



SAFE STREETS VANCOUVER

CITY OF VANCOUVER
TRANSPORTATION SYSTEM
SAFETY ANALYSIS

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Introduction

The Transportation System Safety Analysis (TSSA) for the City of Vancouver evaluated crash data from 2010 to 2016 (i.e., January 1, 2010 to December 31, 2016) to identify crash trends, high priority locations for safety improvements, and what types of projects to implement. The crash data includes vehicles, trucks, pedestrians, bicyclists and motorcyclists. The TSSA considered crash frequency, severity and common attributes of crashes. Moving forward, the outcomes from the safety analysis will be integrated into the City Transportation System Plan update. In addition, this analysis can be used to identify potential safety improvements identified at high priority locations in the City.

The TSSA considered the following for all City owned roads:

- How many crashes occurred?
- Who was involved in crashes?
- What behaviors were involved in the crashes?
- Where and when did the crashes occur?
- How did the crashes occur?

A Technical Advisory Committee composed of staff from the City of Vancouver, Clark County, Southwest

Washington Regional Transportation Council, and Washington State Department of Transportation met at each phase of the analysis to discuss findings and make recommendations.

This document presents the results of the project analyses in four major steps, each step slightly more detailed than the previous step:

Step 1: Analyze Citywide crashes, understand overall performance and trends, and identify priority crash areas;

Step 2: Narrow the analysis to understand the major common characteristics of crashes in the priority crash areas;

Step 3: Identify intersections and roadway segments with potential for safety improvements, and identify improvements at these locations; and

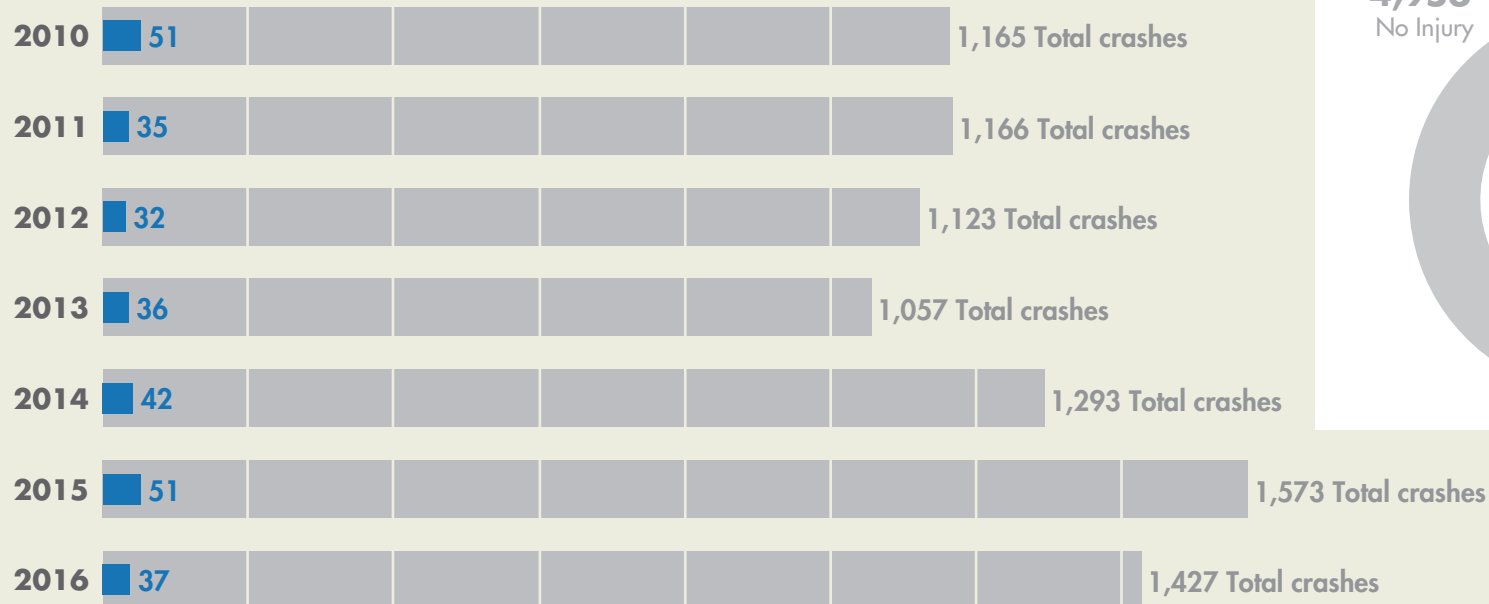
Step 4: Identify a toolbox of improvements (also known as countermeasures) to address the safety issues in Vancouver.



