I-710 Health Impact Assessment
Final Draft Report
Topic: Traffic Safety
Presented to the Technical and Advisory Roundtables
October 24, 2011

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Traffic Safety Literature Review: Factors Influencing Freeway Collision Frequency

- All things being equal, increased volume results in increased collision frequency in proportion to volume
- Increased number of lanes may increase collision frequency independent of volume because of lane changing movements
- Freeway design treatments will decrease collision frequency
- If vehicle density falls significantly and remains low, there would be decreased collision frequency
- Increased truck share will increase collision frequency, based on the increased collision risks of trucks; separation of trucks from cars improves traffic safety

Note: These studies were not conducted on the I-710 Freeway
Traffic Safety Literature Review: Factors Influencing Freeway Collision Severity

- Reductions of speed could reduce the frequency of fatal collisions.
- Increased truck share will increase the share of collisions that are fatal. Nationally, heavy duty trucks represent 4% of vehicles, 7% of vehicle miles, 8% of fatal collisions, and 11% of fatalities.

Note: These studies were not conducted on the I-710 Freeway.
Traffic Safety Literature Review: Pedestrians & Bicyclists off the Freeway

- Vehicle-ped collisions increase with pedestrian and vehicle volume (Harwood 2008, Miranda-Moreno 2011)
- Traffic calming (e.g., speed bumps, curb extensions) reduce vehicle-ped collisions (Elvik 2001)
- Bicycle-specific improvements (dedicated bike lanes, shared-lane markings, and “bicycle boulevards”) reduce vehicle-bike collisions (Reynolds 2009)

Note: These studies were not conducted on the I-710 Freeway

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Percentages of I-710 segments that had higher accident rates than similar highway facilities throughout the State:

- 2 out of 4 (50%) Northbound segments
- 31 out of 59 (53%) Northbound ramps
- 1 out of 4 (25%) Southbound segments
- 20 out of 54 (37%) Southbound ramps

31% of total collisions on I-710 were truck-related.

Existing Conditions Related to Traffic Safety: Collisions Types on the I-710

Percentages of total I-710 collisions by collision type:

- Rear-end: 35% - 53%
- Sideswipe: 20% – 32%
- Hit-object: 15% – 23%
- Broadside: 2% – 6%

Note: ranges given because data provided was broken out for different sections of the freeway

### Existing Conditions Related to Traffic Safety

#### Number of collisions, fatalities, and injuries in I-710 study area, 2006-2008

<table>
<thead>
<tr>
<th>Collision Type</th>
<th>I-710 Mainline</th>
<th>Other Freeways (I-405, SR-91, I-105, I-5, SR-60, I-605)</th>
<th>Within 1 mile of I-710 Mainline (includes collisions within 150 meters of Mainline)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Fatalities</td>
<td>Severe</td>
</tr>
<tr>
<td>Non-truck-related</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle-vehicle</td>
<td>770</td>
<td>5</td>
<td>53</td>
</tr>
<tr>
<td>Pedestrian-related*</td>
<td>23</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>Bicycle-related*</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Truck-related</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle-vehicle</td>
<td>257</td>
<td>8</td>
<td>29</td>
</tr>
<tr>
<td>Pedestrian-related*</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Bicycle-related*</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>All other accidents</td>
<td>452</td>
<td>19</td>
<td>59</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1507</td>
<td>41</td>
<td>152</td>
</tr>
</tbody>
</table>

*Ped and bicycle fatality and injury counts include both ped/bike and vehicle operator deaths/injuries

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Existing Conditions Related to Traffic Safety

Motorized collision types defined by vehicles involved, and where they occurred, 2006-2008

- Many more automobile collisions occurred off the freeway compared to on the freeways
- More truck collisions occurred on the I-710

Source: SWITRS, 2006-2008

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Existing Conditions Related to Traffic Safety

Multi-vehicle collision types defined by vehicles involved, and where they occurred, 2006-2008

- Many more multi-vehicle collisions do not involve trucks
- 17% of the I-710 multi-vehicle collisions involve a truck

Source: SWITRS, 2006-2008
### Collisions on the I-710, broken out by location: on or near ramps vs. not near ramps

