BUT WHERE AM I SUPPOSED TO PARK...?

Parking Demand Management Strategies to Mitigate the Necessity of Replacement Parking when Converting Transit Station Parking Lots into Transit-Oriented Development: A Case Study of the El Cerrito Plaza BART Station

A Planning Report Presented to the

Faculty of the Department of Urban and Regional Planning San Jose State University

In Partial Fulfillment of the Requirements for the Degree Master of Urban and Regional Planning

By Laura Maurer | May 2020


El Cerrito Plaza
SAN FRANCISCO
7 DAILY CITY
10 CAR TRAIN
PLATFORM 2
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2 Warm Springs, Millbrae
El Cerrito Plaza

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Executive Summary

Transit-oriented development (TOD) has increased in importance in the last decade. This importance comes from the increased focus on reducing automobile use since it contributes to climate change, and because of the shortage of housing. TOD is able to provide significant quantities of new housing while reducing the need to use the automobile because of its proximity to transit, but there is often very little available land to develop into TOD. In the last few years, there has been an increased focus on redeveloping surface parking lots at public transportation stations into TOD, but this also means the potential loss of parking for transit riders and possibly reduced ridership. Replacement parking garages can be extremely expensive and some transit agencies like the Bay Area Rapid Transit Authority (BART) are not planning to replace lost parking due to TOD development at stations that already have a good ability for people to access the station by other modes. There are always going to be some people that are not able to use other transportation modes for varying reasons, so the challenge becomes how to have continued, convenient and reliable access for auto-dependent riders when station parking supply is significantly reduced due to TOD infill. What parking management strategies can be implemented to maintain access for riders who have historically driven to their preferred BART station while also encouraging these riders to shift to non-automobile transportation modes?

The purpose of this research is to show that replacement parking is not always needed when converting parking lots into TOD when the circumstances allow for better utilization of existing parking supply. In the past, parking supply was always maintained or increased but because of induced demand-- the tested theory shown to be true time and again that network capacity expansions fill again to capacity quickly with the right circumstances -- we know that this will just increase parking demand. The fresh perspective on parking is to not increase supply and to price the supply that is available. The El Cerrito Plaza BART station could be a good example of the type of transit station where there does not need to be any replacement parking and this report will examine how this could be achieved using the El Cerrito Plaza station as a case example.

Study Methods

This report first determined what are the current existing parking conditions at and around the El Cerrito Plaza BART station. First, the quantity and type of BART parking lot spaces were collected to help determine what would be the full impact of the loss of these parking spaces. Next, the quantity and type of on-street parking near the station was collected to help determine the quantity of potentially usable parking for BART riders. Unsurprisingly, many local jurisdictions do not have any data on how many on-street parking spaces are located in their city, what are the limitations of these parking spaces, or where the parking spaces are located, therefore the data for this report was collected by measuring on-street parking areas to determine parking quantity. Lastly, a parking occupancy analysis was conducted to determine the extent of the use of nearby on-street parking to determine if it was being underutilized and could potentially be shared with BART riders.

This report then examined several parking management strategies that directly deal with physical parking and were examined in several different ways. First, five parking strategies were explained in a broad sense. Next, the effectiveness and important variables for demand-based parking pricing and residential parking permit were more deeply examined with a review of scholarly literature. The other parking strategies were not more deeply examined because of the lack of scholarly literature on the subject. Next, a case study example of each parking strategy was examined. The case studies were chosen for their relevance to the characteristics of the El Cerrito Plaza BART station. Case studies were relevant if they dealt with transit or the study area has similar density, land-use and transportation characteristics of the El Cerrito Plaza BART station area. Last, the parking management strategies were explained as to how they could be specifically applied to the El Cerrito Plaza BART station area.

These specific applications of the parking management strategies were then analyzed to determine which would most effectively maintain some access for BART riders to drive to the station. These strategies were analyzed on their financial feasibility, political feasibility, administrative operability, equity, and time frame.

Summary of Findings

The data collected showed that there was a potential loss of 773 parking spaces between the three BART parking lots at the station. The handicap and station agent parking spaces were determined to be the most important parking spaces that should be prioritized for replacement.

The study area around the station was found to have 304 on-street parking spaces, with the potential for significantly more parking spaces beyond the study area in a quarter- to half-mile radius of the station. The determined quantity of nearby parking could potentially accommodate some of the parking needs of BART riders who drive to the station.

The occupancy analysis showed that in the study area there was an average parking occupancy of seventy percent. This varied by street and by time of day, but even at its busiest hour, there were available parking spaces. Part of the reason for some of parking spaces being unoccupied was because of residential parking permits. Many of the parking spaces were un-usable by BART riders because of time limit restrictions. Non-permitted streets had higher occupancy percentages than residential permit streets. Automobiles parked with permits on permit-regulated streets averaged only about fifty percent of the parked cars on a block and only about twenty-five to thirty-five percent of the total available parking spaces on a street. This shows that the residential permit streets are restricting the parking supply for other parking uses, like for BART riders, which may not be the best outcome.

Five parking demand strategies that deal directly with parking were examined in this report. Firstly, delineating parking spaces that are currently non-delineated could produce additional parking spaces by ensuring that available parking is utilized to the fullest potential. Secondly, shared on-street parking with the use of BART parking permits could allow for dedicated (versus the currently non-dedicated) on-street parking for BART riders. This could bring in much needed revenue to the City of El Cerrito and significantly increase parking reliability for El Cerrito BART riders. Additional changes to the residential parking permit would further help to allow for better utilization of on-street parking spaces. Thirdly, allowing for residential parking permits on both sides of a street would allow for adequate access for residents, while limiting the number of BART permits per block, which would ensure there would be only so many BART riders parked on each block and ensure adequate space for residents. Next, shared off-street private parking lots could allow for the use of unused parking in nearby parking lots with the use of BART parking permits. This would bring added revenue to local parking lot owners and to higher reliability of parking for BART riders. Lastly, demand-based, priced parking can work to shift demand to alternative transportation modes, to less desirable travel times, or to parking further from the station by adjusting parking fees by time of day, day of the weeks or by distance from the station. Residents who live nearby or have other transportation options may choose these other modes when the price of parking is increased and make more parking available for those who need it.

Policy Recommendations

All five of the parking strategies were determined to successfully utilize existing parking to reduce the need for replacement parking and encourage the shift to non-automobile transportation modes. Since all of the strategies were successful and the strategies only varied slightly between criteria, the report recommends prioritizing implementing the strategies that were easy and quick to implement, and the least costly.

Delineating on-street parking was the first strategy recommended, as it would require only some precise measurements and paint. Shared on-street parking and adjustments to the residential parking permit program was the next strategy recommended, as these two strategies need to happen together to ensure the availability of parking for both residents and BART riders. Setting up the permit program could take a bit more time, but because both BART and the City of El Cerrito already have permit programs in place, changes could easily be made to the existing programs. Demand-based parking was the next strategy recommended, as it is a policy add-on to the existing shared on-street parking permits. There is little cost to implement outside of a few signs and some ongoing monitoring costs. Shared off-street parking lots was the last strategy recommended as there are many entities that BART would need to interact with to create agreements to use these parking spaces. This could slow down the implementation process and parking could become available at different times.

Implications for Transit Agencies, Cities, and Transit-Oriented Developers

This research was able to recommend parking demand management strategies for the specific circumstances of the El Cerrito Plaza BART station, but these findings could be applicable to other similar BART stations and other transit agencies that have parking lots and similar land use characteristics to the El Cerrito Plaza BART station. To determine if these strategies would be applicable to other stations or transit agencies, BART and other transit agencies should first determine which stations have the right characteristics that make the stations conducive to not needing replacement parking. These stations would need to have stations that do not have other available land nearby that could be easily be turned into parking. The areas

around the station would need to have reasonable density, good street connectivity and good infrastructure for pedestrians and bicycles. Next, they should analyze the quantity and type of parking that would potentially be lost with development as well as the nearby on and off-street parking within a half mile of the station. They should then conduct a parking occupancy analysis of on and off-street parking to determine how the parking supply around the station is currently utilized and use this to calculate where there is potential to share parking. Outside of the actual physical parking, BART and other transit agencies should determine who are the key partners they would be making parking agreements with and how likely they are to desire to work with them on shared parking agreements. With these characteristic determined, BART and other transit agencies could determine which parking management strategies would be the best fit for the individual circumstances of each station.

Though this report focused on parking management strategies impact on parking for transit riders, these finding can be useful to other entities that would be concerned with transit-oriented development and/or parking. Cities that have transit stations with parking lots, particularly ones that fill to capacity and create spillover parking, may desire to examine their on-street parking near the station to determine how to better utilize unused on-street parking spaces, to better allocate parking spaces to specific uses, and to determine whether shared parking agreements could be financially beneficial for their local jurisdiction.

Transit-oriented developers that are interested in building development on land with existing parking lots may desire to examine how much parking will be lost with their development, which and how much of that lost parking is prioritized for replacement, and whether other on- and off-street parking can be utilized for parking to mitigate the necessity of replacement parking. This can be beneficial because replacement parking can be very expensive, particularly for structured and underground parking, but more importantly is can take up valuable space that could be otherwise used for more housing or other amenities. Examining the parking conditions around station parking lots could help developers better determine the design and financial feasibility of transit-oriented development projects.

Chapter 1: Introduction

1.1. Relevance

American society is dominated by the automobile. We have designed our suburbs and redesigned our cities to accommodate the automobile. Though this design has made the transfer of goods more efficient and increased the mobility of the majority of Americans, it has not come without a cost.

One area that has been negatively impacted by automobile use is the environment. Our auto-dependent society pumped 6,870 metric tons of carbon dioxide into the atmosphere nationwide in 2014, with transportation accounting for twenty-six percent of those emissions.[1] Carbon dioxide is a greenhouse gas and is one of the main pollutants that contributes to global climate change. As we expanded out from city centers, suburbs were developed with lower densities and an abundance of roads. These land developments encroached on adjacent arable land, which can decrease the availability of agricultural land and wildlife habitats.[2] An increase in the quantity of impervious roads can increase storm water runoff and contribute to more frequent and severe flooding.[3] Sprawl also causes people to drive further, drive for more activities, and endure more road congestion.[4]

Our automobile use has also become an economic burden on people and our society. Road maintenance and expansions bears a huge cost onto taxpayers, with the cost per mile of resurfacing roads at about $1.25 million per mile and upwards of $11 million per mile for new roads,[5] often costing hundreds of millions to billions of dollars.[6] Small, sprawling towns and cities often do not have a sufficient number of residents to collect enough taxes to keep up the maintenance of local roads, water, and sewer lines or support local services like police and fire protection.[7] There is also a large economic cost to people's time wasted being stuck in traffic. Increased congestion and longer travel distances increase unproductive time spent in an automobile, with the average American spending about 433 hours of time per year wasted behind the wheel.[8] All these automobiles also need to be stored when they are not in use and parking can be expensive for both the automobile owner and other suppliers of parking. The construction of parking spaces can cost anywhere from a low of $17,000 per space for an above ground parking lot to $48,000 per space for an underground parking structure.[9]

The effects of automobile use also tend to affect certain populations more than others. Freeways in cities often cut through low-income neighborhoods, which create barriers to cohesive neighborhoods and increases exposure to higher levels of air pollution.[10] The ongoing costs of owning an automobile can also be especially detrimental to low-income residents, as it can constitute a larger percentage of their total income compared to higher-income residents.[11] There are large subsidies that are directed toward automobile infrastructure which divert large sums of funding away from other transportation modes like transit or bicycles. This can affect low-income people more drastically compared to the rest of the population, as they often depend more on non-automobile modes when they cannot afford to own an automobile.

There has been increased awareness of the negative effects of auto-dependency in the last decade, to where there has been a shift in focus to reduce automobile use and increase the use of non-automobile modes. The way our cities and suburbs are designed in the United States has proven to make this a difficult task. Transit, biking, and walking modes rely on density and mixed land uses to make them feasible transportation mode options. To remedy these land-use issues, cities have been making changes to local zoning ordinances to accommodate increased heights, increased densities, a mixing of uses, and a reduction in parking requirements or switching to parking maximums for new developments. In particular, areas near transit stations

1 Environmental Protection Agency, *Climate Change indicators: US Greenhouse Gas Emissions*, EPA.gov, accessed May 23,2018, https://www.epa.gov/climate-indicators/greenhouse-gases.

2 Everything Connects, "Urban Sprawl." Everything Connects, accessed May 23, 2018, http://www.everythingconnects.org/urban-sprawl.html.

3 Sierra Club, "Stopping Sprawl", Sierra Club Sprawl Overview, accessed May 23,2018, http://vault.sierraclub.org/sprawl/factsheet.asp.

4 Ibid.

5 American Road and Transportation Builders Association, *How much does it cost to build a mile of road?*, ARTBA Frequently asked Questions, accessed May 23, 2018, https://www.artba.org/about/faq/.

6 The Sierra Club, "Stopping Sprawl".

7 Ibid.

8 Ibid.

9 Shoup, Donald, "The High Cost of Minimum Parking Requirements," *Transport and Sustainability Parking Issues and Policies*, 2014, 87-113. doi:10.1108/s2044-994120140000005011, (90).

10 Langston, Jennifer, "People of color exposed to more pollution from cars, trucks, power plants during 10-year period," University of Washington News, September 14, 2017, accessed May 23,2018, http://www.washington.edu/news/.

11 National Household Travel Survey, *FHWA NHTS Brief: Mobility Challenges for Households in Poverty*, NHTS Brief, accessed May 23, 2018, https://nhts.ornl.gov/briefs/PovertyBrief.pdf.

have become focal points for much of this change in land use. TODs attempt to increase density and mix uses near transit stations to encourage residents to live car-free or car-lite by locating amenities nearby and by providing mobility to regional destinations. The Association of Bay Area Governments (ABAG) and the Metropolitan Transportation Commission (MTC) developed Priority Development Areas (PDA) through the ***Plan Bay Area*** regional long-term planning process, as places that are best suited to accommodate new developments and population growth. Proximity to efficient and reliable transit stations or stops is one of the criteria for determining which areas are suitable PDAs.[12] TODs are therefore an important strategy to reduce people's auto-dependency and accommodate new growth.

Even with supportive policies in place to promote TODs, purchasable or cheap land is often not available to redevelop around existing transit stations. Often the only available parcels of land are the parking lots adjacent to transit stations. Our dependency on automobiles means that these parking lots are often filled to capacity, making it difficult to repurpose for TODs. To make it feasible to repurpose parking lots for TODs, automobile travel to transit stations must be addressed. However, this can be a double-edged sword, as transit agencies wish to retain their current riders that drive to the station and do not want them to decide to stop riding transit because of unavailable parking. The question then becomes how to maintain or increase ridership while also reducing the number of people driving to and parking at the transit station.

Transportation demand management (TDM) is a set of strategies that can be implemented to disincentivize automobile mode choice and incentivize non-automobile mode choices. These strategies can vary depending on the entities, circumstances, and application. Parking demand management (PDM) is a group of strategies that aims to reduce parking demand and can also potentially reduce automobile use. Historically in the US, parking has typically been provided abundantly and cheaply. Being able to easily and cheaply park an automobile is a major contributing factor to the proliferation of automobile use. PDM strategies are an important tactic that can reduce the convenience of parking and change people's driving habits.

Understanding how parking demand management strategies can be implemented becomes more important when applying them to specific projects. BART officials have been in discussion with the City of El Cerrito about the feasibility of repurposing the parking lots at the El Cerrito Plaza BART Station into TOD. The area around the station has convenient access to nearby amenities but lacks parcels that could be easily redeveloped. The City of El Cerrito has appropriate policies in place through the San Pablo Avenue Specific Plan to make TOD possible. However, the El Cerrito Plaza BART station parking lots are at full capacity on weekdays, making it a challenge to determine what to do about the loss of parking or whether to fund the construction of a parking structure on another lot. As BART and other transit agencies continue to engage in repurposing their parking lots for development, it will become even more important for them, in partnership with local government staff, to have a useful tool chest of effective parking demand strategies to help achieve their goals of building more TOD on their parking lots and maintain access for their riders.

1.2. Research Question and Approach

This report aimed to determine what are the best parking strategies that could reduce or eliminate the need for replacement parking at the El Cerrito Plaza BART station when the station's parking lots are converted into transit-oriented development. Only parking strategies that dealt directly with physical parking were evaluated, as other strategies would be more difficult to measure and predict. Constructing a parking structure was one strategy that was not evaluated, as BART has not recommended replacement parking at this station. It was hypothesized that demand-based pricing would be the most effective strategy to encourage riders to shift to alternate transportation modes and that utilizing existing nearby on and off-street parking would be able to fulfill the access needs for riders that had little to no other transportation alternatives when BART parking is removed.

To address the research question, this report examined the current policies that influenced why this BART station is a desirable location to construct transit-oriented development, policies and guidelines that influence the developments design, especially related to parking, and what current actions have been taken at this location. This report also performed a site analysis to determine the existing parking conditions at and around the station. The quantity and type of parking spaces in the BART parking lots and on-street parking near the station was collected and analyzed. A parking occupancy analysis was performed to determine how the on-street parking was utilized.

12 Metropolitan Transportation Commission, *Priority Development Areas*, MTC Plans and Projects, accessed May 23, 2018, https://mtc.ca.gov/our-work/plans-projects/focused-growth-livable-communities.

Next, the report examined different parking management strategies. This examination was conducted by first describing a general overview of each strategy, and then for a couple of strategies, a deeper examination of scholarly literature was conducted. Each strategy examined a specific case study of the parking management strategy in real world use. Case studies that had similar land-use characteristics to the El Cerrito Plaza BART station or were used by transit agencies were chosen. The parking management strategies were then described more specifically to the context of the El Cerrito Plaza BART station. A policy analysis was then performed using these station specific strategies to determine which of the strategies would most effectively reduce or eliminate the need for replacement parking and encourage riders to shift to alternative transportation modes to access the station. Strategy recommendations were then presented for the El Cerrito Plaza BART station, with further recommendation for BART, other transit agencies, cities and transit-oriented developers on how to use the findings from this report for their use on similar projects.

Chapter 2: Site Details and Parking Policies: Background and Relevance

2.1. Research Site

The El Cerrito Plaza BART station is located in the City of El Cerrito, California. The City of El Cerrito is located in the East Bay of the San Francisco Bay Area. It is located approximately 7.5 miles north of the City of Oakland[13], four miles north of the City of Berkeley[14], and borders the City of Richmond to the south and east. Compared to these large cities in the East Bay, the City of El Cerrito is a geographically small city, with a land area of only 3.66 square miles. Yet with a population of about twenty-five thousand people, El Cerrito is densely populated[15]. This density came about because of the city's proximity to other large urban centers like Oakland and San Francisco.

The City of El Cerrito was founded in 1917 and was a streetcar suburb of Oakland and Berkeley. The City grew rapidly during World War II, as the City housed many of workers from the Richmond shipyards. The City was fully built out by the 1970's and has since maintained a steady population. The City was built before the widespread use of the automobile and before the construction of the Interstate Highway System, so the City's built form looks like many other older, inner suburbs. You will find small parcels that have a mix of housing types, most typically on a gridded street network, except for the steep, hilly areas on the eastern side of the City. The western portion of the City is relatively flat, with some smaller hills, whereas the eastern portion of the City is relatively steep.

13 Distance Calculator, "Distance from El Cerrito to Oakland," DistanceCalcualor.net, accessed May 7, 2019, https://www.distancefromto.net/distance-from-el-cerrito-us-to-oakland-us

14 Distance Calculator, "Distance from El Cerrito to Berkeley," DistanceCalcualor.net, accessed May 7, 2019. https://www.distancecalculator.net/from-el-cerrito-2-to-berkeley

15 Wikipedia, "El Cerrito, CA," Wikipedia.com, accessed February 19, 2018, https://en.wikipedia.org/wiki/El_Cerrito,_California#cite_note-CenPopGazetteer2016-6

16 AbuHamdi, Eliana, Andrew Matsas, Caitlin Elliot, Doug Rose, Fernando Burga, Ginette Wessel, Kristine Williams, Laura Sanford, Warren Logan, *Communities on the Right Track: Including Affordable Housing at BART TODs: A Feasibility Study of Ashby and El Cerrito Plaza*, College of Environmental Design University of Berkeley, 2013, accessed May 7, 2019, http://ced.berkeley.edu/downloads/gallery/incity/su13/incity_bart_communitiesonrighttrack_2013.pdf

Figure 1 El Cerrito Plaza BART station and surrounding BART properties [16]
Source: Google Earth, 2020.

The City is mostly residential, a remnant of its history as a bedroom community for nearby economic centers, therefore most businesses in the City are retail/service/restaurant businesses, and small offices that are mostly healthcare or service related. Almost all businesses are located either along San Pablo Ave, the only commercial corridor in the City, which traverses the whole City north/south, or at the El Cerrito Plaza Shopping Center, which is located on the southern border of the City, which also connects to San Pablo Ave.

There are two BART stations located within the City of El Cerrito. The El Cerrito del Norte station is located near the northern border of the City and is adjacent to San Pablo Avenue. The El Cerrito Plaza station is located near the southern border of the City, is directly adjacent to the south to the El Cerrito Plaza Shopping Center, and is a few blocks away from San Pablo Ave.

Both BART stations opened for service in 1973. The stations opened approximately four months after the BART system first opened for service in 1972.[17] Both stations are served by the Richmond-Millbrae line and the Richmond- Warm Springs line. The Richmond- Warm Springs line is planned to extend down to the new Berryessa station in San Jose by the end of 2019[18]. Both lines are available Monday- Saturday daytime and the Richmond- Warm Springs line is also available Monday- Saturday nights and all day on Sundays. Trains typically run on fifteen-minute headways weekdays during the day and twenty-minute headways every night, and all day on Sundays.

2.2. Relevant Policies

There are a number of relevant policies from the regional to local level that support the redevelopment of the El Cerrito Plaza BART station parking lots into transit-oriented development.

17 Bay Area Rapid Transit, *BART Historical Timeline: Achievement over the Years,"* BART, 2017, accessed May 7, 2019, https://www.bart.gov/sites/default/files/docs/bart-historical-timeline.pdf

18 Richards, Gary, "BART testing to San Jose picks up: Nov 1st opening tentatively set," TheMercuryNews.com, February 8, 2019, accessed May 7, 2019, https://www.mercurynews.com/2019/02/08/bart-testing-to-san-jose-picks-up-nov-1-opening-tentatively-set/

2.2.1. Metropolitan Transportation Commission Priority Development Areas

The Metropolitan Transportation Commission (MTC) is a regional public governmental agency responsible for planning, financing, and coordinating transportation for all nine of the San Francisco Bay Area Counties.[19] The MTC worked with local and county governments to determine which areas are suitable to accommodate future growth and are accessible to transit services. These areas were designated as Priority Development Areas (PDAs). The objective of creating these areas is to concentrate future growth in already established areas, so as to avoid expanding growth into the undeveloped outskirts of the region and maintaining much of the single-family housing that already exists. By concentrating growth in established areas, particularly around transit, growth can be accommodated without a massive increase in automobile trips or need for abundant parking.[20]

The MTC predicts that around seventy-two percent of future housing needs can be accommodated in PDAs of the three largest cities (San Francisco, Oakland, and San Jose) and cities that surround the Bay, even though these areas only accounts for about five percent of the land area of the Bay Area. To help achieve this goal, the MTC recommends that cities ease off-street parking minimums to reduce the cost of building in these areas. They also encourage local ordinances that would mandate employers provide pre-tax deductions for transit, provide a parking cash-out for unused parking, and use Transportation Demand Management strategies. They do not make any recommendations on the management of on-street parking by local or county agencies.[21]

Most of the El Cerrito Plaza BART station-owned land is in a designated Priority Development Area, since it is directly adjacent to the transit station. The northeast parking lot is the only station-owned land that is not included in the PDA.[22] This is possibly because the station is surrounded by residential housing, with more single-family homes located on the east side of the transit station than on the west side. The object of the PDAs is to preserve single-family housing, so it seems reasonable that the parking lot closer to these areas would be outside of the PDA. However, the half-mile radius around the transit station is still designated as a Transit Priority Area (TPA), which has some state legislation that restricts the amount of parking that can be mandated.[23]

19 Metropolitan Transportation Commission, "What do we do?" MTC.CA.gov, accessed May 7, 2019, https://mtc.ca.gov/about-mtc/what-mtc/what-we-do

20 Metropolitan Transportation Commission, "Priority Development Areas," MTC.CA.gov, accessed May 7, 2019. https://mtc.ca.gov/our-work/plans-projects/focused-growth-livable-communities/priority-development-areas

21 Plan Bay Area, "Strategies and Performance," In *Plan Bay Area 2040: Final Plan,* PlanBayArea.org, accessed May 7, 2019, http://2040.planbayarea.org/strategies-and-performance

22 Metropolitan Transportation Commission, "Priority Development Area (PDA) and Transit Priority Area (TPA) Map for CEQA Streamlining," MTC.CA.gov, accessed May 7, 2019, https://www.planbayarea.org/pda-tpa-map

23 Ibid.

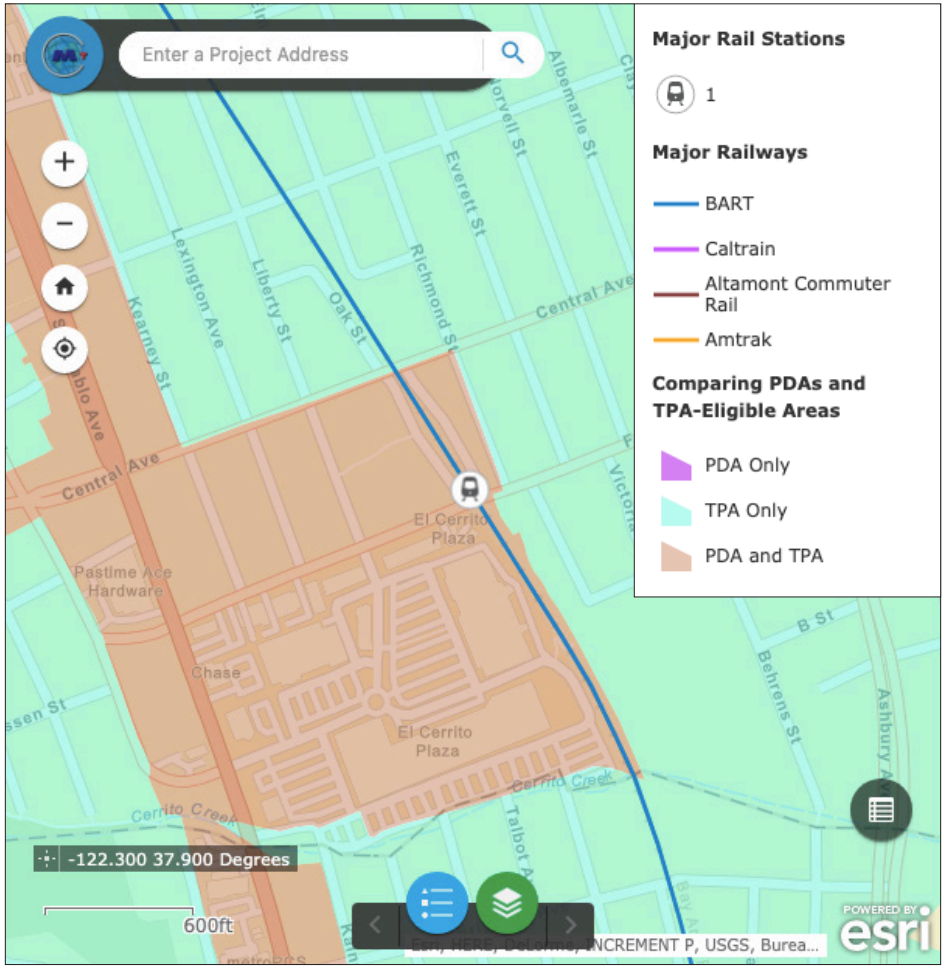


Figure 2 MTC Priority Development Area & Transit Priority Area around El Cerrito Plaza BART station[24]

24 Ibid.

2.2.2. BART Policies

BART has spent considerable time over the years creating policies to guide decisions on development on their properties, in order to achieve ridership and financial goals.

2.2.2.1. BART Transit-Oriented Development Policy

In the past, BART parking lots were viewed as a necessity to get people to choose to take BART over driving directly to their destination. More recently, however, transforming BART parking lots into residential TODs is viewed as a way to get more people living close to the station. People who live close to transit are more likely to use BART, use it regularly, and use BART during off-peak hours. Transforming BART parking lots into office TODs is also viewed as a way to encourage more reverse commute BART trips during peak commute times. BART hopes that these developments will increase BART ridership, and therefor increase revenue.[25] The developments themselves could also bring in revenue, as the land would be leased to the developer from BART. This revenue is anticipated to be greater than the revenue that could be generated from parking fees on these lots.

The biggest challenge to implementing TODs on BART parking lots is the loss of parking. When TODs were constructed on BART parking lots in the past, they often required a one-to-one replacement of parking spaces that were lost, which often entailed constructing costly parking structures. BART's 2016 TOD policy encourages the use of other approaches to replacing parking, such as shared parking with other uses or with on-street parking spaces, or the leasing of off-site parking spaces.[26] How each station addresses the loss of parking from TODs is dictated by the Station Access Typology, which is discussed later in this report.

BART has developed thirteen TODs since the turn of the century, with seven TODs currently under construction, six TOD's planned, and several more in the works.[27] With the passage of California State Assembly Bill 2923 (AB2923) in 2018, BART will have greater zoning control over their properties, which will allow for planned TODs to move to construction sooner, and for new TODs to be envisioned. AB2923 will be discussed in more detail later in the report.

25 Bay Area Rapid Transit, Transit-Oriented Development Policy, BART, June 2016, accessed May 7, 2019, https://www.bart.gov/sites/default/files/docs/BART%20Board%20-%20TOD%20Policy%20Draft%206-9-16%20Adopted%20FINAL_0.pdf

26 Ibid.

27 Bay Area Rapid Transit, "Transit-Oriented Development (TOD)," BART.gov, last updated April 2019, accessed May 7, 2019, https://www.bart.gov/about/business/tod

2.2.2.3. BART Station Access Typology

BART has forty-eight transit stations, with a mixture of elevated, ground level and underground stations.[28] The stations are located in a variety of settings, from large city central business districts surrounded by businesses to the middle of a freeway in the suburbs surrounded by housing. This variety of types of stations and locations means that each station has different requirements when it comes to access needs for BART riders. Underground stations typically have no parking and therefore need to prioritize walking and biking modes of access to the station. Suburban stations that are low-density with housing located far from the station and little access to connecting transit need to prioritize parking or drop-off/pick-up access modes.

28 Bay Area Rapid Transit, "System Facts," BART.gov, accessed May 7, 2019, https://www.bart.gov/about/history/facts

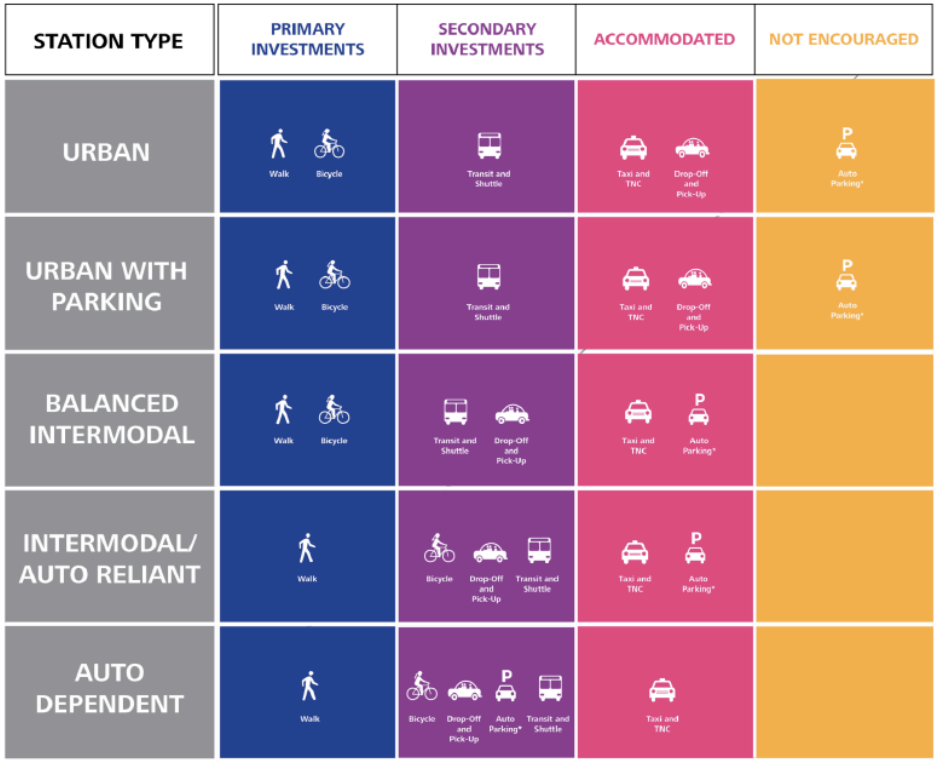


Figure 3 BART Station Access Investment Prioritization[29]

29 Ibid.

To understand what access modes each station should prioritize, BART developed the Station Access Typology in 2016. The policy categorizes stations into five station types: Urban, Urban with Parking, Balanced Intermodal, Intermodal/Auto-Reliant, and Auto-Dependent. Each type has an accompanying auto mode share, with Urban having the least auto mode share and Auto-Dependent with the most. Each station has been assigned a station type, as well as a desired station type to strive to in future planning. To achieve the desired station type, BART has outline what access modes are to be prioritized, which ones should be accommodated, and which ones are not encouraged.[30]

The El Cerrito Plaza BART station is currently assigned as a Balanced Intermodal station type. Balanced Intermodal station types usually have both walking and drive-alone access modes between 25-40 percent. They also have medium to large connecting transit terminals.[31] El Cerrito Plaza actually has a small connecting transit terminal but does match the station type access mode shares.

BART desires for the El Cerrito Plaza BART station to be an Urban with Parking station type. Urban with Parking station types usually have active transportation and connecting transit combined access mode share of about 60-75 percent, with a small part of the percentage coming from connecting transit modes. This station type also usually has small parking lots that fill up early in the morning AM rush.[32] The El Cerrito Plaza BART station already has a small parking lot and a small connecting transit terminal, so with an increase in active transportation modes like walking and biking, this station could become an Urban with Parking station type.

Figure 4 BART Station Access Typology, Current and Desired[33]

To transform the El Cerrito Plaza station into an Urban with Parking station type, the BART station typology investment prioritization advises that walking and biking access modes should take first priority, connecting transit and/or shuttle service take second priority, drop off/pick up and Transportation Network Companies (like

30 Bay Area Rapid Transit, BART Station Access Policy, BART, June 2016, accessed May 7, 2019, https://www.bart.gov/sites/default/files/docs/BART%20Access%20Policy%20-%20Adopted%202016-06-09%20Final%20Adopted_0.pdf

31 Bay Area Rapid Transit, BART Station Access Policy Implementation Key: Station Access Typology Map, BART, June 2016, accessed May 7, 2019, https://www.bart.gov/sites/default/files/docs/Station%20Typology%20Map%202016-06-09%20Final.pdf

32 Bay Area Rapid Transit, BART Station Access Policy Implementation Key: Station Access Typology Map, BART, June 2016, accessed May 7, 2019, https://www.bart.gov/sites/default/files/docs/Station%20Typology%20Map%202016-06-09%20Final.pdf

33 Ibid.

Lyft and Uber) are accommodated, and auto parking is not encouraged.[34] If TOD is constructed on the parking lots at the El Cerrito Plaza station, the Station Access Typology does not encourage auto parking, therefore replacement parking would not be encouraged. Whether or not BART actually decides to replace any lost parking spaces comes down to a variety of factors, with the station access typology being only one factor.

