Draft

Vision Zero Ramp Intersection Study Phase 1

DRAFT FINAL REPORT

ACKNOWLEDGEMENTS

The Vision Zero Ramp Intersection Study Phase 1 is, in part, funded through the San Francisco County Transportation Authority's (Transportation Authority) Neighborhood Transportation Improvement Program (NTIP). The NTIP was established to fund community-based efforts in San Francisco neighborhoods, especially in underserved neighborhoods and areas with vulnerable populations (e.g., seniors, children, and/or people with disabilities). The NTIP is made possible with Proposition K local transportation sales tax funds.

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COVER PHOTO: (CLOCKWISE FROM TOP LEFT) 5TH AND HARRISON STREET, 5TH AND BRYANT STREET, 8TH AND BRYANT STREET, AND 10TH AND BRYANT STREET

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1. Executive Summary

The first phase of the Vision Zero Ramp Intersection Study (Study) is a Neighborhood Transportation Improvement Program (NTIP) planning study led by the Transportation Authority, in partnership with the San Francisco Municipal Transportation Agency (SFMTA) and the office of (District 6 City Supervisor and) Transportation Authority Board Commissioner Jane Kim. Commissioner Kim recommended the use of Prop K local transportation sales tax funds from the NTIP program to fund the study. The NTIP is intended to strengthen project pipelines and advance the delivery of community-supported neighborhood-scale projects, especially in Communities of Concern (CoCs) and other underserved neighborhoods and areas with at-risk populations (e.g., seniors, children, and/or people with disabilities).

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The Study is focused on addressing safety issues at freeway ramp intersections in the San Francisco South of Market (SoMa) neighborhood by proposing design improvements for near-term implementation. The SoMa neighborhood includes more than twenty locations where freeway on- or off-ramps intersect city streets. Many of these intersections are in and around the SoMa Youth and Family Special Use District (SUD). The neighborhood contains several schools, single room occupancy hotels, and senior centers, which attract populations at high risk of injury from traffic collisions. Addressing these collisions is critical to meeting the city's Vision Zero policy goal to end traffic-related deaths by 2024.

For the first phase of the Study, the study teams elected five study intersections based on total collision number rates and where existing planning efforts were not yet addressing safety challenges. The five intersections are:

- I-80 westbound off-ramp at 5th and Harrison streets;
- I-80 eastbound on-ramp at 5th and Bryant streets;
- U.S. 101 southbound on-ramp at 10th and Bryant streets;
- U.S. 101 northbound off-ramp at 9th/Bryant streets; and
- I-80 westbound off-ramp at 8th Street.

These intersections are on the city's Vision Zero High-Injury network, which comprises the 13 percent of streets where over 70 percent of severe injury and fatal collisions occur.

To improve safety at the target intersections quickly, the study team focused on identifying improvements that could be implemented in less than five years, such as curb bulb-outs, leading pedestrian intervals for pedestrian crossing signals, and signal upgrades to reduce conflicts and improve visibility. The study did not include longer-term or corridor-wide analyses and recommendations.

For each of the five intersections, the study team analyzed the traffic collision history between 2011 and 2015 to identify patterns that improvements could address. At least 72 injuries, due to traffic collisions, occurred at Study intersections or on adjacent ramps over this period, including two severe injuries and five fatalities. While most of the collisions occurred on city streets, all five fatal collisions involved a driver losing control on the ramp or freeway rather than at the intersections themselves. Most collisions (about 60 percent) involved two motor vehicles, while 11 percent involved a vehicle and a bicyclist, and nine percent involved a vehicle and a pedestrian. The most common collision type, overall, was that involving a turning vehicle. For each intersection, the study team identified specific traffic movements and patterns that resulted in collisions.

The team also identified physical conditions at each intersection that may contribute to observed collision patterns. Conditions common to multiple intersections include wide streets with high vehicle volumes and travel speeds; long pedestrian crossing distances; narrow sidewalks; closed crosswalks; queuing vehicles blocking crosswalks; complicated traffic patterns; and limited bicycle infrastructure.

Based on the collision analysis at each intersection, the study team developed safety improvement proposals by applying a toolbox of proven near-term safety treatments, such as:

- Curb bulb-outs (**Figure 1**) to shorten pedestrian crossing distances and increase pedestrian visibility;
- Leading pedestrian intervals (LPIs) to give pedestrians a head start crossing the street (**Figure 2**);
- Reopening crosswalks to improve accessibility and reduce pedestrian conflict points;
- Protected left turn signals to reduce conflicts involving turning traffic;
- Improvingssignal visibility with mast-arms, larger signal heads, and signal heads in additional locations; and
- Wayfinding signage to reduce confusion where there are several lanes allowing turns in multiple directions.

For each intersection, the study developed design concept drawings to illustrate proposed improvements. At all intersections, the recommendations include pedestrian curb bulb-outs and traffic signal and street lighting updates. Other recommended improvements at specific intersections include:

- 8th Street and Harrison Street: Eliminating one of three freeway off-ramp lanes to accommodate a pedestrian bulb-out. This recommendation will require further evaluation and detailed traffic analysis, as well as approval from Caltrans;
- 10th Street and Bryant Street: Reducing pedestrian conflict points by reconfiguring lanes, implementing a new crosswalk, and installing lane wayfinding signage;
- 5th Street and Bryant Street: Changing signal timing to reduce turn conflicts between people walking and driving, and installing wayfinding signage;
- 5th Street and Harrison Street: Changing signal timing to reduce left turn conflicts between people walking and driving, implementing a new crosswalk, and installing a temporary median for better driver navigation; and
- 9th Street and Bryant Street: Reducing conflict points between people walking and driving with LPIs.

The study team presented drafts of the improvement plans to advocacy groups, neighborhood groups, and other stakeholders near the Study intersections to solicit their feedback. Stakeholders expressed strong interest in improving freeway ramp safety, particularly for pedestrians and bicyclists. Community groups were also in support of the proposed improvements and provided additional enhancement ideas to add to the plans.

Planning-level cost estimates for design and construction, developed with the SFMTA, range from $455,000 to $825,000 per intersection, including a contingency and allowance for other potential enhancements. The expected total project cost is $4,400,000.

FIGURE 1: EXAMPLE OF A CURB BULB-OUT

FIGURE 2: EXAMPLE OF LEADING PEDESTRIAN INTERVAL (LPI) SIGNAL TIMING

SFMTA will be the lead agency to complete design and construct the proposed improvements. The next steps will include completing design of the recommended improvements and seeking approval from Caltrans (encroachment permits), in addition to SFMTA's legislation process.

SFMTA is including the improvements proposed at 5th Street and Harrison Street and at 5th Street and Bryant Street in its 5th Street Improvement Project, with construction slated to begin in 2018. SFMTA included the recommendations of the other three ramp intersections in its draft Capital Improvement Program (CIP) update for fiscal years 2019 to 2023. The CIP will be finalized upon approval by the SFMTA Board (MTAB), expected in summer 2018. The recommendations are expected to be implemented within three to five years. The study team identified multiple potential funding sources to design and implement the recommended improvements. Potential funding sources include Prop K sales tax, Prop A General Obligation Bond, Prop B general fund set-aside, and Interagency Plan Implementation Committee (IPIC). In addition, the project would likely be competitive for several grant programs. SFMTA is developing a funding plan for the recommendations as part of its CIP update.

2. Introduction

The first phase of the Vision Zero Ramp Intersection Study (Study) is a Neighborhood Transportation Improvement Program (NTIP) planning study led by the Transportation Authority, in partnership with the office of (District 6 City Supervisor and) Transportation Authority Board Commissioner Jane Kim and the San Francisco Municipal Transportation Agency (SFMTA). Commissioner Kim recommended the use of Prop K local transportation sales tax funds from the NTIP program to fund the study. The NTIP is intended to strengthen project pipelines and advance the delivery of community-supported neighborhood-scale projects, especially in Communities of Concern (CoCs) and other underserved neighborhoods and areas with at-risk populations (e.g., seniors, children, and/or people with disabilities).

A. STUDY PURPOSE

The Vision Zero Ramp Intersection Study is focused on addressing safety issues at freeway ramp intersections in the San Francisco South of Market (SoMa) neighborhood by proposing design improvements for near-term implementation. The SoMa neighborhood includes approximately twenty locations where freeway on- or off-ramps intersect city streets, many of which are in and around the SoMa Youth and Family Special Use District (SUD). The neighborhood contains several schools, single room occupancy hotels, and senior centers, all of which attract populations at high risk of injury from traffic collisions.

In 2014, San Francisco adopted its Vision Zero policy to end traffic-related deaths by 2024. To achieve this goal, city agencies are working closely with communities and advocates to identify and prioritize improvement needs and propose solutions. In addition to infrastructure redesigns, the Vision Zero effort includes education and enforcement initiatives to improve street safety. Many SoMa ramp intersections have particularly high frequencies of traffic injuries and fatalities, and addressing these collisions is critical in order to meet San Francisco's Vision Zero goal.

For the first phase of the Vision Zero Ramp Intersection Study, the study team selected five study intersections:

- I-80 westbound off-ramp at 5th and Harrison streets;
- I-80 eastbound on-ramp at 5th and Bryant streets;
- U.S. 101 southbound on-ramp at 10th and Bryant streets;
- U.S. 101 northbound off-ramp at 9th and Bryant streets; and
- I-80 westbound off-ramp at 8th Street.

To improve safety at the target intersections quickly, the study team focused on identifying improvements that could be implemented at these locations in the near term (less than five years), such as curb bulb-outs, leading pedestrian intervals (LPIs) for pedestrian crossings, and signal upgrades to improve visibility. The study did not include longer-term or corridor-wide analyses and recommendations.

B. STUDY PROCESS

The study team first selected five study intersections in and near the Youth and Family Special Use District (SUD) in the SoMa neighborhood based on their collision histories and other factors. An existing conditions analysis at each of the intersections included a detailed analysis of collisions that occurred over a five-year period, to identify patterns that improvements could address. The study team applied a Caltrans-provided toolbox of near-term safety improvement methods, as well as other best-practice treatments, to develop proposed design concepts that would address identified issues at each intersection. As part of an initial feasibility evaluation of each proposal, the study team met with agency and community stakeholders to seek input on the designs. After finalizing the recommendations, the Transportation Authority worked with the SFMTA to coordinate next steps for funding and implementation of each recommendation.

C. STUDY LOCATION SELECTION

The study scope allowed for study of up to five ramp intersections. The study team selected the study locations based on three factors:

1. Location in or near the SoMa Youth and Family SUD, an area characterized by high concentrations of senior centers, single-room occupancy hotels, and schools.
2. A high number and severity of traffic collisions. The study team obtained traffic collision data for the period from 2008 to 2014 and ranked the number of collisions at ramp intersections in or near the Youth and Family SUD to identify those most in urgent need of improvement. A Killed or Seriously Injured (KSI) metric was used as part of the ranking process to give greater weight to collisions with severe injuries and fatalities. Note that the analysis did not include collisions on the ramps themselves, only at ramp intersections.
3. No planned improvements or other study already existing or underway that would result in similar safety treatments at the location. The team screened intersections in SoMa and coordinated with other agencies to determine which were already under study, had recently been improved, or would be studied or improved soon.

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

3. EXISTING CONDITIONS

A. LAND USE

SoMa is characterized by a grid of wide, multi-lane arterial streets and a mix of residential, light industrial, and office land uses. It is San Francisco's fastest-growing neighborhood and is programmed to receive almost 20,000 new residents and 50,000 new jobs by 2040[3] – more than any other San Francisco priority development area – together representing 20 percent of all growth in San Francisco by 2040. This growth, and the resulting increase in travel via all modes, could increase the number of traffic collisions occurring in SoMa and at ramp intersections. As of early 2016, the San Francisco Planning Department (Planning Department) estimated that new development, already in the permit pipeline, could result in a total of nearly 5,000 new residents and an additional 22,000 jobs within a quarter mile of the five intersections. **Figure 3** shows that while this residential growth is projected around all study intersections, the vast majority of new employees would be located near the intersections of 5th and Bryant and 5th and Harrison.

