



Chinatown Neighborhood Transportation Plan

DRAFT FINAL REPORT



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Chinatown Urban Institute students interview seniors about Kearny Street Image credit: CCDC Urban Institute

EXECUTIVE SUMMARY

1. INTRODUCTION AND STUDY PURPOSE

1.1 | STUDY OVERVIEW

The Chinatown Neighborhood Transportation Plan (NTP) is a community-based transportation planning study led by the San Francisco County Transportation Authority (Transportation Authority), in partnership with community organizations in the Chinatown neighborhood. The NTP was funded by San Francisco's Proposition K half-cent sales tax for transportation, and through the Metro-

SAN FRANCISCO'S CHINATOWN

San Francisco's Chinatown is the largest Chinatown outside of Asia and the oldest Chinatown in North America. It is one of the top tourist attractions in San Francisco. In addition to being a vibrant cultural and historic center, Chinatown is home to a unique population. Nearly a third of central Chinatown's population is elderly (75+) and disabled; more than 80 percent are low income, minority, and do not own a vehicle. Because of these characteristics, the neighborhood has been designated a regional Community of Concern by the Bay Area Metropolitan Transportation Commission.

politan Transportation Commission's Community-Based Transportation Planning program, which directs planning funds to low-income and minority communities to help them build consensus on transportation issues and identify solutions to address high-priority needs.

1.2 | COMMUNITY INVOLVEMENT

Community involvement occurred throughout the study and consisted of:

- Community meetings convened by the Chinatown Community Development Center (CCDC), a community based organization working to build community and enhance quality of life for San Francisco residents.
- Interviews, small group discussions, and intercept surveys collected by the CCDC's Urban Institute summer program, focusing on elderly residents in the neighborhood.
- Meetings with Chinatown Transportation Research and Improvement Project (TRIP), a community volunteer organization with the mission to improve quality of life for residents, shoppers, merchants, workers, city agencies, and tourists.

- Interviews with community leaders including representatives of the Chinatown Salvation Army, Cathay Post, the Chinatown Neighborhood Association, Chinese New Comers Service Center, Self Help for the Elderly, and management of the Portsmouth Square Garage.

This outreach indicated that:

- **Traffic volumes/livability and pedestrian safety on Broadway are a top concern.** During outreach events led by the Chinatown CCDC and meetings of Chinatown TRIP, community members expressed concern about high traffic volumes on Broadway, especially traffic exiting the Broadway tunnel during morning peak periods. Many community members expressed that high traffic volumes during peak periods are incompatible with pedestrian safety. Representatives of Self Help for the Elderly also mentioned concerns about the side access roads on Broadway, specifically the intersection of Broadway with Mason St. where a fatality occurred at an uncontrolled crossing.
- **Pedestrian safety on Kearny St is also a major concern especially speeding and high volumes of turning vehicles.** Several community groups especially the Chinatown Community Development Center, Chinatown TRIP, and Self Help for the Elderly, along with many elderly neighborhood residents, also expressed concerns about pedestrian safety on Kearny St. Specific issues of concern include conflicts between crossing pedestrians and high volumes of turning vehicles, speeding vehicles, and lack of time to cross. However, not all community groups were aware of the history of

FIGURE ES-1. STUDY CORRIDORS AND CHINATOWN NEIGHBORHOOD



pedestrian injuries on Kearny St and some felt that Kearny St. is working well due to uncongested conditions for vehicles.

- **Kearny and Clay stands out as a problematic intersection.** Several community groups and community members mentioned pedestrian safety at the intersection of Kearny and Clay Streets as a particular concern, with frequent conflicts occurring between pedestrians and vehicles entering and exiting the Portsmouth Square garage. Tragically, at the time of writing of this report, Ai You Zhou, an elderly woman was struck and killed at this intersection while crossing in the crosswalk.

1.3 | STUDY FOCUS

Based on the community outreach results, the Chinatown NTP focuses on two key community objectives:

- Reducing traffic volumes and improving pedestrian safety on Broadway.
- Improving pedestrian safety on Kearny Street.

Figure ES.1 illustrates the study corridors and their relationship to the boundaries of the Chinatown neighborhood. Although Stockton St. also came up a concern during outreach, the study team did not pursue study of Stockton Street since the San Francisco Municipal Transportation Agency is currently studying transit and pedestrian safety improvements to Stockton Street as part of the 30 Stockton Transit Priority Project.

Both Broadway and Kearny Streets are high injury corridors (HICs) designated through the city's Vision Zero initiative, which seeks to eliminate traffic fatalities in San Francisco by 2024. High injury corridors are street segments with very high concentrations of traffic related injuries and fatalities. High injury corridors make up just 12 percent of San Francisco street miles but encompass more than 70 percent of severe and fatal traffic collisions.¹

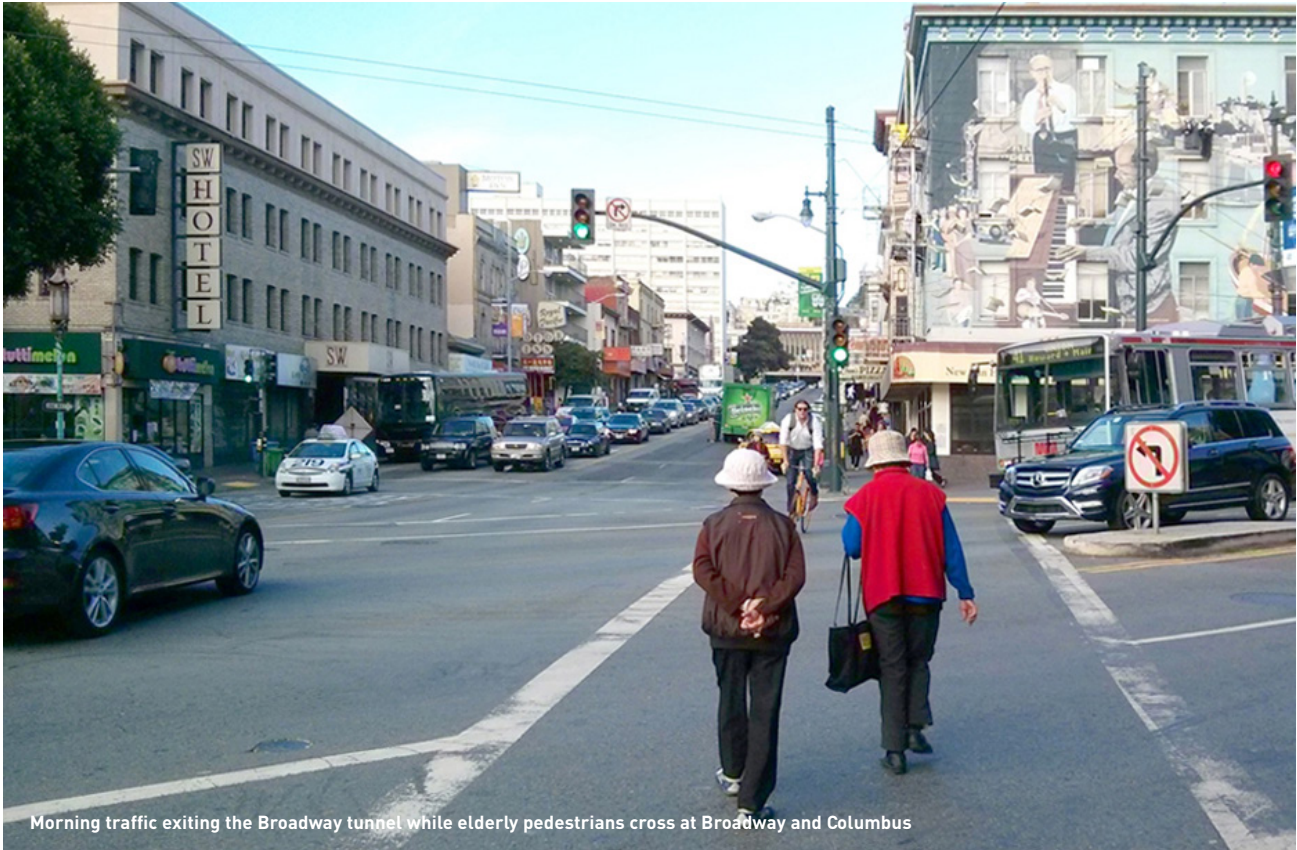
On Broadway, the study evaluates several concepts for reducing traffic volumes and improving pedestrian safety between Van Ness Avenue and Columbus Street and provides implementation recommendations. On Kearny Street, the study examines existing conditions between Bush and Jackson Streets and recommends spot intersection pedestrian safety improvements as well as several concepts for improving safety throughout the corridor.

The following sections describe the approach, analysis, and results for the Broadway and Kearny Street efforts separately. The team followed a different process for each street. On Broadway Street, the team developed and evaluated several concepts for reducing traffic volumes. On Kearny Street, the team evaluated existing conditions and proposed corridor concepts to be evaluated in the next phase of study, which will be led by the San Francisco Municipal Transportation Agency.

NEIGHBORHOOD TRANSPORTATION PLANS AND THE NEIGHBORHOOD TRANSPORTATION IMPROVEMENT PROGRAM

The Transportation Authority supports community-based transportation improvements by leading and funding neighborhood-focused transportation planning studies. These efforts help address community transportation concerns and engage community leadership in the transportation planning process. Over the last decade, the Transportation Authority has completed several neighborhood transportation plans, working in collaboration with community groups and agency partners such as the Municipal Transportation Agency, the Department of Public Works, the Department of Public Health and other City agencies. The Transportation Authority also manages the Neighborhood Transportation Improvement Program, a Proposition K funded program established to support community-based neighborhood scale planning efforts in San Francisco. The NTIP was developed in response to mobility and equity analysis findings from the San Francisco Transportation Plan (SFTP), the city's 30-year blueprint guiding transportation investment in San Francisco. The NTIP Planning program provides \$100,000 in Prop K funding for each supervisorial district to use over the next five years (Fiscal Years 2014/15–2018/19), as well as additional funding to support capital improvements.

¹ Source: www.visionzerosf.org.



Morning traffic exiting the Broadway tunnel while elderly pedestrians cross at Broadway and Columbus

2. BROADWAY STREET

2.1 | INTRODUCTION

Since the construction of the Robert C. Levy (Broadway) Tunnel in 1952, Broadway St has served as a key conduit for commuter traffic from both inside San Francisco and regionally. Broadway east of the tunnel is also one of Chinatown's main streets, serving several schools and senior centers like the Jean Parker Elementary School and Chinatown Community Development Center's Bayside Elderly Housing.

Over the years, through efforts such as the Chinatown-Broadway Street Design (2013), the Chinatown Pedestrian Safety Assessment (2010), and others, the community has worked to transform Broadway Street from a high-

traffic arterial roadway to a more pedestrian-friendly environment that reflects the community character and promotes safety for Chinatown's large and vulnerable elderly population. As described above, community outreach revealed that the community remains concerned about high traffic volumes on Broadway, and particularly concerned about the potential impacts of high traffic volumes on pedestrian safety.

To address these concerns, the NTP investigated existing conditions on Broadway, focusing on traffic patterns and pedestrian safety; developed several concepts for meeting community goals for reduced traffic volumes and improved pedestrian safety on Broadway; and evaluated them according to an evaluation framework that included both community goals and other technical objectives developed by the study team.

2.2 | KEY FINDINGS FROM BROADWAY EXISTING CONDITIONS ASSESSMENT

- **Broadway is a major arterial carrying high traffic volumes through a sensitive community.** Broadway is a four-lane arterial carrying about 1800 vehicles inbound per hour in the average morning peak hour. During this time, the street carries more traffic than all other major east-west arterials in the northeast quadrant of the city except Bush St. Broadway is also a key main street in San Francisco's Chinatown community, which is home to many elderly and disabled residents who are particularly vulnerable to the effects of high vehicle volumes.

TABLE ES-1. PLANNED PEDESTRIAN SAFETY TREATMENTS ALONG BROADWAY STREET.

INTERSECTION OF BROADWAY WITH...	PROJECT (LEAD AGENCY)	PLANNED SAFETY TREATMENTS	CONSTRUCTION SCHEDULE
Columbus Ave	Columbus Avenue Street Safety Project (SFMTA)	High visibility crosswalks (all crossings) Bicycle lanes Transit bulbouts	Early 2016
Stockton St	Broadway Streetscape Study (SFMTA, Planning)	Corner bulbouts Bus bulbouts High visibility crosswalks Leading pedestrian intervals	2016
Powell St	Broadway Streetscape Study (SFMTA, Planning)	Corner bulbouts	2016
Polk St.	Polk Street Streetscape Design Project (SFMTA, Planning)	Bulbouts Pedestrian countdown signals Continental crosswalks Tow-away lane removal Bicycle lane Leading pedestrian intervals	Summer 2016
Van Ness Ave	Van Ness Bus Rapid Transit Project (SFMTA)	Protected southbound left turn	2016

- **In the morning peak period, the majority of Broadway traffic appears to be generated by San Francisco residents.** To explore the travel markets currently using Broadway, the study team purchased data from a company that collects travel information from Geographic Positioning Systems (GPS) devices. The results suggest that nearly three-quarters of vehicles equipped with GPS devices in the Broadway tunnel during the morning peak period have origins in San Francisco. This is consistent with the SFCTA's Mobility Access and Pricing Study (2010), which found that San Francisco travelers, rather than regional travelers, account for the majority of automobile trips in the downtown area and environs during peak travel periods.
- **Broadway is a high pedestrian injury corridor; the main cause of pedestrian collisions are conflicts between pedestrians and turning vehicles.** Broadway was identified as a high-injury corridor for pedestrians through the city's WalkFirst and Vision Zero process. According to the WalkFirst analysis, collisions on Broadway disproportionately involve left- and right-turning vehicles at signalized intersections. To a lesser degree, collisions also involve unpredictable or illegal pedestrian or vehicle behavior such as vehicle speeding/drunken driving or pedestrians crossing against the signal or outside the crosswalk. Speed surveys collected by the study team confirm that speeding is occurring on Broadway during the late afternoon and evening.
- **Each high-injury intersection along Broadway has been recently assessed for pedestrian safety and will receive treatments within the next two calendar years.** City agencies are planning several improvements along Broadway in the near future, many designed to improve pedestrian safety; improvements are being planned or implemented at every high injury intersection in the study area. Table ES.1 lists the high injury intersections along Broadway between Van Ness and Columbus Avenue, and lists the planned improvements and improvement schedule. SFMTA and partner agencies developed these improvements by evaluating the causes of pedestrian collisions at each intersection and identifying solutions to address them while balancing with funding and environmental review constraints and community input.

2.3 | KEY FINDINGS FROM THE EVALUATION OF IMPROVEMENT PROPOSALS

As summarized above, community members expressed strong interest in reduced traffic volumes and improved pedestrian safety on Broadway. The study team worked with the community to compile ideas for meeting these objectives, and then narrowed them down to four concepts based on engineering judgement regarding their potential to affect traffic volumes on Broadway. These four included:

- Removal of one of two southbound left turn lanes on Van Ness Ave at Broadway. Approximately 1500 vehicles access Broadway by turning left at this intersection during the morning two-hour peak period. Constraining this turning movement could potentially discourage traffic from using Broadway.
- Lane removal in the Broadway tunnel as a means of traffic calming, reducing the attractiveness of Broadway relative to other routes, and providing opportunities to repurpose some of the space for other modes.
- Adding a left turn lane on eastbound Lombard St at Van Ness as a means of increasing the attractiveness of the Lombard/Van Ness Avenue/Bay St. route into downtown/North Beach relative to accessing this area via the Broadway tunnel.
- Adjusting signal timing on Broadway by implementing leading pedestrian intervals (LPIs) at all crossings and reducing signal time for eastbound through vehicles. Leading pedestrian intervals allow pedestrians to begin crossing a few seconds ahead of turning vehicles, thereby reducing the potential for conflict. Several studies have shown leading pedestrian intervals to be an effective pedestrian safety improvement measure.²

Working with the community, staff developed a draft technical framework for evaluating the proposed solutions to reducing traffic volumes on Broadway and potentially benefitting pedestrian safety. The framework incorporates not just community interests but also potential tradeoffs with automobile congestion, transit travel time, and effects on the character of nearby streets. Cost was not evaluated, as each of the four proposals would be relatively low-cost to implement (e.g. all involve adjustments to road striping and/or signal timing rather than major capital investments). Table ES.2 presents the final framework, which incorporates community feedback.

TABLE ES-2. PERFORMANCE FRAMEWORK

EVALUATION QUESTION	PERFORMANCE MEASURE
Would the strategy improve pedestrian safety ?	Pedestrian injuries
Would the strategy reduce traffic volumes on Broadway?	Traffic volumes on Broadway east of tunnel
Would the strategy reduce traffic speeds on Broadway?	Traffic speeds eastbound Broadway/segment of east tunnel
Would the strategy change the character of nearby streets ?	Traffic volume and congestion on nearby streets
Would the strategy cause a worsening in traffic congestion in Chinatown?	Substantial increase in traffic delays, measured in intersection delay
Would the strategy result in delays to transit vehicles operating on Broadway or Van Ness Ave?	Transit travel times and speeds

²For example, visit: <http://nacto.org/usdg/intersection-design-elements/traffic-signals/leading-pedestrian-interval/> Fayish A. and Gross, F. Safety Effectiveness of Leading Pedestrian Intervals Evaluated by a Before-After Study with Comparison Groups. Transportation Research Record: Journal of the Transportation Research Board, No. 2198, Washington, D.C., 2010, pp. 15–22.

EVALUATION SUMMARY

Staff evaluated the four proposals using the Transportation Authority’s SF-DTA traffic simulation model. Table ES.3 below summarizes the evaluation findings, Comparisons reflect the difference between conditions in 2020 with and without the network change. Chapter 2 contains the full evaluation results.

