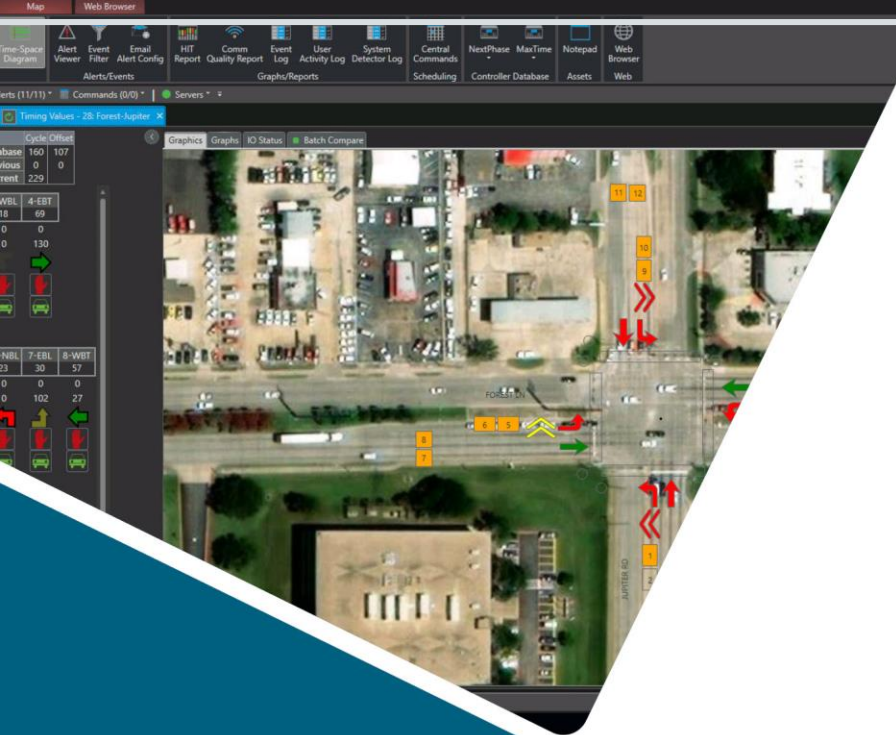




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I-95 Variable Speed Limit Congestion Prediction Algorithm

Britton Johnson, Ph.D., P.E.



