



## Chapter 3. Frequently Asked Questions About the East Bay BRT Project

This chapter is a compilation of answers to some frequently asked questions about the East Bay Bus Rapid Transit project that have not been addressed at length elsewhere in this report. A more comprehensive list of questions and answers can also be found on the City of Berkeley’s website, which will be updated throughout the public review process (see the appendix at the end of this report for the address to this and other BRT websites). The questions addressed here include:

- Who rides the bus in the corridor, and where are they going?
- Would BRT duplicate BART?
- Would it be “worth it” to dedicate lanes to buses?
- How would BRT affect safety (including emergency vehicle access)?
- What would be the land use and economic impacts of BRT?
- How would BRT affect “spillover” parking in neighborhoods?
- Would the East Bay BRT Project be cost-effective?
- How effective have other BRT projects been?

### 3-1 Who Rides the Bus in the Corridor, and Where Are They Going?

AC Transit Routes 1 and 1R buses serve a population that, compared to the rest of Alameda County, is relatively low-income and transit-dependent: 46 percent of the total population in the corridor (not just transit riders) subsists on incomes below the regional poverty line,<sup>64</sup> and 20 percent of households have no cars. More than three-quarter's of the corridor's residents are members of a racial minority group, nearly one in 10 are seniors, and nearly one-quarter are youth.<sup>65</sup>

In 2008, Route 1R riders were surveyed.<sup>66</sup> Key findings included:

- 66 percent of respondents said their household income was less than \$30,000 a year.
- 57 percent said they had no car available for the trip, and 41 percent said their household had no car.
- 68 percent said they had walked to the bus stop, and 70 percent said they would be walking from the bus to their final destinations.
- 14 percent said they had made the same trip by driving before the introduction of rapid bus service to the corridor, while 13 percent said they had taken BART and another 14 percent had not made the trip.

In the same survey, riders were asked where they had boarded the bus and where they would be getting off. Analysis of their responses reveals some interesting patterns. Figure 3-1 categorizes where riders with one or both ends of their trips in Berkeley said they were coming from or going to. For example, 77.4 percent of all riders coming from or going to Berkeley were either going to or coming from Oakland.

Nearly two-thirds – about 65 percent – of Berkeley riders said they were either coming from or going to other 1R stops in Berkeley, or along Telegraph north of downtown Oakland.

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<sup>64</sup> The “regional” poverty line, as defined by the Metropolitan Transportation Commission, is 200 percent of the federal poverty level.

<sup>65</sup> Alameda Contra Costa Transit District, *Fiscal Year 2010 Small Starts Submittal*, September 2008

<sup>66</sup> Nelson\Nygaard Consulting Associates, “International/Telegraph Corridor Rapid Bus Study: Phase IV,” April 2009

FIGURE 3-1 ORIGINS AND DESTINATIONS FOR ROUTE 1R TRIPS WITH ONE OR BOTH ENDS IN BERKELEY

Of all trips beginning or ending in Berkeley, percentage with the other end in ...		
<b>Berkeley</b>		<b>16.1%</b>
<b>Oakland</b>		<b>77.4%</b>
<b><i>Oakland north of Downtown</i></b>		<b>48.8%</b>
North Oakland	(the 8 stops from Telegraph/Alcatraz to Telegraph/40 <sup>th</sup> St.)	34.2%
Uptown/Pill Hill	(the 6 stops from Telegraph/31 <sup>st</sup> St. to Telegraph/20 <sup>th</sup> St.)	14.6%
<b><i>Downtown Oakland</i></b>	<b><i>(the 8 stops from Broadway/14<sup>th</sup> St. to 11<sup>th</sup> St./Madison (SB) and 12<sup>th</sup> St./Oak)</i></b>	<b>16.1%</b>
<b><i>Oakland east of Downtown</i></b>		<b>12.5%</b>
Eastlake/San Antonio	(the 10 stops from International/1 <sup>st</sup> Ave. to International/26 <sup>th</sup> Ave.)	6.3%
Fruitvale/Seminary	(the 8 stops from International/34 <sup>th</sup> Ave. to International/Havenscourt)	3.0%
Elmhurst	(the 10 stops from International/73 <sup>rd</sup> Ave. to International/104 <sup>th</sup> Ave.)	3.3%
<b>San Leandro</b>		<b>6.5%</b>
Northern/downtown San Leandro	(the 6 stops from E. 14 <sup>th</sup> St./Dutton to E.14 <sup>th</sup> St./Dolores)	2.4%
Southern San Leandro	(the 8 stops from E. 14 <sup>th</sup> St./San Leandro Blvd. to Bay Fair BART)	4.2%

