5. Evaluation of Improvements

This section provides an evaluation of the Enhanced Bus Trunkline and Streetcar routes. Many evaluations are completed at a "sketch" level consistent with the evaluation stage of the proposed routes. The evaluation of transit options included the following evaluation factors:

- Ridership
- Vehicle Miles Traveled (VMT) Analysis
- Effects on Environmental Justice Communities
- Safety and Security
- Costs
- Compatibility with Existing Transit
- Economic Development Impact

Ridership

System ridership includes residents, employees, students and visitors. Riders include those moving into the study area, out of the study area, and within the study area. Ridership forecasts take into account current and future demographics and employment, as well as the amount of travel and time-of-day of travel currently found within the study area. Between 2010 and 2040, the study area is projected to add 24,000 jobs and 13,000 housing units. Job growth in the area is expected to be strongest in professional, scientific, technical and other services, and in clean technology and advanced manufacturing. More information on the kinds of riders can be found in the section of this chapter on economic development.

Ridership forecasts were based on comparative system data, including AC Transit and urban transit systems as reported in the National Transit Database. Average per-stop ridership for comparative AC Transit route segments that run within ¼ mile of the proposed route were used to approximate location-specific transit demand.[9] The average number of riders per stop per day for comparative routes ranged from about 31-39 riders. An elasticity factor was applied to the average per-stop ridership to account for increases in service frequency and mode changes in the improved routes. This enhanced per-stop ridership average was then used to calculate the route ridership by multiplying the average per-stop ridership by the approximate number of total stops per proposed route. Numbers are rounded to the nearest 100. **Table 2** lists the total riders and new ridership projections for the proposed routes.

- **Enhanced bus service:** Enhanced service applies an elasticity factor that accounts for frequency of service increases. While the elasticity factor was only included in the upper range of the estimates, ridership would be expected to increase further for additional enhancements such as branding/marketing, low floor busses for faster boarding, and Intelligent Transportation System (ITS) applications such as real-time travel information and signal priority. Literature states that marketing alone can increase ridership up to 10%; the combination of marketing and

[9] Routes without overlap in transit demand, such as routes running perpendicular, overnight routes or transbay routes with less than 2 stops in the project area, were not included.

passenger information can increase ridership as much as 20%.[10] For the Enhanced Bus Trunkline and Streetcar routes, the upper range estimates includes an elasticity factor to account for such variations.

- **Streetcar ridership**: An additional elasticity factor was applied to account for increased demand generated by streetcar systems relative to bus transit. Within three comparative systems analyzed,[11] it was found that streetcar systems typically have approximately 20%-80% more ridership compared to bus systems in the same area. An average estimated ridership increase of 46% was applied to the proposed Streetcar routes.

- **Population projection:** The increase in ridership for all modes is assumed to increase proportionally to the projected population and job increase in the project area (based on ABAG Travel Analysis Zone projection). In reality, increases in population and job growth will also lead to increases in land use intensity, which will encourage more public transit use, making the lower-range estimated ridership increase by 2020 and 2035 conservative measures. For the Enhanced Bus Trunkline and Streetcar routes, the upper range ridership estimates includes an elasticity factor to account for variations in design as well as increased ridership.

- **Transferred Ridership:** The total ridership for comparative stops adjacent to proposed routes was distributed across the additional proposed stops (based on route stop-spacing) to estimate the number of "transferred riders," or those who would transfer from one bus line to the new route line.

- **New Ridership:** New ridership includes only those riders generated from service improvements, while the remainder of the ridership includes those who transfer from other routes. This is calculated by taking the total ridership and subtracting the "transferred ridership" for each route.

[10] Federal Transit Administration. Bus Rapid Transit Practitioner's Guide. TCRP Report 118; Currie, Graham and Wallis, Ian (2008). "Effective Ways to Grow Urban Bus markets – A Synthesis of Evidence."
[11] Seattle's King County with 82% more, New Orleans with 19% more, and Memphis streetcar system with 37% more. Portland's streetcar has 172% more ridership, but was deemed not comparable because of the much larger extent of the regional Tri-Met bus system.

Table 2: Transit Improvements – Daily Ridership Forecast

Improvement	Daily Weekday Ridership	
	Total Riders	New Riders
Enhanced Bus 2020 Forecast		
Enhanced Bus Trunkline Route *Jack London Square to North Berkeley*	**5,800 – 7,300**	3,800 – 5,300
Streetcar Routes 2035 Forecast		
West Oakland Streetcar Route *Jack London Square to MacArthur BART through West Oakland*	**4,200 – 5,300**	3,100 – 4,200
Emeryville Streetcar Route *MacArthur BART to Emeryville's Shellmound Street*	**5,700 – 7,100**	4,900 – 6,300

The projected ridership based on the above analysis is within the range of comparable bus and streetcar systems. For local comparison, AC Transit has an average of about 1,292 riders per line, per weekday.[12] However, this average is brought down by All Nighter service lines, and supplementary lines to less dense areas. In the study area, most AC Transit lines carry between 2,000-9,000 passengers per day. The 72R has about 7,000 riders per weekday and the 72 has about 4,300 riders per weekday. Line 26 has approximately 2,300 riders per weekday, Line 51B has approximately 8,900 riders per weekday and the popular Line 1R carries about 12,000 riders per weekday.[13]

Current AC Transit lines with the higher ridership—72R, 51B, and 1R—have higher frequencies (typically 12-15 minutes). Higher frequencies will increase the popularity of a line, but also are provided to accommodate the high demand for these routes. The proposed routes take both of these factors into account: high demand due to route location as well as future increases in population and employment, as well as increased demand due to high frequencies.

[12] Daily (weekday) ridership for FY2012-2013 was 192,533 for 149 lines. http://www.actransit.org/about-us/facts-and-figures/ridership/

[13] 1R ridership based on 2011 Line 1R Service and Reliability Study Final Report. Ridership of additional routes based on 2013 AC Transit ridership data.

Vehicle Miles Traveled (VMT) Analysis

Reduction in Vehicle Miles Traveled (VMT) is assumed to be directly related to increases in new ridership, and the vehicle miles per day traveled by each route. VMT was calculated from the new riders, or the ridership that is not generated from passengers who transferred to another bus or shuttle route. Baseline VMT was calculated based on new riders transferring from a previous mode, including drive alone, carpooling/other, and walk/bicycle modes. The proportions for non-transit mode shares were assumed to be consistent with journey-to-work data from the American Community Survey (2012), for U.S. Census tracks within the project area.

