Evaluation of Variable Speed Limits on I-270/I-255 in St. Louis

RI08-025

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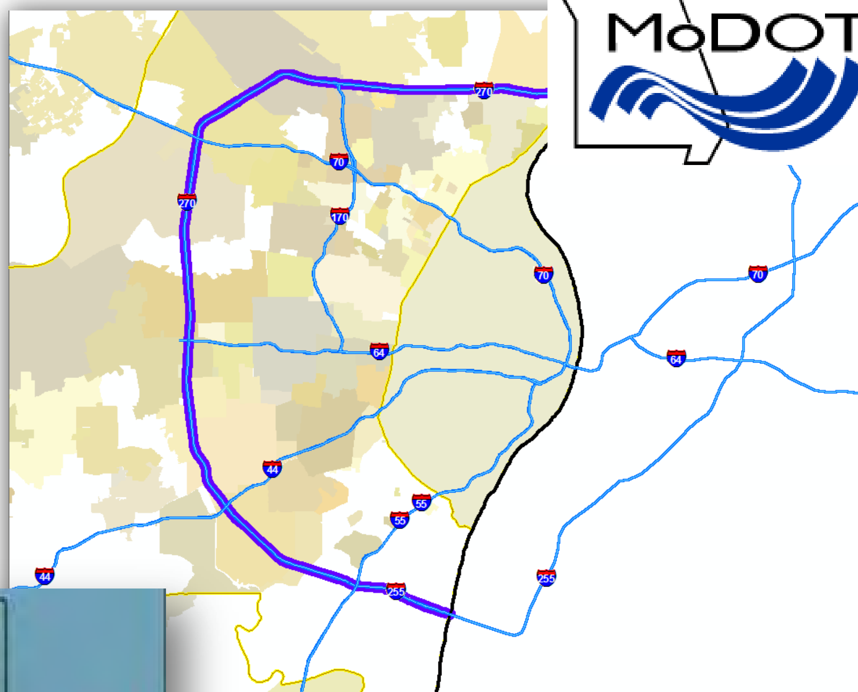

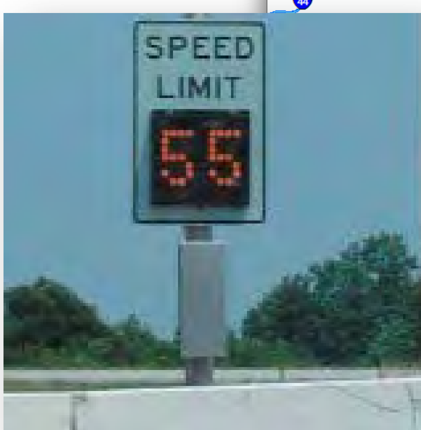

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Appendices: Evaluation of Variable Speed Limits on I-270/I-255 in St. Louis

Prepared for
Missouri Department of Transportation
Organizational Results

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In May of 2008, MoDOT installed a "Variable Speed Limit" (VSL) system along the I-270/I-255 corridor in St. Louis. This project evaluated the VSL system and its potential impacts and benefits to the transportation users. The technical system evaluation focused on three areas - mobility, safety, and public and police perceptions. The VSL is not performing as desired in terms of improvements to overall mobility along the corridor, but is providing limited benefits to some segments. Noticeable benefits have been seen with respect to reduction in the number of crashes during the evaluation period. The driving public and law enforcement are widely dissatisfied with the VSL system based on their perceptions of benefits to congestion relief, compliance with posted speed limits, and overall visibility of the current sign configuration.</td></tr>
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A. METHODOLOGIES

1.0 MOBILITY

Variable Speed Limit (VSL) signs were initiated on May 22nd, 2008 along 38 miles of I-270/I-255 in St. Louis County to vary speed limit during recurring and nonrecurring periods to manage traffic congestion. The system allows speed limits to be varied in near real time based on actual traffic conditions. This is the first of its kind implementation in the state of Missouri and this study evaluates the system based on different measures of performance.

The evaluation of the VSL system was carried out using data from pre-VSL initiation period to compare the results with post-VSL initiation. Pre-VSL initiation data prior to May 22nd 2008 served as the baseline data in evaluation of the VSL system. Post-VSL refers to the system after the initiation of the variable speed limits.

This section presents the methodology for two types of analysis a) uncontrolled analysis, and b) controlled analysis. Uncontrolled analysis was based on data for recurring and non-recurring congestion for all weather conditions. The results are based on monthly averages for different measures of performance. Controlled analysis was carried out for recurring congestion only for traffic conditions that were very similar during pre- and post-VSL conditions. Additionally, only days with clear weather conditions were selected for analysis. Since the traffic conditions were similar for limited number of days, the results are presented for those days only.

1.1 Evaluation Methodology

This section presents the VSL system evaluation methodology conducted over time and space for four congested segments of I-270 identified by the Missouri Department of Transportation (MoDOT). Table 1.1 lists and Figure 1.1 presents these segments. These segments were evaluated based on several tasks described in the next section. The evaluation of the segments was carried out for peak periods mainly as VSL signs are active during these periods.

Table 1.1 Segments evaluated on I-270

Segment Nos.	Direction	On I-270 Between
1	SB	I-64 and Route 100
2	NB	Route 30 and I-44
3	EB	Route 370 and I-170
4	WB	Route 367 and I-170

Four segments, presented in Table 1.1, were evaluated based on several different performance measures defined in the evaluation framework that is comprised of several tasks that will be explained in the next section. Segments 1 and 2 were found to be the most congested segments on I-270 during peak travel periods. For VSL system evaluation, three weekdays; Tuesdays, Wednesdays and Thursdays were mainly selected for analysis. Data analysis indicated that Thursdays had the highest traffic volume during the week. Since the main purpose of the VSL system was to increase speed, throughput, and decrease congestion, days with the highest traffic volume provided better evaluation and comparison between pre- and post-VSL system conditions.