### 3-2 Would BRT Duplicate BART?

The East Bay BRT corridor roughly parallels BART’s Richmond-Fremont line, and connects to BART stations at a number of locations: downtown Berkeley, MacArthur, downtown Oakland stations, Fruitvale, and at either San Leandro or Bay Fair BART, depending on alignment. This has led some to question as to whether BART and BRT service would be redundant.

City staff’s evaluation of the issue came to the following conclusions:

- **Station Spacing:** Parts of the BRT and BART alignments are in fact quite close to each other: in downtown Berkeley, BRT would be on Shattuck, immediately above BART, and Telegraph Avenue is about one-half mile east of the BART alignment, which is under Shattuck and Adeline. However, distances between BART stations can be significant – the distance between the downtown Berkeley and Ashby BART stations, for example, is about 1.2 miles – and the distances between BRT stops along Telegraph Avenue and the nearest BART station would range from around two-thirds of a mile to about a mile. In other words, while the BRT *alignment* might not be far from the BART *alignment*, many BRT stops would not be within walking distance<sup>67</sup> of the nearest BART station,

<sup>67</sup> For healthy adults, a walk of two-thirds of a mile takes about 12 to 15 minutes. Transportation planners generally consider a one-half mile radius around transit stops, or about a 10-minute walk, to be “walking distance.”

and relatively few residents would be within walking distance of both a BART station and BRT stop.

- *Transit Interconnectivity:* The BRT project would improve regional transit connections, as the limited-stop BRT and BART, which essentially offers express service, would complement one another. Long-distance riders bound for destinations along Telegraph, for example, could take BART to 19th Street/Oakland, MacArthur or downtown Berkeley, then complete their trips using the BRT in less time than it takes today. Riders are also now able to use the TransLink regional farecard on both BART and AC Transit.
- *Cost:* For longer trips, BART is more expensive than the proposed BRT: \$3.05 for a trip between downtown Berkeley and Bay Fair BART, compared to \$2 for AC Transit. While most riders would willingly pay a little more for a much faster trip, fares for frequent users can accumulate over time, and cost is an important factor given the numbers of low-income residents in the corridor.

In many ways, BRT would make conventional bus service more like BART. Level boarding would be a major improvement, especially for seniors, persons with disabilities, and people with strollers. Real-time arrival information and pre-payment for faster boarding are additional features of BART that BRT would also provide.

### **3-3 Would It Be “Worth It” to Dedicate Lanes to Buses?**

In many cases, dedicating a lane to buses requires taking away a lane from cars and trucks. However, by allowing buses to go much faster, dedicated lanes can allow “more” buses to run – or rather, the same number of buses can, by finishing each trip faster, make more trips over the course of a day. A single bus can carry as many people as several dozen cars, and if the buses run often enough, and are full enough, a transit-only lane can increase the total *person* capacity of a street by allowing buses to carry many more people than they would in other lanes, or than cars in the lane would.

When Route 1R buses were observed by AC Transit surveyors in 2008,<sup>68</sup> they were found to be carrying more than 100 passengers at some points. While buses in Berkeley, near the end of the route, are not as crowded as buses near the middles of their runs, buses entering Berkeley during the morning rush hour were observed to have as many as 55 passengers on-board. Today, local and rapid buses on Telegraph run about every 6.7 minutes during rush hours, and in 2007, they carried 21,500 passengers per day. By 2015, according to AC Transit, they would run every five minutes and carry about 42,500 passengers a day.<sup>69</sup>

On Telegraph, DEIS/R analysis found that the total number of people in vehicles on Telegraph just north of Ashby Avenue during a typical P.M. peak hour would

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<sup>68</sup> Nelson\Nygaard Consulting Associates, “International/Telegraph Corridor Rapid Bus Study: Phase IV,” April 2009

<sup>69</sup> Alameda Contra Costa Transit District, *Fiscal Year 2010 Small Starts Submittal*, September 2008

be higher with the project than without: 1,045 fewer people would be in cars, but 1,278 more would be on buses.<sup>70</sup>

For more information on the benefits of dedicated lanes, see “Benefits of Dedicated Lanes” in Chapter 1.