Overall, the results indicate that the **Broadway signal timing** concept best meets the community’s goals for reduced traffic and improved pedestrian safety. Leading pedestrian intervals can directly benefit pedestrian safety by reducing the potential for conflicts between pedestrians and vehicles at intersections. Leading pedestrian intervals also directly address conflicts between pedestrians and left- and right- turning vehicles, which are the main source of pedestrian collisions on Broadway. If implemented systematically along the corridor by reducing signal time available for eastbound vehicles, the changes could also potentially reduce traffic volumes on Broadway during the morning peak period.

The **Broadway tunnel lane removal** could slightly reduce traffic volumes on Broadway by creating congestion that would deter vehicles from using the tunnel. It would not be expected to directly improve pedestrian safety if only implemented within the Broadway tunnel, since pedestrians are protected from vehicles within the tunnel.

The **Broadway Van Ness left turn removal** reduces traffic volumes on Broadway at Van Ness Avenue, but traffic volumes east of the tunnel remain about the same. Vehicles can use other routes to access Broadway if the left turn from Van Ness Avenue to Broadway becomes congested. This approach does not directly affect interactions between vehicles and pedestrians on Broadway and therefore would not be expected to benefit pedestrian safety.³

The **additional left turn lane at Lombard and Van Ness Avenue** did not measurably⁴ affect traffic volumes on Broadway. Adding a left turn lane was intended to increase the capacity of the intersection for left-turning vehicles and the attractiveness of Lombard/Bay Street as an alternative to Broadway for vehicles headed downtown. However, due to space and signal timing constraints at the intersection, adding an additional left turn lane does not significantly increase left-turning capacity. Appendix A provides more detail.

TABLE ES-3. CONCEPT EVALUATION RESULTS

	LEFT TURN LANE REMOVAL AND VAN NESS AND BROADWAY	BROADWAY TUNNEL ROAD DIET	BROADWAY SIGNAL TIMING	LOMBARD VAN NESS LEFT TURN LANE INCREASE	
Improve pedestrian safety	○	◐	●	○	KEY ● Objective largely met ◐ Objective partly met ○ Objective not met
Reduce vehicle volumes on Broadway	○	◐	●	○	
Reduce traffic speeds on Broadway	○	○	○	○	
Avoid changing the character of nearby streets	○	○	◐	○	
Avoid congestion on Broadway	●	●	○	●	
Avoid transit delay on Broadway or Van Ness Avenue	○	○	○	○	

Notes: Traffic volume changes based on comparison of morning peak period conditions in 2020. See Chapter 2 for more detail.

³ Eliminating one of two left turn lanes at the intersection of Broadway and Van Ness Avenue could benefit pedestrian safety directly by reducing conflicts between pedestrians crossing on the east leg of the intersection and southbound left turning vehicles. However, the potential for these conflicts will be eliminated in the future after implementation of the Van Ness Bus Rapid Transit project, which will provide a protected signal phase for southbound left turning vehicles. Once the protected signal phase is in place, vehicles will no longer be allowed to turn while pedestrians are crossing.

⁴ A small reduction in traffic volume resulted but was considered to be within the margin of error of the model.

2.4 | RECOMMENDATIONS FOR BROADWAY

As a follow up to the evaluation of corridor concepts for Broadway, the SFCTA team worked collaboratively with the San Francisco Municipal Transportation Agency (SFMTA) to identify locations along Broadway where implementation of leading pedestrian intervals could be considered as part of the city's WalkFirst initiative. The team provided information on which intersections are the best candidates for leading pedestrian intervals based on their collision history (e.g. prevalence of collisions involving pedestrians and turning vehicles), and the volumes of pedestrians and turning vehicles (Appendix B contains this information). SFMTA currently plans to implement LPIs at the intersections of Broadway with Stockton and Polk streets. Note that LPIs are just one of several tools that can be used to improve safety at intersections for pedestrians. As indicated in Table ES.1, SFMTA is implementing safety treatments at all major intersections along Broadway between Van Ness Avenue and Columbus in the next two years.

The study team further recommends that the San Francisco Department of Public Health and the San Francisco Municipal Transportation Agency conduct a before-and-after safety evaluation of planned treatments on Broadway to determine how they affect safety on Broadway and to monitor any changes to traffic volumes.



An elderly pedestrian crosses Kearny street Image Credit: CCDC Urban Institute

3. KEARNY STREET

Beyond reducing traffic volumes and improving safety on Broadway, Chinatown community members (especially the Chinatown Community Development Center, Chinatown TRIP, and Self Help for the Elderly), indicated a strong interest in improving pedestrian safety on Kearny St.

To respond to that interest, the study team reviewed existing conditions on Kearny Street from Bush to Jackson Streets, and prepared short- and long-term improvement recommendations. The short term intersection-specific recommendations will be implemented by the SFMTA as part of the WalkFirst initiative. The long term recommendations will be evaluated further by the SFMTA in the next phase of study.

3.1 | KEY FINDINGS – EXISTING CONDITIONS

SFCTA completed an existing conditions analysis of Kearny St drawing from several sources including field review and counts collected by the project team; data collected as part of the Planning Department’s Portsmouth Square Study; data collected by the Urban Institute, a youth empowerment project of the Chinatown Community Development Center; and several other sources. Key findings are as follows:

EXISTING CONDITIONS FOR PEDESTRIANS

- **Kearny has the worst pedestrian safety record of any street in Chinatown.** The Walkfirst Investment Study identified Kearny as a high injury corridor, along with Broadway and Stockton in Chinatown. However, Kearny’s safety record is worse than Chinatown’s two other high injury corridors, Stockton and Broadway Streets. Kearny Street from Market to Pacific is in the top ten percent of pedestrian high injury corridors citywide, ranked on the basis of severity-weighted injuries per mile.

- **Top pedestrian safety issues on Kearny are high vehicle speeds, unsafe turning movements (particularly right turns), insufficient pedestrian crossing time, and unsafe pedestrian behavior.** In addition to these issues, dual turn lanes at Bush and Pine streets and at the entry and exits to the Portsmouth Square garage may be reducing the visibility of pedestrians to turning vehicles. Additionally, many pedestrians cross against the signal on Kearny. Speed surveys confirmed speeding is occurring on Kearny especially during the morning peak hour (7:30 – 8:30 a.m.) when the 85th percentile speed was recorded at 32 miles per hour, or seven miles per hour over the default speed limit of 25.
 - **The intersections of Kearny with Sacramento and Clay Streets stand out for their poor pedestrian safety records.** The intersection of Kearny and Sacramento has seen the most severe injuries, with one severe injury and one fatality between 2007-2012. The intersection of Kearny and Clay has seen the highest number of total injuries, including seven pedestrian injuries during the same period. Additionally, several community members mentioned the intersection of Kearny and Clay Street as being of particular concern for pedestrian safety during community outreach.
 - **Kearny Street offers few pedestrian amenities.** All pedestrian crossings on Kearny Street from Bush to Jackson have striped continental crosswalks, but many are faded; none of the crossings have a complete set of directional curb ramps, and none have pedestrian curb extensions or bulbouts. All intersections do offer pedestrian countdown signals and are timed for slow crossing speeds.
- EXISTING CONDITIONS FOR PRIVATE VEHICLES, TRANSIT, AND BICYCLISTS**
- **Private vehicles and pedestrians are the dominant users of Kearny St during the evening peak period.** During the peak travel period on Kearny (5-6 p.m.), private vehicles make up the largest share of overall northbound through-traffic. Northbound pedestrian volumes are also very heavy and exceed vehicle volumes at the intersections of Kearny with Bush and California Streets. Transit riders and bicyclists make up a smaller share of overall through-traffic.
 - **Kearny St is relatively uncongested during peak periods indicating excess vehicular capacity and an opportunity to re-balance the street to better achieve safety for all users and improve transit performance.** In general, intersections in the study area are relatively uncongested for vehicles. The typical measure of automobile congestion is roadway level of service (LOS), which is designated A (least congested) through F (most congested). The City has a policy of maintaining LOS D or better, where possible. LOS was examined for a sample of three intersections in the study area (Pine, Clay, and Washington St.)⁵, which were found to have P.M. peak period scores of LOS B, B, and A, respectively, suggesting that motor vehicle capacity is oversupplied relative to other modes of travel. During interviews with community stakeholders, several expressed that they thought Kearny St. was performing well in accommodating vehicle traffic.
 - **Muni operates at slow speeds (6-7 miles per hour on weekdays) due to narrow lane widths, closely-spaced bus stops, and conflicts with turning or parking vehicles, suggesting a need to improve Muni performance on the corridor.** Lane widths of less than 10 feet throughout the corridor often require Muni buses to straddle travel lanes. The average bus stop spacing along Kearny Street between Geary Street and Columbus Avenue is about 550 feet, well below the SFMTA's proposed bus spacing guidelines of 800-1,360 feet for streets with grades of less than 10 percent. Peak period tow-away lanes are frequently violated by vehicles performing pickup and drop-off activities, requiring buses to slow down to change lanes.
 - **Kearny is a high injury corridor for bicyclists and lacks bicycle facilities.** The San Francisco Department of Public Health has identified Kearny St as a high injury corridor for bicyclists.⁶ This segment of Kearny St. does not currently have any bicycle facilities and is not indicated as a bicycle route on SFMTA's San Francisco Bikeway Network Map. However, SFMTA identified Kearny (from Market St. to Columbus) as a priority study corridor as part of implementation of the 2013 SFMTA Bicycle Strategy.

⁵ LOS values for Kearny & Clay and Kearny and Washington are drawn from the Portsmouth Square Existing Conditions Report (2014) completed by the planning department.

⁶Source: San Francisco Department of Public Health, www.transbasesf.org.

3.2 | PRIORITY SHORT TERM SAFETY TREATMENTS

The study team developed short-term recommendations for the Kearny Street corridor, focusing on treatments to improve pedestrian safety in support of the city's Vision Zero and WalkFirst initiatives. Safety countermeasures were drawn from the toolbox of short-term, high-impact pedestrian safety countermeasures identified during the city's WalkFirst Investment Study (www.walkfirst.sfplanning.org). The toolbox was refined to address the pedestrian collision history and the conditions that may contribute to collisions in the future.

SITE SPECIFIC RECOMMENDATIONS

The Sacramento Street and Clay Street intersections are recommended for top priority treatment because they have had the highest frequency of severe and total collisions, respectively, over the last five years, among intersections in the study corridor. As of the time of publication of this report, the SFMTA was moving forward with short-term treatments at the Sacramento Street intersection consisting of re-striped continental crosswalks and extended red no-parking zones around the intersection to improve the visibility of crossing pedestrians to turning vehicles.

The SFMTA will be implementing the following additional treatments at the intersection of Clay and Kearny:

- Leading pedestrian intervals (LPIs) on the east/west crossings (LPIs were already in place on the north and south crossings). Leading pedestrian intervals give crossing pedestrians a head start before vehicles begin to turn, and can reduce collisions involving pedestrians and turning vehicles.
- Advanced limit line at northbound Kearny Street. Advance limit lines encourage motorists to come to a full stop farther away from the marked crosswalk and can reduce the number of vehicles encroaching on the crosswalk.
- Extended red no-parking zones and a no left turn on red for eastbound Clay Street. Restricting left turns on red will reduce or eliminate conflicts between left-turning vehicles and crossing pedestrians.
- Improved pedestrian and vehicular circulation around the Portsmouth Square Garage in order to enhance pedestrian safety and reduce driver confusion regarding garage driveway operations.

3.3 | NEXT STEPS

SFMTA will be moving forward with a comprehensive analysis of all transportation modes with the goal of developing recommendations to improve conditions for all people using Kearny Street, beginning summer 2015. The following three pedestrian safety improvement concepts are recommended for analysis during the next phase. These will need to be considered in conjunction with other corridor issues including slow Muni speeds and high concentrations of bicyclist injuries.

SYSTEMATIC SIGNAL TIMING AND STRIPING TREATMENTS

One concept would be to systematically implement signal timing and striping treatments along the Kearny corridor. These could include:

- Re-time signals along the corridor to reduce vehicle speeds. Current signal timing progression is set to promote vehicle speeds of 30 miles per hour. Reducing vehicle speeds could significantly reduce the share of pedestrian collisions that end in serious injury or fatality in the short term.
- Provide high-visibility continental crosswalks at all crossings to discourage vehicles from violating pedestrian right of way. Continental crosswalks are currently available at all intersections but many have faded over time or are in less visible colors.
- Convert dual turn lanes to single left turn lanes to eliminate multiple threat conflicts between pedestrians and turning vehicles. Dual turn lanes currently exist at the intersections of Kearny with Pine and Bush Streets as well as at the entry and exit of the Portsmouth Square garage. The dual left turn lane at Pine St., for example, appears appropriate for removal and could potentially be removed without increasing delay for vehicles or transit (Appendix B). One of the two left turn lanes could be removed at this location without substantial adverse impacts on automobile level of service (Appendix B).
- Implement leading pedestrian intervals where appropriate to reduce conflicts between pedestrians and turning vehicles. Appendix B suggests where LPIs would be most appropriate.
- Provide temporary painted safety zones where appropriate to slow turning vehicles. These consist of colored pavement in lieu of a pedestrian curb extension. They provide drivers a visual cue to keep their distance from the curb and turn more slowly.

⁶Source: San Francisco Department of Public Health, www.transbasesf.org.

The advantage of the signal timing and striping approach is that it would require little to no new infrastructure and therefore could be implemented quickly at a low cost. By combining systematic implementation of leading pedestrian intervals with slowing signal progression, it would also help address two of the top contributors to pedestrian injuries on the corridor, namely conflicts between pedestrians and turning vehicles, and high vehicle speeds.

PEDESTRIAN SCRAMBLES

Another concept would be to implement pedestrian scrambles at a series of intersections along the corridor, similar to how portions of Montgomery and Stockton Street are designed today; several community members requested pedestrian scrambles for the corridor during public outreach. Pedestrian scrambles involve creating an exclusive signal phase in which pedestrians can cross in all directions while vehicles wait. If pedestrians and vehicles understand and obey the scramble phase, the scramble can eliminate conflicts between pedestrians and turning vehicles, which are a top contributor to collisions along the corridor. Scrambles can sometimes increase delay for transit and vehicles, but could also reduce delay by eliminating the need for right-turning vehicles to wait for crossing pedestrians. Pedestrians may also need to wait longer to cross, which could increase violations. An intersection operations analysis would be needed to determine whether scrambles would increase intersection delay. Scrambles may require new signal hardware (e.g. signal poles and heads) and may trigger the need for curb ramp upgrades, which can increase the project cost and timeline.

ROAD DIET

A final corridor concept would be to remove a travel lane and repurpose the space for some other use, such as a protected bicycle lane or transit-only lane. This could improve pedestrian safety by reducing vehicle speeds due to lower vehicle throughput capacity and by reducing pedestrian exposure for pedestrians crossing the street. Depending on how the lane was repurposed, the road diet could provide a protected lane for bicyclists, improve transit performance, or enhance the pedestrian environment. On the other hand, reduced capacity would likely increase delay to vehicles and transit, unless transit were provided with a protected lane or other transit priority features. The delay impacts would need to be quantified through an intersection operations analysis.

In addition to these concepts, the potential of converting the street from two-way to one-way was briefly considered but is not recommended for further study at this time. The conversion could potentially reduce speeds, but might also generate additional conflicts between pedestrians and turning vehicles. Additionally, it would trigger a review of traffic circulation in the surrounding area which could extend the timeframe for analysis and implementation of treatments.

Table ES.3. provides a summary of the top corridor issues and how they would be addressed by the proposed concepts for further study.

TABLE ES-3. PROPOSED CORRIDOR CONCEPTS AND POTENTIAL CORRIDOR ISSUES ADDRESSED

CORRIDOR ISSUES	SIGNAL TIMING AND STRIPING	PEDESTRIAN SCRAMBLES	ROAD DIET WITH TRANSIT AND/OR BICYCLE LANE
Fast moving vehicles	Likely benefit	Potential benefit	Likely benefit
Conflicts between pedestrians and turning vehicles	Likely benefit	Likely benefit	
Long crossing distances for elderly pedestrians		a	a
Pedestrian violations/jaywalking			a
Slow transit speeds			b
Lack of bicycle facilities			c

NOTES:

- a. could emerge as a benefit if project were implemented in conjunction with pedestrian or transit curb extensions or bulbouts.
- b. Potential benefit if vehicle lane converted to transit-only lane
- c. Potential benefit if vehicle lane converted to bicycle lane

 Likely benefit
 Potential benefit

CHINATOWN NEIGHBORHOOD TRANSPORTATION PLAN

1. INTRODUCTION AND STUDY OVERVIEW

The Chinatown Neighborhood Transportation Plan (NTP) is a community-based transportation planning study led by the San Francisco County Transportation Authority (Transportation Authority), in partnership with community organizations in the Chinatown neighborhood. The NTP was funded by San Francisco’s Proposition K half-cent sales tax for transportation, and through the Metropolitan Transportation Commission’s Community-Based Transportation Planning program, which directs planning funds to low-income and minority communities to help them build consensus of transportation issues and identify solutions to address high-priority needs.