A Kimley-Horn Software Solution



A Kimley-Horn Software Solution



A Kimley-Horn Software Solution

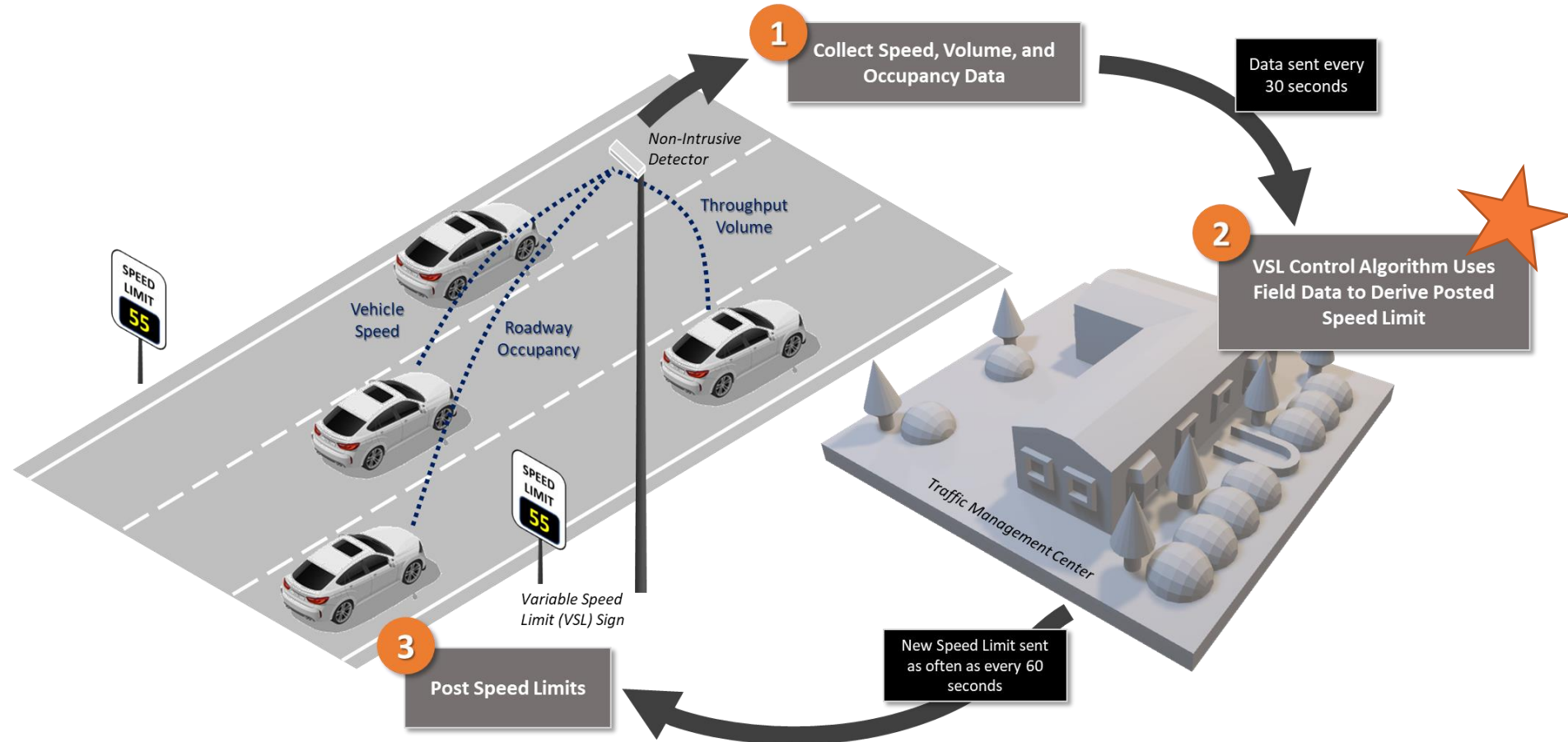


A Kimley-Horn Software Solution

