Weather-Responsive Active Traffic Management

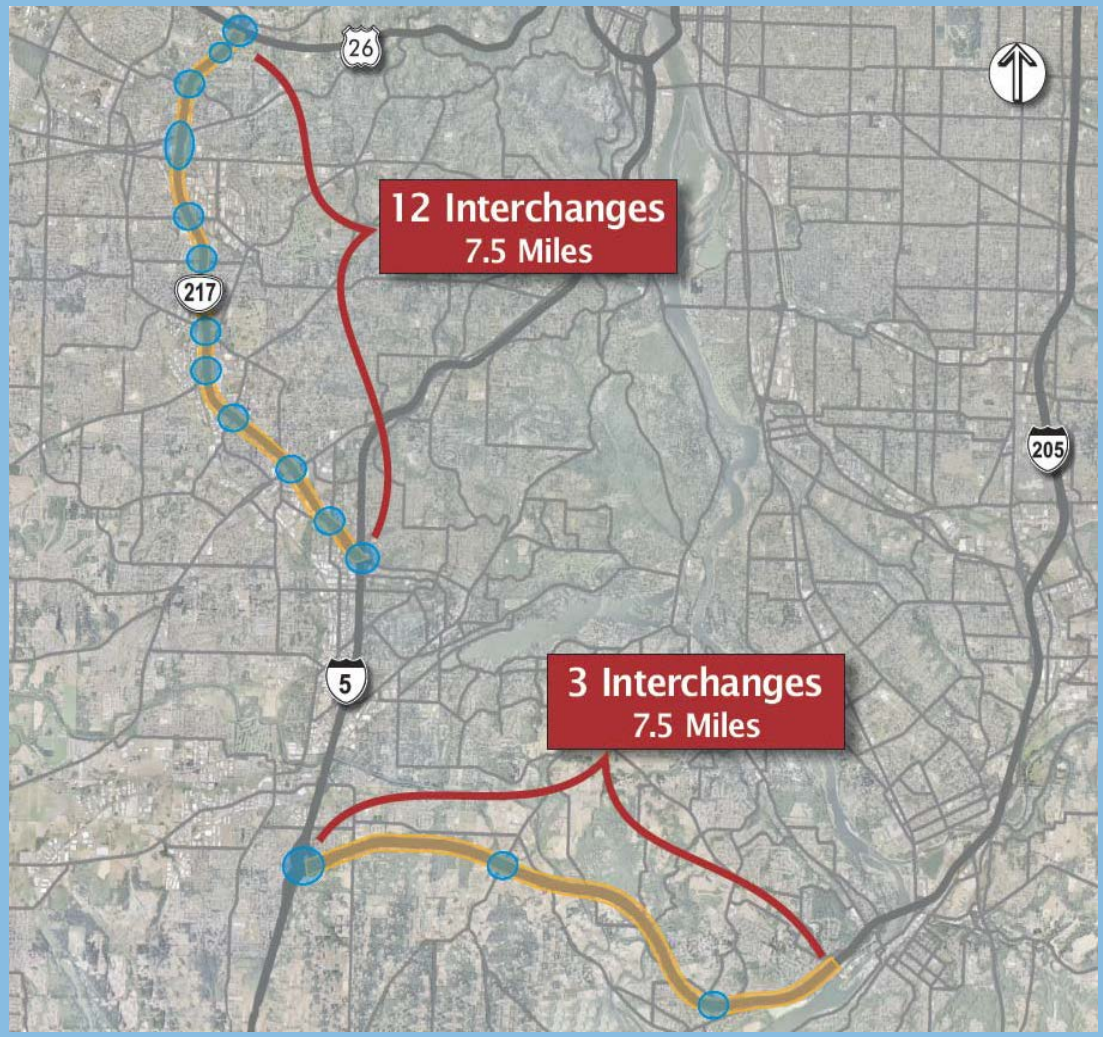
Dennis Mitchell

Road Weather Management Stakeholder Meeting

August 2014

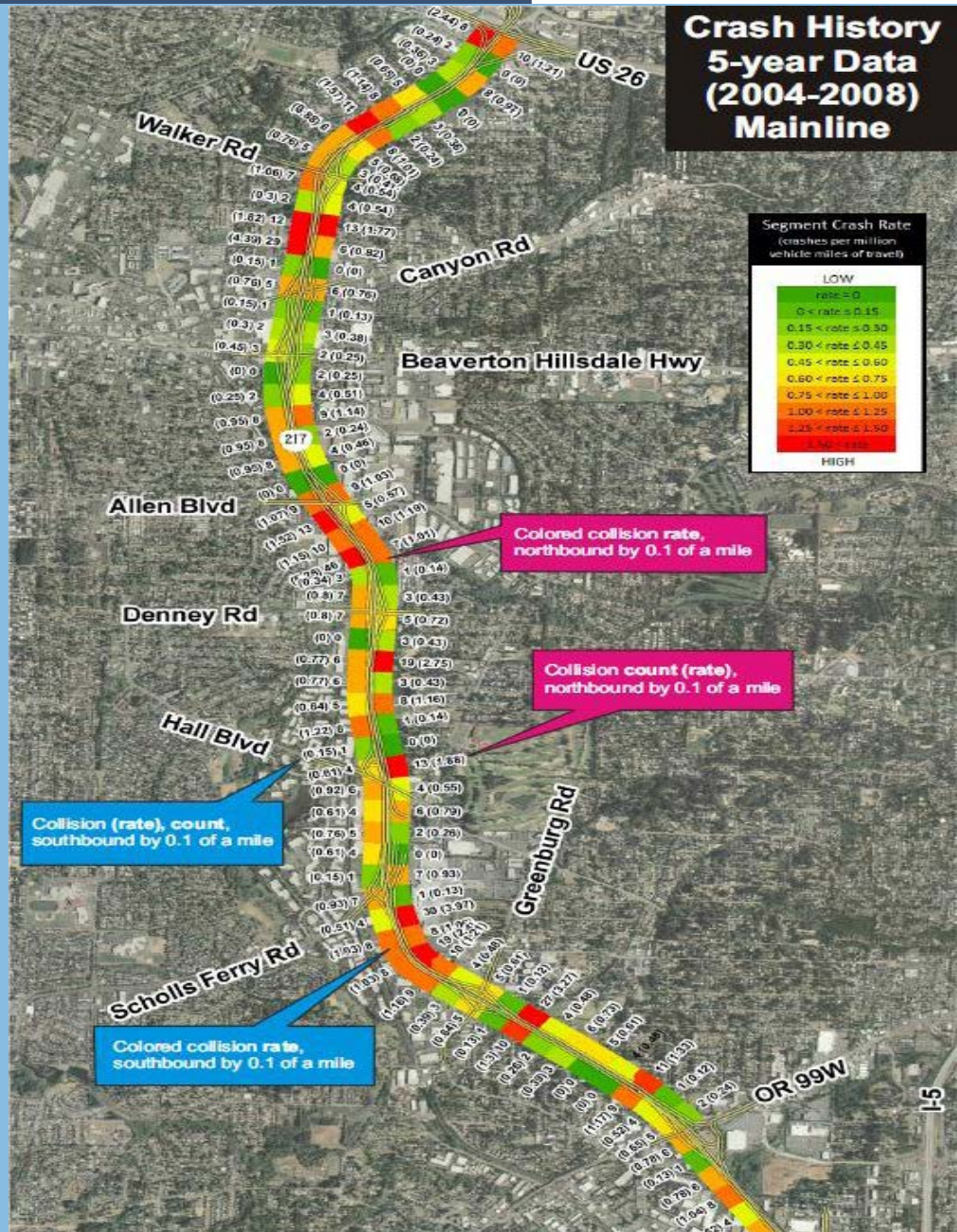
Oregon Route 217

- Closely spaced inter-changes
- 7.52 miles
- 2-3 lane freeway
- 122,000 ADT
- <5% heavy vehicles



