2018 MARIN COUNTY TRAVEL SAFETY PLAN
Systemic Safety Analysis

[Map showing crash data by month and severity]

- Total Crashes by Month
- Total KSI Crashes by Month

- 18% Car
- 6% Bicycle
- 6% Motorcyclist
- 11% Pedestrian
- 1% Other
- 64% Other

[Legend with icons for different categories]

[Logos and affiliations at the bottom]
Marin County Travel Safety Plan

• Setting
• Initial Action
• Characters
• Framework
• Plot
• Point of View
• Conflicts
• Ending
• Hook
SETTING

- North of San Francisco
- Population approximately 260,000
- Rural – Suburban
  - Low density
  - Slow Growth
- 11 cities and towns
  - Populations range 7,000 to 60,000
INITIAL ACTION
Problem - Trouble

• 44 killed or seriously injured (KSI) collisions each year
• Working collaboratively to improve safety
• Systemic Safety Analysis
• Travel Safety Plan

KSI = KILLED OR SEVERELY INJURED
Severely Injured refers to an injury, other than a fatal injury, that includes:
• Broken or fractured bones
• Dislocated or distorted limbs
• Severe lacerations
• Skull, spinal, chest or abdominal injuries that go beyond “Other Visible Injuries”
• Unconsciousness at or when taken from the collision scene
• Severe burns
CHARACTERS - ACTORS

- County of Marin
- Belvedere
- Corte Madera
- Fairfax
- Larkspur
- Mill Valley
- Novato
- Ross
- San Anselmo
- San Rafael
- Sausalito
- Tiburon
- TAM
- Marin General Hospital
FRAMEWORK
Directors - Editors

• MPWA

• TAC

• AGENCIES
  • CHP – Police
  • Fire
  • School
  • Elected official
  • Health

• BOARD OF SUPERVISORS
FRAMEWORK
Theme - Objectives

• Provide a proactive collision analysis
  • Arterial and collector roads (excluding State highways)

• Identify high risk locations and collision patterns

• Develop list of systemic countermeasures
  • Low-cost short-term
  • Higher-cost long-term
COLLISION SEVERITY INDEX
OBSERVED & PREDICTED COLLISIONS

The index is based on a blend of actual (75%) and predicted (25%) collisions at each study location. See Chapter 2 for a description of the model developed to predict collisions. The index weights different mode collisions equally relative to each other. All observed collisions in which a person was killed or severely injured is weighted by a factor of 3.
PLOT Countywide Findings

- 2,756 reported crashes in 5-year period (2012-2016)
- 8% of crashes (219) resulted in fatalities or severe injuries ("KSI")
- 11% of crashes were with pedestrians; but 20% of KSI’s involved pedestrians
- 29% of crashes involved unsafe speed
POINT OF VIEW
Jurisdictional Chapters

• Existing local crash info. by mode, type, and severity

• Local collision profiles, i.e., summary of crash patterns

• High collision networks and crash comparisons
CORRIDORS

The bars in the above chart show the total number of collisions from 2012 to 2016 within the catchment area of each study corridor. The bars also illustrate, by color, a breakdown of those collisions by mode for each corridor. To normalize the collision data, the red dots in the chart show the crash rate per 100 million vehicle miles traveled for each study corridor.

INTERSECTIONS

The bars in the above chart show the total number of collisions from 2012 to 2016 within the catchment area of each study intersection. The bars also illustrate, by color, a breakdown of those collisions by mode for each intersection. To normalize the collision data, the red dots in the chart show the crash rate per million entering vehicles for each study intersection.

- Motor Vehicle Collisions
- Motorcycle Collisions
- Bicycle Collisions
- Pedestrian Collisions
- Total Collisions
This study developed crash profiles to highlight five of the top trends among collisions in Unincorporated Marin County. The collision profiles, shown at the bottom right, are based on an analysis of crash data and related environmental factors. Every profile highlights a crash pattern the study has identified as a priority concern.