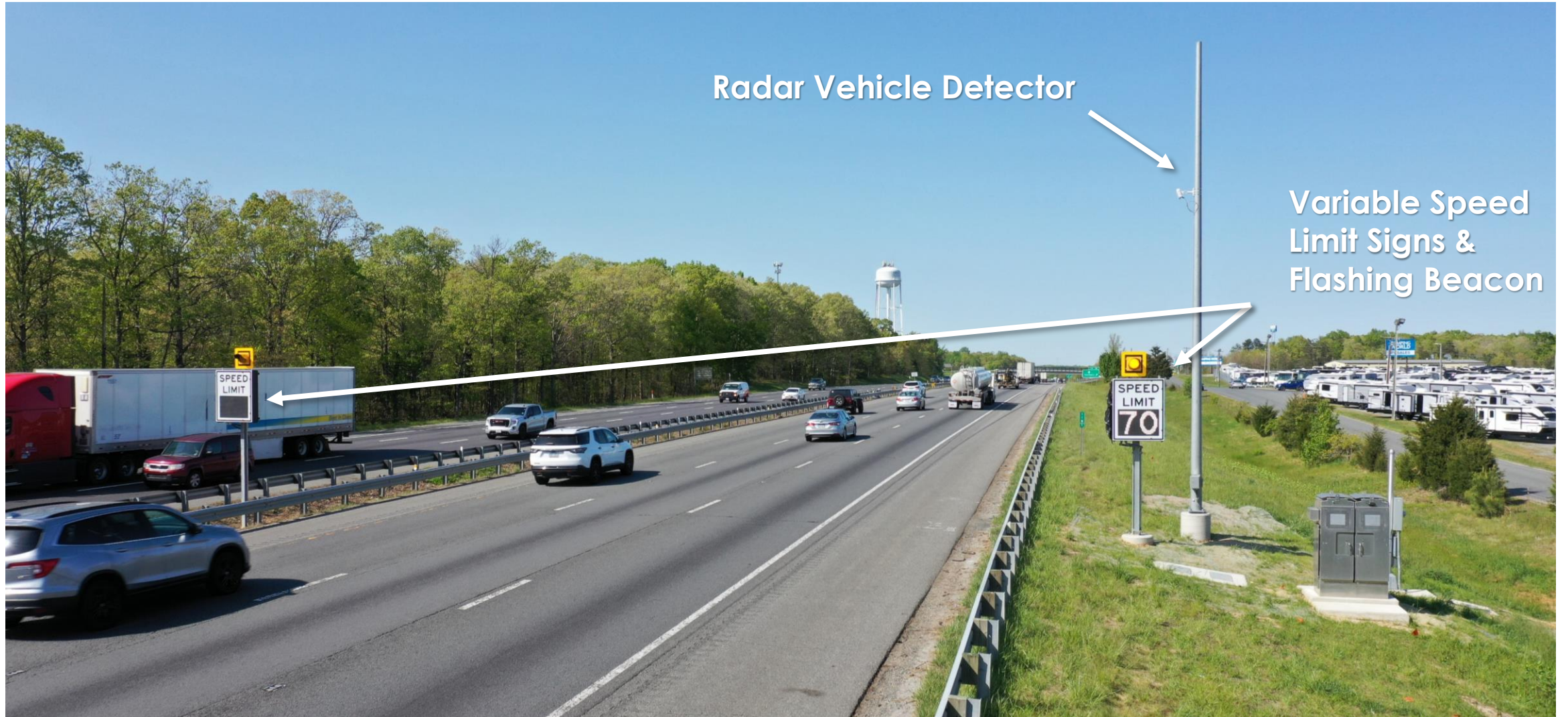
Background Information



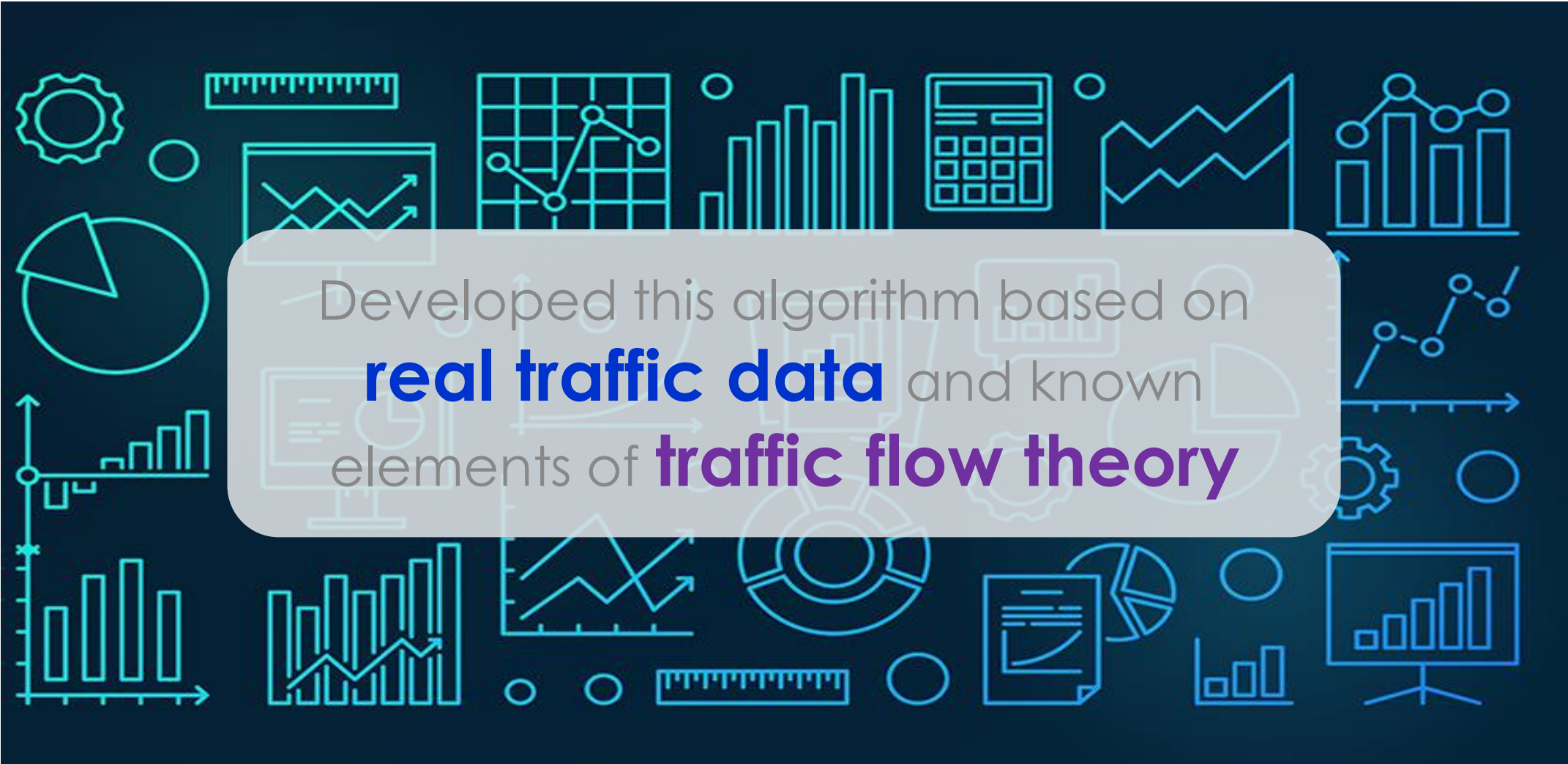
VSL System Operation



Field Imagery

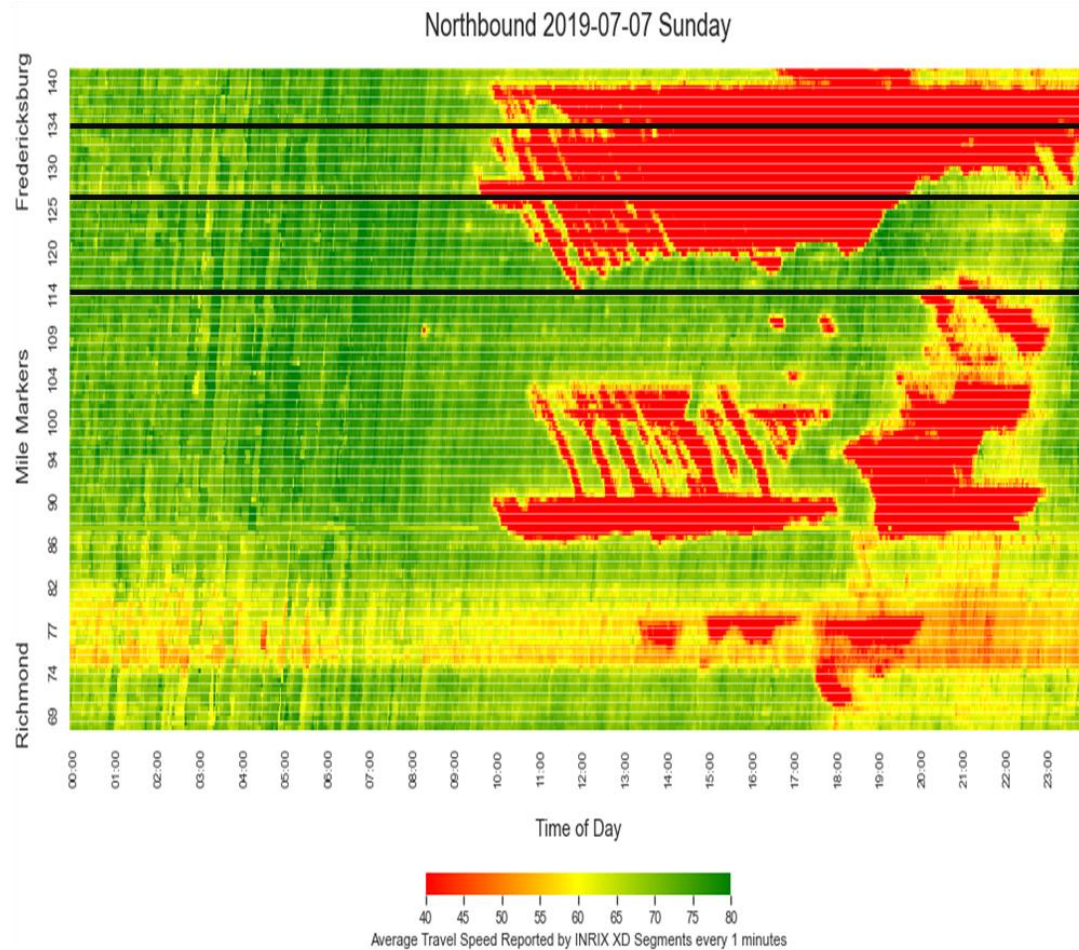


