I-95

Variable Speed Limit System

Commonwealth Transportation Board Meeting

April 20, 2021

VDOT Virginia Department of Transportation

INTERSTATE 95

Key Takeaways

Project Background

Significant congestion; high travel time variability; high crash rates

Variable Speed Deployments

Other DOTs are using VSL for congestion and weather applications

What VSL will look like in Virginia

Field devices; algorithm features; how it works

Expected Benefits

Crash rates are reduced, throughput is increased, fewer stop-and-go conditions

Next Steps

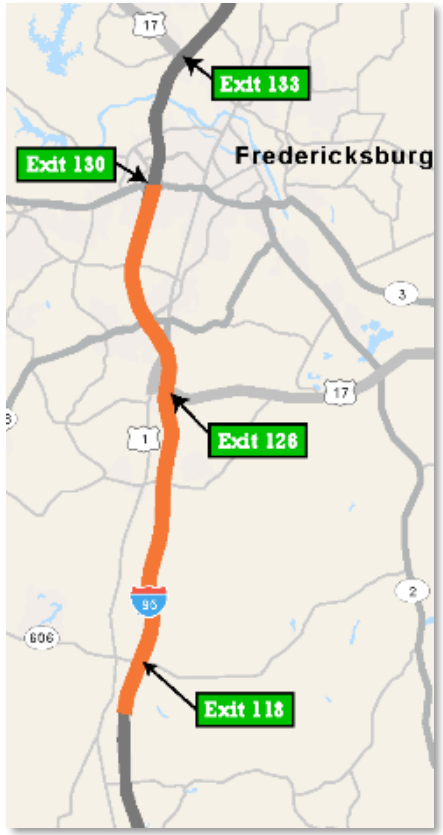
Deployment schedule, performance evaluation, and VSL expansion strategy

Project Background

- I-95 Corridor Improvement Plan (CIP)
  - I-95 near Fredericksburg experiences heavy recurring weekday and weekend congestion
  - High incident and personal vehicle delay increases approaching Fredericksburg (and further north)
  - Unreliable travel time due to stop-and-go conditions throughout the corridor
  - Other projects north of Fredericksburg will not mitigate congestion south of these projects