3 Source: San Francisco Planning Department, 2014.

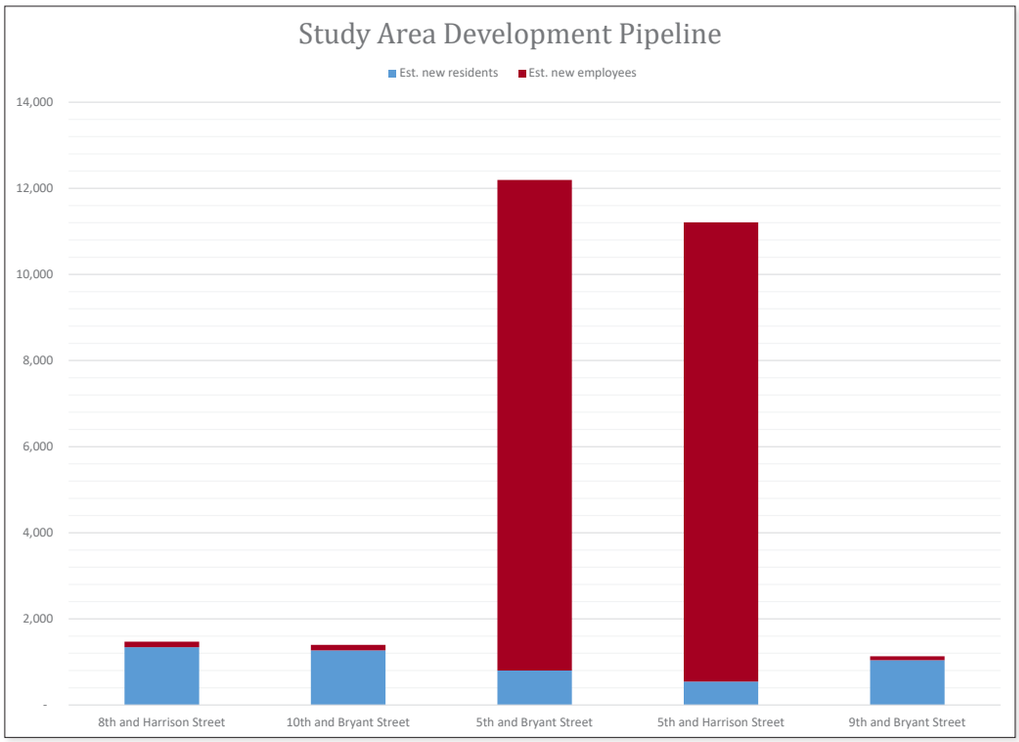
B. PEDESTRIAN

All of the study intersections present opportunities to improve conditions for pedestrians. San Francisco's 2017 High Injury Network (HIN) – using the San Francisco Department of Public Health's (SFDPH) Transportation Injury Surveillance System (TISS), which compiles data from San Francisco General Hospital medical records and San Francisco Police Department (SFPD) incident reports – shows that all five intersections are along at least one HIN corridor. At the 5th and Harrison, 9th and Bryant, and 10th and Bryant intersections, two streets are included in the 2017 HIN, whereas the 5th and Bryant and 8th and Harrison intersections consist of only one HIN street (5th Street and Harrison Street, respectively).

Issues affecting pedestrian access and comfort at multiple study intersections include:

- Wide streets with high vehicle volumes and travel speeds;
- Long pedestrian crossing distances;
- Narrow sidewalks;

FIGURE 3: DEVELOPMENT PIPELINE – ESTIMATED NEW RESIDENTS AND EMPLOYEES WITHIN ¼ MILE OF STUDY INTERSECTIONS



Source: San Francisco Transportation Sustainability Fee (Tsf) Nexus Study, San Francisco Development Pipeline 2016 Quarter 1.
Table A-4: Service Population, Building Space, and Trip Generation Rates: Sq.ft per employee: 498 Avg. residents per unit: 2.32

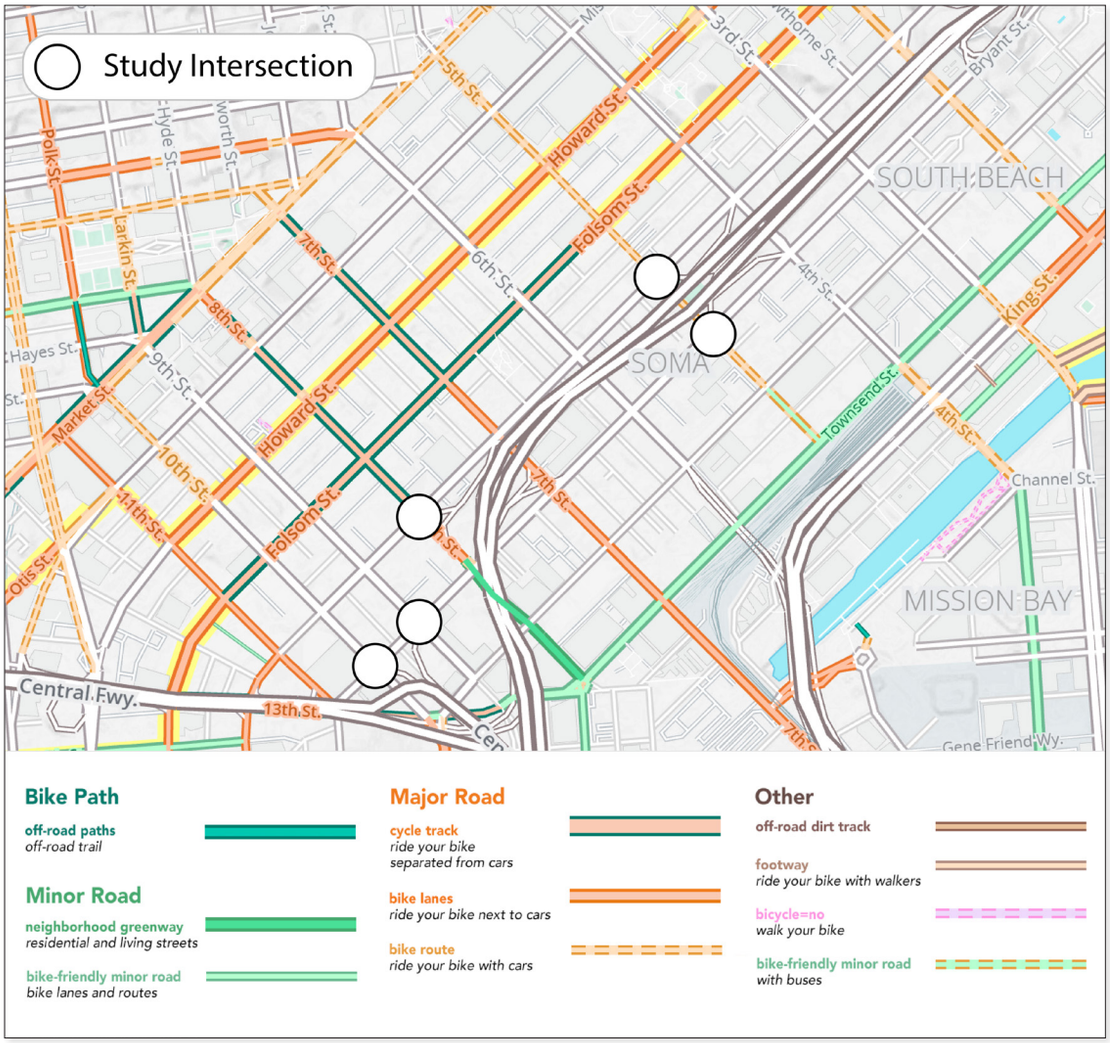
- Two closed crosswalks: one at Harrison Street and 5th Street and another at Bryant Street and 10th Street; and
- Vehicles queuing at freeway on-ramps frequently block crosswalks.

The Planning Department's draft Central SoMa Plan (revised version published 2016, final pending) recommends improvements to similarly narrow sidewalks in its plan area (which includes the two of this study's intersections along 5th Street), including widening them to a minimum of 12 feet. The draft plan calls for several new midblock crossings on Harrison and Bryant Streets, between 2nd Street and 6th Street, as well as opening a previously closed crosswalk at 5th Street and Harrison Street.

C. BICYCLE

Limited bicycle infrastructure currently exists at the study intersections. **Figure 4** illustrates bicycle routes in the study area along with the infrastructure currently available in each intersection. A mix of buffered and Class II bike lanes exist along Howard, Folsom, 7th, and 8th Streets. 5th Street has green-backed sharrows only. Harrison, Bryant, 9th, and 10th streets generally have no bicycle infrastructure.

FIGURE 4: EXISTING BICYCLE NETWORK MAP

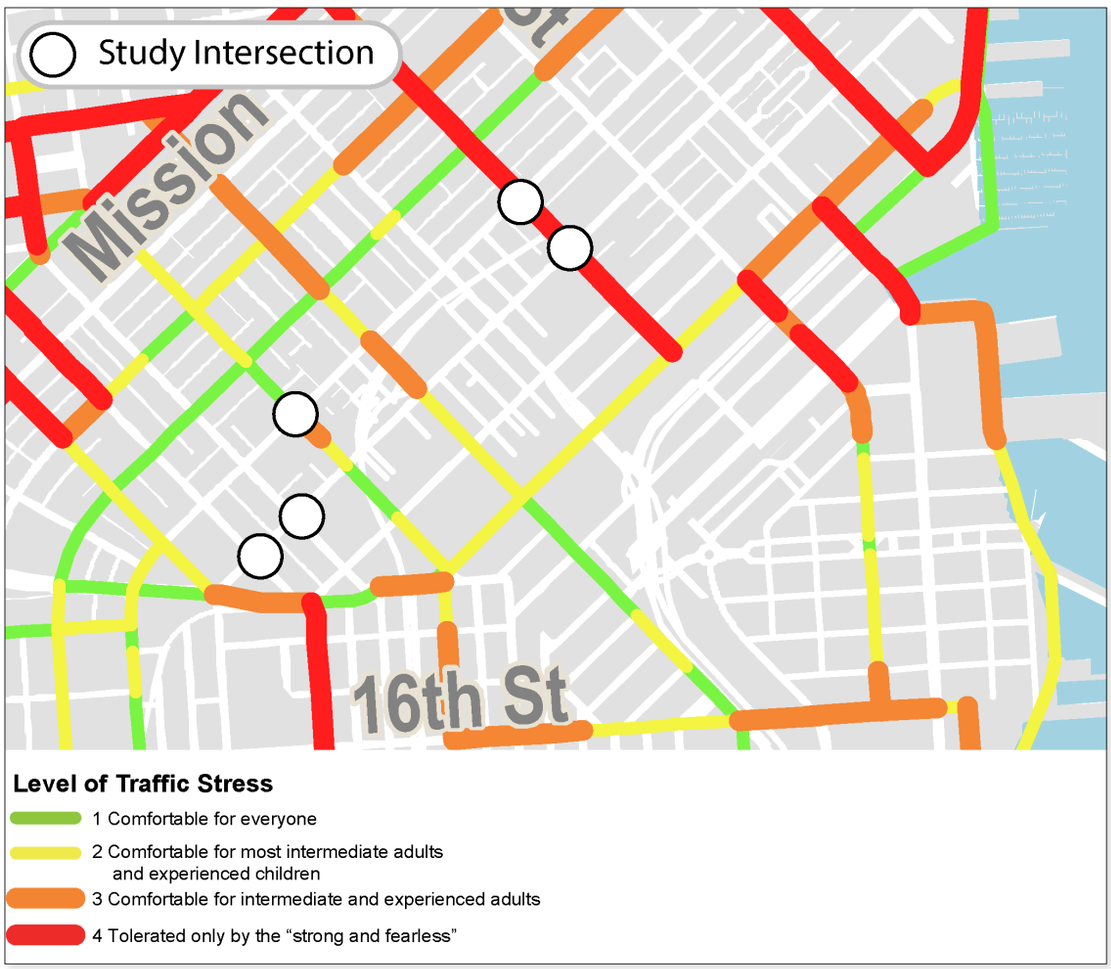


Source: Mapzen, Leaflet, OpenStreetMap, OpenStreetMap contributors, and San Francisco Municipal Transportation Agency

Figure 5 shows the results of SFMTA's 2013 study of "Level of Traffic Stress" (LTS) for bicyclists and the white dots illustrate that the bicycle routes in the study area are very stressful for most bicyclists, especially when compared to other parts of the city. The intersections of 5th and Bryant and 5th and Harrison are along street segments rated LTS 4, or "tolerated only by the strong and fearless." Also, 5th and 8th streets are part of the SFMTA's primary bicycle network[4] and will be prioritized for safety improvements in conjunction with other transportation and development projects in the area.