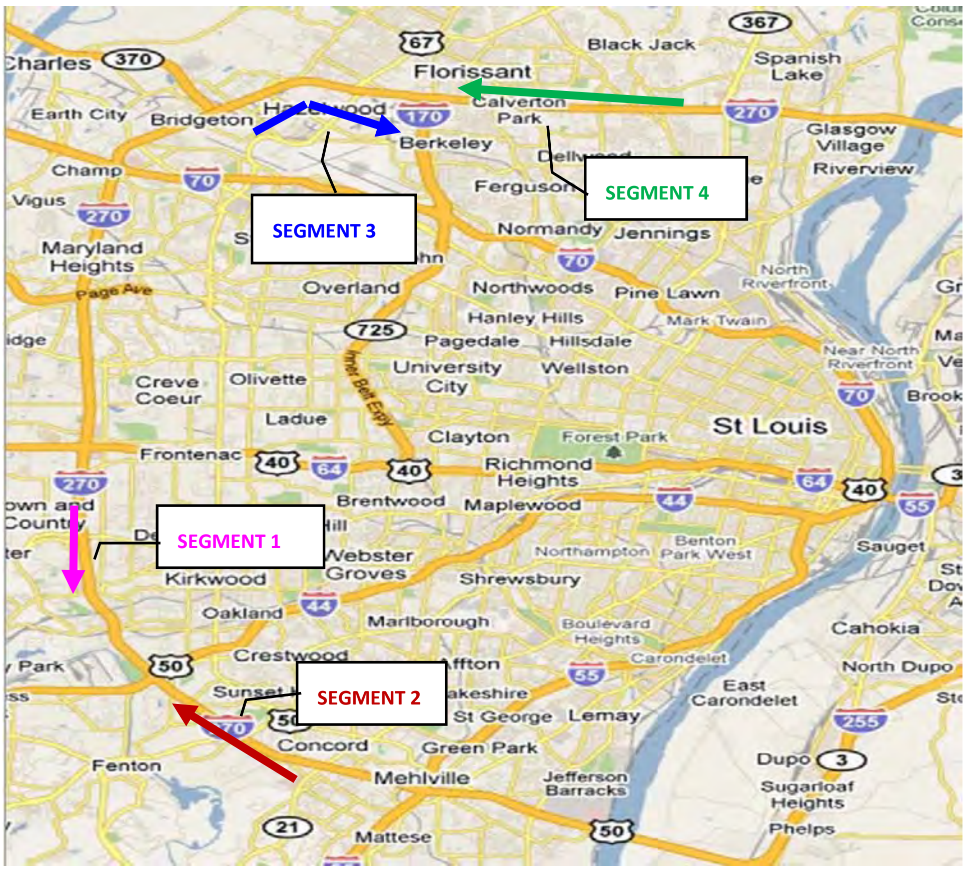


Figure 1.1 Selected segments on I-270

The VSL data were provided by HDR, Inc. to Missouri University of Science and Technology and were obtained by MoDOT from Remote Traffic Microwave Sensors (RTMS) spaced at various distances on I-270/I-255. Similarly, variable speed limit data provided by HDR, Inc. were obtained from ASTI, Inc. and were used in the evaluation of implementation of the VSL system. Traffic data which included volume, occupancy and average speed were available for every 30 seconds. For the different evaluation tasks carried out, the traffic data were averaged out for 1, 5 and 15 minutes as considered appropriate for different evaluation tasks.

The variable speed limits are varied mainly during peak periods and/or during incident conditions. At other times, the variable speed limit signs display 60 mph speed limit (maximum allowable speed limit by regulation). The minimum posted static and variable speed limit is 40 mph (minimum allowable speed limit by regulation). Mainly peak period data were used for evaluation of the VSL system. Peak periods can be defined as that part of the day during which traffic flow is highest compared to other times of the day. Peak periods were determined graphically from plots of traffic volumes and average speed profiles.

I-270/I-255 has five lanes on certain segments and three lanes at other locations. Lane 1 indicates the left most lane and the lane number increments toward the right. Lane 1 is mostly used as a passing lane. The outer shoulder lane (Lane 4 or 5) is used as an exit and entrance lane. The lane closest to the outer shoulder lane is used by heavy vehicles and vehicles merging into the main lanes or exiting the highway. Thus, lanes 2 and 3 were mostly used by through traffic and had the most stable traffic flow in case of 4 or more lanes in one direction. Therefore, traffic flow patterns in these lanes were most likely due to the VSL system and more than random fluctuations in traffic. Measures of performance for lane 2 and average of all lanes were used in detailed evaluation of the VSL system. The various tasks used in evaluation of the segments are presented next.

1.2 Description of Tasks

The VSL system evaluation consisted of six major tasks for both un-controlled and controlled data set. Additional evaluation tasks were added later and the final tasks are presented below:

- Task 1.1: Volume and Occupancy Analysis
- Task 1.2: Average Speed/Lane by Posted Speed Limit During Peak Periods
- Task 1.3: Speed Limit During Peak Periods
- Task 1.4: Speed Limit Compliance by Posted Speed Limit
- Task 1.5: Evaluation of Highway Capacity
- Task 1.6: Evaluation of Congestion Measures
- Task 1.7: Analysis of VSL System During Inclement Weather
- Task 1.8: Roadway Segment Evaluation using GPS Data

These evaluation tasks are described next.

Task 1.1: Volume and Occupancy Analysis

I-270 was analyzed to evaluate the change in average traffic volume before and after the initiation of the VSL system. To study the effect of volume, volume profiles for different dates and lanes were plotted and the differences were recorded. The changes in traffic volume were accounted to discern its effect on average speed, travel time, congestion measures, etc.

Traffic volume or flow versus occupancy curves were plotted for analysis of critical occupancy. Occupancy data was provided by MoDOT is commonly determined as the percentage of time when a short section of the highway is occupied. Higher occupancy indicates that a highway section was occupied for longer periods of time indicating that the vehicle speeds were lower and density was higher keeping the detector occupied. When higher occupancy is observed over time, it indicates congested state of traffic. When occupancy is low it indicates lower traffic volume, higher vehicle speeds and lower value of traffic density indicating uncongested state of traffic. The critical occupancy is defined as the occupancy at which highest flow (volume) is observed. Figure 1.2 presents the values of critical occupancies for pre- and post-VSL system installation conditions i.e., 10.5% and 12.8%, respectively.

