American Road & Transportation Builders Association

Texas Department of Transportation

Texas A&M Transportation Institute

Hybrid Travel Time / EOQ Warning System

Odessa, Texas

Travel Time Systems

- **Purpose:** Give near real-time information to destinations
- **Typical data sources:** Fixed detection, Bluetooth/Wi-Fi, third-party probes, video
- **Output channels:** DMS/PCMS, 511 web/IVR, APIs to nav partners
- **Design choices:** Segment length typically 1–3 miles
- **Procurement model:** Build vs buy; sensor CAPEX vs probe-data OPEX
- **Ops considerations:** Solar/battery sizing, night-time visibility, weather impacts.

End-of-Queue Systems

- **Purpose:** Reduce rear-end and hard-braking crashes
- **Typical data sources:** Portable radar sensors, probe vehicles, video analytics; data fusion
- **Trigger logic:** Typically speed-drop thresholds, can be configurable by lane and time-of-day
- **Design choices:** Typically 0.5 - 2+ miles upstream based on speed/sight distance/grade
- **Procurement model:** Build vs buy; sensor CAPEX vs probe-data OPEX
- **Ops considerations:** Remote monitoring, cellular comms, solar/battery sizing, staffing for repositioning, night-time visibility, weather impacts.

Challenges

- Travel time segment length and placement
- Destination choices
- Work zone skew
- Lane drop dependency
- Speed of detection
- Different back-office models from different vendors

Shared Challenges

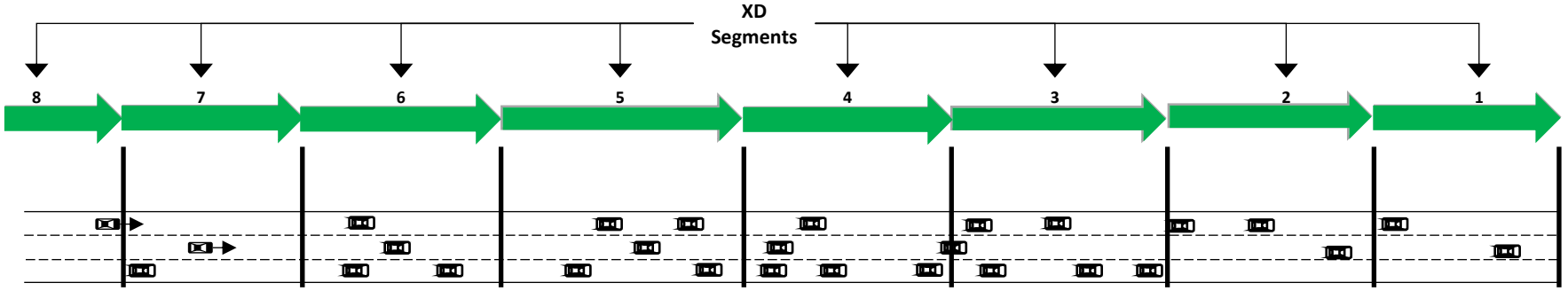
- Placement uncertainty (too early vs too late)
- Balancing speed vs stability in data
- Integration with work zone & incident management
- Traveler trust easily broken, hard to regain
- Comms & power are single points of failure
- O&M costs often underestimated
- Lack of standard metrics limits comparability

The Benefits of a Hybrid System

- **Dual-purpose infrastructure:** One deployment can do both travel time monitoring and EOQ
- **Placement:** Travel time data provides a corridor-wide view, EOQ identifies where queues are forming
- **Richer traveler information:** Combines predictive ETAs with immediate safety warnings.
- **Same data feed:** Probe or detection data serves multiple purposes
- **Operational efficiency:** One monitoring and comms backbone for both functions simplifies O&M, reduces staff workload, and avoids managing siloed systems
- **Value-for-money:** Hybrid systems maximize ROI by serving both **safety** (rear-end crash reduction) and **mobility** (traveler ETA reliability) objectives under one procurement