Data-Driven Approach to Developing a Predictive Algorithm

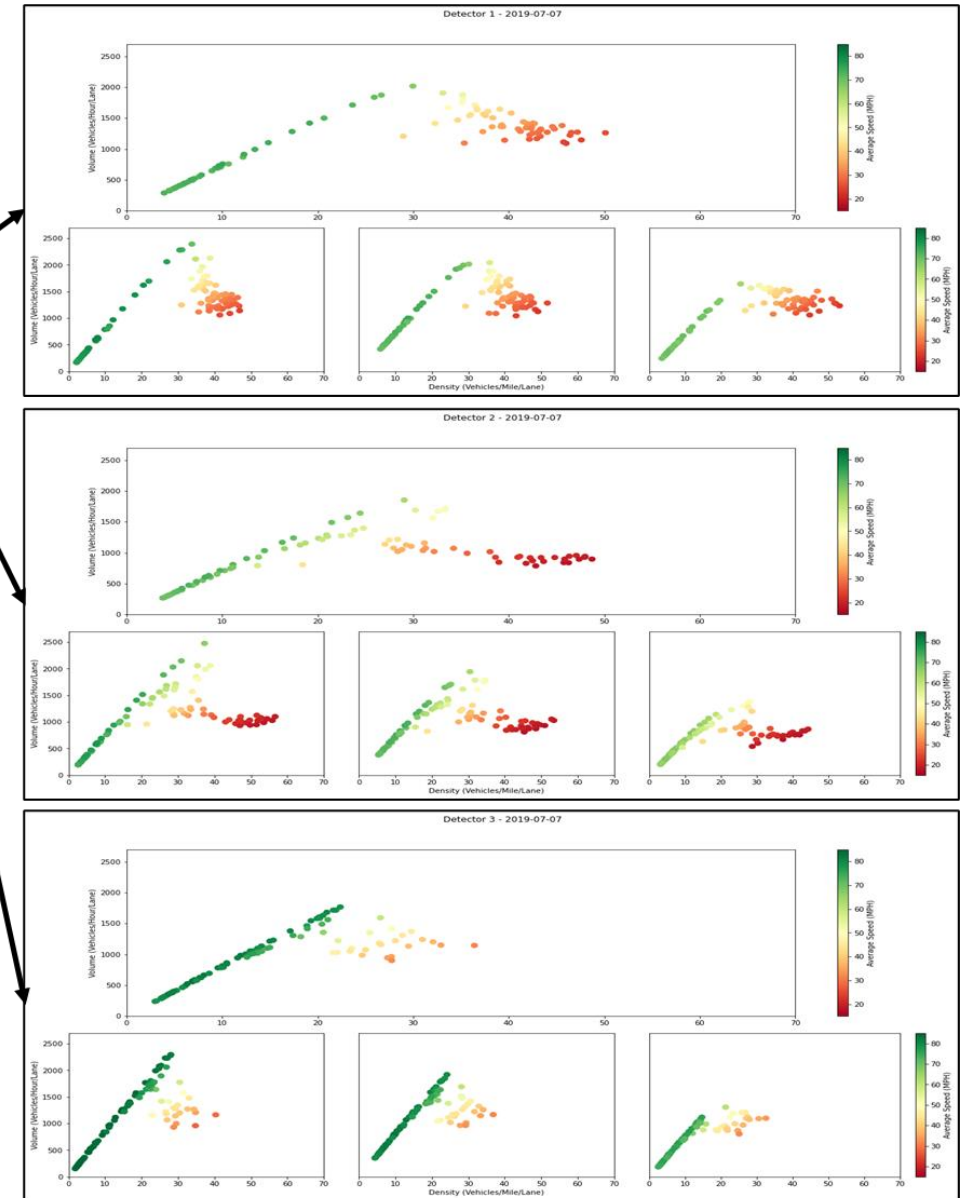


Developed this algorithm based on
real traffic data and known
elements of **traffic flow theory**

