MEMORANDUM - DRAFT

To: Leah Greenblat, Project Manager
WCCTAC

From: Adam Dankberg, P.E.
Kimley-Horn and Associates, Inc.

Re: **Background Studies and Travel Data Technical Memorandum, WCCTAC Express Bus Implementation Plan**

Date: October 8, 2018

1 INTRODUCTION

As part of the first phase of the West Contra Costa Transportation Advisory Committee (WCCTAC) Express Bus Implementation Plan, Kimley-Horn has conducted a review of existing conditions as they relate to express bus service opportunities. This includes the following:

- Review of previous studies and planning work which may inform opportunities to expand express bus service in West Contra Costa County
- Documentation of existing and planned transit services in the study area
- Demographic characteristics of the study population
- Analysis of existing travel patterns in the study area

This memorandum serves to document this analysis, and will be used to support the development of draft route and stop locations as part of Task 3.2 of this project.

1.1 Study Area

The study area for this Plan is western Contra Costa County (West County); this area is shown in Figure 1.

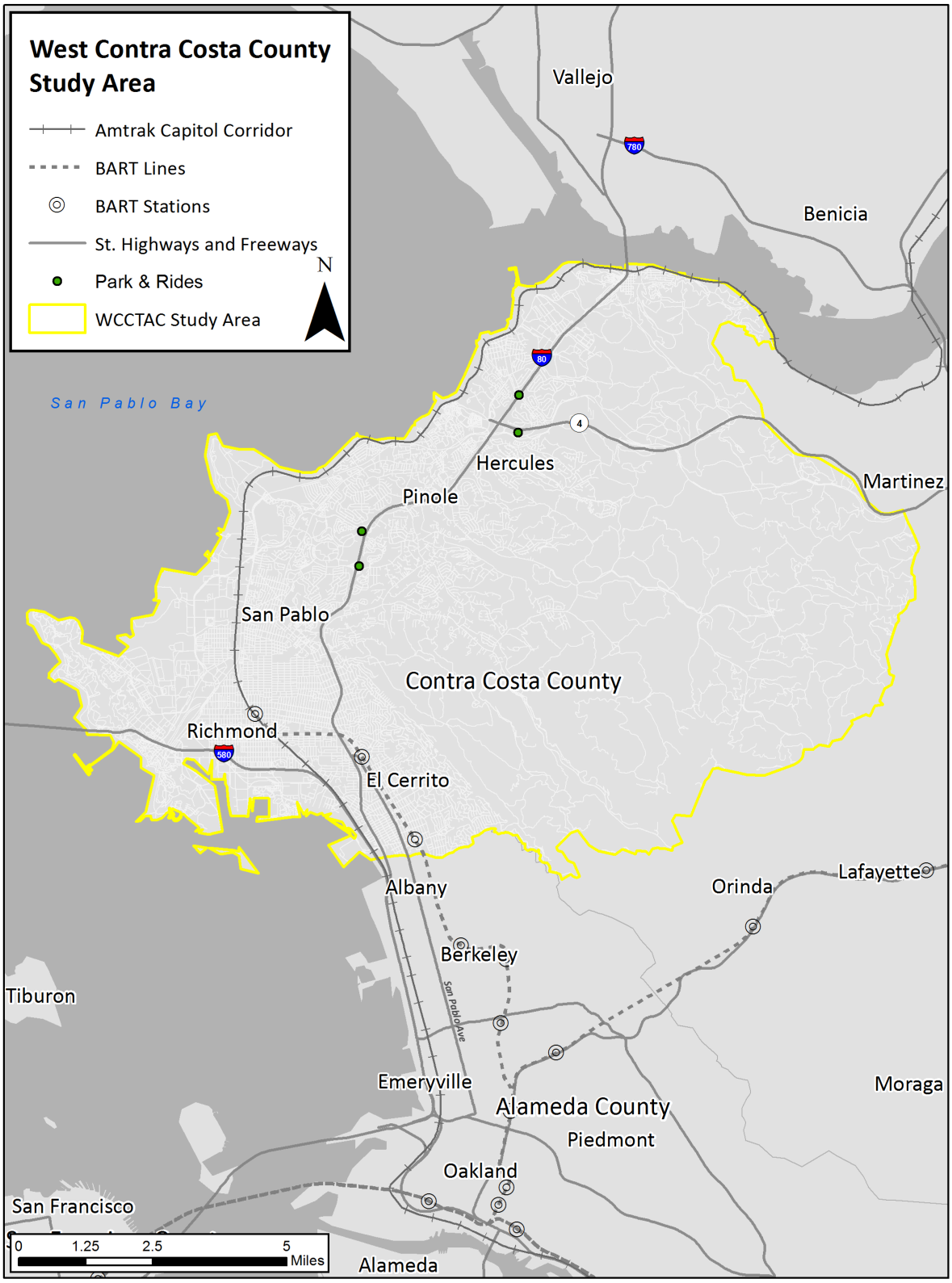


Figure 1: Study Area

2 PREVIOUS STUDIES AND PLANNING WORK

Kimley-Horn reviewed planning studies and other work completed in the study area to develop an understanding of the context in which this study is being conducted. Relevant findings and recommendations from these works are summarized in the following section.

2.1 West Contra Costa County High Capacity Transit Study

In 2015-2017, WCCTAC performed a High Capacity Transit (HCT) Study to evaluate multi-modal options to enhance transit connectivity and accessibility and to plan for future growth. The HCT study served to set the framework for this Express Bus Study. The goals of the HCT study included improving the frequency, reliability, and equity of transit services. The study focused on initially five travel corridors within West County: the I-80 and I-580 freeway corridors, the major north-south spines of San Pablo Avenue and 23rd Street, and the Union Pacific Railroad alignment extending north from the Richmond BART station. Various high capacity modal alternatives for these corridors, including associated capital improvement and service scenarios, were considered. (Expanded ferry service from the Hercules area across the bay to San Francisco was another proposed travel corridor initially identified but not an alternative included for detailed evaluation in the HCT Study. It is the subject of other regional transit improvement studies.)

After a series of outreach efforts and refinement and evaluation of a broad range of alternatives, five alternatives were chosen for further refinement and evaluation and ultimately included in the final report.

The five alternatives included:

1) Express Bus on I-80;
2) San Pablo Avenue/Macdonald Avenue BRT;
3) 23rd Street BRT;
4) UPRR Commuter Rail (short + mid-range options); and
5) BART Extension from Richmond.

The final report provided direction on next steps for each of the alternatives as well as provided information on estimated ridership and costs for each alternative.

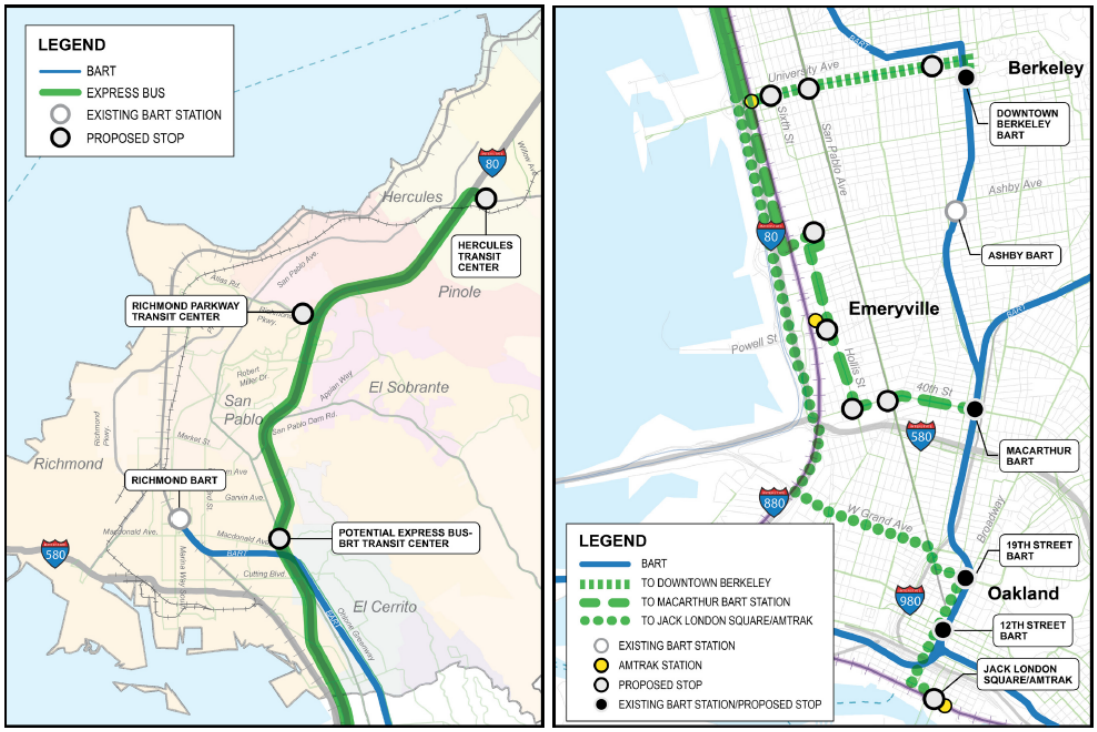
Alternative 1: Express Bus on I-80 provided recommendations for an express, freeway-based service on I-80 that would operate from the Hercules Transit Center to Berkeley, Emeryville, and Oakland. The alternative would also increase service frequency to San Francisco (e.g., on the WestCAT Lynx and/or AC Transit Transbay Line L). In West County, the proposed service would have additional stops at the Richmond Parkway Transit Center and a potential I-80/Macdonald Avenue Transit Center (see Figure 2). The study recommended longer term park and ride circulation and freeway access improvements, including restricted ramps that would make it easier for buses to move in and out of the high occupancy vehicle (HOV) lanes. Proposed bus routes in Berkeley, Emeryville, and Oakland are shown in Figure 2. Proposed park-and-ride and freeway ramp improvements are shown in Figure 3 and Figure 4.

For this alternative, the study projected ridership would increase to over 1,000 weekday daily boardings by 2020, and over 1,500 boardings by 2040. The associated projected costs were broken down by how soon elements of the alternative could be incrementally implemented: short-term (less than 5 years); medium-term (5 to 15 years); and long-term projections (over 15 years). The details of the elements and costs are shown in Figure 5.

A phased implementation approach was suggested for serving travel to and from Berkeley, Emeryville, and Oakland. Expanding direct bus service to these areas was determined to be a viable, low-cost option that can be implemented easily. Given congestion along I-80, a high functioning bus lane on the freeway would allow for effective express bus service at a relatively low cost per rider. In addition to enhancing existing express bus service to San Francisco, introducing new fast and direct service to East Bay cities in Alameda County would have immediate benefits for many West County commuters to these areas.

Alternative 1 was recommended for implementation in the near term and provides the foundation for this study.

Figure 2: WCCTAC HCT Study Express Bus Recommended Service



Source: West Contra Costa High Capacity Transit Study (2017)

Figure 3: Proposed Ramp Improvements at Hercules Transit Center (West Contra Costa High Capacity Transit Study, 2017)

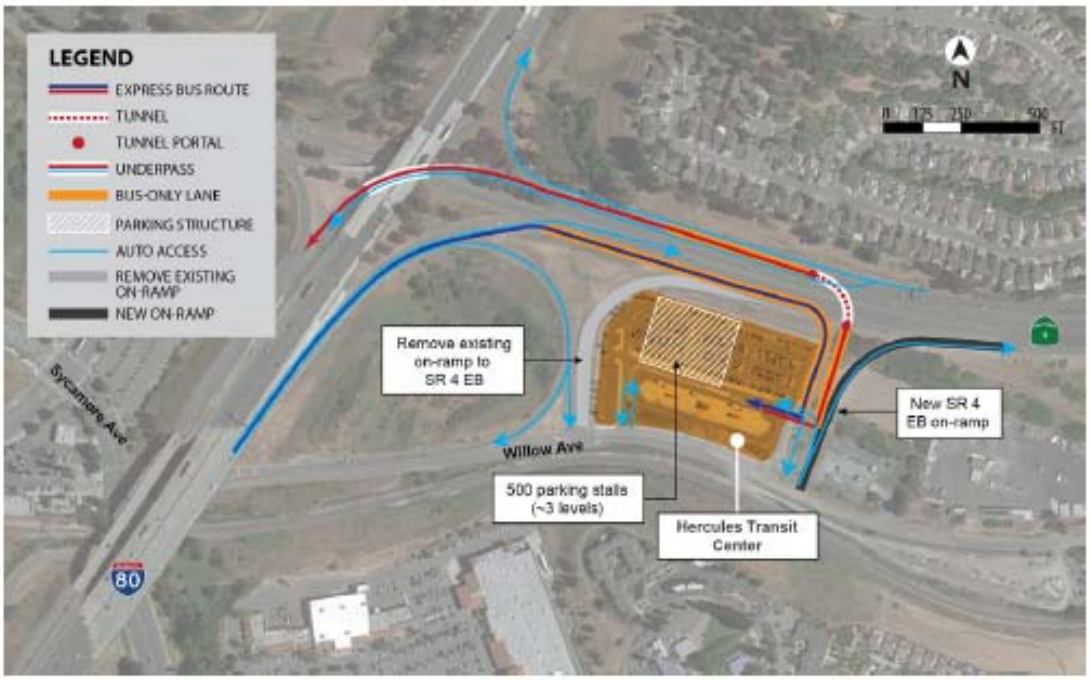


Figure 4: Proposed Ramp Improvements at Richmond Parkway Transit Center (West Contra Costa High Capacity Transit Study, 2017)

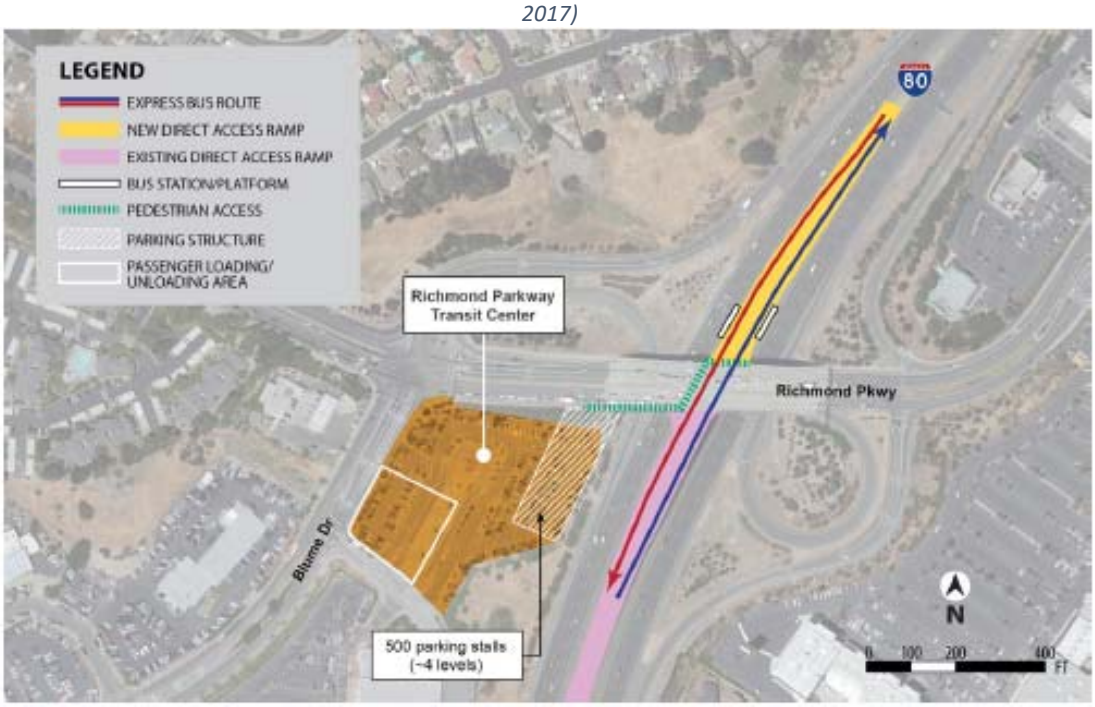


Figure 5: HCT Express Bus Corridor Implementation Costs

Time Horizon	Capital Cost (2017 $)
Short-term	**$11 m**
Increase existing bus frequency on WestCAT Express and Transbay routes	
New service to Berkeley, Oakland, Emeryville	
Transit priority improvements, such as signal priority and queue jumps	
Medium-term	**$90 m**
Bus stop improvements – Berkley, Emeryville, Oakland	
Expanded parking at Richmond Parkway and Hercules Transit Centers	
Long-term	**$141 m**
Freeway ramp improvements at I-80/Macdonald, Richmond Parkway, and Hercules Transit Centers	
New Express Bus-BRT transit center at I-80/Macdonald Avenue	
Total	**$242 m**

Source: WSP | Parsons Brinckerhoff with M Lee Corporation and Kimley-Horn, 2017

2.2 I-80 SMART Corridor Project

The I-80 Integrated Corridor Mobility (ICM) Project implemented an Active Traffic Management (ATM) system along a 20.5 mile stretch of I-80 between the Carquinez Bridge and the Bay Bridge. The main elements of the system included upgrades and integration of Intelligent Transportation System (ITS) elements on I-80, parallel arterial routes, and connecting local roadways to improve travel time reliability and reduce accidents and associated congestion. Those elements included: incident management via overhead signs; traffic information boards showing regional congestion and travel times; ramp metering to smooth traffic merging; and local street signs to guide freeway detours around incidents.

