

**SAN FRANCISCO BAY AREA RAPID TRANSIT DISTRICT
TITLE VI CORRECTIVE ACTION PLAN, Action Plan Item 5.1**

**Title VI Assessment of Proposed BART Temporary Fare Reduction
Options**

**Submitted to the Federal Transit Administration
July 16, 2010**

1. INTRODUCTION

As approved by the Federal Transit Administration (FTA) on April 21, 2010, BART's Title VI Corrective Action Plan (version r15a) includes Action Item 5.1, the requirement to perform analyses of any potential fare change to determine if that fare change would have a disproportionately high and adverse effect on minority and low-income populations. Per the Corrective Action Plan Item 3, BART has followed its Inclusive Public Participation Plan by conducting in June 2010 extensive public outreach to the communities it serves, including low-income, minority, and limited-English proficiency populations, through 18 public meetings held throughout the four counties BART serves. The results of this outreach are described in a separate report, "Proposed Temporary Fare Reduction Options Public Participation Summary Report."

This report of BART's Title VI analysis of the proposed temporary fare reduction begins with a summary of findings and then provides an overview of BART's fare structure and a ridership profile. Next, the data and methodology used to assess the effect of the proposed temporary fare reduction are described. The report then provides a description of and reason for the proposed temporary fare reduction; an assessment of the alternatives available for people affected by the proposed temporary fare reduction; and a determination of whether the proposed temporary fare reduction would have a disproportionately high and adverse effect on minority and low-income populations.

2. SUMMARY OF FINDINGS

Methodology and Data Used

The methodology used to assess the effects of each fare decrease calculates the weighted average systemwide fare decrease for (a) minority and non-minority populations and (b) low-income and non-low-income populations. The decreases are then compared between the protected (minority or low-income) and nonprotected (non-minority or non-low-income) groups to determine if there was a disproportionately high and adverse effect on minority or low-income populations when compared respectively to non-minority or non-low-income populations.

The analysis employed data from two main sources: 2000 Census data and the Station Profile Study, which consists of a survey of BART riders. Census data and survey data were used to determine the numbers and location of each population in order to calculate weighted average fares for each group, as follows:

- Average fares in the analysis are weighted by the number of protected and nonprotected populations. Census data provide the entire population of minority and low-income populations that reside in census tracts whose residents use that station.¹ Census data thus capture all the populations compared to much smaller survey samples that may under represent protected groups. And, although the 2008 Station Profile Study has data for all stations, a sufficient sample size by protected group is not available at some stations. Survey data were used to verify that census tracts assigned to a station for weighting purposes had residents who rode BART and used

¹ Census data for poverty statistics is extrapolated for the population of a census unit based on the responses obtained from the long-form of the Census.

that station. Census tracts were thus assigned to a station based on the home-origins of riders, as declared in the surveys.

Temporary Fare Reduction Options Analyzed

Two temporary fare reduction options were analyzed using the data and methodology described above².

Option A. Temporary Fare Reduction of Three Percent for Four Months

Under this option, BART's fare would be reduced by 3 percent, and then rounded to the nearest nickel. This reduction would be in place for four months. The analysis of this option showed the following results:

- The average fare decrease for the entire population of the four-county BART service area was 3.02 percent, or from \$3.65 to \$3.54, a \$0.11 decrease.
- For the minority population, the average fare decrease was 3.04 percent (\$3.52 to \$3.41, or -\$0.11) and for the non-minority population it was 3.00 percent (\$3.81 to \$3.69, or -\$0.11), a 0.05 percent greater decrease for the minority population.
- For the low-income population, the average fare decrease was 3.05 percent (\$3.44 to \$3.33, or -\$0.11) and for the non-low-income population, the decrease was 2.99 percent (\$3.71 to \$3.60, or -\$0.11), a 0.06 percent greater decrease for the low-income population.

Option B. Temporary Fare Reduction of Five Percent for Three Months

Under this option, BART's fare would be reduced by 5 percent, and then rounded to the nearest nickel. This reduction would be in place for three months. The analysis of this option showed the following results:

- The average fare decrease for the entire population of the four-county BART service area was estimated to be 5.07 percent, or from \$3.65 to \$3.46, a \$0.19 decrease.
- For the minority population, the decrease was 5.12 percent (\$3.52 to \$3.34, or -0.18), while for the non-minority population the fare decrease was 5.04 percent (\$3.81 to \$3.61, or -\$0.19), a 0.07 percent greater decrease for the minority population.
- For the low-income population, the average fare decrease was 5.15 percent (\$3.44 to \$3.26, or -\$0.18) and for the non-low-income population the fare decrease was 5.07 percent (\$3.71 to \$3.52, or -\$0.19), a 0.08 percent greater decrease for the low-income population.

