



SoMa Freeway Ramp Intersection Safety Study

PHASE II



San Francisco
County Transportation
Authority

Final Report July 2019

Acknowledgments

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EXECUTIVE SUMMARY



There are many intersections in San Francisco's South of Market (SoMa) neighborhood where freeway on-ramps or off-ramps intersect city streets. Many are located close to public schools, single room occupancy hotels, and senior centers, which are frequented by populations at high risk of injury from traffic collisions. Additionally, the SoMa has disproportionately large concentrations of low-income residents and traffic injuries and fatalities – making the neighborhood a priority for safety improvements.

This final report encapsulates Phase II of the SoMa Freeway Ramp Intersection Safety Study, which studied and identified recommended safety improvements at 10 freeway ramp intersections in the SoMa neighborhood. The Study goal is to improve safety at these intersections for all travelers, especially the most vulnerable populations, to support progress towards the City's Vision Zero goal to eliminate traffic fatalities by 2024. In April 2018, the Transportation Authority Board adopted the final report for Phase 1 of the Study (titled the Vision Zero Ramp Intersection Study), which recommended safety improvements at an additional five SoMa ramp intersections. The Transportation Authority led Phase 2 of the Study in partnership with SFMTA and a Technical Advisory Committee (TAC) that also included Caltrans, San Francisco Planning Department, and San Francisco Public Works Department. Preparation of this report was made possible in part by the San Francisco County Transportation Authority through a grant of Proposition K Local Transportation Sales Tax funds. The study was also funded by a Caltrans Sustainable Transportation Planning Grant.

The Study intersections were selected based on collision analyses, other planned safety improvement projects in the neighborhood, and a proactive approach to identify intersections where additional improvements could be made. The Study team analyzed collision patterns at each study intersection and recommended best-practice safety treatments to address them while also improving access for all travel modes. Recommended improvements include bulb-outs, signal improvements, crosswalk upgrades, and improvements to signs pavement markings. In some locations, the recommendations include reducing the number of vehicle lanes to shorten pedestrian and bicycle crossings and calm traffic. The Study team engaged with the community to gather input on safety needs at each intersection and proposed improvements. Multilingual outreach included a survey with over 800 responses, an open house held in July 2018, tabling at study intersections and Sunday Streets, meetings with community groups, and social media engagement.

The proposed improvements include near-term upgrades and capital improvements. The near-term plans include improvements such as striping, signal timing changes, and signage upgrades that are low-cost and could be implemented in the next two years. The proposed cost estimate for the near-term upgrades is \$246,800. The capital improvement proposals will require curb or signal work and include upgrades such as new curb bulb-outs, significant traffic lane re-configurations, new traffic signals, and new crosswalks and pedestrian signals. Many of the capital improvements could be implemented within five years, depending on funding availability and required approvals. The proposed cost for capital improvements is \$10,493,500.

The San Francisco Municipal Transportation Authority (SFMTA) will lead the design and construction of the recommended improvements in coordination with San Francisco Public Works and Caltrans, which will need to approve many of the recommended treatments. SFMTA has committed to implementing the recommended near-term improvements within two years, with the exception of improvements that require a longer Caltrans approval process, and is seeking Prop K Neighborhood Transportation Improvement Program (NTIP) District 6 funds for near-term improvements at the first several intersections. This report identifies a range of potential strategies to fund and implement the remaining improvements, including incorporating them into other planned projects, using developer-contributed funds, and seeking other local, state, or federal funding sources.

The Study team analyzed collision patterns at each study intersection and recommended best-practice safety treatments to address them while also improving access for all travel modes.

INTRODUCTION

SoMa Freeway Ramp Intersection Safety Study Phase II (Study) was led by the San Francisco County Transportation Authority (Transportation Authority) in partnership with the San Francisco Municipal Transportation Agency (SFMTA). Preparation of this report was made possible in part by the San Francisco County Transportation Authority through a grant of Proposition K Local Transportation Sales Tax funds. The study was also funded by a Caltrans Sustainable Transportation Planning Grant. The overall purpose of this study is to recommend street safety improvements at 10 freeway on-ramp and off-ramp intersections in the SoMa neighborhood.

The first phase of the study – initiated in May 2016 and completed in early 2018 – evaluated five ramp intersections in the SoMa neighborhood and recommended near-term safety improvements. The recommendations included curb bulb-outs and sidewalk extensions, new crosswalks, increasing pedestrian leading interval signal times, and other traffic safety upgrades. SFMTA included the Phase 1 recommendations in its 2019 – 2023 Capital Improvement Program (CIP) to be built within that five-year period.

During Phase 2, the Study team analyzed 10 additional freeway ramp intersections in the SoMa and recommended improvements to increase safety and accessibility for all road users – especially for those who walk and bike. The Study proposes improvements that can be implemented in the near term over the next two years, as well as capital improvements that could be implemented over the next five years depending on funding availability and the timeline for required approvals.

Study Purpose

The purpose of this study is to increase safety for all road users at 10 freeway ramp intersections in the SoMa. In 2014, the City of San Francisco adopted its Vision Zero policy with the goal to end all traffic-related fatalities by 2024. To achieve this goal, City agencies are working closely with community advocates to identify and prioritize needs for street safety improvements and propose design solutions. These improvements are focused on the city's High Injury Network (HIN), which consists of the streets with the highest concentrations of severe and fatal collisions. In addition to infrastructure redesigns, the Vision Zero initiative includes education and enforcement campaigns to improve street safety. Nearly all SoMa ramp intersections are on the HIN; therefore, improving safety at these intersections is critical to meeting the City's Vision Zero goal.

Specific goals and objectives for this Study were based on existing City goals, policies, and guidelines and were meant to guide the development and evaluation of potential improvements. The Study team prioritized the primary goals, which focus on improving safety and accessibility at the intersections. The secondary goals encompass other important issues considered while developing improvements to meet the primary goals.

Table 1: Study Goals and Objectives

PRIMARY GOALS	PRIMARY OBJECTIVES
Improve safety for all road users	Increase intersection safety for all modes by proposing improvements that address collision patterns and implement best practice safety treatments at each intersection
Improve access for vulnerable road users (those who walk, bike, and people with disabilities)	Ensure adequate facilities and access for pedestrians
	Increase bicycle facilities
	Ensure access for people with disabilities
SECONDARY GOALS	SECONDARY OBJECTIVES
Provide for efficient circulation of all transportation modes	Prioritize travel modes that efficiently use street space while accommodating all transportation modes
Accommodate planned neighborhood growth and ensure compatibility with other planned projects	Accommodate growth and increase in travel demand. Develop proposals compatible with other plans and projects
Develop proposals that are feasible to implement	Recommend treatments that would improve safety in a timely manner given funding constraints

Study Intersection Selection

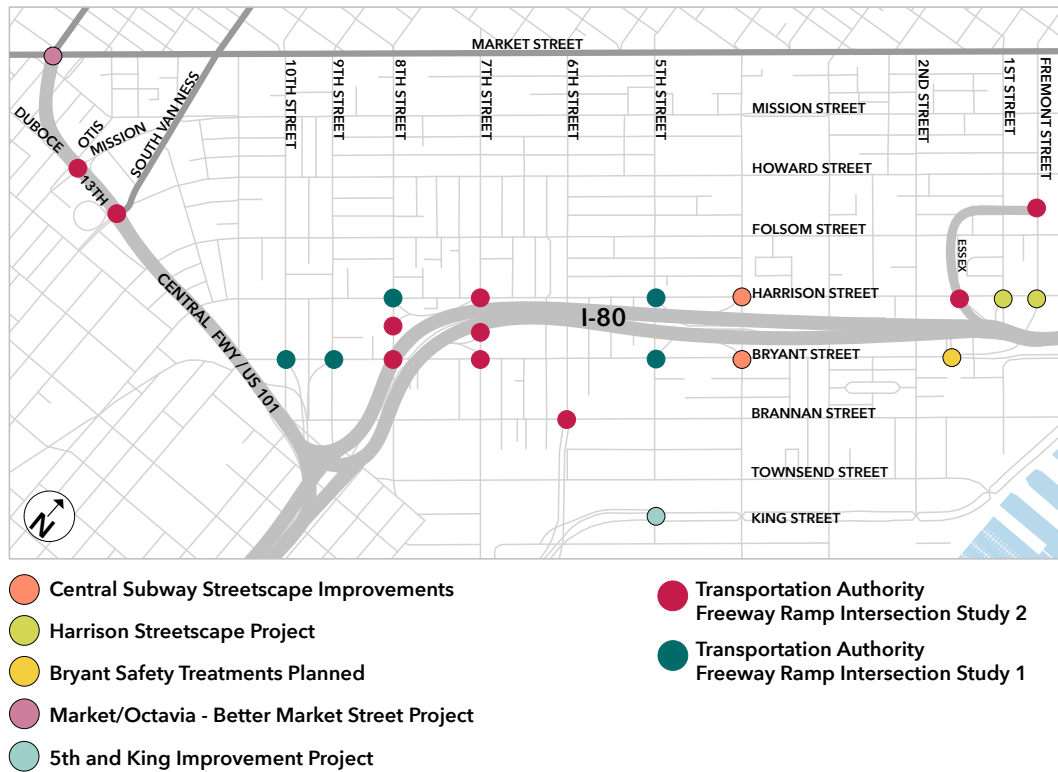
The project team selected 10 freeway ramp intersections in SoMa to be studied, based on three factors:

1. Traffic collisions: The number of traffic collisions at SoMa ramp intersections from 2012 – 2016, including those with and without fatalities and injuries.
2. Planned and future projects: Based on an inventory of all the ongoing and planned safety projects around all SoMa ramp intersections, the Study team identified intersections that were not already part of other safety projects or studies.
3. Proactive approach: The Study team took a proactive approach to assess each ramp intersection to determine if safety at the intersection could be improved.

Based on these criteria, the Study team selected the following 10 Study intersections:

1. Mission, Otis, Duboce, and 13th streets
(U.S. 101 northbound off-ramp)
2. South Van Ness Avenue and 13th Street
(U.S. 101 southbound on-ramp)
3. 8th Street midblock between Bryant and Harrison streets
(I-80 westbound off-ramp)
4. 8th Street and Bryant Street (I-80 westbound off-ramp)
5. 7th Street and Harrison Street (I-80 westbound on-ramp)
6. 7th Street midblock between Bryant and Harrison streets
(I-80 eastbound off-ramp)
7. 7th Street and Bryant Street (I-80 eastbound off-ramp)
8. 6th Street and Brannan Street
(I-280 northbound off-ramp, I-280 southbound on-ramp)
9. Fremont Street midblock between Howard and Folsom streets
(I-80 westbound off-ramp)
10. Essex Street and Harrison Street (I-80 eastbound on-ramp)

Figure 1: Study Ramp Intersections



The map in Figure 1 shows the locations of these 10 Study intersections in orange. It also shows the projects and studies, including the SoMa Freeway Ramp Intersection Safety Study Phase 1, that are addressing safety at the remaining ramp intersections in SoMa.

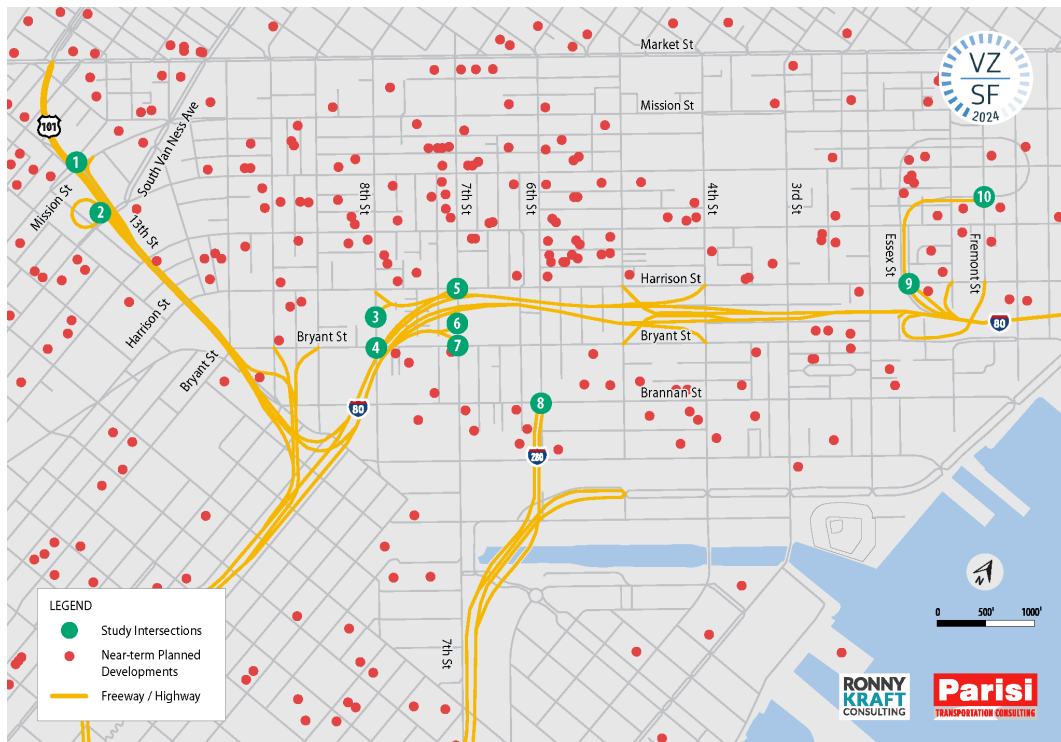
A memo included as Appendix A of this report provides more detail on the Study intersection selection process.