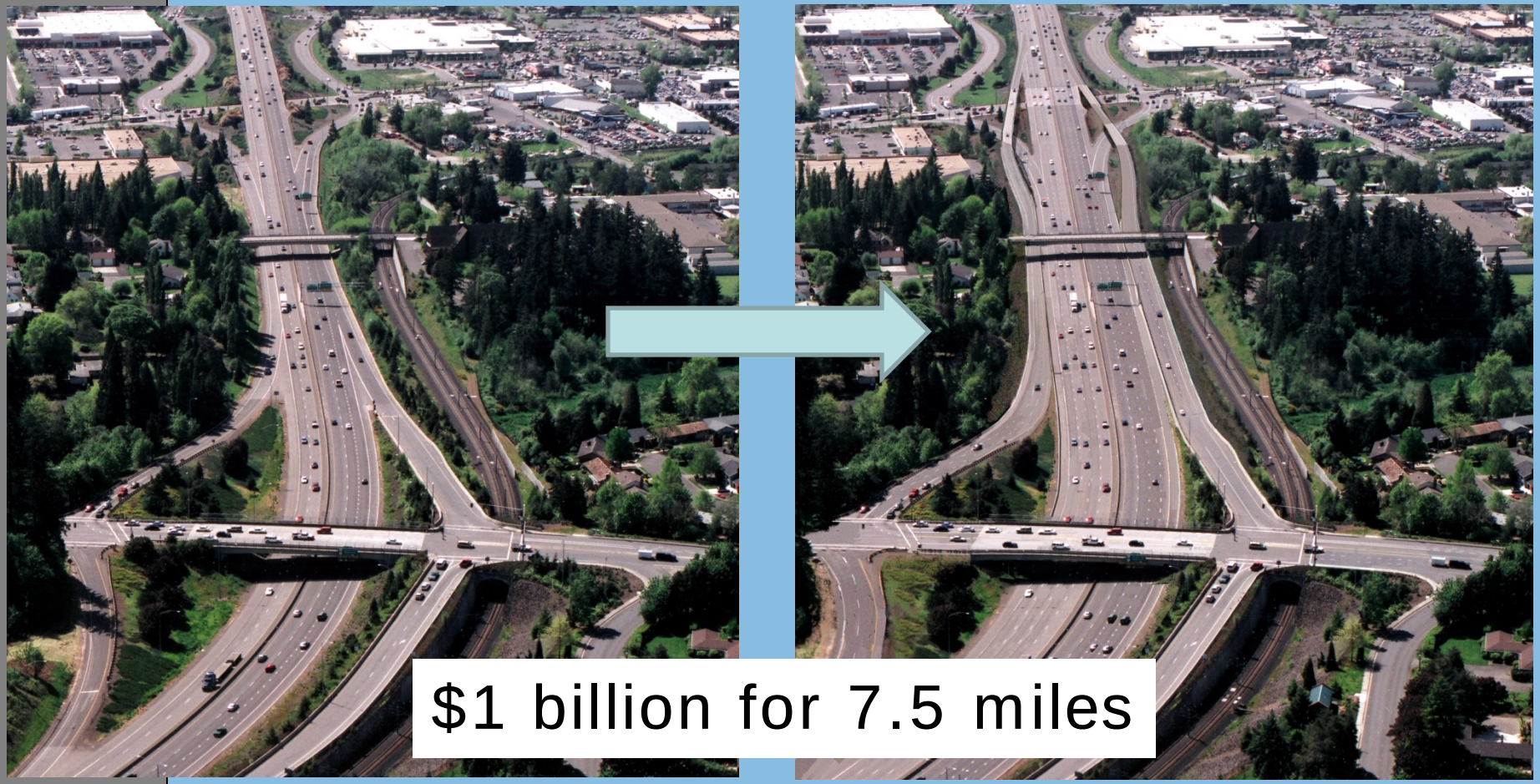
ORE 217 ATM

- 265 crashes per year
- Crash every other day
- Most during peak periods



Planned Solution (2004)

Add lanes, braid ramps



$1 billion for 7.5 miles

New Planning Goals (2011)

- Find a lower cost strategy to improve conditions now