Conclusion Regarding the Proposed Temporary Fare Reduction Options

Pursuant to FTA Circular 4702.1A dated May 13, 2007, a disproportionately high and adverse effect is defined as an adverse effect that either "is predominantly borne" by minority or low-income populations or "is appreciably more severe or greater in

² Totals may not add due to rounding.

magnitude” than the adverse effect suffered by non-minority and/or non-low-income populations. BART used this definition to determine if either of the proposed temporary fare reduction options would have such an effect.

For both of the proposed temporary fare reduction options, the percentage decreases when compared between the protected and non-protected groups are virtually the same (the decreases are actually slightly greater for the protected groups) and show that neither of the proposed temporary fare reduction options would result in a disproportionately high and adverse effect on minority or low-income populations when compared respectively to non-minority or non-low-income populations.

3. BART'S FARE STRUCTURE

BART's fare structure, implemented when the system opened in 1972, calculates fares based on distance traveled with surcharges applied to some trips. These components are summed and then rounded up or down to the nearest nickel. BART has followed this rounding procedure since operations began so that passengers do not have to pay their fares in penny increments. For example, if the calculated fare is \$2.32, then the passenger pays a fare rounded down to \$2.30.

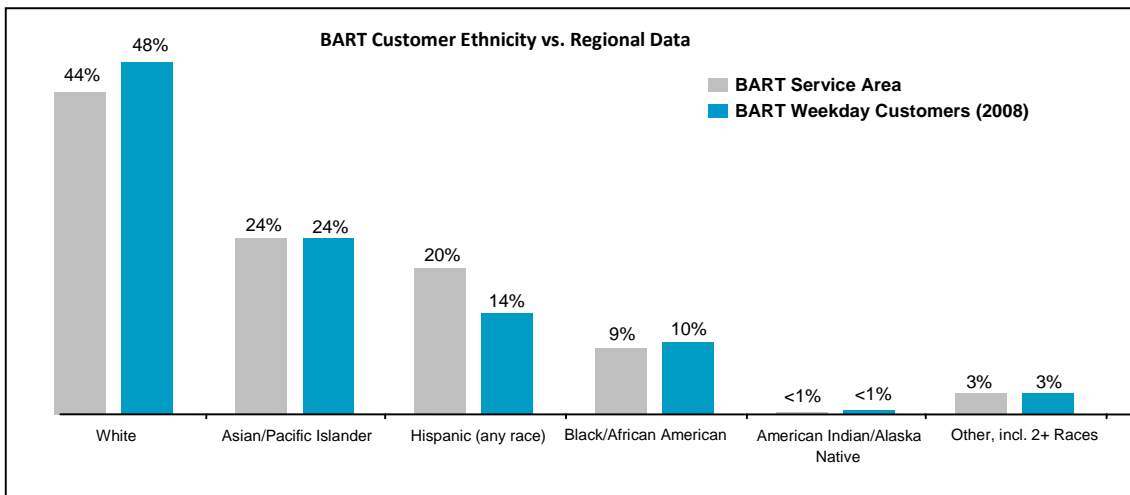
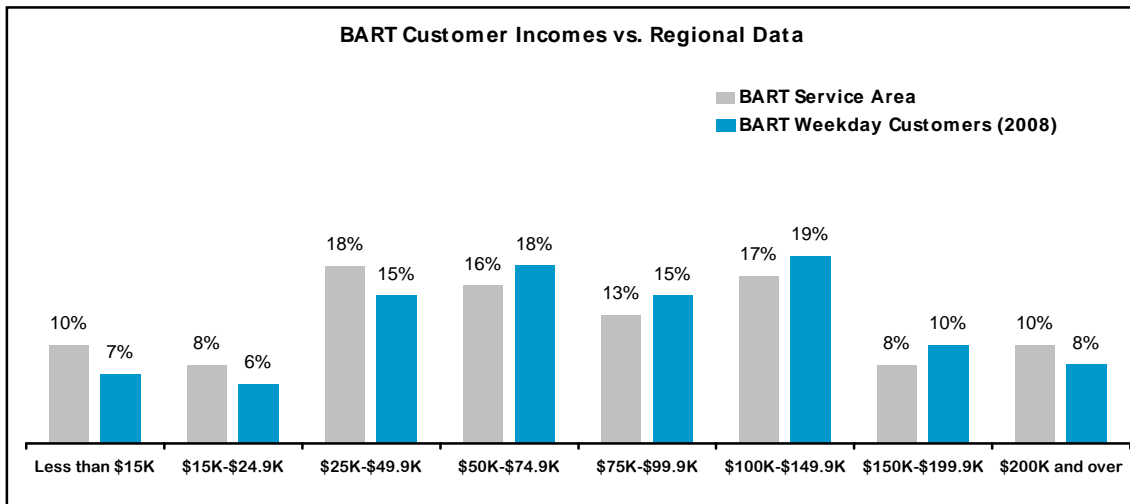
BART's fares are paid with either magnetic stripe tickets or the EZ Rider smart card. BART offers a 6.25 percent discount on its higher-value magnetic stripe tickets and the smart card. A 62.5 percent discount is given to seniors, people with disabilities, and children aged five through 12 (children under the age of five ride free). See Appendix A for a complete list of BART's ticket types, payment methods accepted, and the demographic profiles of the ticket type users.

