California's Experience with HFST

California's Experience with HFST

- Overview
- Challenging Locations
- Collision Reduction (State and Local Roads)
- Typical Placement and current status

Overview

- Benefits of HFST that caused Caltrans to embrace the usage beside its high friction properties and resulting collision reduction results
  - *Non-proprietary*
  - *Very flexible on where it can be placed*
    - AC or PCC, one lane if needed, etc
  - *No impacts to cross drainage*
  - *Can be placed in all environments*
  - *Cost effective when compared to curve realignments*

Overview

- Investigation and recommendations are required for HCCL for all crashes and wet pavement crashes
  - *Quarterly Listing(Table C) for all crashes*
  - *Annual Listing (Wet Table C)for wet pavement locations*
- Highway segments, ramps and intersections are analyzed by computer program

Overview

- Before HFST - Typical countermeasures to select from:
  - *Open Grade Friction Course (OGFC)*
    - Not installed on bridge decks without approval
    - Can’t be installed in cold climate areas
    - Neither in snow or icy locations
    - Not used in areas with severe turning movements
  - *Grinding, grooving*
  - *Drainage Improvements*

Overview
First HFST Location in CA
I-105 on ramp near LAX airport early 2011

Challenging Locations
US Route 199

A Cost effective solution for an environmentally sensitive location

US Route 199

- Two- lane, curvilinear rural highway, ADT 4,000
- 280 curve radius, 30 mph curve
- 30 wet crashes from 2006 to 2009 (4 yrs)
- Total and Injury crash rates were 18.3 and 9.7 times the statewide average
- Given the average collision rate for two lane rural roadway and ADT, it should average only 2 crashes over the 4 years.