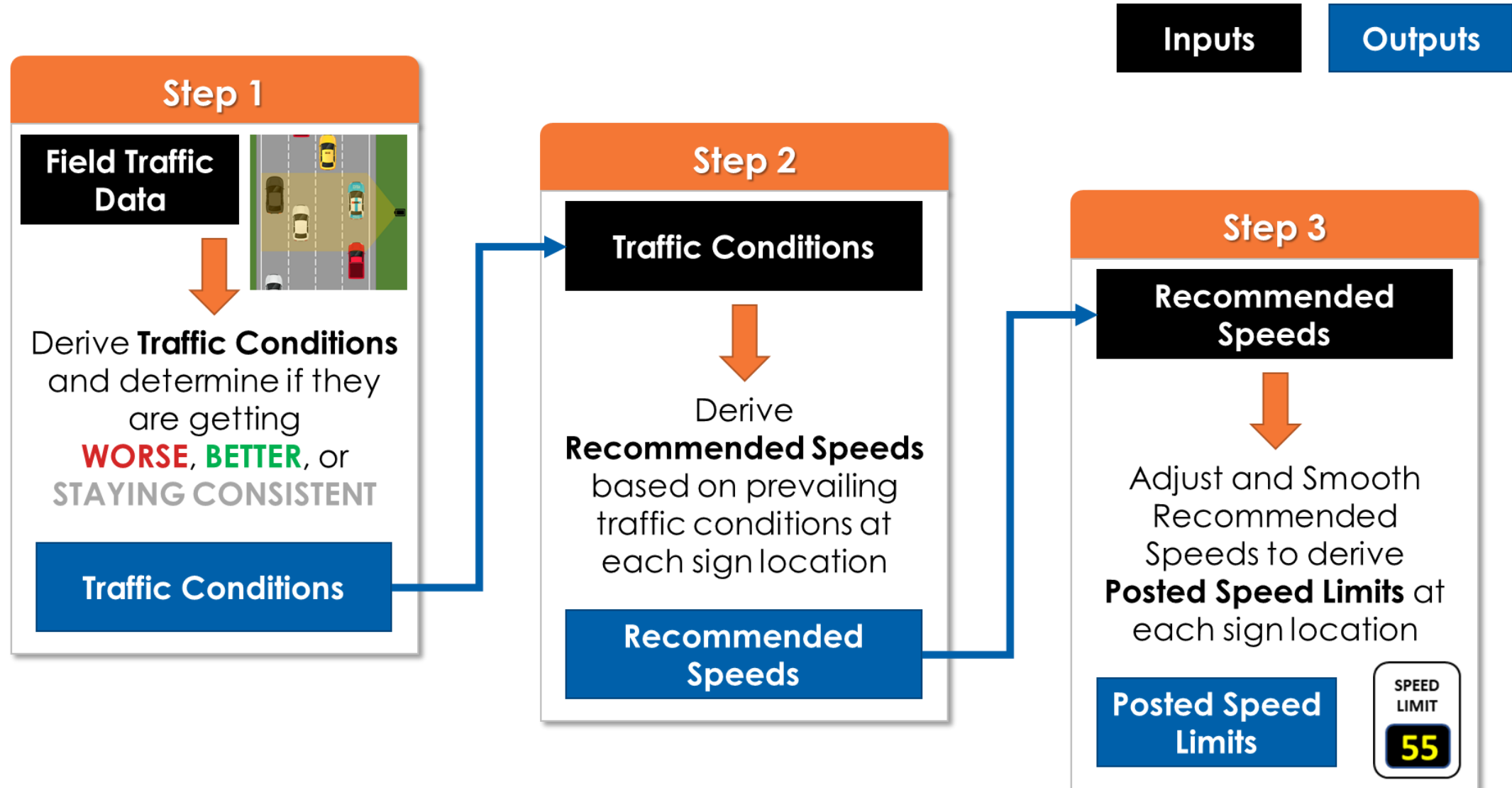
Field Detectors + INRIX Speed Data



Detector Data Aggregated at 15-Minute Intervals

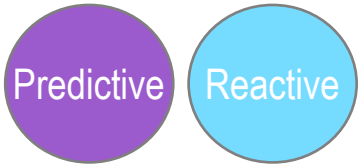


VSL Control Algorithm

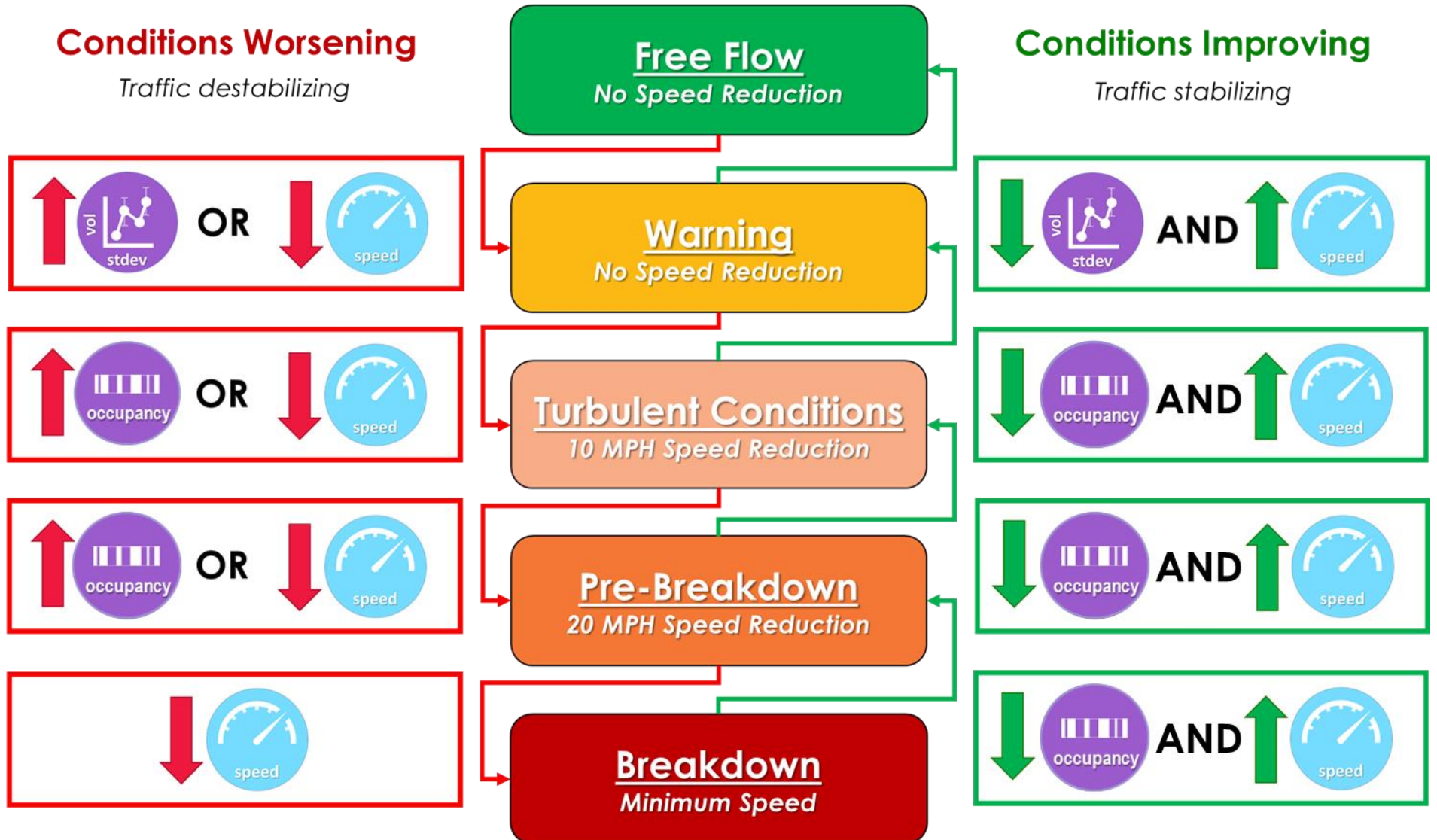


Algorithm Steps 1 and 2 - Overview

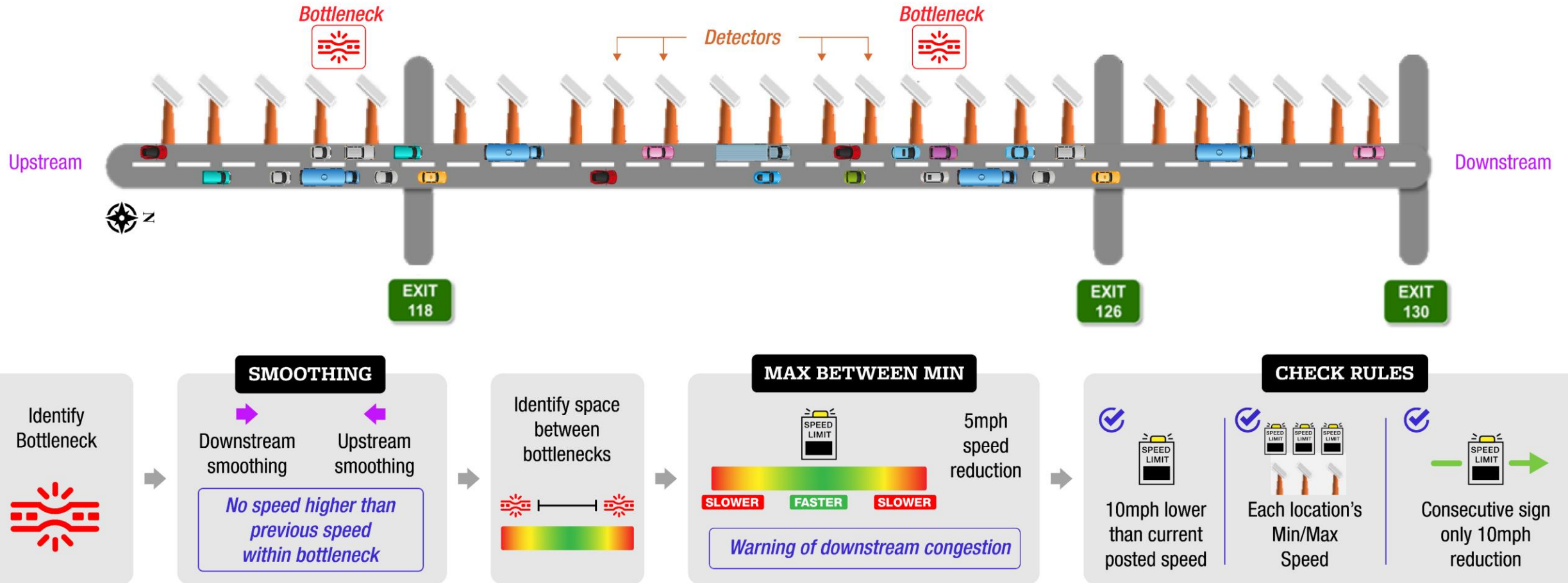
Legend



Traffic States & Recommended Speeds



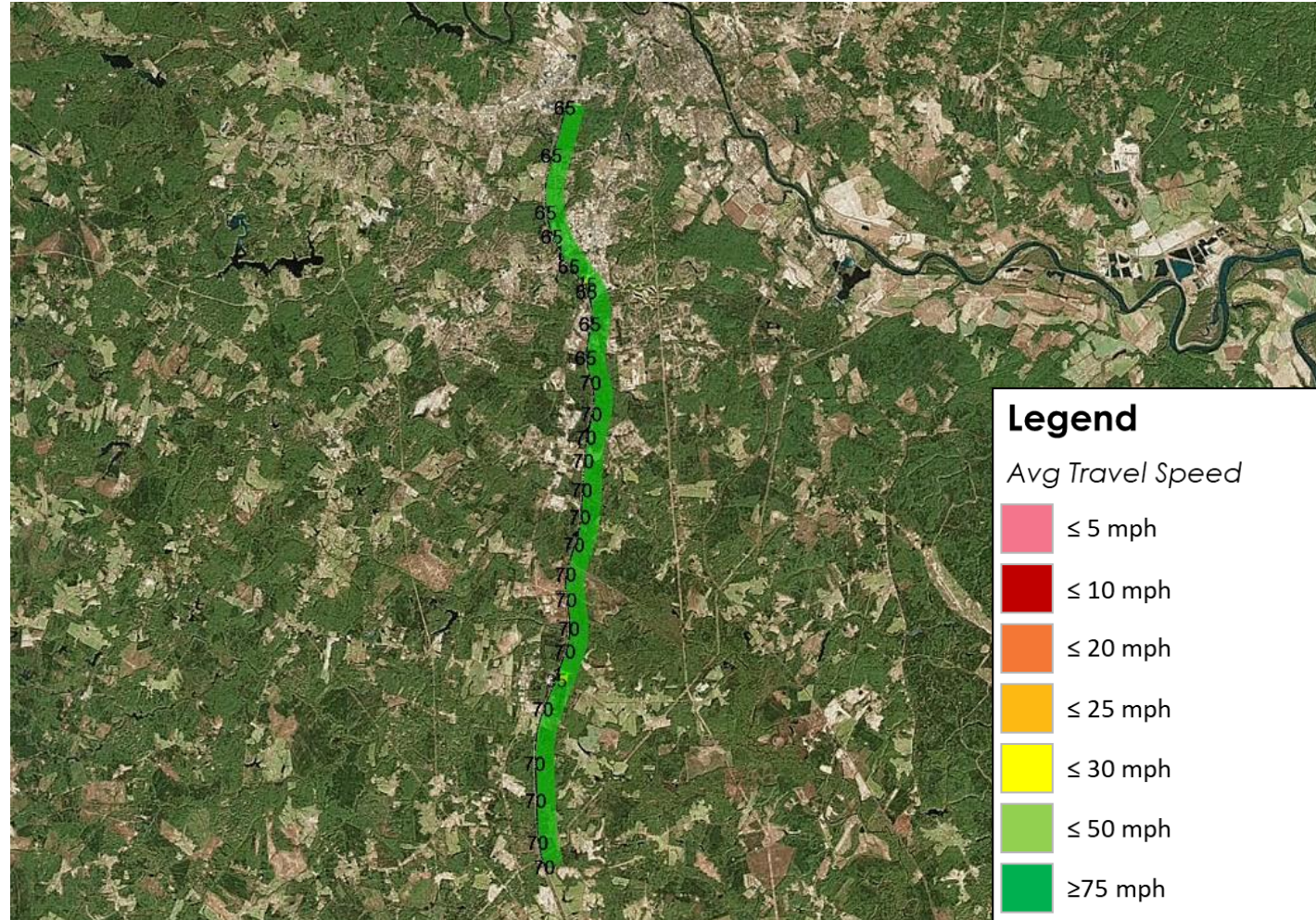
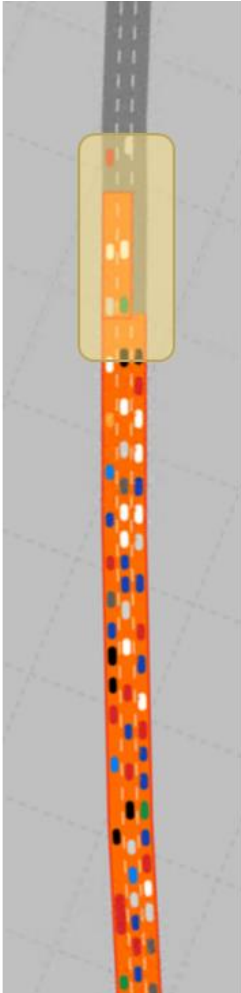
Algorithm Step 3 - Overview



Algorithm Validation – Simulation

Example Scenario

