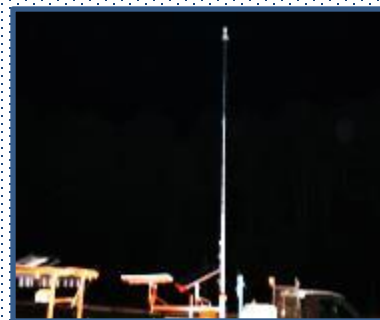




Work Zone Safety and Mobility

PROCESS REVIEW

2019 FINAL REPORT





WORK ZONE SAFETY and MOBILITY PROCESS REVIEW FINAL REPORT

December 2019

This Work Zone Safety and Mobility Process Review Report was prepared by the Connecticut Department of Transportation and is evidence of Connecticut's compliance with [23 CFR 630.1008\(e\)](#).

**STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU of ENGINEERING and CONSTRUCTION**

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EXECUTIVE SUMMARY

This Process Review was conducted by the Connecticut Department of Transportation (CTDOT or Department) to comply with the requirements of 23 CFR Part 630, Subpart J – *Work Zone Safety and Mobility*. This is the fifth process review conducted for this program area since this regulation became effective on October 12, 2007.

Four (4) areas of emphasis were included in the Process Review to continuously improve the Department's work zone program. The key areas which require continuous focus are summarized as follows:

- **Annual Field Reviews** – CTDOT's goal is to conduct a minimum of ten (10) regular reviews and four (4) in-depth reviews per year.
- **Performance Metrics** – CTDOT is conducting data reviews for the opportunities to establish and implement performance tracking for work zone congestion, delays, and crashes.
- **Smart Work Zone Technology** – CTDOT has researched and implemented new technology to enhance safety and mobility through specific project work zones and record data used to set performance metrics.
- **Regional Traffic Coordination** – CTDOT initiated multi-projects coordination effort within the Hartford and Westport regions in order to mitigate traffic impacts and enhance mobility.

This review process is performed biennially and addresses the steps required to support the emphasis areas.

Work Zone field reviews of active roadway projects are conducted annually by the Office of Construction since 2010. Findings and recommendations from these field reviews were provided by the CTDOT Office of Construction directly to the project personnel for subsequent corrective action after each site visit.

Several best practices for CTDOT's implementation of the Work Zone Safety and Mobility program were found through the work zone field reviews. These best practices are evaluated to ensure that they are reflected in the state-wide practices.

This Work Zone Process Review evaluated the findings of the 2017 and 2018 Work Zone Safety Field Reviews. The findings have become action items for the Process Review to improve the Department's Work Zone Program.

Work zone performance metrics mentioned in the report are in the developmental stages and only for specific projects.

- Operational performance metrics were evaluated by analyzing data obtained from a Smart Work Zone System on a major highway reconstruction project on I-84.



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- Safety performance metrics to be evaluated by cross-referencing data from the UConn Crash Repository and the CTDOT's Project Web-GIS Map to validate references to work zone.

These tools may provide the framework to establish work zone performance metrics associated with safety and mobility in the future.

The next biennial Work Zone Process Review due date is December 31, 2021.



BACKGROUND

Federal Regulations

[23 CFR Part 630, Subpart J – Work Zone Safety and Mobility](#), contains the requirements and guidance for systematically addressing and managing work zone safety and mobility impacts on Federal-aid highway projects. This Process Review was prepared to comply with [23 CFR Part 630.1008](#), paragraph (e), *State-level processes and procedures*, that requires States to perform a process review every two years in order to assess the effectiveness of work zone safety and mobility procedures.

To help States evaluate their work zone practices FHWA developed the Work Zone Safety and Mobility Self-Assessment (WZ SA) tool. The WZ SA tool consists of 46 questions designed to assist those with work zone management responsibilities in assessing their programs, policies, and procedures against many of the good work zone practices in use today. The policies, strategies, processes, and tools identified in the WZ SA were gathered from the best practices currently in place in State departments of transportation (DOTs), metropolitan planning organizations (MPOs), and local municipalities. Many of the items can be found in the [Work Zone Best Practices Guidebook](#).

The work zone areas found to need improvement have laid the foundation of the Work Zone Safety and Mobility Process Review.

Moving Ahead for Progress in the 21st Century Act (MAP-21)

[MAP-21](#), as amended, became effective on October 1, 2012. Section 1405 *Highway Worker Safety* requires the Secretary of Transportation to modify [23 CFR Part 630.1108](#), paragraph (a) *Work zone safety management measures and strategies*, concerning the use of positive protective measures to separate workers on highway construction projects from motorized traffic.

Fixing America’s Surface Transportation Act (FAST Act)

The FAST Act directs FHWA to move rapidly to finalize regulations as directed in MAP-21 for highway work zones to protect workers.



PURPOSE and OBJECTIVE

The purpose and objective of this Process Review is to comply with the requirements contained in [23 CFR Part 630.1008](#), paragraph (e) and to determine whether the CTDOT is adequately and programmatically identifying, addressing, and managing work zone safety and mobility impacts on its highway projects.

The results of this Process Review are intended to produce systematic improvements to work zone processes and procedures with the objective of improving safety and mobility on current and future highway projects in Connecticut.



SCOPE and METHODOLOGY

Scope of Review

The scope of this Process Review includes four (4) areas that provides a statewide and programmatic perspective regarding the current status of work zone safety and mobility in Connecticut. The areas include work zone field reviews, work zone performance metrics, smart work zone technology, and regional transportation management plans.

2017-2018 Work Zone Safety Field Reviews

Work zone field reviews were held for randomly selected active roadway projects administered by CTDOT. These field reviews were performed in order to assess current field practices relative to work zone safety and mobility.

During a regular work zone safety field review, personnel from the CTDOT Office of Construction and Division of Traffic Engineering were accompanied by project staff from the District to tour selected projects during active operations.

For in-depth field reviews, staff from the Office of Construction, the Division of Traffic Engineering, the District, and FHWA attended. Reports documented both best practices and areas of improvement for the individual projects reviewed.

The reviews included an overview of traffic control devices, sign installation and removal methods, sign recognition and visibility, and a questionnaire for project personnel to determine strengths and weaknesses in work zone procedures. The goal was to identify best practices and needed improvements through consensus among the various offices present.

Projects were chosen from each of the four (4) districts in the state:

- District 1 – Central Connecticut
- District 2 – Eastern Connecticut
- District 3 – Southwestern Connecticut
- District 4 – Western Connecticut

Each review had multiple focus areas selected from a predetermined list. Once a project was selected, the review team was notified, and a date for the field review was scheduled. The field review team typically met with project personnel at the field office for an initial meeting to answer the questionnaire, and then proceeded to conduct a field review of all other aspects of the work zone. Upon completion of the field review, a report was generated detailing the findings and recommendations. The reports were circulated to the review team and project personnel for comments before being finalized.



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For the two (2) construction seasons covered, a total of thirty-two (32) regular field reviews and eight (8) in-depth reviews were conducted. The following are the standard six (6) focus areas selected for the 2017-2018 field reviews:

- Detours
- Night Work
- Pedestrian/Bicycle Access
- Stage Construction
- Temporary Lane Closures
- Temporary Signalization

Tables 1a & 1b below summarizes the number of reviews conducted. In addition, the tables also show the areas of focus on active construction projects in each of the CTDOT Districts.

Table 1a – Summary of 2017 Work Zone Field Reviews

	District 1	District 2	District 3	District 4	TOTAL
TOTAL PROJECTS REVIEWED	4	5	7	3	19
Focus Areas					
Detour	3	0	6	2	11
Night Work	3	2	7	2	14
Pedestrian / Bicycle Access	2	2	3	1	8
Stage Construction	3	4	4	2	13
Temporary Lane Closure	3	4	7	2	16
Temporary Signalization	3	2	2	0	7

Table 1b – Summary of 2018 Work Zone Field Reviews

	District 1	District 2	District 3	District 4	TOTAL
TOTAL PROJECTS REVIEWED	6	5	5	5	21
Focus Areas					
Detour	2	3	3	1	9
Night Work	6	4	5	4	19
Pedestrian / Bicycle Access	3	2	0	0	5
Stage Construction	4	3	3	3	13
Temporary Lane Closure	6	5	5	5	21
Temporary Signalization	3	1	1	1	6

Each year a Work Zone Safety Review Annual Report is compiled, summarizing the findings and recommended changes found for that year. Each report contains an



executive summary, a table of action items, summary of how the action items can be addressed, and copies of the work zone review reports. CTDOT has continued to conduct annual work zone field reviews every construction season since 2010 in order to continually improve work zone safety for construction crews and the traveling public.

Work Zone Program Performance Metrics

Work Zone Performance Metrics have been developed in the areas related to safety and congestion on a project-specific level.

Work Zone Safety Performance Metrics

Accurate crash data is necessary to develop Work Zone safety performance metrics. Such data would include, but is not limited to:

- Number of crashes
- Types of crashes
- Severity of crashes
- Location in relation to the work zone

A statewide work zone crashes for 2017 and 2018 were analyzed and included in Appendix 3.

Work Zone Operational Performance Metrics

Operational data is necessary to develop Work Zone congestion related performance metrics. This data is more difficult to acquire and includes, but is not limited to:

- Historical and real time speed
- Travel time and delay
- Queue length
- Traffic Volume in real time

Operational related data is produced in a variety of ways. However, collecting some of this data in-house can be labor and time intensive and requires specialized equipment. Purchasing data such as real time speed and travel time from a third party can be costly. The data will most likely come from specialized equipment procured on a project and is fundamental to developing operational related performance metrics.

Data from the Smart Work Zone System (SWZS) on Project No. 0151-0273, I-84 in Waterbury is being analyzed for project specific Work Zone operational performance metrics. Data from a SWZS on project No. 0158-0211, Route 15 in Westport is available and similarly will be analyzed.

Delay is a measure of the extra time incurred by motorists within a commute due to slow movement through the work zone. It is measured in terms of average delay per vehicle. The delay data is derived as a function of the speed, travel time and volume through the



work zone. Baseline speed and travel time data should be used as a benchmark for comparison. The actual data values are compared to the benchmark data to determine the extent of the negative mobility impact created. Historical baseline data (benchmark data) is being used as the benchmark for comparison because it allows for the separation of the actual work zone mobility impacts from pre-construction recurring congestions. The values of the benchmark data varies by time of day rather than a constant benchmark such as the posted speed limit or a theoretical variable travel speed. Accurate volume data from sensor counts is vital to determine the average delay per vehicle and the total vehicle delay in hours.

Queue length is a measure of congestion experienced in a work zone when reported travel speeds drop below a pre-defined threshold selected by the agency. This is not measured directly but is an estimated length and duration based on a selected speed threshold. Queued traffic is typically identified where the traffic is stopped or slowed more than 25 mph below the posted speed limit. The deployed SWZS is not configured to measure the traffic flow density (vpmp) and to determine queue lengths.

CTDOT must proceed cautiously in this endeavor, as there is a lot to be learned and researched prior to developing any value added performance metrics in this area.

For work zone reviews, the travel time data set can have several uses. Below is a list of potential applications/questions that can be examined with the data that come to mind.

Observation/analysis of queues during work zones (establish “baseline” (no work zone) conditions by observing typical travel-speed patterns, visualization of lengths of roadway with reduced travel speeds in the time of interest, etc). This may help optimize the selection of work zone timing, location, and extent; or compare the impacts of measures to reduce number of work-zone occurrences (i.e. total road closure with accelerated schedule – see attached images for I-95 total road closure May 31-Jun 2 and June 7-June 9 in Appendix 5) vs. shorter but more numerous work zones.

Estimation of impacts of work zones for user delays (if coupled with volume data).

Spatial impact of work zone on travel patterns (how alternate routes to a congested work zone are impacted by the work zone).

Verification/Quantification of impacts of work zone configurations or procedures on the traffic stream (as in the rolling roadblock graph attached in Appendix 5). For example, pilot projects could be coupled with a measurement of the real impacts on the road, as long as work zone timing and location are paired up with the travel time data.

Smart Work Zone Technology

CTDOT has researched and implemented the use of Smart Work Zone (SWZ) Technology within qualified work zones to display real time information to motorists and



collect data for performance metrics. The use of SWZ technology is a critical public information tool, and can aide in making more informed choices about improving work zone set ups and traffic flow in and around them.

Smart Work Zone System Operational Performance Metrics

Project 151-273, I-84 Waterbury

The Operational Performance Metrics being tracked using the SWZS during construction hours (M-F 9 pm to 6 am) were:

- I-84 EB and WB Average Daily Speed (mph)
- I-84 EB and WB Average Daily Travel Time (min)
- I-84 EB and WB Average Daily Volume (veh/hr)

The observation of the tracked quarterly performance metrics data consistently showed minimal impacts to traffic flows during the construction hours of operation. This results from the mitigation strategies that were adopted in the contract to effect positive mobility and safety. The strategies included SWZS deployment prior to the start of construction, and the use of a TMP with effective public outreach/public information efforts.

This project is now complete with the opening of the widened lanes in both directions (I-84 EB on 8/24/18 and WB on 9/30/18) and the SWZS was decommissioned on December 21, 2018. The 4th quarter performance metrics clearly showed significant improvements for the level of services (LOS) within the project limits. The 4th quarter performance metrics results indicates improved travel speeds, reduced travel times, and reduced capacity volumes in each direction.

Regional Transportation Management Plan

CTDOT has made efforts to minimize traffic impacts within highly congested corridors within Connecticut. Although federal regulations require the use of Transportation Management Plans for significant projects, the plans are usually limited to traffic coordination between projects adjacent to one another or areas immediately surrounding the project. When multiple projects are actively working in a corridor, motorists try to avoid the restricted areas by diverting to other less traveled routes, which can result in the whole region being congested.

In 2017, the Department made a concerted effort to create two Regional Transportation Management Plans: the Hartford Region and the Norwalk/Westport Region. Both plans were attempting to coordinate staging plans for projects active in construction starting in 2017 construction seasons. The regional coordination effort appeared to be ineffective for active construction projects, but was deemed helpful for design coordination of pending projects. District 1 Project Engineers rely more on District PE meetings on a weekly basis for the coordination of various projects within the Hartford Region. The Norwalk/Westport Regional TMP has been scaled back to focus on the Walk Bridge coordination with area projects. It is recommended that the Division of Traffic Engineering



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create Limitations of Operation for specific projects based on a regional Transportation Management Plan or on pending projects in the area.



PROCESS REVIEW TEAM MEMBERS

The members of the Process Review team that conducted and analyzed the 2017-2018 work zone field reviews or compiled the final process review report were:

[James P. Connery](#), *Construction Division Chief* (**CTDOT Construction**)
[Anthony O. Kwentoh](#), *Transportation Supervising Engineer* (**CTDOT Construction**)
[Kiah A. Patten](#), *Transportation Engineer 2* (**CTDOT Construction**)
[Rabih Barakat](#), *Transp. Principal Engineer* (**CTDOT Bridge Engineering**)
[John S. DeCastro](#), *Maintenance Manager* (**CTDOT Highway Operations**)
[Frederick DiNardi](#), *Maintenance Planner* (**CTDOT Highway Operations**)
[Joseph P. Ouellette](#), *Transp. Supervising Engineer* (**CTDOT Traffic Engineering**)
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[Edgardo D. Block](#), *Transportation Supervising Engineer* (**CTDOT Policy & Planning**)
[Timothy Snyder](#), *Safety / Area Engineer* (**Federal Highway Administration**)
[Robert Ramirez](#), *Safety/Area Engineer* (**Federal Highway Administration**)
[Anthony A. Lorenzetti](#), *Technical Associate* (**UConn Technology Transfer Center**)
(left as of April 2019)



OBSERVATIONS and RECOMMENDATIONS

2017-2018 Work Zone Safety Field Reviews

- **Observation No. 1-1:**

Issues were identified in the various subject areas including additional devices needed, advanced warning, best practices, clear zone interference, CMS spacing, CMS timing, complete project documents, conflicting markings, design issues, enforcement coverage, enforcement of plans, enforcement of specifications, enterprise coordination, material research, message confusion, missing specifications, more protective equipment needed, more thorough plan reviews, pattern installation, pavement issues, pavement markings, pedestrian safety, pedestrian/ ADA issues, procurement issues, project coordination, proper installation of devices, proper messaging, proper signage, proper usage of devices, protection of the work zone, quality of devices, radar speed trailer, rolling road block, selective clearing, sign placement, specification enforcement, stakeholder communication, TMP maintenance, traffic safety, travel hazards, unforeseen conditions, and work zone interference. The issues are listed within the Action Items section of this report.

Recommendation:

The issues will be assigned to the appropriate office for resolution. They will be assigned to the unit that can best resolve them.

Compliance:

The most significant avenue to address the findings listed is through training of the staff directly involved. For the findings from the 2017 and 2018 reviews, training was given to the construction inspectors during their Annual Winter Training. Other findings related to Engineering or Planning have been brought to the units attention to be resolved through policy or coordination with staff.

Resolution:

Keeping staff aware of the issues found in the field is an ongoing effort within the engineering and construction process.

- **Observation No. 1-2:**

In 2017, the Work Zone Review Team completed fifteen (15) regular reviews and four (4) in-depth reviews. In 2018, the team completed seventeen (17) regular reviews and four (4) in-depth reviews (Appendix 2).



Recommendation:

Having a list of potential projects at the beginning of the year and contacting project personnel at the start of work has been an effective method to ensure the goal of ten (10) regular reviews and four (4) in-depth reviews were being met.

Compliance: Not Applicable

Resolution: Not Applicable

Work Zone Program Performance Metrics

- Observation No. 2-1:

Using the SWZS for Project No. 0151-0273, the average daily speed, volume and travel time between construction hours (M-F 9pm to 6am) for time period July 2015 to September 2018, was compared to the established baseline (pre-construction May – Jun 2015). Initial comparisons of the data are summarized below.

Average Daily Speed (MPH) - Construction Hours

I-84 EB			
Quarter	Baseline	Quarterly Mean	Difference
Jul - Sep 15	55.76	54.22	-1.53
Oct - Dec 15	55.76	55.10	-0.66
Jan - Mar 16	55.76	56.79	1.03
Apr - Jun 16	55.76	55.77	0.02
Jul - Sep 16	55.76	52.74	-3.01
Oct - Dec 16	55.76	54.57	-1.19
Jan - Mar 17	55.76	53.75	-2.01
Apr - Jun 17	55.76	53.37	-2.39
Jul - Sep 17	55.76	52.83	-2.93
Oct - Dec 17	55.76	51.88	-3.88
Jan-Mar 18	55.76	53.35	-2.40
Apr-Jun 18	55.76	51.13	-4.62
Jul-Sep 18	55.76	54.47	-1.29
Oct-Dec 18	55.76	53.33	-2.43

I-84 WB			
Quarter	Baseline	Quarterly Mean	Difference
Jul - Sep 15	55.70	54.77	-0.93
Oct - Dec 15	55.70	55.20	-0.50
Jan - Mar 16	55.70	57.24	1.54
Apr - Jun 16	55.70	56.12	0.42
Jul - Sep 16	55.70	54.49	-1.21
Oct - Dec 16	55.70	53.19	-2.51
Jan - Mar 17	55.70	52.42	-3.28
Apr - Jun 17	55.70	52.64	-3.06
Jul - Sep 17	55.70	54.03	-1.67
Oct - Dec 17	55.70	55.54	-0.16
Jan - Mar 18	55.70	56.04	0.34
Apr-Jun 18	55.70	55.55	-0.14
Jul-Sep 18	55.70	54.10	-1.60
Oct-Dec 18	55.70	52.57	-3.13

Legend: faster traffic thru wz
 slower traffic thru wz

Legend: faster traffic thru wz
 slower traffic thru wz

Posted Speed Limit is 55 mph

The speed drops noted in the data analysis for the Average Daily Speeds were deemed to be minimal and would not result in quantifiable queue lengths.



Average Daily Volume (Veh) - Construction Hours

I-84 EB			
Quarter	Baseline	Quarterly Mean	Difference
Jul - Sep 15	11259	8277	-2981
Oct - Dec 15	11259	7124	-4134
Jan - Mar 16	11259	5154	-6105
Apr - Jun 16	11259	6605	-4654
Jul - Sep 16	11259	6808	-4450
Oct - Dec 16	11259	6115	-5144
Jan - Mar 17	11259	5637	-3012
Apr - Jun 17	11259	8247	-2175
Jul - Sep 17	11259	9083	-2175
Oct - Dec 17	11259	7211	-4048
Jan - Mar 18	11259	6063	-5196
Apr-Jun 18	11259	6778	-4480
Jul-Sep 18	11259	6302	-4957
Oct-Dec 18	11259	3376	-7883

I-84 WB			
Quarter	Baseline	Quarterly Mean	Difference
Jul - Sep 15	11234	7464	-3770
Oct - Dec 15	11234	5960	-5274
Jan - Mar 16	11234	5183	-6052
Apr - Jun 16	11234	6406	-4828
Jul - Sep 16	11234	6741	-4493
Oct - Dec 16	11234	6148	-5086
Jan - Mar 17	11234	5556	-2406
Apr - Jun 17	11234	8828	-1335
Jul - Sep 17	11234	9900	-1335
Oct - Dec 17	11234	9153	-2081
Jan - Mar 18	11234	7435	-3799
Apr-Jun 18	11234	7981	-3253
Jul-Sep 18	11234	6273	-4961
Oct-Dec 18	11234	3686	-7548

Legend: less congestion/more diversion thru wz
 more congestion/less diversion thru wz

Legend: less congestion/more diversion thru wz
 more congestion/less diversion thru wz

Average Daily Travel Time (min) - Construction Hours

I-84 EB			
Quarter	Baseline	Quarterly Mean	Difference
Jul - Sep 15	8.31	8.65	-0.34
Oct - Dec 15	8.31	7.24	1.07
Jan - Mar 16	8.31	5.71	2.60
Apr - Jun 16	8.31	6.10	2.21
Jul - Sep 16	8.31	7.87	0.44
Oct - Dec 16	8.31	6.69	1.62
Jan - Mar 17	8.31	6.86	1.45
Apr - Jun 17	8.31	6.83	1.48
Jul - Sep 17	8.31	6.76	1.55
Oct - Dec 17	8.31	3.58	4.73
Jan - Mar 18	8.31	3.36	4.95
Apr - Jun 18	8.31	3.21	5.10
Jul-Sep 18	8.31	3.97	4.34
Oct-Dec 18	8.31	2.03	6.28

I-84 WB			
Quarter	Baseline	Quarterly Mean	Difference
Jul - Sep 15	7.45	5.68	1.78
Oct - Dec 15	7.45	5.56	1.89
Jan - Mar 16	7.45	4.50	2.95
Apr - Jun 16	7.45	4.80	2.66
Jul - Sep 16	7.45	5.36	2.09
Oct - Dec 16	7.45	5.39	2.07
Jan - Mar 17	7.45	5.26	2.20
Apr - Jun 17	7.45	5.40	2.06
Jul - Sep 17	7.45	4.95	2.51
Oct - Dec 17	7.45	5.21	2.25
Jan - Mar 18	7.45	4.93	2.53
Apr - Jun 18	7.45	4.83	2.62
Jul-Sep 18	7.45	5.31	2.14
Oct-Dec 18	7.45	4.65	2.80

Legend: reduced travel time thru wz
 increased travel time thru wz

Legend: reduced travel time thru wz
 increased travel time thru wz

Overall, the preliminary data analysis for the work zone indicate that traffic volumes have decreased, travel times have improved and speed fluctuates depending on the time of year. Decreased traffic volumes are typically associated with commuters using alternate routes to potentially avoid work zone impacts. Traffic



diversions from work zones will result in improved travel times, speeds and possibly reduced congestion. ([Appendix 3: Work Zone Safety Performance Metrics](#) and [Appendix 4: Work Zone Operational Performance Metrics](#))

Recommendation:

The data obtained from the system were used to set performance metrics for indication of an acceptable level of service for roadway while a work zone is in place.

Compliance: Not applicable at this time.

Resolution: Not applicable at this time.

- Observation No. 2-2:

Crash data from the UCONN Crash Data Repository for crashes in 2017 and 2018, associated with active projects (i.e. work zones) are mapped using CTDOT GIS Project Map for analysis. Data from Project No. 0151-0273 was further analyzed to determine the areas within the work zone where crashes are more prevalent.

Recommendation:

The analysis of the crash data was used to guide future performance metrics as an indicator for safety to ensure that the work zone crash rate does not exceed the pre-construction crash rate for the area.

Compliance: Not applicable at this time.

Resolution: Not applicable at this time.

Smart Work Zone Technology

- Observation No. 5-1:

Project No. 151-273, I-84 Reconstruction in Waterbury deployed a smart work zone system provided by VER-MAC. This system has collected operational data (speeds, volumes, and travel times) and displayed that information or programmed messages to the traveling public. The intent of using the system is to help mitigate traffic delays due to congestion or traffic incidents. Using technologies to measure, manage, and improve work zone operations and safety is the overarching goal.

Recommendation:



To obtain more work zone operational data and to display more real time information to motorists, more systems need to be deployed within work zones wherever it is deemed feasible and warranted.

Compliance:

In 2017, Project No. 158-211, Merritt Parkway Safety Improvements in Westport deployed another system provided by ASTI.

Resolution:

Motorists are informed of any traffic delays as they occur. Operational data from these systems will be collected and analyzed to add to the data analysis underway.

Regional Traffic Coordination

- Observation No. 6-1:

CTDOT has facilitated meetings to establish a global Traffic Management Plan for the Hartford Region. The effort was led by CME, the consultant working on the Aetna Viaduct Project in Hartford.

There were a significant number of construction and maintenance projects scheduled to come out to construction for the 2017-2020 seasons within the Hartford region. Without coordination of the lane closures and detours amongst the various projects, traffic can get gridlocked.

CME took staging and detour information for each project and compiled them all into one comprehensive plan so potential conflicts can be visually identified and mitigated before construction starts.

Recommendation:

If conflicts were minimized with the use of this plan, this strategy could be used again for other heavily congested areas in Connecticut.

Compliance: Not applicable.

Resolution: Not applicable.

- Observation No. 6-2:

CTDOT is also attempted to create a Regional Transportation Management Plan for the Westport/ Norwalk Region as well. The Regional Plan originally was led by WSP, the consultant for the Walk Bridge Rehabilitation Project in Norwalk.



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However, the Office of Construction could not achieve the initial objective due to time constraints of other units.

Recommendation:

The strategy for this plan attempted to primarily focus on mitigation of project work zone impacts within the Fairfield corridor.

Compliance: Not applicable.

Resolution: Not applicable.



BEST PRACTICES

FHWA and CTDOT identified the following noteworthy practices during the 2017-2018 Work Zone Field Reviews:

- Law Enforcement: One project made sure that police was present when signing a multi-lane traffic pattern at night.
- Radar Speed Display: Projects use radar speed displays to help calm speeds within work zones.
- Rolling Road Block: More and more projects are becoming compliant with the allowed 15 minutes within the directive and congestion is minimized because of it.
- Safety Meeting: Some projects are having tailgate talks to ensure that everyone knows what needs to get done during the shift and what they are to do.
- Signing: Signs were adjusted to accommodate field conditions (e.g. sides of signs being cut off to prevent vehicles from hitting them) or additional signs were added to ensure motorists were well informed of changing conditions.
- Traffic Control Devices: Flagmen on one project used traffic control wands during their nighttime flagging operation.

These best practices can be made statewide practices to improve work zones overall.



SUGGESTED FUTURE EMPHASIS

- Queue Management with Technology
- Statewide Work Zones Operational Improvement Evaluations
- Work Zone Performance Management
 - Project Specific Performance Metrics
 - Data-Driven Interstate Network Performance (e.g. WAZE, INRIX, other external data sources for travel time based index, delay per mile, and total delay)
- Road User Cost Analysis for Specific Project Work Zone Delays
- Connected and Automated Vehicle Systems Readiness
- Work Zone Data Initiative (WZDI) and Data Exchange
- Work Zone Activity Data Collection
- Work Zone Risk Assessments (Survey data included in Appendix 5)
- Work Zone Speeding Countermeasures
- Public Outreach for Limited Access Highway Impacts



CONCLUSIONS

There were many findings noted during the 2017 and 2018 field reviews which are related to compliance issues with the project's Maintenance and Protection of Traffic specifications and plans. Following completion of each project review, the construction project inspection staff were informed of the findings by the Work Zone Safety Review Team report to take appropriate corrective actions. Some of the issues will be addressed programmatically during the annual construction inspection training sessions, and other will be addressed by delegating the action items (reference Appendix 1) via the Work Zone Safety and Mobility Process Review (WZSPR). The WZSPR team meets periodically to discuss programmatic issues concerning the agency's work zones, checks on the action items, and the final dispositions.

The yearly goal of conducting a minimum of ten (10) regular field reviews and four (4) in-depth field reviews were met. Also the identified systemic work zone safety issues are being addressed throughout construction projects to adhere to the issued Construction Directives and Bulletins for work zone safety.

The successful practices that were identified during field reviews will continue to be incorporated into construction project development and administration. The use of SWZ technology on more construction projects can help reduce congestion and delays caused by work zones. The systems can directly inform motorists of current conditions and aide with data analysis and strategy development. Also, establishing better coordination of lane closures and detours for projects within a region, not just from project to project, can reduce congestion. A future improvement that will transform the review process will be the ability to analyze safety and operational data specifically within work zones to better strategize how to minimize crashes and delays.

With the participation of diverse Department personnel in the Work Zone Process Review Team, the recommendations can go directly to the appropriate units for faster response and implementation. Through peer collaboration, Department coordination, and public outreach, CTDOT will continuously emphasize improving safety and mobility on current and future highway projects in the State of Connecticut.

The WZSPR team have recommended a future emphasis to conduct work zone risk assessments during the development of the appropriate countermeasures. Additional questions will be added to the field review checklists in order to gain perspective on the main areas of work zone safety risks.



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APPENDIX 1: 2017 & 2018 WORK ZONE SAFETY REVIEW ANNUAL REPORTS



2019 Work Zone Safety and Mobility Process Review Final Report

2017 Regular Reviews

1. [0017-0182](#), Bristol
2. [0040-0136](#), East Haddam
3. [0050-0219](#), Bridgeport
4. [0058-0327](#), Groton
5. [0068-0211](#), Killingly
6. [0102-0346](#), Norwalk
7. [0117-0157-R2](#), Ridgefield
8. [0135-0326](#), Stamford
9. [0144-0191](#), Trumbull
10. [0160-0139](#), Tolland and Willington
11. [0162-0145](#), Winchester
12. [0170-3435 C & C1](#), Rocky Hill and Wethersfield
13. [0170-3435 D](#), Windham and Chaplin
14. [0170-3435 F](#), Orange and Woodbridge
15. [0170-3435 I](#), Naugatuck and Waterbury

2017 In-Depth Reviews

1. [0063-0699](#), Hartford
2. [0094-0252](#), New London
3. [0100-0178](#), North Haven
4. [0158-0211](#), Westport

2018 Regular Reviews

1. [0017-0182](#), Bristol
2. [0034-0309](#), Danbury
3. [0056-0307](#), Greenwich
4. [0058-0332](#), Groton
5. [0063-0633](#), Hartford
6. [0063-0699/0700/0701](#), Hartford
7. [0084-0099/0100](#), Monroe
8. [0163-0203](#), Windham
9. [0170-3488](#), East Granby
10. [0170-3488](#), Groton
11. [0170-3488](#), Middlefield and Middletown
12. [0170-3488](#), Norwalk
13. [0171-0442 A](#), Glastonbury
14. [0172-0478 G](#), Ashford
15. [0173-0495 E](#), Wilton
16. [0174-0403](#), Newtown, Southbury, and Farmington
17. [0174-0423 A](#), Winchester and Barkhamsted



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2018 In-Depth Reviews

1. [0094-0252](#), New London
2. [0130-0182](#), Southbury
3. [0158-0211](#), Westport
4. [0171-0431](#), East Hartford and Willington



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APPENDIX 2: WORK ZONE PROCESS REVIEW ACTION ITEMS



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2017					
<i>NFAR = No Further Action Required Ongoing = Pending unit resolution</i>					
CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
1) <i>Leadership & Policy</i>	Not applicable				
2) <i>Program Evaluation / Enterprise coordination & Communications</i>	The adjacent project (Project No. 117-149) has a CMS stating not to take Route 35 and seek an alternate Route when Route 35 is the detour route for Project No. 117-157.	Project 117-149 and Project No. 117-157 have coordinated their detour routes and the projects do not work concurrently allowing at least one route (either Route 7 or Route 35) open for the traveling public to use. This effort is a good practice.	0117-0157	Traffic Engineering, Maintenance, and Construction	NFAR
	On Route 7, north of the intersection with Own Home Avenue in Wilton, temporary construction signs from a previous project are still posted. The Project Engineer stated the signs are left from a past town project.	The signs should be removed if they are not applicable any more. The project can coordinate with the town to have them removed.	0117-0157	Construction	NFAR



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2017					
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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
3) <i>Signing (Inadequate signage and visibility)</i>	The “signal ahead” sign on Route 74 (Tolland Turnpike) was placed before another signal not before the temporary one.	The “signal ahead” sign should be placed after the permanent signal but before the temporary one so motorists will know which one the sign is indicating to.	0160-0139	Construction, Traffic Engineering	NFAR
	There is poor sightline for the Stop sign at the end of Whiting Street.	The project can add a “Stop Ahead” construction sign on Whiting Street to inform motorists of the Stop sign they cannot see from the road.	0162-0145	Construction	NFAR
	Northwest Connecticut Community College parking lot sign is within the TPCBC.	If existing signs are obstructed from view by construction devices or activities, they should be relocated to a more visible location.	0162-0145	Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	The pattern on the northbound side didn't include an "END ROAD WORK" sign at the end.	Signs noted on the places within the Work Zone Safety Guidelines for Maintenance Operations need to be adhered to and installed correctly and completely.	0170-3435 C & C1	Maintenance	NFAR
	A "Flagger Ahead" sign was placed before the utility work zone on Atlantic Street but there was no flagger operation, just a municipal police vehicle with flashing lights on.	If a sign is going to be used to indicate a traffic person ahead it needs to be further back for more advanced warning not at the work area. Also, a "Road Work Ahead" sign would be better to use since there weren't any flaggers being used.	0135-0326	Construction	NFAR
4) <i>Traffic control in Work Zones (Installation & Removal Procedures)</i>	On the westbound side, space was limited to place all the traffic devices.	Field adjustments are allowable as long as the minimum requirements on the traffic plans are met.	0063-0699	Construction, Traffic Engineering	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	A crash truck advising motorists to merge left was providing extra protection for the sign truck while the crew installed the devices for the tangent of the pattern.	Only on roadway sections where there are three or more lanes, can a crash truck protect the traffic-side of the sign truck. However, the crash truck is still considered to be interfering with traffic by closing the second lane before the Limits of Operation allow a closure of two lanes.	0063-0699	Construction	NFAR
	The TPCBC along South State Street was misaligned.	TPCBC needs to have aligned sections to redirect wheels of vehicles back towards the roadway and not get snagged between sections.	0135-0326	Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	Temporary signs used to describe prolonged conditions, like “Raised Structures” or “Bump”, were not anchored or weighted on the base of the temporary stand.	Construction signs mounted on tripod stands used for a long-term duration should be anchored by weighting the bottom of the stand so they don’t get displaced by fast winds on the interstates.	0170-3435 C & C1	Maintenance	NFAR
5) <i>Queues and Management</i>	On I-95 NB, the queue that resulted from implementing the work zone extended to the nearest Service Plaza.	Although the queue that formed could be due to the location on I-95 which historically has a large traffic demand in that area, queue management strategies need to be considered.	0050-0219	Construction	NFAR
6) <i>Construction Sign Retro-Reflectivity (Visibility of signs and Devices)</i>	Signs and messaging: (a) the no right turn sign facing the off-ramp is faded and should be replaced and (b) do not enter signs and a one-way sign (on the north side) are needed at the end of the off-ramp.	Signs need to have their messaging clearly visible to motorists.	0135-0326	Construction and Traffic Engineering	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
7) <i>Movable Barriers (Positive Protection)</i>	Not applicable				
8) <i>Pedestrian / Bicycle Access and ADA Compliances</i>	There is a sidewalk on Bassett Road which was closed but no detour was implemented for pedestrians.	The Chief Inspector said that closing the sidewalk on Bassett Road was discussed with the Town Engineer and he said that no detour was needed since it was rarely used.	0100-0178	Traffic Engineering, Construction	NFAR
	A "Utility Ahead" sign was blocking a sidewalk on Atlantic Street	Equipment and devices shouldn't block the pedestrians' pathway. The sign should be relocated to allow pedestrian access through.	0135-0326	Construction	NFAR
9) <i>VMS / CMS Messaging</i>	The VMS over the northbound side didn't have any message displayed about the work zone below.	If VMS used in lieu of CMS will be the only advance warning messaging for a project, they need to be on and displaying messages.	0170-3435 C & C1	Maintenance and Highway Operations	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	The portable CMS near the I-95 NB Exit 21 on-ramp had the “Road Work Ahead” and “Lanes Closed Ahead” messages. “Lanes Closed Ahead” was not technically correct, since only the left lane was closed.	The CMS messaging should be compliant with the M&PT special provision.	0050-0219	Construction	NFAR
	On I-95 SB there was a truck mounted CMS that read “Constr. Zone” and “Fines Doubled.” “Constr. Zone” is not an approved message. Refer to the special provision for Item No. 0971001A: Maintenance and Protection of Traffic for approved messages.	Enforcement of the specifications for appropriate message to the motorists.	0050-0219	Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	The message of the CMS placed on Route 7 Westbound stated that the road was closed ahead.	The message on the CMS should reflect the current conditions of the project or should be accompanied with future dates so motorists know when the conditions will take effect.	0117-0157	Construction	NFAR
10) <i>Detours</i>	Not applicable				
11) <i>Traffic Control Devices (Quality Standards for Cones, Drums, Barricades, etc.)</i>	The flashing arrow in the closed lane is in the arrow mode not the straight bar.	The flashing arrow used in the closed lane should indicate a closed lane by displaying the straight bar.	0170-3435 F	Maintenance	NFAR
	Some construction signs were dirty with significant scuffing. The signs were still reflective, but were not in ideal shape.	Traffic signs that are dirty or scuffed should be cleaned before use. If they cannot be cleaned to restore reflectivity, they should be replaced.	0050-0219	Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	There was a traffic drum that was horizontally sliced that compromised the physical integrity of the device. There were also drums and cones with reflective tape that was peeling off.	Traffic devices that are misshaped, missing reflectivity, or badly damaged need to be replaced.	0050-0219	Construction	NFAR
	Permanent gore impact attenuator barrels were damaged.	The impact attenuation system needs to be repaired so the barrier wall end is protected.	0135-0326	Construction	NFAR
	Some of the traffic control devices were badly misshaped.	Devices that are misshaped, worn, or has poor reflectivity are in unacceptable condition and should be replaced.	0135-0326, 0162-0145	Construction	NFAR
	A construction sign was mounted on waffle board which is not an acceptable material to use.	Waffle board is an unacceptable material to use for construction signs since the reflectivity of the signs is poor.	0160-0139, 0170-3435 C & C1, 0170-3435 D	Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	Condition of the traffic control devices: (a) TPCBCs are worn and cracked and the pins are not properly connected between some of the sections. The condition is unacceptable for use, and (b) some of the traffic drums are badly misshaped which is an unacceptable condition.	Traffic control devices that are in poor condition should be replaced. To understand what acceptable conditions for traffic control devices are, refer to the ATSSA Guidelines for the Temporary Traffic Control Devices and Features.	0162-0145	Construction	NFAR
	Most cones used for the traffic pattern on the southbound side were in marginal or unacceptable condition.	Traffic devices and signs should be cleaned if dirty or replaced if misshapen, worn, or missing reflective tape.	0170-3435 C & C1	Maintenance	Ongoing
	There was also a sign was mounted too low and one had paint on its face.	Signs should be mounted with an adequate height to increase visibility to the motorists.	0170-3435 I	Construction and Maintenance	Ongoing



