Economic Benefits Provided by The Roaring Fork Transportation Authority: 2011-2018

August 2018

SWEEP

SOUTHWEST ENERGY EFFICIENCY PROJECT

SWEEP Brief Report

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Authored by Will Toor

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About SWEEP

The Southwest Energy Efficiency Project is a public interest organization dedicated to advancing energy efficiency and clean transportation in Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming. For more information, visit: www.swenergy.org

About the Author

Will Toor is director of the transportation program at the Southwest Energy Efficiency Project (SWEEP), a Colorado-based nonprofit that advocates for energy efficiency and clean transportation in six southwestern states. In this role he works to advance both smart growth transportation strategies and electric vehicles. Prior to working at SWEEP, Will spent 15 years in local government, as mayor of Boulder, Colorado, as Boulder County Commissioner, and as chair of the Denver Regional Council of Governments, and served as the director of the University of Colorado Environmental Center. He serves on the Colorado Air Quality Control Commission and the Mobility Choice Blueprint board of directors.

He is co-author of the books *Finding A New Way: Campus Transportation for the Twenty-First Century* and *Transportation for Sustainable Campus Communities*.

He received his Ph.D. in physics from the University of Chicago in 1992.

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I. EXECUTIVE SUMMARY

Public transit systems provide important economic benefits in the areas they serve. These benefits are often not quantified, leaving policy makers and the public with little information on whether public transit systems are cost-effective or broadly beneficial. Transit systems do, however, provide demonstrable benefits to users and their communities such as reduced travel times and transportation costs, increased mobility (especially for non-drivers), and increased efficiency in the transportation system (which reduces demand for roads or parking) (Litman, 2012). Local residents who do not use the transit system still derive indirect benefits (such as reduced road congestion); moreover, transit systems can also help shape more compact land-use patterns, which can have significant economic benefits, and can provide air quality benefits.

While the public may realize that transit systems offer tangible economic benefits to large metropolitan areas, Coloradans also should know that smaller communities can receive significant economic benefits, too, based on their own investments in local transit systems.

In 2013, SWEEP conducted an analysis of three smaller transit systems in diverse areas of Colorado: Mesa County, Fort Collins, and the Roaring Fork Transit Authority (RFTA) serving Garfield and Pitkin Counties. The analysis found that the economic benefits from RFTA were by far the highest of the three locations, because of the Pitkin-Garfield area's high land costs, the lack of affordable employee housing, and the prevalence of very long commutes from less pricey communities to job opportunities.

This fall, voters in Garfield and Pitkin Counties will decide whether to increase property taxes to optimize and expand RFTA services, so SWEEP recently updated the regional analysis regarding the economic benefits of existing RTFA services, using the most current data available. This analysis shows a significant increase in economic benefits since the 2013 study, driven by the increased regional ridership since VelociRFTA Bus Rapid Transit (BRT) was introduced, continued high (and rising) land prices, and the lack of affordable/attainable housing options in the Roaring Fork and Colorado River Valleys.

In 2011, RFTA provided 4.1 million rides and an estimated 53.7 million passenger miles. SWEEP estimates the total 2011 economic benefits from this transit service at $53 million to $64 million. The sizeable benefits stem from the Aspen area's very high land prices (which also make parking really expensive), and a large number of regional employees who have very long commutes.

In 2018, RFTA expects to provide more than 5.5 million rides and over 60 million passenger miles. Using the same methodology as the 2013 study, we estimate the total benefits at $67 million to $88 million. Note that the RFTA operating budget is $34 million, and the portion coming from the local dedicated sales tax is about $20 million, so the quantified benefits significantly exceed the costs.

The analysis considers economic benefits directly attributable to transit service, such as:

- Fuel savings from reduced driving;
- Time and fuel savings from reduced congestion;
- Income generated from jobs made accessible by transit;
- Public benefits saved due to employment; and
- Savings to communities from reduced demand for parking.

Additional benefits (which may be substantial but were not quantified as part of this analysis due to lack of data) include:

- The value of independent living for seniors;
- Health benefits of walking or biking to access transit stops;
- Health benefits of lowered emissions of criteria pollutants and greenhouse gases; and
- Increased property values due to the proximity of transit and accident reduction.

RFTA often uses the tagline "Connecting Our Region with Transit and Trails," and indeed the region derives significant economic and amenity benefits from the recreational and commuter use of trails (such as the Rio Grande trail). SWEEP's analysis, however, only looks at the economic benefits of RFTA's transit investments, and does not include an analysis of the benefits of RFTA's investment in trails.

