6. summarizes several estimates of the cost of congestion per VMT (vehicle mile traveled) from national studies. The Texas Transportation Institute 2004 Urban Mobility Study estimates the congestion costs for Anchorage are $0.031 per vehicle mile traveled for all vehicles.[65] This estimate for all vehicles falls within the range of costs per vehicle mile for automobiles from both the Federal Highway Administration (FHWA) and the Victoria Transportation Policy Institute TDM model. These sources estimate that congestion costs for automobiles are between about $0.02 and $0.20 per vehicle mile traveled.

The benefits of transit in reducing traffic congestion are calculated net of the contribution to congestion made by transit vehicles themselves. Both the FHWA and VTPI estimate that diesel buses add about twice the cost per vehicle mile traveled of an average car to congestion costs.

[65] Texas Transportation Institute, 2004 Urban Mobility Study.

We used the low estimates of congestion costs per VMT for cars and buses from the Federal Highway Administration to calculate the savings from reduced congestion attributable to transit.

Table VI.6. Traffic Congestion Costs Per Vehicle Mile Traveled (VMT) (2004 dollars)

Source	Average Car	Diesel Bus
Litman		
Peak	$0.205	$0.409
Off Peak	$0.024	$0.048
Federal Highway Administration		
Low	$0.019	$0.045
Medium	$0.073	$0.150
High	$0.215	$0.442
Texas Transportation Institute		
Total congestion costs for all vehicles in Anchorage	$13,000,000	
Total Vehicle Miles Traveled in Anchorage	4,140,000	
Per Vehicle Mile Traveled in Anchorage	$0.031	

Sources: Litman, (2005), p 5.5-15, FHWA, 1997 Federal Highway Cost Allocation Study, US DOT, 1997. Texas Transportation Institute, 2004 Urban Mobility Study

VI.D. Reduction in Barriers

In addition to affecting the congestion cost for motorized traffic, transit may change the "barrier effects" imposed by motor vehicles on non-motorized traffic. The barrier effect (also called severance) refers to delays and discomfort that vehicle traffic imposes on non-motorized modes (pedestrians and cyclists). The barrier effect reflects a degradation of the non-motorized travel environment, reducing the viability of non-motorized travel, leading to shifts from non-motorized travel, with associated external costs. Rates of walking and cycling tend to be lower in automobile-oriented areas that have wide roads with high motor vehicle traffic speeds, volumes, and inadequate pedestrian facilities than in areas with more pedestrian-friendly roadway conditions.[66]

These barrier-effect costs may include several components:

- the additional costs of time to cross traffic-filled streets
- the additional costs of pedestrian and bicycle injuries from crashes with motorized vehicles
- the added costs to personal security from walking or bicycling among motorized vehicles on crowded streets
- encroachment by roadways on recreational and cultural resources

[66] Litman (March 2005), page 5.13-1 to 5.13-2. Litman clarifies, that "Severance usually refers only to the impacts of a highway facility itself, while the barrier effect refers to the combined impacts of the roadway and vehicle traffic, and so increases with traffic volumes."

- the costs to local residents living in neighborhoods divided by major roadways and high-speed traffic

Both buses and cars contribute to barrier effects. Litman (March 2005) estimates these barrier effects at between $0.005 and $0.02 per vehicle mile traveled by automobile, with the barrier effects of diesel buses being about two and one-half times greater (Table VI.7.).[67] These estimates are from surveys of particular road corridors that measure the volume of motorized traffic on a roadway and the number of non-motorized trips displaced by the traffic on the roadway.[68] Because of this, they may be an overestimate for the entire road system.

We use the low estimate of the cost of the barrier effect for automobiles, $.005 per vehicle mile traveled, and double that amount for a bus, to calculate the value of the benefit from the reduction in barrier effects produced by the transit system.

VI.E. Traffic Accidents

Having fewer cars on the road reduces the cost associated with traffic accidents. In Section IV. we estimated that the total annual savings from reduced traffic accidents was $.194 thousand. We also estimated that 66% of this savings accrued to the community at large. This savings for businesses and taxpayers from reduced medical costs, emergency services, insurance payments, lost value of productive work, delays in traffic, and property damage was $.130 million.

VI.F. Air Pollution

Transit reduces the cost associated with air pollution including cost to human health[69], reduced aesthetics (smoggy air), environmental damage, and crop damage. Motor vehicles, including buses, produce a variety of harmful air emissions as summarized in Table VI.7.

---

[67] Litman (March 2005), page 5.13-5.

[68] See, for example, the following studies cited in Litman (2005), page 5.13-3:1) Bein (1997), 2) Rintoul (undated) 3) Saellensminde (2002), 4) Grudemo (2002). These studies offer different methods for estimating the additional number of non-motorized trips that residents would take if there were no traffic or roadway obstructions in their neighborhoods. This provides a measure of the number of non-motorized trips that are displaced by roads and traffic. To estimate the dollar value of the barrier effect, the studies then place a dollar value on each of these displaced trips.

[69] For a more detailed description of the health hazards of air pollution in Anchorage, Alaska Department of Environmental Conservation, *Amendments to State Air Quality Control Program, Vol. II: Analysis of Problems, Control Actions, Section III.B: Anchorage Transportation Control Programs,* January 2004, Adrienne Ari, Stephanie Massay, Laurie McKeown, Randall Plant, Anchorage Air Quality Standard Review: Recommended Improvements to Anchorage's Existing Policies to Minimize Adverse Health Effects, Prepared for : Alaska Pure Air Council, April 21, 2003