4. BART STATION PROFILE STUDY

The 2008 Station Profile Study summarizes the largest survey ever conducted of BART riders and resulted in over 52,000 usable completed questionnaires.

- Annual household incomes of BART's weekday riders are fairly similar to the four-county service area.³
- The ethnic composition of weekday BART customers is fairly similar to the region as a whole, but BART customers are slightly more likely to be non-minority and less likely to be Hispanic.
- The average household size of weekday BART customers is 2.7 people, relatively in line with household size estimates in Alameda (2.7), Contra Costa (2.8), San Francisco (2.3) and San Mateo (2.8) counties.

³ Income levels cited in the 2008 Station Profile Study are based on household income (which does not take into account household size. Household income is different than federal poverty level, which is an individual-level determination of poverty status in relation to family income, family size, and a basic standard of living defined by the Census Bureau each year.



5. ASSESSING FARE REDUCTION EFFECTS: DATA AND METHODOLOGY USED

This section describes the data and methodology used to assess the effects of the proposed temporary fare reductions on minority and low-income populations, following the procedures in FTA Circular 4702.1A Section V.4.a, Option A.

In BART’s Corrective Action Plan, Action Item 5.1 and Appendix A, BART outlined a process for assessing the effects of its proposed fare changes. This process has three steps:

1. “Assess the effects of the proposed fare change on minority and low-income populations at the planning and programming stages of the proposed fare change.” (Appendix A, Item 1.a)
2. “Assess the alternatives available for people adversely affected by the fare increase.” (Appendix A, Item 1.b)
3. “Determine which if any of the proposals under consideration would have a disproportionately high and adverse effect on minority and low-income riders.” (Appendix A, Item 1.c)

If a finding is made that the proposed fare change had disproportionately high and adverse effects on low-income or minority populations, BART will develop proposed mitigation actions for public comment in accordance with BART's inclusive public participation plan and, after receiving public comment, bring the proposed mitigation actions to the BART Board for approval (per Appendix A, Items 1.d, 1.e, 1.f, and 1.g). Mitigation is neither necessary nor required where no disproportionately high and adverse effect is found.

The primary data used in the analysis are the following:

- Year 2000 U.S. Census.
- 2008 BART Station Profile Study.
- Actual BART fares, before and after the fare reductions; these are the full fares and do not reflect the various discounts available to riders.
- Inputs to the 2010 BART Ridership Model.

The methodology BART has used to assess the effects of the proposed temporary fare reduction options calculates the weighted average systemwide fare reduction for (a) minority and non-minority populations and (b) low-income and non-low-income populations. The reductions are then compared. A weighted average fare is more accurate than a simple average fare because it proportionally weights the fares by the number of trips taken by riders. In contrast, a simple average fare weights the fares of all stations equally and so does not account for the actual number of passengers and the trips they are taking.

For the purposes of these analyses, low-income is defined as less than 200 percent of the federal poverty level.⁴ The 200 percent threshold was used to account for the high cost of living in the Bay Area compared to the rest of the country and therefore is a more inclusive definition of low-income populations. The 200 percent threshold is also consistent with the assumptions employed by the Metropolitan Transportation Commission in its February 2009 Equity Analysis Report.

The methodology utilizes the following data, which substantially improve the robustness of the methodology:

- Actual BART fares and trips taken instead of estimated values.
- Actual numbers of the minority and low-income populations from Census 2000.⁵

The methodology employed for these analyses is similar to the method developed and applied by the Massachusetts Bay Transportation Authority (MBTA), which has been accepted by the FTA as a valid methodology for a Title VI fare analysis. BART also conferred with peer transit agencies regarding "best practices" in Title VI fare analyses. Like BART, these agencies serve areas with similarly large minority and low-income

⁴ As a reference, for a single person household, 200% of the federal poverty level in 2008 was \$21,982. For a two adult, two child household, the 200% threshold was \$43,668. (Note that the data mapped are based on 2000 Census data as these are the only such data available at the tract level.)

⁵ This is an improvement compared to a more gross method where an entire geographic subarea (for example, a census tract or a traffic analysis zone) is categorized either as predominantly minority or non-minority, low-income or non-low-income depending on the proportion of the protected population living there.

populations: New York, Atlanta, Chicago, Washington DC, Minneapolis, Houston, Portland and San Francisco Muni and AC Transit in the Bay Area.

The three-step methodology is described in detail in Appendix B. Appendix B also includes the process used to identify census tracts in the BART service area that are predominantly minority or low-income tracts. Appendix B Figures 1 and 2 show the BART service area and the geographical distribution of census tracts with a predominantly minority population or low-income population. Of the service area's 819 census tracts, 383 (47 percent) are predominantly minority and 327 (40 percent) are predominantly low-income.