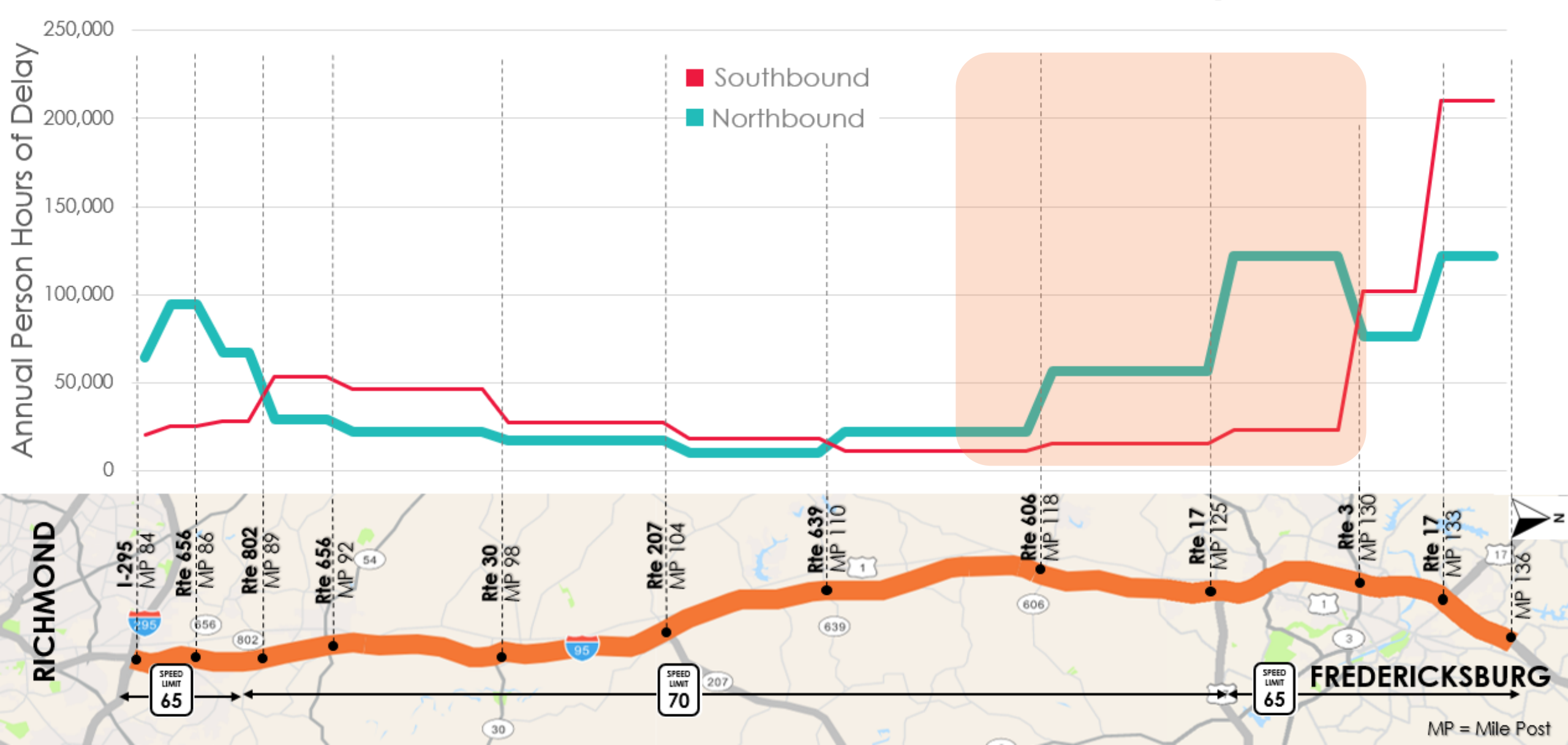
Project Development

Corridor Characteristics

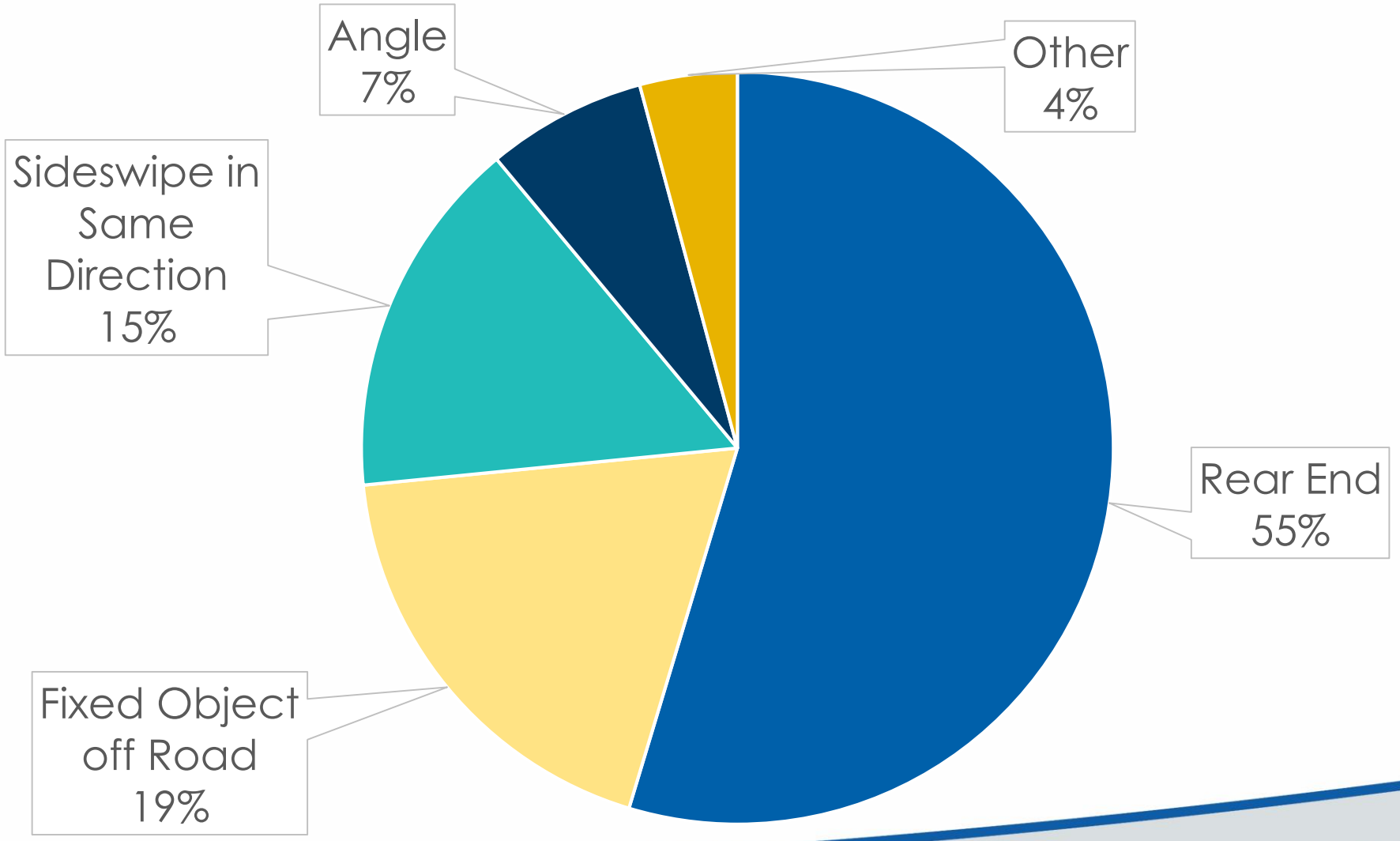


- Recurring and non-recurring congestion
