VTRC

Virginia Transportation Research Council

VDOT

I-95 Fredericksburg Variable Speed Limit Evaluation

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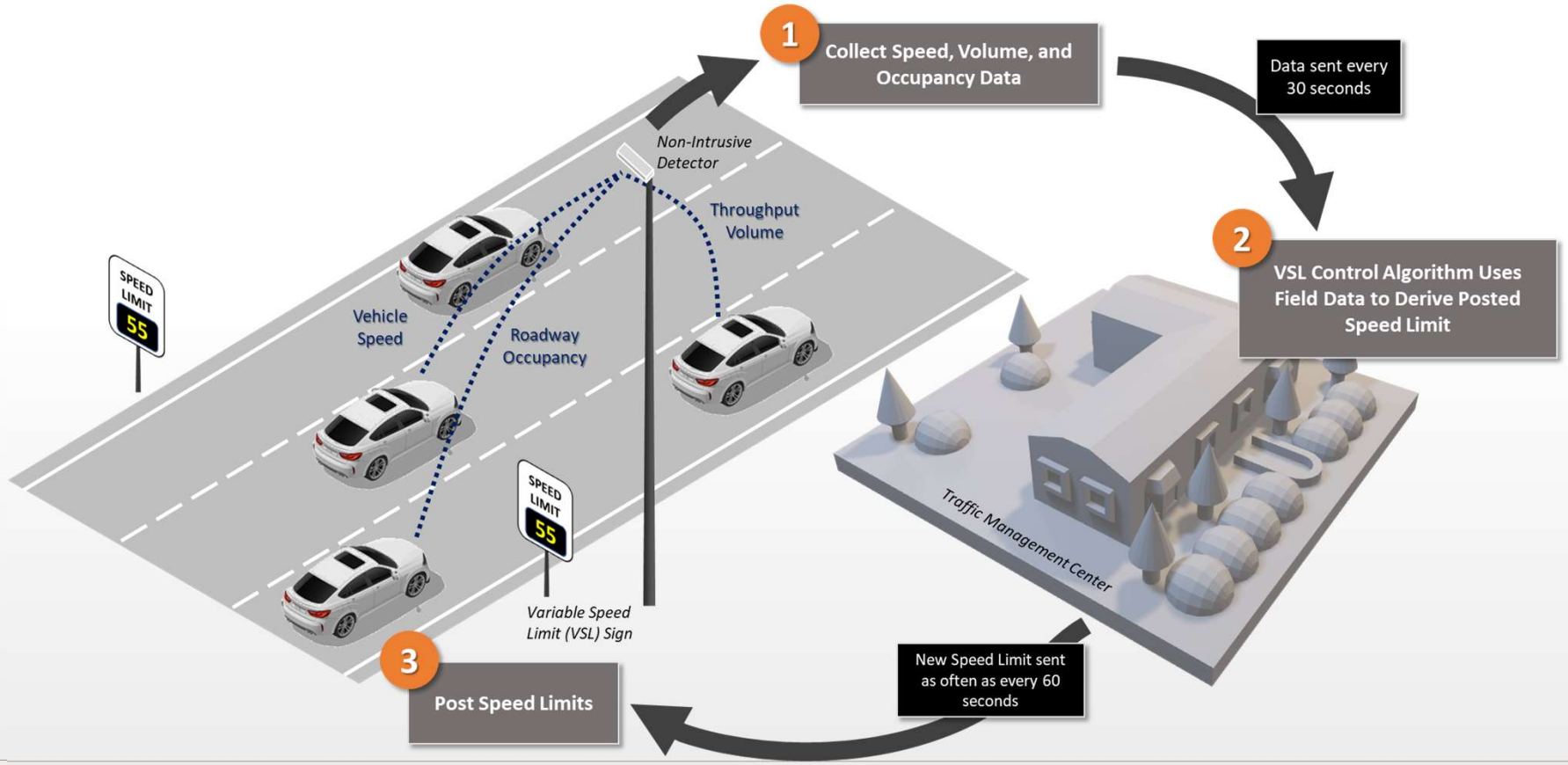
Project Background

- I-95 NB between MP 115-130, south of Fredericksburg experiences significant recurring and non-recurring congestion, especially in the summer.
- Speed variations are present, along with higher crash rates
- In June 2022, VDOT activated an ITTF funded VSL system on the corridor with a goal of improving traffic flow and safety.
- Results from initial 3 months of deployment were presented to the CTB in October 2022