6. PROPOSED TEMPORARY FARE REDUCTION OPTIONS

6.1 Nature of the proposed temporary fare reduction options

Option A would reduce BART fares by three percent for four months. Option B would reduce BART fares by five percent for three months.

6.2 Reason for the proposed temporary fare reductions

In Fiscal Year 2011 (FY11), which began July 1, 2010, BART is projecting it will have a small surplus because of one-time State Transit Assistance funding that was restored after being cut in earlier years. The BART Board would like to show their appreciation to BART's riders for continuing to use the service during difficult times by temporarily reducing riders' fares.

Each year, BART spends about \$600 million to run the system. Riders' fares contribute over half of that amount--about \$330 million each year. For FY11, BART had projected it would have an \$11 million deficit, but the State of California unexpectedly gave BART \$26 million in March 2010. These funds may or may not be available after FY11.

The BART Board is considering uses for these funds, including putting about \$9 million of it into reserves. Other potential uses include replacing car seats, cleaning car interiors, postponing a paratransit fare increase for four months, and instituting a frontline personnel customer service improvement program. About \$2.3 million of the funding could be used to temporarily reduce BART's fares. Each option analyzed in this report has been selected because its combination of percentage reduction and time period of the reduction (three percent reduction for four months or five percent reduction for three months) would cost an estimated \$2.3 million.

6.3 Alternatives available for people affected by the proposed temporary fare reduction options

This section analyzes alternative transit modes, fare payment types, and fare payment media available for people who could be affected by the proposed temporary fare reduction options. The analysis compares the fares paid under the change with fares that would be paid through available alternatives.

6.3.1 Alternative Transit Modes, including Fare Payment Types

BART operates a single mode, heavy rail. However, there are four major operators in the BART service area that provide service parallel to some segments of the BART system:

- AC Transit: Bus operator with service in Alameda County and parts of Contra Costa County, and between parts of Alameda County and downtown San Francisco.
- Caltrain: Commuter rail with service from Gilroy in the South Bay through to downtown San Francisco.
- San Francisco Muni: Bus and light rail operator serving the City and County of San Francisco.
- SamTrans: Bus operator with service in San Mateo County.

The table below compares BART fares, including under the two fare reduction options, and the fares of operators providing service in parts of the BART service area.

	Adult Local Fare effective as of July 2010	Adult Pass Price effective as of July 2010
BART		
Current minimum fare	\$1.75	N/A
Option A. 3% Fare Reduction to Minimum Fare	\$1.70	N/A
Option B. 5% Fare Reduction to Minimum Fare	\$1.65	N/A
AC Transit	\$2.00	\$80
Caltrain (zone-based)	\$2.50-\$11.25	\$66.25-\$298.25
San Francisco Muni	\$2.00	\$70*
SamTrans	\$2.00	\$64

*This pass is also good for unlimited rides on BART within San Francisco.

In comparing the other operators' fares to BART fares, the local cash fares of the other operators are higher than BART's current minimum fare of \$1.75 and consequently would be higher than the minimum fare under the two fare reduction options. A rider could pay a fare using the other operators' passes that would be less expensive than the \$1.75 BART fare under the following circumstances:

- AC Transit: Rider takes more than 45 trips per month.
- Caltrain: Rider takes more than 37 trips per month (based on \$66.25 pass).
- San Francisco Muni: Rider takes more than 40 trips per month.
- SamTrans: Rider takes more than 36 trips per month.

6.3.2 BART Fare Payment Types, Fare Payment Media, Payment Method, and Fare Paid

The table on the next page shows the fare payment types, fare payment media and payment methods BART currently offers, as well as a comparison of current and reduced fares paid using the different fare payment types.

The demographic profile of each fare type user from survey data is provided in Appendix A. Those data show minority and non-minority riders are similar in their usage of ticket types and fare media, although minority riders are somewhat less likely to use the EZ Rider smart card and the 62.5 percent discounted tickets for seniors, people with disabilities, and children. Low-income and non-low-income riders use ticket types and fare media in less similar ways. Low-income riders are more likely to use regular fare magnetic stripe tickets and less likely to use either magnetic stripe or smart card higher-value ticket types. Low-income riders are more likely to use the 62.5 percent discounted tickets and the Muni Fast Pass.

Fare Type	Fare Media	Payment Method	Fare Paid using that Fare Type					
			Minimum Fare			Highest Fare		
			Current	3% Reduction	5% Reduction	Current	3% Reduction	5% Reduction
Regular fare	Paper magnetic stripe ticket, Clipper smart card	Cash, credit or debit card, check, transit benefit payments	\$1.75	\$1.70	\$1.65	\$10.90	\$10.60	\$10.40
EZ Rider 6.25% higher-value discount	Smart card	Credit card, debit card	\$1.65	\$1.60	\$1.55	\$10.20	\$9.95	\$9.75
6.25% higher-value discount	Paper magnetic stripe ticket, Clipper smart card	Cash, credit or debit card, check, transit benefit payments	\$1.65	\$1.60	\$1.55	\$10.20	\$9.95	\$9.75
BART Plus, joint operator fare instrument	Paper magnetic stripe ticket	Cash, credit card or debit card	\$1.65	\$1.60	\$1.55	\$10.20	\$9.95	\$9.75
62.5% discount for seniors, people with disabilities, youth aged 5 to 12	Paper magnetic stripe ticket	Cash, credit card, debit card, check	\$0.65	\$0.65	\$0.60	\$4.10	\$4.00	\$3.90
50% discount to middle and high school students attending participating schools	Paper magnetic stripe ticket	Cash, credit card, debit card, check	\$0.90	\$0.85	\$0.85	\$5.45	\$5.30	\$5.20