2.2.2.4. BART Demand Based Parking Program

Parking in BART parking lots has historically always been free up until the early 2000's. As ridership continued to increase, parking lots began to fill to capacity and demand began to exceed supply. Several stations started to charge a $1 all day parking fee, but this did little to change parking demand. In 2013, BART adopted the Demand Based Parking Program, which adjusted parking lot fees based on occupancy percentages. Parking occupancy is checked every six months, and if the parking lots are above ninety-five percent full during the morning peak commute time, then the parking fee is raised by $0.50. The parking fee is capped at $3 per day, except for the West Oakland BART station, which is allowed to continue to increase with no cap.[35]

Currently all stations, including the El Cerrito Plaza BART station, have reached the cap of $3 per day parking fee except for the South Hayward station, which currently has a parking fee of $2 per day. The West Oakland BART station, the only station without a parking cap, currently has a parking fee of $10.50 per day. This is in line with other market-rate parking lots fees in the vicinity.[36] With an inability to raise the parking fee above $3, the current parking program has lost its ability to affect any change in demand using pricing. The West Oakland station parking fee shows the best evidence for where parking fees would most likely be if BART allowed parking fees above the current $3 cap.

34 Bay Area Rapid Transit, *BART Station Access Policy,* BART, June 2016, accessed May 7, 2019, https://www.bart.gov/sites/default/files/docs/BART%20Access%20Policy%20-%20Adopted%202016-06-09%20Final%20Adopted.pdf

35 Bay Area Rapid Transit, "Demand-Based Parking Program (2013)," In *Bart Station Access Policy Update: Policy Context & Best Practices,* pg. 14, BART, Oct 2015, accessed May 7, 2019, https://www.bart.gov/sites/default/files/docs/BART%20Access%20Policy%20Update%20-%20Policy%20Context%20and%20Best%20Practices%20Review_1.pdf

36 Bay Area Rapid Transit, "Stations," BART.gov, accessed May 7, 2019, https://www.bart.gov/stations

In February of 2020, BART board members discussed the possibility of increasing the cap on parking fees from $3 a day to $6 a day. They also discussed removing the cap all together, like at the West Oakland station, and just continue to raise parking fees as long as parking capacity is over ninety-five percent.[37]

2.2.2.5. California State Assembly Bill 2923

2.2.2.5.1. Background

The TODs that BART has built in the past have taken from ten to fifteen years to complete, often slowed by resistance from surrounding residents. Long delays can be very costly and makes it very difficult for developers to take on the risk of constructing development on BART properties. Other projects just never make it past the planning stages because of the same opposition. With the affordable housing crisis in the Bay Area, two California State Assembly members decided to introduce legislation that would make it easier for BART to develop TODs on their property.

Assembly Member David Chiu (Democrat), who represents part of San Francisco and Assembly Member Timothy Grayson (Democrat), who represents parts of the East and North Bay, introduced Assembly Bill 2923 on February 16, 2018. The legislation was passed by the State Senate and State Assembly in August of 2018 and was signed into law by Governor Jerry Brown on September 30, 2018. The bill went into effect on January 1, 2019.[38]

The legislation allows BART to develop transit-oriented development zoning standards for their properties that lay within a half mile of a transit station entrance.[39] Previously, BART would have had to follow each local jurisdiction's zoning standards for each of their properties. The zoning standards that BART needs to develop with this legislation are for building height, density, number of parking spaces and floor-area ratio (FAR). The local design standards would still hold for these properties.[40]

37 Savage, Nico, "Here's how much BART could charge for parking," EastBaytimes.com, February 13, 2020, accessed May 5, 2020, https://www.eastbaytimes.com/2020/02/13/how-much-would-you-pay-for-a-bart-parking-spot-changes-could-double-rates/

38 California Legislative Information, "AB-2923 San Francisco Bay Area Rapid Transit District: transit-oriented development," Leginfo.legislature.ca.gov, October 1, 2018, accessed May 7, 2019, https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB2923

39 Thorne-Lyman, Abigail, "AB 2923: Preliminary Implementation Approach," PowerPoint Presentation, BART Board of Directors Meeting, Oakland, Dec 6, 2018, accessed May 7, 2019, https://bart.granicus.com/MetaViewer.php?view_id=17&clip_id=1113&meta_id=25032

40 Ibid.

BART has until July 1, 2020 to develop these zoning standards for their properties, otherwise the current TOD guidelines that were adopted in 2017 by BART will become the zoning standard. The BART Board, with recommendation from BART staff, chose to not go beyond the standards in the 2017 TOD guidelines, which means that the current TOD guidelines will become the new zoning standard. After July 1, 2020, local and county jurisdictions have two years to adopt these zoning standards for BART properties that are within a half mile of the BART station entrances. Even if they have not amended their zoning standard by the deadline, BART TOD guidelines will supersede local zoning standards for BART property. During the transition to the new zoning standards, the legislation still allows BART to allow development of TODs on their property as long as it does not exceed one story higher than the current local or county zoning standards. There is also a "sunset provision" that requires the legislation to be reviewed in 2029 after BART has had time to allow for the development of TODs on its properties.[41]

AB2923 also has several other provisions that do not deal with zoning standards. One important provision is the requirement that at least thirty percent of the housing units need to be affordable.[42] This already aligns with BARTs own policy to provide thirty-five percent affordable housing units across all of their TODs.[43]

The legislation also requires that BART reach out to local jurisdictions and Communities of Concern (CoC). This is in line with how BART currently operates when it is planning a TOD. BART has often stated that they are only going to be working with jurisdictions that are supportive and ask for development at their BART stations. The legislation also requires that BART create a list of the top 10 ten cities where they would like to build TODs, which complements their requirement to work with local and county jurisdictions.[44]

Lastly, there is a requirement in the legislation for any instance in which BART does not replace parking that is lost when parking lots are converted to TOD, they must maintain access to the station.[45] This can mean many different things for different stations. Auto-Dependent station types would need some type of parking access to the station, though it would not necessarily need to be on BART property. This provision will be one of the biggest challenges for creating TODs in more auto-dependent station areas.

The last important factor is determining if there are any other obstacles or opportunities at a station. One obstacle could be if a station would require replacement parking, which is expensive and takes up otherwise usable space for more housing or office space.

It is also important to note that BART does not typically sell their property to developers, but instead uses long-term leases of up to sixty-six years.[46] There have been only a few joint developments between BART and local jurisdictions.

2.2.2.5.2. BART AB2923 Guidance Document

In February of 2020, BART released a preliminary draft Guidance Document, which is meant to help aid local jurisdictions and BART in determining what zoning standards would be required and if current local or county zoning standards meet the new BART TOD standards based on the new legislation. BART made the decision to use the existing 2017 BART TOD zoning guidelines for the zoning standard and not pursue additional limits due to time constraints and feasibility.[47] They also chose to only focus on the four standards that are required by the legislation (residential density, building height, floor-area ratio, and parking requirements).[48] These standards are designated into three different TOD place types, with some similar and some different standards between the different types.[49]

The Neighborhood/Town Center place type is a more suburban TOD type, with lower height requirements, lower floor-area ratios, and higher parking maximums than the other place types. The Regional Center place type is a more downtown-style TOD type and has the highest minimum height requirements, highest floor-area ratios, and the lowest parking maximum. The Urban Neighborhood/City Center place type

41 Ibid.

42 Thorne-Lyman, Abigail, "AB 2923: Preliminary Implementation Approach," PowerPoint Presentation, BART Board of Directors Meeting, Oakland, Dec 6, 2018, accessed May 7, 2019, https://bart.granicus.com/MetaViewer.php?view_id=17&clip_id=1113&meta_id=25032

43 Bay Area Rapid Transit, Affordable Housing Policy, BART, January 2016, accessed May 7, 2019, https://www.bart.gov/sites/default/files/docs/Affordable%20Housing%20Policy%20Adopted%201-28-16_0.pdf

44 Thorne-Lyman, Abigail, "AB 2923."

45 Ibid.

46 Bay Area Rapid Transit, Transit-Oriented Development Policy, BART, June 2016, accessed May 7, 2019, https://www.bart.gov/sites/default/files/docs/BART%20Board%20-%20TOD%20Policy%20Draft%206-9-16%20Adopted%20FINAL_0.pdf

47 Bay Area Rapid Transit, "AB 2923 Guidance Document Outline," BART, February 2020, 1, accessed April 13, 2020, https://www.bart.gov/about/business/tod/ab2923

48 Bay Area Rapid Transit, "AB 2923 Guidance", 3.

49 Ibid.

is for stations that are denser than suburbs but not as dense as downtowns, and their requirements fall in between the other two types.[50]

50 Bay Area Rapid Transit, "AB 2923 Guidance", 7.

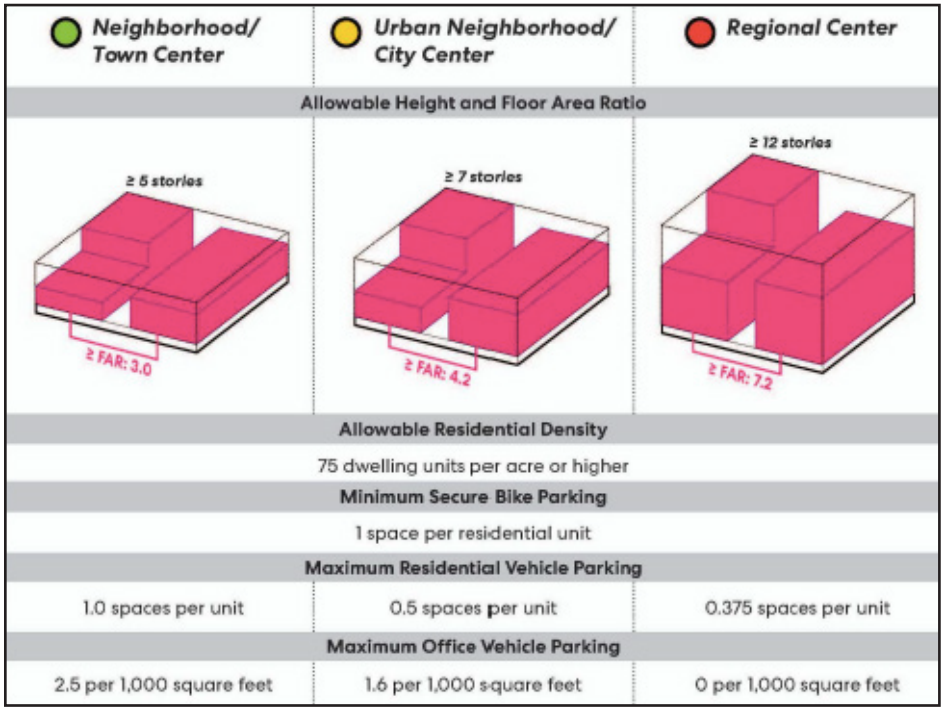


Figure 5 Graph of BART station types and characteristics[51]

The El Cerrito Plaza BART station is designated as an Urban Neighborhood/City Center TOD type. This means that any development would be required to be at least seven stories tall, have a floor-area ratio of at least 4.2, and have at least seventy-five dwelling units per acre. More pertinently, this type must have no more than 0.5 residential parking spaces per unit and 1.6 commercial parking per 1,000 square feet. The place type does not make any requirement for parking for BART riders.[52]

51 Bay Area Rapid Transit, "AB 2923 Guidance Document Outline," BART, February 2020, 7, accessed April 13, 2020, https://www.bart.gov/about/business/tod/ab2923

52 Ibid

Figure 6 Map of BART stations by station type[53]

53 Bay Area Rapid Transit, "AB 2923 Guidance Document Outline," BART, February 2020, 5, accessed April 13, 2020, https://www.bart.gov/about/business/tod/ab2923

2.2.2.5.3. 10- Year TOD Work Plan

In February of 2020, BART also released their draft 10-year TOD workplan outline, which partially discusses how BART prioritizes which BART stations are feasible for development. Stations are analyzed based on several different factors.

First, station areas are analyzed to determine what parcels are developable based on site characteristics and other BART needs. Some parcels of BART-owned land near stations have unusual configurations or topography, which may make it difficult to build on. Even if the parcels are developable, some parcels may fulfill other facility needs, like for important infrastructure or necessary parking.[54]

Second, station development areas are analyzed on whether they are able to fulfill other BART goals. BART TOD policy sets performance targets on housing units and commercial space. The residential units have separate targets for overall housing units and for affordable housing units. The performance targets are set for 2025 and for 2040. So far, BART has performed better on reaching their target for development of commercial spaces for 2025, if all spaces pending approval are developed. BART is still behind on reaching their target for overall housing units and even further behind on affordable housing units. Future TOD developments that focus more on housing would help BART reach their housing targets, which is more behind than their commercial space targets.[55]

The station development areas are then prioritized based on three different factors. One factor is the market feasibility of potential development on any BART owned property at each station, which relates to the ability of a development being able to pencil out financially. The rents in the Bay Area, in general, are very high compared to the rest of the nation and make it easier for large developments to be financially feasible. There are local variations in what rent prices are considered feasible in the Bay Area, so there is still a need to look at each development individually.[56]

The second factor is the presence of local support for development at that station. Local support could mean support for development from local residents, but more importantly, it means support from the local government. An important piece is whether local governments already have zoning in place that is similar to the new BART TOD development standards, which would allow for development in a shorter time frame. It is also important that the local city council and city staff be on board with development at BART stations since BART only likes to work with cities that want to work with them. The time frame in which the city government would like to see development is also an important element. Because of other infrastructure needs or staff time, some cities may not wish to see development in the near term.[57]

The last factor is to analyze what other opportunities or obstacles exist at the station development areas. Stations that would need replacement parking or station improvements to increase capacity would make TOD more costly. Cities or counties that have alternative affordable housing funding mechanisms would make it easier for developers to get financing for affordable housing projects.[58]

After looking at all of these factors, BART will determine which five to ten stations to prioritize for development in the next ten years. From this list, BART will identify which developments are near-term projects that they will focus on in the first four years.[59]

Though the final TOD priority list has yet to be released, the El Cerrito Plaza Station is likely to be included, as it is ranks high on the different factors that BART has outlined as desirable. The two large parking lots at the station are of a usual shape and size without any topography issues. The smaller southeast lot is oddly shaped and small, which could make that one parcel difficult to develop. There do not seem to be any other need for these lots for other BART infrastructure, though there is a potentially need for some replacement parking of certain parking types.

As the area is surrounded by mostly residential housing, these developable parcels are a good fit for development of more housing, which can help BART achieve their housing performance targets. The City of El Cerrito also has an inclusionary ordinance that requires at least ten percent affordable housing on developments with more than nine units, which any BART development would have.[60]

54 Bay Area Rapid Transit, "10-year Transit-Oriented Development Work Plan Outline," BART, February 2020, 8, accessed April 13, 2020, https://www.bart.gov/sites/default/files/docs/10-Year%20Work%20Plan%20Outline_Final%202020-02-18.pdf

55 Bay Area Rapid Transit, "10-year TOD Work Plan," 6-8.

56 Bay Area Rapid Transit, "10-year TOD Work Plan," 9.

57 Ibid.

58 Bay Area Rapid Transit, "10-year TOD Work Plan," 10.

59 Bay Area Rapid Transit, "10-year TOD Work Plan," 12.

60 City of El Cerrito, "Inclusionary Housing Zoning Ordinance," El-Cerrito.org, accessed May 3, 2020, https://www.el-cerrito.org/1287/Inclusionary-Housing-Program

The rental market in the area has similar dense residential developments either recently built, under construction, or approved which are able to fill units with the higher rents.[61] This suggests that dense development on BART property would be financially feasible.

There is considerable local support for development at the station, both with local residents, and the City's government. The City of El Cerrito's San Pablo Avenue Specific Plan already zones the west and southeast parking lot similar to BART TOD standards; although the northeast parking lot is not currently zoned for dense development. The City's government has expressed interest to work with BART to develop any of the El Cerrito Plaza station parking lots.

With a designation of an ***Urban with Parking*** station access type, BART does not recommend replacing BART riders parking, which means there would be no expensive parking garages to build at this station. With the city's inclusionary housing ordinance, it can potentially help fund affordable housing from in-lieu fees, but the funding amount is highly dependent on how many developments are built in the city, and whether they choose the in-lieu fee option over building affordable housing on-site.

2.2.3 The City of El Cerrito

Though BART will have the ability to create their own zoning standards for their properties, the City of El Cerrito has more supportive zoning standards for some parts of BART's property at the El Cerrito del Norte and Plaza BART stations.

61 FPI Management, "Prices/Availability," Metro 510, accessed May 3, 2020, https://www.liveatmetro510.com/

2.2.3.1. The San Pablo Ave Specific Plan

In 2014, the City of El Cerrito adopted the San Pablo Avenue Specific Plan (SPASP), which looked at parcels specifically along the San Pablo Avenue corridor. The corridor runs the full length of the City from the southern border with Albany to the northern border with Richmond. The Specific Plan area also includes parcels along Central Avenue, which is a short section of road that connects San Pablo Avenue to Interstate 80.[62]

Many of the parcels along the San Pablo Avenue corridor are fairly small, and usually not much wider or deeper than most residential parcels. Closer to both BART stations, the parcels are much larger, more similar to commercial parcels found along major arterial streets in suburban cities. The El Cerrito Plaza Shopping Center is much larger than any other parcel in the Specific Plan area. It was originally built like a traditional mall, with a central building surrounded by parking, but it was redeveloped into a square plaza with parking surrounded by buildings in the early 2000s. It is still much smaller than most suburban malls.

The San Pablo Avenue Specific Plan developed two new planning zones. The first new zone is the Transit-Oriented High-Intensity Mixed-Use (TOHIMU) zone. The parcels that surround the two BART stations and the nearby areas of San Pablo Avenue and Central Avenue were assigned this new zone type. The other new zone is the Transit-Oriented Medium-Intensity Mixed-Use (TOMIMU) zone. The parcels that are about halfway between both BART stations along the San Pablo Avenue corridor were assigned this new zone.[63]

The intent of creating the new zones was to encourage more dense development along the corridor, and more specifically near the two BART stations in El Cerrito. Allowing the mix of uses helps to ensure that businesses on the ground floor have an increased number of potential patrons, and the residents have closer access to everyday amenities.[64]

62 City of El Cerrito, "Form-Based Codes," In *San Pablo Ave Specific Plan,* chap 2, pg. 02-9, Dec 2014, accessed May 7, 2019, http://www.el-cerrito.org/DocumentCenter/View/4411

63 City of El Cerrito, "Form-Based Codes," In *San Pablo Ave Specific Plan,* chap 2, pg. 02-35, Dec 2014, accessed May 7, 2019, http://www.el-cerrito.org/DocumentCenter/View/4411

64 City of El Cerrito, "Form-Based Codes," pg. 02-36

Figure 7 San Pablo Ave Specific Plan Area[65]

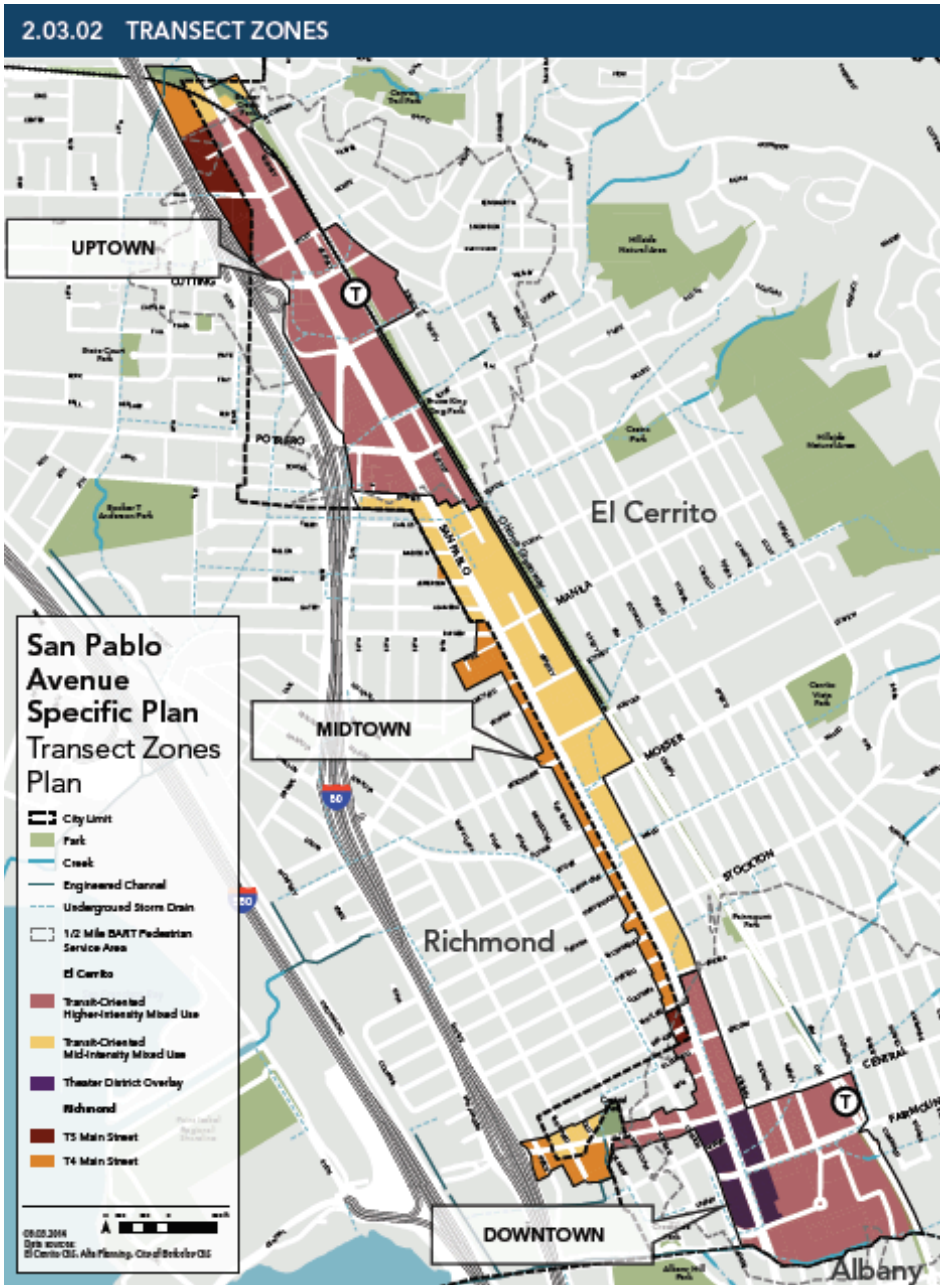


Figure 8 Transit-Oriented High-Intensity Mixed-Use & Transit-Oriented Medium-Intensity Mixed-Use zones[66]

65 City of El Cerrito, "Form-Based Codes," In *San Pablo Ave Specific Plan,* chap 2, pg. 02-9, Dec 2014, accessed May 7, 2019, http://www.el-cerrito.org/DocumentCenter/View/4411

66 Ibid.

The new zones are designed using a form-based code, which focuses more on the form of buildings and their relationship to each other and to the street, and less on the different land uses. Most of the zoning standards have to deal with the size, shape and location of buildings, as well as the amount and location of parking.[67]

One of the biggest changes with the new zones are the changes in the maximum heights. The TOHIMU zone has a higher maximum height of sixty-five feet than the TOMIMU zone, which has a lower maximum height of fifty-five feet. Both of these zones could allow even greater heights if the development includes affordable housing, per the state density bonus. There are also minimum heights required in these new zones, which encourages density. Both zones require a minimum of three stories for residential development and two stories for commercial.[68]

The shape and location of the buildings also changed for the new zones. Typically, buildings have required a setback from the street, but the new zones have no setback requirement. The Specific Plan actually encourages buildings being built up to the right-of-way.[69] To encourage interesting building facades, the Specific Plan sets out guidelines for variation in the wall plane, color, texture, and materials of the exterior façade of the building.[70]

The other biggest change with the new zones is the changes to the required amount and location of parking. Most jurisdictions require a minimum number of parking spaces, either per unit or sometimes per bedroom for residential building, or spaces per square foot of building for commercials buildings where the parking requirements differ based on uses. The SPASP is completely different. There is no minimum parking requirement for either residential or commercial uses and instead sets parking maximums based on the zone and use.[71]

For residential uses, the TOHIMU zone allows up to one parking space per unit and the TOMIMU zone allows up to one and a half parking spaces per unit. For commercial uses in the TOHIMU zone, buildings with less than 3,000 square feet do not require any parking and no maximum is set, whereas buildings over 3,000 square feet are allowed up to one parking space per 1,000 square feet of building. In the TOMIMU zone, buildings with less than 3,000 square feet do not require parking and no maximum is set, whereas buildings over 3,000 square feet are allowed up to one parking space per 500 square feet.[72]

The Specific Plan also requires curb cuts to access parking to be on side streets if possible and for parking to be located behind the building or on the side of a building if it is on a corner.[73] The intent is to maintain as much of a continuous building face on the street as possible.

The El Cerrito Plaza BART station's west and southeast parking lots are zoned as TOHIMU.[74] With an allowable height of up to sixty-five feet and the ability to build an additional story with AB2923, and with being able to build up to the sidewalk with no requirement for parking, these two lots have the potential to build a significant number of residential units. The small southeast lot, although zoned for dense development, is small and oddly shaped, making it difficult to develop.

The northeast parking lot is not assigned to either of the new zones but instead is zoned as a Transit-Oriented Mixed-Use zone (TOM).[75] This is in many ways similar to the other new zones, but with a few exceptions. The height limit for buildings is lower, at fifty feet, with a potential of up to sixty-five feet with a conditional use permit, or even more with the state density bonus if the building has affordable units.[76] The other difference is the amount of required parking. For residential units, the zoning requires 1.5 parking spaces per unit, but if the building is within three hundred feet of a BART station, the requirement is reduced by twenty-five percent. For commercial space, the requirements vary greatly depending on the use and building square footage.[77] With this zoning, the northeast parking lot has less potential to build a significant number of residential units with the lower height limit and much greater parking requirements.

67 City of El Cerrito, "Form-Based Codes," Pg. 02-xii

68 City of El Cerrito, "Form-Based Codes," pg. 02-37

69 City of El Cerrito, "Form-Based Codes," pg. 02-36

70 City of El Cerrito, "Form-Based Codes," pg. 02-79

71 City of El Cerrito, "Form-Based Codes," In *San Pablo Ave Specific Plan,* chap 2, pg. 02-36, Dec 2014, accessed May 7, 2019, http://www.el-cerrito.org/DocumentCenter/View/4411

72 City of El Cerrito, "Form-Based Codes," pg. 02-37

73 City of El Cerrito, "Form-Based Codes," pg. 02-119

74 City of El Cerrito, "Community View/GIS: Zoning," El-Cerrito.org, accessed May 7, 2019, http://maps.digitalmapcentral.com/production/VECommunityView/cities/elcerrito/index.aspx?

75 City of El Cerrito, "Community View/GIS: Zoning".

76 City of El Cerrito, "Code of Ordinances: Table 19.07-B Development Standards- Commercial and Mixed-Use Districts," Library.Municode.com/Ca/ElCerrito, Last updated March 29, 2019, accessed May 7, 2019, https://library.municode.com/ca/el_cerrito/codes/code_of_ordinances?nodeId=TIT19ZO_PTIIBADIRE_CH19.07COTRIEMIEDI_19.07.020LAUSRE

77 City of El Cerrito, "Code of Ordinances: Table 19.24-A Required Parking," Library.Municode.com/Ca/El Cerrito, Last updated March 29, 2019, accessed May 7, 2019, https://library.municode.com/ca/el_cerrito/codes/code_of_ordinances?nodeId=TIT19ZO_PTIVREAPSOALDI_CH19.24OREPALO

Figure 9 El Cerrito zoning map by parcel[78]

78 Ibid.

2.3. Current Actions at the Site

The possibility of BART building TOD at the El Cerrito Plaza BART station is not just a hypothetical scenario; BART staff are actively planning for development at this station. There are no current development plans for any of the parking lots, but the BART staff has been conducting preliminary research to determine the effects of parking loss and desired development level.

2.3.1. Library Feasibility Study

The City of El Cerrito would like to build a new library for the City, as the current library was built in 1948 and is seismically unfitted.[79] Instead of retrofitting the old current library, the City instead would like to build a new library somewhere else. In 2016, the City put a bond measure on the ballot to provide thirty million dollars for the purchase of a site and for the construction of the new library. The bond measure needed a super-majority to pass but it fell just three percentage points short of the necessary votes.[80] The City was not deterred though by the failure of the bond measure since it still had great support, so they have been looking at other ways to bring a new library to El Cerrito.[81]

One site that the City is considering is the potential new TODs at the El Cerrito Plaza BART station. The large parcel sizes of the west and northeast parking lots ensure that any TOD on the site would provide ground floor space that would be adequate for a library.[82] BART and the City of El Cerrito have agreed to look at the feasibility of including a library in any potential development at the El Cerrito Plaza BART station.

79 City of El Cerrito, "El Cerrito Library Needs," El-Cerrito.org, accessed May 7, 2019, http://www.el-cerrito.org/936/Library-Services-Priorities

80 Ballotpedia, "El Cerrito, California, Library Bond Issue, Measure B (November 2016)," Ballotpedia.org, accessed May 7, 2019, https://ballotpedia.org/El_Cerrito,_California,_Library_Bond_Issue,_Measure_B_(November_2016)

81 City of El Cerrito, "El Cerrito Library Needs".

82 Radin, Rick, "El Cerrito to study housing, library at Plaza Bart," Mercurynews.com, August 17, 2016, accessed May 7, 2019, https://www.mercurynews.com/2016/08/17/el-cerrito-to-study-housing-library-at-plaza-bart/

2.3.2. BART Intercept Survey at El Cerrito Plaza station

In January of 2019, BART conducted an online survey as a preliminary measure to assess the current state of how people access the El Cerrito Plaza BART station and to understand their behavior and opinions.[83] BART distributed over 1,600 postcards at the El Cerrito Plaza BART station on two separate days during morning and/or afternoon commute hours. The postcards provided a URL or QR code to access an online survey about the station. Of the 1600 postcards that were handed out, approximately 500 surveys were completed.[84]

The survey studied the travel behavior of riders, particularly where they were coming from and how they were getting to the station. The study found results that are in line with previous station access surveys on mode share splits. The survey found that walking was the most common mode choice to access the station at forty-two percent. This represents an increase in walking mode choice since the last system wide station access survey in 2015, where walking had a thirty-eight percent mode share.[85] The next most common mode choice to access the station was single occupancy automobiles at thirty-six percent. The survey found that the active transportation mode share, which includes walking and biking mode shares, was over half of all trips.[86] The vast majority of people surveyed responded that they lived within a mile and a half of the station.[87] This is reflective of the fact that the radius of the catchment area of the station is about a mile and a half due to geographical boundaries and two nearby BART locations within two miles of the El Cerrito Plaza BART Station.

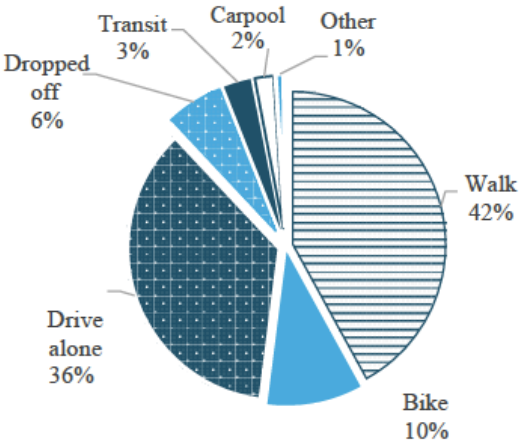


Figure 10 Pie chart of answer to how do people travel to the BART station[88]

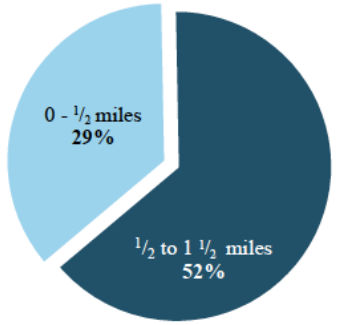


Figure 11 Pie chart or answer to how far people travel from to the BART station[89]

88 ARUP, "Access Survey Results," 5.

89 ARUP, "Access Survey Results," 7.

The survey also took a deeper dive into where people parked when they chose to drive to the station. Just over two thirds of drivers parked in the BART parking lots, with the remaining third of people parking on the nearby residential streets. For those that parked on the nearby residential streets, the vast majority were able to find a place to park within five blocks of the station. Five blocks are approximately a half mile, which is the distance that most people are comfortable walking.[90]

90 ARUP, "Access Survey Results," 6.

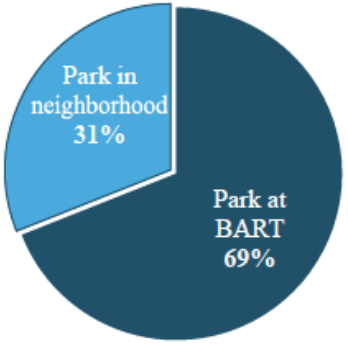
83 ARUP, "El Cerrito Plaza BART Station Access Survey Results," BART, May 7, 2019, accessed May 3, 2020, 2, https://www.bart.gov/sites/default/files/docs/2.2%202019-05-07%20Survey%20Analysis%20appendix%20summary-posted%20to%20web.pdf

84 ARUP, "Access Survey Results," 3.

85 Bay Area Rapid Transit, "BART Transit-Oriented Development Program," PowerPoint presentation, City of El Cerrito City Council meeting, El Cerrito, Ca, February 5, 2019, 9, accessed April 13, 2020, http://el-cerrito.org/Archive.aspx?AMID=41

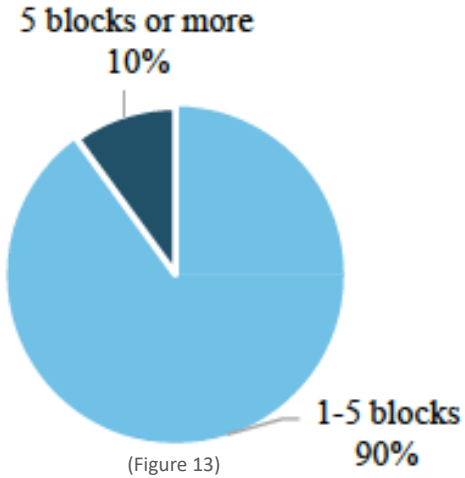
86 ARUP, "Access Survey Results," 5.

87 ARUP, "Access Survey Results," 7.



(Figure 12)

Figure 12 Pic chart of answer to where do people park when taking BART[91]



(Figure 13)

Figure 13 Pie chart of answer to how far people parked from BART[92]

91 ARUP, "Access Survey Results," 6.

92 ARUP, "Access Survey Results," 6.

The survey also asked respondents about their travel behavior and how the possible removal of the BART parking lots would affect their travel behavior. One of the survey questions asked why people chose to drive to the station. About a third of the people said that they lived too far away to walk or bike to the station. Though a mile and a half is an easily bikeable distance, there are topography issues in the eastern portion of El Cerrito and in Kensington that make biking difficult. About another third of the people chose to drive because it was the fastest mode choice. About twenty percent of the people said that they needed to pick up or drop off their kids before or after their BART ride. Of the remaining responses, it is notable that only three percent of the people drove to the station because of mobility issues.[93]

While those that live too far to walk or bike and those that have mobility issues are unlikely to change mode choice to get to the station, those that believe that driving is the fastest option could present an opportunity to change their travel behavior. With more research on where people need to drop off/pickup children, there is also an opportunity for possibly some people to change their travel behavior.