How the System Works



Field Imagery

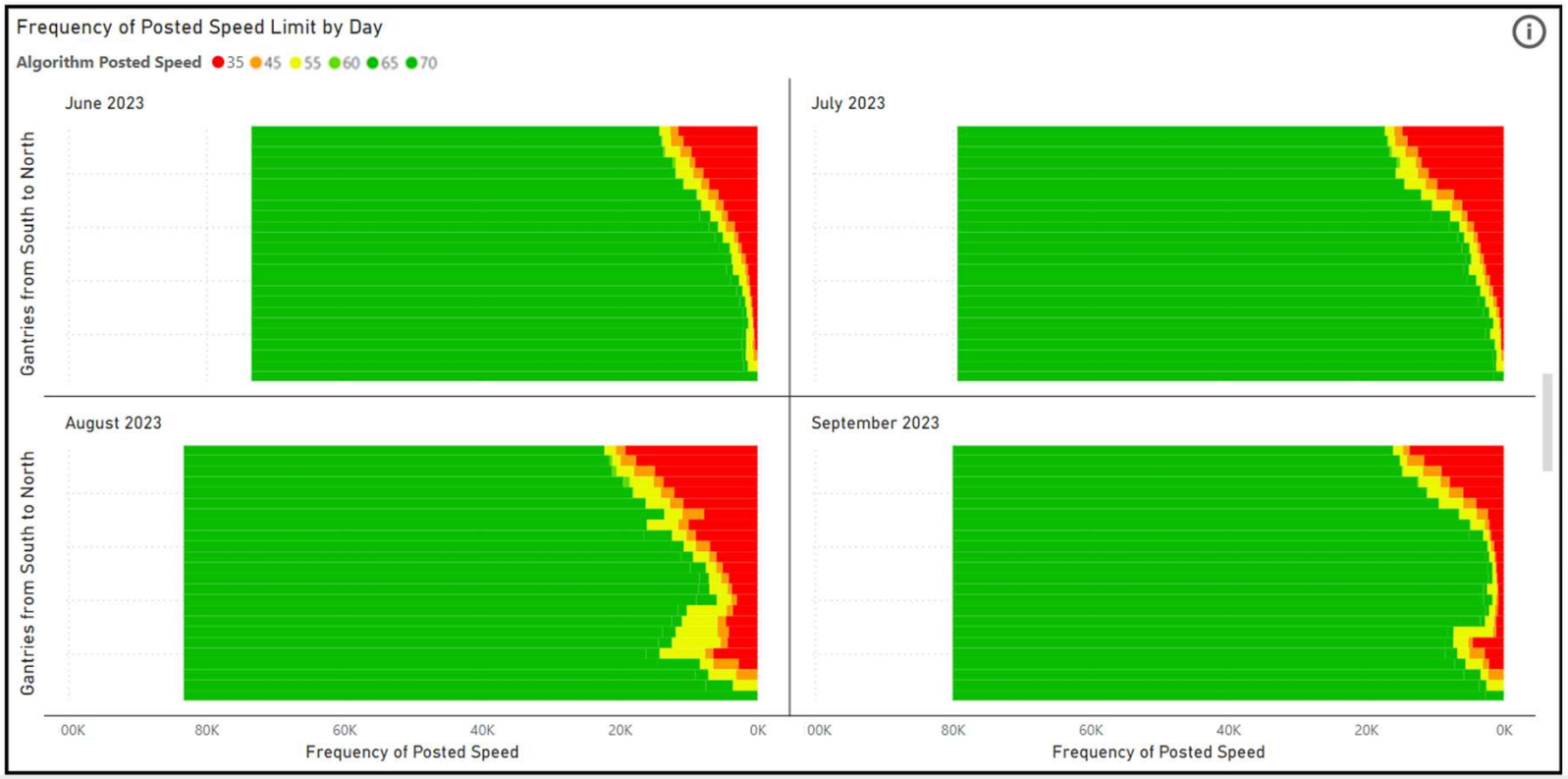
Corridor Video

System Utilization (June 2022-June 2024)

- **Reduced speeds were posted most often:**
  - In the spring and summer
  - On Friday, Saturday, and Sunday
  - Between 11 AM and 8 PM