### **3-4 How Would BRT Affect Safety (including Emergency Vehicle Access)?**

BRT could improve safety in a number of ways for pedestrians, for cyclists, and for emergency vehicles.

Improved access for emergency vehicles is an important benefit of dedicated lanes. Emergency vehicles would be able to access the median transitway on Telegraph, near Alta Bates Summit Medical Center, to bypass traffic in the other lanes. Since congestion in the corridor is projected to increase with or without BRT, dedicated lanes would help to avoid slower emergency response times in the future.

BRT should improve pedestrian and bicyclist safety in the following ways:

- A reduction in the number of lanes would discourage speeding and reckless driving and “calm” traffic, which should improve safety for both pedestrians and bicyclists in the corridor. Currently, it is easy for cars to travel over the speed limit of 25 miles per hour.
- BRT platforms at crosswalks would serve as “median refuges,” allowing pedestrians to safely wait in the middle of street for the next walk signal. Refuges would also be provided in some other locations.
- Crosswalks would be improved throughout the corridor.
- BRT would remove the “multiple threat” to pedestrians that exists at unsignalized crosswalks with multiple lanes of traffic in each direction, as shown in Figure 2-5.
- The recommended “combined” service alternative eliminates the risk that bus riders waiting at curbside stops for the next local bus would dash across the street if they saw a BRT bus coming. Further, with a BRT bus arriving every five minutes, passengers would be even less likely to dart into traffic as they could be certain that another bus would arrive in just a few minutes.
- Buses would be removed from curbside lanes along Telegraph south of Dwight, improving safety for cyclists.
- Bicycle lanes would be added on Telegraph between Webster and the Oakland border.
- On Telegraph south of Dwight, cyclists would only need to merge across a single lane of traffic to make a left turn.

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<sup>70</sup> Alameda Contra Costa Transit District, *AC Transit East Bay Bus Rapid Transit Project Draft Environmental Impact Statement/Environmental Impact Report*, May 2007

- If cyclists were to use the the southbound transit and delivery vehicle lane on Telegraph north of Dwight, they would have to contend with relatively few vehicles.
- On Bancroft, the transit lane would be made 15 feet wide in order to safely accommodate buses and bikes side by side (on Durant, the transit lane would be 13 feet wide).

BRT could also degrade safety in some ways:

- Where “island” stops would be in the center of the street, all bus riders would have to cross at least one lane of traffic to reach the platform (however, the maximum number of lanes that would have to be crossed, including transit lanes, would be four, compared to six today).
- In a few locations along Telegraph, sidewalks would not be buffered from traffic by parked vehicles (although this is already the case in some places, and among City staff’s proposed improvements to the project are trees, sidewalk furniture or bollards along the curb at these locations).

### **3-5 What Would Be the Land Use and Economic Impacts of BRT?**

The most important fact to bear in mind when considering the potential impacts of BRT on land use in Berkeley is that all development decisions will remain solely within the purview of the City and are not at the discretion of AC Transit or state officials. There are no state laws related to transit, transit villages, transit corridors, or transit-oriented development mandating higher densities or heights. Nor would implementation of BRT require any waivers of existing regulations.

BRT would probably have some impact on land values and development. As a relatively new mode of transit, there have been comparatively few studies of BRT’s effects on development. The research that is available, however, suggests that the land use impacts of BRT are typically closer to those of rail lines than of other bus routes. Numerous studies have found that land uses tend to intensify around train stations, in part because of the access they offer, but also because rail infrastructure conveys a sense of permanance, of public investment in a place. Developers are typically less willing to invest in locations served by buses that might be re-routed or eliminated.