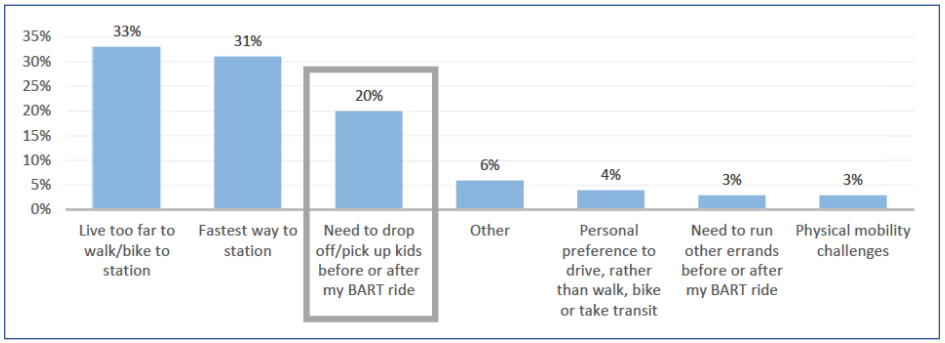


Figure 14 El Cerrito Plaza BART Survey results to question about reason for driving to BART[94]

Another survey question asked drivers how they would get to their final destination if there were no parking available at the El Cerrito Plaza BART station. About a third of the people said that they would drive to a different BART station. There are two other BART stations that are within two miles of the El Cerrito Plaza BART station, so the drive to a different station would not significantly increase travel time. Seventeen percent of people said that they would take some other mode choice than driving alone to get to their destination. About another third of the people said, they would just drive all the way to their destination.[95] Further research on what are people's final destinations could provide insight on how likely they could be encouraged to change mode choice based on pricing or time advantages.

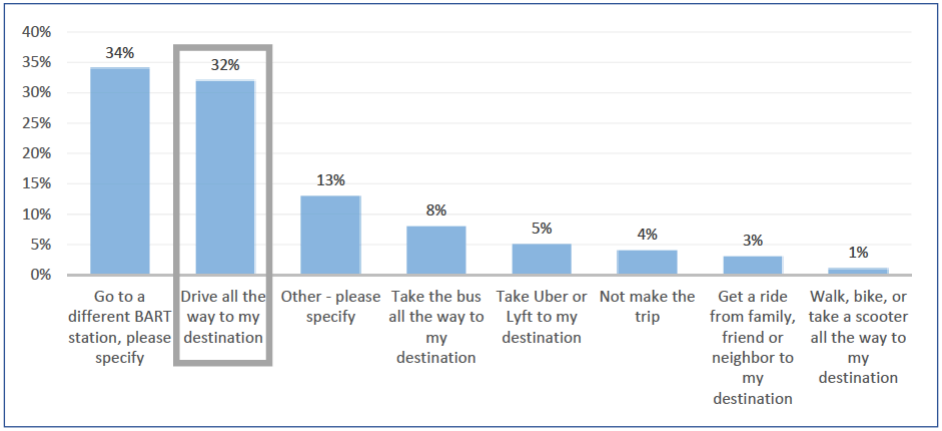


Figure 15 El Cerrito Plaza BART survey results to question about how to get to BART if no parking is available[96]

Lastly, the survey asked respondents if they would be willing to pay to park on the residential streets near the BART station. Over eighty percent of the people surveyed said that if the parking was within a five-minute walk to the station, they would be willing to pay a monthly or annual pass to park on the residential streets.[97]

93 Bay Area Rapid Transit. "BART Transit-Oriented Development Program." PowerPoint presentation, City of El Cerrito City Council meeting. El Cerrito, Ca. February 5, 2019. Accessed April 13, 2020. http://el-cerrito.org/Archive.aspx?AMID=41

94 Bay Area Rapid Transit, "TOD Program," 13.

95 Bay Area Rapid Transit, "TOD Program," 14.

96 Bay Area Rapid Transit, "TOD Program," 14.

97 ARUP, "El Cerrito Plaza BART Station Access Survey Results," BART, May 7, 2019, accessed May 3, 2020, 3, https://www.bart.gov/sites/default/files/docs/2.2%202019-05-07%20Survey%20Analysis%20appendix%20summary-posst-ed%20to%20web.pdf

2.4. Conclusion

The El Cerrito Plaza BART station parking lots are an ideal place to construct transit-oriented development for a couple different reasons. Regionally, the El Cerrito Plaza BART station is in MTC's Priority Development Area, which aims to concentrate current and future housing demand near high frequency transit. Locally, the City of El Cerrito's San Pablo Avenue Specific Plan zones the west and southeast parking lots at the station as Transit-Oriented High-Intensity Mixed-Use, which used form-based codes that aim to build dense housing and /or commercial space near transit. BART has also announced that the El Cerrito Plaza BART station is on its list of stations actively being planned for transit-oriented development.

BART has several policies and guidelines in place that could influence the creation of future development at the El Cerrito Plaza BART station. The Transit-Oriented Development Policy advocates for the creation of transit-oriented development on BART property to help increase ridership and potentially bring in more revenue than what could be achieved with parking lot fees for stations with parking lots. The Station Access Typology helps guide BART to determine how a station currently prioritizes access to the station and how they would like to prioritize access to the station in the future. BART desires for the El Cerrito Plaza BART station to be ***Urban with Parking***, which does not prioritize parking, accommodates pick up/drop off and prioritizes transit, walking and bicycle access. The Demand Based Parking Program uses demand-based pricing of parking fee to try to change parking behavior. With fees currently capped at $3 at nearly every station, including El Cerrito Plaza, changing parking demand at BART stations could be very difficult. Recent discussions at BART have indicated though that the cap may be increased or even eliminated, which could make it possible to affect parking demand again using parking fee increases. Assembly Bill 2923 gives BART the unique ability to supersede local zoning control and create their own development standards for transit-oriented development on their property. They have determined the main development standards for different development types and are currently working on how to prioritize which development to actively pursue first.

BART has already taken some measure toward planning for transit-oriented development at the El Cerrito Plaza BART station. The City of El Cerrito has been actively looking for a site for a new library and has discussed with BART the possibility of including a library as part of any new development at the site. A feasibility study is currently under study. A BART rider survey was conducted in January 2019 which asked riders about access to the station, travel behavior and opinions about parking. The survey helped to understand which people were less likely to be able to or wish to switch to alternate transportation modes and why, and which people were more likely to no longer use BART if parking was unavailable to riders.

Learning the background policies of different entities was necessary to develop a greater understand why transit-oriented development at the El Cerrito Plaza BART station is desirable and how certain policies has and will shape the design and implementation of the development. This information, along with the collected site data in the next chapter, will be useful later in the report when determining which parking management strategies could be implemented and how they are implemented.

Chapter 3: Review of existing conditions at and around the El Cerrito Plaza BART station

3.1. Parking Supply

To get a better understanding of the effects of potential new transit-oriented development with no replacement parking at the El Cerrito Plaza BART station, it is imperative to understand what parking currently exists in the area and how it is used. Since BART riders, not only park in BART owned parking lots but also on the nearby residential streets, both types of parking were examined. With the loss of BART-owned parking lots because of development, there will be greater demand imposed on the nearby residential parking, so it is just as important to understand residential parking existing conditions since any negative consequence are mostly likely to affect these areas.

3.1.1. El Cerrito Plaza BART Station Parking Lots

3.1.1.1. Characteristics

The only ***dedicated*** parking for BART riders is in the three BART parking lots located around the station. The largest of the parking lots is to the west of the station. The medium sized parking lot is to the north east of the station and the small irregularly shaped parking lot is located directly east of the station. They are all surface parking lots.

BART parking lots are only available for BART riders. When parking fees are required, payment must be made inside the station at a parking payment kiosk. The fees can also be paid for through a mobile app before entering the station but also requires verification that the rider has entered the gate. This is done by tying the riders' Clipper Card account to the parking payment app.

Figure 16 Map of BART parking lot by lot type

3.1.1.2. Parking types

There are a mix of different types of parking dispersed between the three parking lots and vary on who is allowed to park, when they are allowed to park and how much it costs to park.

There are eight different types of parking and fall into two broad categories: Open and Restricted. Open parking types are those that are accessible to anyone, though there may be some limitations to being able to use these parking spaces. Restricted spaces are limited to very specific people/purposes. Open parking types have a variety of costs, time restrictions, and limitation to accessibility.

OPEN PARKING TYPES

Open Fee Parking:

This parking type is what most people would consider traditional parking spaces. They are available on a first-come first-serve basis and are available to anyone. There is a $3 daily parking fee from 4am through 3pm Monday through Friday. All other days and times, the parking is free.

Permitted Parking:

This type of parking is more restricted than the Open Fee parking. People must sign up with BART to pay for a monthly permit to park in permit-designated spaces and at specific stations. The monthly permits cost $105 per month and is an ongoing cost, meaning they cannot just choose which months they want to pay for. If they do not pay for a pass one month, they could lose their space. This is because most stations have waiting lists for people who would like to get a monthly pass but there are currently not enough spaces to meet demand. Permitted spaces are available from 4am to 10 am Monday through Friday for those that have a permit. After 10am until 3pm Monday through Friday, these spaces then revert to being open fee parking and are then available to anyone and for the $3 daily fee. Outside of these hours and days, these spaces revert to open fee parking, but no daily fee is imposed.

Figure 17 Map of BART parking lot by parking type

Carpool Parking:
Carpool parking is a bit of a hybrid of permit parking and open fee parking. Riders are required to obtain a Carpool ID through BART, but carpool parking spaces are still available on a first come first serve basis with no designated number of Carpool IDs per station. These spaces are available similarly to Permitted Parking spaces with a $3 daily fee 4am to 10am Monday through Friday for those vehicles with at least two riders with Carpool IDs. After 10am until 3pm Monday through Friday, the spaces revert to Open Fee parking and therefore are available to anyone and for a $3 daily fee. Outside of these hours and days, these spaces revert to Open Fee parking, but no daily fee is imposed.

Motorcycle Parking:
This type of parking is the only parking that is limited to a specific type of vehicle. Because of motorcycles' small size, motorcycle parking spaces are significantly smaller than regular parking space and can keep motorcycles from using other regularly sized parking spaces that would be better utilized by automobiles. There is no fee for parking any day or time.

Handicap Parking:
This type of parking is limited to people who possess a handicap placard or license plate. These parking spaces require more space to accommodate for the use of mobility devices and mobility equipment. These spaces are available similar to Open Fee parking, with a $3 daily fee 4am to 3pm Monday through Friday. Outside of these days and time, the parking is available for free.

RESTRICTED PARKING TYPES

Station Agent Parking:
To ensure that station agents, who often need to be at the station before regular transit services start, have access to the station, there are designated parking spaces for station agents. They are the only people any day and time to park in these spaces.

Get Around Parking:
Encouraging car-free or car-lite living, having easy access to a car share vehicle can be essential to travel without the use of a personal vehicle. Transit stations are a good transfer spot to switch to carshare to finish a journey. Get Around is one carshare company in the Bay Area. There are designated spaces where only Get Around carshare vehicles are allowed to park. They are the only vehicles any day and any time that can park in these spaces.

Vendor Parking
BART stations often have at least one small retail space located just by their station entrances and some provide parking to these vendors to facilitate the convenience to bring their retail items to the location easily. These spaces are only available for the vendors and are the only ones allowed to park any day and time in these spaces.

3.1.1.3. Data Collection Methodology

As there was no detailed breakdown of number of parking spaces by each parking type available from BART, a site survey was taken of the parking lots to determine the location and number of each type of parking.

The parking lots were walked by a friend and me where parking space numbers and type of parking were recorded on a Google map satellite print out of each parking lot. Parking space numbers were recorded only at the beginning and end of lanes or where numbers broke between different lots. Total parking space quantity was determined by adding all lanes that pertained to a particular type of parking. For types of parking that were smaller in number, mostly restricted parking types, parking type was also recorded for individual parking spaces versus large continuous areas.

These data were then entered into an Excel spreadsheet. The data was used to help determine overall parking spaces per parking type and for the whole station.

3.1.1.4. Findings

Overall, there are 773 parking spaces between the three BART parking lots. There were only five restricted parking type parking spaces, so the remaining 767 parking spaces are public parking spaces that are accessible to any rider, with some limitations.

The West parking lot has about 2/3rds of the total parking spaces with 507 spaces. This lot contains the most variety of parking types. All restricted spaces are in this lot so nearly all are public parking spaces. Open fee parking spaces make up just over sixty percent of the West lot with permitted parking spaces making up much of the remainder of the West parking lot with just over thirty percent of the total parking. Handicap parking and motorcycle parking both account for about three percent each of the last remaining public parking spaces in the West parking lot.

The North East parking lot has about twenty-five percent of the total parking spaces and all are Public Open Fee parking spaces.

The South East parking lot, which is the smallest of the three lots, has the remaining approximately eight percent of the total parking spaces and all spaces are Carpool parking spaces.

3.1.1.5. Interpretation

Understanding what kind of parking is available and how much of each type there are can be useful for understanding how much parking could be lost from each lot.

Certain types of parking may be more necessary to replace over others. Handicap parking may be one of those parking types that would need to be replaced, as those with physical limitations are highly unlikely to switch to many other transportation mode, particularly active transportation modes. Replacement handicap parking could be on BART property or on nearby on-street parking spaces.

Restricted parking spaces may also be more desirable to replace since they serve very specific purposes for those people. Station Agent parking in particular is probably the most needed since opening station agents cannot use public transit to get to BART and are less likely to live around the station, so they are more likely to need to drive. Getaround parking spaces may also be desirable to replace since they can encourage more people to live without a car, but they are not a necessity. The vendor parking space is also less necessary as the vendor could drop off their merchandise and then park elsewhere.

Overall, most of the parking spaces in the three parking lots are not essential for other reasons; therefore, those riders to the station could potentially park elsewhere or be encouraged to choose different transportation modes.

3.1.2. Local On-Street Parking

The local on-street parking spaces near the station experience spillover parking of BART riders because the demand for parking is greater than the BART parking lots supply.

3.1.2.1. Characteristics

Residential on-street parking spaces are the main ***non-dedicated*** parking spaces for BART riders. There is no delineation of parallel parking spaces on the street, whereas angle parking along Fairmount Ave is delineated. There are no parking meters for on-street parking spaces.

There are two main types of on-street parking spaces and a few less usual types near the station. These parking types vary by who is allowed to use the space, what time they can be use the spaces and if there are any other limitations.

Residential Permit Parking:

To ensure that on-street parking is not filled with BART riders, many streets around the station require the use of a residential parking permit to park for more than four hours during designated times. Only residents are allowed to apply for residential parking permits. The permits cost $7 a year and each housing unit is allowed up to a maximum of four parking permits. The use of a residential parking permit to park for more than four hours is required between 7am and 6pm Monday through Friday. Anyone can park on these streets if they are parking for less than four hours during this time. Outside of these permit-required days and times, anyone can park on these streets with little restrictions. The one limitation is that automobiles cannot be parked for longer than seventy-two hours, whether or not they have a permit. Many of these residential parking permit streets are actually only on one side of the street, with open parking usually on the other side of the street.

Residential Open Parking:

Open Parking is basically unrestricted on-street parking. There is no cost to parking on these streets and there are no time limits or time restrictions on when someone can park throughout the day. The one limitation is the same as for residential permit parking, where automobiles cannot be parked on the street for longer than seventy-two hours.

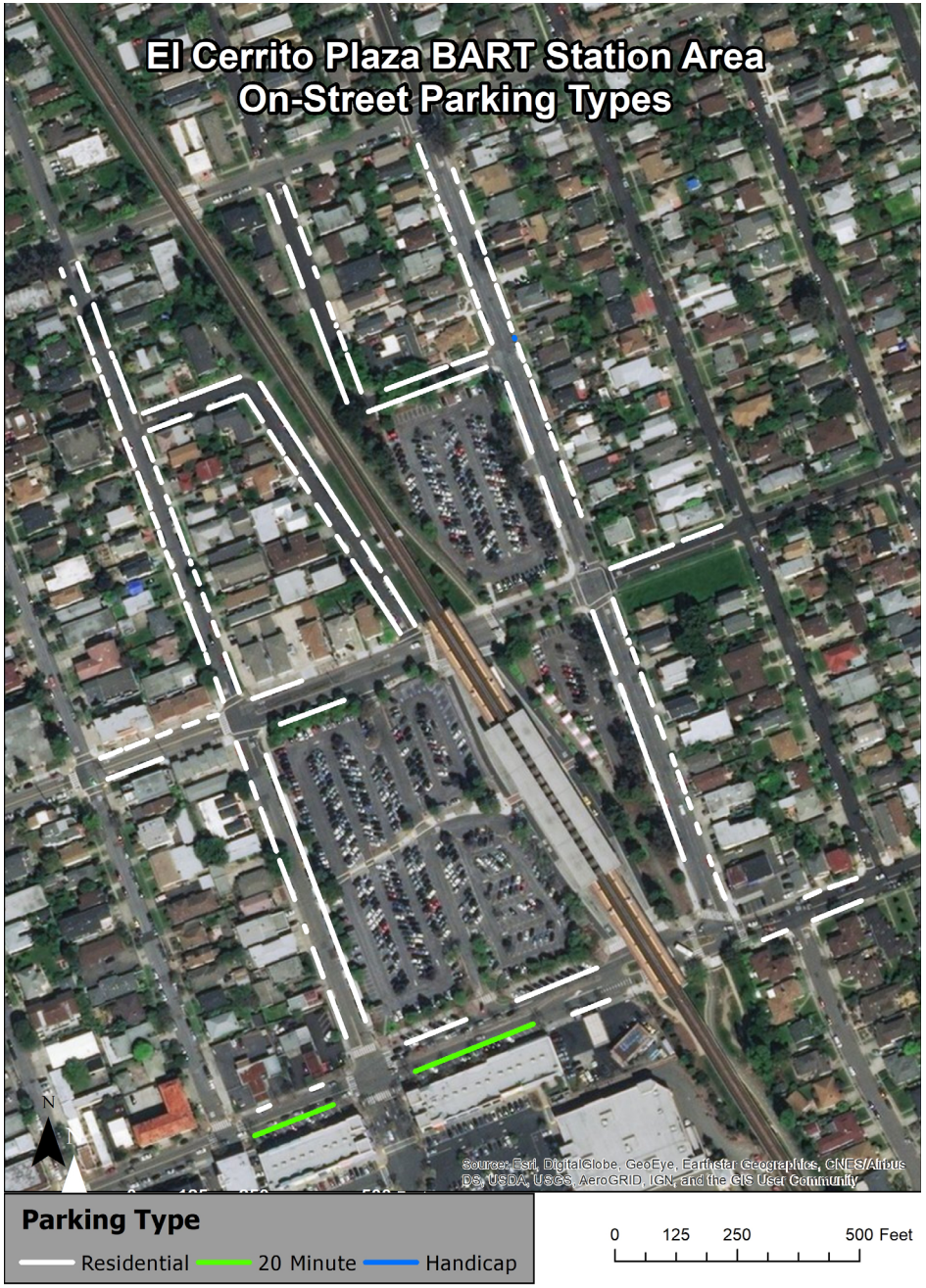


Figure 18 El Cerrito Plaza BART station area on-street parking types map

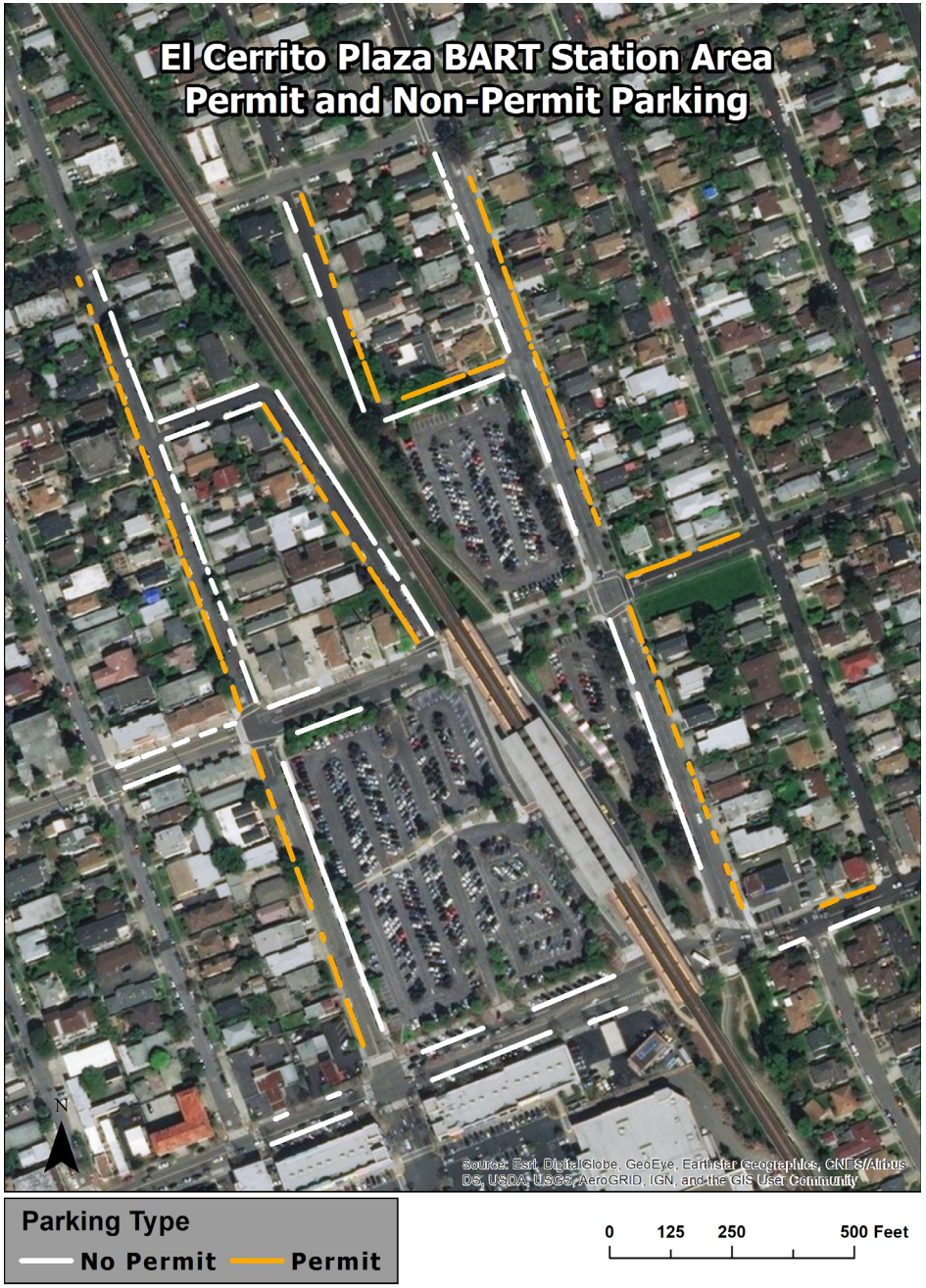


Figure 19 El Cerrito Plaza BART station area permit and non-permit parking map

20-minute Parking:

Near the El Cerrito Plaza shopping center, there is angle parking that is designated as 20-minute parking. These parking spaces serve the retail establishments in the shopping center and these 20-minute parking spaces ensure that BART riders do not spill over onto nearby streets, where there is a necessity to maintain parking spaces that can be turned over to ensure available parking spaces for customers. There is no cost to park in these spaces and the only time limit is the 20-minute maximum parking time.

Handicap Parking:

Although handicap parking is more often found on streets in commercial districts and not on residential streets, some on-street handicap parking can be available. These spaces are at no cost just like other on-street spaces and have no time limits or regulations throughout the day. These spaces do require a handicap tag or a handicap license plate. The only other limitation is similar to other parking spaces limitation where an automobile cannot be parked for longer than seventy-two hours.

3.1.2.2. Data Collection Methodology

The first step to determining the amount and type of on-street parking was to determine the area that would be subjected to potentially spillover parking from BART riders. An initial quarter mile distance from the station was initially set, because a quarter mile is considered an easily walkable distance and what most people are willing to walk from parking to the station. With the amount of data that needed to be collected for this, as well as other data, the study area was reduced to make the site analysis manageable for one person. The streets that were immediately adjacent to BART parking lots and up to one block in most directions was the limit of the streets analyzed.

To determine the types of on-street parking, some data was already available, and some data needed to be collected. The City of El Cerrito has data on which streets are Residential Permit streets. The other types of parking types for on-street parking space was determined through site analysis. I walked the area to determine the parking type for each block and only for handicap parking, the parking space type.

As the parking spaces on the street are not delineated, determining the number of parking spaces around the station could not be done just by counting, like in the BART parking lot spaces. While walking the area to determine parking types for each street block, I measured the distance between curb cuts and/or curbs to find the street area that could potentially be parked. I used a walking measuring stick to measure the distances from curbs to driveways and driveways to driveways. The curb or driveway house numbers were used to delineate the beginning and end of each parking area.

Figure 20 El Cerrito residential parking permit required streets[98]

98 City of El Cerrito. "Community View/GIS: 4-hour Parking Zones." El-Cerrito.org. Accessed May 7, 2019. http://maps.digitalmapcentral.com/production/VECommunityView/cities/elcerrito/index.aspx?

These data were entered into an Excel spreadsheet. Using these data, the number of ***potential*** parking spaces could be determined. An eighteen-foot length was the measurement used to delineate a parking space. This is an average car parking space length and most cars are able to park in this parking space size, except some large SUVs and large trucks. After the number of parking spaces was determined, I went through to determine if any additional parking spaces could be delineated

if a sixteen-foot compact parking length was exchanged for some eighteen-foot parking lengths. I also tried to determine if any parking areas that previously did not have enough area to support a single parking space could fit a sixteen-foot compact parking space.

3.1.2.3. Findings

Using only the eighteen-foot parking space length, the entire study area had 337 parking spaces. Of these, 111 are residential permit parking spaces, including one handicap parking space, 33 are 20-minute parking spaces, and 193 are open parking spaces.

If the sixteen-foot parking space length was swapped or added for some of the parking area, the study area had potentially 23 more parking spaces. Though not counted, several parking areas that are below the compact parking space length could potentially be used for motorcycle parking or even a super compact car parking space with a fourteen-foot parking space length. These could be used for vehicles like Fiats or other similar cars that have short lengths.

Though not allowing for any additional parking spaces, many parking areas had enough parking area to allow for twenty-foot length parking spaces. These could accommodate some of the larger vehicle types that may otherwise find it a challenge to park in other average length parking spaces.

3.1.2.4. Interpretation

The number of available open parking spaces in the study area is nearly equal to the number of parking spaces in the North East parking lot. This represents a significant amount of additional parking near the station. This also does not even account for the all parking areas that are within a quarter-mile walk from the station entrance. There could be significantly more demand on these open on-street parking spaces if the BART parking lots are transformed into transit-oriented development and there is no replacement parking on BART property. There will continue to be a need to balance residential parking needs and BART riders parking needs.

Though residential permit parking is only available on some streets, whether those streets are actually needed for residential parking during the day is questionable. If some of those parking spaces are consistently being underutilized, they could potentially add additional parking to be used by BART riders.

3.1.2.5. Further research

As the data collection methodology previously discussed, all the streets within a quarter mile walking distance from the station entrance could not be studied. If another site analysis were to be conducted, all the streets within a quarter mile should be measured. It could even be potentially useful to measure and analyze up to a half a mile walk from the station entrance as when supply becomes greatly diminished, people may be more willing to walk further than they are currently willing to walk if it means they can find a parking spot.

3.2. Parking Utilization

To better understand the effect of loss of parking from transforming BART parking lots into TOD and the spillover effect it can have on the nearby residential parking, it was necessary to get a better understanding of how the parking was used throughout the day. It is also important to understand how parking is used on the different types of parking spaces.

3.2.1. El Cerrito Plaza BART station parking lots

3.2.1.1. Data Collection Methodology

BART maintains a record of fill times for each of these parking lots. This is the average time that the parking lots at any given station fills to capacity. These records do not include a breakdown of parking fill times by parking type, and certain parking types may not be at capacity even when the lot is considered at full capacity. As this is also an average, any given days may not reach capacity at all or reach capacity at a different time. Usually later fill times are on Fridays, especially before a holiday weekend and non-federal holidays.

3.2.1.2. Findings

BART's station page for El Cerrito Plaza lists the average fill time as 7:50 am as of March 2020. This is earlier than the 8:30 am average fill time in 2015. Like many stations within the BART system, parking lots' average fill times have become earlier and earlier over the years.

Though there is no BART records of average fill times by parking type, having used this station for my own personal transportation needs, I know that the permitted parking that is available until 10am is never full by that time, but quickly fills when those unused parking spaces are reverted back to Open Fee parking spaces. I also know that the motorcycle parking spaces never reach capacity and often seem barely used. Additionally, the handicap parking seems to always be full, even on the weekends.

3.2.1.3. Interpretation

Since there is no turnover of parking until the afternoon, the only way for people to get a parking space in the parking lot would be to get there earlier and earlier before the lot fills up. This is not a good long-term strategy to maintain access for riders to the station. Though this lack of parking may influence some people to use a different mode to get to the station, others may decide to drive all the way to their destination instead of taking BART because of this lack of parking.

As the demand for parking at this station outstrips the supply, the price of parking may be one variable that effects the demand. When the price for a good is set too low, it can create a demand higher than what can be supplied. Since the demand for parking is concentrated all in the morning on weekdays and little demand at any other time, the parking fee at this station is not adequately priced to balance supply and demand.

3.2.1.4. Further research

Since BART does not distinguish when or if each parking type reaches average capacity, if a site analysis was performed for the station parking lots, measuring average fill times by parking type would be very important. On the flip side, measuring the average time when parking lots are ***under*** a certain fill percentage, like ninety-five percent, could provide insight on to when demand starts to diminish. In addition, averaging daily fill times for each day of the week, and well as averaging fill times for federal holidays would be useful. These other measurements could help to understand what the appropriate parking fees are to charge and how to vary those fees by these variables.

3.2.2. Local On-Street Parking

3.2.2.1. Data Collection Methodology

The same study area that was used to determine the number of parking space was also used for a parking occupancy study to determine how much of the parking was used on the local streets. I choose to collect the data on a Thursday in May, so that it reflected an average BART day. Monday are typically busier than other days of the week and Fridays are typically slower than other days, so a Thursday represent a day with demand that was not high or low. The study was also performed in May since it represents an average day of the year. Rainy winter days usually have higher demand as people prefer not to drive as much and drier spring and summer days are more typical of weather in the Bay Area. May is also during the school year, as the summer months see decreased demand when kids and adults are not in school.

I walked the study area on a specific route that allowed me to not double back on any street. I walked this route at 6am, 10 am, 2pm, and 6pm to get a good range of times to see the differences in demand throughout the day. I tallied the number of cars parked on any given block, distinguishing between vehicles parked with and without a residential parking permit. I also tallied how many open parking spaces were available. Since these parking spaces were not delineated, I used a rough estimate by walking 12 normal stride steps to approximate a parking space. I also noted any unusual or interesting info that came up that was outside of the other variables.

These data were entered into an Excel spreadsheet. These data were used to determine the percentage that each block side was full. A block's full percentage was calculated by dividing the total of both full parking with and without permit spaces by total spaces tallied, where total spaces is the full parking tallied with and without permits and empty spaces tallied. The number of potential spaces for each block side that was determined in the previous site analysis was not used because the 'perfect' number of parking spaces does not matter if the parking spaces are not actually delineated. What matters to parkers is if there is a big enough space to park their car.

These data were also used to determine the percentage of vehicles parked with a permit out of all the full parking on residential permit parking block sides. A block's percentage of full permit parking was determined by dividing the amount of full permit spaces by the total amount of full parking spaces with and without permits. The percentage on non-permit full parking was determined by subtracting the percentage of full permit parking from one hundred percent. These percentages help to break down the makeup of the full parking spaces on residential parking streets to understand if other non-residential parkers are utilizing the residential permit parking spaces.

Breaking down these data even further, the data was used to determine the percentage of vehicles parked with a permit out of the total number of spaces tallied on a residential permit parking block side. A block's percentage of full permit parking was determined by dividing the number of full permit parking by the total number of parking spaces tallied. The percentage of empty and full non-residential permit parking spaces was determined by subtracting the percentage of full permit parking by one hundred percent. These results can help to understand how much permit holders actually use the permitted street parking.

These percentages were determined for each of the four different tally times and each given an overall average for the day. All of the percentages were determined not including the 20-minute parking block sides except for overall percentage full. These block sides were not included because these are not actually available for BART or residential use and represent a completely different type of usage. It is still included for reference since it is directly adjacent to the station parking lots.

3.2.2.2. Findings

The total percentage of parking that was full for all streets at all times in the study area, including and excluding 20-minute parking, was about seventy percent.

The percentages of full parking have a reasonable degree of variability when looking at different times and different parking types. For all streets, excluding 20-minute parking, the percentage hovered in the mid-seventy to min-eighty range for most of the day but then dropped to around fifty-five percent at 6 pm.

Percent Full			
Time	Total	Permit	No Permit
6:00 AM	74.83%	51.84%	81.21%
10:00 AM	83.28%	76.00%	84.98%
2:00 PM	77.99%	58.81%	83.50%
6:00 PM	55.19%	50.42%	52.74%

Figure 21 Table of percentage of full parking by time and parking type

For parking permitted streets, the percentages hovered around fifty to sixty percent at all times of the day except for at 10am, where it was around seventy-six percent. The open parking percentages hovered around eighty to eighty-five percent for most of the day and then drops significantly at 6pm to around fifty-three percent.

Percent Full			
Time	Total	Permit	No Permit
6:00 AM	74.83%	51.84%	81.21%
10:00 AM	83.28%	76.00%	84.98%
2:00 PM	77.99%	58.81%	83.50%
6:00 PM	55.19%	50.42%	52.74%

Figure 22 Table of percent of full parking by time and parking type

Besides the difference of percentages between full blocks at different times for each street type, there is also considerably different percentage full between parking types at different times of the day. At 6am, the open parking streets are about thirty percent more full than residential permit streets, but by 10 am the streets' percentage are close to each other, with only about a ten percent difference. At 2pm, the two street parking types diverge again with the open parking streets being about twenty-five percent more full than residential permit parking. By 6pm, the streets' percentages are nearly identical with only a one percent difference.

Percent Full			
Time	Total	Permit	No Permit
6:00 AM	74.83%	51.84%	81.21%
10:00 AM	83.28%	76.00%	84.98%
2:00 PM	77.99%	58.81%	83.50%
6:00 PM	55.19%	50.42%	52.74%

Figure 23 Table of percent of full parking by time and parking type

The maps of the percentage of full parking for permit and no permit individual street blocks shows that there is considerable variety in the percentage of full parking between streets blocks and between the same street block at different times of the day. There is a noticeable increase in the quantity of blocks over ninety percent full at 2 pm and an increase of blocks under fifty percent full at 6 pm.