Robust transit service also helps shape more compact land use patterns, which can have significant economic benefits over time; however, we did not attempt to quantify such benefits. We also assumed no land-use multiplier for any of the benefits associated with decreased driving, such as gasoline savings, even though most studies find that this multiplier effect is at least two. However, almost all of these studies are in larger urban areas, so there are little data to consider for an area like the RFTA service region. Thus, this study provides a very conservative estimate of the economic benefits associated with public transit

The transit system's most significant benefit is the mobility that it provides, enabling workers access to employment. Many employees do not have personal vehicles and have no viable alternatives to reach their jobs unless they use transit. So, without transit service, some people could not hold down jobs and employers would have fewer potential employees. In addition, if they could not get to work, some of those people without jobs likely would need public assistance to support themselves and their families.

In areas with strong demand for parking and high land values, transit provides a major benefit by reducing the number of required parking spaces. In the absence of transit, thousands of additional parking spaces would be necessary to accommodate additional vehicle trips. Avoided vehicle trips also result in less gasoline consumption and reduced levels of congestion on major roadways.

II. ECONOMIC BENEFITS OF RFTA SERVICE: 2011 AND 2018

The Roaring Fork Transportation Authority (RFTA) system serves a population of over 66,000 with local and regional service in communities along 41 miles of the Colorado Highway 82 corridor between Glenwood Springs and Aspen and along 27 miles of U.S. Highway 6 and Interstate 70 between Glenwood Springs and Rifle. RFTA may also extend local transit service to Parachute in 2019.

This case study quantifies several economic benefits that the RFTA system provides for the region. The analysis demonstrates that increased investment in transit on regional systems can yield significant value to communities due to decreased gasoline and vehicle maintenance costs, reduced traffic congestion, better access to employment, avoided public assistance benefits, and reduced parking demand. The basis for key assumptions, as well as the calculations for all figures cited below, can be found in Appendix A, the Methodology section.

Table 1. Benefits of RFTA's Transit Service

Benefit	Savings 2011 (Thousands $)	Savings (2018) (Thousands $)
Gasoline Savings	$3,300	$4,500
Vehicle Maintenance Savings	1,100	1,600
Reduced Traffic Congestion Savings	700	1,000
Avoided Public Assistance Payments	1,600	1,800
Reduced Parking Infrastructure Cost	2,500 – 14,000	4,100 - 25,000
Total Transit Benefit*	**$9,700 – 21,000**	**$13,000 - 33,900**
Income from Employment Accessible by Transit	*$43,000*	*$54,000*
Total Transit Benefit with Employment Benefit	**$52,000 – 63,000**	**$67,000-87,900**

**Totals may not match figures due to rounding*

Fuel Savings

Transit trips on the RFTA system reduced vehicle miles traveled (VMT) in private cars by 19.6 million miles in 2011, saving 953,000 gallons of gasoline worth $3.3 million. Less driving also reduces wear and tear and the need for vehicle repair and maintenance, saving drivers an additional $1 million.

In 2018, avoided vehicle miles increased to 29 million miles, with gasoline savings of 1.3 million gallons and retail savings of $4.5 million. The reduction in vehicle operating costs increased to $1.6 million.

Reduced Traffic

Use of transit removes vehicles from the road, which helps to reduce congestion on the regional road network. We estimate that without transit service in the region, additional congestion would cost drivers just over $1 million.

Access to Work

One of transit's most important mobility benefits is its ability to provide people with access to employment. Onboard surveys in 2011 showed that 68 percent of RFTA's riders used the system to commute to their jobs. Based on the average household income of transit riders, the total annual wages earned by transit riders would be $140 million. If 15 percent of commuters (1,303 daily riders) would not be able to get to their jobs without transit, they would stand to lose $43.0 million in annual wages. Some of these lost wages would be acquired by others filling the jobs and therefore would not be a net loss to the region; therefore, the employment benefit is not grouped with the other benefits in Table 3.

For the RFTA region, however, transit plays a critical role in matching employees to employment opportunities along the Highway 82, Highway 6, and I-70 corridors. Without transit, it would be very difficult for many of these jobs to be filled, which could contribute to higher labor costs and the need for more affordable housing closer to employment centers. While there are uncertainties about the scope of this benefit, the worker-job connection is still an important economic benefit that we felt should be represented. In addition to these lost wages, some of the unemployed would likely turn to public assistance to supplement their income. Providing basic assistance to these unemployed workers would cost up to an additional $1.6 million in public assistance payments.