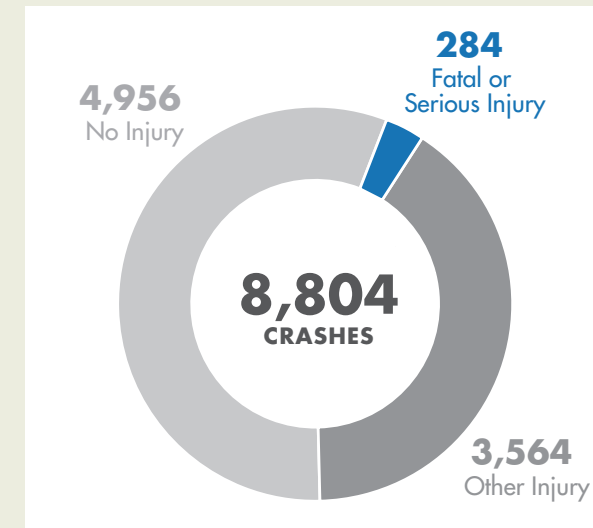
Citywide Safety Performance

Number of Crashes

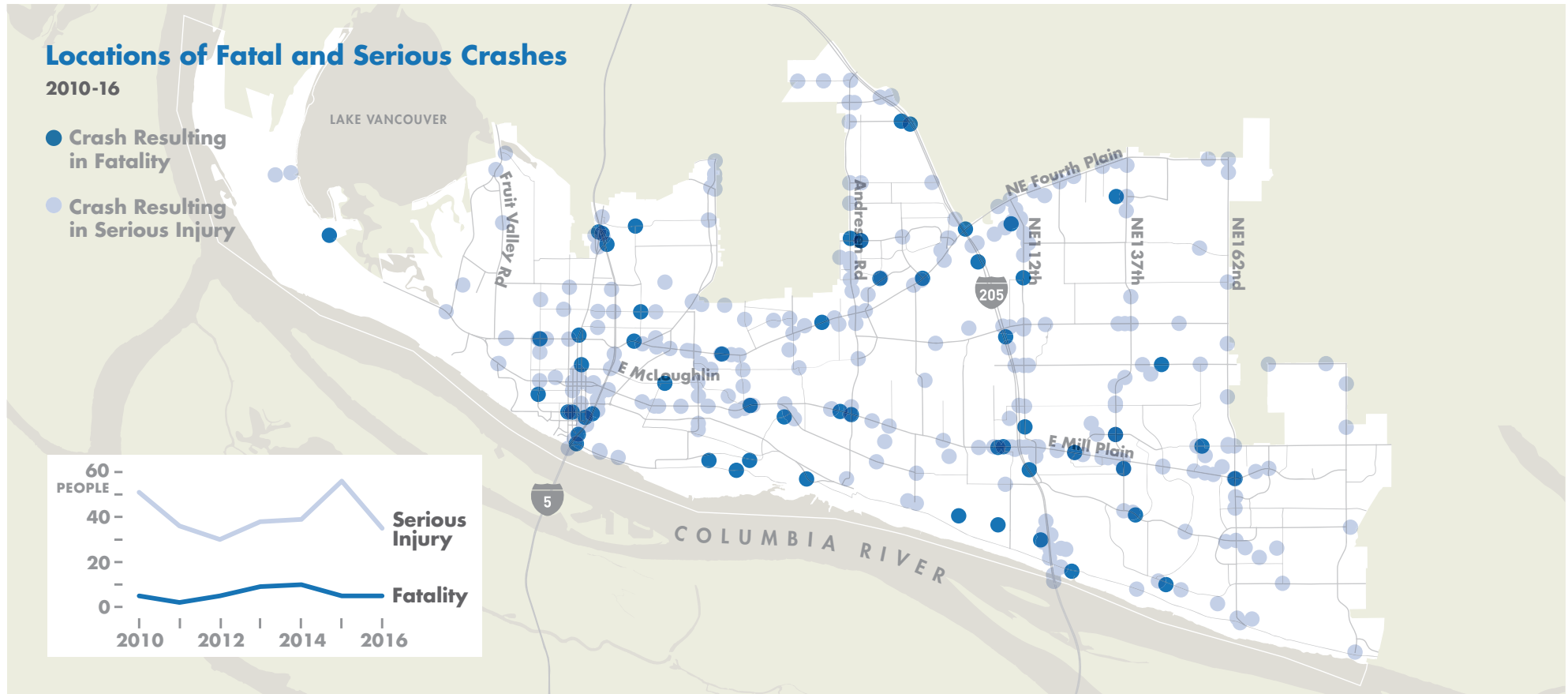
2010-16



↑ Crashes resulting in fatality or serious injury



From 2010 to 2016, there were 8,804 crashes on City-owned roads. During this period, 284 crashes resulted in a fatality or serious injury, while 4,956 crashes resulted in no injury. While the number of crashes may fluctuate year-to-year because of changes in traffic volume, weather events, work zones, or surrounding land uses, in Vancouver, the number of fatalities and serious injury crashes per year has remained relatively flat during the project study period.

