VISION ZERO SF

Working together to prioritize street safety and eliminate all traffic deaths in San Francisco by 2024

VISION ZERO HIGH INJURY NETWORK: 2017 UPDATE

A METHODOLOGY FOR SAN FRANCISCO, CALIFORNIA

JULY 2017

San Francisco Department of Public Health, Program on Health, Equity and Sustainability
in collaboration with the
San Francisco Municipal Transportation Agency

POPULATION HEALTH DIVISION
SAN FRANCISCO DEPARTMENT OF PUBLIC HEALTH

July 25, 2017 (v. 1.0)

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Executive Summary

This report describes the methodology developed in 2017 by the San Francisco Department of Public Health (SFDPH) to identify corridors with high concentrations of severe traffic injuries and fatalities in support of San Francisco's Vision Zero policy, in collaboration with the San Francisco Municipal Transportation Agency.

San Francisco adopted Vision Zero as City policy in 2014, with the goal of zero traffic deaths for all modes, including people in motor vehicles, walking, and cycling[1]. The 2017 Network update includes key data enhancements that provide the most comprehensive analysis San Francisco has had to date with respect to the location of severe and fatal injuries, which will help the City be more targeted in Vision Zero investments and identifies some locations previously not on the Network, particularly in the southeast parts of the City.

San Francisco is the first city in the country to use mapped hospital data along with police injury data to analyze spatial patterns of severe and fatal injuries in support of Vision Zero. This data was used identify locations of unreported traffic injuries – people treated at Zuckerberg San Francisco General Hospital (ZSFG) with injuries not reported to the San Francisco Police Department (SFPD). In addition, when possible, injury severity of SFPD reported data was updated to reflect a more accurate injury outcome as determined by ZSFG medical staff.

The geospatial algorithm used to calculate the network was also updated. Each block in the San Francisco street network was transformed – "corridorized" – into overlapping quarter mile sections. The highest scoring (i.e., most injuries per mile) sections along a street were selected using an injury per mile threshold set to determine network eligibility. Natural start and end points were created based on the threshold chosen. Further refinement was done based on where sections of streets had recent fatalities or were located on the original 2015 network.

The updated Network has been refocused exclusively on severe and fatal traffic-related injuries across all modes using the new comprehensive SFPD-ZSFG dataset, that also include fatalities reported by the Office of the Medical Examiner. This was done to better align the updated network with the goal of Vision Zero, eliminating all traffic fatalities and reducing severe injuries.

Table 1. Mileage Summary Statistics

	Miles of Network on City Streets*	Percent of City Streets*	Miles Overlap with 2015 VZ High Injury Network	Percent Overlap with 2015 VZ High Injury Network
2017 VZ High Injury Network	128.9	12.8%	87.8	68.1%

*****Does not include freeways, The Presidio, Fort Mason, and streets closed to vehicles.

Table 2. Injury Summary Statistics 2017 Vision Zero High Injury Network (SFPD/ZSFG, 2013-2015)*

	Count of *Severe/Fatal Injuries* on the 2017 Vision Zero High Injury Network	Percent of *Severe/Fatal Injuries* on 2017 Vision Zero High Injury Network	Count of *All Injuries* on the 2017 Vision Zero High Injury Network	Percent of *All Injuries* on 2017 Vision Zero High Injury Network
Pedestrian	404	77.1%	1,675	63.0%
Cyclist	248	71.1%	1,319	62.8%
Vehicle	450	74.5%	4,536	59.5%
All Injuries	1,102	74.6%	7,530	60.8%

*****Geocoded injury data as pulled on 07/11/2017.
San Francisco Police Department (SFPD) collision reports, 2013-2015.
Zuckerberg San Francisco General Hospital (ZSFG) data linked to Emergency Medical Services data, 2013-2015.