This public and resulting private investment has been found to increase most property values. Since BRT would feature significant investments in infrastructure – while no tracks would be laid, AC Transit would be unlikely to abandon dedicated lanes and high-platform stations – it is likely that the EBBRT project would impact land values in ways similar to light rail projects.<sup>71</sup>

However, transit systems do not by themselves generate development. A survey of developers in the San Pablo Avenue corridor found that other considerations,

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<sup>71</sup> Transportation Research Board, *Transit Cooperative Research Program Report 118: Bus Rapid Transit Practitioner’s Guide.*, 2007

such as streetscape, land costs, safety, and zoning are all contributing factors.<sup>72</sup> Light rail stations in areas perceived to have a crime problem, or in a restrictive zoning district, may not generate much development. On the other hand, investment in BRT is often accompanied by improvements, such as enhanced landscaping and lighting, that can add to an area's attractiveness.

In order to better understand the potential land use impacts of the EBBRT project, AC Transit commissioned a report. Among its findings:<sup>73</sup>

- *Effects on Overall Land Use Patterns:* The existing development pattern is supportive of transit use, and BRT would encourage intensification of land use within the corridor. Investments associated with BRT, such as stations and streetscape improvements, would attract development and pedestrian activity. Loss of traffic lanes and on-street parking could make the corridor less attractive to lower-density land uses.
- *Growth-Inducing Effects:* BRT would not change the amount of growth in the region, but could impact the distribution of that growth. More development could be attracted to the corridor, although probably not more than is anticipated by Berkeley's General Plan.<sup>74</sup>
- *Consistency with Existing Land Use Policies:* BRT would support Berkeley General Plan policies encouraging higher-density, transit-oriented development in the downtown and along major arterials and transit corridors.<sup>75</sup>

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<sup>72</sup> Mejias, L. and E. Deakin., "Redevelopment and Revitalization Along Urban Arterials: Case Study of San Pablo Avenue, California, from the Developers' Perspective.," *Transportation Research Record: Journal of the Transportation Research Board No. 1902*, Transportation Research Board of the National Academies, 2005

<sup>73</sup> Hausrath Economics Group, *AC Transit East Bay BRT Project: Land Use Report*, 2007.

<sup>74</sup> The current General Plan land use classifications along the proposed BRT corridor are Avenue Commercial and Downtown. These classifications allow for population densities of 44 to 88 persons per acre and 88 to 220 persons per acre respectively, which are equivalent to the City's Medium Density and High Density classifications. The Telegraph Avenue corridor and the Downtown are also identified by the City of Berkeley as Priority Development Areas (PDA) and are eligible for planning grants, technical assistance and, in the case of downtown, capital infrastructure funds through regional agencies.

<sup>75</sup> BRT would support the following General Plan, draft Southside Plan and draft Downtown Area Plan (DAP) goals and policies supporting higher-density, transit-oriented development in the downtown and along major arterials and transit corridors:

- General Plan Policy LU-23 – Transit-Oriented Development
- General Plan Policy LU-24 – Car-Free Housing in the Downtown
- General Plan Policy H-16 – Transit-Oriented New Construction
- Southside Plan Policy LU-A1 – Provide incentives to encourage development of a variety of different housing types that are affordable to students, University employees and employees of Southside businesses
- Southside Plan Policy LU-F14 – Mixed-use buildings with housing above retail uses are the preferred land use throughout the C-T commercial subarea
- DAP Goal ES-3 – Encourage high density, highly livable development to take advantage of Downtown's proximity to regional transit and to improve the availability of diverse walk-to destinations - such as retail, services, culture and recreation
- DAP Policy LU-2.1 – Housing Needs
- DAP Policy LU-2.2 – Housing Diversity and Affordability
- DAP Policy LU-3.1 – Transit-Oriented Development
- DAP Policy LU-4.1 – Office Space
- DAP Policy LU-5.1 – University Land Uses

The report also considered economic impacts. It found that by removing parking, BRT could have a negative impact on businesses that rely on auto access, especially those not located near stations. Over the long-term, BRT could cause a gradual shift in the retail mix away from such businesses to those driven by foot traffic. In short, some businesses would benefit, while others would not.