- Hot spots with stop-and-go conditions
- Speed variations
- Higher crash rates – significant incident delay

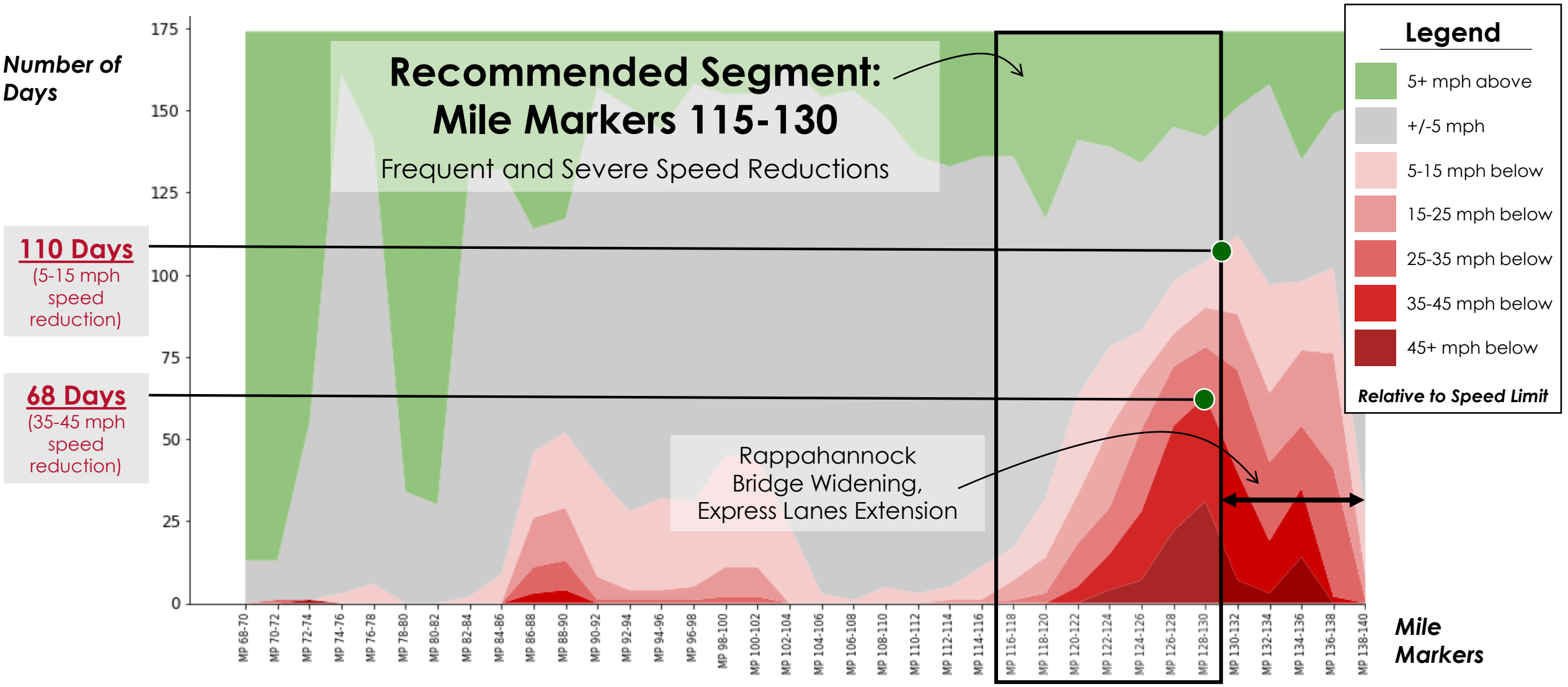
2015 – 2019 Total Annual Person Hours of Delay