Table VI.7. Vehicle Emission Air Pollutants				
Emission	**Description**	**Sources**	**Harmful Effects**	**Scale**
Carbon dioxide (CO2)	A by-product of combustion	Fuel production and engines	Climate Change	Global
Carbon monoxide(CO)	A toxic gas which undermines blood's ability to carry oxygen	Engine	Human health, climate change	Very Local
CFC's	Durable chemical harmful to the ozone layer and climate	Older air conditioners	Ozone depletion	Global
Fine particulates(PM_{10}; PM2.5)	Inhalable particles consisting of bits of fuel and carbon	Diesel engines and other sources	Human health, aesthetics	Regional
Hydrocarbons (HC)	Unburned fuel forms ozone.	Fuel production and engines	Human health, ozone precursor	Regional
Lead	Element used in older fuel additives	Fuel additive and batteries	Circulatory, reproductive, and nervous system	Local
Methane (CH4)	Significant “greenhouse” gas	Fuel production and engines	Climate Change	Global
Nitrogen oxides (NOx)	Various compounds Some are toxic, all contribute to ozone	Engine	Human health, ozone precursor, ecological damages	Local and Regional
Ozone (O2)	Major urban air pollution problem resulting from NOx and VOCs combined in sunlight	NOx and VOC	Human health, plants, aesthetics	Regional
Road dust	Dust created by vehicle movement.	Vehicle use	Human health, aesthetics	Local
Sulfur oxides (SOx)	Lung irritant, and causes acid rain.	Diesel engines	Human health risks, acid rain	Local and Regional
Volatile organic hydrocarbons (VOCs)	Organic compounds that form aerosols	Fuel production and engines	Human health and ozone precursor	Local and Regional
Toxics (e.g. benzene)	VOCs that are toxic and carcinogenic.	Fuel production and engines	Human Health risks	Very Local
Source: Littman (2005), p 5.10-1.				

As summarized in Table VI.8., vehicle CO emissions are the largest in total mass among all emissions. The Alaska Department of Environmental Conservation determined as part of the State Air Quality Control Program that 77% of the winter season CO (carbon monoxide) in the Anchorage are was from motor vehicles in 2002—93 tons of CO per day.[70] About 37% (25 tons) was from cold starts and the remainder (68 tons) was from on road travel. On net, buses reduce total CO pollution because diesel fuel emits less CO than gasoline burned by automobiles. However, there is also evidence that diesel buses emit more particulate matter and SOx (sulfur oxides) than automobiles. Actual emission rates are a function of the age of the fleet of vehicles and patterns of use.

[70] Alaska Department of Environmental Conservation, Amendments to the State Air Quality Control Program, Volume II: Analysis and Problems, Control Action, Section III.B Anchorage Transportation Control Program, January 2004, p. III.B.3-1.

Table VI.8. Emission Rates for Selected Modes (grams per passenger mile)						
	Occupancy	**Hydrocarbons**	**CO**	**NOx**	**SOx**	**Particulate Matter**
Automobile	1.19	4.26	34.30	2.58	0.09	0.14
Diesel bus	10	0.35	4.83	2.16	0.29	0.55
Source: Based on KPMG, GVRD Air Quality Management Plan: Stage 2 Draft Report: Priority Emission Reduction Measures, Greater Vancouver Regional District (Vancouver), May 1992, Table 5-8, p. 5-43, quoted in Litman (2005), page 5.10-13. Adjustments include an average occupancy rate of ten for buses, an occupancy rate of 1.19 for cars and 1.61 km per mile. Occupancy rate for busses from People Mover on and off survey (2002) and occupancy rate for cars from Anchorage Household Travel Survey (2002).						

Somewhat different estimates of pollutants per passenger mile come from the American Public Transportation Association. They estimate that buses produce only one-tenth the carbon monoxide emissions per passenger mile compared to automobiles.[71] Buses produce similar levels of carbon dioxide and nitrogen oxides per passenger mile and about one-sixth the level of volatile organic hydrocarbons (VOC) per passenger mile compared to cars.

Table VI.9. Average Emissions in 1999 (grams per vehicle mile and grams per passenger mile)				
Vehicle Type	**Type of Pollutant**			
	Carbon Dioxide	**CO**	**Nitrogen Oxides**	**VOCs**
Bus				
Per vehicle mile	2,387	11.6	11.9	2.3
Per passenger mile (10 passengers)	239	1.2	1.2	0.23
Automobile				
Per vehicle mile	416	19.4	1.4	1.9
Per passenger mile (1.5 passengers)	277	12.9	1.0	1.3
SUVs and Light Trucks				
Per vehicle mile	522	25.3	1.8	2.5
Per passenger miles (1.5 passengers)	348	16.9	1.2	1.7
Litman (2004) page 42, quoted from American Public Transportation Association (2002), Public Transportation National Summaries and Trends Statistics.				

Based on vehicle miles, a bus produces more carbon dioxide and nitrogen oxides than a car but less carbon monoxide (CO) and about the same level of volatile organic hydrocarbons (VOC).

The types of health-related effects of the most common pollutants are shown in Table VI.10.

[71] Litman (2004) page 42, quoted from American Public Transportation Association (2002), Public Transportation National Summaries and Trends Statistics.

Table VI.10. Human Health Effects of Common Air Pollutants

Pollutant	Quantified	Not yet Quantified	Other Possible Effects
Ozone	Mortality Morbidity Respiratory symptoms Minor RADs Respiratory RADs Hospital admissions Asthma attacks Changes in pulmonary function Chronic sinusitis and hay fever	Increased airway responsiveness to stimuli Centroacinar fibrosis Inflammation in the lung	Immunologic changes Chronic respiratory diseases Extrapulmonary effects (changes in function or structure of organs)
Particulate matter/ TSP/ Sulfates	Mortality Morbidity: Chronic and acute bronchitis Hospital admissions Lower respiratory illness Upper respiratory illness Chest illness Respiratory symptoms Minor RADs All RADs Days of work loss Moderate or worse asthma status for asthmatics	Changes in pulmonary function	Inflammation of the lung Chronic respiratory diseases other than chronic bronchitis
Carbon Monoxide	Morbidity: Hospital admissions–congestive heart failure Decreased time to onset of angina	Behavioral effects Other hospital admissions	Other cardiovascular effects Developmental effects
Nitrogen Oxides	Morbidity: Respiratory illness	Increased airway responsiveness	Inflammation of the lung Immunological changes Decreased pulmonary function
Sulfur Dioxide	Morbidity in exercising asthmatics Changes in pulmonary function Respiratory symptoms		Respiratory symptoms in non asthmatics
Lead	Mortality Morbidity: Hypertension Nonfatal coronary heart disease Nonfatal strokes Intelligence quotient (IQ) loss effect on lifetime earnings IQ loss effects on special education needs	Health effects for other age ranges other than those studied Neurobehavioral function Other cardiovascular diseases Reproductive effects Fetal effects from maternal exposure Delinquent and antisocial behavior in children	

Litman (March 2005) page 5.10-2 from Ken Gwilliam and Masami Kojima, *Urban Air Pollution: Policy Framework for Mobile Sources*, DRAFT Prepared for the Air Quality Thematic Group, World Bank (www.worldbank.org), May 2003.