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	A number of the traffic control devices and post-mounted signs are worn and dirty. Some traffic cones were missing reflective tape and misshaped and some construction signs had lettering worn off and low reflectivity.	Traffic control devices that are in unacceptable quality per ATSSA Quality Guidelines need to be replaced so visibility of the work zone is maximized.	0170-3435 I	Construction and Maintenance	Ongoing
12) <i>TMP / RTMP Coordination</i>	There was no Transportation Management Plan included in the project documents.	There should be a TMP for the project since the project is on an interstate which is considered to be significant.	0068-0211, 0170-3435 C & C1	Design, Construction	Ongoing
	The project hasn't been updating the Transportation Management Plan. They didn't think the plan was applicable since their staging plans have changed.	Although the staging has changed, anything done for traffic control and public outreach need to be noted in the TMP updates.	0094-0252	Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
13) <i>Lighting for Night Time Inspection</i>	Not applicable				
14) <i>Barricade Warning Lights</i>	Not applicable				



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
15) Rolling Road Block Applications	The contractor stated that there were 5 crash trucks and 3 State troopers on site. Normally, there are 5 troopers on site. A state trooper assisted the sign crew while the traffic drums and cones were being installed. Adjacent to live traffic, the state trooper was used to block the open lane adjacent to the closed lane in order to protect the workers installing the traffic drums.	Using TMAs instead of state police vehicle to protect sign crew in closed lanes is the requirement. Also, closing the middle lane before the limitations of operation allows is considered interference to traffic.	0050-0219	Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	The project used a Rolling Road Block (RRB) to install their traffic pattern. On the Westbound side from 8:32 pm to 8:54 pm (22 minutes). On the Eastbound side from 9:17 pm to 9:29 pm (12 minutes).	Although the RRB went over the time limit stated in the Construction Directive, the residual back up was minimal. Still the project should try to adhere to the policy as much as possible.	0063-0699	Construction	Ongoing
	A Rolling Road Block was used to install the traffic pattern. It started at 7:16 pm and the left lane was opened to traffic at 7:24 pm. A TMA was positioned in the middle lane protecting the crew while they were on the road in the right lane installing the taper.	The Contractor was compliant in keeping the time under the allowable 15 minutes granted in the Rolling Road Block Directive. However, the TMA in the middle lane used to protect the workers while traffic is let through is infringing on the Limitations of Operation by closing two lanes before it is allowed.	0100-0178	Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	A Rolling Road Block (RRB) was used on I-91 in a four-lane section from 7:47 pm to 8:08 pm (21 minutes) while the sign crew set up the two-lane closure pattern. The RRB extended not only after the taper was installed for the first lane but even after the taper was installed for the second lane. The State Police directed the implementation of the RRB which contradicted the Department policy.	The Office of Construction has issued a Construction Directive to limit Rolling Road Blocks to 15 minutes. This prevents significant delays from occurring due to the road being blocked and to allow residual backups to disperse quickly. This directive should be used by the Office of Maintenance to ensure consistency within the Department.	0170-3435 C & C1	Construction	Ongoing



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	A Rolling Road Block (RRB) was used on Route 15 from 8:03 pm to 8:28 pm (25 minutes) while the sign crew installed the pattern.	Use of RRB should comply with the Construction Directive.	0170-3435 F	Construction	Ongoing
16) <i>Law Enforcement in Work Zones</i>	Observed minimal infringements not deemed systemic.	Not applicable			
17) <i>Limitations of Operation (Work Hours)</i>	Not applicable				



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
18) <i>Maintenance and Protection</i>	The quantity of Type D Portable Impact Attenuation Systems was too low.	Item quantities should better reflect what will be used in the field through plan reviews and post-construction reviews.	0158-0211	Design, Construction	NFAR
	The estimate for the Traffic person (Uniformed Flagger) item was too low.	Quantity estimation needs to reflect how many Traffic person hours will be needed to complete all contract work.	0160-0139	Design, Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	The storage area on Manhattan Street should be secured better.	The drums/barricades used to close Manhattan Road on the east end and the construction fencing on the northbound side of Atlantic Street at the intersection of South State Street needs to be fixed and secured for safety.	0135-0326	Construction	NFAR
	H-piles for the leading end of Wall No. 103 need protection.	The leading ends of the H-piles beside the edge of the roadway are blunt objects that need protecting.	0135-0326	Construction	NFAR
	Leading end on TPCBC along Wall No. 103 needs protection. Also, sections of the TPCBC were left not connected at the loops.	TPCBC poses blunt objects if the leading end is not protected or angled away from the roadway. Also, if sections are missing the connection pins, the exposed ends become blunt end that needs protection as well.	0135-032	Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	Equipment mobilized into the left lane and parked before pattern installation was complete. If traffic was let through once the taper was installed, motorists could have bypassed the pattern installation, changed into the left lane and met the parked equipment abruptly.	Equipment that will be used can mobilize to the work zone but should be within the closed lane by the end of the taper to allow traffic to be let through without concern about motorists bypassing the traffic pattern installation and changing lanes to be met with the equipment in the way.	0170-3435 C & C1	Construction	NFAR
	The equipment parked on the northbound side was parked within the clear zone.	The clear zone requirement based on the design speed of the roadway need to be maintained. Objects within the clear zone are considered blunt ends and need to either be placed outside the clear zones or positively protected.	0170-3435 C & C1	Maintenance and Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
<i>19) Best Practices and Lessons Learned (Opportunities for policy improvements)</i>	The Contractor held a tailgate talk before proceeding out onto the roadway.	Holding tailgate talks before every shift is a good practice to ensure the team roles work efficiently.	0050-0219	Construction and Maintenance	NFAR
	Both rolling roadblocks, one on I-95 SB at 8 PM and the other on I-95 NB at 9 PM, were initiated and removed within 8 minutes and 9 minutes, respectively. Time was still needed after the roadblock was removed from installing the rest of the work zone drums, cones, and signs.	The Contractor executed the Rolling Road Blocks within the allowable 15 minutes in accordance with the Department (RRB) directive.	0050-0219	Construction	NFAR
	Drum spacing in tapers was held to 40 feet, while cone spacing in the tangent sections were kept to 80 feet.	The traffic cones and drums were installed according to TTC plan.	0050-0219	Construction and Maintenance	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	The construction signs on the median barrier had their sides cut off to keep them from infringing into the travel lanes.	Adjusting the signs to accommodate the field conditions is a good practice, as long as the adjustments do not alter the message or prohibit the motorists from safely moving through the work zone.	0063-0699	Construction	NFAR
	A sign is posted on the riverbed below stating CAUTION BRIDGE WORK AHEAD.	Considering possible waterway navigation under the bridge and informing users of construction work is a good practice.	0160-0139	Construction	NFAR
	The General Supervisor stated that more State Police should be used on their multi-lane traffic patterns for enforcement.	Using State Police for enforcement within a work zone is a good and safe practice.	0170-3435 C & C1	Maintenance	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	Before every shift, the Contractor's crew leader holds a tailgate talk. Crew leader also draws out the traffic pattern on a white board so the crew can see the pattern they are going to install while he describes how they will install it. During the tailgate talk, District 1 Maintenance crew has everyone present sign in.	Holding tailgate talks every shift is a good practice. It ensures everyone understands what's to be done in that shift and work can proceed smoothly. Having a sign in sheet can safeguard the supervisors that each worker will account for the information received.	0170-3435 C & C1	Maintenance	NFAR
	On the Southbound side the Variable Message Sign (VMS) overhead displayed a message about the Work Zone conditions.	Since the Contractor didn't use Changeable Message Signs, it was good to have the CMS used to bring awareness about the roadwork conditions.	0170-3435 C & C1	Maintenance	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	The Contractor on this project uses the “Reduce Speed to 45 MPH” construction sign.	Although the “Reduce Speed to 45 MPH” construction sign is not enforceable, it is considered a good practice for speed reduction in work zone.	0170-3435 C & C1	Maintenance	NFAR
	The Contractor uses a green 12-inch cone underneath overhead utility lines to bring awareness to truck drivers to lower raised truck beds in that location.	Although the green cones are not used for lane closures, it was a good practice to use high-visibility markers to aid truck drivers to identify overhead power lines.	0170-3435 C & C1	Maintenance	NFAR
	The Northbound side used 42-inch cones for its traffic pattern.	The taller 42-inch cones are best for traffic patterns on interstates.	0170-3435 C & C1	Maintenance	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	Near an intersection, small arrow signs mounted on traffic cones were used to guide motorists into their appropriate lane.	Extra signs added to the pattern is useful, however signs should only be mounted on appropriate supports deemed crashworthy.	0170-3435 D	Maintenance	NFAR
	A speed trailer was mounted on the back of the Contractor's work truck to help calm traffic.	Having traffic calming devices like speed trailers within the traffic pattern are a good practice in reducing speeds within work zones.	0170-3435 D, 0170-3435 F	Maintenance	NFAR
	The Contractor installed an extra REDUCE SPEED TO 45 MPH sign within the pattern.	The REDUCE SPEED signs are good traffic calming practice that can be considered for other highway traffic patterns.	0170-3435 F	Maintenance	NFAR
	For a night operation on secondary road, the use of traffic control wands for the flagging operation in lieu of a typical flagger paddle.	Using equipment such as the traffic control wands for the enhanced visibility for nighttime flagging operations is a good practice.	0170-3435 I	Maintenance	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	The Project Engineer suggested that if a Portable Work Zone Management System is included in a project it should be accompanied with items for protection for the system.	Highway Operations can consider adding a requirement for the protection of the PWZMS field trailers placed within roadway clear zone.	0158-0211	Maintenance	NFAR
	A roof overhang prevented trucks from accessing the back of the convenient store's building.	When designing for business access around a building, all obstructions like the roof overhang needs to be considered.	0162-0145	Maintenance	NFAR
	Guiderail element was mounted on TPCBC due to a lack of embedment for the post in order for the guiderail to continue running along the roadway.	Using concrete barrier to support the existing guiderail was deemed a good practice.	0117-0157	Maintenance	NFAR
20) Training Needs	The construction engineers on specific projects was made aware of the WZS determinations.	In general winter training are provided to the working level engineers on WZS topics.	All projects reviewed	Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
21) <i>Speeding In Work Zones</i>	The I-95 southbound “Your Speed” radar sign was black (unlit), even though there was a fair amount of traffic on I-95. Earlier in the night it was observed that the sign was constant on for speeds in the upper-30’s and would flash for speeds over 40 MPH. It is unclear why the sign appeared off.	The radar speed display should be operational during the entire time the work zone is in place. This is a traffic calming strategy that can help promote safety in the work zone. If the device was having technical issues, it should be corrected as soon as possible.	0050-0219	Construction	NFAR
	Law enforcement activities in work zones emphasis was on presence to calm traffic.	Speeding issues can be addressed through enforcement operations on as needed basis.	0050-0219	Construction	Ongoing
22) <i>Smart Work Zone System (ITS Technology)</i>	The PWZMS is installed but it is not currently being used.	The project staff and vendor should work together to get the system operational and collecting data as soon as possible.	0158-0211	Construction and Highway Operations	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
23) <i>Design Issues (Completeness of Plans & Specs)</i>	The project has to close the road over a weekend to resolve constructability issues. The new bridge is elevated 3 feet higher than the roadway and needs to match the grade of the road. The quantity for the Remote Controlled Changeable Message Sign was increased to assist with an added detour.	Construability issues can possibly be resolved with more thorough plan reviews and likely prevent other issues with deficient item quantities (i.e. Changeable Message Signs) and the need for additional traffic plans (i.e. detour plan).	0160-0139	Design and Construction	NFAR
	With the limited space, the Stage 2 Configuration makes it difficult for oncoming traffic to merge onto the highway, especially at night.	Other staging options to assist the oncoming traffic should be explored by Traffic Engineering and Design.	0068-0211	Design	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	There was utility work at the intersection of Atlantic Street and South State Street with a left lane closure on the off-ramp. Vehicles attempted to enter the left turn lane before the closure.	The lane should be closed entirely with drums or cones to prevent vehicles from entering.	0135-0326	Traffic and Construction	NFAR
	The Chief Inspector suggested for future temporary bridges with temporary signals, use open grates on the bridge instead of temporary asphalt pavement. The asphalt pavement on the bridge has little to no adhesion so when traffic stops on the bridge at the light, the pavement is being shoved and potholes forming.	A good solution for temporary surface on bridges should be considered since asphalt pavement gets shoved and open grates may ice over during the winter.	0160-0139	Design, Traffic, and Construction	Ongoing



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
24) <i>Contractors Compliance (Plans & Specs Enforcement)</i>	Maintenance provided the CMS used for the project and they could only procure one used near the pattern in Windham.	The Contractor is supposed to provide the traffic control for the project, including Changeable Message Signs. If CMS are needed for either ends of the project for advance warning, the Contractor should provide that.	0170-3435 D	Construction and Maintenance	NFAR
	“End Road Work” signs were only installed on one side of the road (the closure side) instead of both sides of the road, as shown in the special provision for Item No. 0971001A: Maintenance and Protection of Traffic.	Compliance with the traffic plans should be enforced and have signs installed on both sides of the roadway as required in the contract.	0050-0219	Construction	NFAR
	I-95 mainline liability signs seemed to have been missing.	Missing liability signs should be installed.	0050-0219	Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	<p>There were sections of traffic cones that were installed crossing the outside of the lane line, effectively narrowing the width of the travel lane. The traffic cones and drums should be installed either within the closed lane or on the lane line not to minimize the travel lane width. Tight lane widths increase the chances of these devices being struck by vehicles, as well as the potential for vehicle sideswipes.</p>	<p>The lanes should remain at the full width unless specifically requested to the District for a reduction.</p>	0050-0219	Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	One Changeable Message Sign does not work and the field staff has requested for it to be replaced.	If the Contractor does not provide functioning traffic control devices, a non-compliance notice can be issued or the issue can be elevated to supervisory staff.	0100-0178	Construction	NFAR
	Some of the Temporary Precast Concrete Barrier Curb sections had pins that were not fastened on the bottom.	The TPCBC needs to be installed according to the plan including fastening the pins at both ends	0100-0178	Construction	NFAR
	The liability sign for the project is posted after the start of the pattern not before the advance warning signs closer to the project limits.	Liability and Fines Doubled signs should be at the beginning of the advance warning signs area so motorists are aware of their responsibility when entering the work zone.	0100-0178	Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	The only sign in advance of the project on Phelps Way was the legal sign. There were no “signal ahead” sign or “road work ahead” sign until right before the temporary bridge.	More advance warning signs should be on Phelps Way and not just before the project site to allow motorists more notice of what’s to come before coming upon it.	0160-0139	Construction and Traffic Engineering	NFAR
	Some of the detour signs were missing	Construction signs should be installed according to plan (see attached marked up plan).	0162-0145	Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	The construction signs were only installed on the left side of the highway not both sides of the highway.	The advance warning signs are to be installed on both sides of the highway as noted in the Work Zone Safety Guidelines for Maintenance Operations. It will bring more awareness to motorists about the work ahead no matter which lane they're traveling in.	0170-3435 C & C1, 0170-3435 F	Maintenance	NFAR
	The traffic patterns used arrow signs in the tapers.	The typical plans included in the Work Zone Guidelines for Maintenance Operations depicted that a high mounted internally illuminated flashing arrow should be used within the taper not temporary construction arrow signs.	0170-3435 D, 0170-3435 F	Maintenance	NFAR




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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	The Chief Inspector doesn't like how the Construction Access specification was written. He says that it doesn't clearly state how to maintain the access.	A proposal for the Construction Access special provision for clarification can be made.	0100-0178	Maintenance	NFAR
	State Police has told the Chief Inspector that the Contractor's workers pulling in and out of the median area before lanes are closed is infringing on the limitations of operation. The workers aren't using their strobes on their vehicles.	The Limitations of Operation need to be enforced. Another Work Zone Safety meeting can be held to establish acceptable practices for work zone safety.	0100-0178	Construction and Design	NFAR




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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
25) <i>Traffic Signals</i>	The construction sign informing motorists of bridge closure dates has a message that's too long and has lettering too small for motorists to read while driving by.	Signs message need to be clear, concise and visible from a distance to allow motorists enough time to read them before reaching the sign.	0117-0157	Traffic Engineering and Construction	NFAR
	There is a concurrent pedestrian walk across South State Street at the intersection of Atlantic Street. Visibility to pedestrian is obscured for right turning vehicles onto South State Street.	It is recommended that a sign be installed with clear visibility to tell motorists of the pedestrians and to yield.  <small>R10-15</small>	0135-0326	Traffic Engineering and Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	<p>There is signing on South State Street showing which lane vehicles should be in for left turns to Canal Street, through moves to I-95 and through/right turns to Canal Street /South State Street. However, in the current staging configuration, the left turn lane is closed.</p>	<p>It is recommended to revise the signs before Canal Street as shown below. Any lane signs at the intersection and pavement markings should be adjusted accordingly.</p> 	0135-0326	Traffic Engineering and Construction	NFAR
26)PI / PO with Stakeholders	Ongoing strategies for all construction projects at varying levels of emphasis.				



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
27) <i>Pavement Markings</i>	The blackout paint for the temporary pavement markings does not match the roadway color.	Research should be conducted to have a selection of colors to use for marking roadway pavement. Covered markings that do not match the roadway can become misleading markings themselves and conflict with other markings.	0094-0252	Design, Construction	NFAR
	The black aggregate cover-up markings on I-95 are beginning to wear and should be refreshed prior to winter.	Pavement markings should be maintained to indicate to motorists where the lanes are.	0135-0326	Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	Pavement markings for pedestrian detour pathway are faded.	Pavement markings should be clearly defined and should not conflict with other markings. If the markings are worn, they should be refreshed.	0162-0145	Construction	NFAR
28) <i>Selective Clearing</i>	Plant over growth has obstructed the messaging of some post-mounted signs.	Selective clearing will improve the visibility of the signs.	0117-0157	Construction	NFAR
	Sign had overgrown brush blocking it.	Clearing of brush is needed for visibility to the signs.	0135-0326	Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
1) <i>Leadership & Policy</i>	Not applicable				
2) <i>Program Evaluation / Enterprise coordination & Communications</i>	Not applicable				
3) <i>Signing (Inadequate signage, visibility and conflicting message)</i>	There were signs stating LEFT TWO LANES CLOSED, then LEFT LANE CLOSED, and then LEFT TWO LANES CLOSED.	Mixed messaging can confuse motorists when they are transitioning into a traffic pattern.	0063-0699/0700/0701	Traffic Engineering and Construction	NFAR
4) <i>Traffic control in Work Zones (Installation & Removal Procedures)</i>	The trench in the work area had an unprotected edge.	The temporary barriers should be used for protection to workers from errant vehicles.	0034-0309	Construction	NFAR
	The drop-off by the edge of the roadway of Route 188 eastbound is unprotected.	Positively protecting the edge like on the westbound side can enhance the safety within the work zone.	0130-0182	Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	While setting up the traffic pattern, the Exit 13 on ramp was not closed before crossing over it to install the taper.	Truck-mounted attenuators or police cruisers could've been used to close ramp. It would be safer to do this before crossing over so no motorist would proceed into the Rolling Road Block and closed lane while being set up.	0170-3488 A	Maintenance	NFAR
	There are two left turn lanes to turn onto the expressway of Route 7 Southbound. Since the right lane on the expressway was closed the right left turn lane was closed as well to prevent anyone turning into the closed lane. Some motorists not realizing that there was only one left turn lane open, queued to left in the median. When the	The review team suggested to the inspection staff to place cones in the median to channelize the traffic into one lane before turning onto the expressway. This way, motorists will know that there is only one lane open.	0170-3488 C	Traffic Engineering and Maintenance	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	light changed and all motorists proceeded to the expressway, the motorists realized what had happened, tried to merge into the other lane, and were upset motorists who were in the proper lane. There was a potential for a crash to occur or at least delays from the merging vehicles.				
5) <i>Queues and Management</i>	Not applicable				
6) <i>Construction Sign Retro- Reflectivity (Visibility of signs and Devices)</i>	Not applicable				
7) <i>Movable Barriers (Positive Protection)</i>	Not applicable				



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
8) <i>Pedestrian / Bicycle Access and ADA Compliances</i>	Due to staging revisions resulting from underground utility conflicts, it was practically not feasible to maintain pedestrian pathways and ADA compliance in the work zones. The project design did not provide clear detours for pedestrians.	Temporary sidewalks should have been installed for pedestrians to use or pathways in road can be created and protected with barrier around utility work.	0017-0182	Construction and Design	Ongoing
	Advance warning signs are mounted on the sidewalk.	Construction devices or materials should not block pedestrians from accessing pathways. Either the objects should be moved or another pathway be given around them.	0034-0309	Construction	NFAR
	Plywood ramps and gravel pathways were used for handicapped access from a nearby church.	Gravel pathways and plywood ramps aren't compliant with ADA requirements and more secured pathways need to be provided.	0063-0633	Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	Pedestrians are passing under caution tape used to close off sections of the sidewalk.	Pedestrian safety should be evaluated on regular basis due to the various sequencing of field operations every day. Also, construction fencing can be used to prevent pedestrians from passing under.	0063-0633	Construction	NFAR
9) <i>VMS / CMS Messaging</i>	There were two Changeable Message Signs within close proximity to each other.	Changeable Message Signs and Variable Message Signs need to be at least 1000 feet apart.	0094-0252	Construction	NFAR
	The CMS was obstructed by an exit sign and span pole.	The CMS being obstructed can prevent motorists from reading the whole message and cause confusion. The sign should be moved to a clearer area.	0170-3488 B	Maintenance	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	The Changeable Message Sign at Exit 84 on I-95 SB had a long transition from first frame to the second.	2 to 4 seconds per message panel is recommended and the timing between frames need to be 1 second off so motorists can read the full message from the time they can first read the message to the time they drive by the sign.	0094-0252	Construction	NFAR
10) <i>Detours</i>	Not applicable				
11) <i>Traffic Control Devices (Quality Standards for Cones, Drums, Barricades, etc.)</i>	Truck-Mounted Attenuators were not used.	TMAs should be used for work area protection.	0174-0423 A	Maintenance	NFAR
	The impact attenuation system used to protect the sides of the water tank was too short in its array.	The array for the system should be extended to better protect against any blunt ends upon impact.	0084-0099/0100	Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	Multiple cones placed to delineate work areas were deemed to be in marginal conditions.	Devices in poor condition should be replaced. Refer to the ATSSA Quality Guidelines for Temporary Traffic Control Devices and Features.	0017-0182	Construction	NFAR
	Some of the traffic control devices were in poor condition. Missing reflective tape, dirty and scuffed with lettering faded.	For good condition for traffic control devices, refer to the ATSSA Quality Guidelines for Temporary Traffic Control Devices and Features.	0056-0307 0130-0182 0171-0431 0170-3488 D 0170-3488 B 0172-0478 G 0171-0442 A	Construction and Maintenance	Ongoing
	Delineators on top of temporary barrier were bent out of shape and only had one side with a color.	Refer to the ATSSA Quality Guidelines for Temporary Traffic Control Devices and Features for acceptable quality of devices. Also, delineators on an alternate one-way traffic pattern should	0163-0203, 0063-0633	Construction and Maintenance	Ongoing



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
		have white on one side and yellow on the other for both sides of the roadway.			
	The Right Lane Closed Ahead sign was in unacceptable condition and needed to be replaced.	For acceptable quality of traffic control signs and devices, refer to the ATSSA Quality Guidelines for Temporary Traffic Control Devices and Features.	0170-3488 A	Construction and Maintenance	Ongoing
	Majority of the signs were on waffle board substrate.	Signs need to be mounted on a rigid substrate so reflectivity isn't diminished. Waffle board signs should be removed and replaced in accordance with the specifications.	0170-3488 D, 0171-0442 A	Construction and Maintenance	NFAR
	Some of the 36-inch cones were used to delineate the structures in the roadway, but the cones are deemed too short.	Use of the 42-inch cones are required and can bring more visibility for delineation.	0173-0423 A	Maintenance	Ongoing



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	Most of the construction signs used had faded lettering and were in marginal or poor condition.	Devices in marginal or poor condition should be replaced with those in good condition so they can be clearly seen by motorists.	0173-0423 A	Construction and Maintenance	NFAR
	The Changeable Message Sign had some light bulbs out cutting off part of the messaging.	Refer to the ATSSA Quality Guidelines for Traffic Control Devices and Features.	0173-0495 E	Maintenance	
	One traffic drum used to delineate a structure was crushed at an intersection and knocked over.	Devices in poor quality should be removed from the project and replaced	0174-0423 A	Construction and Maintenance	
12) <i>TMP / RTMP Coordination</i>	Not applicable				
13) <i>Lighting for Night Time Inspection</i>	Not applicable				
14) <i>Barricade Warning Lights</i>	Not applicable				



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
<i>15) Rolling Road Block Applications</i>	The Rolling Road Block for the southbound side started at 7:03 pm and ended at 7:14 pm (11 minutes). The Rolling Road Block for the northbound side started at 8:00 pm and ended at 8:13 pm (13 minutes).	The Rolling Road Block was kept within the allowable 15 minutes.	0158-0211	Construction	NFAR
	The Rolling Road Block took place from 8:10 pm to 8:20 pm.	The Rolling Road Block was compliant with the criteria of Construction Directive CD-2016-2.	0170-3488 B	Maintenance	NFAR
	The Rolling Road Block used to install the traffic pattern went from 7:03 pm to 7:18 pm (15 minutes).	The sign crew was compliant with the Construction Directive to use a RRB within 15 minutes.	0171-0442 A	Maintenance	NFAR
<i>16) Law Enforcement in Work Zone</i>	The police orders may not always get filled for the night shift and their presence is needed more often to calm traffic.	If municipal police are unavailable to fill orders, if possible state police should be considered to have	0034-0309	DESPP and Construction	Ongoing



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
		presence in the work zone.			
<i>17) Limitations of Operation (Work Hours)</i>	Not applicable				
<i>18) Maintenance and Protection</i>	Not applicable				
<i>19) Best Practices and Lessons Learned (Opportunities for policy improvements)</i>	There was a speed trailer within the work zone. It displayed a sign with the reduced speed limit of 45 mph.	It is a good practice to use devices that can calm speeds within work zones.	0094-0252	Construction	NFAR
	The project held a tailgate Safety Meeting held prior to proceeding onto road. MTV weight limitations was discussed and closing Hubble Street.	Having tailgate talks is a good practice to ensure work crew is familiar with work conditions.	0171-0442 A	Maintenance and Construction	NFAR
<i>20) Training Needs</i>	Annual winter training are usually provided to the working level engineers.		All projects	Construction	Ongoing



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
21) <i>Speeding In Work Zones</i>	Speed Enforcement were not conducted with radars.	State police can help with speed enforcement if specifically ordered to do so.		DESPP and Construction	Ongoing
22) <i>Smart Work Zone System (ITS Technology)</i>	Not applicable				
23) <i>Design Issues (Completeness of Plans & Specs)</i>	There was no item for a Changeable Message Sign included in the contract.	Although the project is on a local road, informing motorists through advance warning devices of impending work can help reduce impacts and congestion.	0034-0309	Design, Construction	NFAR
	There were no holiday restrictions included in the contract but the project usually gets word to shut down for the holidays.	There are some major holidays all Contractors recognize and do not commence with work. Those holidays should be included in every contract so no work is cancelled last minute and money wasted.	0034-0309	Traffic Engineering	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	The Liquidated Damages are deemed too low to be effective when trying to get the Contractor off the road.	Increasing the dollar amount of the Liquidated Damages can be more incentive for the Contractor to clear the road when needed.	0174-0403	Construction	NFAR
	Some bridges in the project were stage construction, some were non-stage construction.	When packaging bridge projects, have bridges of similar style be treated the same for repairs.	0174-0403	Design	Ongoing
	Excavation behind the roadway TPCBCs had about 3+/- feet drop and less than 1 foot shelf behind the barriers. The available shelf is within the TPCBCs deflection zone.	The TPCBCs should be pinned to the pavement to protect the excavation area. [Post Review: The barrier was shifted to allow 1 foot behind it.]	0084-0099/0100	Design and Construction	Ongoing
	The traffic plans had the stop bar at the edge of a driveway, making it difficult for buses to turn into and out of the driveway	The project moved the stop bar back to allow better access to the driveway.	0163-0203	Construction	NFAR



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	with cars stopped just beyond.				
24) Contractors Compliance (Plans & Specs Enforcement)	Temporary Precast Concrete Barrier Curbs across from the NISSAN car dealership needed delineators.	Delineators should be attached to the top of the barrier as shown on the plans.	0017-0182	Construction	NFAR
	There was a Shoulder Closed Ahead sign within the closed shoulder, not in advance of it.	Advance warning signs should be installed before the changed condition to allow motorists time to respond appropriately.	0158-0211	Construction	NFAR
	The barricade warning lights were missing on some of the post-mounted, diamond-shaped signs.	Traffic plans call for all post-mounted, diamond-shaped signs to have barricade warning lights on them.	0171-0431	Construction	NFAR
	Material was stored adjacent to the roadway with no protection.	Objects need to be stored outside the clear zone for the road or be positively protected.	0017-0182	Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	It was observed that a liability sign was mounted on the I-95 SB off ramp but not on the I-95 NB off ramp.	All traffic signs need to be installed as noted on the plans and additional signs can be added if needed. Any changes need to be approved by Traffic Engineering.	0058-0332	Construction	NFAR
	A Type A impact attenuation system used traffic drums for delineation.	The nose of the attenuation system should also have an attenuation delineator.	0084-0099/0100	Construction	NFAR
	Many reflectors on the TPCBCs had silver on the right side of the roadway but on the back of delineators there was yellow.	Delineators on the right side of the roadway should only have the silver facing the traffic and nothing on the rear.	0084-0099/0100	Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	The passing zones for both projects still exist.	The passing zone at the north end of Project 84-100 should have been eliminated during construction (as shown on sheet 02.04.03). Also, it is recommended that the existing passing zone through the 84-99 site be removed entirely during the bridge construction and reinstalled as shown on the final SPM plan	0084-0099/0100	Traffic and Construction	NFAR
	There was no advance warning signs placed on the northbound side at the time of the Rolling Road Block unless they were installed by another crew behind Rolling Road Block.	Traffic signs and devices should be installed according to plan.	0158-0211	Construction	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	42-inch traffic cones were used for the exit ramp taper instead of traffic drums at 40 feet spacing.	The proper devices should be used as noted on the plans.	0158-0211	Maintenance	NFAR
	The traffic cones were installed in open travel lane or on lane lines	Should provide the full width of the open travel lane for traffic.	0158-0211	Maintenance	NFAR
	The END ROAD WORK signs are installed before the work area ends.	The END ROAD WORK signs should be moved to ends of the work areas on both sides of the bridge.	0163-0203	Maintenance	NFAR
	There were no liability signs posted but the Contractor says he will post them once given the locations for installation.	Liability signs need to be posted before any patterns or work takes place to inform motorists of upcoming construction work and who is liable for an incident.	0170-3488 A	Maintenance	NFAR



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CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	There was no END ROAD WORK sign posted at the end of the pattern.	End Road Work signs lets the motorist know when they have gone through a work zone and that they can return to their normal Roadway speed. Traffic signs and devices should be installed according to plan.	0170-3488 A	Maintenance	NFAR
	Only one arrow was placed to guide motorists to appropriate lane.	More arrows should be placed for the shifted lanes, especially for intersections and motorists exiting business driveways onto Route 20.	0170-3488 D	Maintenance and Construction	NFAR
	The video detection cameras had not yet been installed at the five signalized intersections within the project, but District 4 Construction staff was not aware of the lack	Adhere to the specifications for video detection.	0170-3488 D	Maintenance and Construction	NFAR



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2018					
<i>NFAR = No Further Action Required Ongoing = Pending unit resolution</i>					
CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	of detection causing any issues.				
	When the Route 20 EB right lane closure traffic pattern was being installed, the traffic cones were being placed approximately two feet to the left of the broken lane line. This caused vehicles in the travel lane too shy to the left, sometimes crossing over the double yellow center line into the Route 20 WB left travel lane.	Adhere to the traffic plans when setting up lane closures.	0170-3488 D	Construction and Maintenance	NFAR



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2018					
<i>NFAR = No Further Action Required Ongoing = Pending unit resolution</i>					
CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	It was observed that the liability signs on I-84 Eastbound and Westbound in Willington were placed too closed to the work zone.	According to the Traffic Plan Typical, these signs should be placed far enough in advance of the work zone to allow motorists to exit if they do not want to drive through the work zone.	0171-0431	Construction	NFAR
	No END ROAD WORK sign was placed at the end of the pattern.	END ROAD WORK signs are necessary to inform motorists when have proceeded through the work zone and can use the full roadway to drive at the full speed limit.	0171-0442 A	Maintenance	NFAR
	The project had a shoulder closure with brief stoppages for tree clearing but the sign said "One Lane Road".	Ensure the proper signing pattern is in place for the operation being performed. Signs stating "Shoulder Closure" or "Be Prepared to Stop" or one with a flagger depiction would have been more appropriate.	0084-0099/0100	Construction	NFAR



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2018					
<i>NFAR = No Further Action Required Ongoing = Pending unit resolution</i>					
CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	There was equipment parked within the clear zone.	Equipment and materials need to be at least 26 feet off the edge of the roadway or positively protected.	0158-0211	Construction	NFAR
	A paver was parked within the clear zone of Route 17.	Since the highway speed was 50 mph, equipment and material have to be at least 24 feet off the road or positively protected.	0171-0442 A	Maintenance	NFAR
	A construction sign is placed within the deflection zone of the guiderail.	Guiderail can be used to protect materials and equipment as long as it's stored outside the deflection zone.	0171-0442 A	Maintenance	NFAR
	Equipment was parked at the edge of the roadway	Blunt objects need to be outside of the clear zone (at least 16 feet from edge of the roadway) or positively protected.	0173-0495 E	Maintenance	NFAR



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2018					
<i>NFAR = No Further Action Required Ongoing = Pending unit resolution</i>					
CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	The Crew Leader said that catch basin tops are laid by the edge of road where they will be installed that day but are otherwise stored in the storage pit off the road. The General Supervisor said that the crews typically install three to seven tops a day. When doing a drive through, three catch basin tops were placed near the edge of the roadway.	The tops would normally be a hazard being stored next to the edge of the roadway. The sequence of the work dictates being placed near where they will permanently be installed each day.	0174-0423 A	Maintenance	NFAR
25) <i>Traffic Signals</i>	Not applicable				
26) <i>PI / PO with Stakeholders</i>	The project has Twitter and Facebook accounts and the Consultant has a website to post project updates and also, flyers given to local residents and the	PI/PO on this project appears to be following very good practices to keep businesses, pedestrians, and the Town Officials informed on project impacts and mitigation efforts.	0063-0633	Construction	NFAR