EXISTING CONDITIONS

Land Use Context

The SoMa neighborhood is one of San Francisco’s fastest growing neighborhoods. According to a September 2014 report by the San Francisco Planning Department, the SoMa is slated to receive upwards of 20,000 new residents and 50,000 new jobs by 2040 – more than any other Priority Development Area (PDA) in the city and representing 20% of all growth in San Francisco by 2040. Furthermore, the San Francisco Transportation Plan 2040 projects the city will see automobile trips rise roughly 30and SoMa will see some of the greatest impacts from the increased congestion Figure 2 illustrates the location of near-term planned land use developments in relation to Study intersections.

Figure 2: Planned Development in SoMa



Existing Transportation Network

The SoMa roadway network includes elevated sections of I-80, I-280, and U.S. 101 above a grid of arterial streets with 25 mph speed limits. Some arterials are one-way, and many are wide multi-lane streets that accommodate large flows of vehicular traffic. Most of the Study intersections have more than four legs, which serve both the grid of city streets and additional freeway on-ramps and off-ramps. Additionally, some of the approach legs of the Study intersections have multiple lanes serving one or more turn lanes, resulting in more complex traffic patterns.

COUNTS

The Study team used multimodal counts to estimate existing vehicle, pedestrian, and bicycle usage at all the intersections. The counts were also used to estimate possible traffic impacts from different design alternatives and the preliminary design plans. There were existing counts from other studies at five of the Study intersections and the Study team collected counts for the rest of the five intersections including:

1. Mission, Otis, Duboce, and 13th streets
(U.S. 101 northbound off-ramp)
2. South Van Ness Avenue and 13th Street
(U.S. 101 southbound on-ramp)
3. 7th Street and Harrison Street (I-80 westbound on-ramp)
4. 7th Street and Bryant Street (I-80 eastbound off-ramp)
5. 7th Street between Bryant and Harrison streets
(I-80 eastbound off-ramp)

Based on all the multimodal counts, here are the highlights:

- Traffic volumes are high at all intersections – there was a minimum of 1,529 vehicles during the p.m. peak hour on 7th Street, between Harrison and Bryant streets. The highest traffic volume is at 6th and Brannan streets (5,263 at p.m. peak hour) and highest total traffic volume is at Mission, Otis, Duboce, and 13th streets (9,093 combined a.m. and p.m. peak hours).
- The pedestrian and bicycle volumes are the highest at Mission, Otis, Duboce, and 13th streets (2,704 combined a.m. and p.m. peak hours).

See Appendix G for full traffic counts.

PEDESTRIAN INFRASTRUCTURE

The existing SoMa street network accommodates a diverse group of users, but the allocation of scarce roadway space currently prioritizes private vehicles over other travel modes. The existing pedestrian network in the SoMa includes sidewalks and crosswalks at most intersections. However, some SoMa freeway ramp intersections have gaps in the sidewalk network and closed or non-existent crosswalks, creating a difficult and unwelcoming walking environment. People walking may also follow the most direct route even when there is not an existing sidewalk or crosswalk, which is a safety concern.

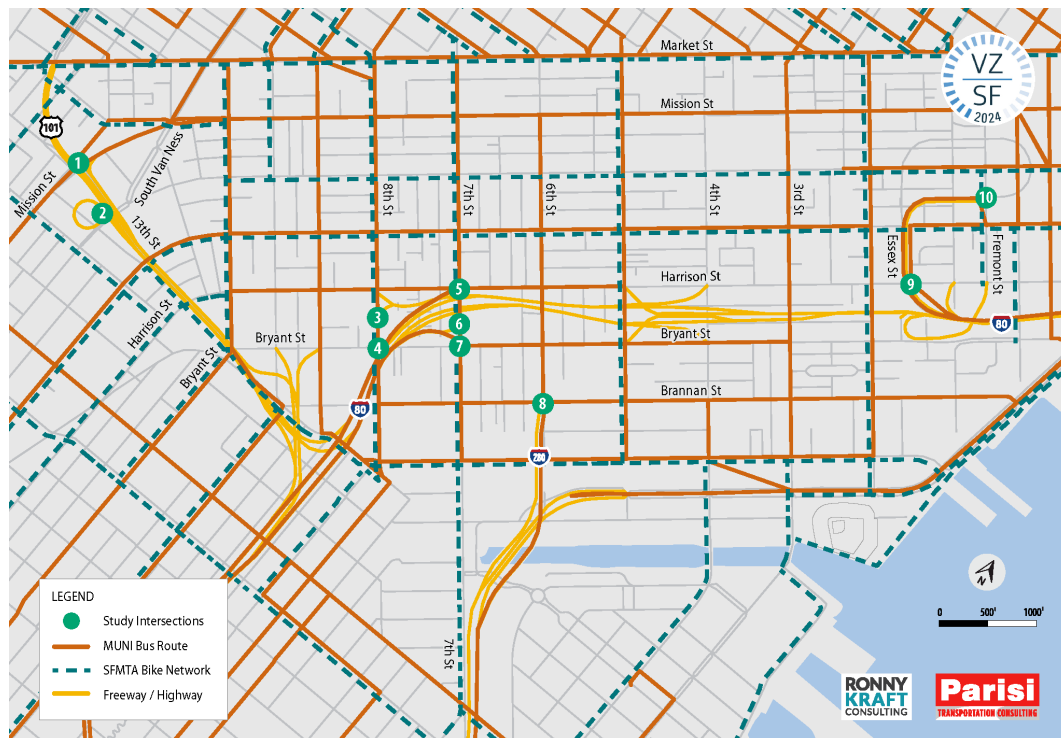
The Study team identified challenges for people walking including:

- Wide streets with long pedestrian crossing distances
- Closed crosswalks and missing sidewalks at some locations
- Narrow sidewalks and median refuges
- Lack of signal and signage visibility
- Lack of streetlights at some corners and lighting impacted by overhead freeway structures
- High vehicle volumes
- Conflicts between pedestrians and turning vehicles
- Freeway ramp vehicle queues frequently blocking crosswalks

BICYCLE INFRASTRUCTURE

Many SoMa streets are part of the city's bicycle route network. At the Study intersections, bike routes exist along the entirety of 7th and 8th streets. As shown in green in Figure 3, there are existing bike lanes along the entirety of 7th and 8th streets. Bicycle lanes exist on 13th Street to the east of the Study intersections, but they end at Folsom Street. New bike lanes will be constructed along Brannan Street in 2019 and are planned along 13th Street/Duboce Avenue from Folsom Street to Valencia Street. There are currently no bike lanes along other SoMa streets at the Study intersections.

Figure 3: Existing SFMTA Bicycle Routes, Muni Bus Route and Study Intersections



The Study team identified the following issues that people bicycling may experience:

- Lack of a bicycle lane, protection from traffic, and/or bicycle signals;
- High-speed turning movements and high vehicle volumes;
- Multiple lanes directing traffic in several directions, including onto freeway ramps, can make navigation difficult;
- Sight distance limited by obstructions such as parked vehicles; and
- Lack of streetlights at some corners and lighting impacted by overhead freeway structures.

TRANSIT INFRASTRUCTURE

The SoMa neighborhood has generally good transit service coverage, although some routes are relatively infrequent, and most do not have designated bus-only lanes to minimize the effects of traffic congestion on reliability. Transit routes exist along most Study intersection streets as shown in Figure 3 in dashed black.

The Study team identified the following issues for transit riders:

- Delays due to automobile congestion;
- Narrow sidewalks at or near bus stops;
- Lack of transit bulbs and limited lighting at some stops;
- High-speed turning movements and high vehicle volumes make accessing stops difficult for riders; and
- Closed or non-existent crosswalks making intersections longer and more difficult to cross, adding to stop access challenges.

TRAFFIC CONGESTION

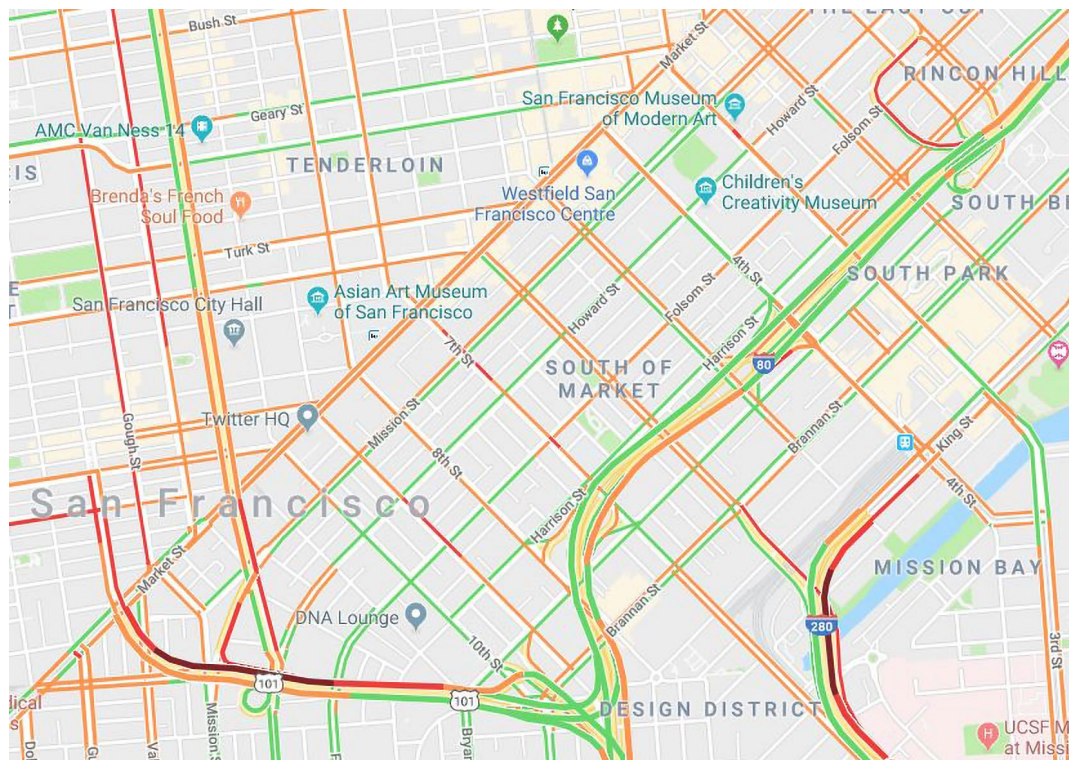
To obtain a general picture of traffic congestion levels, the Study intersections were analyzed using the *typical traffic* feature on Google Maps. This feature collects speed and location data from cell phones to create an index for vehicle speeds. Traffic conditions are illustrated in Figure 6 and Figure 7. Green symbolizes uncongested conditions and dark red symbolizes congested conditions. The analysis was done for the weekday a.m. peak (7 – 9 a.m.) and p.m. peak (4 – 6 p.m.).

A.M. Peak

On freeways, traffic is relatively free-flowing on I-80, I-280 south, and U.S. 101 south during the morning peak commute. Medium levels of freeway congestion are experienced on I-80 eastbound between 5th and 7th streets, while significant queues develop on U.S. 101 northbound around approaching Market Street and on I-280 northbound approaching 6th Street.