4 SFMTA Bike Map, July 2016, transbasesf.org

FIGURE 5: LEVEL OF TRAFFIC STRESS FOR BICYCLISTS



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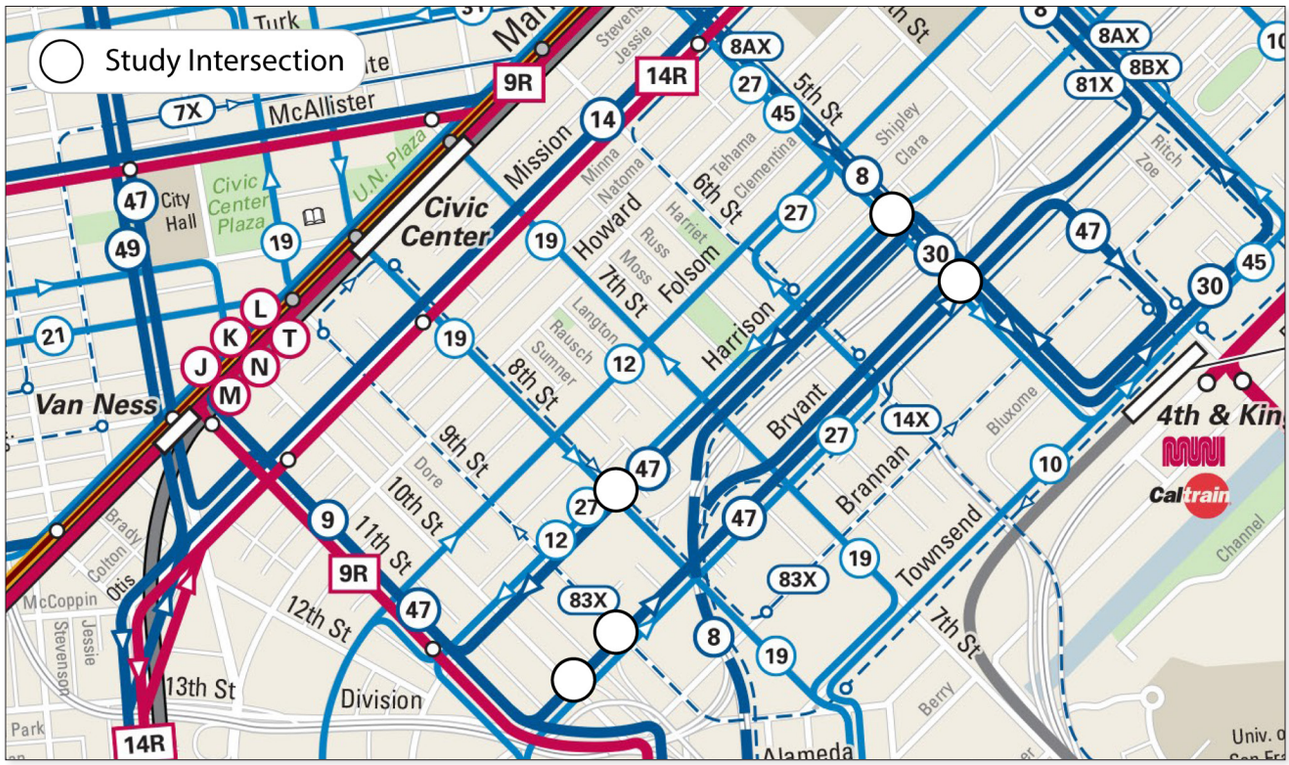
D. TRANSIT

Currently, 10 Muni routes serve the study area, of which the 8, 8AX, 30, and 47 all have service headways of less than 10 minutes during the day on weekdays. These frequent routes encompass 5th Street and/or Harrison and Bryant streets through the study intersections. 8th Street and 9th Street serve less-frequent transit routes through study intersections. **Figure 6** shows Muni service in and around the study intersections.

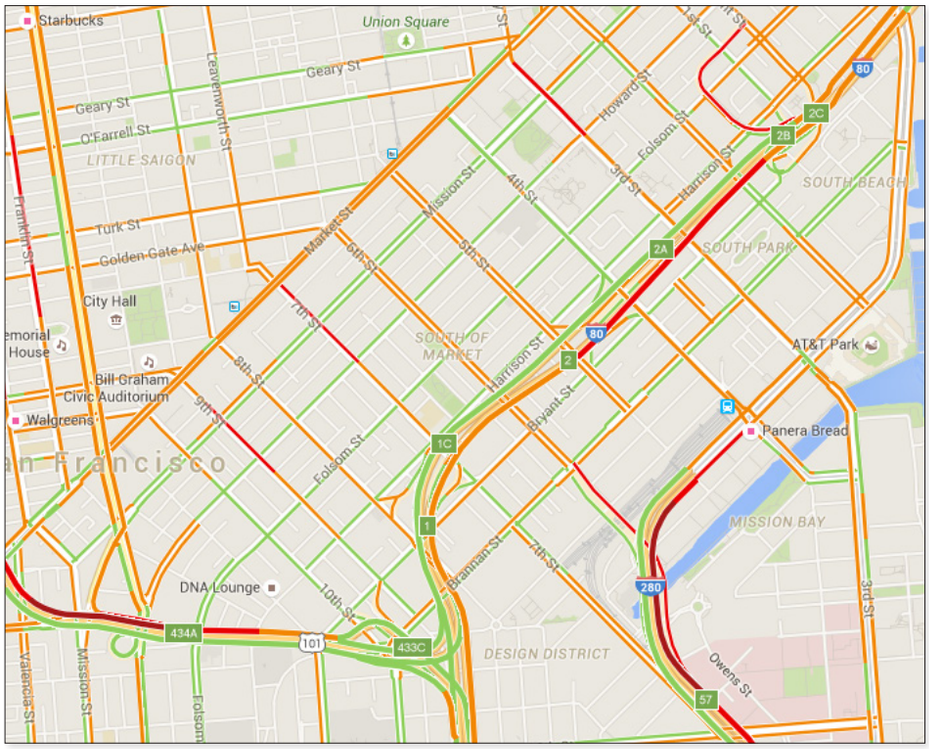
FIGURE 6: MUNI ROUTES- AT STUDY INTERSECTION RAMPS



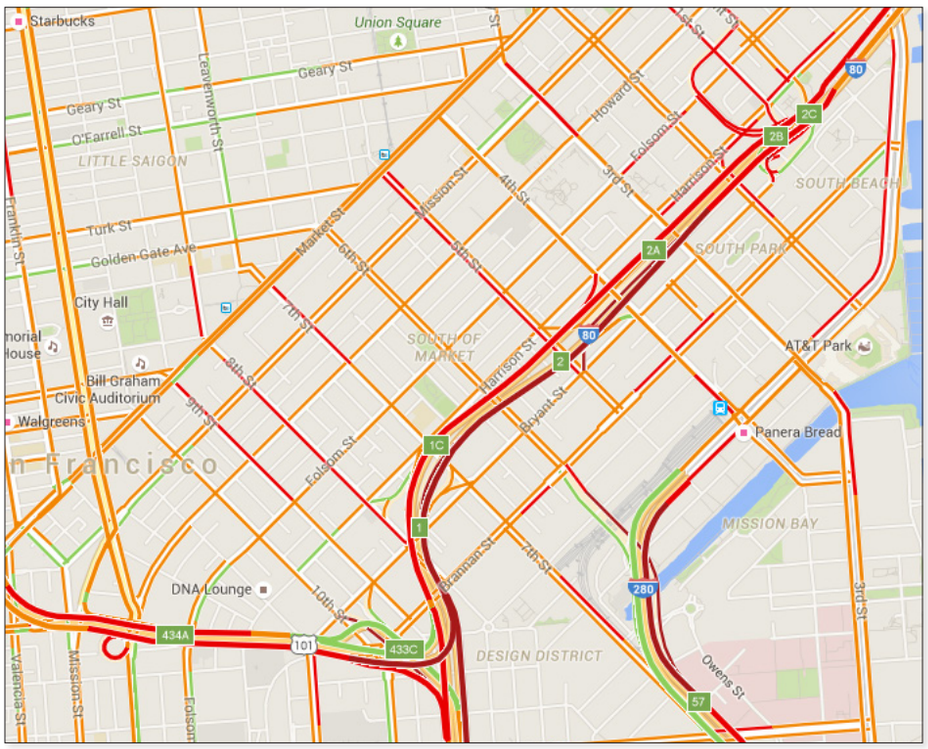
Source: Muni bus routes and stops, https://www.sfmta.com/getting-around/transit/routes-stops

FIGURE 7: TYPICAL TRAFFIC IN SOMA, A.M. AND P.M. PEAK

TYPICAL TRAFFIC, WEDNESDAY 8:15 A.M.



TYPICAL TRAFFIC, WEDNESDAY 5:30 P.M.



Source: Google maps, typical traffic conditions, accessed June 2016.

E. AUTOMOBILE TRAFFIC

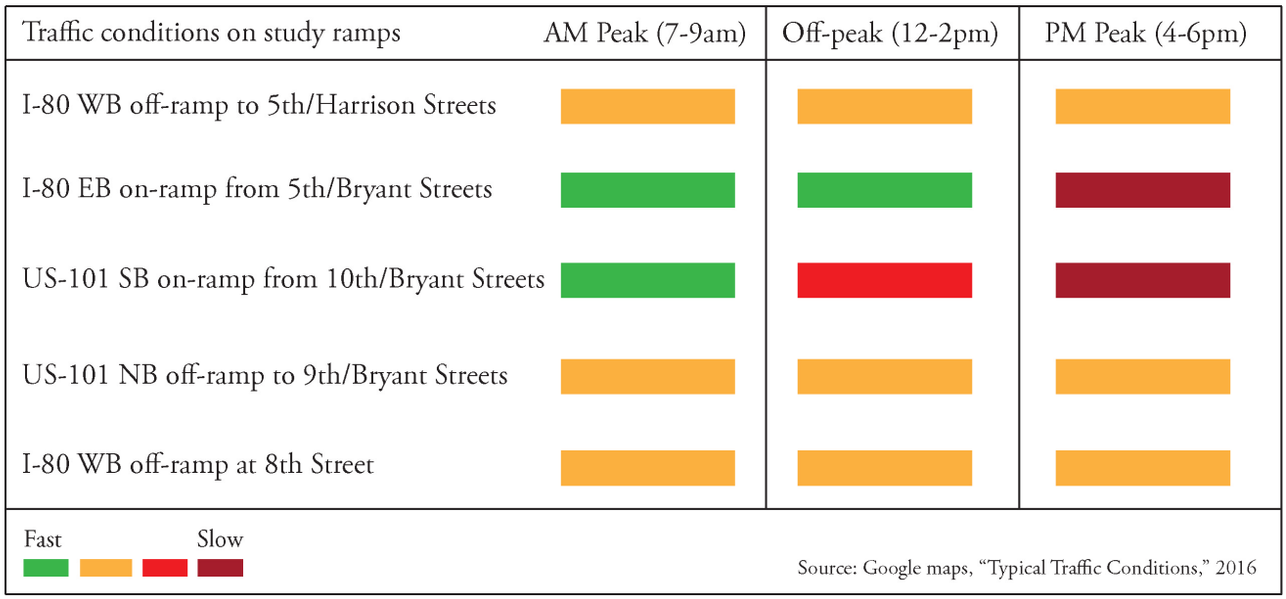
SoMa's roadway network includes the elevated I-80, I-280, and U.S. 101 freeways above a grid of arterial streets and local streets all with 25 mph speed limits. Many of the arterials are one-way, multi-lane (typically 4-5 lane) streets designed primarily to accommodate large flows of vehicular traffic. Each study intersection has five legs, four to serve the grid of city streets and an additional on- or off-ramp leg. Many of the approach legs have multiple lanes serving one or more turning movements, with some lanes requiring turns while others allowing optional turning movements, resulting in complicated traffic patterns.

To obtain a general picture of traffic congestion levels, the study team reviewed SoMa streets with Google Maps' Typical Traffic feature, which collects speed and location data from users' mobile phones to create an index for vehicle speeds on any given road. **Figure 7** illustrates traffic conditions during the a.m. peak (7 – 9 a.m.) and p.m. peak (4 –- 6 p.m.) periods in SoMa (ranging from green for uncongested to dark red for slow/congested). On freeways, traffic is relatively free-flowing on westbound I-80, southbound I-280, and southbound U.S. 101 during the morning commute, as indicated by Typical Traffic's green and orange ratings. However, northbound U.S. 101 is congested on the Central Freeway and eastbound I-80 experiences moderate to high congestion, especially between 5th Street and 7th Street approaching the Bay Bridge. Traffic congestion in the p.m. peak period is significantly worse than in the morning throughout the SoMa freeway network, particularly on eastbound I-80. Congestion begins on both I-80 E and U.S. 101 N as early as 1:30 p.m.

Typical Traffic indicates that congestion on the street network exhibits similar patterns, with morning congestion primarily on northbound streets in the one or two blocks approaching Market Street, while the p.m. peak has more widespread congestion across the SoMa street network. P.m. peak congestion is especially high on streets approaching freeway on-ramps. Freeway congestion, especially during the p.m. peak, frequently results in on-ramp queues spilling back across study intersections to upstream blocks. Both the study team and community stakeholders frequently observed these queues resulting in blocked crosswalks and intersections.

Figure 8 illustrates how congestion affects ramps at the study intersections. The I-80 eastbound on-ramp from 5th and Bryant streets and the U.S. 101 southbound on-ramp from 10th and Bryant streets experience the most severe traffic congestion during the p.m. peak period, while the remaining ramps have moderate traffic congestion throughout the day.