Calculations are such that the new VMT produced by the new routes (new route VMT) are compared to the vehicle miles of new riders before they switched modes (baseline VMT). The new route VMT produced by the proposed lines is based on frequency and route length of route. The baseline VMT is based on projected new riders switching from drive-alone (67%), carpool or other (23%), and walk/bike modes (10%). Baseline VMT includes trips by automobiles, producing ranges of VMT based on the assumption that average trip length for riders is between 2.5 and 3 miles long. Bicycle and walk-modes do not contribute to the baseline VMT because they have no vehicle-miles. Therefore, bicyclists and walkers increase the VMT per rider when they switch to the new system. **Table 3** lists the estimated VMT that the proposed route will create as well as the reduction in VMT that is caused by new riders shifting from non-transit modes to transit modes.

Table 3: Daily VMT Reduction by Route

Alternative	Daily Weekday VMT	
	Total VMT for Route	VMT Reduction
Enhanced Bus 2020 Forecast		
Enhanced Bus Trunkline Route *Jack London Square to North Berkeley*	2,700 miles	**4,700 – 6,200 miles**
Streetcar Routes, 2035 Forecast West Oakland		
West Oakland Streetcar Route *Jack London Square to MacArthur BART through West Oakland*	800 miles	**5,300 – 6,500 miles**
Emeryville Streetcar Route *MacArthur BART to Emeryville's Shellmound Street*	1,300 miles	**8,300 – 10,200 miles**

Effects on Environmental Justice Communities

This section provides an analysis of effects on minority and low-income community within the study area. While this impact overview does not obviate the need for further Title VI[14] analyses prior to service improvements, nor does it replace the need for environmental clearance, it does provide an overview of potential effects on protected populations.

The primary evaluation factor for this analysis includes transit access within a ¼ mile of transit routes within the study area. Each set of improvements was evaluated and compared with existing transit service to compare access to transit. Additional considerations include construction impacts, gentrification and reduced sales leakage.

Low-Income and Minority Communities

For purposes of determining minority and low-income concentrations within the EBOTS study area, the following definitions were used:

- "Minority" populations include any non-white individuals or households (including Hispanic or Latino populations, regardless of race);
- "Low-income" populations include households making less than 200% of the federal poverty rate, which is currently at $23,550 for a family of four. This means that households with incomes under $47,100 for a family of four would be considered low-income.

The EBOTS study area is racially diverse; 73% of the population is minority, with the highest concentrations located in West Oakland where some census tracts are greater than 80% minority. Other significant concentrations of minority populations occur in Emeryville, where census tracts are between 60% and 80% minority (excluding the area bounded by 53rd Street and 67th Street, and Shellmound and Vallejo which is approximately 40% to 60%) and in West Berkeley from Dwight Way to Camelia Street. However, concentrations of minority populations still range from 40% to 60% in the remaining tracts within the study area. In fact, no census tracts within the study area are less than 40% minority. Since there are no tracts where the ethnicity is below 40% in the study area, the function of this qualitative analysis will be to provide a highlight of where specific service alternatives may provide a higher or lower level of access for minority populations. **Table 4**, below, presents the percentages of minority and low income populations within the EBOTS study area. **Figure 9** presents a map depicting the concentrations of Minority populations in the study area.

A review of the low-income populations reveals a slightly different picture from the patterns of minority concentrations. Approximately 44% of households in the EBOTS study area would be classified as low-income using the definition of households earning less than 200% of the federal poverty level. However, only one area, West Oakland, has significant populations of low income households. In the census block group bounded by Grand and 5th Street, and Adeline and Mandela Parkway, between 70% and 80% of the households fall within the definition of low-income. The second greatest concentration of low-income households is immediately adjacent, bounded by Grant and 5th Street, and Adeline and Market

[14] Title VI of the Civil Rights Act of 1964 protects people from discrimination based on race, color or national origin, specifically in programs/activities that are federally funded. Source: www.fta.dot.gov

Street. This area has concentrations of 60% and 70% of low income. **Figure 9** presents a map depicting the concentrations of Low-Income populations in the study area.

Table 4 shows the overall minority and low-income population by percentage in the study area.

Table 4: Minority and Low Income Populations in the EBOTS Study Area

Area	% Minority	% Non-Minority	% Low-Income	% Non-Low-Income
EBOTS Study Area	73.0%	27.0%	44.4%	55.6%

Access to Transit

Nearly all areas within the Study area are within ¼-mile of transit, including areas within low-income and minority areas. Since widespread service is being provided by existing transit service (including shuttle services), little change will occur in the numbers of low-income and minority populations served by transit. However, the intensity and quality of service will be improved with the potential transit improvements. **Table 5** shows the percent minority and the percent low income residing within ¼-mile of each route. **Figure 9** and **Figure 10** show the density of minority and low-income residents within the study area.

Table 5: Minority and Low-Income Population within ¼-mile of Routes

Scenario and Routes	% Minority	% Low-Income
Existing Transit Routes within the Study Area (1/4-mile buffer)	71.95%	43.11%
Planned Transit Routes within the Study Area , including AC Transit and Emery Go-round improvements described in Section 3 (1/4-mile buffer)	71.88%	43.01%
EBOTS Transit Improvements • Enhanced Bus Trunkline Route • Streetcar Routes	71.88%	43.01%

*Notes: Includes routes with 30 minutes or less peak frequency. Does not include communities outside of the study area. Because the Enhanced Bus Trunkline and Streetcar route improvements include the AC Transit Updated Bus Routes (covering most of the study area), the percent minority and low-income populations within ¼ mile of routes does not change.

The buffer analysis of the AC Transit updates and the proposed routes identified approximately 71.88% of the population within the ¼-mile buffer as minority, which is slightly lower than the overall minority percentage within the EBOTS study area and slightly lower compared with existing service. This is because the south end of West Oakland is wider than the rest of the study area, and a direct route cannot be within ¼-mile of all the properties there. However, improvements to service and reliability would offset this modest difference and improved transit service would benefit all users, especially in West Oakland where several key improvements are identified.

Potential Construction impacts

The construction impacts due to the potential transit improvements are minimal. Construction of Streetcar routes would not likely result in any displacements of commercial or residential buildings and construction would not likely occur for longer than 18 months and would be phased in segments to minimize disruption to the community including limited road closures and detours. Construction of a streetcar could result in impacts related to noise, dust and detours during construction. These impacts could be mitigated with appropriate best management practices and outreach to the community.

Disabled, Transit Dependent, and Senior Populations

Information concerning populations with disabilities was compiled as additional information about the protected classes of population that are the subject of this environmental justice assessment. Data regarding disabled, transit dependent, and senior populations was considered when looking into the federally-protected environmental justice community areas. **Table 6** shows the percent of transit dependent, disabled, and senior populations within the study area. Disabled populations make up 13% of the population, while elderly populations make up 9.5% of the population within the study area. Transit dependent populations are considered those without access to an automobile, these make up 21.9% of households in the study area.