- Not replace the previously established long term needs of the corridor
- Be consistent with the long term corridor plan

Targeted Safety Improvements

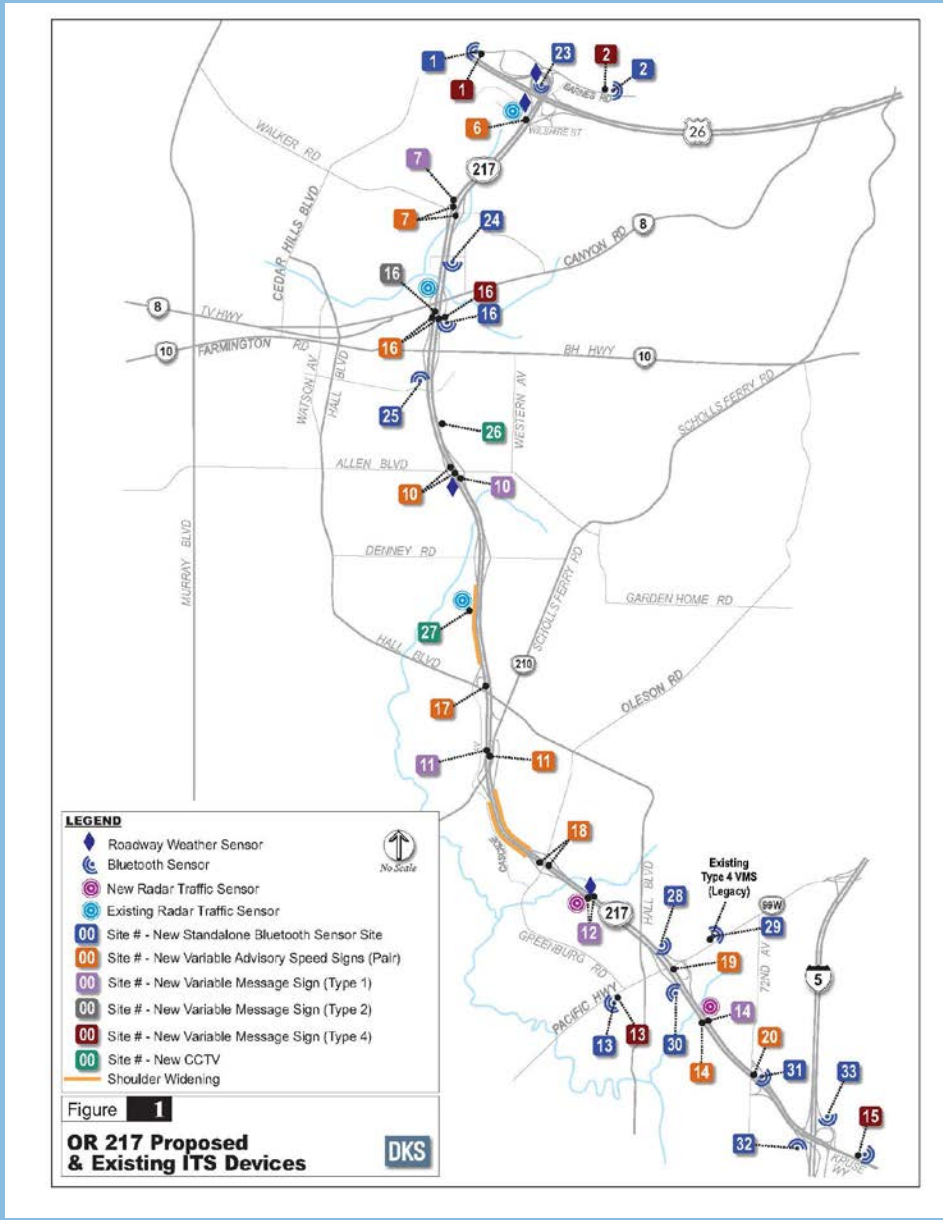
Affordable improvements we can build today, with immediate driver benefits:

- Traveler information system
- Queue warning system
- Variable advisory speeds
- Curve warning system
- Updated adaptive ramp metering
- Targeted shoulder widening

Total Cost: 1% of $1 Billion

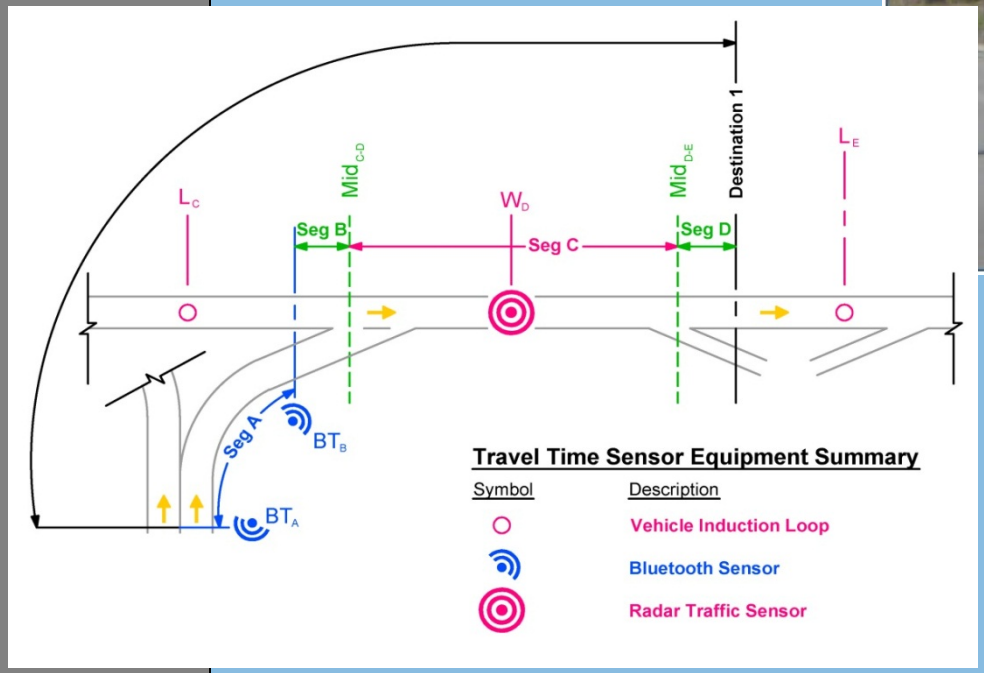
ITS Equipment

- 28 variable advisory speed signs
- Seven mainline VMS
- Six arterial VMS
- Four RWIS grip factor sensors
- Five radar traffic sensors
- 12 Bluetooth sensors
- 24 Ramp Meters
- 20 mainline loop data stations
- 11 CCTV Cameras