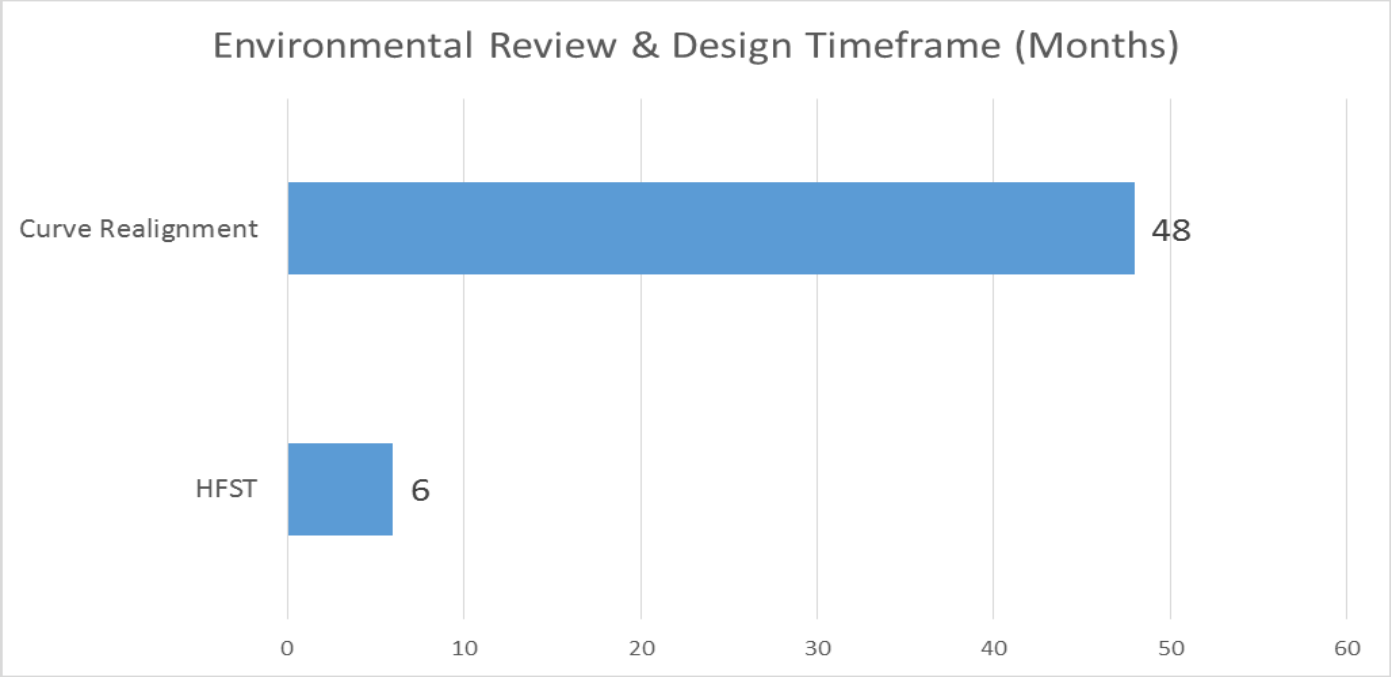
US Route 199

- Previous treatments installed that didn't lead to any measurable crash reductions
  - *One inch, Open Grade Asphalt Concrete*
  - *Double stacked chevrons*
  - *Double the number of speed warning signs*
  - *Centerline rumble strips*
- Next step in the incremental approach was to consider realignment of roadway

US Route 199

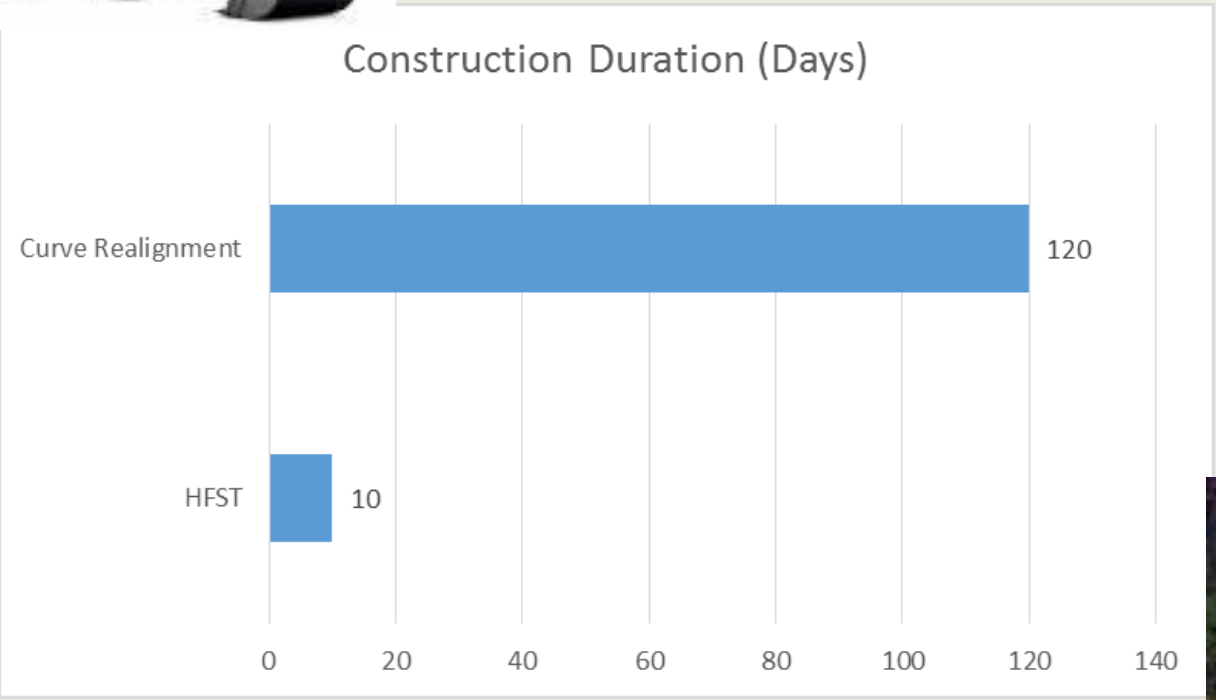
HFST / Realignment Consideration
Highly Sensitive Environmentally Area

Roadway parallels the Smith River
Wetlands
Two species protected by Federal Endangered Species Act