Updating this analysis to 2018, we found that the potential for lost wages had grown to $53 million, and the potential increase in public assistance payments had grown to $1.75 million.

Reduced Parking Infrastructure Cost

In 2011, we found that without transit service to serve destinations such as Aspen and Snowmass Village, more parking spaces would be necessary to accommodate the thousands of additional vehicles trips into these areas. If ground-level commercial or residential properties absorb the expenses, the total annual cost for three, 480-space garages to accommodate additional commuters would be between $2.5 million and $3.3 million (depending on if the garage is built aboveground or belowground). If land costs are fully borne by the garage, annualized cost would be $13.8 million.

Now, though, our updated analysis found that the parking cost, including land value, rises to $25 million, reflecting both greater levels of avoided parking demand and higher land costs.

Distribution of Benefits

Note that the benefits identified above accrue not only to transit riders, but also to the general public. The entire community shares the benefits of reduced congestion, avoided public assistance payments, reduced road maintenance costs, and reduced parking infrastructure costs.

Non-Quantified Benefits

Additional benefits from transit service that have not been quantified in this case study include:

- The value of seniors able to live independently at home rather than moving to assisted living facilities or nursing homes;
- The value of the improved access to health care offered by transit service;
- The value of public health and wellness benefits due to transit riders walking or biking to and from bus stops;
- Savings related to accident reduction and safety improvements;
- Increased value of real estate in areas with good transit service; and
- The value of health benefits associated with fewer air pollutants and reduced greenhouse gas emissions.
- As noted in the executive summary, we do not estimate the amenity value or commuter value of the regional trails provide by RFTA.

While the benefit of decreased parking demand is quantified in this analysis, additional land use considerations are also important for destinations such as Aspen and Snowmass Village. If they lacked transit, the communities would have to add new parking areas (which could be a challenge due to lack of readily available land), driving up the area's already-high housing costs. The use of transit also encourages walking in these destinations, which helps support retailers who rely on high foot traffic around their shops to bring in customers.

The RFTA operating budget is $34 million, and the portion coming from the local dedicated sales tax is about $20 million, so the quantified benefits significantly exceed the costs.

III. APPENDIX A: METHODOLOGY

VMT Reduction

We used the total Passenger Miles Traveled (PMT) on the transit system to determine how much vehicle driving is replaced by transit. Specific information on how transit users would change their travel plans if transit service ceased was not part of RFTA's Passenger Opinion Survey, so SWEEP used national averages in this report.

Based on data from Transit Performance Monitoring System (TPMS), the American Public Transportation Association (APTA) has developed default mode shift factors to represent how transit users would behave without transit service (APTA, 2009). The mode shift factor for "small" agencies (with service populations below 500,000) is 0.34, meaning that every passenger mile of transit travel displaces 0.34 Vehicle Miles Traveled (VMT) in private vehicles. APTA's analysis also provided a more detailed breakdown of exactly which mode of transportation (such as car, bike or walking) will be used in the face of discontinued transit service in small agencies, as shown in column 2 of Table 2.

However, due to the regional nature of many trips on the RFTA system, it is unlikely that many transit trips could be replaced by walking, biking and taxi trips. Therefore, the percentages for trip displacement for longer, regional trips have been reweighted to shift the 43 percent of walking, biking and taxi trips to the remaining options (based on the initial proportion of those other options). The mode shift factor for regional trips is 0.38.

There is an additional subtlety here. The APTA Study notes that "As expected, the mode shift factor rises with agencies serving larger populations, presumably as they attract more riders with access to a vehicle. It should be stressed that these are defaults only. Many agencies, particularly those with commuter rail or express bus services targeting choice riders, may expect to demonstrate higher mode shift factors…. "

For the RFTA VelociRFTA Bus Rapid Transit service, the 2016 passenger survey shows that 65 percent of riders are choice riders who could otherwise drive (RFTA, 2016). Thus, for those services it is probably appropriate to use a mode shift factor towards the higher end. For these trips we use 0.47, the number that APTA uses for large systems.