1.1 | NEIGHBORHOOD TRANSPORTATION PLANNING PROGRAM

The Chinatown NTP is part of the Bay Area Community-Based Transportation Planning (CBTP) program, an MTC initiative. The goal of these programs is to build consensus within communities on transportation problems and identify solutions to address high-priority needs. Each NTP study:

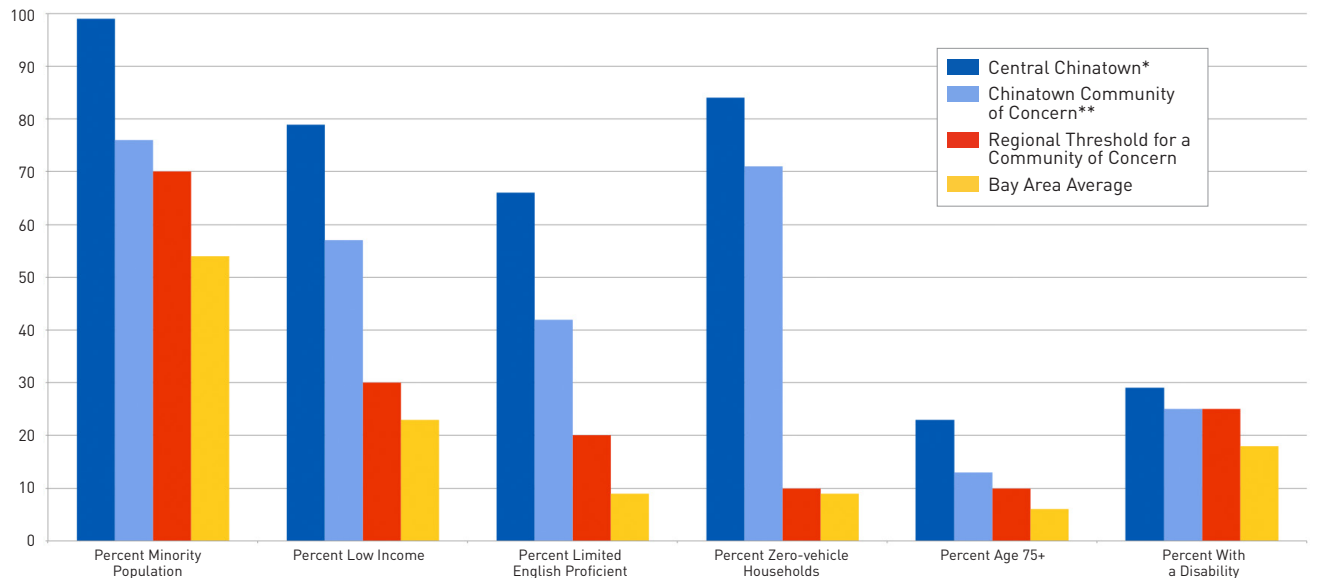
- Works with the community to identify pressing transportation issues and needs;
- Collaborates with community-based organizations to substantively involve and engage members of the community throughout the study process;
- Develops high-priority transportation solutions through technical analysis, agency participation, and public outreach; and
- Builds the capacity of the community for continued involvement to help advance recommendations to implementation.

1.2 | SETTING, CONTEXT AND APPROACH

CHINATOWN

San Francisco’s Chinatown is the largest Chinatown outside of Asia and the oldest Chinatown in North America, and is one of the city’s top tourist attractions. In addition to being a vibrant cultural and historic center, Chinatown is home to a uniquely vulnerable population, leading the Bay Area Metropolitan Transportation Commission to designate it as a regional Community of Concern (COC)⁷. Figure 1 shows the demographic factors and thresholds used to define COCs, and indicates the percentage of these populations as a share of the total population in central Chinatown⁸; the Chinatown Community of Con-

FIGURE 1. CHINATOWN DEMOGRAPHIC CHARACTERISTICS



Source: Metropolitan Transportation Commission, 2013, One Bay Area Draft Equity Analysis Report. *As represented by Census Tract 114. **Includes parts of downtown San Francisco, North Beach, and Treasure Island.

⁷For more information about regional Communities of Concern, visit <http://www.sfcta.org/sites/default/files/content/Programming/Lifeline/Cycle3STP/Attach%204-Comm%20of%20Concern.pdf>

⁸Census tract 114.

cern (which includes downtown, North Beach, and Treasure Island); as well as the entire Bay Area. Nearly a third of central Chinatown's population is disabled; more than 80 percent are low income, minority, and do not own a vehicle. The concentrations of minority, low-income, limited English proficiency, zero-vehicle, elderly, and disabled populations in Chinatown are among the highest in the Bay Area and well above the thresholds necessary to establish a COC.

STUDY FOCUS

The Community Based Transportation Program is designed to be flexible, in order to respond to the unique context of individual neighborhoods. Based on community input provided early in the study, the NTP focused on the community's top concern – improving pedestrian safety on two of the neighborhood's pedestrian high injury corridors – Broadway and Kearny (Figure 2). Although Stockton St. also came up as a concern during outreach, the study team did not pursue study of Stockton Street since the San Francisco Municipal Transportation Agency is currently studying transit and pedestrian safety improvements to Stockton Street as part of the 30 Stockton Transit Priority Project.

High injury corridors (HICs) are street segments that have very high concentrations of traffic related injuries and fatalities. High injury corridors make up just 12 percent of San Francisco street miles but encompass more than 70 percent of severe and fatal traffic collisions.⁹ Figure 3 illustrates the high injuries corridors in Chinatown.

On Broadway, the study evaluates whether several community-proposed ideas for improving pedestrian safety and calming traffic would be beneficial for the corridor. On Kearny, the study examines existing conditions for pedestrians and proposes potential safety improvement concepts for SFMTA to evaluate as the corridor is examined for rollout of Muni Forward, WalkFirst, and the City-wide Bicycle Strategy. The remainder of the report describes the history and conditions, potential treatments, and evaluation results on Broadway and Kearny.

1.3 | COMMUNITY INVOLVEMENT

The NTP included community involvement at several stages of the project. Outreach activities consisted of:

- Community meetings convened by the Chinatown Community Development Center (CCDC), a community based organization working to build community and enhance quality of life for San Francisco residents.
- Interviews, small group discussions, and intercept surveys collected by the CCDC's Urban Institute summer program.
- Meetings with Chinatown Transportation Research and Improvement Project (TRIP), a community volunteer organization with the mission to improve quality of life for residents, shoppers, merchants, workers, city agencies, and tourists.
- Interviews with community leaders including representatives of the Chinatown Salvation Army, Cathay Post, the Chinatown Neighborhood Association, Chinese New Comers, Self Help for the Elderly, and management of the Portsmouth Square garage.

1.4 | PREVIOUS STUDIES AND INITIATIVES

Chinatown has seen numerous transportation planning studies completed in recent years. The following list highlights a few.

CURRENT TRANSPORTATION PROJECTS & STUDIES

- **Chinatown Broadway Street Design.** The Planning Department, in collaboration with Public Works, SFMTA, and the Chinatown Community Development Center, developed a streetscape design for Broadway from the Broadway Tunnel to Columbus Avenue. The project builds on the improvements to Broadway east of Columbus Avenue. The project is funded and construction is expected to begin spring/summer of 2015.
- **Columbus Avenue Safety Project.** The San Francisco Municipal Transportation Agency is proposing safety measures for pedestrians on Columbus Avenue from Green to Broadway Streets. Proposed pedestrian safety improvements are being funded through a combination of SFMTA revenue bonds (approximately \$509,000) and Proposition B bonds (approximately \$800,000). These improvements are being coordinated with an existing paving project led by San Francisco Department of Public Works. Construction is expected to begin in early 2016.

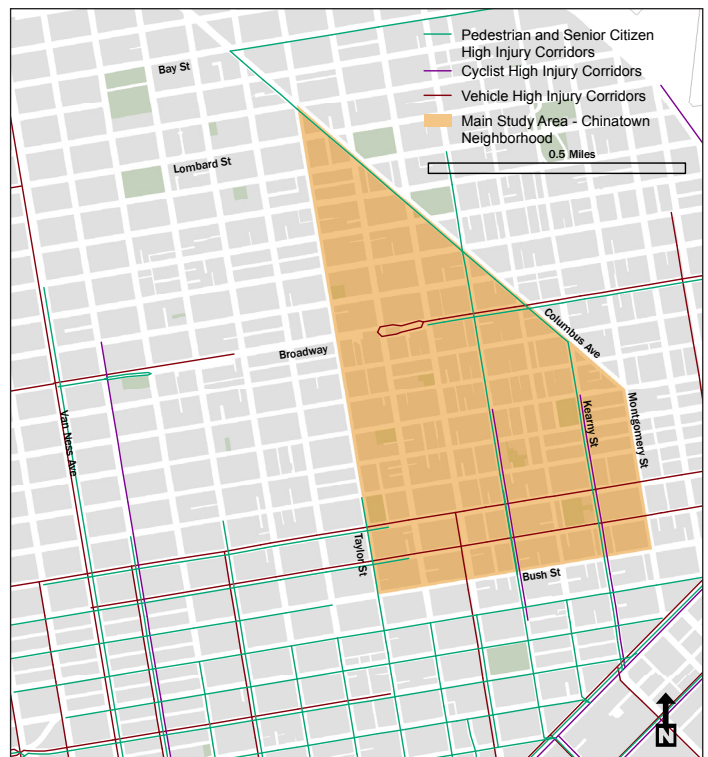
⁹ Source: San Francisco Department of Public Health, 2015, as indicated on www.visionzerosf.org.

- **Portsmouth Square Area Project.** The Portsmouth Square Area Project is a joint effort of the San Francisco Planning Department and the San Francisco Recreation and Parks Department to re-imagine one of the city’s most significant historic, cultural, and civic spaces. An Existing Conditions report has been completed. The next phase of the project will focus on developing a concept design.
- **The Polk Streetscape Project** will implement the following improvements at Broadway and Polk: bulbouts into Broadway to reduce the crossing distance and conflicts between turning vehicles and people walking, leading pedestrian interval, transit bulb, removal of peak hour tow-away lane, southbound bike lane, and continental crosswalks. Construction is scheduled to begin in Summer 2016.
- **Van Ness Avenue Bus Rapid Transit.** The Van Ness Avenue Bus Rapid Transit project will change the southbound left-turn signal phasing from a combination permitted/protected movement to a protected movement (e.g. double-left turn arrows). This will eliminate current conflicts between southbound left-turning vehicles and pedestrians crossing north-south on the east side of Broadway. Construction is expected to start in 2016.
- **WalkFirst Investment Study/Vision Zero.** The WalkFirst Investment Study identified Broadway and Kearny as high pedestrian injury corridors and provided a menu of short- and medium-term recommendations for improving pedestrian safety at each intersection. One of the intersections in the study area (Kearny and Sacramento) has also been identified as a “Vision Zero” intersection, meaning the SFMTA has committed to implementing improvements to the intersection by 2016.
- **Muni Forward.** Muni Forward, led by the SFMTA, aims to make getting around San Francisco safer and more reliable. Several corridors in Chinatown have been identified for improvement, including Kearny St.

FIGURE 2. CHINATOWN NEIGHBORHOOD AND STUDY FOCUS CORRIDORS



FIGURE 3. CHINATOWN NEIGHBORHOOD HIGH INJURY CORRIDORS



Source for Figure 3: San Francisco Department of Public Health, 2015 – www.transbasesf.org

PREVIOUS TRANSPORTATION PROJECTS OR STUDIES

- Columbus Avenue Neighborhood Transportation Study (2010). Completed by the Transportation Authority in 2010, this study identified narrow sidewalks, long crossing distances, and high on-street parking demand as major concerns on Columbus Avenue, and proposed improved parking management, wider sidewalks, and intersection improvements.
- The Chinatown Economic Action Plan was spearheaded by the San Francisco Office of Economic and Workforce Development to improve economic conditions in Chinatown. The plan cited crowded, narrow sidewalks, heavy traffic, and high parking demand as key transportation issues of concern. The plan resulted in several improvements to alleyways in Chinatown.
- Chinatown Community Development Center Pedestrian Safety Assessment. The Chinatown Community Development Center conducted a Pedestrian Safety Assessment in Chinatown to help identify priority areas for pedestrian safety improvement. The team studied 142 intersections in the Chinatown area then narrowed the list to 21 high-priority, high-injury intersections recommended for improvement.

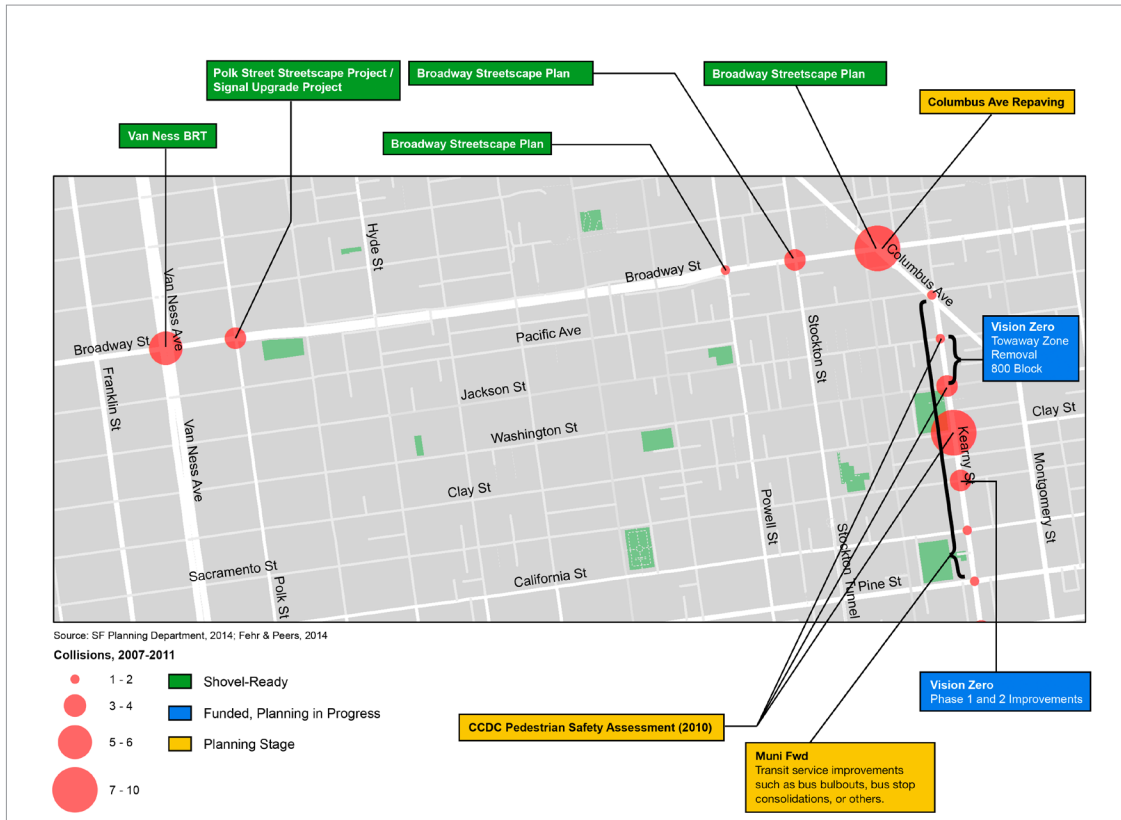
Figure 4 illustrates the locations of these previous and ongoing efforts.

1.5 | REPORT ORGANIZATION

The remainder of this report is organized into two sections corresponding to the two study corridors, Broadway and Kearny. The team followed a different process for each street. On Broadway Street, the team developed and evaluated several concepts for reducing traffic volumes. On Kearny Street, the team evaluated existing conditions for pedestrians and other types of travelers, and proposed corridor concepts to be evaluated in the next phase of study, which will be led by the San Francisco Municipal Transportation Agency.

Chapter 2, Broadway St, examines the effectiveness of several community-proposed ideas for improving safety and calming traffic on Broadway and proposes improvement concepts. Chapter 3, Kearny St., describes existing conditions on Kearny St., short-term improvement recommendations, and potential longer-term improvement concepts to be carried forward in the next phase of study, which will be led by the SFMTA.

FIGURE 4. PREVIOUS AND ONGOING STUDIES ALONG BROADWAY AND KEARNY



Note: all intersections with collisions (all indicated with a red circle) were included in the Walkfirst Investment Study. SFMTA has prepared a menu of possible recommendations for each intersection (not shown).

BROADWAY ST, VAN NESS TO COLUMBUS

1. INTRODUCTION

Since the construction of the Robert C. Levy (Broadway) Tunnel in 1952, Broadway St has served as key conduit for commuter traffic from both inside San Francisco and regionally. Broadway east of the tunnel is also one of Chinatown’s main streets, serving several schools and senior centers like the Jean Parker Elementary School and Chinatown Community Development Center’s Bayside Elderly Housing.

Over the years, through efforts such as the Chinatown-Broadway Street Design (2013), the Chinatown Pedestrian Safety Assessment (2010), and others, the community has worked to transform Broadway Street from a high-traffic arterial roadway to a more pedestrian-friendly environment that reflects the community character and promotes safety for Chinatown’s large and vulnerable elderly population.

Community outreach held in October, 2013 and August, 2014 revealed that the community remains concerned about high traffic volumes on Broadway, and particularly concerned about the potential impacts of high traffic volumes on pedestrian safety.

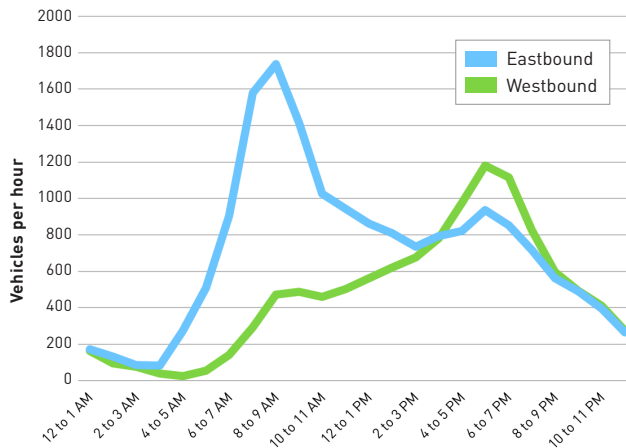
To address these concerns, the NTP investigated travel patterns on the Broadway corridor and evaluated several potential approaches to reduce traffic volumes and improving safety. It begins with a summary of existing conditions, focusing on documenting vehicle volumes and traffic patterns, then provides an evaluation of solutions according to a community-approved evaluation framework.

2. BROADWAY EXISTING CONDITIONS

2.1 | VEHICLES

Broadway is a major east-west arterial in the northeast quadrant of San Francisco. Traffic peaks in the morning, eastbound direction (Figure 5) at about 1800 vehicles per hour. According to analysis of modeled traffic flows, Broadway carries more morning peak-hour traffic than all other major east-west arterials in the northeast quadrant of the city except Bush St. Broadway is also a key main street in San Francisco’s Chinatown community, which is home to many elderly and disabled residents who are particularly vulnerable to the effects of high vehicle volumes.

FIGURE 5. BROADWAY TRAFFIC VOLUMES BY TIME OF DAY



Source: SFCTA Count Dracula database, 2011 traffic counts.