2015-2019 Collision Types



Frequency of Speed Reductions Along Corridor



Northbound I-95, PM Peak Period, Weekends (Jan 2019 – Aug 2020)

Why VSL is Deployed

Speed Harmonization

End-of-Queue Warning

Weather and Visibility Advisories

I-15 in Las Vegas, NV

Example VSL Signs

I-5 in Seattle, WA

Example VSL Signs

I-80 in San Francisco, CA

Full-Matrix Electronic Sign

I-77 in Virginia

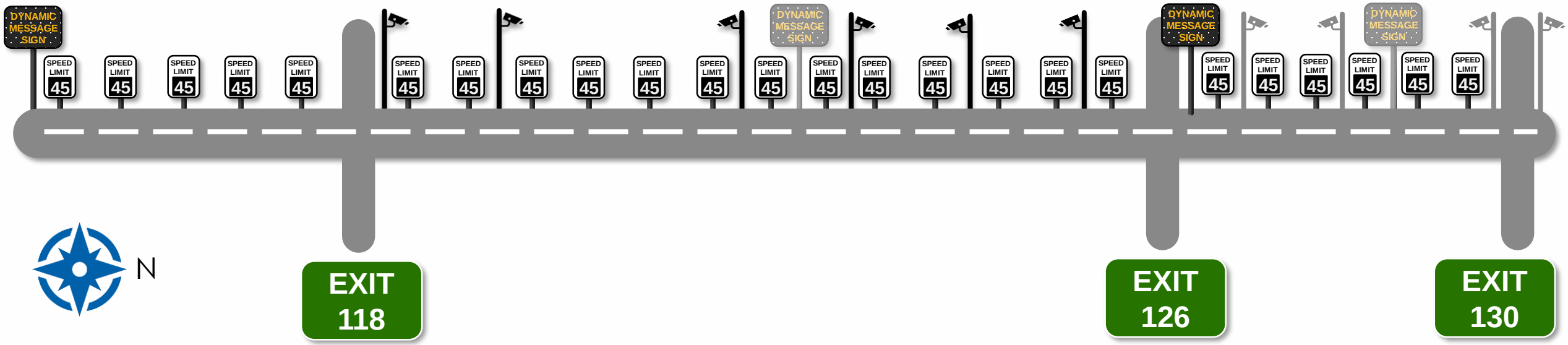
Full-Matrix LED Sign