Transit priority elements were also incorporated that benefit express bus service using I-80, including preferential access treatments and transit priority. At highway entrances, preferential treatment would allow buses to bypass ramp meter signals as other HOV vehicles. The project implemented transit signal priority (TSP) systems along arterials connecting I-80 to San Pablo Avenue that could be potentially be utilized by a new express bus service. Some of the improvements have not been installed, or are not activated yet therefore specific locations would have to be identified if needed for any new Express Bus service recommendations.

2.3 CCTA Express Bus Study (2016)

The Contra Costa Transportation Authority (CCTA) initiated a study in 2016 that built off the 2001 Contra Costa Express Bus Study, which analyzed several corridors to document the need and establish a vision for express bus service. The 2016 study was a collaborative effort between all the county's express bus operators, including AC Transit, WestCAT, Contra Costa County Transit Authority (County Connection), and Tri-Delta Transit. The study focused on three main corridors: I-80, I-680, and Highway 4.

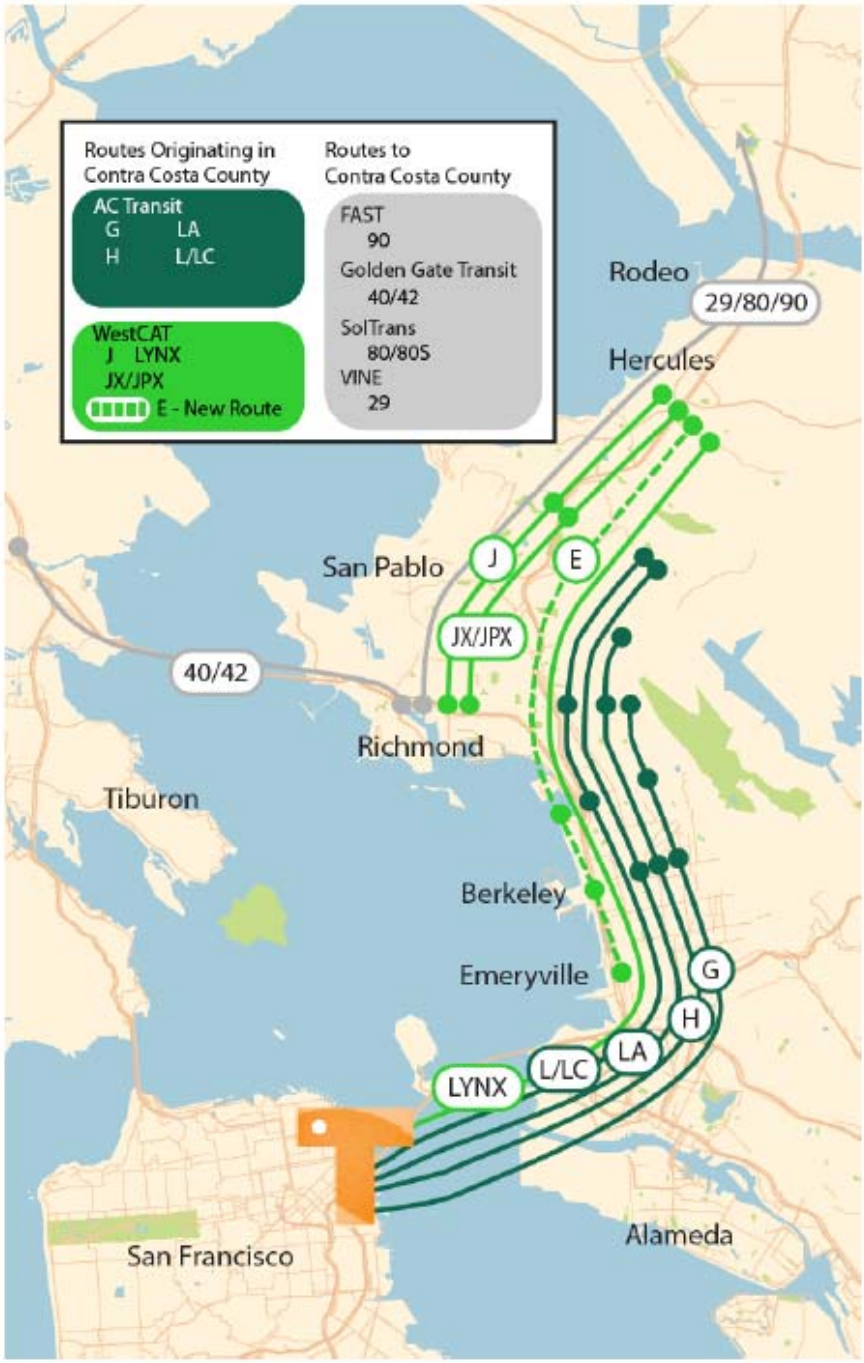
The service plan for I-80 was combined with Highway 4 and proposed a series of express bus routes that would provide service from Martinez to West County and the Hercules Transit Center. The plan envisioned routes that enter the freeway at various points with destinations to El Cerrito Del Norte BART, Berkeley, Emeryville, and San Francisco. Proposed routes B1/B2, C1/C2, D, and E are documented in Figure 6. These routes would provide service

from Hercules and Richmond Parkway to Berkeley/Emeryville and San Francisco. A map of proposed Route E, with service from Hercules and Richmond Parkway to Berkeley and Emeryville, is shown in Figure 7.

Figure 6: I-80/Highway 4 Proposed Service Pattern (CCTA Express Bus Study, 2016)

Service Pattern	Vallejo	Concord	Martinez	Hercules	Richmond Pkwy	Del Norte	Berkeley/ Emeryville	San Francisco	Headway Peak	Headway Base
A	X				X	X			10	15
B1[35]		X	X	X	X			X	10	-
B2			X	X	X			X		15
C1[36]				X	X	X			6	12
C2				X	X	X			9	12
D					X			X	10	15
E				X	X		X		15	15
Peak Headway	10	10	10	2	1.5	2.5	15	5		
Base Headway	15	-	15	4	2.5	5	15	7.5		

Figure 7: Proposed Route E (CCTA Express Bus Study, 2016)



2.4 Grand MacArthur Transit Operations Analysis (Ongoing)

A number of AC Transit Transbay routes currently travel to San Francisco along westbound I-580 using the Bay Bridge, which is very congested during most of the AM peak period. The Grand MacArthur Transit Operations Analysis is exploring diverting Transbay buses to use West Grand Avenue to reduce travel time delay and improve travel time reliability during commute periods. The study found that the optimal transit route varies by time of day and freeway conditions. Therefore, this analysis is considering a dynamic transit routing application that would provide a decision-making process for Transbay buses to select the optimal route.

The project identified an interim solution as well as long-term solution that would implement tools to demonstrate benefits to Transbay buses. The interim solution includes a web interface for AC Transit for real-time traffic information as well as camera feeds at key points along West Grand Avenue. The long-term solution could include automated decision tools that determine optimal routing with real-time traffic integration with AC Transit's CAD/AVL. Both solutions, if implemented along other corridors, could benefit current and future express bus routes from West County.

2.5 AC Transit Transbay Tomorrow

To address some long-standing issues with overcrowding, and to update their service network, AC Transit developed the Transbay Tomorrow service plan. The plan reallocates existing resources based on number of vehicles and total hours of service in a cost neutral approach with some additional funds provided by the Metropolitan Transportation Commission's (MTC) Bay Bridge Forward (BBF) Program. The plan uses various strategies to improve overcrowding, reliability, speed, and productivity of the service. In addition to adding vehicles and increasing frequency and span of service, stops are consolidated and routes are realigned to use major roads to increase speed and reliability.

The plan outlines that these strategies, although currently constrained by funding, can be implemented further as part of a larger set of unconstrained proposals for Transbay service expansion, should there be additional sources of funding identified.

2.6 San Pablo Avenue Complete Streets Project (Ongoing)

Alameda County Transportation Commission (ACTC) is conducting a complete streets study of San Pablo Avenue from downtown Oakland to Hilltop Mall. The project will propose multimodal improvements along (and potentially parallel to) San Pablo Avenue. These improvements will include bus facilities that could potentially be utilized by an express bus service proposed through this Plan. Bus improvements under consideration include exclusive lanes, transit signal priority, and queue jumps.

2.7 WCCTA Short-Range Transit Plan (2016)

To obtain funding for transit services over the next ten years, the Western Contra Costa Transit Authority (WCCTA) adopted a Short-Range Transit Plan (SRTP) that serves as a blueprint to meet current and future transit needs and demands for the community. WCCTA provides the WestCAT transit service; its service area includes the area of West Contra Costa County spanning from the Hilltop area to Crockett. Forecasted population growth, planned development changes, and a fiscally constrained budget are analyzed and balanced to develop the SRTP. The plan outlines current service levels and identified needs to be addressed including a financially unrestrained vision for the future that includes improving: service to Oakland/Emeryville; Lynx service to and from Pinole; service expansions throughout the area; increased weekend service; and service to Solano County.

Oakland, Emeryville, and Berkeley are identified as having a strong commuter demand from the service area. The SRTP states that the majority of the morning trips in the service area are destined for the East Bay (primarily Oakland and UC Berkeley) and transfer to BART at the El Cerrito del Norte BART station. Preliminary results showed that an express route to the East Bay had potential demand. West Berkeley, downtown Oakland, and Emeryville's commercial district were identified as having potential demand for an express route.

The SRTP also proposed the addition of express bus service between Pinole and San Francisco. The plan does not identify a specific park-and-ride location, but it notes that routing on an express bus service could be adjusted to serve local stops to alleviate the lack of a park-and-ride facility.

Both the proposed service to Pinole and potential express service to Oakland/Emeryville are considered part of WCCTA's long-term "vision," which was developed without considering financial constraints; thus, these proposed services are considered long-term goals and not yet being considered for implementation.

2.8 Emeryville-Berkeley-Oakland Transit Study (EBOTS)

The Emeryville-Berkeley-Oakland Transit Study (EBOTS) focused on cultivating an environment within the study corridor that would enhance the environment for transit, pedestrians, and bicyclists. The goals of the study included: creating an environment where a car is not required for mobility; creating a well-connected and cohesive transit corridor; coordinating transit improvements with future population growth; implementing short-term transit improvements; and enhancing long-term mobility within the corridor.

Short-term, mid-term (5-10 years), and long-term (10-20 years) improvements were identified that would benefit routes serving the EBOTS area, including express buses from West County. Short-term improvements included: expanding the West Berkeley shuttle; initiating a shuttle in West Oakland; and implementing bus stop upgrades and amenity improvements. Mid-term improvements included an enhanced bus trunkline that would provide bi-directional service from Jack London Square to West Oakland BART and north through Emeryville and west Berkeley. Long-term improvements included adding streetcar routes that would serve West Oakland BART and Jack London Square. These improvements showed a projected increase of 4,000-7,000 transit trips and a reduction in total vehicle miles traveled (VMT) per line. The improvements would support an express bus service to the EBOTS area, providing connectivity that would effectively and conveniently expand access for all transit users.

3 EXISTING TRANSIT SERVICES

3.1 Existing Transit Services

A number of existing express transit services are already provided in the study area by both AC Transit and WestCAT. These services are documented below.

WestCAT

WestCAT provides the following express bus routes in West County, which are also depicted in Figure 8:

- Routes **JL/JR** provide express bus service from Hercules, Pinole, and Tara Hills to El Cerrito del Norte BART. Both routes have a northern terminus at Hercules Transit Center and provide service along San Pablo Avenue in Hercules, Pinole, and Tara Hills. These routes diverge in northern Richmond, where route JL serves Hilltop Mall, while route JR serves Richmond Parkway Transit Center; both routes then travel straight to El Cerrito del Norte BART via I-80. Service is provided all day in both directions.
- Routes **JX/JPX** provide express bus service from Hercules to El Cerrito del Norte BART. Both routes have a northern terminus at Hercules Transit Center. Route JX provides direct, point-to-point service between

Hercules Transit Center and El Cerrito del Norte BART via I-80. Route JPX provides service along San Pablo Avenue and Tennent Avenue in Pinole, then follows I-80 to El Cerrito del Norte. Non-peak JPX trips also make additional stops along Fitzgerald Drive in Pinole and at Richmond Parkway Transit Center. Service is provided all day in both directions.

- The **Lynx** is an express bus route service from various locations in Hercules to the Salesforce Transit Center in San Francisco. All trips serve the Hercules Transit Center; other locations in Hercules served at various points throughout the day include the Rodeo Park & Ride, Victoria Crescent, and BioRad.

AC Transit

AC Transit has a network of bus lines that make local stops in various areas within its East Bay service area, then run an express segment on the regional freeway network to another transbay destination. These are branded as "Transbay" lines. All Transbay lines in the study area provide service to the Salesforce Transit Center in San Francisco. For all Transbay lines in the study area, only riders going to (or from) the Salesforce Transit Center may board (or alight) along the local segments; riders may not utilize the service to make local trips. The following Transbay lines provide service in West Contra Costa County; these are also depicted in Figure 9:

- **Line G** provides service from Potrero Avenue & Richmond Street in El Cerrito to the Salesforce Transit Center; in the study area, it makes local stops in El Cerrito along Richmond Street and at El Cerrito Plaza BART. Line G makes additional local stops in Berkeley and Albany before heading to San Francisco via I-80.
- **Line H** provides service from Barrett Avenue & San Pablo Avenue in Richmond to the Salesforce Transit Center. In the study area, it makes local stops along Barrett Avenue and Arlington Boulevard in Richmond and El Cerrito. Line H makes additional local stops in Berkeley before heading to San Francisco via I-80.
- **Line L** provides service from Princeton Plaza Shopping Center in San Pablo to the Salesforce Transit Center. In the study area, it makes local stops in San Pablo along El Portal Drive, Church Lane, and San Pablo Avenue, and along San Pablo Avenue in Richmond and El Cerrito. It makes additional local stops in Albany before heading to San Francisco via I-80.
- **Line LC** provides service from Hilltop Park & Ride to the Salesforce Transit Center. It also makes local stops in Richmond at Hilltop Mall, Park Central & Hilltop Drive, and Richmond Parkway Transit Center before getting on I-80; the route gets off I-80 at El Portal Drive and makes local stops along Glenlock Street and Rollingwood Drive. South of Rollingwood Drive, Line LC has the same alignment as Line L.
- **Line LA** provides service primarily from the Hilltop Park & Ride and the Richmond Parkway Transit Center to the Salesforce Transit Center. In the study area, it makes local stops at Hilltop Mall, Park Central & Hilltop Drive, and Richmond Parkway Transit Center before heading to San Francisco via I-80.