*Source: 2008 Customer Satisfaction Survey. Note: Children and students are under-represented in survey sample, as only those who appeared to be age 13+ were surveyed.

6.4 Effects of the proposed temporary fare reduction options on minority and low-income populations

The methodology described in Section 5 above was applied to determine whether either Option A, a temporary three percent fare reduction for four months, or Option B, a temporary five percent fare reduction for three months would have a disproportionately high and adverse effect on the minority population or low-income population. The results are shown in Table 1 for Option A and Table 2 for Option B. (Totals may not add due to rounding.)

Table 1: Impact of Option A. Proposed Temporary 3% Fare Reduction for 4 Months

	Weighted Avg Fare Paid		Absolute Decrease in Fare	Percent Decrease in Fare
	Current Fare	3% Reduction		
For all populations	\$3.648	\$3.538	-\$0.11	-3.02%
Minority and Non-Minority				
Minority	\$3.518	\$3.411	-\$0.11	-3.04%
Non-Minority	\$3.806	\$3.692	-\$0.11	-3.00%
Difference between Minority and Non-Minority	-\$0.288	-\$0.281	\$0.01	-0.05%
Low-income and Non-Low income				
Low-income: 200 percent of federal poverty level	\$3.439	\$3.334	-\$0.11	-3.05%
Non-Low-income	\$3.708	\$3.597	-\$0.11	-2.99%
Difference between Low-income and Non-Low-income	-\$0.269	-\$0.263	\$0.01	-0.06%

Table 2: Impact of Option B. Proposed Temporary 5% Fare Reduction for 3 Months

	Weighted Avg Fare Paid		Absolute Decrease in Fare	Percent Decrease in Fare
	Current Fare	5% Reduction		
For all populations	\$3.648	\$3.463	-\$0.19	-5.07%
Minority and Non-Minority				
Minority	\$3.518	\$3.338	-\$0.18	-5.12%
Non-Minority	\$3.806	\$3.614	-\$0.19	-5.04%
Difference between Minority and Non-Minority	-\$0.288	-\$0.276	\$0.01	-0.07%
Low-income and Non-Low income				
Low-income: 200 percent of federal poverty level	\$3.439	\$3.262	-\$0.18	-5.15%
Non-Low-income	\$3.708	\$3.520	-\$0.19	-5.07%
Difference between Low-income and Non-Low-income	-\$0.269	-\$0.258	\$0.01	-0.08%

6.5 Determination of whether either of the proposed temporary fare reduction options would have a disproportionately high and adverse effect on minority and low-income populations

Analysis results show the following weighted average fare decreases for the two options:

Option A. Three Percent Reduction for Four Months

For the entire population of the four-county service area, the decrease was 3.02 percent as shown in Table 1 above. For the minority population, the average fare decrease was 3.04 percent and for the non-minority population it was 3.00 percent, a 0.05 percent greater decrease for the minority population. For the low-income population, the average fare decrease was 3.05 percent and for the non-low-income population, the decrease was 2.99 percent, a 0.06 percent greater decrease for the low-income population.

In conclusion, the analysis results indicate that the percentage decreases are virtually the same between the protected and nonprotected groups, with the protected groups receiving a slightly greater discount. Thus the differences are not “appreciably more severe or greater in magnitude” for the minority and low-income populations when compared respectively to non-minority and non-low-income populations (a 0.05 percent and 0.06 percent greater decrease respectively) and therefore fare reduction Option A would not result in a disproportionately high and adverse effect on minority and low-income populations.

Option B. Five Percent Reduction for Three Months

For the entire population of the four-county service area, the decrease was 5.07 percent as shown in Table 2 above. For the minority population, the average fare decrease was 5.12 percent and for the non-minority population it was 5.04 percent, a 0.07 percent greater decrease for the minority population. For the low-income population, the average fare decrease was 5.15 percent and for the non-low-income population, the decrease was 5.07 percent, a 0.08 percent greater decrease for the low-income population.

In conclusion, the analysis results indicate that the percentage decreases are virtually the same between the protected and nonprotected groups, with the protected groups receiving a slightly greater discount. Thus the differences are not “appreciably more severe or greater in magnitude” for the minority and low-income populations when compared respectively to non-minority and non-low-income populations (a 0.07 percent and 0.08 percent greater decrease respectively) and therefore fare reduction Option B would not result in a disproportionately high and adverse effect on minority and low-income populations.