Table 6: Disabled, Transit Dependent, and Senior Populations

	Total	Percent
Transit Dependent (Zero Car Households)	3,387	21.9%
Disabled Population	4,381	13.0%
Seniors (Age 65 and over)	3,211	9.5%

Source: U.S. Census Bureau. 2008–2012 American Community Survey. Table P12 Age by Sex, Table B25044 Tenure by Vehicles Available, and Table B25044 Tenure by Vehicles Available.

Benefits for Low-Income and Minority Communities

Benefits to low-income and minority communities could include improved access to appropriate educational and employment opportunities and attraction of retail and services that would reduce sales leakage out of the area.

Figure 9: EBOTS Study Area Minority Populations

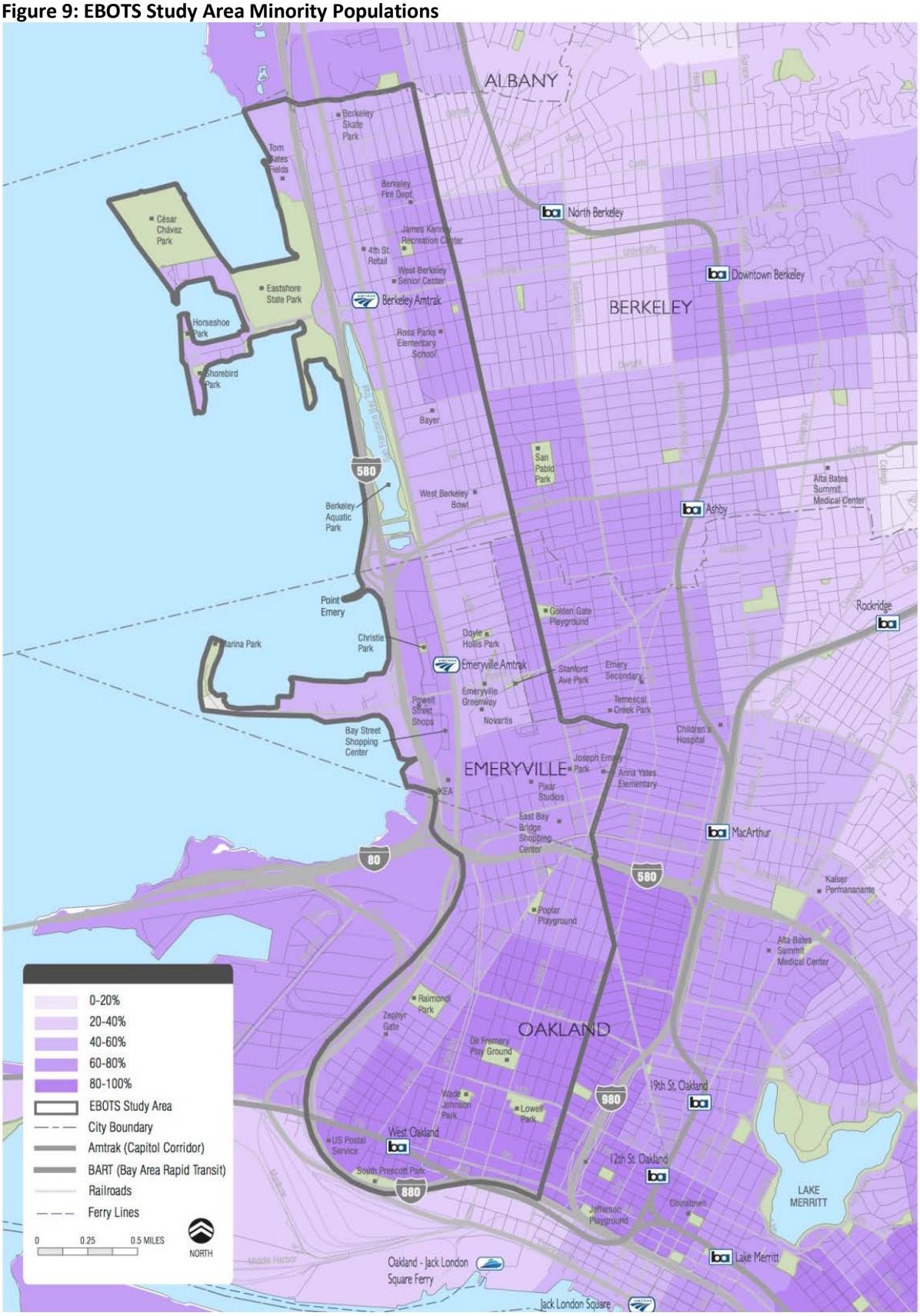
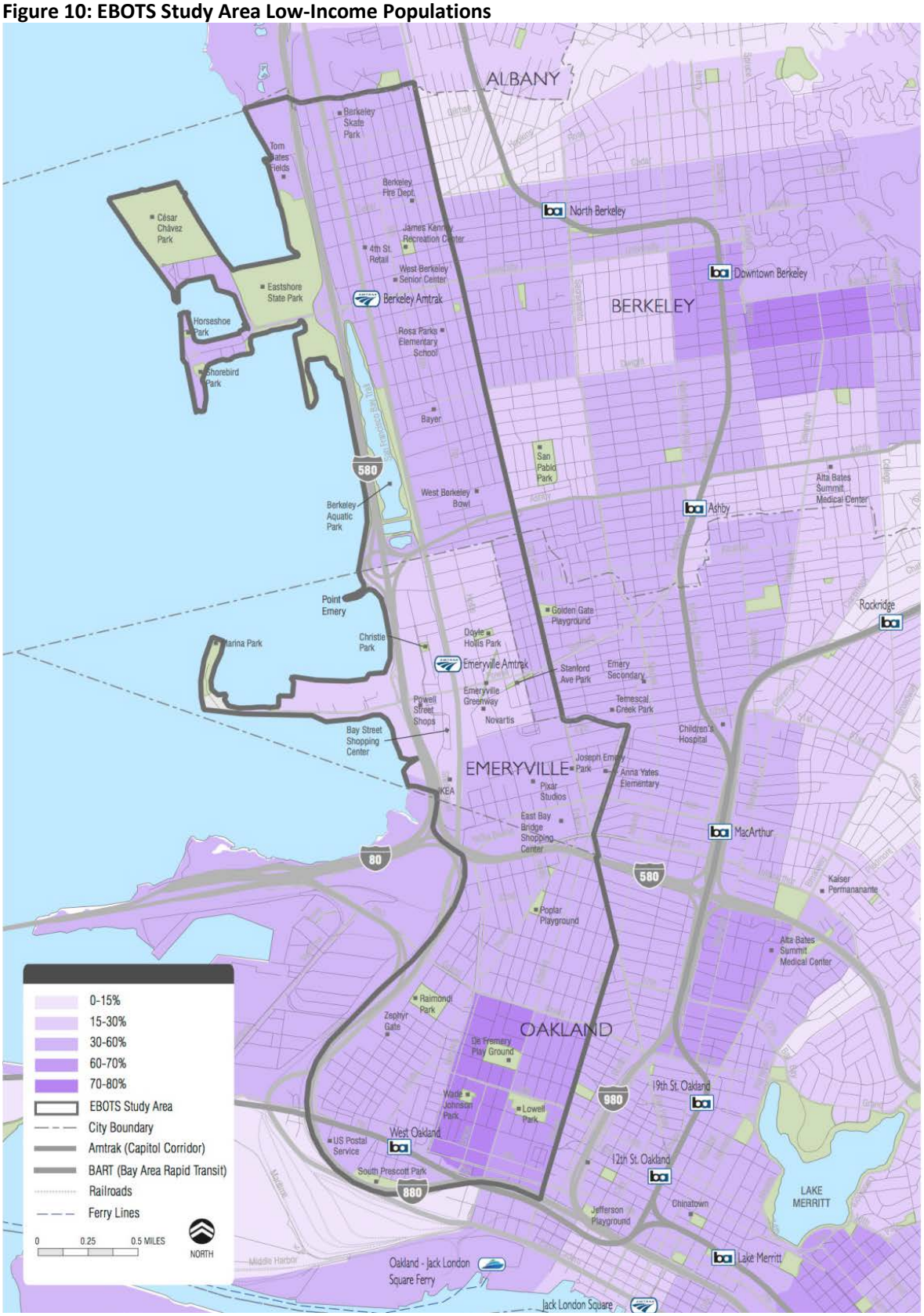