To measure the economic cost of these air pollutants, various studies have measured the costs of removing the pollutants from the air or the amounts that people are willing to pay not to have these pollutants in the air. The Transit Cooperative Research Program (TCRP) summarized the results from a number of studies that suggest the highest cost per vehicle mile is associated with nitrogen oxides (Table VI.11.).[72] The range of costs including all pollutants varies from $0.015 to $0.195 per vehicle mile traveled. This wide range is due to variations in local conditions, driving speeds, other contributors to pollution, local weather patterns, the exposure of people to the pollutants, and the surrounding cropland.

Table VI.11. Air Pollution Costs of Motor Vehicles per Vehicle Mile Traveled (dollars)

Pollutant		PM_{10}	VOCs	CO	NO_x	SO_x	VOCs and NO_x	All Pollutants
Grams per Vehicle Mile Traveled								
	Low	0.2	3.1	38.2	3.6	0.2	6.7	
	High	0.3	3.7	45.3	4.0	0.2	7.7	
Dollar Costs of Damages per Kg emitted								
Health	Low	$13.51	$0.14	$0.01	$1.62	$9.56	$0.01	
	High	$185.43	$1.59	$0.12	$23.97	$90.40	$0.15	
Visibility	Low	$0.55	$0.00	$0.00	$0.28	$1.25	$0.00	
	High	$5.41	$0.14	$0.00	$1.52	$5.54	$0.00	
Forest and	Low	$0.00	$0.00	$0.00	$0.00	$0.00	$0.26	
Vegetation	High	$0.00	$0.00	$0.00	$0.00	$0.00	$0.42	
Total	Low	$14.07	$0.14	$0.01	$1.90	$10.81	$0.28	
	High	$190.84	$1.73	$0.12	$25.49	$95.95	$0.57	
Dollar Costs per Vehicle Mile Traveled								
Health	Low	$0.00	$0.00	$0.00	$0.01	$0.00	$0.00	$0.012
	High	$0.06	$0.01	$0.01	$0.10	$0.02	$0.00	$0.182
Visibility	Low	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.001
	High	$0.00	$0.00	$0.00	$0.01	$0.00	$0.00	$0.009
Forest and	Low	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.002
Vegetation	High	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.003
Total	**Low**	$0.00	$0.00	$0.00	$0.01	$0.00	$0.00	$0.015
	High	$0.06	$0.01	$0.01	$0.10	$0.02	$0.00	**$0.195**

Source: Grams per vehicle mile traveled and dollar costs per Kg from ECONorthwest and PBQD (2002), page II-36.

A higher estimate of the cost per vehicle mile traveled comes from Litman (2005) who estimates automobile air pollution costs from $0.063 to $0.075 per vehicle mile traveled and bus air pollution costs between $0.193 and $0.223 per vehicle mile traveled (Table VI.12.).

We estimate air pollution costs based on the low estimate for automobiles from the TCRP study ($0.015 per vehicle mile traveled) and the assumption that a diesel bus imposes three times the cost of a car for every vehicle mile traveled.

[72] ECONorthwest and PBQD, (2002), page II-36

Table VI.12. Air Pollution Cost Per Vehicle Mile Traveled (VMT) (2004 dollars)		
	Average Car	**Diesel Bus**
Litman,		
Peak	$0.075	$0.223
Off Peak	$0.063	$0.193
TCRP		
Low	$0.015	NA
High	$0.195	NA
Source: Litman (March 2005), p. 5.10-20 and calculations based on estimates in Table 46 from ECONorthwest and PBQD (2002), page II-36.		

VI.G. Noise Pollution

Transit has only a small effect on noise pollution. Motor vehicles cause various types of noise, including engine acceleration, tire/road contact, braking, horns, and vehicle theft alarms. The type of vehicle, tire, travel speed, incline, pavement type and condition, and surrounding barriers and distance from the noise source all affect the amount of noise pollution.[73] Automobiles are generally quieter than buses because cars have smaller engines and a higher power-to-weight ratio than buses. A typical diesel bus produces the noise equivalent of 5 to 15 average automobiles, depending on conditions.[74]

Table VI.13. summarizes several different national estimates of highway noise costs for cars and diesel buses based on surveys of the decline in property values attributable to noise and vibration near noisy traffic corridors. The FHWA estimates buses to be anywhere from 13 to 20 times more noisy along urban highways.[75] Litman (March 2005) estimates that the noise pollution costs of buses are about five times an average car. The TCRP report estimates noise pollution costs from buses to be from five times noisier than cars along principle arterials to nine times more noisy than cars along minor arterials. When we apply these costs per vehicle mile estimates to the displaced miles traveled in Anchorage, buses have only a small effect reducing the cost of noise pollution.

[73] Litman (March 2005), p. 5.11-1 – 5.11-3.
[74] (Delucchi and Hsu, 1998) quoted in Litman (2004), page 42.
[75] FHWA, quoted in ECONorthwest and PBQD (2002).

Table VI.13. Noise Pollution Cost per Vehicle Mile Traveled (VMT) (2004 dollars)			
		Average Car	**Diesel Bus**
Litman			
	Peak and Off Peak	$0.012	$0.060
FHWA			
	Low	$0.000	$0.006
	Medium	$0.001	$0.020
	High	$0.004	$0.054
ECONorthwest and PBQD			
	Principle Arterials	$0.002	$0.010
	Minor Arterials	$0.001	$0.009
Litman (March 2005), page 5.11-11 and Victoria Transportation Policy Institute online Transportation Demand Management Model, FHWA (1997) 1997 Federal Highway Cost Allocation Study, USDOT, and ECONorthwest and PBQD (2002) (1996), page II-39.			

VI.H. Water Pollution

Motor vehicles contribute to water pollution from leaks from engines and brake systems, during fuel distribution, and from waste fluids that are disposed of inappropriately.[76] The TCRP Report indicates that there are a large number of variables affecting the level and distribution of water pollution, making it difficult to quantify the effects of particular projects.[77] Litman (March 2005) argues that transit travel tends to produce less water pollution because it requires fewer vehicles, and they tend to be maintained better than private vehicles.[78] In contrast, the TCRP Report argues that a bus is about five times more polluting than a car, so a reduction in five or more car trips by a bus could result in a net gain in water pollution costs. Without more information about the actual water pollution rates of Anchorage buses, we cannot generate a reasonable estimate water pollution costs.