On surface streets, beginning around 8:15 a.m., eastbound Mission Street and northbound South Van Ness Avenue near 13th Street experience heavy congestion. 7th Street also experiences congestion starting around 8 a.m. Many of the other streets experience low or no congestion.

Figure 4: Typical a.m. Peak Hour Traffic Congestion



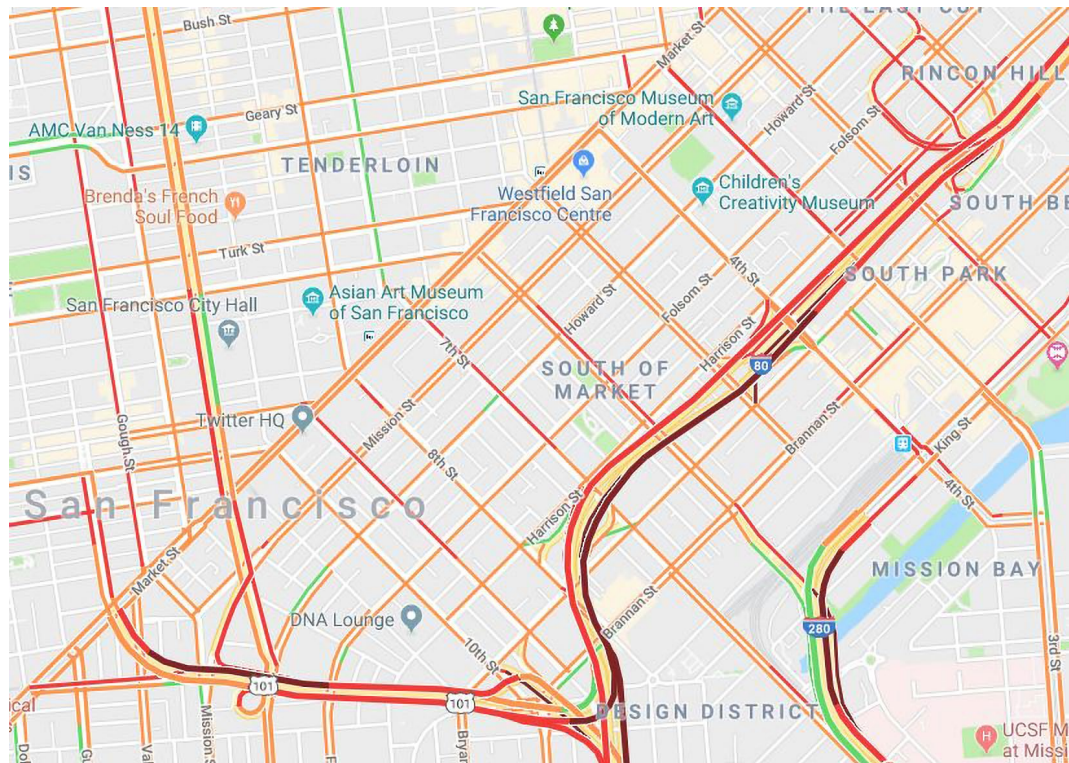
Source: Google Maps, Typical Traffic Conditions, accessed April 2018.

P.M. Peak

Traffic in the p.m. peak is significantly more severe than in the morning on all freeways and arterial streets. The heaviest congestion occurs on I-80 eastbound, though all of the SoMa. Congestion begins on both I-80 eastbound and U.S. 101 in both directions as early as 12:15 p.m.

Arterial streets within the SoMa experience high levels of congestion, especially approaching freeway on-ramps.

Figure 5: Typical p.m. Peak Hour Traffic Congestion



Source: Google Maps, Typical Traffic Conditions, accessed April 2018.

Ramp Congestion

Congestion also adversely impacts ramp access at Study intersections, as illustrated in Figure 6. During the day, the I-280 northbound off-ramp onto 6th and Brannan streets, the U.S. 101 northbound off-ramp to 13th and Mission streets, the I-80 westbound off-ramp to Fremont Street between Howard and Folsom, and the I-80 eastbound on-ramp from 8th and Bryant streets experience the most severe traffic congestion. The I-80 eastbound off-ramp to 7th and Bryant streets experiences essentially no traffic congestion, but sees moderate congestion upstream caused by the off-ramp at the mid-block of 7th Street. Other ramp intersections experience moderate traffic congestion throughout the day.

Figure 6: Typical Traffic Conditions on Study Intersection Ramps

TRAFFIC CONDITIONS ON STUDY RAMPS	AM PEAK (7 - 9AM)	OFF-PEAK (12 - 2PM)	PM PEAK (4 - 6PM)
US 101 NB Off-Ramp to 13th/Mission			
US 101 SB On-Ramp from 13th/S Van Ness			
I-80 WB Off-Ramp to 8th (Midblock)			
I-80 EB On-Ramp from 8th/Bryant			
I-80 WB On-Ramp to 7th/Harrison			
I-80 EB Off-Ramp to 7th (Midblock)			
I-80 EB Off-Ramp to 7th Bryant			
I-280 EB Off-Ramp to 6th/Brannan			
I-280 WB On-Ramp from 6th/Brannan			
I-80 EB On-Ramp to Harrison/Essex			
I-80 WB Off-Ramp to Fremont			

FAST SLOW

Source: Google maps, "Typical Traffic Conditions." 2018

Related Planned Projects

Currently, several safety-focused planning studies and projects are underway that overlap with the Study intersections:

1. **SFMTA's 7th and 8th Streets Safety Project:** The goal of the 7th and 8th Streets Safety Project is to improve safety and comfort for all modes of travel along 7th Street between Market Street and Folsom Street, and 8th Street between Market Street and Townsend Street. This project is implementing paint treatments to increase the visibility of people walking and biking, as well as concrete elements to provide smoother transit boarding and increased separation between people biking and driving. The project elements include a lane removal, protected bikeways, bus boarding islands, parking removal adjacent to crosswalks to increase visibility of people walking and biking, and signal hardware upgrades.
2. **6th Street Pedestrian Safety Project:** The 6th Street corridor has one of the highest concentrations of pedestrian collisions, injuries, and fatalities in San Francisco. In support of the City's Vision Zero policy, the 6th Street Pedestrian Safety Project aims to create a safe and inviting place for people to walk and bike by transforming 6th Street by adding wider sidewalks, new traffic signals, and streetscape improvements.
3. **Brannan Street Safety Project:** In conjunction with utility and pavement upgrades, SFMTA will install safety upgrades along Brannan Street between Division Street and the Embarcadero, including at the intersection of 6th Street and Brannan Street. Improvements include new bike lanes, traffic signal timing changes, intersection upgrades, and a reduction in the number of travel lanes to calm traffic.
4. **Market Octavia Plan Amendment (Hub) Public Realm Plan:** The San Francisco Planning Department has proposed improvements as part of the Market Octavia Plan Amendment along 13th Street and Duboce Avenue, including at two Study intersections – 13th and Mission streets and 13th Street and South Van Ness Avenue. The project plans propose a reconfiguration of the intersection at 13th Street and Mission Street to accommodate the addition of two-way travel on Otis Street, new protected bicycle lanes, new curb bulb-outs, improved sidewalks, and other new or upgraded pedestrian amenities.

-
5. **Caltrans Signal Upgrade:** Caltrans is planning improvements at the intersection of 7th Street and Harrison Street that will upgrade traffic signals and improve safety by signaling a crosswalk across a freeway ramp entrance.
 6. **Other Improvements from Existing Developer Obligations:** Repaving, curb ramps, and general repairs required per existing development agreements at Essex and Harrison streets and 6th and Brannan streets intersections.

The recommendations proposed in this Study were designed to integrate with the existing planned improvements listed above.

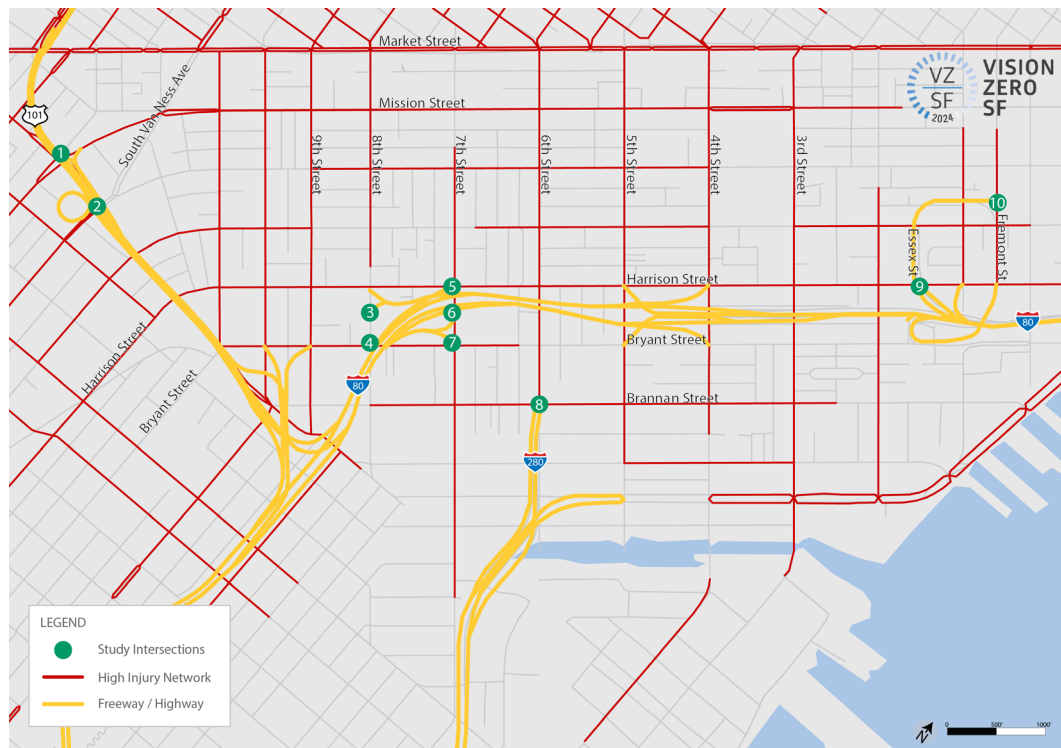
For more details on related planning projects, refer to Appendix B.

COLLISION ANALYSIS

High-Injury Network

All Study intersections are included in the City's 2017 update to the Vision Zero High Injury Network (HIN) developed by the San Francisco Department of Public Health. HIN streets represent those with the highest concentrations of severe and fatal collisions. The HIN includes traffic collision data reported to San Francisco Police Department combined with records of traffic injuries treated at San Francisco General Hospital.

Figure 7: 2017 High Injury Network Map



Collision Overview

The Study team analyzed historical collision data at each of the 10 Study intersections from 2012 - 2016 to identify any patterns that intersection safety improvements could address. The dataset includes collisions recorded by the San Francisco Police Department and the San Francisco Department of Public Health. According to the dataset, a total of 133 injury collisions occurred at eight of the intersections over this period. Of these collisions, eight were severe injury collisions and none were fatal. Only the 8th Street between Bryant and Harrison streets intersection had no recorded collisions. Additionally, no data was available for the newly constructed intersection

at Fremont Street between Howard and Folsom streets. Collision data key takeaways include the following:

- 53% of all collisions were vehicle to vehicle collisions. The rest of the collisions included vulnerable road users: pedestrians, bicyclists, and motorcyclists.
- 63% of the collisions were classified as broad-side and rear-end collisions.
- The dataset contains no correlation between collision rates and peak compared to non-peak periods, weekdays to weekends, day of week, time of day, or weather conditions.

Study intersections included in the collision analysis and the number and severity of collisions are as follows:

Table 2: Study Intersection by Number Total Collisions (2012 - 2016)

STUDY INTERSECTION	TOTAL COLLISIONS	SEVERE INJURY
6th Street and Brannan Street	11	
7th Street and Bryant Street	8	1
7th Street and Harrison Street	13	
7th Street between Bryant and Harrison	5	
8th Street and Bryant Street	19	
Harrison Street and Essex Street	10	
Mission Street and 13th Street	35	6
South Van Ness Avenue and 13th Street	32	1
Total	133	8

There were four collisions for which only a collision date is known¹: one at 7th and Harrison streets, one at 8th and Bryant streets, and two at 13th and Mission streets.