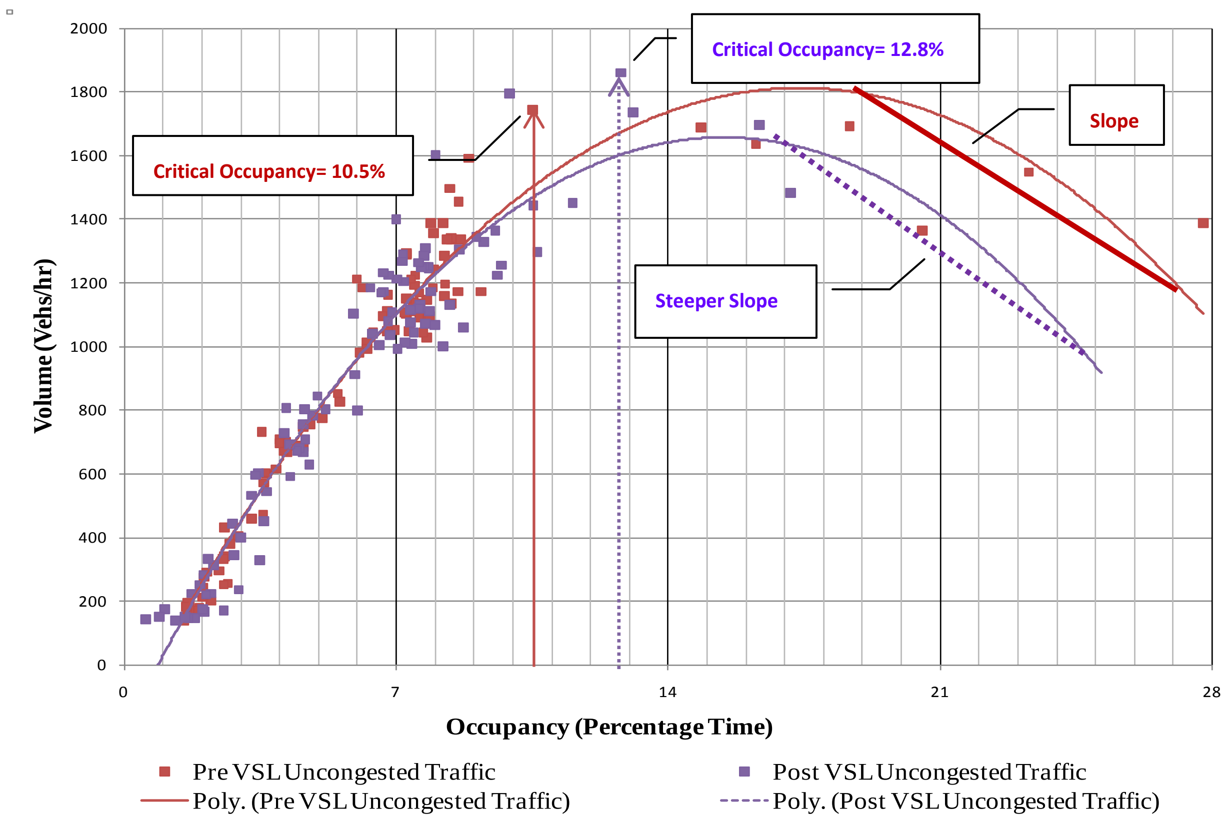


Figure 1.2 Flow Occupancy Plot indicating Critical occupancy

On a volume-occupancy curve such as Figure 1.2, the slope of the line indicates average speed. When speed limits are lowered, the volume-occupancy curve is affected and two observations are most important as evident from Figure 1.2, i) the critical occupancy can be higher for lower posted speed limit compared to critical occupancy for higher speed limit; ii) the slope of the line that fits the volume occupancy curve (the right side of the curve which represents congested traffic condition) shows a slight change in slope. The steeper the slope of the line the faster the speeds of the vehicles, whereas flatter slope indicates lower speed of vehicles. Lower speed past the critical occupancy results in higher volume and congestion is delayed. This volume-occupancy relationship was compared for pre- and post-VSL data.

Task 1.2: Average Speed/Lane by Posted Speed Limit during Peak Periods

The evaluation objective was to compare the mean speeds per lane before and after the initiation of the VSL system. The speed differential, the mean, standard deviation, and statistical analysis of speeds between lanes were evaluated. The mean speeds were averaged for peak periods and compared for pre- and post-VSL conditions along the highway. Average volumes were also plotted with the average speeds to compare the speeds and volumes along the highway.

Standard deviation is a measure of dispersion between data points. Standard deviation in speeds is a measure of dispersion between weighted mean values of speed. The weighted mean value of speed is similar to an arithmetic mean, however, instead of each of the data points contributing equally to the final value, speed with higher volume weights heavily. Standard deviation equals the difference of sample value from the weighted mean value. Speeds averaged for every 5 minutes were used for standard deviation calculation. The sample weighted mean speed can be expressed as:

$$\overline{\mathrm{X}} = \frac{\sum_{i=1}^{N} \mathrm{W_i X_i}}{\sum_{i=1}^{N} \mathrm{W_i}} \tag{1}$$

And the sample standard deviation is expressed as:

$$\sigma = \sqrt{\frac{1}{N-1} \sum_{i=1}^{N} (\mathrm{X_i} - \overline{\mathrm{X}})^2} \tag{2}$$

where:

$\overline{\mathrm{X}}$ = weighted mean speed miles per hour,

N = number of observations,

X_i = i^{th} speed observation, miles per hour,

W_i = number of observations with speed X_i, and

σ = Standard Deviation of N observations, miles per hour.

Standard deviation in speed across lanes indicates the dispersion in the average speed of each lane. Several studied have suggested that difference in speeds across lanes is a major cause of crashes; the greater the speed differential between vehicle speeds across the lanes, the higher is the probability of crashes. A lower value of standard deviation in speeds across the lanes indicates speed homogeneity.

Task 1.3: Speed Limit during Peak Periods

The objective of this task was the evaluation of the posted variable speed limit during peak periods. This task concentrated in evaluating speed during peak periods mainly because VSL system is most active during peak periods. This evaluation determined the effectiveness of the system logic and the traffic flow parameters used for determining the appropriate speed limit.