Table 2. Mode or Trip Choice by Transit Users if Transit Service Were Discontinued

Mode Choice	Percentage	Reweighted Percentage for Regional Trips
Drive alone	12.8%	22.4%
Walk	26.8%	0%
Ride with someone	22.8%	39.9%
Taxi	11.7%	0%
Bicycle	4.5%	0%
Not make trip	21.5%	37.6%
Mode shift factor[1]	0.34	0.38

For regional trips, we estimated PMT on transit by multiplying 2011 regional ridership numbers supplied by RFTA staff (1,875,380 by 16 miles[2]) to get 30,006,080 PMT. The remaining trips on the system (2,262,525) were estimated to average 10.5 miles per trip and result in 23,786,685 PMT (RFTA 2012b). Regional trips with a mode shift factor of 0.38 displace 11,518,972 VMT and local trips with a mode shift factor of 0.34 displace 8,087,473 VMT, for a total displacement of 19,606,444 VMT.

Based on the 2011 average light-duty vehicle fuel efficiency of 20.5 miles per gallon (EIA 2012), the reduction of 19.6 million VMT would save 953,621 gallons of gasoline. Based on the average statewide price of gasoline in 2011 ($3.45 per gallon), drivers would save $3,289,992 in avoided fuel costs. (This figure likely underestimates the savings, as gasoline prices in RFTA's service area are consistently higher than the state average) (EIA 2013).

Reduced VMT also reduces vehicle maintenance costs, such as the need for routine tune-ups and replacement tires. Costs such as insurance, license and registration fees, and depreciation are not considered as they are not as directly affected by reduced mileage. The average per mile cost for routine maintenance is $0.045 and for tires is $0.01(AAA,2012). Thus, drivers saved $1,072,471 (the reduced VMT multiplied by $0.055). For the 2018

[1] The Mode Shift Factor is calculated by adding the percentage of Drive Alone plus the percentage of Taxi, plus the percentage of Ride with Someone divided by 2.5 (the average vehicle occupancy for carpooling).
[2] While the RFTA system did not explicitly calculate this number, RFTA staff suggested that 13 would be a reasonable estimate of overall average trip length, because trips in the Aspen region average approximately 11 miles and longer regional trips average 16 miles.

analysis, we used 2017 ridership numbers from the 2018 audited service contracts (RFTA 2018), and used more accurate estimates of trip length (from measurements that RFTA did during winter 2017). These calculations found longer regional trips, but substantially shorter local trip lengths, than the estimates we used in 2013. We use these updated numbers in the analysis. We also used updated fuel economy figures from the U.S. Bureau of Transportation Statistics, and did a sampling of fuel prices in Glenwood Springs and Aspen in August 2018 to estimate retail fuel prices (Bureau of Transportation Statistics, 2018).

Congestion

The Federal Highway Administration (FHWA) estimates a range of the cost of congestion for each vehicle type for both rural and urban highways (FHWA, 1997). As the Highway 82 corridor has aspects of both rural and urban highways, we used the number for "all highways." Buses have a congestion cost of $0.0843 per mile and automobiles have a cost of $0.0448 per mile. Based on average bus and light-duty vehicle occupancy rates (14 and 1.63, respectively), a bus is expected to displace 8.6 automobiles. Therefore, the net savings per bus mile would be $0.30 [(8.6 * $0.0448)-$0.0843]. Total bus miles in the Highway 82 corridor in 2011 were 2,184,773 (from 2011 RFTA audited service contract data), giving a total congestion reduction benefit of $656,492.

We used the same approach for 2018, using 2017 bus miles from the current audited service contract report, rather than 2011 miles.

Access to Work

In 2011, the RFTA 2012 Passenger Opinion Survey found that 68.3 percent of riders use the system for commuting to and from work (RFTA, 2012). Based on a ridership of 4,137,905, there would be 2,826,189 trips due to commuting (or 1,413,095 round trips). To determine the number of commuters, the number of round trips is divided by the average number of annual working days (210), which gives 6,729 commuters. Based on data from the Passenger Opinion Survey, 4,051 of these are regional commuters making longer trips and 2,678 are local commuters.

To determine the average annual household income of all commuting riders, we multiplied the means of the ranges of values given in the Passenger Opinion Survey by the percentage found in that income range, resulting in an average annual household income of $41,712. For local commuters, the APTA report cited in Table 4 states that 21.5 percent of trips currently made on transit would not take place at all without transit service.

Assuming that work trips would be a higher priority than other trips, we estimate that only half this percentage of local work trips on transit would not take place, meaning 268 local commuters would be unable to get to work. For regional commuters who have fewer alternatives (unable to walk, bicycle or take a taxi), APTA's numbers suggest that 37.6 percent of trips would not take place without transit. Again, assuming the importance of work trips, we estimate that 18 percent, or 762 regional commuters, would be unable to get to work without transit. A total of 1,030 local and regional commuters (or 15 percent of all commuters) would be unable to maintain their employment and would lose out on $42,982,429 in annual wages.