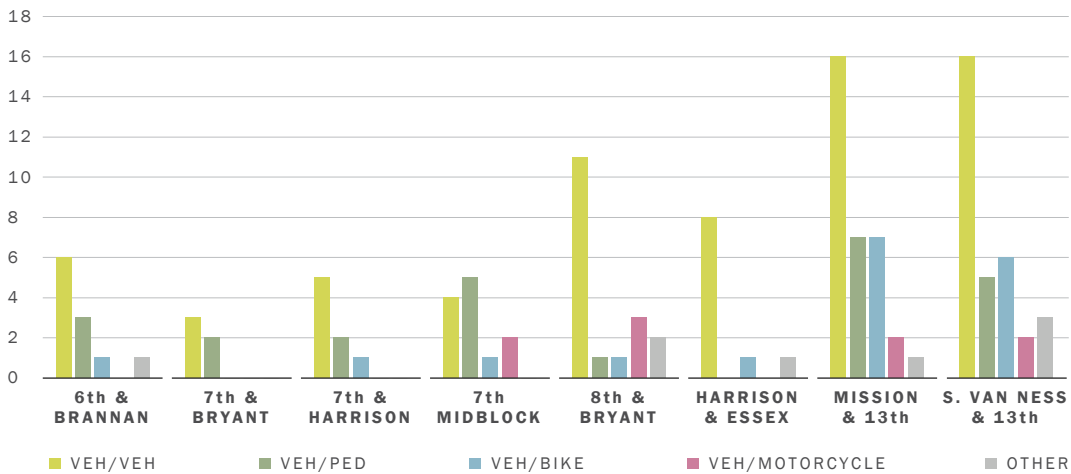
¹ These collisions are omitted from the proceeding collision characteristics and diagrams/ but are included in the count for total collisions. Appendix B contains further details of collisions at these eight intersections.

Collision Characteristics

MODE

Figure 8 shows an overview of collisions by transportation mode and Figure 9 shows the breakdown of collision occurrences by mode, organized by intersection. Notably, most collisions occurred between vehicles except at the 7th Street mid-block intersection where there were a higher number of vehicle on pedestrian collisions. The Harrison Street and Essex Street and the 7th Street and Bryant Street intersections also had no vehicle on pedestrian collisions or vehicle on bicycle collisions, respectively.

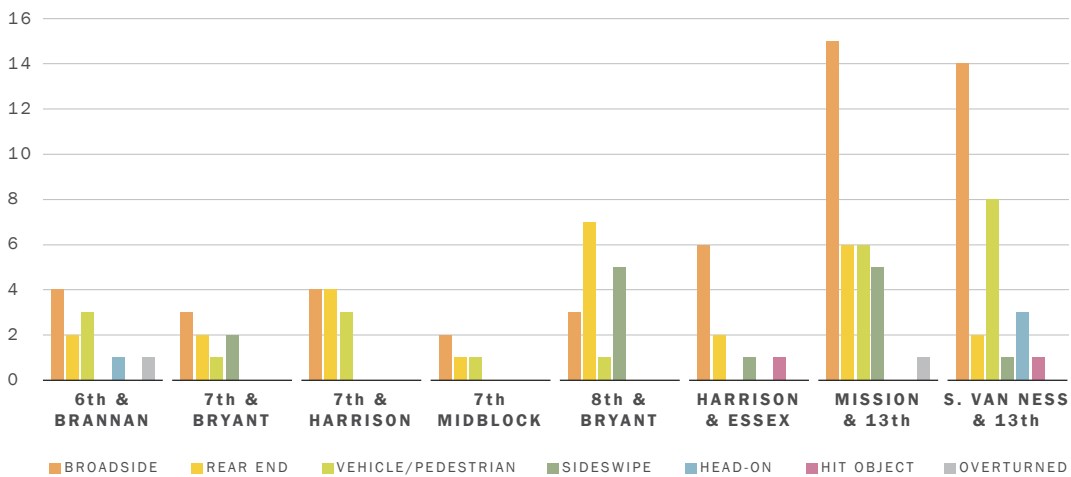
Figure 8: Parties Involved by Intersection



COLLISION TYPE

Broadsides were the most common collision type at each study intersection, except at the 8th Street and Bryant Street intersection.

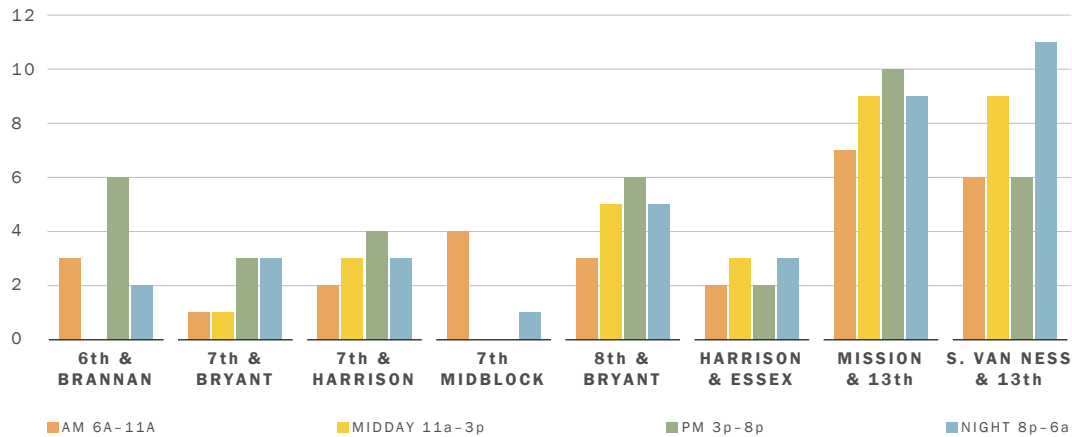
Figure 9: Collision Type by Intersection



TIME OF DAY

Figure 10 shows collisions by time of the day. Collisions tended to happen more often in the 3 – 8 p.m. period, except at the 7th Street midblock intersection, where most collisions occurred from 6 – 11 a.m. and at the South Van Ness Avenue and 13th Street intersection, where most collisions occurred during the late-night period from 8 p.m. – 6 a.m.

Figure 10: Collision by Time of Day



Collision Analysis by Intersection

The Study team analyzed each collision for which a police report was available. There were 11 collision reports that did not contain enough information to be diagrammed.

Refer to Appendix B for more intersection-specific collision details.

13th Street and Mission Street, Duboce Street and Otis Street

This intersection had 35 collisions – the highest number among all Study intersections – with most collisions occurring on the eastern side. Additionally, this intersection had the highest number of severe injury collisions. There were six bicycle collisions where the cyclists were found at fault, half of which were due to red light violations. Four collisions occurred from vehicles making illegal left turns from northbound Mission Street onto westbound 13th Street westbound and five collisions involving pedestrians occurred in the southeast corner, three of which involved vehicles making right turn maneuvers. Many collisions occurred at night.

13th Street and South Van Ness Avenue

This intersection had 32 collisions, the second-highest number among the Study intersections. Most collisions occurred in the central area of the intersection, which included instances of red light violations, unsafe lane changes, and unsafe turning maneuvers. Most vehicles found at fault were heading southbound on South Van Ness Avenue or eastbound on 13th Street. Four cyclists were found at fault for collisions on or near sidewalks. At this intersection, many collisions occurred during night time which could be related to street lighting where drivers are not able to see the red lights, or pedestrians and bicyclists.

8th Street mid-block between Harrison and Bryant Streets

There were no collisions recorded at this location from 2012 – 2016.

8th Street and Bryant Street

This intersection had a total of 19 collisions, including many collisions between vehicles as a result of unsafe speed. Several collisions occurred with at-fault vehicles heading southbound on 8th Street. Three collisions occurred because a vehicle tried to avoid the freeway on-ramp at the last second and collided with a vehicle in the adjacent travel lane.

7th Street and Harrison Street

This intersection had a total of 13 collisions with a relatively high number of pedestrian collisions (4). Many collisions were due to red light violations or unsafe speeds. There were six collisions involving vehicles traveling westbound on Harrison Street. This intersection also has a closed crosswalk on the south leg of the intersection where a pedestrian and vehicle collision occurred.

7th Street mid-block between Harrison and Bryant Streets

The 7th Street mid-block intersection between Harrison and Bryant Streets had five collisions, all clustered in the same area around the off-ramp where vehicles exit I-80 and yield to cross traffic. In two instances, pedestrians were struck in the crosswalk where visibility is less than ideal due to the curvature of the off-ramp.

7th Street and Bryant Street

This intersection also had eight collisions. There were two vehicle-on-pedestrian collisions in the same area at the east corner. In both cases, the vehicle was making a right turn from 7th Street onto Bryant Street.

6th Street and Brannan Street

There were 11 total collisions at this intersection, including three vehicle-on-pedestrian collisions in the east corner of this intersection. In all three instances, the vehicle, which was exiting the I-280 off-ramp and making a right turn onto Brannan, was found at fault.

Harrison Street and Essex Street

The 10 collisions at Harrison and Essex streets were mostly clustered in the western portion of the intersection. Many were broadside collisions resulting from red light violations or excessive speed. All incidents involved vehicles except for one collision between a pedestrian and a bicyclist.

Fremont Street off-ramp between Howard and Folsom

This new intersection which was signalized in 2015 did not have collision data available for the study period.

INTERAGENCY COORDINATION AND COMMUNITY ENGAGEMENT

Interagency Coordination

This Study was led by the Transportation Authority in close partnership with SFMTA on the Study team that met on a bi-weekly basis throughout the study to discuss project updates and next steps, review deliverables, and share technical input. The Study team formed a Technical Advisory Committee (TAC) that included the San Francisco Planning Department (SF Planning), the San Francisco Department of Public Works (SFPW), SFMTA, and Caltrans, and sought input at the key points of the Study process and on all major deliverables. The Study team also provided information and updates during major outreach rounds to additional agencies and, based on interest, met with representatives from the Mayor's Office of Disability, San Francisco Fire Department, San Francisco Police Department, and California Highway Patrol (CHP).

Public Outreach Process

The Study team also conducted three rounds of outreach to the public to solicit feedback from community stakeholders on the challenges they experience at the Study intersections and to inform intersection design recommendations. During the outreach process, the Study team maintained an updated website and mailing list of interested stakeholders to keep them informed about the project.

Round 1 Outreach

The goal for the first round of our outreach efforts was to identify the challenges stakeholders experience traveling through the Study intersections. The Study team developed a survey which asked respondents about the issues they experience and about any improvement ideas they had to increase safety of the intersections.

The Study team conducted the survey both online and in person at stakeholder meetings and a tabling event. It was advertised through multiple channels, including:

- Mailers translated into Spanish, Chinese, and Filipino languages directing recipients to take the survey;
- Online promotions including an educational video, e-newsletter, and multilingual social media posts promoting the Study and survey;
- Outreach to community-based organizations (CBOs), partner agencies, and other targeted groups with an interest in the project;
- In-person meetings with CBOs, partner agencies, and other organizations by Transportation Authority staff; and
- Intercept outreach in the Study area in collaboration with SFMTA's Vision Zero SF team.

Round 2 Outreach

The goal of the second round of outreach was to gather feedback on the draft safety improvement plans created for the Study intersections. This round of outreach was centered around an open house event, where the team presented the draft improvement designs to community stakeholders. During the open house, the Study team conducted an interactive activity to gather feedback on what aspects of the draft designs the attendees supported or did not support. The attendees stuck sticker dots next to different design features such as crosswalks, signs, and sidewalk extensions. As the attendees placed the dots, they commented on the different design features and provided feedback to the Study team. Additionally, the Study team conducted an intercept survey, met with interested community organizations, and manned information tables at Sunday Streets.

The second round of outreach included:

- Public Open House on July 31st, 2018 at Bayanihan Center from 5:30 p.m. to 7:30 p.m.;
- Information tables at the SoMa Sunday Streets on August 18th, 2018;
- Poster placement in the SoMa neighborhood;
- Online and social media promotions;
- Phone and email outreach to CBOs, partner agencies, and other stakeholder interest groups and individuals; and
- Intercept outreach in the Study area in collaboration with Vision Zero SF team.

Round 3 Outreach

During the third round of the outreach, the Study team notified all interested stakeholders that the draft final report was available for review, shared public meeting dates, and met with interested stakeholders to share final design drawings, cost estimates, and the funding and implementation plan.

Stakeholder Involvement

The SoMa is a vibrant neighborhood with diverse residents, several key business districts, and many schools and community centers. During each outreach round, the Study team reached out to the extensive list of SoMa and citywide community groups and stakeholders listed in Appendix E. Although most groups did not express interest in meeting directly, many did participate through the survey, by attending the open house, or via other communications with the project team.