Taking a closer look at the break down of the makeup of the full parking, the percentage of parked with permit out of all full parking on residential permit streets was just over fifty percent. When looking at different times of the day, full permit parking was considerably higher at 6am, with permit, parking being about sixty-five percent of the total full parking but then for the rest of the day the percentage of full permit parking hovers between forty-eight and fifty-seven percent.

Figure 24 El Cerrito Plaza station area parking occupancy study percentage full parking 6 am map

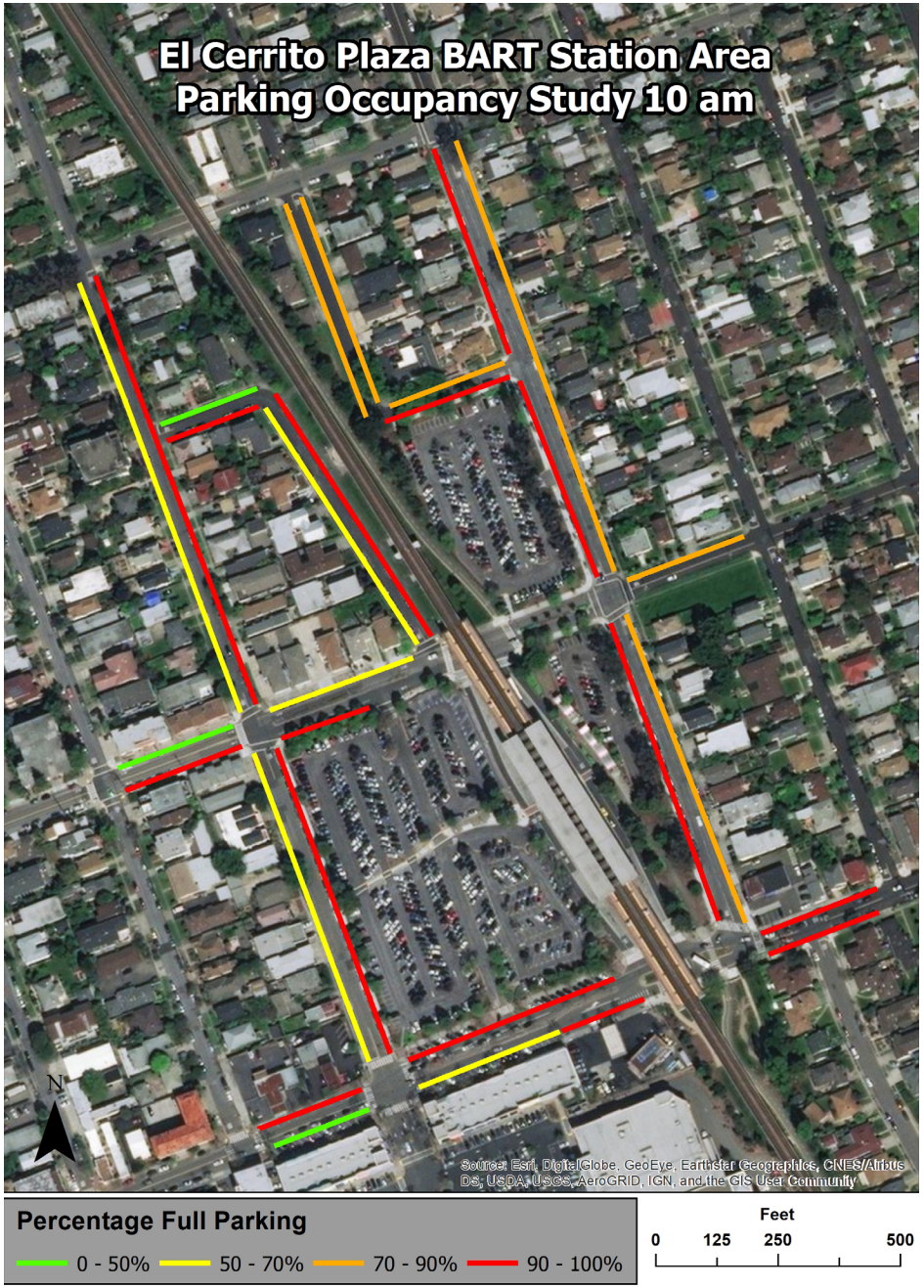


Figure 25 El Cerrito Plaza BART station area parking occupancy full parking 10 am map

Figure 26 El Cerrito Plaza station area parking occupancy study percentage full parking 2 pm map

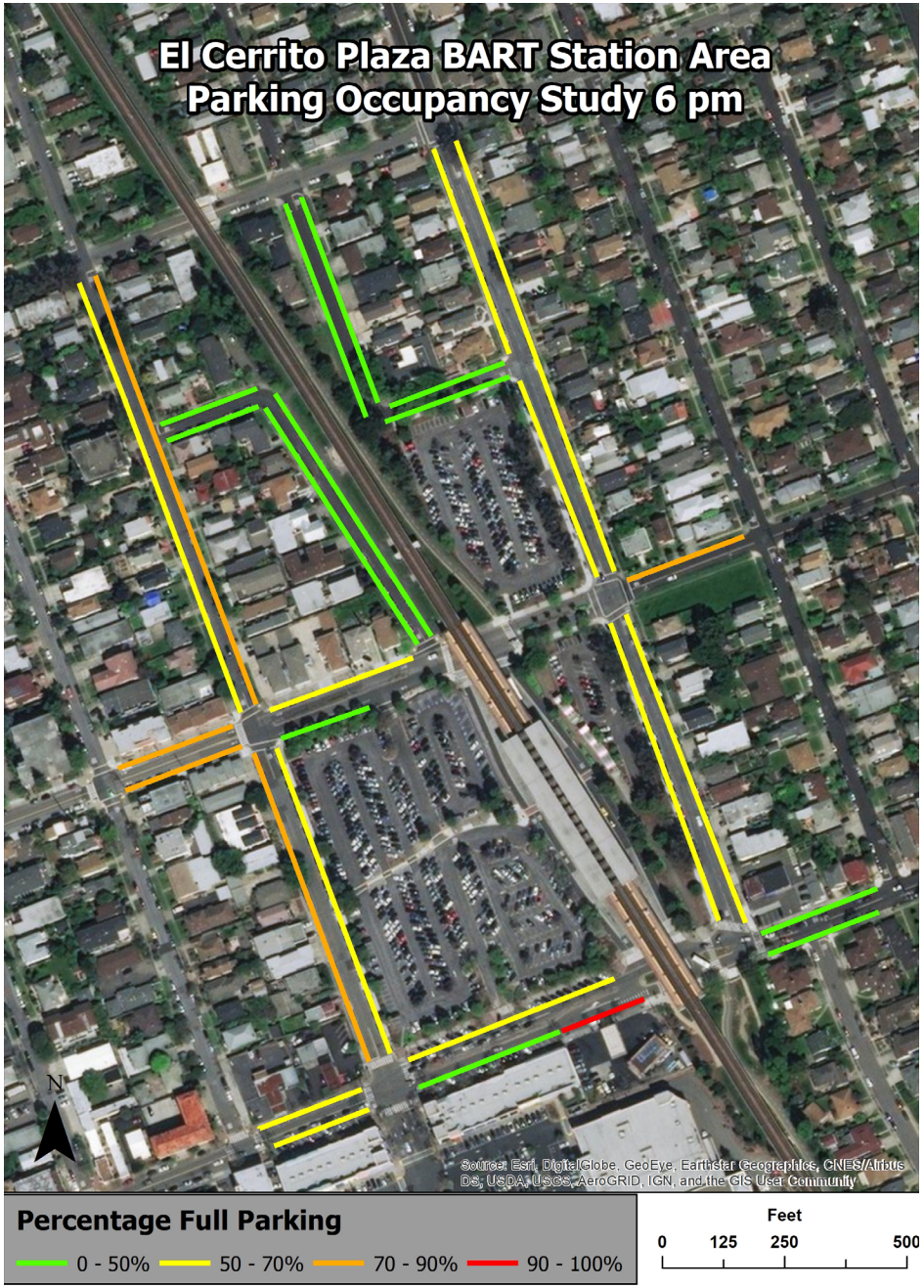


Figure 27 El Cerrito Plaza station area parking occupancy study percentage full parking 6 pm map

Percent Parked with Permit of Full		
Time	Permit	No Permit
6:00 AM	65.30%	34.70%
10:00 AM	47.56%	52.44%
2:00 PM	56.88%	43.12%
6:00 PM	50.37%	49.63%

Figure 28 Table of percentage of parked with permit of full parking by time and parking type

The maps of the percentage of parked with permit of the full parking for permitted street blocks shows that there is less variety between streets, with only a few smaller streets reaching over ninety percent of parked with permit of full parking, and less variety between the same street block at different times of day, showing some level of consistency of demand for residential permit parking.

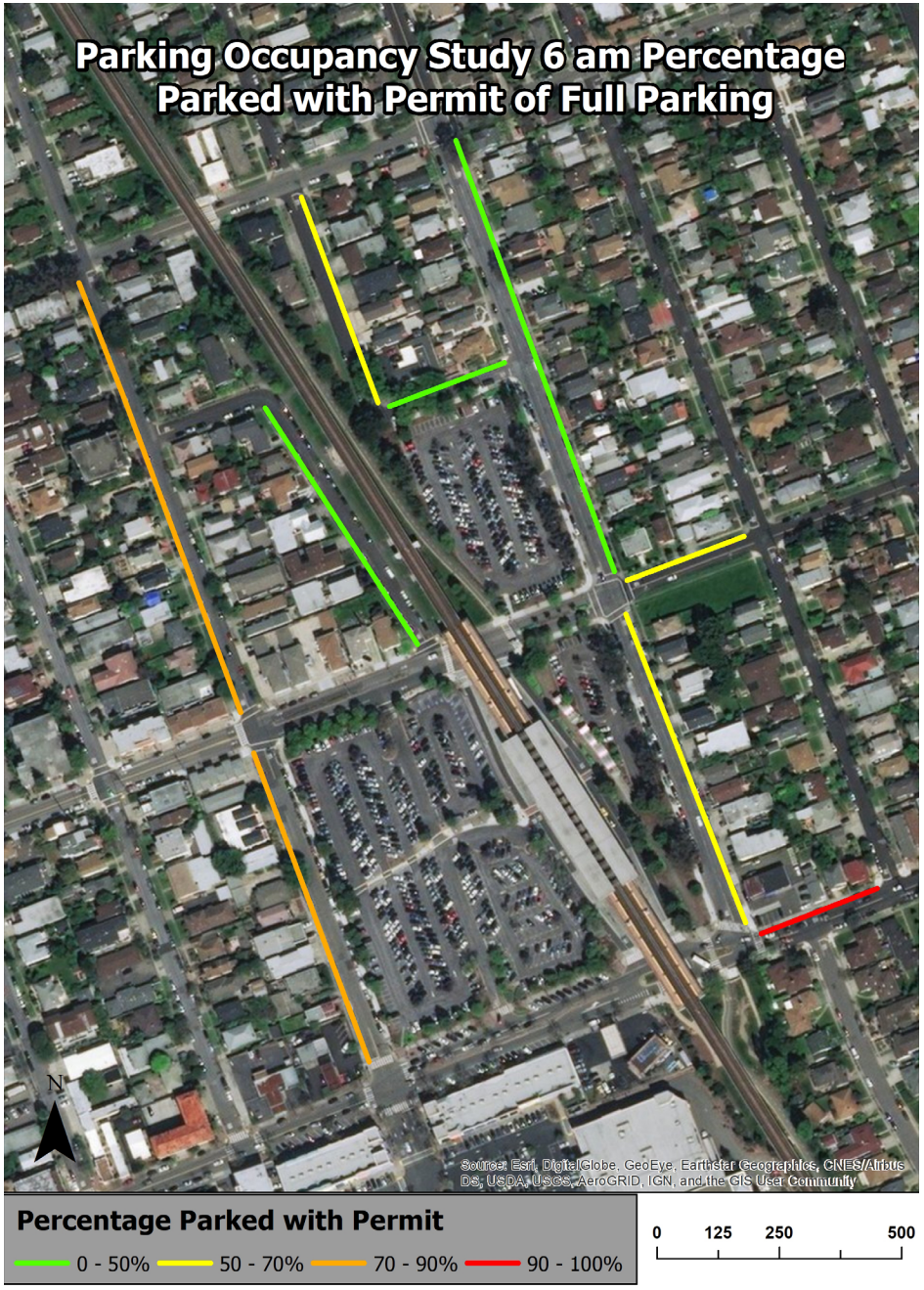


Figure 29 El Cerrito Plaza station area parking occupancy study percentage parked with permit of full parking 6 am map

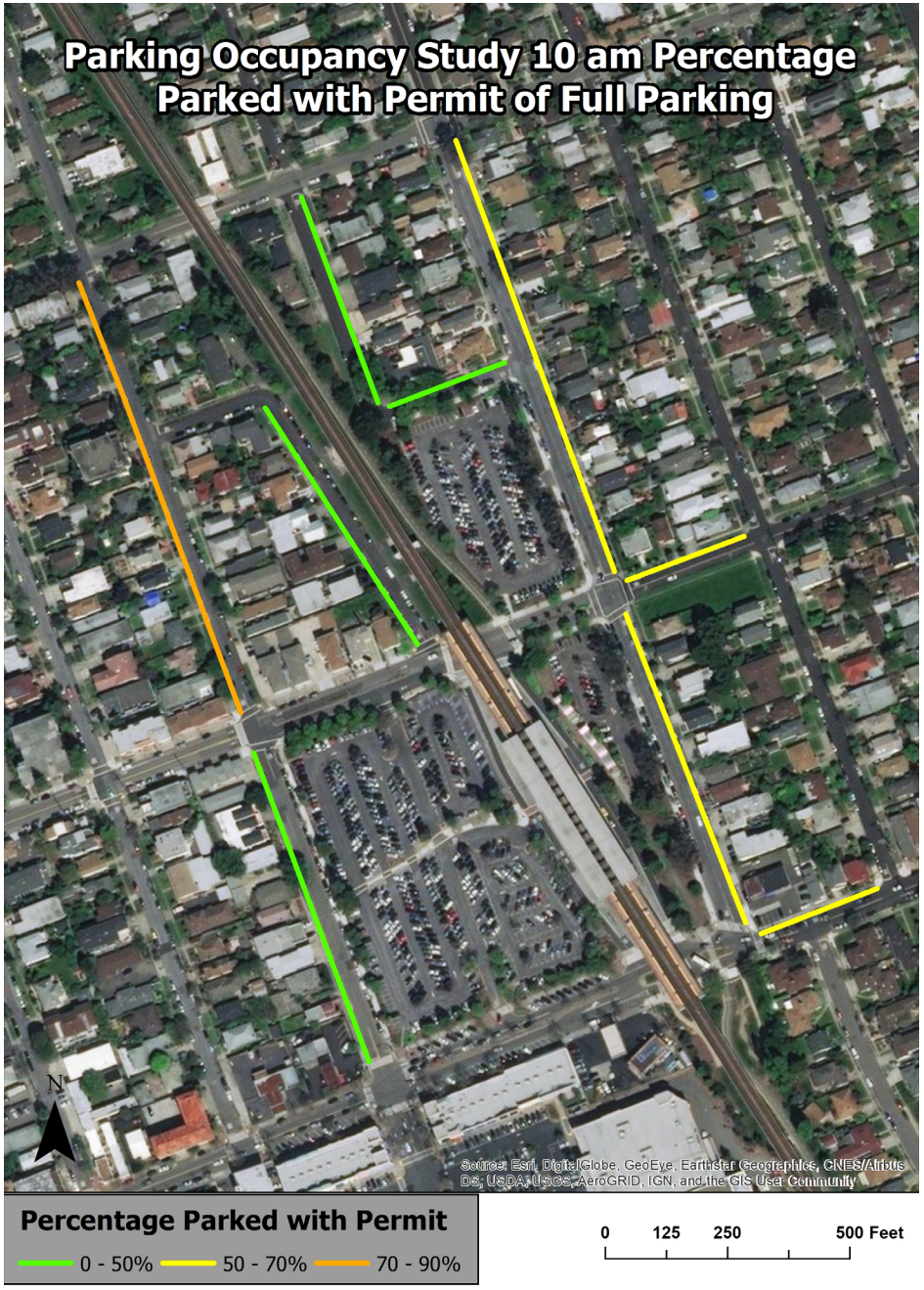


Figure 30 El Cerrito Plaza station area parking occupancy study percentage parked with permit of full parking 10 am map

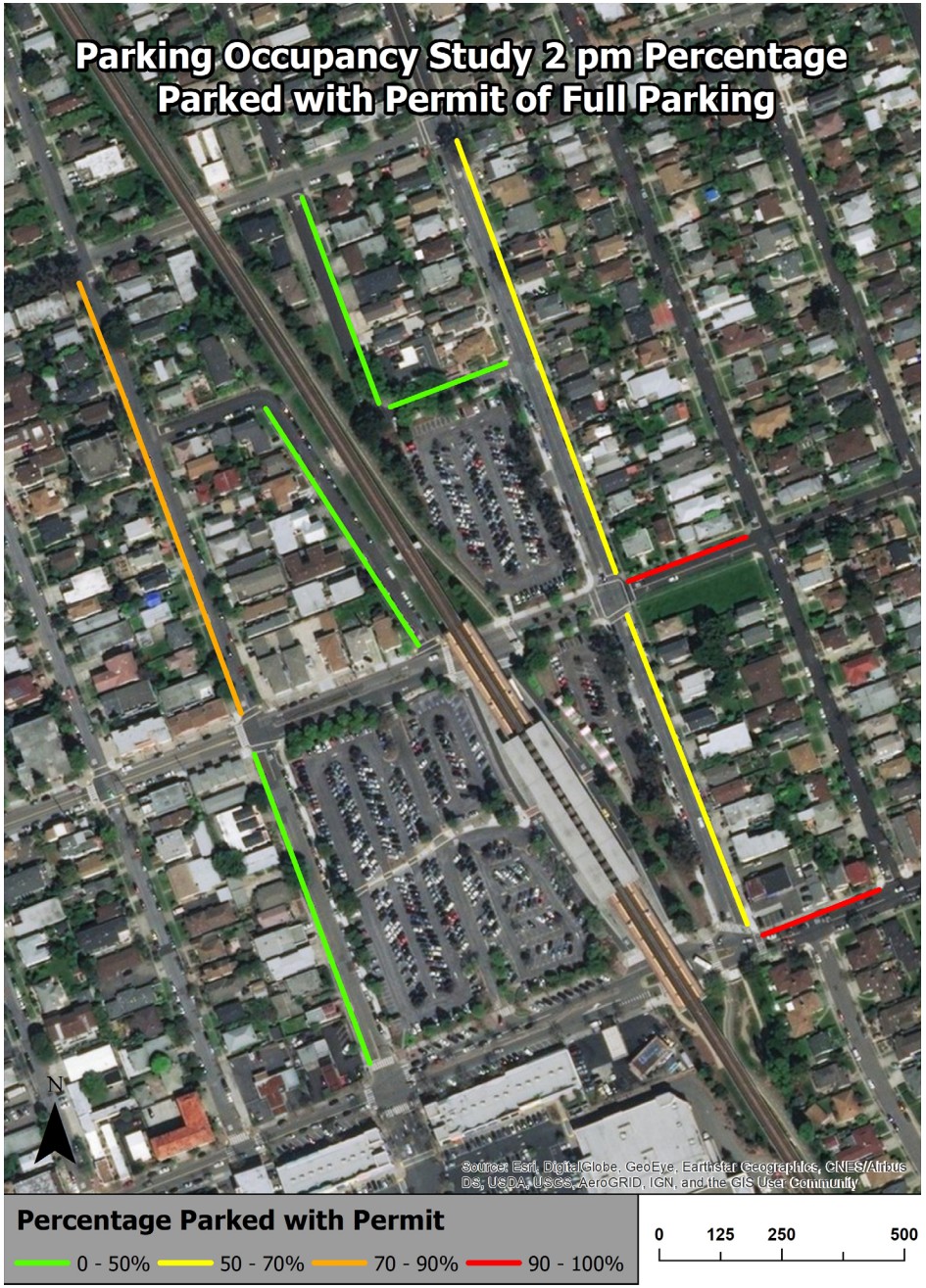


Figure 31 El Cerrito Plaza station area parking occupancy study percentage parked with permit of full parking 2 pm map

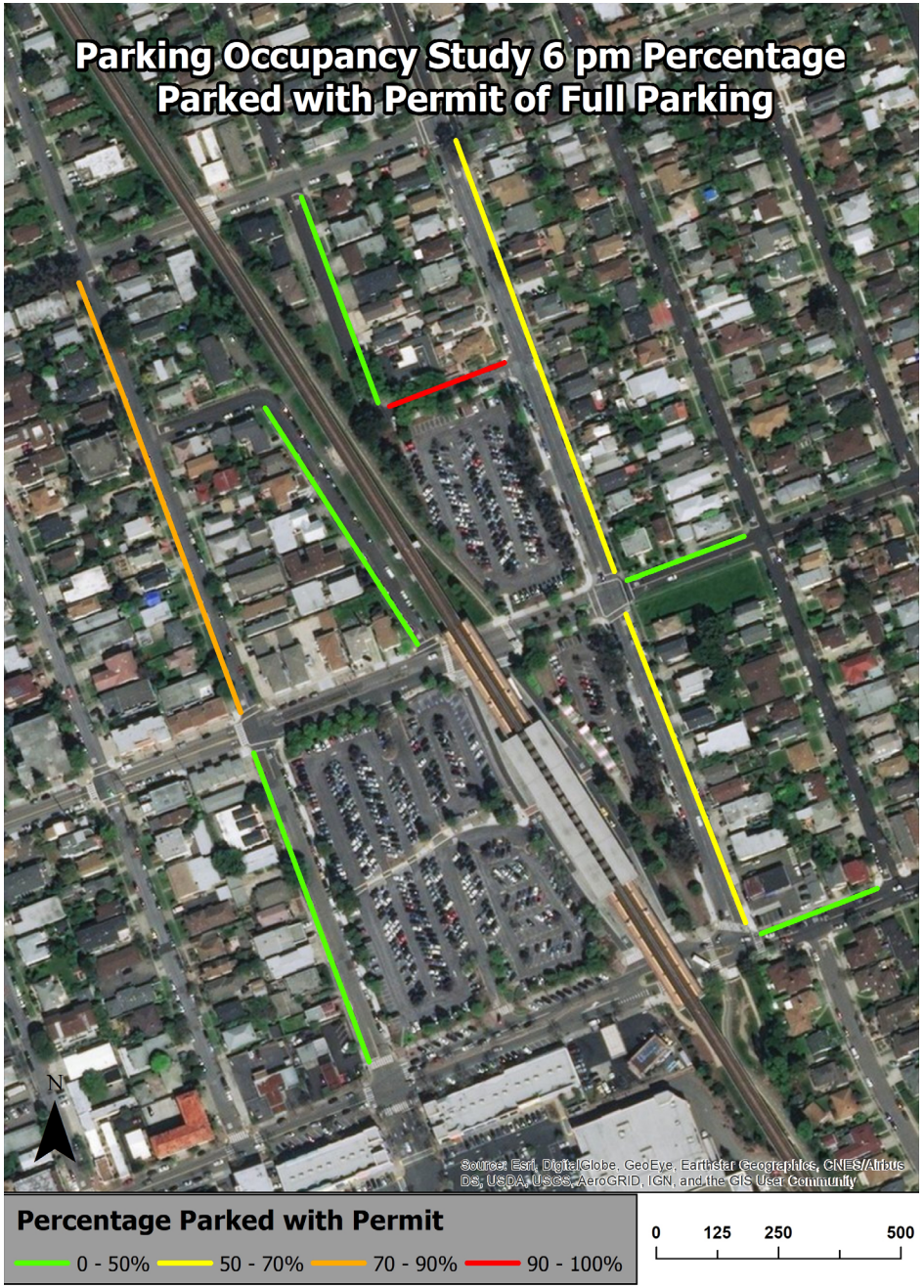


Figure 32 El Cerrito Plaza station area parking occupancy study percentage parked with permit of full parking 6 pm map

For a further nuanced look at the makeup of full parking, the percentage of residential permit parking out of the total parking spaces tallied is about thirty-one percent. When looking at different times of the day, full permit parking was fairly steady during the day, hovering between thirty-one and thirty-seven percent and then dipping slightly at 6pm to about twenty-four percent.

Percent Parked with Permit of Total Available		
Time	Permit	No Permit
6:00 AM	35.90%	64.10%
10:00 AM	37.01%	62.99%
2:00 PM	31.28%	68.72%
6:00 PM	24.08%	75.92%

Figure 33 Table of percent parked with permit of total available parking by time and paring type

The maps of the percentage of parked with permit of total available parking by street block shows almost no variety between street blocks or between street blocks at different times. Nearly all streets have less than fifty percent of parked with permit of total available parking. Since these are permitted street blocks, it shows that there is potentially considerable parking that is being underutilized, since the only other people allowed to park on these streets are people parking for less than four hours, which is not the typical BART rider.

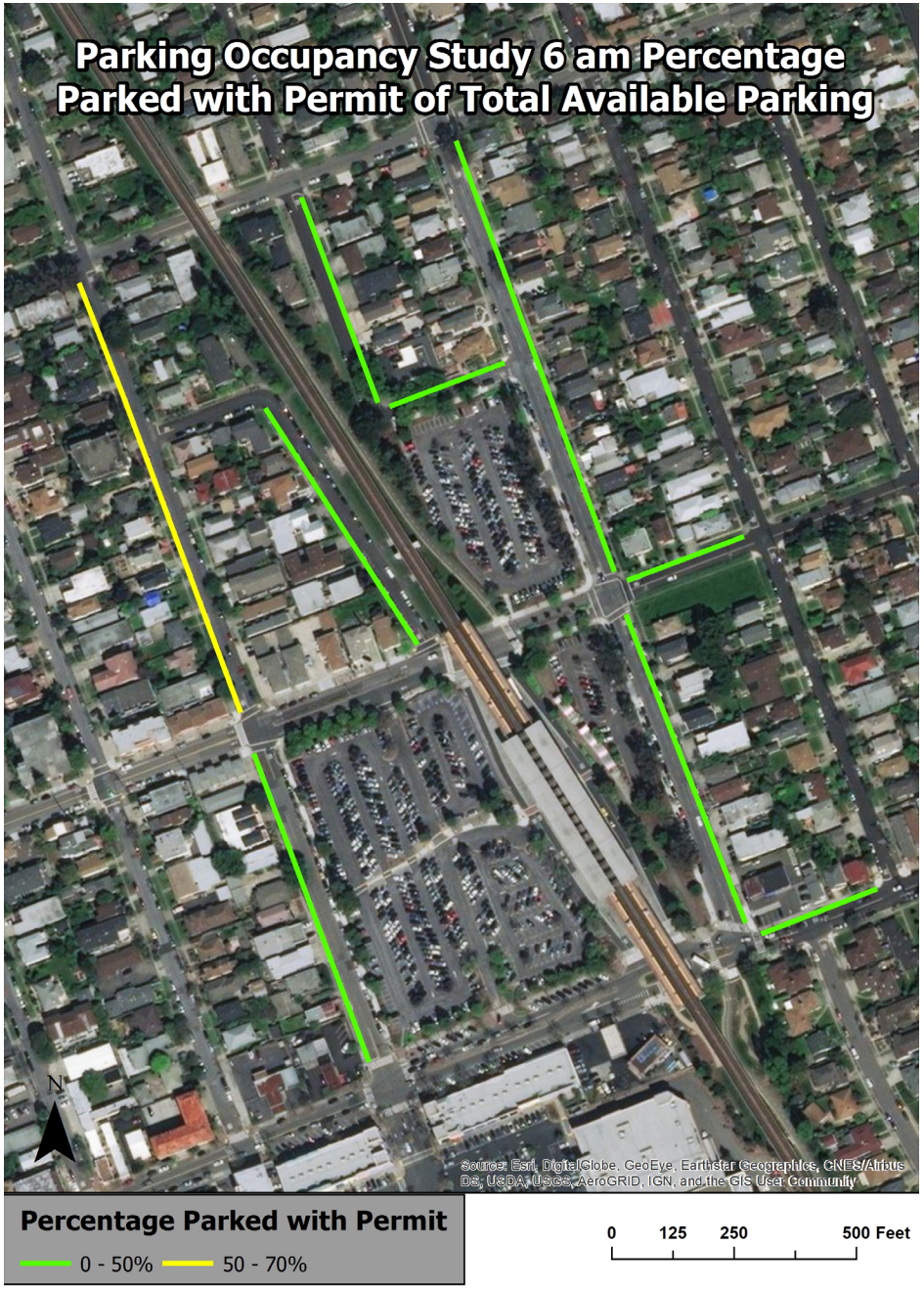


Figure 34 El Cerrito Plaza station area parking occupancy study percentage parked with permit of total parking 6 am map

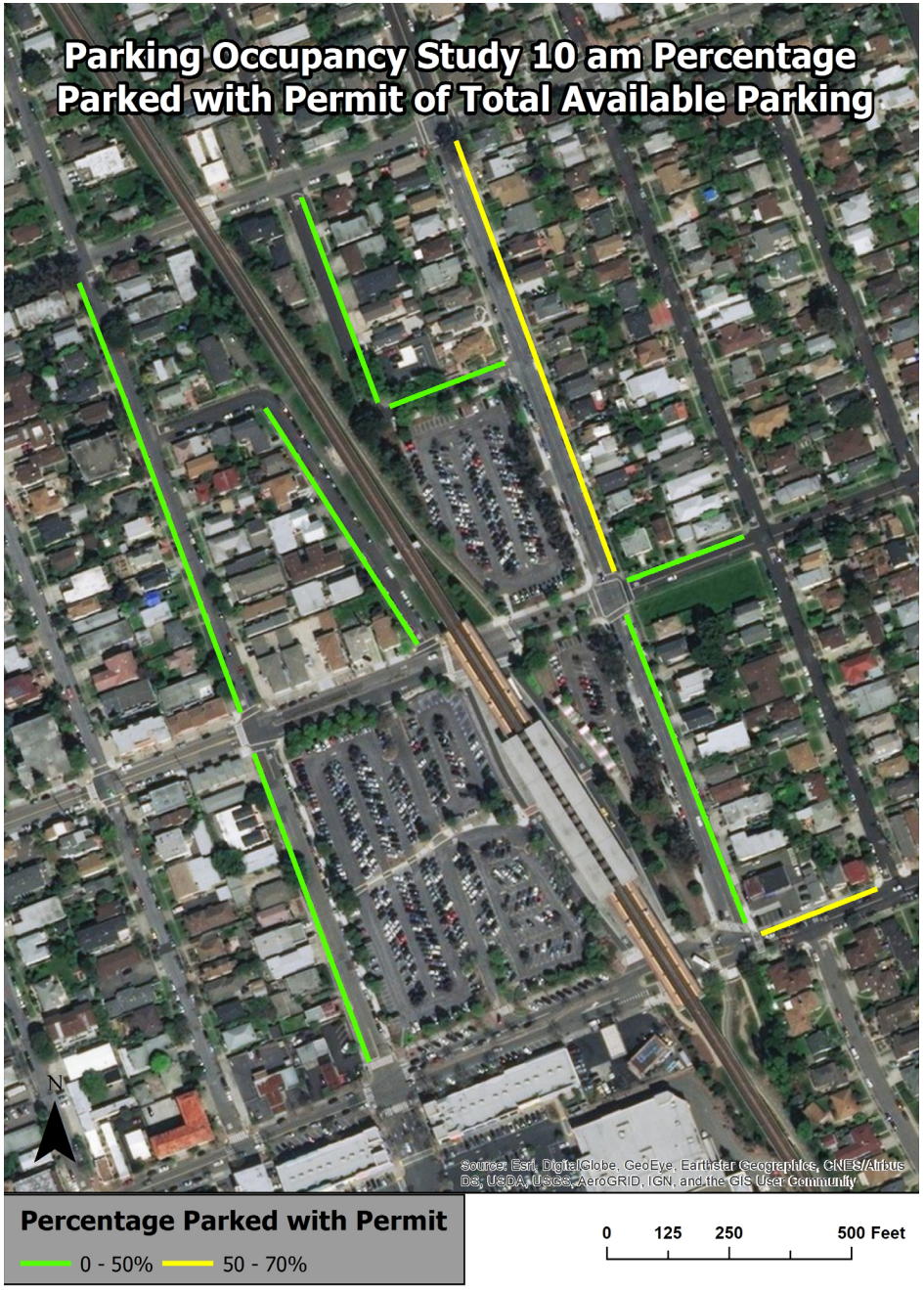


Figure 35 El Cerrito Plaza station area parking occupancy study percentage parked with permit of full parking 10 am map

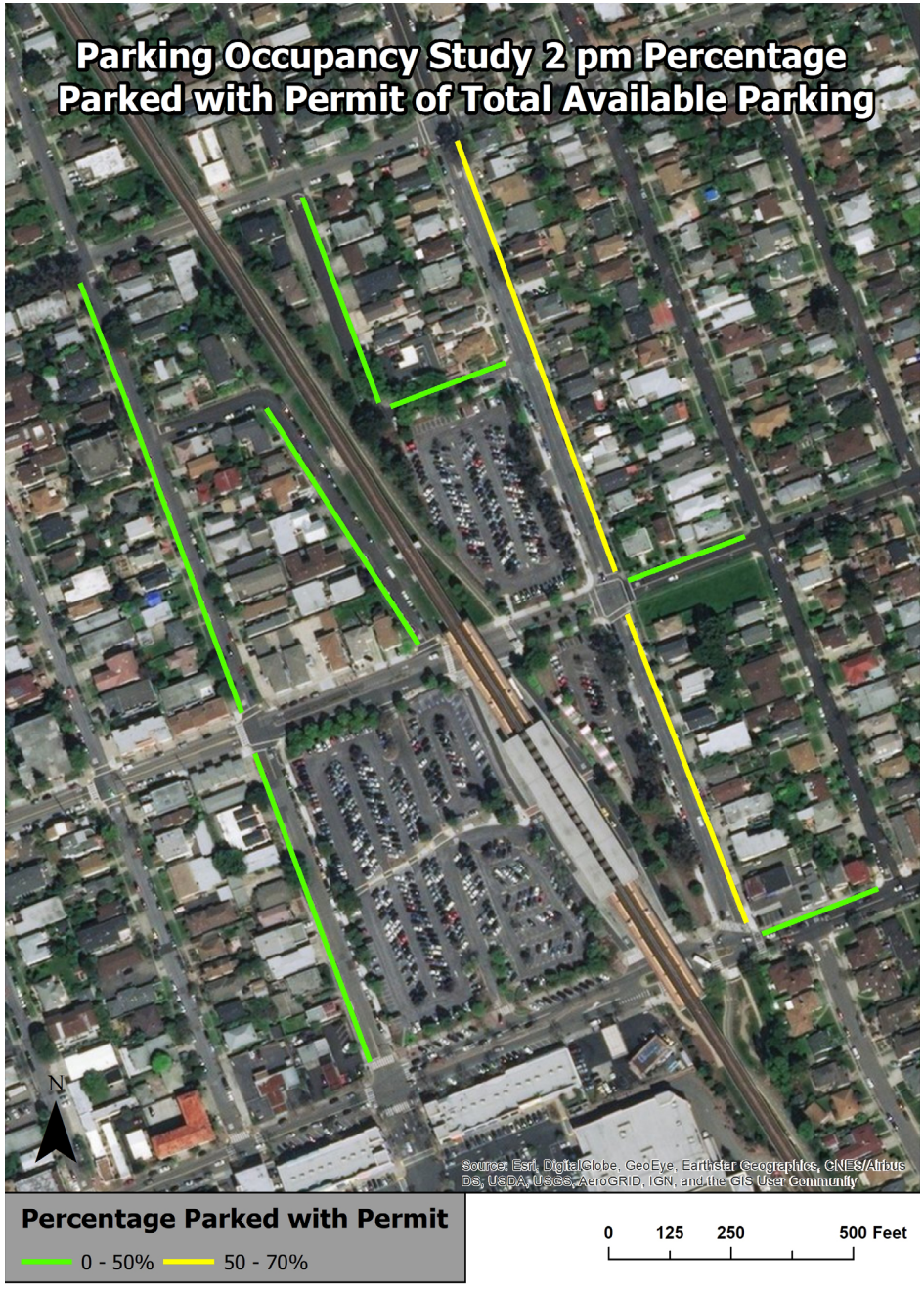


Figure 36 El Cerrito Plaza station area parking occupancy study percentage parked with permit of full parking 2 pm map

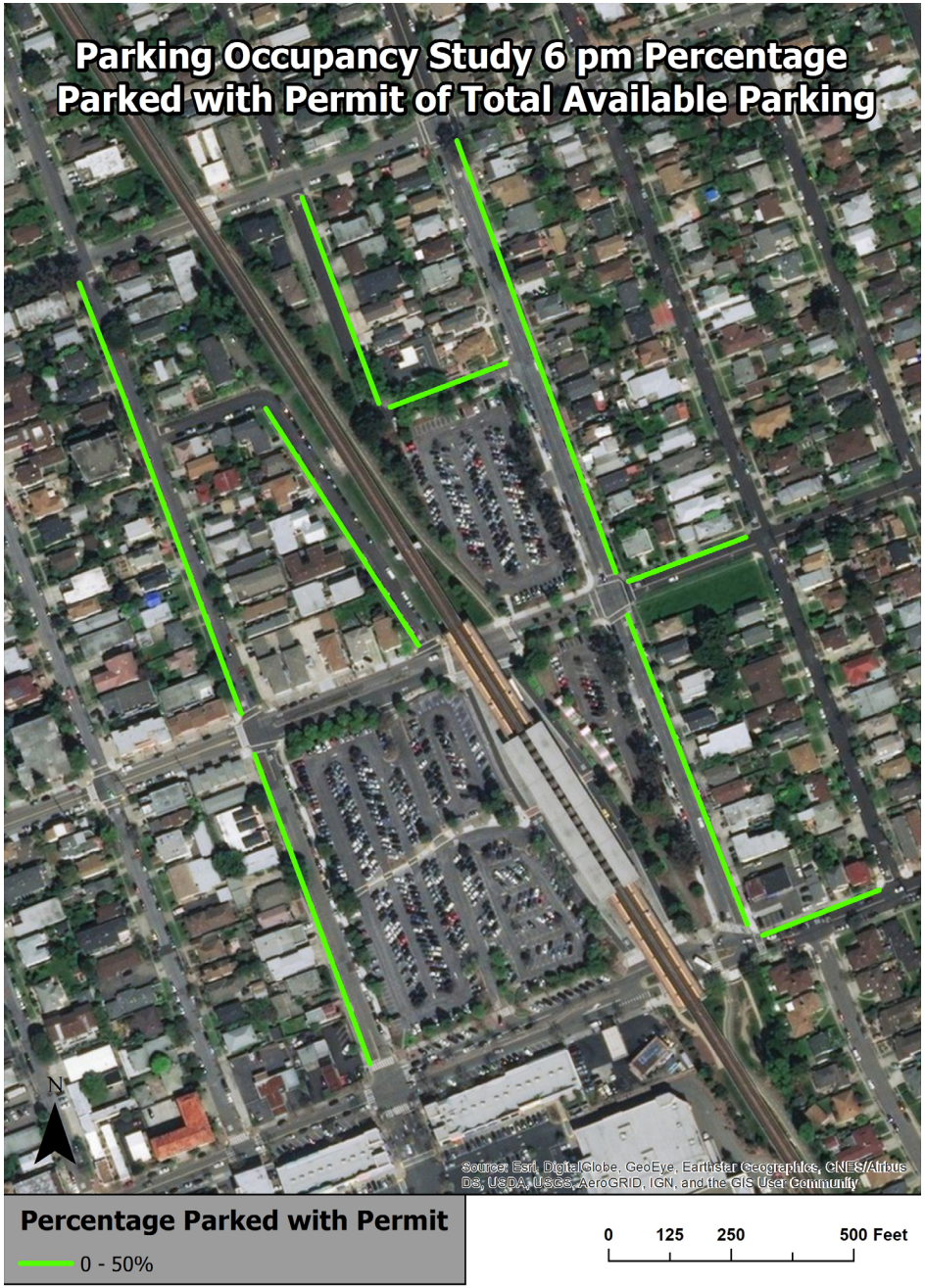


Figure 37 El Cerrito Plaza station area parking occupancy study percentage parked with permit of full parking 6 pm map

3.2.2.3. Interpretation

The seventy percent full parking overall shows that the parking in the area is well utilized but not at capacity.