This distinction is key to understanding the likely impacts of BRT on businesses. Merchants, both in Berkeley and elsewhere, often oppose proposals to remove street parking or to raise the price of parking. It is certainly true that the easier access to a business is by all modes of travel, the better business will be. However, in a constrained urban environment, access by one mode often comes at the expense of others, and protecting access for cars at all costs is sometimes not the most profitable strategy.

The relative importance of access to businesses by different modes varies depending on both the type of business and where it is located. Small businesses in pedestrian-oriented neighborhoods stand to benefit most from strategies to increase foot traffic, such as improved transit access.

### **3-6 How Would BRT Affect "Spillover" Parking in Neighborhoods?**

Two institutions along the BRT route significantly impact surrounding neighborhoods through "spillover" parking. A 2001 study for the City found that University of California students, faculty and staff occupy about 2,200 off-campus parking spaces on an average weekday,<sup>76</sup> while Alta Bates Medical Center's 2008 traffic report found that about 566 visitors and staff park in the surrounding area on a daily basis. Could BRT help to reduce these impacts?

Without extensive analysis of the origins of trips to the UC and Alta Bates, it is difficult to say. However, some preliminary conclusions can be drawn from available data:

- In its 2020 Long Range Development Plan,<sup>77</sup> the UC proposed to accommodate all current unmet demand for parking as well as projected growth in parking demand by constructing 2,300 new spaces on-campus and in surrounding areas. However, it proposed to defer construction of 500 spaces if BRT were under construction by 2010. This figure was based on a 10 percent decrease in the 2000-2001 percentages of students, faculty and staff driving alone to campus. The university did not assume that BRT alone would reduce demand for parking; it also factored in other campus-based incentives.

According to 2005 and 2006 surveys of students, faculty and staff, drive-alone levels have already fallen approximately 14 percent from 2000-2001 levels.<sup>78</sup> This could suggest that the 10 percent reduction in demand

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<sup>76</sup> Nelson\Nygaard Consulting Associates, "Southside/Downtown Transportation Demand Management Study," March 2001

<sup>77</sup> University of California, *UC Berkeley 2020 Long Range Development Plan Final Environmental Report*, 2004

<sup>78</sup> University of California Berkeley Parking & Transportation Department, *The Fall 2005 Student Transportation Survey and Faculty/Staff Transportation and Parking Survey, Fall 2006*

for parking the university assumed BRT and other programs might be able to achieve may have been a conservative estimate. It further suggests that, if the university goes ahead with plans for additional parking, spillover into adjacent neighborhoods might be reduced. However, greater availability of parking is also likely to encourage more campus visitors to drive. Responses from the 2005-06 surveys showed that one out of six faculty and staff live somewhere in Oakland, and the most popular reasons for not taking transit were related to speed and convenience (most students live in Berkeley and already walk, bike or take transit to campus). Though the BRT market for additional campus-bound riders is somewhat limited by geography and personal preferences, this does suggest that current drivers could be attracted by a faster, more reliable transit service, thereby reducing parking demand.

- According to the January 2008 Traffic Monitoring Report for Alta Bates Medical Center,<sup>79</sup> 78 percent of employees and 84 percent of visitors arrive at the hospital by car. Although no data is available on where their trips begin, this suggests a relatively large potential market for improved transit service, particularly if additional measures recommended by the report to discourage driving and parking in the neighborhood are implemented. It should be made clear that while BRT would reduce demand for parking, adding bus lanes on Telegraph would also reduce parking supply. In this area, it will be very important that AC Transit seriously consider the additional strategies to address parking impacts recommended by City of Berkeley staff, which are described in Chapter 4.

### **3-7 Would the East Bay BRT Project Be Cost-Effective?**

AC Transit's Major Investment Study found that Bus Rapid Transit would be almost as effective as Light Rail Transit and would cost much less to build and operate. BRT would cost much more than rapid bus, but it is much more effective than rapid bus in terms of reducing travel time and improving reliability.