With less access to employment due to lack of transit, some of these individuals might turn to public assistance to supplement their income. For this analysis, we have assumed that 25 percent of these potentially unemployed individuals would rely on public assistance. For two-adult families, Colorado offers an average monthly TANF (Temporary Aid to Needy Families) benefit of $510 (or $6,120 over 12 months) (CDHS 2011). If 25 percent of the individuals unemployed due to lack of transit received this amount of public assistance over the course of a year, the cost would be $1,576,599. Thus the total employment benefit of transit would equal the lost wages, in addition to the avoided public assistance payments, for a total of $44,559,029.

For 2018, we used the same methodology, with updated data from the 2016 passenger survey and the 2018 audited service contract cost allocation.

Parking Infrastructure

One significant benefit provided by transit in the Roaring Fork Valley is that it reduces demand for parking at key destinations such as Aspen and Snowmass Village. Transit's ability to provide easy access to these destinations for employees, recreational users, and errand runners reduces parking demand in Aspen by more than 1,000 spaces. In 2011, we found that an estimated 4,307 employees use transit to get to their jobs in Aspen each day (based on passenger survey data combined with ridership data); 2,812 of these riders are regional commuters and 1,494 are local commuters. Based on the different mode shift factors for regional and local travelers shown in Table 4, we estimated that, if transit service ceased, 822 commuters would drive alone and 1,464 would carpool in 585 vehicles (with an average occupancy of 2.5 people per carpool). This shift would result in an additional 1,407 vehicles coming into Aspen each day, each of which would require a parking space.

To accommodate these additional vehicles, Aspen would need to build new structured parking garages at significant costs because of high land prices.[3] A survey of commercial real estate listings in downtown Aspen showed that the average price-per-square-foot of land was $1,348, which translates to approximately $58.7 million per acre (Setterfield and Bright 2013). A four-level parking structure on one acre of land could provide approximately 480 parking spaces; three garages of this size would be needed to meet new parking demand just for commuters who currently rely on transit. Construction of the structure would cost approximately $8.6 million, or

[3] Whether or not a several story parking garage in downtown Aspen would be aesthetically acceptable and fit in with the city's character is an additional challenge to adding large amounts of parking.

$18,000 per space, and annual operating and maintenance (O&M) costs would be approximately $288,000, or $600 per space. The total annualized cost would be $9,602 per space, or $4.6 million for one garage and $13.8 million for three garages.[4] Note that construction costs may be greater than assumed here, as costs in Aspen are generally higher than the rest of the state.

Alternatively, structured parking could be built that also would accommodate commercial or residential uses on the ground-level area (allowing land costs to be recouped). With slightly higher construction costs of $9.6 million (an additional level would increase costs to $20,000 per space) and the same O&M costs, the total annualized costs would be $842,400 for one structured garage and $2.5 million for three structured garages.

Building an underground lot would perhaps fit better with Aspen's aesthetics of a historic, small town look, but would require a higher construction cost of $12 million ($25,000 per space), again assuming that land costs could be recovered with ground-level commercial or residential properties. Total annualized construction and operating and maintenance costs for an underground lot would be $2,304 per space, or $1.1 million for one garage or $3.3 million for three garages.

For 2018, we updated the analysis of parking demand avoided by transit, using an analysis of the number of daily inbound transit riders coming across the Castle Creek Bridge from regional and local routes during an average winter weekday in 2016 (RFTA, 2018b). We found that the parking demand displaced by transit has grown to 1,740 spaces, a 24 percent increase – a major change. Based on a current analysis of the cost-per-square-foot of commercial land in Aspen, we found that the land cost has increased to $1,878 (Setterfield Bright, 2018), a 39 percent increase. We also updated the methodology in one significant way: In the previous analysis, we did not include costs of bonding for land acquisition. For this analysis, we assume a 20-year bond at a 4 percent interest rate.

[4] Assumptions for these calculations come from Victoria Transport Policy Institute. 2012. Parking Costs, Pricing and Revenue Calculator. Retrieved from www.vtpi.org/parking.xls. The basic assumptions are that capital projects would be financed at an interest rate of 2.5% over 20 years, which is the average rate of 10- and 30-year municipal bonds listed on Bloomberg.com on March 15, 2013

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