Figure 1. Map of 2017 Vision Zero High Injury Network

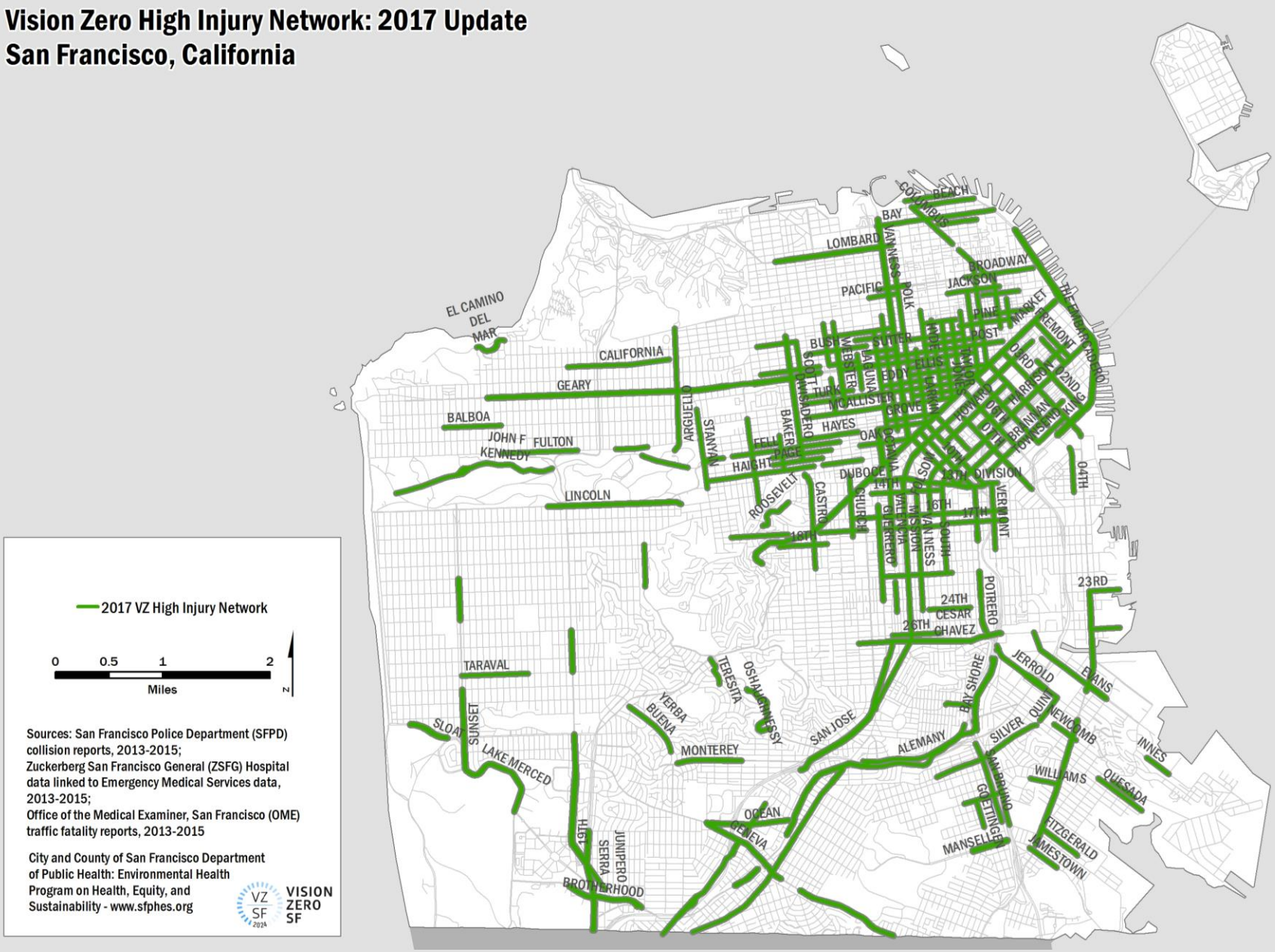
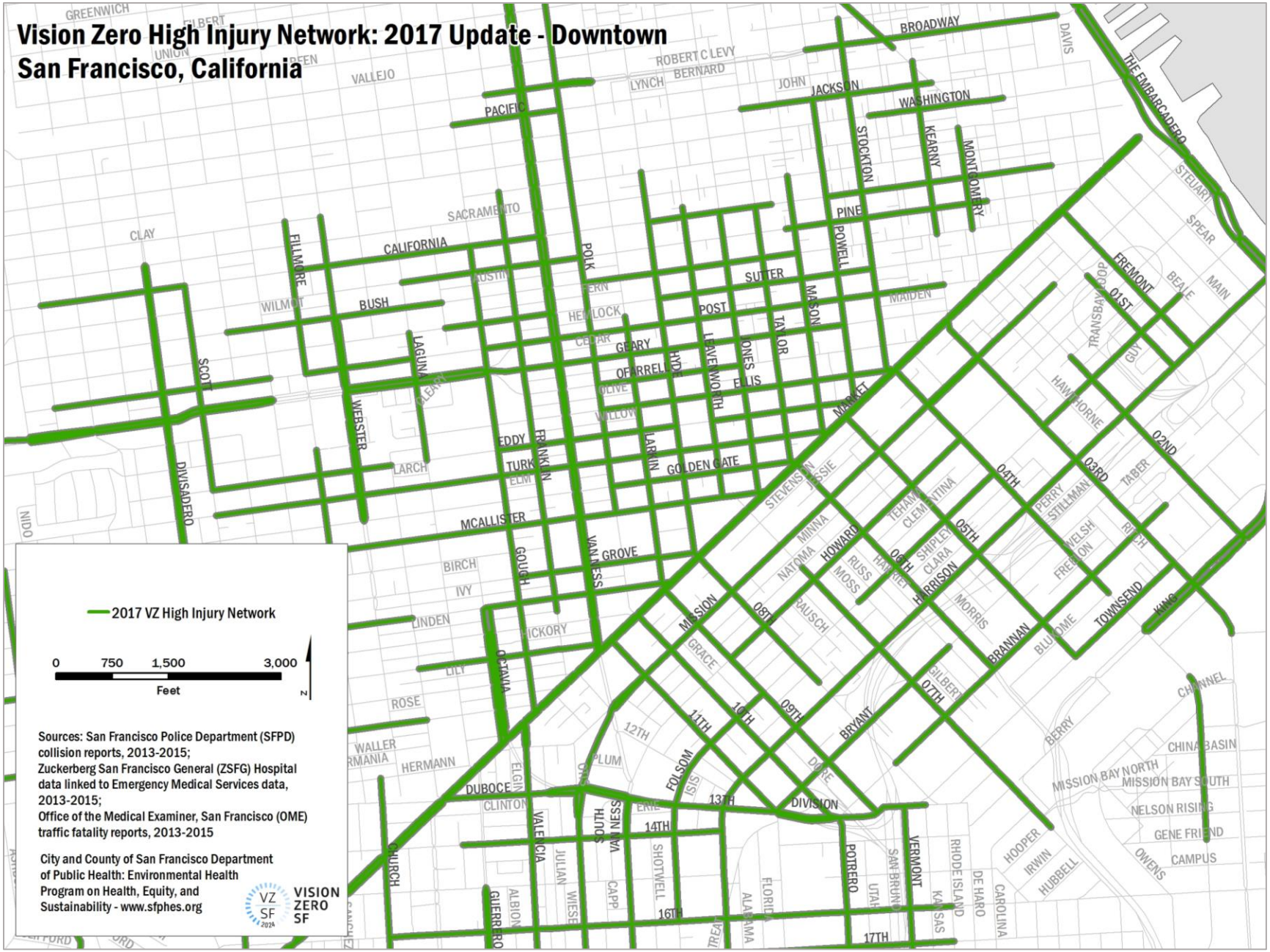


Figure 2. Downtown Map of 2017 Vision Zero High Injury Network



Recommended Citation

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Disclaimers

Data and Methods: This methodology is provided as public information as defined under San Francisco and California public records laws. The San Francisco Department of Public Health (SFDPH), the San Francisco Municipal Transportation Agency (SFMTA), and the San Francisco Police Department (SFPD) cannot limit or restrict the use of this methodology by other parties in any way. Where this methodology is communicated, distributed, reproduced, mapped, or used in any other way, the user should: 1) acknowledge SFDPH's Program on Health, Equity, and Sustainability (PHES) as the methodology's source (see Recommended Citation) and SFDPH-Traffic Injury Surveillance System (TISS)/SFPD-Crossroads as the data source and include the data time period; and 2) provide a reference to this documentation where applicable. However, users should not attribute their own analysis or interpretation of data to SFDPH, SFMTA, SFPD, or the City and County of San Francisco ("City" or "CCSF").

While the data presented in this report has been collected and/or produced for the use of the City, CCSF cannot guarantee its accuracy or completeness. Accordingly, CCSF, including SFDPH, SFMTA, and SFPD, make no representation as to the accuracy of the information or its suitability for any purpose, and disclaim any liability for omissions or errors that may be contained therein. As all data is associated with methodological assumptions and limitations, CCSF recommends that users review all documentation associated with this analysis prior to its interpretation or communication.

The Vision Zero High Injury Network ("Network"): The 2017 Vision Zero High Injury Network represents a snapshot in time (2013-2015) where severe and fatal injuries are most concentrated. It may not reflect current conditions or changes to the City's transportation system. Although prior incidents can be indicative of future incidents, the Vision Zero High Injury Network is not a prediction (probability) of future risk. The Network approach is in contrast to risk-based analysis, which focus on locations determined to be more dangerous with increased risk or danger often calculated by dividing the number of injuries or collisions by vehicle volumes to estimate risk of injury per vehicle. The Vision Zero High Injury Network provides information regarding the streets where injuries, particularly severe and fatal, are concentrated in San Francisco based on injury counts; it is not an assessment of whether a street or particular location is dangerous. The Vision Zero High Injury Network is derived from the more severe injury outcomes (count of severe/fatal injuries) and may not cover locations with high numbers of less severe injury collisions.

Hospital and emergency medical service records from which SFPD-unreported injury and reclassified injury collisions are derived are protected by the Health Insurance Portability and Accountability Act and state medical privacy laws, thus have strict confidentiality and privacy requirements. As of June 2017, SFDPH is working in conjunction with SFDPH's Office of Compliance and Privacy Affairs, Zuckerberg San Francisco General Hospital ("ZSFG") and the SFMTA to determine how SFDPH can share the data in compliance with federal and state privacy laws. Intersection and other small-area specific counts of severe/fatal injuries have thus been intentionally excluded from this document as data sharing requirements are yet to be determined.

Only injuries and deaths with valid geographic information are mapped. All geocodable injury data is represented on the simplified San Francisco street centerline model maintained by the Department of Public Works (SFDPW)[i]. Data on transportation-related injuries on streets in San Francisco reported to SFPD, or treated at ZSFG, is queried and aggregated on a yearly basis, and is current up to December 2015. Injuries and deaths occurring at complex intersections with multiple roadways are mapped onto a single point, and injuries and fatalities occurring on highways are excluded.

SFDPH, SFMTA, and SFPD reserve the right to update this document if injury data is added, removed or revised.