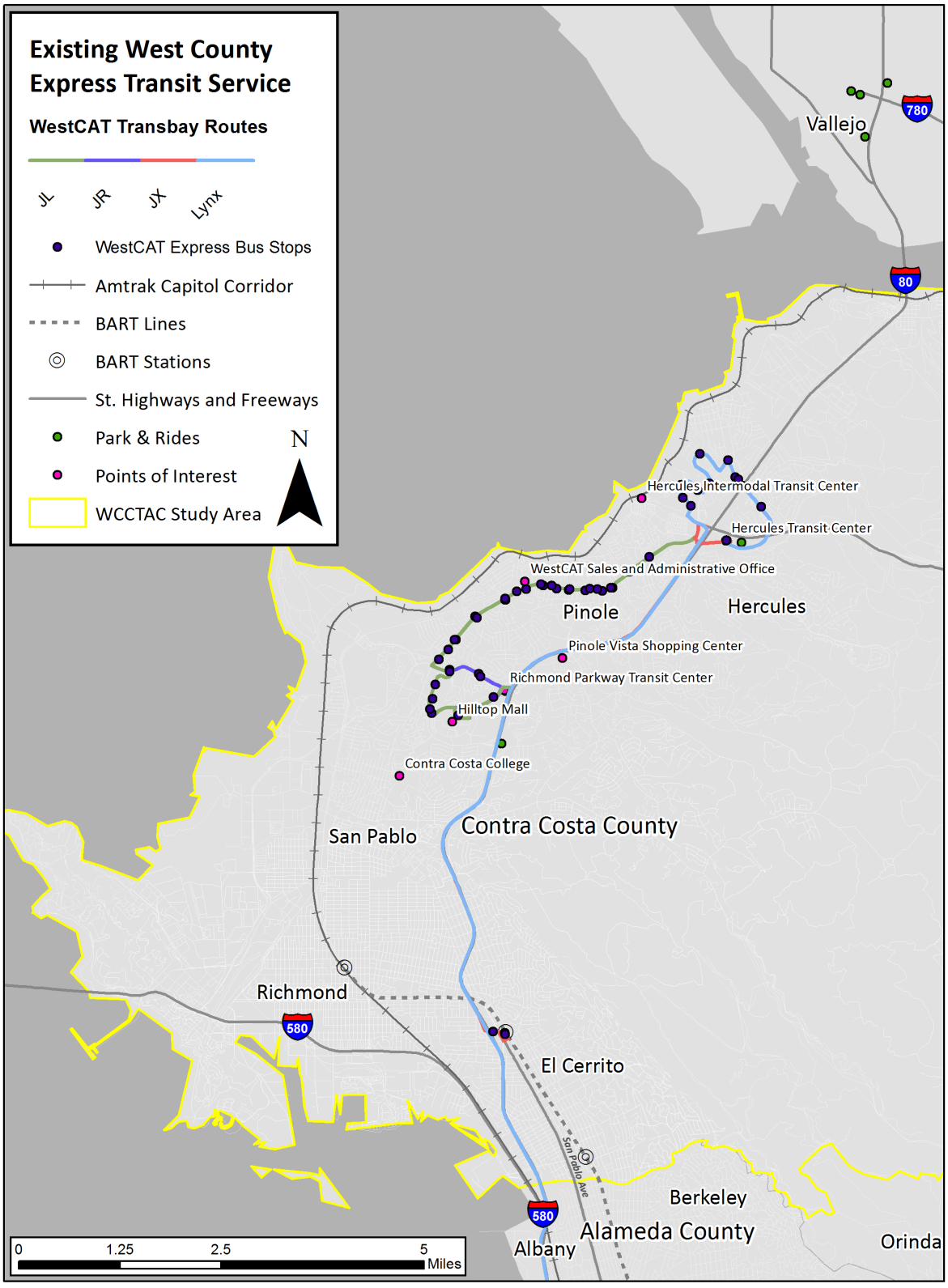
Other Transit Services

Transit providers in other counties provide express bus service with destinations located within the study area. These include the following:

- Golden Gate Transit's Route 40/40X provides express bus service from San Rafael Transit Center to El Cerrito del Norte BART; it makes some local stops along Cutting Boulevard in Richmond. Trips on Route 40 also serve one stop in Point Richmond.
- Vine Transit Route 29 provides express bus service to Vallejo Ferry Terminal and El Cerrito del Norte BART. Route 29 serves stops in Calistoga, St. Helena, Yountville, Napa, and American Canyon.
- Fairfield and Suisun Transit's (FAST) Green Express route provide express bus service from Fairfield and Suisun City to El Cerrito del Norte BART.

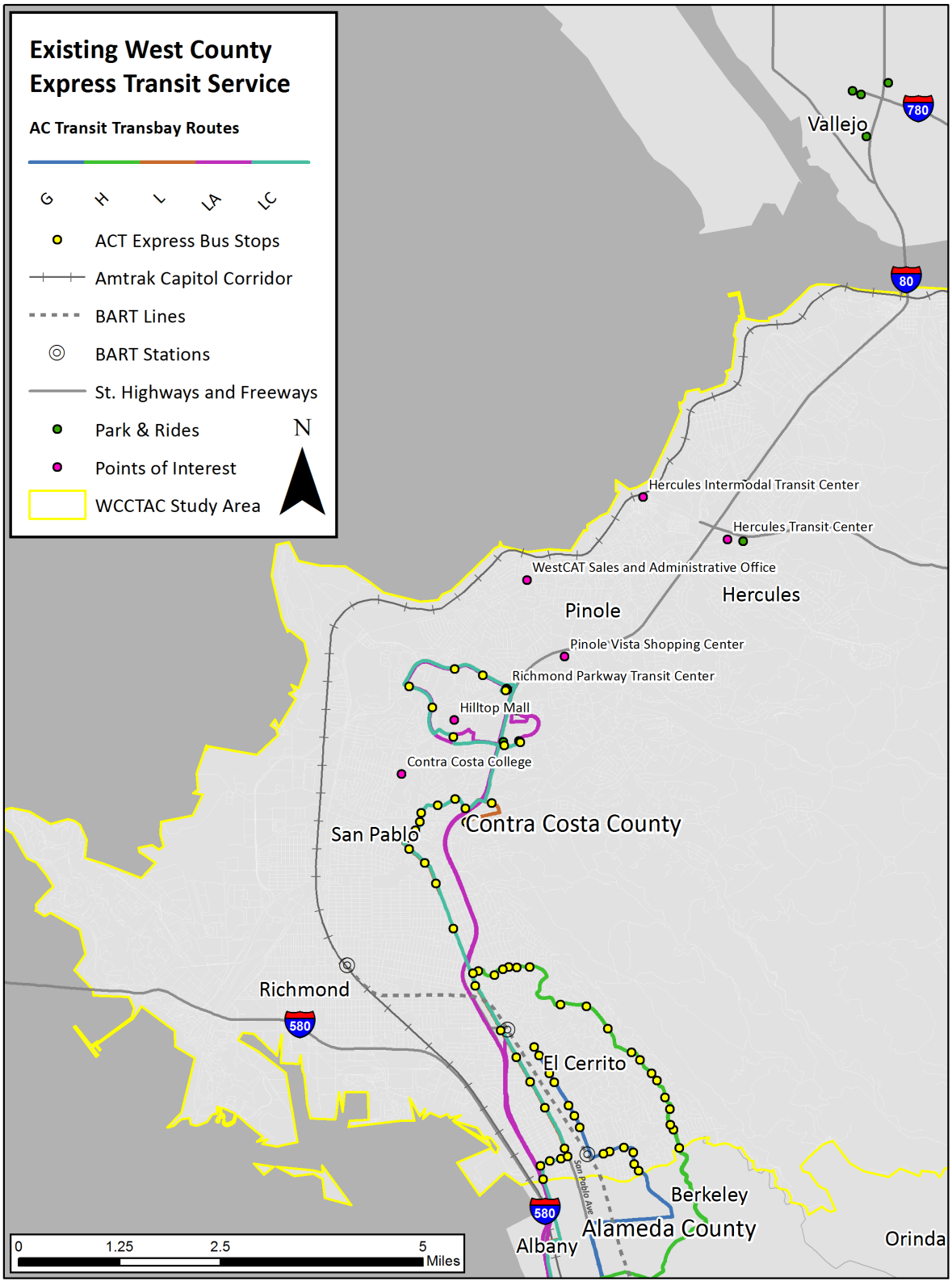
- Soltrans provides express bus service from locations in Vallejo to El Cerrito del Norte BART via Routes 80 and 82.

In addition to express bus service, BART provides heavy rail service to the Richmond Transit Center in downtown Richmond providing access to downtown Berkeley, downtown Oakland, and San Francisco. The Capitol Corridor passenger rail line, operated by Amtrak, provides service from Sacramento to San Jose and makes stops at the Richmond Transit Center, Berkeley, Emeryville, and Jack London Square.



Sources: ACS 2016, AC Transit Contra Costa County, BART

Figure 8: Existing WestCAT Express Bus Service



Sources: WestCAT, Contra Costa County, BART

Figure 9: Existing AC Transit Express Bus Service

3.2 Existing Transit Ridership

Ridership data is useful to evaluate the performance of existing routes and to project the ridership potential of new service in other areas. Data was supplied to Kimley-Horn by a number of transit agencies. WestCAT provided ridership by route for express routes. AC Transit provided ridership by route, trip, and stop, as well as on-board survey data. BART provided station-level ridership and on-board survey data.

Table 1 shows the ridership by route for existing AC Transit and WestCAT express bus routes. Figure 10 shows ridership by stop for AC Transit Transbay routes; ridership data by stop was not available for WestCAT. In the study area, ridership on Transbay routes is highest at major transit centers and on stops along San Pablo Avenue. The highest ridership stops in the study area (accounting only for ridership generated by AC Transit Transbay routes) are listed below in Table 2.

Table 1: Ridership by Route (AC Transit, WestCAT)

Provider	Route	Inbound Vehicle Trips	Outbound Vehicle Trips	Average Daily Riders
AC Transit Transbay Routes				
	G	7	5	471
	H	8	9	628
	L	10	11	678
	LA	12	14	449
	LC	0	3	55
	Total	37	42	2,281
WestCAT Express and Transbay Routes				
	JR/JL Express	54	56	1,211
	JX Express	29	28	394
	JPX Express	42	43	564
	LYNX Transbay	42	44	1,110
	Total	167	171	3,279

Table 2: Top 5 Ridership Stops in Study Area (AC Transit Transbay Ridership Only)

Location	Workers
Richmond Parkway Transit Center	68
San Pablo Ave & Moeser Ln (Richmond)	31
Hilltop Dr & Vista Del Mar (Richmond)	23
Park Central St & Hilltop Dr (El Sobrante)	22
Arlington Ave & Coventry Rd (Kensington)	21

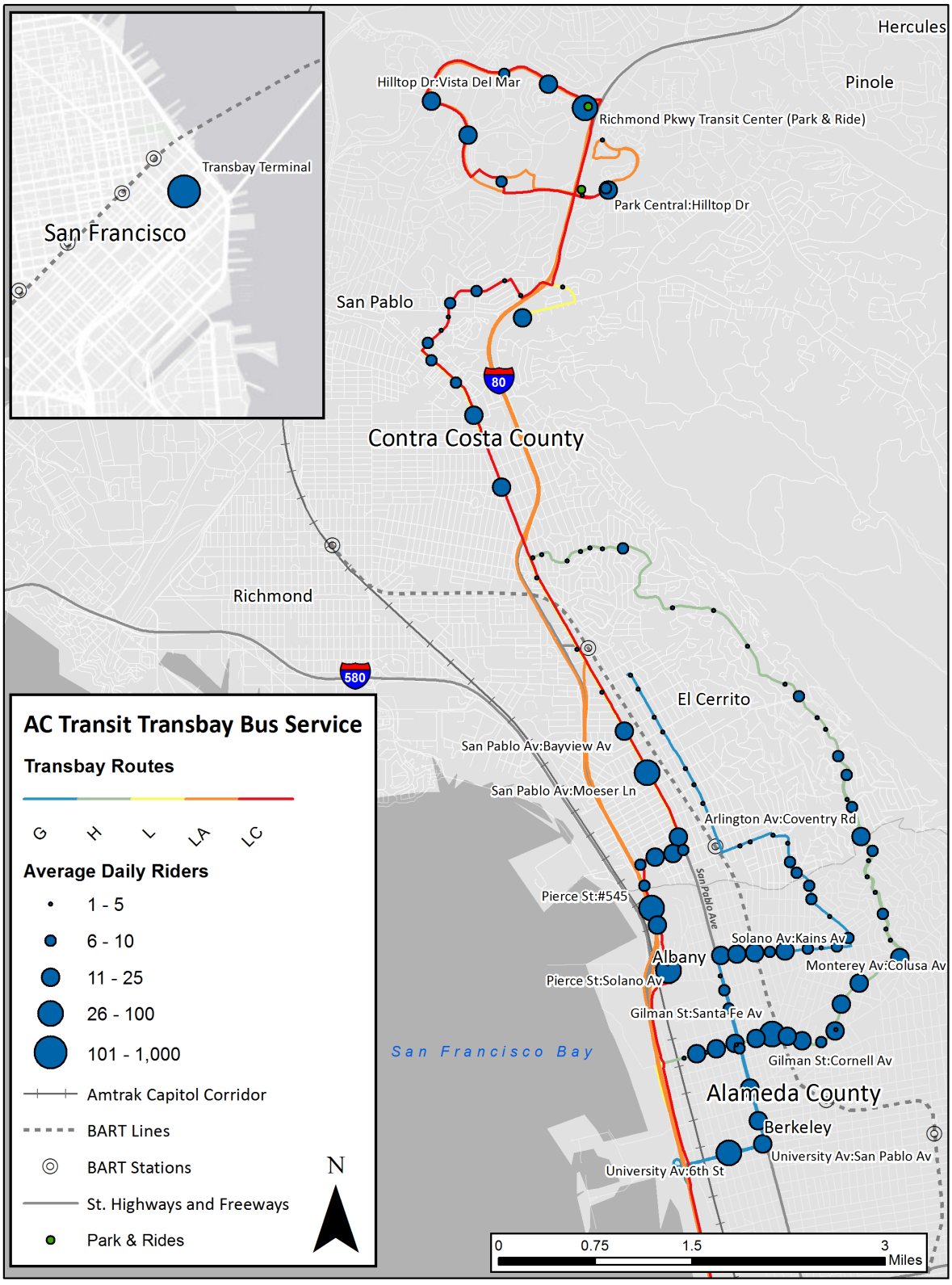
Mode of access data was gleaned from on-board survey data from AC Transit Transbay lines. Figure 11 shows bus access mode for Transbay riders boarding in the study area and heading to San Francisco; Figure 12 shows the bus access mode for Transbay riders boarding in San Francisco and heading to the study area. Mode of access data was not available for Line LC. For all AC Transit Transbay routes providing service in the study area, the vast majority of riders walk to reach their bus.

Figure 13 shows the number of AC Transit Transbay riders who have access to an automobile; overall, only 49% of riders surveyed had access to a car.