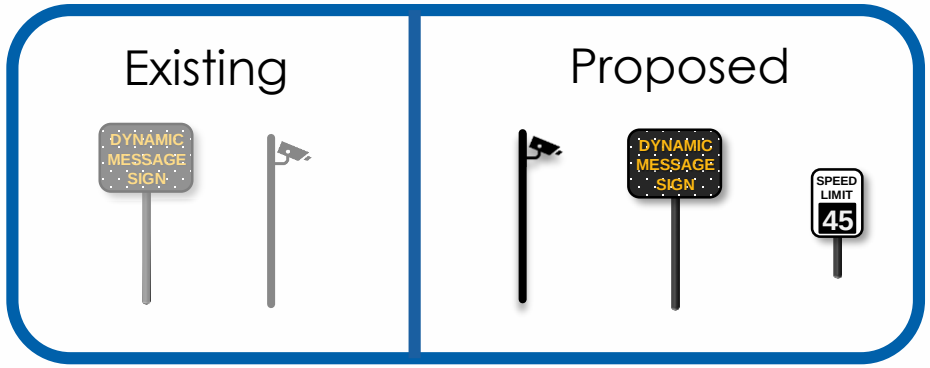
HRBT in Virginia

Static Sign with Cutout

Imagery of Future VSL on I-95

I-95 Variable Speed Limit System



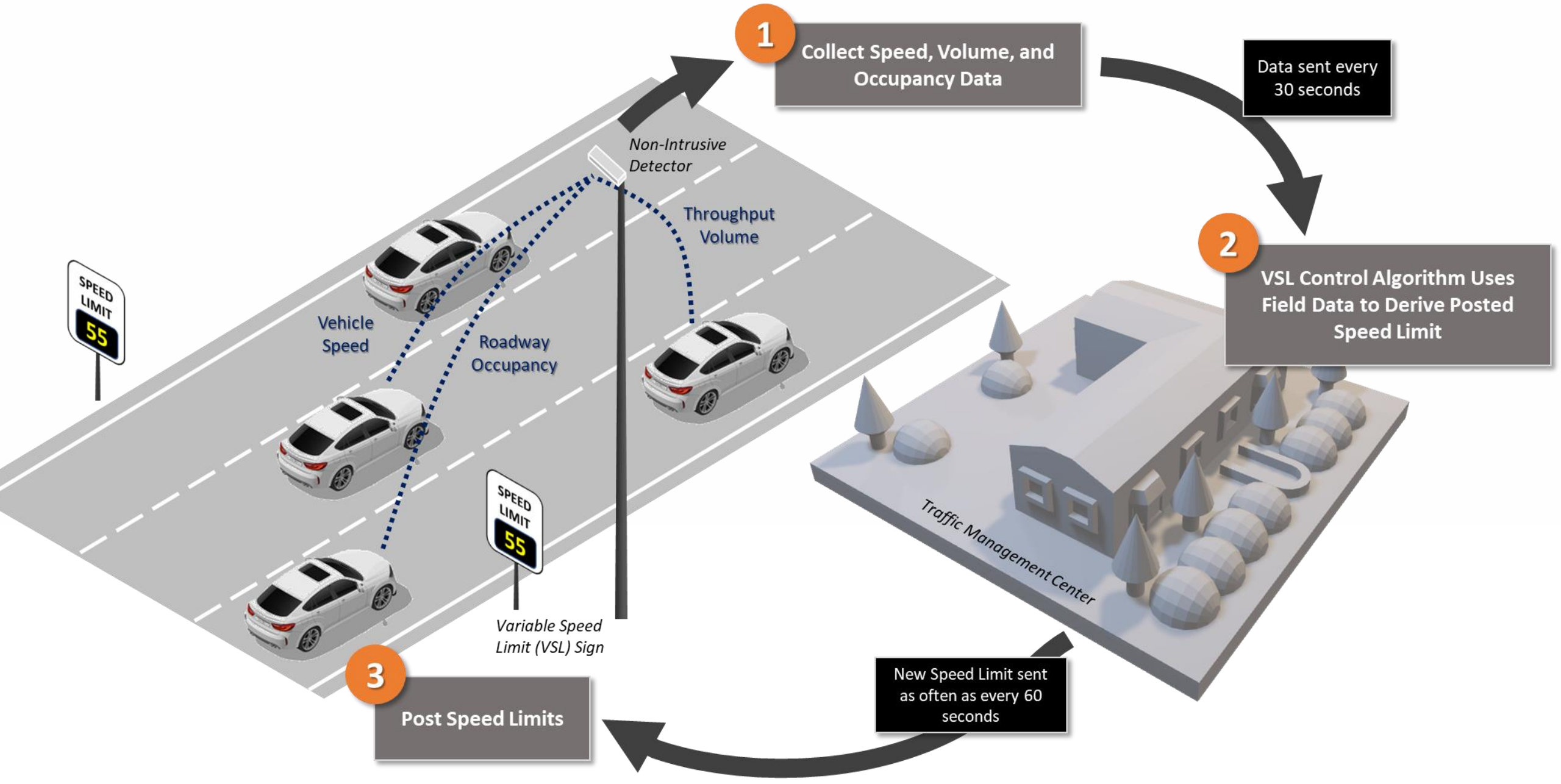


To Fredericksburg

INTERSTATE 95

How VSL Works

I-95 Variable Speed Limit System



VSL Control Algorithm

I-95 Variable Speed Limit System

Inputs | Outputs

Step 1

Field Traffic Data

Derive **Traffic Conditions** and determine if they are getting **WORSE**, **BETTER**, or **STAYING CONSISTENT**