The table below shows the proportion of crash types by mode. Data to the right provides a comparison of the percentage of Unincorporated Marin County collisions vs. total collisions across all of Marin jurisdictions by mode, collision type, select age and collision violation categories.

The following pages identify safety countermeasures for study corridors and intersections. These countermeasures make up a toolkit of safety interventions the Unincorporated Marin County can utilize to implement projects tailored to unique safety issues.

<table>
<thead>
<tr>
<th>Total County Collisions</th>
<th>Total Marin Collisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>624</td>
<td>2,756</td>
</tr>
</tbody>
</table>

**624** TOTAL COUNTY COLLISIONS

**2,756** TOTAL MARIN COLLISIONS

2012-2016

**CRASH TYPES BY MODE: RATIOS OF ALL COLLISIONS**

<table>
<thead>
<tr>
<th>Mode</th>
<th>Head-On</th>
<th>Sideswipe</th>
<th>Broadside</th>
<th>Rear End</th>
<th>Hit Object</th>
<th>Overturned</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car</td>
<td>8%</td>
<td>6%</td>
<td>14%</td>
<td>29%</td>
<td>38%</td>
<td>5%</td>
<td>4%</td>
</tr>
<tr>
<td>Bike</td>
<td>3%</td>
<td>7%</td>
<td>18%</td>
<td>5%</td>
<td>22%</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>Ped</td>
<td>5%</td>
<td>8%</td>
<td>3%</td>
<td>5%</td>
<td>6%</td>
<td>38%</td>
<td>54%</td>
</tr>
<tr>
<td>Other*</td>
<td>1%</td>
<td>43%</td>
<td>38%</td>
<td>34%</td>
<td>1%</td>
<td>38%</td>
<td>8%</td>
</tr>
</tbody>
</table>

**UNINCORPORATED COUNTY VS. MARIN COLLISIONS - RELATIVE SHARE**

<table>
<thead>
<tr>
<th>Violation</th>
<th>Unincorporated Marin</th>
<th>All Marin Collisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>DUI</td>
<td>14.9%</td>
<td>10.5%</td>
</tr>
<tr>
<td>Unsafe Speed</td>
<td>33.6%</td>
<td>28.2%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mode</th>
<th>Unincorporated Marin</th>
<th>All Marin Collisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto</td>
<td>63.1%</td>
<td>63.8%</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>11.2%</td>
<td>6.4%</td>
</tr>
<tr>
<td>Bicycle</td>
<td>22.2%</td>
<td>18.1%</td>
</tr>
<tr>
<td>Other</td>
<td>1.0%</td>
<td>0.6%</td>
</tr>
</tbody>
</table>

**COLLISION TYPE**

<table>
<thead>
<tr>
<th>Type</th>
<th>Unincorporated Marin</th>
<th>All Marin Collisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head-on</td>
<td>5.7%</td>
<td>7.1%</td>
</tr>
<tr>
<td>Sideswipe</td>
<td>6.2%</td>
<td>8.7%</td>
</tr>
<tr>
<td>Rear-end</td>
<td>21.2%</td>
<td>24.5%</td>
</tr>
<tr>
<td>Broadside</td>
<td>13.0%</td>
<td>20.3%</td>
</tr>
<tr>
<td>Hit Object</td>
<td>25.4%</td>
<td>11.8%</td>
</tr>
<tr>
<td>Overturned</td>
<td>16.9%</td>
<td>5.6%</td>
</tr>
<tr>
<td>Vehicle/Pedestrian</td>
<td>2.8%</td>
<td>11.0%</td>
</tr>
<tr>
<td>Other</td>
<td>8.8%</td>
<td>10.7%</td>
</tr>
</tbody>
</table>

**LOCAL COLLISION PROFILES**

**BICYCLE COLLISIONS**

California Office of Traffic Safety ranked Unincorporated Marin County 2nd of 58 California counties with high levels of bicycle collisions in 2015.