7. CONCLUSION

This analysis of the proposed temporary fare reduction options finds that the proposed fare changes would not result in disproportionately high and adverse effects on minority or low-income populations compared to non-minority and non-low-income populations. In fact, the decreases for the protected groups are slightly greater than the decreases for the nonprotected groups.

APPENDIX A: BART Fare Payment Ticket Types and Fare Media Use by Ethnicity and Income*

Fare Payment Type	Fare Media	Payment Method	Minority	Non-Minority	Low Income under \$25K	Non Low Income over \$25K	Low Income under \$50K	Non Low Income over \$50K
Regular fare	Paper magnetic stripe ticket	Cash, credit or debit card, check, transit benefit payments	48.8%	45.6%	60.1%	45.7%	57.3%	43.8%
6.25% higher-value discount (\$48 in value sold for \$45 or \$64 in value sold for \$60)	Paper magnetic stripe ticket	Cash, credit or debit card, check, transit benefit payments	25.2%	23.7%	7.3%	26.8%	11.5%	29.2%
EZ Rider 6.25% higher-value discount (\$48 in value autoloading for \$45)	Smart card	Credit card, debit card	6.4%	10.9%	2.2%	9.6%	3.6%	10.6%
BART Plus, joint operator fare instrument (6.25% discount on BART at point-of-sale, used as flash pass on ten regional bus operators, sold in multiple denominations)	Paper magnetic stripe ticket	Cash, credit card or debit card	1.2%	.9%	1.0%	1.1%	1.2%	1.0%
62.5% discount for seniors, people with disabilities and youth aged 5 to 12 (\$24 ticket sold for \$9)	Paper magnetic stripe ticket	Cash, credit card, debit card, check	4.6%	6.7%	12.0%	4.4%	9.5%	3.9%
50% discount to middle and high school students at participating schools (\$32 ticket sold for \$16)	Paper magnetic stripe ticket	Cash, credit card, debit card, check	.4%	.3%	.4%	.2%	.3%	.2%
Muni Fast Pass (San Francisco Muni monthly pass accepted on BART in 8 SF stations)**	Paper magnetic stripe ticket	Cash, credit or debit card, check, transit benefit payments	12.9%	11.6%	16.5%	11.8%	16.3%	10.9%
Other or n/a	n/a	n/a	.4%	.4%	.5%	.4%	.4%	.4%
Total			100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

*Source: 2008 Station Profile Survey

Note: Children and students are under-represented in survey sample, as only those who appeared to be age 13+ were surveyed.

**The Fast Pass is good for unlimited rides on San Francisco Muni's bus and light rail services and BART within San Francisco. SFMTA is solely responsible for setting the price of the Fast Pass. SFMTA reimburses BART per Fast Pass trip taken on BART at a 32 percent discount rate to BART's regular fare for San Francisco trips, which for most trips is equal to BART's minimum fare.

APPENDIX B: Data and Methodology Used in Analysis

The primary data used in the analysis are the following:

- Year 2000 U.S. Census.
- 2008 BART Station Profile Study. With more than 52,000 surveys completed by weekday riders in spring 2008, the 2008 Station Profile Study summarizes the largest survey ever conducted by BART of how BART riders use and access the system.
- Actual BART fares, before and after the fare decreases; these are the full fares and do not reflect the various discounts available to riders.
- Inputs to the 2010 BART Ridership Model. The 2010 BART Ridership Model (BRM) is an Excel-based spreadsheet model mainly used to project future BART ridership. The 2010 model inputs include spring 2008 actual ridership data in the form of a table showing the average weekday trips taken between all 43 stations, fare tables, and census tract demographic data.

Methodology

The methodology used to assess the effects of each fare decrease calculates the weighted average systemwide fare decrease for (a) minority and non-minority populations and (b) low-income and non-low-income populations. The decreases are then compared between the protected (minority or low-income) and nonprotected (non-minority or non-low-income) groups to determine if there was a disproportionately high and adverse effect on minority or low-income populations when compared respectively to non-minority or non-low-income populations.

The analysis employed data from two main sources: 2000 Census data and the Station Profile Study, which consists of a survey of BART riders. Census data and survey data were used to determine the numbers and location of protected populations in order to calculate weighted average fares for each group, as follows:

- Average fares in the analysis are weighted by the number of protected and nonprotected populations. Census data provide the entire population of minority and low-income populations that reside in census tracts whose residents use that station.⁶ Census data thus capture all the populations compared to much smaller survey samples that may under-represent protected groups. And although the 2008 Station Profile Study has data for all stations, a sufficient sample size by protected group is not available at some stations. Survey data were used to verify that census tracts assigned to a station for weighting purposes had residents who rode BART and used that station. Census tracts were thus assigned to a station based on the home-origins of riders.
- Incorporating Census data creates a strong methodological framework for conducting future fare impact analyses. Future analyses will use a data set that is reliable, comparable, and consistent. BART's ability to conduct Station Profile surveys depends on available funding, and the survey is not scheduled or funded on a regular basis. Ten years elapsed between the preceding survey and the current survey. This

⁶ Census data for poverty statistics is extrapolated for the population of a census unit based on the responses obtained from the long-form.

current survey cost \$475,000 and was paid for by the Santa Clara Valley Transportation Authority as part of the San Jose BART extension project.