FIGURE 8: TYPICAL TRAFFIC CONDITIONS ON STUDY INTERSECTION RAMPS

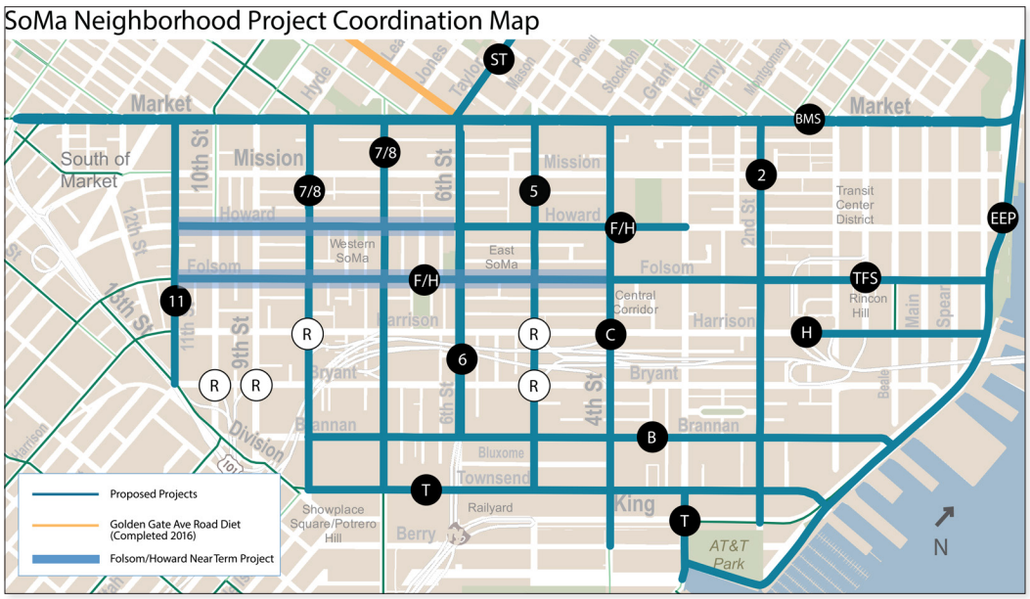


F. RELATED PLANNED PROJECTS

Many other projects and planning efforts are underway to improve streets in the SoMa neighborhood, as illustrated in **Figure 9** (Study Streets – Planned Capital Projects).

SFMTA has two planned capital projects – the 5th Street Improvement Project and the 7th Street and 8th Street Near-Term Safety Project – that include three of the five study intersections. The 5th Street Improvement Project will improve safety along the corridor between Townsend and Market streets and is considering potential pedestrian, bicycle, transit, and loading parking improvements. SFMTA plans to install these improvements between late 2018 and late 2019. The 7th Street and 8th Street project is implementing protected bikeways, transit boarding islands, a traffic lane reduction, traffic signal upgrades, and other safety improvements along 7th Street between Market Street and Folsom Street and along 8th Street between Market Street to Townsend Street. Project implementation is phased, with improvements in some portions of the corridors already implemented and the remainder of the upgrades slated for construction in 2018. The study team is coordinating with SFMTA to make sure that recommended improvements are integrated with respective planned capital projects. For more details, refer to Appendix D.

FIGURE 9: STUDY STREETS – PLANNED CAPITAL PROJECTS



- (R) Vision Zero Ramp Intersection Study
- (2) 2nd Street Improvement Project
- (5) 5th Street Streetscape Project
- (6) 6th Street Improvement Project
- (7/8) 7th/8th Streets Safety Project
- (11) 11th Street Improvement Project
- (B) Brannan Safety Project
- (C) Central Subway Project
- (BMS) Better Market Street Project
- (EEP) Embarcadero Enhancement Project
- (F/H) Folsom/Howard Streetscape Project
- (H) Harrison Street Project
- (T) Townsend Bicycle Strategy Project
- (TFS) Transbay Folsom Streetscape Project
- (F) Folsom 11th St. to 13th St. Southbound Bike Gap Closure
- (ST) SaferTaylor Street Project

4. COLLISION ANALYSIS

A. OVERVIEW

The study team analyzed the traffic collision history at each of the study intersections in the five-year period from 2011 to 2015 to identify patterns that improvements could address. At least 72 collisions occurred at the study intersections over this period, including two severe injuries and five fatalities. **Table 1** shows these collisions by intersection. The intersections of 5th Street and Bryant Street, 5th Street and Harrison Street, and 10th Street and Bryant Street had the highest numbers of collisions. This dataset includes San Francisco Police Department-reported collisions and all fatal collisions. It does not include any non-fatal California Highway Patrol-reported collisions between 2013 and 2015[3], which are likely to be fewer in number than the SFPD-reported collisions. Overall observations based on the available collision data include:

- **Most collisions occurred on city street right-of-way.** All recorded injury collisions occurred on city streets except for the five fatal collisions that all occurred on state right-of-way. Some state-reported collisions may be missing from the dataset as noted above.
- **All five fatal collisions appear to involve a vehicle losing control on or near a ramp, and most involved impact with a median or guardrail.** The ramp geometries or design may have been a contributing factor in these cases.
- **Most injury collisions involved two vehicles or a vehicle and motorcycle.** About 60% of the injury collisions involved two vehicles (including motorcycles); 11 percent involved a vehicle and bicyclist and 9 percent involved a vehicle and a pedestrian.
- **About a third of the collisions occurred at dusk or nighttime.**
- **Collisions involving a turning vehicle were the most common collision type overall.**

3 Collisions from this period were not yet available from the Statewide Integrated Traffic Records Systems Database.

TABLE 1: STUDY INTERSECTIONS BY NUMBER OF COLLISIONS DURING FIVE-YEAR STUDY PERIOD (2011-2015)

INTERSECTION AND FREEWAY RAMP	COLLISIONS	SEVERE COLLISIONS	FATAL COLLISIONS
U.S. 101 southbound on-ramp from 10th Street and Bryant Street	17	-	1
I-80 eastbound on-ramp from 5th Street and Bryant Street	16	1	-
I-80 westbound off-ramp to 5th Street and Harrison Street	20	1	3
U.S. 101 off-ramp to 9th Street and Bryant Street	10	-	1
I-80 westbound off-ramp to 8th Street and Harrison Street	9	-	-
Total	**72**	**2**	**5**

B. COLLISION CHARACTERISTICS

The study team analyzed police reports to determine which parties were involved in collisions (**Figure 10**). Overall, collisions at the intersection of 8th Street and Harrison Street were more evenly distributed across modes, whereas collisions between vehicles were much more frequent at 10th Street and Bryant Street. The team also analyzed which types of traffic violations or behaviors were most frequent causes of each collision (**Figure 11**). Speeding and cell-phone use may be under-reported since police may not be present to observe these behaviors prior to the collision.

FIGURE 10: PARTIES INVOLVED IN COLLISIONS BY INTERSECTION

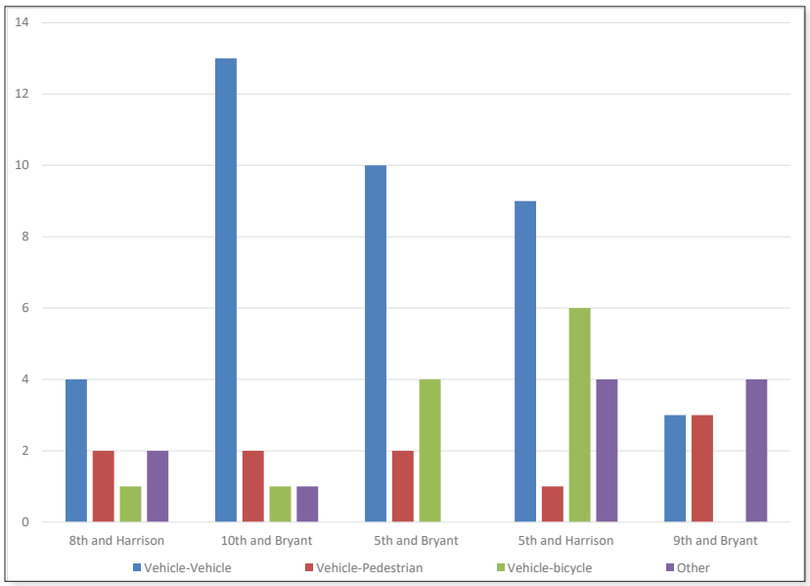
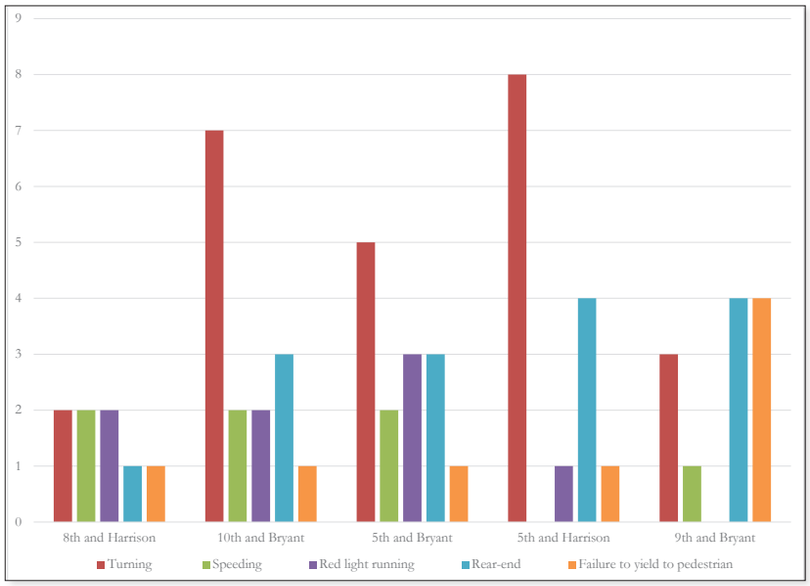


FIGURE 11: COLLISION CAUSES BY INTERSECTION



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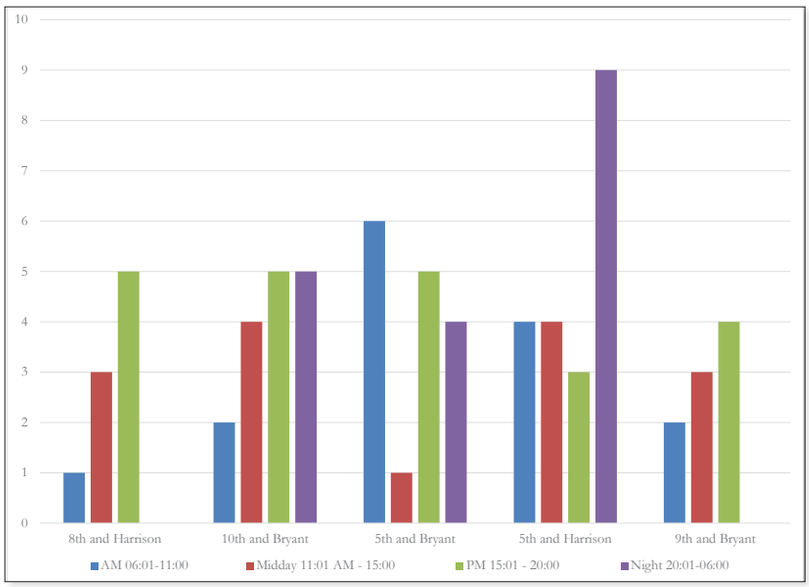
The study team also examined the time of day when collisions occurred. As shown in **Figure 12**, certain intersections such as 5th Street and Bryant Street experienced more collisions during the a.m. period, whereas 5th Street and Harrison Street experienced more collisions during the night time.