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2018					
<i>NFAR = No Further Action Required Ongoing = Pending unit resolution</i>					
CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	nearby church with project updates.				
27) <i>Pavement Markings</i>	The existing pavement markings can still be seen on the roadway and can be confusing.	Eradicate all conflicting pavement markings.	0063-0699/0700/0701	Construction	NFAR
28) <i>Selective Clearing</i>	Clearing is needed around signs next to trees	Selective clearing should be done to ensure signs are clearly visible.	0171-0431	Construction	NFAR
	Tree cutting operation dropped a tree on the roadway and it took about 10 to 12 minutes to open the road to a one-way alternating pattern after clearing the debris.	There needs to be a procedure in place for debris falling in roadway.	0084-0099/0100	Construction and Traffic Engineering	Ongoing



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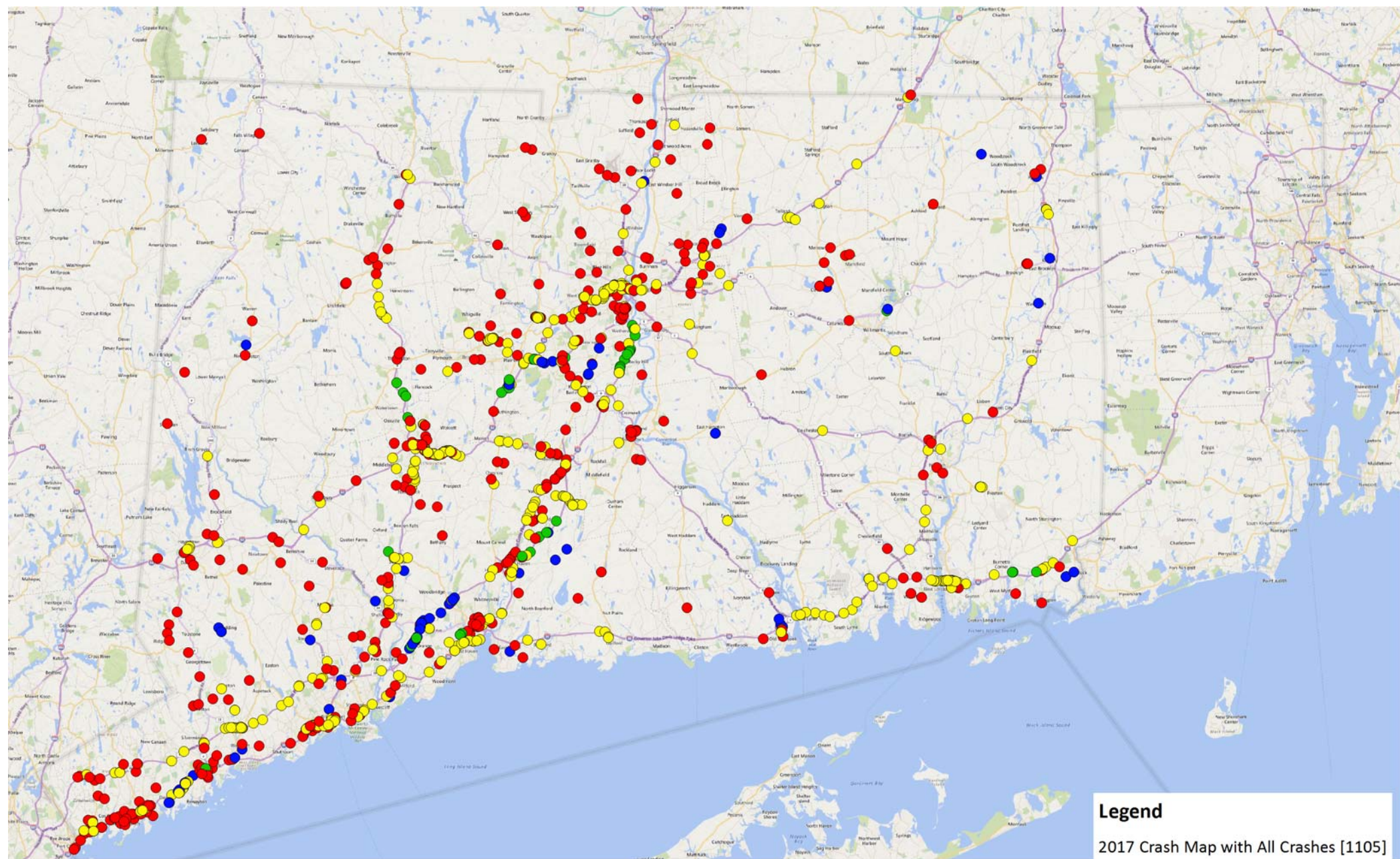
2018					
<i>NFAR = No Further Action Required Ongoing = Pending unit resolution</i>					
CATEGORIES	FINDINGS	RECOMMENDATIONS	RELATED PROJECTS	OFFICE ASSIGNED	STATUS
	The liability sign on Route 7 Northbound was mounted too low and was obstructed by some of the brush.	The liability sign needs to be raised high enough for motorists to easily read while driving by and selective clearing should be done to prevent messaging from being obstructed.	0170-3488 C	Maintenance	NFAR



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APPENDIX 3: WORK ZONE SAFETY PERFORMANCE METRICS

2017 Crash Map



Legend

2017 Crash Map with All Crashes [1105]

- Has Construction Project Associated [545]
- Has VIP Project Associated [81]
- Has No Project Associated [428]
- Has BOTH Type of Projects Associated [51]

2017 Crashes related to Work Zones (January 1st, 2017 to December 31st, 2017)

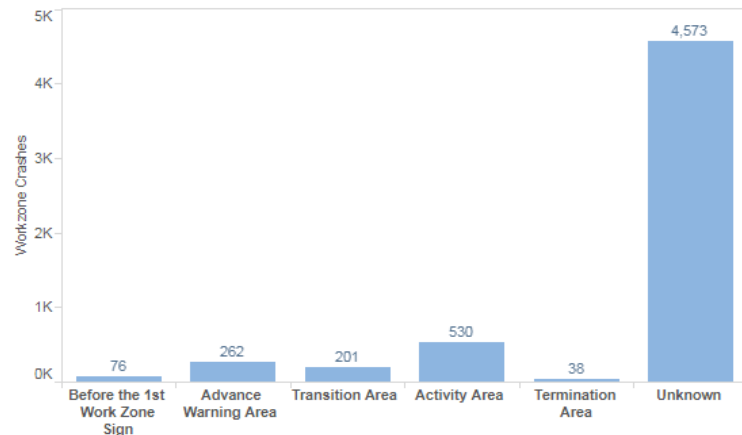
Location Relative of Workzone

Location Relative To Work Zone	Crashes	% of All Crashes
Not a Work Zone	109,912	95.05%
Null	47	0.04%
Unknown	4,573	3.95%
Activity Area	530	0.46%
Advance Warning Area	262	0.23%
Transition Area	201	0.17%
Before the 1st Work Zone Sign	76	0.07%
Termination Area	38	0.03%
Grand Total	115,639	100.00%

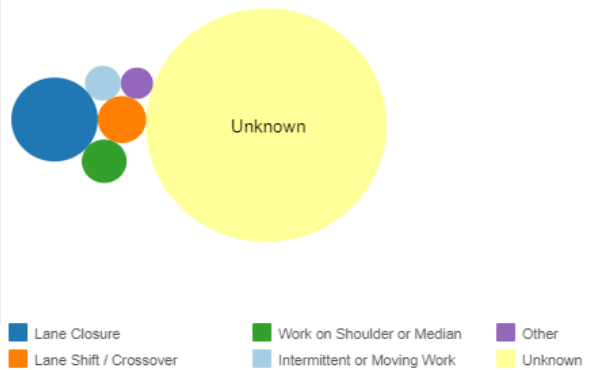
Type of Workzone

Type Of Work Zone	Crashes	% of All Crashes
Not a Work Zone	109,907	95.04%
Null	47	0.04%
Unknown	4,569	3.95%
Lane Closure	591	0.51%
Work on Shoulder or Median	158	0.14%
Lane Shift / Crossover	184	0.16%
Intermittent or Moving Work	101	0.09%
Other	82	0.07%
Grand Total	115,639	100.00%

Location Relative to Work Zone Excluding Null and Not a Work Zone Crashes



Work Zone Type Excluding Null and Not a Work Zone Crashes



Workzone Related	Crashes	% of All Crashes	Worker Presence	Crashes	% of All Crashes	Law Enforcement Presence	Crashes	% of All Crashes
No	114,440	98.96%	Not a Work Zone	109,691	94.86%	Not a Work Zone	109,724	94.88%
Yes	1,137	0.98%	Null	47	0.04%	Null	47	0.04%
Unknown	62	0.05%	Unknown	4,594	3.97%	Unknown	4,567	3.97%
			No	567	0.49%	No	829	0.72%
			Yes	740	0.64%	Yes	452	0.39%
Grand Total	115,639	100.00%	Grand Total	115,639	100.00%	Grand Total	115,639	100.00%

These data are exempt from discovery or admission under 23 U.S.C 409. Data was last updated on 4/1/2019

Total crashes Related to Work zones: 1,137 Crashes

Lane Closure: 591 Crashes

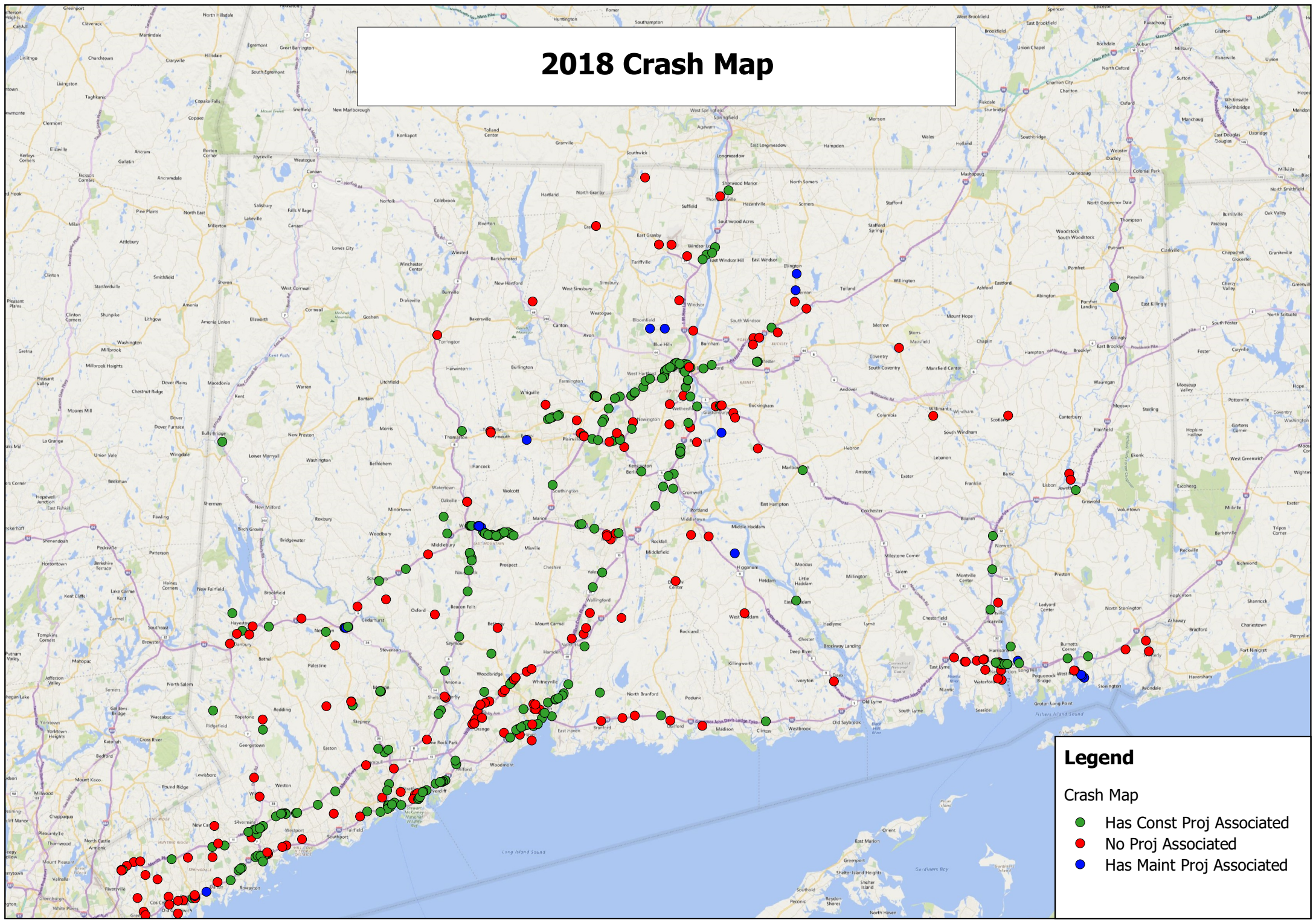
Work on shoulder or Median: 158 Crashes

Lane Shift / Crossover: 184 Crashes

Intermittent or Moving Work: 101 Crashes

Other: 82 Crashes

2018 Crash Map



Legend

Crash Map

- Has Const Proj Associated
- No Proj Associated
- Has Maint Proj Associated

2018 Crashes related to Work Zones (January 1st, 2018 to December 31st, 2018)

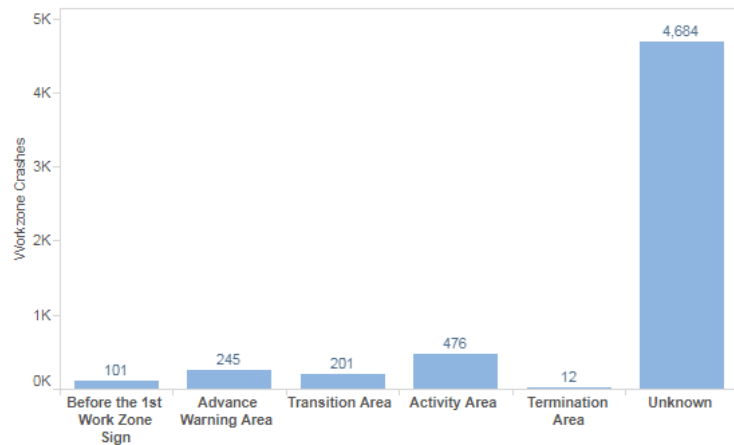
Location Relative of Workzone

Location Relative To Work Zone	Crashes	% of All Crashes
Not a Work Zone	102,822	94.73%
Unknown	4,684	4.32%
Activity Area	476	0.44%
Advance Warning Area	245	0.23%
Transition Area	201	0.19%
Before the 1st Work Zone Sign	101	0.09%
Termination Area	12	0.01%
Grand Total	108,541	100.00%

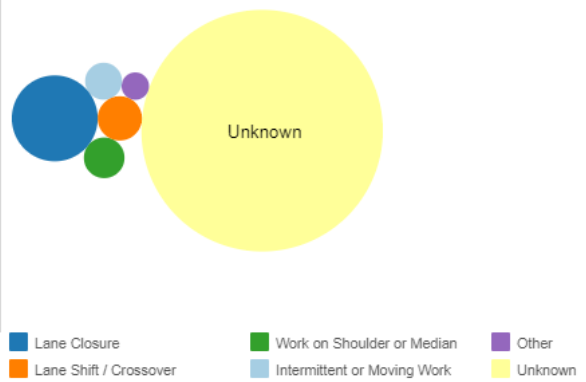
Type of Workzone

Type Of Work Zone	Crashes	% of All Crashes
Not a Work Zone	102,811	94.72%
Unknown	4,680	4.31%
Lane Closure	592	0.55%
Work on Shoulder or Median	132	0.12%
Lane Shift / Crossover	157	0.14%
Intermittent or Moving Work	109	0.10%
Other	60	0.06%
Grand Total	108,541	100.00%

Location Relative to Work Zone Excluding Null and Not a Work Zone Crashes



Work Zone Type Excluding Null and Not a Work Zone Crashes



Workzone Related	Crashes	% of All Crashes	Worker Presence	Crashes	% of All Crashes	Law Enforcement Presence	Crashes	% of All Crashes
No	107,425	98.97%	Not a Work Zone	102,583	94.51%	Not a Work Zone	102,605	94.53%
Yes	1,056	0.97%	Unknown	4,698	4.33%	Unknown	4,685	4.32%
Unknown	60	0.06%	No	579	0.53%	No	833	0.77%
Grand Total	108,541	100.00%	Yes	681	0.63%	Yes	418	0.39%
			Grand Total	108,541	100.00%	Grand Total	108,541	100.00%

These data are exempt from discovery or admission under 23 U.S.C 409. Data was last updated on 4/1/2019

Total crashes Related to Work zones: 1,056 Crashes

Lane Closure: 592 Crashes

Work on shoulder or Median: 132 Crashes

Lane Shift / Crossover: 157 Crashes

Intermittent or Moving Work: 109 Crashes

Other: 60 Crashes

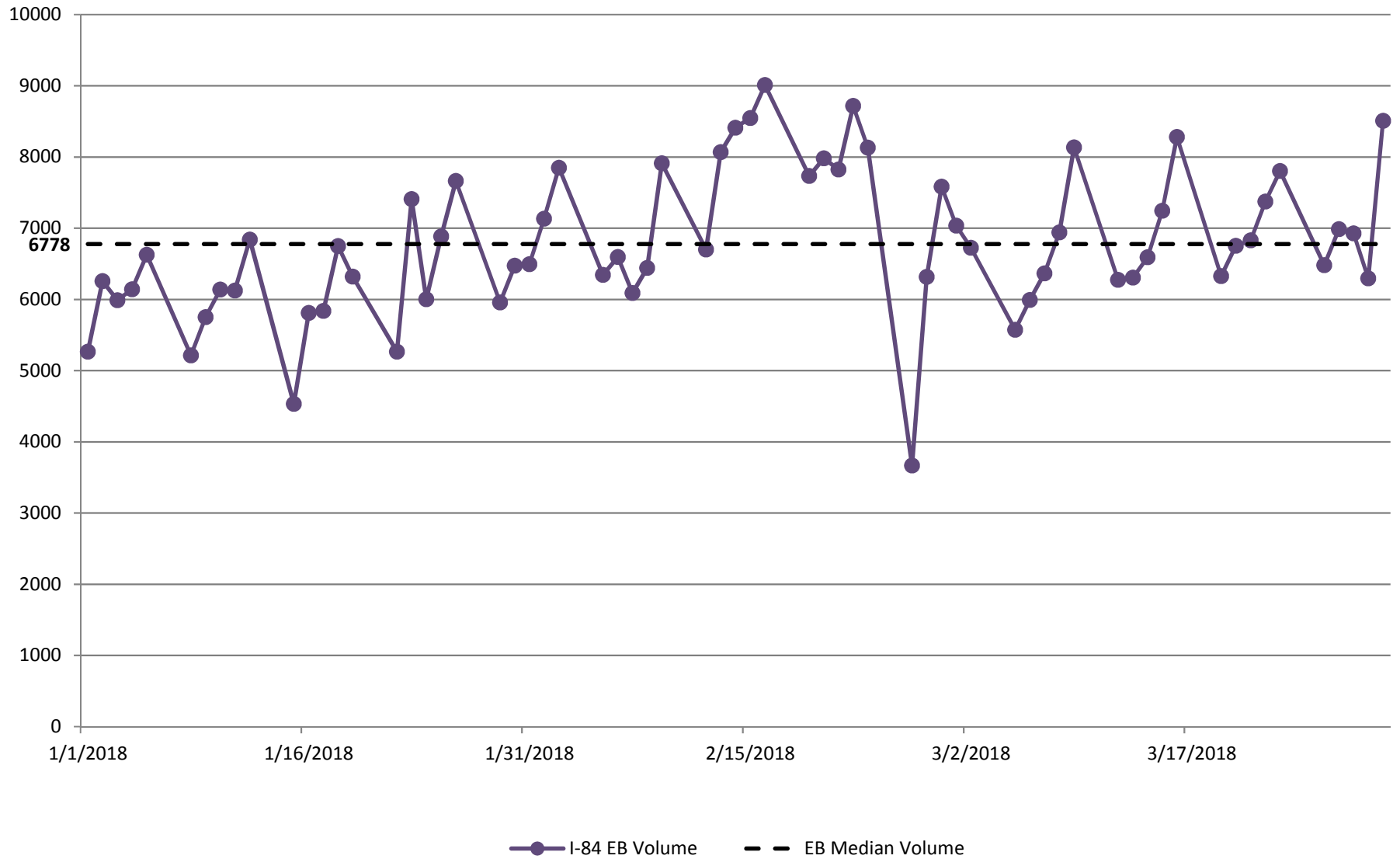


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APPENDIX 4: WORK ZONE OPERATIONAL PERFORMANCE METRICS

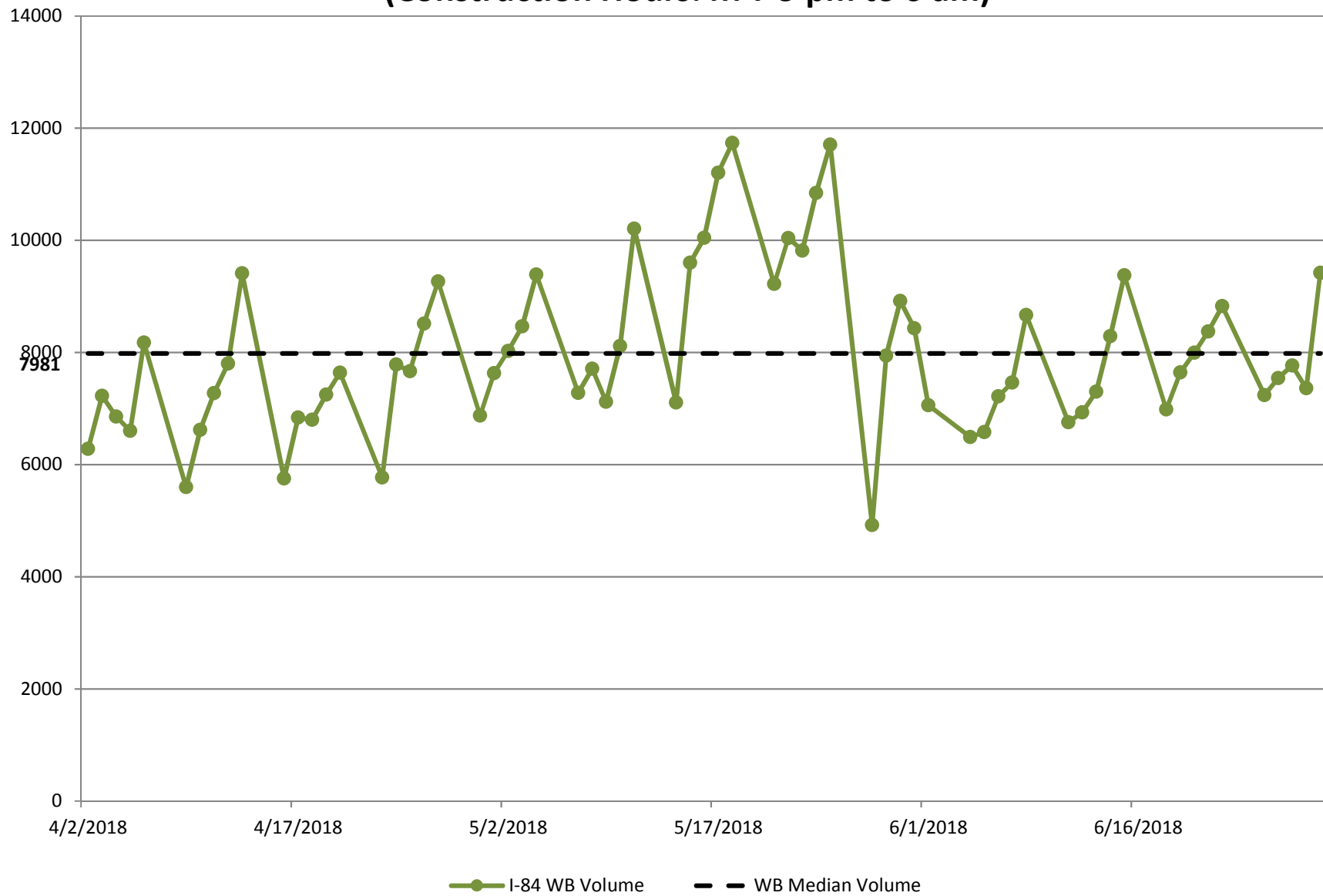
I-84 EB Average Daily Volume (veh/hr) - 2nd Quarter 2018

(Construction Hours: M-F 9 pm to 6 am)



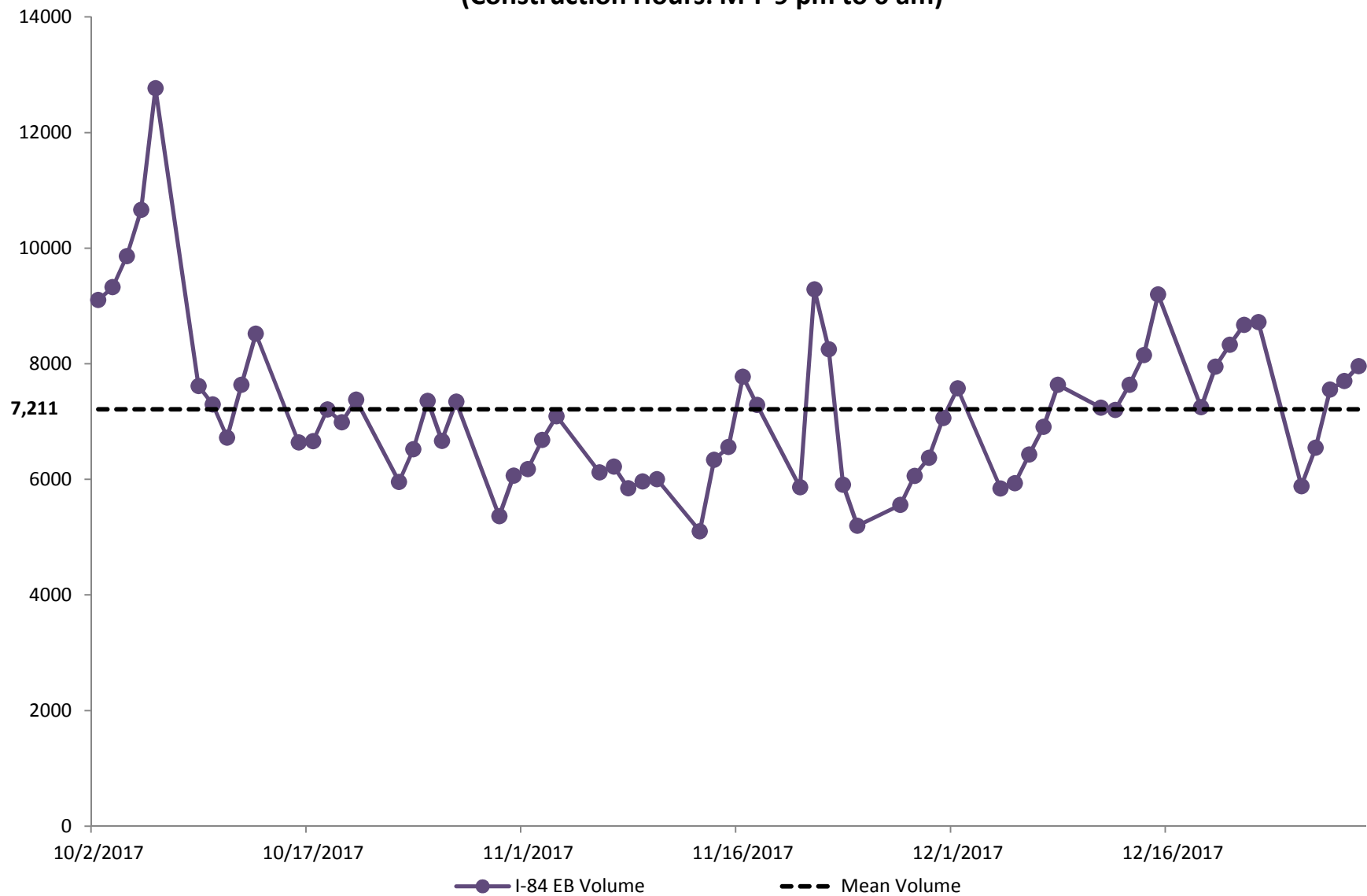
I-84 WB Average Daily Volume (veh/hr) - 2nd Quarter 2018

(Construction Hours: M-F 9 pm to 6 am)



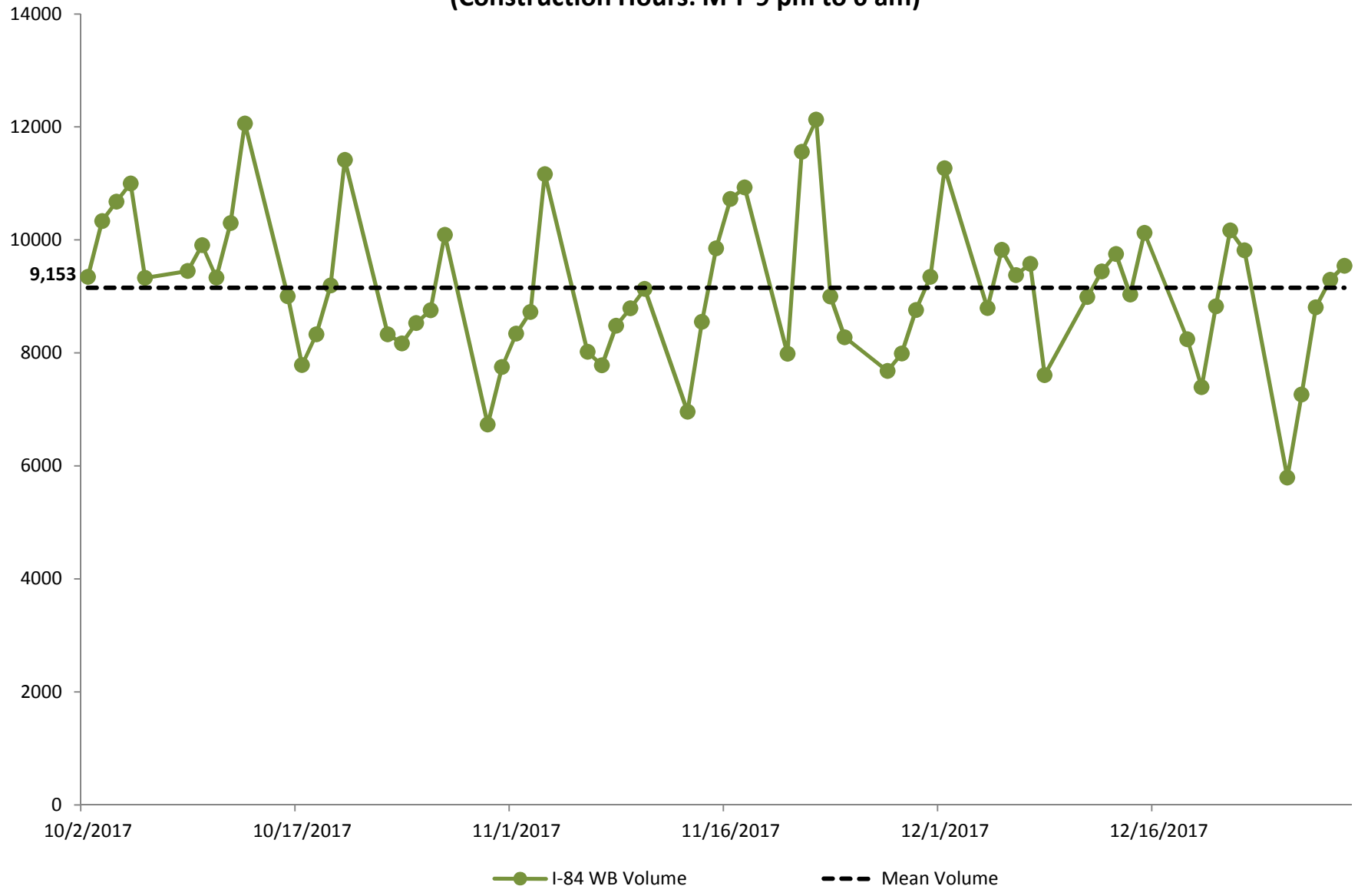
I-84 EB Average Daily Volume (veh/hr) - 4th Quarter 2017

(Construction Hours: M-F 9 pm to 6 am)



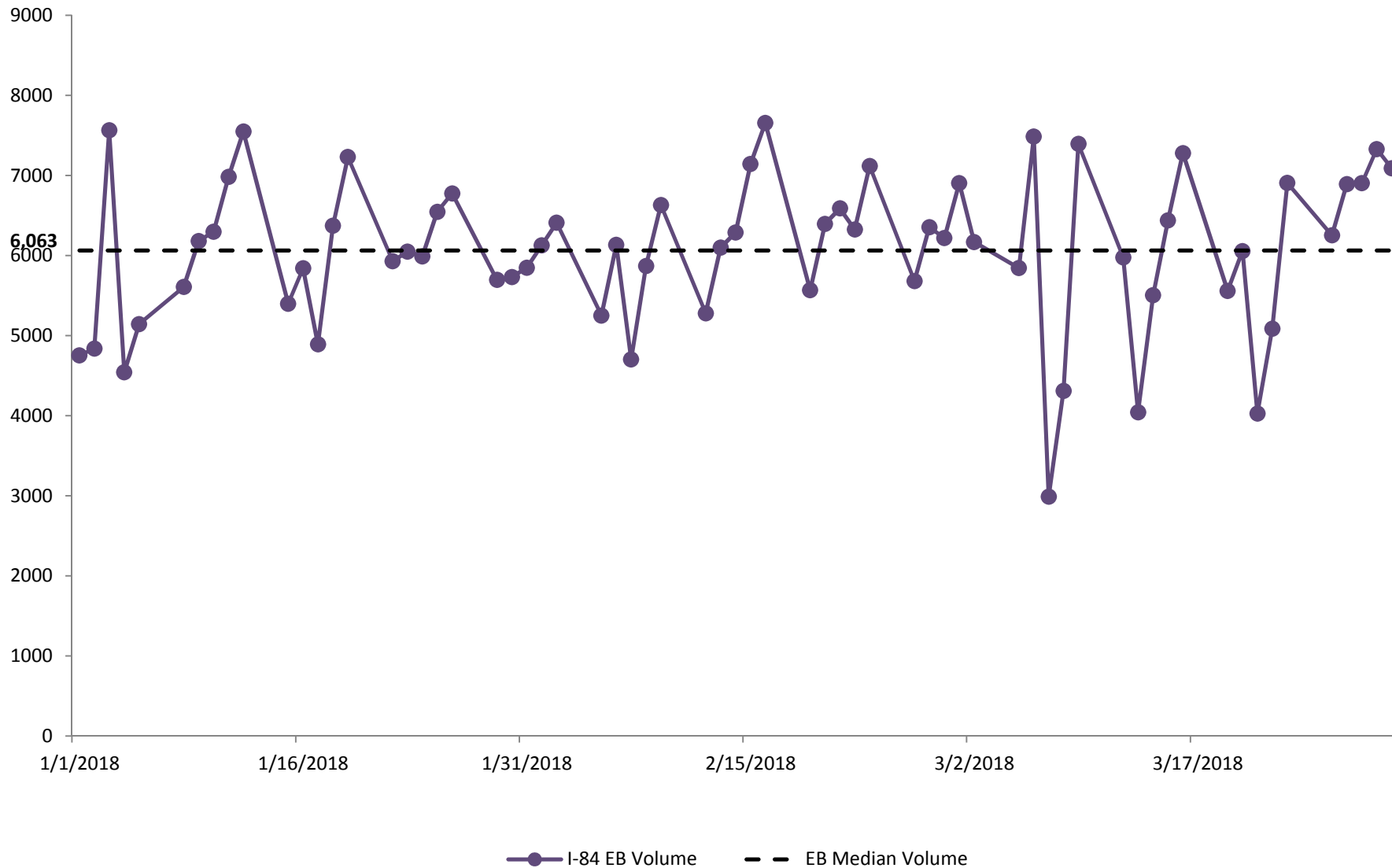
I-84 WB Average Daily Volume (veh/hr) - 4th Quarter 2017

(Construction Hours: M-F 9 pm to 6 am)