Travel Time

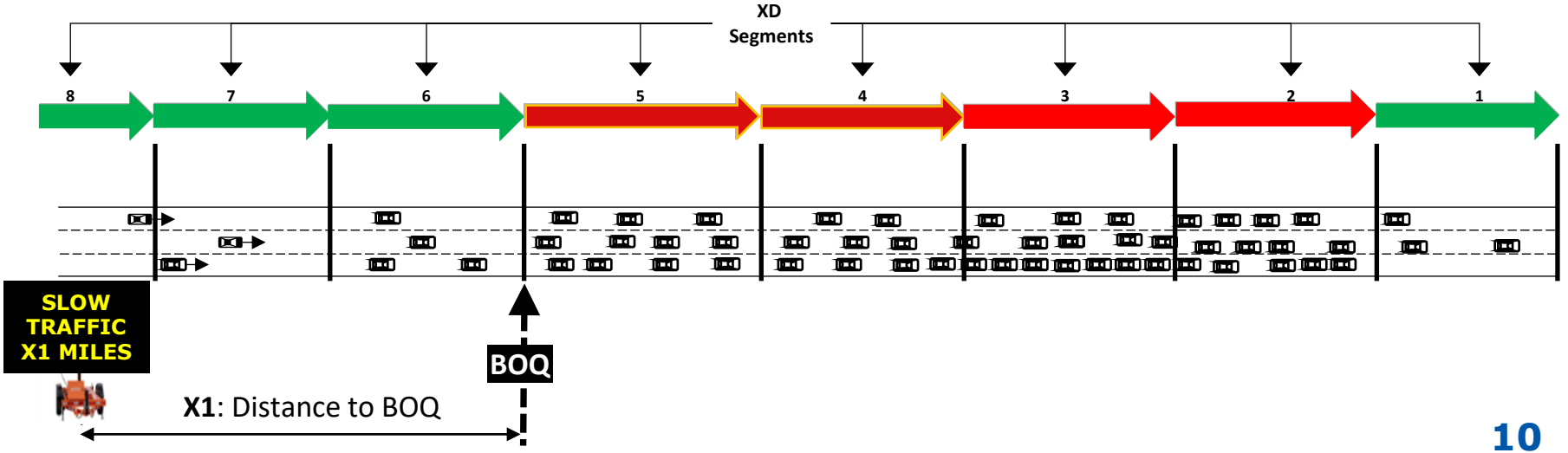
IF	$v > 45$ mph	Free-flow / NO Queue
IF	$25 \text{ mph} < v \leqq 45$ mph	Slow Traffic
IF	$v \leqq 25$ mph	Stopped Traffic




STANTON
18 MILES
16 MIN

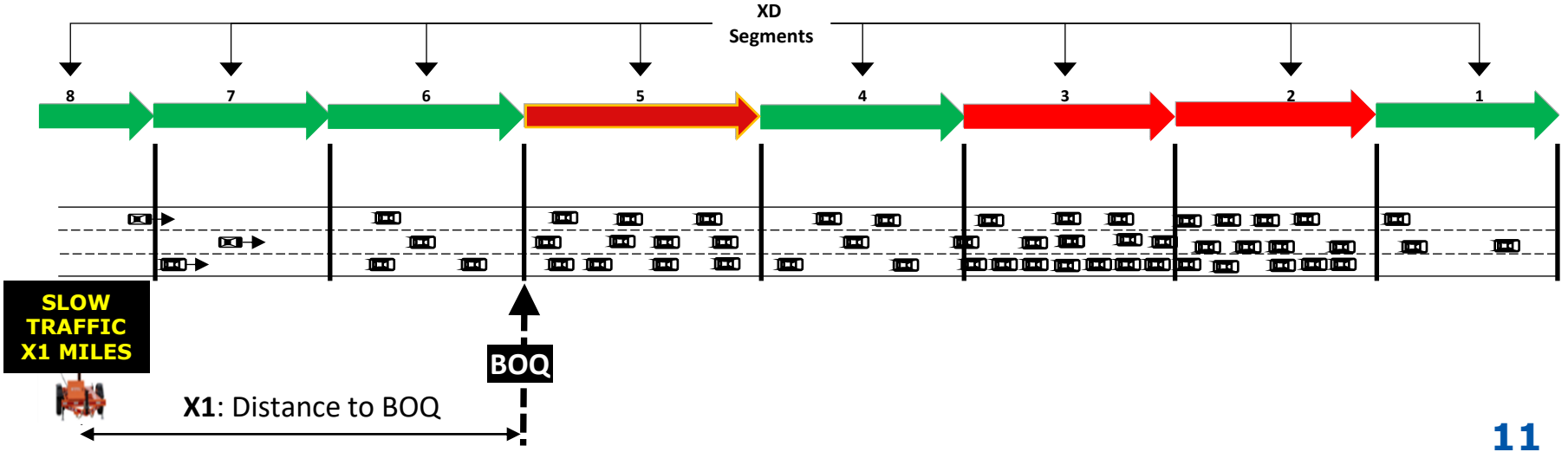
Queue Warning: Slow Traffic

IF	$v > 45$ mph	Free-flow / NO Queue
IF	$25 \text{ mph} < v \leqq 45$ mph	Slow Traffic
IF	$v \leqq 25$ mph	Stopped Traffic