Travel Time

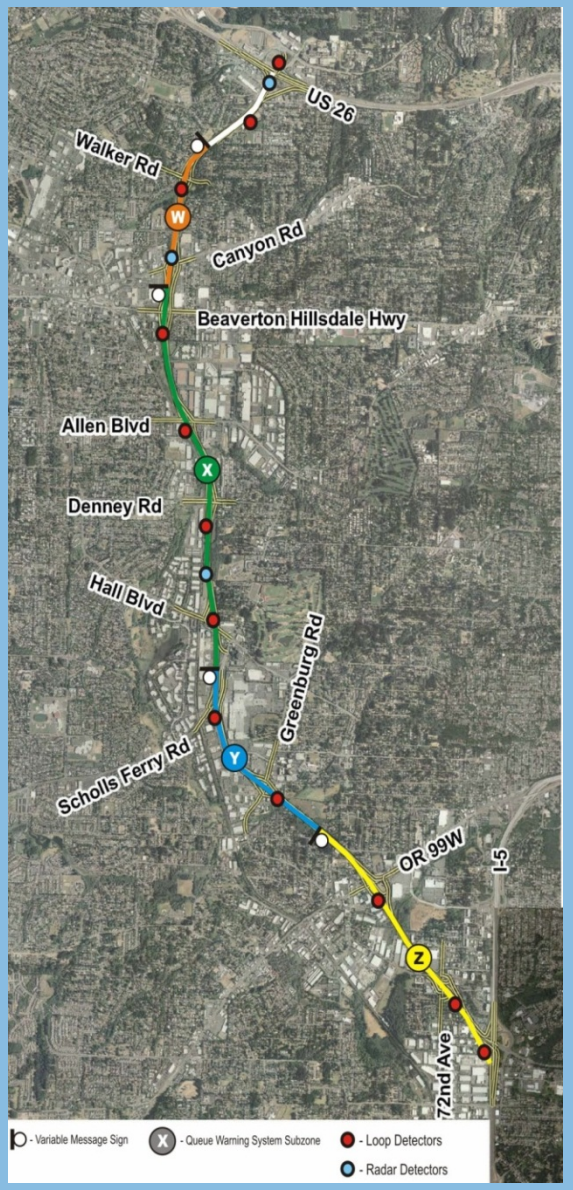
- Displayed during peak times



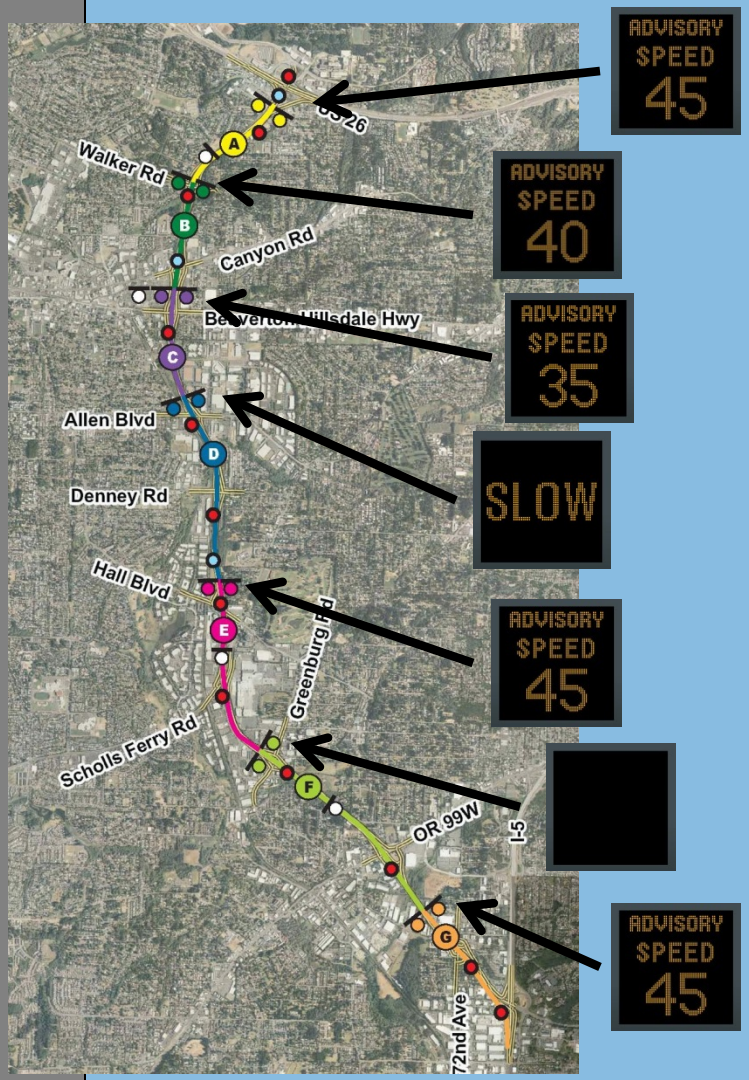
- Combines data from vehicle induction loops, radar and Bluetooth sensors

Queue Warning System

- Reduce sudden braking and rear-end collisions
- Provide details on distance to queue
- No message if already congested



Congestion Responsive VAS



- Each subzone's speed determined by the lower of:
  - Local 85th percentile speed
  - Downstream speed + step (5-10 mph)
- Speeds measured by dual loops and radar
- Speeds < 30 mph display "SLOW"

Weather Responsive

- Goal is to notify drivers of adverse weather conditions by:
  - Providing advised speeds for different adverse weather events (including visibility)
  - Using applicable messages on VMS during adverse weather events
- Four RWIS grip factor sensors installed in corridor
- Worst weather condition will control whole corridor

Weather Responsive

Weather Speed Lookup Table

Visibility \ Grip Factor	> 0.70	0.70 > X > 0.30	< 0.30	Chain Requirement
> 500'	Speed Limit	Speed Limit - 10 MPH	Speed Limit - 20 MPH	Chain Speed
< 500'	Speed Limit - 10 MPH	Speed Limit - 20 MPH	Minimum Speed	Chain Speed

Weather VMS Message Lookup Table

Visibility	Classification \ Grip Factor	> 0.70	0.70 > X > 0.30	< 0.30	Chain Requirement
> 500'	Moist or Wet	(None)	USE CAUTION	USE CAUTION	(None)*
	Frosty, Snowy, Icy, or Slushy	N/A	ICE USE CAUTION	ICE USE CAUTION	(None)*
< 500'	Moist or Wet	LOW VISIBILITY USE CAUTION	USE CAUTION	USE CAUTION	(None)*
	Frosty, Snowy, Icy, or Slushy	LOW VISIBILITY USE CAUTION	ICE USE CAUTION	ICE USE CAUTION	(None)*