**PEDESTRIAN COLLISIONS (OVER THE AGE OF 65)**

California Office of Traffic Safety ranked Unincorporated Marin County 3rd of 58 California counties with high levels of pedestrian collisions involving seniors in 2015.

**SPEED RELATED COLLISIONS**

California Office of Traffic Safety ranked Unincorporated Marin County 1st of 58 California counties with high levels of speed related collisions in 2014.

**MOTORCYCLE COLLISIONS**

11% (69) of all collisions in Unincorporated Marin County involved motorcycles, almost double the county average.

**HIT OBJECT COLLISIONS**

25% (156) of all collisions in Unincorporated Marin County involved hitting fixed objects, more than double the county average.
CHAPTER 14: UNINCORPORATED MARIN COUNTY

Unincorporated Marin County had an estimated population of 69,016 as of January 1, 2016, according to the California Department of Finance, representing approximately 26.2 percent of Marin County’s total population. In the five-year period between 2012 and 2016, Unincorporated Marin County experienced a total of 624 reported crashes on local streets. One hundred of those crashes involved a person that was killed or severely injured, and of the 100, seven crashes involved fatalities.

Unincorporated Marin County’s share of reported crashes on local streets, as a proportion of total crashes in Marin County, during the five-year period is summarized below:

- 22.6% of all county-wide crashes
- 45.2% of county-wide crashes in which a person was killed or severely injured (KSI)
- 1.3% of all fatal county-wide crashes

For all crashes, Unincorporated Marin County’s share of those crashes as a proportion of total crashes in Marin County was less than the jurisdiction’s 26.2 percent share of the total county population. However, for crashes involving severe injuries or fatalities, Unincorporated Marin County’s share of those crashes as a proportion of total crashes in Marin was greater than the jurisdiction’s 26 percent of the total county population.

COLLISIONS 2012 TO 2016

624 TOTAL COLLISIONS
16% KILLED OR SEVERELY INJURED [1% FATALITIES]

COLLISION BY MODE

CRASH TYPES BY MODE: RATIOS OF ALL COLLISIONS

Panoramic Highway between Shoshone Highway and Gravity Car Road is one of unincorporated county’s priority project locations. The corridor had 26 total reported collisions in a recent five-year period. Over-tail incidents are the most common motorcycle collision type and hit-object are the most common motor vehicle collision type.
# CONFLICTS

KSI Crashes by Jurisdiction & Mode

## Percentage Share of KSI Crashes by Jurisdiction and Mode

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Total</th>
<th>Pedestrian/Vehicle</th>
<th>Solo-Bicycle</th>
<th>Solo-Motorcycle</th>
<th>Solo-Motor Vehicle</th>
<th>Bicycle/Vehicle</th>
<th>Motorcycle/Vehicle</th>
<th>Multi-Vehicle</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Crashes (n=)</td>
<td>219</td>
<td>44</td>
<td>28</td>
<td>25</td>
<td>29</td>
<td>38</td>
<td>22</td>
<td>30</td>
<td>3</td>
</tr>
<tr>
<td>Unincorporated</td>
<td>46%</td>
<td>7%</td>
<td>71%</td>
<td>76%</td>
<td>79%</td>
<td>32%</td>
<td>55%</td>
<td>37%</td>
<td>-</td>
</tr>
<tr>
<td>San Rafael</td>
<td>22%</td>
<td>55%</td>
<td>7%</td>
<td>16%</td>
<td>-</td>
<td>24%</td>
<td>18%</td>
<td>17%</td>
<td>33%</td>
</tr>
<tr>
<td>Novato</td>
<td>15%</td>
<td>20%</td>
<td>11%</td>
<td>-</td>
<td>14%</td>
<td>16%</td>
<td>9%</td>
<td>27%</td>
<td>-</td>
</tr>
<tr>
<td>San Anselmo</td>
<td>4%</td>
<td>7%</td>
<td>4%</td>
<td>-</td>
<td>3%</td>
<td>5%</td>
<td>5%</td>
<td>3%</td>
<td>-</td>
</tr>
<tr>
<td>Sausalito</td>
<td>4%</td>
<td>2%</td>
<td>4%</td>
<td>-</td>
<td>-</td>
<td>8%</td>
<td>5%</td>
<td>7%</td>
<td>33%</td>
</tr>
<tr>
<td>Fairfax</td>
<td>4%</td>
<td>2%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>11%</td>
<td>5%</td>
<td>7%</td>
<td>33%</td>
</tr>
<tr>
<td>Corte Madera</td>
<td>2%</td>
<td>5%</td>
<td>-</td>
<td>4%</td>
<td>-</td>
<td>11%</td>
<td>-</td>
<td>7%</td>
<td>-</td>
</tr>
<tr>
<td>Mill Valley</td>
<td>2%</td>
<td>-</td>
<td>-</td>
<td>4%</td>
<td>-</td>
<td>9%</td>
<td>-</td>
<td>3%</td>
<td>-</td>
</tr>
<tr>
<td>Larkspur</td>
<td>1%</td>
<td>2%</td>
<td>4%</td>
<td>-</td>
<td>3%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ross</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Tiburon</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Belvedere</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Findings by Jurisdiction