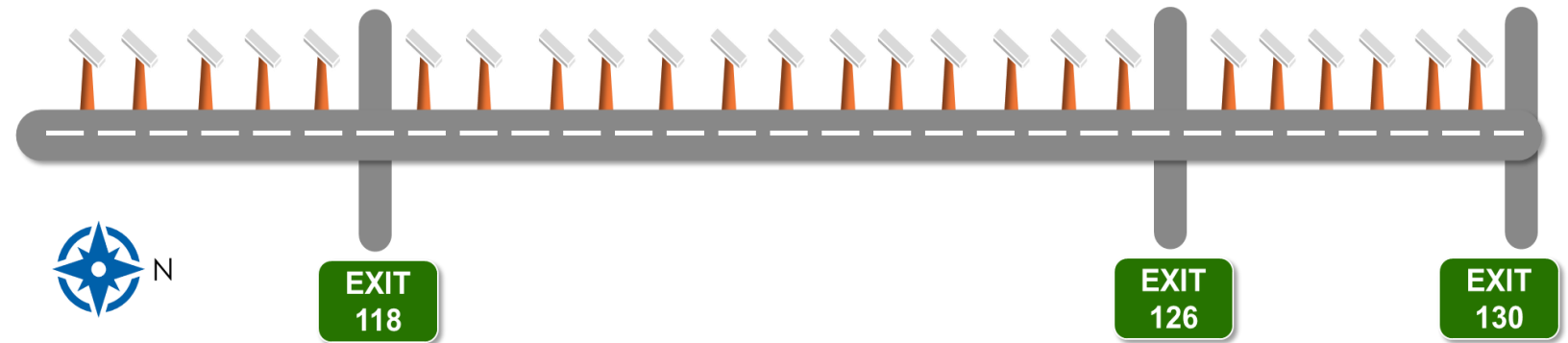
Crash closing one lane of traffic



Algorithm Validation – Field Data



- Early Deployment of Wavetrax Detectors
 - Temporary trailers deployed in October 2021
 - Algorithm calibration and validation prior to construction completion
 - Collect evaluation data for before/after implementation study



June 22, 2022



New VDOT tool aims to curb crashes, prevent stop-and-go traffic on stretch of I-95

'Crash rates are so high' on I-95 between Thornburg and Fredericksburg, VDOT official says