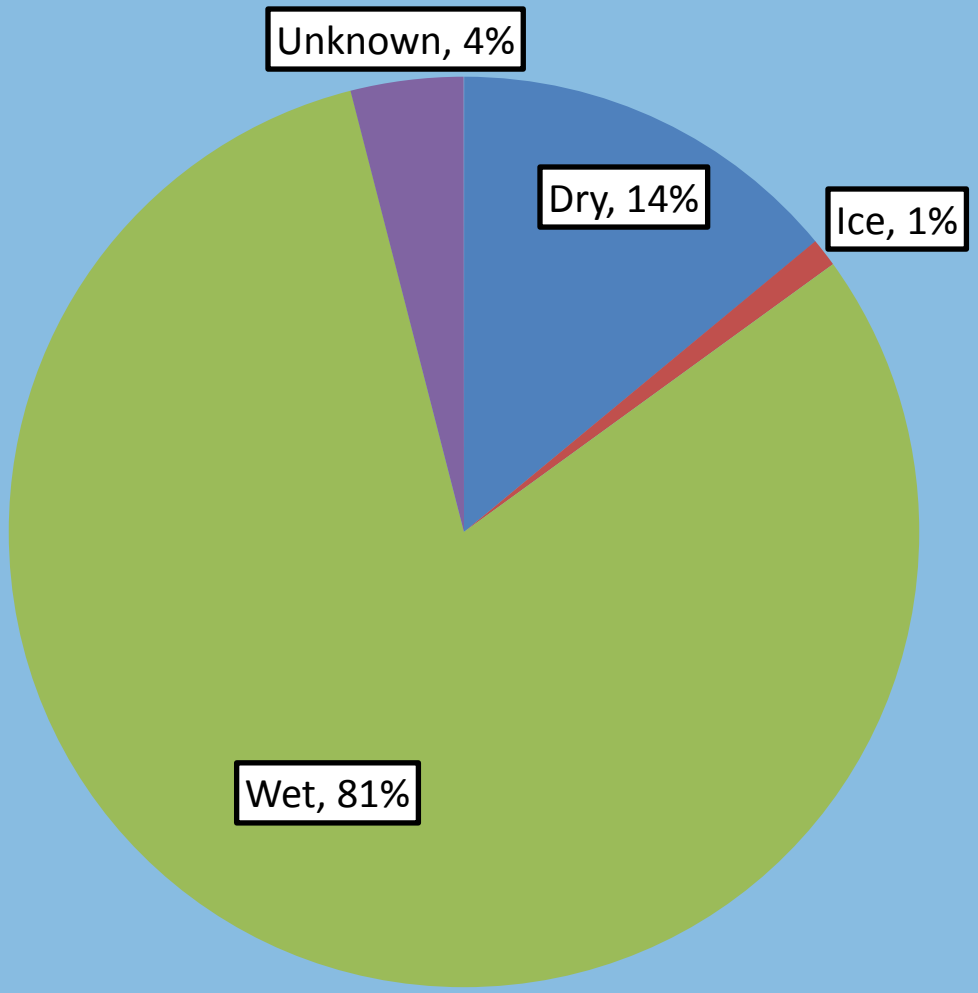
*Snow zone chain requirement messages for VMS will come from ATMS/TOCS