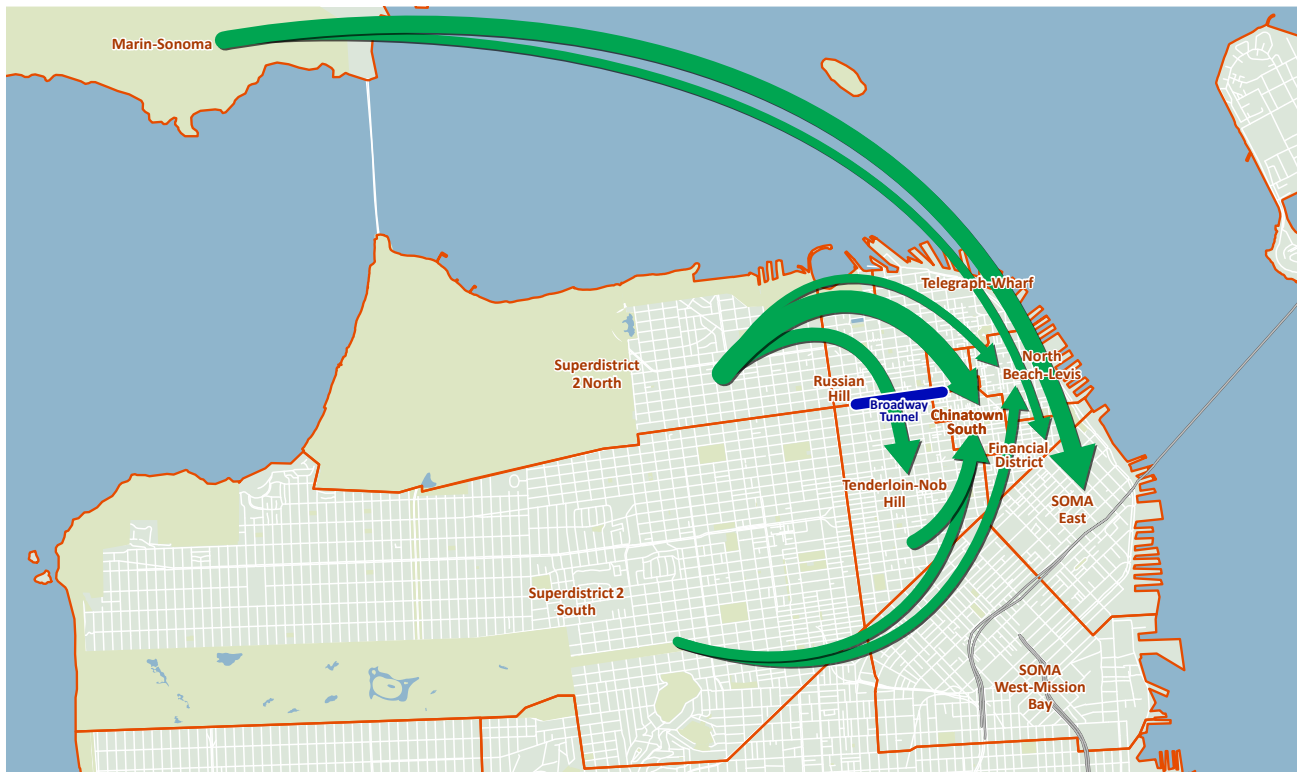
Morning traffic exiting the Broadway tunnel while elderly pedestrians cross at Broadway and Columbus

In the morning peak period, the majority of Broadway traffic appears to be generated by San Francisco residents

To explore the travel markets currently using Broadway, the study team purchased data from a company that collects travel information from Geographic Positioning Systems (GPS) devices. The data purchased provides the origins and destinations of all the GPS-equipped vehicles that used the Broadway tunnel (including west bound and east bound travel) for six sample months between spring and winter 2014/2015.¹⁰ The data collection sample may not be representative of the population as a whole, since only certain vehicles (likely newer, more expensive) are equipped with GPS. Nevertheless, the data provide a partial picture of the travel patterns of those using the Broadway tunnel.

Figure 6 illustrates the top origin-destination pairs for GPS-enabled vehicles using the Broadway tunnel in the morning peak period. Some neighborhoods were grouped into larger areas referred to as superdistricts. The top origins include Marin & Sonoma Counties (22 percent combined), Superdistrict 1 (the Presidio/Marina/Cow Hollow neighborhoods, 22 percent), and Superdistrict 2 (the Richmond/ Western Addition/Hayes Valley/Pacific Heights neighborhoods, 20% combined). Overall, about 74 percent of the vehicles had origins in San Francisco. The top destinations included North Beach (19%), SoMa (17%), and the financial district (13%). Overall, 90 percent of those sampled had destinations in San Francisco. Appendix C provides more detail.

FIGURE 6. TOP ORIGIN DESTINATION PAIRS FOR GPS-ENABLED DRIVERS IN THE BROADWAY TUNNEL – AM TIME PERIOD



Source: Streetlight Data, 2015; Fehr & Peers, 2015. Not all origin-destination pairs are shown. Time period defined as 6:00 a.m. to 10:00 a.m. Reflects average travel patterns between 4/2014 and 2/2015.

¹⁰ Data were collected during April, June, September, November and December 2014 and February 2015.

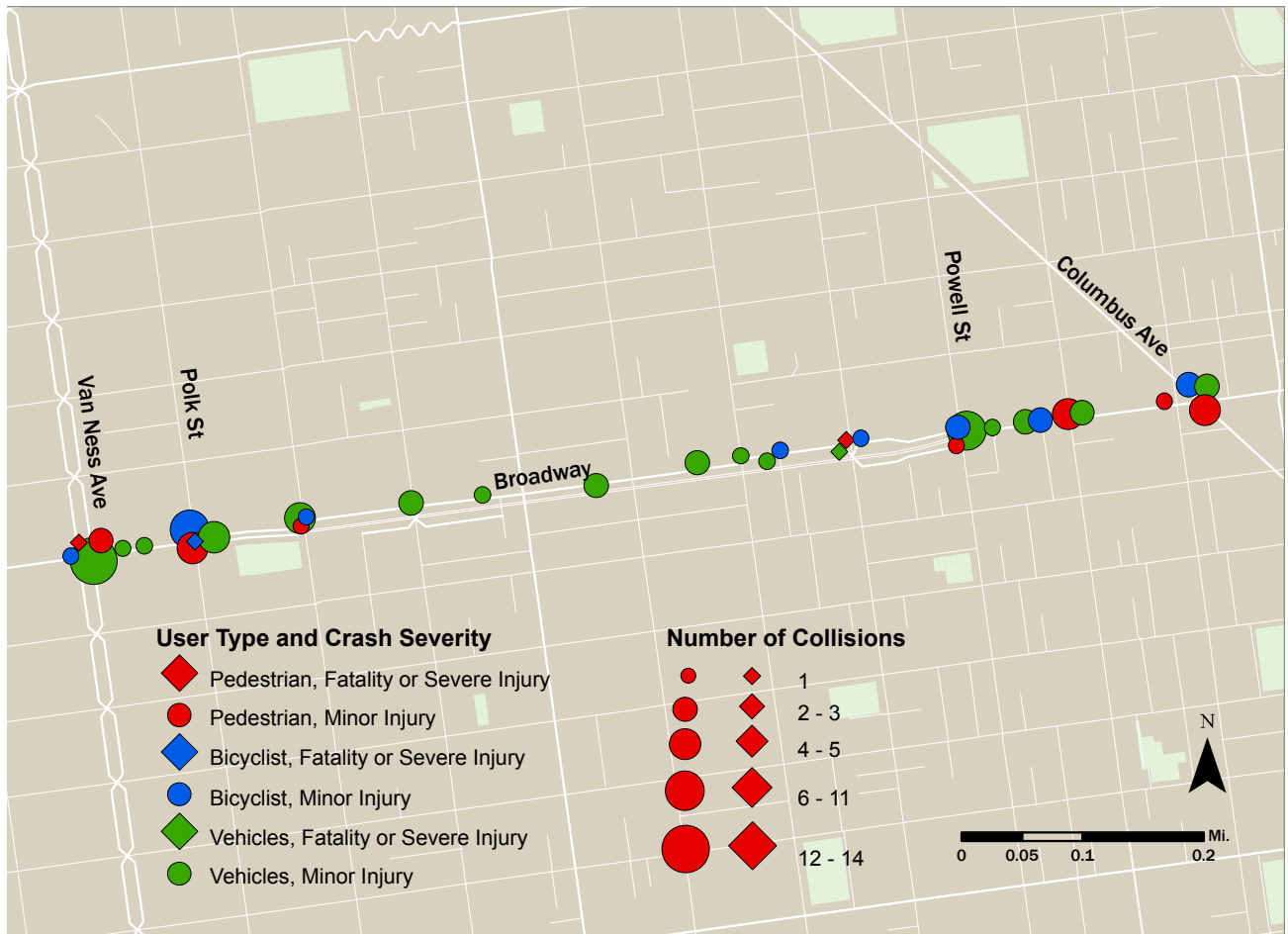
The data suggest that a significant share of those using the Broadway have origins and destinations in San Francisco. This is consistent with the SFCTA's Mobility Access and Pricing Study (2010), which found that San Francisco travelers, rather than regional travelers, account for the majority of automobile trips in the downtown area and environs during peak travel periods.

Broadway is a high injury corridor for both vehicles and pedestrians. Figure 7 illustrates the locations of pedestrian-vehicle, vehicle-vehicle, and bicycle-vehicle collisions along Broadway 2007-2012. Collisions are concentrated at the intersections of Columbus, Stockton, Powell, Polk, and Van Ness Avenue.

2.2 | PEDESTRIANS

Broadway was identified as a high-injury corridor for pedestrians through the city's Walkfirst and Vision Zero process. According to the Walkfirst analysis, collisions on Broadway disproportionately involve left- and right-turning vehicles at signalized intersections. To a lesser degree, collisions also involve unpredictable or illegal pedestrian or vehicle behavior such as vehicle speeding/drunk driving or pedestrians crossing against the signal or outside the crosswalk.

FIGURE 7. BROADWAY COLLISIONS 2007-2012 INCLUDING PEDESTRIANS, VEHICLES, AND BICYCLISTS



As shown in Figure 8, about a quarter of pedestrian collisions have historically occurred during the morning peak period (defined in the graphic as 7 am – 10 am). After taking into account variations in vehicle volume throughout the day, the evening (e.g. 7-10 pm) appears to be the riskiest time of day for pedestrians, accounting for about 26 percent of pedestrian collisions but only about 13 percent of daily vehicle volume.

Since speeding was identified as a contributing factor for pedestrian collisions, data on vehicle speeds was collected in three locations along Broadway, including eastbound Broadway at the exit of the Broadway Tunnel, Eastbound Broadway between Powell and Stockton Streets, and Westbound Broadway between Powell and Stockton Streets,¹¹ during the following time periods:

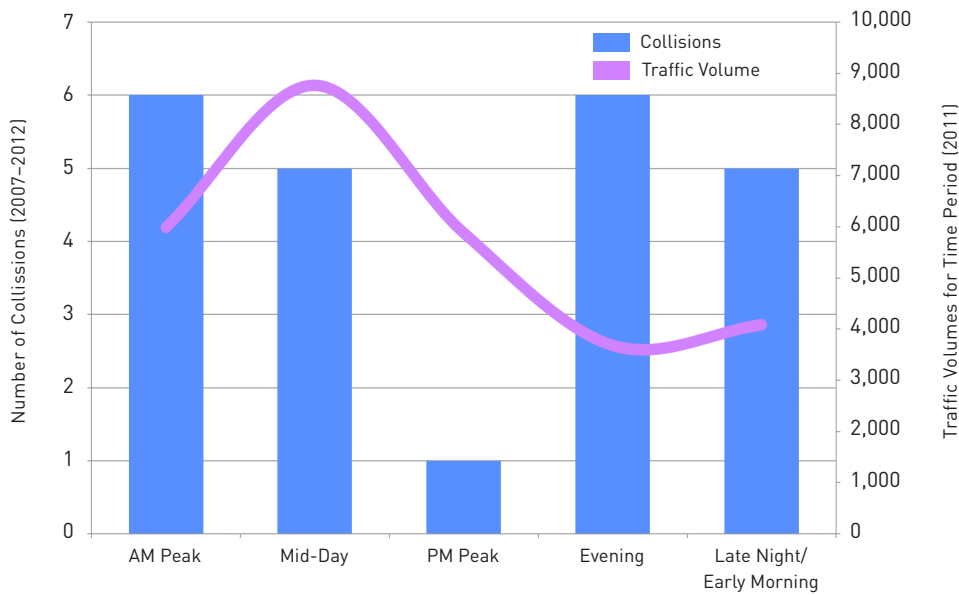
- AM Peak (7:30-8:30AM)
- PM Peak (5:00-6:00PM)
- Evening Off-peak (8:00-9:00PM)

TABLE 1. 85TH PERCENTILE SPEED SURVEY RESULTS

		POSTED SPEED LIMIT	AM	PM	EVENING
1	EB Tunnel Exit	25	27	32	33
2	EB Broadway	25	29	27	32
3	WB Broadway	25	24	22	31

Table 1 presents the results, which indicate that speeding is occurring on Broadway particularly during the less-congested P.M. and evening periods.

FIGURE 8. PEDESTRIAN COLLISIONS ON BROADWAY (2007–2012) BY TIME OF DAY COMPARED TO 2011 TRAFFIC VOLUMES



Source: Collisions by intersection drawn from the Statewide Traffic Integrated Records System (SWITRS). Traffic volumes by time of day represent 2011 mainline traffic volumes collected on Broadway between Larkin and Hyde Streets.

¹¹ Speed observations were recorded only for vehicles that were neither accelerating nor decelerating from a stop light. Therefore, these speed surveys represent the general speeds of flowing traffic at the mid-block survey locations. Speed observations were collected by a surveyor using a radar gun, which may introduce bias to the driver behavior; drivers may slow down when catching sight of a person monitoring their speed, and thus the results should be used with caution.

2.3 | TRANSIT

Muni route 30X (Marina Express) runs along the Broadway tunnel providing service between the Marina and the financial district during peak periods only. This route is not a Muni Forward corridor.

Additionally, Golden Gate Transit routes 27, 92X and the 97 run down Van Ness Avenue and then along Broadway to connect commuters from Marin County with the financial district.

2.4 | BICYCLISTS

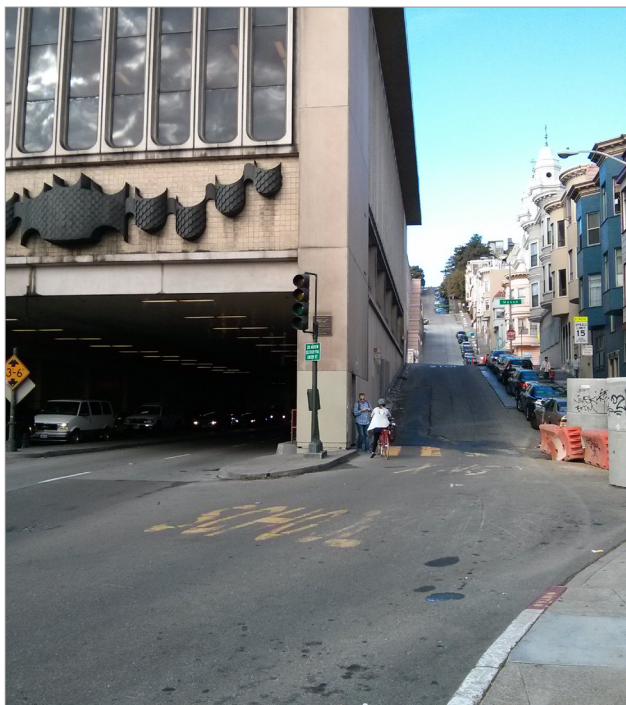
Broadway is a designated city bicycle route (Route 10), but the street currently lacks bicycle facilities such as separated bicycle lanes, shared-use markings, or other accommodations.

2.5 | PLANNED IMPROVEMENTS

As described previously, city agencies are planning several major improvements along Broadway in the near future, many designed to improve pedestrian safety; improvements are being implemented at every high injury intersection in the study area. Table 2 lists the high injury intersections along Broadway between Van Ness and Columbus Avenue, and lists the planned improvements and improvement schedule.

TABLE 2. PLANNED PEDESTRIAN SAFETY TREATMENTS ALONG BROADWAY STREET.

INTERSECTION OF BROADWAY WITH...	PROJECT (LEAD AGENCY)	PLANNED SAFETY TREATMENTS	CONSTRUCTION SCHEDULE
Columbus Ave	Columbus Avenue Street Safety Project (SFMTA)	High visibility crosswalks (all crossings) Bicycle lanes Transit bulbouts	Early 2016
Stockton St	Broadway Streetscape Study (SFMTA, Planning)	Corner bulbouts Bus bulbouts High visibility crosswalks Leading pedestrian intervals	2016
Powell St	Broadway Streetscape Study (SFMTA, Planning)	Corner bulbouts	2016
Polk St.	Polk Street Streetscape Design Project (SFMTA, Planning)	Bulbouts Pedestrian countdown signals Continental crosswalks Tow-away lane removal Bicycle lane Leading pedestrian intervals	Summer 2016
Van Ness Ave	Van Ness Bus Rapid Transit Project (SFMTA)	Protected southbound left turn	2016



A bicyclist mounts the hill rather than entering the Broadway tunnel

3. COMMUNITY OUTREACH RESULTS AND PERFORMANCE FRAMEWORK

3.1 | COMMUNITY OUTREACH RESULTS

Community outreach held in October, 2013 and August, 2014 revealed that in spite of the pedestrian safety investments being made all along Broadway, the community remains concerned about high traffic volumes on Broadway, and particularly that high traffic volumes could be contributing to poor safety outcomes on the corridor. Figure 9 lists the responses to a survey distributed at the outreach meeting which asked attendees what they considered to be the most important transportation problems in the neighborhood- pedestrian safety and heavy traffic emerged as the top two concerns.