According to AC Transit's latest estimates, the EBBRT project would cost approximately \$235 million<sup>80</sup> to build. Construction costs<sup>81</sup> would include:

- Approximately 50 BRT stations including features such as raised platforms, ticket machines, shelters, electronic real-time bus arrival displays, and access ramps
- Construction of bus-only lanes including rehabilitation of existing pavement in lanes and full reconstruction of pavement adjacent to stations, as well as, potentially, mountable concrete curbs on either side of median lanes
- Improved traffic signals

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<sup>79</sup> Fehr & Peers Transportation Consultants, "Alta Bates Medical Center Ashby Campus Draft January 2008 Monitoring Report," May 2008

<sup>80</sup> Alameda Contra Costa Transit District, *Fiscal Year 2010 Small Starts Submittal*, September 2008

<sup>81</sup> Federal capital funding available to AC Transit for construction of BRT could not be used for operating expenses.

Is the project's budget realistic? Costs for similar projects offer some guidance. The East Bay BRT project is projected to cost about \$14 million per mile to build. This would be more than the EmX project in Eugene, Oregon (\$6.1 million per mile), which consists mostly of dedicated lanes. It would also be more than the Washington Street segment of Boston's Silver Line (\$11.4 million per mile), although that project did not include an exclusive transitway and opened in 2002. The AC Transit estimate is less than it cost to build Los Angeles' Orange Line (\$21.9 million per mile), but that project consists almost entirely of a dedicated, off-street busway.<sup>82</sup>

The project appears inexpensive when compared to other regional transit projects. San Francisco's Van Ness Avenue BRT project is projected to cost about \$59 million per mile,<sup>83</sup> while the recently completed T-Third Street light rail line cost about \$127 million per mile,<sup>84</sup> and the planned Central Subway is projected to cost about \$930 million per mile.<sup>85</sup>

Would the project be cost-effective in terms of attracting new users to transit? According to analysis conducted for its Small Starts application for federal funding,<sup>86</sup> it would be cost-effective when compared to its peers:

- "Cost per Hour of Transportation System User Benefit" (TSUB) is a Federal Transit Administration (FTA) measure of a proposed project's cost-effectiveness. Basically, it is the annual cost, including both amortized capital and incremental operating costs, of every one-hour reduction in a rider's travel time. Of the 22 projects that had applied to FTA for "Small Starts" funding (a grant program for transit projects that cost less than \$250 million to build) as of February, only two have earned a "high" TSUB ranking – and the East Bay BRT project was one of them.<sup>87</sup>
- In addition to TSUB, FTA measures "cost per new rider," or "incremental cost per incremental trip" – the cost of every additional "linked" trip (that is, a door-to-door trip, which may include transfers) attracted to transit. Figure 3-2 below shows the TSUB and new-rider costs of all West Coast "Small Starts" and "New Starts" (more than \$250 million) projects currently in development for which figures were available.<sup>88</sup>

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<sup>82</sup> United States Department of Transportation, "Characteristics of Bus Rapid Transit for Decision-Making" Project No. FTA-FL-26-7109.2009.1, Federal Transit Administration Office of Research, Demonstration and Innovation, February 2009

<sup>83</sup> Federal Transit Administration, *Annual Report on Funding Recommendations, Fiscal Year 2010*, 2009

<sup>84</sup> San Francisco Municipal Transportation Agency webpage, "About the T-Third Line," <http://www.sfmta.com/cms/mroutes/tthirdsvc.htm>