Based on interest among the contacted stakeholder groups, the project team held in-person meetings or gave presentations to the following groups:

- Walk SF
- San Francisco Bicycle Coalition
- Western SoMa Community Benefits District (CBD)
- The Crafty Fox; Brick and Mortar
- Market-Octavia Citizens Advisory Committee
- Pedestrian Safety Advisory Committee
- San Francisco Transit Riders
- Independent Living Resource Center
- SoMa Hotel Council
- Transbay Joint Powers Authority Citizens Advisory Committee Chair

Feedback Summary

During the outreach process, the Transportation Authority received a range of stakeholder feedback that informed the proposed improvements. The feedback identified specific issues with the intersections at present and provided design ideas for improvements. Table 3 summarizes issues that were identified through the community feedback process and provides corresponding design recommendations for each safety issue identified. In some cases, the issues identified were broader than design treatments at individual intersections alone could address. In these cases, the study recommendations may help address the issue, but ,ultimately, a larger solution may be needed such as a corridor street redesign or additional safety education and enforcement programs.

Table 3: Summary of Public Feedback by Design Criteria

CRITERIA	ISSUES TO ADDRESS	DESIGN RECOMMENDATION ELEMENTS
PEDESTRIAN CROSSINGS	Concerns regarding pedestrian crossing lengths with the two-way Otis Street design	Included a one-way Otis Street option, with street configuration to be finalized by Market Octavia Plan Amendment
	Replace or augment yield signs on un-signalized off-ramps	Pedestrian ahead signage, flashing beacons, and/or protected signal phases
	Pedestrian visibility concerns and need for shorter and wider crosswalks	More corner curb extensions and high-visibility crosswalk markings Protected signal phases, signals with leading pedestrian intervals, and longer pedestrian walking times More "No Right on Red" signs and painted stop lines in advance of crosswalks
	Lack of protected bike lanes and bike signals	Add more protected bike lanes Add more bike-specific signals
BICYCLE INFRASTRUCTURE	Need bicycle delineation through the intersection and avoid unprotected merge areas between bike and cars	Add more bike lanes fully delineated through the entire intersection Refine designs to eliminate merges between bikes and turning cars
TRANSIT	Bus stop improvements	Bus bulbs added
	Need transit priority lanes	More dedicated bus-only lanes where feasible within intersection-focused scope

CRITERIA	ISSUES TO ADDRESS	DESIGN RECOMMENDATION ELEMENTS
ACCESSIBILITY	Improve accessibility to bus stop islands with more curb ramps or raised crosswalks	Ensure curb ramps available to access bus stop islands
	Need Accessible Pedestrian Signals (APS) at all signalized intersections	Install Accessible Pedestrian Signals (APS) at all signalized intersections
	Maintain curb access where needed when installing bike lanes	Detailed design phase for protected bike lanes to ensure curb access where needed
AUTO	Create sharper turns to slow down vehicles, especially coming from freeway ramps	Curb extensions, protected signal phases, and "No Right on Red" signs to slow down traffic and protect vulnerable users
	Maintain vehicle access to businesses	Driveway access would remain. Some intersection turning movements eliminated but alternate routes are available.
	Reduce auto lanes	Reallocate road space where feasible within intersection-focused scope
	Need traffic enforcement	Some design treatments, such as improved signage, signal visibility, and crosswalk markings may help.
GENERAL/OTHER	Improve intersection lighting, especially below overpasses	Install additional street lighting, especially under freeway overpasses
	Need more street greenery and placemaking elements	Install street trees and/or landscaping treatments where feasible and practical
	Additional space from pedestrian improvements could become occupied by encampments.	Consider including landscape, hardscape, or other vertical elements (e.g. bicycle racks) in added space.
	Construction of concrete elements could temporarily disrupt adjacent businesses.	Minimize construction durations and conduct outreach to adjacent businesses to minimize disruption.

RECOMMENDED DESIGN IMPROVEMENTS

The Study team developed recommended improvement designs for the selected ramp intersections. They include proposed near-term upgrades as well as medium-term capital improvements at each intersection. The near-term plans include improvements such as striping, signal timing changes, and signage upgrades that are low-cost and could be implemented in the next two years. The capital improvement proposals will require curb or signal work and include upgrades such as new curb bulb-outs, significant traffic lane re-configurations, new traffic signals, and new crosswalks and pedestrian signals. Many of the capital improvements could be implemented within five years, depending on funding availability and required approvals. The design recommendations shown below were refined based on the results of stakeholder outreach and technical analysis. Appendix C provides more detailed technical design drawings and identifies which improvements could be constructed in the near term and which require capital upgrades.

In addition to the specific improvements at each intersection, recommended intersection upgrades include the following:

- Install high-visibility crosswalks.
 - Add advance stop bars to reduce the number of vehicles blocking crosswalks.
 - Add leading pedestrian intervals to reduce conflicts between turning vehicles and pedestrians.
 - Install Accessible Pedestrian Signals (APS) at all crossings.
 - Consider upgraded lighting to improve visibility.
-

Mission, Otis, Duboce, and 13th Streets (U.S. 101 northbound off-ramp)

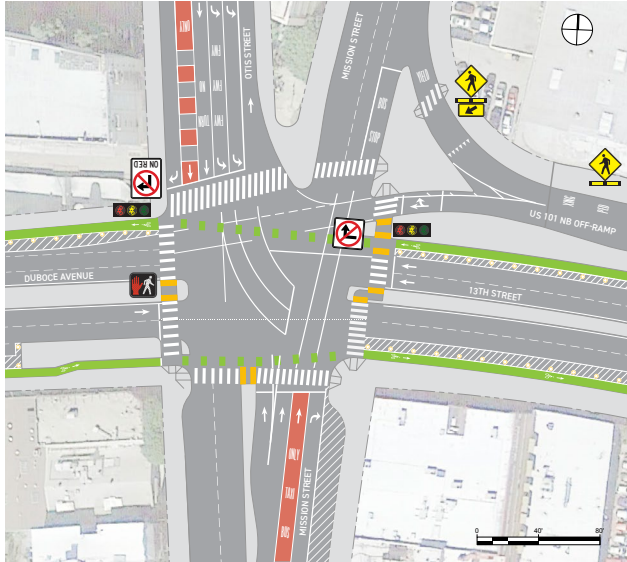


Figure 12: Mission, Otis, Duboce, 13th Street Improvement Plan (Option 1)

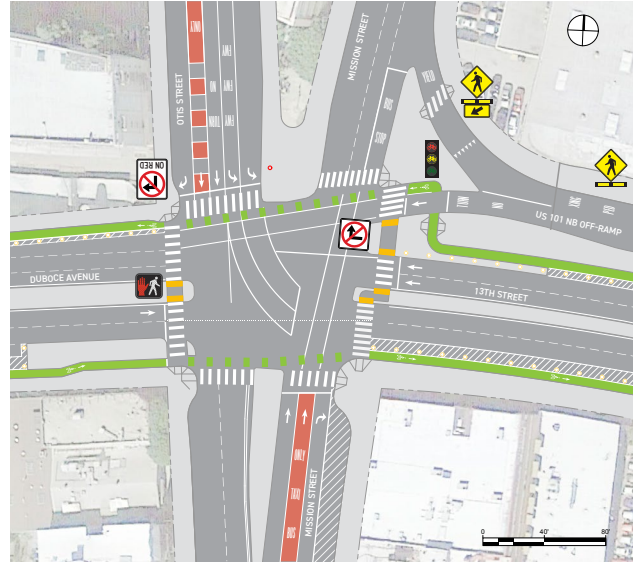


Figure 11: Mission, Otis, Duboce, 13th Street Improvement Plan (Option 2)

The intersection in Figure 12 is within the Market Octavia Plan Area. The recommendations from the Market Octavia Plan Amendment Public Realm Plan include protected bike lanes on 13th Street and Duboce Avenue and a two-way Otis Street re-design with traffic signal updates. The two-way Otis Street proposal would replace a sharp double left turn movement and improve pedestrian conditions at the nearby intersection of Mission Street, Otis Street, and South Van Ness Avenue. At this Study intersection, the two-way Otis street re-configuration would require lengthening the crosswalk across Otis Street and narrowing the adjacent median refuge area; narrowing the median refuge in Mission Street on the south side of the intersection; and eliminating the U-turn from Otis Street to Mission Street. It would also add to the complexity of the intersection and increase traffic queues on the freeway off-ramp.

During public outreach, the study team presented the two-way Otis Street option and heard concerns that additional traffic movements would add to the complexity of the intersection and lengthen pedestrian crossing distances. To address these concerns, the Study team developed safety improvements that could be implemented at the intersection in either of two scenarios:

- Two-way Otis Street with modified median and signal timing updates (shown in Figure 12, left); and
- One-way Otis Street with designs to reduce know conflict points (shown in Figure 11, right).

The planning and environmental review process for the Market Octavia Plan Amendment will determine the final configuration for Otis Street.

As discussed in the collision analysis, many of the collisions occurred at the eastern side of the intersection. The Study team recommended improvements to reduce vehicle and pedestrian conflict points, signal timing changes and signal head upgrades, and the installation of pedestrian bulb-outs and median refuges.

Recommendations for this intersection include:

Improved pedestrian and bicycle facilities:

- Install new protected cycle tracks on Duboce Avenue and 13th Street. For the 2-way Otis Street scenario, a new signal phase would separate westbound 13th Street traffic and the accompanying westbound bicycle movement from the signal phase for westbound off-ramp traffic. Include a protected intersection treatment at the southwest corner to separate eastbound cyclists from traffic.
- Enlarge and improve median refuges.
- Add new corner sidewalk extensions to shorten crossing distances and increase pedestrian visibility for right turning vehicles.

Improved visibility and reduced conflict points:

- Improve lighting under the freeway to increase pedestrian visibility.
- Add flashing pedestrian crossing signs at the U.S. 101 off-ramp to increase pedestrian visibility and awareness for drivers.
- Add "No Right Turn on Red" signs to reduce vehicle conflict points with pedestrians and bicyclists.

Simplified the intersection configuration where possible and prioritizing transit:

- Add a bus only lane on Mission Street to improve Muni's on-time reliability and reduce conflict points between Muni busses and other road users.
- Reduce the number of traffic lanes on the northbound Mission Street approach to make room for a bus-only lane and more sidewalk space.
- Remove the U-turn option from Otis Street to Mission Street to simplify turning movements and reduce conflict points.

South Van Ness Avenue and 13th Street (U.S. 101 southbound on-ramp)

The intersection in Figure 13 is also within the Market Octavia Plan Area. The Market Octavia Plan Amendment Public Realm Plan proposed improvements include protected bike lanes on 13th Street.

The collision pattern at this intersection indicated that better traffic signal visibility and phasing may help address many collisions, especially involving left turning vehicles from South Van Ness Avenue to 13th Street. Wayfinding signage may help drivers avoid last minute maneuvering near the on-ramp.

Recommendations for this intersection include:

Improved and added pedestrian and bicycle facilities:

- Add new protected bike lanes on 13th Street to separate vehicles and bicyclists.
- Add a new sidewalk on the west side of South Van Ness Avenue with a new signalized crosswalk at the freeway on-ramp entrance to improve pedestrian accessibility and safety.
- Add new and larger pedestrian median refuge areas.

Simplified lane configurations

- Remove one westbound left turn lane and one eastbound through lane to fit the protected bike lanes.
- Convert a southbound through lane to a left turn lane with a protected signal phase from southbound South Van Ness Avenue to eastbound 13th Street to reduce conflicts between left turning vehicles and pedestrians.
- Reconfigure the entrance of the freeway on-ramp to provide two exclusive right turn lanes feeding onto the U.S. 101 on-ramp and one through lane heading southbound on South Van Ness Avenue. The dedicated right lanes with a signal and signage will provide lane designation clarity. The reconfiguration and signal will also improve safety for pedestrians as they cross the entrance to the on-ramp.