Figure 10: EBOTS Study Area Low-Income Populations



Safety and Security

Safety and security for transit riders, pedestrians, bicyclists, and other vehicles is a concern with the addition of an expanded or new transit line or system. At community meetings and in the surveys community members expressed feeling unsafe when waiting at bus stops and occasionally when riding the bus. Furthermore, participants raised several concerns for street crossings and pedestrian safety. Based on these concerns, safety and security issues addressed here include:

- Security concerns at transit stops and facilities.
- Safety concerns related to increased collisions and multimodal conflicts.
- Additional safety concerns related to streetcars and streetcar tracks.

Further analysis of specific sites can help identify areas for mitigation by specific site design to prevent adverse safety impacts. A detailed safety plan could be developed to establish the standards and design, construction, and commissioning of a system's safety elements.

Bus Stops and Facilities

There are several safety concerns for bus amenities; typically amenities increase the efficiency and safety of passengers. Facilities to enhance safety should have good visibility, lighting, grade separation, and clear demarcation of pedestrian and vehicle areas.[15] However, the full extent of a safety analysis depends on several site-specific factors. Landscaping, signage, and other facilities can enhance safety by providing benefits such as lighting and visibility. However, amenities can sometimes cause visual or physical obstructions to vehicles. Site-specific analysis of future stops will need to be conducted in order to fully analyze the safety and security of amenities.

For example, bulb outs can have both positive and negative safety effects. Bulb outs can improve safety by reducing the need for buses to re-enter traffic flow after stopping and improve access and increase space for boarding and alighting passengers. They can also potentially decrease pedestrian-vehicle conflicts by making pedestrians more visible to approaching traffic. Bulb outs can potentially have negative impacts on bike safety as they may be causing breaks in continuous bike lanes, which could lead to increased conflicts. [16] Bus stops will have lights and cameras for security.

Intermodal Collisions

Any increase in transit service increases chances for intermodal (including pedestrian, bicyclist, and other vehicles) conflicts. The impact of the proposed routes on the safety of the corridor is site specific and depends on the design guidelines of the system as well as the site-specific travel characteristics and design of the streets. For example, bus idling and visual obstructions can cause problems for all modes. When idling at intersections, buses can be a visual obstruction limiting drivers' view of pedestrians at crosswalks. Rear-end collisions and accidents from vehicles quickly changing lanes are a large concern with increased transit due to events where buses make abrupt stops within a shared lane to pick up passengers.

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[15] Accessing Transit – Design Handbook for Florida Bus Passenger Facilities.
[16] Oakland Bus Bulbs Analysis – AC Transit East Bay Bus Rapid Transit Project in Alameda County.

Streetcars

One of the most common streetcar concerns is that the streetcar tracks provide a hazard for bicycle wheels. Bicycle wheels can get stuck in the track ruts, causing injuries from falls and collisions. Some safety and security concerns unique to streetcars include:

- Bicyclists wheels can get stuck or slip on tracks
- Streetcar vehicles cannot change directions to respond to a vehicle conflict
- Streetcars within travel lanes will increase traffic congestion, causing increased conflicts

Costs

All costs were evaluated based on costs of similar systems and guidelines provided by AC Transit. Note that these costs are estimates and actual costs vary widely depending on the specifics of the service and route. Moreover, if routes are operated by a non-profit or under private contract, costs would likely be lower, yet drivers may not be as well compensated. Because of the broad nature of the estimates, all numbers are rounded to the nearest million dollars.

Enhanced Bus Trunkline Route Costs

Capital Costs for the Enhanced Bus Trunkline route are based on the route mileage as well as the number of total vehicles needed. Capital costs were estimated with a range starting at $270,000 per mile in each direction for a total of 16.2 miles as well as $700,000 per vehicle. Per-mile costs (not including vehicles) are based on the San Pablo Avenue BRT (2005) and the Wilshire Ventura Blvd Metro Rapid System (2000) and inflated to 2014 dollars.[17] These costs include stops (accommodating approximately 5 stops per mile) and amenities such as bus arrival information, street furniture, marketing costs, and intersection signal priority costs. Vehicle costs were estimated at $700,000, an estimate based on comparative new 40-foot and 60-foot hybrid vehicle purchases.[18] To account for variations in costs for different types of system vehicles and operators, a range was created based on an additional 15% contingency rate. With these assumptions, capital costs total $11 – 12 million. Based on a 12-year infrastructure lifecycle,[19] annualized capital costs would be approximately $1 million/year.