Day of Week	System Activation
Sunday	17%
Monday	5%
Tuesday	3%
Wednesday	4%
Thursday	5%
Friday	9%
Saturday	9%

Patterns of VSL Postings (Summer 2023)



Direction of Traffic

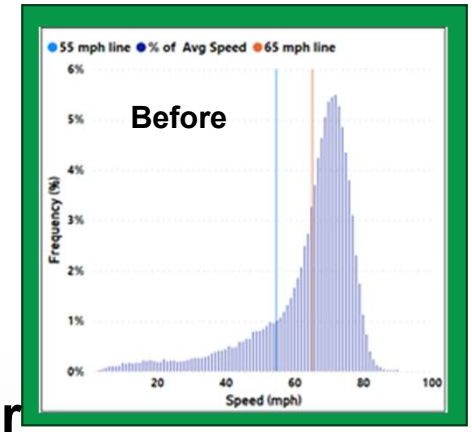
System Evaluation - Driver Behavior

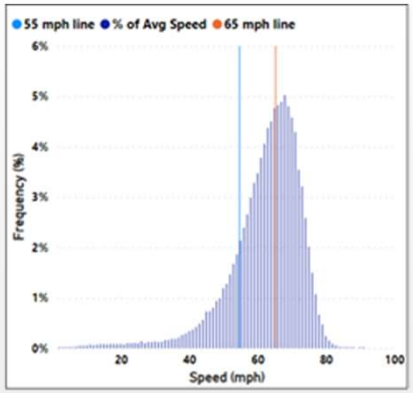
- Speeds remained the same during free flow and congestion
- Improved uniformity during transitional flow (45-60 mph) with 1.5-4 mph speed reductions

Posted Speed	Mean Speed (mph)		% > 5 mph Over Limit		% > 10 mph Over Limit	
	Before	After	Before	After	Before	After
65,70	72.2	71.6	28.7	26.3	4.8	4.4
60	64.3	62.6	52.5	39.0	24.6	11.2
55	64.0	62.3	74.5	68.0	62.1	47.2
45	53.8	50.0	61.3	56.4	53.4	46.0
35	28.0	28.6	20.7	23.1	13.9	12.6