Queue Warning: Slow Traffic

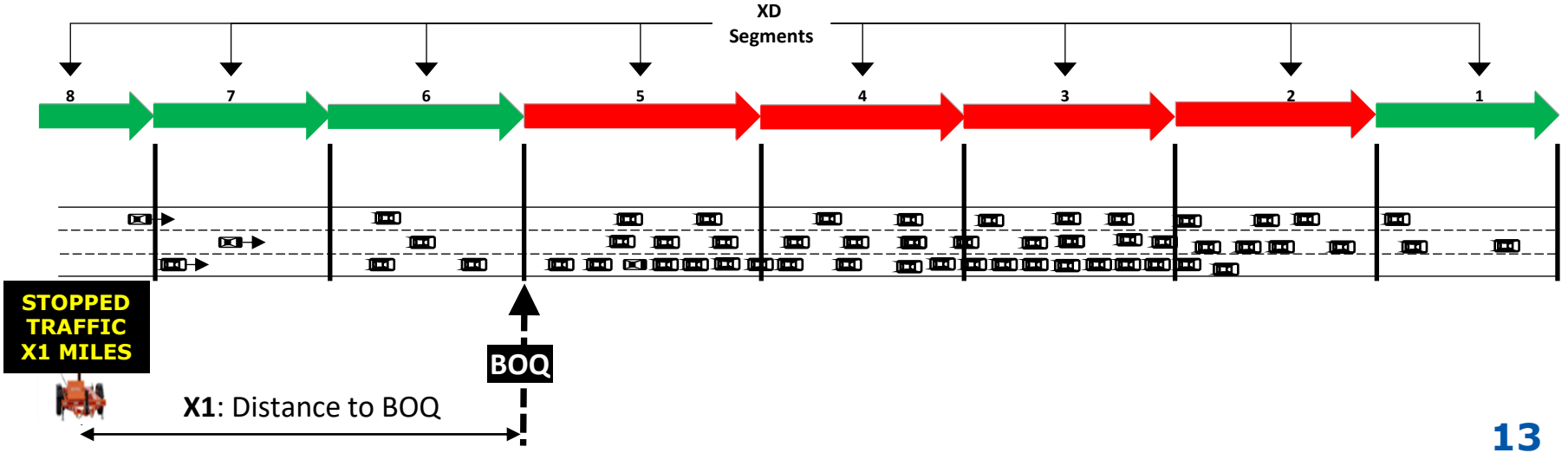
IF	$v > 45$ mph	Free-flow / NO Queue
IF	$25 \text{ mph} < v \leqq 45$ mph	Slow Traffic
IF	$v \leqq 25$ mph	Stopped Traffic