- Capital Costs: $11 – 12 million
- Annualized Capital Costs: $1 million/year

The operating and maintenance costs for the Enhanced Bus Trunkline is based on an estimated number of annual revenue hours, calculated based on route length, peak and off-peak headways, and turnaround time. According to data reported by the National Transit Database (NTD) in 2010, typical operational and maintenance costs for bus services around the country range from approximately $100/hour to $168/hour (while AC Transit's fully allocated costs are $168/hour). Therefore, the estimate used was $168/hour with a range based on an additional 15% contingency rate to account for variations due to system specifics.

- Operating and Maintenance Costs: $8 – 9 million per year

[17] The San Pablo Avenue BRT study's (2005) costs for traffic, stop improvements and amenities, ridership surveys, marketing and amenity operations was approximately $3.2 million for 26 stops and 14 miles (National Bus Rapid Transit Institute, The San Pablo Rapid BRT Project Evaluation Final Report, 2006). In 2014 dollars, this per-mile cost equals about $270,000. The Wilshire and Ventura Blvd Metro Rapid System (2000) cost approximately $8.2 million for 42 miles for stops and intersection signal priority (Final Report, Los Angeles Metro Rapid Demonstration Program, 2002). In 2014 dollars, this per-mile cost also equals about $270,000.

[18] This estimate is based on several system costs, including: a 2012 purchase of 60-foot articulated hybrid-electric buses at $813,100 for CTTRANSIT Hartford (cttransit.com); 40-foot hybrid bus costs of about $500,000 by King County metro Transit (kingcounty.gov, 2013); and San Francisco new Flyer hybrid bus costs of $752,000 per vehicle in 2013. This value is also consistent with estimates made for Oakland in the Broadway Transit Urban Circulator Study (2013).

[19] U.S. Department of Transportation Federal Transit Administration (FTA): Useful Life of Transit Buses and Vans. Report No. FTA VA-26-7229-07.1

Streetcar Route Costs

The capital costs for the Streetcar Routes were calculated based on the Seattle streetcar system capital costs ($27.6 million per track-mile in 2014 dollars) and rounded to a rate of $30 million.[20] To account for variations in costs for different types of systems, an upper range value was created based on an additional 15% contingency rate. With these assumptions, capital costs total $129 - $148 million for both lines. Based on a 30-year infrastructure lifecycle, annualized capital costs would be $10 – 11 million/year.[21]

- Total Capital Costs: $228 - $331 million
    a. West Oakland Route: $129 - $148 million
    b. Emeryville Route: $159 - $183 million
- Annualized Capital Costs: $10 – 11 million/year
    a. West Oakland Route: $4 - $5 million/year
    b. Emeryville Route: $5 - $6 million/year

Like the operating costs for the Enhanced Bus, operating and maintenance costs for the Streetcar routes were calculated based on the headway times and total route distance in order to calculate the total operating hours. Streetcar operating and maintenance costs were assumed to be 60% higher than bus service based on findings from the NTD where typical streetcar costs are 40 - 60% higher for comparable modern streetcar systems. This total cost was $270 per hour with an upper range created using an additional 15% contingency rate to account for variations.

- Total Operational and Maintenance Costs: $14 - $16 million/year
    a. West Oakland Route: $6 - $7 million/year
    b. Emeryville Route: $8 - $9 million/year

[20] Seattle Streetcar capital costs were $56.4 million for 2.5 miles of track ($22.6 million per track-mile, or $27.6 million per track-mile in 2014 dollars). The Seattle Streetcar systems was constructed from 2005-2007. An additional 25% inflation rate was added to account for increasingly high costs of construction in the Bay Area.

[21] Based on an assumption that Streetcar vehicles last approximately 30-40 years. From: Pittsburg City Planning, Strip District Transportation and Land Use Plan Best Practices – Streetcar Capital Cost Estimate – City of Pittsburg. Alternative source, streetcar lifecycle of approximately 30 year: City of Seattle, Section 10 Asset Class - Seattle Streetcars Report.

Compatibility with Existing Transit

When new transit service begins in the EBOTS study area it would likely supplement existing transit service. The proposed Enhanced Bus trunkline and Streetcar routes provide redundant service along Mandela Parkway and 40th Street, yet connect different key locations. These routes also provide service alongside AC Transit's potential realignments of Route 26 and Route 57. The relative service frequency and redundancy of these routes should be considered along with phasing and future demand needs. Furthermore, how and where Emery Go-Round will operate is an important consideration, especially with the Emeryville Streetcar Route, which has segments similar to the Shellmound and Powell Bridge Emery Go-Round routes. **Table 7** lists factors contributing to each route's compatibility with existing transit.

Table 7: Compatibility with Existing Transit

Service	Compatibility with Existing Transit
Enhanced Bus Trunkline Route	• Emery Go-Round: There would be minimal overlapping service along Hollis Street. • AC Transit: Service would overlap with AC Transit's proposed Line 26 within West Oakland, yet this Route would still provide a more direct connection from the West Oakland BART station to Shellmound. Service would also overlap with AC Transit's proposed Transbay Line Z along 6th Street in West Berkeley. Line 48 would overlap service between Ashby and Gilman along 7th and 6th streets.
Streetcar Routes	Emeryville Streetcar Route • AC Transit: Streetcar service from MacArthur to Shellmound would overlap with AC Transit's proposed line 57. Line 57 could be redundant. • Emery Go-Round: There would be overlapping service connecting BART to locations currently served by the Hollis Emery Go-Round route and the Powell Bridge Emery Go-Round route. West Oakland Streetcar Route • AC Transit: Streetcar service on Mandela would overlap with the Enhanced Bus trunkline as well as AC Transit's proposed Line 26. However, West Oakland Streetcar Route would continue to MacArthur BART station and Line 26 would serve Shellmound. • Emery Go-Round: There would be minimal overlapping service with this route.

Economic Development Impact

Economic Development Potential

Each of the EBOTS cities has a significant existing employment base; Emeryville has the largest, followed by West Berkeley and West Oakland. The existing residential population is considerably smaller, resulting in these areas having a very high ratio of jobs to employed residents when compared to the EBOTS cities overall.[22] West Oakland has the largest number of residents, followed by Emeryville and West Berkeley. For all three EBOTS cities, fewer than 500 residents live and work in the same city within the study area; this results in substantial in-commuting because of the large employment base, combined with substantial out-commuting by EBOTS residents to jobs located in other places.