The high percentage full parking between 6am and 2pm with a sharp drop in percentage full parking at 6pm is reflective of the high demand for parking during morning commute hours and the necessity of cars to be parked in these areas until people return from work.

The variation in percentage full parking by type of parking and time present some interesting findings. Residential permit parking was always less fully parked than the open parking streets and by anywhere from ten to thirty percent differences except at 6pm when parking demand decreased, and the percentages were nearly equal. This is reflective of the fact that demand is less for parking outside of morning commute times. I would have anticipated more overall full parking at 6pm then I saw because many of the people who live in the area return from work and park in the neighborhoods. This could indicate that residential parkers more often return to the area after 6pm. As I lived on one of these streets, I know that late night the parking can become very full.

Though the permit parking was significantly lower than non-permit parking, the percentage of permit parkers out of the full parking was considerably higher at 6am than at any other time of the day. This could reflect a more accurate representation of the percentage of residential permit holders, as people who live on these streets are often still at home this early in the morning. Even when the percentage of full parking increases considerably by 10am, the full permit parking is a much smaller percentage of the total full parking. This could indicate that most residential permit holders leave for work, with only some people either leaving for work at later times or not leaving at all.

The percentage of full permit parking out of the total full parking hovers around fifty percent, showing that there is still a considerable amount of non-permit parking on residential permit streets. These could indicate that there are BART riders that do use BART for trips that would be less than four hours. This could also be people illegally parking.

The percentage of full permit parking out of the total parking tallied shows a fairly consistent percentage across the whole day. Since the total number of parking spaces tallied stays mostly consistent across time versus the total percentage of full parking, the results between times can be compared more equally. This shows that never more than about thirty-seven percent of the parking available was utilized by residential permit holder throughout the day and that the demand for parking by residents is consistent. This shows that there is potentially underutilized parking on the residential permit streets that could be used by BART riders and would not interfere with local residents' ability to park during the day.

On a side note, it was observed several times at different places and different time where cars were parked in front of a driveway. It is unknown whether these people were the residents of those driveways or if there was an agreement between the parker and the owner of the driveway to allow them to park in front of the driveway. No matter the owner of the driveway, parking in front of driveways is illegal in California. This could indicate that there is poor enforcement of parking rules or that police choose to not ticket those parked in front of driveways unless there is a complaint.

Another side note, there were several parking areas that were often not parked because they were too small, but a few crafty small vehicles could sometimes fit in what most people would not consider a parkable space. This could indicate the need for super compact parking spaces for super small vehicles.

Last note, many cars parked right up to the edge of a driveway(s) and were able to fit cars into spaces that may have otherwise been un-parkable since they could use the driveway space to maneuver their vehicle instead of needing extra buffer space in the parking space to maneuver. This information could be utilized to make smaller spaces when they have at least one edge that is a driveway or a curb. This could increase the number of useable parking spaces in the area.

3.2.2.4. Further research

There were several variables that were not explored in the current parking occupancy study. Though the number of full parking spaces on residential permit street was recorded, the individual cars were not checked to determine how long they were parked on those streets. A subsequent study could mark vehicle locations and record if they are in the same location at different times throughout the day. This could give a better understanding of whether these vehicles are parking for under four hours and likely using parking to use BART or if these vehicles are just illegally parking all day and there is not enough enforcement of time restrictions.

The residential permit program has only one permit type for around the El Cerrito Plaza BART station which means that people living on the outskirts of the permit boundary can technically park anywhere in the permit zone. Some people use this to their advantage to park on residential permit streets that are the closest to BART though they are not residents of that particular street. Though the overall percentage of full permit parking was not high, a subsequent study could use license plate info to determine if those parking with permits on residential permit streets are actually residents of those streets. The permit program was not designed to allow residents to park closer to BART but to ensure that residents near BART are able to park near their own house. There is possibly even less of a need for permit parking during the day for residents if those who misuse the permit program were factored out.

Like for the previous site analysis of parking spaces, a subsequent study of parking occupancy would benefit from expanding the study area to include at least a quarter mile walk from the station entrance or at least to include all streets that have at least one block side that has residential permit parking. I would predict that occupancy levels would reduce the further the streets are from the station but there is always the chance that other variables could influence the occupancy levels, like proximity to other uses.

The El Cerrito Plaza shopping center is located directly to the south of the station, which has parking lots for its retail establishments. These parking lot spaces are free of charge but do have a two-hour time limit. The parking is monitored and enforced by the shopping center's staff. Due to the large size of the parking lot, a parking occupancy study was unfeasible for one person to manage but a subsequent study could be done to look at how much of the parking is utilized, where it is utilized more or less and how longer vehicles are utilizing those parking spaces. If it was found that many cars are, parking for six hours or more there is a possibility that BART parkers are illegally parking in the shopping center parking. It could also be employees of the retail establishments that are parking for long hours, but this could be checked with local businesses. The shopping center may benefit from this type of study so that they have a baseline of parking occupancy and could perform the study again after BART parking lots parking is removed to determine if there is an increase in spillover parking.

3.3. Conclusion

After examining the existing conditions at and around the El Cerrito Plaza BART station, there is a significant quantity of on-street parking near the station that could potentially accommodate the parking needs of BART riders when the BART parking lots are converted to TOD. If all three parking lots are converted to TOD, there will be a loss of 773 parking spaces. Just within the study area around the station, there are 304 on-street parking spaces that could potentially accommodate the parking needs of BART riders. There are also many more parking spaces that were not within the study area but are within a quarter mile radius of the station that could also potentially accommodate the parking needs of BART riders.

The parking occupancy study showed though that a lot of on-street parking is already used by BART riders, but also that residential permit streets were not being well utilized since these streets were usually not full and permit parkers were usually not more than half of the vehicles parked on permit streets. This points to the potential to change parking policies on these streets to better utilize all the existing parking near the station to accommodate parking needs of BART riders and maintain just enough parking for residents.

Chapter 4: Parking Demand Management Strategies and Case Studies

4.1. Overview of Transportation Demand Management and Parking Demand Management

4.1.1. Transportation Demand Management

In a world where there is ever growing travel demand but a decreased ability to increase supply to meet this demand, many transportation entities and professionals have moved toward using Transportation Demand Management [TDM] to either reduce travel demand or to redistribute travel demand to different times, places or travel modes. TDM strategies can include increasing the types and ease of use of alternative transportation options, using incentives to try to change travel behavior, changing land use patterns to favor uses that allow for multiple mode choices, using legislative policies to require system-wide implementation, and management of parking.

Which Transportation Demand Management strategies are used can vary greatly depending on who is implementing the strategy, what are their goals, and how much funding and support there is for these projects. Often multiple strategies are employed to try to achieve these goals and may work in tandem with other strategies employed by other entities.

4.1.2. Parking Demand Management

Since Transportation Demand Management often focuses on reducing single-occupancy automobile travel, Parking Demand Management [PDM] is an important tool to affect travel behavior, as all automobile travel needs parking for their automobiles at the beginning and end of their travel. There is a large range of PDM strategies that can vary greatly depending on the type of parking, whether the parking is at the origin or destination, who is implementing these strategies, and whether the strategy affects demand or supply.

4.1.2.1. Parking Type

Parking demand management strategies can vary by different land-use parking types. Housing unit parking needs require long-term storage of vehicles and this parking could be needed at any time of the day. Business parking for employees requires medium-term storage of vehicles but the parking is often only needed during normal business hours and day, with little demand outside of this time. On-street parking and commercial parking lots require short-term storage of vehicles and the parking is needed throughout the day and evening all week but little need during the night. Transit station parking needs require short to medium-term storage of vehicles with high demand in the morning and diminished demand thereafter during the weekday and medium to low demand on weekends and nights.

Depending on parking type, different strategies can try to address increasing turnover of short-term parking, changing demand times to space them out over time instead of at one particular time, or making other travel modes more accessible so that less parking is needed.

4.2. Parking Demand Management Strategies, Literature Review, Case Studies and Local Application

Since parking is a physical good, basic supply and demand principles can apply to the management of parking. A change in one variable affects a change in the other variable. Parking Demand Management strategies produce either a change in the supply of parking or a change in the demand for parking.

4.2.1. Supply

In the past, when the demand for parking increased, the first strategy to meet the new demand was to increase the parking supply. As there is less available space to build parking lots, particularly in older dense cities, the ability to increase supply is severely limited by space and funding because of high costs.

4.2.1.1. Utilize Existing Supply

Increasing supply of parking is often not feasible because of financial restraints, available space, and lack of desire for additional parking space for environmental reasons. Without the will to build more parking infrastructure, the first step to meeting demand for parking is to better utilize the parking infrastructure that is already in place.

4.2.1.1.1. Delineated On-Street Parking Spaces

4.2.1.1.1.1. Overview

On downtown or commercial streets, on-street parking spaces are often delineated with paint on the street. This is often done when on-street parking is charged a fee to park. Parking meters or kiosks need to assign payment to each parking space, so it is important for the individual spaces to be visible to the driver so as to pay for the correct space. Residential streets or any other street that does not have a fee to park often does not have delineated parking spaces. Though painting the street is not expensive compared to other infrastructure improvements, if parking spaces were delineated on all streets it could get quite expensive to add and maintain delineated parking spaces everywhere.

There is still an advantage, in some areas, to adding delineated parking spaces even when there is no fee charged for parking. Drivers are not always good at visually deciphering how much space is needed to park a vehicle and without any other guiding clues may overestimate how much space is needed to park or how to leave adequate room for other vehicles. Large parking areas without delineation are more likely to have more lost parking spaces, as there are no other infrastructural clues to determine where to park. Parking areas between driveways are often easier to park maximizing all the parking spaces because the parking spaces are smaller and provide visual clues on the boundaries of the parking space.

If drivers park in the wrong place, a parking area that could have held, for example, five parking spaces now can only hold four. Improper spacing of vehicles can lead to loss of parking. In areas that do not have high demand this loss of potential spaces may not be an issue but in high demand areas, these potentially lost parking spaces are very much needed.

The size of the delineated parking spaces can make a difference in whether more parking spaces can fit in a parking area. As mentioned previously, when parking spaces are located with at least one edge of the parking space by a driveway or curb, the driveway or curb can provide the extra maneuvering space than would otherwise need to be provided for in the parking space itself. This can allow for parking spaces with shorter lengths. In certain parking areas that are just short of adding another parking space with an eighteen-foot length, changing the parking spaces to sixteen-foot lengths on the parking space edges can help provide that additional parking space.

4.2.1.1.1.2. Literature Review

There is no literature review for the delineation of parking spaces because I was unable to find any academic literature pertaining to the subject.

4.2.1.1.1.3. Case study: El Cerrito Plaza BART Station Area

The data collected from the site analysis of parking spaces and the parking occupancy study in the El Cerrito Plaza BART station study area can be used to show the difference between the ‘ideal’ maximum parking space quantity of a street block and an example of the ‘actual’ maximum parking space quantity of a street block.

One prime example of this difference is on the east side of Liberty Street between Fairmount Ave and Central Ave. The whole block has parking areas for vehicles, as there are no curb cuts along the whole block. Using the measurement from the site analysis, the parking area of this block is 458 feet in length. With a delineated parking space of eighteen-foot length, the 'ideal' parking maximum parking space quantity would be twenty-five parking spaces.

From the parking occupancy study, the 'actual' maximum parking space quantity for this block was twenty-two or twenty-three parking spaces. This constitutes a loss of two to three parking spaces on this one block. It was observed that there were often extra-large gaps between cars that were just small enough to not allow another car to park.

Another example of this difference is on the west side of Oak Street north of Central Ave. This is a residential street with many driveway curb cuts along the block. Using the measurements from the site analysis, the 'ideal' maximum parking space quantity is sixteen parking spaces.

From the parking occupancy study, the 'actual' maximum parking space quantity ranged from fifteen to eighteen. When the 'actual' maximum parking space quantity was below the ideal, there was a loss of one parking space.

It may seem surprising then when the 'actual' maximum parking quantity was over the 'ideal' amount, but this is actually a good example of how parking spaces that edge curbs or driveways provide extra maneuvering space. Some parking areas were not large enough to accommodate two sixteen-foot length parking spaces but with no delineation, two drivers will try to park there anyways as long as their vehicles can fit. This is good evidence that smaller than eighteen-foot length parking spaces can be used in these parking areas without causing compromising access to crosswalks and driveways.

4.2.1.1.1.4. El Cerrito Plaza BART Station Area Application

The only current delineated parking in the El Cerrito Plaza station study is the parking along Fairmount Ave. There is 20-minute angled parking along the south side of Fairmount Avenue but is not actually usable parking for BART riders. On the north side of Fairmount Avenue between Richmond Street and Liberty Street there is angled parking that is usable parking for BART riders. On the north side of Richmond Street between Liberty Street and Lexington Avenue, there are two delineated parallel parking spaces.

The remaining streets in the station study area are all not delineated, except for the one handicap parking space on the east side of Richmond St between Central Avenue and Lincoln Avenue.

Delineating parking spaces throughout the study area should be considered to better utilize the existing parking supply, especially on street blocks that are adjacent to BART property and have long parking areas. As parking demand for BART riders probably exceeds the boundary of the study area, streets up to a quarter mile walk or any streets that have at least one residential permit street block should also be considered to have parking spaces delineated.

4.2.2. Increase BART Parking Supply

Parking is often restricted to only specific uses and specific times when parking is in high demand. These restrictions are often put in place to ensure that certain users have preferential access to the uses near this parking, but overly restricting access to other uses can potentially mean that otherwise usable parking spaces go unused at different times of the day or when there is a change in demand for the initial parking restricted spaces. Having completely unrestricted parking can also cause problems if the demand is high and those users that should have preferential access to the uses near the parking may not be able to find parking. The challenge is to find the right balance of restrictions to balance the needs of all users of the parking spaces.

4.2.2.1. Shared On-Street Parking Spaces

4.2.2.1.1 Overview

On-street parking is a public good and is therefore usually available to all users, but often restrictions are applied so that some uses are prioritized over others. If restrictions are too rigid there can be pent up supply that is unable to be used for other uses and increase demand for parking in other areas. Easing or adjusting restrictions could help to ensure that parking is being fully utilized. Instead of on-street parking being restricted to one use, such as residential parking, these parking spaces could be restricted to several uses.

For unregulated on-street parking, sometimes allowing more restriction can be useful if it is found that there is high-demand and there is demand from only one or two uses. By adding some restrictions, it can regulate how much of that demand can access the high-demand parking.

4.2.2.1.2. Literature Review

There is no literature review for shared on-street parking because I was unable to find academic literature pertaining to the subject.

4.2.2.1.3. Case Study: South Hayward BART Station and the City of Hayward

In 2011, BART was interested in converting one of the parking lots at the South Hayward Station in Hayward, California to high-density affordable and market-rate housing. The City of Hayward was concerned about the loss of the parking from converting the parking lot, and how that would affect the surrounding streets around the station.[99]

To address these issues, the City of Hayward and BART formed a Joint Powers Authority [JPA] called the South Hayward BART Station Access Authority [SHBSAA] to manage street parking around the station. After conducting a parking study and getting community input and feedback, the SHBSAA implemented several changes for parking around the station.[100]

There were two major changes to the existing parking around the station. One of the major concerns was the impact of spillover parking on the availability of parking for local residents. BART riders were already known to park on residential streets, which constrains the supply of parking for local residents. The increased demand from the conversion of one of BART's parking lots would significantly increase demand for parking by BART riders on these streets.[101]

To address these concerns, the SHBSAA created a new parking area called the Transit Oriented Development Preferential Residential Permit Parking Area (TOD PRPP Area). Streets in this area restricts parking to residents only 7 am to 4pm Monday through Friday. Residents are required to have permits to park in this zone and are able to apply for up to four free permits per housing unit. Parking is not allowed for BART Riders for any amount of time during permit hours and days of the week.[102]

The other major concern was how to maintain vehicle access to the station with the loss of a BART parking lot and reduced on-street parking with the implementation of a residential parking permit program on streets close to the station. To address this concern, the SHBSAA looked to other existing on-street parking to help fill this demand.

The SHBSAA created another new parking area called the Transit Oriented Development BART Commuter Preferential Permit Area (TOD-BART Commuter PPP Area). There are two different types of parking on the streets in this area. Some streets that were previously no parking at any time were converted into BART commuter parking. These parking areas restrict parking to BART commuters only and for all hours of the day and days of the week. These parking spaces must pay the BART daily parking fee through BART parking validation machines inside the station.[103]

Other streets in this area have demand for both BART riders and residents so the restrictions on these parking spaces are slightly different. These parking spaces are restricted to BART commuters only from 4 am to 3pm Monday through Friday. The parking spaces become regular parking space outside of these designated times and days of the week. These parking spaces also need to pay the BART daily parking fee.[104]

Across the whole parking area, the SHBSAA designates that approximately seven percent of parking spaces should be allocated to monthly permit parking and three percent to daily permit parking.[105] The fees for permits are paid through BART's permit payment platform and require display of permits on vehicles to help with enforcement.[106]

99 City of Hayward, *South Hayward BART Transit-Oriented Development: Approval of Action Plan for South Hayward BART Joint Powers Authority*, Staff Report, February 19, 2013, 2, accessed April 13, 2020

100 Ibid

101 Ibid. 6.

102 Ibid.

103 Ibid. 7.

104 Ibid.

105 Ibid. 4.

106 Ibid. 8.

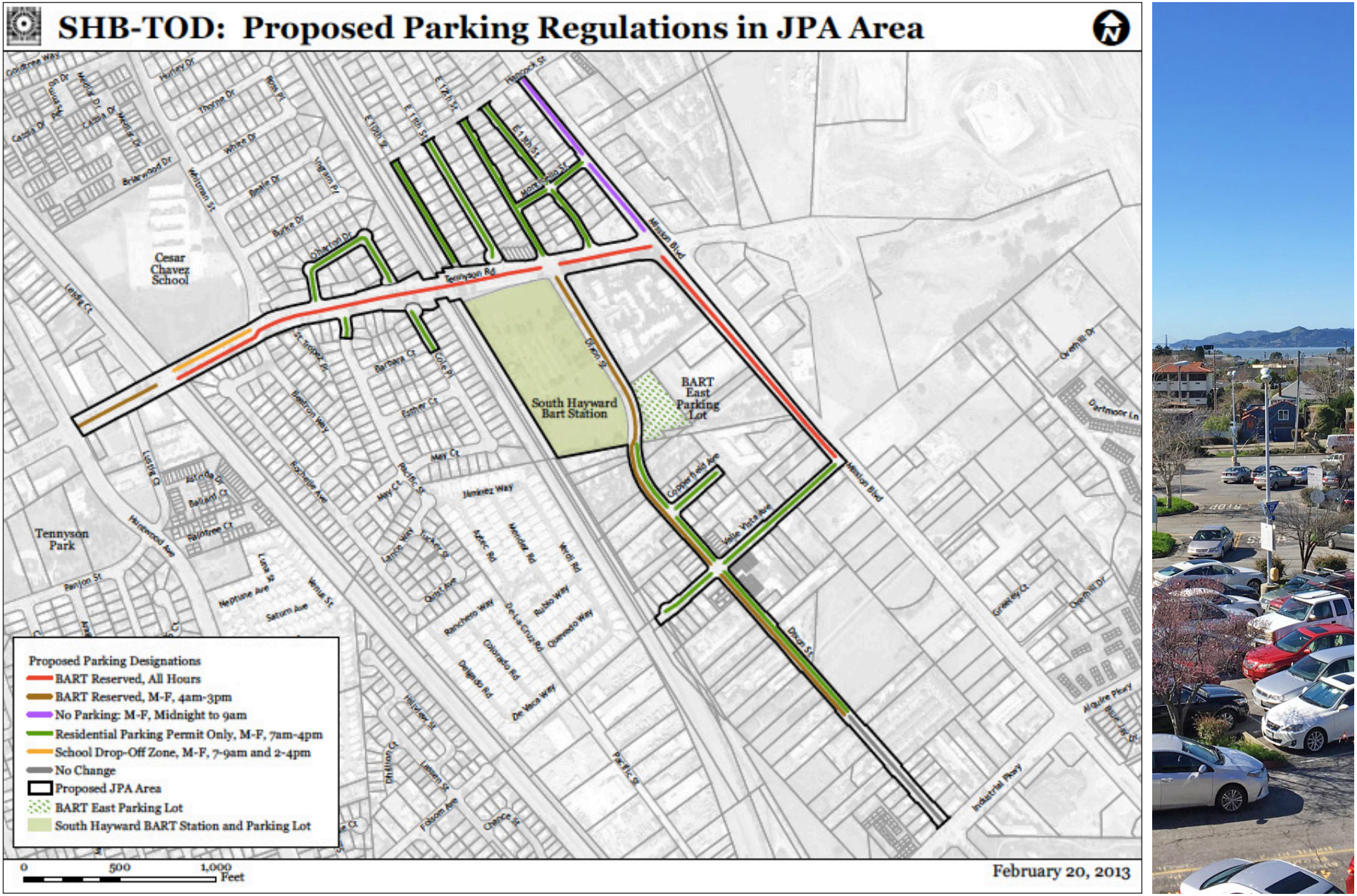


Figure 38 Parking types in the South Hayward BART Joint Powers Authority area[107]

107 City of Hayward, "South Hayward Parking Fee Program," Public Hearing Powerpoint, March 14, 2013, accessed April 13, 2020

The City of Hayward funded the initial capital investments for these new parking areas. This included striping and re-striping parking spaces, painting parking space numbers and installing new parking and way-finding signs. It also covered the expense of the creation of the new residential parking permit program and cost of physical permits.[108]

Enforcement of these parking rules is handled by the City of Hayward. Hayward already has staff that enforces parking in other areas of Hayward, so the new parking areas just expand the areas that they need to enforce. BART supplies Hayward enforcement personnel with information on if payment has been made for particular parking spaces.[109]

The revenue that is collected from BART daily fees, daily and monthly permits from these parking spaces, and any citation revenue is deposited into the SHBSAA. The revenue is allocated to be used to cover operational expenses like administering permits, enforcement, and ongoing maintenance. Part of the revenue is also allocated to reimburse the City of Hayward for their initial capital investment. Any additional revenue that remains after these expenses is set aside to make investments in the SHBSAA area, like streetscape improvements or complimentary transportation improvements.[110]

4.2.2.1.4. El Cerrito Plaza BART Station Application

There are several unregulated (open) parking street blocks in the El Cerrito Plaza BART station area. Some of these street blocks are directly adjacent to the current BART parking lots and there is little demand for these parking spaces from nearby uses. The other unregulated street blocks are on residential neighborhood streets and there is varying demand for parking from the nearby residents. There is a lower demand for parking from the nearby residents' weekdays during the day and higher demand overnight.

As the six street blocks that are adjacent to the current BART parking lots are not required for other uses, these unregulated on-street parking spaces could be dedicated as BART parking. Since BART does not own these on-street parking spaces, BART and the City of El Cerrito could work out an agreement to where BART would have sole access to these spaces for their riders during peak parking demand days and times.

The remaining unregulated residential on-street parking spaces in the study area and potentially the unregulated residential on-street parking within a quarter mile of the station entrance could also be dedicated BART parking, albeit with a few more restrictions. As there is some demand from residents for these on-street parking spaces during the same times as BART riders, not all the spaces on these street blocks could be dedicated to BART riders. These street blocks could also allow for residents to park with residential permits. The time when these parking spaces would be dedicated to BART riders could also be restricted so that vehicles are not driving in the neighborhoods in the early hours of the morning and potentially disturbing residents. A later morning start time for dedicated BART rider parking spaces would also ensure that most of the residents' vehicles would no longer be parked in these parking spaces and the highest quantity of parking would be available for BART riders.

To regulate which BART riders could access these dedicated on-street parking spaces, BART could expand its existing parking permit program to these parking spaces. This would eliminate the need for the City of El Cerrito to create a new permit program. The payment of permit fees for BART riders could also be handled the same as the current BART permit program.

The fees that are collected for these permits could be allocated between BART and the City of El Cerrito. BART would require some of the fees to cover the cost to run the permit program and cover any transaction fees for processing permit fees. The City of El Cerrito would require some of the fees to cover the cost of enforcement of parking regulations for these spaces, painting of parking spaces, and any necessary signage. Some of the fees could also be allocated to the City of El Cerrito for "rent" on these parking spaces.

To ensure that there are a few available parking spaces for residents, permits could be limited to a certain number for each street block. For example, if there were sixteen available parking spaces on a given block, only thirteen BART parking permits could be allocated for that street block. This would ensure a few open spaces for residents with residential parking permits. BART could create different permit letters for different blocks.

108 Ibid. 10.

109 Ibid. 9.

110 Ibid. 11.

The Residential Permit residential on-street parking spaces could also be converted to dedicated BART parking in coordination with an adjustment to the residential parking permit program. This would open up both sides of these streets to BART permit parking but maintain some space for residents by limiting the number of BART permits for each street.

4.2.2.2. Residential Parking Permit Program Adjustments

4.2.2.2.1. Overview

Residential streets in more densely populated cites often have other uses nearby that can create increase demand for parking spaces on these streets. This can lead to difficulty for residents to find parking near their residences or to find parking at all. These parking issues are often addressed through the use of the residential parking permit program.

Residential parking permit programs restrict parking access for other uses. Residents usually apply for a permit, which may or may not require a fee, which needs to be shown during enforcement times. Most jurisdictions have a cap on the number of permits that are available for each resident or housing unit.

There are many different ways that parking is restricted for other uses on residential parking permit streets and can vary by the type of use. Where demand for parking comes from nearby commercial use, parking is often restricted by time limits or fees.

Commercial areas have short-term demand, so high turnover is desired to ensure access for more patrons. Time limits for nearby residential permit street may limit the amount of time patrons can park on these streets, whereas residents with permits may be able to park for unlimited amounts of time. Some commercial areas that already use parking meters may expand these meters into the residential parking permit areas and require patrons to pay an hourly fee but permit holders would be able to park for free.

Office and transit stations have medium-term parking demand, so there is little parking turnover and the majority of demand is in the morning, with parking duration through to the early evening. Time limits for nearby residential permit streets may also limit the amount of time commuters can park on these streets, whereas residents with permits may be able to park for an unlimited amount of time. The time limits for commuters may be longer than those used for patrons in residential parking permit areas since turnover is not as usual. Parking meters are usually not as common in these areas either as these are usually better for high turnover areas where people pay by the hour versus by the day.

Residential parking permits are considered an effective program to ensure preferential parking for nearby residents in areas with competing parking demand from other uses, but some programs may work too well and prevent the best possible utilization of parking by a variety of uses.

4.2.2.2.2. Literature Review

The use of residential parking permits to restrict parking access to non-residents is not a new strategy. It has been used for decades to effectively prevent spillover parking of non-residents on residential streets near other uses, but there is growing research looking at the potential other negative effects of using residential parking permits as a parking demand management strategy.

There were a few major themes that emerged from the literature about the other effects of residential parking permit programs. The themes that were identified in the research with residential parking permit programs are that it increases car ownership and use, is an inefficient economic use of parking spaces, and often the permit cost is significantly less than what people are willing to pay.

Car Ownership and Use

Though residential parking permit programs can effectively reduce parking spillover from non-residents, which is beneficial for the resident, only recently has research examined whether these programs were beneficial for the city or the environment. One effect that has been studied is the effect of residential parking permit programs effect on car ownership and use.

Two research articles came to the same consensus that residential parking permit programs increase car ownership. In the article by Guo (2013)-2, he found that residential parking permit programs in New York City area neighborhoods increased car ownership and that one out of every eleven cars could be attributed to the permit program.[111] The article by Groote et al. found the opposite but complementary find-

111 Guo, Zhan, "Residential street parking and car ownership: a study of households with off-street parking in New York City region," *Journal of the American Planning Association* 79, no. 1 (2013): 32-48.

ing that for every year of wait list time for a parking permit in Amsterdam there was a two percent decrease in car ownership. Residential parking permits make owning a car easier, so any factor that decreases the ease of owning a car, like a wait list that forces a resident to pay full market price while they wait, can potentially decrease car ownership.[112]

Two other research articles came to the conclusion that parking permit programs can also affect how cars are used. The article by Taylor found that 90 percent of residential on-street parkers in Melbourne had access to off-street parking and 63 percent had enough off-street parking to adequately park all owned vehicles. So even with adequate off-street supply, most residents were instead choosing to park on the street.[113] This finding can be partially explained by the article by Guo (2013)-1 which found that residential parking permit programs in the New York City area increase car usage and trip length because it creates parking certainty and parking ease. On-street parking, particularly when a resident has a parking permit, provides another option for residents to park that is mostly guaranteed and is easier to park in. As such, there is often little incentive to park their cars in off-street parking spaces and in turn, this can increase car usage.[114]

Though all of these articles concluded that residential parking permit programs increase car ownership and use, the findings may not be applicable to most cities, particularly in the US. Car ownership rates in New York City and Amsterdam are significantly lower overall than in most US cities although Melbourne has ownership rates and usage that are more similar to the US. In addition, the study from Amsterdam showed the number of permits that could be sold to residents was highly restricted, which is very different from what is found in any United States city.[115]

112 Groote, Jesper, Jos van Ommerem, Hans R.A. Koster, "Car ownership and residential parking subsidies: Evidence from Amsterdam," *Economics of Transportation 6 (2016) 25-36.*

113 Taylor, Elizabeth Jean, "Who's been parking on *my* street? The politics and uneven use of residential parking spaces," *Land Use Policy* (2018).

114 Guo, Zhan, "Home parking convenience, household car usage, and implications to residential parking policies," *Transport Policy* 29 (2013) 97-106.

115 Groote, Jesper, Jos van Ommerem, Hans R.A. Koster, "Car ownership and residential parking subsidies: Evidence from Amsterdam," *Economics of Transportation 6 (2016) 25-36.*

To summarize the findings, residential parking permit programs have the unintended consequence of increasing car ownership and use, which is beneficial to the resident but not for the city or the environment, particularly in highly congested areas. Changes to residential parking permit programs, like limiting the number of permits a resident can receive, can possibly counteract this effect.

Inefficient Use of Parking Space

Residential parking permits are usually operated in residential areas that have other nearby uses that increase the demand for on-street parking. These permits allow residents to park on streets and restricts access for other users. Though these permits prevent excessive spillover parking from other uses, research has begun to examine whether or not this is the most efficient use of on-street parking space.