SLOW
TRAFFIC
1 MILE

Queue Warning: Stopped Traffic

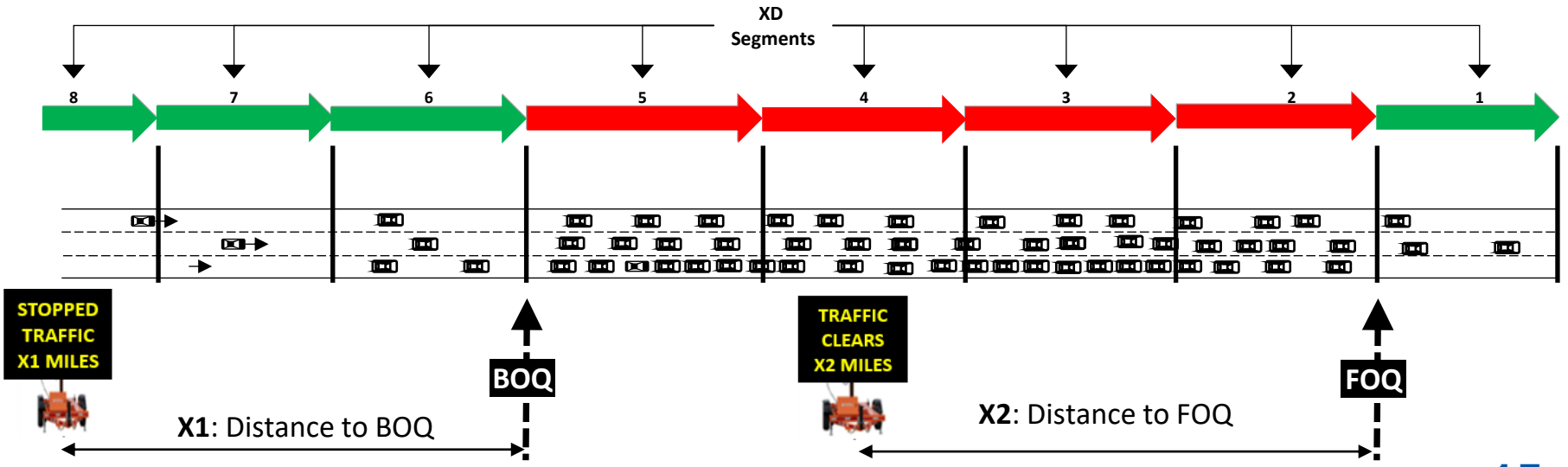
IF	$v > 45$ mph	Free-flow / NO Queue
IF	$25\ mph < v \leqq 45$ mph	Slow Traffic
IF	$v \leqq 25\ mph$	Stopped Traffic




STOPPED
TRAFIC
1 MILE

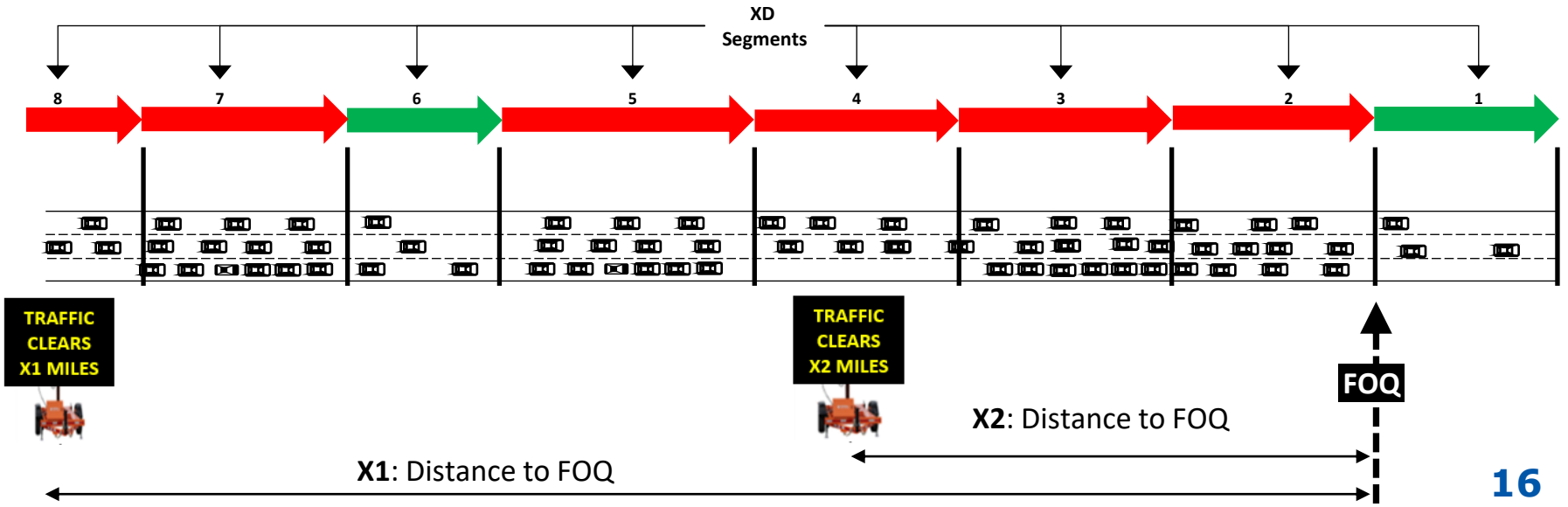
Queue Warning: Traffic Clears

IF	$v > 45$ mph	Free-flow / NO Queue
IF	$25\ mph < v \leqq 45$ mph	Slow Traffic
IF	$v \leqq 25\ mph$	Stopped Traffic