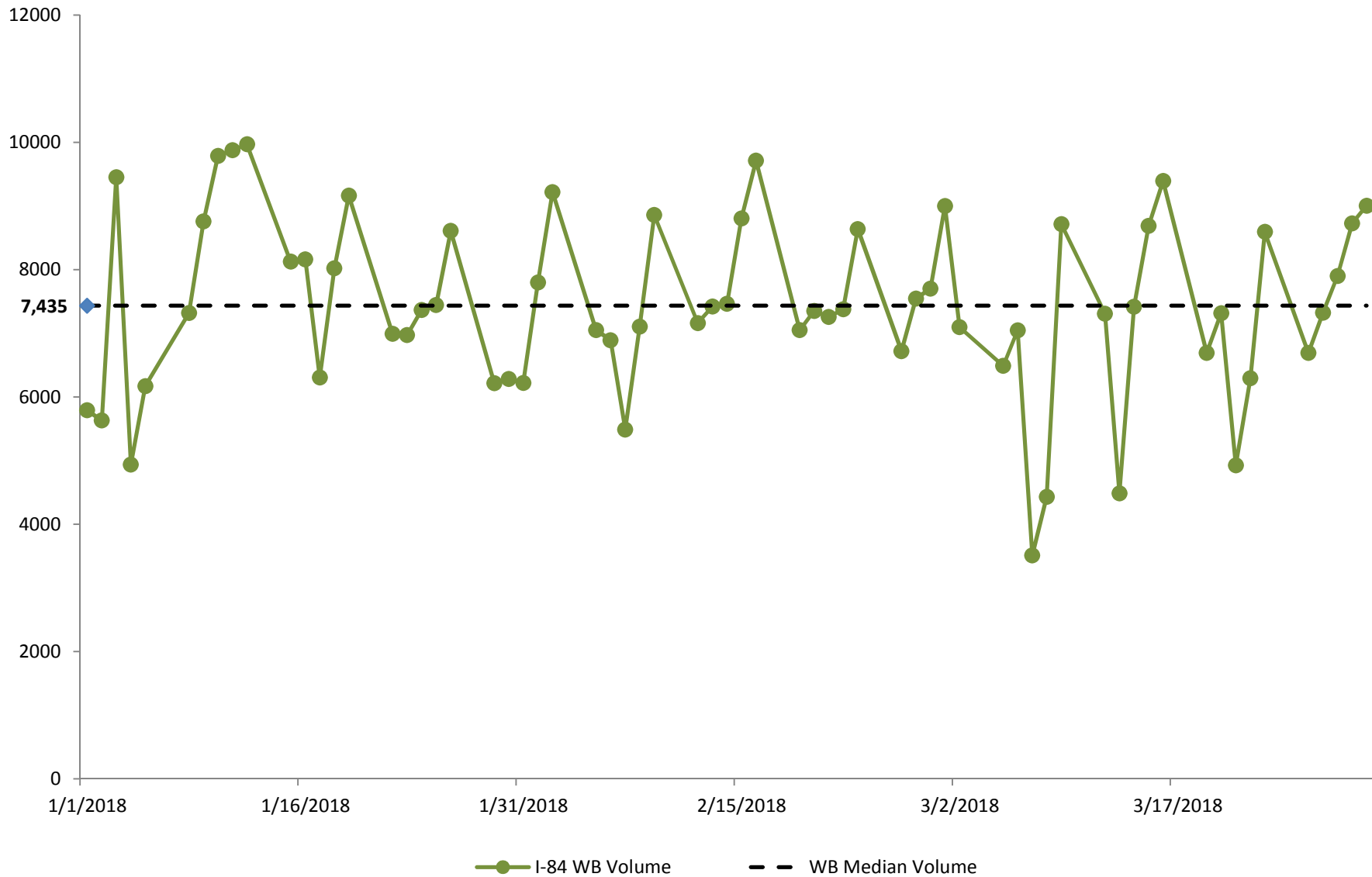


I-84 EB Average Daily Volume (veh/hr) - 1st Quarter 2018

(Construction Hours: M-F 9 pm to 6 am)

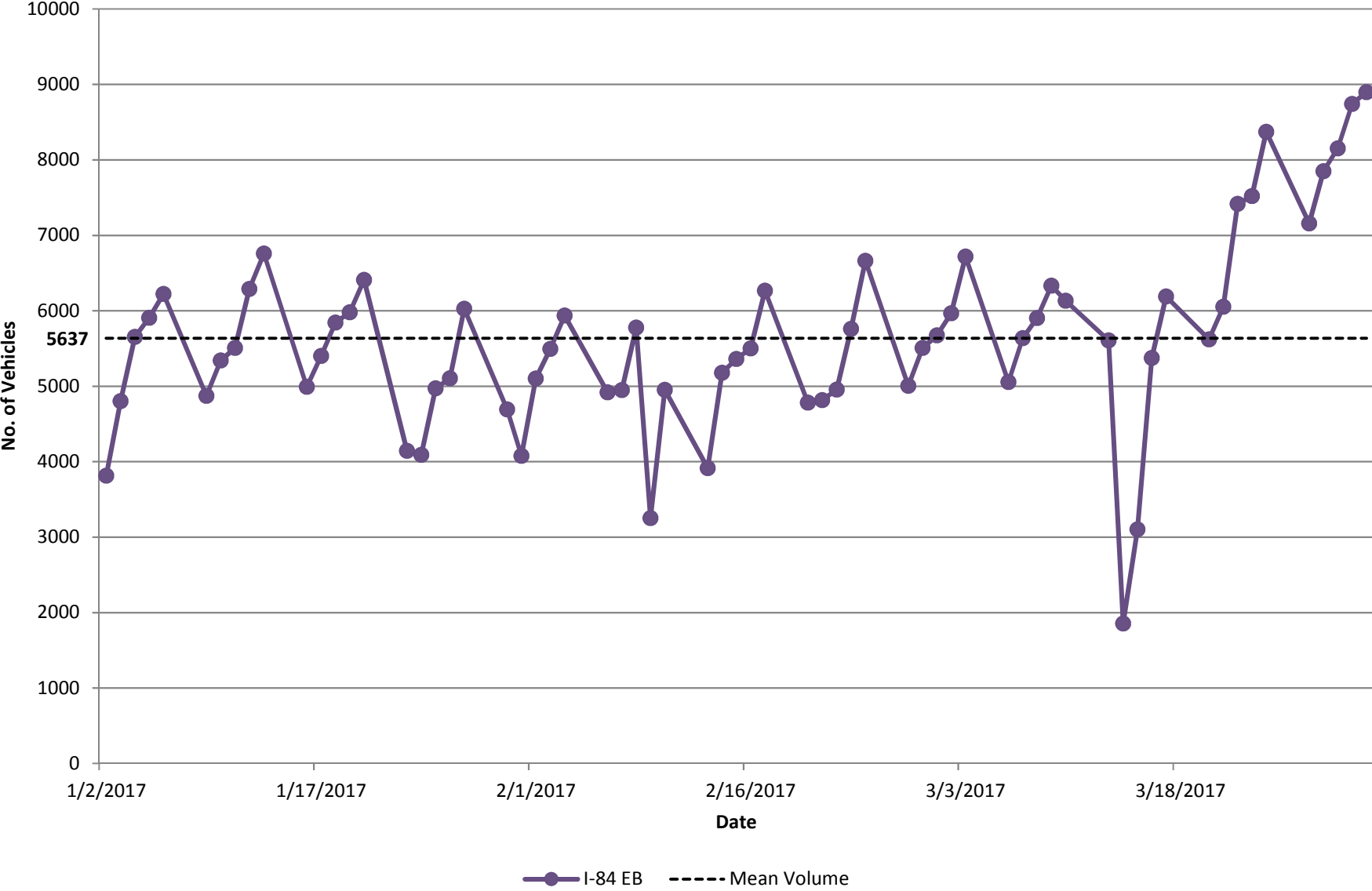


I-84 WB Average Daily Volume (veh/hr) - 1st Quarter 2018 (Construction Hours: M-F 9 pm to 6 am)



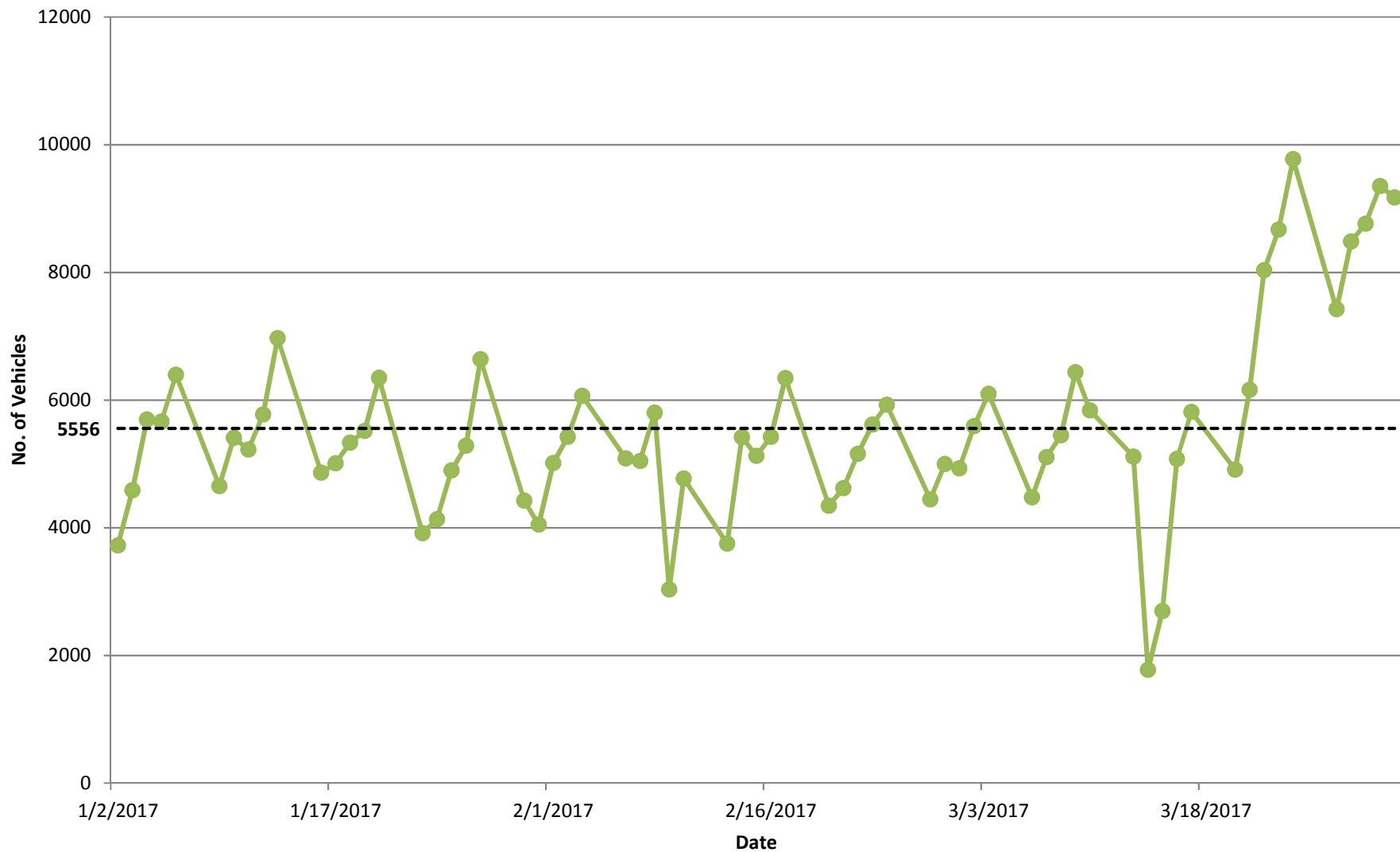
I-84 EB Average Daily Volume - 1st Quarter 2017

(Construction Hours: M-F 9pm to 6am)



I-84 WB Average Daily Volume - 1st Quarter 2017

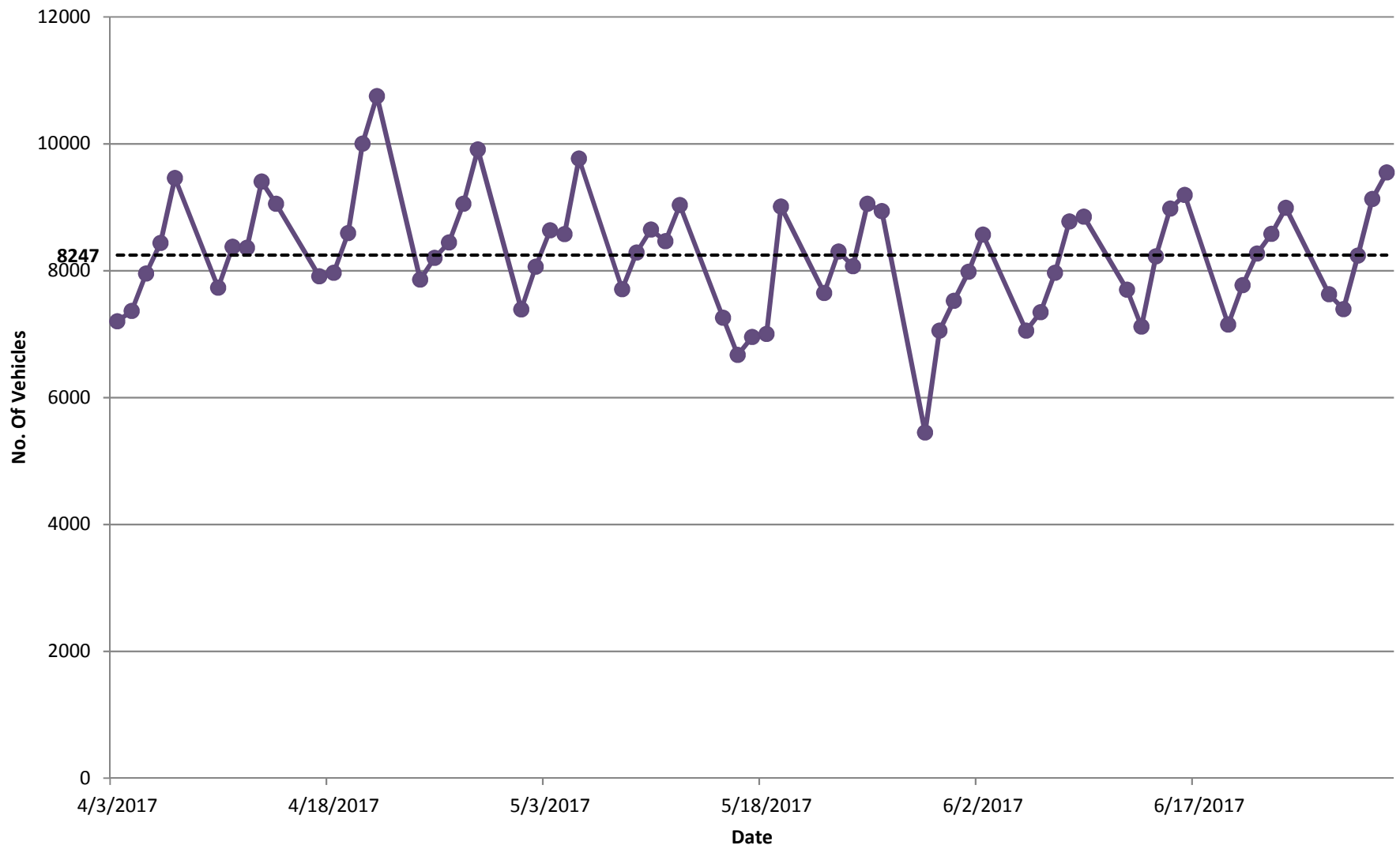
(Construction Hours: M-F 9pm to 6am)



I-84 WB Mean Volume

I-84 EB Average Daily Volume - 2nd Quarter 2017

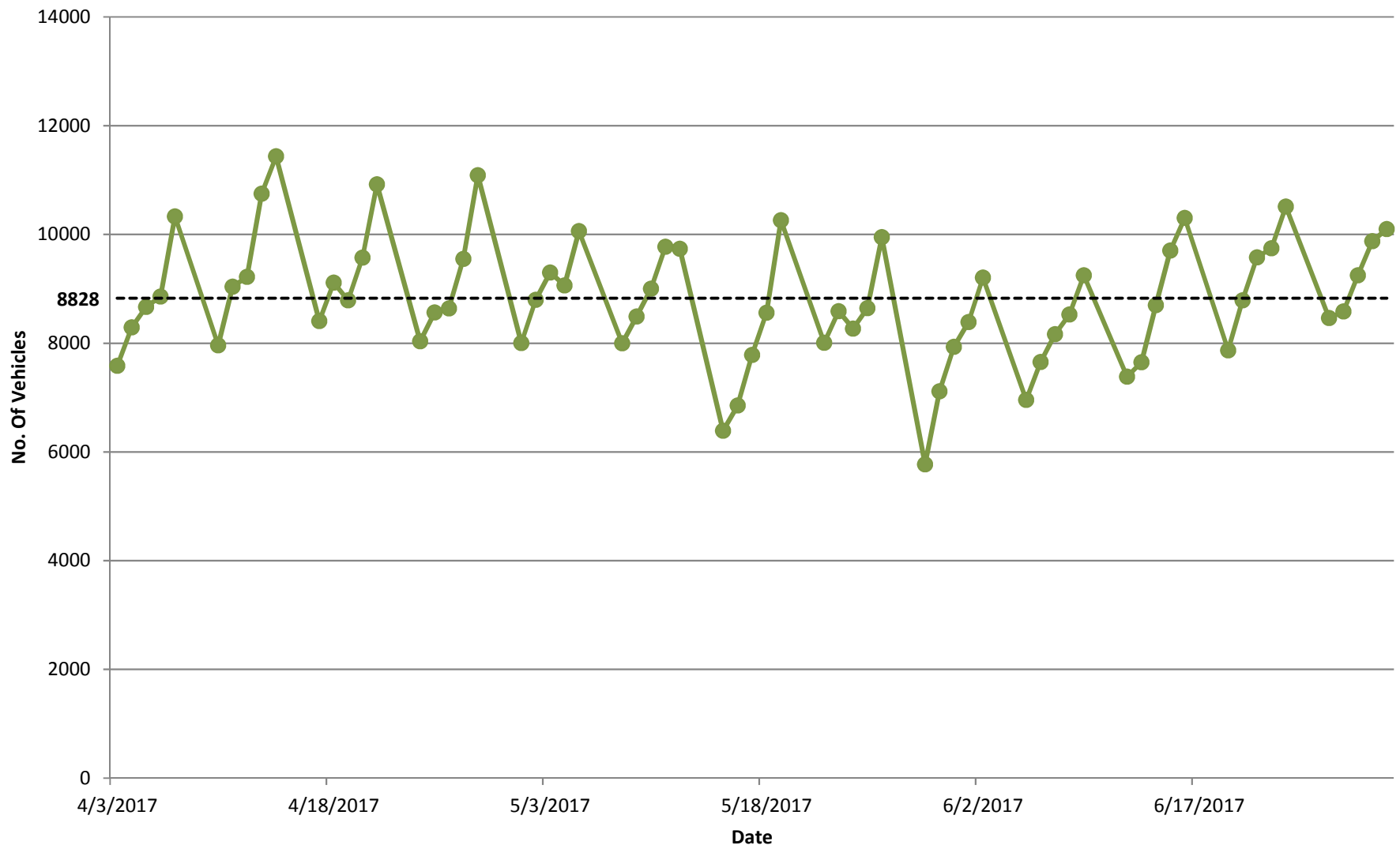
(Construction Hours: M-F 9pm to 6am)



—●— I-84 EB - - - - Mean Volume

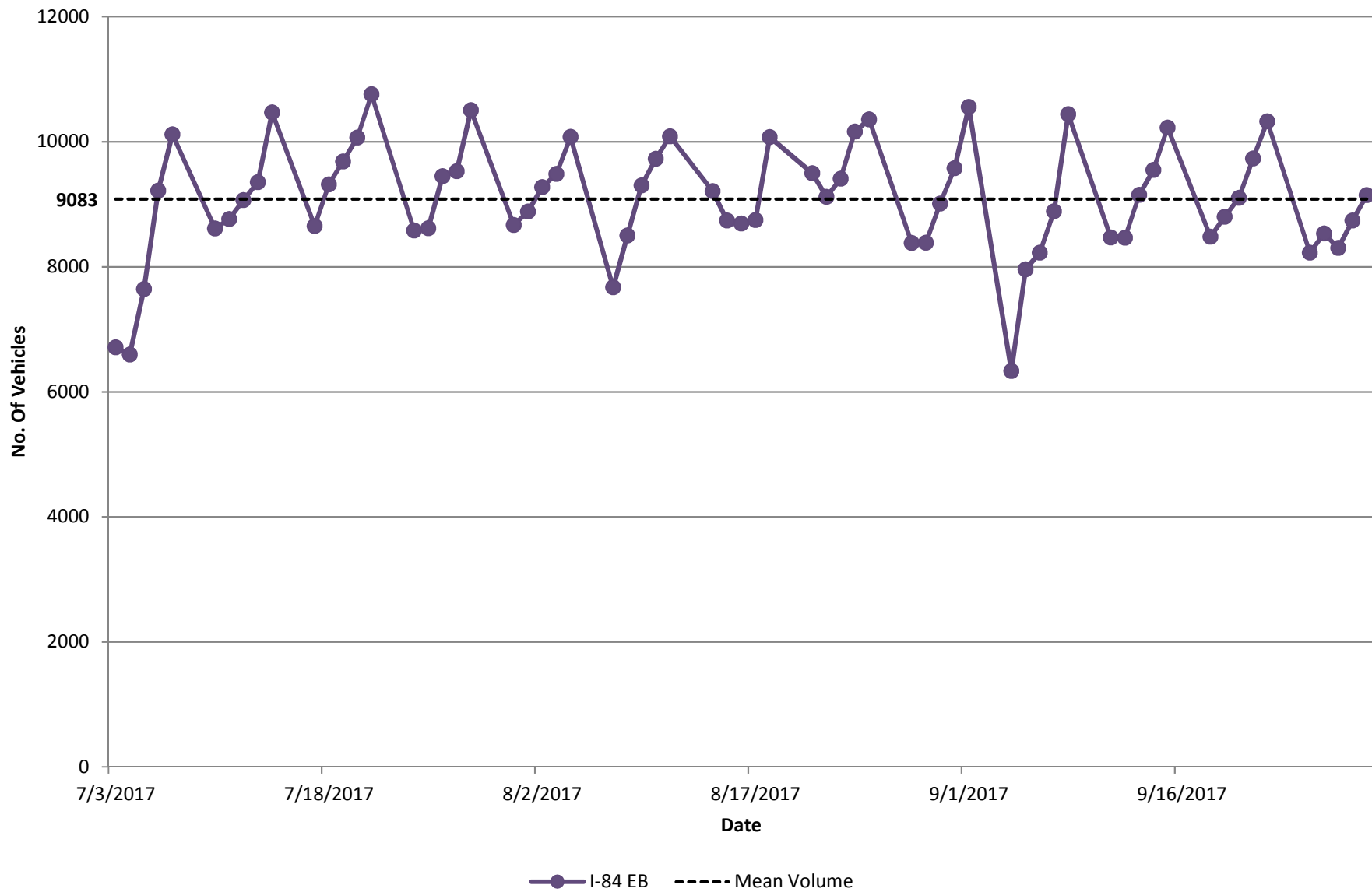
I-84 WB Average Daily Volume - 2nd Quarter 2017

(Construction Hours: M-F 9pm to 6am)

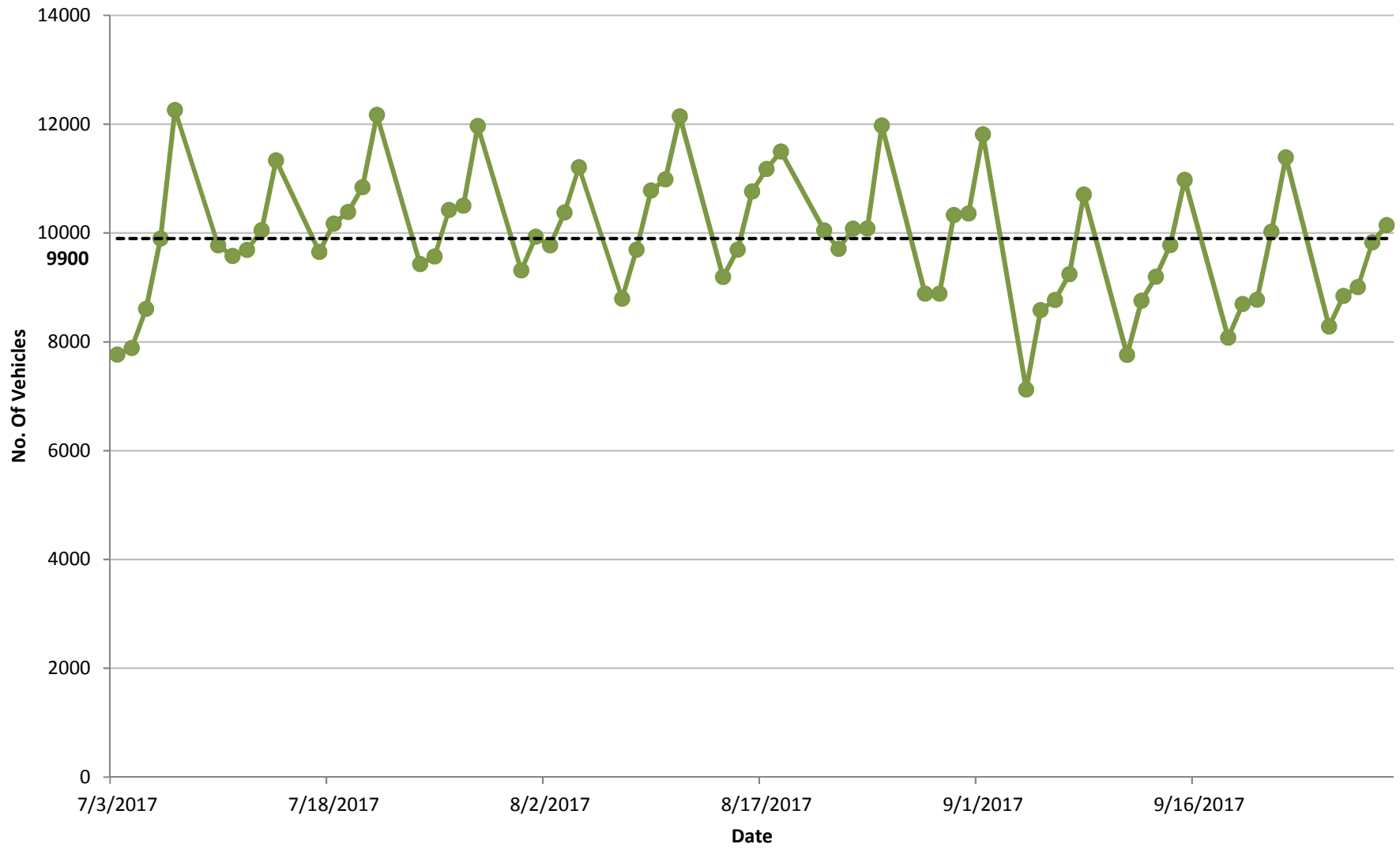


I-84 WB Mean Volume

I-84 EB Average Daily Volume - 3rd Quarter 2017 (Construction Hours: M-F 9pm to 6am)



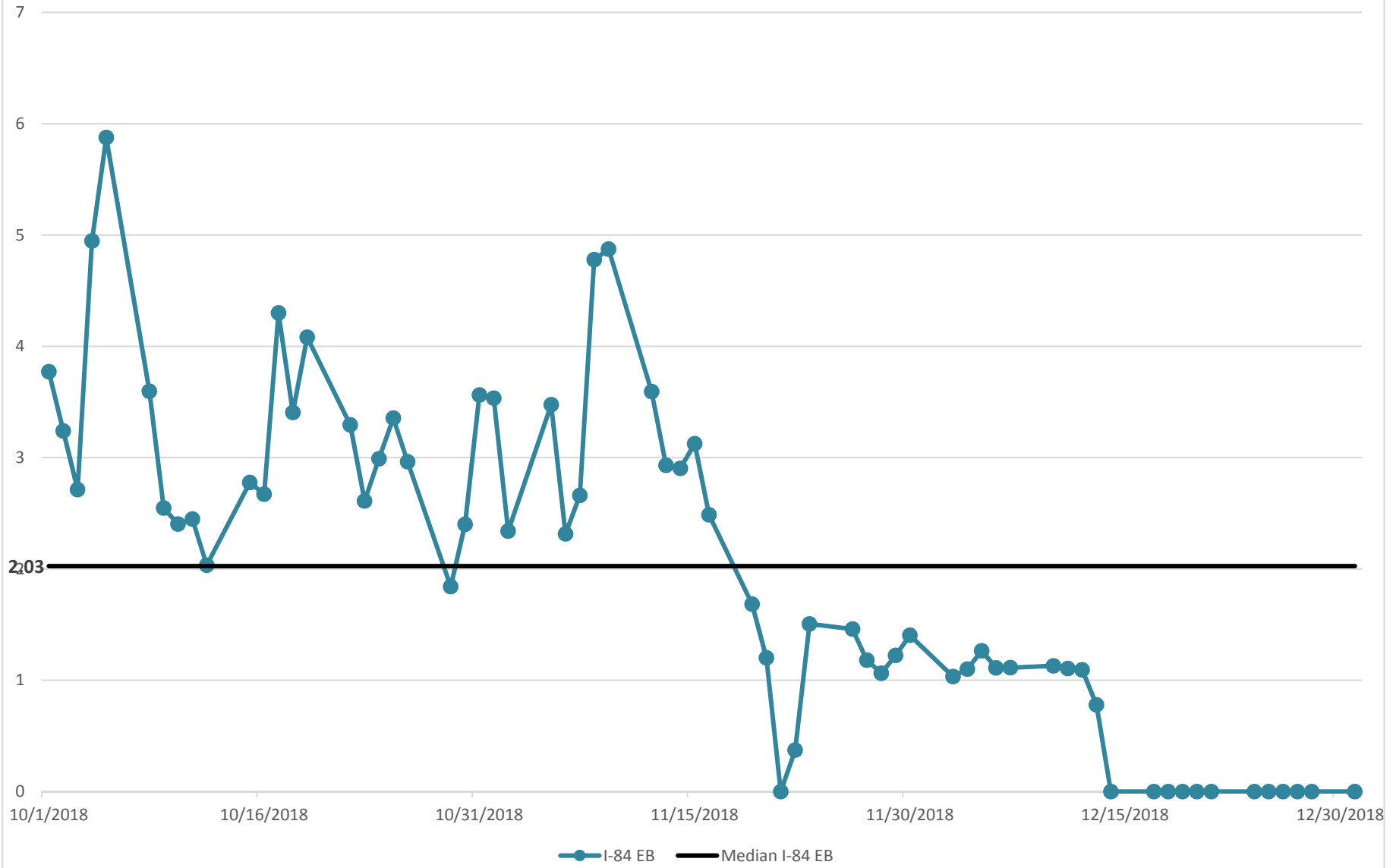
I-84 WB Average Daily Volume - 3rd Quarter 2017 (Construction Hours: M-F 9pm to 6am)



I-84 WB Mean Volume

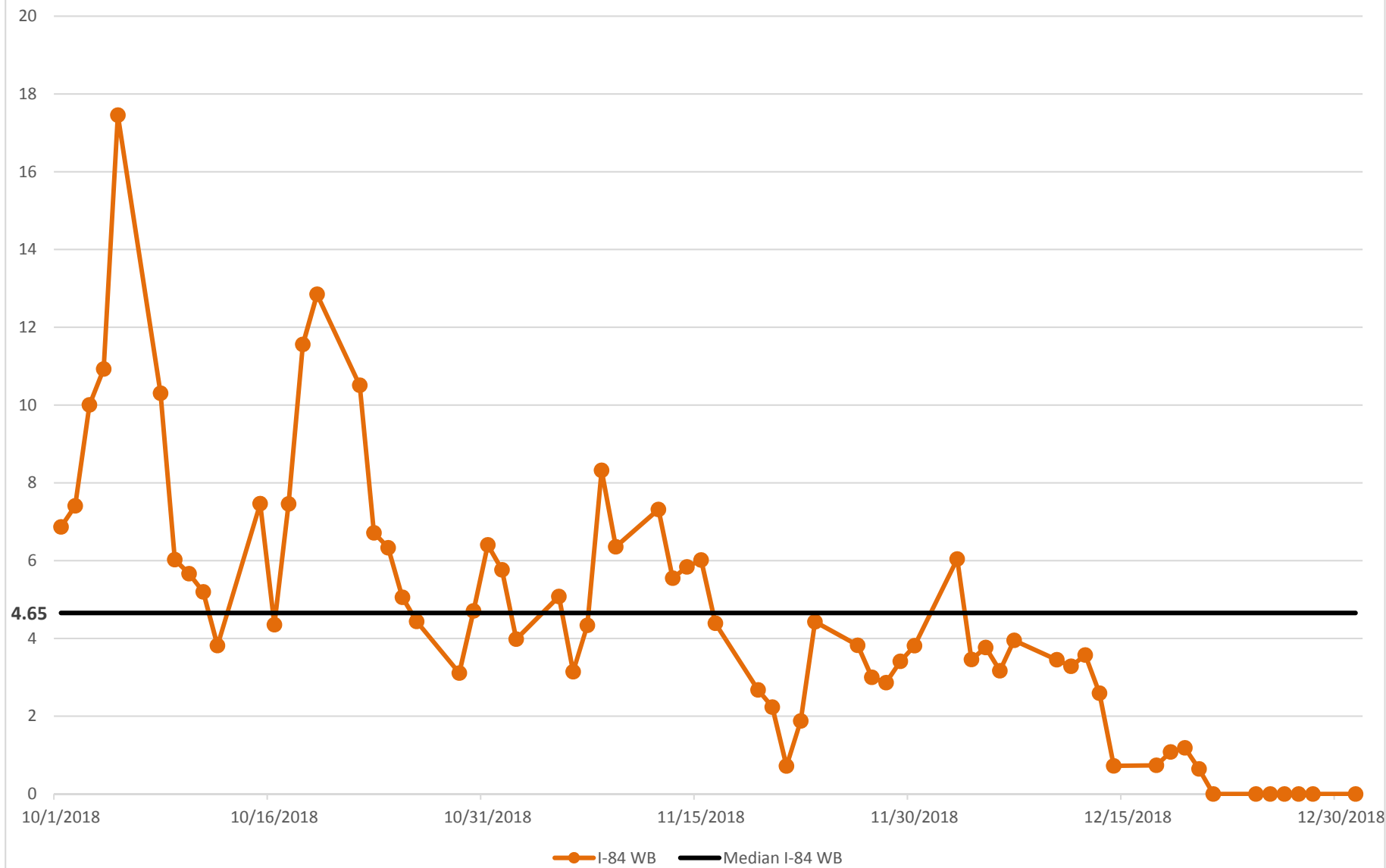
I-84 EB Average Daily Travel Time (min) - 4th Quarter 2018

(Construction Hours: M-F 9 pm to 6 am)



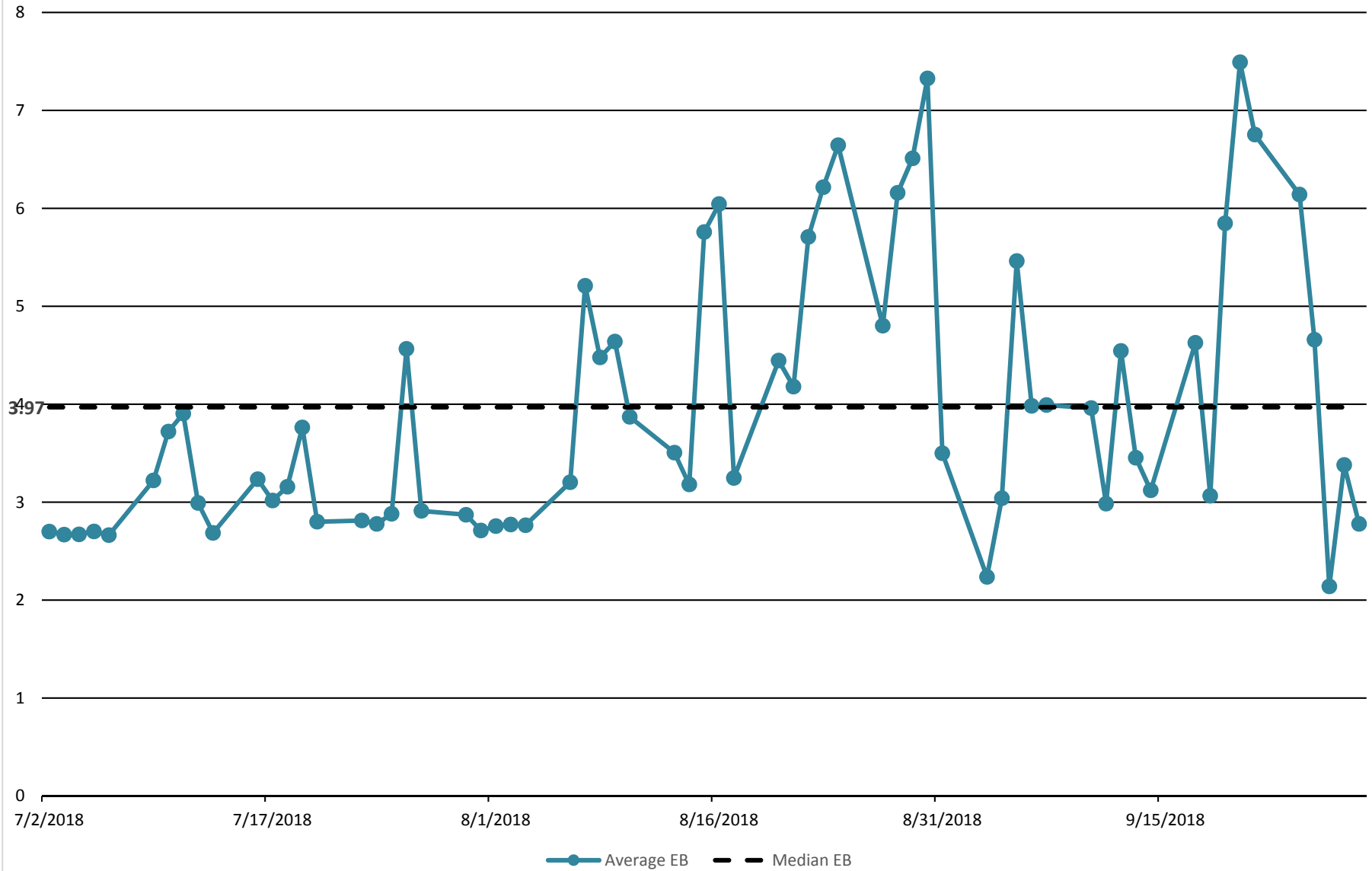
I-84 WB Average Daily Travel Time (min) - 4th Quarter 2018