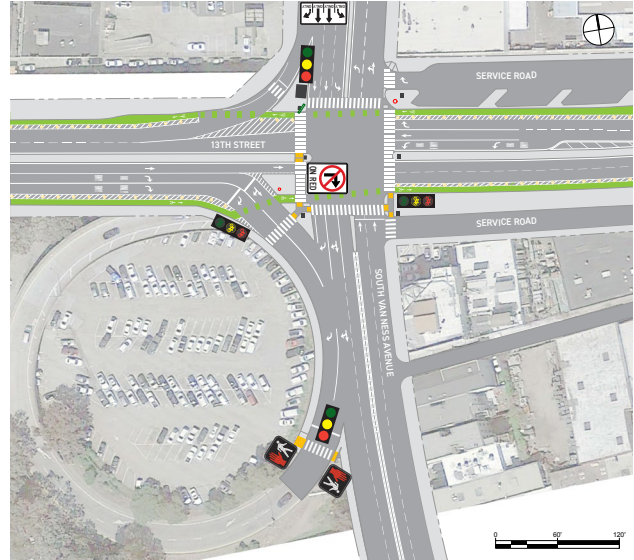


Figure 13: South Van Ness Avenue and 13th Street Improvement Plan

Improved visibility:

- Add new “No Turn on Red” signs on eastbound 13th Street right turn approach to South Van Ness. This sign will increase visibility of pedestrians and bicyclists and slow down right turning traffic on South Van Ness Avenue.
- Better pedestrian-scale lighting under freeway underpasses.

Improved wayfinding:

- Add overhead signage on the north leg of the intersection to give drivers lane designation information in advance of the intersection.

8th Street between Bryant and Harrison streets (I-80 westbound off-ramp)

This intersection is part of the SFMTA’s 8th Street Safety Project, which is planning a parking protected bike lane and transit boarding island with crosswalk.

This is a yield-controlled intersection and there were no reported traffic collisions during the data analysis period from 2012 - 2016. The recommendations are based on multiple site visits, technical advisory committee member comments, and public outreach.

Recommendations include:

Install rapid flashing beacons in advance of the crosswalk and update crosswalk striping to increase driver awareness and visibility of pedestrians.

Add new curb extensions and curb ramps to shorten pedestrian crossing distances, reduce turning vehicle speed, and increase visibility of pedestrians.

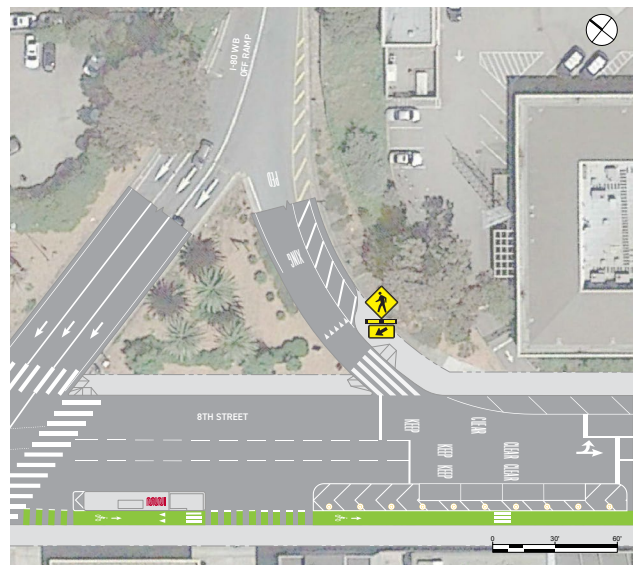


Figure 14: 8th Street between Bryant and Harrison streets Improvement Plan

8th Street and Bryant Street (I-80 westbound off-ramp)

At this intersection, wayfinding signage may help address collisions caused by last-minute merging. There is also a lack of high-quality pedestrian and bicycle facilities at the intersection. This intersection is part of the SFMTA's 8th Street Safety Project, which is planning a parking protected bike lane and transit boarding island in the median.

Recommendations for this intersection include:

Improve pedestrian and bicycle facilities:

- Add a new crosswalk across the east leg of Bryant Street and an exclusive left turn signal phase from southbound 8th Street to eastbound Bryant Street to increase pedestrian accessibility and reduce conflicts with turning traffic.
- Add a new sidewalk along the north side of Bryant Street with a signalized crosswalk across the on-ramp to increase pedestrian safety and accessibility.
- Add a median refuge on the south side of 8th Street connected to the new transit boarding island.

Improve visibility:

- Add new sidewalk extensions to shorten pedestrian crossing distances and increase visibility of crossing pedestrians. This includes a bus bulb on Bryant Street at the southwest corner.
- Update crosswalk striping at the intersection to increase visibility.

Improve wayfinding:

- Add new lane designation overhead signs in advance of the intersection for approaching vehicles on both 8th Street and Bryant Street to reduce lane designation confusion among drivers.
- Change the designation of the #2 lanes (second from left) on both 8th Street and Bryant Street from shared through/left turn to exclusive left turn lanes to simplify wayfinding and reduce last-minute merging to avoid queues.



Figure 15: 8th and Bryant streets Improvement Plan

7th Street and Harrison Street (I-80 westbound on-ramp)

The intersection in Figure ?? has improvements planned as part of a Caltrans signal upgrade project and SFMTA's 7th Street Bikeway Project. The Caltrans improvements include conversion of one of the northbound through/left turn lanes to an exclusive left turn lane, a new signalized crosswalk at the freeway on-ramp entrance, and signal upgrades on 7th Street. The SFMTA's bicycle lane project includes a parking protected bike lane on 7th Street and a transit boarding island on 7th Street and a transit boarding island.

The recorded collisions at this intersection indicate that there were a high number of pedestrian collisions, as well as a number of collisions due to red light violations or excessive speed.

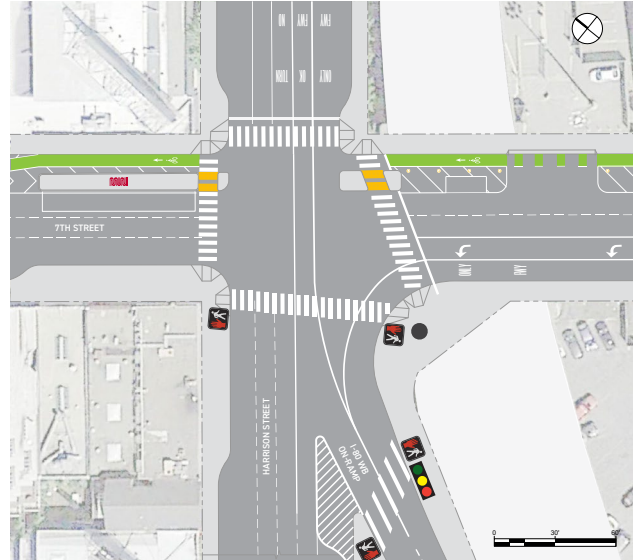


Figure 16: 7th and Harrison streets Improvement Plan

Recommendations for this intersection include:

Improved pedestrian facilities:

- Add a new crosswalk across with a protected signal phase on the west leg of Harrison Street to increase pedestrian accessibility.

Improved visibility:

- Add a pedestrian refuge area on 7th Street to increase safety of pedestrians and riders accessing the bus stop.
- Install sidewalk extensions on all corners of the intersection to shorten pedestrian crossing distances and increase pedestrian visibility. This would include a bus bulb on Harrison Street at the northwest corner.
- Install near-side traffic signals for better visibility.

7th Street between Bryant and Harrison streets (I-80 eastbound off-ramp)

The intersection in Figure 17 is part of SFMTA's 7th Street Near-Term Safety Project. The SFMTA's project recommendations include a parking protected bike lane and transit boarding island on 7th Street.

The collisions at this intersection involved vehicles exiting the on-ramp striking pedestrians in the crosswalk, vehicles on 7th Street, or another vehicle on the off-ramp.

Recommendations for this intersection include:

Installed flashing beacons to increase drivers' awareness and visibility of crossing pedestrians.

Close the left-most off-ramp lane to reduce the number of conflict points with pedestrians and increase visibility (potentially reconsider if the 8-Bayshore is rerouted to this ramp).

Added curb extensions and curb ramps to shorten pedestrian crossing distances, reduce turning vehicle speed, and increase visibility of pedestrians.

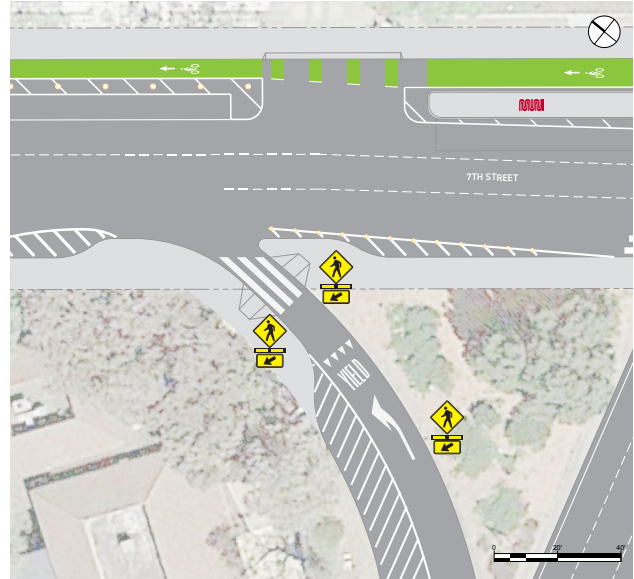


Figure 17: 7th Street between Bryant and Harrison streets Improvement Plan

7th Street and Bryant Street (I-80 eastbound off-ramp)

The intersection in Figure 18 is part of SFMTA's 7th Street Near-Term Safety Project. The project recommendations include the addition of a protected bike lane and bicycle signal phase.

At this intersection, most of the collisions occurred in the southeast corner of the intersection due to right turn vehicle movements from 7th Street onto Bryant Street.

Recommendations for this intersection include:

Removed far left freeway off-ramp lane to shorten pedestrian crossing distances.

Installed bulb-outs at all corners of the intersections to increase pedestrian visibility.

Installed new mast arms at the freeway off-ramp and at the southeast corner facing Bryant Street to increase traffic signal visibility for motorists.

Installed additional traffic signals at the southwest corner of the intersection.

Added pedestrian refuge associated with the bus boarding island to increase pedestrian and transit rider safety.

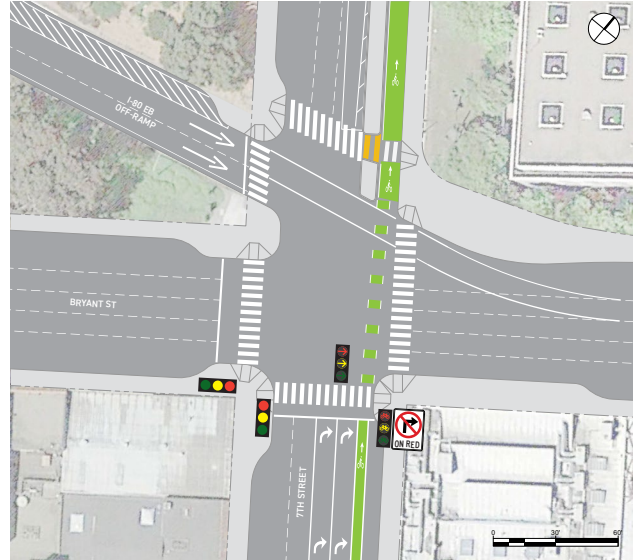


Figure 18: 7th and Bryant streets Improvement Plan

6th Street and Brannan Street (I-280 northbound off-ramp, I-280 southbound on-ramp)

The intersection in Figure 19 is part of SFMTA's Brannan Street Safety Project, which includes new bicycle lanes on Brannan Street.

At this intersection, the collisions are scattered throughout the intersection; several involved right-turning drivers from the off-ramp hitting pedestrians in the crosswalk on the east leg of Brannan Street.

Recommendations for this intersection include:

Improved pedestrian and bicycle facilities:

- Upgrade the bicycle lanes on Brannan Street, including converting the eastbound approach to a buffered bicycle lane by eliminating one of two right turn lanes.
- Add a new crosswalk with a median refuge across the freeway ramp leg of the intersection for better pedestrian accessibility.

Improved visibility:

- Add a protected right turn signal phase from the off-ramp onto Brannan Street to reduce conflicts between turning traffic and pedestrians.
- Extend the sidewalks at the northeast, southwest, and southeast corners to reduce pedestrian crossing distances and increase visibility.
- Install nearside traffic signal at the southwest corner of Brannan and 6th Street to improve signal visibility.
- Convert the southbound tow-away lane on 6th Street to a right turn only lane to keep fast-moving through traffic farther from the sidewalk and reduce merging in the intersection.