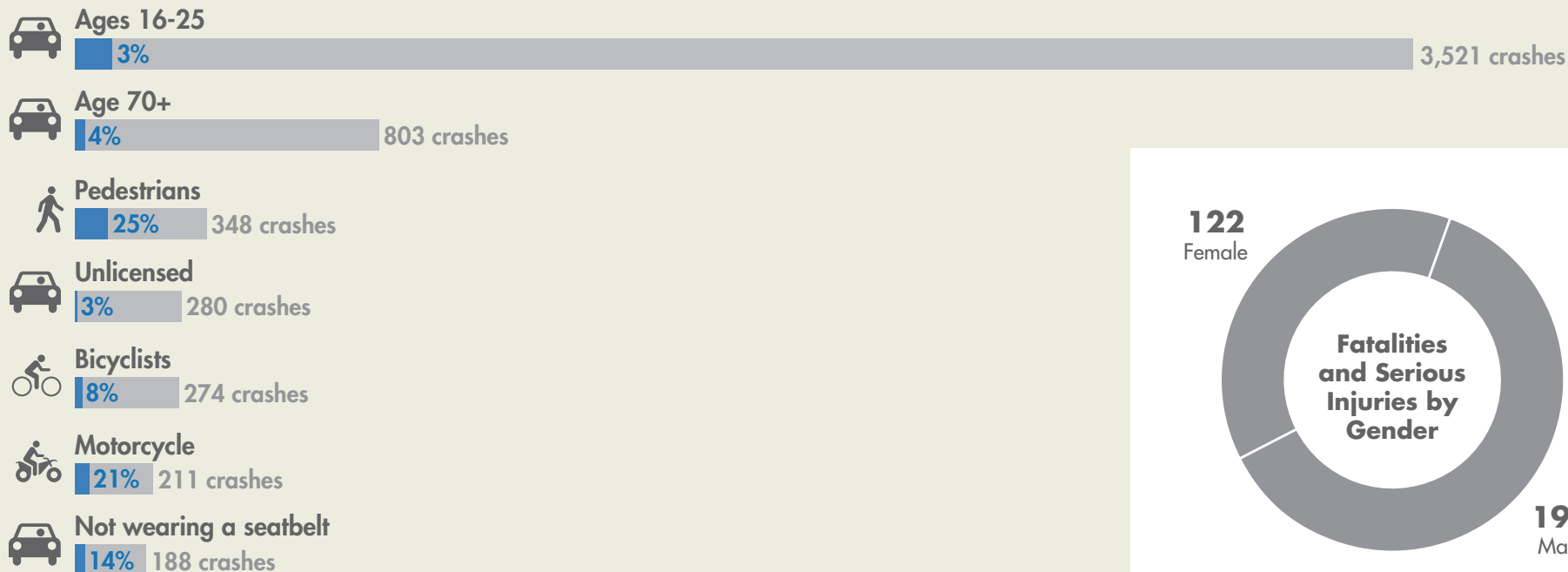


Crashes are concentrated on the major roadways in Vancouver, and there were more crashes east of Interstate 5 than west of Interstate 5—consistent with distribution of land in Vancouver. Overall, from 2010-2016 there were:

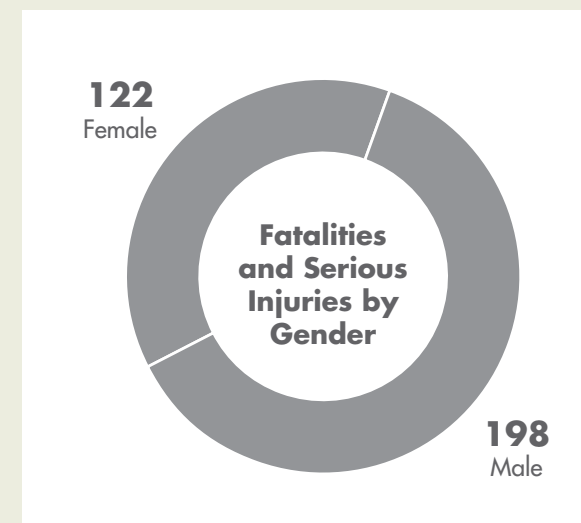
- 41 people killed in traffic crashes, on average approximately 6 fatalities per year
- 285 people seriously injured in crashes, on average approximately 41 serious injuries per year; and
- 110 people killed or seriously injured using active transportation, on average approximately 16 fatalities and serious injuries per year

Most Frequent Crashes By Road Users

2010-16



↑ Crashes resulting in fatality or serious injury



In Vancouver, young drivers between the ages of 16 and 25 are most frequently involved in crashes by a wide margin. They are also the largest group of people involved in fatal and serious injury crashes, followed by pedestrians, motorcycle riders, and older drivers (age 70+). However, in proportion to the number of crashes, there is more risk of fatal or serious injury associated with pedestrian crashes: 25 percent of all pedestrian crashes include a fatal or serious injury and three percent of young driver crashes involve a fatal or serious injury. Approximately four percent of the total number of crashes in the City involved a