[i]City and County of San Francisco Department of Public Works/Bureau of Street-Use and Mapping. 2015. San Francisco Basemap Street Centerlines. San Francisco, CA. Available at: https://data.sfgov.org/Geographic-Locations-and-Boundaries/San-Francisco-Basemap-Street-Centerlines/7hfy-8sz8/data

I. Background: 2010-2016

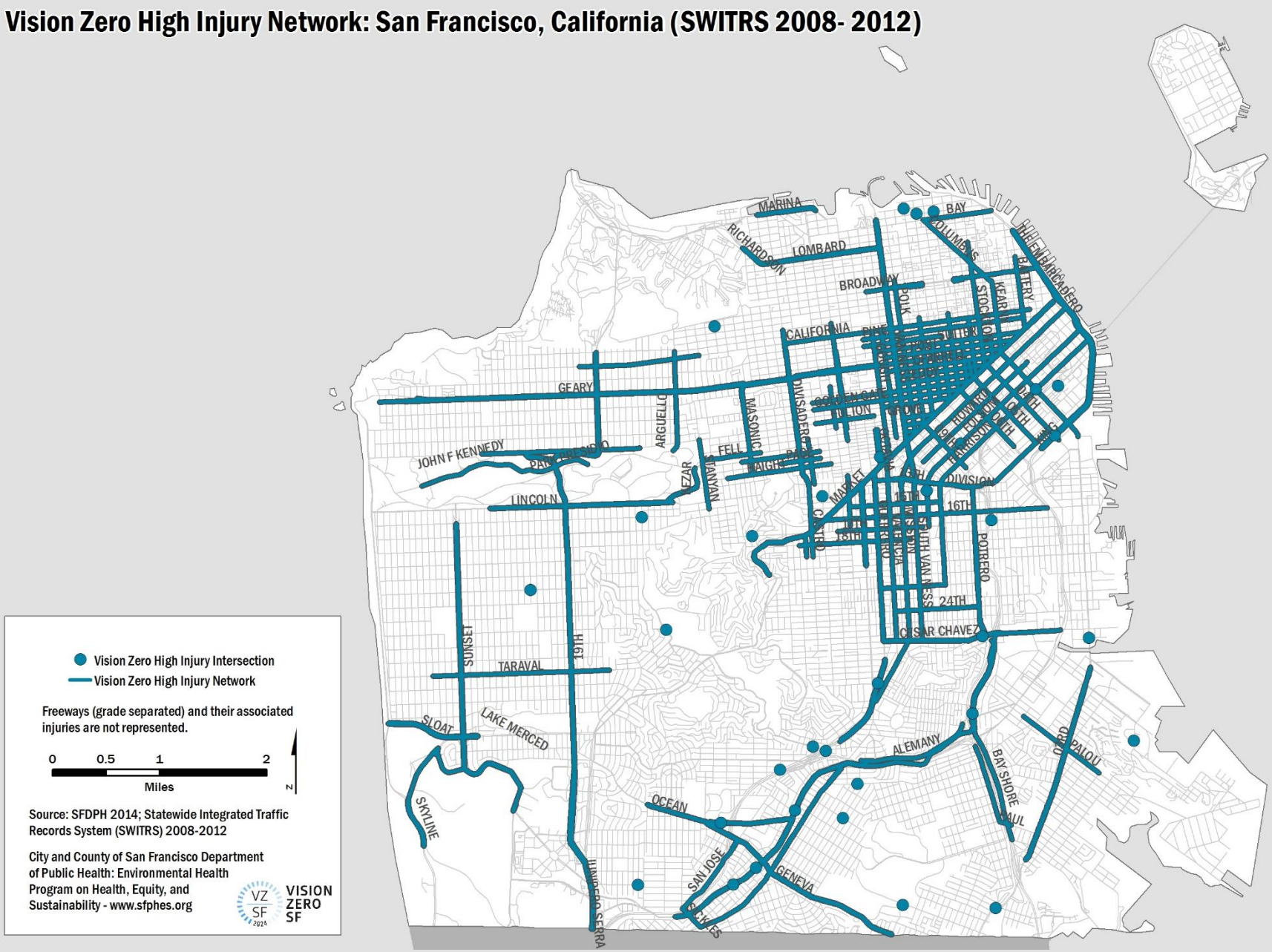
In 2014, San Francisco adopted Vision Zero as City policy – with a goal of *zero* traffic deaths for all modes, including people in motor vehicles, people walking and people cycling by 2024. This document is a summary of the 2017 analysis to update the city's Vision Zero High Injury Network in support of San Francisco's Vision Zero policy.

Corridor-level analysis supports efficient and effective transportation injury prevention. Prioritization based on high injury intersections alone typically identifies and addresses only a very small overall proportion of injuries. Because injuries, particularly severe and fatal, are relatively rare events at an individual intersection or location, there can be a high degree of variability at individual locations from year-to-year. However, when analyzing aggregated injury data over a few years, there are evident corridor patterns of injury that represent a larger share of injuries. The concentration of injury collisions along corridors often represents the aggregation of established environmental-level risk factors including traffic, pedestrian and cyclist volumes and speeds as well as other corridor-specific conditions. Interventions targeting corridors can address the factors contributing to injuries at multiple streets and intersections.

The 2017 update to the Vision Zero High Injury Network builds on previous methods employed to identify Pedestrian, Cyclist, and Vehicle High Injury Corridors for a comprehensive, multi-modal network in San Francisco. These methodologies are extensively documented elsewhere[2]. The original Pedestrian High Injury Corridors (PHIC) were created in 2011 in support of Mayor Gavin Newsom's Pedestrian Safety Executive Directive (2010) using traffic collision injury data obtained from the Statewide Integrated Traffic Records System (SWITRS) for years 2005-2009, the most current available at that time. In 2013 the PHIC was updated using SWITRS data for years 2007-2011 in coordination with SFMTA's WalkFirst, a pedestrian safety prioritization plan. At the request of the SFMTA's Livable Streets Program SFDPH created a Cyclist High Injury Corridors (CHIC) map in 2014 using SWITRS data from 2007-2011. A Vehicle High Injury Corridors (VHIC) map was created in 2014 using SWITRS data from 2008-2012 after San Francisco adopted Vision Zero. In February 2015 all three corridor maps were combined and presented as the Vision Zero High Injury Network as part of the first Vision Zero Two-Year Action Strategy, 2015-2016. Figure 3 is a map of the previous Vision Zero High Injury Network released in 2015.

SFDPH updated the network as City agencies now have access to more timely and comprehensive collision data regarding the number and severity of traffic injuries in San Francisco. SFDPH convened a technical advisory group (TAC) composed of members from SFMTA, SFPD, and the Controller's Office to advise on the refined methodological approach for the update to the Vision Zero High Injury Network as outlined in this document.

Figure 3. Map of 2015 Vision Zero High Injury Network [PREVIOUS NETWORK]



II. 2017 Methodology

Improved, More Timely Data Sources

Since the creation of the original Vision Zero High Injury Network, the San Francisco Police Department (SFPD) has adopted the Crossroads Software Traffic Collision Database System, a software program for collision report data input and management, producing queries and reports, and data analysis of traffic collisions. SFPD in conjunction with SFMTA and SFDPH have established data sharing to allow for inter-agency access to traffic collision data collected by this system. This new system allows for more timely access to SFPD Collision Report data. Prior to Vision Zero, the City largely relied on police-recorded collision reports as the primary data source of injury and death data as reported through the Statewide Integrated Traffic Records System (SWITRS) managed by the California Highway Patrol[3]. All police jurisdictions in California are required to submit their collision reports to SWITRS which then digitize the information into a database and provides it back to cities. SWITRS has recently had up to a three-year lag in providing data back to California's cities and counties.