Community members proposed several ideas for improving pedestrian safety and reducing traffic volumes on Broadway. The top suggestion was to remove one of two southbound left turn lanes on Van Ness Ave at Broadway on a pilot basis. In the morning peak period (7-9 a.m.), approximately 800-1,000 vehicles access Broadway by turning left at this intersection (Appendix D).

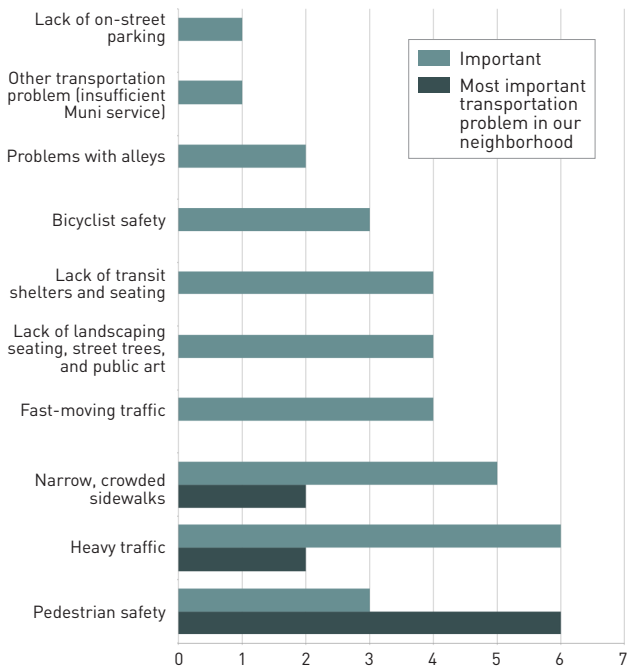
Vehicles currently must wait for gaps in traffic to turn at this intersection, as the intersection has a permissive fol-



Dual southbound left turn lane at Broadway and Van Ness

lowed by a protective signal phase. The pilot would test whether removal of one southbound left turn lane would discourage some vehicles from using the intersection, thereby reducing the number of vehicles on Broadway and potentially improving pedestrian safety along the corridor by decreasing the potential for vehicle-pedestrian conflicts.

FIGURE 9. COMMUNITY MEETING SURVEY RESPONSES REGARDING IMPORTANT AND MOST IMPORTANT TRANSPORTATION PROBLEMS IN THE CHINATOWN NEIGHBORHOOD



Several other ideas for addressing traffic volumes and pedestrian safety on Broadway were expressed at the meeting or developed by the study team in subsequent discussions with community stakeholder organizations. These were narrowed down to a short list of four ideas based on the study team's judgement regarding which held the most promise for reducing traffic volumes on Broadway. These included:

- Removal of one of two southbound left turn lanes on Van Ness Ave at Broadway. Approximately 1500 vehicles access Broadway by turning left at this intersection during the morning two-hour peak period. Constraining this turning movement could potentially discourage traffic from using Broadway.
- Lane removal in the Broadway tunnel as a means of traffic calming, reducing the attractiveness of Broadway relative to other routes, and providing opportunities to repurpose some of the space for other modes.
- Adding a left turn lane on eastbound Lombard St at Van Ness as a means of increasing the attractiveness of the Lombard/Van Ness Avenue/Bay St. route into downtown/North Beach relative to accessing this area via the Broadway tunnel.

- Adjusting signal timing on Broadway to by implementing leading pedestrian intervals (LPIs) at all crossings and reducing signal time for eastbound through vehicles. Leading pedestrian intervals allow pedestrians to begin crossing a few seconds ahead of turning vehicles, thereby reducing the potential for conflict. Several studies have shown leading pedestrian intervals to be an effective pedestrian safety improvement measure.¹²

3.2 | PERFORMANCE FRAMEWORK

In response to community interests and concerns, staff developed a draft framework for evaluating the proposed solutions to improving pedestrian safety and reducing traffic volumes on Broadway. The framework incorporates not just community interests but also potential tradeoffs with automobile congestion, transit travel time, and affects to the character of nearby streets. The final framework (Table 3) incorporated input collected at a subsequent community meeting.

TABLE 3. PERFORMANCE FRAMEWORK

EVALUATION QUESTION	PERFORMANCE MEASURE
Would the strategy improve pedestrian safety ?	Pedestrian injuries
Would the strategy reduce traffic volumes on Broadway?	Traffic volumes on Broadway east of tunnel
Would the strategy reduce traffic speeds on Broadway?	Traffic speeds eastbound Broadway/segment of east tunnel
Would the strategy change the character of nearby streets ?	Traffic volume and congestion on nearby streets
Would the strategy cause a worsening in traffic congestion in Chinatown?	Substantial increase in traffic delays, measured in intersection delay
Would the strategy result in delays to transit vehicles operating on Broadway or Van Ness Ave?	Transit travel times and speeds

¹²For example, visit: <http://nacto.org/usdg/intersection-design-elements/traffic-signals/leading-pedestrian-interval/> Fayish A. and Gross, F. Safety Effectiveness of Leading Pedestrian Intervals Evaluated by a Before-After Study with Comparison Groups. Transportation Research Record: Journal of the Transportation Research Board, No. 2198, Washington, D.C., 2010, pp. 15–22.

4. CONCEPT ANALYSIS

4.1 | ANALYSIS ASSUMPTIONS

The study team initially investigated whether the left-turn removal at Broadway and Van Ness could be evaluated through a pilot project, and prepared supporting traffic analysis projections for Caltrans review and approval (Appendix D), which would be required for a pilot project on Van Ness Avenue, a state highway. Ultimately, the technical team recommended that the concept be evaluated using a traffic simulation model, rather than a real-world pilot, to better capture how the lane removal would perform in conjunction with the Van Ness Bus Rapid Transit Project.

The Van Ness Bus Rapid Transit project will begin construction in early 2017, and will result in the conversion of one general-purpose lane in each direction into a transit only lane along Van Ness Avenue from Lombard to Mission Streets. Figure 10 compares today's conditions with a proposed rendering of the corridor after BRT construction. The SFCTA's SF-DTA traffic simulation model (SF-DTA) can simulate how the lane removal and other proposals would affect travel patterns after the roadway has been reconfigured for the Van Ness Bus Rapid Transit project.

The SF-DTA model is a temporally dynamic, mesoscopic traffic simulation model that contains a highly detailed representation of San Francisco's street network, including lane configurations, turn restrictions, and signal timing at every intersection in San Francisco. The SF-DTA Model also represents all surface-running transit routes including frequencies and vehicle types. The model simulates all motorized vehicle (e.g. cars, trucks, and transit vehicles) travel occurring on surface streets in San Francisco, using travel forecasts produced by the authority's regional travel demand model (SF-CHAMP) which ultimately derive from regional and state household travel surveys and traffic counts collected on city streets.

The SF-DTA model allows comparison of two scenarios with different network inputs shows how network changes such as signal timing changes, roadway capacity increases or decreases, and other street changes could affect driver routes, traffic volumes, and the operational performance of city streets. The model does not predict how travelers would change their modes of travel (e.g. switch from driving to transit, for example) in response to changes in the transportation network.

For the purpose of this study, the Transportation Authority developed a version of the DTA model for the morning peak commute traffic period, which is the peak travel period on Broadway (see Figure 2). The model was validated for reasonableness and calibrated where necessary through comparison to actual traffic counts collected on city streets. The analysis scenarios simulate a hybrid 2015/2020 scenario.¹³

The following describes the assumptions made in modeling the strategies:

- **Van Ness Broadway – Lane Removal:** One of the two planned southbound left turn lanes on Van Ness Avenue at Broadway was removed and minor signal timing adjustments were incorporated to provide more green time for the southbound left turn and slightly less for the northbound through movement.
- **Broadway Tunnel Road Diet:** One of two lanes in each direction (eastbound and westbound) of the Broadway tunnel was converted into a transit-only lane. No signal timing adjustments were made.
- **Broadway Signal Timing:** A four-second leading pedestrian interval was added to each pedestrian crossing at each intersection from Van Ness Avenue and Columbus Avenue. The green signal time was decreased commensurately for eastbound vehicles at each intersection. No other signal timing adjustments were made.

FIGURE 10. COMPARISON OF EXISTING AND FUTURE CONDITIONS ALONG VAN NESS AVENUE AFTER CONSTRUCTION OF THE VAN NESS BUS RAPID TRANSIT PROJECT



¹³ The land use assumptions reflect Association of Bay Area Governments (ABAG) land use projections for 2015 (ABAG JHC p2013 land use), and the transportation network reflects projects

- **Van Ness-Lombard Capacity Increase:** The eastbound approach of Lombard Street at the intersection with Van Ness Avenue was converted from one shared-through-left turn lane and two right turn-only lanes to one left-turn only lane, one shared-through-left-right lane, and one right-turn only lane, thus increasing the number of left-turn lanes from one to two. Appendix A provides more detail on why this configuration was chosen for modeling.

4.2 | EVALUATION RESULTS

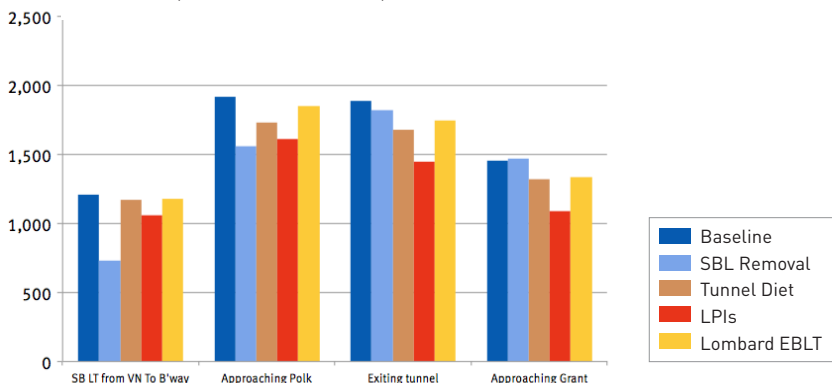
This section compares the evaluation results for the four scenarios tested according to the performance framework defined in Table 3. All results reflect the difference between a 2020 baseline scenario and a 2020 project scenario (e.g. one in which the specific network change is made).

TRAFFIC VOLUMES

Figure 11 illustrates the predicted morning peak hour (7:45-8:45 AM) traffic volumes along Broadway at major cross streets under the four modeled scenarios. It shows that the Broadway/Van Ness southbound left turn reduction reduces traffic volumes at the intersection of Broadway and Van Ness, but travelers find their way back onto Broadway via alternate routes and traffic volumes remain largely unchanged east of the Broadway tunnel. The left turn capacity increase at Lombard and Van Ness does not measurably¹⁴ change traffic volumes anywhere along Broadway.

The remaining two scenarios (tunnel road diet and signal timing changes) reduce eastbound morning peak hour traffic volumes on Broadway by about 10 and 20 percent, respectively, at the tunnel exit relative to baseline conditions. The signal timing changes reduce peak hour traffic volumes by creating delay for eastbound vehicles.

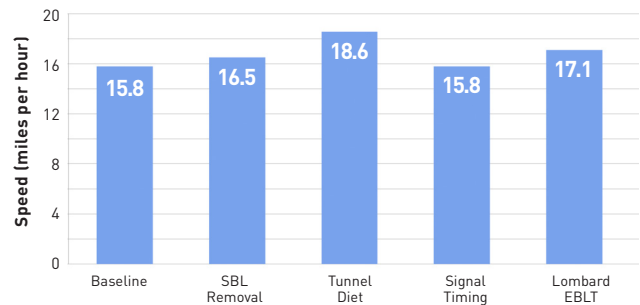
FIGURE 11. PREDICTED MORNING PEAK HOUR (7:45-8:45 AM) EASTBOUND TRAFFIC VOLUMES IN 2020 IN DIFFERENT MODEL SCENARIOS (VEHICLES PER HOUR)



TRAFFIC SPEEDS

Forecasted traffic speeds along Broadway (from Powell to Columbus) generally were not altered significantly by any of the proposals, since modeled speeds in the morning peak period in 2020 are predicted to be quite low (16 miles per hour) and remain relatively low for each scenario (Figure 12). The Broadway tunnel road diet proposal appears to increase speeds slightly, which can be explained by the fact that capacity is constrained only within the tunnel and then opens up again at the tunnel exit. Overall, the signal timing approach appeared to reduce speeds the most relative to other approaches.

FIGURE 12. 2020 BROADWAY TRAFFIC SPEED (EB AM PEAK), POWELL TO COLUMBUS

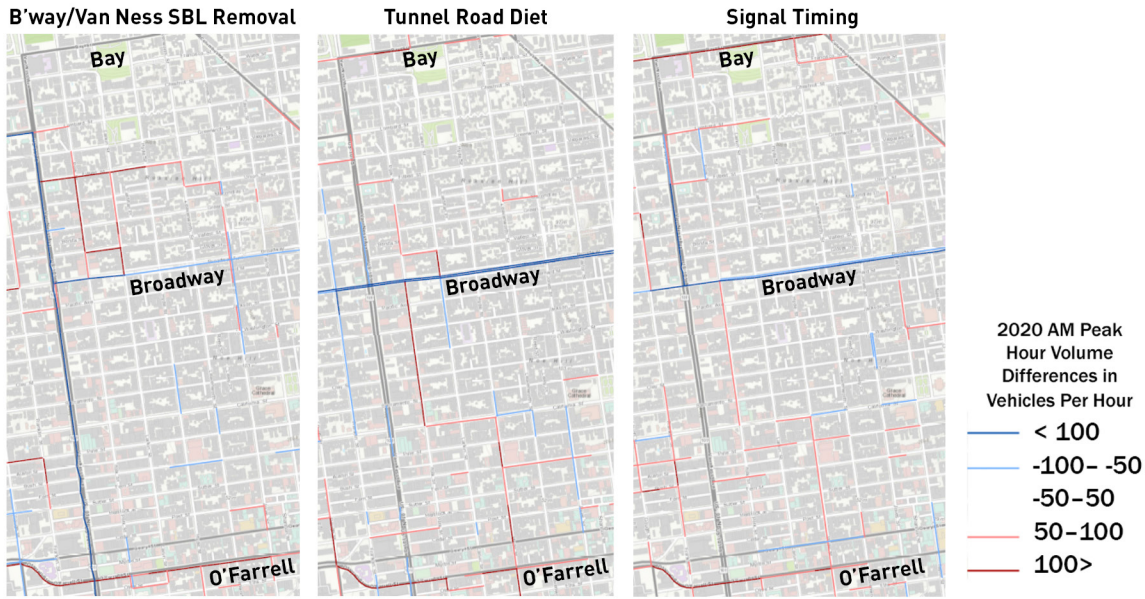


NEARBY STREETS

The effects of the proposals on traffic volumes on nearby streets was evaluated by creating volume differential maps that compare the difference in traffic volumes on each roadway segment between the 2020 baseline and the 2020 project scenarios. Segments with a significant (e.g. greater than 100 vehicles per hour) difference in traffic volume are highlighted in dark red (for increases) and dark blue (for decreases). All scenarios caused some

¹⁴ Note that anything less than 5 percent change is considered to be within the margin of error of the model and should be ignored.

FIGURE 13. MORNING PEAK HOUR TRAFFIC VOLUME DIFFERENCES UNDER THREE SCENARIOS



traffic diversion to other streets. Figure 13 illustrates the traffic diversion predicted under three of the four scenarios. Two of three scenarios (southbound left turn removal and tunnel road diet) appear to cause some traffic volume increases on Polk Street, which is a neighborhood commercial corridor. The signal timing scenario appears to cause traffic volume increases primarily on other major arterials including Bay Street and O'Farrell. The traffic diversion effects of the fourth scenario (Lombard left turn capacity increase) were not analyzed as the scenario appeared to have little impact on traffic volumes.

TRAFFIC & TRANSIT DELAY

Traffic delays were evaluated by reviewing the cumulative seconds of delay per vehicle during the morning peak period (7:45 to 8:45) in 2020 on two segments of roadway: Van Ness Avenue between Lombard and Broadway and Broadway from the tunnel exit to Columbus Avenue. The results (Figure 14) indicate that all scenarios increase traffic delay on one or both of these segments, but delay increases are most significant for the southbound left turn removal at Broadway and Van Ness Avenue and the left turn capacity increase at Lombard and Van Ness Avenue. Both these scenarios cause substantial increases in traffic delay on Van Ness Avenue. The model also predicts that the southbound left turn removal scenario will re-

sult in increased queue lengths and increased instances of queues that spill back for multiple blocks, as illustrated by Figure 15. This result is supported by past analysis – see Appendix E for relevant memorandum prepared by the SFMTA traffic engineer.

Because transit will have a protected travel lane in the future on Van Ness Avenue, it should be insulated from most of the traffic delay resulting from these scenarios. Transit vehicles that use Broadway (including the 30X and several Golden Gate Transit lines) would be affected by the delay unless a dedicated transit lane is provided.

FIGURE 14. 2020 PEAK HOUR-DELAY (AM PEAK HOUR 7:45-8:45 AM, SECONDS OF DELAY PER VEHICLE)

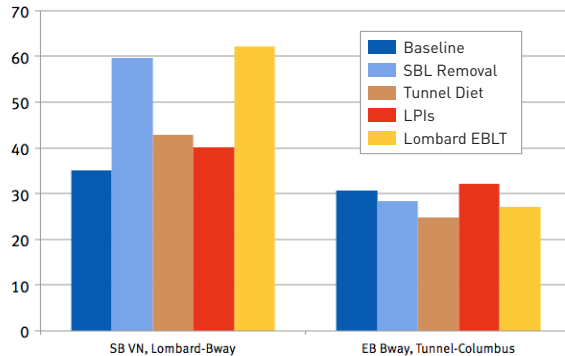


FIGURE 15. SAMPLE QUEUE LENGTH COMPARISON BETWEEN SCENARIOS WITH A SINGLE AND DOUBLE LEFT TURN LANE ON SOUTHBOUND VAN NESS AT BROADWAY

2020 Baseline Scenario – Two Southbound Left Turn Lanes at Broadway / Van Ness



2020 Scenario 1 – One Southbound Left Turn Lane at Broadway / Van Ness



PEDESTRIAN SAFETY

The SF-DTA Model does not predict traffic-related injuries and fatalities, but does predict changes in traffic volume and speed, which can impact the number of traffic injuries and fatalities that occur. The team reviewed relevant research that has attempted to quantify the relationship between traffic volumes and pedestrian injuries, including one developed by the San Francisco Department of Public Health in 2014,¹⁵ and another developed by researchers in Canada.¹⁶ These two models predict changes in pedestrian injuries associated with reductions in daily automobile traffic volumes. The models suggest that the change in daily traffic volumes on Broadway associated with any of the scenarios appear to be too small to measurably reduce pedestrian injuries and fatalities on Broadway.