Each of the EBOTS cities envisions substantial economic development over the next 20 years, to 2035, encompassing a range of new jobs, commercial development, and residential development. West Oakland, through the recently adopted West Oakland Specific Plan, envisions the largest amount of new development as it seeks to preserve its existing economic base and current population, while attracting significant new industrial, Research and Development (R&D), office, retail, and mixed-use development alongside new residential land uses. Emeryville, with the most active current real estate market of the three EBOTS cities, will continue to add a variety of new employment supporting R&D and office uses, and will approach build-out for residential uses. West Berkeley, pursuant to the provisions of the West Berkeley Plan, will see the lowest increase of the three cities in new employment and residential uses, with most activities likely focused on opportunities sited in the M-zoned District west of 6th and 7th Streets. All three EBOTS cities seek to promote commercial and mixed-use development, with multifamily residential, at densities that are supportive of transit.

A comparison of existing conditions and future project development is shown in **Table 8** below. Growth projections are based on Plan Bay Area figures, using travel analysis zones (TAZ's) that approximately correspond to the EBOTS study area. An exception is West Berkeley where the EIR for Measure T, No Project Alternative, was used to reflect existing entitlements and the lesser amount of development that is allowed (the West Oakland figures exclude the former Oakland Army Base and other areas that are included in the West Oakland Specific Plan):

Table 8: Projected Employment and Household Change by EBOTS Subarea, Year 2010 - 2035

Location	2010	2035	Change
West Berkeley			
Employment	16,645	20,945	4,300
Households	7,718	9,369	1,651
Emeryville			
Employment	16,040	22,536	6,496
Households	5,694	10,603	4,909
West Oakland			
Employment	8,786	15,316	6,530
Households	6,795	11,861	5,066

Sources: Plan Bay Area; City of Berkeley; BAE.

[22] A more detailed discussion is contained in BAE's December 20, 2013 memorandum on the Economic Development Inventory and Opportunities Analysis, found in Appendix F.

Emeryville's current development pipeline includes more than 2,000 new residential units, while more than 200 are planned in West Berkeley. New employment-generating development is not currently as active, but is expected to pick up as the economic recovery continues, with the East Bay benefiting from spillover, as the San Francisco, Peninsula, and Silicon Valley areas become increasingly expensive, as has occurred in past cycles. In the near-term (next 5 years or less), current market trends suggest that Emeryville will see the most new development, followed by West Berkeley, and West Oakland. Substantial new development in West Oakland is likely to accelerate in the medium-term (5 years+) and beyond, as the West Oakland Specific Plan is implemented, and fewer available sites remain in Emeryville and West Berkeley.

Transit and Local Economic Development

Appropriately planned and operated local transit can enhance economic development in two primary respects. The first impact is related to mobility, or enhancing the ability of workers and residents to circulate within an area and make connections to the regional transit system. Particularly for built-up areas with a strong economic base, enhanced local transit is critical to accommodate growth without substantial increases in congestion, especially for the EBOTS area with its limited connections to the regional transit system.

The second impact from local transit is its potential to be an attractor for new development and new types of uses. Early in Emeryville's redevelopment as a modern employment center, the establishment of the Emery Go-Round shuttle bus system was critical in attracting office-based employers who have staff that rely on BART to commute to work. Similarly, Oakland is proposing to develop an "O" transit loop that connects West Oakland with BART, Downtown, and the Broadway corridor as part of the West Oakland Specific Plan's vision for attracting new uses and substantial equitable development to the area. The potential for local transit to be an attractor means that it can also increase a local area's share of future growth above what would otherwise occur.

Another consideration for the EBOTS study is the extent to which new residential versus commercial uses generate more transit ridership. A Public Policy Institute of California study, *Making the Most of Transit: Density, Employment Growth, and Ridership around New Stations* (Kolko et al, 2011), points out that while much of the emphasis has been on building residential around transit stations, across the US there is a stronger relationship between employment density and transit ridership than there is for residential density; at a Census tract level high density employment is correlated with 24 percent more ridership than high density residential.

For West Berkeley and Emeryville, with the existing West Berkeley and Emery Go-Round shuttles, and AC Transit service, the expansion of existing service is more likely to generate mobility benefits than attraction benefits. In other words, most, not all projected growth in these two PDA's would still likely occur if there is only limited expansion of transit service, assuming the West Berkeley and Emery Go-Round shuttles remain in operation.

For West Oakland, expansion of existing AC Transit Service and/or the creation of additional new high-quality local transportation options are likely to be important factors in attracting the substantial new development, firms, employees, and residents envisioned in the Specific Plan. The lack of enhanced high-quality transit options for West Oakland is more likely to affect how much growth can be attracted to the area than it is for West Berkeley or Emeryville.

Transit Technology and Economic Development

The success of streetcar systems in attracting new development activity in Portland, OR, Seattle, WA, and in other cities around the US has created tremendous interest. These two streetcar systems in Portland and Seattle operate in mixed flow, rather than dedicated lanes (as many Bus Rapid Transit projects that have contributed to development do). More than 70 US cities are currently in one stage or another of proposed, planned, or under construction streetcar systems. Streetcar systems are often claimed to generate greater economic development benefits because of developer preferences for systems with fixed investments; rider preferences for rail over buses; the higher quality rider experience with an electric streetcar vs. a diesel or alternative-fuel bus; and the greater rider capacity that streetcars can provide. Conversely, streetcar systems are considerably more expensive to develop and operate on a per-mile basis.

The Institute for Transportation and Policy Development Policy (ITDP) recently published a study, *More Development for Your Transit Dollar: An Analysis of 21 North American Transit Corridors,* (Hook, Lotshaw, Weinstock, 2013)[23] that found that of the five transit corridors that generated the most investment in Transit-Oriented Development (TOD), on a dollar of TOD investment per dollar of transit investment, two were bus systems (Cleveland HealthLine BRT and Kansas City Main Street MAX bus), two were streetcars (Portland and Seattle South Lake Union), and one was light-rail (Portland MAX Blue Line). For the 11 transit corridors with "Moderate" TOD Impacts, seven were Bus Rapid Transit (BRT) or bus systems, and four were light-rail transit (and five of the BRT systems met ITDP's definition for high quality transit). Neither this study nor other research has been able to establish a TOD investment potential from regular transit bus operations.

It is challenging and impractical for the EBOTS study to develop useful measures that can relate the amount of transit investment to a certain TOD outcome. This is because transit investment often occurs in conjunction with agency revitalization plans and upzoning that in themselves spur development and increase the value of land, even without transit. Development outcomes are also correlated to current development patterns, current market conditions, and future market potential, all of which vary from place to place. Within the EBOTS subareas there is sufficient variation in these factors that it is not practical to develop measures for how much incremental investment in TOD would result from an incremental investment in transit.

Key Factors Shaping Transit and TOD

ITDP and other studies indicate that the following factors would be most important, in the following order, for determining how transit investment influences economic development:

- Local government plans that allow for denser development and use revitalization techniques, including public investment, to spur development.
- Current development land market conditions, including the availability of opportunity sites.