Construction Hours: M-F 9 pm to 6 am



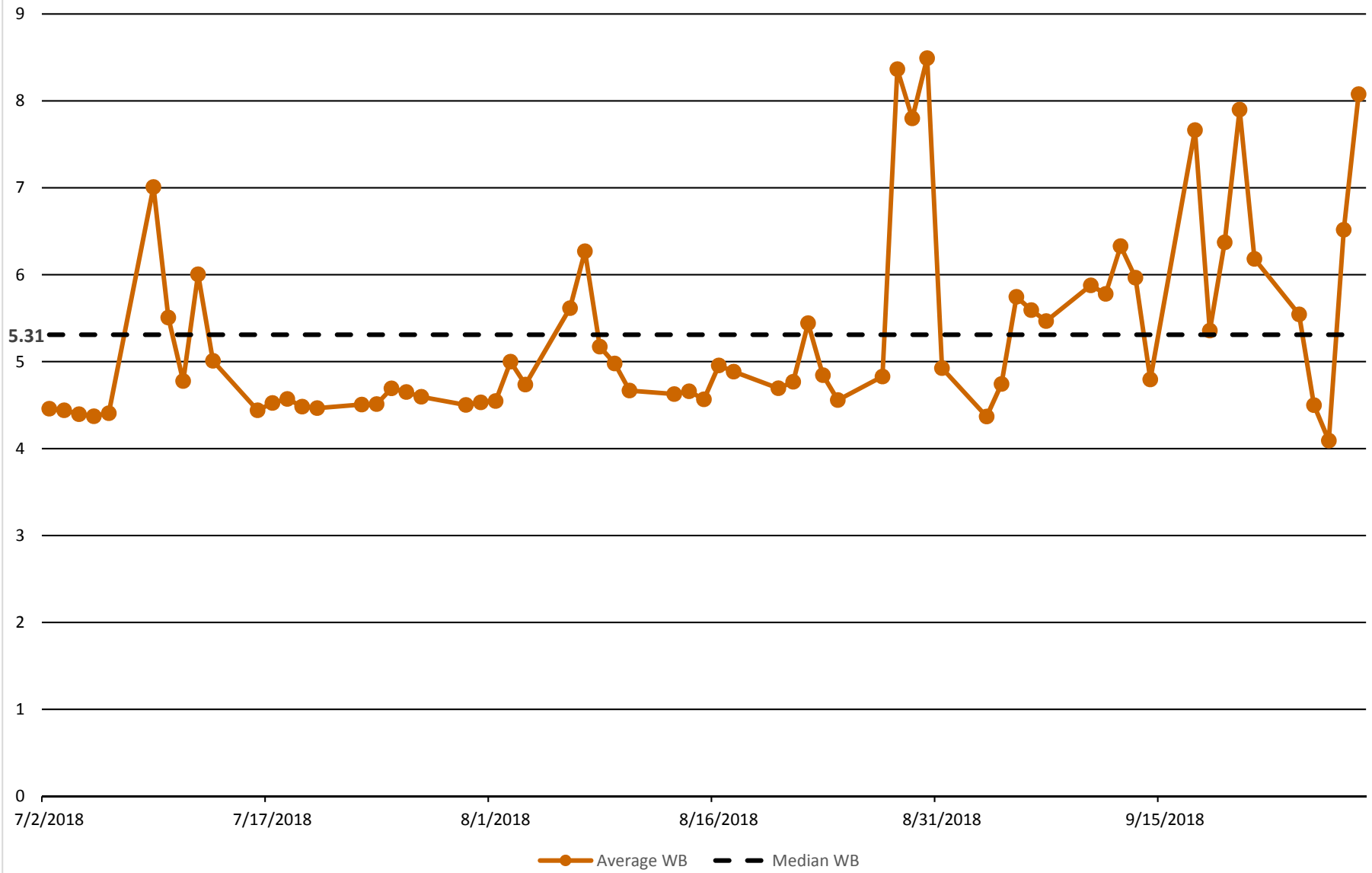
I-84 EB Average Daily Travel Time (min) - 3rd Quarter 2018

(Construction Hours: M-F 9 pm to 6 am)



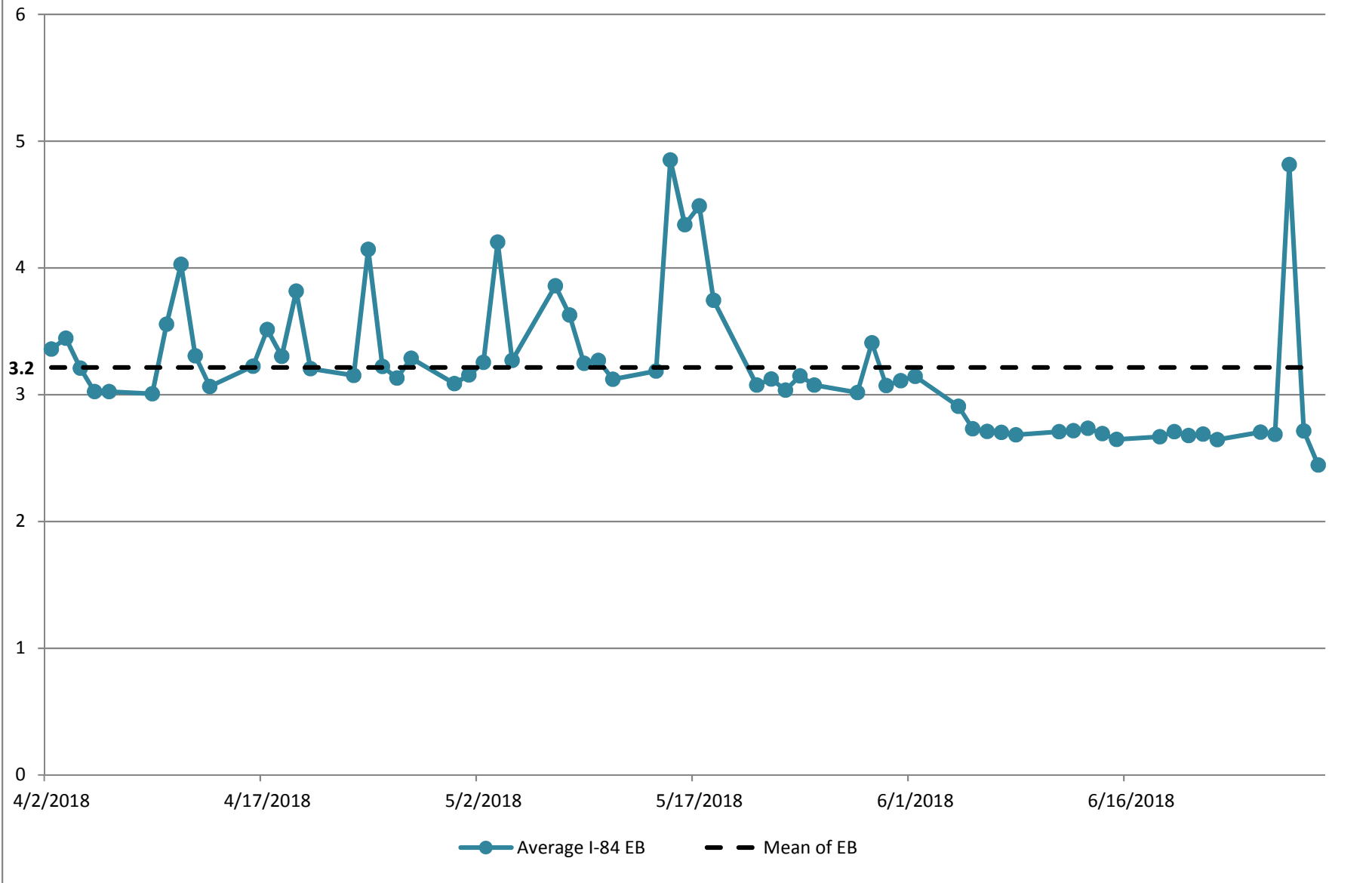
I-84 WB Average Daily Travel Time (min) - 2nd Quarter 2018

Construction Hours: M-F 9 pm to 6 am



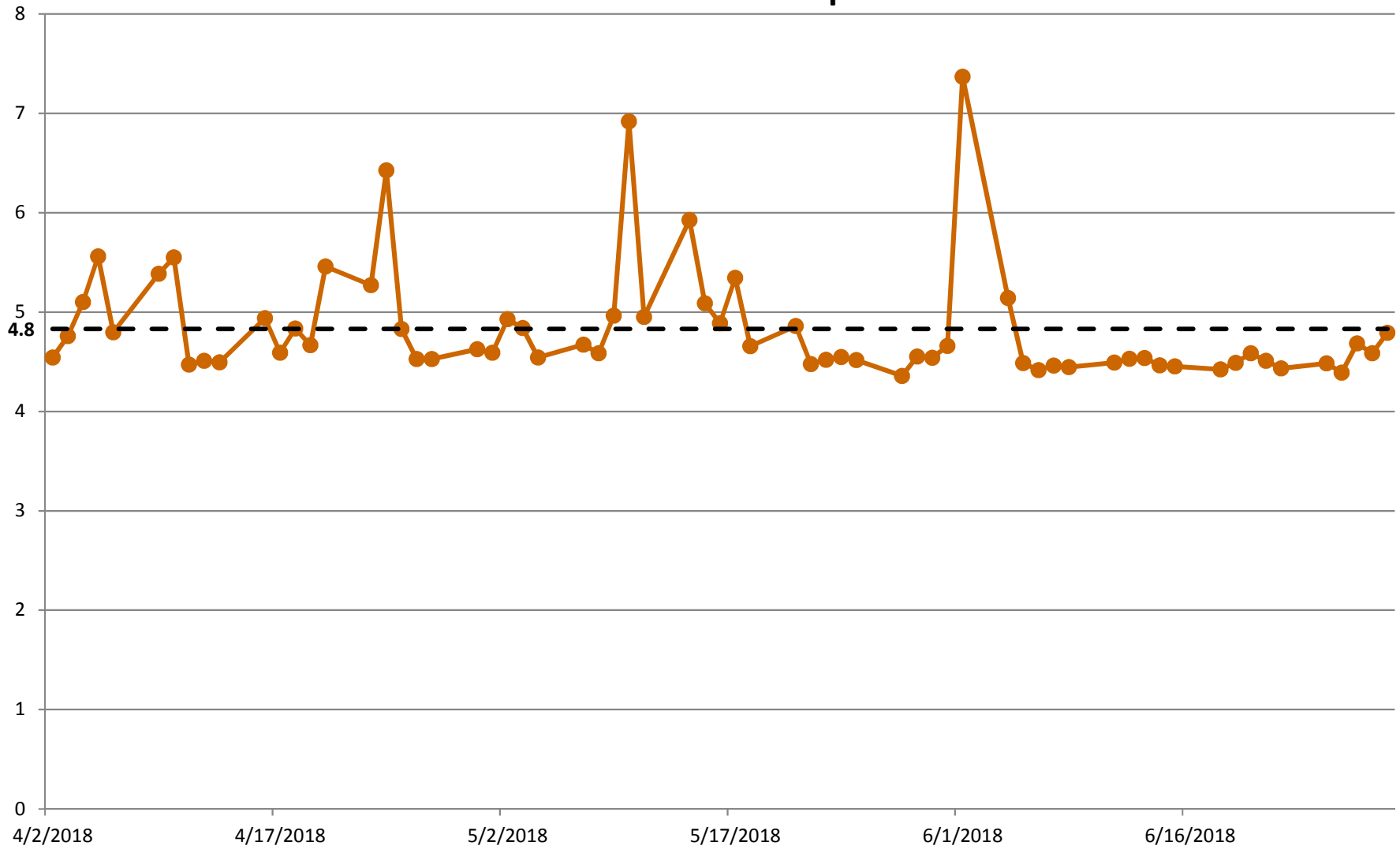
I-84 EB Average Daily Travel Time (min) - 2nd Quarter 2018

(Construction Hours: M-F 9 pm to 6 am)



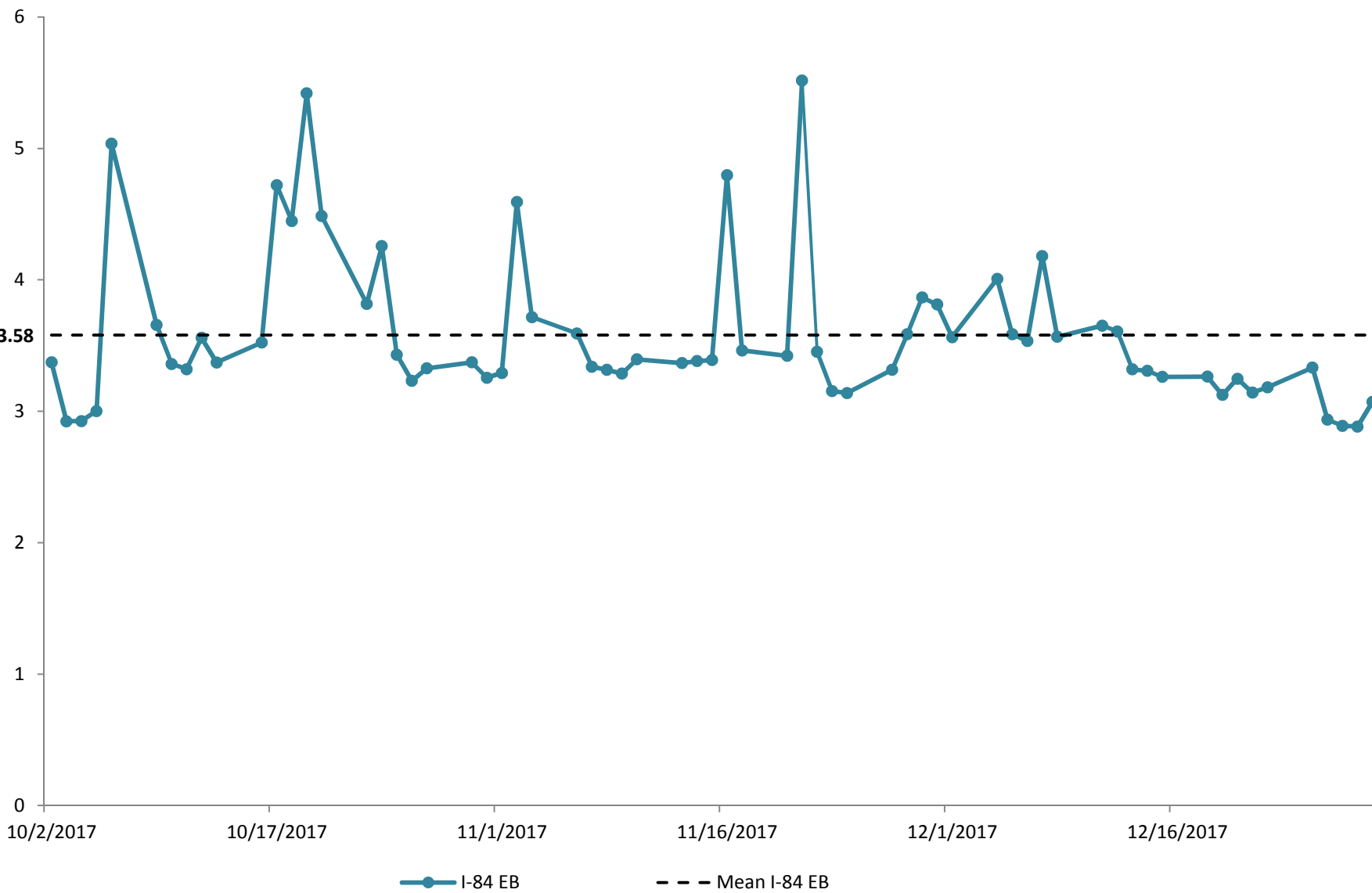
I-84 WB Average Daily Travel Time (min) - 2nd Quarter 2018

Construction Hours: M-F 9 pm to 6 am

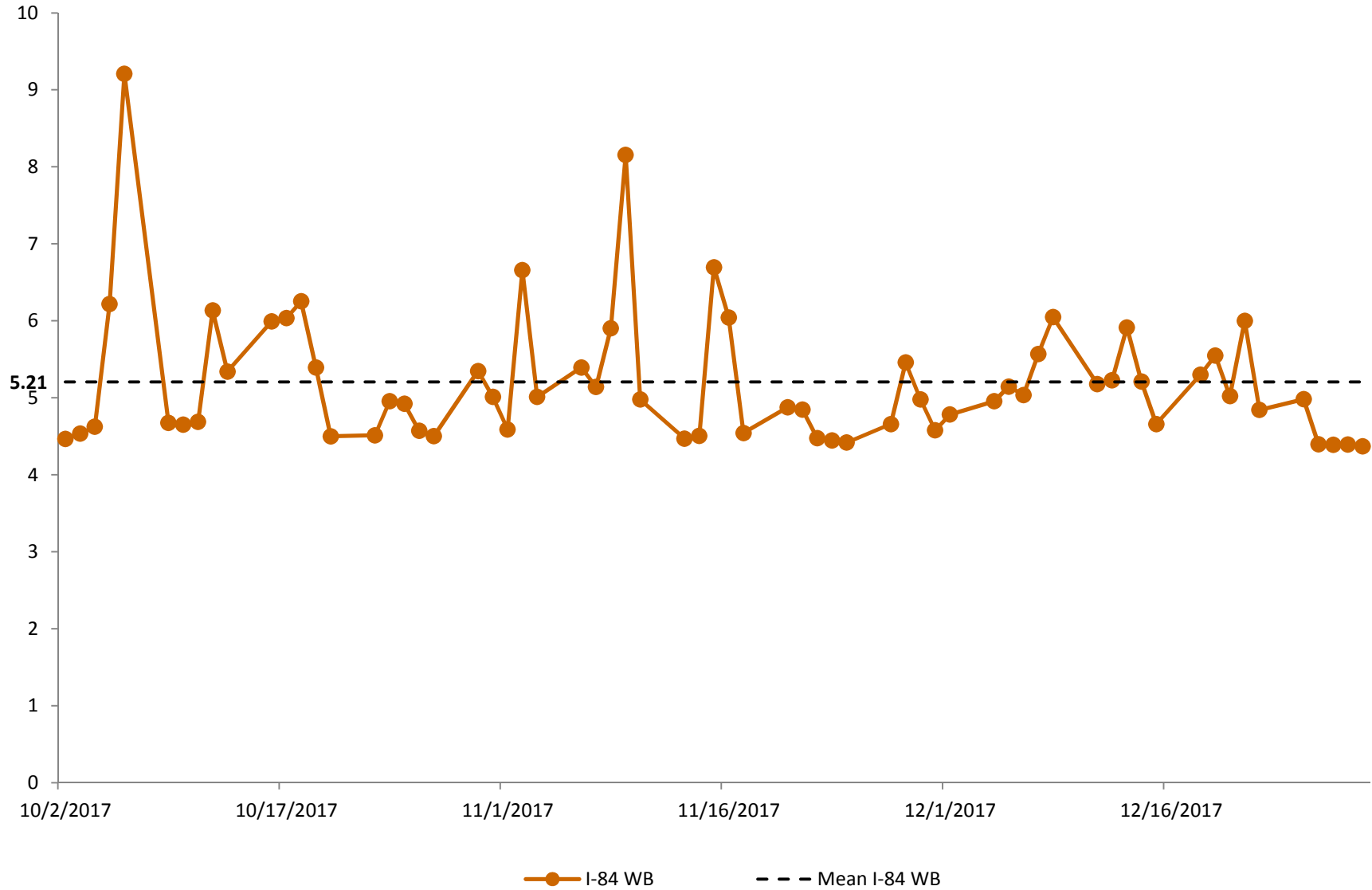


—●— Average I-84 WB - - - Mean of WB

I-84 EB Average Daily Travel Time (min) - 4th Quarter 2017 (Construction Hours: M-F 9pm to 6am)

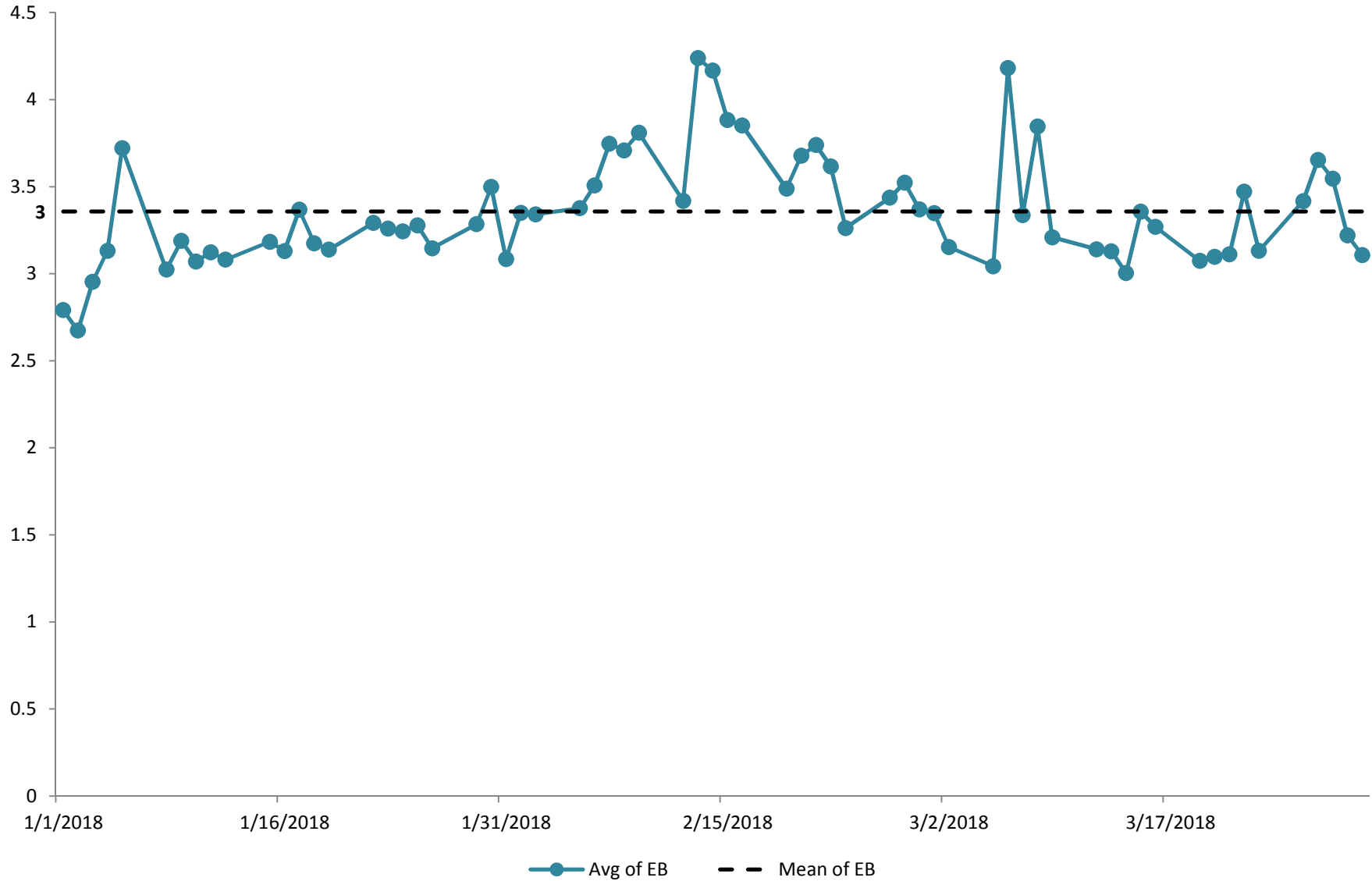


I-84 WB Average Daily Travel Time (min) - 4th Quarter 2017 (Construction Hours: M-F 9pm to 6am)



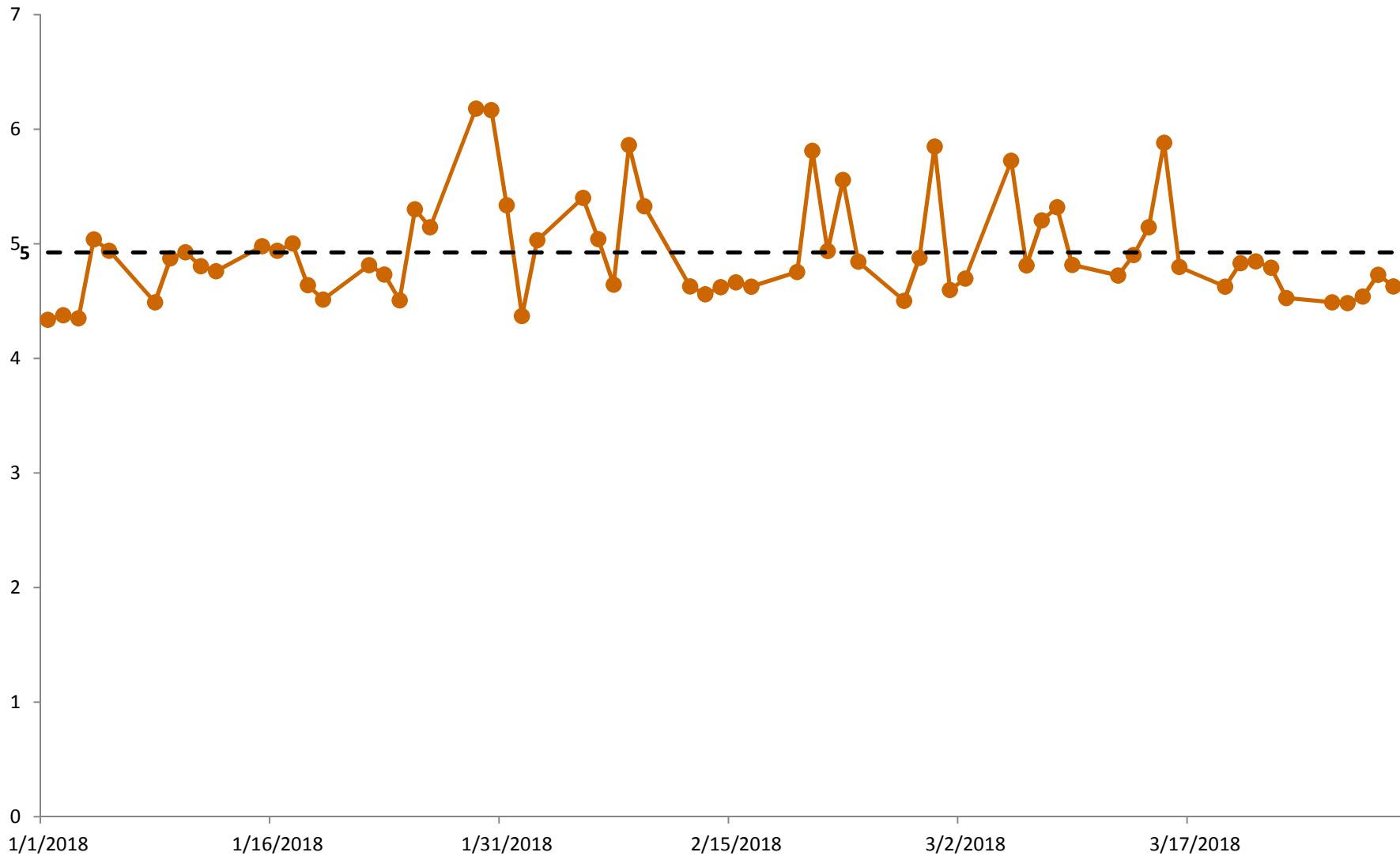
I-84 EB Average Daily Travel Time (min) - 1st Quarter 2018

(Construction Hours: M-F 9pm to 6am)



I-84 WB Average Daily Travel Time (min) - 1st Quarter 2018

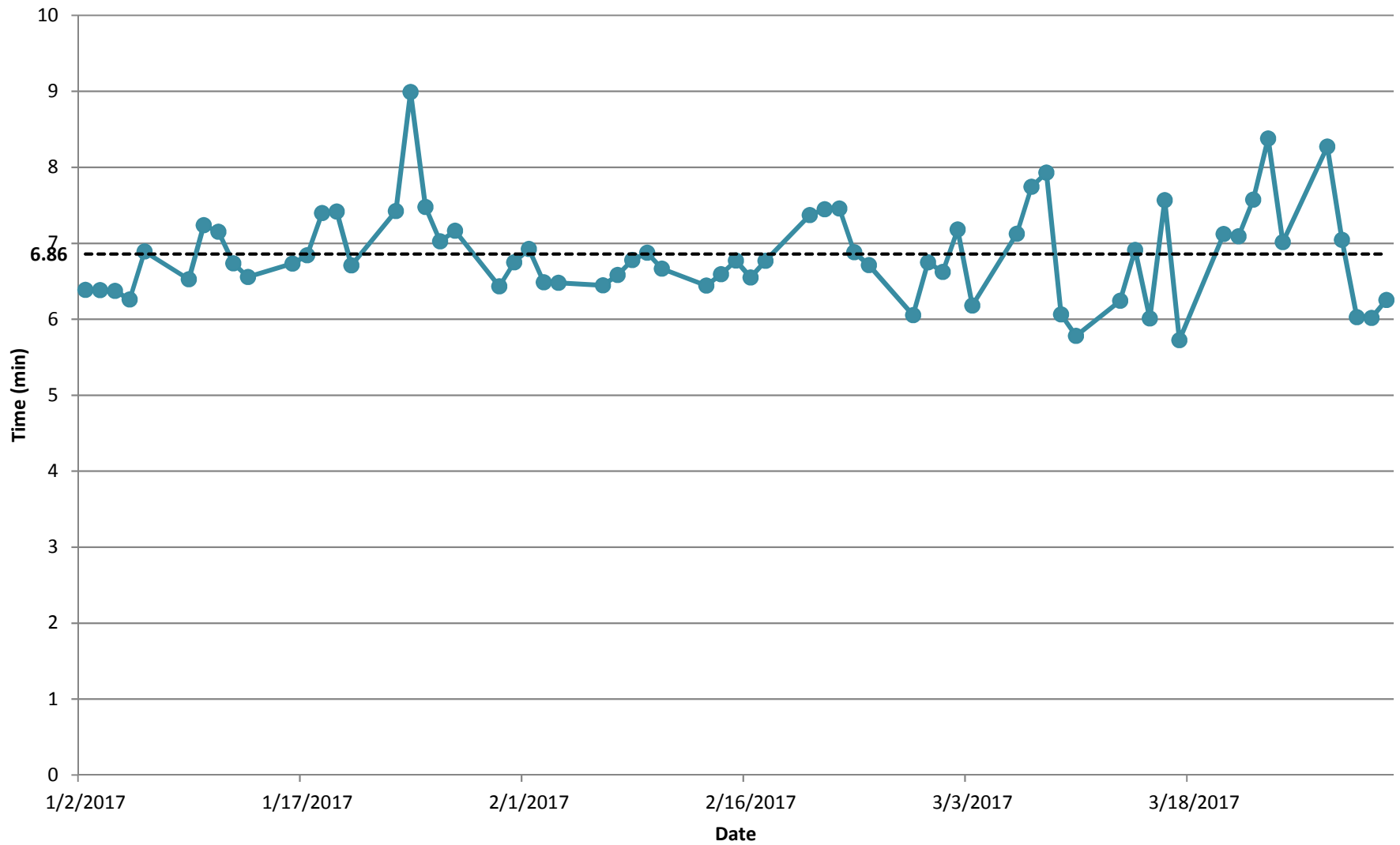
(Construction Hours: M-F 9pm to 6am)



—●— Avg of WB - - - Mean of WB

I-84 EB Average Daily Travel Time - 1st Quarter 2017

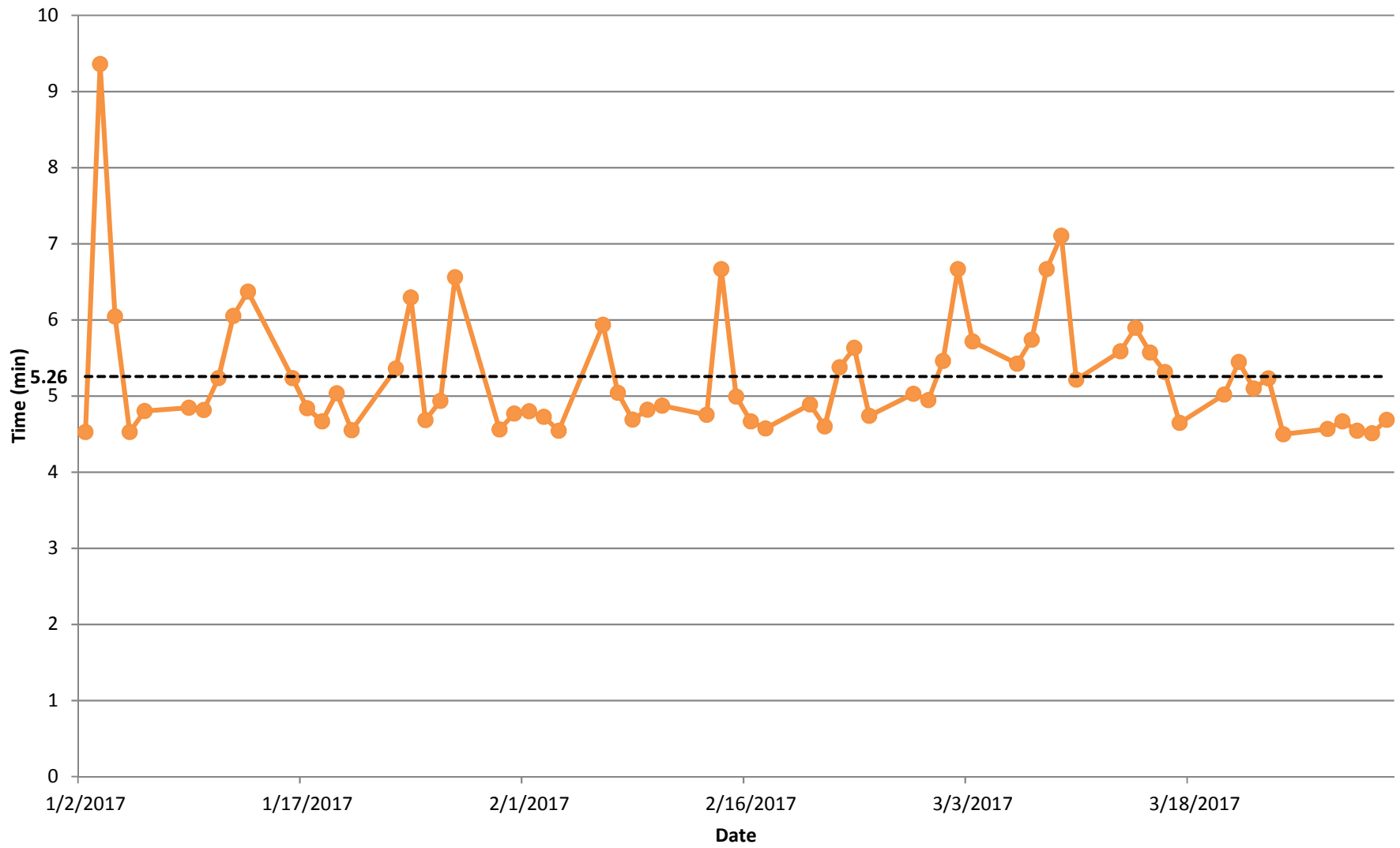
(Construction Hours: M-F 9pm to 6am)



I-84 EB Mean Travel Time

I-84 WB Average Daily Travel Time - 1st Quarter 2017

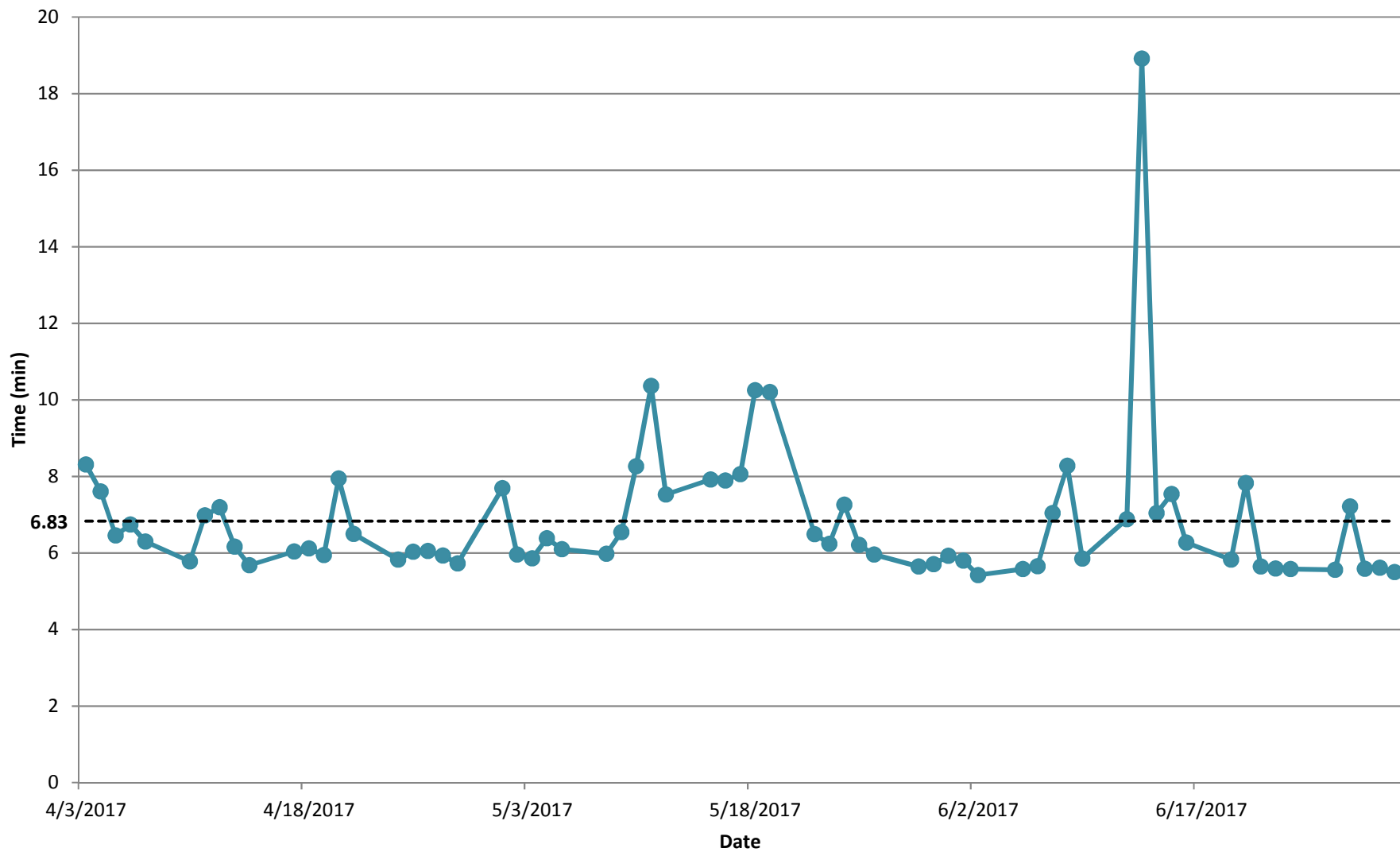
(Construction Hours: M-F 9pm to 6am)