Since the 2015 network was developed, SFDPH in conjunction with the Zuckerberg San Francisco General Hospital and Trauma Center (ZSFG), the only Level-One trauma center in San Francisco, have developed a comprehensive Transportation-related Injury Surveillance System (TISS) to conduct accurate, coordinated and timely monitoring of transportation-related injuries and deaths. This system links existing transportation-related injury and fatality data collected by City and County of San Francisco agencies (including the aforementioned SFPD collision reports, as well as hospitalization, emergency medical service, and Medical Examiner's Office (OME) data) into a comprehensive database to provide a more complete picture of transportation-related injuries occurring in the city. The creation of this data system has vastly expanded the City's access to data to better analyze the geographic distribution, causes, costs, and consequences of transportation-related injuries in San Francisco by utilizing detailed crash factor data in SFPD collision reports and health outcome data in ZSFG patient records.

Leveraging these new data sources, the 2017 Vision Zero High Injury Network Update has four main improvements:

- *Clinical Assessment of Injury Severity* - Utilizing hospitalization data from the TISS to **improve the accuracy of injury severity assessment** for SFPD-reported traffic injuries.
- *Inclusion of People Severely Injured and Treated at ZSFG but not in SFPD Data* - Utilizing the TISS data to **identify and geolocate ZSFG-only traffic injuries** in order to have a more comprehensive assessment of injury and injury locations.
- *Standardized Analytic Approach to Identifying Corridors* – Utilizing **improved geospatial analysis techniques** to better **identify concentration of linear patterns** of transportation-related severe and fatal injuries.
- *One Severe/Fatal Injury Network for All Transportation Modes* - Focusing on corridors with high numbers of killed and severely injured to **better align the network's purpose with the goal of Vision Zero to eliminate all traffic fatalities and reduce the most severe injuries.**

Clinical Assessment of Injury Severity

As described above, both SFPD and ZSFG records were included in the 2017 High Injury Network Update. TISS uses LinkSolv[4] software to probabilistically link a SFPD reported traffic injury victim to a ZSFG patient record using several variables including: time of collision/time admitted to ZSFG, victim name/patient name, victim mode of travel mode/international classification of disease (ICD) v.9 E code, collision location, etc. One of the benefits of utilizing TISS linked data is injury severity for SFPD-reported injury records linked to ZSFG records can be updated to reflect a more accurate, clinical assessment of the injury outcome as diagnosed by ZSFG medical staff. SFPD assessment of injury is determined by standards outlined in the California Highway Patrol Collision Investigation Manual and is primarily based on an officer's visual assessment of a victim at the scene of the collision. According to the manual, a severe injury is classified by the following characteristics[5]:

1. Broken of fractured bones
2. Dislocated of distorted limbs
3. Severe lacerations
4. Skull, spinal, chest or abdominal injuries that go beyond "Other Visible Injuries"
5. Unconsciousness at or when taken from the collision scene
6. Severe burns

On the other hand, ZSFG data provides a clinical assessment of injury severity. In accordance with the Vision Zero Severe Injury Protocol[6], SFDPH classifies the following ZSFG patients as severe injuries:

1. Any patient entered into ZSFG Hospital's Trauma Registry who was injured in or outside of a vehicle involved in a crash within the public roadway due to impact with a vehicle or road structure within the City or County of San Francisco requiring hospital admission for treatment of their injuries;
2. Any patient entered into ZSFG Hospital's Trauma Registry who was injured in or outside of a vehicle (bus, truck, car, motorcycle, bike, moped, light rail vehicle (LRV), train, etc.) involved in a crash within the public roadway due to impact with a vehicle or road structure within the City or County of San Francisco and sustained an ISS (injury severity score) greater than 15

ISS is an established medical score to assess trauma severity. It correlates with mortality, morbidity and hospitalization time after trauma. Major trauma is defined as being an Injury Severity Score greater than 15 and is associated with a greater than 10% risk of mortality[7]. This definition of severe traffic-related injury is consistent with previously established guidelines including those used by the American College of Surgeons, the National Trauma Data Bank, the California Department of Public Health, and the World Health Organization.

Injury severity for people in both the SFPD and ZSFG datasets was determined based on the severity as determined by ZSFG data, which could mean either upgrading or downgrading the severity classification of an injury initially assessed by SFPD at the scene. The following tables summarize changes in injury severity as originally assessed by SFPD based on ZSFG data using the above criteria.

Table 3. Reclassification of SFPD Injury Severity based on ZSFG Data for Linked Records (N=4,289; SFPD/ZSFG, 2013-2015)

Linked/Reported Injury Extent	Count Extent of Injury	Percent
SFPD Categorized: Severe Injury	**522**	**12.2%**
Remain Severe (also severe per ZSFG record)	316	60.5%
Downgraded (not severe per ZSFG record)	206	39.5%
SFPD Categorized: Other Visible Injury	**1,367**	**31.9%**
Remain Other Visible	1,088	79.6%
Upgrade to Severe per ZSFG record	279	20.4%
SFPD Categorized: Complaint of Pain	**2,335**	**54.4%**
Remain Complaint of Pain	2,047	87.7%
Upgrade to Severe per ZSFG record	288	12.3%
Total	**4,289**	**100.0%**

Table 4. Reclassification of SFPD Injury Severity based on Hospital Data for Linked Records (N=4289; SFPD/ZSFG, 2013-2015)

Injury Extent	Original SFPD Report	Reclassified SFPD/ZSFG	Percent Change
Severe Injury	522	883*	40.9%
Non-severe Injury	3,702	3,341	-10.8%
Total		**4,289**	

*includes 8 ungeocoded injuries and 1 private road (874 geocoded)

After reclassification there was a net increase of 361 severe injuries among people injured with both SFPD and ZSFG records, for a total of 987 reported severe injuries.

Inclusion of People Severely Injured and Treated at ZSFG but not in SFPD Data

Another advantage of utilizing data from TISS is the ability to include ZSFG data where a patient was injured in a transportation-related collision but no SFPD report was filed. TISS utilizes data from emergency medical service providers King-American Ambulance Company, American Medical Response, and San Francisco Fire Department Emergency Medical Services Agency, to identify locations of unreported traffic injuries. From 2013-2015, TISS identified 411 severe injuries seen at ZSFG with location information from the above providers *that were not reported in SFPD collision reports*.

Tables 5 summarize ZSFG severe injuries not reported to SFPD by mode. Table 6 summarizes ZSFG injuries not reported to SFPD by percent of total severe injuries (ZSFG/SFPD) by mode.

Table 5. Severe Injuries Seen at ZSFG and Transported by Ambulance, Not in SFPD Data by Mode (N=411; SFPD/ZSFG, 2013-2015)

	Severe Injuries Seen at ZSFG, Not in SFPD Data (N=411+)	Percent of Severe Injuries Not in SFPD Data
Bicyclist		
Severe Injury	136	33.1%
Pedestrian		
Severe Injury	114	27.7%
Vehicle		
Severe Injury	161	39.2%

+includes 8 injuries that are not consistent with the fatality protocol[8] location standards (403 geocoded)

Table 6. Severe Injuries Seen at ZSFG and Transported by Ambulance, Proportion of Total Severe Injuries by Mode (N=1,398; SFPD/ZSFG, 2013-2015)

	Severe Injuries Seen at ZSFG, Not in SFPD Data (N=411+)	Total Percent of Severe Injuries
Bicyclist (N=346)		
Severe Injury	136	39.3%
Pedestrian (N=469)		
Severe Injury	114	24.3%
Vehicle (N=583)		
Severe Injury	161	27.6%

+includes 8 injuries that are not consistent with the fatality protocol[8] location standards (403 geocoded)

Potential reasons why injury underreporting may be occurring in SFPD dataset include:

- An injured person chose not to report the collision to SFPD;
- SFPD did not respond to the scene of the injury or did not file a collision report;
- The collision was reported to another police agency (CHP, Sheriff, etc.);
- Linksolv was missing key variables and unable to complete a match.