One reason for this is that the scenarios are primarily focused on reducing morning, peak period traffic, which is a small share (about 20 percent) of overall daily traffic on Broadway. Any changes to morning peak period traf-

fic volumes have a small overall effect on daily traffic volumes, and therefore are predicted to have a small effect on pedestrian collisions which occur throughout the day. As shown in Figure 7, only about 26 percent of pedestrian collisions occur in the morning peak period on Broadway.

Measures to reduce morning peak period traffic are also less effective in improving pedestrian safety because morning traffic travels at low speeds in congested conditions. Speed surveys indicate that morning peak period traffic on Broadway generally travels at the speed limit, whereas evening traffic is above the speed limit, making this a more hazardous time for pedestrians. As many pedestrian collision occur in the evening (7-10 p.m.) as the morning peak period, although the evening traffic volumes are about 40 percent lower (Figure 7).

A further complication is that the strategies all result in some traffic diversion to other streets. This traffic diversion could simply shift the location of pedestrian injuries from Broadway to other locations. For these reasons, the

¹⁵ San Francisco Department of Public Health, 2014. Modeling Vehicle Pedestrian Injury Collisions at Signalized Intersections – DRAFT FOR PEER REVIEW.

¹⁶ Miranda-Moreno LF1, Morency P, El-Geneidy AM.. Accid Anal Prev. 2011 Sep;43(5):1624-34. The link between built environment, pedestrian activity and pedestrian-vehicle collision occurrence at signalized intersections.

study team concluded that the traffic volume changes seen in the modeled scenarios would not be expected to improve pedestrian safety.

The team also considered whether any of the strategies would improve pedestrian safety by directly addressing the source of pedestrian collisions, as follows:

- **Van Ness Broadway – Lane Removal:** Removing one of two-left turn lanes at the intersection of Broadway and Van Ness would not be expected to have any direct implications for pedestrian safety at the intersection because vehicles would be turning on a protected signal phase that is separated from the pedestrian crossing phase.
- **Broadway Tunnel Road Diet:** Removing roadway capacity within the Broadway tunnel itself would not directly address pedestrian safety because pedestrians in the tunnel travel on a separated pathway that is elevated from vehicular traffic.
- **Van Ness-Lombard Capacity Increase:** Increasing left-turn capacity at this intersection would not directly affect pedestrian safety at the intersection or elsewhere, unless it was implemented in conjunction

with a protected signal phase. Changing the signal phase from today’s conditions (permissive) to a protected phase could reduce conflicts between pedestrians and vehicles at this intersection, but would not impact safety along Broadway.

- **Broadway Signal Timing:** Implementing leading pedestrian intervals (LPIs) at Broadway intersections would be expected to improve pedestrian safety. As stated previously, turning vehicles are a top contributor to pedestrian collisions on Broadway, and LPIs directly reduce conflicts between pedestrians and turning vehicles by providing pedestrians with a few seconds of lead time to cross before vehicles start turning. Several studies have demonstrated leading pedestrian intervals to be an effective pedestrian safety countermeasure at signalized intersections.¹⁷ They are particularly appropriate at locations with high volumes of crossing pedestrians and turning vehicles.

EVALUATION SUMMARY

Table 4 below summarizes the evaluation findings, Comparisons reflect the difference between conditions in 2020 with and without the network change.

TABLE 4. CONCEPT EVALUATION RESULTS

	LEFT TURN LANE REMOVAL AND VAN NESS AND BROADWAY	BROADWAY TUNNEL ROAD DIET	BROADWAY SIGNAL TIMING	LOMBARD VAN NESS LEFT TURN LANE INCREASE
Improve pedestrian safety	○	◐	●	○
Reduce vehicle volumes on Broadway	○	◐	●	○
Reduce traffic speeds on Broadway	○	○	○	○
Avoid changing the character of nearby streets	○	○	◐	○
Avoid congestion on Broadway	●	●	○	●
Avoid transit delay on Broadway or Van Ness Avenue	○	○	○	○

KEY
 ● Objective largely met
 ◐ Objective partly met
 ○ Objective not met

¹⁷Fayish, Aaron C., and Frank Gross. "Safety Effectiveness of Leading Pedestrian Intervals Evaluated by a Before-After Study with Comparison Groups." Transportation Research Record: Journal of the Transportation Research Board 2198 (2010): (1), 15-22.

Overall, the results indicate that the **Broadway signal timing** concept best meets the community's goals for reduced traffic and improved pedestrian safety. Leading pedestrian intervals can directly benefit pedestrian safety by reducing the potential for conflicts between pedestrians and vehicles at intersections. Leading pedestrian intervals also directly address conflicts between pedestrians and left- and right- turning vehicles, which are the main source of pedestrian collisions on Broadway. If implemented systematically along the corridor by reducing signal time available for eastbound vehicles, the changes could also potentially reduce traffic volumes on Broadway during the morning peak period. Note, however, that leading pedestrian intervals are typically designed to minimize delay effects for vehicles, so in practice, these traffic volume reductions are unlikely.

The **Broadway tunnel lane removal** could slightly reduce traffic volumes on Broadway by creating vehicle delay that would deter vehicles from using the tunnel. It would not be expected to directly improve pedestrian safety if only implemented within the Broadway tunnel, since pedestrians are protected from vehicles within the tunnel.

The **Broadway Van Ness left turn removal** reduces traffic volumes on Broadway at Van Ness Avenue, but traffic volumes east of the tunnel remain about the same. Vehicles can use other routes to access Broadway if the left turn from Van Ness Avenue to Broadway becomes congested. This approach does not directly affect interactions between vehicles and pedestrians on Broadway and therefore would not be expected to benefit pedestrian safety.¹⁸

The **additional left turn lane at Lombard and Van Ness Avenue** did not measurably¹⁹ affect traffic volumes on Broadway. Adding a left turn lane was intended to increase the capacity of the intersection for left-turning vehicles and the attractiveness of Lombard/Bay Street as an alternative to Broadway for vehicles headed downtown. However, due to space and signal timing constraints at the intersection, adding an additional left turn lane does not significantly increase left-turning capacity. Appendix A provides more detail.

4.4 | RECOMMENDATIONS FOR BROADWAY

As a follow up to the evaluation of corridor concepts for Broadway, the SFCTA team worked collaboratively with the San Francisco Municipal Transportation Agency (SFMTA) to identify locations along Broadway where implementation of leading pedestrian intervals could be considered as part of the city's WalkFirst initiative. The team provided information on which intersections are the best candidates for leading pedestrian intervals based on their collision history (e.g. prevalence of collisions involving pedestrians and turning vehicles), and the volumes of pedestrians and turning vehicles (see Appendix B). SFMTA currently plans to implement LPIs at the intersections of Broadway with Stockton and Polk Streets. Note that LPIs are just one of several tools that can be used to improve safety at intersections for pedestrians. As indicated in Table ES.1, SFMTA is implementing safety treatments at all major intersections along Broadway between Van Ness Avenue and Columbus in the next two years.

The study team further recommends that the San Francisco Department of Public Health and the San Francisco Municipal Transportation Agency conduct a before-and-after safety evaluation of planned treatments on Broadway to determine how they affect safety on Broadway and to monitor any changes to traffic volumes.

¹⁸ Eliminating one of two left turn lanes at the intersection of Broadway and Van Ness Avenue could benefit pedestrian safety directly by reducing conflicts between pedestrians crossing on the east leg of the intersection and southbound left turning vehicles. However, the potential for these conflicts will be eliminated in the future after implementation of the Van Ness Bus Rapid Transit project, which will provide a protected signal phase for southbound left turning vehicles. Once the protected signal phase is in place, vehicles will no longer be allowed to turn while pedestrians are crossing.

¹⁹ A small reduction in traffic volume resulted but was considered to be within the margin of error of the model.

KEARNY ST., FROM BUSH TO JACKSON

1. INTRODUCTION

Beyond reducing traffic volumes and improving safety on Broadway, Chinatown community members (especially the Chinatown Community Development Center, Chinatown TRIP, and Self Help for the Elderly), indicated a strong interest in improving pedestrian safety on Kearny Street.

To respond to that interest, the study team reviewed existing conditions on Kearny Street from Bush to Jackson Streets, and prepared spot improvement recommendations and corridor safety improvement concepts. The short term intersection-specific recommendations will be implemented by the SFMTA as part of the WalkFirst initiative. The corridor concepts will be evaluated further by the SFMTA in the next phase of study.

Information in this section draws from several sources including:

- Field review, traffic counts, speed surveys, and video recordings collected by the study team
- A walk audit prepared by the UC Berkeley Institute of Transportation Studies with Fehr & Peers transportation consultants on May 13, 2013 and documented as part of the City of San Francisco Pedestrian Safety Assessment, (Appendix F).
- Data collected by students at the Chinatown Urban Institute, a youth empowerment and professional development program offered by the Chinatown Community Development Center in San Francisco during summer 2014. This included interviews with on-

street pedestrians as well as senior residents at the International Hotel and Clayton Hotel.

- Interviews with several community stakeholder organizations

2. KEARNY EXISTING CONDITIONS

2.1 | OVERVIEW

Kearny St. from Jackson to Bush is a 0.4 mile long, one-way (northbound) major arterial with six intersecting cross streets (Bush, Pine, California, Sacramento, Clay, Washington, and Jackson). It has active street front retail, including restaurants, cafes, and banks, with several major destinations along Kearny including Portsmouth Square, the Hilton Hotel, the Saint Mary School (K-8), and City College of San Francisco.

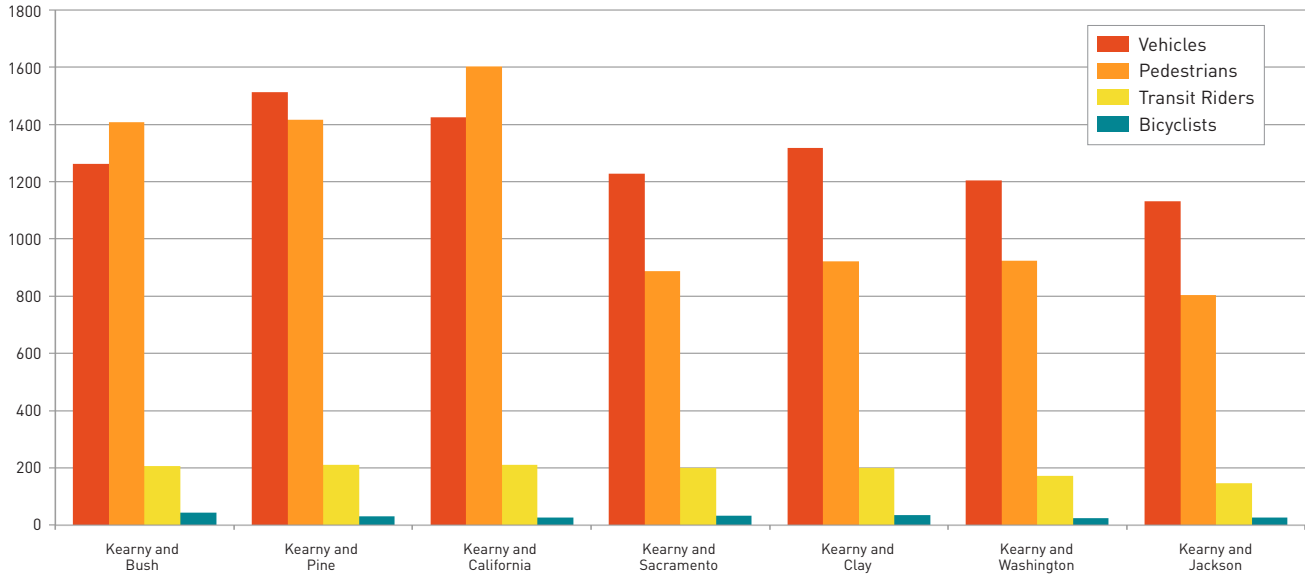
Table 5 provides an overview of Kearny's characteristics. More detail on existing conditions for each mode of travel is provided below. Because pedestrian safety was identified early on as a top community concern, the existing conditions analysis emphasizes pedestrian safety.

Figure 16 provides an overview of northbound traffic volumes at each intersection on Kearny, including northbound vehicles, pedestrians, bicyclists, and transit riders. It illustrates that during the P.M. peak period, private vehicles make up the largest share of overall through-traffic. Pedestrian volumes are also very heavy and exceed vehicle volumes at the intersections of Kearny with Bush and California Streets. Transit riders and bicyclists make up a smaller share of overall through-traffic.

TABLE 5. KEARNY ST. FROM JACKSON TO BUSH – CORRIDOR OVERVIEW

FEATURE	DESCRIPTION
Number of travel lanes	Three main one-way travel lanes plus two (east and west side) combined parking / tow-away lanes. Portions of the tow-away lane are operative during both a.m. and p.m. peak periods; portions operative only in the p.m. peak, and some portions (such as the east-side tow-away lane between Washington and Jackson) have been removed and are used only for parking or loading/unloading.
Intersection characteristics and signal equipment	All intersections are signalized. Intersection signal equipment was recently updated to allow signal connectivity as part of SFMTA implementation of transit signal priority technology. Three intersections (Clay, Pine, and Bush) have dual turn lanes that create multiple-threat situations with crossing pedestrians.
Crossing distances and speeds	Crossing distances (as recorded from Google StreetView) vary from a low of approximately 28 feet at Kearny and Jackson St. to a high of 52 feet at Kearny and California. Crossing speeds are timed at a maximum of 2.9 feet per second for the combined walk and flashing don't walk phases.
Curb ramps	None of the intersections have a complete set of directional curb ramps. Kearny has several sub-floor basements that make certain ramp upgrades technically and financially challenging to complete.
Transit	The MUNI 8X, 8A/BX use this portion of Kearny. Bus stops are on the right-hand (eastern) side of the street at Bush (northeast corner), California (northeast corner), Clay (northeast corner), and Jackson (southeast corner). The California Street cable car crosses at California St., and the 1 bus line crosses at Sacramento and Clay Streets. Several express lines (1, 31, 38, AX, BX) cross at Bush and Pine.

FIGURE 16. KEARNY STREET PEAK HOUR (5P.M.-6P.M.) NORTHBOUND/SOUTHBOUND VOLUMES



Notes: Vehicle volumes (sum of peak hour NBLeft + NBThru + NBRight), pedestrian volumes (sum of peak hour crossing volumes in East + West crosswalks), and bicycle volumes (sum of peak hour NBLeft + NBThru + NBRight) are drawn from peak hour (5-6 p.m.) traffic counts collected December 9th, 2014. Transit volumes are from SFMTA's Automatic Passenger Count data, and represent the average load of bus during peak hour at closest bus stop south of intersection multiplied by the number of buses in the schedule during the peak hour (9 buses).

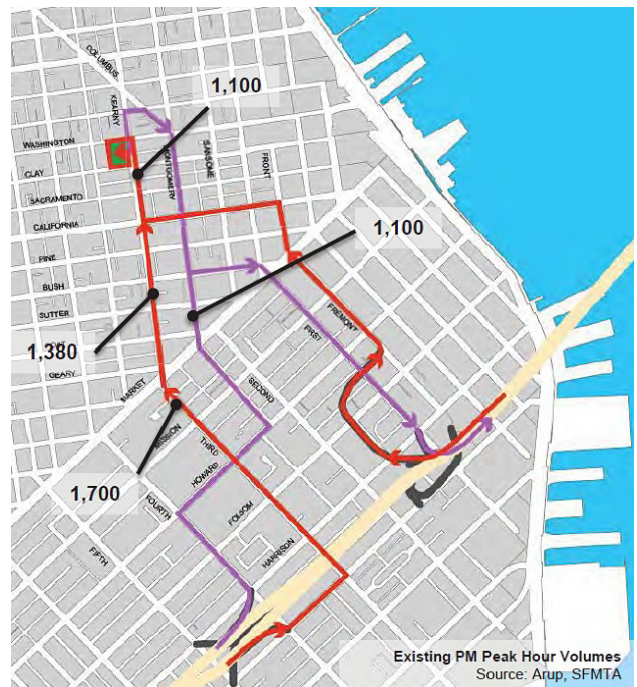
2.3 | VEHICLES

Kearny provides a connection to the Financial District and Chinatown for vehicles headed north from 3rd Street, which is also a one-way arterial connecting to I-280 and I-80. Vehicles may also use Kearny to access Montgomery and head south on I-80 or US 101. Figure 17 illustrates the inbound/outbound paths of vehicles.

Hourly traffic counts for a full 24-hour period were collected using an automatic traffic recorder on Thursday, May 29th and Saturday, May 31st 2014 on Kearny between Clay and Washington St. indicate that the highest volumes of automobile traffic on Kearny occur during the peak hour from 4:45 to 5:45 p.m (Figure 18).

In general, intersections in the study area are relatively uncongested for vehicles. The typical measure of automobile congestion is roadway level of service (LOS). LOS is designated A through F from least congestion to most congestion, respectively. LOS was examined for a sample of three intersections in the study area (Pine, Clay, and Washington St.)²⁰, which were found to have P.M. peak period scores of LOS B, B, and A, respectively, based on P.M. peak period traffic counts collected in 2014.