• 35% of all crashes occurred in San Rafael

• 22% of all crashes occurred in Unincorporated Marin County

• 16% of crashes in Unincorporated Marin Counter resulted in fatalities or severe injuries

• The most common crash types in Unincorporated Marin County were solo-vehicle (23%), solo-bicycle (19%) and solo-motorcycle (19%)

• 55% of pedestrian KSI crashes occurred in San Rafael; 20% in Novato

• 26% of bicycle KSI crashes occurred in San Rafael
Measures to Improve Safety

• Identified countermeasures
• Identified priority projects
• Prepared Safety Grant Applications
  • 3 HSIP applications prepared and awarded
• Focused enforcement
### Potential Countermeasures for High Collisions Network Study

#### Corridors and Intersections

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Motor Vehicle</th>
<th>Motorcycle</th>
<th>Bicycle</th>
<th>Pedestrian</th>
<th>Total</th>
<th>Potential HSP Countermeasure</th>
<th>Non-HSP Countermeasure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lucas Valley Road (aka 'Big Rock')</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>6</td>
<td>R4, Install guardrail (where applicable)</td>
<td>NH7, Install 'Bikes May Use Full Lane' sign (for downhill segment)</td>
</tr>
<tr>
<td>2</td>
<td>Kent Avenue: Hillside to Stadium Way</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>R36, Install bike lanes</td>
<td>NH5, Install wayfinding (install bicycle route signs and designate corridor as a bike route)</td>
</tr>
<tr>
<td>3</td>
<td>Paradise Dr: Kramer Tract to Teaberry Lane</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>R4, Install guardrail, R16, Widen shoulder, R27, Install chevron signs on horizontal curves</td>
<td>NH7, Install 'Bikes May Use Full Lane' sign</td>
</tr>
<tr>
<td>4</td>
<td>Point San Pedro: Summit Avenue to Sea Way</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>N518, Install pedestrian crossing at uncontrolled locations with advanced safety feature: (install reflective or flashing LED beacon)</td>
<td>NH7, Install 'Bikes May Use Full Lane' sign</td>
</tr>
</tbody>
</table>