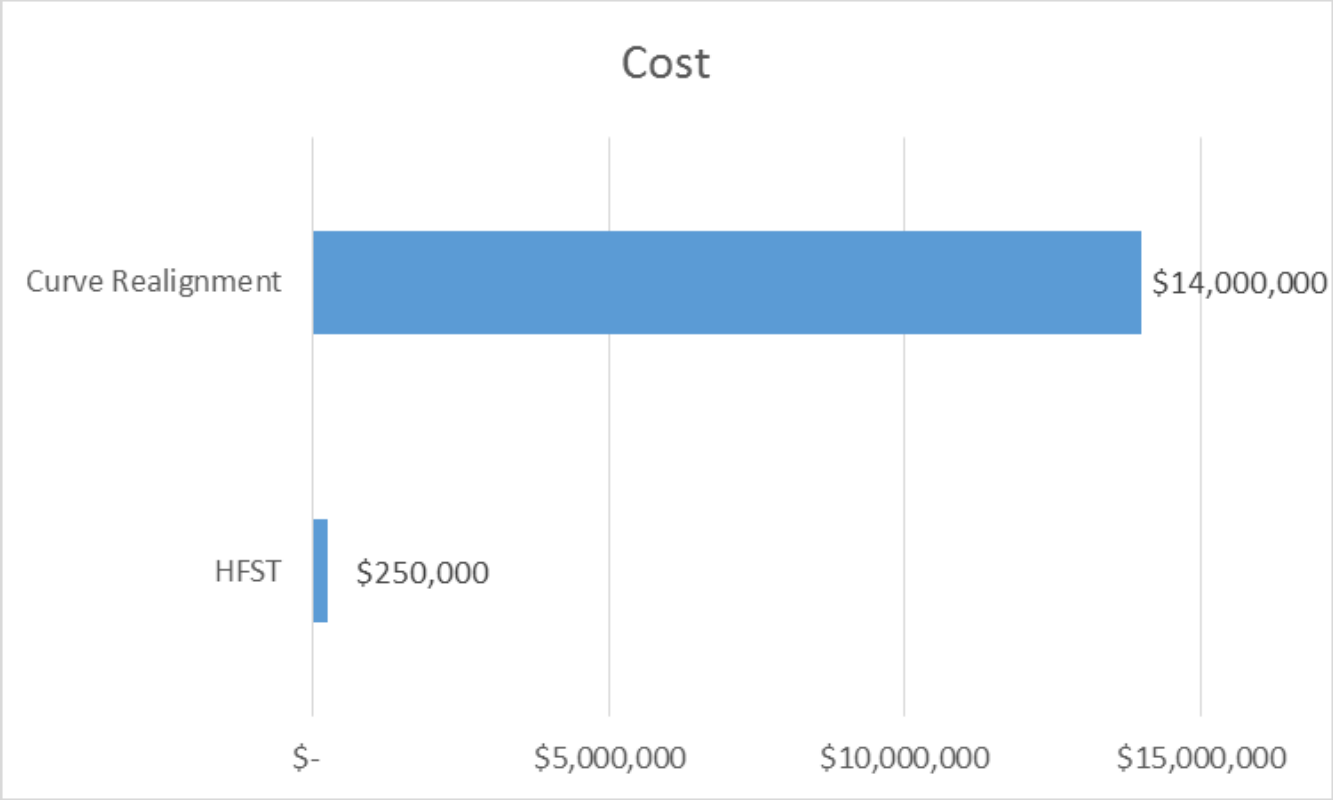
US Route 199

HFST / Realignment Consideration
Construction



US Route 199

HFST / Realignment Consideration Cost….$$$$



US Route 199
HFST / Realignment Consideration

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- .....in the meantime while waiting to get through Programming, PE phase, Environmental phase, R/W phase and Construction Phase.....<u>32</u> more crashes would likely have occurred with 8 of those causing injuries.....