<table>
<thead>
<tr>
<th>Collision Type</th>
<th>Ramp Exit, Last 50 Feet (n=188)</th>
<th>Mid-Ramp (n=235)</th>
<th>Ramp Entry, First 50 Feet (n=56)</th>
<th>Not State Highway, Ramp-related, Within 100 Feet (n=114)</th>
<th>Ramp-related Intersection (n=49)</th>
<th>Not State Highway, Intersection-related, Within 250 Feet (n=11)</th>
<th>Non-ramp related (n=6,354)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-truck (n=6,422)</td>
<td>2.43%</td>
<td>3.21%</td>
<td>0.79%</td>
<td>1.65%</td>
<td>0.70%</td>
<td>0.16%</td>
<td>91.06%</td>
</tr>
<tr>
<td>Truck (n=585)</td>
<td>5.47%</td>
<td>4.96%</td>
<td>0.85%</td>
<td>1.37%</td>
<td>0.68%</td>
<td>0.17%</td>
<td>86.50%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2.68%</strong></td>
<td><strong>3.35%</strong></td>
<td><strong>0.80%</strong></td>
<td><strong>1.63%</strong></td>
<td><strong>0.70%</strong></td>
<td><strong>0.16%</strong></td>
<td><strong>90.68%</strong></td>
</tr>
</tbody>
</table>

- 9% to 14% of collisions on the I-710 occur on or near ramps

Source: SWITRS, 2006-2008
Pedestrian and Bicycle Injuries and Fatalities within the I-710 Corridor, 2006-2008

<table>
<thead>
<tr>
<th>Collision Type</th>
<th>Pedestrian Fatalities</th>
<th>Pedestrian Severe Injuries</th>
<th>Pedestrian Non-severe Injuries</th>
<th>Bicyclist Fatalities</th>
<th>Bicyclist Severe Injuries</th>
<th>Bicyclist Non-severe Injuries</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-truck-Pedestrian</td>
<td>33</td>
<td>106</td>
<td>621</td>
<td></td>
<td></td>
<td></td>
<td>760</td>
</tr>
<tr>
<td>Truck-Pedestrian</td>
<td>3</td>
<td>2</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>Non-truck-Bike</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>32</td>
<td>351</td>
<td>387</td>
</tr>
<tr>
<td>Truck-Bike</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>36</strong></td>
<td><strong>108</strong></td>
<td><strong>637</strong></td>
<td><strong>5</strong></td>
<td><strong>35</strong></td>
<td><strong>359</strong></td>
<td><strong>1180</strong></td>
</tr>
</tbody>
</table>

- Pedestrian and bicycle fatalities are higher than Healthy People 2020 guidelines

Source: SWITRS, 2006-2008
Non-Truck Collisions

2006 – 2008

Collisions occur in areas with higher traffic volumes

Source: SWITRS, 2006-2008

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Truck Collisions

2006 – 2008

Mostly on freeways and arterials

Source: SWITRS, 2006-2008
Injury severity for truck-related collisions, at each geographic location

- More severe and fatal truck collisions occurred on the freeways than off the freeways

Source: SWITRS, 2006-2008
Pedestrian Collisions

2006 – 2008

Mostly in places with higher pedestrian volumes

Source: SWITRS, 2006-2008
Bicycle Collisions

2006 – 2008

Mostly in places with higher bicycle volumes

Source: SWITRS, 2006-2008

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Hazardous Material Incidents

- 3 collisions involving a truck carrying hazardous materials since January, 2000
- 1 driver death, no other injuries
- Causes: mechanical failure, external obstacle that the driver attempted to avoid, and driver error (speeding around turn?)
- 2,800 gallons of gasoline burned off; 3,360 gallons of crude oil leaked

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Community Concern Regarding Traffic Safety

Tier 2 Final Report recommendations:

• Continue support and implementation of safety programs.
• Increase enforcement of traffic and vehicle safety laws and regulations.
• Increase public and trucker education on safety and neighborhood issues.
• Implement infrastructure improvements.
• Separate trucks and cars.