VI.I. Option Value

Even if residents do not ride transit regularly, some would value the option to use it in an emergency. The option value of transit could amount to about $200,000 to $2 million each year.

Residents benefit from the option to use transit for rare, infrequent, or future events for a variety of reasons.[79] Having transit available when weather or road conditions are bad, when a personal vehicle is disabled, or when a driver is temporarily

[76] Litman (March 2005), page 5.15-1.
[77] ECONorthwest and PBQD (2002), page II-34
[78] Litman (March 2005), page 5.15-2.
[79] These different types of option value are from Litman (2004) page 21 and ECONorthwest and PBQD, TRB (2002), page II-31.

physically disabled is a valuable resource. In addition having a fleet of buses available in an emergency or for special events is valuable for the community.

In these many different ways, transit provides a transport option available to everyone in the community when or if they need it. The value associated with having this alternative available is the "option value" of transit. The ECONorthwest and PBQD, Transportation Research Board (TRB) report (2002) describes a method for estimating the "option value" of transit based on automobile drivers' willingness to pay for it. That willingness to pay for the transit option depends on the number of times a driver expects to use transit, the costs of driving compared to transit use, and the "volatility" of driving costs. The TRB report explains that the "volatility" of driving costs is the average amount that the cost of auto trips increases due to greater volatility/unreliability from bad weather, repairs, or other factors.[80]

This TRB method requires more data than is currently available for Anchorage.[81] However, using the ECONorthwest & PBGD methods, we can estimate a broad range of possible option values for Anchorage. Litman (2004) summarizes the ECONorthwest &PBQD method as follows: "In typical conditions [the option value of transit] appears to be in the range of $1 to $10 per resident who expects to use transit a few times each year."[82] Using Litman's approximation, this option value of transit could amount to about $200,000 to $2 million each year if 100,000 residents in Anchorage expected to have the option to use transit a few times each year.

VI.J. Other Benefits Not Quantified

Public Health

Savings related to the reduction in traffic accidents and reduced pollution have already been calculated. In addition to these public health savings, transit reduces stress, can increase overall physical activity, and can encourage an increase in security.

Public transportation provides an alternative to dealing with the stress and aggravations of driving in traffic. Bus passengers have more opportunities to relax, read, converse, and distract themselves from traffic than drivers who are driving their own vehicle.

According to the American Public Transportation Association, "The stress of driving in congested conditions is linked directly to a long list of health problems, including cardiovascular disease, suppressed immune system functioning and strokes, as well as more headaches, colds and flu. Studies indicate that less travel time, more

[80] ECONorthwest and PBQD, TRB (2002), page II-33.
[81] We do not have measures of the "volatility" of driving costs. This would require a survey of the variations in the costs of driving due to changes in weather, congestion, and other factors.
[82] Litman (2004), page 21.

predictability, enhanced control and less effort required to make a trip reduces the stress levels and negative health effects associated with driving."[83]

Public transit can help reduce the costs of physical inactivity by encouraging people to walk and get the exercise needed to avoid or to reduce the risk of health problems such as cardiovascular disease, diabetes, hypertension, obesity, osteoporosis, and some cancers.[84]

Various studies have quantified the economic costs of physical inactivity by examining the cost savings to businesses that have employee health or exercise programs.[85] The Active Living Leadership project by the Robert Wood Johnson Foundation has summarized the results of many of these studies in their "calculator" of the costs of physical inactivity.[86] This calculator estimates losses in worker productivity, increases in medical care costs, and increases in worker compensation due to physical inactivity. According to this calculator, the largest component of the costs of physical inactivity are "productivity losses" due to employees staying home because they are sick or coming in to work and working below their abilities because they are sick.[87]

We used this calculator to approximate the costs of physical inactivity in Anchorage. The calculator depends on estimates of the percent of the population that does not get regular physical activity, and several other parameters.[88] Based on results from the Behavioral Risk Factor Surveillance System, we estimated the percent of population that does not get regular physical activity at 67%.[89] Using the Active Living by Design physical activity cost calculator, we estimate the costs of physical inactivity in Anchorage to be about $400 million annually, but do not calculate a reduction in this cost due to the availability of transit.

Transit may also indirectly promote physical activity by helping to facilitate the development of town centers and employment hubs. The Anchorage 2020 plan intends these types of development to be more walkable and to promote greater physical activity.

---

[83] American Public Transportation Association, *The Benefits of Public Transportation, The Route to Better Personal Health,* page 3.
[84] Litman (2004), page 38 and Litman (March 2005), pages 5.3-5 – 5.3-6.
[85] See, for example, Canadian Fitness and Lifestyle Research Institute (1999). Chenoweth (2003), Colditz (1999), Gettman (undated), and Pratt (2000).
[86] Chenoweth (2004).
[87] Chenoweth (2004).
[88] To use the calculator, we input the following parameters: 1) Total Population in 2002, 269,070; 2) Adults 18 years and older, 189,562; 3) Adults 65 years and older, 15,165; 4) Percent people 65 years and older, 5.6%; 5) Working Adults in 2002, 140,800; 6) Median Household Income in 1999, 55,546. All of these parameters (except median income) are from Alaska Department of Labor Research and Analysis Section. Median income is from the 2000 US Census of Population.
[89] The Healthy Anchorage Indicators program presents estimates for two alternative measures of physical inactivity. They report 67.1% of Alaska residents do not get vigorous exercise at least three days a week and that 22.8% of Alaskans (or 21.0% of Anchorage residents) do not get any physical activity during leisure time. Their data is from the Behavioral Risk Factor Surveillance System. For a description of these measures, see http://www.indicators.ak.org/indicators/exercisenotreg98F.htm and http://www.indicators.ak.org/indicators/ExerciseNoActivity98F.htm.

Personal security may be enhanced by transit. Litman argues, "Transit travel is sometimes thought to increase personal security risks to passengers and transit station neighbors." However, transit travel is not always more risky than automobile travel because "motorists also encounter personal security threats, such as car thefts, road rage, and aggressive driving. Many people have an exaggerated sense of risks from transit use. Transit accidents and assaults tend to receive excessive media attention. For example, in one 8-month period newspapers published 40 stories with headlines linking "transit" and "death," but only 14 linking "auto" or "car" with death, despite the much greater number of fatalities caused by automobile accidents.[90]

"Aggressive death casualties tend to be lower in areas with high transit use, high rates of non-motorized travel and lower per-capita highway lane miles, while aggressive driving fatalities tend to increase in more automobile dependent regions. Residents of low-density, exurban areas tend to have greater risk of combined traffic and stranger-murder fatalities. Walking, cycling and transit use tend to decline in areas that are considered insecure, and factors such as street design and maintenance, transit system management and land use policies in an area can affect the quality of personal security."[91]

Land Use

Transit can affect land use development patterns including reducing suburban sprawl, contributing to more mixed-use communities, and affecting the distribution of economic activity in the city. The benefits from these developments may be reflected in higher property values in some locations.