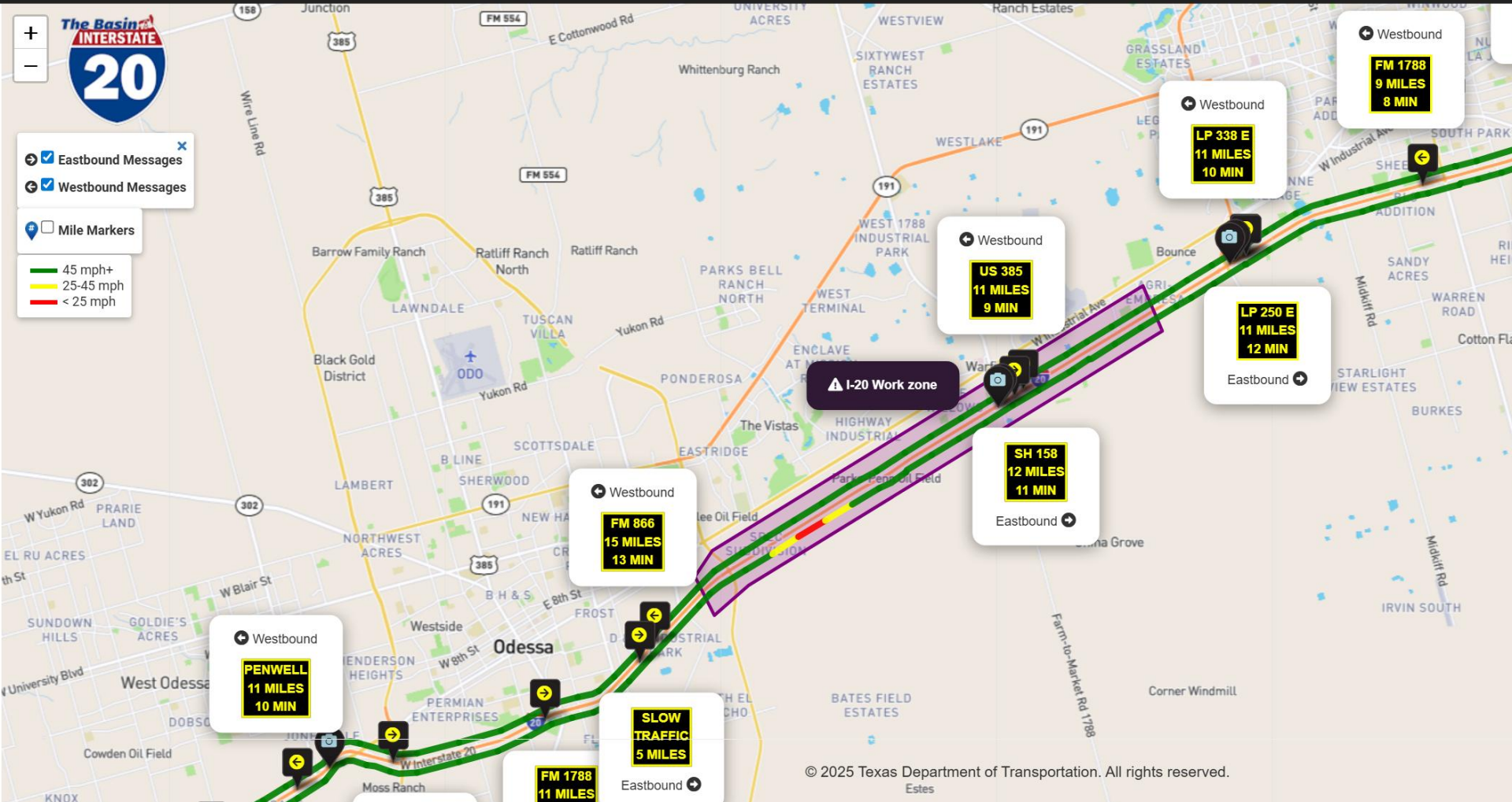
Queue Warning: Traffic Clears

IF	$v > 45$ mph	Free-flow / NO Queue
IF	$25\ mph < v \leqq 45$ mph	Slow Traffic
IF	$v \leqq 25\ mph$	Stopped Traffic