I-84 WB Mean Travel Time

I-84 EB Average Daily Travel Time - 2nd Quarter 2017

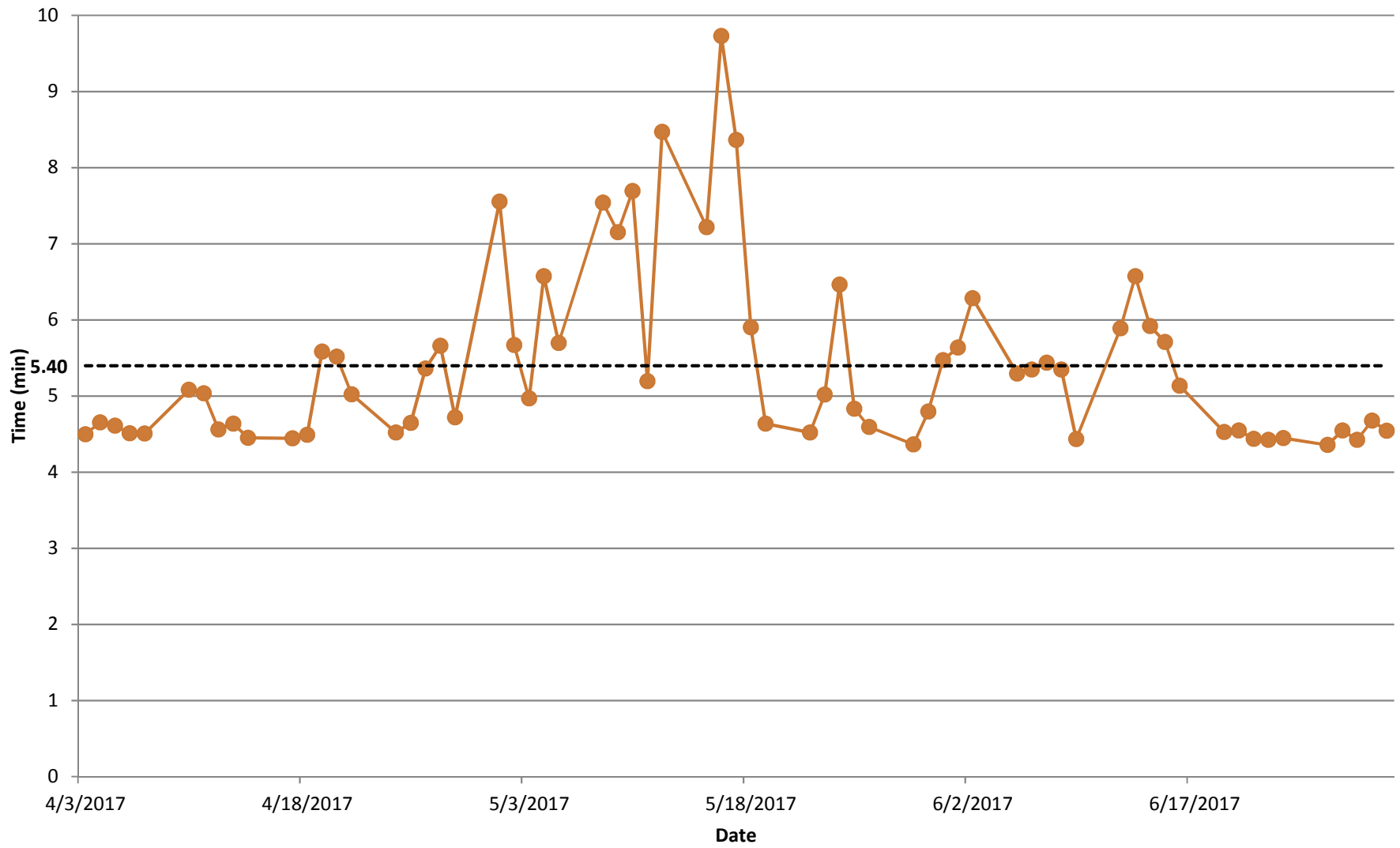
(Construction Hours: M-F 9pm to 6am)



● I-84 EB - - - - Mean Travel Time

I-84 WB Average Daily Travel Time - 2nd Quarter 2017

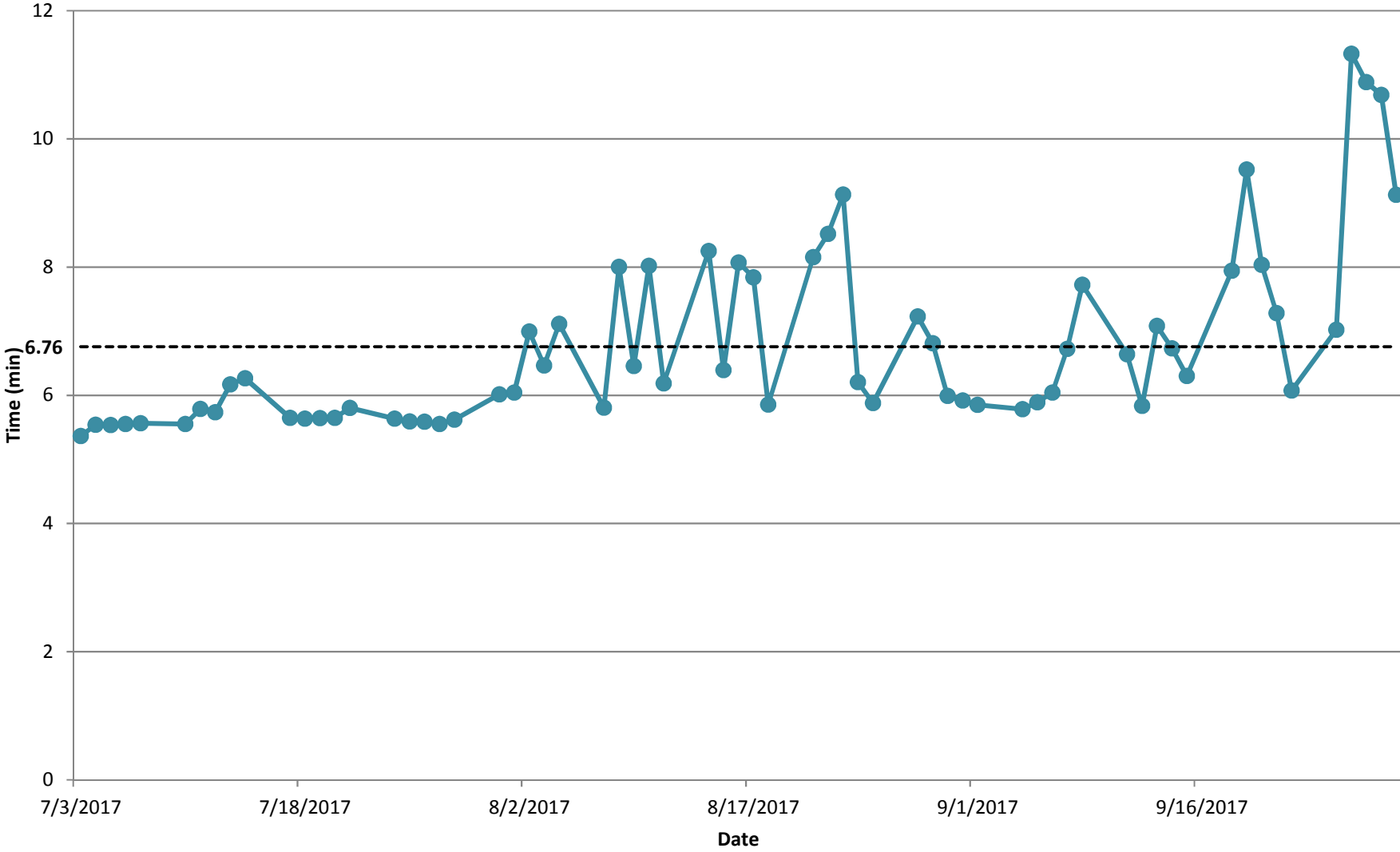
(Construction Hours: M-F 9pm to 6am)



—●— I-84 WB - - - - Mean Travel Time

I-84 EB Average Daily Travel Time - 3rd Quarter 2017

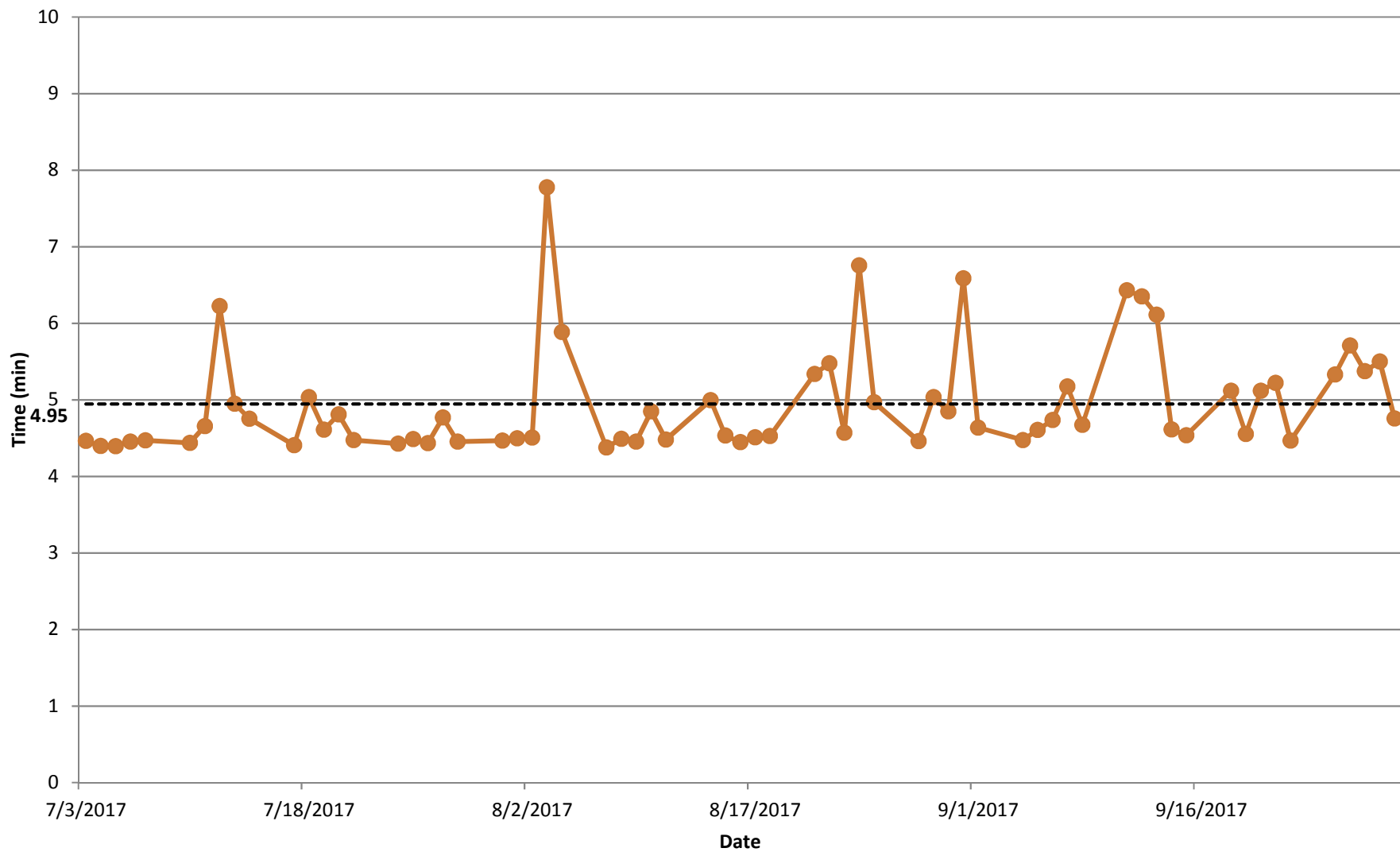
(Construction Hours: M-F 9pm to 6am)



I-84 EB Mean Travel Time

I-84 WB Average Daily Travel Time - 3rd Quarter 2017

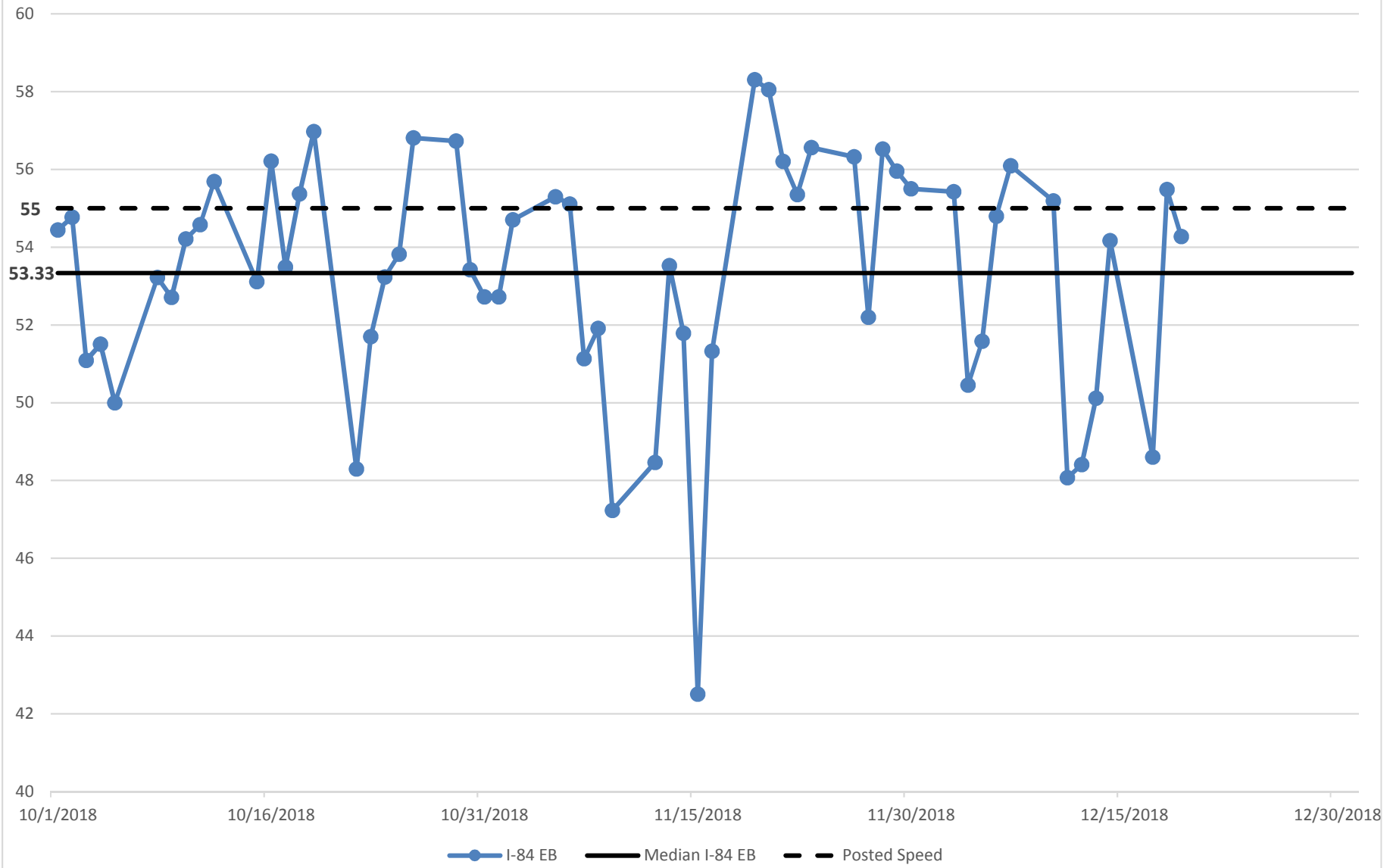
(Construction Hours: M-F 9pm to 6am)



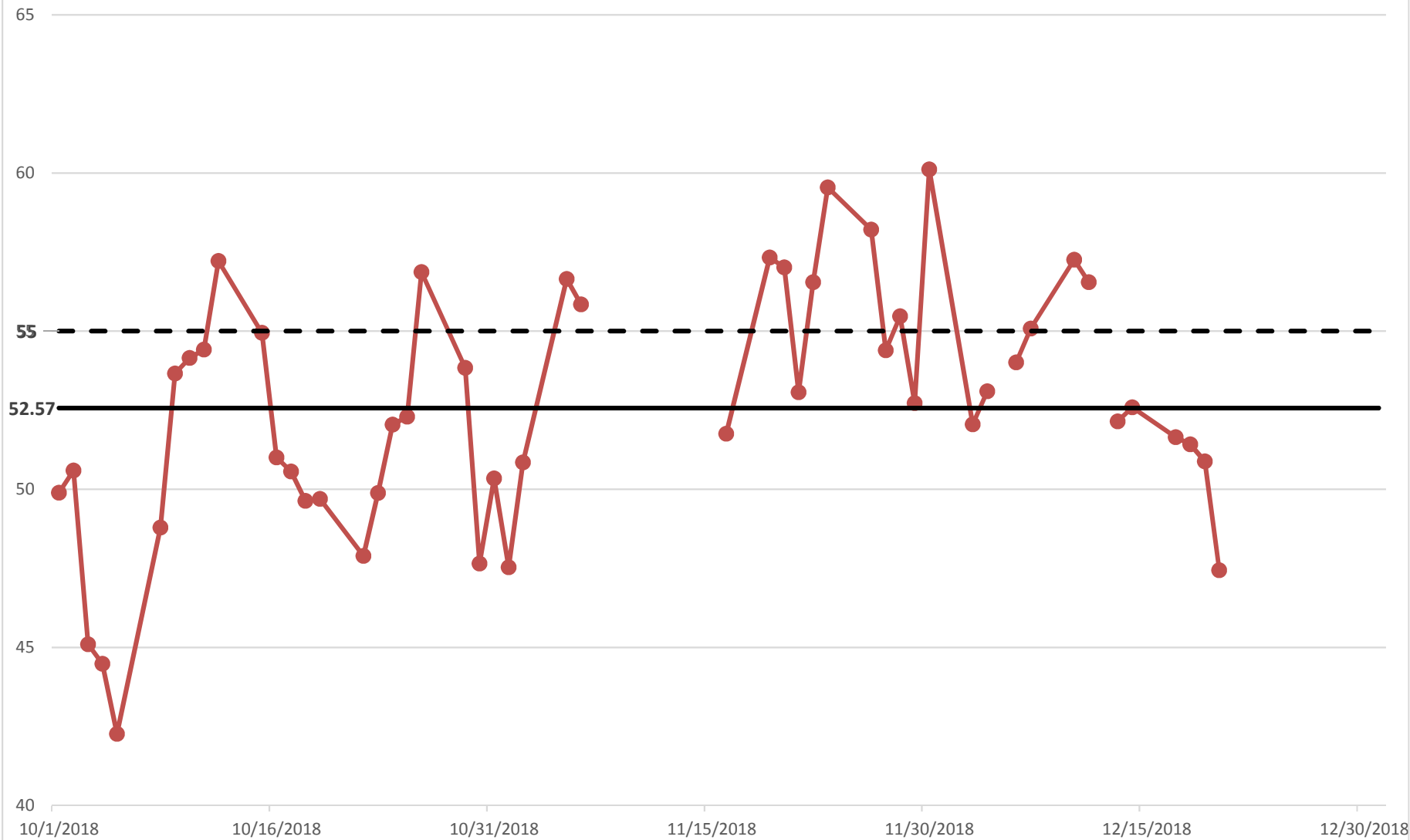
I-84 WB Mean Travel Time

I-84 EB Average Daily Speed (mph) - 4th Quarter 2018

(Construction Hours: M-F 9 pm to 6 am)



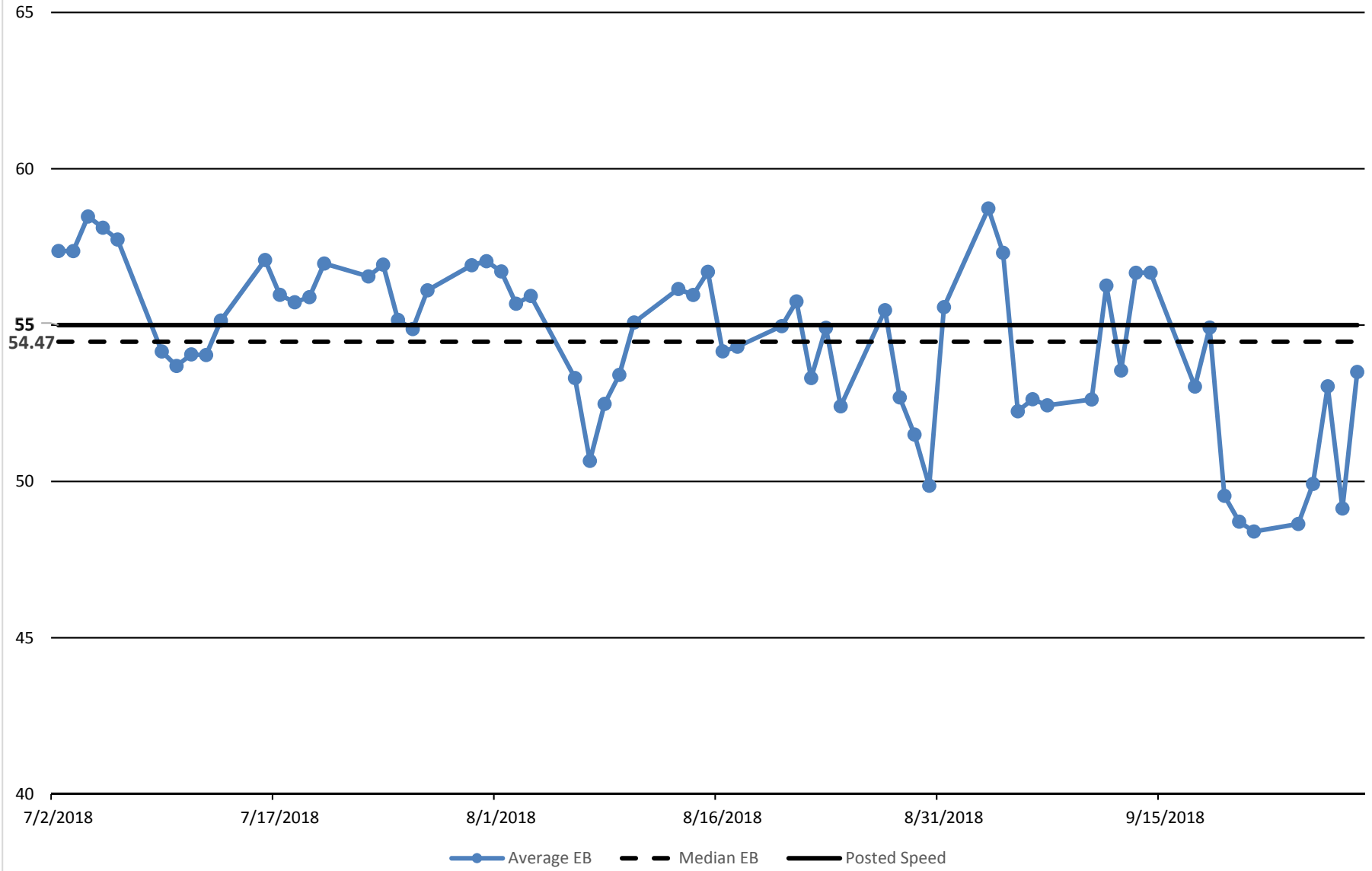
I-84 WB Average Daily Speed (mph) - 4th Quarter 2018 (Construction Hours: M-F 9 pm to 6 am)



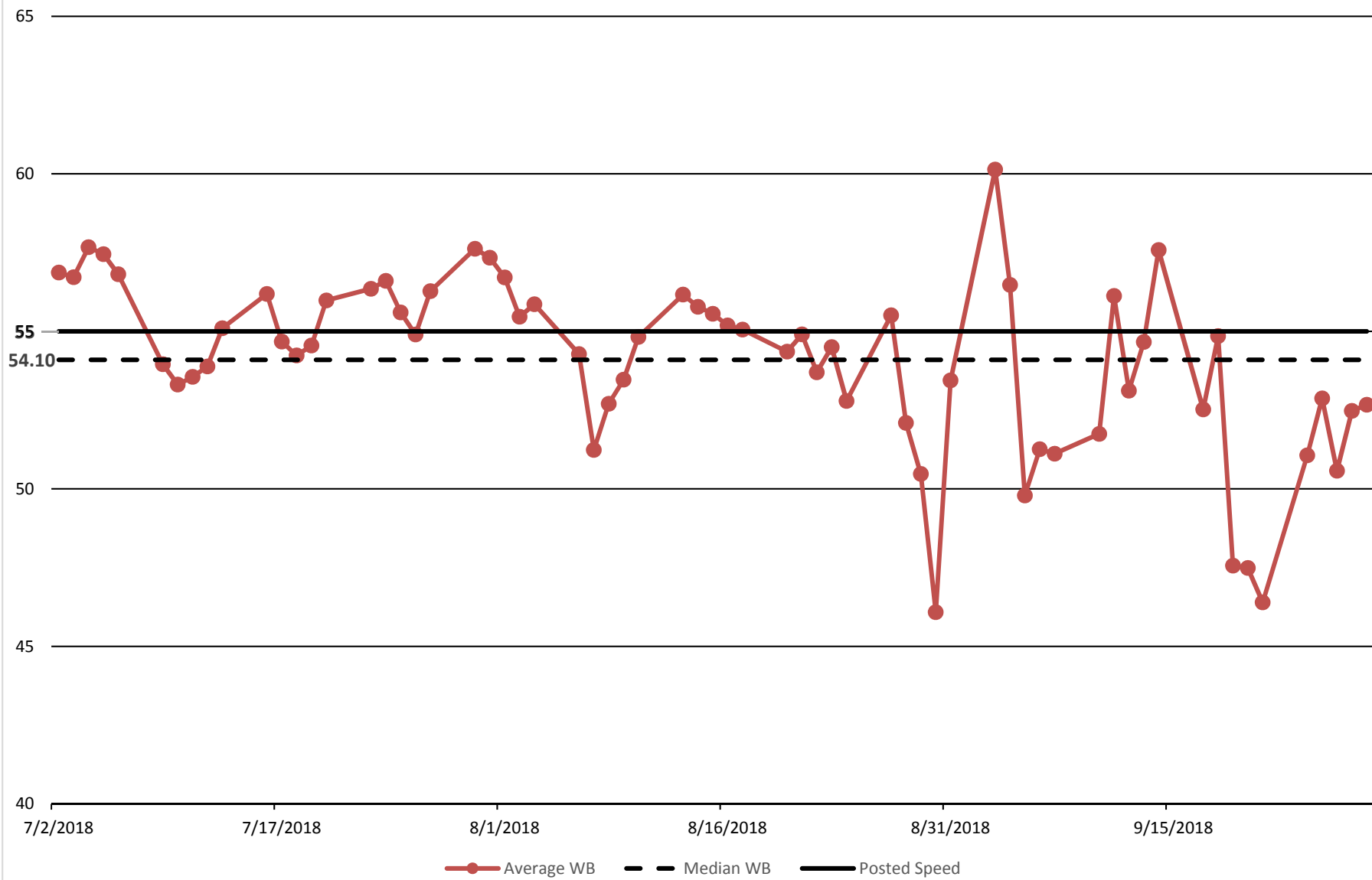
I-84 WB Median I-84 WB Posted Speed

I-84 EB Average Daily Speed (mph) - 3rd Quarter 2018

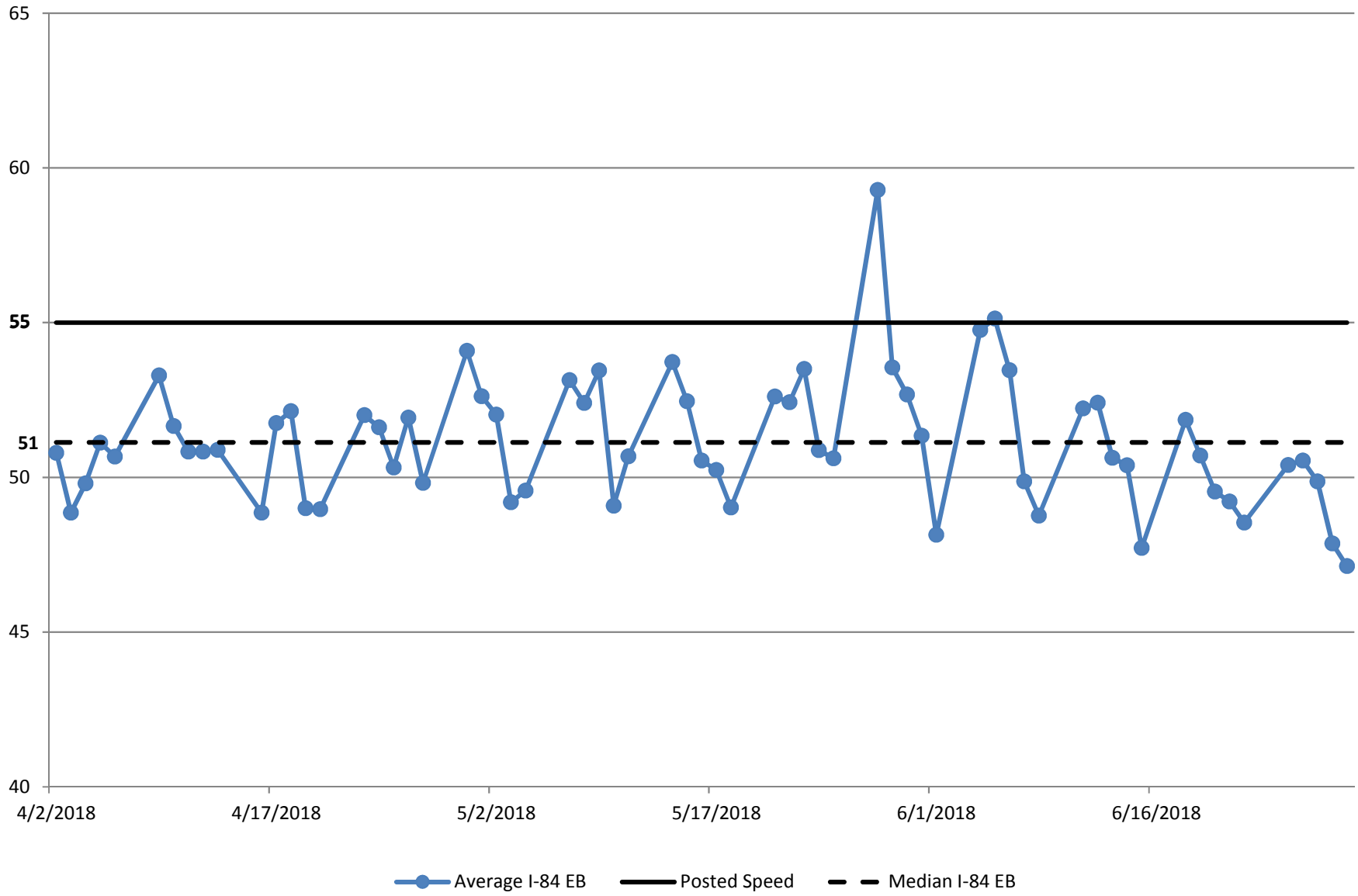
(Construction Hours: M-F 9 pm to 6 am)



I-84 WB Average Daily Speed (mph) - 3rd Quarter 2018 (Construction Hours: M-F 9 pm to 6 am)

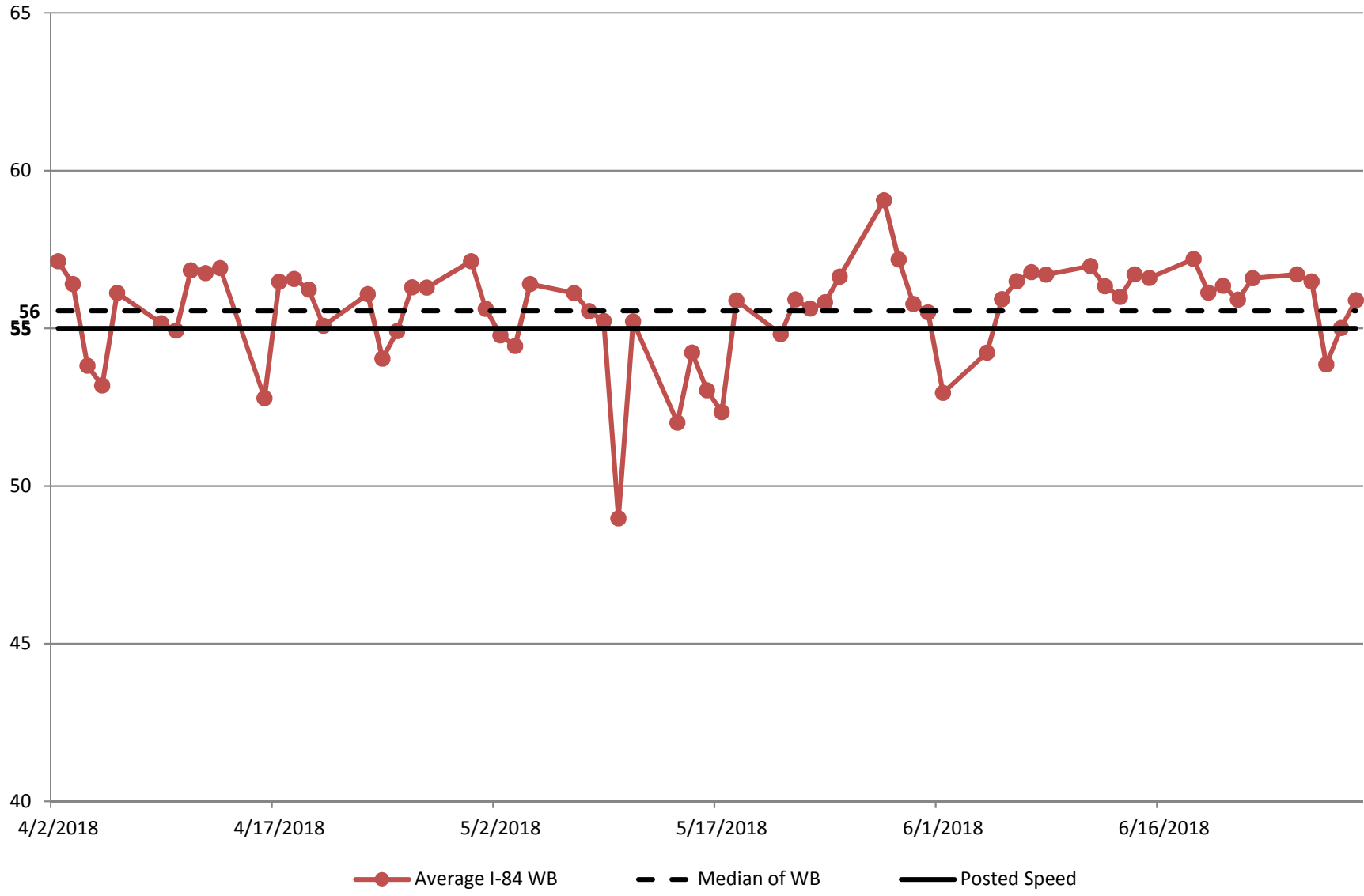


I-84 EB Average Daily Speed (mph) - 2nd Quarter 2018 (Construction Hours: M-F 9 pm to 6 am)