#### Intersections

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Motor Vehicle</th>
<th>Motorcycle</th>
<th>Bicycle</th>
<th>Pedestrian</th>
<th>Total</th>
<th>Potential HSP Countermeasure</th>
<th>Non-HSP Countermeasure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sir Francis Drake and Bon Air</td>
<td>10</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>14</td>
<td>S2, Improve signal hardware, S3, Improve signal timing and detection, S19, Check for and/or install pedestrian countdown signal heads, S20, Pedestrian crossing with enhanced safety features (ADA curb ramps, tighten curb radii)</td>
<td>NH2, Remove slip lane(s), NH8, Square up intersection</td>
</tr>
<tr>
<td>2</td>
<td>Birthingdale and Tower and Kipling</td>
<td>8</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>11</td>
<td>S3, Improve signal timing and detection, S20, Install pedestrian crossing (with advanced safety feature: such as curb extensions &amp; directional ADA pedestrian ramps)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Sir Francis Drake and Eliseo and Barry</td>
<td>9</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>11</td>
<td>S2, Improve signal hardware, S3, Improve signal timing and detection (to help reduce congestion), S19, Check for and/or install pedestrian countdown signal heads, S20, Pedestrian crossing with enhanced safety features</td>
<td>NH2, Remove slip lane(s), NH8, Square up intersection</td>
</tr>
</tbody>
</table>
**Priority Projects**

Safety improvements identified for the following study locations were identified as priority projects based on an evaluation of collision data and consultation with jurisdiction staff.

### Panoramic Highway: Shoreline Highway to Gravity Car | Corridor

**Existing Conditions:**
Panoramic Highway is a two-lane arterial and a popular bicyclist and motorist route. The corridor had 26 total reported collisions in five years, including five KSI bicycle collisions, four KSI motorcycle collisions, and four KSI motor vehicle collisions. Overturn incidents are the most common motor vehicle collision type, and hit objects are the most common motor vehicle collision type.

**Potential Improvements:**
- **Roadway Improvements:** Roadway improvements may include widening the shoulder and installing designated turn out areas where feasible, installing curve advanced warning signs, guardrails, and dynamic variable speed warning signs.
- **Bicycle Facility Improvements:** Installing a wider shoulder, where feasible, could give cyclists and motorists more room to maneuver. Installing “Bikes may use full lane” signs clarifies where bicyclists are expected to ride and reminds motorists to expect bicyclists on the road. Other signage to alert motorists to bicyclist presence could also be beneficial.

### College Avenue: Sir Francis Drake Boulevard to Woodland Road | Corridor

**Existing Conditions:**
College Avenue is a two-lane arterial that services the College of Marin and AE Kent Middle School. The corridor had 21 total reported collisions in five years, including one KSI pedestrian collision. Rear-end incidents are the most common motor vehicle collision.

**Potential Improvements:**
- **Pedestrian Crossing Improvements:** The intersection of Woodland Road and College Avenue may benefit from installation of a traffic signal or roundabout. Signalization would require a warrant study to determine if the countermeasure is appropriate.
- **Bicycle Facility Improvements:** Upgrading bike lanes to green bike lanes, installing green paint through conflict zones and adding bike boxes could increase the visibility of bicyclists.

### North San Pedro Road: Golf Avenue to Meriam Dr | Corridor

**Existing Conditions:**
North San Pedro Road is a two-lane arterial road with a median line that connects to Highway 101. Major destinations along this road are Van Vleet Valley School and the Marin County Civic Center. North San Pedro Road is also a designated bicycle route. The corridor had 10 total reported collisions in five years, including two KSI pedestrian collisions. Rear-end incidents are the most common motor vehicle collision type.

**Potential Improvements:**
- **Pedestrian Crossing Improvements:** A number of pedestrian crossing improvements could be considered along this corridor including some of the following: high visibility crosswalks, DIYBs, advanced stop bars, bulb outs, right-turning curb radius, and directional curb ramps. These could improve pedestrian crossings by shortening crossing distances and emphasize pedestrian presence.
- **Bicycle Facility Improvements:** Installing “Bikes may use full lane” signs clarifies where bicyclists are expected to ride and reminds motorists to expect bicyclists on the road.
Next Steps

• Continue to work collaboratively
• Develop action plan and guiding policies
• Identify regionwide goals
• Identify individual goals for Unincorporated County
WEBLINK

• 2018 Marin County Travel Safety Plan
  • Systemic Safety Analysis

• https://www.marincounty.org/depts/pw/divisions/transportation/transportation/roadway-safety-review