The effects of transit on land use patterns are difficult to isolate since so many other factors such as zoning, land use policies, and the existing distribution of economic activity affects land use patterns. Most of the specific land use effects from transit would likely be close to particular transit stations, hubs, park-and-ride lots, or other specific transit improvements.

The transit system in Anchorage could reduce sprawl development by creating low cost transport in the city center. This concentrates development in the Anchorage Bowl and encourages higher density use of the land in the Anchorage bowl instead of spreading out of the bowl area. Concentrated development reduces the need to displace green space, build additional roads, and provide services to the expanded development associated with sprawl development.

The Anchorage 2020 Comprehensive Plan proposes transit corridors along major streets in Anchorage. Buses would provide more frequent service along these high-volume corridors. With this added access and lower cost transportation along these corridors, some economic activity in the municipality may redistribute to these areas.

---

[90] Litman (2004), page 37.
[91] Litman (March 2005), page 5.3-5

Energy Conservation

The American Public Transportation Association reports that transit helps conserve non-renewable energy resources: "At its current level of use, public transportation is reducing Americans' energy bills. For every passenger mile traveled, public transportation is twice as fuel efficient as private automobiles. Per year, public transportation saves more than 855 million gallons of gasoline, or 45 million barrels of oil. Americans use more energy for transportation than for any other activity. Nearly 43% of America's energy resources are used in transportation, compared to industrial use (39%), residential use (11%), and commercial use (7%). Greater use of public transportation therefore offers [an] effective strategy [for achieving significant energy savings] without imposing new taxes, government mandates, or regulations."[92]

We can approximate the amount that Anchorage public transportation contributes to energy conservation by the number of vehicle miles displaced by transit. According to our estimates, transit displaces about 9 million automobile vehicle miles annually. The average fuel efficiency of cars in the US is about 24.7 miles per gallon.[93] Consequently the displacement of car trips by the bus saves about 336,000 gallons of gasoline (about 8,000 barrels of oil) every year. This amounts to about $0.8 million dollars worth of conserved gasoline every year.[94] However, offsetting these fuel savings are the costs of diesel fuel for buses, which amounts to about $1 million each year.[95]

Quality of Life

Many of the community benefits enumerated in this section contribute directly or indirectly to quality of life for residents. Less traffic congestion reduces the driving stress and road rage of drivers on Anchorage streets. Fewer traffic accidents reduces the pain and suffering associated with fatalities and injuries to drivers, passengers, and transit riders. Reduced air pollution improves the aesthetics of the community; it is easier to see the mountain ranges surrounding the city. Improvements to public health from reduced air pollution allow residents to live healthier lives and engage in more outdoor activities. Changes in land use and patterns of development contribute to greater sense of community in mixed use or high-density development. These contributions of transit to quality of life are indirect effects from reductions in traffic, improvements to the environment, or changes in land use that we already described and quantified earlier in

[92] American Public Transportation Association, The Benefits of Public Transportation: Conserving Energy and Preserving the Energy We Breath," page 2.

[93] US Environmental Protection Agency, Light-Duty Automotive Technology and Fuel Economy Trends: 1975 Through 2005, EPA420-S-05-0001, July 2005

[94] We accounted for fuel cost savings in the user benefits of reduce operating costs of automobiles. However, the economic value of energy conservation may also include the avoided costs of securing overseas oil supplies with military force, the benefit of conserving lands instead of drilling for oil, and the value to the economy of diversifying to renewable energy sources. There are currently no reliable estimates of these values for energy conservation available for Anchorage.

[95] Because the energy conservation savings from reduced car trips is about the same as the costs of fuel for buses, we do not include energy conservation benefits in the sum of all types of benefits of reduced car trips.

this section. Another important contribution to quality of life from transit is providing access to residents and visitors, as discussed in Section V. of this report.

VII. SENSITIVITY ANALYSIS

VII.A. Growth in Bus Ridership

The share of residents using public transit increases with the size and population density of the community.[96] Thus as Anchorage continues to grow in population, use of transit is likely to increase at a faster rate than population.

Table VII.1. Portion of Residents Using Transit at Least Once a Month

City Size (Thousands)	Percent of Residents Riding Transit Monthly
Under 250	1.4%
50-499	5.4%
Anchorage (270 thousand)	**4.7%**
500-999	6.4%
1,000-2,999	10.0%
3,000+	21.0%
Nationwide	11.6%

Source, Page IV-14 People Mover Blueprint and NPTS (1995) quoted in Litman (2004) page 15

The bus system can accommodate an increase in ridership on most routes without an increase in cost, because buses do not operate at full capacity most of the time. If 10 percent more residents switched from cars and taxis to riding the bus (294 thousand additional bus rides) benefits would increase $983 thousand, or $3.34 per ride, assuming no increase in the cost of providing service. This would increase the benefit to cost ratio for the transit system to 1.83.

VII.B. Improved Access

The Anchorage population is becoming more diverse as it grows and certain groups that rely on the transit system for access to jobs, health care services, and other community resources are growing much faster than the overall population. Seniors, Alaska Natives, and foreign born migrants in particular are all growing as a share of the Anchorage population.[97]

If transit provided access to jobs and community services for an additional 10 percent of the population in need (70 thousand additional trips) benefits would increase by $137 thousand, or $1.96 per ride, assuming no increase in the cost of providing service.

[96] Litman (2004), page 16. Destination density (e.g., clustering of employment) tends to have a greater impact on transit ridership than residential density.
[97] "Anchorage at 90: Changing Fast with More to Come", Scott Goldsmith, Lance Howe, and Linda Leask, UA Research Summary #4, ISER, 2005

VII.C. Increase in Fuel Cost

An increase in the price of petroleum fuels with no other change has only a modest positive effect on total transit system benefits. Although the savings for riders increases compared to travel by car or taxi, the cost of gasoline is only a small part (10 percent to 20 percent) of owning and operating a car, and some of the saving would be offset by higher diesel costs for the transit system.[98]

VII.D. Service Expansion

Based on the experience in other communities, service improvements can significantly increase ridership (Table VII.2).