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Existing Traffic Injuries and Fatalities in the I-710 Corridor Compared to ‘Healthy People 2020’ Goals

<table>
<thead>
<tr>
<th>Healthy People 2020 Goal</th>
<th>Counts**</th>
<th>2008 Rate</th>
<th>Achieved Goal?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce deaths caused by motor vehicle collisions to 12.4 deaths per 100,000 population</td>
<td>44.33</td>
<td>8.72</td>
<td>Yes</td>
</tr>
<tr>
<td>Reduce deaths caused by motor vehicle collisions to 1.2 deaths per 100 million vehicle miles traveled*</td>
<td>44.33</td>
<td>0.34</td>
<td>Yes</td>
</tr>
<tr>
<td>Reduce injuries caused by motor vehicle collisions to 694.4 nonfatal injuries per 100,000 population</td>
<td>3,210.33</td>
<td>631.60</td>
<td>Yes</td>
</tr>
<tr>
<td>Reduce pedestrian deaths on public roads to 1.3 deaths per 100,000 population</td>
<td>7.67</td>
<td>1.51</td>
<td>No</td>
</tr>
<tr>
<td>Reduce pedestrian injuries on public roads to 20.3 nonfatal injuries per 100,000 population</td>
<td>237.67</td>
<td>46.76</td>
<td>No</td>
</tr>
<tr>
<td>Reduce bicycle deaths on public roads to 0.22 deaths per 100,000 population</td>
<td>1.67</td>
<td>0.33</td>
<td>No</td>
</tr>
</tbody>
</table>

Study area population estimated from the American Community Survey 2005-2009, and was 508,283.

*Motor vehicle deaths include related pedestrian and bicycle fatalities
*VMT used as denominator for 2008 was 35.5 million VMT per day, which was annualized. Source: 2008 SCAG Regional Transportation Plan

**Fatality and injury counts are 3-year averages of fatalities and injuries totaled between 2006-2008

Note: Injuries and fatalities listed are within 1 mile of the I-710; not all listed collisions are attributable to traffic from the I-710.
Predicted Impacts Related to Traffic Safety: I-710 General Purpose Lanes

Compared to 2008 levels:

• Non-truck collisions on general purpose lanes:
  • Alt 1: higher volumes, lower speeds → increased collisions, lower severity
  • Alt 5A: slightly higher volumes and speeds → small increase in the number of collisions and a proportional increase in number of severe collisions
  • Alt 6A/B/C: higher volumes and speeds → increase in the number of collisions and the severity of collisions

• Truck collisions on general purpose lanes:
  • GP lane truck volumes increasing for all alternatives
  • Increases in number of severe collisions expected in all alternatives
  • Volumes and number of collisions correlates as follows: Alt 5A > Alt 1 > Alt 6A/B

Source: HIP
Predicted Impacts Related to Traffic Safety: Arterials

Compared to 2008 levels:

- Non-truck collisions:
  - Alt 1: higher volumes, lower speeds → increased collisions, lower severity
  - Alt 5A and Alt 6A/B/C: higher speeds (LOS) and volumes → increase in the number of collisions and the number of severe collisions

- Truck collisions:
  - ~40% increase in volumes under all alternatives → increase in number and severity of collisions

- Ped/bike collisions:
  - Under all alternatives, future growth in population and traffic volume → increase in number of collisions, which are disproportionately severe
  - Potential changes in ped/bike volumes specific to each alternative could change number of collisions (see Mobility chapter)

Source: HIP
Impacts Related to Traffic Safety: Hazmat

• The number of hazmat incidents is likely to be proportional to the volume of trucks carrying hazardous materials, which we assume to increase proportionately to the increase in truck volume.

• We therefore predict that, for all alternatives being considered, the frequency of hazardous materials incidents on the freeways would increase.

• Hazmat incidents of high severity do occur, though infrequently, and the chances of a severe hazmat incident increase as the frequency of all hazmat related collisions increase.

Source: HIP
### Summary of Health Outcomes (2035)