TRAFFIC
CLEARS
2 MILES

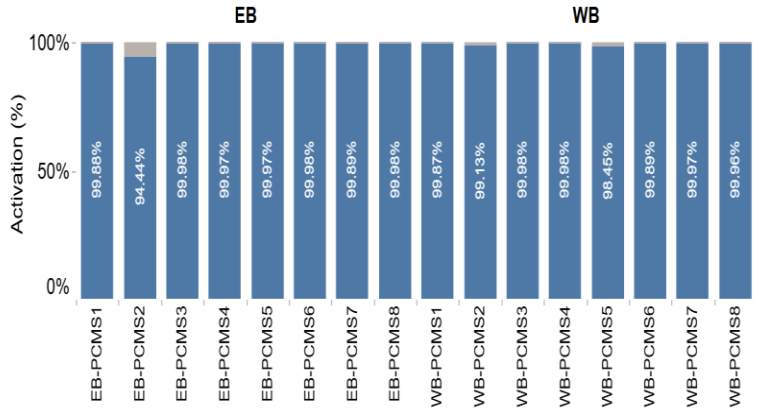
I-20 Odessa Travel Map



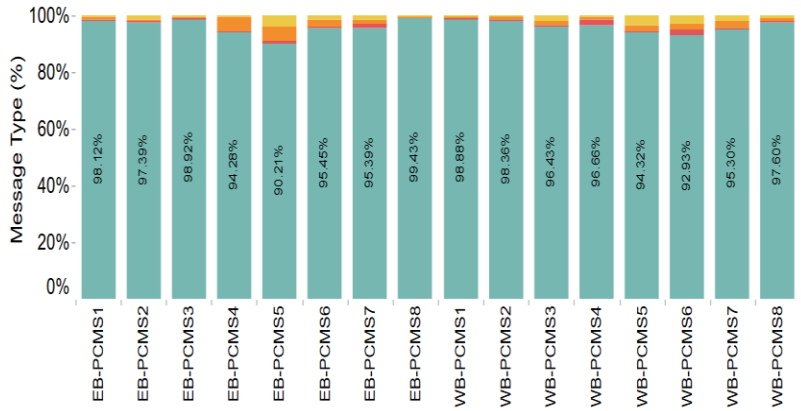
Odessa I-20 Traveler Information & Queue Warning System

Statistics for June 1, 2025 – September 28, 2025

Activations



Message Type by Sign



PCMS ID

(All)

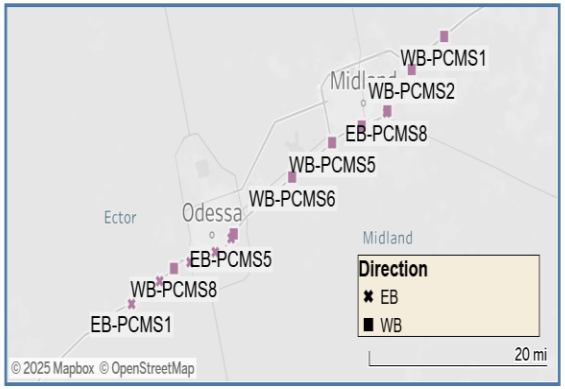
Message Type

- (All)
- slowTrafficXMiles
- stoppedTrafficXMiles
- trafficClearsXMiles
- travelDistTimeFromSpeed

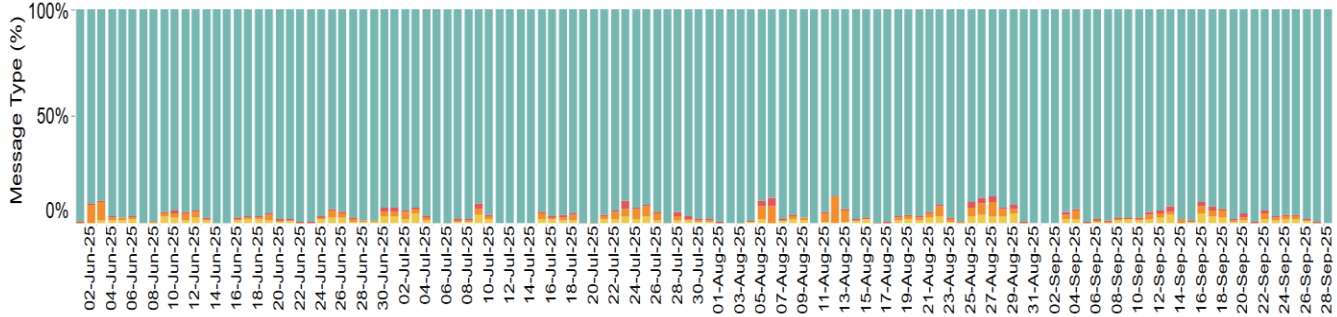
Message Type

- travelDistTimeFromSpeed
- trafficClearsXMiles
- stoppedTrafficXMiles
- slowTrafficXMiles