Consistent with SWITRS, counter reports, incidents where no SFPD officer responds to a collision and an injured party files a report with SFPD at a later date, are not included in the collision dataset. As a next step for the TISS project, SFDPH staff will be conducting further research to understand underreporting of injuries and how reporting may be improved.

Combined SFPD-ZSFG Transportation Injury Surveillance Severe and Fatal Dataset

Table 7. Severe and Fatal Injuries by Data Source and Linkage Status (N=1,494; SFPD/ZSFG, 2013-2015)

	Count Injuries	Percent of Total
ZSFG - Patient Record Not Matched to Police Report	**411+**	**27.5%**
Bicyclist		
Severe Injury	136	9.1%
Pedestrian		
Severe Injury	114	7.6%
Vehicle		
Severe Injury	161	10.8%
SFPD/ZSFG - Patient Record Matched to Police Report	**883***	**59.1%**
Bicyclist		
Severe Injury	179	12.0%
Pedestrian		
Severe Injury	336	22.5%
Vehicle		
Severe Injury	368	24.6%
SFPD - Police Report not Matched to Patient Record	**104**	**7.0%**
Bicyclist		
Severe Injury	31	2.1%
Pedestrian		
Severe Injury	19	1.3%
Vehicle		
Severe Injury	54	3.6%
OME – Office of the Medical Examiner Record (Fatalities)	**96**	**6.4%**
Bicyclist		
Fatal Injury	11	0.7%
Pedestrian		
Fatal Injury	61	4.1%
Vehicle		
Fatal Injury	24	1.6%
Total	**1,494#**	**100.0%**

*includes 8 ungeocoded injuries and 1 private road (874 geocoded)
+includes 8 injuries that are not consistent with the fatality protocol[8] location standards (403 geocoded)
#1,477 injuries geocoded

Without the addition of TISS data, 27.5% of traffic-related collisions that resulted in a severe injury where the individual(s) were transported to ZSFG would not be included in the analysis (Figure 4).

Using this new 2013-2015 dataset with a larger sample size of severe and fatal traffic-related injuries, both from underreporting and reclassification of existing data, the TAC decided to move forward with a Vision Zero High Injury Network that refocused on addressing corridors with a high incidence of severe and fatal injuries. As demonstrated in Figure 5, vulnerable road users, pedestrians and cyclists, still make up the majority of the dataset.

Figure 4. Percent of Severe and Fatal Injuries by Data Source (N=1,494; SFPD/ZSFG, 2013-2015)

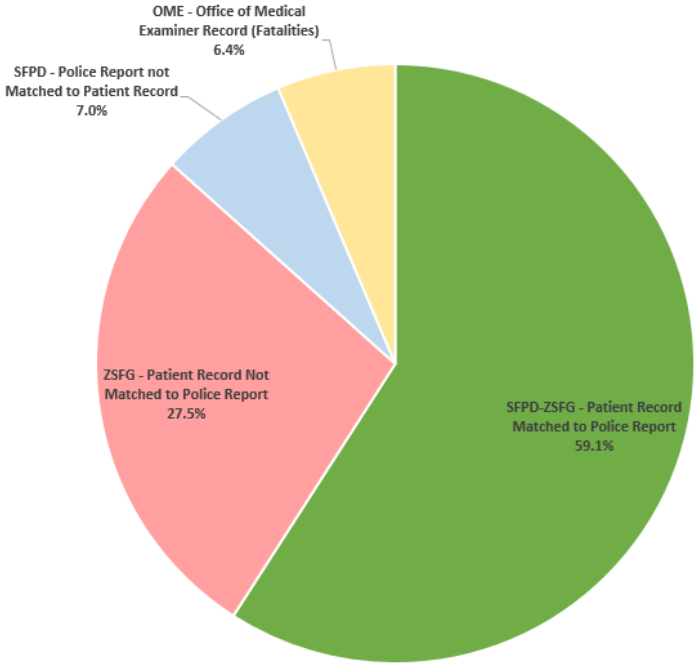
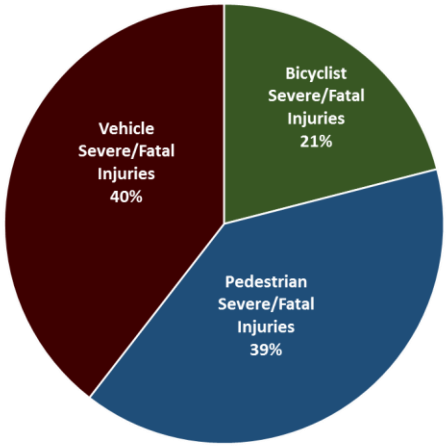


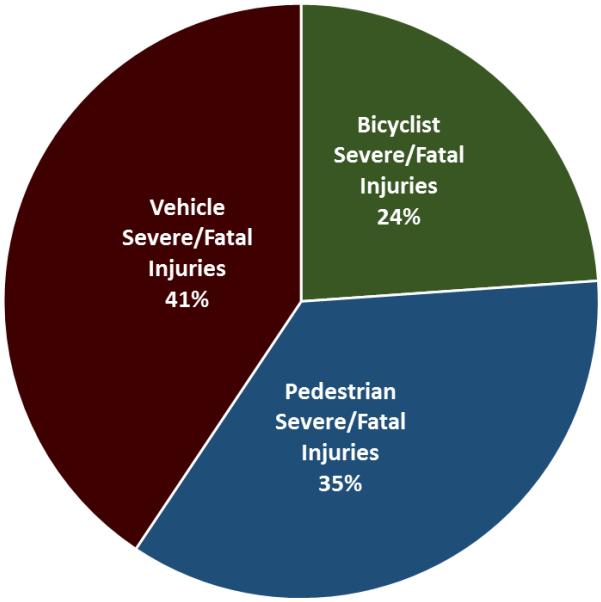
Figure 5. Comparison of Original SFPD/OME Dataset to TISS Dataset

Original SFPD Dataset Only,
Reported Only, No Injury Reclassification



N=722 SFPD/OME Reported
Severe/Fatal Injuries

Combined SFPD/ZSFG Dataset,
Reported/Unreported, Injury Reclassification



N=1,494 SFPD/ZSFG/OME
Reported and Unreported
Severe/Fatal Injuries

Standardized Analytic Approach to Identifying Corridors

In addition to improvements in the sources of traffic-related injury data, improvements were made to the way corridors were calculated in ArcGIS 10.5. Each street segment block was converted into ~0.25 mile overlapping "corridorized" sections using an ArcPy script. This was done to create a consistent unit of measurement and assess the concentration of linear patterns of injuries within a defined distance. The previous corridor methodology required manually determining where a corridor started/ended. With this new method, the highest scoring (i.e. most injuries per mile) corridorized sections within a street can easily be identified and an appropriate threshold set to determine network eligibility. Natural start and end points are created based on the threshold chosen and corridorized sections will stay consistent over time for future evaluation purposes.

Figure 6. Selection of Street Block

The street centerline geospatial model maintained by the Department of Public Works (SFDPW, 2015) was used for this analysis with freeways, private streets, and streets in the Presidio excluded. The script begins by selecting an individual street segment block.