Mode of access and demographic data was also collected in the 2017 WestCAT on-board survey. Figure 14 shows the mode of access for WestCAT riders traveling from home to their first boarding point. Similar to the AC Transit Transbay lines, the vast majority (80%) of riders of WestCAT express routes (Routes JR/JL/JX/JPX) accessed the bus by walking. For WestCAT transbay service (Lynx), 30% of riders walked to their first boarding point while 26% were dropped off and 42% either drove alone and parked or carpooled and parked. Almost all riders accessed their non-home destination by walking – 93% and 96% of express and transbay riders, respectively.

Figure 15 shows the number of drivable vehicles available to WestCAT express and transbay riders. Only 17% of express riders and 8% of transbay riders did not have access to a car.

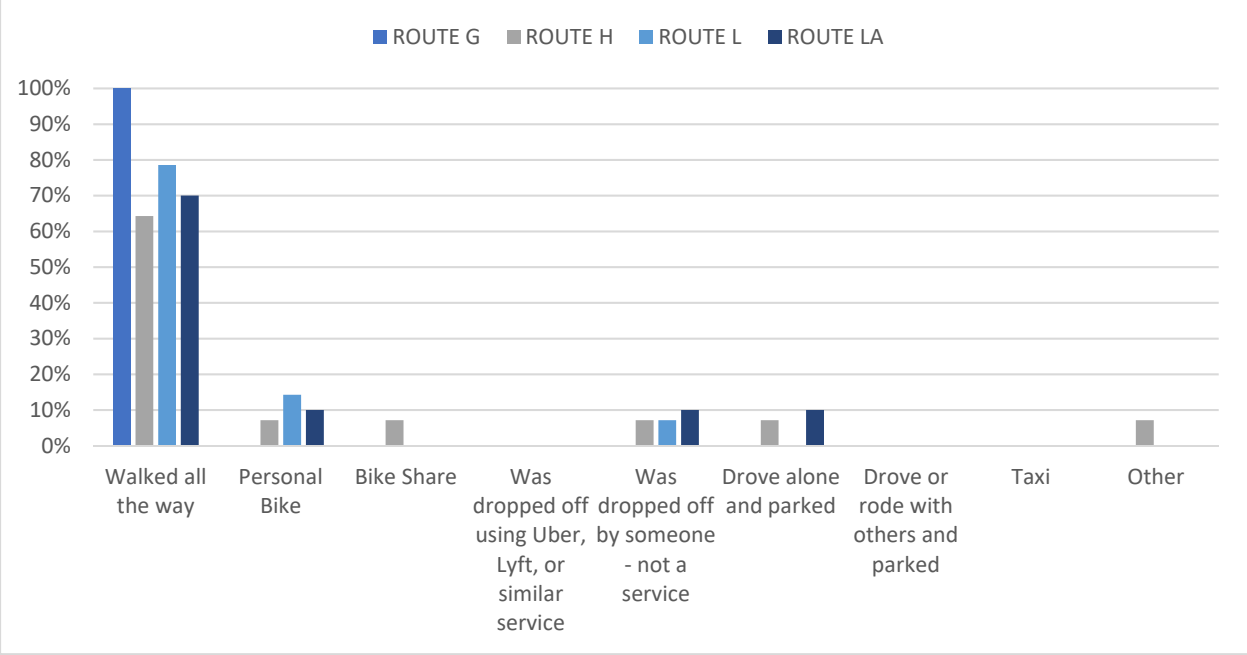
Figure 16 shows mode of access for the BART stations in the study area. Approximately one third of riders at these stations access them by driving alone or carpooling.



Sources: AC Transit

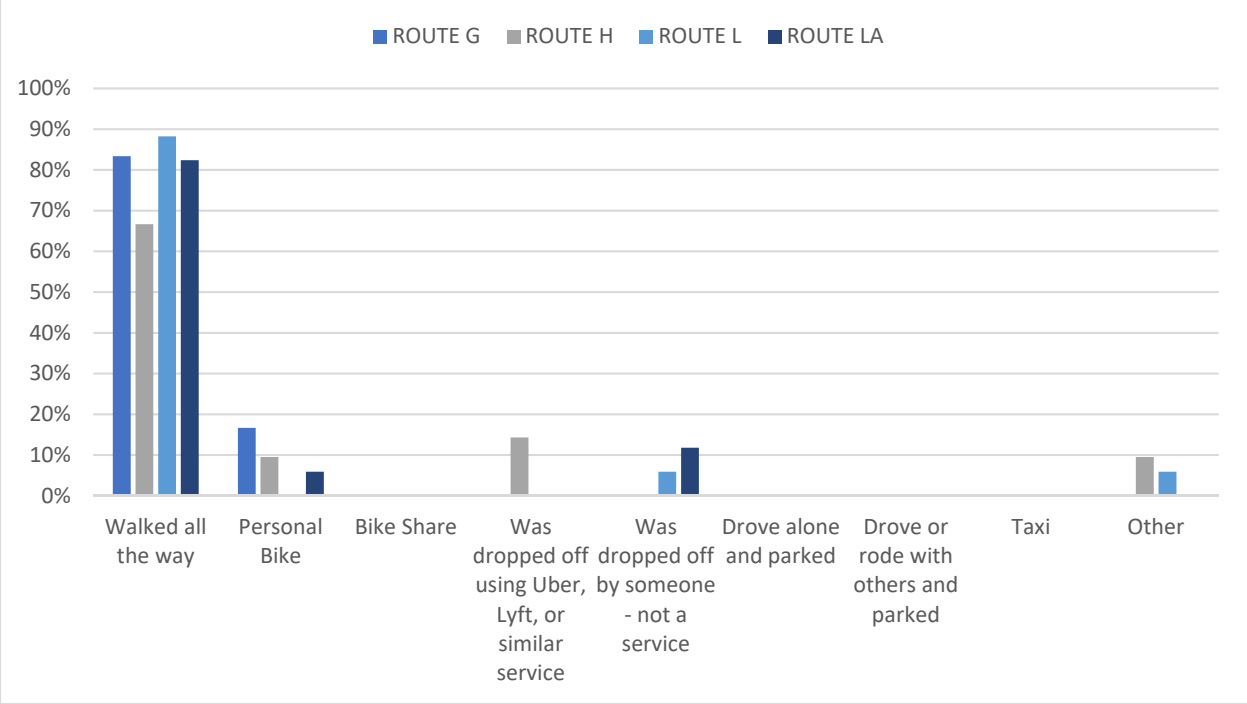
Figure 10: Ridership by Stop (AC Transit)

Figure 11: AC Transit Transbay Access Mode – Toward San Francisco



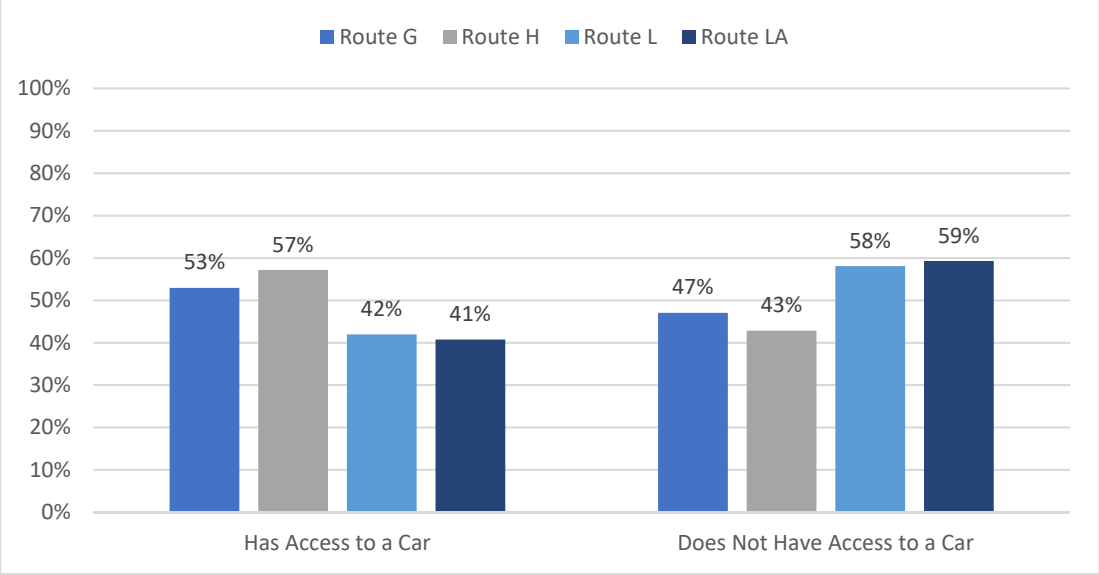
Source: AC Transit Onboard Survey Data (Obtained 2012, cleaned 2018)

Figure 12: AC Transit Transbay Access Mode – Toward Study Area



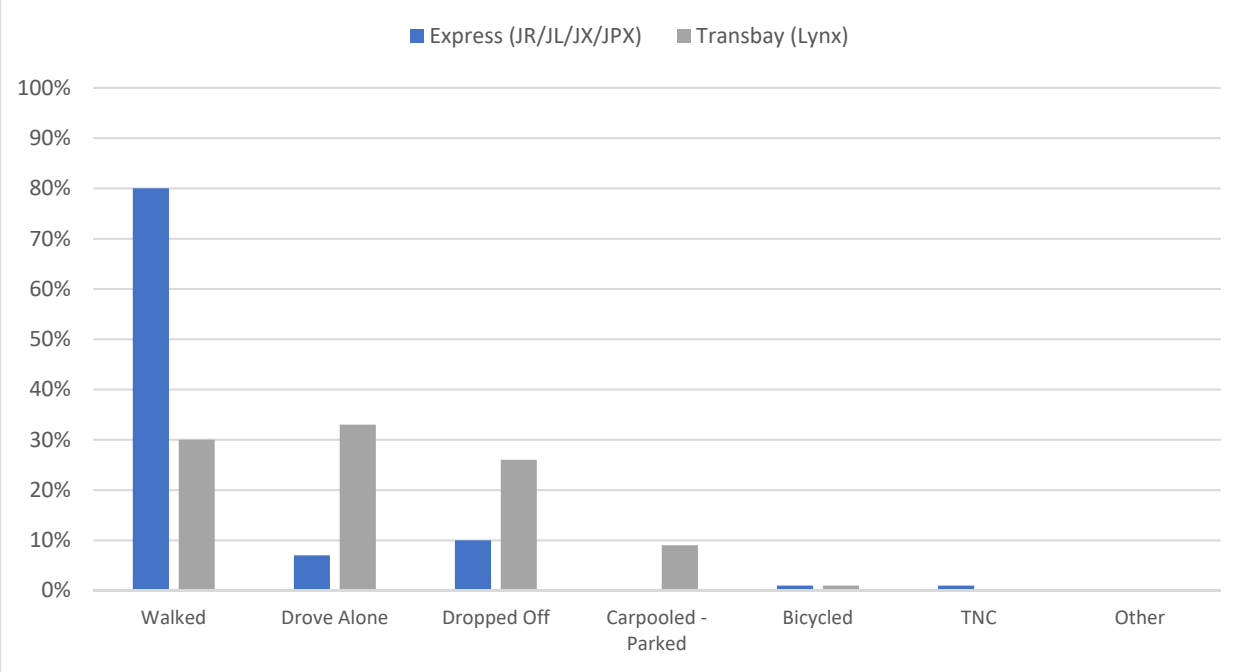
Source: AC Transit Onboard Survey Data (Obtained 2012, cleaned 2018)

Figure 13: Automobile Access – AC Transit Transbay Riders



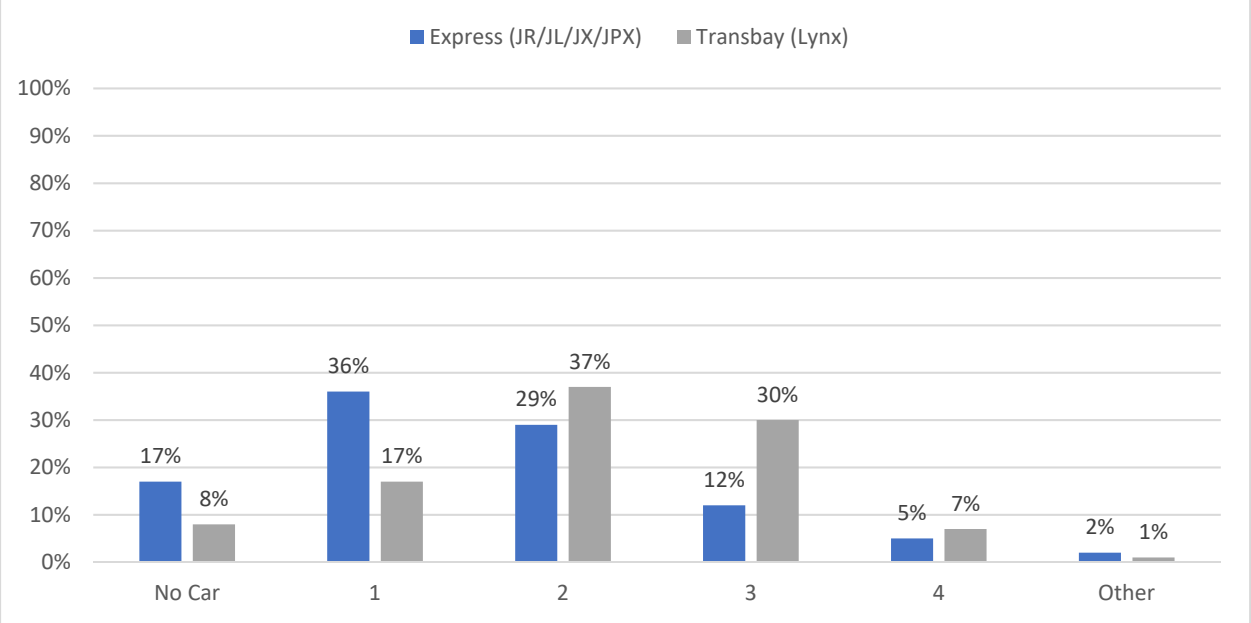
Source: AC Transit Onboard Survey Data (Obtained 2012, cleaned 2018)