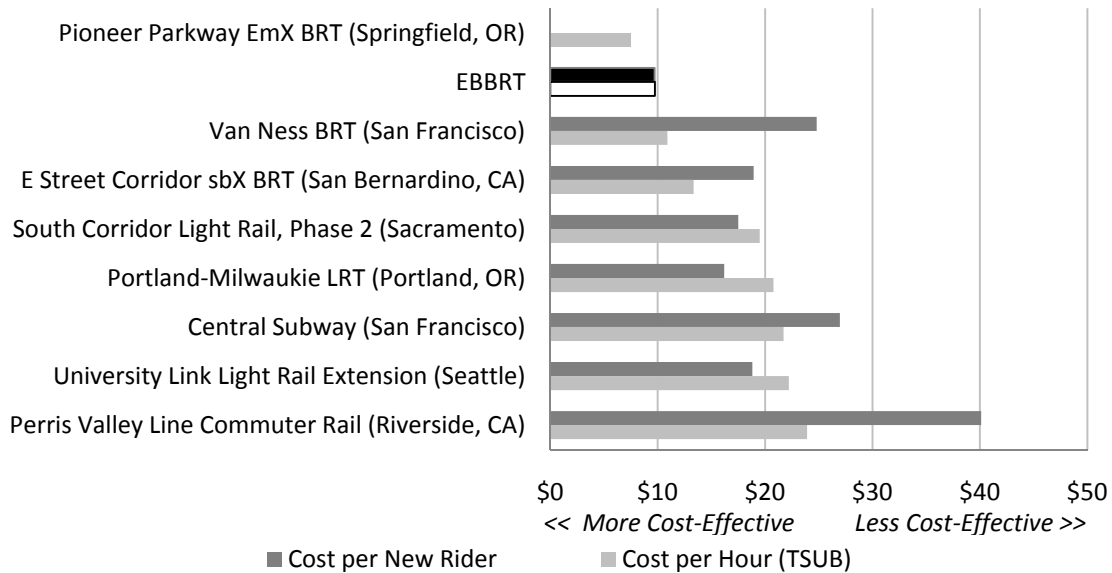
<sup>85</sup> San Francisco Examiner, "Subway Completion Faces Delay," April 21, 2009

<sup>86</sup> Alameda Contra Costa Transit District, *Fiscal Year 2010 Small Starts Submittal*, September 2008

<sup>87</sup> Federal Transit Administration, *Annual Report on Funding Recommendations, Fiscal Year 2010*, 2009

<sup>88</sup> Federal Transit Administration, *Annual Report on Funding Recommendations, Fiscal Year 2010*, 2009

FIGURE 3-2 FTA COST-EFFECTIVENESS RATINGS FOR EAST BAY BRT AND PEER PROJECTS



### 3-8 How Effective Have Other BRT Projects Been?

Numerous studies have been conducted by transit agencies, independent research organizations, and academics on the effectiveness of Bus Rapid Transit. A brief survey of findings of these studies is presented below. For more information about how other systems have performed, two comprehensive sources are:

- *Characteristics of Bus Rapid Transit for Decision-Making*,<sup>89</sup> the Federal Transit Administration’s comprehensive evaluation of the performance of national and international Bus Rapid Transit projects
- *Transit Cooperative Research Program (TCRP) Report 90: Bus Rapid Transit (Volumes 1 and 2) and Report 118: Bus Rapid Transit Practitioners Guide*, which analyze BRT implementations in 26 cities in North America, Australia, Europe, and South America<sup>90</sup>

For additional information, please see “General BRT Resources” in the appendix.

#### 3-8.1 Travel Time

There are two primary components of transit speed:

- Running time, which depends on traffic congestion, delay at intersections, and time spent pulling into and out of stops

<sup>89</sup> Project No. FTA-FL-26-7109.2009.1. United States Department of Transportation, Federal Transit Administration Office of Research, Demonstration and Innovation. February 2009

<sup>90</sup> Transportation Research Board, *Transit Cooperative Research Program Report 90: Bus Rapid Transit (Volume 1: Case Studies in Bus Rapid Transit)*, 2003; Transportation Research Board, *Transit Cooperative Research Program Report 90: Bus Rapid Transit (Volume 2: Implementation)*, 2003; Transportation Research Board, *Transit Cooperative Research Program Report 118: Bus Rapid Transit Practitioner’s Guide*, 2007

- Dwell time, which is a measure of how long a bus has to remain at stops while passengers load and unload

By reducing both running time and dwell time, BRT can reduce delay significantly. According to the Transit Cooperative Research Program’s (TCRP) *Transit Capacity and Quality of Service Manual, 2nd Edition*, even a “porous” or semi-exclusive transit lane should reduce travel times on an arterial route with average stop spacing of one-half-mile and average dwell time of 20 seconds by 6 to 12 percent.<sup>91</sup> In its BRT report, the FTA found that more complete BRT treatments, such as exclusive lanes and level boarding, could result in much greater time savings:

“Overall, BRT systems are reporting improvements in travel time over previous corridor travel times or existing local bus service. Improvements range from 5 to 70 percent, with the median percentage improvement at 25 percent, due mainly to the large number of on-street running way BRTs in the U.S. The strongest indicator of improved travel time is the level of running way segregation, and most systems with less than 25 percent improvement operate on-street in mixed traffic lanes. The systems with the highest reported travel time savings of 40 percent or higher were those with grade-separated busways.”<sup>92</sup>