Traffic Conditions

Step 2

Traffic Conditions

Derive **Recommended Speeds** based on prevailing traffic conditions at each sign location

Recommended Speeds

Step 3

Recommended Speeds

Adjust and Smooth Recommended Speeds to derive **Posted Speed Limits** at each sign location

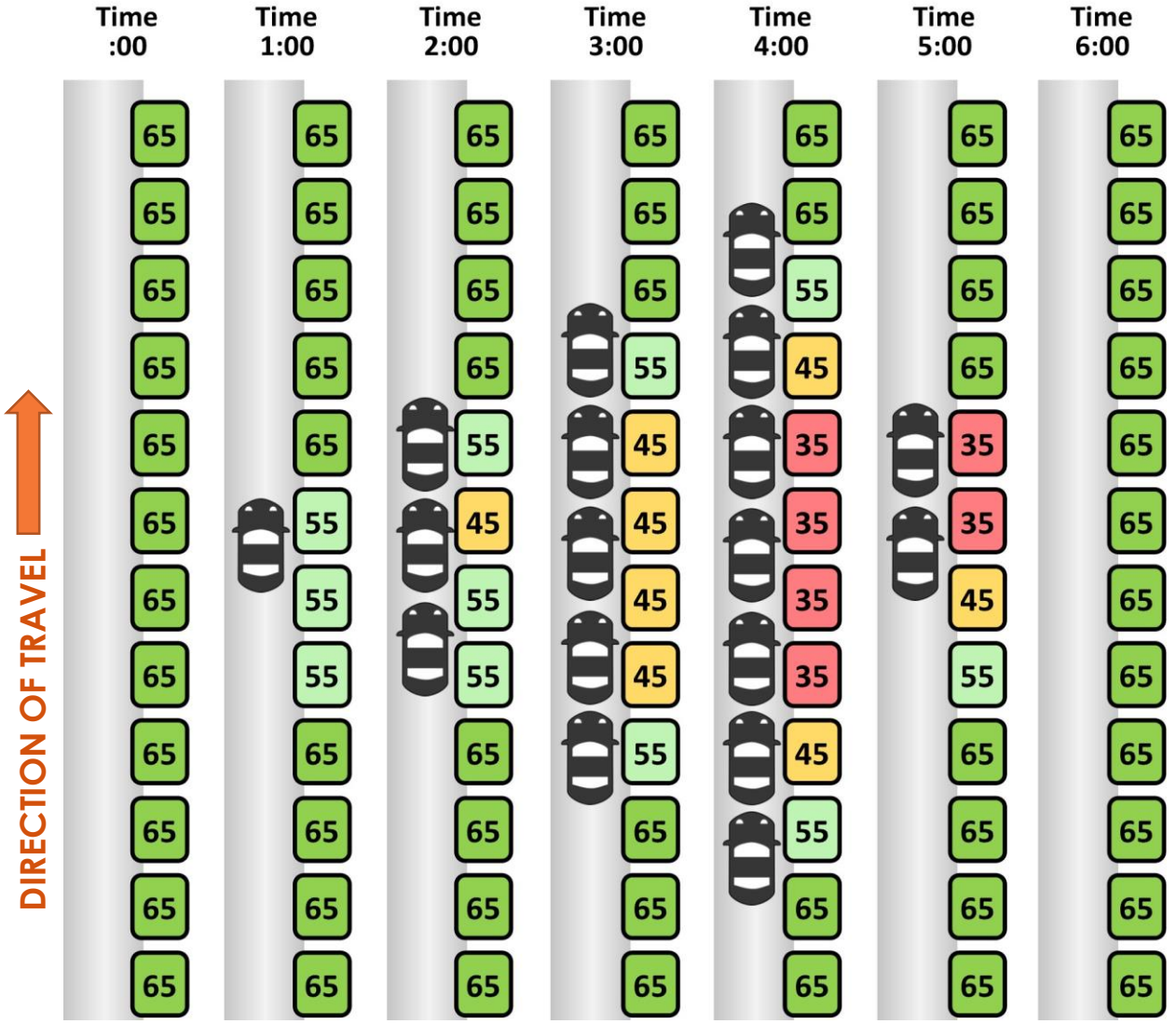
Posted Speed Limits

How VSL Works

Congestion Example

- **Time 0:00.** All signs display free flow speed limits (i.e., 65 mph or 70 mph)
- **Time 1:00.** Signs upstream begin to show reduced speed limits as congestion builds
- **As Congestion Builds Over Time.** Posted speed limits will decrease further and along more of the corridor