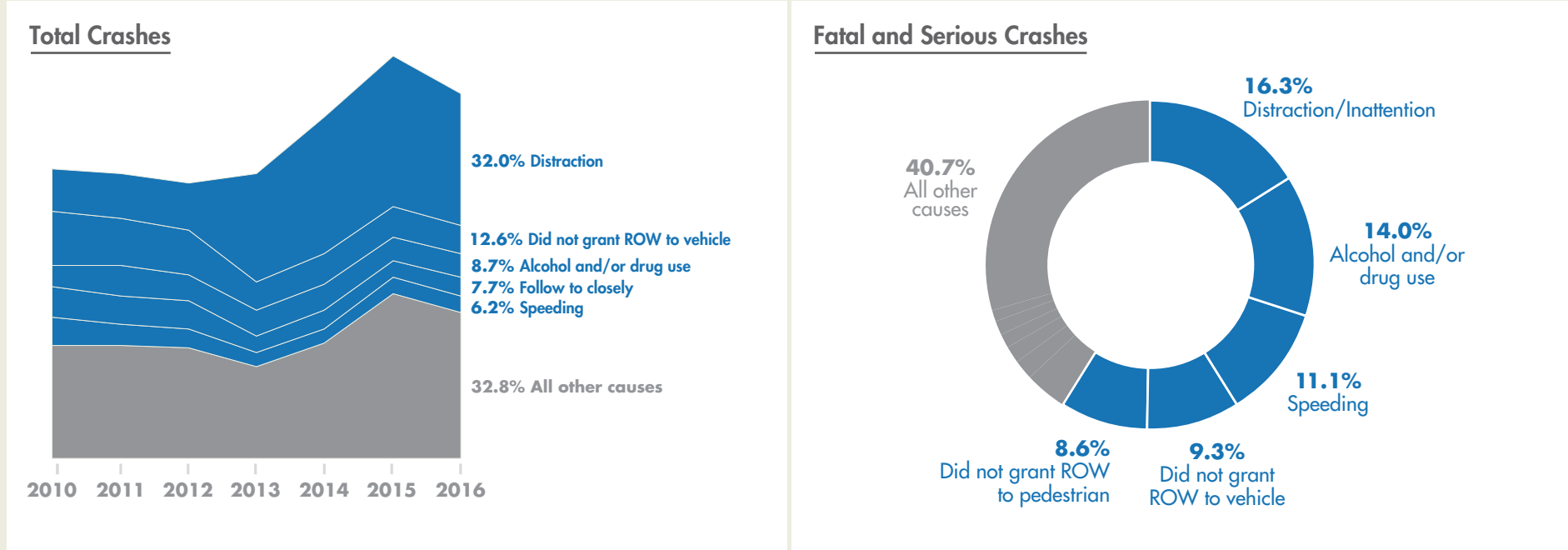
pedestrian. This percentage is higher than the statewide average of 2.8 percent of crashes involving pedestrians.¹

More men than women experienced a fatality or serious injury due to a crash. Approximately 61 percent of the fatal and serious injuries included men, and 37 percent included women. There were six fatalities and serious injuries for which gender was not reported.

¹ Crash Data Summary for 2012-2016 for City of Vancouver, Local Programs Division, Washington State Department of Transportation, 2017

Most Frequent Crashes By Behavior

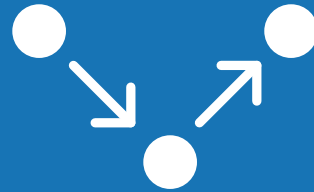
TOP CONTRIBUTING CIRCUMSTANCES TO CRASHES
 2010-16



Driver distraction/inattention is most frequently identified as a factor contributing to crashes in Vancouver (all severities). This is common in many jurisdictions across the country. This trend has increased since 2013. For fatal and serious injury crashes, the leading contributing behaviors were distraction/inattention, alcohol and/or drug use, speeding, not granting right-of-way (ROW), and failure to yield to a pedestrian.

Four focus crash areas were identified through a collaborative process considering the total number of crashes per category, the number of fatal and serious injury

crashes per category, the proportion of fatality and serious injury crashes, overall policy goals of the City, and consistency with the statewide Target Zero Plan. As such: pedestrians, bicyclists, young drivers, and lane departure crashes were selected as categories for focused crash analysis. The analysis also included studying the safety performance of signalized intersections and a prioritized list of intersections with potential for safety improvement was developed.



Factors Contributing to Crashes in Vancouver

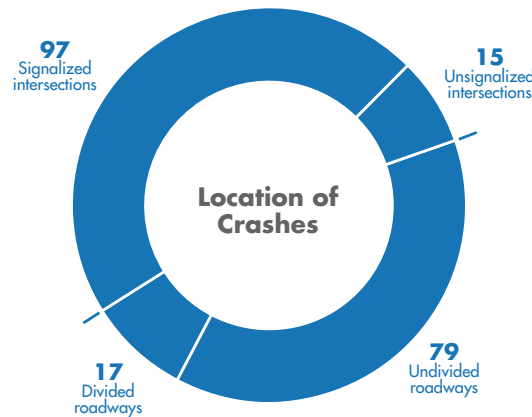
 **Pedestrian Crashes**
2012-16

HIGHER THAN



**STATEWIDE
AVERAGE**
RELATIVE TO OTHER CRASHES

54% INTERSECTIONS



46% ROADWAYS

Signalized Intersections on 35-40 MPH Roads
Causes and Severity of Crashes



Undivided Roadways with 5 or 6 Lanes
Causes and Severity of Crashes



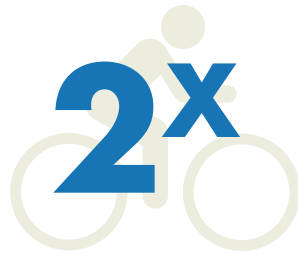
Pedestrian crashes were selected as a focus area because of the relatively high severity of these crashes when they do occur, the fact that the proportion of pedestrian crashes in Vancouver is higher than the statewide average proportion, and the City's focus on improving safety for active transportation.

From 2012-2016 there were 208 pedestrian crashes in the City. More than half of these occurred at intersections. Of the crashes at intersections, 86 percent of the crashes were at signalized intersections, and most of these were higher speed

locations (posted speeds greater than or equal to 35 miles per hour). Pedestrian crashes also were over-represented on five or six lane arterials (principal and minor arterials). The most common contributing factors to the pedestrian signalized intersection crashes on higher speed roads is failure to yield right-of-way to the pedestrian, distraction/inattention, and under the influence of alcohol and/or drugs.