FIGURE 12: COLLISIONS BY TIME OF DAY

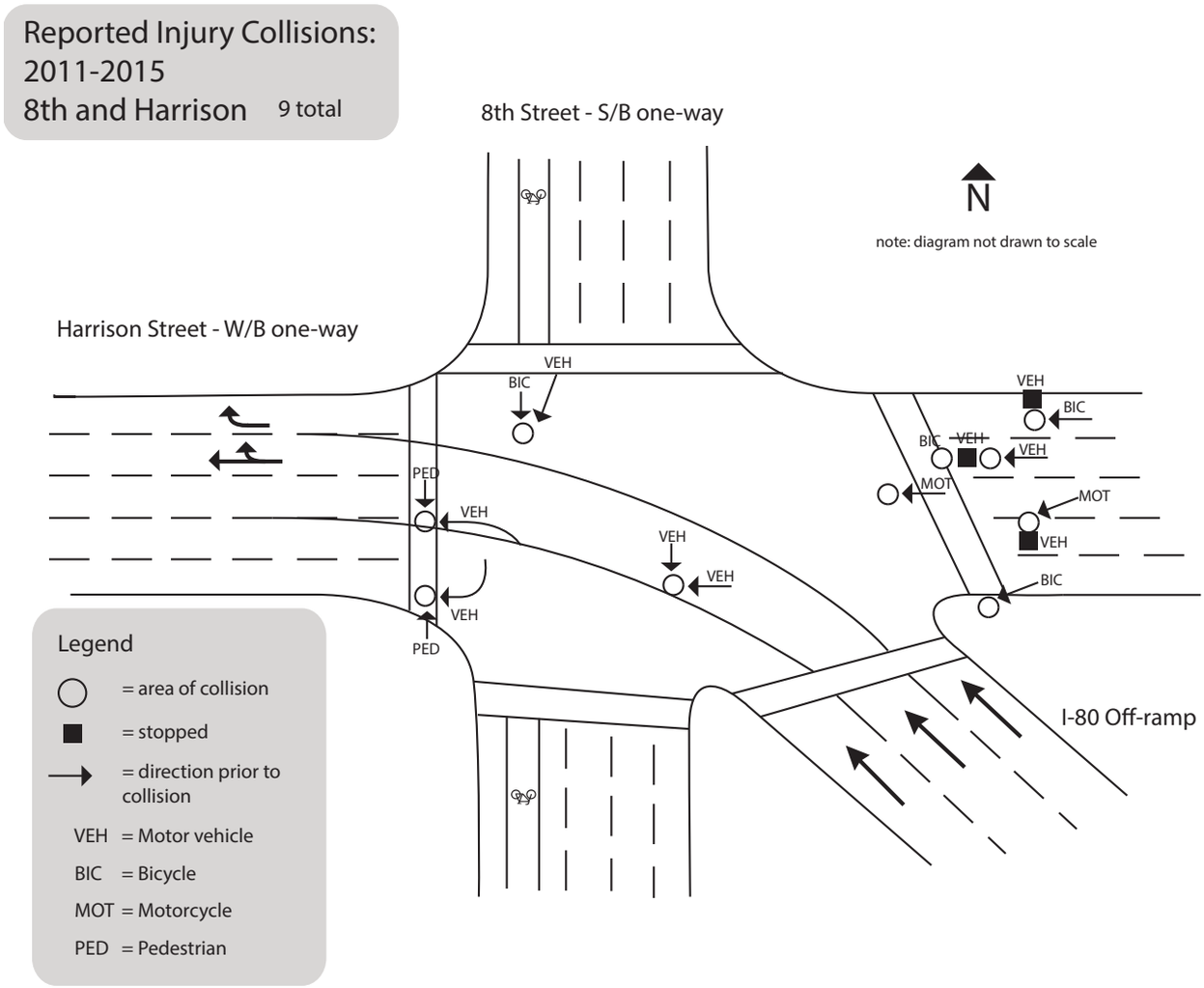


C. COLLISION DIAGRAMS

This section provides diagrams of all collisions for which the study team had access to a police report. Appendix D contains short narrative summaries of all the collisions.

8TH STREET AND HARRISON STREET

The fewest collisions occurred at the intersection of 8th Street and Harrison Street. The most common collision types involved stopped vehicles and turning movements.



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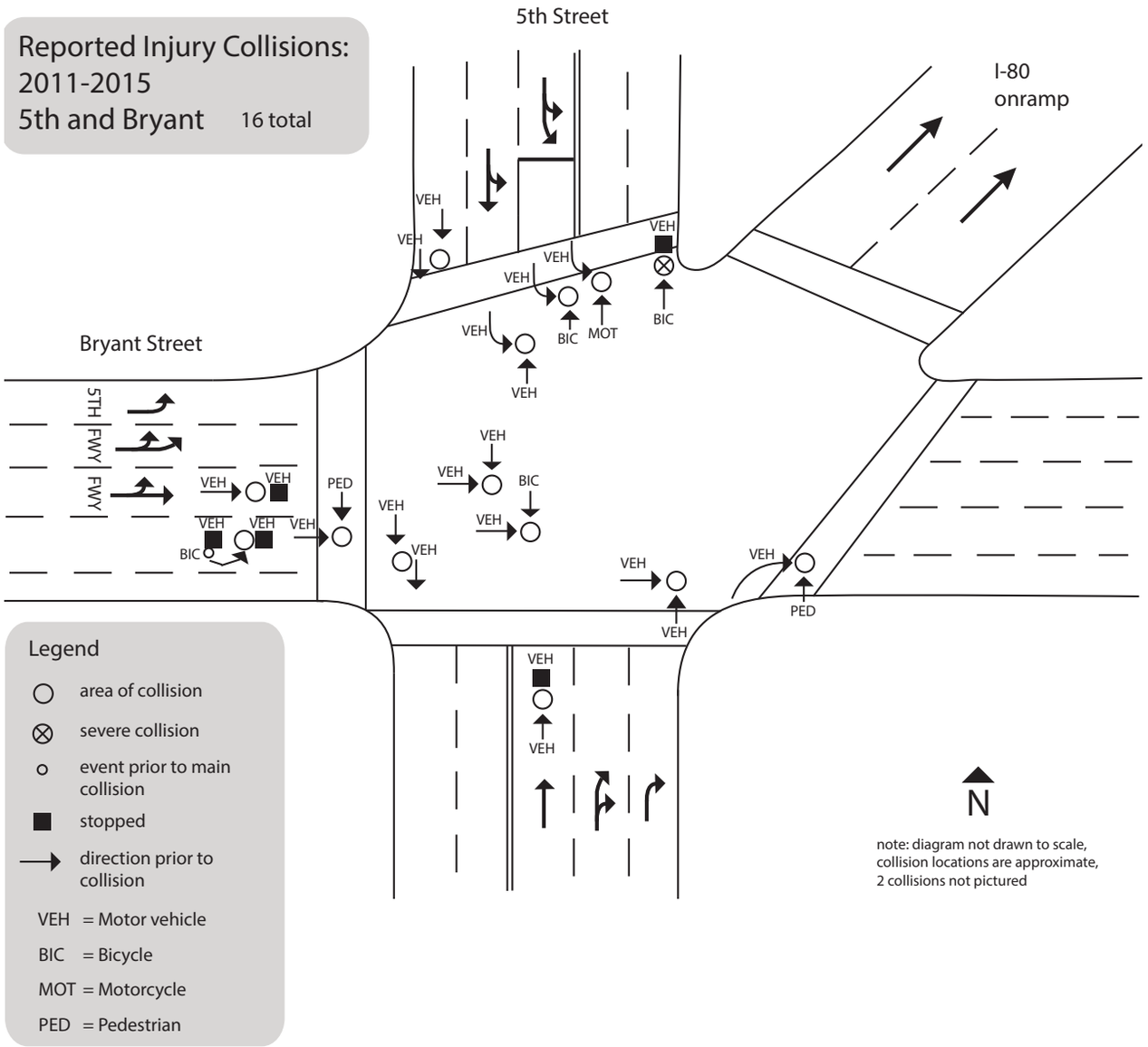
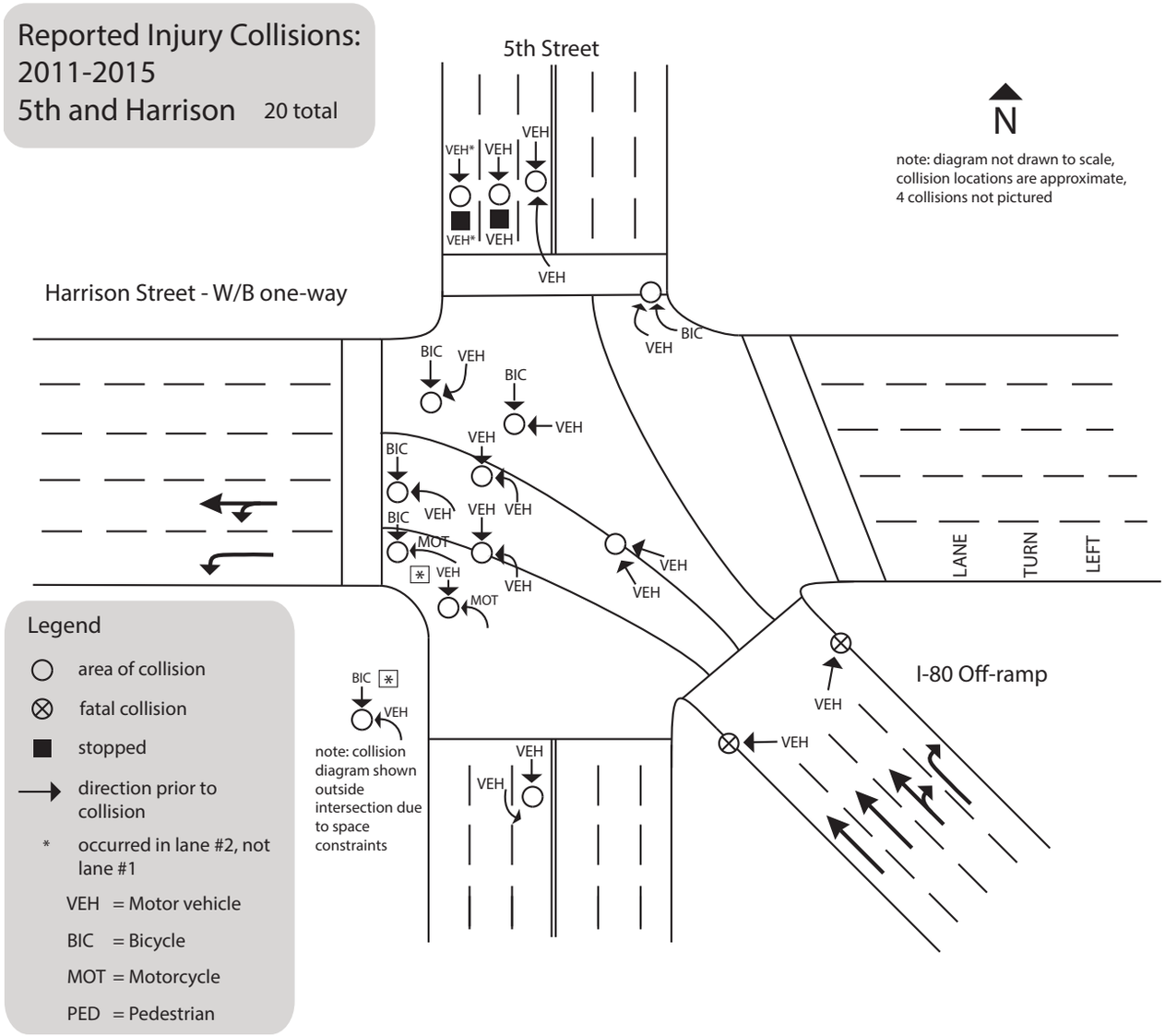
5TH STREET AND BRYANT STREET

The intersection of 5th Street and Bryant Street experiences a high frequency of turning-related collisions, especially involving vehicles turning left from southbound 5th Street onto eastbound Bryant Street colliding, with through traffic on 5th Street, and red light running-related collisions. These scenarios often result in broadside, or "t-bone" type crashes.



5TH STREET AND HARRISON STREET

The intersection of 5th Street and Harrison Street had the highest numbers of turning and multiple-injury collisions. Most turn collisions happened when vehicles turned left from northbound 5th Street onto westbound Harrison Street and hit vehicles or bicyclists travelling southbound on 5th Street. Three fatal collisions (involving four fatalities) also occurred, all located on or at the terminus of the off-ramp. This may be related to the fact that the ramp has a 25-mph curve at the end. A higher number of collisions also occurred during night time compared to the other study intersections.