[23] Available at https://go.itdp.org/display/live/More+Development+for+Your+Transit+Dollar%3A+An+Analysis+of+21+North+American+Transit+Corridors

- Transit quality, defined as frequent service, high quality station design, passenger information systems, and other features (ITDP publishes a "BRT Standard" to score transit quality, much of which is applicable to other modes)[24].

- Current demographic and economic trends.

- The pedestrian orientation of areas around transit stations or stops.

All three EBOTS cities already have or will be implementing plans that have provided a framework for development to allow for substantial new development over the next 20 years and beyond. All three cities have a similar built form and pedestrian orientation. Transit quality is more about a set of design features and operational characteristics that can be applied to rail-based or bus-based transit. Therefore, this factor does not support making distinctions between the concepts.

Therefore, current development land market conditions and local demographic and economic trends are the two remaining factors that can be used to evaluate differences between the EBOTS transit concepts. In the near-term, these factors would favor Emeryville, since this portion of the study area currently has the strongest current market for development, followed by West Berkeley and West Oakland. In the medium-term and beyond, as implementation of the West Oakland Specific Plan would shift the development land market, the greater potential for growth would favor West Oakland, which could also offer the potential for a greater return, measured as TOD investment that results from the investment in transit. To the extent that expanded transit in the EBOTS area is funded as a New Starts or Small Starts project, the federal and local processes for approval, construction, and commencement of operations is likely to be in the medium- to long-term, and take considerably longer than five years.

For transit technology, the variance in TOD outcomes that ITDP identifies between streetcar and bus systems suggests that it should not automatically be assumed that a streetcar will result in a greater amount of new TOD and economic development. With a focus on transit quality as more of a driver of TOD potential than the choice of transit technology, the potential for a streetcar should be evaluated in terms of its ability to move more people at lower cost within a given transit corridor than the bus alternative. The potential for a bus-based system to generate acceptance and interest similar to a streetcar system should be evaluated in terms of the quietness and smoothness of operation of the vehicle (with electric vehicles being ideal), the quality of stops and services, and its branding as a modern transit option.

New Development Value Capture

Another set of criteria to evaluate the economic development potential of the transit concepts involved the extent to which it could be phased to better match development as it occurs, and the extent to which that development could contribute to capital or operating costs through value capture mechanisms. Value capture is an important strategy for generating a portion of the local match required by many grant sources, as well as for generating direct investment and operating funds for new transit. Value capture techniques involve a range of financing tools that seek to generate funds from a portion of the value of new development. Potential strategies specific to new development, and their applicability to EBOTS

[24] The categories for the BRT Standard are: BRT Basics; Service Planning: infrastructure; Station Design and Station-Bus Interface; Quality of Service and Passenger Information Systems; and Integration and Access. The BRT Standard is available at https://go.itdp.org/display/live/The+BRT+Standard

study area improvements, are shown below in **Table 9** (this list excludes general taxes that would apply to all properties, such as parcel taxes, sales tax increase, utility user tax increase, etc.). Some value capture is being done already, including the Property-based Business Improvement District that funds the Emery Go-Round.

Table 9: Value Capture Strategies Overview

Value Capture Strategies Overview		Shuttle Routes	Enhanced Bus Trunkline Route	Streetcar Routes
Category	**Description**			
Tax Increment Finance (TIF)	Allocates a portion of new tax revenue for funding improvements. The current tool available in California is Infrastructure Finance Districts (IFD). These are challenging to establish under current law, and would likely require 2/3 voter approval. As a practical matter only the local city share of new tax revenues would be available. • Annual receipts tied to new development. Can be used for improvements (including bond financing) consistent with IFD legislation.	✓	✓	✓
Assessment Districts	Creation of a district that imposes a surcharge on property tax bills. There are a wide variety of such districts under California law. There are various property owner or voter approval requirements, typically 2/3. A Public Transit Benefit Assessment District (SB142) allows agencies operating transit to create an assessment district through Board action. • Annual receipts that can be used for improvements (including bond financing), or operating costs (depends upon district type).	✓	✓	✓
Parking Assessment Districts	Creation of a new parking assessment district to use revenues from parking fees and fines to support transit operations. A Property-based Business Improvement District funds the Emery Go-Round. • Annual receipts tied to parking meter rates and parking ticket charges.	✓	✓	✓
Developer Impact Fees	Charges levied against new development to offset the cost of improvements to accommodate the impacts of that development. Requires preparation of a	✓	✓	✓

	nexus study to identify the impact from development, cost of improvements to mitigate it (e.g. transit), and formula for appropriate allocation. Emeryville's Traffic Impact Fee projects include street improvements for buses, including signal timing and bus stop amenities. • One-time payments from each new development project into the Capital Improvement Program per the nexus study.			
Density Bonuses	Allows a developer to increase the size of a project for provision of a public benefit, e.g. contribution to transit improvement. This would require modification of existing plans in the EBOTS area. Emeryville has density bonuses for transit passes and real-time arrival displays. • One-time payments from each new development project that uses the bonus.	✓	✓	✓

California laws impose strict approval requirements, and limitations on use of funds, upon local jurisdictions that wish to use the above-listed value capture tools. Experience suggests that most of these tools are more likely to generate property owner, voter, and other public support for new and enhanced transit options (such as an Enhanced Bus trunkline or Streetcar route), and less likely to gain approval for extensions of existing transit options that are seen as being financed by existing federal, state, and local sources (such as AC Transit service).

There are additional challenges tied to use of value capture that would need to be addressed in future studies. These challenges include:

- **Timing**: The amount realized from many value capture tools is tied to development, which is spread over time. By comparison, new transit needs to be build up-front as a system, leading to a mismatch between the timing of costs and revenues. Another challenge is that development is highly cyclical, which means that revenues can vary greatly from year-to-year.

- **Underwriting Financing**: Bond underwriters look to established sources of revenues, rather than projections of potential future revenue. This can make it difficult to use value capture tools, aside from assessment districts, as a fund sources to repay bonds.

- **Implementation**: There should be consistency between the three cities in the EBOTS area in how value capture tools are used, which requires a greater than usual level of coordination.

These challenges can be addressed through phasing of improvements and obtaining loans from local cities' other funds, among others. The challenges of creating an integrated transit system that spans and

benefits three cities in the EBOTS area may justify the creation of revenue-sharing arrangements between the three cities to allow more effective use of value capture tools to help fund transit.

Potential Value of Development and Value Capture

This section provides an estimate of the potential value of new development in the EBOTS area from 2015 through 2035. Such a discussion is highly conceptual at this stage of planning, and these figures should be considered an indication of the potential magnitude of funds for discussion, rather than a projection of expected receipts. Much more detailed study would be needed to come up with figures that could be used for a financing strategy to fund project costs.