  Note: *The minimum posted speed limit will be 35 mph*
- **As Congestion Dissipates Over Time.** Posted speed limits will return to free flow speed limits (i.e., 65 mph or 70 mph)



Corridor Evaluation & Expansion Strategy

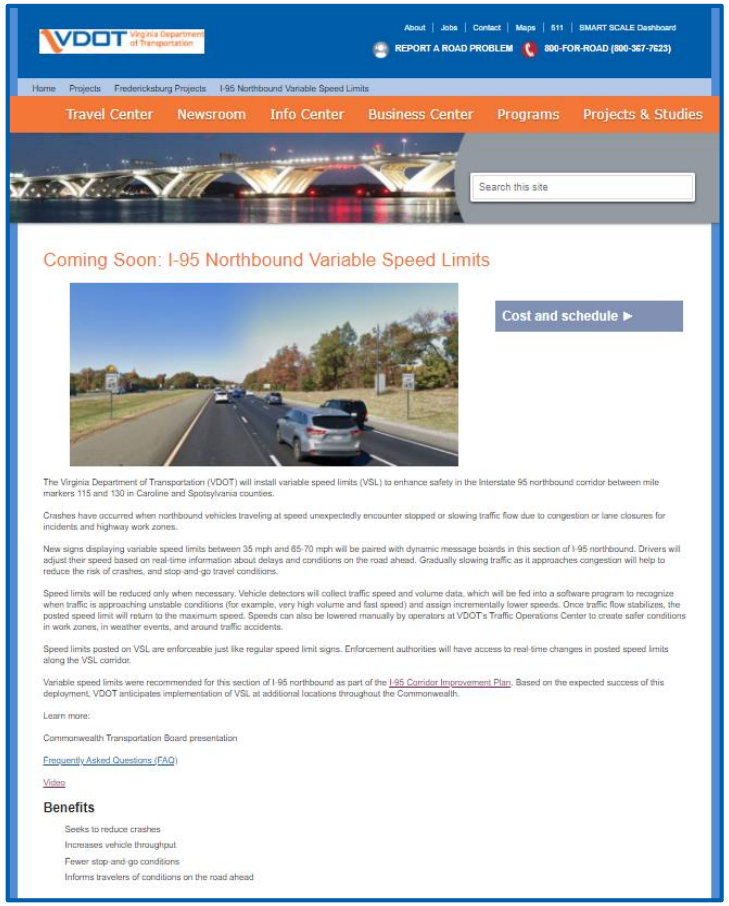
- Evaluate Project Performance
  - Reduce Recurring and Non-Recurring Congestion
  - Reduce Incidents
  - Improve Travel Time Reliability
  - Increase Throughput
- Define characteristics for future deployments
  - Crash rates
  - Congestion hot spots, severity and duration
  - Weather or visibility impacts
  - Available capacity for increased throughput
- Identify and prioritize candidate VSL corridors throughout state for future deployments

Project Timeline

- Concept of Operations – Completed
- High-Level System Requirements and Design – Completed
- VSL Algorithm – In Development
- System Deployment – In Design
- Public Engagement Plan – In Development
- **System Operational – Fall 2021**

Public Communication

- Messaging:
  - Increasing awareness
  - Lead with safety
- Timing (3 waves):
  - CTB presentation
  - Launch
  - Seasonal outreach
- Web : virginiadot.org/variablespeedlimits
- Strategies:
  - Joint event with VSP at launch
  - Social media, earned media, owned media
  - I-95 Safety Rest Areas
- Other
  - Briefings with local governments/law enforcement before activation
  - Communicating change early with private mapping partners



VDOT I-95 VSL Public Outreach Video:

https://www.youtube.com/watch?v=480pyXmiHzA

Questions