Table 1.2 Zones defined on I-270 for VSL system initiation

ZONES	DIRECTIONS	ROUTE	LOGMILE RANGE
A	EB, WB	I-255	0.00 - 3.99
B	SB, NB	I-270	0.00 - 6.13
C	SB, NB	I-270	6.13 - 12.64
D	SB, NB	I-270	12.64 - 20.32
E	SB, NB	I-270	20.32 - 26.50
F	EB, WB	I-270	26.50 - 35.30

MoDOT has divided I-270 into six zones or segments (as referred to in this report) for modifying the variable speed limits. Out of these six segments, four were evaluated for this project. Table 1.2 presents the details of these zones. In a zone, if the average occupancy for a lane is greater than 7%, and the average lane volume is less than 10 vehicles, the system will check the average highway speed at 30-second intervals for that zone. If the average highway speed is less than 60 mph, the system recommends the variable speed limit to be reduced to less than 60 mph. The recommended speed is similar to speeds on congested segments, rounded up to the nearest possible 5-mph interval speed limit. This task evaluated if the VSL logic explained above was initiated accurately, the time lag for VSL initiation i.e., decrease and increase in variable speed limit, the identification of critical detectors in the zone for system initiation and its effect on the upstream and downstream speed limit signs and traffic conditions. This evaluation task was carried out for controlled data analysis only.

Task 1.4: Speed Limit Compliance by Posted Speed Limit

Speed compliance is an important performance measure because if the driver compliance is low then the change in speed limit will be of little use and the VSL system will have a low level of effectiveness. Low level of compliance will indicate that drivers drive at their desired speed compared to the posted speed limit and the installation of the VSL system has limited impact on drivers and is not effective. Higher level of driver compliance, in contrast, would indicate the system is effective in terms of decreasing or increasing the speeds of drivers and the drivers follow the posted speed limit.

Speed compliance was evaluated using average speed data for pre- and post-VSL system initiation aggregated for 30-second intervals during peak hours. Comparing the average speeds at peak period with the posted speed limit will indicate if the drivers followed the speed limit. Comparison was conducted for average speed of each lane to identify the lanes above and below the posted speed limit. This indicates if the drivers followed the desired speed, posted speed or drove at a speed as a result of traffic congestion.

The percent of drivers that complied with the posted speed limit were evaluated for peak periods. The average speeds and traffic count corresponding to the peak period were analyzed. Average speeds plus 5 mph were considered complying with the posted speed limit and were recorded. Average speeds were discarded when occupancy was more than 30% (NCHRP Report 398). The threshold for congestion is based on 30% occupancy. Occupancy, however, was not suggested as an appropriate measure. Thirty percent occupancy indicated congested state of traffic and vehicles' speeds were lower as a result of congestion and not compliance with the posted speed limit. Percent of vehicles that complied with the posted speed limit were calculated as:

$$\text{Percent of complied vehicles} = \frac{\text{Count of complied vehicles}}{\text{Count of all vehicles}} * 100 \qquad (3)$$

This task was carried out for controlled data analysis only.

Task 1.5: Evaluation of Highway Capacity

Highway capacity is an important parameter as it is required in many phases of planning, design, operation and maintenance. Highway Capacity Manual (HCM, 2000) defines highway capacity as the maximum hourly rate at which vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under prevailing conditions. Capacity calculation methods have been debated based on the assumptions made for each model. For this report, the maximum observed flow of the segment is considered for capacity comparison in pre- and post-VSL conditions. It should also be noted that though the average speeds used for this task are time mean speeds, it did not affect the results because the plots are based on comparison of pre- and post-VSL systems.

Task 1.6: Evaluation of Congestion Measures

The congestion measures were travel times for the segment, delay as a result of change in travel time, and variables related to queue measurement. Travel times were measured using the time to travel for a segment, plus different indices were used to evaluate the reliability of arrival on-time. Furthermore, delay related measures were used to calculate the cost savings as a result of the VSL system.

Measuring mobility and reliability is a task performed in a variety of ways, in several different types of analysis, and for many purposes. Reliability measures are divided as individual measures and area measures. "Individual" measures relate best to the individual traveler such as Delay per Traveler, Travel Time, Travel Time Index, Buffer Time Index, and Planning Time Index whereas the "Area" measures are more applicable beyond the individual measure such as Delay, Congested Travel, Percent of Congested Travel. Individual measures such as Travel Time Index, Buffer Time Index, and Planning Time Index were calculated for peak periods for average of specific lanes and average of all lanes. The individual and area measures are described in the following.

The travel time in minutes can be determined as follows:

$$\text{Travel Time} = 60 * \text{Segment Length} / \text{Average speed} \tag{4}$$

where:

Travel Time = minutes,
Segment Length = length of segment, miles, and
Average speed = mph.

The travel time in person-minutes as it is commonly used can be determined as (NCHRP Report 618):

$$\text{Travel Time} = \text{Actual Travel Rate} * \text{Segment Length} * \text{Volume} * \text{Veh. Occupancy} \tag{5}$$

where:

Travel Time	= person-minutes,
Actual Travel Rate	= rate of travel, minutes per mile,
Volume	= vehicle count, vehicles, and
Vehicle Occupancy	= number of persons in a vehicle, persons/vehicles, 1.29.

In the above equation, Actual Travel Rate can be calculated as:

$$\text{Actual Travel Rate} = \frac{\substack{\text{Travel Time} \\ \text{(minutes)}}}{\substack{\text{Segment Length} \\ \text{(miles)}}} \qquad (6)$$

Actual Travel Rate can simply be calculated as:

$$\text{Actual Travel Rate} = \frac{60}{\substack{\text{Average Speed} \\ \text{(mph)}}} \qquad (7)$$

For calculation of travel time, archived data from I-270 aggregated for volume and average speed over 5-minute intervals were used. For vehicle occupancy a constant value of 1.29 persons per vehicle was used as suggested by MoDOT.

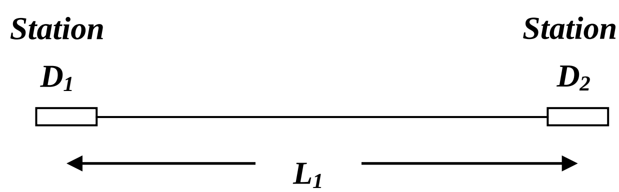


Figure 1.3 Illustration of Detector Stations and Distance between them

For this study, Equation 5 was modified to determine the travel time between two selected detectors (stations). The modified equation for travel time between two detectors stations as indicated in Figure 1.3 can be expressed as:

$$T_{\ 1-2} = \left[\frac{1}{2} \times \left[\frac{60}{V_{D_1}} + \frac{60}{V_{D_2}}\right] L_1\right] \times \left[\frac{1}{5} \times \left(\frac{VOL_{D_1} + VOL_{D_2}}{2}\right)\right] \times 1.29 \qquad (8)$$

where:

T_{1-2}	= travel time from station D_1 to station D_2, person-minutes,
L_1	= distance between station D_1 and station D_2, (similar to segment length in Equation 5), miles,

V_{D1}, V_{D2} = average speed measured at station D_1 and station D_2, respectively, mph,

VOL_{D1}, VOL_{D2} = average volume measured at station D_1 and station D_2, respectively, vehicles/5 minutes.