Figure 14: Mode of Access – WestCAT Express/Transbay Riders



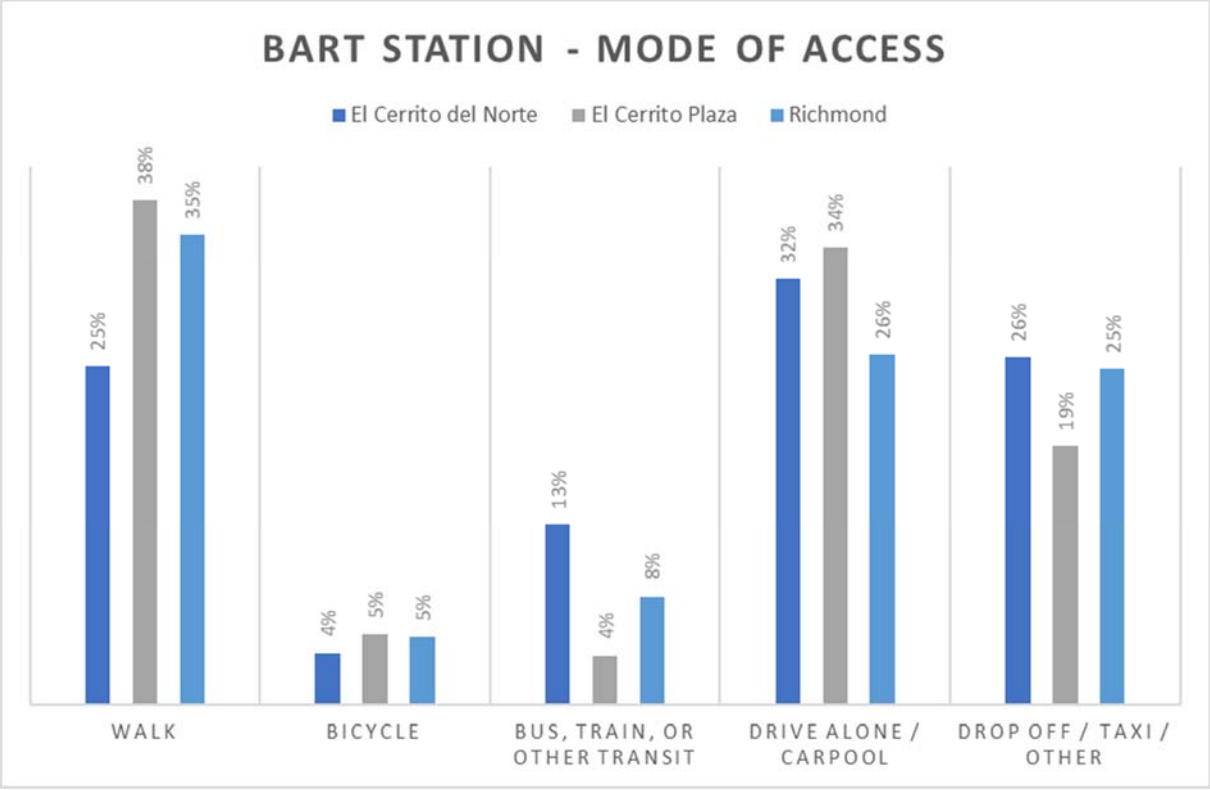
Source: WestCAT Transit Passenger Survey Data (2017)

Figure 15: Drivable Vehicles Available to Household – WestCAT Express/Transbay Riders



Source: WestCAT Transit Passenger Survey Data (2017)

Figure 16: Mode of Access – El Cerrito Plaza/El Cerrito del Norte/Richmond BART



Source: 2015 BART Station Profile Survey

4 POPULATION AND EMPLOYMENT

4.1 Population Density

Figure 17 shows the population density in West County. As can been seen in the figure, population density in the study area is concentrated in the cities of Hercules, Pinole, San Pablo, Richmond, and El Cerrito, as well as the unincorporated areas in between. Population density is significantly lower in the areas north of Rodeo, west of Richmond Parkway, and the San Pablo Ridge.

4.2 Employment Density

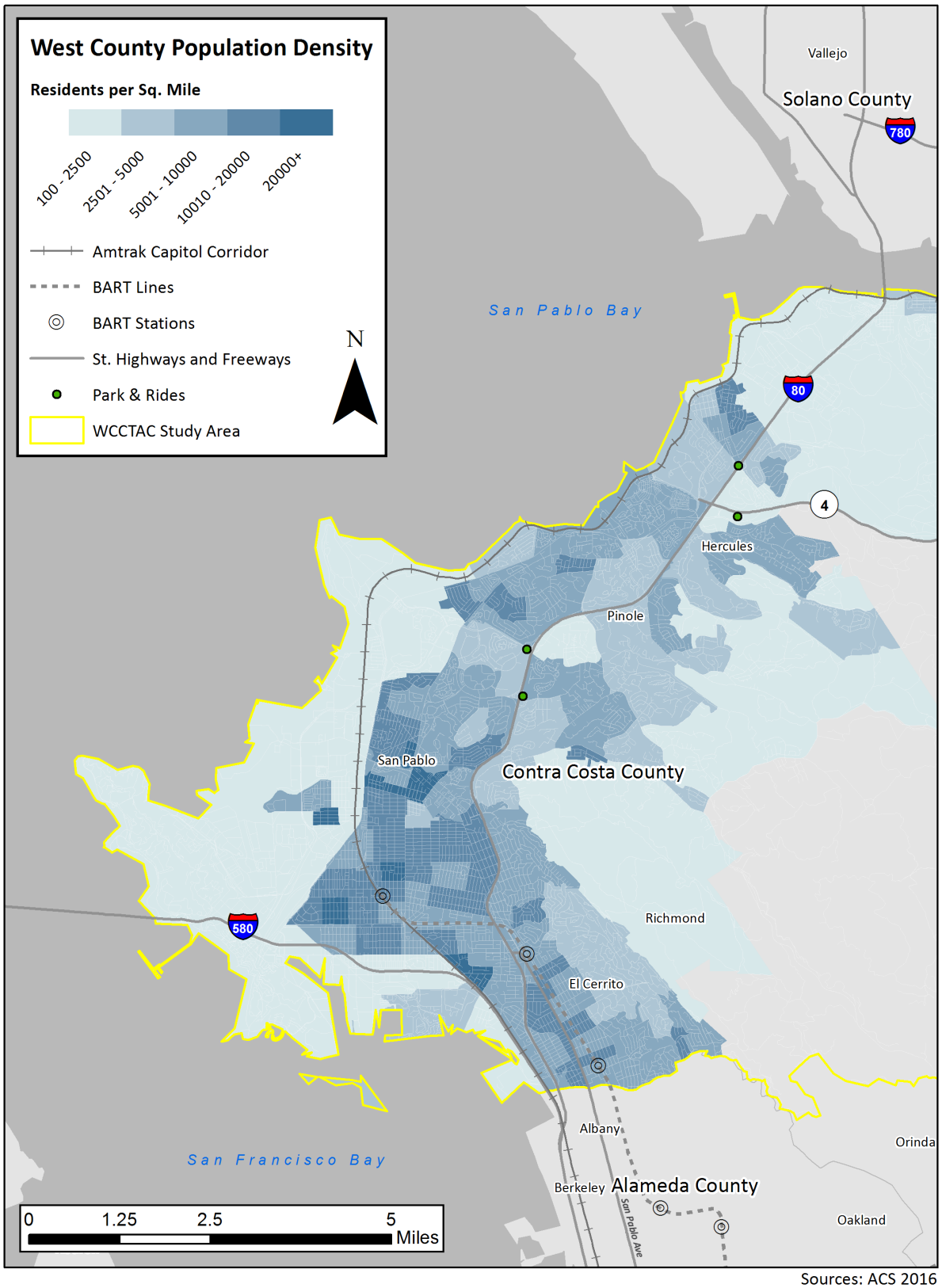
Figure 18 shows overall employment density throughout the region including West Contra Costa County, San Francisco, and Alameda County. Major employment centers include San Francisco, Oakland, and Emeryville.

4.3 Demographics

Approximately 26.6% of the population of West County is low income; this figure is based on the definition of low income as established by the Department of Housing and Urban Development, which defines low income as people making at or below 50% of the county median income. Figure 19 shows the concentration of low income households in the study area.

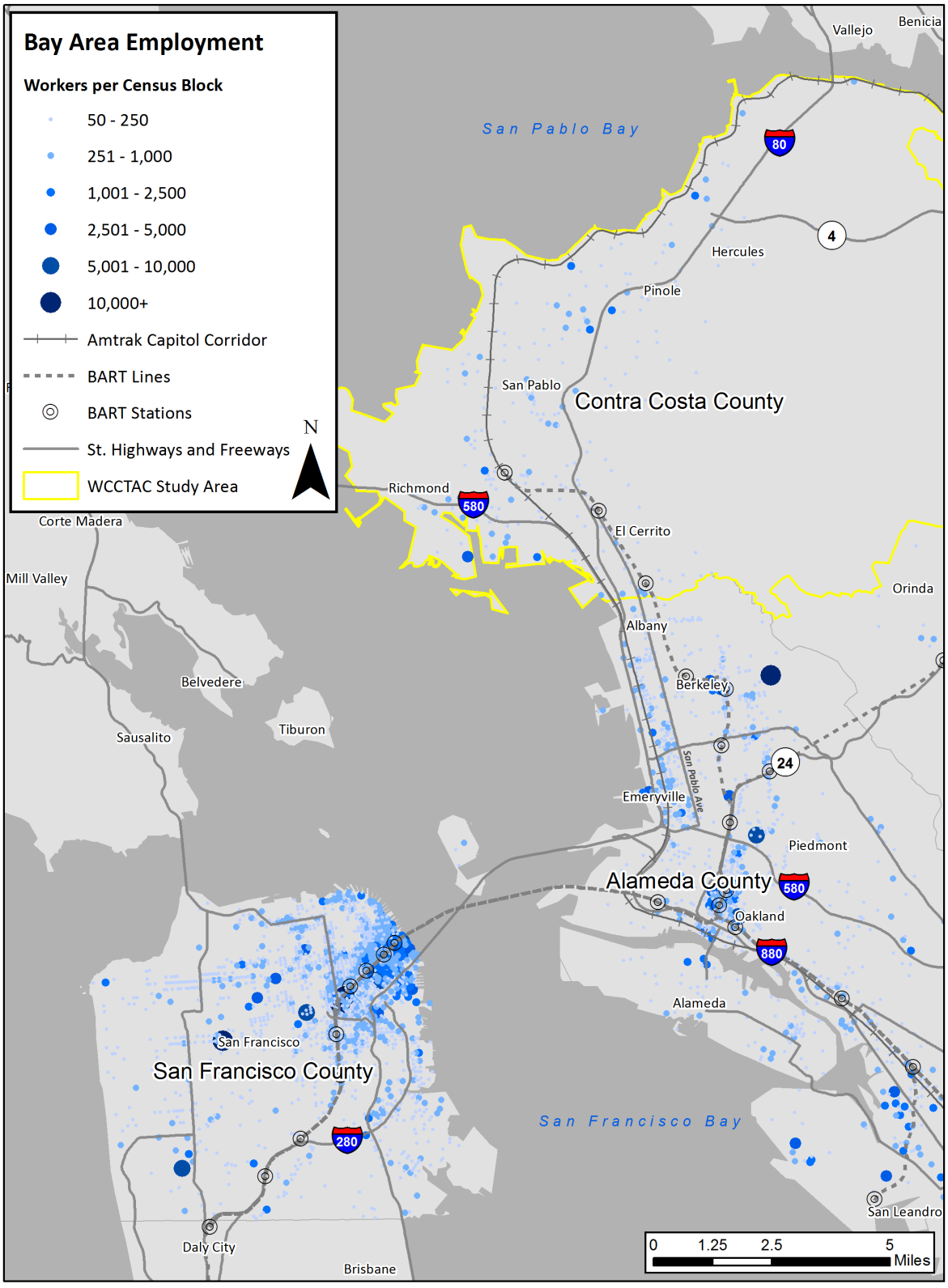
West Contra Costa County has a minority population of 75.3% (ACS); minority population in this case is defined as residents identified as non-White or Hispanic. Figure 20 shows the distribution of minority populations in the study area.

The ACS indicated that 7.8 percent of households in the study area do not have a vehicle. A significant portion of these households are concentrated in the cities of Richmond, San Pablo, and El Cerrito. Figure 21 shows the concentration of zero-automobile households in the study area.



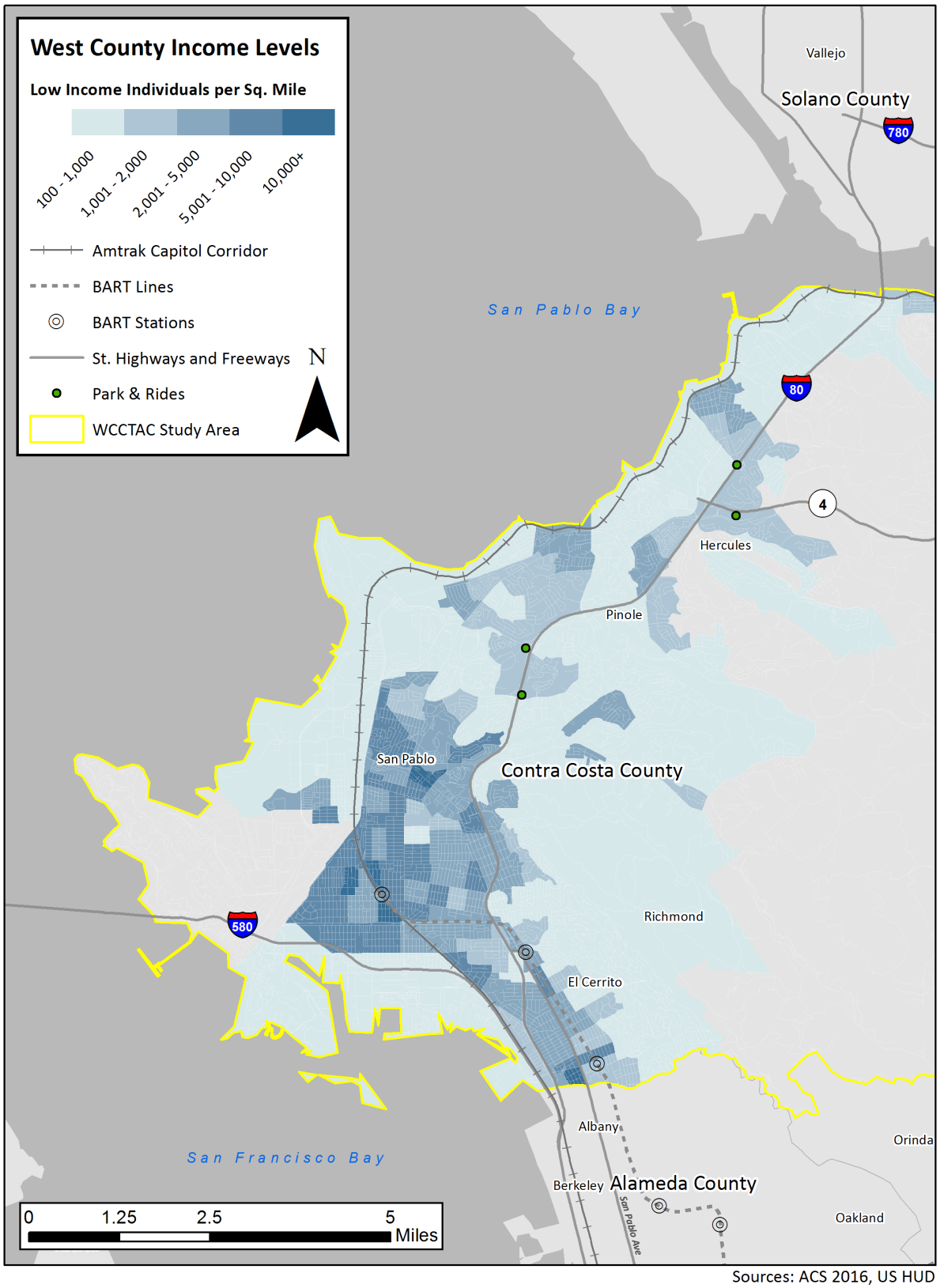
Sources: ACS 2016

Figure 17: Study Area Population Density (US Census Data)