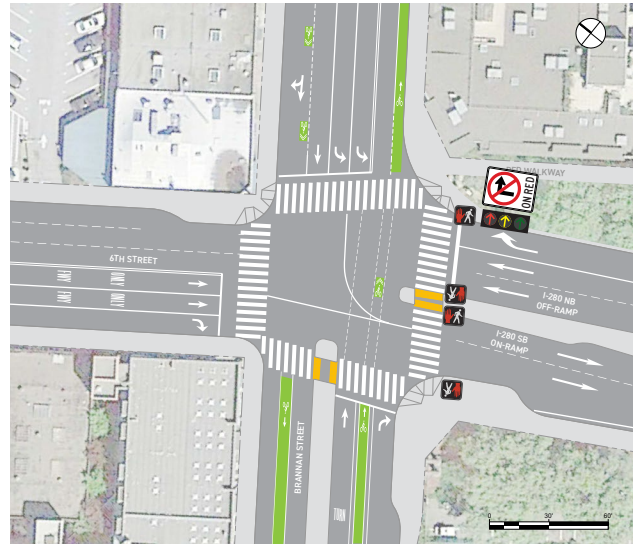


Figure 19: 6th and Brannan streets Improvement Plan

Essex Street and Harrison Street (I-80 eastbound on-ramp)

The intersection in Figure 20 is slated for developer-provided improvements, which include curb extensions at the northeast and southeast corners of the intersection.

At this intersection, most of the collisions occurred on the west side of the intersection due to red light violations or excessive speed.

Preliminary recommendations for this intersection include:

Improved visibility:

- Upgrade traffic signals to provide better signal visibility.
- Increase sidewalk widths at corners to increase pedestrian visibility and awareness of turning vehicles.

Improved pedestrian facilities:

- Add new signalized crosswalk across the freeway entrance and a protected right turn signal from Harrison Street onto the on-ramp to prevent conflicts with pedestrian crossings. Convert the eastbound through/right turn lane to a right turn only lane to improve clarity.
- Add a new signalized crosswalk across the west leg of Harrison Street.
- Add a new sidewalk along the south side of Harrison Street.

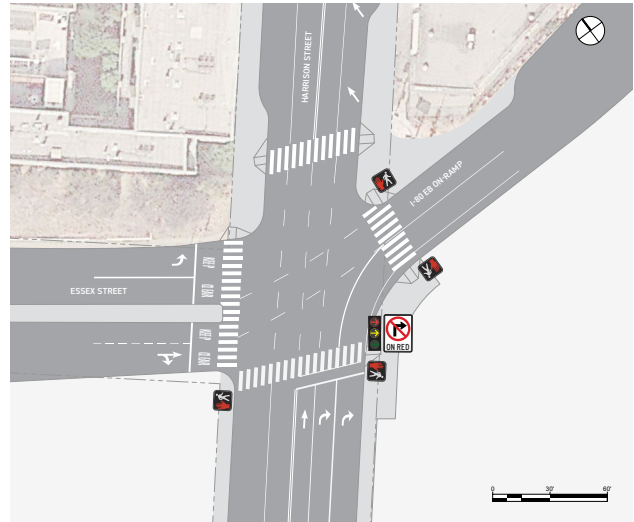


Figure 20: Essex and Harrison streets Improvement Plan

Fremont Street between Howard and Folsom streets (I-80 westbound off-ramp)

The intersection in Figure 21 had no collision data available at the time of this Study. The Study team recommends proactive improvements including:

- The addition of a signalized crosswalk on east leg of Fremont Street.
- Construct a raised splitter median island to direct drivers to the appropriate receiving lane.
- Add “No Right Turn on Red” signs on both sides of the freeway ramp to reduce conflicts with pedestrians.

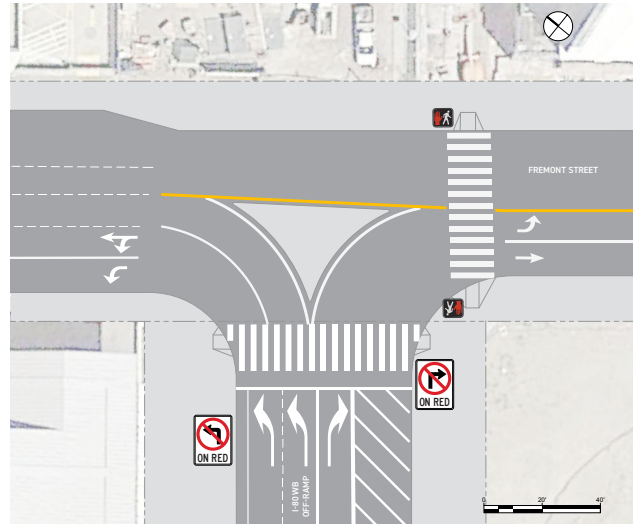


Figure 21: Fremont between Howard and Folsom streets Improvement Plan

DESIGN EVALUATION

Traffic Analysis

The Study team conducted traffic analysis on five of the ramp intersections to determine the effects of proposed safety treatments that would potentially affect traffic capacity. The analysis included intersections at which the proposed improvements included lane capacity reductions or changes to signal phasing that could reduce traffic capacity (e.g., opening a new crosswalk). The other five intersections were not part of the traffic analysis as their impacts to traffic were expected to be minimal. For each analyzed intersection, the Study team first determined the existing traffic conditions, then tested the proposed design changes to understand the associated traffic effects. The analysis focused on:

- Whether any increase in traffic delay would potentially result in queues spilling back to upstream intersections or towards an on-ramp onto a freeway mainline; and
- Whether there would be significant increases in traffic delay that would affect transit performance.

The Study team used Synchro 10 and Simtraffic software to simulate existing and scenario signal phases and timing: volume to capacity ratios, traffic delay, queue lengths, and upstream blockages due to queuing during peak commute hours. The summary list below describes the traffic analysis conclusions. In some cases, the Study team refined proposed intersection designs to reduce queuing based on the analysis.

For more detailed information see Appendix C.

Mission, Otis, Duboce, and 13th streets (U.S. 101 northbound off-ramp)

One-Way Otis Scenario: This scenario does not require adding an additional signal phase because the two-stage bicycle lane movement allows westbound 13th Street traffic, off-ramp traffic, and westbound bicycles that have completed the two-stage maneuver to proceed across the intersection concurrently. As a result, queue increases would be relatively minimal and would only rarely back up to the next intersection. The Otis Street southbound left turn would see a slight increase in delay in the a.m. and back up into the previous intersection, but this is manageable given the benefit of the additional bicycle facility on 13th Street. During the p.m. peak, traffic queues are expected to remain similar to existing conditions.

Two-Way Otis Scenario: In order to accommodate a westbound bike lane and two-way Otis Street, an additional signal phase is required to separate westbound vehicle and bike traffic on 13th Street from traffic coming off the off-ramp. This additional phase reduces queues on the eastbound approach, but would increase delay and queues on all other intersection approaches.

- Due to the northbound through lane reduction, northbound through lane queue lengths would increase substantially. As a result, queued traffic would block buses from entering the northbound bus lane about 41% of the time in the a.m. peak hour and 14% of the time during the p.m. peak hour, increasing transit delay.
- The off-ramp queue would extend onto the freeway mainline approximately 73% of the time in both the a.m. and p.m. peak periods, compared to 30 - 37% in the a.m. and 12% in the p.m. under existing conditions. This would be a significant issue when seeking Caltrans approval for the proposed safety improvements.
- Southbound queues would typically extend through the intersection of Otis Street, McCoppin Street, and Gough Street, which occurs much less frequently today.
- Westbound queues would block the intersection of 13th Street and South Van Ness Avenue more frequently than they do today.

The Study team included both scenarios in the final recommendations pending a final Otis Street proposal as part of the Market Octavia Plan Amendment. The study team also looked at other scenarios such as changing the east crosswalk so that pedestrians would need to wait in order to cross that crosswalk in two stages. While this had the benefit of reducing the delay caused by the proposed two-way Otis Street, it would make the pedestrian crossing much more difficult. Therefore, the scenario was not recommended.

South Van Ness Avenue and 13th Street (U.S. 101 southbound on-ramp)

Reductions in the number of lanes for several movements (eastbound through, southbound through, westbound left turn) at this intersection combined with signal timing changes to accommodate a protected southbound left turn would increase queues on some approaches.

- Elimination of an eastbound through lane would increase the queue on that approach, but it would likely not extend to the adjacent signal at 13th/Duboce/Mission/Otis.
- The proposed protected southbound left turn would lengthen queues substantially in both the a.m. and p.m. peak hours. As a result, queues would extend back and block the upstream intersection at 12th Street about 90% of the time during the peak hours.
- The reduction in westbound left turn lanes from two to one combined with the proposed protected southbound left turn would result in longer queues on the westbound approach. They would extend back to the upstream intersection at Folsom Street up to 44% of the time in the p.m. peak hour.

Based on these findings, the Study recommends conducting a pilot as part of the near-term improvements, prohibiting southbound left turn movements for all time periods (they are currently prohibited only during the p.m. peak hour). The pilot evaluation would determine if 1) the change addresses existing conflicts involving southbound left turns at this intersection and 2) if it shifts higher volumes of turning traffic to other intersections (e.g. South Van Ness Avenue and 14th Street), creating potential issues there. If the pilot is successful in reducing overall conflicts in the network, then it could remain in place in lieu of adding a protected southbound left turn. Left turn signal modifications at 14th Street and South Van Ness Avenue could help to accommodate the increase in turning vehicles diverted from 13th Street/South Van Ness Avenue. With the possible elimination of the southbound left turn, which has relatively low traffic volumes, green time can be re-allocated to the other higher-volume movements. As a result, prohibiting the southbound left turn would reduce queues and delay at the intersection to manageable levels even with the proposed lane changes to accommodate eastbound and westbound bike lanes.

7th Street between Bryant and Harrison streets (I-80 eastbound off-ramp)

The recommended reduction of the freeway off-ramp from two lanes to one would increase queue lengths during both the a.m. and p.m. peak hours. The queue length would still be within the ramp storage area and would typically not back up onto the freeway mainline.

SFMTA is considering re-routing the inbound 8-Bayshore from Bryant Street to this midblock off-ramp, 7th Street, and Folsom Street before rejoining its current route on 3rd Street. If SFMTA implements this change, a second lane may need to be retained on this off-ramp to accommodate and avoid delays to Muni buses.

7th Street and Bryant Street (I-80 eastbound off-ramp)

The analysis found no significant effects on traffic from the proposed improvements at this intersection.

- Reducing the freeway off-ramp from three lanes to two would not have a significant effect on queues on the off-ramp, and that they would not extend back to the mainline during typical peak hour conditions.
- The recommended conversion of one northbound through lane into a second northbound right turn lane would not significantly affect queues on 7th Street.

6th Street and Brannan Street (I-280 northbound off-ramp, I-280 southbound on-ramp)

The new protected northbound right turn phase from the off-ramp together with the new crosswalk across the freeway ramps and associated signal timing changes would increase queuing at some approaches while decreasing it at others.

- Northbound I-280 splits about 3,000 feet south of the intersection into two legs that each end at surface street traffic signals (at the Study intersection on 6th Street and at an intersection on 5th Street), causing lengthy queues in the existing condition on both freeway legs. The entire freeway essentially functions as off-ramp queue storage.
- The I-280 off-ramp northbound right turn will see a large decrease in capacity due to the proposed signalization of this movement to separate pedestrians and right turning vehicles. Queues in the a.m. peak would be noticeably higher than current conditions. Delays and queuing could potentially be reduced by requiring pedestrians to push a button to cross Brannan Street in the east crosswalk.
- Queue lengths would vary on surface street approaches. In the p.m. peak, southbound 6th Street and northbound freeway off-ramp queues would decrease and may decrease even further due to the upcoming lane reduction on southbound 6th Street between Market and Howard. However, queues on eastbound Brannan Street would increase and back up to the next intersection. A re-evaluation of the traffic volumes is warranted in the future to determine how the Brannan Street Safety Project traffic calming measures affect future traffic volumes. Moreover, a future protected bicycle lane on Brannan Street may decrease the pedestrian crossing distances across Brannan, allowing the signal timing to be slightly more efficient
- Establishing both a new crosswalk across the off-ramp and a protected northbound off-ramp right turn phase together would significantly increase eastbound Brannan Street queues in the p.m. peak and off-ramp northbound right turn queues during the a.m. peak.