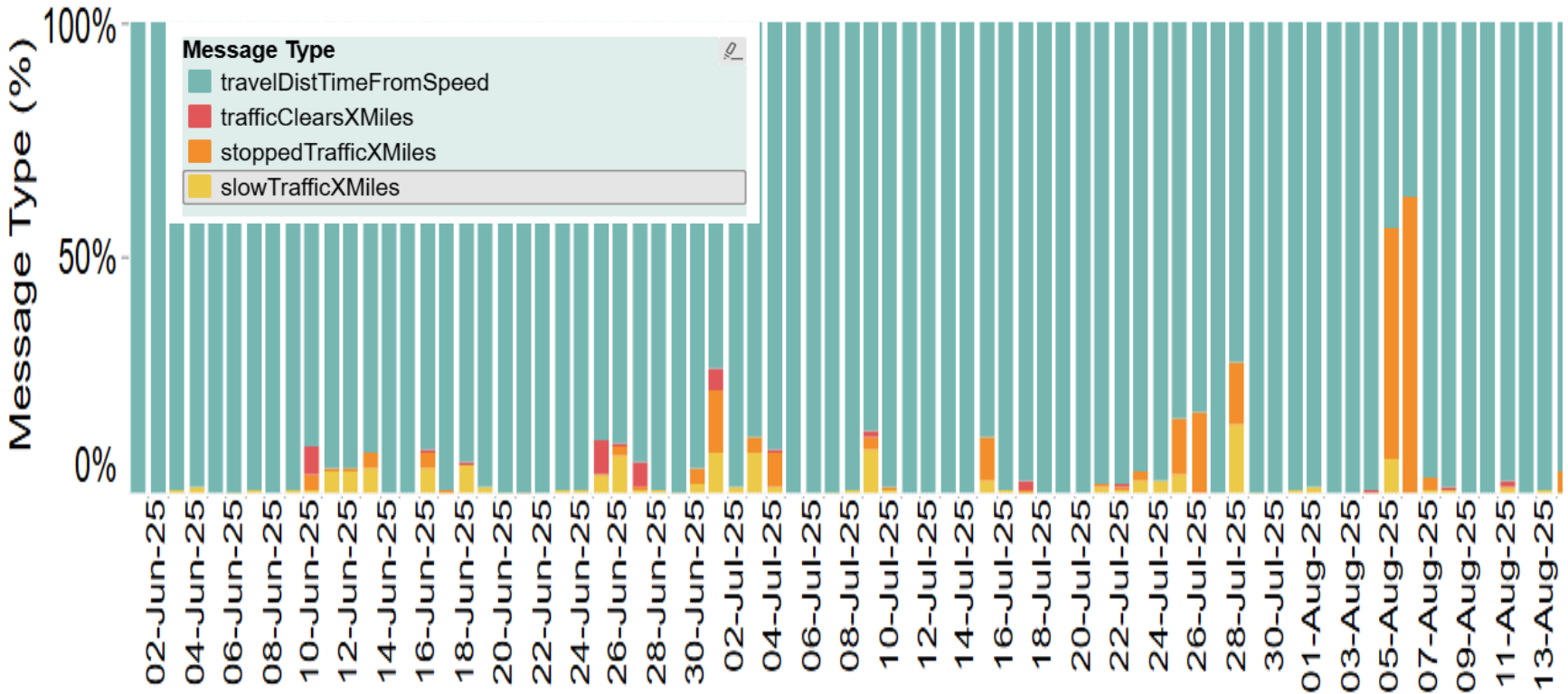
Activatio... Offline Active



Message Type for All—Daily



Message Type for EB-PCMS6—Daily



Summary: Why Hybrid?

- **Automatic Switching**: System switches automatically between travel time and EOQ
- **Dual-Purpose Infrastructure**: One deployment supports both travel times and queue warnings.
- **Richer Traveler Information**: Drivers get both predictive ETAs and immediate warnings.
- **Value for Money**: Safety + mobility benefits under one investment.

THANK YOU!

Robert Brydia PMP
Division Head
System Operations and Technologies
Texas A&M Transportation Institute
r-brydia@tti.tamu.edu
(979) 317-2824