The terms in the above equation are very similar to Equation 5.

Travel Delay

For determination of congestion measures such as congestion intensity, duration, extent and variability, different variables were used. These variables quantify traffic congestion for pre- and post-VSL conditions. Delay and Percent of Congested Travel were used as measures for traffic congestion. The delay (in person- minutes) for a roadway segment is the sum of time lost due to congestion and can be expressed as:

$$\text{Delay} = (\text{Travel Time}_{\text{Pre-VSL}} - \text{Travel Time}_{\text{Post-VSL}}) * \text{Volume} * \text{Vehicle Occupancy} \quad (9)$$

where:

Delay = person-minutes,

$\text{Travel Time}_{\text{Post-VSL}}$ = travel time for post-VSL conditions, person-minutes, and

$\text{Travel Time}_{\text{Pre-VSL}}$ = travel time for pre-VSL conditions, person-minutes.

Travel time for the above equation was obtained from Equation 8. For the VSL study, however, Equation 9 was modified to calculate delay in minutes, as:

$$\text{Delay} = (\text{Travel Time}_{\text{Pre-VSL}} - \text{Travel Time}_{\text{Post-VSL}}) \quad (10)$$

where:

Delay = minutes,

$\text{Travel Time}_{\text{Post-VSL}}$ = travel time for post-VSL conditions, minutes, and

$\text{Travel Time}_{\text{Pre-VSL}}$ = travel time for pre-VSL conditions, minutes.

Travel time for the above equation was obtained from Equation 4. The Percent of Congested Travel is an extension of the congested travel measure. It also measures the extent of congestion. It is computed as the ratio of the congested segment minutes of travel to the total minutes of travel.

$$\text{Percentage of Congested Travel (\%)} = \text{Delay}/\text{Travel Time}_{\text{Pre-VSL}} \times 100 \quad (11)$$

For the above equation, Delay was calculated using Equation 10 and Travel time was calculated using Equation 4.

Travel Time Reliability

It is expected that large numbers of people try to reach their destinations during peak hours. Drivers are used to the everyday congestion and they plan ahead of time by leaving their origin early enough to reach their destination on time. It is the unexpected congestion that causes delay and frustration to travelers. A trip that usually takes a half-hour, with little or no warning, during congested conditions may take an hour.

Motorists are late for work, miss a doctor's appointment, or face hefty childcare penalties for picking kids late. Similarly, a trucker can get held up in unexpected traffic, making late shipments to the manufacturer, disrupting just-in-time delivery, and losing the competitive edge to other shippers. Travelers want travel time reliability as measured from day to day or across different times of the day. Drivers want to know that a trip will take a half-hour today, a half-hour tomorrow, and so on. To evaluate travel time reliability three indices Travel Time Index (TTI), Buffer Time Index (BTI) or Buffer Index (BI), and Planning Time Index (PTI) were calculated for peak period.

The Travel-Time Index (TTI) is a dimensionless quantity that compares travel conditions during the peak period to travel conditions during free-flow or posted speed limit conditions. TTI is expressed as (NCHRP Report 618):

$$\text{Travel Time Index} = \frac{\text{Actual Travel Rate}}{\text{FFS or PSL Travel Rate}} = \frac{\text{Actual Travel Rate}}{\text{PSL Travel Rate}} \tag{12}$$

where:

Actual Travel Rate = minutes per mile (calculated using Equation 7), and

Free flow speed (FFS), Posted Speed Limit (PSL) Travel Rate = minutes per mile.

In the above posted speed limit (PSL) travel rate was used. By definition, the free flow speed is the speed intercept when flow is zero on a calibrated speed- flow curve. In practical term, it is the average speed of the traffic stream when flow rates are less than 1000 vehs/hr/ln. For peak hour, flow rates are mostly more than 1000 vehs/hr/ln so for this project, PSL was used to calculate all indexes. PSL was used as a constant value of 60 mph for both pre- and post-VSL conditions, because if posted speed limit was reduced, this index naturally decreased and comparison between pre- and post-VSL will not be appropriate.

Planning-Time Index (PTI) represents the total travel time planned with an adequate buffer time included. Thus, the Planning Time Index compares near-worst case travel time to PSL travel time.

$$\text{Planning Time Index} = \frac{95^{\text{th}}\text{Percentile Travel Time}}{\text{PSL Travel Time}} \tag{13}$$

where:

PSL Travel Time = minutes (using Equation 4).

Figure 1.4 illustrates the relationship between TTI, BTI, and PTI. BTI represents the additional time that is necessary to be on-time for 95 percent of the trips, whereas the PTI represents the total travel time.