Three articles examined the economic benefit or loss from allocating on-street parking to residents and found that there is an economic loss when resident parking is prioritized in a residential parking permit program area that competes with other uses. In the article by Molenda et al., if given the choice, residents would request more parking than would be economically beneficial. This supposes that it could be more economically beneficial if more, but not all, of on-street parking spaces were allocated for other uses besides residential parking.[116] This finding was supported by the article by van Ommeren et al. (2014), which also found that residential parking permits cause an economic loss, as costly parking garages would become necessary in mixed-demand areas that prioritize residents. They also found that non-residents incurred higher parking costs in these areas because the residential parking permits were oversold and underpriced, increasing the parking shortage and therefore increasing the price for non-residents.[117] The article by Moylan et al., which analyzed a parking permit program in Berkeley, similarly found that on-street parking was inefficiently used in residential parking permit areas, especially those slightly further from commercial corridors. They found that the costs of operating these programs were unnecessarily increased by requiring permit in areas that did not have enough demand to need them.[118]

116 Molenda, Inga, and Gernot Sieg, "Residential parking in vibrant city districts," *Economics of Transportation* 2, no. 4 (2013): 131-139.

117 van Ommeren, Jos, Jesper de Groot, and Guiliano Mingardo, "Residential parking permits and parking supply," *Regional Science and Urban Economics* 45 (2014): 33-44.

118 Moylan, Emily, Matthew Schabas, and Elizabeth Deakin, "Residential permit parking: Better off without it?" *Transportation Research Record* 2469, no.1 (2014) 23-31.

Though there was a consensus in the literature about the economic loss from residential parking permit programs, the findings may not be applicable to United States cities. The article by van Ommeren et al. (2014) was conducted in Amsterdam, which has very different levels of car ownership and usage, so the economic loss may be different since the economic benefit could possibly be regained when people use other travel modes, like bicycling. The article by Molenda et al. used modeling to show how much parking people would want, which is less reliable than if people's opinions had been collected through surveys or other direct methods. The article by Moylan et al. is the most applicable since it analyzed data from a residential parking program directly and in a United States city.

To summarize the findings, residential parking permit programs can be beneficial to residents, but the benefits lead to economic losses elsewhere. Though residential parking is prioritized with these permit programs, a more efficient use of on-street parking would benefit other nearby local uses as well, particularly if the residential parking permit programs limits non-residential parking too much and on-street parking in under-occupied. Residential parking permit programs would be more beneficial to all if they severely limited the areas to which they apply and allocate more parking to non-residents than what most residents would prefer. This can balance the supply of parking between both residents and non-residents.

Resident Willingness to Pay

The cost of a residential parking permit varies by jurisdiction, but often permits are given to residents for free or at such a low cost, that it is essentially free, and often several permits are available for each household. With barely any restrictions on who can park on-street, many of these permit areas still have high occupancy levels. Though there will always be people that think public on-street parking should be essentially free, recent research has found that many residents would be willing to pay significantly more for access to on-street parking.

Two articles came to the same conclusion that at least a portion of residents would be willing to pay significant more for a parking permit than what they are currently sold. The article by Guo et al. found that residents in the New York City area were willing to pay an average of $407 per year for a parking permit, where permits in many cities are around $10-40 per year. They found also that residents were more willing to pay for permits when the parking crowding was not spillover parking from non-residents.[119] These findings were supported by the article by van Ommeren et al. (2011) which found that residents in Amsterdam were willing to pay an average of £10 per day for parking, even though residential parking permits in the city actually cost £.10 per day. It was also found that non-residents were willing to pay £20-40 per day, which is significantly more than residents are willing to pay for the same parking.[120] These articles show that there is a significant difference between what many people are willing to pay and what is actually charged, by both residents and non-residents.

These findings many not be applicable to United States cities for a couple of reasons. The article by van Ommeren was conducted in Amsterdam, which has different car ownership rates and limits permit parking based on availability of off-street parking and overall parking quantity and is rarely implemented in the United States. The article by Guo et al. was conducted in the New York City area, which also has different car ownership rate from other United States cities. These different characteristics could affect the price that residents are willing to pay, especially if residents are used to free parking. In addition, since most United States cities, residents own significantly more cars than residents in New York City and Amsterdam, there is overall higher parking demand than what was found in the research. When there is increased scarcity, people may be willing to pay more.

To summarize these findings, residents are often willing to pay more for residential parking permit than what they are currently being charged. Often these permit fees are kept low by legislation, which restricts the price to the cost to operate, or because there are enough vocal residents opposing pricing increases that politicians concede to their demands for essentially free parking. These residents may benefit from cheap parking but in turn, the cities lose out. The cities not only lose potential revenue from the residents, but when residents are allowed more parking than is economically beneficial, they lose even more potential revenue from non-residents who are willing to pay even more than residents. To properly control demand for on-street parking in residential areas, cities would benefit by charging more for residential parking permit and limiting the number of spaces allocated to residents in areas with mixed parking demand from non-residents.

119 Guo, Zhan, and Simon Mc Donnell. "Curb parking pricing for local residents: An exploration in New York City based on willingness to pay." *Transport Policy* 30 (2013): 186-198.

120 van Ommeren, Jos, Derek Wentink, and Jasper Dekkers. "The real price of parking policy." *Journal of Urban Economics* 70, no.1 (2011): 25-31.

4.2.2.2.3. Case Study: Berkeley, California Residential Parking Permit Program

Research was conducted by Emily Moylan, Matthew Schabas, and Elizabeth Deakin in Berkeley, which examined if residential parking permit programs were successfully at utilizing available parking spaces on residential permit streets for all users. These streets typically required residential permits because there was spillover demand from nearby commercial uses. These nearby uses included the University of California Berkeley campus, and several commercial shopping corridors. Residential parking permit streets allowed non-residents to parking on these streets for a maximum of two hours.[121]

The effectiveness of utilization of parking was determined by the parking occupancy rate on each block in the study area. A parking occupancy rate of seventy-five percent and at least one available parking space per block was considered optimal because occupancy below this level was considered underutilized and if there was not at least one open space then the block was full and had potential excess demand. One open space per block is often referred to as about eighty-five percent occupancy so a range of seventy-five to eighty-five percent occupancy rate were considered optimal.[122]

The researchers conducted a parking occupancy study on several streets on the south side of Berkeley. The number of cars parked, including permitted and non-permitted vehicles, and empty spaces were count on each block at several different times throughout the day.[123]

The parking occupancy study found that only two percent of the observed blocks were at capacity, meaning they did not even have one parking space available on the block. Only about seventeen percent on blocks were found to be in the optimal range of seventy-five to eighty-five percent occupied. The remaining eighty-one percent of the observed blocks were under seventy-five percent occupied, meaning they were being underutilized.[124]

There are a couple reasons that residential parking permit streets had sub-optimal parking occupancy rates. One simple explanation could be that there is just not enough demand in the area and the occupancy rates reflect the actual overall demand in the area. The other explanation could be that there is additional demand for parking in these areas but that the residential parking permit is overly restricting use of these streets for parking, causing an imbalance between supply and demand.

The researchers recommended making adjustments to residential parking permit restrictions to allow for greater use of underutilized parking. Removing time restrictions and moving to parking fees for non-residents to parking is one possible change. By removing time limits, non-residents who have a need to park for longer than the previous time limits allowed would now be able to park on these streets. The parking fee can help to limit demand and match supply levels by creating a financial constraint. Other residential parking permit streets may want to just remove the permits altogether if demand is shown to consistently be below optimum occupancy levels.[125]

4.2.2.2.4. El Cerrito Plaza BART Station Application

A residential parking permit program currently exists for streets around the El Cerrito Plaza BART station. Residents are able to petition the City of El Cerrito for their street block to require parking permits if they are able to get sixty percent of residents of the street block to agree to make the street require parking permits. Each housing unit is allowed up to four parking permits and each permit costs $7. Permit owners are required to park on residential parking permit streets from 7 am to 6 pm Monday through Friday.

The parking occupancy study discussed earlier in this report provides a good basis to determine if the residential parking permit program around the El Cerrito Plaza BART station is being used effectively. The overall percentage full on residential parking permit streets is about sixty percent, which is significantly below the seventy-five percent optimal occupancy rate describe from the case study. Even when looking at each time period tallied, all times percentage full was below the optimal occupancy rate except for at 10 am, where it just barely reaches optimum level at seventy-six percent full. Looking at individual streets blocks, only three of the nine residential parking permit street blocks surpassed the optimal occupancy rate. Two of the street blocks just barely past the optimal rate at eighty-six percent full and the remaining

121 Moylan, Emily, Matthew Schabas, and Elizabeth Deakin, "Residential permit parking: Better off without it?" *Transportation Research Record* 2469, no.1 (2014) 23-31, accessed May 15, 2019, (2014): 26, https://doi.org/10.3141/2469-03.

122 Ibid.

123 Ibid. 25.

124 Ibid. 29.

125 Ibid. 30.

street block only had three parking spaces, and low absolute numbers make it easier to get large percentages. At the other three times of the day there were only three other streets blocks that met the optimal parking rate and no other street blocks exceeded the optimal rate. Some of these streets may not be as utilized as the numbers show as there is probably some illegal parking of non-residents vehicles that exceed time limits since the parking rules are poorly enforced.

The parking occupancy study also showed that the percentage of the full permit parking was around half of the overall full parking for the overall total and even less of the total parking. Full permit parking average percentage of overall total parking was about thirty-one percent. As most streets had the residential parking permit program on only one block on the street, this utilization actually represents the utilization for both sides of the street and would have a significantly lower overall occupancy rate. This suggests that most of the residential permit parking street blocks at most times of the day are being underutilized.

One way to help utilize the existing parking around the station on residential streets, since there is high demand from BART riders for this parking on these streets, is to adjust the regulations to allow for more available parking for BART riders. Residential parking permit street blocks could be converted into shared on-street parking for BART riders by monthly permit. Similar to how the converted unregulated (open) parking spaces to BART permit parking limited the number of permit spaces, these residential permit parking street blocks can limit the number of available BART parking permits to ensure some available parking for residents with permits.

The residential parking permit program could also make new limits and regulations to discourage the use of on-street parking over off-street parking. Most of the housing around the station has some off-street parking, but many people choose to use their garages for other uses like storage or additional living space. Making it cheap and easy to park on the street encourage more people to use their garages for these other uses and increasing on-street parking demand. The number of permits that are available to each housing unit could be reduced to allow for some use of the street but still restricting it enough to encourage the use of off-street parking. Parking permits could also be priced higher to reflect the true cost to enforce the parking rules and each successive permit could cost more to encourage limiting the number of parking permits used by residents.

4.2.2.3. Shared Parking Lots

4.2.2.3.1. Overview

On-street parking is not the only other available parking that could be shared with other uses. Commercial parking is often shared between multiple commercial uses and an increasing number of parking lots and structures are being shared between different uses, to better utilize parking that may have demand at different times of the day or days of the week.

Transit agencies are often located in dense urban areas where land for parking is at a premium. With other uses nearby sometimes these transit agencies pair up with other nearby entities to provided shared parking for both uses. Less often transit agencies may look to already existing parking near the station to potentially meet the demand that currently parking supply does not suffice. Often nearby parking is also adequately utilized but sometimes off-street parking requirements may have demanded more parking supply than what was needed or that parking demand at these parking lots has diminished over time. Other nearby parking may have parking demand that is at a different time or day than the transit stations, so they have parking that is underutilized when there is high demand for transit riders.

Creating agreements between the owners of parking lots and transit agencies to share parking can help to better utilize existing parking, better meeting parking demand without adding more supply and potentially bring in revenue for the parking lot owner. Parking lots that have different parking demand times from the transit agency could make all of their parking lots available for transit riders. For parking lots that also have parking demand at the same time as the transit agency, a certain amount of unutilized parking could be allocated for transit rider use. Parking kiosks could be used at some parking lots to charge the parker for the ability to park in these parking lots. Another option could be to create permits to limit the number of potential parkers and to streamline payment for parking if the need is on a regular basis versus an intermittent or short-term basis.

They are a variety of ways to enforce the new parking rules. Many parking lot owners probably already have some sort of enforcement procedure in place so most would be able to handle the enforcement of the new parking rules. Depending on the proximity of these parking lots to the transit stations, many transit agencies could potentially handle enforcement of parking rules as long as they already have enforcement

procedures in place at those stations. There may be some liability issues that could prevent transit agencies from enforcing parking rules on private land.

4.2.2.3.2. Literature Review

There is no literature review for shared parking because of the difficulty of finding literature on the subject. Most literature that was found pertained to either shared parking between commercial uses, like in a strip mall, or for jointly developed parking garages between different uses, like transit and a hospital or an office building and a shopping center. These literature articles were not applicable to the circumstances of the El Cerrito Plaza BART station as the shared parking strategy is not focused on the shared use of BART parking lots, or the creation of more parking through a parking garage, but instead focuses on finding existing nearby smaller parking lots with excess supply of parking space that could be used for BART riders.

4.2.2.3.3. Case Study: TriMet Shared Church Parking

TriMet is a transit agency in the Portland metropolitan area. They run bus, light rail, and commuter rail service. Much of the Portland metropolitan area is denser than many other metropolitan areas in the United States because of their urban growth boundary. Density can cause land to increase in value and make it less financially feasible to build surface parking lots. Building stations in built out areas can also restrict the availability of land to create parking. TriMet therefore looked to the existing parking near the station to potentially allow for some parking at their stations/stops.

TriMet has agreements with eighteen different churches in nine cities across the TriMet system to provide parking for their riders. Churches are great candidates for shared parking because churches often only have demand for parking on the weekends, particularly on Sunday whereas transit rider parking demand is weekdays during the day. The churches that agreed to share their parking donated the use of their parking to TriMet. Shared use parking with private businesses and parking lots, like Regal Cinema and the Elks Lodge, are probably not donating their available parking to TriMet. The parking at these parking lots, as well as all other parking lots are available all day for free. The shared church parking provides an additional 621 parking spaces plus an unspecified amount of parking at one other station to the amount of available parking in the TriMet system. This parking was able to be supplied at no charge to TriMet and the riders.[126]

4.2.2.3.4. El Cerrito Plaza Station Application

The area around the El Cerrito Plaza BART station is an older inner suburb that was built out before the creation of the station. The existing parking for the El Cerrito Plaza BART station was created by demolishing some existing housing near the station, so there is no available land around the station to create any new parking. There are several businesses that were redeveloped after El Cerrito was built out and had larger requirements for off-street parking, so their parking lots have reasonable amounts of parking spaces. The only other substantive amount of parking in the area is at the El Cerrito Plaza shopping center.

The utilization of parking at these off-street parking lots vary. The El Cerrito Plaza shopping Center is already shared parking with is utilized by the numerous shops in the center and has high utilization rates. There are several other businesses located along San Pablo Ave. that have individual parking for their businesses. A 2011 parking study done by the City of El Cerrito showed that many of these parking lots have low utilization rate even during their open business hours. The lower utilization rates could be for several reasons. The business itself may be seeing less demand and that could translate into decreased demand for parking. The business could also have normal demand but the demand for parking particularly could have decreases. One particular example of this are the bank parking lots. With the increase in online banking, the necessity to physically go to the bank has decreased over the years and therefor there is a decrease demand for parking. Lastly, the parking that was mandated by the city may have been overestimated and parking that was never needed was required to be built.

There is also one other parking lot in the area that could possibly be shared with transit riders. East of the station about a half mile away is a cemetery parking lot. This lot is just dirt with no delineated parking, but it is very often not in use and the number of potential parking spaces is unknown.

BART could work with all of these individual landowners to create a Joint Powers Authority to make agreements to share some portion of their parking with BART. A new parking occupancy would need to be conducted to determine the occupancy rate of each parking lot over several days to get a better understanding of the number of parking spaces that could be allocated to BART riders without interfering with the ability of their business patrons to find parking.

126 Trimet, "Park and Ride Locations," Trimet.org, accessed April 13, 2020, https://trimet.org/parkandride/

BART could issue parking permits for each parking lot for the allocated parking spaces through their existing parking permit program. This could make enforcement easier because the same vehicles would be parked every day and with no open access to parking, there would be less traffic into the lot as people will not be searching for potential parking.

Permit fees that are collected by BART could be deposited into the Joint Powers Authority and could cover capital and operational costs. The enforcement of these parking rules could probably be done by existing enforcement staff from each landowner and paid for by the revenue from permit fees. Capital cost would probably be low since most parking lots already have existing delineated parking space so only a few signs would need to be installed. Some of the fee could also go the BART staff for administrative tasks for setting up the agreements and managing the permit program.

4.2.3. Demand

When there is imbalance between parking supply and demand, typically policy makers have focused on increasing or better utilizing supply. On the other end, there is a new focus instead on decreasing or shifting parking demand. Decreasing demand is usually only desired for office uses as people who work from home instead of going into the office creates very little negative economic effects. For many other uses, a decrease in demand would mean a negative economic effect. This is why most policymakers focus on shifting demand. Parking demand can be shifted to different transportation modes, different locations, or different times. There are a mixture of incentives, deterrents, and infrastructure changes that are employed to try to shift demand.

4.2.3.1. Demand-Based Pricing

4.2.3.1.1. Overview

Pricing is one mechanism that can be used to change behavior. Economics theory says that when supply is free, there is essentially unlimited demand for that good. As prices increase, demand for that good decreases. The challenge with pricing is to find the right price to find equilibrium between supply and demand.

To measure whether parking is at equilibrium, there needs to be at least a one open space per block or at least a few open spaces in a parking lot. This way parking is well utilized but there are still available spaces for drivers. For on-street parking, this usually translates into about an eighty-five percent occupancy rate. Parking lots can usually further maximize parking utilization rates because of the large quantity of parking spaces. Many transit parking lots aim for a ninety-five percent occupancy rate.

Transit station parking is often free but some transit agencies, particularly in dense city areas and where demand is high, charge a fee for parking. Parking is usually charged by the day since many park and ride lots are for commuters, but some places may charge by the hours. Most transit parking lots charge a flat fee at all times that require a fee.

There are several different ways to adjust parking fees to try to achieve a change in parking demand. A flat parking fee can be adjusted higher or lower depending on occupancy rates

Instead of charging a flat fee, demand-based parking could adjust parking fees based on where and when there is demand. Adjusting parking fees by location could mean charging higher fees for locations that are closer to the destination. For transit stations, this would mean that parking spaces that are closer to the entrance would be in higher demand; with demand diminishing the further the parking space is from the entrance. Several different parking fees could be charged based on distance zones from the entrance.

Parking fees could be adjusted by time in several different ways. Fees could first be adjusted by day of the week. Often there is higher commuter parking demand in the beginning of the week and a decreased demand on Fridays, particularly for Fridays before a holiday weekend. Parking fees could be highest on Mondays when demand is highest, and the parking fee could progressively decrease throughout the week.

Commuter parking demand also peaks in the morning hours on weekdays and by the afternoon demand significantly decreases. Parking fees could be only required during the morning hours and the fees could no longer be required after the demand drops in the afternoon.

The demand for parking by commuters in the morning can also vary by the hour. Very early morning demand for commuter parking may be small with a ramp up in demand up to around 8 or 9 am, as the majority of people start work around 9 am. Parking fees could the highest during the highest demand hour and vary depending on ongoing demand by each hour and then decreasing after the peak travel time.

When pricing parking fees based on demand, regular monitoring of parking occupancy over the different hours of the day and over the week is necessary to see if demand is changing and then parking fees can be adjusted accordingly. It can also take several changes in parking fee before demand is effectively changed but even if demand is met at one point in time, demand is constantly changing so monitoring is an ongoing need.

The additional challenge with demand-based pricing is trying to balance parking demand with transit demand. Even if parking equilibrium can be reached, it may result in a decrease in demand for transit. People are price sensitive and they do not only consider the price of parking but also consider the price of their whole trip. Monitoring of ridership would need to be conducted when making any parking fee change to determine if it is having any negative effect on ridership.

4.2.3.1.2 Literature Review

Charging for both on- and off-street parking is not a new concept, but the traditional blanket approach to pricing has been ineffective at reducing parking congestion. There has been a shift in the last decade or so to using a demand-responsive approach to pricing parking, which determines the parking fee based on demand. Donald Shoup's well-received book "The High Cost of Free Parking" popularized this idea in 2005, but there have been only a few cities that have implemented this strategy, so the research is limited.

There were several themes that emerged from the literature about the different ways to implement a parking pricing program to produce effective parking management. The themes that were identified in the literature were the optimal average occupancy percentage, the optimal pricing area size, and time frame to adjust parking fees, and the optimal duration of parking time limits.

OPTIMAL AVERAGE OCCUPANCY PERCENTAGE

The industry standard optimal average occupancy percentage has been 85 percent, which ensures that there is, on average, at least one open parking space on a standard city block. The research that was examined showed though that there is more variation to what is implemented as the optimal average occupancy percentages.

Two research articles used optimal average occupancy rates that were lower than the industry standard. The research by Pierce et al. (2013) about the on-street SF***park*** project used a lower average occupancy target range of 60 percent to 80 percent.[127] Similarly, the research by Pierce et al. (2015) about the public off-street garage SF***park*** project used a lower average occupancy target range of 40 percent to 80 percent.[128]

On the flip side, two research articles either found higher rates to be optimal or that different measures were optimal. Research by Arnott found that in high-demand locations and time periods, an average occupancy rate of over 90 percent was optimal.[129] Contrary to the previous three research articles, research by Millard-Bell et al., which also examined the SF***park*** project, concluded that a 90 percent probability that a block was full was the better way to measure parking occupancy than average occupancy percentage.[130]

The different average percentage rates that were used or other rates that were recommended can be attributed to the type of research that was conducted in the articles. Both the article from Pierce et al. (2013) and the article from Peirce et al. (2015) analyzed data from the SF***park*** project, which set the average occupancy rates lower than the industry standard for a couple of reasons. Since the average occupancy percentage was calculated for three-hour time periods for on-street parking in the article from Pierce et al. (2013), a lower average occupancy percentage allowed for more wiggle room in case any period of time within the time frame was over

127 Pierce, Gregory, and Donald Shoup, "Getting the prices right: an evaluation of pricing parking by demand in San Francisco," *Journal of American Planning Association* 79 (2013): 67-81.

128 Pierce, Gregory, Donald Shoup, and Hank Willson, "Optimizing the use of public garages: Pricing parking by demand," *Transport Policy* 44 (2015): 89-95.

129 Arnott, Richard, "On the optimal target curbside parking occupancy rate," *Economics of Transportation* 3, no. 2 (2014): 133-144.

130 Millard-Ball, Adam, Rachel R. Weinberger, and Robert C. Hampshire, "Is the curb 80% full or 20% empty? Assessing the impacts of San Francisco's parking pricing experiment," *Transportation Research Part A: Policy and Practice* 63 (2014): 76-92.

the target average occupancy percentage.[131] Conversely, the average occupancy percentage for off-street parking garages was far below the target average occupancy percentage range and the off-street garage SF***park*** project also had a financial incentive to not lower the parking price too low so they could recover costs, so a lower target average occupancy percentage rate was used in the article by Pierce et al. (2015).[132]

On the other hand, both the article from Millard-Bell et al. and from Arnott used modeling to calculate the optimal measure or optimal percentage. Though the article by Millard-Bell et al. also used data from the SF***park*** project, they use modeling to analyze the data. They determined that the probability that a block was full was a better measure of parking occupancy because when occupancy was under 90 percent there was no cruising for parking, therefore it only mattered if the parking on the block was probably full.[133] The article from Arnott also used modeling, but instead used a model that factored in the economic gains/losses from parking occupancy. The article concluded that a higher than 90 percent average occupancy percentage was optimal in high-demand locations and at high-demand times because there was a greater economic benefit when the parking occupancy was nearly full.[134]

To summarize these findings, it suggests that the industry standard of 85 percent should be considered a guideline and that in practice there are a number of reasons that different target average occupancy percentage ranges are optimal or that a different parking occupancy measure altogether could be optimal, particularly if the objective of the project is to reduce cruising.

131 Pierce and Shoup, "Getting the prices right".

132 Pierce, Gregory, Donald Shoup, and Hank Willson, "Optimizing the use of public garages: Pricing parking by demand," *Transport Policy* 44 (2015): 89-95.

133 Millard-Ball, Adam, Rachel R. Weinberger, and Robert C. Hampshire, "Is the curb 80% full or 20% empty? Assessing the impacts of San Francisco's parking pricing experiment," *Transportation Research Part A: Policy and Practice* 63 (2014): 76-92.

134 Arnott, Richard, "On the optimal target curbside parking occupancy rate," *Economics of Transportation* 3, no. 2 (2014): 133-144.

OPTIMAL PRICING AREA SIZE AND TIME PERIODS

The traditional blanket approach to parking pricing not only rarely changes the price of parking, but the parking fees are usually the same for the whole parking zone and the same throughout the day, which is often ineffective at reducing parking congestion. Demand-responsive parking pricing adjusts parking pricing based on demand in an area but can also be adjusted separately in different sized areas and by different time frames. The research that was examined showed that there is a lot of variability in what size areas and what time frames are used in demand-responsive parking programs.

Five research articles adjusted the parking price by different parking area sizes and varied by the degree of specificity of the area size. The research by Ottosson et al. about the parking pricing program in Seattle showed a switched from one large single parking priced zone to many smaller neighborhood parking priced zones.[135] Research by The United States Department of Transportation and Clinchant about the LA Express Park program showed an initial switch from very large parking priced zones to smaller neighborhood zones, similar to the Seattle parking pricing program, but the LA Express Park program went further and later switched from neighborhood zones to more specific pricing block by block.[136] Changing more directly to smaller pricing areas sizes than the other programs, the articles by Peirce et al. (2013) about the SF***Park*** on-street parking showed a switch from large parking zones directly to pricing block by block.[137] Going for a little of both, the article by the City of Boston about their parking program studied two different districts but used different area sizes to adjust pricing. One area adjusted pricing by the area zone, whereas the other adjusted prices by block.[138] On the other hand, one article by Peirce et al. (2015) about the off-street garage ***SFpark*** project showed that no change was made in the pricing area size.[139]

135 Ottosson, Dadi Baldwin, Cynthia Chen, Tingting Wang, and Haiyun Lin, "The sensitivity of on-street parking demand in response to price changes: A case study in Seattle, WA," *Transport Policy* 25 (2013): 222-232.

136 United States Department of Transportation, *Los Angeles Congestion Reduction Demonstration Express Lanes Program and National Evaluation Report*, by Jeremy Schroeder, FHWA-JPO-14-126, August 2015, 34-36.

137 Pierce, Gregory, and Donald Shoup, "Getting the prices right: an evaluation of pricing parking by demand in San Francisco," *Journal of American Planning Association* 79 (2013): 67-81.

138 City of Boston, *Performance Parking: Final Report,* Boston, MA. 2017.

139 Pierce, Gregory, Donald Shoup, and Hank Willson, "Optimizing the use of public garages: Pricing parking by demand," *Transport Policy* 44 (2015): 89-95.

These research articles also adjusted the parking price by different time frames. Whereas the research by Ottosson et al. about the Seattle parking pricing program and the research by the City of Boston about the their parking program showed no time period variation of pricing[140] [141], the research by The United States Department of Transportation (USDOT), and Clinchant about LA Express Park, and the research by Pierce et al. (2013) and Pierce et al. (2015) about the SF***park*** project showed time period variation of pricing. Furthermore, the research by The USDOT about the LA Express Park program and the research by Pierce et al. (2013) about the SF***park*** project showed not just pricing adjusted by different time period but they used different time periods. The LA Express Park program had longer overall parking pricing enforcement hours; therefore, each of their parking time periods was one hour longer than the SF***park*** on-street parking time periods.[142] The SF***park*** off-street garages were priced 24 hours a day, so there were more time periods and the length of each time period varied by demand.[143] The research by Clinchant about the LA Express Park program used modeling to analyze real-time dynamic pricing, which would set no time frames but instead would change pricing minute to minute based on actual occupancy.[144]

Although the research articles show parking pricing programs that vary in the pricing by area size and time period, these differences can be attributed to the difference in the type of parking, and the extent of the parking pricing programs. The article by Pierce et al. (2015) about the ***SFpark*** off-street garage parking lacked the need for variation by area size because the garages were already a small geographic area. Conversely, all the other on-street parking programs reviewed included much larger geographic areas, so there was more chance that demand would vary throughout the parking area. Therefore, most parking area sizes were assigned much smaller geographic areas within the larger parking pricing areas in order to more effectively manage parking demand.

When considering the extent of parking programs, the article by Pierce et al. (2013) about the SF***park*** project has the largest program out of all the programs examined. A grant from the federal government allowed for the use of new electronic parking meters and parking sensors, which was able to provide an unprecedented amount of data. This allowed the SF***park*** project program to implement more specific parking pricing area sizes and time periods.[145] The LA Express Park program examined by The USDOT also had a grant from the federal government but not to the same extent as the SF***park*** project program. Its funding allowed them to price parking by different area sizes gradually and by different time periods.[146] The research article by Ottossen et al. about the Seattle parking pricing program had the least funding, therefore it restricted their ability to use more specific area sizes and time periods.[147] The article by Clinchant about the LA Express Park used modeling to show the hypothetical effects of real-time dynamic pricing, which would be more effective at managing parking congestion, but would require significantly more resources than any of the other programs examined.[148]

To summarize these findings, though more, smaller parking pricing areas and time periods can make it easier to meet varied demand, it presents more funding and operational challenges. For smaller areas or less funded programs, a blanket price increase may be the most effective use of available resources, whereas for larger areas or those with more funding, varying pricing by different areas sizes and time periods may be more effective at changing varied parking demand throughout a parking pricing area.

140 Ottosson, Dadi Baldwin, Cynthia Chen, Tingting Wang, and Haiyun Lin, "The sensitivity of on-street parking demand in response to price changes: A case study in Seattle, WA," *Transport Policy* 25 (2013): 222-232.

141 City of Boston, *Performance Parking.*

142 USDOT, *Los Angeles Congestion Reduction.*

143 Pierce, Shoup, and Willson, "Optimizing the use of public garages."

144 Clinchant, Stéphane, Christopher Dance, Tom de Ruijter, Peer Ghent, and Onno Zoeter, "Using analytics to understand on-street parking: the impact of special permit use and the benefit of demand-based rates over zones," In *22nd ITS World Congress*, 2015.

145 Pierce, Gregory, and Donald Shoup, "Getting the prices right: an evaluation of pricing parking by demand in San Francisco," *Journal of American Planning Association* 79 (2013): 67-81.

146 United States Department of Transportation, *Los Angeles Congestion Reduction Demonstration Express Lanes Program and National Evaluation Report*, by Jeremy Schroeder, FHWA-JPO-14-126, August 2015, 34-36.

147 Ottosson, Dadi Baldwin, Cynthia Chen, Tingting Wang, and Haiyun Lin, "The sensitivity of on-street parking demand in response to price changes: A case study in Seattle, WA," *Transport Policy* 25 (2013): 222-232.

148 Clinchant, Stéphane, Christopher Dance, Tom de Ruijter, Peer Ghent, and Onno Zoeter, "Using analytics to understand on-street parking: the impact of special permit use and the benefit of demand-based rates over zones," In *22nd ITS World Congress*, 2015.

TIME LIMITS

Often before charging for parking, many jurisdictions impose time limits on parking to encourage turnover of parking spaces, particularly in areas that have high demand for short-term parking. Yet, people often parking over the posted time limit, or work the system by moving their car as often as the time limits require when they need their short-term parking spaces for long-term parking. The research that was examined showed that there is a benefit to using time limits, if used correctly, along with parking pricing.

Two research articles that examined parking pricing programs both found that adjusting time limits along with parking prices can be beneficial. The article by Clough about the goBerkeley parking program showed that low demand areas that had parking fees lowered and time limits extended increased their average occupancy percentage. It also found that high demand areas that had parking fees increased and time limits reduced and standardized decreased their average occupancy percentage.[149] Similarly, the article by Kittelson about the Washington DC parking program also showed an increase in the average occupancy percentage in areas where parking fees decreased and time limits were extended.[150]

The combination of time limits and pricing can work together and can be attributed to their similar effect on parking demand. In the article by Pierce et al. (2013) about the on-street SF***park*** program, the author describes three types of people that are more likely to move away from high-demand areas: Long-term parkers, solo drivers, and those who place a low value on saving travel time. Long-term parkers are more affected by changes in price and in time limits than short-term parkers are. Higher prices can be absorbed more easily when the parking time is short, but increased prices can rapidly become unaffordable when parking time is long. Similarly, when time limits are short, long-term parkers either cannot park in those areas, or may need to regularly move their car, incurring a time cost. Therefore, long-term parkers have more incentive to park where it is cheaper and allows for longer parking.[151]

To summarize these findings, though time limits can sometimes be ineffective at reducing demand since people ignore or work around time limits, when used in conjunction strategically with parking pricing, time limits can help shift long-term parkers out of high-demand areas and into low-demand areas.

4.2.3.1.3. Case Study: SFpark

The City of San Francisco in 2011 started a new demand-responsive parking program, with a pilot study examining certain high-demand on-street parking areas, as well as several city-owned garages.

An initial evaluation period recorded the existing conditions on the streets and in the garages. On-street parking occupancy rates were recorded for each block in the study areas at several different time frames throughout the day. Parking garage occupancy rates were recorded for the whole garage. These conditions provided the basis for parking fee changes.[152]

Any on-street parking blocks that were above eighty percent occupied at each time frame had their parking fees increased. If it was between sixty and eighty percent occupied the parking fee remained the same and if it was below sixty percent the parking fee was decreased.[153]

The parking fees for parking spaces in the city-owned garages were adjusted similarly by occupancy rate for different time periods but used slightly different occupancy rates. If occupancy was over eighty percent, parking fees were increased, just like for on-street parking. If the occupancy was between forty and eighty percent the parking fees were not changed and if it was below forty percent the parking fees were decreased.[154]

The occupancy rates of these on-street parking blocks and parking garages were re-measured every eight weeks and parking fees were readjusted.

149 Clough, Andrew, *goBerkeley Pilot Program Results and Next Steps,* (Staff Report), Berkeley, CA, Dec 16, 2014.

150 Kittelson & Associates, Inc, *parkDC: Penn Quarter/Chinatown Parking Pricing Pilot and Final Report,* Washington, DC: District Department of Transportation, January 2019.

151 Pierce, Gregory, and Donald Shoup, "Getting the prices right: an evaluation of pricing parking by demand in San Francisco," *Journal of American Planning Association* 79 (2013): 67-81.

152 San Francisco Metropolitan Transportation Agency, *SFpark Pilot Project Evaluation,* SFMTA, June 2014, accessed April 14, 2020, 20, http://sfpark.org/resources/docs_pilotevaluation/

153 Ibid.

154 Ibid. 20, 22.

The pilot study found that, compared to a control area that did not get parking fee adjustments, the parking fee adjustments created more on-street parking blocks that had occupancy rates in the optimal occupancy rate range. The parking fee adjustments for parking garages created more garages that had optimal occupancy rates.[155]

4.2.3.1.4. El Cerrito Plaza Station Application

The parking lots at the El Cerrito Plaza have demand-based parking fees at all BART station parking lots. When the fee program started in 2013, parking lot occupancy rates were evaluated every six months and if they were over ninety-five percent occupied then rates were raised by $.50 up to a cap of $3. The El Cerrito Plaza BART station parking has already hit this cap so there is no longer any ability to adjust parking demand by adjusting parking fees.