Table VII.2. Transit Ridership Factors
Based on Surveys of Experience in Other Communities

Factor	Elasticity
Service (transit vehicle mileage)	0.71
Central city population	0.61
Regional employment	0.25
Headways	-0.20
Wait time	-0.30
Fare price	-0.32
Travel time	-0.60

Source: Litman (2004), page 12. Note: The elasticities in this table are estimates of the percent change in transit use for a one-percent change in each of the factors listed. For example, a one-percent increase in employment generates about a 0.25 % increase in transit ridership and a fifty percent ***decrease*** in headway (from one hour to a half-hour) would generate about a ten-percent increase in transit ridership according to these estimates.

Among the important transit characteristics that influence ridership are the following:

- types of bus routes
- services offered
- proximity of bus stops to households
- geographic extent of the routes
- times of the day buses run
- frequency of services
- price paid for standard fare,
- discounts offered through employee incentive programs
- special passes for people with disabilities
- speed of travel

[98] Furthermore, because of the relatively low load factor on the transit system, the fuel consumed on a transit passenger trip is not much less than on a private vehicle trip.

- amount of time required to ride the bus instead of driving a car
- integration of the transit system with transportation modes
- comfort and crowding of the buses and bus stops
- cleanliness of buses, bus stops, and transit centers
- whether people feel comfortable and safe using transit
- the social perception of bus services
- residents' perceptions of transit as a respectable and desirable travel option[99]

The People Mover Blueprint represents a plan to improve the quality of service by putting more buses on the road, increasing the frequency of services, reducing headways to every 30 minutes on every major route all day, and providing more convenient connections at the major transit hubs. Although these service improvements would add to the cost of operating the transit system, they would increase benefits in two ways. Current riders would benefit from the reduction in time spent in travel by transit, and new riders would benefit by switching from higher cost private transportation.

System expansion under the Blueprint would add about $2 million to system cost.[100] This would increase benefits to current riders by $893 thousand. This additional expenditure then would be "cost effective"—the additional benefit would outweigh the additional cost—if bus ridership increased 11 percent or more as a result of people switching from cars and taxis to the bus—about 325 thousand trips.

[99] Litman (2004), pages 11 to 16.
[100] People Mover Blueprint, RLS and Associates (2001), Page VII-4. Not all of these phases of the expanded services may be implemented by 2007. Personal communication with People Mover staff, September 2005.

VIII. TRANSIT AS AN ECONOMIC ENTERPRISE

The People Mover budget of $22.9 million, spent on wages, supplies, materials, and capital improvements to the transit system creates direct and multiplier spending in the local economy. This spending supports 354 jobs and generates $15.6 million of payroll within the Anchorage economy each year. These are measures of the economic effect of the spending that produces the economic benefits calculated in previous sections of this report.

Table VIII.1: Operating the Anchorage People Mover System: Employment and Income Generation in 2004

	Employment	Payroll (million $)
People Mover	155	$8.6
Total Private	199	$7.0
AnchorRIDES	81	
Other Private	118	
Total	**354**	**$15.6**

VIII.A. People Mover Expenditures

Spending to operate public transportation, to purchase buses and vans, to build bus stops and transit facilities, and to hire transit employees totaled $22.9 million in 2004. This total direct spending for transit includes both municipal spending for operations ($15.7 million) and spending by the Municipality and the Anchorage Metropolitan Area Transportation Solutions (AMATS) for capital purchases such as vehicles, facilities, and fleet improvements ($7.2 million).

This spending by the Public transportation Department created 155 direct jobs in 2004 for operating and maintaining vehicles and administering the department. These jobs had a payroll of about $8.6 million.

Table VIII.2. Total People Mover Expenditures in 2004 (million $)

OPERATIONS	**$15.7**
Personnel Costs	$10.0
Supplies	$2.0
Fuel	$1.0
Utilities	$0.2
Vehicle Parts	$0.2
Bus Stop Materials	$0.5
Wholesale Trade	$0.1
Services	$3.3
Transportation Services	$2.5
Other Services	$0.9
Other	$.4
CAPITAL	**$7.2**
Vehicles	$2.2
Facilities	$3.8
Improvements to existing system	$1.3

Personnel Costs includes all wages, salaries, benefits, and contributions to retirement by currently employed workers. Retirement payments to retired People Mover workers appear as expenditures by the State of Alaska in the P.E.R.S. system. Total Supplies, Services, Debt Service, and Municipal Capital expenditures from People Financial Records. Bus Fuel estimate is from People Mover financial officer. All fuel assumed to be purchased locally. Utilities include Gas, Heat, Water, Sewer, and Electricity and is estimated as 10% of total Intermediate Inputs (excluding services) from US IO Table and assumed to be purchased locally. Vehicle Parts is estimated as 11% of total Intermediate Inputs (excluding services) from US IO Table. Materials for Bus Stop Improvements is from People Mover Financial Officer and assumed to be purchased locally. Wholesale Trade is the residual of total supplies minus each type of other supply totaled separately. Transportation Services are contracted services to provide ADA (American Disability Act) AnchorRIDES van trips. These services are assumed to be purchased locally. All other services, according to US IO Table, are mostly engineering services and business services. Many of these services are purchased locally, but there is no estimate of the percent local. Total Capital expenditures and expenditures on vehicles, facilities, and roads from Municipality of Anchorage Capital Improvement Program 2002 and 2005. Breakdown of AMATS revenues from FTA and FHWA from AMATS 2004 Transportation Improvement Program

VIII.B. Multiplier Effects

Transit spending has a multiplier effect that results in the creation of 199 private sector jobs and $7.0 million in income for these workers in the local economy. The 81 AnchorRIDES drivers contracted by the Municipality are an important component of this private sector spending. In addition, transit employees spend their wages in the local economy for food, cars, clothing, medical services, and many other types of purchases. Local fuel distributor businesses that provide fuel for buses spend their money on utilities, wages, and other expenses to operate their fuel distribution businesses. Local construction contractors that build transit centers and bus stops spend their money in the local economy to hire workers, buy materials, and purchase construction machinery.

Each type of transit spending contributes differently to the local economy. Therefore, it is important to distinguish among the different types of transit spending and the different multiplier effects as shown in Table VIII.3.