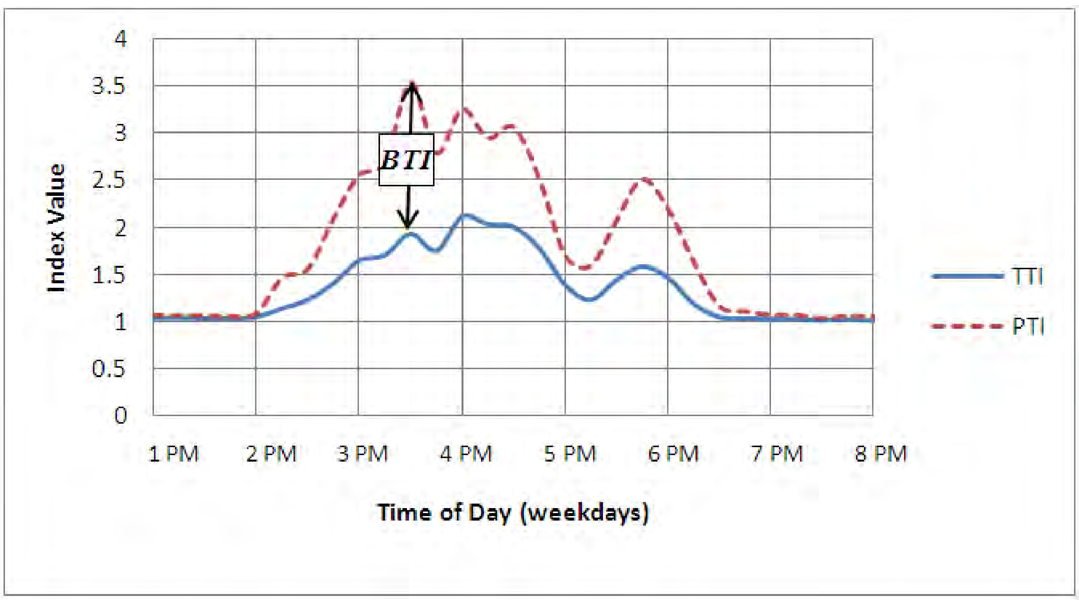


Figure 1.4 Travel Time Reliability Indexes

Buffer-Time Index (BTI) is a measure of trip reliability that expresses the amount of extra buffer time needed to be on-time for 95 percent of the trips. BTI is expressed as:

$$\text{Buffer Time Index} = \frac{\text{95th Percentile Travel Time} - \text{Average Travel Time}}{\text{Average Travel Time}} \tag{14}$$

where:

95^{th} Percentile and Average Travel Time = minutes (using Equation 4).

Cost Analysis

For cost analysis, travel time savings were calculated for cars and trucks. The median value of travel time associated with labor cost obtained from HDR Research was used in the analysis. For heavy vehicles, the median value was $43.88/hr and for passenger cars it was $22.36/hr. The proportion of heavy vehicles in traffic was 11.45% and this was obtained from MoDOT Annual Average Daily Traffic Count Maps data. These values were used to obtain a single multiplication factor for cost estimation of travel time savings, i.e. average labor cost equaled $24.82 [(0.1145*$43.88) + (0.8855*$22.36)]. Since, the assumptions are common for all four segments in both pre- and post-VSL system conditions, data comparison will not be affected. The average daily and annual labor costs were calculated as:

$$\text{Average Daily Labor Cost} = \text{Delay} * \text{Average Labor Cost}/60 \tag{15}$$

$$\text{Average Annual Labor Cost} = \text{Average Daily Labor Cost} * 250 \tag{16}$$

where:

Delay = person-minutes,
Average Labor Cost = $/hour,
Average Daily Labor Cost = $ person, and
Average Annual Labor Cost = $ person.

The Average Annual Labor Cost was calculated based on the assumption of 250 (average) workdays in a year. The resultant is dollars saved for miles of travel on a particular segment. For comparison between segments, Average Annual Labor Cost was divided by the length of the segment to calculate dollars saved per mile.

It should be noted that this cost analysis is a very high level assessment. There are many factors that can be considered and further analyzed. A complete in-depth cost analysis was beyond the scope of this report. This analysis was carried out to provide limited in-sight into a potential detailed cost analysis of the VSL system.

Measures Related to Queue

Queue extent is described by estimating the number of vehicles affected by congestion and by the geographic distribution of congestion. The route-miles, or lane-miles of the transportation system affected by congestion may be used to measure the geographic extent of mobility problems.

Duration can be defined as the length of time during which congestion affects the travel system. The peak hour has expanded to a peak period in many corridors, and duration, in other words is the time for which the congestion lasted.

The severity or intensity of congestion that affects travel is measured from an individual traveler's perspective. In concept, it is measured as the difference between the desired condition and the conditions being analyzed.

For this task, pre- and post-VSL conditions were compared. Average speeds aggregated at one minute intervals were used for this task to provide accurate estimates of various measures. Two dimensional time-space plots were generated for the highway segments and average speeds were indicated using different shades to differentiate different states of traffic. The duration was measured on the time axis (x-axis), whereas the extent and intensity can be observed on the space axis (y-axis). Areas portraying low speed indicated congestion and from different shades (colors) different intensities of congestion can be observed. This sub-task was carried out for controlled data analysis only.

Task 1.7: Analysis of VSL System during Inclement Weather

This task covers important aspects of Tasks 1.1-1.6 for inclement weather conditions. Inclement weather days include rain, snow, sleet, etc for evaluation of the system. This task also evaluates if the VSL system was initiated and was working during the inclement weather conditions and any effect on traffic flow parameters. This task was carried out for controlled data analysis only.

Task 1.8: Roadway Segment Evaluation using GPS Data

This task provides information on the assessment of roadway segments. The VSL system uses traffic data collected from permanent roadside detection units (referred to as detectors) that are spaced approximately every mile along the I-270 corridor. The traffic data is collected every 30 seconds and includes average speed and occupancy for the past 30-second time period. The Transportation Management Center (TMC) polls each detector and collects traffic data by each lane and direction of travel. This traffic data is sent by a Virtual Private Network (VPN) connection to the VSL system vendor. The vendor uses the traffic data to evaluate the need to change the speed limit (reduction or increase) based on the traffic data and the current speed limit displayed. The vendor sends proposal speed limit changes back to the TMC for implementation based on a speed limit change protocol.

These detectors play an important role in the operation of the VSL system. The roadway segment assessment does the following:

- Compared traffic data collected from actual field GPS travel runs (referred to as GPS runs) to detectors
- Assesses differences between GPS runs and detectors and explores potential reasons why
- Identify potential enhancement to improve VSL operations

This task was carried out separately from tasks explained above and the results are presented as a standalone section in Appendix B. While this assessment process is not necessarily essential in conducting the “before” and “after” conditions, since both conditions were evaluating under the same data process of using supplied detector data. It provides further additional insight into the operation of the VSL system. Actual field GPS travel runs were conducted on four (4) segments based on the criteria established in the following:

Tables 1.3 and 1.4 list the location of the segment, the first and last detector station, peak periods, and exit numbers for the evaluated highway segments. The roadway segment assessment plan developed in this evaluation set a minimum numbers of 12 GPS runs for every segment, three runs for each day i.e. on Tuesday, Wednesday and Thursday. Three to four different drivers from the evaluation team who live in St. Louis were used to conduct the GPS runs. These drivers were familiar with the corridor. Lanes 2 and 3 were used to establish consistency between this evaluation and the controlled mobility section.