The amount of additional dedicated parking spaces that come from sharing on-street and off-street parking spaces may still not met the demand for parking around the station. These additional shared parking spaces could use demand-based parking fees to shift demand to alternative transportation modes.

The additional dedicated on-street parking around the station would require a monthly parking permit according to the previous discussed parking demand management strategy. Since the monthly permit is paid with a flat fee, the best alternative is to price the permits by location.

Streets that are adjacent to the current BART parking lots would be some of the closest parking spaces to the entrance to the station and would therefore be the most desirable. These parking spaces monthly permit fee could be higher than any of the other monthly fees. The further the on-street parking spaces are from the station entrance the further the monthly parking fee could decrease. Most of the off-street parking lot spaces are several blocks away from the station, and these stations could have the lowest monthly permit fee of all the permits.

People that live closer to the station may choose to switch to a different transportation mode choice if the price of a monthly permit makes driving to the station less desirable.

155 Ibid. 38, 61.

4.3. Conclusion

The data collected from the site analysis of the parking conditions at and around the El Cerrito Plaza BART station provides a good starting point to analyze what are the current parking conditions at the station. The examination of these five different parking management strategies provides the background knowledge to help to determine what could be the future parking conditions at the station and why they could work well to affect parking demand. The specific application of these parking management strategies will be used in the next section as the different parking management strategies for policy analysis.

Chapter 5: Policy Analysis of Parking Demand Management Strategies

5.1. Evaluation Criteria

With a good understanding of the different parking strategies, these policies can be evaluated on different criteria to help determine which policy would be the most effective or, if multiple policies could be effective, how to prioritize which policies to implement first.

There are several different traditional criteria that are used to evaluate policies. Depending on the type of issue being addressed, additional criteria may be used that are more specific to the issue.

Traditional evaluation criteria include technical and financial feasibility, political desirability, and administrative operability.

All of the parking policies were chosen for this report because they were technically feasible. Other technically feasible parking demand policies that did not directly deal with parking, such as improving pedestrian and bike infrastructure were also not examined in this report.

5.1.1 Financial Feasibility

Many policies could be very effective at technically addressing an issue but if they are very expensive, the policy may be a poor option.

The ability of a policy to be financially feasible has to examine the different costs and benefits. Good policies are able to produce more benefits than costs. The policy with the best overall benefit would have the best financial feasibility.

5.1.1.1. Up-front costs

One of the biggest costs for most policies are the initial costs to implement the policy. These can include any infrastructure improvements or other capital investment and initial administrative cost to plan and implement the policy. These are one-time up-front costs

5.1.1.2. Ongoing costs

Once a policy is implemented, there are other on-going costs to maintain a policy. These can include labor costs for administration, maintenance, monitoring, and enforcement. These can also include physical material costs for maintenance and repairs.

5.1.1.3. Revenue

Not all policies will generate revenue, but those that do can help to create a better cost/benefit ratio. Revenue can be generated by fees or though delivery of services.

5.1.2. Political Desirability

Support for different policies can vary depending on how it effects the different stakeholders. Stakeholders' support can vary for different aspects of a particular policy.

There are several different stakeholder opinions that are important for the analysis of these parking policies.

5.1.2.1. Residents near El Cerrito Plaza BART station

The residents that live near the El Cerrito Plaza BART station withstand the worst of the negative effects of spillover parking from BART riders. Residents want to maximize their ability to park on their street near their houses. They may have misperceptions about the availability of parking for residents during the day. They may be averse to paying more for the ability to park on their street because they feel entitled to those parking spaces.

5.1.2.2 BART Riders

People that drive to BART are going to have to significantly change their driving habits when the BART parking lots are converted into transit-oriented development. They will want to maintain their ability to drive to the station so they may be willing to either pay more or park further from the station if it guarantees a parking space. Some drivers may be influenced to switch to different modes. They may be willing to pay more for guaranteed parking space but may not be happy about the increased cost.

5.1.2.3. El Cerrito Government

City staff and council have a variety of interests to balance so they may be supportive of different policies for different interests. City council is accountable to its citizen and may be more supportive of policies that their constituents support. City staff may be more supportive of policies that help to achieve the city's long-term goals, even if they are supported less by the city's constituents.

5.1.2.4. Parking Lot Owners

Local parking lot owners are mostly only concerned with maximizing profit. They will want to minimize the amount of effort it takes to obtain these profits. They may not have an opinion on policy options that do not affect them.

5.1.2.5. BART

Similar to El Cerrito staff and council, BART has a variety of interests to balance. BART may be more supportive of policies that maintain or increase ridership. They will be supportive of policies that are lower cost and require less staff time to plan, implement, and maintain.

5.1.3. Administrative Operability

The ability for policies to be easily and effectively administered and operated can determine the operability of different policies. Policies that require more stakeholders to plan or implement can decrease the ease of operability. Polices that have multiple elements could make a policy more complicated to operate. The availability and cost of staff to implement a policy can also affect the operability

5.1.4. Equity

Although not a traditional criterion for evaluation, equity is becoming a more common criteria to evaluate policies. In the past, certain key stakeholder interests were not included when making decisions on what policies to implement. There is increased focus on the equity of policies to ensure that the policies do not unnecessarily disadvantage one particular community over another, with particular attention to reduce negative effects to commonly disadvantaged communities. Policies that balance the interest of stakeholders or focus on more benefits for typically disadvantaged communities will have better equity.

5.1.5. Time Frame

The time that is takes to complete policy implementation can be an important factor of whether a policy will be the most effective. Some issues require immediate actions, whereas other issues may allow or need longer time frames. More complicated issues are more likely to require multiple policies to be implemented.

5.2. Policy Analysis

Each policy was evaluated on each of the previously described criteria. Each policy was then scored on an ordinal scale to be able to compare policies to each other. The policy or policies that scaled the highest were noted to help determine which policy may be the preferred policy option.

5.2.1. Policy Matrix

Criteria		Alternatives				
		Delineated Parking	Shared On-street Parking	Residential Parking Permit Adjustments	Shared Off-Street Parking	Demand-Based Pricing
Financial Feasibility						
	Upfront Cost	-$$	-$$	-$$	-$	-
	Ongoing Costs	-$	-$$	-$$	-$	-
	Revenue	-	$$	$$	$	$$$
Politcial Desirability						
	Residents	☺ ☺	- ☺ / ☺	- ☺ / ☺	-	-
	BART Riders	☺ ☺	- ☺ / ☺	☺ ☺	☺ ☺	☺
	El Cerrito Gov	☺	☺	☺	☺	☺ ☺
	Parking Owners	-	-	-	☺ ☺	☺ ☺
	BART	☺	☺ ☺	☺ ☺	☺ ☺	☺ ☺
Operability		✓ ✓ ✓	✓ ✓	✓ ✓	✓	✓ ✓
Equity		-	- ✓/✓	- ✓/✓	- /✓	✓
Time-Frame		🕓	🕓 🕓	🕓 🕓	🕓 🕓 🕓	🕓 🕓

Legend

-	Negligable to no cost or revenue	-✓/✓	Negative and positive equity effects
-$/ -$$/ -$$$	Low cost to high revenue	- /✓	Negligable and positive equity effects
$/ $$/ $$$	Low revenue to high revenue	✓ /✓✓ /✓✓✓	Low to high ease of operability &
-	Non- Applicable		Low to high positive equity effects
- ☺/ ☺	Positive and negative desirability	🕓 / 🕓🕓 / 🕓🕓🕓	Short to long time-frame
☺ / ☺☺	Low to high desirability		

Figure 39 Policy matrix for parking strategies by criteria

5.2.2. Evaluations

5.2.1.1. Financial Feasibility

All of the policies evaluated have significantly lower costs compared to any policy that would have supplied more parking since infrastructure can be very costly. The cost differences between policies are also small since capital costs are low cost improvements like paint and signs. The other main cost difference comes from the staff cost for setting up and implementing the policy.

The delineated parking, shared on-street parking, and residential parking permits adjustments policies all have similar upfront costs because they all require adding parking space delineation. Shared off-street parking has less up-front costs since the parking lots already have delineated parking spaces, so only new parking signs would be needed. Demand-based pricing is an administrative policy so there are no upfront infrastructure costs outside of staff cost for planning.

Delineated parking and shared off-street parking policies have the lowest on-going costs since they require little to no administration and only slight costs for maintenance of parking spaces and enforcement costs for shared off-street parking. Shared on-street parking and residential parking permit adjustment policies have more ongoing administrative cost as to run the permit programs.

The demand-based pricing policy has the best ability to generate revenue since the fees collected can be adjusted more often than just setting a fee rate only every couple of years or longer. The shared on-street parking policy also has a good ability to generate revenue because it takes parking spaces that are currently being used by BART riders for free and starts charging them a permit fee. There is also a significant amount of parking spaces that could start to generate revenue by sharing these on-street parking spaces. The shared off-street parking spaces would also now generate revenue but not to the same degree as shared on-street parking since there are overall fewer parking spaces made available with this policy. Delineated parking spaces do not generate revenue because they are only an infrastructure improvement.

5.2.1.2. Political Desirability

The local residents have the most support for the delineating parking spaces policy, as this policy help create potentially additional parking spaces to park their cars but also just make it easier to park when cars are adequately spaced out. The residents have mixed support for the shared on-street parking and residential parking permit adjustment policies since on one hand they allow for more of the residential parking to be used by BART riders, but since some of the parking is currently unregulated will now be regulated, which could prevent more illegal parking. The residents are neutral on the other policies since they do not affect residential parking.

BART riders have the most support for several policies. The residential parking permit adjustment, and off-street parking policies have the most support because they provide additional dedicated parking supply that is currently unavailable, even if it comes at a price. The delineated parking policy may add a few additional spaces, but more importantly will make it easier to park. Though the shared on-street parking does provide additional dedicated parking spaces, these spaces are currently accessible for free and would now only be available for a fee.
The Demand-based parking policy has the least support since it also means that they will have to possibly pay more for their parking than they currently do.

City staff and council have the most support for the demand-based pricing policy because this will provide the most revenue, which can then be used to maintain high enforcement levels and potentially use excess funds to deliver other tangible benefits to the community. The other four policies have slightly lower support since they may benefit certain constituents over others or require funding capital costs that may be hard to fund.

Parking owners are neutral on the delineated parking, shared on-street parking and residential parking permit adjustment policies since these policies do not affect them. They have good support for the shared off-street parking and demand-based parking policies since they both bring in revenue that they currently do not collect and with little necessary effort on the parking lot owners' part.

BART has the high support for many of the policies, with only slightly less support for the delineated parking policy. Even though the delineated parking policy does allow for a few more parking spaces and make it easier for riders to park, in and of itself does not create any revenue, as do the other policies. The other four policies have high support because they add dedicated parking supply and generate revenue.

5.2.1.3 Administrative Operability

The delineated parking policy has the best administrative operability because it is essentially a one-time infrastructure improvement with almost no ongoing administration outside of semi-annual repainting of parking space markings that have faded. The off-street parking has the lower administrative operability because there it is more difficult to make arrangements with multiple parking lot owners versus dealing with a single entity like when dealing with the City of El Cerrito. The shared on-street parking and residential parking permit adjustment policies have some planning and operational set up to be able to implement and requires staff time but not as much time as dealing with parking lot owners. The demand-based parking policy has more ongoing administrative requirements since parking occupancy needs to be regularly monitored but by less administrative need since this policy has no infrastructure.

5.2.1.4 Equity

The equity of most of the policies are either neutral or a mix of good and bad. The demand-based parking policy has the most equity because it charges parking fees based on demand. Higher parking fees can disproportionally affect low-income riders, but the policy puts in place a needs-based low-income discount, which ensures that low-income riders are still able to park if they have no other means or transportation. The shared on-street parking, residential parking permit adjustments, and off-street parking policies reallocate some parking from some people to give to others. The delineated parking policy does not really affect any particular group over others.

5.2.1.5 Time Frame

The delineated parking policy has the shortest time frame of all the policies. Since the policy includes only infrastructure improvements and because paint is readily available and low cost, the parking spaces could be delineated within a very short amount of time. Exact locations would need to be determined and funding acquired to pay for the policy but with little planning needed, the policy is the quickest to implement.

As the on-street parking and residential parking permit adjustment policies build off the delineated parking policy but adds in changes to parking programs, there will be more time needed to plan these changes. These policies could not be implemented in the very short amount of time but could still be implemented in the relatively short amount of time. The demand-based pricing could also be planned in about this same amount of time.

The shared off-street parking policy would take the longest time to implement because there are so many more entities to deal with when making agreements to share parking. There would be considerably more staff time needed to work out separate agreements with each parking lot owner so the full implementation could take a moderate amount of time, with possibly different parking lots being implemented at different times.

5.3. Findings and Recommendations

5.3.1 Findings

After evaluating all the policies by the criteria, there is no clear indication of one policy's superiority over any other. These policies are very similar to each other with only minor changes between them, with some policies building off others. The policies that were better for certain criteria were usually only slightly better than the other policies.

This seems to indicate that all off the policies would be beneficial to implement, so the question then becomes which projects should be prioritized. Some of the main factors influential in choosing which policies to prioritize are cost and time frame, since funding can be limited, and quicker results are politically desirable. Political desirability consensus between stakeholders will always be a challenge and administrative operability is often behind the scenes, so they have less influence on prioritization of policies.

Even though the delineated parking policy does not bring in revenue, the quick implementation time and low overall cost makes it the best policy to prioritize first. This policy is also necessary to make many of the other policies possible.

The demand-based parking does bring in the most revenue, but it needs to be implemented with the shared on-street parking and residential parking permit adjustment policies. These policies also work together to provide shared on-street parking. With a short timeframe to implement and relatively low cost and good potential revenue, these two policies would be the next policies to prioritize. They can be planned and implemented with each other.

The demand-based parking policy would be the next policy to prioritize since it works alongside the shared on-street parking and residential parking permit policies. It can be planned along with these policies but could be implemented later, so that the initial changes from the other two policies could be monitored and help determine if additional measures are needed to manage parking demand.

The shared off-street parking policy would be the last policy to prioritize. This policy would take the longest to implement because of the longer time necessary to negotiate agreements with parking lot owners. There is less costs to implement but there is less potential for revenue.

5.3.2 Recommendations

5.3.2.1. Site Recommendations

Based off of these findings, it is recommended to implement all of the policies, starting with delineated parking, then add shared on-street parking and residential parking permit adjustments together, then shortly after add demand-based parking and finally add shared off-street parking. This order of implementation allows for visible and tangible results to build more political support from key stakeholders. It also allows for staff resources to be spread out over time so as to not overwhelming the staff.

Though these policies were examined to address the loss of parking at the El Cerrito Plaza BART station parking lots, all of these policies could be planned and possibly implemented before the parking lots are converted, especially because it can often take many years before construction would start on the transit-oriented development. Changing parking demand before the loss of the BART parking lots could help reduce the amount of dedicated parking supply that may be needed if some people can already be shifted to alternative transportation modes. Demand-based parking is one of the best policies that could be implemented before the loss of parking since it does not require any infrastructure changes and pricing has been shown to be effective at changing parking demand. BART has already signaled too that it is interested in raising the parking fee cap, which would allow them greater flexibility to raise parking fee to levels that could actually affect parking demand.

5.3.2.2. BART Recommendations

Though this report examined the application of parking demand management strategies to the specific case study of the El Cerrito Plaza BART station, there are lessons that can be learned from this report that could be applicable to other BART stations.

There is a large variety of types of stations throughout the BART system and the same strategies will not work at every station, but similar station types may have enough similar factors that can make strategies that are effective at one station more likely to be effective at others. BART already classifies all its stations into different stations type, so the first place that BART could start to examine the applicability of these strategies would be to look at other stations of the same station type of the El Cerrito Plaza BART station.

Of the stations that have the same station type as the El Cerrito Plaza BART station, BART could research the different types of parking within a quarter mile walk of the station. Where quantity of parking space is known, that data could be collected. Where quantity is of parking spaces is not known, like non-delineated on-street parking or gravel parking lots, a site analysis could be conducted to determine the number of potential parking spaces. It would also be important to determine the different entities that manage these parking spaces, as use of these parking spaces will require joint agreements. The entities that manage these parking spaces could also help to determine whether there is excess supply that is otherwise unused or has demand at different times or days that could be shared. For parking where this is unknown, a parking occupancy study can be conducted to better understand how much of the parking is occupied and at what times and days the parking is occupied.

Where there is available supply or differing demand, and where the entities that manage parking are receptive, BART could then examine which parking space location or locations could best achieve the parking needs of their riders. BART may also want to go further than what this report examined and look into to other transportation demand management strategies that could also be useful to encourage more transit and active transportation mode choice, which can affect parking demand.

Though this report examines parking demand strategies to mitigate the need for replacement parking because of transit-oriented development of its parking lots, many of these strategies could also be used at stations that will not lose parking lots but who still have a need to better utilize the parking that exists near the stations because of excess demand.

5.3.2.2. Transit Agency Recommendations

Though this report examined parking demand management strategies at BART, this report could also be useful for other transit agencies throughout the country. Many commuter rail transit agencies similar to BART are more likely than local light rail or local bus service to have parking lots. Metro systems like New York City's subway and Chicago's subway are also less likely to have parking lots. The main transit agencies then where this report would be most applicable would be agencies like Washington Metro and Los Angeles Metro.

The main difference in how these agencies would use this report would be that they would need to determine which stations in their systems most closely align with the El Cerrito Plaza BART station type. They could start by looking at the mode split of the station. Stations that are accessed primarily by automobile may not be a good candidate to try to implement these kinds of parking demand strategies. They could also look at the land use characteristics of the area around the station. If there are few street network connections, steep topography, or a low density of people near the station, it would be less feasible that any significant number of people could choose to switch to active transportation modes. Stations that a good mix of mode uses, good street network connectivity, and reasonable density near the station will be the most similar to the El Cerrito Plaza BART station.

After deciding which stations to examine, the process would be similar to the process used in this report for the El Cerrito Plaza station and for other similar stations within the BART system. The transit agencies could examine the existing parking conditions around the station, determine where there is parking that could potentially be shared and then examine which of the parking would best fulfill the parking needs of its riders.

5.3.2.3. City Government and TOD Developer Recommendations

Though this report focused on parking demand management strategies at a transit station that could lose parking when converting parking lots in TOD, there are other entities that could benefit from the findings in this report. Local city governments that have transit parking lots in their jurisdictions, particularly if those parking lots fill to capacity and parking spills over onto nearby streets, may desire to employ some of the same site analysis methods that were used in this report. For local governments that do not have current data on the number of parking spaces near

a transit station, measuring on-street parking areas could be useful for accurately understanding what parking assets the city owns. This data in turn could be used to determine if delineating parking spaces would be beneficial, particularly where parking demand is high. Local governments may also want to conduct a parking occupancy analysis to determine where, when and how parking is used in a particular area. These analyses could focus on how parking is utilized on residential parking permits streets compared to non-permit streets, on what times of day the demand for parking is highest and whether the demand is from residents, transit riders, shoppers, workers or students, or which specific areas or blocks have the highest demand for parking. For on-street parking that has competing interests, using the knowledge about the parking management strategies, local government could determine whether to better utilize their parking assets through shared parking agreements with local businesses or transit agencies and/or to implement the use of demand based parking into local programs like residential parking permit programs. These methods could work particularly well for local governments that desire to see more transit-oriented development in their cities as a way to encourage these kinds of development by proactively investigating the issue of parking loss.

Transit-oriented development developers may also be interested in the findings from the report, even if they are not creating development on a transit parking lot. Since it is necessary for transit-oriented development to be near transit stations, other land may be available for redevelopment which would also result in the loss of parking. Replacing the loss parking in these developments would be costly and take up valuable land that could be used for more housing, commercial, and/or office space, or other development amenities. It would be in the interest of these developers to find alternate strategies to address the loss of parking, like by utilizing other existing parking nearby. Developers may desire to conduct a site analysis of the area near a development site to determine if the existing nearby parking supply could replace the parking that is lost from the development or if some replacement parking would instead be needed. The site analysis could also be used to help estimate the financial feasibility of a development project, since less replacement parking translates into lower costs and a better chance for a return on investment. Developers may also use the data about existing parking around the development to potentially demonstrate that fewer on-site parking spaces for residential development is necessary, which would also translate into lower development costs and a better return on investment.

Chapter 6: Limitations, Further Research and Final Conclusion

6.1. Limitations and Further Research

Like most research, there are always more variables that could have been examined. This report was limited by the amount of time that one person, me, could spend on collecting data, researching strategies, finding case examples and writing this report.

One variable that could have been explored more extensively are the different geographic and socio-economic characteristics that could influence riders' transportation mode choices to transit stations. This report only examined physical changes to parking but there are a multitude of variables that can influence a person's travel behaviors. These can include variables like population density within walking and biking distances of transit, topography, street network connectivity, presence of active transportation infrastructure (i.e. sidewalks and bike lanes), travel times, travel cost, weather, crime levels, race, age, income levels, education levels, and job type. A thorough examination of scholarly literature would be necessary to determine the level of effect each of these variables has on transportation mode choice, and to determine which variable(s) have a greater effect than others and in which circumstances. Using the information gathered through this research, BART could categorize these variables for each station and then rank each variable dependent on how much it influences travel mode choice. Certain variables could be weight if they have a greater influence on travel behavior. Each station could then be scored by how likely a particular stations variable contributes to the ability to shift travel mode choice to the station. Those stations with a high ability to influence travel mode choice to alternative transportation modes could be better suited to reducing how much parking would potential be needed to maintain access to a station since they are more likely to shift people away from traveling by automobile.

Another variable that was not examined was other parking-demand management and transportation demand management strategies that do not directly affect parking spaces but would still be able to potentially affect parking demand. These can include strategies like reduced transit fares for riders who choose non-automobile mode choices, improving active transportation infrastructure like protected bike lanes or widened sidewalks, coordinating with cities with large central business district to require parking cash outs or unbundled parking costs, and financial support to local transit agencies to provide feeder service to the stations. Again, an examination of scholarly literature would be necessary to determine how effective each of these other parking demand and transportation demand management strategies could affect parking demand and travel demand. Another policy analysis could be completed using the same criteria as in this report so that other strategies could be analyzed alongside the strategies previously examined. Collaboration with city, regional, county, and state governments, other transit agencies and private businesses would be necessary to implement these strategies, which can make it more difficult to come to a consensus on strategy choices and adds to how long it takes for strategies to be enacted.

This report focused on one particular BART station, but an analysis of parking management strategies could examine these policies across all stations in the system that have parking. This would probably need to include more parking demand management strategies since replacement parking would be necessary for more auto-dependent stations and because the catchment areas of the stations are much larger than at the El Cerrito Plaza BART station. Park and ride parking lots further from the station could be a potential strategy for stations that may have large catchment areas and more available land within a reason distance from the station where a surface parking lot could be built, and riders could be shuttled to the station. By analyzing all the stations not only individually but as a whole system, parking demand could be analyzed between multiple stations. When thinking of parking demand between several stations, strategies like adding replacement parking at a different station than where parking was lost becomes a new possible strategy. An examination of scholarly literature on other parking demand strategies that include increasing supply would need to be studied to determine its effectiveness and how much parking to supply.

6.2. Final Conclusion

The El Cerrito Plaza BART station is in an ideal position to convert their existing parking lots into transit-oriented development. The BART system provides regional mobility and the station area has access to essential amenities nearby. The parking lots are the only available land near the station that are developable, or at least developable without high cost and displacement of people. However, the conversion of these parking lots to transit-oriented development means a loss of dedicated parking for BART riders. BART's policies do not recommend replacing parking at this station so the challenge becomes how to maintain ridership without replacing parking.

This report examined the existing conditions at and around the station to determine how much parking there currently is and how much could be lost. The report found that 773 could potentially be lost if there is no replacement parking but that even in the small study area around the station there was about 304 on-street parking spaces, plus many more in a quarter mile radius from the station, which could accommodate some of the loss of parking. The nearby on-street parking was only seventy percent occupied, even during the peak commute times. This shows that there is a potential for more on-street parking space to be utilized by BART riders. Residential parking permit streets were more likely to be less occupied than non-permit streets, and the percentage of vehicles parked with permits on these streets was typically less than thirty percent.

An examination of different parking management strategies was explored to help determine what strategies could work best at this station to accommodate the loss of parking and shift demand to alternative transportation modes. Since there was a reasonable supply of parking near the station, most of the strategies focused on better utilizing this existing supply. One strategy focused on shifting demand to either different times, days and locations, or to different transportation modes. After analyzing all the strategies, it was determined that all of the strategies would be effective at allowing for automobile access to the station. The strategy recommendations were to start with the strategies that were quicker to implement and were lower cost. Delineating on-street parking would be the quickest and cheapest to implement, followed by shared on-street parking and residential parking permit changes, then demand-based pricing and finally shared parking lots. These strategies could also be implemented before any loss of parking occurs, particularly demand-based

pricing, which could be used in BART parking lots and encourage shifts to alternative transportation mode choices.

These strategies could have a significant effect on parking demand in and around the station. The strategies balance the parking needs of BART riders who do not have viable other transportation options besides driving with the needs of local residents' daytime parking needs. The pricing of on-street parking that was previously free of charge could encourage more rider to choose alternative transportation modes, particularly if they live close to the station. Agreements for the use of on-street parking spaces and off-street parking lots could bring in needed revenue to local city governments and local businesses while utilizing existing parking more effectively. Demand-based pricing could discourage driving to the station and/or for people to parking further from the station, which has more available parking spaces.

BART and other transit agency can use the methods and findings in this report to examine parking needs for their stations that have parking lots. Conducting a site analysis of the existing parking supply and conducting an occupancy analysis could produce useful data of how much parking is nearby, how occupied that parking is and by whom. Stations with similar land-use characteristic could potentially apply similar parking demand management strategies as found in this report, particularly demand-based parking pricing. This report can also give them an idea of the which other entities they will need to collaborate with when using existing parking that they do not own. Cities and TOD developers could also use these same methods and findings to produce useful data on existing parking conditions near transit stations. Cities could use this data to determine the impact that new development could have on the existing parking supply and if there are opportunities to collaborate with developers or transit agencies to share on-street parking space. Developers could use this data to determine if and how much replacement parking would be necessary, which in turn affects development costs and financial feasibility.

This report showed that it is possibly to remove transit parking for development and not need to replace most of the parking. Using a package of parking demand management strategies that focused on utilizing the existing parking near a transit station better and discouraging auto travel with demand-based parking, accessing a transit station by automobile can be maintained when transit parking is lost. Many of these strategies require collaboration with other entities, which can add complications to the process and maintenance of strategies, but it is significantly cheaper than building costly replacement parking structures and discourages auto-dependency by no longer prioritizing automobile modes over other transportation modes or housing needs.

Appendix A: BART Parking Lot Raw Data

FID	Lot	Type	Access	Fee	Frequency	TimeStart	TimeEnd	Days	Spaces	% Total Public
0	West	Open	Public	3.00	Daily	4am	3pm	Mon-Fri	310	40.42%
1	West	Motorcycle	Public	0.00	NA	12am	12am	Mon-Sun	16	2.09%
2	West	Get Around	Restricted	0.00	NA				2	0.26%
3	West	Permit	Public	105.00	Monthly	4am	10am	Mon-Fri	114	14.86%
4	West	Handicap	Public	3.00	Daily	4am	3pm	Mon-Fri	16	2.09%
5	West	Snack Shop	Restricted	0.00	NA				1	0.13%
6	West	Permit	Public	105.00	Monthly	4am	10am	Mon-Fri	45	5.87%
7	West	Agent	Restricted	0.00	NA				2	0.26%
8	NorthEast	Open	Public	3.00	Daily	4am	3pm	Mon-Fri	206	26.86%
9	SouthEast	Carpool	Public	3.00	Daily	4am	10am	Mon-Fri	60	7.82%
10	West	No	Restricted	0.00	NA				1	0.13%
								Total	773	

Appendix B: On-street Parking Spaces Raw Data

FID	StreetMain	StreetCross	StreetType	PermitReq	StreetFrom	StreetTo	DistanceFT	Spaces18FT	Spaces18FTActual	Spaces Added	Total Over All	Notes
0	Oak E	Central N	Street	n	Red Curb	Electrical Enterence	68.5	3.81	3	1	4	
1	Oak E	Central N	Street	n	Electrical Enterence	Electrical Enterence	45	2.5	2		2	
2	Oak E	Central N	Street	n	Electrical Enterence	6623 Willow	297	16.5	16		16	
3	Willow N	Oak W	Street	n	6623 Willow	540 Liberty	103.5	5.75	5	1	6	
4	Willow N	Oak W	Street	n	540 Liberty	Curb	57.5	3.19	3		3	
5	Willow S	Oak W	Street	n	Curb	532 Liberty	68.5	3.81	3	1	4	
6	Willow S	Oak W	Street	n	532 Liberty	Curb	59	3.28	3		3	
7	Oak W	Central N	Street	y	Curb	535 Oak	45	2.50	2		2	
8	Oak W	Central N	Street	y	535 Oak	531 Oak	43	2.39	2		2	
9	Oak W	Central N	Street	y	531 Oak	525/523 Oak	29	1.61	1		1	
10	Oak W	Central N	Street	y	525/523 Oak	519 Oak	23.5	1.31	1		1	
11	Oak W	Central N	Street	y	519 Oak	515 Oak	40.5	2.25	2		2	

FID	StreetMain	StreetCross	StreetType	PermitReq	StreetFrom	StreetTo	DistanceFT	Spaces18FT	Spaces18FTActual	Spaces Added	Total Over All	Notes
12	Oak W	Central N	Street	y	515 Oak	511 Oak	30	1.67	1		1	
13	Oak W	Central N	Street	y	511 Oak	Curb	138.5	7.69	7	1	8	
14	Central N	Liberty E	Street	n	6609 Central	Curb	88.5	4.92	4	1	5	
15	Liberty E	Central N	Street	n	Curb	6605 Central	62	3.44	3		3	
16	Liberty E	Central N	Street	n	6605 Central	510 Liberty	30	1.67	1		1	
17	Liberty E	Central N	Street	n	510 Liberty	512 Liberty	29	1.61	1		1	
18	Liberty E	Central N	Street	n	512 Liberty	514/516 Liberty	21	1.17	1		1	
19	Liberty E	Central N	Street	n	514/516 Liberty	518/20/20A Liberty	6	0.33	0		0	
20	Liberty E	Central N	Street	n	518/20/20A Liberty	522 Liberty	79	4.39	4		4	
21	Liberty E	Central N	Street	n	522 Liberty	526/528 Liberty	12	0.67	0		0	
22	Liberty E	Central N	Street	n	526/528 Liberty	530 Liberty	26	1.44	1		1	
23	Liberty E	Central N	Street	n	530 Liberty	Curb	33.5	1.86	1	1	2	
24	Liberty E	Central N	Street	n	Curb	542 Liberty	81	4.50	4		4	
25	Liberty E	Central N	Street	n	542 Liberty	546 Liberty	8	0.44	0		0	
26	Liberty E	Central N	Street	n	546 Liberty	554 Liberty	72	4.00	4		4	
27	Liberty E	Central N	Street	n	554 Liberty	Curb	45.5	2.53	2		2	
28	Liberty W	Central N	Street	y	Curb	6605 Central	15.5	0.86	0	1	1	Compact only
29	Liberty W	Central N	Street	y	555 Liberty	551 Liberty	16.5	0.92	0	1	1	Compact only
30	Liberty W	Central N	Street	y	551 Liberty	549 Liberty	60	3.33	3		3	
31	Liberty W	Central N	Street	y	549 Liberty	545 Liberty	19	1.06	1		1	
32	Liberty W	Central N	Street	y	545 Liberty	543 Liberty	29.5	1.64	1		1	
33	Liberty W	Central N	Street	y	543 Liberty	535 Liberty	48	2.67	2		2	
34	Liberty W	Central N	Street	y	535 Liberty	529 Liberty	46	2.56	2		2	
35	Liberty W	Central N	Street	y	529 Liberty	525 Liberty	60	3.33	3		3	
36	Liberty W	Central N	Street	y	525 Liberty	523 Liberty	20	1.11	1		1	
37	Liberty W	Central N	Street	y	523 Liberty	519 Liberty	21.5	1.19	1		1	
38	Liberty W	Central N	Street	y	519 Liberty	515 Liberty	16	0.89	0	1	1	Compact only
39	Liberty W	Central N	Street	y	515 Liberty	511 Liberty	36	2.00	2		2	
40	Liberty W	Central N	Street	y	511 Liberty	507 Liberty	74	4.11	4		4	
41	Liberty W	Central N	Street	y	507 Liberty	505 Liberty	18	1.00	1		1	
42	Liberty W	Central N	Street	y	505 Liberty	Curb	43	2.39	2		2	
43	Central N	Liberty W	Street	n	Curb	6527 Central	13.5	0.75	0		0	
44	Central N	Liberty W	Street	n	6527 Central	6523 Central	22.5	1.25	1		1	
45	Central N	Liberty W	Street	n	6519 Central	6515 Central	18.5	1.03	1		1	
46	Central N	Liberty W	Street	n	6511 Central	6505 Central	33	1.83	1	1	2	
47	Central N	Liberty W	Street	n	6505 Central	Curb	29.5	1.64	1		1	
48	Central S	Liberty W	Street	n	Curb	6500 Central	83	4.61	4		4	
49	Liberty W	Central S	Street	y	Curb	441/443 Liberty	42	2.33	2		2	

FID	StreetMain	StreetCross	StreetType	PermitReq	StreetFrom	StreetTo	DistanceFT	Spaces18FT	Spaces18FTActual	Spaces Added	Total Over All	Notes
50	Liberty W	Central S	Street	y	441/443 Liberty	435 Liberty	30.5	1.69	1		1	
51	Liberty W	Central S	Street	y	435 Liberty	431 Liberty	71	3.94	3	1	4	
52	Liberty W	Central S	Street	y	427 Liberty	425 Liberty	65.5	3.64	3		3	
53	Liberty W	Central S	Street	y	421 Liberty	419 Liberty	14	0.78	0		0	
54	Liberty W	Central S	Street	y	419 Liberty	411/413 Liberty	47	2.61	2		2	
55	Liberty W	Central S	Street	y	409 Liberty	6525 Fairmount	76	4.22	4		4	
56	Fairmount N	Liberty W	Street	n	6501 Fairmount	6501 Fairmount	19.5	1.08	1		1	
57	Fairmount N	Liberty W	Street	n	6525 Fairmount	6525 Fairmount	19.5	1.08	1		1	
58	Fairmount S	Liberty W	20 Min	n	4060 El Cerrito Plz	4010 El Cerrito Plz		13	13		13	20 minute parking
59	Fairmount S	Liberty E	20 Min	n	3090 El Cerrito Plz	3010 El Cerrio Plz		20	20		20	20 minute parking
60	Fairmount S	Liberty E	Street	n	6700 Fairmount	6700 Fairmount	62	3.44	3		3	
61	Fairmount N	Liberty E	Street	n	Bart Enterence	Parking Enterence		8	8		8	Angle parking
119	Fairmount N	Liberty E	Street	n	Parking enterence	Curb		11	11		11	Angle parking
62	Liberty E	Central S	Street	n	Red curb	Curb	458	25.44	25		25	Bulb out ends
63	Central S	Liberty E	Street	n	Curb	BART enterence	124	6.89	6		6	Bulb out ends
64	Richmond W	Central S	Street	n	Curb	BART enterence	96	5.33	5		5	
65	Richmond W	Central S	Street	n	Bart Enterence	Red Curb	305	16.94	16	1	17	
66	Fairmount S	Richmond E	Street	n	Bulbout	Red Curb	22	1.22	1		1	
67	Fairmount S	Richmond E	Street	n	Coronado Curb	6814/6816 Fairmount	83.5	4.64	4		4	
68	Fairmount N	Richmond E	Street	y	Curb	6813 Fairmount	55.4	3.08	3		3	
69	Fairmount N	Richmond E	Street	y	6813 Fairmount	6811 Fairmount	26.5	1.47	1		1	
70	Richmond E	Central S	Street	y	6801 Fairmount	6801 Fairmount	43	2.39	2		2	
71	Richmond E	Central S	Street	y	6801 Fairmount	410/412 Richmond	16	0.89	0	1	1	
72	Richmond E	Central S	Street	y	410/412 Richmond	414/416 Richmond	15.5	0.86	0	1	1	
73	Richmond E	Central S	Street	y	414/416 Richmond	420 Richmond	13	0.72	0		0	
74	Richmond E	Central S	Street	y	420 Richmond	422 Richmond	34.5	1.92	1	1	2	
75	Richmond E	Central S	Street	y	422 Richmond	424 Richmond	27	1.50	1		1	
76	Richmond E	Central S	Street	y	424 Richmond	430 Richmond	35	1.94	1	1	2	
77	Richmond E	Central S	Street	y	430 Richmond	434 Richmond	54.5	3.03	3		3	
78	Richmond E	Central S	Street	y	434 Richmond	438 Richmond	23.5	1.31	1		1	
79	Richmond E	Central S	Street	y	438 Richmond	440 Richmond	5.5	0.31	0		0	
80	Richmond E	Central S	Street	y	440 Richmond	Red Curb	40	2.22	2		2	
81	Central N	Richmond E	Street	y	Red Curb	501 Everett	62	3.44	3		3	
82	Central N	Richmond E	Street	y	501 Everett	6811 Central	8.5	0.47	0		0	
83	Central N	Richmond E	Street	y	6811 Central	Curb	83	4.61	4		4	
84	Richmond E	Central N	Street	y	6807 Central	508 Richmond	25.5	1.42	1		1	
85	Richmond E	Central N	Street	y	510 Richmond	512 Richmond	55.5	3.08	3		3	