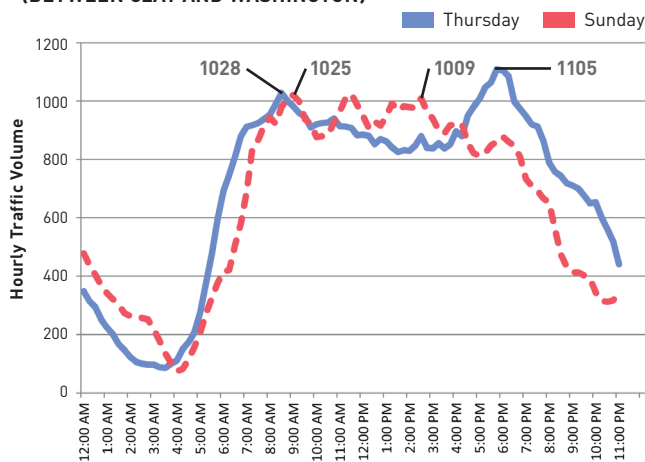
FIGURE 17. INBOUND/OUTBOUND VEHICLE PATHS CONNECTING WITH US-101



Source: San Francisco Planning Department, Portsmouth Square Area Project Existing Conditions Report 2014

²⁰LOS values for Kearny & Clay and Kearny and Washington are drawn from the Portsmouth Square Existing Conditions Report (2014) completed by the planning department.

FIGURE 18. DAILY TRAFFIC VOLUMES ON KEARNY STREET (BETWEEN CLAY AND WASHINGTON)



Source: San Francisco Planning Department, Portsmouth Square Area Project Existing Conditions Report 2014

This section of Kearny Street lacks posted speed signs; the default speed on San Francisco streets is 25 miles per hour unless otherwise posted. Vehicle speeds in the study area were collected on northbound Kearny St. between Jackson Street and Pacific Avenue during the following periods with the following results for the 85th percentile speeds:

- AM Peak (7:30-8:30AM) - 32 miles per hour.
- PM Peak (5:00-6:00PM) - 28 miles per hour.
- Evening Off-peak (8:00-9:00PM) - 28 miles per hour.

TRANSIT

Muni operates numerous routes in the study area, including the 8 Bayshore and 8AX/8BX Bayshore Expresses which runs northbound on Kearny St. through the full extent of the study corridor. Transit operates on most of the cross streets as well. The California Street cable car crosses at California St., and the 1 bus line crosses at Sacramento and Clay Streets. Several express lines (1, 31, 38, AX, BX) cross at Bush and Pine. Figure 19 illustrates the transit routes in the study area.

Demand: Together the 8/8AX/8BX routes carry over 16,000 customers on an average weekday. Most of the 8/8AX/8BX stops within the project area north of Bush Street are primarily drop-off locations, with the highest-use stop located at Clay Street as shown in Figure 20.

Facilities: Bus stops are on the right-hand (eastern) side of the street at Bush (northeast corner), California (northeast corner), Clay (northeast corner), and Jackson (southeast corner).

Transit performance: The 8/8AX/8BX bus routes average 6-7 miles per hour on weekdays along Kearny Street between Geary Street and Columbus Avenue. Several factors contribute to slow transit operations, including narrow lane widths, closely-spaced bus stops, and conflicts with other vehicles making turns or parking maneuvers.

Muni operates at slow speeds (6-7 miles per hour on weekdays) due to narrow lane widths, closely-spaced bus stops, and conflicts with turning or parking vehicles

Lane widths of less than 10 feet throughout the corridor often require Muni buses to straddle travel lanes. The average bus stop spacing along Kearny Street between Geary Street and Columbus Avenue is about 550 feet, well below the SFMTA’s proposed bus spacing guidelines of 800-1,360 feet for streets with grades of less than 10 percent. The placement of some bus stops at intersections also contributes to delays. For example, the bus stops located at the nearside of signalized intersections at Sutter and Jackson streets decrease the effectiveness of transit signal priority, and the high volume of right-turning vehicles at Jackson Street makes it difficult for bus operators to exit the nearside bus stop at this intersection. During peak periods, traffic congestion on cross-streets results in vehicle queues blocking Kearny Street and slowing bus operations, particularly at Post Street. Peak period tow-away lanes are frequently violated by vehicles performing pickup and drop-off activities, requiring buses to slow down to change lanes. South of the project area, 30 Stockton and 45 Union-Stockton bus operators must merge across three lanes of traffic to turn left onto Sutter Street. At the northern end of the project area, 8X/BX bus operators must merge across two lanes of traffic to turn left onto Columbus Avenue.



Muni riders waiting for the bus along Kearny Street
Image Credit: CCDC Urban Institute

FIGURE 19. TRANSIT ROUTES ON KEARNY AND SURROUNDING STREETS

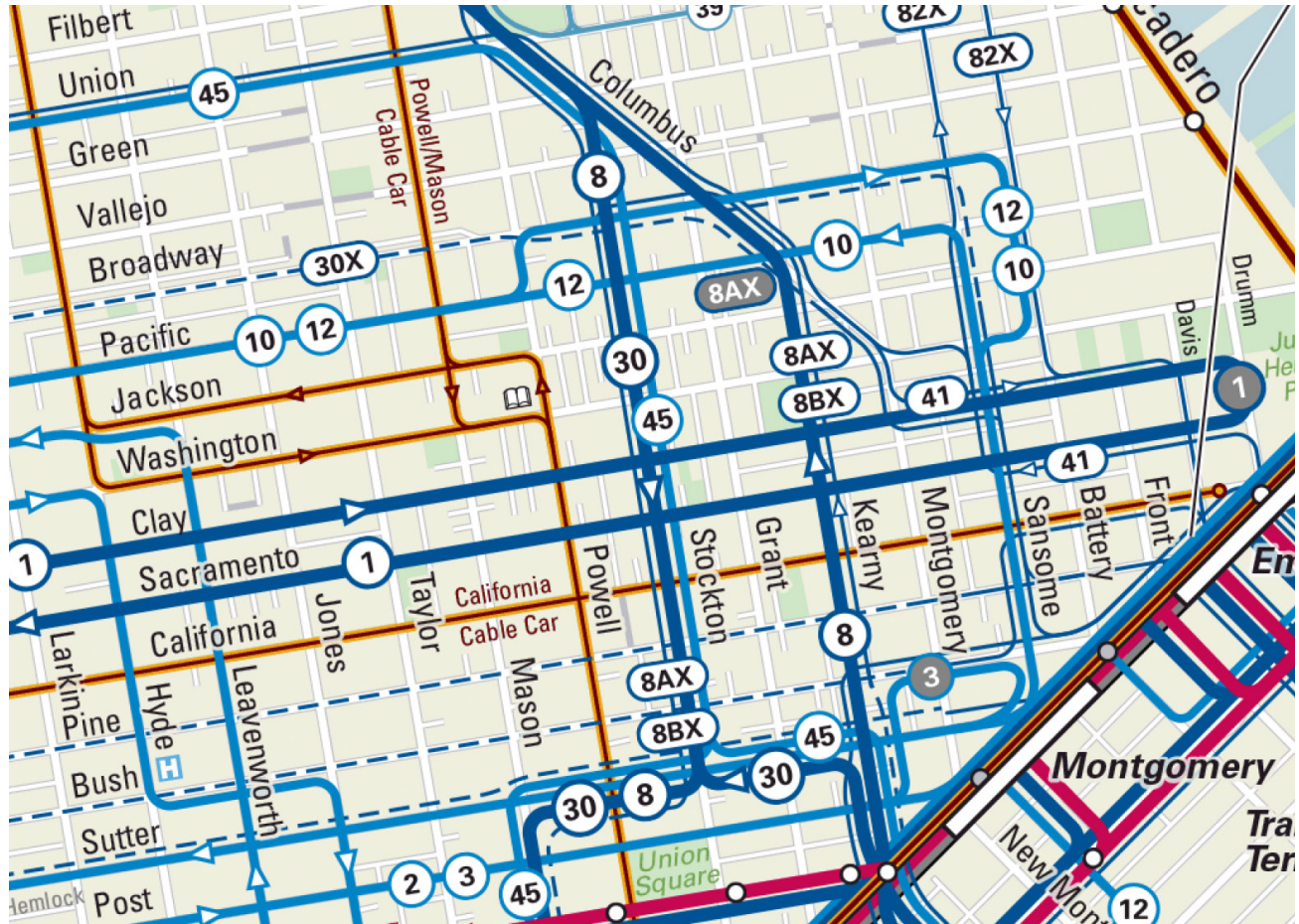
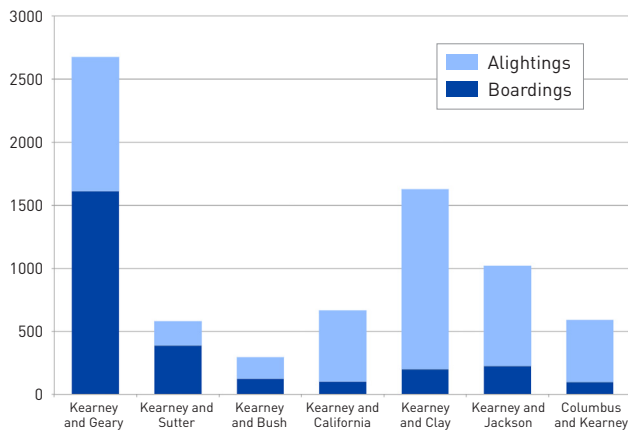


FIGURE 20. FALL 2013 8X/8AX/8BX COMBINED AVERAGE WEEKDAY RIDERSHIP



BICYCLES

Demand: As was shown in Figure 16, between 25-43 northbound bicyclists pass each intersection on Kearny during the P.M. peak hour (5-6 p.m.). Bicycle volumes are higher on the southern part of the corridor near Bush St., and lower toward the north.

Safety: The San Francisco Department of Public Health has identified Kearny St as a high injury corridor for bicyclists.²¹ Approximately seven bicyclist collisions occurred on Kearny between 2007-2012 (Figure 21), including one severe injury collision at Sacramento St.

Facilities: Kearny St. does not currently have any bicycle facilities and is not indicated as a bicycle route on SFMTA’s San Francisco Bikeway Network Map. However, SFMTA identified Kearny (from Market St. to Columbus) as a corridor to be analyzed for improvement as part of implementation of the SFMTA’s 2013 Bicycle Strategy.

²¹Source: San Francisco Department of Public Health, www.transbasesf.org.

FIGURE 21. PEDESTRIAN, BICYCLE, AND VEHICLE COLLISION LOCATIONS ALONG KEARNY ST.



Source: SWITRS, 2007-2012. Some overlapping collisions were moved slightly to improve legibility.

PEDESTRIANS

Demand: As was shown in Figure 16, Kearny currently experiences high pedestrian volumes, with between 800-1600 pedestrians crossing in the north/south direction at each intersection during the evening peak hour (5-6p.m.) The highest volumes are in the southern portion of the corridor at Bush, Pine, and California Streets.

collision locations along with bicycle and motor vehicle only collisions. The intersection of Kearny and Sacramento has seen the most severe injuries, with 1 severe injury and 1 fatality. The intersection of Kearny and Clay has seen the highest number of total injuries, including 7 pedestrians. Among all collisions on Kearny, 5 involved senior pedestrians.

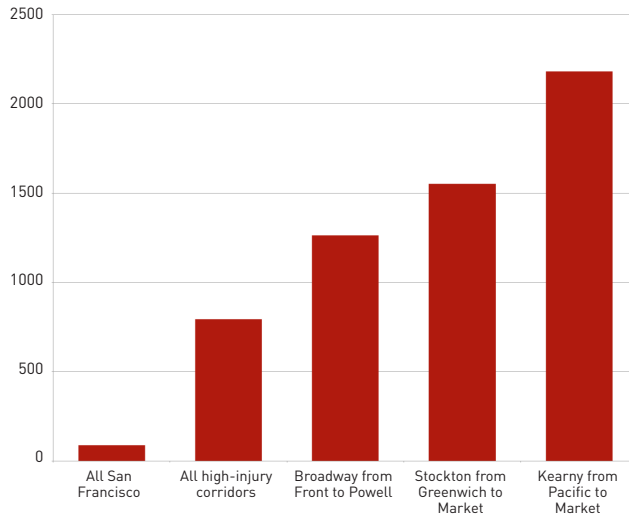
Pedestrian safety:

Pedestrian safety is a major problem along Kearny St. The WalkFirst Investment Study identified Kearny as a high injury corridor, along with Broadway and Stockton in Chinatown. However, Kearny’s safety record is worse than either Stockton or Broadway Streets. Figure 22 illustrates analysis performed by the Department of Public Health to identify pedestrian high injury corridors for San Francisco. It shows that Kearny (analyzed by DPH from Pacific to Market), has a higher number of severity-weighted pedestrian injuries per mile than either Stockton or Broadway (based on segments defined for the analysis), and a far higher number than all other high injury corridors on average.

Between 2007-2012, 26 pedestrian minor injuries, two severe injuries and 2 fatalities (at Washington and Sacramento Streets) occurred on Kearny between Bush and Jackson. Figure 21 illustrates pedestrian col-

²² The Walkfirst Investment Study (www.walkfirst.sfplanning.org) was a multi-agency effort to prioritize corridors for safety improvement.

FIGURE 22. HIGH-INJURY CORRIDOR ANNUAL INJURY STATISTICS WEIGHTED PEDESTRIAN INJURIES PER 100 MILES PER YEAR (2007–2011)



Source: San Francisco Department of Public Health, "Identifying High Pedestrian Injury Corridors for Targeted Safety Improvements – A Methodology for San Francisco, California – 2013 Update."

Top contributors to pedestrian injuries were identified using several sources including:

- The WalkFirst Investment Study²², which classified all pedestrian corridors into a typology based on the types of pedestrian collisions occurring there.
- A 2014 summer research project undertaken by the Chinatown Urban Institute. Students at the Chinatown Urban Institute, a youth empowerment and professional development program offered by the Chinatown Community Development Center in San Francisco analyzed pedestrian safety conditions on Kearny as part of their summer 2014 class project. They presented results from their analysis at an August 6, 2014 community meeting.
- A research project completed by the U.C. Berkeley Institute for Transportation Studies. The City of San Francisco Pedestrian Safety Assessment (2013), prepared by the UC Berkeley Institute of Transportation Studies evaluated pedestrian safety and walkability at key locations in San Francisco (Appendix F). As part of this effort, walking audits were conducted at three focus areas, including one at Kearny Street between Columbus Avenue and Sutter Street. In a walking audit, a team carefully observes the pedestrian environment, identifying challenges to pedestrian safety and comfort as well as opportunities for improvement. The walking audit on Kearny Street was conducted on May 13, 2013.

- Observations of vehicle yielding behavior compiled by the San Francisco Department of Public Health while measuring vehicle yielding behavior on Kearny St as part of the San Francisco Safe Streets Campaign.
- Field review and data analysis compiled by the project team.



Turning vehicles conflicting with crossing pedestrians at Kearny and Jackson Street Image Credit: CCDC Urban Institute



Elderly pedestrian waiting to cross at Kearny and Jackson Image Credit: CCDC Urban Institute



Pedestrians crossing during a don't walk phase at Kearny and Clay
Image Credit: CCDC Urban Institute

Top pedestrian safety issues on Kearny are high vehicle speeds, unsafe turning movements (particularly right turns), insufficient pedestrian crossing time/lack of understanding of crossing constraints, and unsafe pedestrian behavior.

- **High vehicle speeds:** The WalkFirst Investment Study identified high-speed, high-volume collisions as a pedestrian collision profile represented on Kearny Street, and a speed survey confirmed that speeding is occurring on the street especially in the morning peak period. In addition, speeding was identified as a top concern during community outreach.
- **Unsafe turning movements, particularly right turns:** The WalkFirst Investment Study identified right turns at signalized intersections as a top pedestrian collision profile represented on Kearny. Researchers at the UC Berkeley Institute of Transportation study noted conflicts throughout the Kearny corridor between pedestrians and turning vehicles, particularly at locations with double-left and double-right turn lanes. The San Francisco Department of Public Health found that one in ten turning vehicles on Kearny St. do not yield to crossing pedestrians.
- **Insufficient pedestrian crossing time / lack of understanding of crossing time constraints.** Students at the Chinatown Urban Institute identified insufficient pedestrian crossing time as a top-cited concern at three intersections on Kearny Street. Students recorded between ten and twenty instances per hour of individuals running out of time to cross the street during three observation periods each at the intersections of Jackson, Washington, and Clay. The insufficient crossing time is likely related to the high concen-

trations of elderly individuals in the area, who require more time to cross the street. However, some community residents also pointed out that elderly individuals may not understand how to cross safely with a countdown signal, and may start crossing too late. Note that corridor signals are already timed for slow crossing speeds (See Appendix G).

- **Unsafe pedestrian behavior (e.g. jaywalking).** The Walk-First Investment Study identified pedestrians crossing outside the crosswalk and unpredictable pedestrian behavior as pedestrian collision profiles represented on Kearny. Students at the Urban Institute also recorded between 10–20 instances per hour of individuals crossing outside the crosswalk at the intersection of Kearny and Washington, and 20–30 instances per hour at Kearny and Clay.



An elderly pedestrian violates the signal at Kearny at Clay

Other pedestrian safety challenges include spot issues at the Hilton Hotel and Portsmouth Square garage. Researchers at the UC Berkeley Institute of Transportation Studies observed taxis routinely blocking the sidewalk while trying to enter the hotel driveway on the east side of Kearny Street just south of Washington. They also noted some confusion between drivers and pedestrians at the entrance/exit of the parking garage on the west side of Kearny Street between Washington and Clay Streets. In order to walk past the parking garage, pedestrians must cross two entrance lanes and two exit lanes separated by a median.

Existing Pedestrian Safety Infrastructure: Kearny currently features the following pedestrian infrastructure/safety treatments:

- Sidewalks are approximately 12 feet in width, and sidewalk crowding does not appear to be an issue based on field review.
- Continental crosswalks are available on all crossings, although many are faded/less visible.
- No pedestrian curb extensions or refuge islands exist at any intersection along the corridor. The presence of sub-floor basements along the corridor (see Appendix F) may complicate the creation of curb extensions.
- Signals are currently timed to support slow pedestrian crossing speeds, and all are within SFMTA's guidelines²³ of 2.5 feet per second for the full pedestrian phase. Appendix G lists the crossing speeds at each intersection.
- The signal at Kearny and Clay currently is programmed with a leading pedestrian interval on the north and south legs of the intersection.
- None of the intersections have a complete set of directional, ADA-compliant curb ramps.