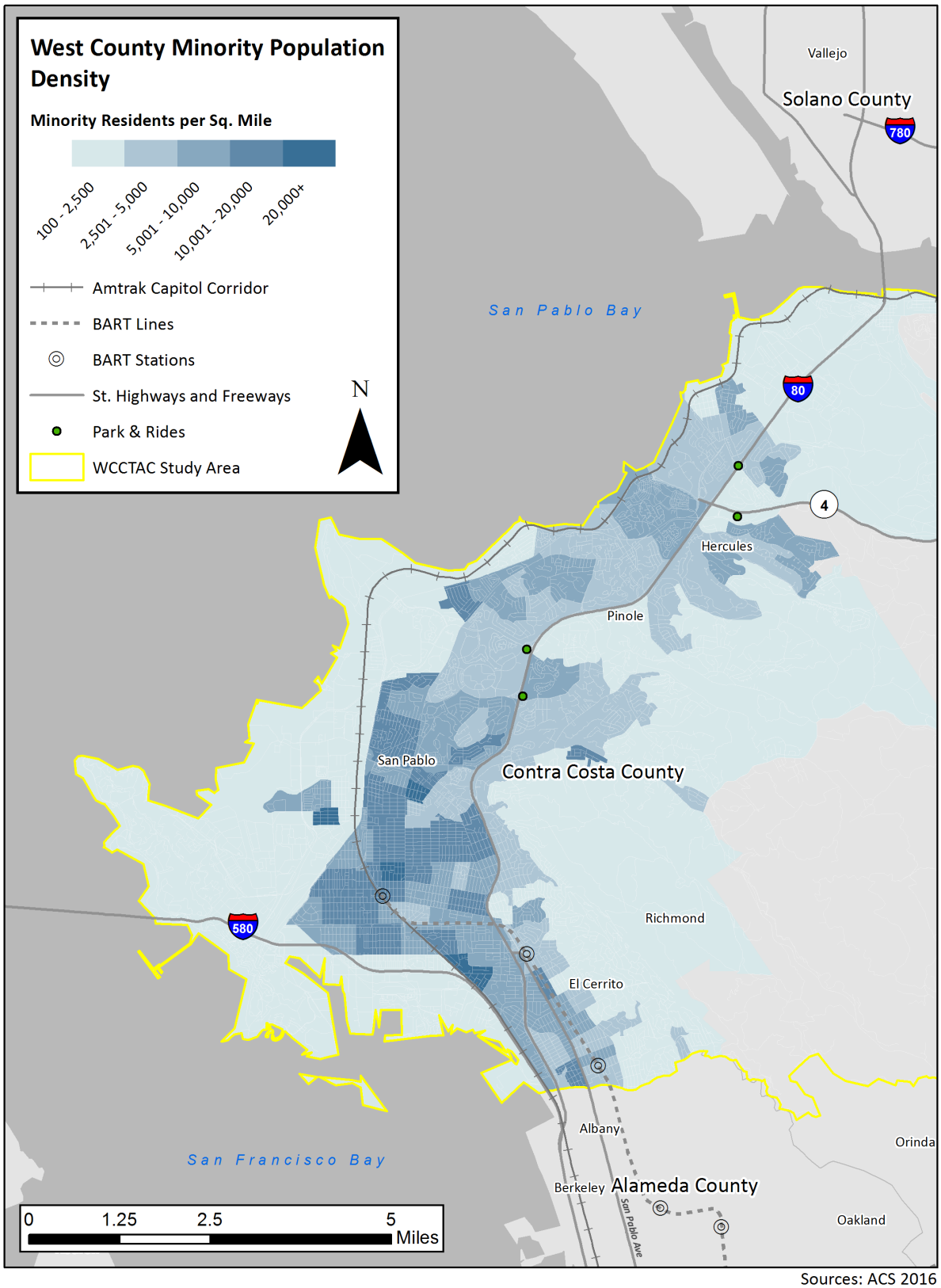
Sources: LEHD 2015

Figure 18: Study Area Employment Density



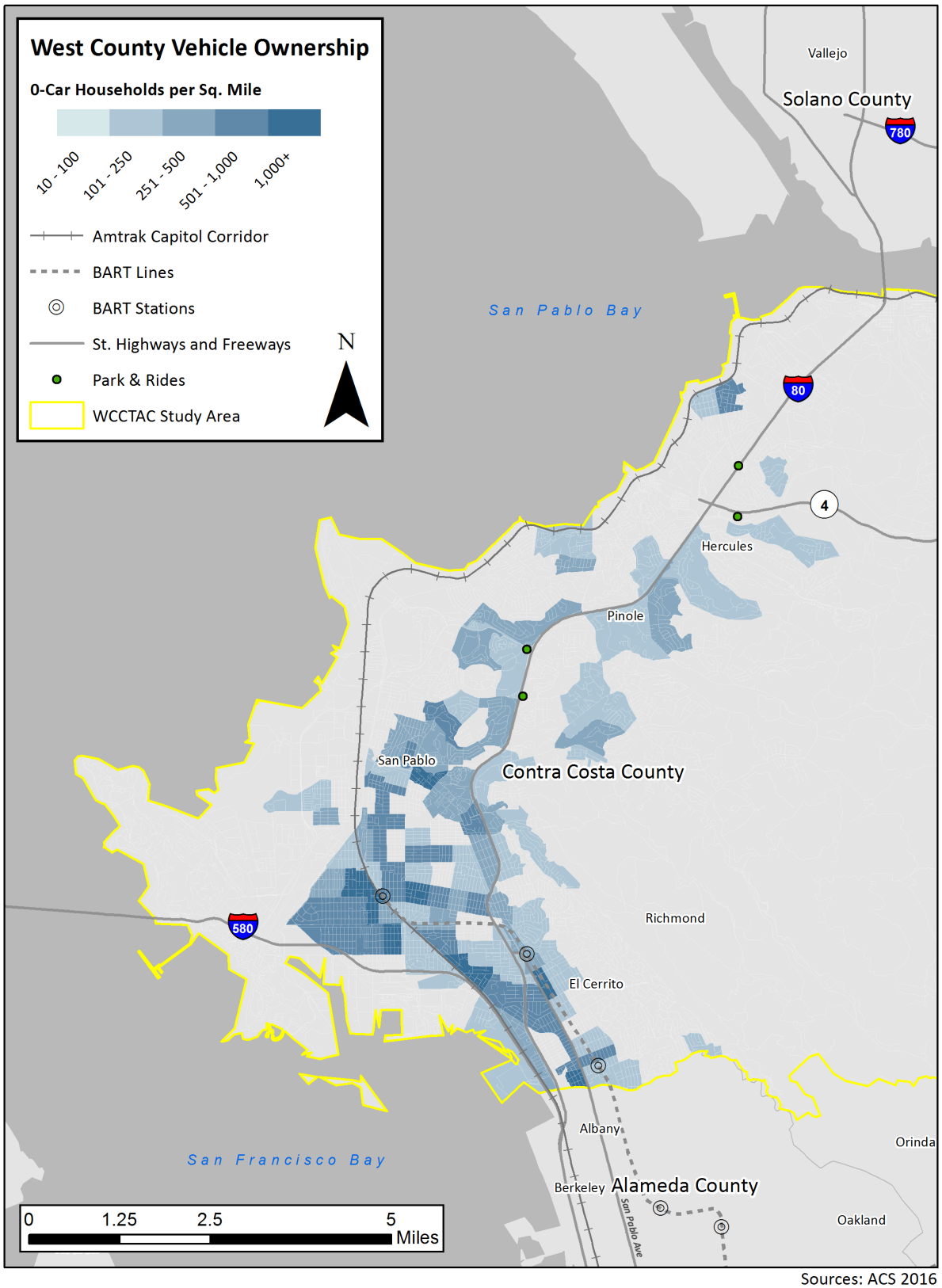
Sources: ACS 2016, US HUD

Figure 19: Study Area Low-Income Population Density (US Census Data)



Sources: ACS 2016

Figure 20: Study Area Minority Population Density



Sources: ACS 2016

Figure 21: Study Area Density of Zero-Auto Households (US Census Data)

5 CURRENT COMMUTE PATTERNS

5.1 Existing Commute Patterns

Over 115,000 workers reside in the study area; a high proportion of these commuters–over 95,000, or 83%–of these workers are employed in locations outside of the study area. A breakdown of the top ten employment locations (cities or census-designated places) for all workers is shown in Table 3. Table 4 breaks down the top ten employment locations outside of the study area.

Table 3: Top 10 Overall Employment Locations for Study Area Residents (LEHD Data)

Location	Workers
San Francisco	21,471
Oakland	11,344
Berkeley	9,971
Richmond	9,901
San Rafael	3,044
San Pablo	2,678
Martinez	2,102
Walnut Creek	2,052
San Jose	1,937
Pinole	1,886
Other	*49,514*
Total	**115,900**

Table 4: Top 10 Non-Study Area Employment Locations for Study Area Residents (LEHD Data)

Location	Workers
San Francisco	21,471
Oakland	11,344
Berkeley	9,971
San Rafael	3,044
Martinez	2,102
Walnut Creek	2,052
San Jose	1,937
Concord	1,875
Emeryville	1,735
Vallejo	1,517
Other	*38,622*
Total	**95,670**

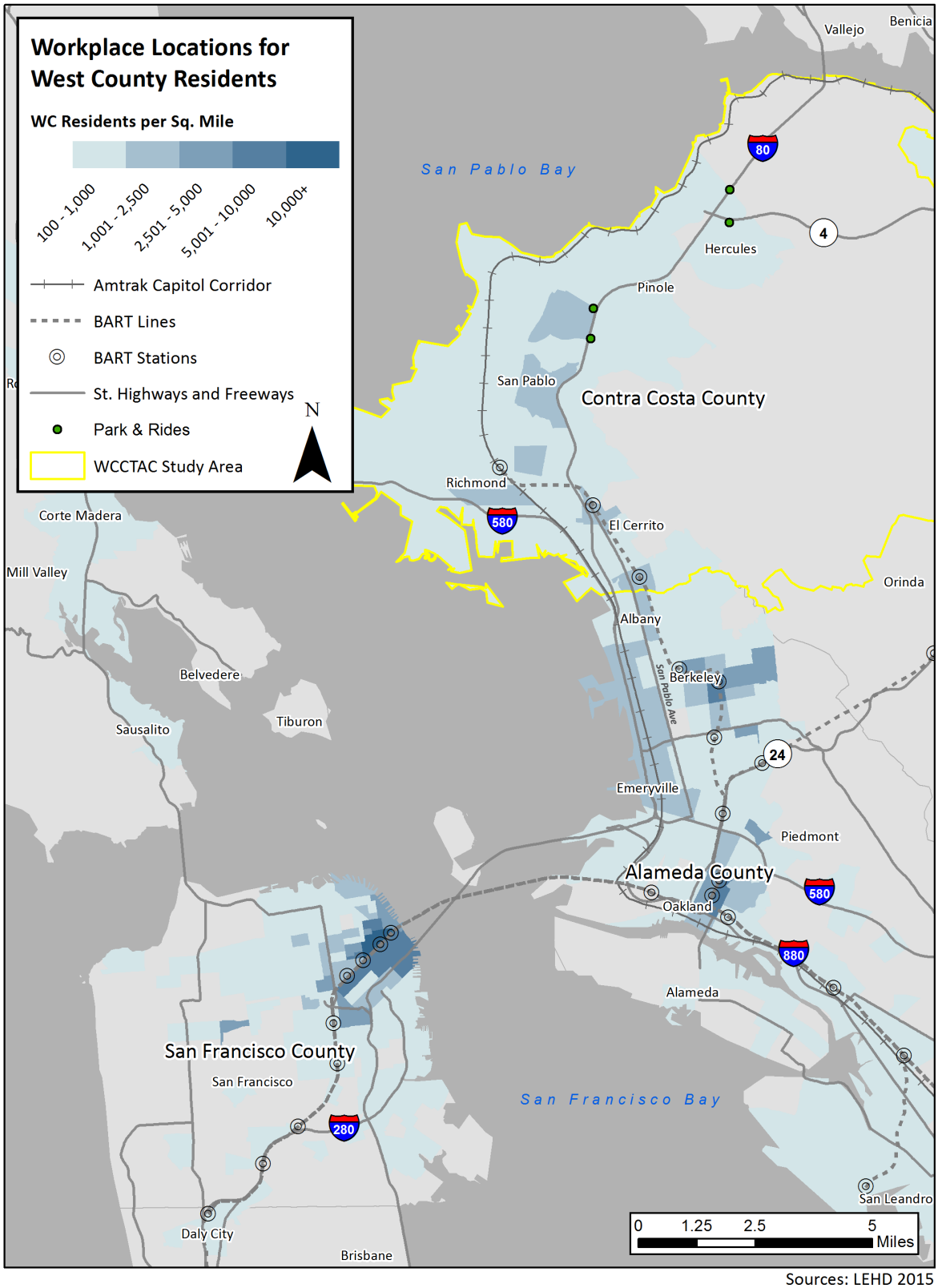
Figure 22 shows the employment density of West Contra Costa County residents; i.e. the number of study area residents per square mile working in a particular census tract. Notable areas outside of the study area with a high concentration of West Contra Costa County workers include:

- San Francisco
    - Market Street Corridor

  - Financial District
  - South of Market Neighborhood ("SoMa")
  - UCSF Parnassus Campus
  - Northern portions of the Mission District
- Oakland
  - Jack London Square
  - Downtown Oakland
  - Uptown Oakland
  - Broadway/MacArthur Boulevard Area
- Berkeley
  - Downtown Berkeley
  - UC Berkeley Campus
  - North Berkeley
- Berkeley/Emeryville
  - Commercial area approximately bound by University Avenue, San Pablo Avenue, I-80, and I-580

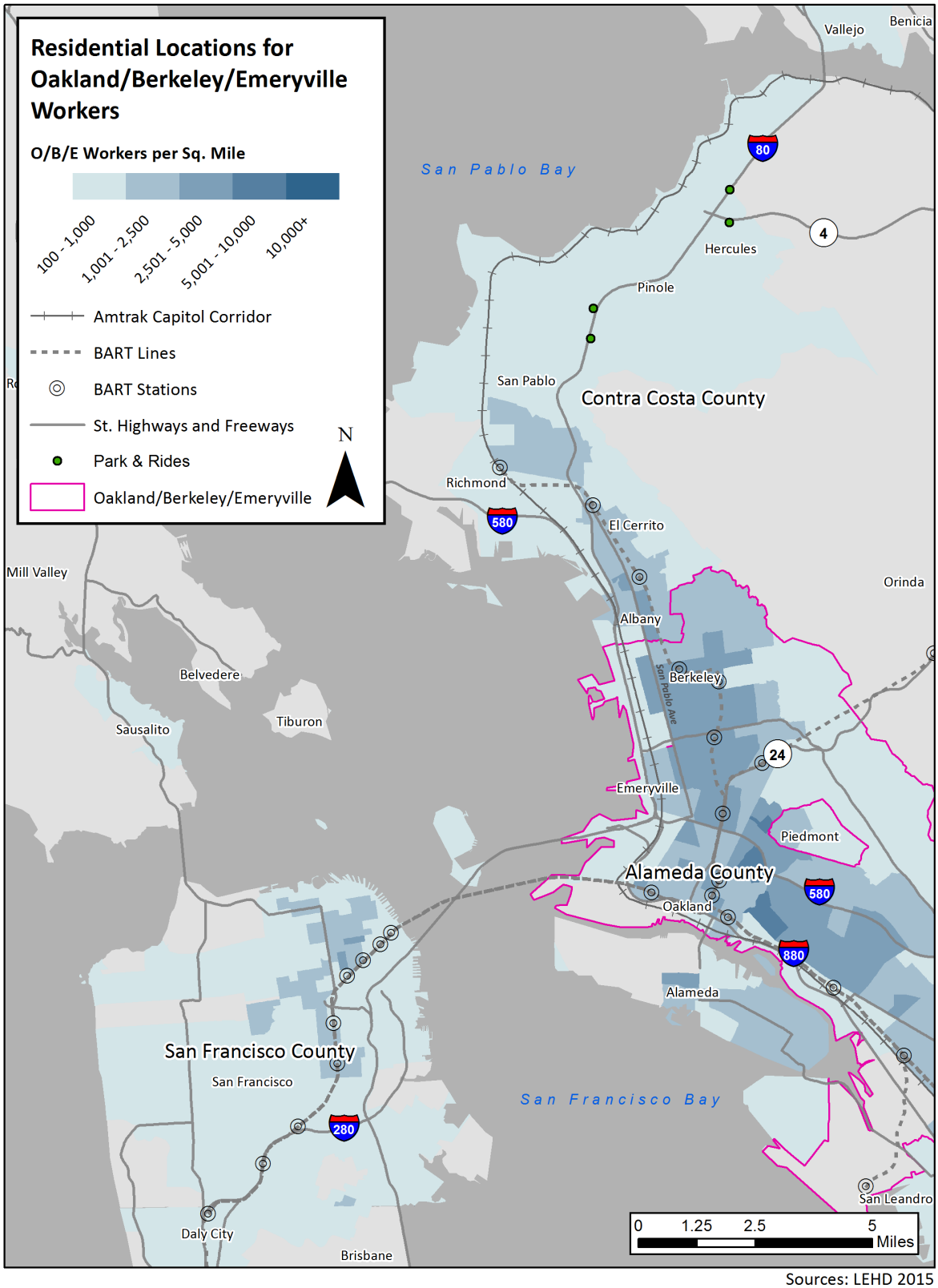
Figure 23 shows the residential locations of workers employed in Oakland, Berkeley, or Emeryville. Figure 24 shows the residential locations of workers employed in San Francisco. For both locations, workers in the study area are concentrated in Richmond, San Pablo, and Hercules.