Table 1.3 Location of Segments and Peak Period

Segments	I-270 between	Start MM*	End MM	Direction	Peak Period
1	I-64 and Route 100	12.4	10	SB	3:00 - 7:00 PM
2	Route 30 to I-44	3.6	5.7	NB	5:30 - 9:30 AM
3	Route 370 to I-170	21.4	25.1	EB	3:00 - 7:00 PM
4	Route 367 to I-170	31.6	26.9	WB	6:00 - 10:00 AM

*MM = mile markers

Table 1.4 Detectors and Exits Numbers

Segments	First	Last	Exit Numbers	
1	12	10	13	9
2	3	5	2	5B
3	21	25	20A	25B
4	31	26	31B	26B

Handheld GPS devices that can store location, time and traffic data were used to collect the field information. The GPS device collects location information (longitude and latitude), time of day, and travel time. This information is collected at a regular time interval as the vehicle travels down the roadway. This information is used to calculate distance between data collection points and average speed across the distance between data collection points.

The handheld GPS device collects and stores multiple data points as the driver travels through the designated segments in the above tables. These field GPS travel runs were conducted on June 22nd, 23rd, 24th, 29th, 30th and July 1st of 2010. MoDOT provided traffic data from the associated permanent vehicle detector stations for the same dates. This complete information in electronic format will be provided to MoDOT as part of this report.

Drivers were staggered and traveled through the designated AM or PM segments collecting data. Once the initial runs were completed, they would return and begin the second run. Drivers were experience traffic engineering staff who have conducted travel times runs previously. The drivers were asked to travel with the flow in their lane. If approaching a vehicle that appears to be traveling at a lower rate of speed than general speed of vehicles in adjacent lanes, then they could pass the vehicle.

GPS device was activated before entering the I-270 corridor upstream from where the segment began to ensure data collection started well before the segment. The GPS device was de-activated downstream after existing at an interchange past the end of the second peak segment. Traffic data stored in GPS device were then downloaded and processed upon returned to their St. Louis office.

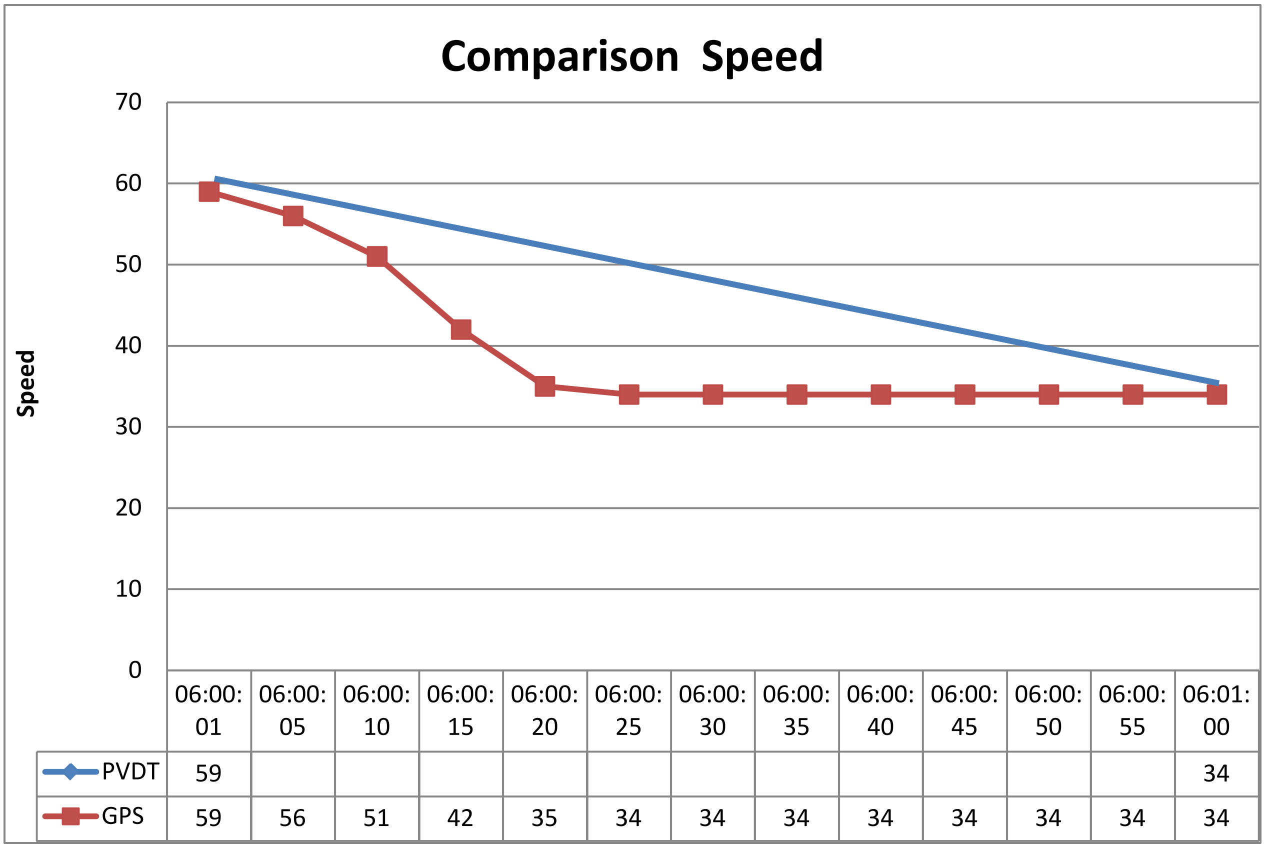
The VSL system uses traffic information from detectors to make operational decisions. These vehicle detector stations are located approximately every one mile along the corridor. The validation that traffic information being used in the VSL system operation will help confirm the reliability of traffic data being used in the VSL system operational decisions and could provide an opportunity to enhance the VSL system operations.