VSL System Activation Summary

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June 2022

Frequency of Speed Reductions by Day

Date	Speed Reductions
Wednesday, June 22, 2022	5%
Thursday, June 23, 2022	14%
Friday, June 24, 2022	23%
Saturday, June 25, 2022	13%
Sunday, June 26, 2022	32%
Monday, June 27, 2022	3%
Tuesday, June 28, 2022	3%
Wednesday, June 29, 2022	1%
Thursday, June 30, 2022	11%

July 2022

Frequency of Speed Reductions by Day

Date	Speed Reductions
Friday, July 01, 2022	18%
Saturday, July 02, 2022	22%
Sunday, July 03, 2022	4%
Monday, July 04, 2022	0%
Tuesday, July 05, 2022	19%
Wednesday, July 06, 2022	0%
Thursday, July 07, 2022	0%
Friday, July 08, 2022	17%
Saturday, July 09, 2022	30%
Sunday, July 10, 2022	24%
Monday, July 11, 2022	0%
Tuesday, July 12, 2022	2%
Wednesday, July 13, 2022	3%
Thursday, July 14, 2022	4%
Friday, July 15, 2022	18%
Saturday, July 16, 2022	30%
Sunday, July 17, 2022	30%
Monday, July 18, 2022	2%
Tuesday, July 19, 2022	4%
Wednesday, July 20, 2022	5%
Thursday, July 21, 2022	4%
Friday, July 22, 2022	11%
Saturday, July 23, 2022	28%
Sunday, July 24, 2022	28%

Frequency of Speed Reductions by Day

Date	Speed Reductions
Monday, July 25, 2022	9%
Tuesday, July 26, 2022	6%
Wednesday, July 27, 2022	5%
Thursday, July 28, 2022	19%
Friday, July 29, 2022	15%
Saturday, July 30, 2022	30%
Sunday, July 31, 2022	26%

August 2022

Frequency of Speed Reductions by Day

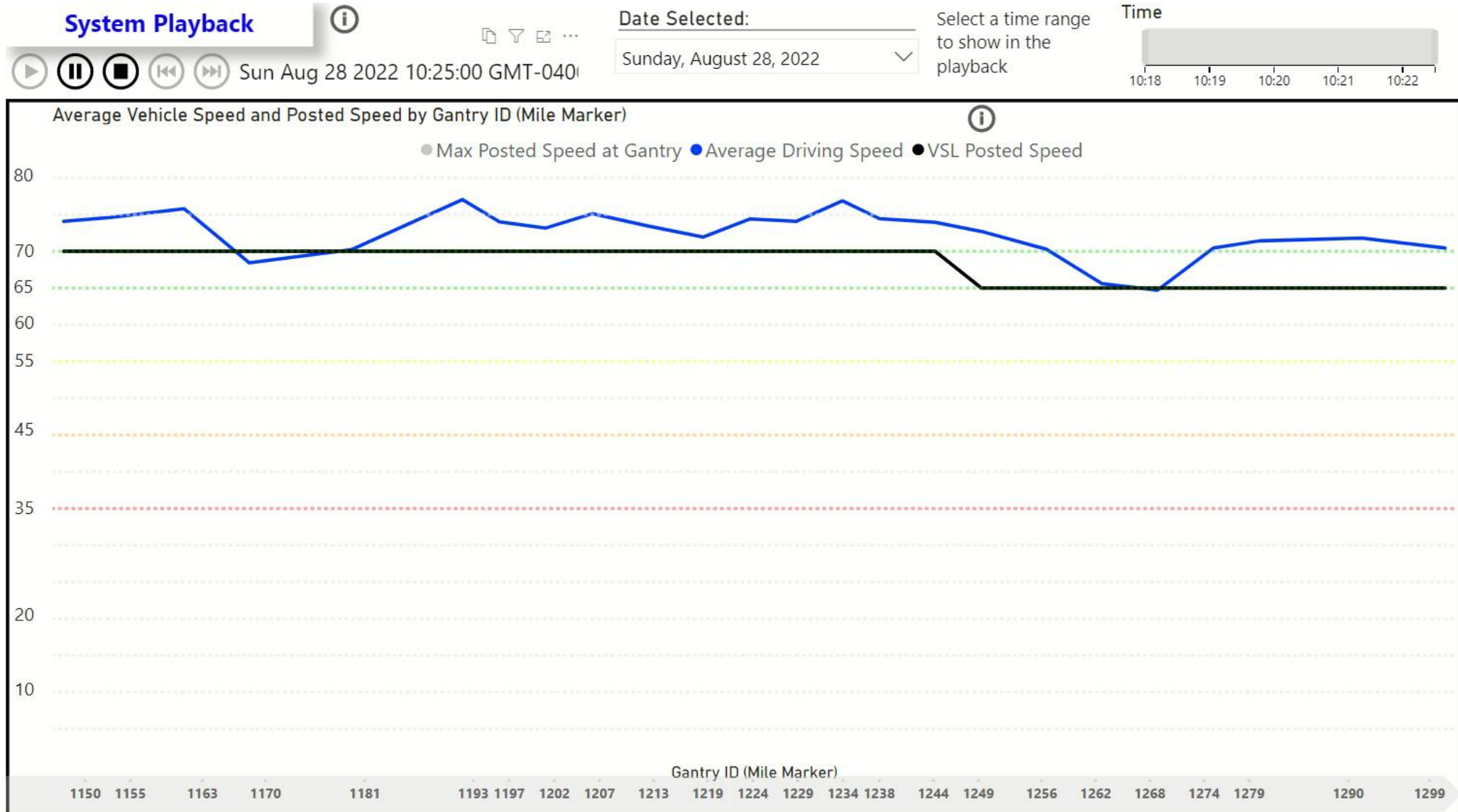
Date	Speed Reductions
Monday, August 01, 2022	3%
Tuesday, August 02, 2022	6%
Wednesday, August 03, 2022	6%
Thursday, August 04, 2022	10%
Friday, August 05, 2022	32%
Saturday, August 06, 2022	33%
Sunday, August 07, 2022	33%
Monday, August 08, 2022	8%
Tuesday, August 09, 2022	7%
Wednesday, August 10, 2022	5%
Thursday, August 11, 2022	2%
Friday, August 12, 2022	21%
Saturday, August 13, 2022	30%
Sunday, August 14, 2022	35%
Monday, August 15, 2022	10%
Tuesday, August 16, 2022	1%
Wednesday, August 17, 2022	1%
Thursday, August 18, 2022	5%
Friday, August 19, 2022	23%
Saturday, August 20, 2022	34%
Sunday, August 21, 2022	27%
Monday, August 22, 2022	1%
Tuesday, August 23, 2022	0%
Wednesday, August 24, 2022	1%