Variable Advisory Speed

Curve Warning System

US26 / OR217
Interchange

Crashes by Road Surface Condition



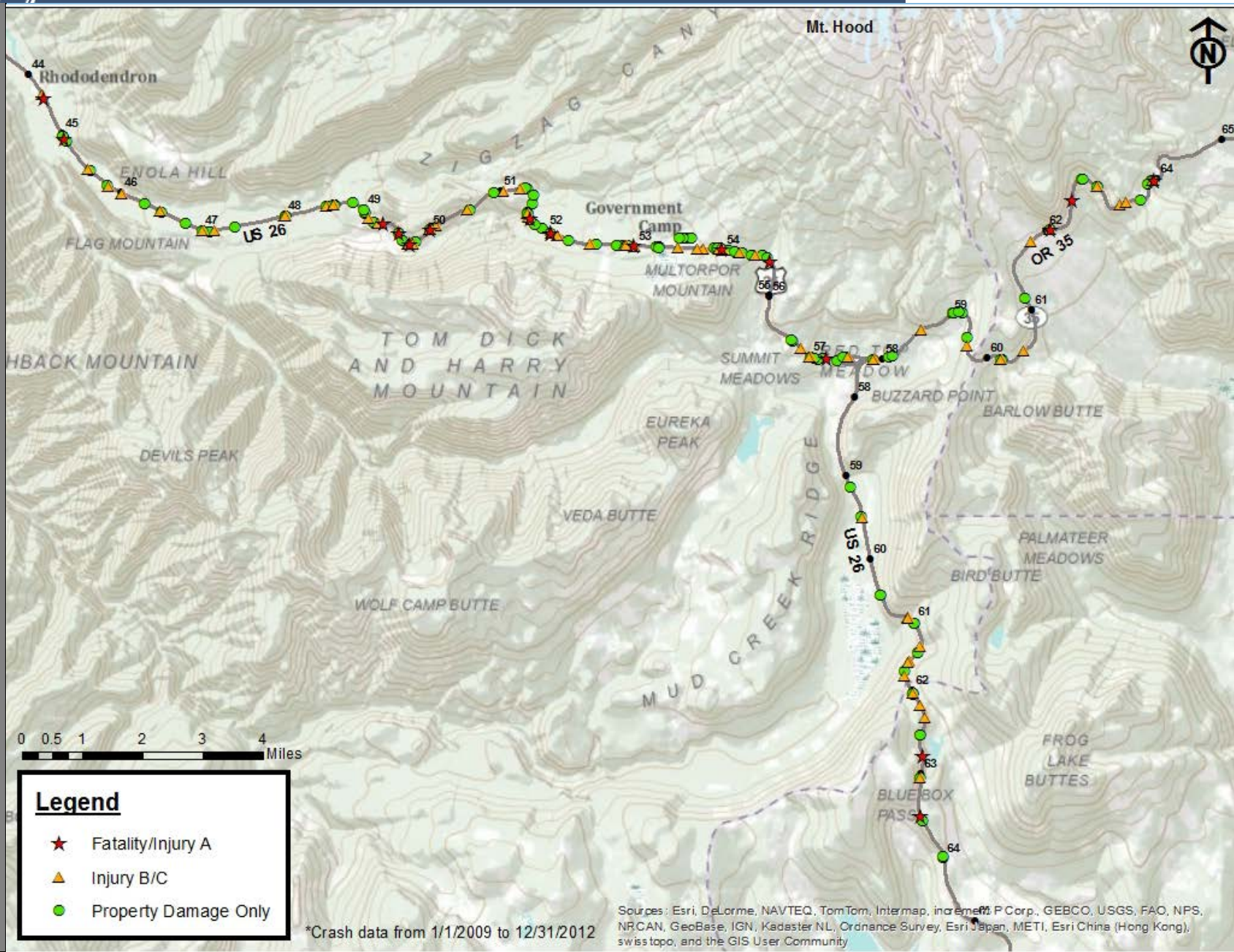
Curve Warning System

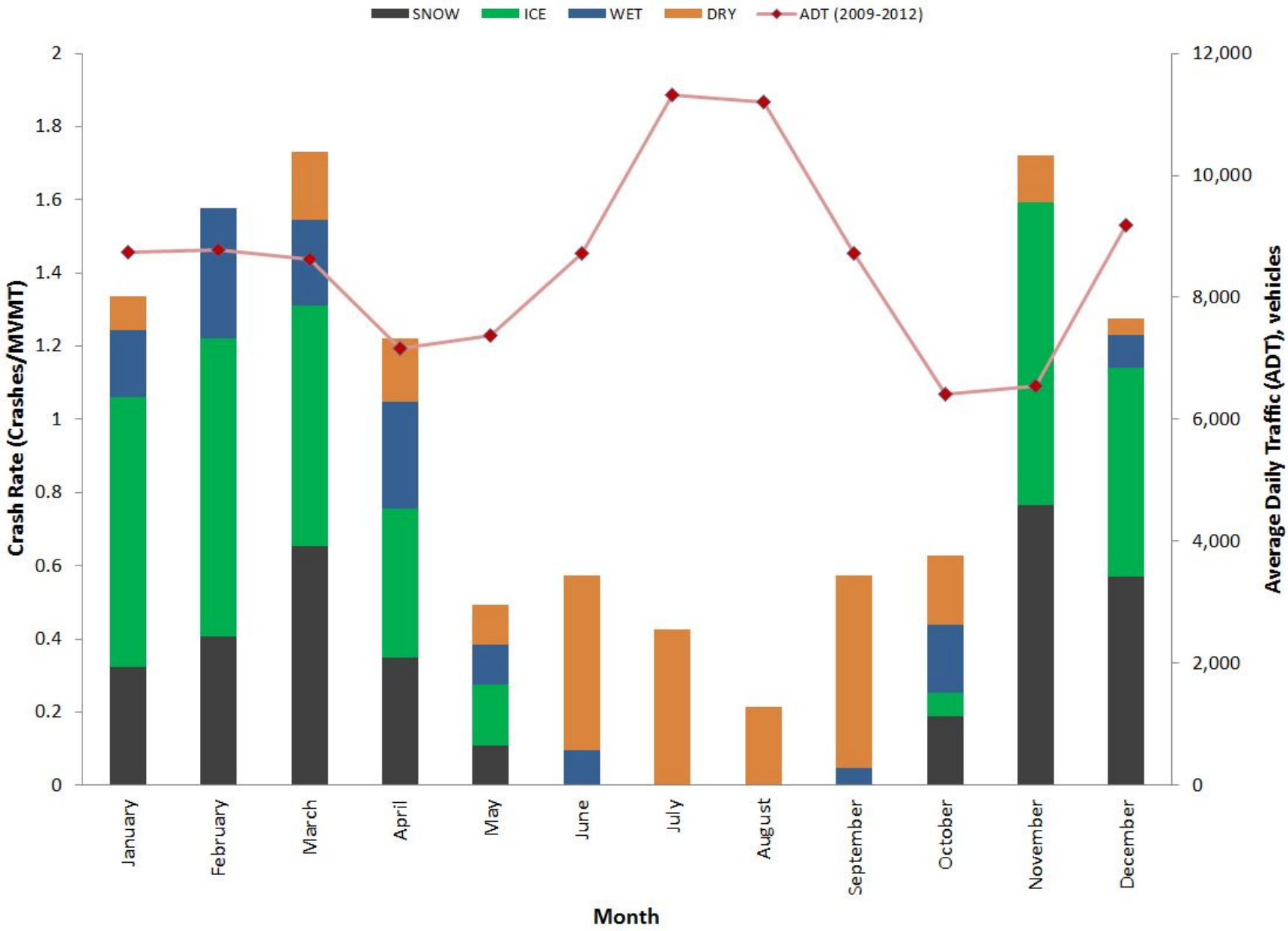
- Activates based on grip factor
- Sensors
  - Temperature
  - Moisture
  - Visibility