Table VIII.3. Types of Transit Expenditures and Multiplier Effects

Type of Expenditure	Description
Personnel	Wages and benefits paid to local employees.
Operations	Operating expenditures other than wages and salaries to operate buses, offices, and other functions of public transportation
Capital	Expenditures to buy buses, vans, construct bus stops and transit centers, etc.
Indirect Multiplier Effects	Spending by local businesses to procure the goods used by transit. This is the spending by fuel distributors, construction contractors, and other businesses providing goods and services to the transit department.
Induced Multiplier Effects	Broader multiplier effects from spending by public transportation employees and other local businesses in the local economy.

In order to track accurately these many types of expenditures, multiplier effects, and the number of jobs the spending creates, we used the ISER Alaska Input-Output Model.[101] This spreadsheet model systematically accounts for the multiplier effects of each type of spending and estimates the number of jobs created by that spending.

VIII.C. Economic Significance of Transit

The total economic effect of the operation of the transit system, including both indirect and multiplier spending was 354 jobs and $15.6 million of payroll in 2004.

VIII.D. Economic Impact of Transit

If the transit system disappeared, the economy would not lose all these 354 jobs. Most of the money currently spent on transit would be redistributed to other purchases within the economy and produce other local multiplier effects. But some of the federal

[101] Scott Goldsmith**,** ISER Alaska Input-Output Model, Institute of Social and Economic Research, University of Alaska Anchorage, Anchorage, Alaska, January 1998.

dollars spent on the People Mover system would be reallocated to other places, and the loss of this money would have a negative impact on jobs and income in the economy.

To calculate the job and income loss if the transit system disappeared, we estimated how money now spent on transit would be redistributed in its absence. Money spent on bus fares would be spent on other purchases in the local economy, the Municipality would reduce the property tax and residents would spend that money elsewhere in the local economy, and businesses would reallocate to other advertising the money they currently spend on advertising through the transit system. All this redirected spending would generate jobs and income in the local economy.

Much of the capital funding for transit comes from Federal Highway Administration (FHWA) and Federal Transit Authority (FTA) revenues. If there were no transit system, we assume that FHWA revenues would be reallocated to local road construction projects and FTA revenues would be reallocated between Anchorage and other Alaska cities.

Although most of the money now going to pay for the transit system would stay in Anchorage if the transit system disappeared, this alternative spending would probably result in fewer jobs and income in the community. This is primarily because such a large part of the transit budget consists of payroll for local workers. We estimate the People Mover system generates 191 more jobs and $10.1 million more payroll than spending that money in other ways in the local economy.

Table VIII.4. Summary of Economic Impact of Transit Spending

	People-Mover Economic Significance	Alternative Use of Local People-Mover Funds	People Mover Compared to Alternative Use of Funds
Employment	354	163	191
Payroll (million $)	$15.6	$5.5	$10.1

REFERENCES

Alaska Department of Environmental Conservation, *Amendments to State Air Quality Control Program, Vol. II: Analysis of Problems, Control Actions, Section III.B: Anchorage Transportation Control Programs*, January 2004.

Alaska Department of Transportation and Public Facilities, *2002 Alaska Traffic Collisions*, 2004.

Alaska Department of Transportation and Public Facilities, *Annual Traffic Volume Report Central Region 2001, 2002, 2003, 2004.*

American Public Transportation Association, *The Benefits of Public Transportation*, http://www.apta.com/research/info/online/, 2002.

Anchorage Metropolitan Area Transportation System, *2004-2006 Transportation Improvement Program,* 2005.

Ari, Adrienne, Stephanie Massay, Laurie McKeown, Randall Plant, Anchorage Air Quality Standard Review: Recommended Improvements to Anchorage's Existing Policies to Minimize Adverse Health Effects, prepared for Alaska Pure Air Council, April 21, 2003.

Beimborn, Edward, and Alan Horowitz, *Measurement of Transit Benefits,* prepared for University Research Training Program, Office of Technical Assistance and Safety, Urban Mass Transportation Administration, Washington DC, 20590, June 1993.

Bein, Peter, *Monetization of Environmental Impacts of Roads,* Planning Services Branch, British Columbia, Ministry of Transportation and Highways, 1997.

Blincoe et al. Economic Costs of Vehicle Crashes 2000, National Highway Traffic Safety Administration, Washington DC, 2002.

Bureau of Labor Statistics, US Department of Labor, *Consumer Expenditures in 2002, Report 974,* February 2004.

Cambridge Systematics, Inc. and Apogee Research, Inc., *Transit Cooperative Research Program Report 20: Measuring and Valuing Transit Benefits and Disbenefits,* Transportation Research Board, National Research Council, National Academy Press, Washington DC, 1996.

Canadian Fitness and Lifestyle Research Institute, *Physical Activity: Health Benefits and Costs to the Health Care System,* Available on the World Wide Web at http://www.cflri.ca/cflri/news/99/9903_1.html.

Chenoweth, David, et al, *The Economic Cost of Physical Inactivity in Michigan,* Michigan Fitness Foundation, Lansing Michigan, 2003, Available online: http://www.michiganfitness.org/indexpagedownloads/CostofInactivity.pdf.

Chenoweth, David, Walter Bortz, *Physical Inactivity Cost Calculator,* Active Living Leadership, 2004, Available online: http://www.leadershipforactiveliving.org/costcalc.htm.

Colditz GA. “Economic costs of obesity and inactivity,” Medical Science Sports Exercise, Nov, 31(11 Supplement):S663-667 (1999).

CRG Research. “People Mover On Board Survey,” December, 2005.

Delucchi, Mark, and Shi-Ling Hsu, “External Damage Cost of Noise Emitted from Motor Vehicles,” Journal of Transportation and Statistics, Vol. 1, No. 3. October 1998, pp 1-24.

Delucchi, Mark, *The Annualized Social Cost of Motor Vehicle Use in the United States, Based on 1990-1991 Data*, Institute of Transportation Studies, University of California, 1997.

ECONorthwest and PBQD, *Estimating the Benefits and Costs of Public Transit Projects: A Guidebook for Practitioners, Transportation Cooperative Research Program Report 78*, National Academy Press, 2002.

Federal Highway Administration, US Department of Transportation, *Federal Highway Cost Allocation Study*, 1997.

Gettman, Larry, *Economic Benefits of Physical Activity*, Series 2, Number 7 of the PCPFS Research Digest, (year?).