Frequency of Speed Reductions by Day

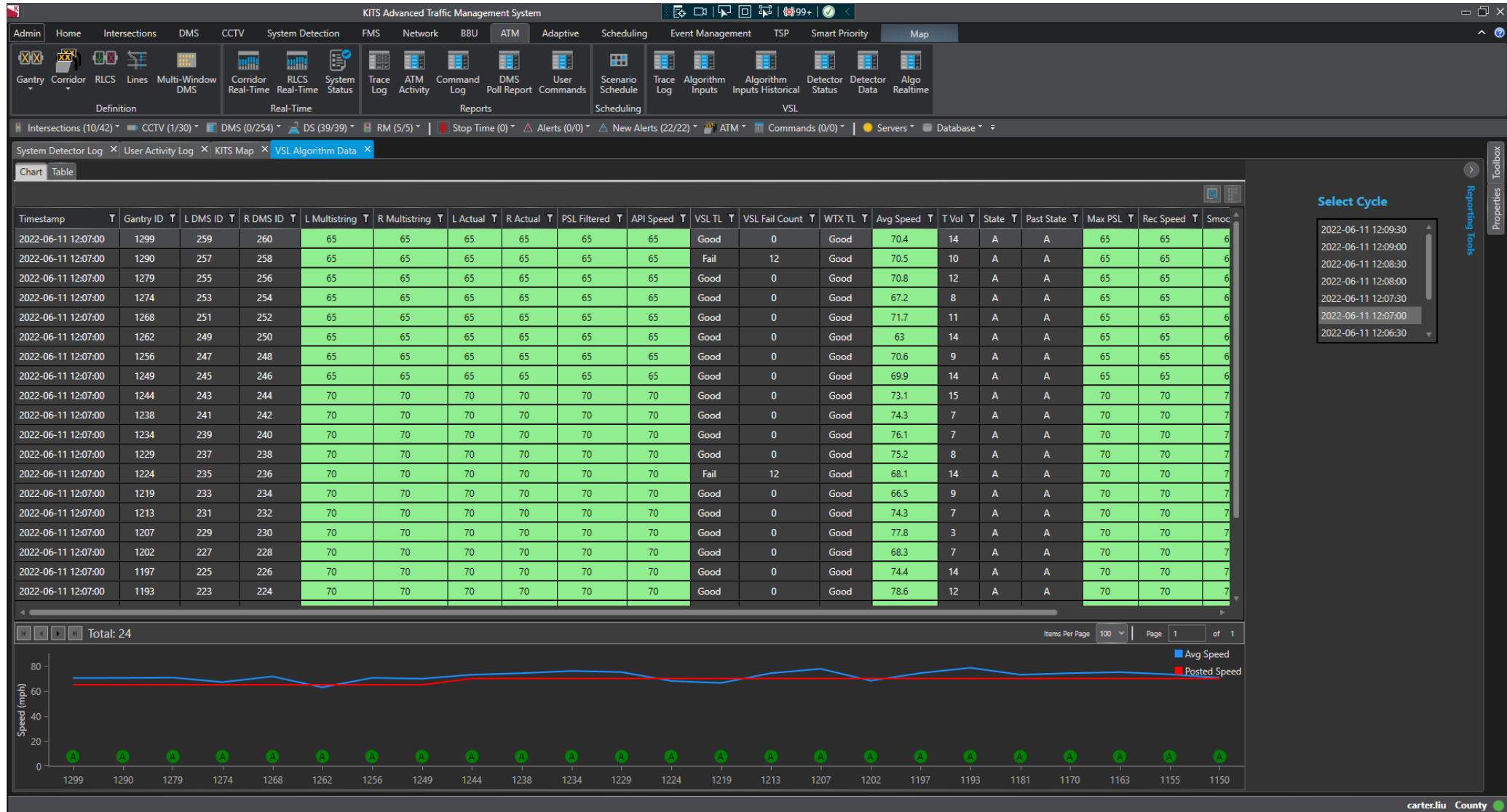
Date	Speed Reductions
Thursday, August 25, 2022	0%
Friday, August 26, 2022	9%
Saturday, August 27, 2022	13%
Sunday, August 28, 2022	18%
Monday, August 29, 2022	2%
Tuesday, August 30, 2022	3%
Wednesday, August 31, 2022	0%

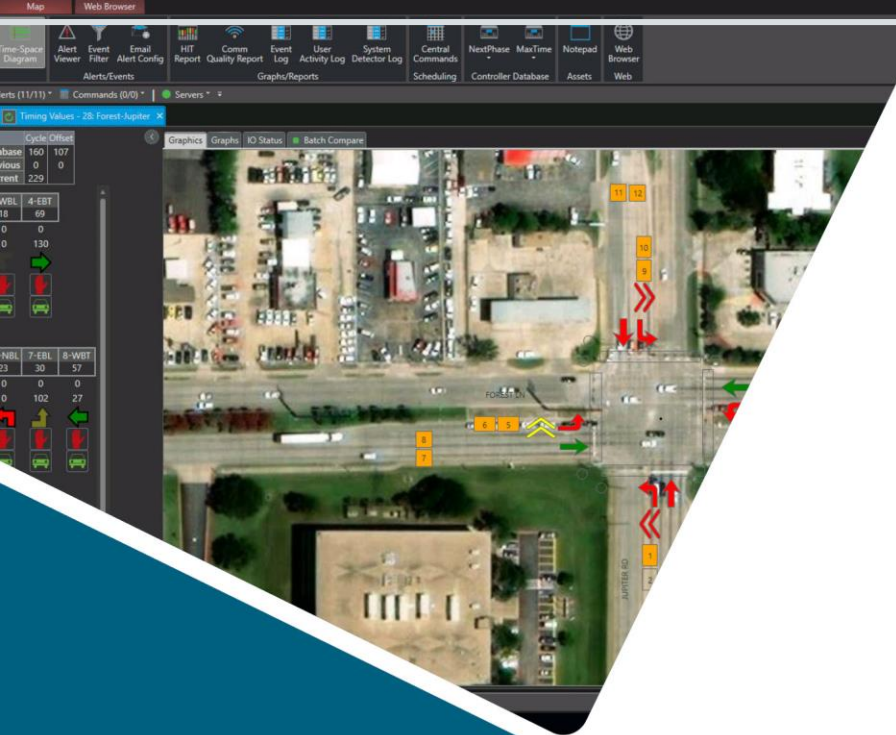
Weekends

System Playback – Monday Aug 29th



Future KITS Real-Time Algorithm View





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Britton Johnson, Ph.D., P.E. | britton.johnson@kimley-horn.com

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