- Census data which provide the required socioeconomic indicators are rigorously collected to represent all residents of a tract, and thus provide a data set that is much larger and encompassing than any survey, including BART's 2008 Station Profile Study. Survey data provide a snapshot in time of that portion of ridership that chooses to complete the survey. Census data, however, represent all members of a protected group. Rather than diluting the analysis, using Census data provides a stronger analytical foundation. Therefore, using Census data to determine the location and numbers of protected populations constitutes a valid approach.

The methodology BART has used to assess the effects of the fare decrease calculates the weighted average systemwide fare decrease for (a) minority and non-minority populations and (b) low-income and non-low-income populations.

The two steps that comprise the weighted average fare methodology are described below.

Step 1: Estimate weighted average boarding fares “Before Fare Decrease” and “After Fare Decrease” for each BART station.

In Step 1, the weighted average fare paid by customers at each of BART's 43 stations is estimated. A “weighted average fare” is weighted by how many riders pay that fare. The more riders that pay a certain fare, the closer the weighted average fare will be to that more-often paid fare. This is in contrast to a simple average fare where each fare has the same weight.

Input files from the BRM model developed by HDR Engineering to simulate and forecast BART ridership were used in this analysis for the following reasons:

- The model was developed using actual spring 2008 weekday origin-destination trip data.
- The census tracts associated with each BART station within the model were verified and updated with home-origin station data from BART's 2008 Station Profile Study. Using riders' home-origins to assign the census tracts to each station links the appropriate census tract population to each station and thus to the average fare paid at each station. The BRM model uses the actual fares customers pay in the form of a station-to-station table of fares, unlike large-scale regional travel models such as the Metropolitan Transportation Commission model, which aggregates BART data.

The following steps were followed to calculate station-specific average fares, weighted by weekday trips.

1. The station-to-station fare table in effect before the fare decrease was multiplied by the 2008 actual station-to-station trip data. This results in the weighted average fare by station before the fare decrease.

2. Next, the station-to-station fare table in effect after the fare decrease was multiplied by the 2008 actual station-to-station trip data. This results in the weighted average fare by station after the fare decrease.
3. Using the before and after average fares, for each station the percent decrease in average fares from before the fare decrease compared to after the fare decrease was computed.
4. Since the BRM model contains the census tracts that are associated with each BART station, the average fare decrease estimated above was translated from the station level to the census tract level. Therefore, each census tract had an average fare calculated for it. If a census tract was close to two different BART stations, the average fare associated with that tract was calculated by taking the weighted average of the average fares for both stations.

Step 2: Estimate systemwide weighted average fares for minority, non-minority, low-income and non-low-income populations.

For each BART station, the census tracts that generate ridership to that station (known as the station's "catchment area") are part of the data input into the BRM model. Assignment of a census tract in BART's service area to a particular station was verified using the 2008 Station Profile Study data that indicated that people residing in a census tract used that station. For each census tract, Year 2000 Census data supplied the number of minority, non-minority, low-income and non-low-income populations residing in that tract.

The following steps were followed to estimate systemwide weighted average fares for the protected and nonprotected groups.

1. For each population group, the numbers from the catchment area census tracts were summed with the result that the catchment area of each station had four separate groups of population figures: minority, non-minority, low-income and non-low-income.
2. Next, the systemwide weighted average fare for each of the four population groups was estimated by weighting the average boarding fares for each station (calculated in Step 2 above) by the actual number of people in each population group residing within the station catchment area. This calculation was performed for both the "before" and "after" fare decrease scenarios.

Step 3: Calculate and then compare the percent decrease paid by (a) minority and non-minority populations and (b) low-income and non-low-income populations.

1. Using the systemwide weighted average fares calculated in Step 2 above, the percent decrease in fares paid by each of the four population groups was calculated "before" and "after" the fare decrease. An example of this calculation is shown in Table B1.
2. To determine if the fare decrease had a disproportionately high and adverse effect on minority or low-income populations, the percent average fare decrease paid was compared between (a) the minority group and the non-minority group and (b) the low-income group and the non-low-income group.