Mt Hood ATM

- US26 & ORE35 Variable Advisory Speed
- Federal Grant
- Recreational route
  - Through traffic in summer to central Oregon
  - Skiing on Mt. Hood in winter

Oregon Department of Transportation




SNOW
ICE
WET
DRY
ADT (2009-2012)
Crash Rate (Crashes/MVMT)
Average Daily Traffic (ADT), vehicles
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
0
2,000
4,000
6,000
8,000
10,000
12,000
January
February
March
April
May
June
July
August
September
October
November
December
Month

Variable Speed based on Weather

Warning based on Road Condition

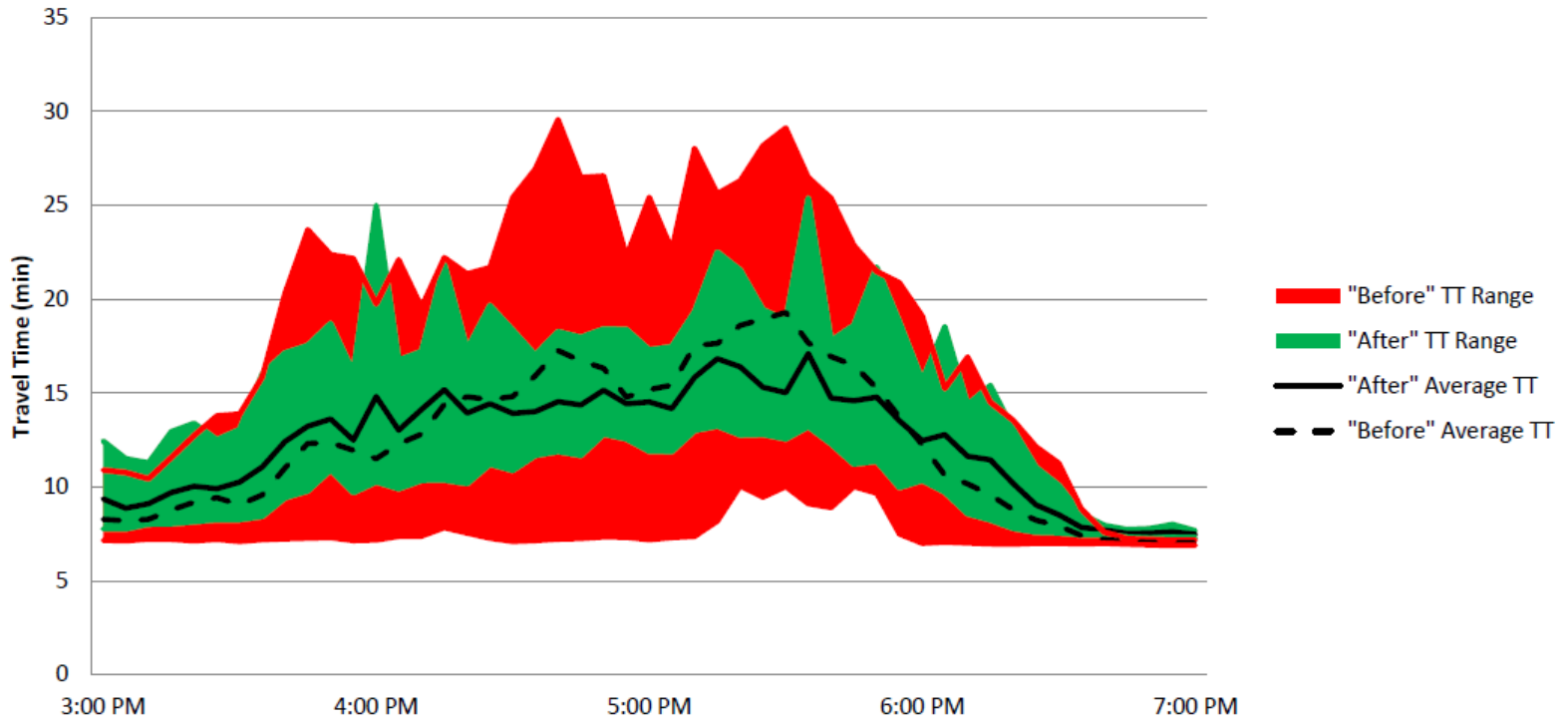
Weather Responsive Evaluation Plan

Evaluation Objectives:

1. Measure impact on mean speeds and speed distribution
2. Measure impact on incident rates
3. Measure driver compliance
4. Compare weather based speeds to congestion based recommended speeds
5. Measure impact on reliability
6. Document lessons learned

Travel Time Reliability Improvement

with Ramp Meter upgrade, Travel Time, and VAS



- Average Buffer Index before VAS = 48.8%
- Average Buffer Index after VAS = 27.64%

- Before = July 2012 midweek days
- After = Midweek days from the past three weeks

ITS

Project Timeline

- US26/ORE217 Curve Warning — Feb 2014
- ORE217 Congestion VAS — July 2014
  I5/I405 Congestion VAS
- ORE217 Weather VAS — Sept 2014
- I5/ORE217 Curve Warning — Oct 2014
- Mt Hood VAS — 2015