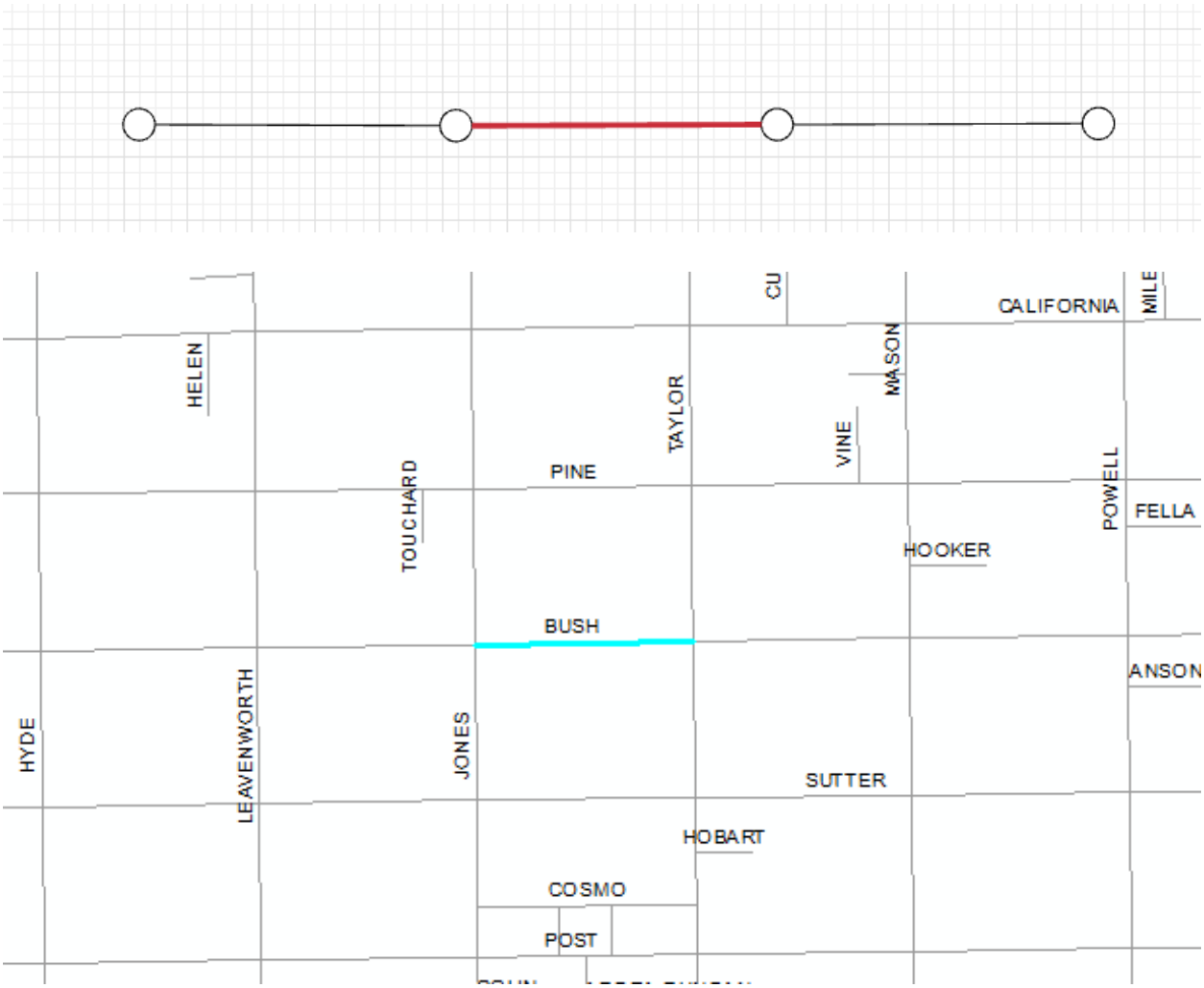


Figure 7. Conversion of Blocks into ~0.25 Mile Corridors

The script then selects the adjacent blocks on the same street. If the total is less than 0.25 miles the script the next set of adjacent blocks along the street are added until at least 0.25 miles of the street is selected. Streets that could not be converted into at least 0.25 miles were excluded from this analysis. This was done to drop out alleyways and short streets that may become over weighted when count of injuries are normalized per mile to account for minor variations in corridorized lengths. These streets and intersections will be included in other high injury analysis that include smaller geographic scales.

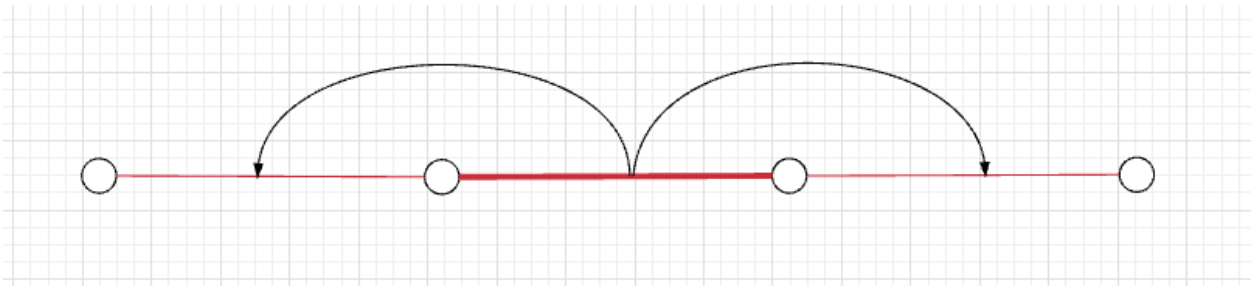
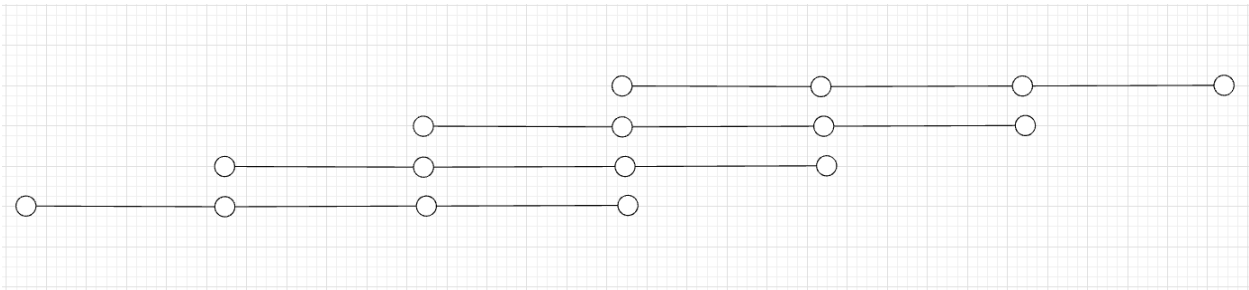


Figure 8. Iteration through All Blocks along Street

The script then moves on to the next block along the street and the process repeats until every block on that street has been converted into ~0.25 "corridorized" sections. The starting and ending points of each corridorized section overlaps part of the previous section. This process was repeated for every street block in San Francisco.