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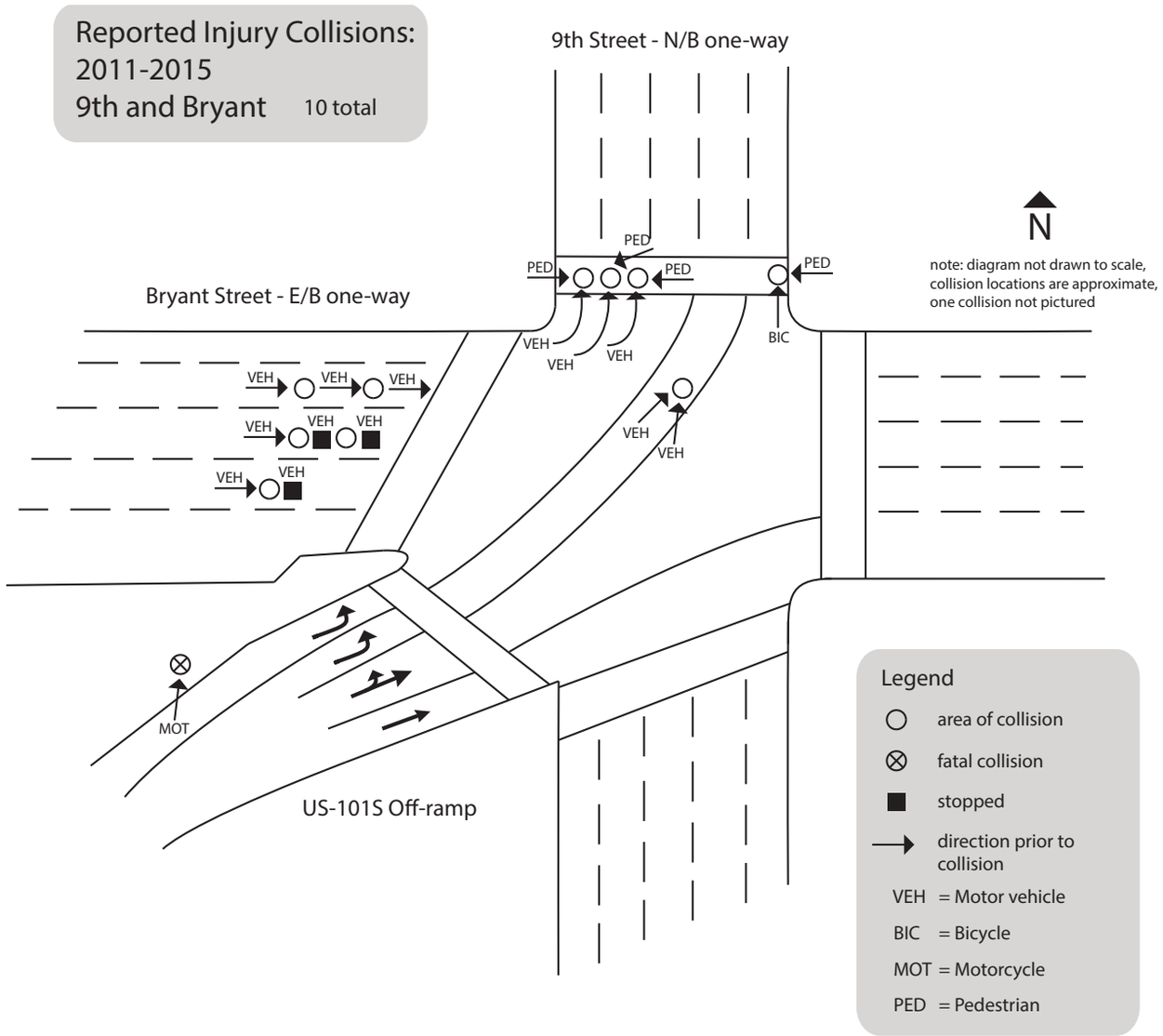
9TH STREET AND BRYANT STREET

The intersection of 9th Street and Bryant Street had the most vehicle/pedestrian conflicts of all five study intersections, mostly resulting from a failure of vehicles to yield to pedestrians in the northern crosswalk on 9th Street. More rear-end collisions (most on eastbound Bryant Street before 9th Street) occurred here than in other intersections. One fatality also occurred on the freeway off-ramp near this intersection.



5. DESIGN RECOMMENDATIONS AND EVALUATION

A. SAFETY IMPROVEMENT TOOLBOX

y, the study team developed a toolbox of short-term safety treatments that can be used for the study intersections as well as others with similar collision patterns and lane geometry. The study team applied this toolbox to the selected intersections and recommended applicable safety improvements at each location. The safety toolbox is comprised of a Caltrans-provided list of short-term treatments and additional best practice treatments commonly used in the City and County of San Francisco.

The toolbox includes improvements focused on all modes that improve street safety without major construction. The treatments in the toolbox (see Appendix F) include:

- Curb extensions (bulb-outs) to shorten the pedestrian/bicycle crossing distance and increase visibility of pedestrians/bicyclists;
- Leading pedestrian intervals to give pedestrians a head start and to reduce conflicts between drivers and pedestrians;
- Protected left turn signals to reduce conflicts between left-turning vehicles and oncoming traffic and pedestrians;
- Street-lighting to increase visibility, especially of pedestrians and bicyclists; and
- Advance stop lines to reduce crosswalk encroachment by drivers, and to provide improved sightlines at multilane approaches.

Along with this list, the study team also observed collision patterns and proposed additional best practice safety treatments to improve each intersection. The additional treatments are:

- New traffic signal mast-arms and larger traffic signal heads to improve signal visibility;
- Wayfinding signage to reduce driver and bicyclist confusion and weaving; and
- Open closed crosswalks to improve accessibility and reduce conflict points between vehicles and pedestrians, who may otherwise need to cross multiple legs of an intersection.

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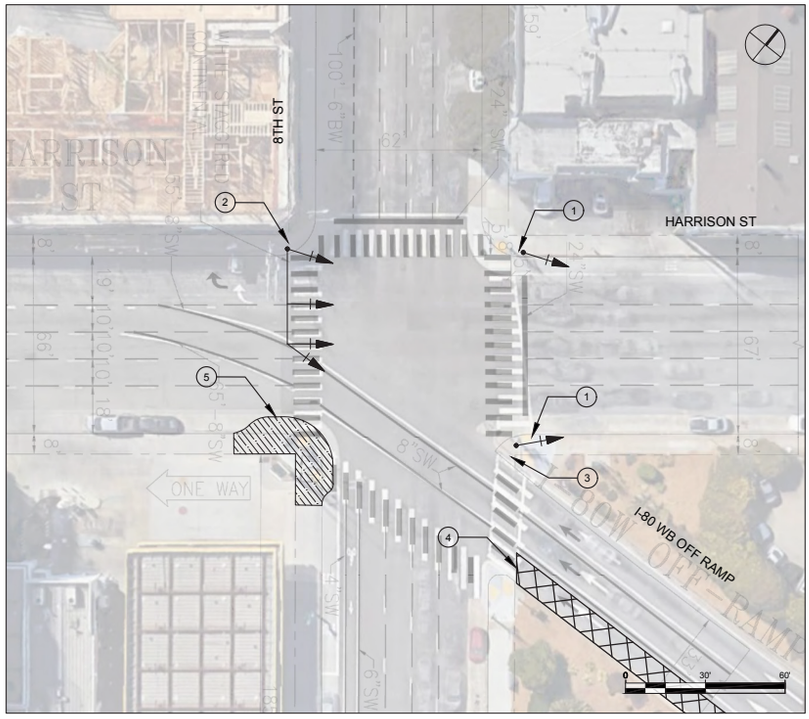
B. STUDY RECOMMENDATION DIAGRAMS

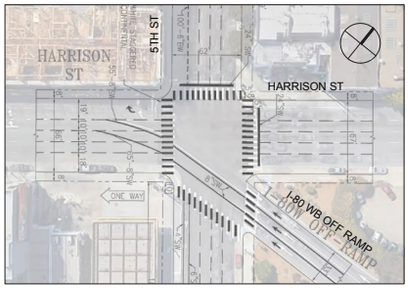
Based on the collision analyses and using the toolbox of safety treatments described in Section 5, the study team proposed design improvements at each intersection to address observed collision types.

8TH STREET AND HARRISON STREET

At this intersection, two types of collisions occurred most frequently: vehicles rear-ending stopped vehicles at the traffic light and turning vehicles colliding with pedestrians and bicyclists. These two types of collisions indicate that traffic signal visibility, as well as pedestrian and bicycle visibility, may be key contributing factors. In addition, the left lane of the off-ramp directs traffic very close to pedestrians on the sidewalk at the southwest corner of the intersection. The proposed improvements shown in include signal upgrades to improve their visibility. The study team also recommends further consideration of eliminating one of the three off-ramp lanes to direct traffic exiting the freeway farther from the southwest corner of the intersection. Implementation of this lane reduction would also enable construction of a bulb-out at the southwest corner to reduce pedestrian crossing distances.

FIGURE 13: 8TH STREET AND HARRISON STREET IMPROVEMENTS





EXISTING CONDITIONS

IMPROVEMENT CONCEPTS:

1. INSTALL NEARSIDE TRAFFIC SIGNAL
2. INSTALL TRAFFIC SIGNAL MAST ARM POLE
3. UPGRADE 8" TRAFFIC SIGNAL HEADS TO 12"
4. CONSIDER OFF-RAMP STRIPING CHANGE PENDING ON ADDITIONAL TRAFFIC ANAYSIS AND CALTRANS REVIEW
5. CONSIDER POTENTIAL INSTALLATION OF A PEDESTRIAN BULB PENDING OFF-RAMP STRIPING CHANGE

*ALL PHYSICAL IMPROVEMENTS WILL REQUIRE CALTRANS APPROVAL

HARRISON STREET / 8TH STREET

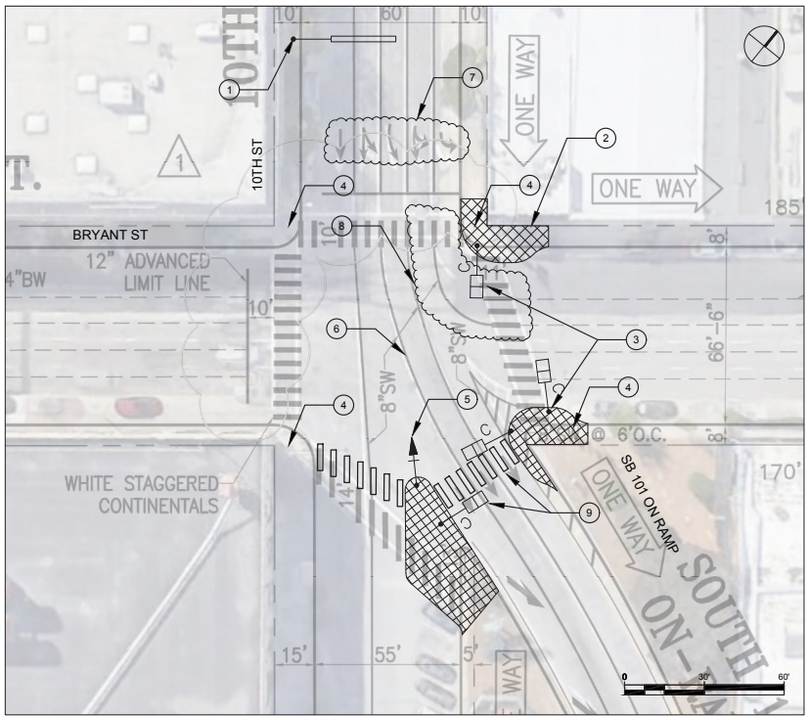
10TH STREET AND BRYANT STREET

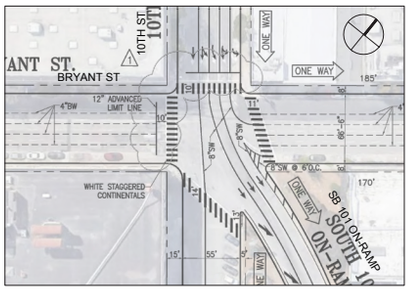
At this intersection, most of the collisions occur in the southbound direction as 10th Street (5-lane wide) directs traffic in three different directions (continuing down 10th Street, to eastbound Bryant Street, and to the southbound U.S. 101 on-ramp) with multiple lane options for each direction. This lane configuration, combined with minimal advance signage, creates a challenging navigation situation for all modes of transportation and likely results in the large number of observed turning and weaving collisions.

The recommended improvements include:

- Improve intersection wayfinding and signage:
  - » SFMTA should consider closing the southbound left turn tow-away lane to simplify lane configuration and eliminate double left turn conflicts with pedestrians.
  - » Install a cantilevered overhead lane sign for the southbound intersection approach to reduce confusion regarding possible movements from each lane.
  - » Refresh lane line delineators to improve navigation.
- Improve visibility:
  - » Upgrade and add new traffic signal heads for better visibility.
  - » Upgrade street lighting to improve visibility at the intersection.
  - » Re-stripe high-visibility crosswalk markings.
  - » Add leading pedestrian interval phases to improve pedestrian visibility.
- Improve pedestrian and bicycle facilities:
  - » Open a new crosswalk at the southeast corner of the intersection.
  - » Add pedestrian bulb-outs to shorten crossing distances.
  - » Consider adding a bike box at the southwest corner to facilitate two-stage southbound left turns.