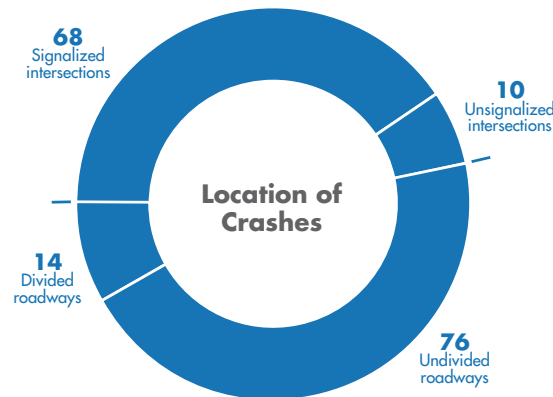
 **Bicycle Crashes**
2012-16

CRASHES NEARLY



**STATEWIDE
AVERAGE**

46% INTERSECTIONS



54% ROADWAYS

Signalized Intersections on 35-40 MPH Roads
Causes and Severity of Crashes



Undivided Roadways with 5 or 6 Lanes
Causes and Severity of Crashes



Bicycle crashes were selected as a focus crash type because of the relatively high proportion of bicycle crashes in the City. From 2012 to 2016, there were 168 crashes involving bicyclists, approximately three percent of the total number of crashes in the City. This percentage is higher than the Washington statewide average of 1.2 percent of crashes involving bicyclists in 2015². In addition, the City's emphasis on complete streets and multi-modal transportation makes bicycle safety a priority.

Five and six lane roadways were over-represented for bicycle crashes on roadway segments. The common characteristics of the bicycle crashes at intersections were traffic signals and posted speeds greater than or equal to 35 miles per hour. Similar to pedestrian crashes, the common contributing factors to the crashes are failure to yield the right-of-way and distraction/inattention.

² 2015 Annual Collision Summary (WSDOT, 2015) http://www.wsdot.wa.gov/mapsdata/crash/pdf/2015_Annual_Collision_Summary.pdf



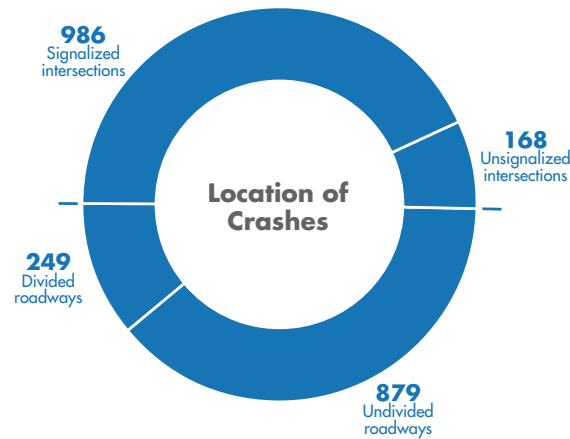
Crashes Involving Young Drivers

2012-16

INVOLVED IN
35%
OF CRASHES

2012-2016

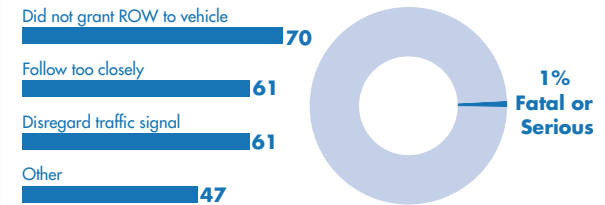
51% INTERSECTIONS



49% ROADWAYS

Signalized Intersections during Daylight without Driver Distractions

Causes and Severity of Crashes



Undivided 20-25 MPH Roadways with 2 Lanes

Causes and Severity of Crashes



Young driver crashes were selected as a focus area because of the high frequency of these crashes in the City. In addition, although most of the young driver crashes are relatively low severity, the small proportion of serious injury crashes involving young driver crashes is higher than the statewide average. Approximately half of the young driver crashes occurred at intersections—and most of these were signalized; and half along roadway segments—most of these are undivided two-lane roads. While the young driver crash frequency is high, the severity is relatively low—87 percent of the crashes are possible injury or no injury. More of the young

driver intersection crashes are occurring mid-day consistent with school hours, and there is a relatively wide array of common contributing factors: did not grant right of way, followed too closely, disregarded the traffic signal, and to a lesser extent, speeding or improper turning. On roadway segments common contributing factors include: distraction/inattention, failure to yield the right of way, and to a lesser extent, speeding.