Following are some examples of travel time savings experienced by users of BRT projects in North American cities with some dedicated right-of-way, from research conducted for this report:

FIGURE 3-3 EXAMPLES OF BRT TRAVEL TIME SAVINGS

Eugene, Oregon	30%
Cleveland	42%
New York City	~20%
Vancouver, BC	16%

### 3-8.2 Reliability

Reliability is related to both variability of travel times – the consistency of “gaps” between arriving buses -- and the ability of buses to stay on schedule and arrive on time. As with travel time, the two primary elements in reliability are consistent running times and consistent dwell times, both of which can vary greatly depending on the amount of congestion and numbers of passengers at different times of day.

Although it can be difficult to compare reliability across systems, the FTA has developed a measure:

<sup>91</sup> Transit Cooperative Research Program, *Transit Capacity and Quality of Service Manual, 2nd Edition*, 2004

<sup>92</sup> United States Department of Transportation, “Characteristics of Bus Rapid Transit for Decision-Making” Project No. FTA-FL-26-7109.2009.1, Federal Transit Administration Office of Research, Demonstration and Innovation, February 2009

“A ratio higher than 1.00 indicates that peak travel times are longer than non-peak, and the higher the ratio, the more variable the travel time. Not surprisingly, the ratio is typically lower for BRT systems that operate along dedicated or exclusive lanes than for those systems that operate within a mixed-flow environment. Of the systems that provided data for this report, almost all that operate on a segregated running way have a ratio of 1.0 to 1.2. For systems that operate along mixed-flow lanes, this ratio was typically higher, particularly in regions suffering from heavy local traffic conditions.”<sup>93</sup>

### **3-8.3 Ridership**

Ridership increases from BRT can also be difficult to compare across systems, as new service in a corridor with low existing ridership can show a much higher percentage gain than new service in a corridor with a higher base of ridership, even if the latter attracts more riders in absolute terms. However, the FTA has found that:

“There have been increases in transit ridership in virtually all corridors where BRT has been implemented. Increases in BRT ridership have come from both individuals that used to use transit and totally new transit users that have access to automobiles. Data on BRT systems around the world reveal a wide range of ridership increases, from as little as 5 percent to well over 100 percent. Typically, increases are at least around 35 percent, and many are significantly higher.”<sup>94</sup>

Following are examples of ridership increases experienced by BRT projects both in North America and internationally, as well as numbers of drivers shifting to BRT, from *TCRP Report 90*<sup>95</sup> and from separate research conducted for this report.

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<sup>93</sup> United States Department of Transportation, “Characteristics of Bus Rapid Transit for Decision-Making” Project No. FTA-FL-26-7109.2009.1, Federal Transit Administration Office of Research, Demonstration and Innovation, February 2009

<sup>94</sup> United States Department of Transportation, “Characteristics of Bus Rapid Transit for Decision-Making” Project No. FTA-FL-26-7109.2009.1, Federal Transit Administration Office of Research, Demonstration and Innovation, February 2009

<sup>95</sup> Transportation Research Board, *Transit Cooperative Research Program Report 90: Bus Rapid Transit (Volume 1: Case Studies in Bus Rapid Transit)*, 2003

**FIGURE 3-4 EXAMPLES OF BRT RIDERSHIP INCREASES**

Los Angeles	26-33%
Eugene, Oregon	131%
Cleveland	42%
Pittsburgh	38%
Boston	147%
Vancouver, BC	28%
Adelaide, Australia	76%
Brisbane, Australia	42%
Leeds, UK	50%

**FIGURE 3-5 PERCENTAGES OF BRT RIDERS SHIFTING FROM DRIVING**

East Bay (72R San Pablo)	19%
Los Angeles (Orange Line)	33%
Las Vegas	10%
Albuquerque	33%
Boston Silver Line (Silver Line Washington St branch)	2%
Boston (Silver Line airport branch)	19.6%
Boston (Silver Line Boston Marine Industrial Park branch)	49.5%
Halifax, Nova Scotia	23-28%