FID	StreetMain	StreetCross	StreetType	PermitReq	StreetFrom	StreetTo	DistanceFT	Spaces18FT	Spaces18FTActual	Spaces Added	Total Over All	Notes
86	Richmond E	Central N	Street	y	514 Richmond	516 Richmond	28	1.56	1		1	
120	Richmond E	Central N	Street	y	516 Richmond	520 Richmond	3	0.17	0		0	
87	Richmond E	Central N	Street	y	520 Richmond	524 Richmond	65	3.61	3		3	
88	Richmond E	Central N	Street	y	524 Richmond	526 Richmond	15.5	0.86	0	1	1	
89	Richmond E	Central N	Street	y	526 Richmond	528 Richmond	27	1.50	1		1	
90	Richmond E	Central N	Disabled	y	528 Richmond	530 Richmond	3	0.17	0		0	
91	Richmond E	Central N	Street	y	530 Richmond	534 Richmond	12.5	0.69	0		0	
121	Richmond E	Central N	Street	y	534 Richmond	534 Richmond	19.5	1.08	1		1	Disabled Parking
92	Richmond E	Central N	Street	y	534 Richmond	538 Richmond	35	1.94	1	1	2	
93	Richmond E	Central N	Street	y	538 Richmond	542 Richmond	37	2.06	2		2	
94	Richmond E	Central N	Street	y	542 Richmond	546 Richmond	34.5	1.92	1	1	2	
95	Richmond E	Central N	Street	y	546 Richmond	548 Richmond	51.5	2.86	2	1	3	
96	Richmond E	Central N	Street	y	548 Richmond	Red Curb	18.5	1.03	1		1	
97	Richmond W	Willow N	Street	n	557 Richmond	555 Richmond	38	2.11	2		2	
98	Richmond W	Willow N	Street	n	555 Richmond	551 Richmond	27	1.50	1		1	
99	Richmond W	Willow N	Street	n	551 Richmond	549 Richmond	3.5	0.19	0		0	
100	Richmond W	Willow N	Street	n	549 Richmond	547 Richmond	41.5	2.31	2		2	
101	Richmond W	Willow N	Street	n	547 Richmond	545/543 Richmond	9.5	0.53	0		0	
102	Richmond W	Willow N	Street	n	545/543 Richmond	539 Richmond	49	2.72	2		2	
103	Richmond W	Willow N	Street	n	539 Richmond	535 Richmond	26.5	1.47	1		1	
104	Richmond W	Willow N	Street	n	535 Richmond	Curb	53.5	2.97	2	1	3	
105	Willow N	Richmond E	Street	y	Curb	6727 Willow	56.5	3.14	3		3	
106	Willow N	Richmond E	Street	y	6727 Willow	532 Elm	99.5	5.53	5		5	
107	Elm E	Willow N	Street	y	Curb	532 Elm	62	3.44	3		3	
108	Elm E	Willow N	Street	y	532 Elm	538 Elm	23.2	1.29	1		1	
122	Elm E	Willow N	Street	y	538 Elm	542 Elm	3	0.17	0		0	
109	Elm E	Willow N	Street	y	542 Elm	544/546 Elm	29.5	1.64	1		1	
110	Elm E	Willow N	Street	y	544/546 Elm	550 Elm	18	1.00	1		1	
111	Elm E	Willow N	Street	y	550 Elm	552 Elm	43.8	2.43	2		2	
112	Elm E	Willow N	Street	y	552 Elm	Curb	48	2.67	2		2	
113	Elm W	Willow N	Street	n	Curb	6628/6630 Lincoln	48	2.67	2		2	
114	Elm W	Willow N	Street	n	6628/6630 Lincoln	547/549 Elm	67.5	3.75	3	1	4	
115	Elm W	Willow N	Street	n	547/549 Elm	Trail Walkway	150	8.33	8		8	
116	Willow S	Richmond W	Street	n	Bart Walkway	Red curb	197	10.94	10	1	11	
117	Richmond W	Willow S	Street	n	2nd Tree	Bart enterence	75.5	4.19	4		4	
118	Richmond W	Willow S	Street	n	Bart Enterence	Red Curb	115.5	6.42	6		6	

Appendix C: Parking Occupancy Study Raw Data

FID	StreetMain	StreetCross	StreetType	PermitReg	Full6am	FullPermit6am	Empty6am	TotalAll6am	TotalPermit6am	FullPerc6am	PermPercFull6am	PermPercTotal6am
0	Oak E	Central N	Street	n	14	0	1	15	14	93.33%		
2	Willow N	Liberty E	Street	n	4	1	2	7	5	71.43%		
3	Willow S	Liberty E	Street	n	1	2	3	6	3	50.00%		
4	Oak W	Central N	Street	y	7	5	6	18	12	66.67%	41.67%	27.78%
6	Central N	Liberty E	Street	n	0	0	4	4	0	0.00%		
8	Liberty E	Central N	Street	n	12	4	5	21	16	76.19%		
9	Liberty W	Central N	Street	y	2	13	10	25	15	60.00%	86.67%	52.00%
11	Central N	Liberty E	Street	n	0	1	4	5	1	20.00%		
12	Central S	Liberty S	Street	n	1	2	1	4	3	75.00%		
13	Liberty W	Central S	Street	y	1	4	8	13	5	38.46%	80.00%	30.77%
14	Fairmount N	Liberty W	Street	n	2	0	0	2	2	100.00%		
15	Fairmount S	Liberty W	Angle 20	n	6	0	7	13	6	46.15%		
16	Fairmount S	Liberty E	Angle 20	n	6	0	14	20	6	30.00%		
17	Fairmount S	Liberty E	Street	n	3	0	0	3	3	100.00%		
18	Fairmount N	Liberty E	Street	n	18	1	0	19	19	100.00%		
19	Liberty E	Central S	Street	n	21	1	0	22	22	100.00%		
20	Central S	Liberty E	Street	n	6	0	0	6	6	100.00%		
21	Richmond W	Central S	Street	n	18	1	1	20	19	95.00%		
22	Fairmount S	Richmond E	Street	n	5	0	0	5	5	100.00%		
23	Fairmount N	Richmond E	Street	y	0	1	2	3	1	33.33%	100.00%	33.33%
24	Richmond E	Central S	Street	y	5	7	3	15	12	80.00%	58.33%	46.67%
25	Central N	Richmond E	Street	y	2	3	2	7	5	71.43%	60.00%	42.86%
26	Richmond E	Central N	Street	y	9	5	7	21	14	66.67%	35.71%	23.81%
27	Richmond W	Willow N	Street	n	7	2	1	10	9	90.00%		
28	Willow N	Richmond W	Street	y	0	0	9	9	0	0.00%		
29	Elm E	Willow N	Street	y	2	3	5	10	5	50.00%	60.00%	30.00%
30	Elm W	Willow N	Street	n	5	3	0	8	8	100.00%		
31	Willow S	Richmond W	Street	n	9	0	0	9	9	100.00%		
32	Richmond W	Willow S	Street	n	9	1	1	11	10	90.91%		

FID	StreetMain	StreetCross	StreetType	PermitReg	Full10am	FullPermit10am	Empty10am	TotalAll10am	TotalPermit10am	FullPerc10am	PermPercFull10am	PermPercTotal10am
0	Oak E	Central N	Street	n	19	0	1	20	19	95.00%		
2	Willow N	Liberty E	Street	n	0	0	7	7	0	0.00%		
3	Willow S	Liberty E	Street	n	4	2	0	6	6	100.00%		
4	Oak W	Central N	Street	y	6	2	8	16	8	50.00%	25.00%	12.50%
6	Central N	Liberty E	Street	n	1	1	2	4	2	50.00%		
8	Liberty E	Central N	Street	n	18	4	0	22	22	100.00%		
9	Liberty W	Central N	Street	y	4	10	11	25	14	56.00%	71.43%	40.00%
11	Central N	Liberty E	Street	n	0	0	5	5	0	0.00%		
12	Central S	Liberty S	Street	n	3	1	0	4	4	100.00%		
13	Liberty W	Central S	Street	y	7	4	5	16	11	68.75%	36.36%	25.00%
14	Fairmount N	Liberty W	Street	n	2	0	0	2	2	100.00%		
15	Fairmount S	Liberty W	Angle 20	n	1	0	12	13	1	7.69%		
16	Fairmount S	Liberty E	Angle 20	n	11	0	9	20	11	55.00%		
17	Fairmount S	Liberty E	Street	n	3	0	0	3	3	100.00%		
18	Fairmount N	Liberty E	Street	n	18	1	0	19	19	100.00%		
19	Liberty E	Central S	Street	n	21	1	0	22	22	100.00%		
20	Central S	Liberty E	Street	n	6	0	0	6	6	100.00%		
21	Richmond W	Central S	Street	n	20	0	0	20	20	100.00%		
22	Fairmount S	Richmond E	Street	n	5	0	0	5	5	100.00%		
23	Fairmount N	Richmond E	Street	y	1	2	0	3	3	100.00%	66.67%	66.67%
24	Richmond E	Central S	Street	y	5	7	3	15	12	80.00%	58.33%	46.67%
25	Central N	Richmond E	Street	y	3	3	1	7	6	85.71%	50.00%	42.86%
26	Richmond E	Central N	Street	y	6	12	3	21	18	85.71%	66.67%	57.14%
27	Richmond W	Willow N	Street	n	9	1	0	10	10	100.00%		
28	Willow N	Richmond W	Street	y	5	2	2	9	7	77.78%	28.57%	22.22%
29	Elm E	Willow N	Street	y	6	2	2	10	8	80.00%	25.00%	20.00%
30	Elm W	Willow N	Street	n	10	1	2	13	11	84.62%		
31	Willow S	Richmond W	Street	n	10	0	0	10	10	100.00%		
32	Richmond W	Willow S	Street	n	10	1	0	11	11	100.00%		

FID	StreetMain	StreetCross	StreetType	PermitReg	Full2pm	FullPermit2pm	Empty2pm	TotalAll2pm	TotalPermit2pm	FullPerc2pm	PermPercFull2pm	PermPercTotal2pm
0	Oak E	Central N	Street	n	19	0	1	20	19	95.00%		
2	Willow N	Liberty E	Street	n	0	0	7	7	0	0.00%		
3	Willow S	Liberty E	Street	n	4	1	1	6	5	83.33%		
4	Oak W	Central N	Street	y	8	2	5	15	10	66.67%	20.00%	13.33%
6	Central N	Liberty E	Street	n	2	1	1	4	3	75.00%		
8	Liberty E	Central N	Street	n	18	4	0	22	22	100.00%		
9	Liberty W	Central N	Street	y	3	9	13	25	12	48.00%	75.00%	36.00%
11	Central N	Liberty E	Street	n	0	1	4	5	1	20.00%		
12	Central S	Liberty S	Street	n	3	1	0	4	4	100.00%		
13	Liberty W	Central S	Street	y	6	3	5	14	9	64.29%	33.33%	21.43%
14	Fairmount N	Liberty W	Street	n	2	0	0	2	2	100.00%		
15	Fairmount S	Liberty W	Angle 20	n	7	0	6	13	7	53.85%		
16	Fairmount S	Liberty E	Angle 20	n	8	0	12	20	8	40.00%		
17	Fairmount S	Liberty E	Street	n	3	0	0	3	3	100.00%		
18	Fairmount N	Liberty E	Street	n	18	1	0	19	19	100.00%		
19	Liberty E	Central S	Street	n	21	1	0	22	22	100.00%		
20	Central S	Liberty E	Street	n	6	0	0	6	6	100.00%		
21	Richmond W	Central S	Street	n	19	0	1	20	19	95.00%		
22	Fairmount S	Richmond E	Street	n	5	0	0	5	5	100.00%		
23	Fairmount N	Richmond E	Street	y	0	1	2	3	1	33.33%	100.00%	33.33%
24	Richmond E	Central S	Street	y	5	8	3	16	13	81.25%	61.54%	50.00%
25	Central N	Richmond E	Street	y	0	3	4	7	3	42.86%	100.00%	42.86%
26	Richmond E	Central N	Street	y	5	11	5	21	16	76.19%	68.75%	52.38%
27	Richmond W	Willow N	Street	n	9	1	0	10	10	100.00%		
28	Willow N	Richmond W	Street	y	4	2	3	9	6	66.67%	33.33%	22.22%
29	Elm E	Willow N	Street	y	4	1	5	10	5	50.00%	20.00%	10.00%
30	Elm W	Willow N	Street	n	6	1	6	13	7	53.85%		
31	Willow S	Richmond W	Street	n	9	0	1	10	9	90.00%		
32	Richmond W	Willow S	Street	n	9	1	1	11	10	90.91%		

FID	StreetMain	StreetCross	StreetType	PermitReg	Full6pm	FullPermit6pm	Empty6pm	TotalAll6pm	TotalPermit6pm	FullPerc6pm	PermPercFull6pm	PermPercTotal6pm
0	Oak E	Central N	Street	n	8	0	12	20	8	40.00%		
2	Willow N	Liberty E	Street	n	1	0	6	7	1	14.29%		
3	Willow S	Liberty E	Street	n	0	2	4	6	2	33.33%		
4	Oak W	Central N	Street	y	5	2	9	16	7	43.75%	28.57%	12.50%
6	Central N	Liberty E	Street	n	1	1	2	4	2	50.00%		
8	Liberty E	Central N	Street	n	14	4	4	22	18	81.82%		
9	Liberty W	Central N	Street	y	5	12	8	25	17	68.00%	70.59%	48.00%
11	Central N	Liberty E	Street	n	1	3	1	5	4	80.00%		
12	Central S	Liberty S	Street	n	2	1	1	4	3	75.00%		
13	Liberty W	Central S	Street	y	8	3	4	15	11	73.33%	27.27%	20.00%
14	Fairmount N	Liberty W	Street	n	1	0	1	2	1	50.00%		
15	Fairmount S	Liberty W	Angle 20	n	7	0	6	13	7	53.85%		
16	Fairmount S	Liberty E	Angle 20	n	5	0	15	20	5	25.00%		
17	Fairmount S	Liberty E	Street	n	3	0	0	3	3	100.00%		
18	Fairmount N	Liberty E	Street	n	9	0	9	18	9	50.00%		
19	Liberty E	Central S	Street	n	13	1	9	23	14	60.87%		
20	Central S	Liberty E	Street	n	2	0	4	6	2	33.33%		
21	Richmond W	Central S	Street	n	13	0	7	20	13	65.00%		
22	Fairmount S	Richmond E	Street	n	1	1	3	5	2	40.00%		
23	Fairmount N	Richmond E	Street	y	0	0	3	3	0	0.00%		0.00%
24	Richmond E	Central S	Street	y	5	5	5	15	10	66.67%	50.00%	33.33%
25	Central N	Richmond E	Street	y	3	2	2	7	5	71.43%	40.00%	28.57%
26	Richmond E	Central N	Street	y	5	8	6	19	13	68.42%	61.54%	42.11%
27	Richmond W	Willow N	Street	n	5	1	4	10	6	60.00%		
28	Willow N	Richmond W	Street	y	0	2	7	9	2	22.22%	100.00%	22.22%
29	Elm E	Willow N	Street	y	3	1	6	10	4	40.00%	25.00%	10.00%
30	Elm W	Willow N	Street	n	2	3	9	14	5	35.71%		
31	Willow S	Richmond W	Street	n	2	0	8	10	2	20.00%		
32	Richmond W	Willow S	Street	n	5	1	4	10	6	60.00%		

FID	StreetMain	StreetCross	StreetType	PermitReg	FullAveDay	AvePermPercFullDay	AvePermPercTotalDay
0	Oak E	Central N	Street	n	80.83%		
2	Willow N	Liberty E	Street	n	21.43%		
3	Willow S	Liberty E	Street	n	66.67%		
4	Oak W	Central N	Street	y	56.77%	28.81%	16.53%
6	Central N	Liberty E	Street	n	43.75%		
8	Liberty E	Central N	Street	n	89.50%		
9	Liberty W	Central N	Street	y	58.00%	75.92%	44.00%
11	Central N	Liberty E	Street	n	30.00%		
12	Central S	Liberty S	Street	n	87.50%		
13	Liberty W	Central S	Street	y	61.21%	44.24%	24.30%
14	Fairmount N	Liberty W	Street	n	87.50%		
15	Fairmount S	Liberty W	Angle 20	n	40.38%		
16	Fairmount S	Liberty E	Angle 20	n	37.50%		
17	Fairmount S	Liberty E	Street	n	100.00%		
18	Fairmount N	Liberty E	Street	n	87.50%		
19	Liberty E	Central S	Street	n	90.22%		
20	Central S	Liberty E	Street	n	83.33%		
21	Richmond W	Central S	Street	n	88.75%		
22	Fairmount S	Richmond E	Street	n	85.00%		
23	Fairmount N	Richmond E	Street	y	41.67%		
24	Richmond E	Central S	Street	y	76.98%	57.05%	44.17%
25	Central N	Richmond E	Street	y	67.86%	62.50%	39.29%
26	Richmond E	Central N	Street	y	74.25%	58.17%	43.86%
27	Richmond W	Willow N	Street	n	87.50%		
28	Willow N	Richmond W	Street	y	41.67%	53.97%	22.22%
29	Elm E	Willow N	Street	y	55.00%	32.50%	17.50%
30	Elm W	Willow N	Street	n	68.54%		
31	Willow S	Richmond W	Street	n	77.50%		
32	Richmond W	Willow S	Street	n	85.45%		

Bibliography

AbuHamdi, Eliana, Andrew Matsas, Caitlin Elliot, Doug Rose, Fernando Burga, Ginette Wessel, Kristine Williams, Laura Sanford, Warren Logan. *Communities on the Right Track: Including Affordable Housing at BART TODs: A Feasibility Study of Ashby and El Cerrito Plaza*. College of Environmental Design University of Berkeley, 2013. Accessed May 7, 2019. http://ced.berkeley.edu/downloads/gallery/incity/su13/incity_bart_communitiesonrighttrack_2013.pdf

American Road and Transportation Builders Association. "How much does it cost to build a mile of road?" ARTBA Frequently Asked Questions. Accessed May 23, 2018. https://www.artba.org/about/faq/

Arnott, Richard. "On the optimal target curbside parking occupancy rate." *Economics of Transportation* 3, no. 2 (2014): 133-144. Accessed May 15, 2019. https://doi.org/10.1016/j.ecotra.2014.07.001.

ARUP. "El Cerrito Plaza BART Station Access Survey Results." BART. May 7, 2019. Accessed May 3, 2020. https://www.bart.gov/sites/default/files/docs/2.2%202019-05-07%20Survey%20Analysis%20appendix%20summary-possted%20to%20web.pdf

Ballotpedia. "El Cerrito, California, Library Bond Issue, Measure B (November 2016)." Ballotpedia.org. Accessed May 7, 2019. https://ballotpedia.org/El_Cerrito,_California,_Library_Bond_Issue,_Measure_B_(November_2016)

Bay Area Rapid Transit. "10-year Transit-Oriented Development Work Plan Outline." BART, February 2020. Accessed April 13, 2020. https://www.bart.gov/sites/default/files/docs/10-Year%20Work%20Plan%20Outline_Final%202020-02-18.pdf

Bay Area Rapid Transit. "AB 2923 Guidance Document Outline." BART, February 2020. Accessed April 13, 2020. https://www.bart.gov/about/business/tod/ab2923

Bay Area Rapid Transit. "Affordable Housing Policy." BART, January 2016. Accessed May 7, 2019. https://www.bart.gov/sites/default/files/docs/Affordable%20Housing%20Policy%20Adopted%201-28-16_0.pdf

Bay Area Rapid Transit. "BART Historical Timeline: Achievement over the Years." BART, 2017. Accessed May 7, 2019. https://www.bart.gov/sites/default/files/docs/bart-historical-timeline.pdf

Bay Area Rapid Transit. "BART Station Access Policy." BART, June 2016. Accessed May 7, 2019. https://www.bart.gov/sites/default/files/docs/BART%20Access%20Policy%20-%20Adopted%202016-06-09%20Final%20Adopted.pdf

Bay Area Rapid Transit. "BART Station Access Policy Implementation Key: Station Access Typology Map." BART, June 2016. Accessed May 7, 2019. https://www.bart.gov/sites/default/files/docs/Station%20Typology%20Map%202016-06-09%20Final.pdf

Bay Area Rapid Transit. "BART Transit-Oriented Development Program." Powerpoint presentation, City of El Cerrito City Council meeting. El Cerrito, Ca. February 5, 2019. Accessed April 13, 2020. http://el-cerrito.org/Archive.aspx?AMID=41

Bay Area Rapid Transit. "Demand-Based Parking Program (2013)." In *Bart Station Access Policy Update: Policy Context & Best Practices,* pg. 14. BART, Oct 2015. Accessed May 7, 2019. https://www.bart.gov/sites/default/files/docs/BART%20Access%20Policy%20Update%20-%20Policy%20Context%20and%20Best%20Practices%20Review_1.pdf

Bay Area Rapid Transit. "El Cerrito Plaza BART Station Access Survey Results." BART. May 7, 2019. Accessed April 13, 2020. https://www.bart.gov/about/business/tod/el-cerrito-plaza

Bay Area Rapid Transit. "Other Best Practices." In *Bart Station Access Policy Update: Policy Context and Best Practices Review,* 30-34. BART, Oct 2015. Accessed May 7, 2019. https://www.bart.gov/sites/default/files/docs/BART%20Access%20Policy%20Update%20-%20Policy%20Context%20and%20Best%20Practices%20Review_1.pdf

Bay Area Rapid Transit. "Stations." BART.gov. Accessed May 7, 2019. https://www.bart.gov/stations

Bay Area Rapid Transit. "System Facts." BART.gov. Accessed May 7, 2019. https://www.bart.gov/about/history/facts

Bay Area Rapid Transit. "Transit-Oriented Development (TOD)." BART.gov, last updated April 2019. Accessed May 7, 2019. https://www.bart.gov/about/business/tod

Bay Area Rapid Transit. "Transit-Oriented Development Policy." BART, June 2016. Accessed May 7, 2019. https://www.bart.gov/sites/default/files/docs/BART%20Board%20-%20TOD%20Policy%20Draft%206-9-16%20Adopted%20FINAL_0.pdf

California Legislative Information. "AB-2923 San Francisco Bay Area Rapid Transit District: transit-oriented development." Leginfo.legislature.ca.gov. October 1, 2018. Accessed May 7, 2019. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB2923

City of Boston. *Performance Parking: Final Report.* Boston, MA. 2017. Accessed May 15, 2019. https://www.boston.gov/transportation/performance-parking-pilot

City of El Cerrito. "Code of Ordinances: Table 19.24-A Required Parking." Library.Municode.com/Ca/ElCerrito. Last updated March 29, 2019. Accessed May 7, 2019. https://library.municode.com/ca/el_cerrito/codes/code_of_ordinances?nodeId=TIT19ZO_PTIVREAPSOALDI_CH19.24OREPALO

City of El Cerrito. "Code of Ordinances: Table 19.07-B Development Standards - Commercial and Mixed-Use Districts." Library.Municode.com/Ca/ElCerrito. Last updated March 29, 2019. Accessed May 7, 2019. https://library.municode.com/ca/el_cerrito/codes/code_of_ordinances?nodeId=TIT19ZO_PTIIBADIRE_CH19.07COTRIEMIEDI_19.07.020LAUSRE

City of El Cerrito. "Community View/GIS: 4-hour Parking Zones." El-Cerrito.org. Accessed May 7, 2019. http://maps.digitalmapcentral.com/production/VECommunityView/cities/elcerrito/index.aspx?

City of El Cerrito. "Community View/GIS: Zoning." El-Cerrito.org. Accessed May 7, 2019. http://maps.digitalmapcentral.com/production/VECommunityView/cities/elcerrito/index.aspx?

City of El Cerrito. "El Cerrito Library Needs." El-Cerrito.org. Accessed May 7, 2019. http://www.el-cerrito.org/936/Library-Services-Priorities

City of El Cerrito. "Form-Based Codes." In *San Pablo Ave Specific Plan,* chap 2. Dec 2014. Accessed May 7, 2019. http://www.el-cerrito.org/DocumentCenter/View/4411

City of El Cerrito. "Inclusionary Housing Zoning Ordinance." El-Cerrito.org. Accessed May 3, 2020. https://www.el-cerrito.org/1287/Inclusionary-Housing-Program

City of Hayward. "South Hayward BART Transit-Oriented Development: Approval of Action Plan for South Hayward BART Joint Powers Authority." Staff Report. February 19, 2013. Accessed April 13, 2020.

City of Hayward. "South Hayward Parking Fee Program." Public Hearing Powerpoint. March 14, 2013. Accessed April 13, 2020.

Clinchant, Stéphane, Christopher Dance, Tom de Ruijter, Peer Ghent, and Onno Zoeter. "Using analytics to understand on-street parking: the impact of special permit use and the benefit of demand-based rates over zones." In *22nd ITS World Congress*. 2015.

Clough, Andrew. *goBerkeley Pilot Program Results and Next Steps.* (Staff Report). Berkeley, CA. Dec 16, 2014. Accessed May 15, 2019.

Distance Calculator. "Distance from El Cerrito to Berkeley." DistanceCalcualor.net. Accessed May 7, 2019. https://www.distancecalculator.net/from-el-cerrito-2-to-berkeley

Distance Calculator. "Distance from El Cerrito to Oakland." DistanceCalcualor.net. Accessed May 7, 2019. https://www.distancefromto.net/distance-from-el-cerrito-us-to-oakland-us

Environmental Protection Agency. *Climate Change indicators: US Greenhouse Gas Emissions*. EPA.gov. Accessed May 23, 2018. https://www.epa.gov/climate-indicators/greenhouse-gases

Everything Connects. "Urban Sprawl." Everything Connects. Accessed May 23, 2018. http://www.everythingconnects.org/urban-sprawl.html

FPI Management. "Prices/Availability." Metro 510. Accessed May 3, 2020. https://www.liveatmetro510.com/

Groote, Jesper, Jos van Ommerem, Hans R.A. Koster. "Car ownership and residential parking subsidies: Evidence from Amsterdam." *Economics of Transportation 6 (2016) 25-36.* Accessed May 15, 2019. https://doi.org/10.2139/ssrn.2656984.

Guo, Zhan. "Home parking convenience, household car usage, and implications to residential parking policies." *Transport Policy* 29 (2013) 97-106. Accessed May 15, 2019. https://doi.org/10.1016/j.tranpol.2013.04.005.

Guo, Zhan. "Residential street parking and car ownership: a study of households with off-street parking in New York City region." *Journal of the American Planning Association* 79, no. 1 (2013): 32-48. Accessed May 15, 2019. https://doi.org/10.1080/01944363.2013.790100.

Guo, Zhan, and Simon Mc Donnell. "Curb parking pricing for local residents: An exploration in New York City based on willingness to pay." *Transport Policy* 30 (2013): 186-198. Accessed May 15, 2019. https://doi.org/10.1016/j.tranpol.2013.09.006.

Kittelson & Associates, Inc. *parkDC: Penn Quarter/Chinatown Parking Pricing Pilot and Final Report.* Washington, DC: District Department of Transportation. January 2019. Accessed May 15, 2019.

Langston, Jennifer. "People of color exposed to more pollution from cars, trucks, power plants during 10-year period". University of Washington News. September 14, 2017. Accessed May 23, 2018. http://www.washington.edu/news/

Mackowski, Daniel, Yun Bai, and Yanfeng Ouyeng. "Parking space management via dynamic performance-based pricing." *Transportation Research Procedia* 7 (2015): 170-191. Accessed May 15, 2019. https://doi.org/10.1016/j.trpro.2015.06.010.

Metropolitan Transportation Commission. "Priority Development Areas." MTC.CA.gov. Accessed May 7, 2019. https://mtc.ca.gov/our-work/plans-projects/focused-growth-livable-communities/priority-development-areas

Metropolitan Transportation Commission. "Priority Development Area (PDA) and Transit Priority Area (TPA) Map for CEQA Streamlining." MTC.CA.gov. Accessed May 7, 2019. https://www.planbayarea.org/pda-tpa-map

Metropolitan Transportation Commission. "What do we do?" MTC.CA.gov. Accessed May 7, 2019. https://mtc.ca.gov/about-mtc/what-mtc/what-we-do

Millard-Ball, Adam, Rachel R. Weinberger, and Robert C. Hampshire. "Is the curb 80% full or 20% empty? Assessing the impacts of San Francisco's parking pricing experiment." *Transportation Research Part A: Policy and Practice* 63 (2014): 76-92. Accessed May 15, 2019. https://doi.org/10.2139/ssrn.2338230.

Molenda, Inga, and Gernot Sieg. "Residential parking in vibrant city districts." *Economics of Transportation* 2, no. 4 (2013): 131-139. Accessed May 15, 2019. https://doi.org/10.1016/j.ecotra.2014.02.002.

Moylan, Emily, Matthew Schabas, and Elizabeth Deakin. "Residential permit parking: Better off without it?" *Transportation Research Record* 2469, no.1 (2014) 23-31. Accessed May 15, 2019. (2014): 23–31. https://doi.org/10.3141/2469-03.

National Household Travel Survey. *FHWA NHTS Brief: Mobility Challenges for Households in Poverty*. NHTS Briefs. Accessed May 23, 2018. https://nhts.ornl.gov/briefs/PovertyBrief.pdf

Ottosson, Dadi Baldwin, Cynthia Chen, Tingting Wang, and Haiyun Lin. "The sensitivity of on-street parking demand in response to price changes: A case study in Seattle, WA." *Transport Policy* 25 (2013): 222-232. Accessed May 15, 2019. https://doi.org/10.1016/j.tranpol.2012.11.013.

Pierce, Gregory, and Donald Shoup. "Getting the prices right: an evaluation of pricing parking by demand in San Francisco." *Journal of American Planning Association* 79 (2013): 67-81. Accessed May 15, 2019. https://doi.org/10.1080/01944363.2013.787307.

Pierce, Gregory, Donald Shoup, and Hank Willson. "Optimizing the use of public garages: Pricing parking by demand." *Transport Policy* 44 (2015): 89-95. Accessed May 15, 2019. https://doi.org/10.4324/9781351019668-43.

Plan Bay Area. "Strategies and Performance." In *Plan Bay Area 2040: Final Plan.* PlanBayArea.org. Accessed May 7, 2019. http://2040.planbayarea.org/strategies-and-performance

Radin, Rick. "El Cerrito to study housing, library at Plaza Bart." Mercurynews.com. August 17, 2016. Accessed May 7, 2019. https://www.mercurynews.com/2016/08/17/el-cerrito-to-study-housing-library-at-plaza-bart/

Richards, Gary. "BART testing to San Jose picks up: Nov 1st opening tentatively set." TheMercuryNews.com. February 8, 2019. Accessed May 7, 2019. https://www.mercurynews.com/2019/02/08/bart-testing-to-san-jose-picks-up-nov-1-opening-tentatively-set/

San Francisco Metropolitan Transportation Agency. *SFpark Pilot Project Evaluation*. SFMTA. June 2014. Accessed April 14, 2020. http://sfpark.org/resources/docs_pilotevaluation/

Savage, Nico. "Here's how much BART could charge for parking." EastBaytimes.com. February 13, 2020. Accessed May 5, 2020. https://www.eastbaytimes.com/2020/02/13/how-much-would-you-pay-for-a-bart-parking-spot-changes-could-double-rates/

Sierra Club. "Stopping Sprawl." The Sierra Club Sprawl Overview. Accessed May 23, 2018. http://vault.sierraclub.org/sprawl/factsheet.asp

Shoup, Donald. "The High Cost of Minimum Parking Requirements." *Transport and Sustainability Parking Issues and Policies*, (2014): 87-113. doi:10.1108/s2044-994120140000005011.

Taylor, Elizabeth Jean. "Who's been parking on *my* street? The politics and uneven use of residential parking spaces." *Land Use Policy* (2018). Accessed May 15, 2019. https://doi.org/10.1016/j.landusepol.2018.11.011.

Thorne-Lyman, Abigail. "AB 2923: Preliminary Implementation Approach." PowerPoint Presentation, BART Board of Directors Meeting, Oakland, Dec 6, 2018. Accessed May 7, 2019. https://bart.granicus.com/MetaViewer.php?view_id=17&clip_id=1113&meta_id=25032

Trimet. "Park and Ride Locations." Trimet.org. Accessed April 13, 2020. https://trimet.org/parkandride/

United States Department of Transportation. *Los Angeles Congestion Reduction Demonstration Express Lanes Program and National Evaluation Report*, by Jeremy Schroeder. FHWA-JPO-14-126, August 2015, 34-36.

van Ommeren, Jos, Jesper de Groot, and Guiliano Mingardo. "Residential parking permits and parking supply." *Regional Science and Urban Economics* 45 (2014): 33-44. Accessed May 15, 2019. https://doi.org/10.1016/j.regsciurbeco.2013.11.003.

van Ommeren, Jos, Derek Wentink, and Jasper Dekkers. "The real price of parking policy." *Journal of Urban Economics* 70, no.1 (2011): 25-31. Accessed May 15, 2019. https://doi.org/10.2139/ssrn.1480564.

Wikipedia. "El Cerrito, CA". Wikipedia.com. Accessed May 7, 2019. https://en.wikipedia.org/wiki/El_Cerrito,_California#cite_note-CenPopGazetteer2016-6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A Case Study of the El Cerrito Plaza BART Station

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