#### Traffic Safety

<table>
<thead>
<tr>
<th>Health Impact/Alternative</th>
<th>Impacts of Alternatives</th>
<th>Health Outcome</th>
<th>Uncertainties</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Impact</td>
<td>Magnitude</td>
<td>Severity</td>
</tr>
<tr>
<td><strong>Non-truck Vehicle-Vehicle Fatalities and Injuries</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alt 1</td>
<td>-</td>
<td>Minor</td>
<td>High</td>
</tr>
<tr>
<td>Alt 5A</td>
<td>-</td>
<td>Minor-Med</td>
<td></td>
</tr>
<tr>
<td>Alt 6A</td>
<td></td>
<td>Minor-Med</td>
<td></td>
</tr>
<tr>
<td>Alt 6B</td>
<td></td>
<td>Minor-Med</td>
<td></td>
</tr>
<tr>
<td>Alt 6C</td>
<td></td>
<td>Minor-Med</td>
<td></td>
</tr>
<tr>
<td><strong>Truck-Auto Fatalities and Injuries</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alt 1</td>
<td>-</td>
<td>Moderate</td>
<td>High</td>
</tr>
<tr>
<td>Alt 5A</td>
<td>-</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Alt 6A</td>
<td></td>
<td>Minor-Med</td>
<td></td>
</tr>
<tr>
<td>Alt 6B</td>
<td></td>
<td>Minor-Med</td>
<td></td>
</tr>
<tr>
<td>Alt 6C</td>
<td></td>
<td>Minor-Med</td>
<td></td>
</tr>
<tr>
<td><strong>Vehicle-Pedestrian/Bicycle Fatalities and Injuries</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alt 1</td>
<td>-</td>
<td>Minor-Med</td>
<td>High</td>
</tr>
<tr>
<td>Alt 5A</td>
<td>-</td>
<td>Minor-Med</td>
<td></td>
</tr>
<tr>
<td>Alt 6A</td>
<td></td>
<td>Minor-Med</td>
<td></td>
</tr>
<tr>
<td>Alt 6B</td>
<td></td>
<td>Minor-Med</td>
<td></td>
</tr>
<tr>
<td>Alt 6C</td>
<td></td>
<td>Minor-Med</td>
<td></td>
</tr>
<tr>
<td><strong>Hazardous Materials Exposure from Releases</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alt 1</td>
<td>-</td>
<td>Negligible</td>
<td>Typically low, but infrequently high</td>
</tr>
<tr>
<td>Alt 5A</td>
<td>-</td>
<td>Negligible</td>
<td></td>
</tr>
<tr>
<td>Alt 6A</td>
<td>-</td>
<td>Negligible</td>
<td></td>
</tr>
<tr>
<td>Alt 6B</td>
<td>-</td>
<td>Negligible</td>
<td></td>
</tr>
<tr>
<td>Alt 6C</td>
<td>-</td>
<td>Negligible</td>
<td></td>
</tr>
</tbody>
</table>

**Explanations:**
- **Impact** refers to whether the alternative will improve (+), harm (-), or not impact health (\(\sim\)).
- **Magnitude** reflects a qualitative judgment of the size of the anticipated change in health effect (e.g., the increase in the number of cases of disease, injury, adverse events): Negligible, Minor, Moderate, Major.
- **Severity** reflects the nature of the effect on function and life-expectancy and its permanence: High = intense/severe; Med = Moderate; Low = not intense or severe.
- **Strength of Causal Evidence** refers to the strength of the research/evidence showing causal relationship between traffic safety and the health outcome: ♦ = plausible but insufficient evidence; 🌟🌟 = likely but more evidence needed; 🌟🌟🌟🌟 = high degree of confidence in causal relationship. A causal effect means that the effect is likely to occur, irrespective of the magnitude and severity.

Source: HIP

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Recommendations Related to Traffic Safety

- Traffic Safety Analysis
- Vehicles
- Walking and Biking Improvements

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• Traffic Safety Analysis
  o Conduct further traffic modeling to determine vehicle speeds and trips taken on arterials to better understand the relationship.

• Vehicles
  o Arterial speeds should be limited via traffic controls and traffic calming measures in order to reduce the number and severity of collisions and to encourage traffic to remain on the freeway.
  o Separate trucks from cars on the I-710 in order to reduce severe collisions on the freeway.
  o Strictly enforce truck routes to keep them out of residential neighborhoods in order to reduce truck-pedestrian/bicyclist collisions.
• **Walking and Bicycling Improvements:**
  
  • Supplement the planned intersection improvements with pedestrian-level improvements that increase their visibility and safety. Such improvements include, for example, clearly marked and protected crosswalks (e.g., with laddered crosswalks and pedestrian countdown signals).
  
  • Starting with existing residential streets that are walkable/bikeable, expand the network of walkable/bikeable streets throughout the I-710 corridor to provide safe and pleasant streets that can be used for active transportation. This could include implementing “bicycle boulevards” (i.e., limited-access, low speed streets that have traffic calming features such as mid-block diverters with bicycle cut-outs) in local streets.
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