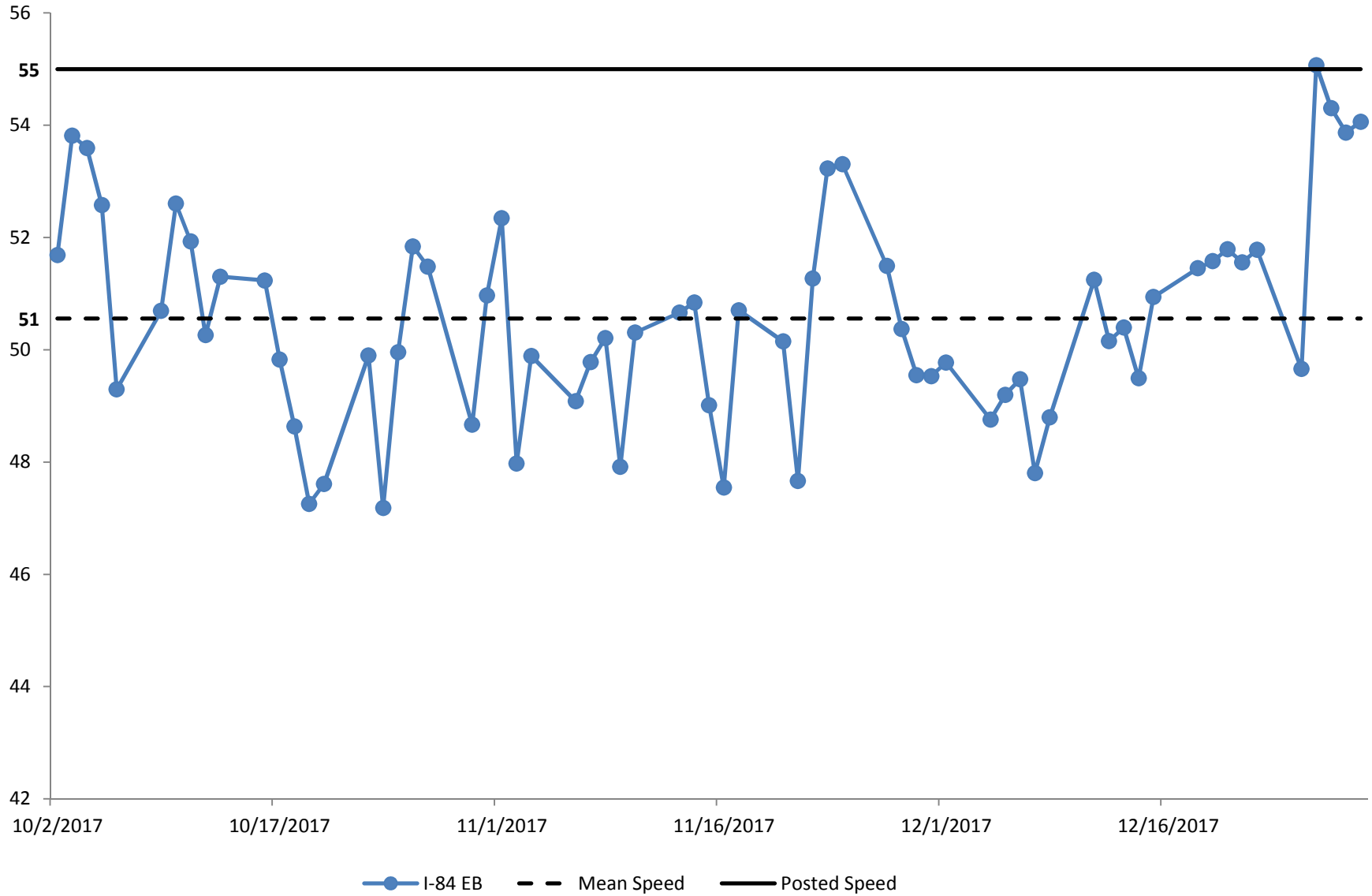


I-84 WB Average Daily Speed (mph) - 2nd Quarter 2018

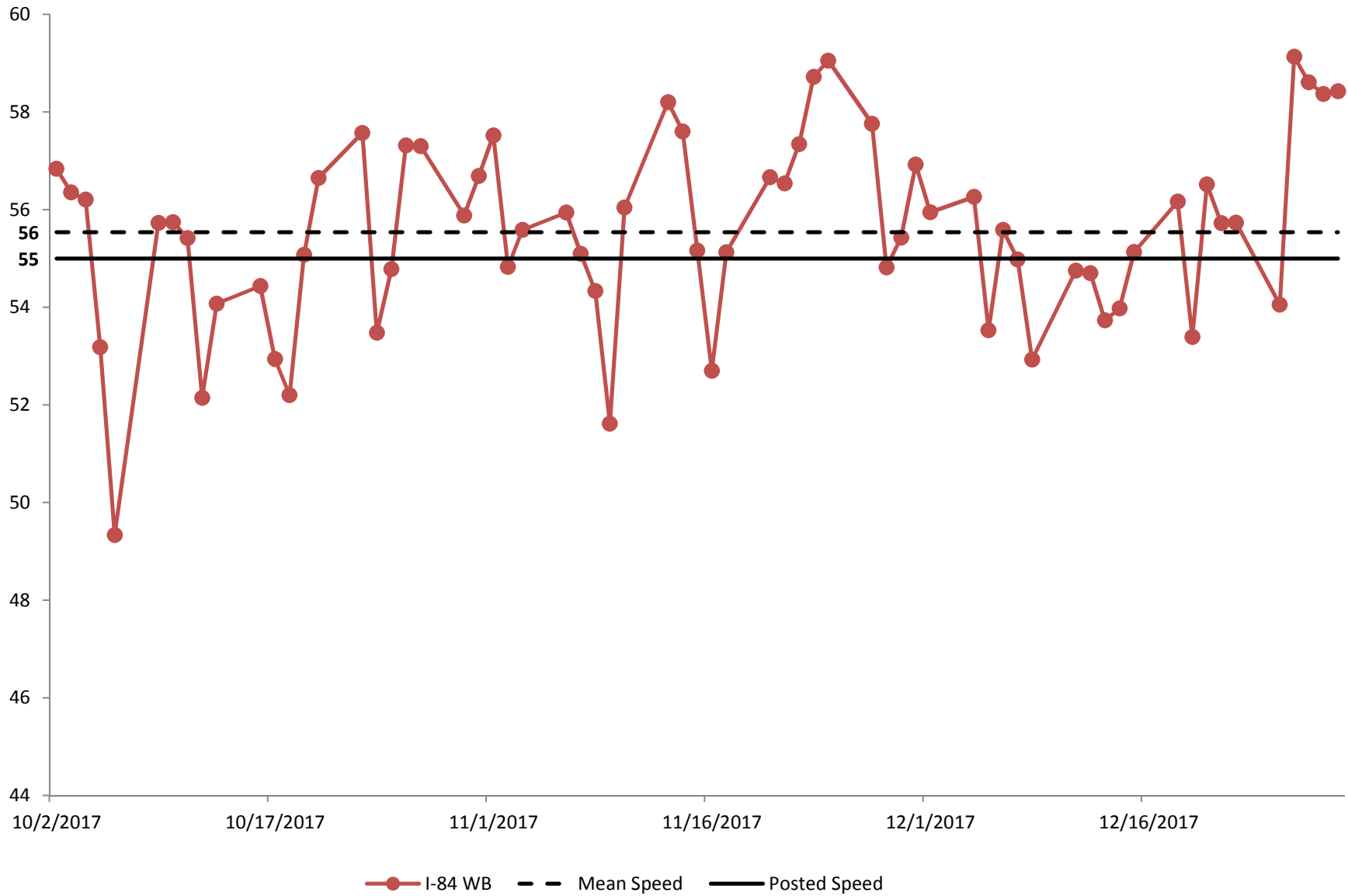
(Construction Hours: M-F 9 pm to 6 am)



I-84 EB Average Daily Speed (mph) - 4th Quarter 2017 (Construction Hours: M-F 9pm to 6am)

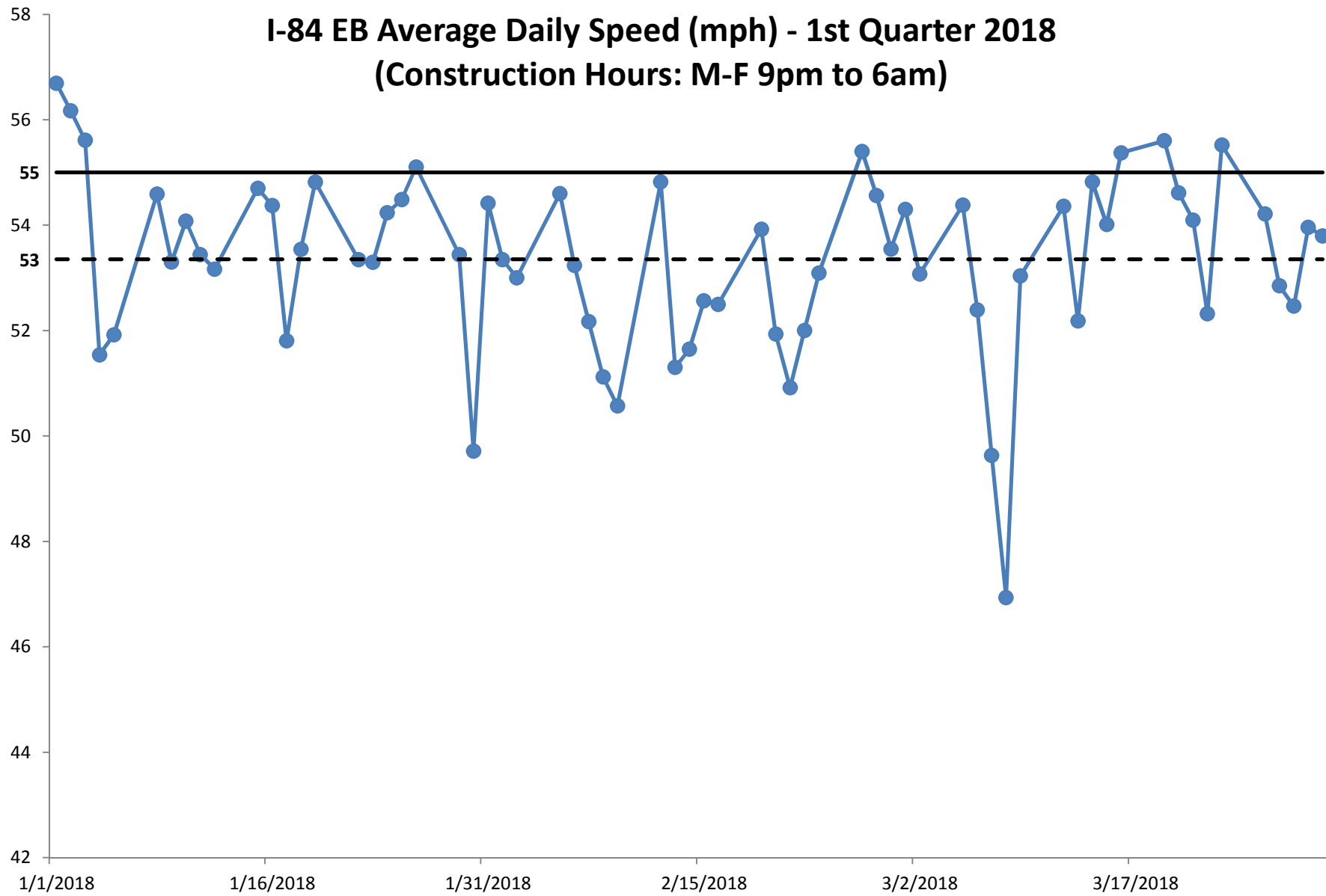


I-84 WB Average Daily Speed (mph) - 4th Quarter 2017 (Construction Hours: M-F 9pm to 6am)



I-84 EB Average Daily Speed (mph) - 1st Quarter 2018

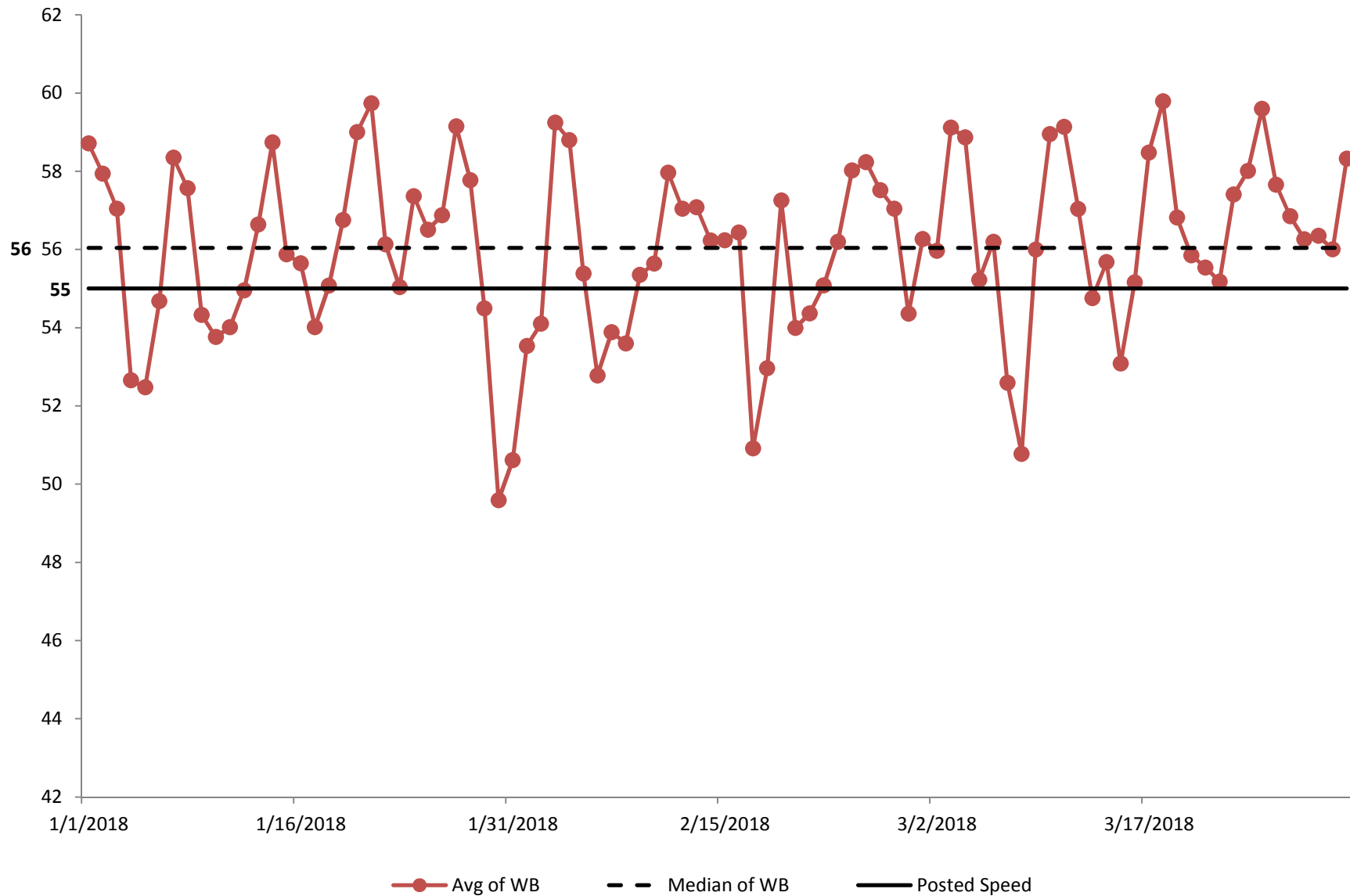
(Construction Hours: M-F 9pm to 6am)



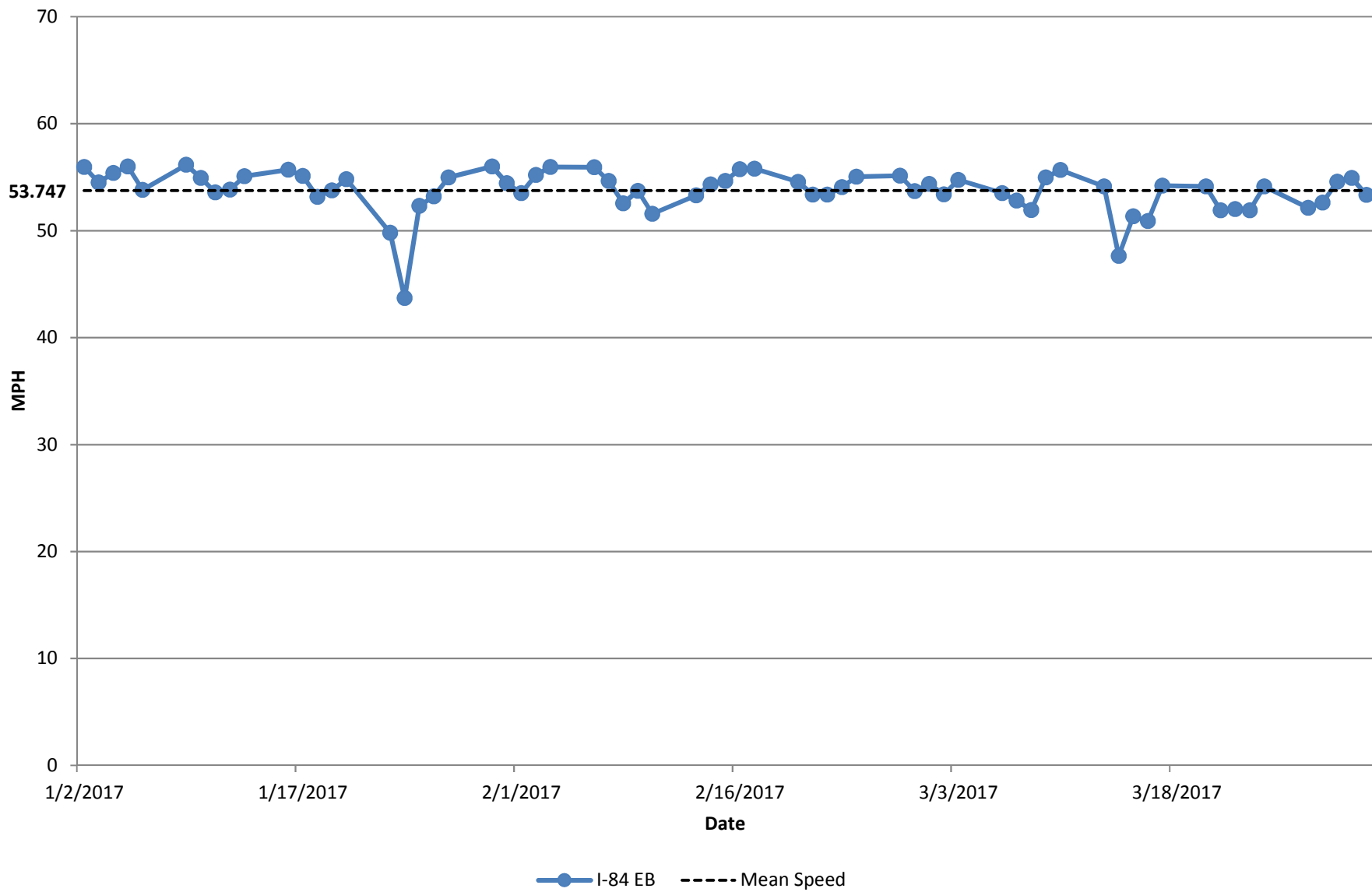
—●— Avg of EB - - - Median of EB — Posted Speed

I-84 WB Average Daily Speed (mph) - 1st Quarter 2018

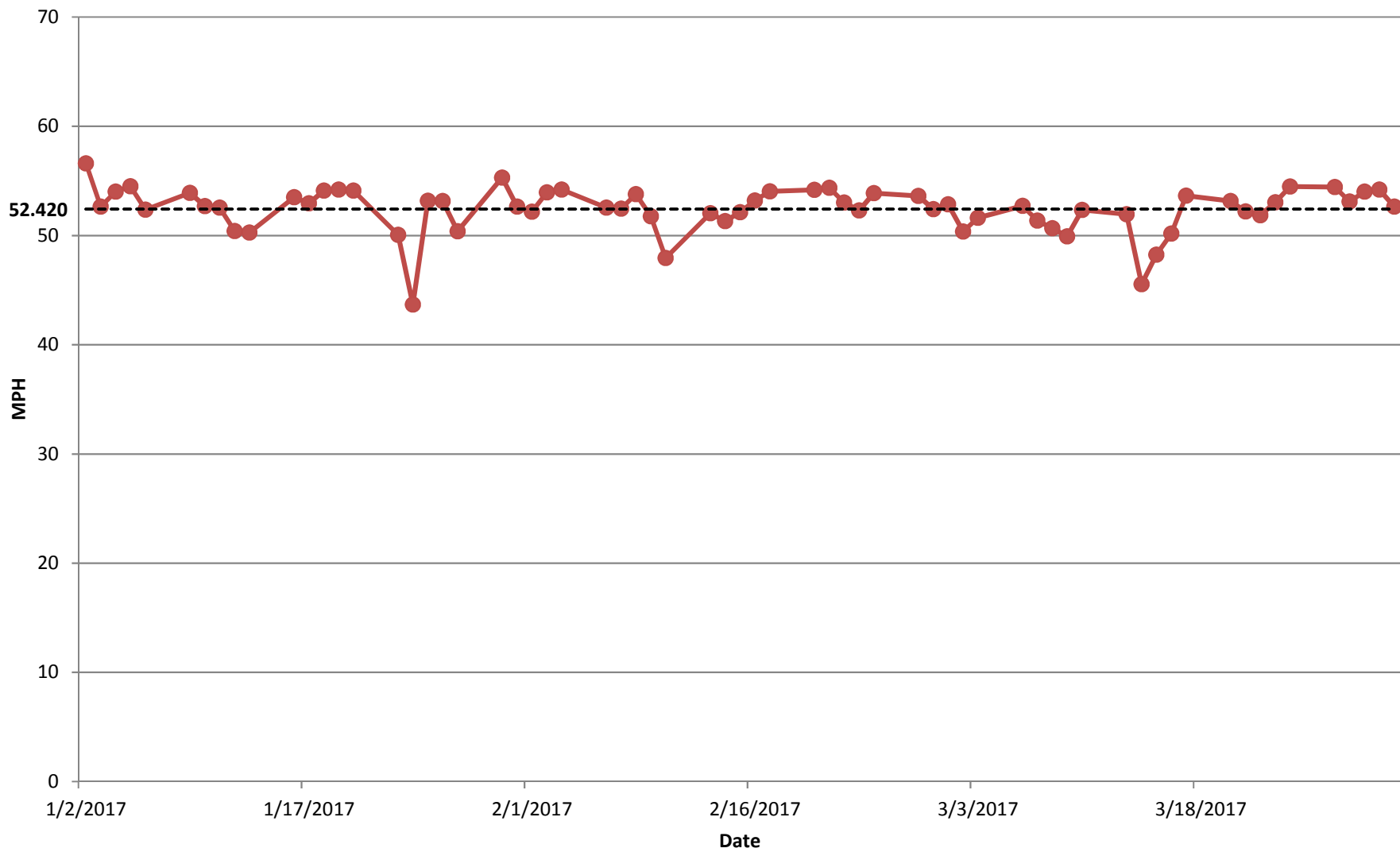
(Construction Hours: M-F 9pm to 6am)



I-84 EB Average Daily Speed - 1st Quarter 2017 (Construction Hours: M-F 9pm to 6am)

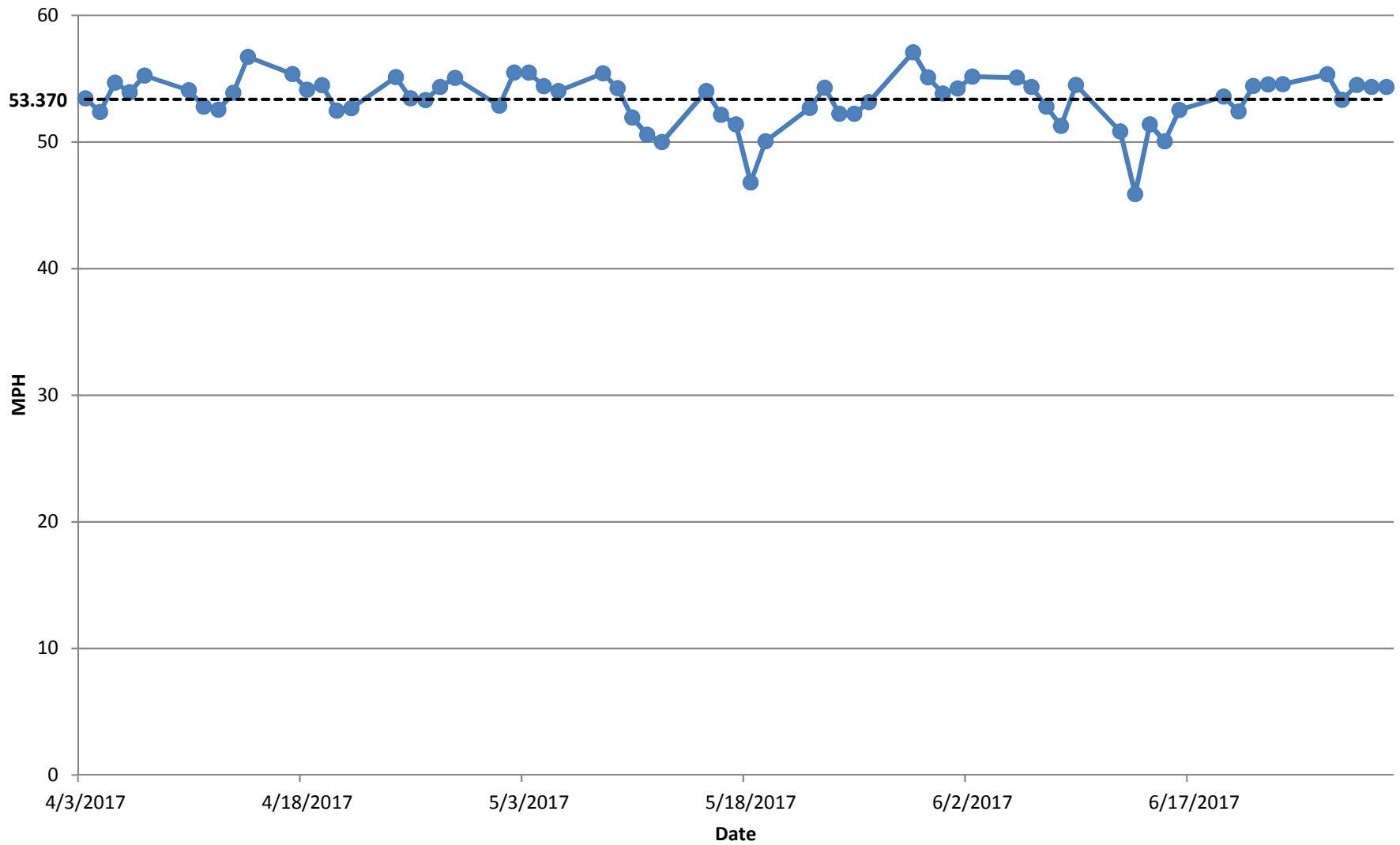


I-84 EB Average Daily Speed - 1st Quarter 2017 (Construction Hours: M-F 9pm to 6am)



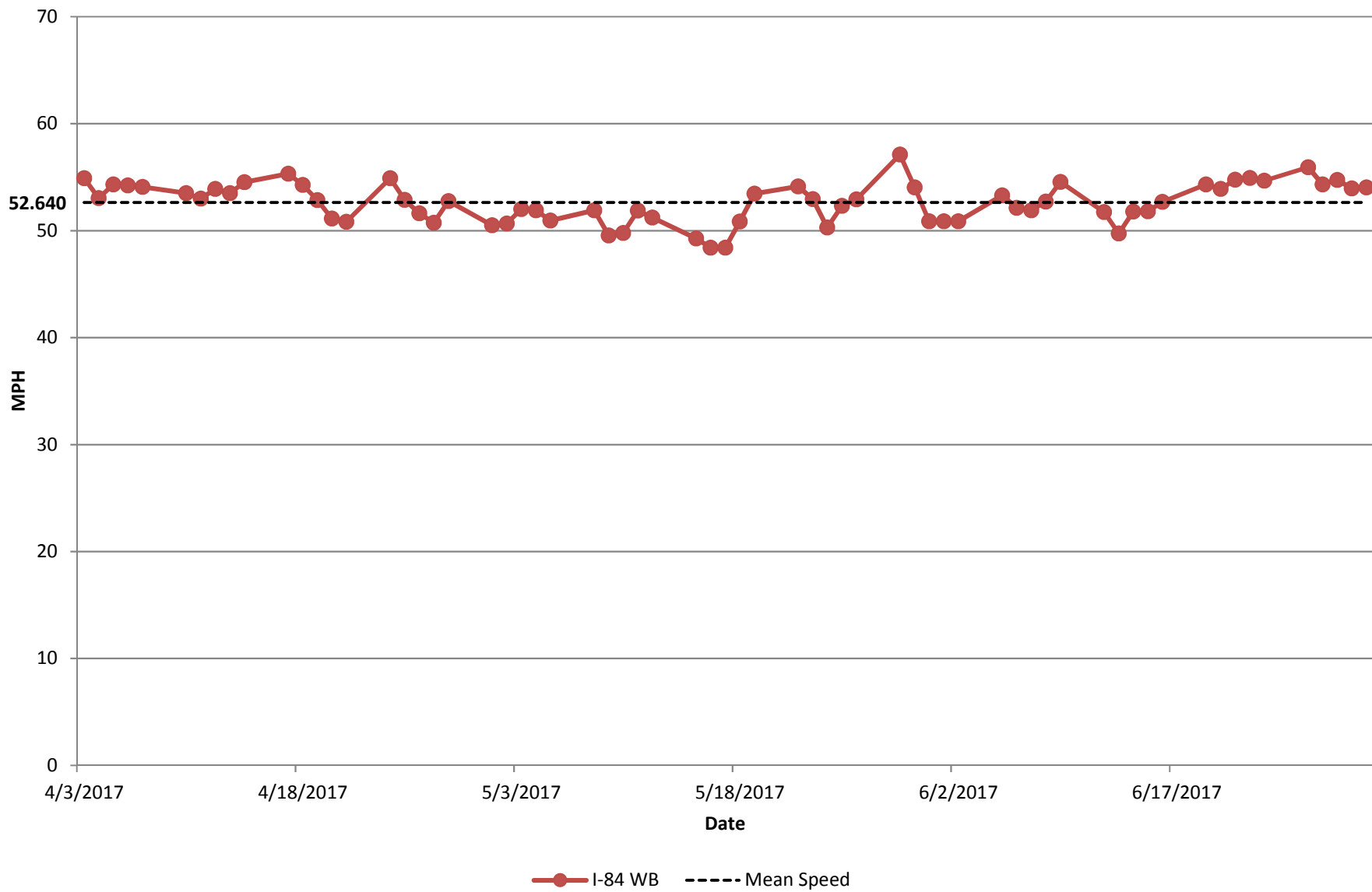
I-84 WB Mean Speed

I-84 EB Average Daily Speed - 2nd Quarter 2017 (Construction Hours: M-F 9pm to 6am)

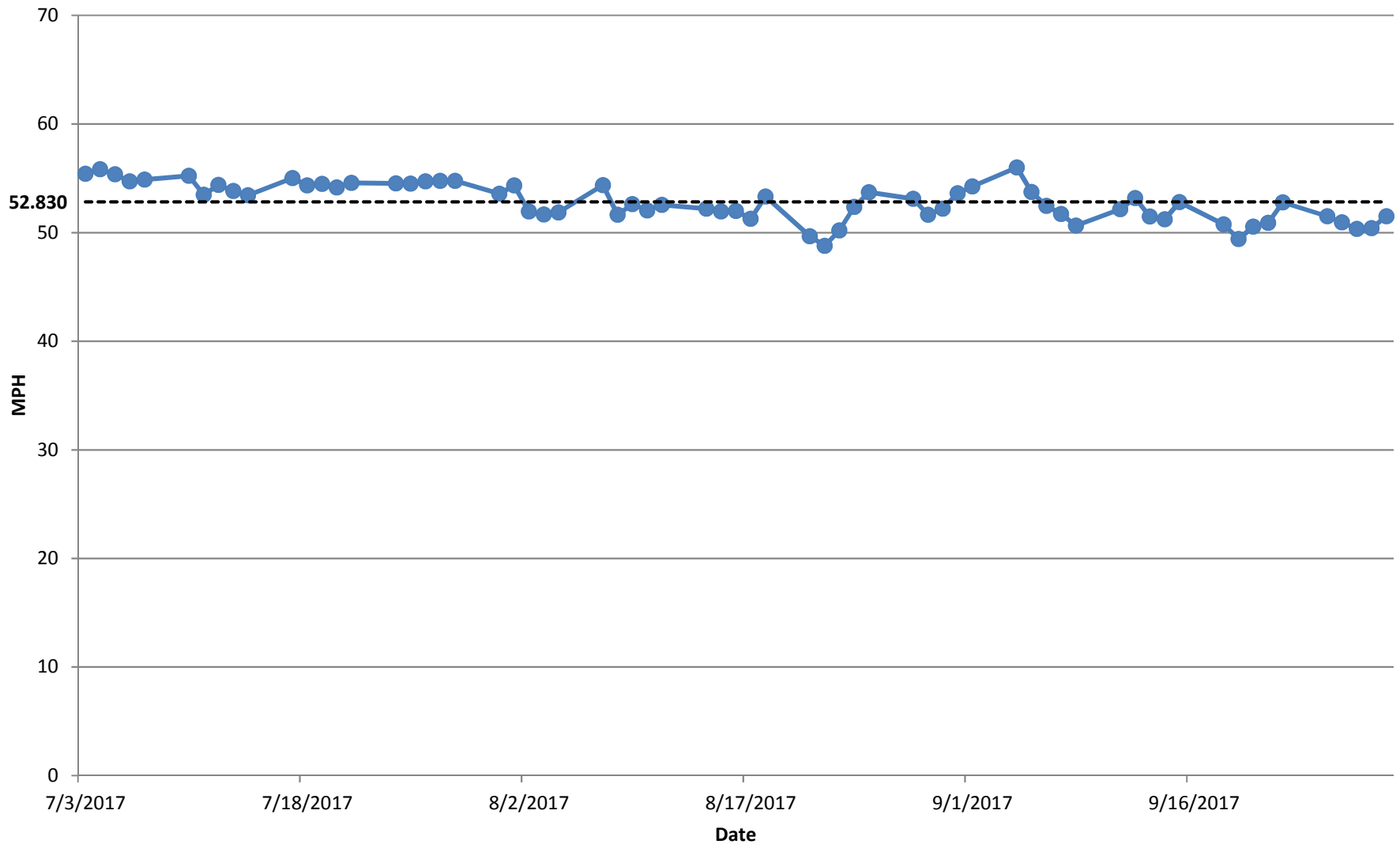


—●— I-84 EB - - - - Mean Speed

I-84 WB Average Daily Speed - 2nd Quarter 2017 (Construction Hours - M-F 9pm to 6am)

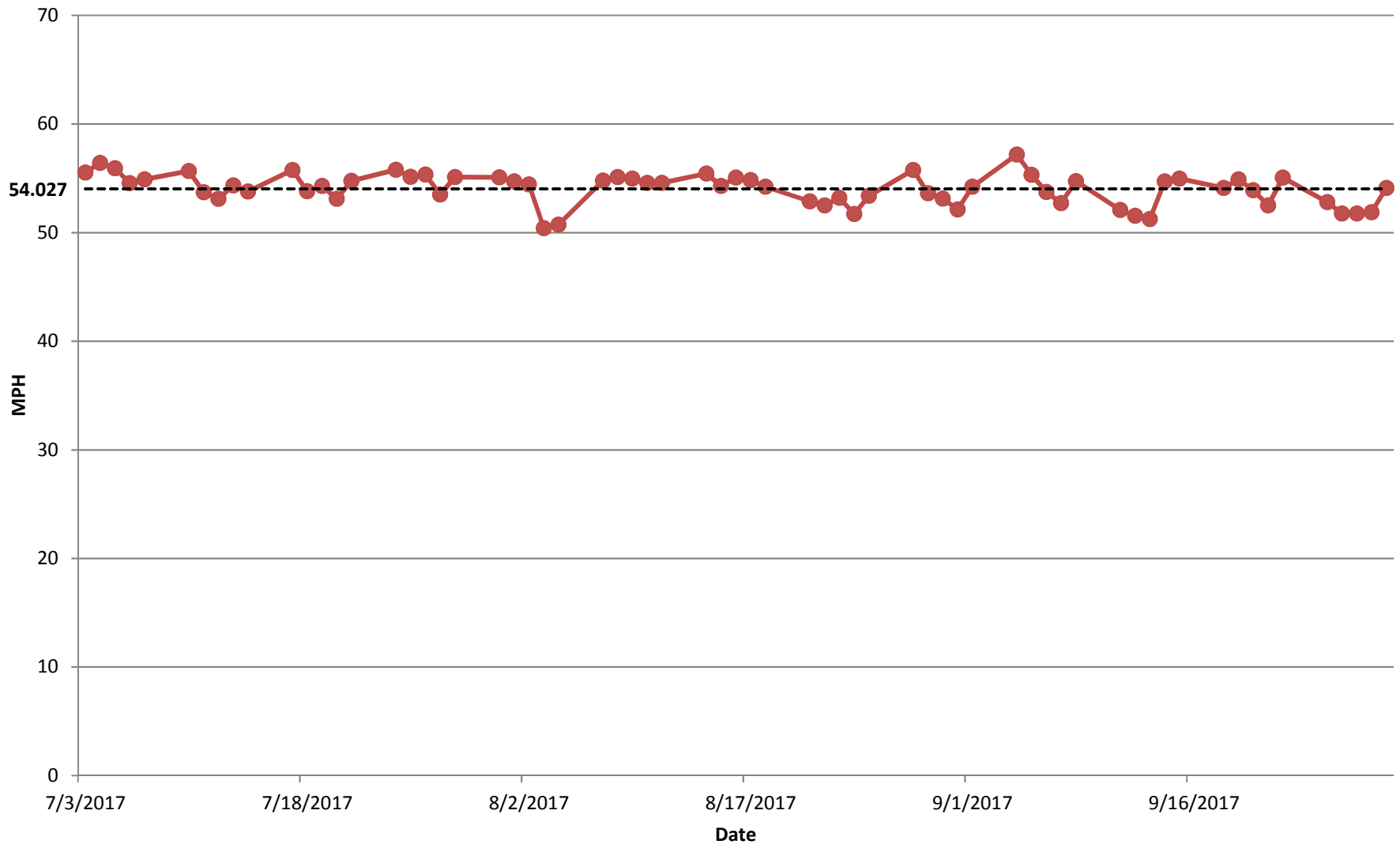


I-84 EB Average Daily Speed - 3rd Quarter 2017 (Construction Hours: M-F 9pm to 6am)