Cost Estimates

The Study team developed planning-level cost estimates for the Study intersections, shown Table 4, projecting that the recommended improvements to all 10 intersections would cost approximately \$10.7 million. Of this, approximately \$250,000 represents the cost of the identified near-term improvements, which can be implemented in the next two years. The remaining costs are for the capital improvements, which will take several years to implement. The cost estimates are based on typical City costs for the proposed types of improvements. Estimates include further planning, design, construction, and contingency costs. They assume concurrent implementation of similar improvements (e.g., implementing signal upgrades at multiple intersections at once).

For full cost estimate details, see Appendix F.

Table 4: Intersection Total Cost Summary

INTERSECTIONS	NEAR-TERM IMPROVEMENTS	CAPITAL IMPROVEMENTS	TOTAL COST
Mission, Otis, Duboce, and 13th streets (U.S. 101 northbound off-ramp)	\$54,900	\$1,063,300	\$1,118,200
South Van Ness Avenue and 13th Street (U.S. 101 southbound on-ramp)	\$20,900	\$1,076,000	\$1,096,900
8th Street between Bryant and Harrison streets (I-80 westbound off-ramp)	\$10,000	\$328,000	\$338,000
8th Street and Bryant Street (I-80 westbound off-ramp)	\$37,000	\$2,024,000	\$2,061,000
7th Street and Harrison Street (I-80 westbound on-ramp)	\$10,000	\$1,266,000	\$1,276,000
7th Street between Bryant and Harrison streets (I-80 eastbound off-ramp)	\$11,500	\$441,000	\$452,500
7th Street and Bryant Street (I-80 eastbound off-ramp)	\$38,600	\$1,093,000	\$1,131,600
6th Street and Brannan Street (I-280 northbound off-ramp, I-280 southbound on-ramp)	\$49,300	\$1,115,600	\$1,164,900
Fremont Street between Howard and Folsom streets (I-80 westbound off-ramp)	\$5,600	\$469,000	\$474,600
Essex Street and Harrison Street (I-80 eastbound on-ramp)	\$9,000	\$1,617,600	\$1,626,600
Total Cost	\$246,800	\$10,493,500	\$10,740,300

FUNDING AND IMPLEMENTATION PLAN

The next steps toward implementation of the recommended safety improvements include design, project approvals, funding, and construction. The Study team developed a funding and implementation plan in coordination with SFMTA and Caltrans.

SFMTA will lead design and implementation of the recommendations in coordination with San Francisco Public Works and Caltrans. Since the Study intersections involve both city streets and Caltrans freeway ramps, the proposed improvements will require Caltrans approvals in addition to the typical SFMTA legislation process for street design changes. Some of the proposed improvements may require additional traffic analysis during the Caltrans approval process regarding how the recommendations would affect off-ramp queues. The Transportation Authority could potentially provide assistance with Caltrans coordination for improvements that would require a more substantial approval process.

SFMTA has committed to implementing most near-term improvements within two years, with the exception of those that require a longer Caltrans approval process. Recommended near-term improvements at 7th Street and 8th Street are funded by D6 NTIP Capital funds. The goal for capital improvements is to implement them within five years, if possible, given funding availability and approval process.

Project funding and implementation are closely related, as a number of the improvements will be implemented by developers or with developer funds or together with other corridor projects. Table 4, shows the implementation plan for a couple of the intersections. Table 6 shows potential federal, state, and local funding sources that can be applicable to fund the proposed improvement plans. The Transportation Authority and SFMTA will continue to monitor and seek opportunities to use the identified funding sources to advance the Study recommendations.

Table 5: Implementation Plan by Intersection

INTERSECTION	FUNDING PLAN FOR CAPITAL IMPROVEMENTS	IMPLEMENTATION PLAN FOR CAPITAL IMPROVEMENTS
Mission, Otis, Duboce, and 13th streets	Improvements could be funded with revenue from Market Octavia area plan fees.	
South Van Ness Avenue and 13th Street	<p>Improvements will be prioritized as part of a future SFMTA new signal or signal modification project. SFMTA and the Transportation Authority will seek funding from sources listed in Table 6.</p> <p>Pending coordination with Caltrans, improvements could potentially be incorporated into an upcoming Caltrans U.S. 101 repaving project.</p>	<p>If not implemented by Caltrans, SFMTA to implement the improvements</p> <p>Construction in 2022 or 2023</p>
8th Street midblock between Bryant and Harrison streets	<p>Improvements will be prioritized as part of a future SFMTA new signal or signal modification project. SFMTA and the Transportation Authority will seek funding from sources listed in Table 6.</p> <p>Pending coordination with Caltrans, improvements could potentially be incorporated into an upcoming Caltrans U.S. 101 repaving project.</p>	<p>If not implemented by Caltrans, SFMTA will prioritize the improvements as part of an upcoming new signal or signal upgrade project.</p>
8th Street and Bryant Street	<p>The project can be considered for the upcoming SFMTA CIP where it would also need to compete with other projects and funding sources.</p> <p>Additional funding is needed for capital improvements. SFMTA and the Transportation Authority will seek funding from sources listed in Table 6.</p>	<p>TBD pending future funding, additional coordination with Caltrans, and other priorities on the Vision Zero High Injury Network.</p>
7th Street and Harrison Street		<p>SFMTA will incorporate improvements as part of 7th Street project. Project will start, pending other priorities on the Vision Zero High-Injury Network.</p>
7th Street midblock between Bryant and Harrison streets	<p>Recommended improvements will be funded through SFMTA's 7th Streetscape project. SFMTA to seek additional funds when project starts and scope is finalized.</p>	<p>7th Street project will also need to coordinate with possible SFPUC water main work in the area to either combine work into one contract or to ensure the contracts do not impact each other.</p>
7th Street and Bryant Street		

All proposals that do not require Caltrans approval can be done by SFMTA in-house resources within 2 years of the publication of this report.

Near-term improvements along 7th and 8th Streets will be funded by Prop K Neighborhood Transportation Improvement Program (NTIP)

Near-term improvements for all other locations to be funded by SFMTA sources.

INTERSECTION	FUNDING PLAN FOR CAPITAL IMPROVEMENTS	IMPLEMENTATION PLAN FOR CAPITAL IMPROVEMENTS	
6th Street and Brannan Street	<p>Pending coordination with Caltrans, improvements could potentially be incorporated into an upcoming Caltrans I-280 repaving project.</p> <p>The project can be considered for the upcoming SFMTA CIP where it would also need to compete with other projects and funding sources.</p> <p>The improvements can also be considered for 101/280 managed lanes project.</p> <p>If not implemented by Caltrans, additional funding is needed for capital improvements. SFMTA and the Transportation Authority will seek funding from sources listed in Table 6.</p>	<p>If not implemented by Caltrans, SFMTA will implement the recommended improvements pending funding sources confirmation.</p>	<p>All proposals that do not require Caltrans approval can be done by SFMTA in-house resources within 2 years of the publication of this report.</p> <p>Near-term improvements along 7th and 8th Streets will be funded by Prop K Neighborhood Transportation Improvement Program (NTIP)</p>
Fremont Street between Howard and Folsom streets	<p>SFMTA to prioritize IPIC funds from Transbay District to fund the capital improvements.</p>	<p>SFMTA to implement recommendations when IPIC funds become available.</p> <p>Earliest potential funding available will be in fiscal year 2021.</p>	<p>Near-term improvements for all other locations to be funded by SFMTA sources.</p>
Essex Street and Harrison Street	<p>New mast arm will be funded through EP-33 Prop K funds.</p> <p>Remaining improvements could be funded and possibly implemented by the developer of a proposed project on an adjacent property. Another potential funding source is Rincon Hill IPIC funds.</p>	<p>SFMTA will prioritize the new mast arm as part of an upcoming signal modification project.</p> <p>SFMTA to implement remaining recommendations pending funding source confirmation</p> <p>SFCTA and SFMTA staff to meet in 2022 to evaluate status of developer's required commitments to intersection improvements. If proposed development does not proceed, alternative funding plan to be developed.</p>	

Table 6: Potential Funding Sources**FUNDING SOURCE****Prop K Sales Tax****POTENTIAL FUNDING AVAILABLE**

Project scope could be eligible for the Prop K Pedestrian Safety category and potentially Traffic Calming, New Signs and Signals, and Signals and Signs Maintenance and Renovation categories. FY 2019/20 – 2023/24 funds are all programmed to individual projects and placeholders but could be reprogrammed to these projects with agreement of project sponsors and SFCTA Board.

TIMELINE

Near-term improvements: Project sponsor could seek Neighborhood Transportation Improvement Program funds with support of District 6 SFCTA Commissioner. Project sponsor could seek allocation of currently programmed placeholders (e.g. Vision Zero Improvements or Advancing Equity through Safer Streets placeholders)

Capital improvements: Future projects may be programmed for FY 2024/25 via 2024 Prop K update.

FUNDING SOURCE**Prop AA Vehicle Registration Fee****POTENTIAL FUNDING AVAILABLE**

Project scope could be eligible for the Prop AA Pedestrian Safety category. All funds are currently programmed, but projects may finish under budget resulting in additional available funds.

TIMELINE

Near-term: Funds for an interim call for projects may become available if current projects are cancelled or completed under budget.

Capital improvements: Future projects may be programmed for FY 2022/23 via 2022 Prop AA Strategic Plan adoption.

FUNDING SOURCE**One Bay Area Grant (OBAG)****POTENTIAL FUNDING AVAILABLE**

OBAG enables counties to invest federal funds particularly in areas that local governments have identified and approved for future growth. Projects include local street and road maintenance, streetscape enhancements, bicycle and pedestrian improvements, transportation planning, Safe Routes to School projects, and more.

TIMELINE

The next cycle of OBAG funds is expected to have funds available for projects starting in FY 2022/23

FUNDING SOURCE**Prop B General Fund set-aside**

Potential inclusion in future SFMTA Capital Improvement Program (development to begin spring 2020)

FUNDING SOURCE**Prop A General Obligation bond**

Potential inclusion in future SFMTA Capital Improvement Program (development to begin spring 2020)

FUNDING SOURCE**General Fund Population Baseline****POTENTIAL FUNDING AVAILABLE**

The City is required to increase General Fund contributions to the SFMTA by a percentage equal to the City's annual population increase. 25% of this increase goes to capital street safety improvements.

TIMELINE

Potential inclusion in future SFMTA Capital Improvement Program (development to begin spring 2020).

FUNDING SOURCE**Interagency Plan Implementation Committee (IPIC)****POTENTIAL FUNDING AVAILABLE**

Total unprogrammed anticipated revenues for transportation in Transit Center area in FY20/21 - FY23/24: \$7,197,000. IPIC funds may be identified in future SFMTA CIP process.

TIMELINE

Funds programmed annually in summer-fall for following fiscal year.

FUNDING SOURCE**Highway Safety Improvement Program (HSIP)****POTENTIAL FUNDING AVAILABLE**

TBD, previous cycle \$182 million awarded to 221 projects in California.

TIMELINE

It is expected that the next HSIP Call for Projects (Cycle 10) be announced around April/May, 2020.

FUNDING SOURCE**Active Transportation Program (ATP)****POTENTIAL FUNDING AVAILABLE**

Funds available in both a state competitive process and a regional competitive process. Anticipated \$220M statewide plus approximately \$37M at MTC regional level available over four-year period. Average of past grants about \$1.8M.

TIMELINE

Funding will be available for FY 2021/22, 2022/23, 2023/24, 2024/25 in the ATP Cycle 5 call for projects in spring 2020. Additional ATP funds from other sources, including cancelled projects, may result in additional and earlier funding availability.

FUNDING SOURCE**Potential Future Transportation Network Company (TNC) Tax****POTENTIAL FUNDING AVAILABLE**

Could generate approximately \$30 to \$35M per year. As currently proposed, half of the tax revenue, approximately \$15M would be allocated to Vision Zero-related improvements such as the proposed improvements of this study.

TIMELINE

If this tax is approved by voters in November 2019, the policy is expected to go into effect in January 2020.

FUNDING SOURCE**Caltrans – State Highway Operation and Protection Program (SHOPP)****POTENTIAL FUNDING AVAILABLE**

Proposed improvements on 6th Street and Brannan Street, Mission and 13th Street, and South Van Ness Ave and 13th Street could be included in Caltrans repaving projects using this funding source.

TIMELINE

To be determined

APPENDICES

Appendix A Intersection Selection Memo

Appendix B Existing Conditions Report

Appendix C Technical Drawings

Appendix D Traffic Analysis Reports

Appendix E Outreach Report (Round 1 and Round 2)

Appendix F Full Cost Estimates

Appendix G Intersection Traffic Counts