US Route 199
HFST / Realignment Consideration

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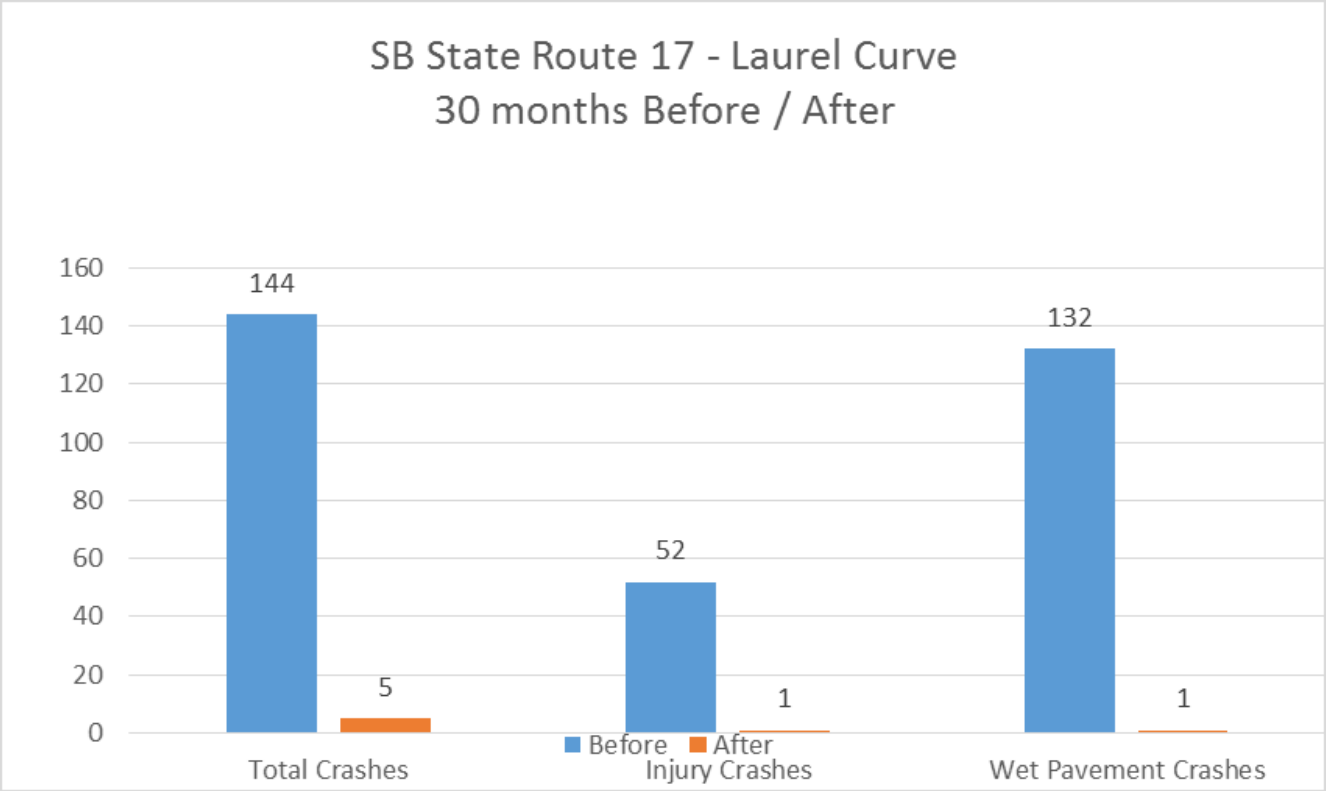
- .....HFST installed in November 2013. No official crash data but discussions with district and maintenance staff, location is performing very well!

Rte 17 – Laurel Curve near Santa Cruz

- ADT 27,200 (one direction), high speed expressway commuter route
- Latest 5 years of collision data, 191 of 228 or 84% of collisions were in wet pavement conditions.
- OGFC -existing pavement surface
- Ongoing High Collision Concentration – no answers
- HFST was installed in July 2012

Rte 17 – Laurel Curve near Santa Cruz

Rte 17 – Laurel Curve near Santa Cruz



96.5% collision reduction!!

HFST on Local Roadways

Promoting the use of HFST to use on local roadways:

Currently have 10 counties, 19 projects ~ 75 locations.

HFST on Local Roadways –
Before - After Results

BEFORE

- 17 horizontal curve locations installed in October 2014 on 12 county roads
- 91 total crashes, 10 Severe -5 years before installation
- ~18 crashes annual average (combined locations)

AFTER

- 10 crashes, 0 severe – 13 months after
- ~9 crashes annual average (combined locations)
- 50% overall collision reduction, 100% severe collision reduction