Crashes Involving Road/Lane Departure

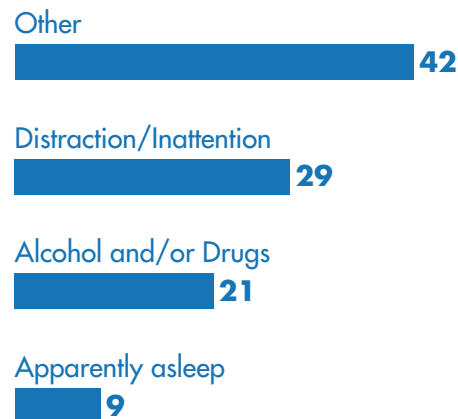
2012-16

**MOST CRASHES
OCCUR ON**

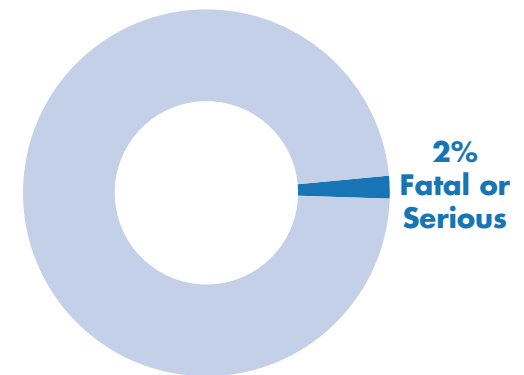


**UNDIVIDED
2-LANE ROADS**

Causes



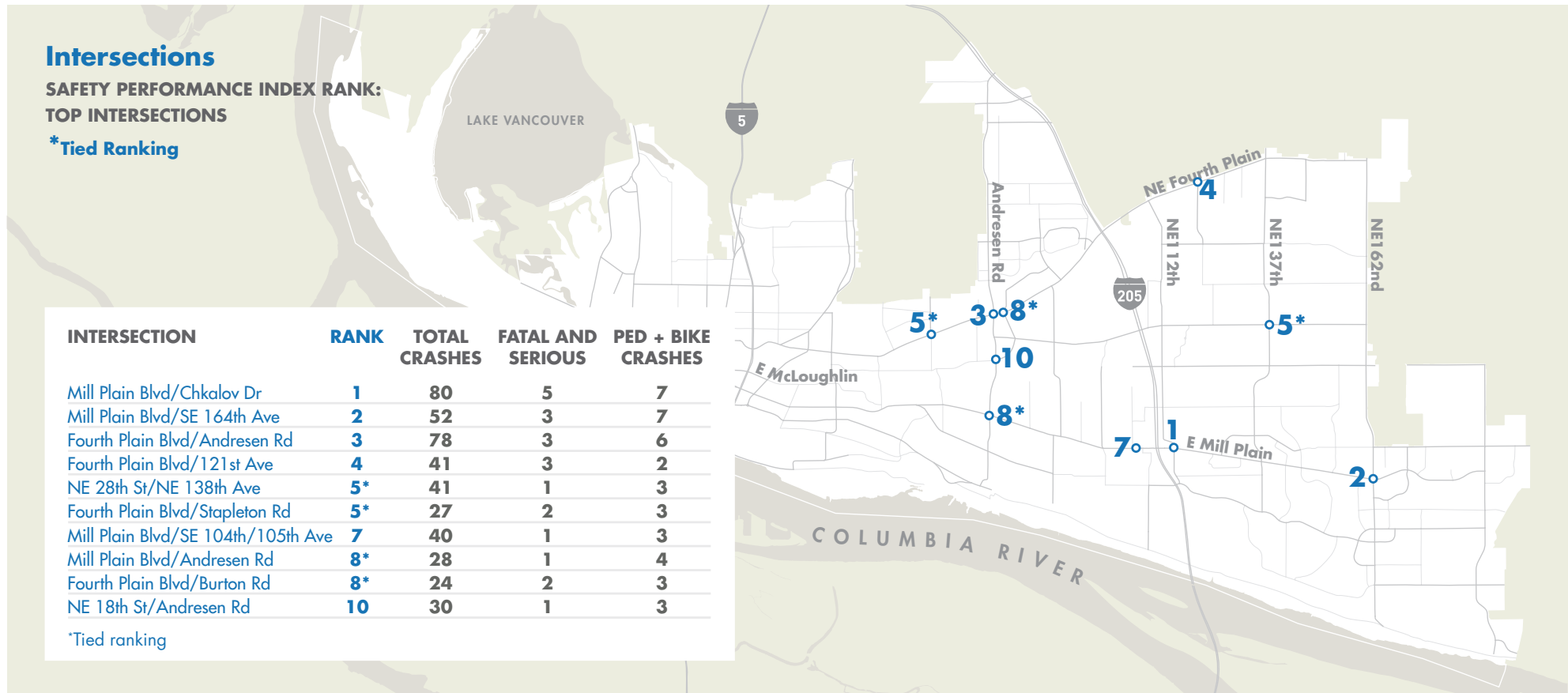
Severity



Understanding the characteristics of crashes along a roadway segment is important to achieving the Complete Street policy objectives of the City and to encouraging active transportation. Lane departure crashes occurred most frequently on two-lane undivided roads with posted speeds of 25 miles per hour; the majority of these crashes were property damage only. Alcohol and/or drugs and distraction/inattention were factors in a large number of these crashes.