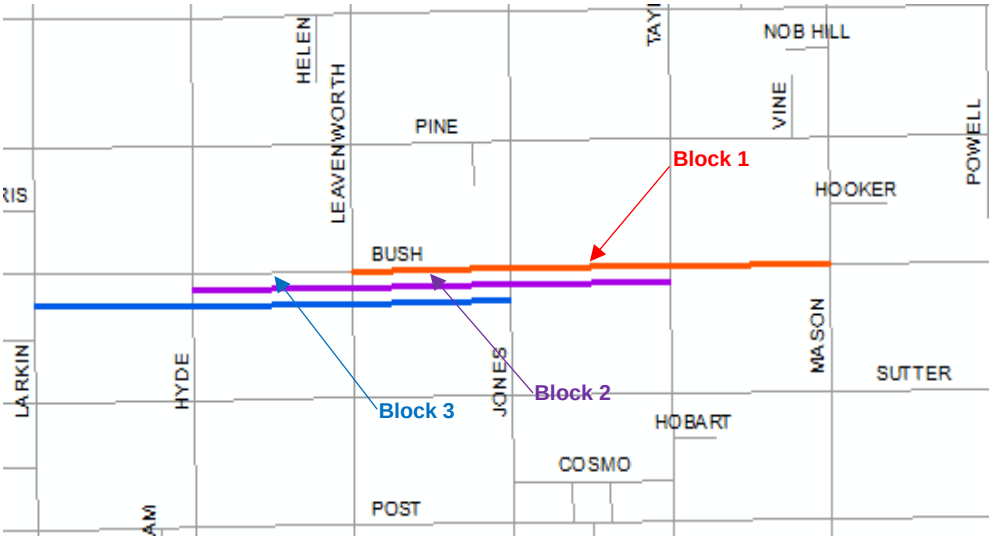


Table 8. Summary Statistics for Corridorized Street Segments

Statistic	Miles
Mean	0.33
Median	0.30
Minimum	0.25
Maximum	3.23*
Standard Deviation	0.12

*Upper Great Highway is represented as one long corridor in the SFPDW street centerline dataset.

Each corridorized section was then geometrically intersected with severe and fatal injuries to get a count of reported and unreported occurring on that section. Injuries were restricted to only those that had the same primary street as the corridorized section given that the CHP 555 manual states the primary street is "…the [street] upon which the involved party most at fault was traveling." All injuries not at an intersection were linearly referenced to the correct offset from an intersection based on the distance reported by the SFPD or an address if given by the EMS service. Count of injuries were then normalized to a per mile rate to account for minor variations in the lengths of corridorized sections.

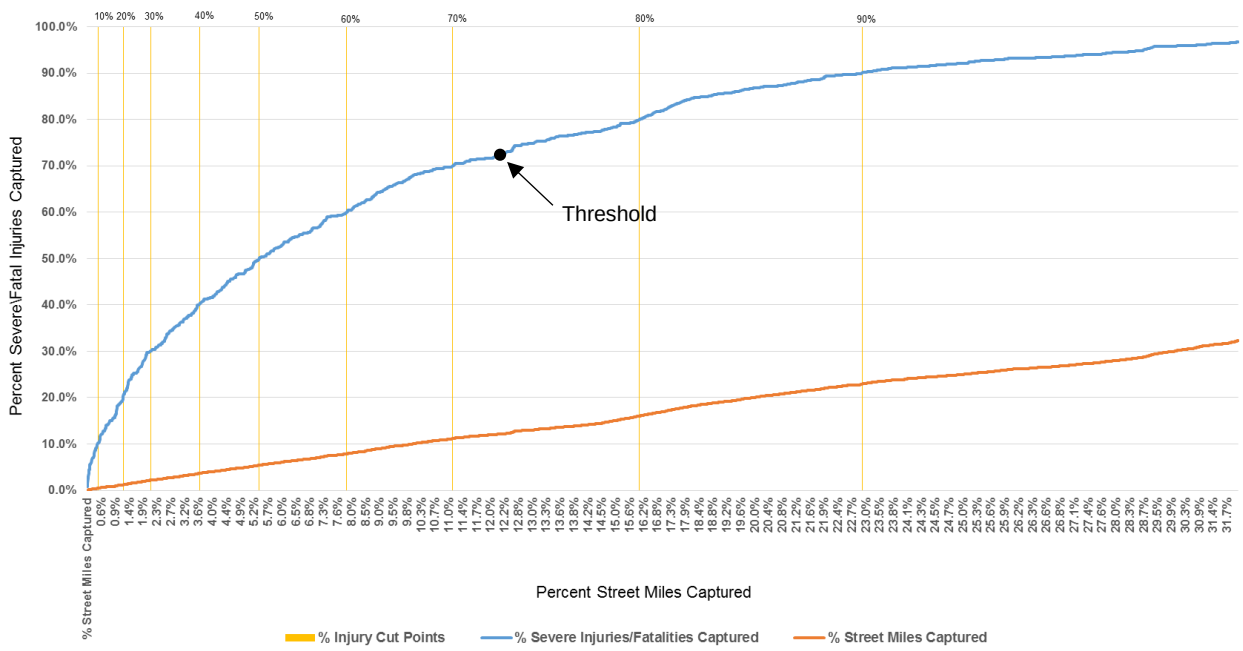
Establishing a Threshold for Network Eligibility

SFDPH with assistance from the TAC determined an appropriate severe and fatal injury per mile threshold for eligibility on the updated network. The objective was to effectively select corridors with the highest incidents of severe and fatal injuries. This was done in order to provide a map of the areas of the city with the most severe injury outcomes.

Severe and fatal injuries in San Francisco follow a power law distribution where sections of streets with the highest number of severe and fatal injuries account for a disproportionate amount of the total number of severe and fatal injuries citywide. For example, about 10 percent of all severe and fatal injuries occurring in the city can be found in only 5 city street miles (0.5 percent of total miles), yielding about 37 severe and fatal per mile as shown in Figure 10.

As one moves right on the blue curve in Figure 10, the number of street miles needed to capture the same percent of total severe and fatal injuries increases. Moving from 10 percent to capturing 20 percent of total severe and fatal injuries (a 10 percent increase) requires roughly 12 miles of street (1.2 percent of total street miles), and yields about 30 severe/fatal injuries per mile. Capturing 60 percent of severe/fatal injuries would require roughly 79 miles of street network (7.9 percent of total street miles) and yield a capture rate of 11 severe/fatal injuries per mile. Each additional city street mile yields less injuries captured per mile.

Figure 10. Distribution of Total Severe and Fatal Injuries Capture per Percent of City Street Miles



The goal of the TAC was to set a threshold that would capture approximately 70 percent of reported and unreported severe and fatal injuries, similar to the previous network. This threshold was determined to be ≥7 severe and fatal injuries per mile, regardless of mode, and strikes a good balance between percent of injuries captured versus street miles captured. The TAC created one multimodal Vision Zero High Injury Network to prioritize locating where severe and fatal injuries are concentrated regardless of transportation mode and better align with the policy goal of Vision Zero.

Additionally, given the historical context of having a pre-existing Vision Zero High Injury Network, the TAC determined that it was important that sections of the previous network be retained if they met one of the following conditions:

- If original section had ≥6 reported/unreported severe/fatal injuries per mile;
- If original section had a fatality that occurred in the last 4 years (2013-2016).

A manual verification was also conducted to assess if specific sections identified in the updated network were being highlighted due to all severe and fatal injury collisions occurring at one particular intersection along a given section. After this review the following street sections were removed from the network update and SFMTA staff were notified of the particular problem intersection:

- Lake Merced Blvd. between Sunset Blvd. and Skyline Blvd.
- 18th St. between Harrison St. and Potrero Ave.
- Park Presidio Blvd. between Clement St. and Lake St.
- Bay St. between Gough St. and Fillmore St.
- Jennings St. between 3rd St. and Cameron Wy.