The first step to projecting value capture is to identify the amount of development to which value capture tools could be applied. The projections of EBOTS area future household and employment growth previously prepared were reviewed, and pro-rated for the amount of development that is yet to occur in the EBOTS area, as shown in the **Table 10**.

Table 10: Projected New Development Measures in the EBOTS Area, 2015-2035

Projected New Development, EBOTS Area, 2015-2035				
	West Berkeley	Emeryville	West Oakland	Total
Housing Units	679	3,014	4,053	**7,746**
Non-residential – sq. ft.	812,000	1,617,124	1,417,692	**3,847,616**

Note: The above table is based on the lesser of Plan Bay Area projections or individual City estimate of maximum build-out allowed per existing plans

Sources: Plan Bay Area Final Forecast, July 2013; Cities of Berkeley, Emeryville, and Oakland; BAE, 2014.

Over the 20-year period from 2015 to 2035, assuming value capture tools can be put in place in the near-term, these could be applied to up to approximately 7,700 new dwelling units and 3.8 million square feet of all types of new commercial development.

The value of this amount of new development was calculated based on the real estate market values identified in **Appendix F**. These values are considered to be "mid-point" values in the economic cycle, and thus represent an appropriate average as well as a conservative approach to calculating value creation. As shown in the **Table 11** below, new development in the EBOTS area would have a potential value in excess of $3.5 billion through 2035, and would generate more than $35 million in new annual property tax revenues by 2035 (with revenues starting at $0 in 2015 and growing as development occurs). Cities only collect a share of property tax revenues, with the rest going to school districts, counties, and other special districts. Using a conservative assumption that the local city share would average 20 percent, by 2035 there could be a total of just over $7 million in new annual property tax revenues combined from new development throughout the EBOTS area.

Table 11: Potential New Property Tax Increment, EBOTS Area, 2015-2035

Potential New Property Tax Increment, EBOTS Area, 2015-2035			
	Quantity	Average Value per du/sq.ft.	Total
Residential			
Multifamily Residential	5,422	$294,000	**$1,594,000,000**
Multifamily For-Sale	2,324	$410,000	**$973,600,000**
Commercial			
All Uses	3,847,616	$260	**$1,000,400,000**
Projected Value of New Development			**$3,568,000,000**
Annual New Property Taxes at 1%			**$35,680,000**
City Share at Average 20% of New Increment			**$7,136,000**

Source: BAE, 2014

Cities will look to set aside a large part of this new increment, likely at least half or more, to fund the increased cost of new public services to serve new development. However, the above figures do suggest the following magnitude of potential value capture for discussion:

- Tax Increment Financing (TIF)/Infrastructure Finance District (IFD) financing, assuming property owner/voter approval, and based on 50 percent of the local city share of available increment, and using general bond underwriting principles, could support up to $30 million or more in bond financing by 2035 – if credit guarantees or other solutions are found to meet the challenge of available increment being much lower in early years.

- Assessment districts, if they can obtain property owner approval at a level equal to 0.1 percent of assessed value, could generate approximately $3.5 million in annual revenues by 2035, and support up to $30 million or more in new bond financing.

Further study, and evaluation of policy, political, and other considerations, would be needed to quantify the revenues that could be generated from impact fees, density bonuses, parking districts or other tools. For discussion purposes, it would be reasonable to consider that a combination of these other value capture techniques could potentially generate funds comparable to TIF or assessment districts.

Comparison of EBOTS Transit Options

The preceding discussion addressed the relationship between transit and local economic development and the factors that are likely to shape the impact of the transit alternatives in the EBOTS subareas. Each alternative would have different implications for economic development, with no one of them being clearly superior. The advantages and disadvantages associated with each option in terms of local economic development and implementation tied to economic development are summarized as shown in **Table 12** below:

Table 12: Economic Development Impact by EBOTS Transit Project

Service	Advantages	Disadvantages
Enhanced Bus Trunkline Route	• Enhanced access to Emeryville development opportunity sites	• No connection to MacArthur BART, busiest East Bay station outside Downtown Oakland and Downtown Berkeley

Service	Advantages	Disadvantages
	• North-South orientation promotes trips between destinations in EBOTS area • Further expands access to and quality of transit in West Oakland	• Enhanced access to Emeryville is limited to Hollis Street, and does not provide a direct connection to the Emeryville Shops • East-West connection carried by limited capacity of Emery Go-Round
Streetcar Routes	• Provides a connection from Jack London Square through West Oakland as well as from MacArthur BART to West Oakland • Gives direct access from MacArthur BART station to Shellmound • Phasing can be done by route; value capture by each city • Oakland alignment covers the "O" loop envisioned by City • Could handle increasing ridership in parts of Emery Go-Round routes with heaviest demand	• No additional West Berkeley or North Oakland connectivity • Service to Shellmound is not enhanced to/from destinations north of this area. • Because Emeryville has the most active market for new development in the Inner East Bay, enhanced service to Emeryville is not likely to generate significant additional development

In addition to the advantages and disadvantages that each transit option would offer in total, it is important to also consider the impact that each individual EBOTS subarea may experience for each option.

West Berkeley

- Routes through this subarea exhibit only modest potential to spur economic development due to new transit service, primarily because there is greater market demand than available sites and allowable development pursuant to the West Berkeley Plan. This reduces the ability of new transit to spur additional transit-oriented investment. The Enhanced Bus trunkline could be advantageous because it provides more service to West Berkeley destinations and extends its northern reach closer to opportunity areas at the northern end of the Priority Development Area (PDA).

Emeryville

- Routes through this subarea exhibit only modest potential to spur economic development due to new transit service, primarily because Emeryville has the most active market for new development in the Inner East Bay and as long as the Emery Go-Round continues to provide service, additional transit service is not likely to generate significant additional development (although current service does not have the capacity for future growth). Both the Enhanced Bus and Streetcar proposed routes are advantageous because they provide service through this area from West Oakland and MacArthur BART stations.

West Oakland

- Routes through this subarea exhibit substantial potential to spur economic development due to new transit service. This is because new modern transit, in conjunction with implementation of the strategies, including public investment, outlined in the West Oakland Specific Plan, has the potential to accelerate market interest in new development in West Oakland. The Enhanced Bus trunkline service and West Oakland Streetcar service proposed routes would both provide a high level of service along Mandela Parkway, and provide direct access to the largest number of opportunity sites for new development. The Streetcar two-route concept is functionally the same as the "O" transit loop proposed in the West Oakland Specific Plan.