The following pages show the distribution of study area residents who commute by driving alone (Figure *25*), carpool (Figure 26), transit (Figure 27), and either walking or biking (Figure 28). The data show that areas around San Pablo, Richmond, and El Cerrito have higher commute mode shares for modes other than driving alone; while areas to the north, such as Pinole and Hercules, have higher drive-alone commute mode shares. This is consistent with the auto-ownership patterns discussed in Section 4.3.



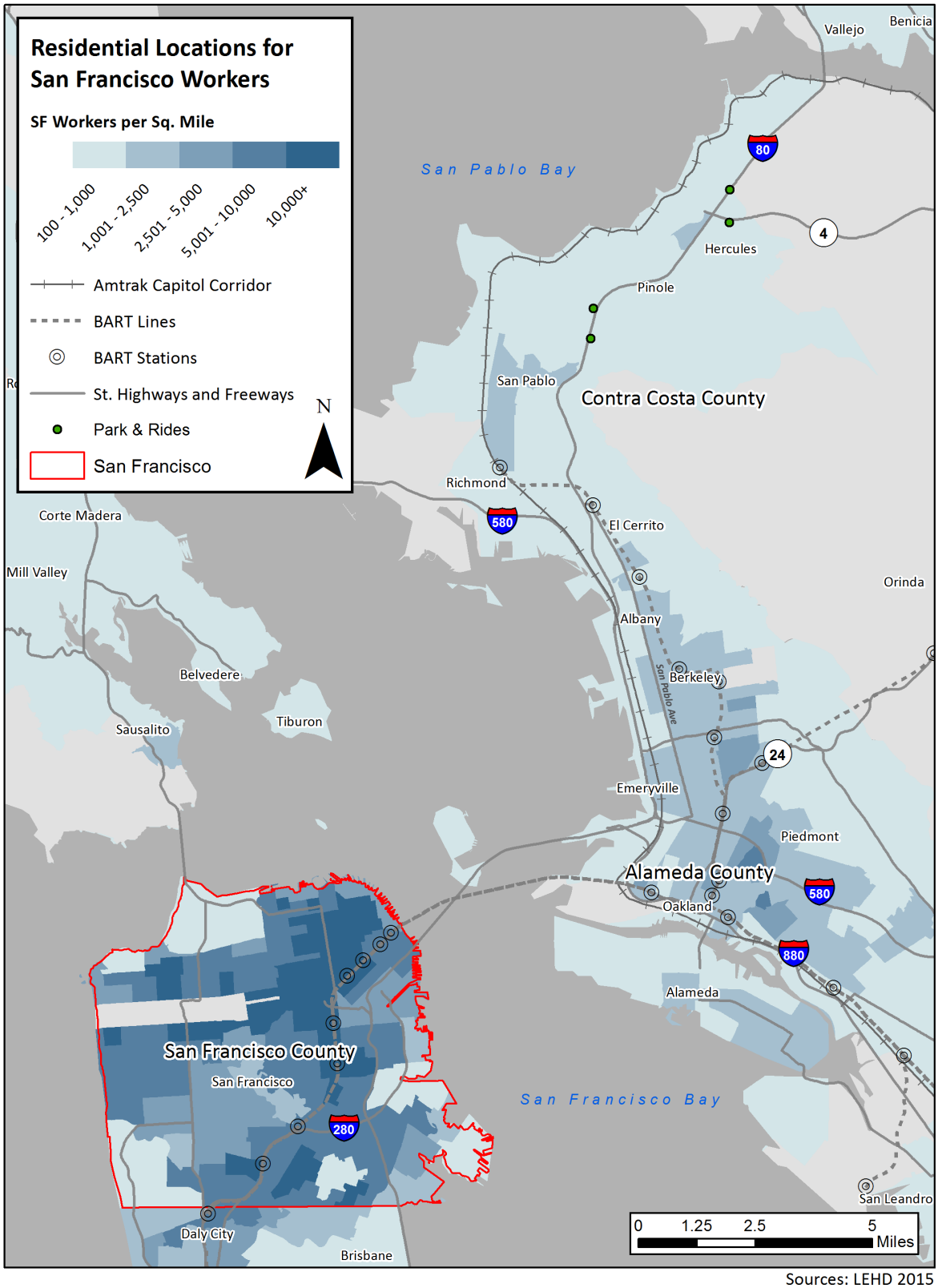
Sources: LEHD 2015

Figure 22: Employment Locations for West County Residents (LEHD Data)



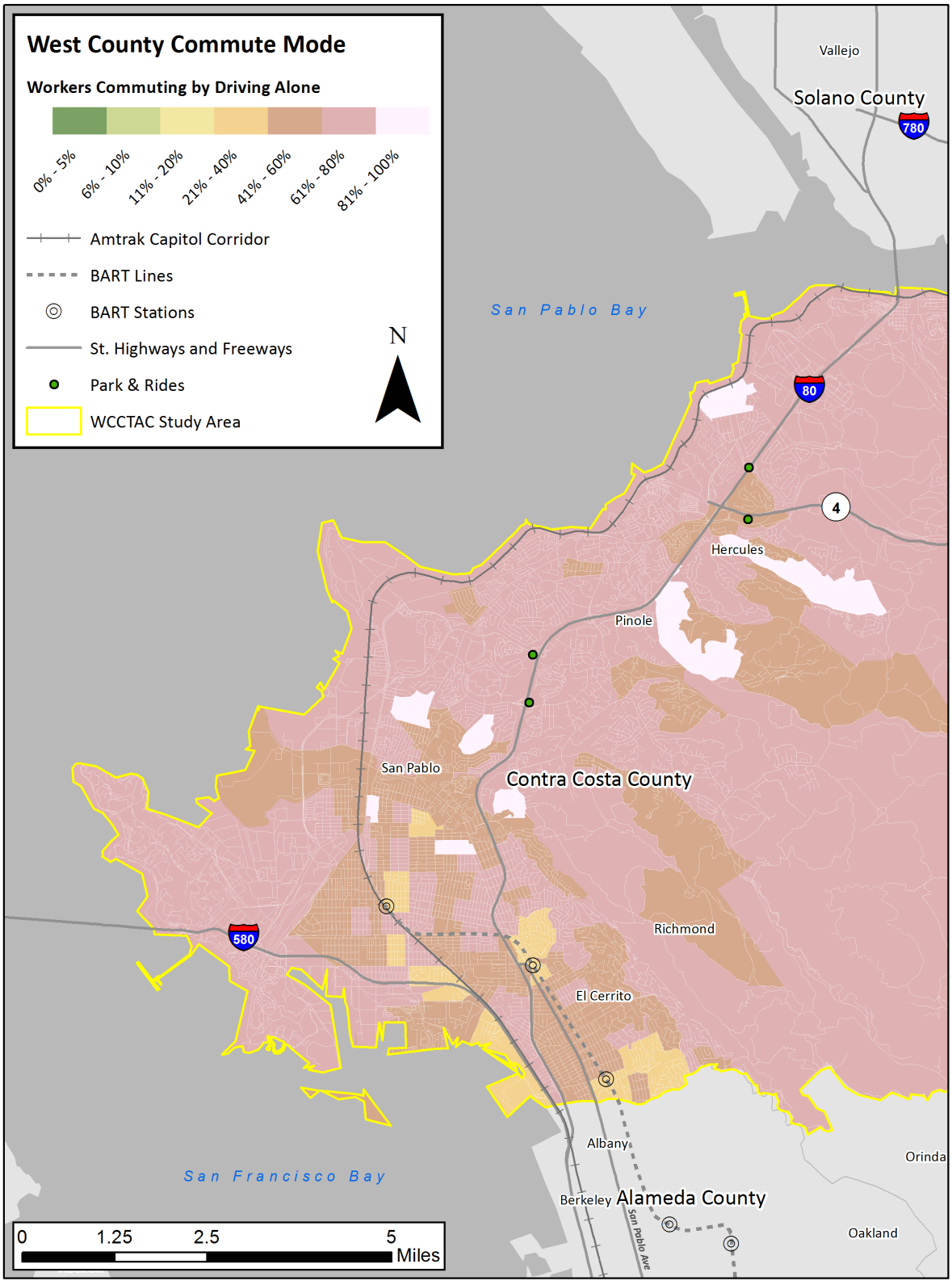
Sources: LEHD 2015

Figure 23: Residential Locations of Oakland/Berkeley/Emeryville Employees (LEHD Data)



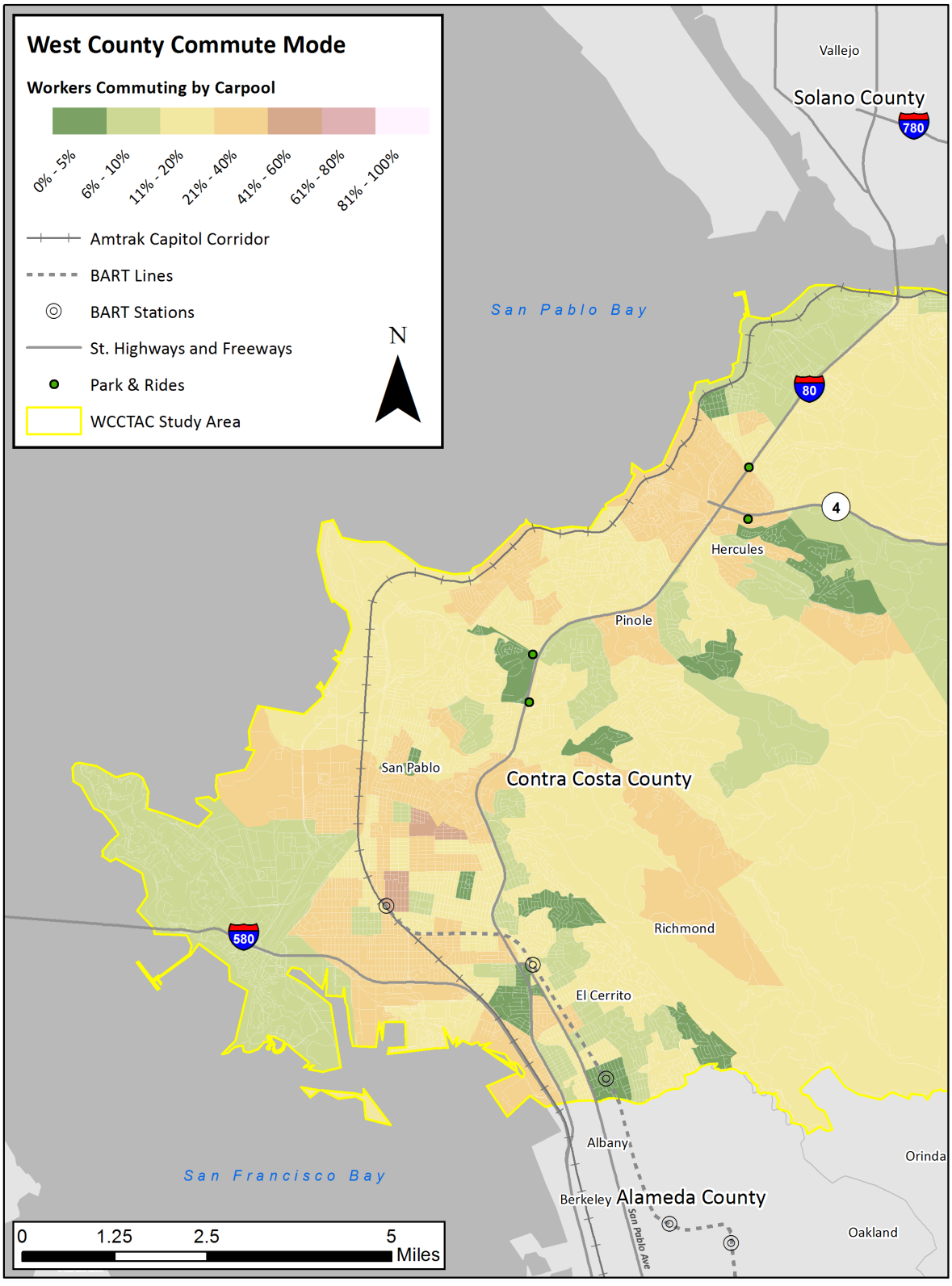
Sources: LEHD 2015

Figure 24: Residential Locations of San Francisco Employees (LEHD Data)



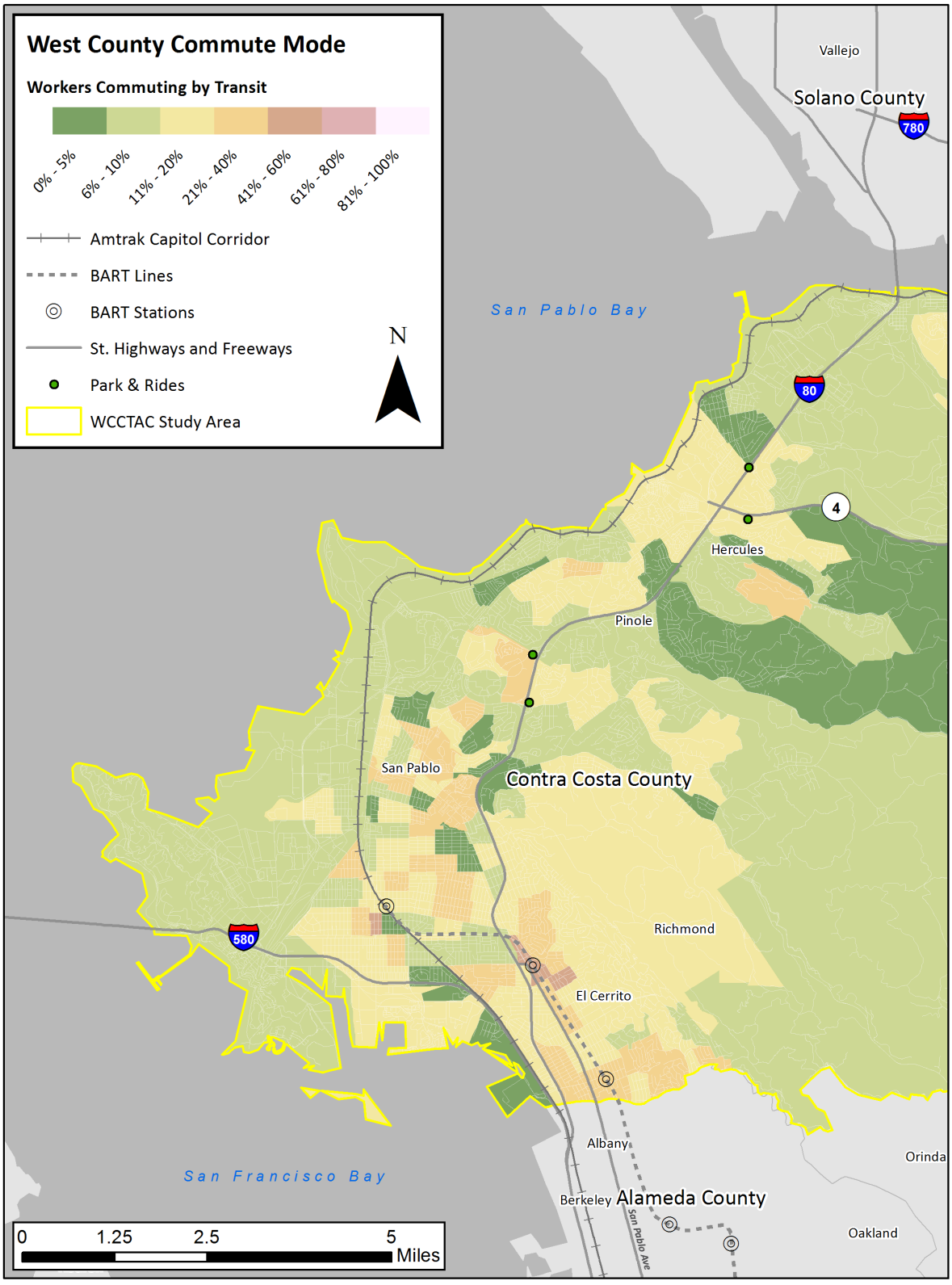
Sources: ACS 2016

Figure 25: Percent of Commuters in Study Area Who Drive Alone (US Census Data)