Unlike the 2015 Vision Zero High Injury Network, at this point in time the 2017 Vision Zero High Injury Network does not include High Injury Intersections. They are being analyzed separately and are part of the data sharing discussion described in the *Disclaimer*.

A final manual check of the updated network was performed to verify there were no glaring errors or omissions. Based on this review the following street sections were added:

- O'Shaughnessy Blvd., not on original network, between De Vale Ave. and Bosworth St. added to capture short section of O'Shaughnessy Blvd. with several severe injuries;
- Monterrey Blvd., not on the original network, expanded between Gennesse St. and Plymouth Ave. to capture section with 2016 fatality;
- Mission St., on original network, expanded between Avalon Ave. and Trumbull St. to capture section with 2017 fatality;
- Lake Merced Blvd., on original network, expanded between Font St. and Winston Dr. to capture section with 2017 fatality.

Figure 11 shows how sections of the 2017 Vision Zero High Injury Network qualified for eligibility.

Figure 11. Map of 2017 Vision Zero Network by Eligibility

Vision Zero High Injury Network Eligibility: 2017 Update
San Francisco, California

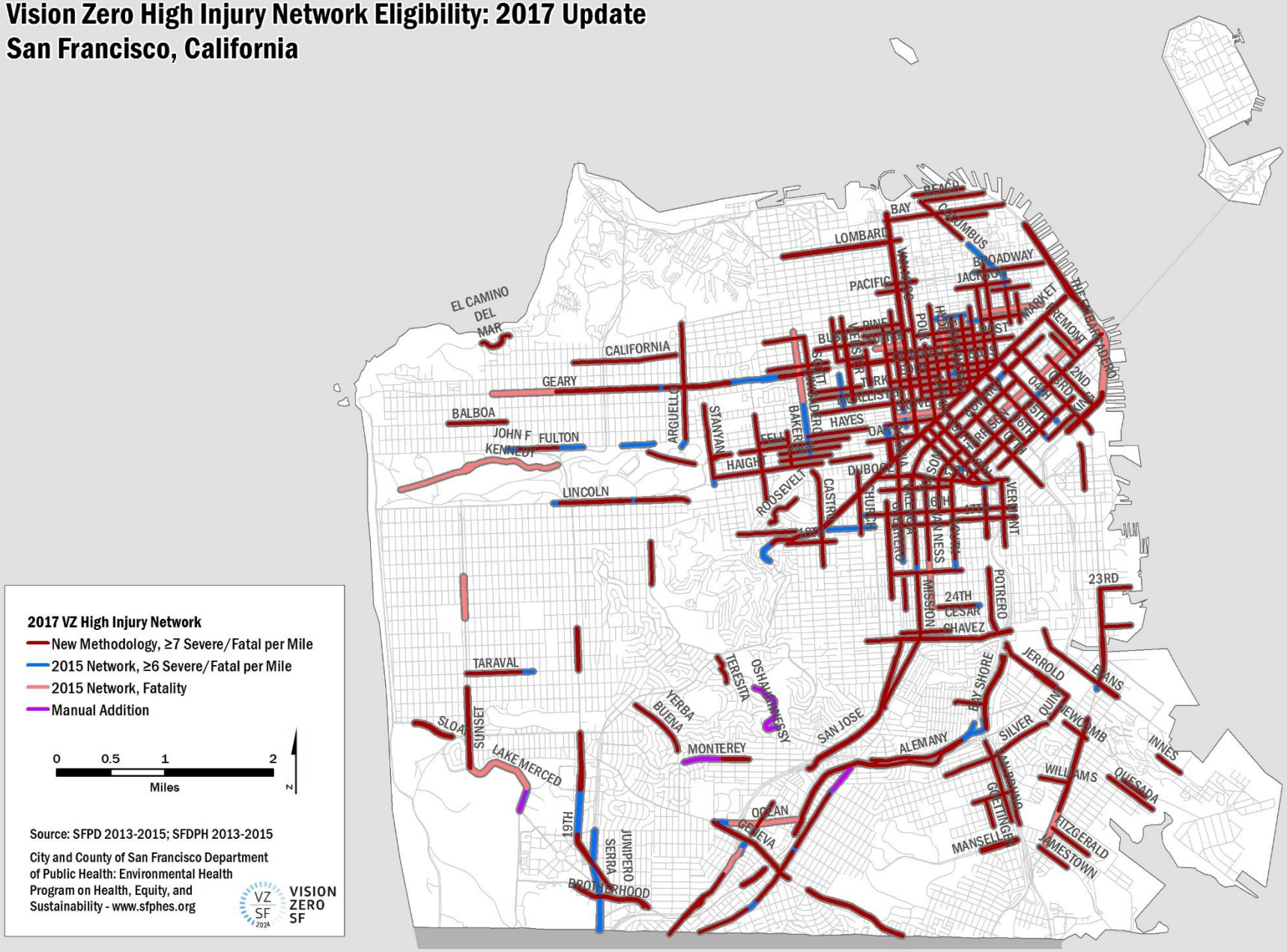


Table 9. Mileage Summary Statistics Comparison

	Miles of Network on City Streets*	Percent of City Streets*	Miles Overlap with 2015 VZ High Injury Network	Percent Overlap with 2015 VZ High Injury Network
2017 VZ High Injury Network	128.9	12.8%	87.8	68.1%
2015 VZ High Injury Network	125.3	12.6%	---	---

*****Does not include freeways, The Presidio, Fort Mason, and streets closed to vehicles.

Table 10. Injury Summary Statistics 2017 Vision Zero High Injury Network (SFPD/ZSFG, 2013-2015)*

	Count of Severe/Fatal Injuries on the 2017 Vision Zero High Injury Network	Percent of Severe/Fatal Injuries on 2017 Vision Zero High Injury Network	Count of All Injuries on the 2017 Vision Zero High Injury Network	Percent of All Injuries on 2017 Vision Zero High Injury Network
Pedestrian	404	77.1%	1,675	63.0%
Cyclist	248	71.1%	1,319	62.8%
Vehicle	450	74.5%	4,536	59.5%
All Injuries	1,102	74.6%	7,530	60.8%

*****Geocoded reported and unreported injury data as pulled on 07/11/2017.

Table 11. Injury Summary Statistics 2015 Vision Zero High Injury Network (SFPD/ZSFG, 2013-2015)*

	Count of Severe/Fatal Injuries on the 2015 Vision Zero High Injury Network	Percent of Severe/Fatal Injuries on 2015 Vision Zero High Injury Network	Count of All Injuries on the 2015 Vision Zero High Injury Network	Percent of All Injuries on 2015 Vision Zero High Injury Network
Pedestrian	342	65.3%	1,627	61.2%
Cyclist	210	60.2%	1,308	62.3%
Vehicle	378	62.6%	4,745	62.2%
All Injuries	930	63.0%	7,680	62.0%

*****Geocoded reported and unreported injury data as pulled on 07/11/2017.

In comparison to the 2015 Vision Zero High Injury Network, the 2017 Vision Zero High Injury Network captures a significantly larger percent of severe and fatal injuries occurring on city streets in a similar proportion of total city street miles; however the 2015 Network captures slightly more injuries, regardless of severity, overall.

Future Updates

SFDPH will continue to monitor changes in traffic-related injury statistics on the 2017 Vision Zero High Injury Network. It is SFDPH's goal that a comprehensive evaluation and update of the network will take place in 2019 using SFPD and ZSFG data from 2016-2018.

Please contact Devan Morris (devan.morris@sfdph.org) or Megan Wier (megan.wier@sfdph.org) for more information regarding this methodology.

References

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