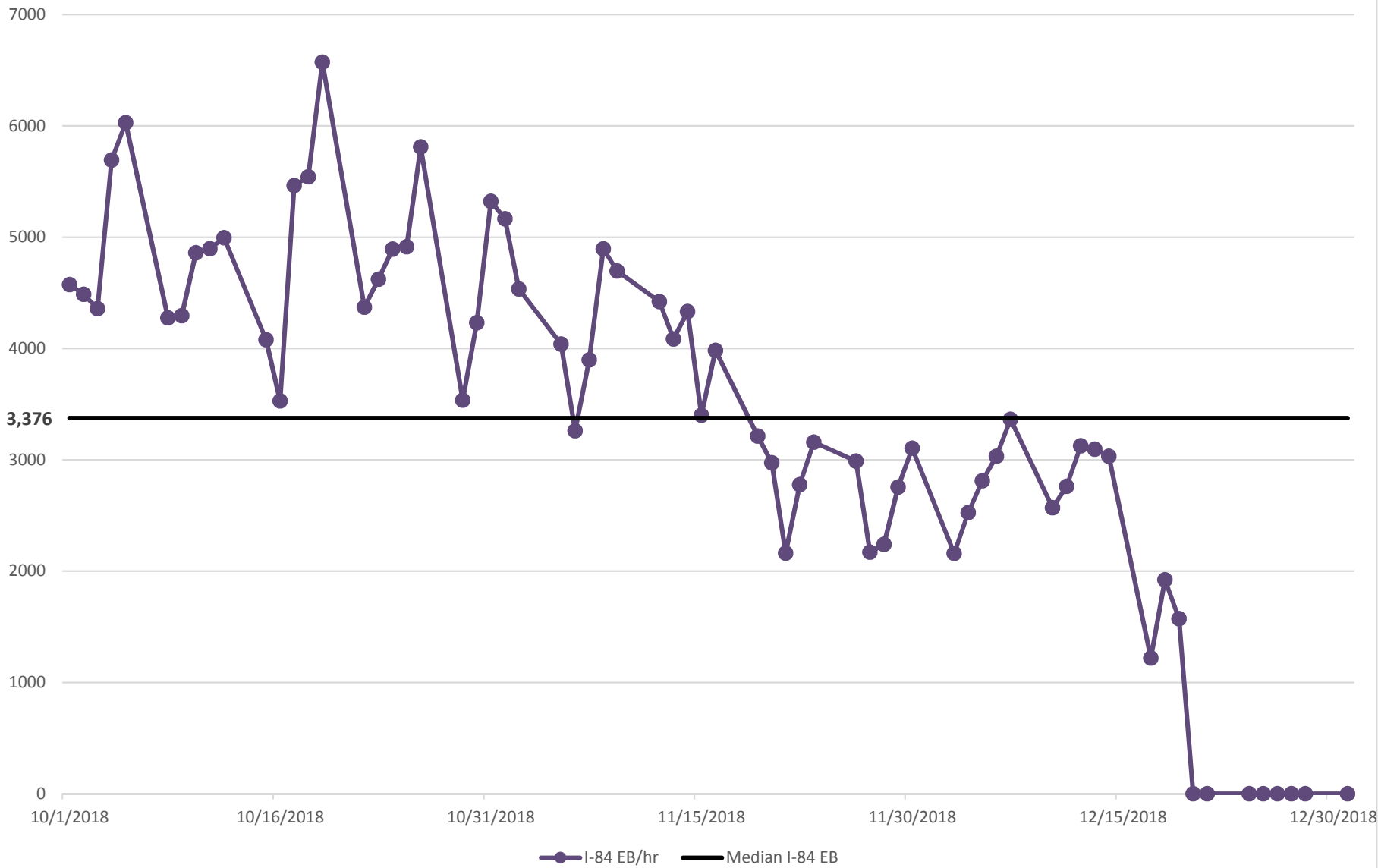
I-84 EB Mean Speed

I-84 WB Average Daily Speed - 3rd Quarter 2017 (Construction Hours: M-F 9pm to 6am)



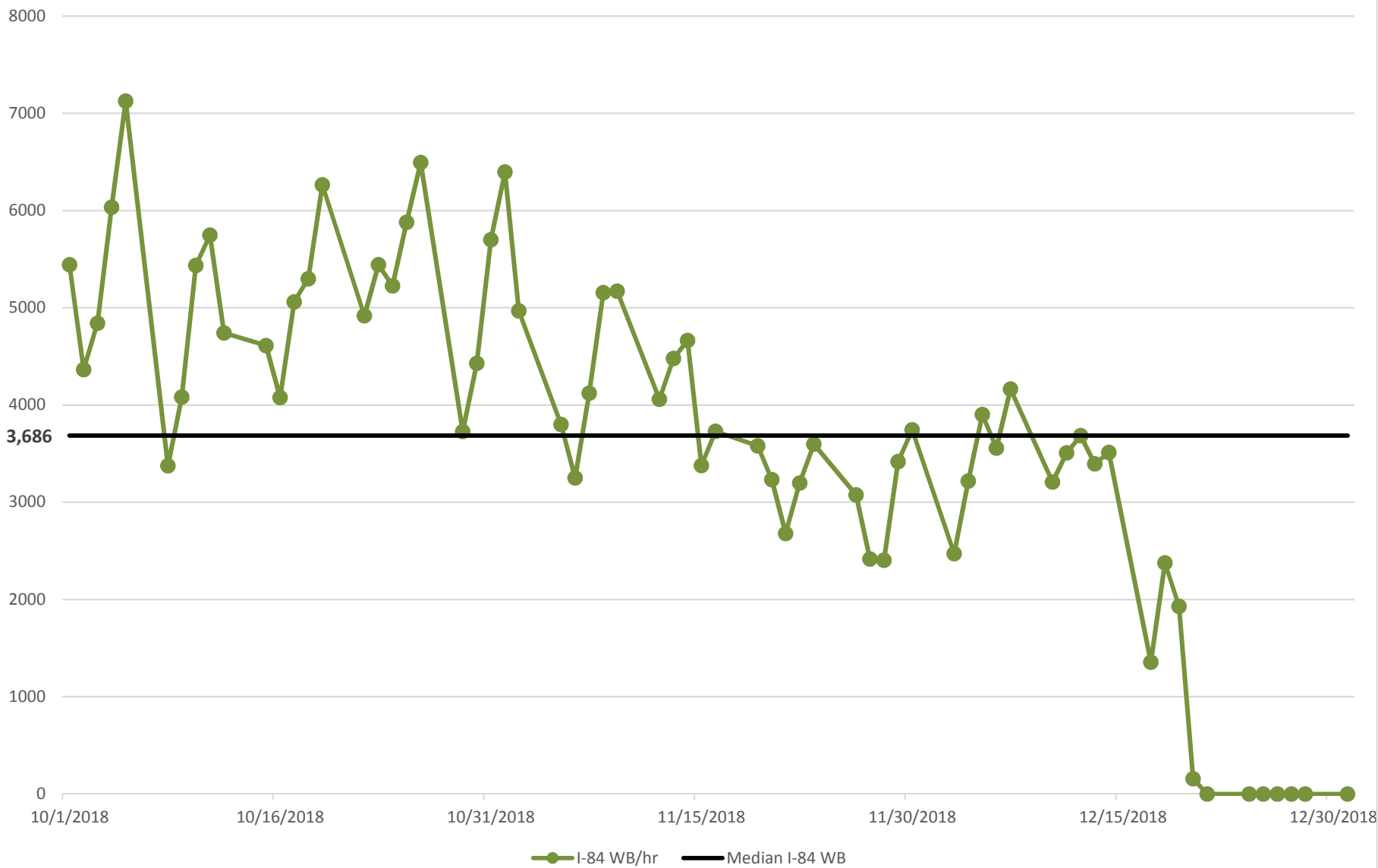
I-84 WB Mean Speed

I-84 EB Average Daily Volume (veh/hr) - 4th Quarter 2018 (Construction Hours: M-F 9 pm to 6 am)



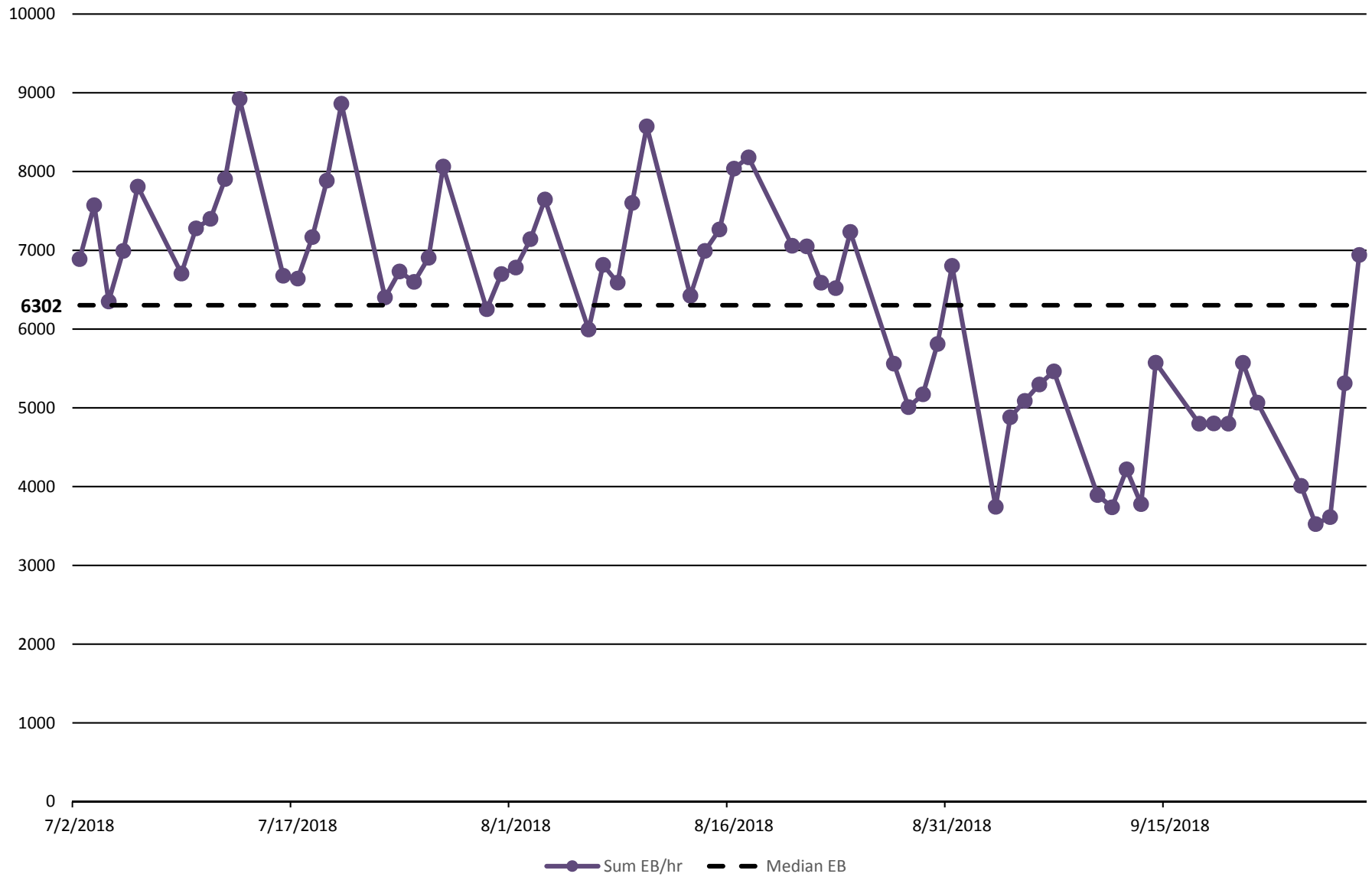
I-84 WB Average Daily Volume (veh/hr) - 4th Quarter 2018

(Construction Hours: M-F 9 pm to 6 am)



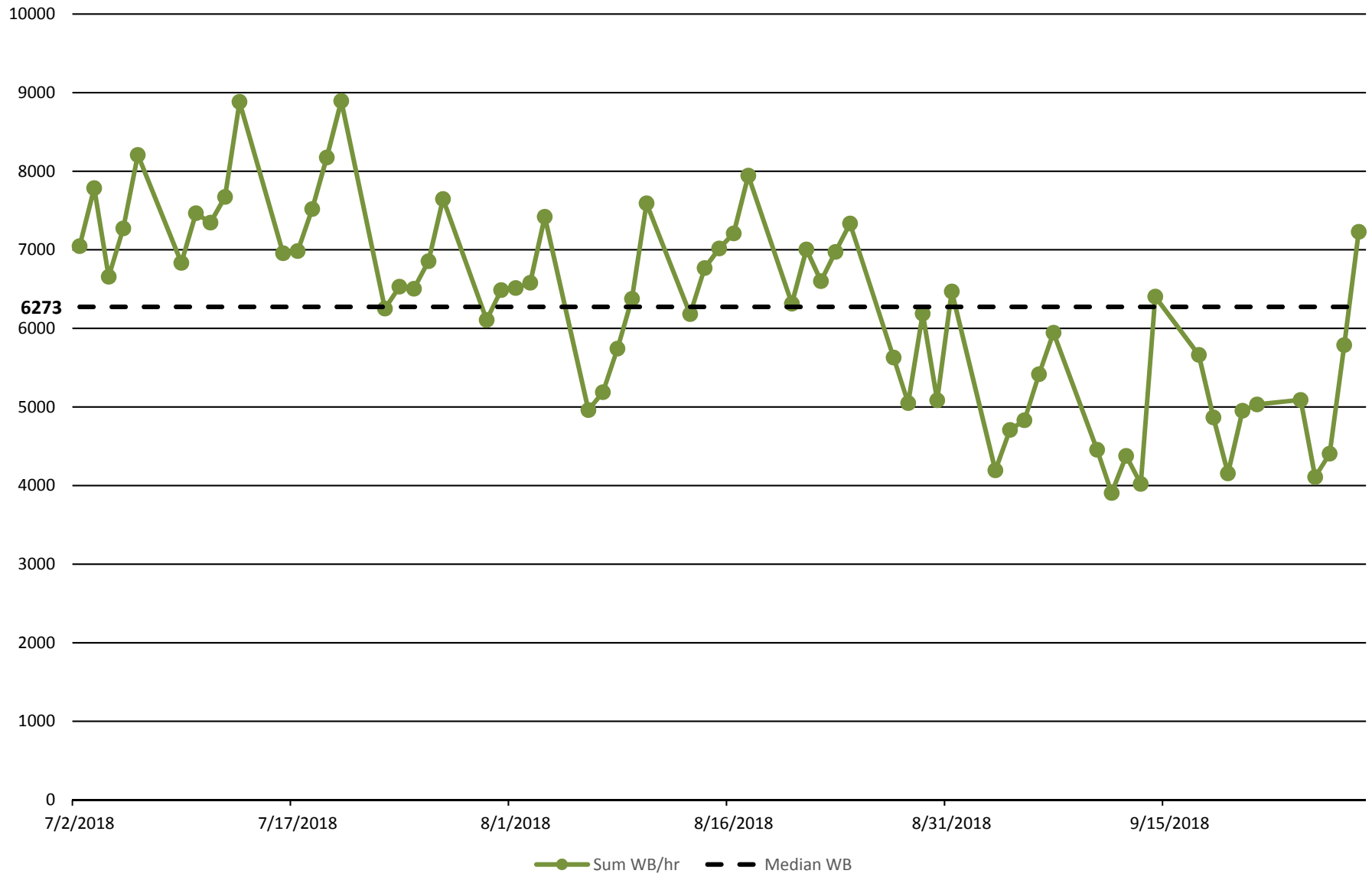
I-84 EB Average Daily Volume (veh/hr) - 3rd Quarter 2018

(Construction Hours: M-F 9 pm to 6 am)



I-84 WB Average Daily Volume (veh/hr) - 3rd Quarter 2018

(Construction Hours: M-F 9 pm to 6 am)





2019 Work Zone Safety and Mobility Process Review Final Report

APPENDIX 5: WORK ZONE RISK ASSESSMENT

Work Zone Risk Assessment Evaluation Form

WORK ZONE RISK ASSESSMENT EMPHASIS	YES	NO
1. Managing Speeding in Work Zones	<input type="checkbox"/>	<input type="checkbox"/>
2. Mitigating Work Zone Crashes	<input type="checkbox"/>	<input type="checkbox"/>
3. Advance Warning Area (Signs)	<input type="checkbox"/>	<input type="checkbox"/>
4. Work Area Protection of Construction Activities in Close Proximity to Live Traffic	<input type="checkbox"/>	<input type="checkbox"/>
5. Confusing Signage Leading to Improper Guidance	<input type="checkbox"/>	<input type="checkbox"/>

6. Proper Installation and Removal of Signs in Accordance to Procedures	<input type="checkbox"/>	<input type="checkbox"/>
7. Use of Rolling Road Block Procedure	<input type="checkbox"/>	<input type="checkbox"/>
8. Back of Queue Management	<input type="checkbox"/>	<input type="checkbox"/>



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APPENDIX 6: TRAVEL TIME TOOL FOR VISUALIZATION

TRAVEL TIME TOOL FOR VISUALIZATION (T3V)

A.K.A.

“POOLED FUND TASK 4”

“RITIS TOOLS”

ACCESS AND REGISTRATION

- EVERY CTDOT EMPLOYEE HAS ACCESS TO THE TOOLS (T3V)
- EVERY MPO EMPLOYEE HAS ACCESS TO THE TOOLS
- CONTRACTORS MAY HAVE ACCESS WHEN WORKING FOR THE MPO OR THE CTDOT
- DATA USE RESTRICTIONS APPLY IN ALL CASES
- WWW.RITIS.ORG
- “REQUEST AN ACCOUNT”
- WAIT FOR CONFIRMATION FROM RITIS

WHAT IS THE DATA THAT WE CAN VISUALIZE

- NATIONAL PERFORMANCE MANAGEMENT RESEARCH DATA SET (NPMRDS)
- PROBE DATA RECORDING THE TRAVEL TIME OF VEHICLES OVER “TRAFFIC MESSAGE CHANNELS” (TMCs) EVERY 5 MINUTES
 - PASSENGER CARS AS WELL AS TRUCKS
 - TMCs ARE TYPICALLY AROUND 0.5 MILES LONG (CAN BE LONGER OR SHORTER)
 - TMCs ARE DIRECTIONAL (THERE IS ONE TMC FOR EACH HIGHWAY SEGMENT IN EACH TRAVEL DIRECTION)

WHAT IS THE DATA THAT WE CAN VISUALIZE

- THERE IS NO DATA IMPUTATION IN THE NPMRDS
 - EITHER MEASURED DATA OR BLANK DATA (TYPICALLY LATE AT NIGHT)
- THERE IS THE POSSIBILITY OF SEEING “AVERAGE HISTORIC” TRAVEL TIMES USING AN EXPANDED DATA SET
- DATA CAN BE CONVERTED TO TRAVEL SPEEDS
 - $\text{TRAVEL SPEED} = \text{TMC LENGTH} / \text{TMC TRAVEL TIME.}$

WHERE IS DATA AVAILABLE?

- NATIONAL HIGHWAY SYSTEM
- EXPANDED ROAD NETWORK (MOST STATE-NUMBERED ROUTES), PROVIDED BY DATA VENDOR (INRIX)

RULES FOR DATA USE (RESTRICTIONS)

- EVERY DOT & MPO EMPLOYEE CAN CREATE AN ACCOUNT AND GET THE RITIS TOOLS
 - APPLIES TO CONTRACTORS WHILE DOING WORK ON A DOT/MPO PROJECT
 - NEEDS TO BE APPROVED BY DOT PRIOR TO ACCESS BEING PROVIDED
- RAW DATA CANNOT BE SHARED OUTSIDE DOT/MPO
 - BASICALLY, CANNOT PROVIDE ACCESS TO DATA SO THAT SOMEONE ELSE CAN RE-CREATE THE TOOLS PROVIDED
- VISUALIZATIONS AND ANALYSES CREATED BY DOT / MPO CAN BE SHARED
- QUESTIONS PLEASE ASK ME (EDGARDO.BLOCK@CT.GOV) – X2495

WHY DID WE GET THIS DATA?

- REPORT SYSTEM RELIABILITY METRICS TO FHWA AS PART OF THE MAP-21/FAST ACT FRAMEWORK OF NATIONAL PERFORMANCE MEASURES
- UNDERSTAND CONGESTION AND RELIABILITY
- OBTAIN BETTER INSIGHTS INTO HOW THE NETWORK IS PERFORMING AND HOW INDIVIDUAL LOCATIONS ARE PERFORMING

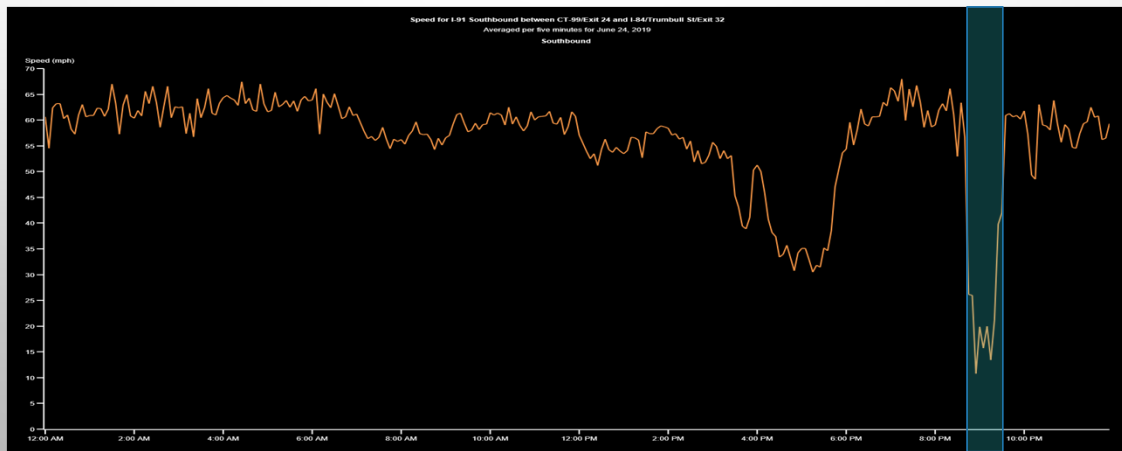
POTENTIAL APPLICATIONS

- PERFORMANCE MANAGEMENT
- CONGESTION MANAGEMENT (SCREENING TOOL FOR SIMULATION STUDIES ON CORRIDORS)
- ESTIMATION OF USER DELAY COSTS (NETWORK CONGESTION + OUR PROJECTS ON ROADS)
- WORK ZONE MANAGEMENT
- INCIDENT MANAGEMENT
- PRESENTATIONS TO DECISIONMAKERS AND STAKEHOLDERS
- **MANY OTHERS THAT WE WILL BE FINDING OUT AS WE USE THE TOOLS**

IMPACT OF WORKZONE ON TRAVEL SPEED (COURTESY COLIN BAUMMER)

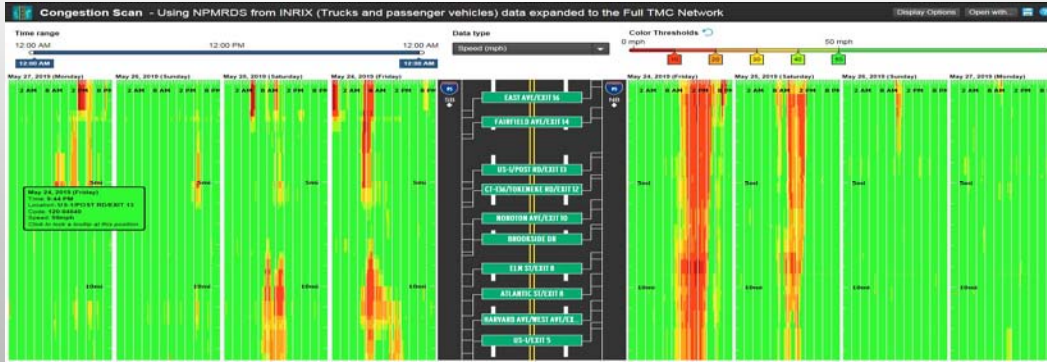
- I-91 SB BETWEEN RTE 99 (EXIT 24) AND I-84 TRUMBULL STREET (EXIT 32), JUNE 24, 2019
- WORKZONE REVIEW – ROLLING ROAD BLOCK TO CLOSE A LANE (8:45PM START) – ROAD OPENED 30 MIN. LATER

IMPACT OF WORKZONE ON TRAVEL SPEED (COURTESY COLIN BAUMMER)



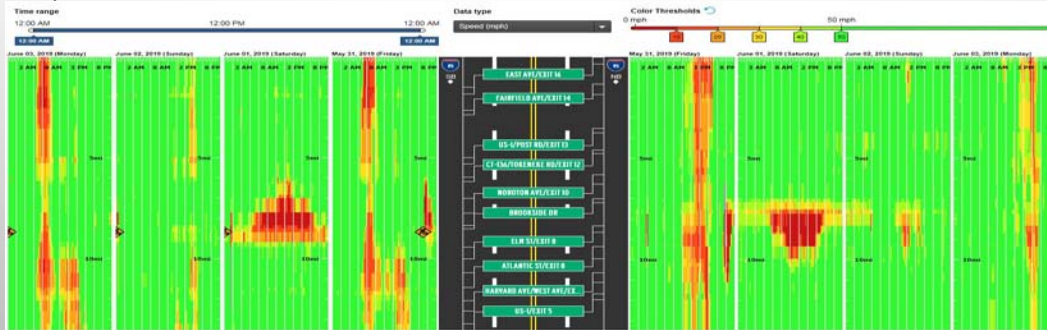
US 1/ I-95 ABC PROJECT IN STAMFORD (MAY 31-JUN 2 AND JUN 7-JUN 9)

May 24-May 27 (Memorial Day Weekend)



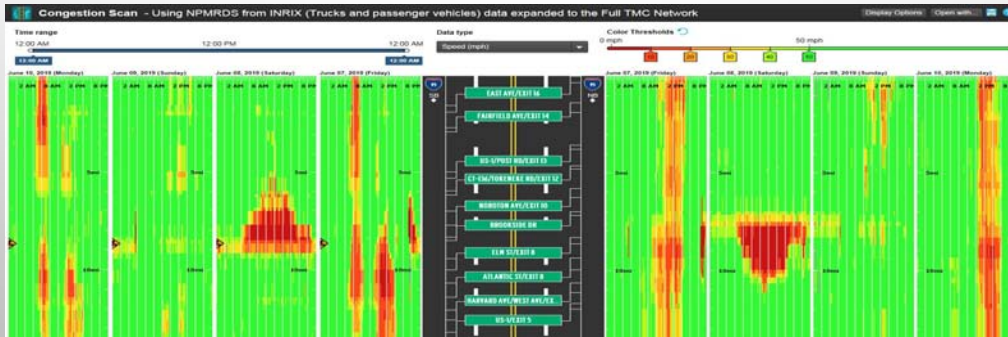
US 1/ I-95 ABC PROJECT IN STAMFORD (MAY 31-JUN 2 AND JUN 7-JUN 9)

May 31 - June 3



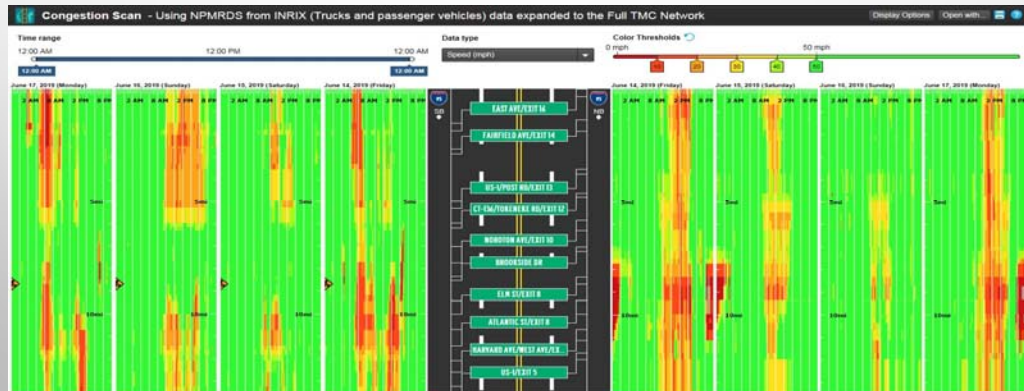
US 1/ I-95 ABC PROJECT IN STAMFORD (MAY 31-JUN 2 AND JUN 7-JUN 9)

Jun 7 – Jun 10

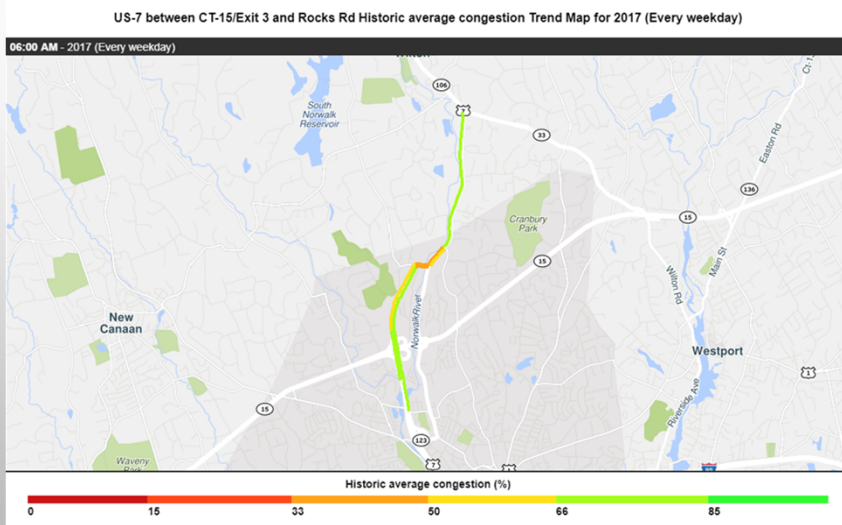


US 1/ I-95 ABC PROJECT IN STAMFORD (MAY 31-JUN 2 AND JUN 7-JUN 9)

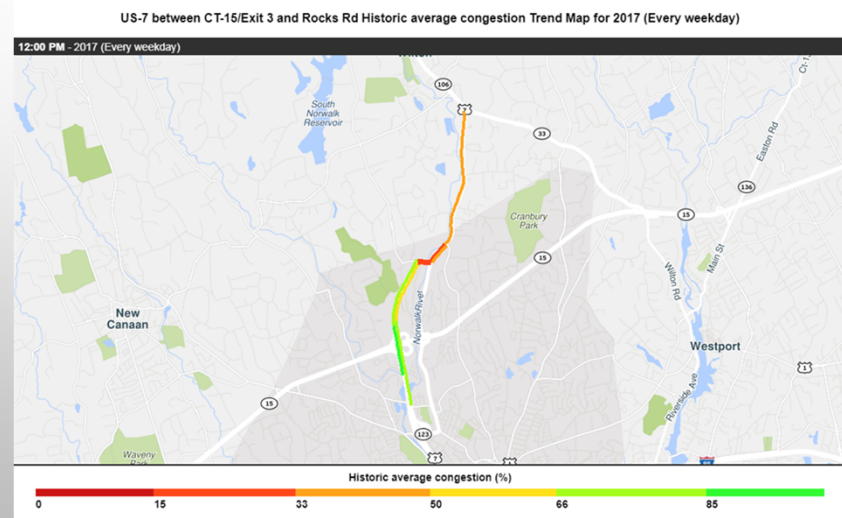
Jun 14 – Jun 17



US 7 AT GRIST MILL ROAD, NORWALK

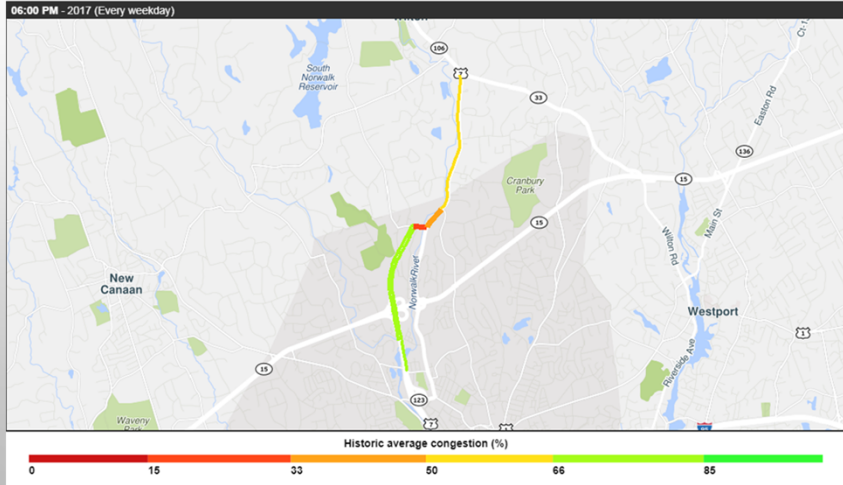


US 7 AT GRIST MILL ROAD, NORWALK



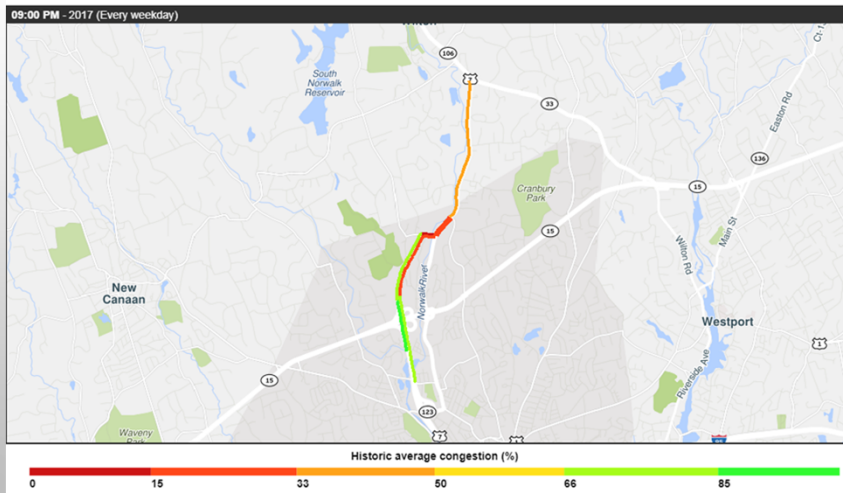
US 7 AT GRIST MILL ROAD, NORWALK

US-7 between CT-15/Exit 3 and Rocks Rd Historic average congestion Trend Map for 2017 (Every weekday)

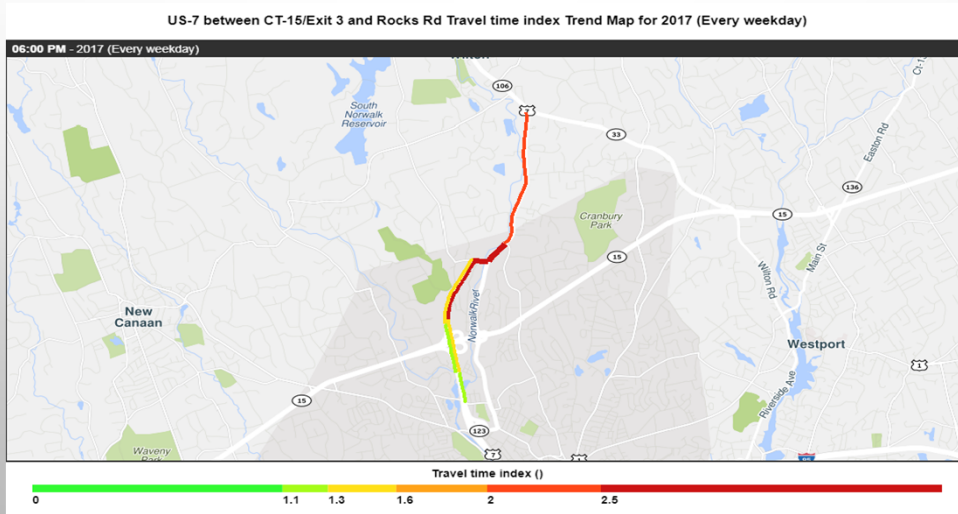


US 7 AT GRIST MILL ROAD, NORWALK

US-7 between CT-15/Exit 3 and Rocks Rd Historic average congestion Trend Map for 2017 (Every weekday)



US-7 AT GRIST MILL ROAD, NORWALK (TTI)



LIVE DEMO

- WWW.RITIS.ORG