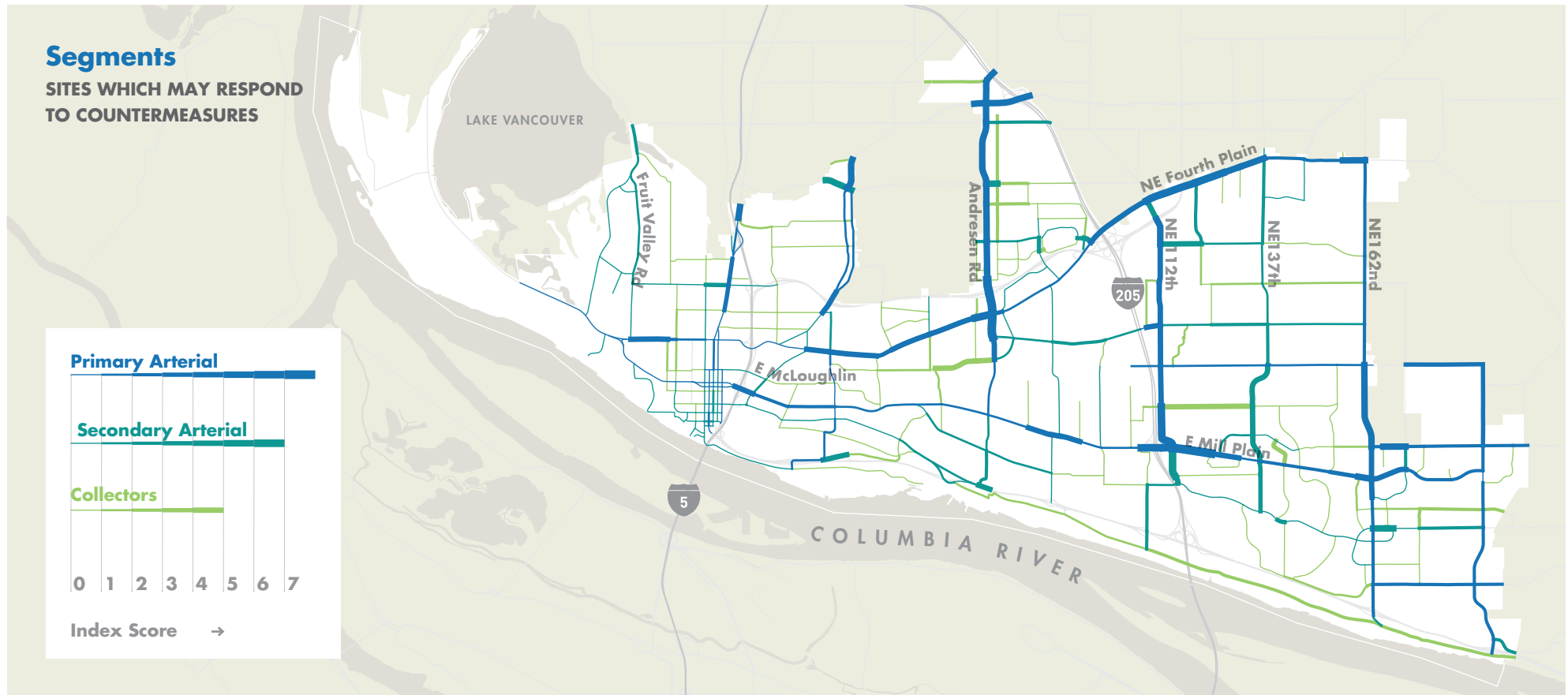
Sites with Potential for Safety Improvements



Each study intersection was ranked three times using each of the following safety performance measures:

- 1) **Crash Frequency:** the total number of all intersection crashes
- 2) **Fatal and Serious Injury Crashes:** the number of crashes with a fatality or seriously injured person
- 3) **Combined Pedestrian and Bicycle Crashes:** the number of crashes at an intersection that included a pedestrian and bicyclist.

The individual rankings were summarized to develop a combined score. Using these criteria, Mill Plain Boulevard, Fourth Plain Boulevard, and Andresen Road were identified as candidates for safety treatments. Mill Plain Boulevard/Chkalov is ranked highest because it had the highest number of crashes and the most fatal and injury crashes during the study period. While Fourth Plain/Andresen had the second highest number of crashes, because there were fewer pedestrian and bicycle crashes it was ranked lower than Mill Plain/SE 164th Avenue.



Roadway segments which may respond to safety countermeasures were identified through a scoring process considering frequency and density of pedestrian, lane departure, bicyclist and young driver crashes; number of lanes (i.e., four, five or six lane roads); and posted speed limit. In each case a higher number indicated higher priority for safety related projects in the future. The project analysis identified number of lanes and posted speed limit as characteristics which may respond to safety improvements. Pedestrian, lane departure, bicyclist and young driver crash density was selected as these are crash focus areas in the project. Arterials were

ranked separately from Collector roads. The highest ranked arterial roads were SE Mill Plain Boulevard near I-205, NE Andresen Road, NE Fourth Plain Boulevard and NE 112 Avenue. The highest ranked Collector roads were SE Chakalov Boulevard near SE Mill Plain, SE 20th Street from 167th to McGillivray and NE Minnehaha from NE Saint James Road to NE Saint Johns Road.



Findings and Recommendations

Findings

The TSSA was conducted to develop an understanding of the major crash trends and major factors contributing to crashes in Vancouver. With this understanding the City has an opportunity to integrate safety countermeasures into planning, design and construction of all transportation projects. Over time—with commitment to and a focus on safety related policies, programs, and projects the frequency and severity of crashes in Vancouver can decrease.

Countermeasures

Recommended strategies to address the sites with potential for safety improvements are summarized on the following pages. This information is provided to inform discussions about optional improvements at a particular location or for a particular crash type. The project technical report provides more details about the effectiveness and implementation costs of the countermeasures.

Summary of Crash Trends

The majority of crashes in Vancouver are low severity. However, there were 284 crashes involving fatalities or serious injuries between 2010 and 2016.