Appendix H contains a conceptual depiction of existing conditions at each intersection, including the position and direction of curb ramps; pedestrian, vehicle, and bicycle volumes; collision history; frequency of violations; location of transit stops; loading/unloading zones; tow-away zones; and presence of obstructions that could make curb adjustments difficult such as fire hydrants and drainage basins. Appendix F shows the locations of sub-floor basements.

²³ Source: SFMTA Pedestrian Signal Guidelines Memorandum, 2009.

3. COMMUNITY OUTREACH RESULTS

On Kearny St., the approach to public outreach involved interviews with community stakeholders. This outreach was conducted in two stages. One stage involved interviews and on-street outreach conducted by the CCDC's Urban Institute. The other involved interviews with key community stakeholders.

3.1 | URBAN INSTITUTE COFFEE HOUR INTERVIEWS

Students at the Chinatown Urban Institute, a youth empowerment and professional development program offered by the Chinatown Community Development Center in San Francisco analyzed pedestrian safety conditions on Kearny as part of their summer 2014 class project. Their project included interviews with senior residents of the International Hotel and the Clayton Hotel, as well as interviews with pedestrians on the street. Issues that came up most frequently in their interviews included:

- Vehicle speeding. Many community members feel unsafe because of vehicles moving at high speeds along the corridor.
- Unsafe right turns. Several individuals mentioned feeling unsafe crossing against high volumes of right-turning vehicles.
- Insufficient pedestrian crossing time. Several elderly individuals expressed that pedestrian crossing times are insufficient.

"The cars go really fast. When the light changes, the cars have to brake really hard to stop."

—Andy, 20, CCSF student

"I would step down from the sidewalk before the light turns green because I'm scared I can't make it across, especially when my leg isn't good."

—Mrs. Li

"When we walk with canes, we get stuck in the middle."

—Ms. Wong, 75

"The cars are going too fast."

—Ms. Liang, Clayton Hotel resident

3.2 | COMMUNITY STAKEHOLDER INTERVIEWS

To more fully assess community perspectives on transportation needs and issues on Kearny Street, the study team conducted seven interviews with eleven key stakeholders in Chinatown. Interviews were held between May 6-11, 2015 unless otherwise noted.



Chinatown Urban Insite students interview seniors about Kearny Street Image credit: CCDC Urban Insite

General interview questions used to prompt and guide each discussion included:

- What do you think is working well about transportation on Kearny St. today?
- What do you think is not working well?
- What would you most like to see change on this street?
- What would you like to remain same in the future?

Interviewees were:

- Major Thomas Mui, Commanding Officer, The Salvation Army San Francisco Chinatown Corps
- Pius Lee, Chairman, Chinatown Neighborhood Association
- Richard Ow, Chinatown Resident & Chaplain, American Legion, Cathay Post 384
- Rita G. Mah, Esq., Executive Director, Chinese Newcomers Service Center, plus four of her employees
- Peter H. Lee, Executive Corporate Manager, Portsmouth Plaza Parking Corporation
- Anni Chung, Executive Director, Self Help for the Elderly, and Winnie Yu, Assistant Director of Employment Training and Economic Development, Self Help for the Elderly.²⁴

Appendix I contains a full record of these interviews. Additionally, SFCTA staff presented project updates at meetings of the Chinatown Community Development Center's Chinatown Transportation Research and Improvement Project (TRIP) group throughout the course of the project, including in September 2013, April, June, August,

and November of 2014, and in April of 2015. During these meetings, concerns about pedestrian safety on Kearny Street routinely came up and key concerns/observations from these meetings are included in the summary below.

3.3 | SUMMARY FINDINGS

- Most interviewees felt that pedestrian safety in Chinatown is a top concern in general.
- More than half the organizations expressed specific concern about pedestrian safety on Kearny Street. In particular, members of Self Help for the Elderly and Chinatown TRIP expressed strong concerns about the history of pedestrian injuries and fatalities on Kearny Street, citing speeding vehicles and high volumes of turning vehicles conflicting with crossing pedestrians as top contributing factors. One interviewee expressed frustration with the slow pace of the city's response to pedestrian safety problems on Kearny St.
- Three interviewees/organizations cited the intersection at Clay as among the worst along Kearny in terms of traffic safety issues – particularly clashes between vehicles and pedestrians that sometimes result in altercations. Vehicles entering/exiting the Portsmouth Square garage were seen as contributing to the problem.
- Two interviewees/organizations did not immediately recognize a pedestrian safety problem on Kearny Street. Instead, they felt that sidewalk crowding and pedestrian safety on Stockton Street represented the more pressing transportation problems facing the community.



A vehicle turning into the Portsmouth square garage not yielding to crossing pedestrians Image Credit: CCDC Urban Insite

²⁴These were more informal conversations held earlier in the study process (in November 2013 and January 2014).

- Most interviewees expressed that vehicular traffic flows smoothly on Kearny north of Sutter, and several seemed positive about the fact that traffic congestion is not an issue (although a few noted that, by contrast, traffic congestion is often a problem south of Sutter and onto Third St.).
- Several interviewees cited jaywalking as an issue throughout Chinatown and voiced support for more pedestrian education and enforcement efforts. At least two interviewees specifically acknowledged that cultural differences in traffic laws, customs and enforcement between San Francisco and China likely contribute to the problem for newer immigrants. Some expressed that they felt the only way to address the pedestrian safety problem in Chinatown was through education.
- When asked by the study team whether they would like to see any changes on Kearny St., several interviewees mentioned wanting pedestrian scrambles as a means to limit potential conflict between pedestrians and vehicles; traffic signal timing to slow speeds; and use of crossing guards to protect crossing pedestrians.
- Several interviewees indicated that pedestrian safety should be the top priority for improvement even at the expense of tradeoffs such as vehicle congestion. One interviewee mentioned that she wanted to see the street kept open for vehicle traffic and didn't want to see lanes dedicated to transit or bicycles.

4 RECOMMENDATIONS AND NEXT STEPS

4.1 | SUMMARY OF ISSUES

The Chinatown NTP identified several issues affecting Kearny St. Most significantly, the corridor has had a history of severe and fatal pedestrian collisions. As described above, these collisions have been primarily resulting from:

- Vehicles moving at high speeds through a street with large numbers of elderly and disabled pedestrians
- High volumes of right- and left- turning vehicles conflicting with crossing pedestrians
- High numbers of pedestrian violations
- Insufficient crossing time for elderly pedestrians, in spite of signals timed for slow crossing speeds; this may be also related to lack of understanding of count-down signals/crossing constraints.

Issues affecting other modes include:

- Slow-moving transit vehicles
- Lack of bicycle facilities

The next section presents short- and long-term recommendations for addressing these issues.

4.2 | PRIORITY SHORT TERM SAFETY TREATMENTS

The study team developed short-term recommendations for the Kearny Street corridor, focusing on treatments to improve pedestrian safety in support of the city's Vision Zero and WalkFirst initiatives. Safety countermeasures were drawn from the toolbox of short-term, high-impact pedestrian safety countermeasures identified during the city's WalkFirst Investment Study (www.walkfirst.sfplanning.org). The toolbox was refined to address the pedestrian collision history and the conditions that may contribute to collisions in the future.

The Sacramento Street and Clay Street intersections are recommended for top priority treatment because they have had the highest frequency of severe and total collisions, respectively, over the last five years, among intersections in the study corridor. As of the time of publication of this report, the SFMTA is moving forward with short-term treatments at the Sacramento Street intersection consisting of re-stripped continental crosswalks and extended red no-parking zones around the intersection to improve the visibility of crossing pedestrians to turning vehicles.

The following additional treatments are recommended for the Clay Street intersection:

- Leading pedestrian intervals (LPIs) on the east/west crossings (LPIs were already in place on the north and south crossings). Leading pedestrian intervals give crossing pedestrians a head start before vehicles begin to turn, and can reduce collisions involving pedestrians and turning vehicles.
- Advanced limit line at northbound Kearny Street. Advance limit lines encourage motorists to come to a full stop farther away from the marked crosswalk and can reduce the number of vehicles encroaching on the crosswalk.
- Extended red no-parking zones and a no left turn on red for eastbound Clay Street. Restricting left turns on red will reduce or eliminate conflicts between left-turning vehicles and crossing pedestrians.
- Improved pedestrian and vehicular circulation around the Portsmouth Square Garage in order to enhance pedestrian safety and reduce driver confusion regarding garage driveway operations.

4.3 | CORRIDOR CONCEPTS FOR FURTHER STUDY

Whereas the improvements described above could address some immediate concerns in the near-term, changing travel patterns and evolving priorities suggest that a larger-scale re-thinking of the entire corridor may be warranted. This should not delay implementation of the near-term recommendations described above; rather, this presents a unique opportunity to achieve multiple objectives, such as implementation of Muni Forward, Vision Zero, and the SFMTA's 2013 Bicycle Strategy, through a single coordinated effort.

The following section proposes corridor concepts for further study that would address the top corridor issues but require more planning and analysis to fully define. The following three corridor concepts each have the potential to significantly improve pedestrian safety on the street and some could address other corridor issues as well:

- Implementing a series of pedestrian scrambles
- Removing vehicular traffic from one or more lanes (e.g. road diet), potentially to create space for a transit or bicycle lane
- Systematic implementation of signal striping and timing treatments

Each of these concepts is discussed below including:

- Potential benefits/ corridor issues addressed
- Potential tradeoffs
- Key questions to be explored during further study

PEDESTRIAN SCRAMBLES

One corridor concept would be to implement a series of pedestrian scrambles at a series of intersections along the corridor, similar to how portions of Montgomery and Stockton Street are designed today. A pedestrian scramble involves holding vehicle traffic while pedestrians are allowed to cross in all directions, including diagonally across the street.

Corridor issues addressed:

- Would likely decrease pedestrian conflicts with turning vehicles by creating separated signal phasing for pedestrians and vehicular green time. Vehicles would be prohibited from turning on red and pedestrians would be prohibited from crossing during vehicular green time. A University of California, Berkeley study from 2003 assessed pedestrian safety before and after the implementation of a pedestrian scramble in Chinatown, Oakland and concluded that the scramble

reduced the number of pedestrian-vehicle conflicts at the intersection.

- Implementing a series of scrambles along the corridor could allow for better comprehension /understanding as opposed to a single scramble at one location.
- Could potentially slow traffic speeds as a result of vehicles having to wait longer to proceed through each intersection.

Potential Tradeoffs

- Could increase delay/wait time for all road users (e.g. vehicles, pedestrians, transit, bicyclists), although at intersections with high volume of turning vehicles, the pedestrian scramble may reduce delay for turning vehicles that would otherwise have had to yield to crossing pedestrians.
- Increasing wait time for pedestrians could increase the number of pedestrian violations, potentially offsetting some of the safety benefits of scrambles.²⁵ Several intersections along Kearny are already experiencing a high number of pedestrian violations.
- A series of scrambles may be inconsistent with the desire for high performing transit on this Muni Forward corridor, both in terms of available transit green signal time and complicating the possibility of transit improvements such as transit signal priority.
- May be implemented in conjunction with pedestrian bulbouts, reducing crossing distances and in turn, the minimum length of the pedestrian phase. This would increase green time for vehicles, which may offset intersection delay caused by the scrambles. The feasibility of bulbouts would be determined by further study on street utility infrastructure and future lane configurations.

Case Study

Four pedestrian scrambles were implemented on Stockton Street in 2002 at the intersections of Stockton and Pacific, Jackson, Washington, and Clay. SFMTA staff have compared the number of pedestrian collisions at each intersection in the seven years prior to implementation of the scrambles and the seven years following, and found that the absolute number of collisions remained the same before and after. Further analysis would be needed to determine whether the scrambles have had a safety benefit, including analysis of background changes in vehicle and pedestrian volumes as well as any changes in the severity or type of pedestrian collisions before and after.

ROAD DIET

Another corridor concept would be to remove a travel lane and repurpose the space for some other use, such as a protected bicycle lane, transit-only lane, or sidewalk.

Corridor issues addressed

- Could improve pedestrian safety by reducing vehicle speeds due to lower vehicle throughput capacity.
- Depending on how the lane was repurposed, the road diet could provide a protected lane for bicyclists, improve transit performance, or enhance the pedestrian environment.
- If implemented in conjunction with pedestrian or transit bulbouts, could potentially reduce pedestrian crossing distances across Kearny Street, not only enhancing the pedestrian experience but also providing more green time to the vehicular phase along Kearny Street.

Potential Tradeoffs

- Reduced capacity would likely increase delay to vehicles and transit, unless transit were provided with a protected lane.

Case study

- Valencia Street in San Francisco has become a national model for road diets. In 1999, the road was converted from two-lanes in each direction to one-lane with bicycle lanes in each direction. Since the conversion, total bicycle and pedestrian collisions have declined, along with triple-digit percentage increase in bicycle use. Furthermore, vehicular volumes dipped only slightly and diversion was not concentrated on any single parallel route. This is the configuration of Valencia Street prior to and after the road diet.

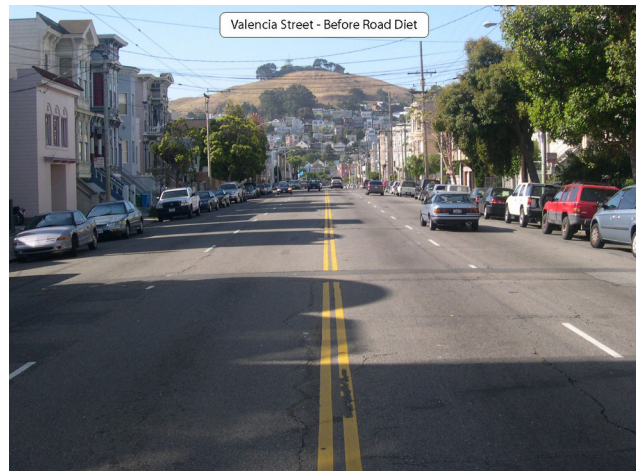
SYSTEMATIC SIGNAL TIMING AND STRIPING TREATMENTS

A final corridor concept would be to systematically implement signal timing and striping treatments along the Kearny corridor. These could include:

- Re-time signals along the corridor to reduce vehicle speeds. Current signal timing progression is set to promote vehicle speeds of 30 miles per hour. Reducing vehicle speeds could significantly reduce the share of pedestrian collisions that end in serious injury or fatality in the short term.
- Provide high-visibility continental crosswalks at all crossings to discourage vehicles from violating pedestrian right of way. Continental crosswalks are current-

ly available at all intersections but many have faded over time or are in less visible colors.

- Convert dual turn lanes to single left turn lanes to eliminate multiple threat conflicts between pedestrians and turning vehicles. Dual turn lanes currently exist at the intersections of Kearny with Pine and Bush Streets as well as at the entry and exit of the Portsmouth Square garage. The dual left turn lane at Pine St., for example, appears appropriate for removal and could potentially be removed without increasing delay for vehicles or transit (Appendix B). One of the two left turn lanes could be removed at this location without substantial adverse impacts on automobile level of service (Appendix B).
- Implement leading pedestrian intervals where appropriate to reduce conflicts between pedestrians and turning vehicles. Appendix B suggests where LPIs would be most appropriate.



Images courtesy of <http://www.westerncity.com/Western-City/February-2015/Road-Diets-Make-Streets-Leaner-Safer-and-More-Efficient>

²⁵ The Berkeley study cited above also concluded that there were more pedestrian violations after the scramble was implemented.

- Provide temporary painted safety zones where appropriate to slow turning vehicles. These consist of colored pavement in lieu of a pedestrian curb extension. They provide drivers a visual cue to keep their distance from the curb and turn more slowly.

The advantage of the signal timing and striping approach is that it would require little to no new infrastructure and therefore could be implemented quickly at a low cost. By combining systematic implementation of leading pedestrian intervals with slowing signal progression, it would also help address two of the top contributors to pedestrian injuries on the corridor, namely conflicts between pedestrians and turning vehicles, and high vehicle speeds.

Table 5. provides a summary of the top corridor issues and how they would be addressed by the proposed concepts for further study.

In addition to these concepts, the potential of converting the street from two-way to one-way was briefly con-

sidered but is not recommended for further study at this time. The conversion could potentially reduce speeds, but might also generate additional conflicts between pedestrians and turning vehicles. Additionally, it would trigger a review of traffic circulation in the surrounding area which could extend the timeframe for analysis and implementation of treatments.

3. NEXT STEPS

The recommendations in this study will inform the next phase of study of Kearny St., which will be led by the SFMTA beginning in summer, 2015. The study will examine and propose treatments to improve transit operations on Kearny Street consistent with the Muni Forward initiative; treatments to improve bicycle safety and access on the corridor consistent with the 2013 Bicycle Strategy; and treatments to more systematically address pedestrian safety.

TABLE 5. PROPOSED CORRIDOR CONCEPTS AND POTENTIAL CORRIDOR ISSUES ADDRESSED

CORRIDOR ISSUES	SIGNAL TIMING AND STRIPING	PEDESTRIAN SCRAMBLES	ROAD DIET WITH TRANSIT AND/OR BICYCLE LANE
Fast moving vehicles	Likely benefit	Potential benefit	Likely benefit
Conflicts between pedestrians and turning vehicles	Likely benefit	Likely benefit	Potential benefit
Long crossing distances for elderly pedestrians	Potential benefit	a	a
Pedestrian violations/jaywalking	Potential benefit	Potential benefit	a
Slow transit speeds	Potential benefit	Potential benefit	b
Lack of bicycle facilities	Potential benefit	Potential benefit	c

NOTES:

- a. could emerge as a benefit if project were implemented in conjunction with pedestrian or transit curb extensions or bulbouts.
- b. Potential benefit if vehicle lane converted to transit-only lane
- c. Potential benefit if vehicle lane converted to bicycle lane

 Likely benefit
 Potential benefit