FIGURE 14: 10TH STREET AND BRYANT STREET IMPROVEMENTS





EXISTING CONDITIONS

IMPROVEMENT CONCEPTS::

1. INSTALL CANTILEVERED OVERHEAD SIGN TO DESIGNATE LANE ASSIGNMENTS
2. INSTALL PEDESTRIAN BULB
3. PROVIDE LEADING PEDESTRIAN INTERVAL PHASE
4. UPGRADE 8" TRAFFIC SIGNAL HEADS TO 12"
5. INSTALL FARSIDE TRAFFIC SIGNAL
6. REFRESH PAVEMENT MARKINGS AND LANE DELINEATOR LINES
7. CONSIDER ALTERNATIVE LANE ARRANGEMENTS (E.G., TOW-AWAY LANE CLOSURE, TWO-STAGE BIKE BOX)
8. CONSIDER RESTRIPING CHANNELIZING LINES
9. INSTALL HIGH-VISIBILITY STAGGERED CROSSWALK MARKINGS AND NEW PEDESTRIAN SIGNALS

*ALL PHYSICAL IMPROVEMENTS WILL REQUIRE CALTRANS APPROVAL

BRYANT STREET / 10TH STREET

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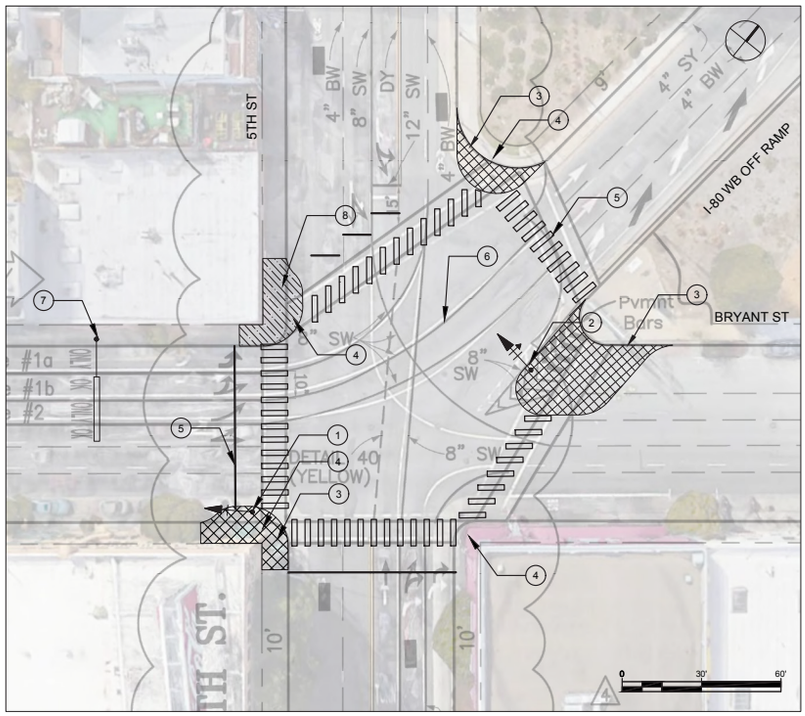
5TH STREET AND BRYANT STREET

Many of the collisions at this intersection involve turning vehicles and/or red light-running, resulting in broadside or "t-bone" crashes.

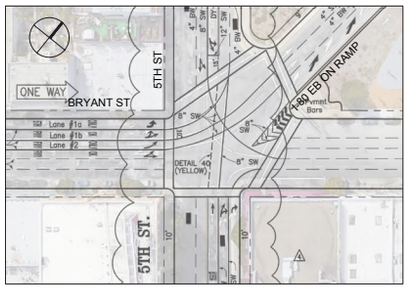
Recommendations include:

- Reduce turning conflicts:
  - » Add a protected or lagging left turn signal from northbound 5th Street onto Harrison Street to reduce conflicts with pedestrians and southbound vehicles.
- Improve visibility:
  - » Upgrade traffic signals with new mast-arms and larger signal heads for better visibility.
  - » Improve street lighting at the intersection.
  - » Add leading pedestrian interval phases to improve pedestrian visibility.
- Improve pedestrian and bicycle facilities:
  - » Install pedestrian curb bulb-outs to shorten crossing distances. The bulb-out extending into 5th Street would be temporary until the 5th Street Streetscape project design is finalized.
  - » Add a temporary median at the north leg of the intersection to more clearly demarcate the travel lanes and provide a pedestrian refuge. The median would be temporary until the 5th Street Streetscape project design is finalized.
  - » Open a new crosswalk across the south leg of the intersection, which may require an exclusive pedestrian signal phase. Add advance traffic stop bars to encourage drivers to stop in advance of the crosswalk.

FIGURE 15: 5TH STREET AND BRYANT STREET IMPROVEMENTS



BRYANT STREET / 5TH STREET



EXISTING CONDITIONS

IMPROVEMENT CONCEPTS::

1. INSTALL NEARSIDE TRAFFIC SIGNAL
2. INSTALL FARSIDE TRAFFIC SIGNAL. CONSIDER PROVISION OF PROTECTED PHASING.
3. INSTALL PEDESTRIAN BULB
4. UPGRADE 8" TRAFFIC SIGNAL HEADS TO 12"
5. INSTALL HIGH-VISIBILITY STAGGERED CROSSWALK MARKINGS AND STOP BARS
6. REFRESH PAVEMENT MARKINGS AND LANE DELINEATOR LINES
7. INSTALL CANTILEVERED OVERHEAD SIGN TO DESIGNATE LANE ASSIGNMENTS
8. CONSIDER TEMPORARY INSTALLATION OF BULB UNTIL 5TH STREET STREETSCAPE PROJECT PLANNING IS FINALIZED
9. CONSIDER POTENTIAL FUTURE BIKE NETWORK IMPROVEMENTS ON 5TH STREET DURING NEXT STAGE OF DESIGN

*ALL PHYSICAL IMPROVEMENTS WILL REQUIRE CALTRANS APPROVAL

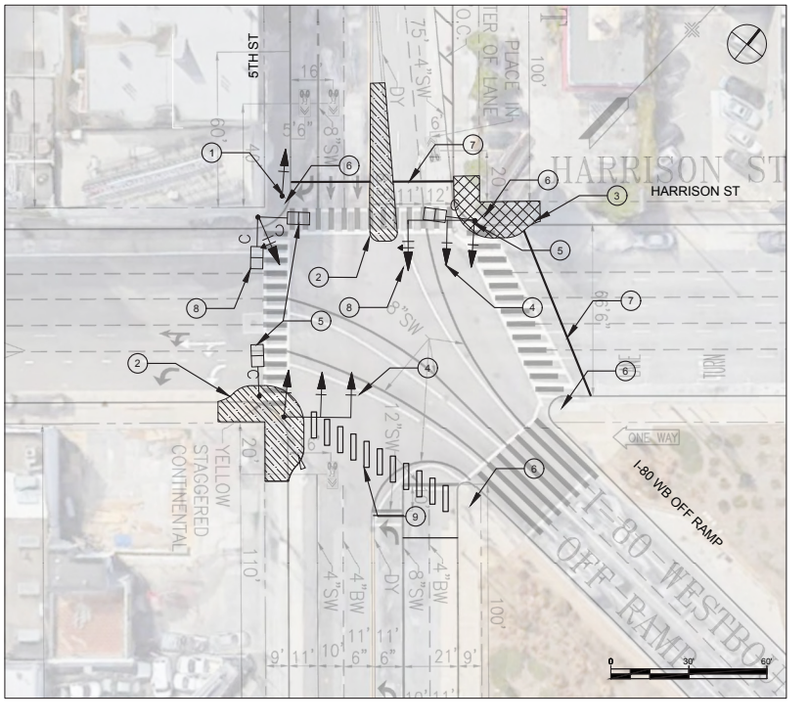
5TH STREET AND HARRISON STREET

This intersection had the highest number of collisions among the five study intersections. Many of the collisions involved vehicles making northbound left turning movements and westbound I-80 off-ramp through movements. This intersection also had a disproportionate number of night-time collisions. The proposed improvements include:

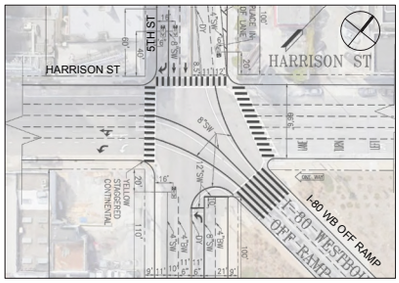
Recommendations include:

- Reduce turning conflicts:
  - » Add a protected or lagging left turn signal from northbound 5th Street onto Harrison Street to reduce conflicts with pedestrians and southbound vehicles.
- Improve visibility:
  - » Upgrade traffic signals with new mast-arms and larger signal heads for better visibility.
  - » Improve street lighting at the intersection.
  - » Add leading pedestrian interval phases to improve pedestrian visibility.
- Improve pedestrian and bicycle facilities:
  - » Install pedestrian curb bulb-outs to shorten crossing distances. The bulb-out extending into 5th Street would be temporary until the 5th Street Streetscape project design is finalized.
  - » Add a temporary median at the north leg of the intersection to more clearly demarcate the travel lanes and provide a pedestrian refuge. The median would be temporary until the 5th Street Streetscape project design is finalized.
  - » Open a new crosswalk across the south leg of the intersection, which may require an exclusive pedestrian signal phase. Add advance traffic stop bars to encourage drivers to stop in advance of the crosswalk.

FIGURE 16: 5TH STREET AND HARRISON STREET IMPROVEMENTS



HARRISON STREET / 5TH STREET



EXISTING CONDITIONS

IMPROVEMENT CONCEPTS:

1. INSTALL NEARSIDE TRAFFIC SIGNAL
2. CONSIDER TEMPORARY INSTALLATION OF BULB AND MEDIAN UNTIL 5TH STREET STREETSCAPE PROJECT PLANNING IS FINALIZED
3. INSTALL PEDESTRIAN BULB
4. INSTALL TRAFFIC SIGNAL MAST ARM POLE
5. PROVIDE LEADING PEDESTRIAN INTERVAL PHASING
6. UPGRADE 8" TRAFFIC SIGNAL HEADS TO 12"
7. INSTALL STOP BAR SET BACK FROM CROSSWALK
8. CONSIDER PROVIDING LAGGING OR PROTECTED LEFT TURN VEHICULAR PHASE
9. INSTALL PEDESTRIAN CROSSING WITH EXCLUSIVE SIGNAL PHASE
10. CONSIDER IMPROVED STREET LIGHTING AT THE INTERSECTION
11. CONSIDER POTENTIAL FUTURE BIKE NETWORK IMPROVEMENTS ON 5TH STREET DURING NEXT STAGE OF DESIGN

*ALL PHYSICAL IMPROVEMENTS WILL REQUIRE CALTRANS APPROVAL

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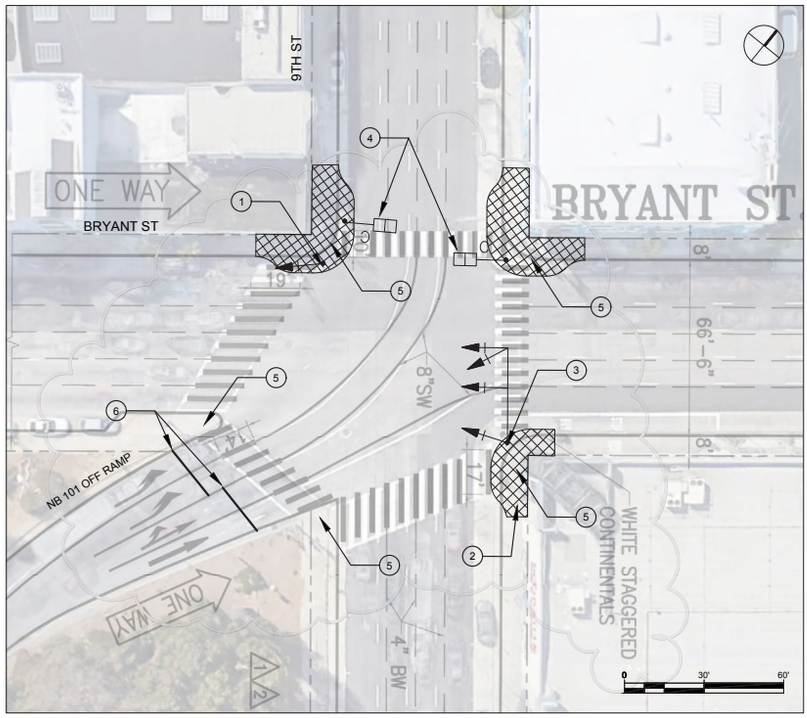
9TH STREET AND BRYANT STREET

This intersection had the highest number of vehicle-pedestrian conflicts of the study intersections. These collisions occurred at the north leg of the intersection where eastbound left turning vehicles collided with pedestrians. Improvements to pedestrian visibility could potentially prevent these conflicts. Improvement recommendations include:

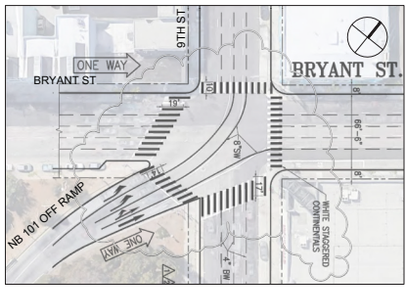
Recommendations include:

- Provide leading pedestrian interval phasing across the north leg of the intersection.
- New pedestrian bulb-outs to shorten pedestrian crossing distances.
- Advanced traffic stop-bars to provide space and visibility to pedestrians.
- Upgrade traffic signals with new mast-arms and larger signal heads for better visibility.