TABLE B1: Example of Weighted Average Fares Calculation for Proposed 3% Temporary Fare Reduction

Example of calculation of weighted average fares for minority and non-minority populations
 (This example uses 14 stations. In actual calculation, all 43 stations in BART system were used)

Station Name					MINORITY POPULATION		NON-MINORITY POPULATION	
	Column A Average fare before fare change (from Step 1)	Column B Average fare after fare change (from Step 1)	Column C Sum of minority population in the station catchment area	Column D Sum of non-minority population in the station catchment area	Average fare before fare change X minority population (Column A x Column C)	Average fare after fare change X minority population (Column B x Column C)	Average fare before fare change X non-minority population (Column A x Column D)	Average fare after fare change X non-minority population (Column B x Column D)
12th Street	\$2.951	\$2.866	23,902	8,695	70,545	68,501	25,662	24,919
24th Street	\$2.390	\$2.321	39,330	31,695	93,987	91,279	75,740	73,559
Ashby	\$2.920	\$2.837	20,342	12,005	59,390	57,701	35,048	34,051
Concord	\$4.232	\$4.091	30,754	51,768	130,152	125,799	219,085	211,757
Castro Valley	\$3.888	\$3.764	17,376	30,716	67,555	65,402	119,415	115,609
Fremont	\$4.547	\$4.401	103,870	73,171	472,258	457,154	332,683	322,043
Fruitvale	\$2.989	\$2.900	82,383	27,518	246,236	238,882	82,249	79,793
Lake Merritt	\$2.924	\$2.837	22,398	6,608	65,501	63,536	19,326	18,746
MacArthur	\$3.000	\$2.913	30,477	22,759	91,442	88,767	68,286	66,288
Montgomery	\$3.485	\$3.378	4,097	3,683	14,281	13,841	12,838	12,442
North Concord	\$4.688	\$4.557	12,432	23,802	58,285	56,655	111,590	108,470
Powell	\$3.296	\$3.194	29,303	17,672	96,583	93,609	58,245	56,451
San Bruno	\$4.006	\$3.894	21,417	17,268	85,795	83,391	69,177	67,238
ittsburg/Bay Point	\$4.858	\$4.707	84,395	83,229	410,021	397,221	404,358	391,735
		TOTAL	522,476	410,588	1,962,031	1,901,739	1,633,702	1,583,101

MINORITY POPULATION

Before Fare Change:
 Systemwide weighted average fare for minority population = $1,962,031 / 522,476$
 = \$ 3.76

After Fare Change:
 Systemwide weighted average fare for minority population = $1,901,739 / 522,476$
 = \$ 3.64

Percent Fare Change for minority population = - 3.19 %

NON-MINORITY POPULATION

Before Fare Change:
 Systemwide weighted average fare for non-minority population = $1,633,702 / 410,588$
 = \$ 3.98

After Fare Change:
 Systemwide weighted average fare for non-minority population = $1,583,101 / 410,588$
 = \$ 3.86

Percent Fare Change for non-minority population = - 3.02 %

Predominantly Minority or Low-Income BART Service Area Census Tracts

The BART service area used in these analyses was the four-county region that BART serves: Alameda, Contra Costa, San Francisco and San Mateo counties. This is the same service area used in BART's Inclusive Public Participation Plan.

The following process was followed to identify census tracts in the BART service area that are predominantly minority or low-income tracts.

1. Using the 2000 Census data, the percent of minority population for the BART service area as defined above was estimated to be 52.7 percent.
2. Next, using the 2000 Census data, the percent of minorities for each census tract within the BART service area was estimated. If the percent of minorities in any single census tract was found to be greater than the four-county percentage of 52.7 percent, then that census tract was flagged as predominantly minority.
3. Using 2000 Census data, the percent of the population that is low-income within the BART service area was determined to be 21.6 percent. Low-income was defined as under 200 percent of the federal poverty level⁷. The 200 percent threshold was used to account for the high cost of living in the Bay Area compared to the rest of the country and therefore is a more inclusive definition of low-income populations. The 200 percent threshold is also consistent with the assumptions employed by the Metropolitan Transportation Commission in its February 2009 *Equity Analysis Report*.
4. Next, using the 2000 Census data, the percent of low-income population was determined for each tract. If that value for any single census tract was found to be higher than the service area percentage of 21.6 percent, then that tract was mapped as a predominantly low-income tract.

The results of this process indicate the following for the 819 census tracts that comprise the four-county BART service area, as mapped in Figure 1 and Figure 2 on the following pages:

Minority Population Tracts

	Service Area Census Tracts	% of Tracts
Minority Tract: a tract is counted as predominantly minority if more than 52.7% of that tract's population is minority	383	47%
Non-Minority Tract	436	53%
Total	819	100%

⁷ As a reference, for a single person household, 200% of the federal poverty level in 2008 was \$21,982. For a two adult, two child household, the 200% threshold was \$43,668. (Note that the data mapped are based on 2000 Census data as these are the only such data available at the tract level.)

Low-income Population Tracts

	Service Area Census Tracts	% of Tracts
Low-income Tract: a tract is counted as predominantly low-income if more than 21.6% of the tract's households have incomes under 200% of federal poverty level	327	40%
Non-Low-income Tract	492	60%
Total	819	100%

Figure 1: Locations of Predominantly Minority Population in the BART Service Area