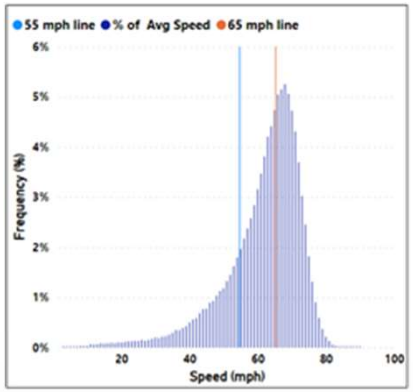
Speed Distributions - 55 MPH

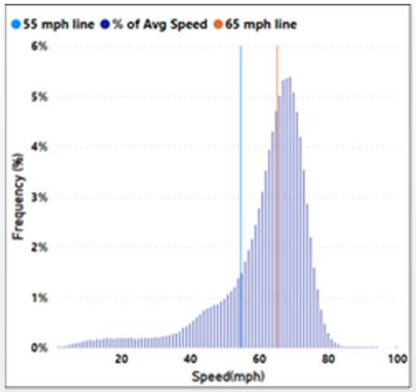
Winter



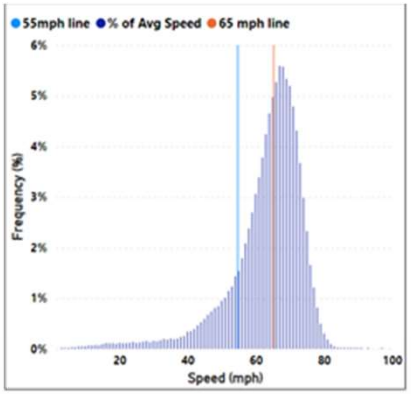


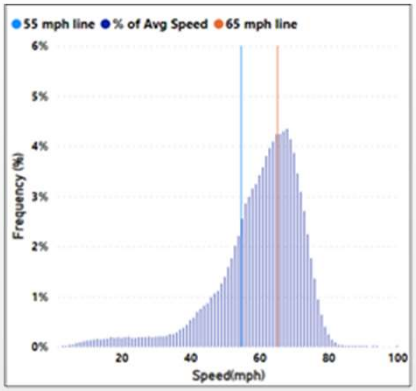
Summer





Fall

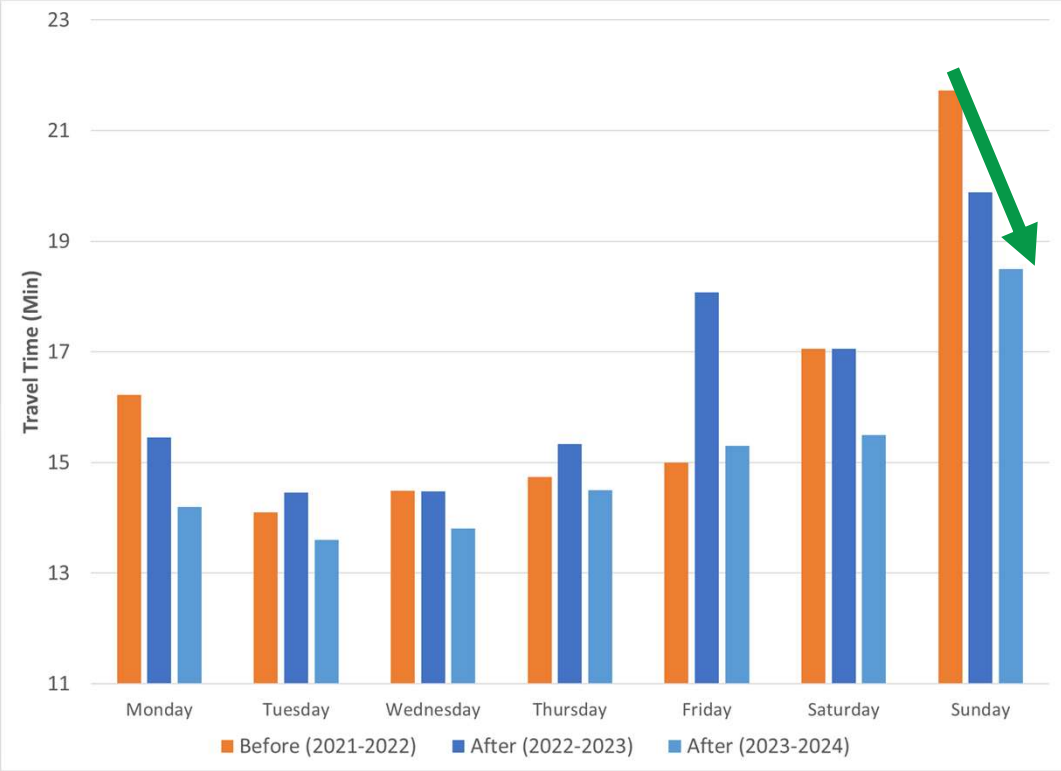




2022

2023

Travel Time
(Year over year comparison, 6 AM-8 PM)



- **June 2023 – June 2024 average travel times are down from the year prior to VSL activation for all days except Friday.**
  - Average reduction of 6.3%
  - Sundays down 14.8%
- **Reliability has also improved for all days except Friday**
  - Average improvement of 17.5%

System Evaluation – Safety

- **Crashes were compared between milepost 115 and 130 from system activation using 1 year before/after data**
  - Trends at comparison sites were also examined.
- **Crashes are rare and random events. Trends from 1 year of VSL activation data are a small sample and should be viewed with caution.**

During the same period, similar sections of I-95 experienced a 20% increase in crashes and a 41% increase in fatal/injury crashes.

Measure	6/22/22-6/21/23 Crashes	Change from 1 Year Before
All Crashes	286	-2%
Fatal/Injury Crashes	57	-14%
Rear Ends	159	-11%
Sideswipe – Same Direction	36	-3%

Summary

- Activations of reduced speed limits (less than 65 mph) are most highly concentrated in northern sections of the corridor on summer weekends.
- The VSL system was able to produce reductions in mean speeds when transitional speed limits (45 or 55 mph) were posted.
- Following VSL activation travel times and reliability generally improved from the year prior to activation, especially on Sundays.
- Safety data from the first year after VSL deployment shows positive initial results, however more data needs to accumulate before firm safety conclusions can be made.

Next Steps

- **Continue to monitor and evaluate the VSL system.**

- **Currently exploring opportunities to enhance effectiveness of VSL system through an ITTF project that will leverage connected vehicle technology.**