Goldsmith, Scott, *Economic Projections for Alaska and the Southern Railbelt, 2004-2030*, Institute of Social and Economic Research, University of Alaska Anchorage, Anchorage, AK ,November 2004.

Goldsmith**,** Scott, *ISER Alaska Input-Output Model*, Institute of Social and Economic Research, University of Alaska Anchorage, Anchorage, Alaska, January 1998.

Goldsmith, Scott, Lance Howe, Linda Leask, Institute of Social and Economic Research, Anchorage *at 90: Changing Fast, With More to Come*, Understanding Alaska of University of Alaska Anchorage, June 2005.

Grudemo, Stefan, Pernilla Ivehammar and Jessica Sandstrom, *Calculation Model for Encroachment Costs of Infrastructure Investments*, Swedish National Road and Transport Research Institute, 2002.

HDR Alaska, Inc. “Land Use Allocation Documentation Report: Anchorage 2020 Land Use Assumptions,” prepared for Municipality of Anchorage, 2002.

HLB Decision Economics, Inc. *The Economic Benefit of Laketran Transit System on Lake County*, prepared for Lake County, January, 2002.

HLB Decision Economics, Inc. *The Economic Return on Public Transportation, Preliminary Draft Report*, prepared for Transit Cooperative Research Program, Transportation Research Board, National Research Council, April 2004.

HLB Decision Economics, Inc., “The Socio-Economic Benefits of Transit in Wisconsin,” Final Report No 0092-03-07, prepared for Wisconsin Department of Transportation Research Development, and Technology Transfer, December 2003.

Housatonic Area Regional Transit District, Jack Faucett Associates, Inc., The KFH Group, Inc., *The Economic Impact of HART to the Housatonic Valley Region,* February, 1997.

Litman, Todd, "Evaluating Public Transit Benefits and Costs: Best Practices Guidebook," Victoria Transport Policy Institute, Victoria British Columbia, 2004.

Litman, Todd, "Online Transportation Demand Management Encyclopedia," Victoria Transport Policy Institute, Victoria, British Columbia, July 2005.

Litman, Todd, "Transit Price Elasticities and Cross-Elasticities," Victoria Transport Policy Institute, Victoria, British Columbia, March 2005.

Litman, Todd, "Transportation Cost Analysis Spreadsheets" Victoria Transport Policy Institute, Victoria, British Columbia, April 2005. Available online at http://www.vtpi.org/tca/tca.xls.

Litman, Todd, "Transportation Cost and Benefit Analysis: Techniques, Estimates, and Implications," Victoria Transport Policy Institute, Victoria, British Columbia, March 2005.

Martin, David and Laurie Michaelis, *Research and Technology Strategy to Help Overcome Environmental Problems in Relation to Transport in UK,* UK Atomic Energy Authority, March 1992.

McCollom Management Consulting, N. Davis and Company, NuStats International, Dr. Peter Furth, *Transit Performance Monitoring System (TPMS) Results, Summary Report, Phases I and II*, prepared for American Public Transportation Association, Federal Transit Administration, February 2002.

Moore, Terry and Paul Thorsnes, *The Transportation/Land Use Connection,* Planning Advisory Services Report 448/449, American Planning Association, Chicago, 1984.

Municipality of Anchorage Traffic Department and Anchorage Metropolitan Area Transportation Solutions, *2003 Anchorage Bowl Long Range Transportation Plan,* 2004.

Municipality of Anchorage Transportation Planning Division, Cambridge Systematics, and Rader Econometrics and Engineering, *Anchorage Congestion Management System, Status of the System Report,* Municipality of Anchorage, Anchorage, AK, December 2000.

Municipality of Anchorage, *2005 Approved General Government Operating Budget,* 2004.

Municipality of Anchorage, Planning Department, Traffic Division, *Public Transportation Development Plan,* 2004.

Northern Economics, in association with NuStats and Klugherz Associates, *Alaska Visitor Expenditures and Opinions 2001*, prepared for Alaska Visitor Statistics Program, State of Alaska, Department of Community and Economic Development, November 2002.

NuStats, *Municipality of Anchorage Household Travel Survey: Final Report,* Municipality of Anchorage, Anchorage, AK, September 2002.

Pratt, Michael, Caroline A. Macera, Guijing Wang, "Higher Direct Medical Costs Associated with Physical Inactivity," in *The Physician and Sports Medicine,* Vol. 28, No 10. October 2000.

Public Transportation Department, *People Mover On-Off Ridership Database, March 2005.*

Rintoul, Donald, *Social Cost of Transverse Barrier Effects,* Planning Services Branch, British Columbia, Ministry of Transportation and Highways.

RLS and Associates, Inc, *The People Mover Blueprint: A Plan to Restructure the Anchorage Transit System,* prepared for Municipality of Anchorage, Public Transportation Department, 2001.

Saellensminde, Kjartan, "Summary: Walking and Cycling Track Networks in Norwegian Cities: Cost Benefit Analyses Including Health Effects and External Costs of Road Traffic," TOI Report 567, Institute of Transport Economics, Oslo Norway, 2002.

Schrank, David and Tom Lomax, *The 2005 Urban Mobility Study*, The Texas Transportation Institute, The Texas A&M University System, May 2005.

Shoup, Donald, *High Cost of Free Parking,* American Planning Association Press, Washington, D.C., 2005.

State of Alaska Legislature, *Aging Adults in Alaska: A Report Based on the Oct 29, 2004 Bipartisan Legislative Hearing: Aging Adults: Is There Room for us in Alaska,* hosted by Representative Sharon Cissna, 2004.

Texas Transportation Institute, *2004 Urban Mobility Study*, 2004.

U.S. Bureau of Labor Statistics, Consumer Expenditure Survey, *Consumer Spending Patterns in Anchorage, 2001-2002*, (March 2004).

U.S. Department of Energy, Environmental Protection Agency, *2005 Fuel Economy Guide: Introduction*, http://www.fueleconomy.gov/feg/FEG2000.htm.

U.S. Government Accountability Office, *The Benefits and Costs of Highway and Transit Investments: Highlights of an Expert Panel,* GAO-05-423SP, US Government Printing Office, Washington, DC, May 2005.

US Environmental Protection Agency, *Light-Duty Automotive Technology and Fuel Economy Trends: 1975 through 2005*, EPA420-S-05-0001, July 2005, http://www.epa.gov/otaq/cert/mpg/fetrends/420s05001.htm#highlight1.