First HFST Location
I-105 on ramp near LAX airport early
Before / After Results

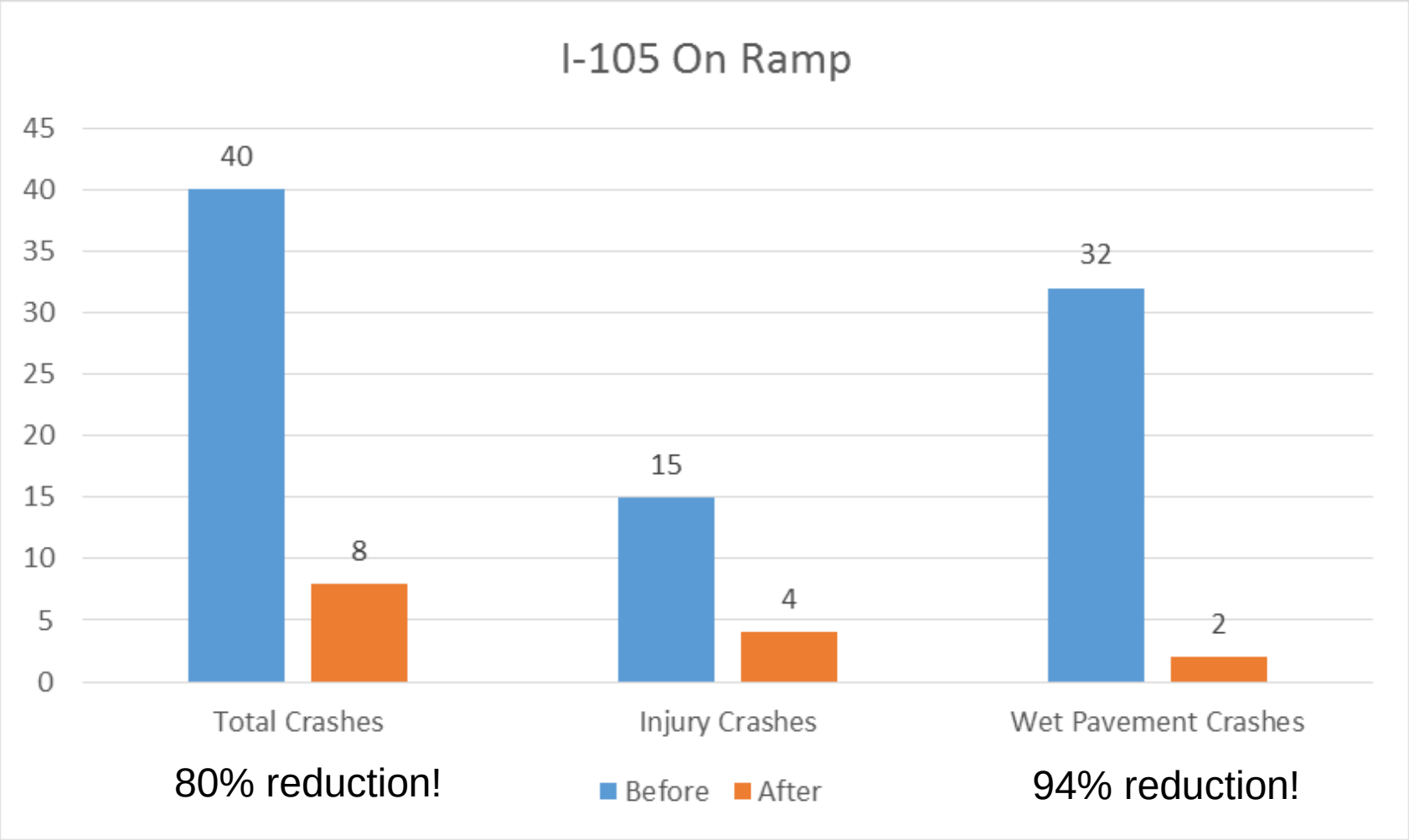
Average number of crashes for this ramp type using the ADT and time period (31 months) - 12

<u>Before</u>

ADT – 31,000
Total Crashes – <u>40</u> over 31 months
Wet Pavement Crashes – 32
Total Collision Rate was 3.3 times higher than statewide average

<u>After</u>

Total Crashes – <u>8</u> (80% reduction)
Wet Pavement Crashes – 2 (94% reduction)
Total Collision rate has dropped below the statewide average


I-105 On Ramp
45
40
35
30
25
20
15
10
5
0
40
8
15
4
32
2
Total Crashes
Injury Crashes
Wet Pavement Crashes
80% reduction!
Before
After
94% reduction!

Typical HFST Placement – On Ramps

Typical HFST Placement

Curves on Highway and Freeway connectors

HFST Projects as Dec 2015

- Total locations in California -232
- State Highways
  - *157 locations total statewide*
    - 45 locations completed
    - 25 in construction
    - 87 in PE phase
- Local Roadways
  - *19 locations*
    - 75 locations in 10 Counties

Thanks…

Contact Information:

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