More men than women experienced fatalities and serious injuries from crashes.

Young drivers are the most frequently involved road user group in crashes.

Approximately 25% of crashes that involved a pedestrian resulted in a fatality or serious injury.

Distraction/Inattention led to the most crashes across all severities.

Distraction/inattention, speeding, alcohol and/or drugs, and not using a seatbelt led to the most fatal and serious injury crashes.

The majority of all crashes and fatal or serious injury crashes are occurring at signalized **intersections**, and the most common crash types are: **rear-end, angle, fixed object, and turning.**

Roads with more lanes (three through six lanes) had more pedestrian and bicycle crashes than roads with fewer lanes. Roads like E. Mill Plain Boulevard, Fourth Plain Boulevard, Andresen Road, and NE 162nd show most potential for responding to pedestrian and bicycle safety countermeasures.

Focus Area	Countermeasure
Pedestrians	Align vehicle speeds with adjacent land use and built environment (e.g., roundabouts, curb extensions, signal timing)
	Improve pedestrian safety awareness and behaviors among all users (e.g., pedestrian safety education campaigns)
	Increase enforcement of laws pertaining to pedestrians using the network (e.g., targeted pedestrian crossing enforcement campaigns)
	Expand and improve pedestrian facilities (e.g., at pedestrian crossings and near bus stops, install refuge islands, shorten crossing distances with curb extensions; at signalized intersections, provide a leading pedestrian indicator; install rectangular rapid flashing beacons and pedestrian hybrid beacons)
	Improve safety for children walking to schools (e.g., safe route to school programs, or pedestrian crossing guards)
	Improve data and performance measures (e.g., annual pedestrian count programs, estimate pedestrian miles traveled data, compile and annually report pedestrian crash data)
Lane Departure	Reduce opposite direction crashes (e.g., add raised medians or other access control on multi-lane arterials)
	Reduce number of vehicles leaving the roadway (e.g., wider road striping or striping with more retroreflectivity)
	Improve roadway to accommodate turning traffic (e.g., provides lane guidance striping through large intersections or in locations with off-set lanes)
	Improve corridor access management (e.g., consolidate access points, limit access to properties)
	Set appropriate speed limits (e.g., reduce posted speeds in neighborhoods, implement roadway modifications to reduce speeds through high pedestrian areas)
	Communicate appropriate speeds through the use of traffic control devices (e.g., speed reader signs)
	Manage roadway speeds through facility design (e.g., add medians, roundabouts, curb extensions, speed bumps as appropriate to the roadway context)
	Reduce speeding through enforcement (e.g., implement speed enforcement campaigns couple with driver education about negative risks associated with speed)



Enhanced pedestrian crossing



Medians can reduce the frequency and severity of lane departure crashes in urban environments.

Focus Area

Countermeasure

Bicyclists

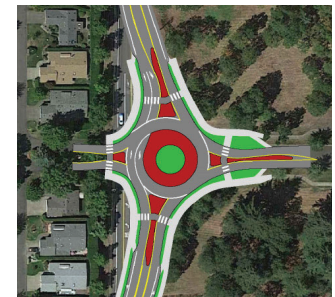
- Improve bicyclist and driver safety awareness and behavior (e.g., bicycle safety education for bicyclists and drivers, promote use of reflective gear and lights for bicyclists riding in dark)
- Enact policies/laws to improve bicycle safety (e.g., encourage use of bicycle helmets, provide education to students about bicycle laws)
- Improve bicyclist facilities (e.g. construct more protected bicycle facilities, especially in urban areas; implement traffic calming techniques; install colored bicycle boxes at intersections)
- Improve safety for children bicycling to schools (e.g., provide safe routes to schools programs, provide education about bicycle laws to students)
- Improve data and performance measures (e.g., collect bicycle count data, collect bicycle miles traveled data, collect bicycle origin and destination data, annually report bicycle crash data)



Bicycle lane with striped buffer

Intersections

- Modify intersection control and features (e.g., Provide/improve left- and right-turn channelization, consider protected left turns, prohibiting right turn on red, right turn signal, or removing turns)
- Improve driver compliance at intersections (e.g., consider targeted enforcements campaigns, explore opportunities for automated enforcement)
- Improve driver awareness of intersections (e.g., review intersection and traffic control sight distance, add reflective backplates at intersections, add advanced intersection warning systems)
- Modify intersection control and features for pedestrians and bicyclists (e.g., add leading pedestrian interval, restrict right turn on red, install high visibility pavement markings)
- Modify traffic control devices (e.g., install roundabouts, review sight distance for left-turning movements at high volume intersections)



Example of a suburban roundabout intersection

Young Driver

- Foster compliance with Washington State's Intermediate Driver License (e.g., school education programs to students and parents about driver licensing laws)
- Strengthen Intermediate Driver License restrictions (e.g., support state efforts to strengthen these laws through extending permit holding period, extending passenger restrictions, or parental engagement in certification)
- Improve young driver education and intervention (e.g., school education programs, media campaigns aimed at students)
- Improve enforcement against high risk behaviors among young drivers (e.g., explore opportunities for school education and outreach programs for young drivers)
- Enforce compliance with laws pertaining to intoxicated driving (e.g., support high visibility and media campaigns related to young drivers)



Young driver focused on driving

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