FIGURE 17: 9TH AND BRYANT IMPROVEMENTS



BRYANT STREET / 9TH STREET



EXISTING CONDITIONS

IMPROVEMENT CONCEPTS:

1. INSTALL NEARSIDE TRAFFIC SIGNAL
2. INSTALL PEDESTRIAN BULB
3. INSTALL TRAFFIC SIGNAL MAST ARM POLE
4. PROVIDE LEADING PEDESTRIAN INTERVAL PHASING
5. UPGRADE 8" TRAFFIC SIGNAL HEADS TO 12"
6. INSTALL STOP BAR

*ALL PHYSICAL IMPROVEMENTS WILL REQUIRE CALTRANS APPROVAL

C. EVALUATION OF RECOMMENDED DESIGNS

PLANNING-LEVEL COST ESTIMATES

The study team developed planning-level cost estimates for the five study intersections, shown in Table 2, projecting that the recommended improvements to all five intersections would cost approximately $4.4 million. The cost estimates are based on typical city costs for the proposed types of improvements, and assume concurrent implementation of similar improvements (e.g., implementing signal upgrades at multiple intersections at once). They include design and construction costs, as well as a 30 percent contingency. In addition, the $4.4 million estimate includes a placeholder for potential enhancements that could be incorporated into one or more of the intersections, in response to feedback received during public outreach. The placeholder amount is approximately equivalent to the cost of adding three additional pedestrian bulb-outs. For more detailed cost estimates, refer to Appendix G.

TABLE 2: PLANNING-LEVEL COST ESTIMATES

STUDY INTERSECTIONS	DESIGN*	CONSTRUCTION*	TOTAL COST BY PHASE*
5th Street and Harrison Street	$116,000	$580,000	$696,000
5th Street and Bryant Street	$78,000	$385,000	$463,000
8th Street and Harrison Street	$100,000	$495,000	$595,000
9th Street and Bryant Street	$138,000	$685,000	$823,000
10th Street and Harrison Street	$76,000	$377,000	$453,000
Potential Enhancement Cost			$360,000
Contingency 30%			$1,017,000
Total Cost			**$4,407,000**

*Cost estimates are rounded to nearest 1000

EFFECTS ON TRAFFIC

Most of the proposed safety improvements would not directly affect traffic capacity at the study intersections, and this study did not include a traffic analysis. However, certain proposed or potential changes would affect traffic capacity and necessitate a traffic analysis in the next phase of work. In particular, modifications to lane configurations or signal timing that reduce the capacity of freeway off-ramps–such as this study's recommendation to consider reducing the number of lanes on the westbound I-80 off-ramp at 8th Street–would necessitate completion of a detailed traffic and queueing analysis, in close coordination with Caltrans to identify how freeway off-ramp queues would be affected.

POTENTIAL PARKING LOSS

The proposed intersection safety measures will need additional street space to accommodate curb extension bulb-outs and advance stop bars. Improvements at four of the five study intersections combined will require approximately 13 on-street parking spaces be removed. The 5th Street and Harrison Street intersection will need the removal of two on-street parking spaces for curb extension bulb-outs on the northwest and southeast corners of the intersection. The 5th Street and Bryant Street intersection will need four on-street parking spaces removed for bulb-outs and advance stop bars on the southwest and southeast corners of the intersection. The 9th Street and Bryant Street location will need five on-street parking spaces removed for bulb-outs on the north, west, and east corners of the intersection, and 10th Street and Bryant Street will need two spaces removed for bulb-outs on the northeast and southeast intersection corners. Safety measures proposed at the 8th Street and Harrison Street intersection will not require any on-street parking removal. To see detailed diagrams of each intersection's potential parking loss locations, see Appendix E.

6. INTERAGENCY COORDINATION AND COMMUNITY ENGAGEMENT

A. INTERAGENCY COORDINATION

This study was led by the Transportation Authority, in close partnership with SFMTA. SFMTA staff was part of the study team and met bi-weekly to provide, discuss project updates, review deliverables, and provide input. Both agencies worked together to identify study locations, existing conditions, recommendations, funding, and implementation strategies. The study team also shared drafts of the study recommendations with Caltrans, the San Francisco Planning Department, and the San Francisco Police Department, all of which provided feedback that is either incorporated into the current recommendations or will inform the design phase of work.

B. COMMUNITY ENGAGEMENT

OUTREACH ACTIVITIES

The study intersections are in a vibrant neighborhood with diverse residents, several nearby business districts, and multiple public institutions, including schools and community centers. The study team reached out to community groups and other stakeholders in the spring and summer of 2017 to share information and gather feedback on the study intersections and proposed improvements. The study team reached out to the following organizations to share information and present recommendations. The team met with or presented to organizations marked with an asterisk (*), including some as part of the Vision Zero Task Force or at a Vision Zero D6 Quarterly Meeting, in the list below:

- Bessie Carmichael schools
- Central City SRO Collaborative*
- Pedestrian Safety Advisory Committee (PSAC)*
- San Francisco Bicycle Coalition*
- Senior and Disability Action*
- South of Market Community Action Network
- United Playaz*
- Vision Zero D6 Quarterly Meeting participants*
- Vision Zero Task Force*
- Walk SF*
- West Bay Pilipino Center*
- Western SoMa Voice*
- Yerba Buena CBD*

From this community outreach, the study team received valuable feedback on proposed improvements. Community feedback is separated into two categories:

- Refinement of proposed improvements in design and construction phase. The study team will pass this feedback to SFMTA and other appropriate agencies to address in the design and/or construction phase. The cost estimates include additional budget assumptions to incorporate these and/or other enhancements during design. Suggested design improvements included:
  - » Additional pedestrian bulbs at intersection corners;
  - » Enforcement to stop vehicles from blocking the pedestrian crosswalks;
  - » Additional advanced stop bars; and
  - » Greening in large pedestrian bulb-out areas.
- Feedback to be considered in other study or new projects. There were also suggestions that are not part of this study scope but related to improving the pedestrian and bicyclist experience throughout SoMa. These suggestions included:
  - » Sidewalk widening to provide more space for pedestrians;
  - » Bus stop amenities such as shelter, benches, and maps for transit riders;
  - » Enforcement to keep the pedestrian bulbs clear of blockages (e.g., street vendors and encampments);
  - » Additional intersections to be studied; and
  - » The need to generally address traffic congestion in SoMa.

7. NEXT STEPS

The next steps toward implementation of the recommended safety improvements include design, traffic analysis, project approvals, funding, and construction.

A. IMPLEMENTATION APPROACH

SFMTA will lead design and implementation of the recommendations in coordination with San Francisco Public Works and Caltrans, with the intent to implement the improvements within three to five years. Some changes could be implemented more quickly, such as simple striping and signal timing modifications.

SFMTA plans to incorporate recommendations at all five of the study intersections into larger corridor improvement projects or as part of its traffic signal upgrades program. The intersections at 5th Street and Harrison Street and at 5th Street and Bryant Street will be included in the 5th Street Improvement Project, which will implement pedestrian, bicycle, transit, and loading/parking improvements along 5th Street, between Townsend Street and Market Street. The project timeline calls for beginning construction of near-term project elements such as painted treatments in late 2018, with construction of longer-term treatments such as curb changes and signal upgrades to follow in 2019.

SFMTA plans to implement the remaining improvements together with similar street safety treatments at other locations in San Francisco. SFMTA has included programmatic lines for improvements on 8th, 9th, and 10th streets in its draft Capital Improvement Plan (CIP) for fiscal years 2019 through 2023. The CIP will be finalized upon approval by the SFMTA Board, expected in July 2018.

B. DESIGN AND APPROVALS PROCESS

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. Caltrans requires encroachment permits for projects with construction costs below $1 million. The proposed modifications to each of the study intersections would fall under that threshold.

Some of the proposed improvements will also require additional analysis during the design phase, particularly to determine their effects on traffic circulation. For any change that would reduce the capacity of freeway off-ramps, Caltrans requires a traffic analysis to determine whether the change would extend traffic queues onto the mainline of the freeway and create any traffic safety issues. The study has recommended further study of one change that would affect off-ramp capacity: a reduction in the number of lanes on the I-80 westbound off-ramp at the intersection of 8th Street and Harrison Street from three to two. In addition, the study's recommended changes to signal timing, including where new crosswalks, protected turn phases, and leading pedestrian intervals are proposed, could affect off-ramp signal timing and thereby reduce off-ramp capacity. SFMTA will conduct traffic analysis in coordination with Caltrans, where needed, as part of the design phase of work.

Also, during the design process, the study team recommends consideration of potential enhancements to the study recommendations, based on community input received to date. As discussed in Section 6, these could include new trees or other green infrastructure and additional safety upgrades.

C. FUNDING

The study team identified a range of potential funding sources for the proposed safety improvements, shown in **Table 3**. Potential local funding sources include the Prop K sales tax, Prop A General Obligation Bond, Prop B general fund set-aside, and Interagency Plan Implementation Committee (IPIC). In addition, the projects would likely be competitive for several other discretionary state and regional grant programs that local sources could leverage.

TABLE 3: POTENTIAL FUNDING SOURCES

FUNDING SOURCE	POTENTIAL FUNDING AVAILABLE	TIMELINE
Prop K	Approx. $5.6M available in eligible categories in FY 2018/19 (includes approximately $1.2M reserved for matching a possible Active Transportation Program grant. Approximately $500,000 represents remaining District 6 Neighborhood Transportation Improvement Program [NTIP] Capital capacity.)	Funds available through FY 2018/19. New five-year prioritization program (covering FY 2019/20 through FY 2023/24) under development.
Prop B General Fund set-aside	Pending SFMTA Board approval of FY 2019-23 CIP	
Prop A General Obligation bond	Pending SFMTA Board approval of FY 2019-23 CIP	
Interagency Plan Implementation Committee (IPIC)	Total in FY 2019/20 in eligible categories: $5,488,000. IPIC funds appropriated to SFMTA may be available pending SFMTA Board approval of FY 2019-23 CIP.	Summer 2018 call for FY 2019/20 funds
Highway Safety Improvement Program (HSIP)	$10M maximum for a project, or $250,000 for a set-aside category	Call for projects every two years, with next expected in spring 2018
Active Transportation Program (ATP)	Funds available in both a state competitive process and a regional competitive process. Anticipated $220M statewide plus $37M at regional level available over four-year period. Average of past grants about $1.8M.	Funding will be available for FY 2019/20, 2020/21, 2021/22 and 2022/23 in the ATP Cycle 4 call for projects in Spring 2018. Additional ATP funds from other sources, including cancelled projects, may result in additional and earlier funding availability.

SFMTA has included the proposed improvements in its draft CIP for fiscal years 2019 through 2023 and identified likely funding sources. **Table 4** lists the study intersections and the CIP projects they are included within.

TABLE 4: STATUS OF PROPOSED IMPROVEMENTS IN SFMTA CIP

RAMP INTERSECTION RECOMMENDATIONS	PROJECT IN SFMTA DRAFT FY 2019-23 CIP	STATUS IN SFMTA DRAFT FY 2019-23 CIP
• 5th and Harrison • 5th and Bryant	5th Street Improvement Project	• Initiated as part of the SFMTA CIP for FY 2017-21. • Scope and budget for the 5th Street Improvement Project as included in the draft SFMTA CIP for FY 2019-23 includes detail design and construction funding for proposed ramp intersection improvements.
• 8th and Harrison	Bicycle Traffic Signal Upgrades Program	• Intersection identified as proposed project location in the Bicycle Traffic Signal Upgrades Program as included in the draft SFMTA CIP for FY 2019-23. • Proposed curb work (e.g. bulb-outs) may be included as part of Street Coordination Improvements as proposed in the draft SFMTA CIP for FY 2019-23. • Transportation Authority staff will coordinate with SFMTA on Bicycle Traffic Signal Upgrades Program development following SFMTA Board approval of CIP to work toward implementation of proposed improvements.
• 9th and Bryant • 10th and Bryant	Traffic Signal Modifications Contract 36/Streets Coordination Improvements	• Design funding for citywide signal upgrades through Contract 36 as included in the draft SFMTA CIP for FY 2019-23. • Proposed curb work (e.g. bulb-outs) may be included as part of Street Coordination Improvements as proposed in the draft SFMTA CIP for FY 2019-23. • Transportation Authority staff will coordinate with SFMTA on Contract 36 scope and Streets Coordination Improvements program development following SFMTA Board approval of CIP to work toward implementation of proposed improvements, specifically to identify construction phase funding for Contract 36.

DRAFT

8. APPENDICES

A. STUDY INTERSECTION SELECTION MEMO

B. TRAFFIC COUNTS

C. RECOMMENDED IMPROVEMENT CONCEPT DIAGRAMS

D. EXISTING CONDITIONS REPORT

E. POTENTIAL PARKING REMOVAL

F. CALTRANS SHORT-TERM IMPROVEMENT LIST

G. PROJECT COST ESTIMATE