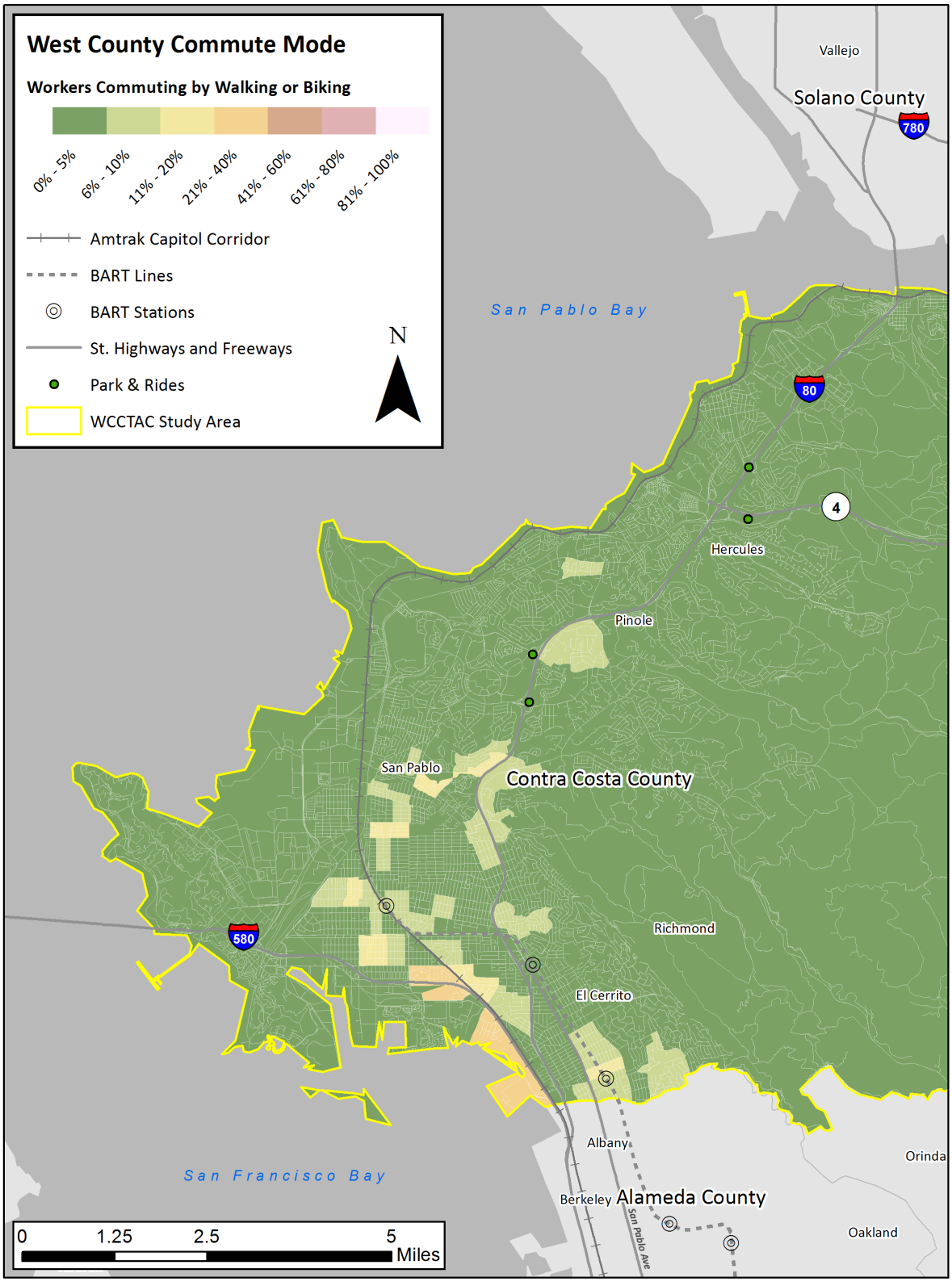
Sources: ACS 2016

Figure 26: Percent of Commuters in Study Area Who Carpool (US Census Data)



Sources: ACS 2016

Figure 27: Percent of Commuters in Study Area Who Use Transit (US Census Data)



Sources: ACS 2016

Figure 28: Percent of Commuters in Study Area Who Walk or Bike (US Census Data)

5.2 Existing Transit Market Share

Since express bus services primarily serve commuters, the market share of an express bus service can be determined by dividing ridership by the number of potential commuters that could use the service.

LEHD employment data, combined with information on access distance from on-board surveys, can be used to determine the number of potential commuters within the "capture area" of an express bus service. The WestCAT on-board survey found that, on average, Lynx riders who drive to access the bus average of 2.6 miles (i.e, the distance from home to their stop). All Lynx riders, once they reach Salesforce Transit Center, have an average walk time to their non-home destination of 9.3 minutes. Per TCRP Report 95, 50 percent of park-and-ride lot users live within 2.5 miles of the lot, and 85 percent of users live within a capture area with a parabolic shape, with more users being captured "upstream" from the facility, in the opposite direction of major commute flows[1].

To approximate the capture area of express bus service, areas within 2.5 miles of park-and-ride lots and areas within ¼ mile from other express bus stops were considered to be within the residential capture area, and areas within ½ mile of Salesforce Transit Center were considered to be within the destination capture area. People who live within the residential capture area and work within the destination capture area are the potential primary market for express bus service.

Since on-board survey data indicated that the vast majority of AC Transit Transbay riders walk to access the bus, it was assumed that Transbay buses are not capturing the park-and-ride market. Per LEHD employment data, a total of 989 workers live within ¼-mile of an AC Transit Transbay stop and also work within ½ mile of the Salesforce Transit Center. An average of 537 daily boardings occur at these stops, indicating that AC Transit Transbay is capturing 54% of the potential market for express bus service in the areas that it serves in West County.

On-board survey data for WestCAT indicated that Lynx riders include a mix of people who walk to access their stop and people who access the service via park-and-ride. Per LEHD employment data, a total of 811 workers live within 2.5 miles of park-and-rides served by Lynx who also work within ½-mile of the Salesforce Transit Center. Utilizing access mode share information from the WestCAT on-board survey, it was estimated that there are 377 daily park-and-ride users on the Lynx service, which represents a capture of 47% of the potential commute market.

Identifying the market capture of existing services informs the potential market capture of new express bus services. Express bus service in the area captures a substantial portion of the commuters whose home and work destinations are both within walking distance of an express bus stop. If new express routes proposed as part of this Plan include local segments, the stops and alignments of those segments should be selected so that they are within walking distance of residents who commute to the express destination. The data also tells us the potential market capture of park-and-ride locations; if new express routes proposed as part of this Plan are designed as point-to-point services between park-and-rides and a commute destination, park-and-ride locations should be selected assuming that they will capture a similar portion of the travel market as existing services.

5.3 Travel Time Comparison

Table 5 shows a comparison of travel times between automobiles and transit. Automobile travel times shown are based on Google Maps estimates of travel times to arrive at the trip destination by 8:30 AM on a Tuesday. Transit travel times shown are based on scheduled departure and arrivals times in the same timeframe. Transit travel times for "one-seat rides" for a particular origin-destination pair are shown separately from travel times for transit trips requiring at least one transfer. As can be seen in the table, transit travel times are most competitive for trips

[1] "TCRP Report 95: Park-and-Ride/Pool," Transportation Research Board, 2004. http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_95c3.pdf

where a one-seat ride is available; transit travel times are also competitive for trips where the destination is located near an existing BART station.

The travel times shown for trips going from Arlington Boulevard & Potrero Avenue in El Cerrito to Salesforce Transit Center may help inform the low levels of ridership on the northern portions of Lines G and H, as shown in Figure 10. Both of these lines have lengthy segments on local roads which increase travel time, thus making these services less competitive when compared to travel times by automobile or by taking a local bus to BART. Additionally, the northern portions of these lines, particularly Line H, serve higher-income areas with few transit-dependent households.

Table 5: Auto vs. Transit Travel Time Comparison

Origin	Destination	Auto Travel Time	One Seat Ride		Transit Trips Requiring Transfers		
			Travel Time	Transit Services	Travel Time	Transit Services	Transfers Required
Hercules Transit Center	Salesforce Transit Center (San Francisco)	0:55-1:40	0:43	Lynx	0:55	JR/JL/JX/JPX, BART (Embarcadero)	1
	El Cerrito del Norte BART	0:20-0:45	0:16-0:23	JX/JPX	-	-	-
	Jack London Square (Oakland)	0:40-1:15	-	-	1:04	JR/JL/JX/JPX, BART, Broadway Shuttle	1-2
	14th St & Broadway (Oakland)	0:35-1:15	-	-	0:43-0:50	JR/JL/JX/JPX, BART (12th Street/Oakland City Center)	1
	San Pablo Ave & Powell St (North Oakland)	0:30-1:10	-	-	0:48-0:53	JR/JL/JX/JPX, 72R	1
	San Pablo Ave & University Ave (Berkeley)	0:30-1:05	-	-	0:48	JR/JL/JX/JPX, 72R	1
Richmond Parkway Transit Center	Salesforce Transit Center (San Francisco)	0:45-1:30	0:46-0:50	LA	0:49-1:02	JR/JL/JX/JPX, BART (Embarcadero)	1
	Jack London Square (Oakland)	0:30-1:00	-	-	0:52	JR, BART (12th Street/Oakland City Center), Broadway Shuttle	1-2
	14th St & Broadway (Oakland)	0:30-1:00	-	-	0:40	JR, BART (12th Street/Oakland City Center)	1
	San Pablo Ave & Powell St (North Oakland)	0:26-0:55	-	-	0:49-0:57	JL, 72R	1
	San Pablo Ave & University Ave (Berkeley)	0:22-0:50	-	-	0:49	JR, 72R	1
I-80 Park & Ride at Hilltop Dr	Salesforce Transit Center (San Francisco)	0:45-1:25	1:10	LA	1:15	JL, BART (Embarcadero)	1
Tennent Ave & San Pablo Ave (Pinole)	Salesforce Transit Center (San Francisco)	0:50-1:40	-	-	0:55-1:14	JL, Lynx JPX, BART (Embarcadero)	1
Tulare Ave & San Pablo Ave (San Pablo)	Salesforce Transit Center (San Francisco)	0:40-1:20	0:51	L	0:49	72R, BART (Embarcadero)	1
Moeser Ln & San Pablo Ave (El Cerrito)	Salesforce Transit Center (San Francisco)	0:35-1:10	0:36	L	0:47	72R, BART (Embarcadero)	1
Arlington Blvd & Potrero Ave (El Cerrito)	Salesforce Transit Center (San Francisco)	0:40-1:15	0:55	H	0:53	Line 7, BART (Embarcadero)	1

6 FINDINGS

The following are key findings based on the review of previous studies and planning work in the study area:

- Previous studies have made recommendations of providing new or better express bus access to San Francisco and the East Bay. The West Contra Costa County High-Capacity Transit study identified a recommended set of routes providing access to Oakland, Berkeley, and Emeryville. The WestCAT SRTP identified demand for a similar set of potential express bus destinations.
- The connectivity needed to distribute and collect riders in the East Bay may be made more feasible from a combination of existing and proposed services (e.g. EBOTS) or existing and proposed transit-related improvements, such as the signal improvements made as part of the I-80 SMART Corridor Project or potential bus improvements to San Pablo Avenue as part of the San Pablo Avenue Complete Streets Study. As recommendations are developed for this Plan, coordination and further study will be required to identify opportunities for other transit services to connect to proposed express bus routes.

The following are key findings based on the travel data analyzed in this memorandum:

- Existing express bus services in the study area serve both choice riders (riders who have access to a car but choose to ride transit anyway) and transit-dependent riders (riders with no access to a car who must ride transit).
- On-board survey data shows that most WestCAT riders have access to a car, whereas only half of riders on AC Transit Transbay routes have automobile access. This is reflective of the service areas of these service providers. Zero-auto households are more concentrated in San Pablo, Richmond, and El Cerrito, which is also the area served by AC Transit Transbay routes. WestCAT's express and transbay routes serve Hercules, Pinole, and Tara Hills, where zero-auto households are less prevalent.
- Existing AC Transit express bus services have a high market capture (54%) of people who live and work within walking distance of both their origin and destination stop.
- The existing WestCAT Lynx express bus service captures 47% of people who live within driving distance of Lynx-served park-and-rides and work within walking distance of the Salesforce transit center.
- Many of the existing express bus services in the study area essentially have a local segment and an express segment. Along the local segments of these routes, buses make frequent stops at curbside bus stops spaced approximately every ¼ to ½ mile. The express segments of these routes connect the local segment to an express destination. In the case of AC Transit Transbay and WestCAT Lynx service, this express destination is the Salesforce Transit Center in San Francisco. In the case of WestCAT express routes (Routes JR/JL/JX/JPX), the express destination is El Cerrito del Norte BART. Potential new express bus services should take into account the fact that local segments will better capture transit-dependent commuters within walking distance, while routes serving park-and-rides will better capture car-owning choice riders within driving distance.
- Lines G and H see low ridership at stops near their northern termini; this could be due to a number of factors. The northern portions of route H serve primarily high-income areas with few transit-dependent residents. Additionally, both of these lines have lengthy segments on local roads which increase travel time, thus making these services less competitive when compared to travel times by automobile or BART.
- Transit travel times are most competitive with automobile travel times when a one-seat ride is available and in cases where a trip destination is located near an existing BART station.
- The following are major commute destinations for study area residents; these should be considered for destinations for a potential express bus service:

- San Francisco
  - Market Street Corridor
  - Financial District
  - South of Market Neighborhood ("SoMa")
  - UCSF Parnassus Campus
  - Northern portions of the Mission District
- Oakland
  - Jack London Square
  - Downtown Oakland
  - Uptown Oakland
  - Broadway/MacArthur Boulevard Area
- Berkeley
  - Downtown Berkeley
  - UC Berkeley Campus
  - North Berkeley
- Berkeley/Emeryville
  - Commercial area approximately bound by University Avenue, San Pablo Avenue, I-80, and I-580