The straight-line method is used to determine the speed between two detectors. An example - detector #1 reports an average speed for a 30-second interval of 59 mph and detector #2 reports an average speed for a 30-second interval of 34 mph. Average speed is the average of all vehicles passing a detector area by lane in a 30 seconds interval. Comparing this average speed detector output with the GPS runs shows any differences and could lead to explaining why the differences might exist. Continuing with the example of two detector's average speed output above, the speed based on the straight-line method would be 46.5 mph and was calculated using this equation ($Speed_{D1}$ + $Speed_{D2}$)/2.

In actuality, there might be numerous potential paths (other than a straight-line path) between two detectors that define the traffic flow conditions. The following Figure 1.5 graph demonstrates an example of one potential path along with the straight-line path. The average across the other path was calculated by a similar equation ($Speed_{D1}$+$Speed_{D2}$+…+$Speed_{Dn}$)/n where n is the number speeds collected. The average speeds of the potential paths are 46.5 mph (straight-line path) and 40.76 mph (example GPS run path). The other path shows an earlier slow down.

The GPS device with the ability to gather multiple points between the same two detectors provides a more accurate description of the traffic conditions over the same segment between two detectors.

Segments' speed and travel times were calculated using detector data and compared to actual GPS travel runs. A high-level assessment was made at the hourly-interval period during peak periods. The hourly average speeds and average travel times were calculated from detector data and then compared to the average of several GPS runs conducted during that same time period. The detector's speed variance was also calculated across each hour to gain insight in the variation speed across the hour. The detector data is available at 30 second-intervals (120 data delivery periods per hour) and the variance assessment provides a view on how uniform the average speed is across the hour. This variance can also be a quick measurement on whether or not the GPS travel runs reflect what is being used to make decisions on VSL system operation.



	06:00:01	06:00:05	06:00:10	06:00:15	06:00:20	06:00:25	06:00:30	06:00:35	06:00:40	06:00:45	06:00:50	06:00:55	06:01:00
PVDT	59												34
GPS	59	56	51	42	35	34	34	34	34	34	34	34	34

Figure 1.5 Detectors and GPS Runs Data Example

This example shows how the straight-line path between two detectors could produce information that does not reflect actual field conditions collected from the GPS runs. The example further demonstrates using the detector's output speed output would not be as responsive to early traffic congestion formation when compared to actual GPS runs. Occupancy would reflect similar results based on its relationship with speed and congestion.

The run-level assessment was made on 119 individual GPS travel runs. Data collected by the GPS devices were compared to the detector data during the same specific (within one minute) time period. GPS travel runs were compared to Lane 2, Lane 3 and Combined (Lanes 2 plus 3), since specific lane information was not collected during the field runs with only the drivers being instructed to travel in either lane 2 or lane 3.

The value gained from the traffic data comparison and its associated assessment could provide further insight into potential enhancements to the VSL system's operation. This roadway segment evaluation explored how roadway segments transition from a free flow condition to a congested condition at a time when the VSL system is most frequently deployed.

2.0 SAFETY

2.1 Data Acquisition

The research team collected two types of data sets: 1) crash data, and 2) Annual Average Daily Traffic (AADT) data. This section briefly explains the data sets and ways to process them for the analyses.

2.2 Crash data

MoDOT provided the research team with 6 years (2004 through 2009) of crash data. Table 2.1 shows an example of the crash data provided. As shown in the table, each crash record includes information about the crash location, direction, time, severity, cause, surface, light, weather conditions, etc. From the data sets provided, a data dictionary was developed for each categorical field such as severity type (i.e. fatal, injury and property damage only), cause, weather, light, etc.

Table 2.1 Crash Data (Sample)

County	Desg	Travelway	Dir	Cont Log	Accident Class	Accident Date	Severity Rating	Image #	Intersection #	Log Unit	Intrsc	Intrchg	Grpd	Light Cond	Road Surf Cond	Weather Cond	Tway Id	Property Damage	Day of Week	Time
ST. LOUIS	IS	255	N	3.452	REAR END	2/2/2008	PROPERTY DAMAGE ONLY	80022779	315207	3.452	Y	Y		DARK W/ STREET LIGHTS ON	WET	CLEAR	6512	NONE	SAT	1900
ST. LOUIS	IS	255	N	3.452	REAR END	6/21/2008	PROPERTY DAMAGE ONLY	80090663	315207	3.452	Y	Y		DAYLIGHT	DRY	CLEAR	6512	NONE	SAT	1303
ST. LOUIS	IS	255	N	3.454	REAR END	12/8/2008	PROPERTY DAMAGE ONLY	80138310	315207	3.454	Y	Y		DAYLIGHT	ICE	FREEZING	6512	NONE	MON	756
ST. LOUIS	IS	255	N	3.463	OUT OF CONTROL	10/29/2008	PROPERTY DAMAGE ONLY	80135353	315207	3.463	Y	Y		DARK - NO STREET LIGHTS	DRY	CLEAR	6512	MODOT	WED	1910
ST. LOUIS	IS	255	N	3.502	OTHER	2/20/2008	PROPERTY DAMAGE ONLY	3.08E+09	0	3.502		Y		DAYLIGHT	DRY	CLEAR	6512	NONE	WED	1000
ST. LOUIS	IS	255	N	3.502	OTHER	2/20/2008	PROPERTY DAMAGE ONLY	3.08E+09	0	3.502		Y		DAYLIGHT	DRY	CLEAR	6512	NONE	WED	1005
ST. LOUIS	IS	255	N	3.513	REAR END	5/7/2008	PROPERTY DAMAGE ONLY	3.08E+09	0	3.513		Y		DAYLIGHT	WET	RAIN	6512	NONE	WED	1420
ST. LOUIS	IS	255	N	3.602	REAR END	5/5/2008	PROPERTY DAMAGE ONLY	80061535	0	3.602		Y		DAYLIGHT	DRY	CLEAR	6512	NONE	MON	705
ST. LOUIS	IS	255	N	3.656	REAR END	6/13/2008	PROPERTY DAMAGE ONLY	80080243	0	3.656		Y		DAYLIGHT	WET	RAIN	6512	NONE	FRI	1710
ST. LOUIS	IS	255	N	3.656	OUT OF CONTROL	6/21/2008	PROPERTY DAMAGE ONLY	80090667	0	3.656		Y		DAYLIGHT	WET	RAIN	6512	NONE	SAT	1510
ST. LOUIS	IS	255	N	3.671	REAR END	4/1/2008	PROPERTY DAMAGE ONLY	80045104	653666	3.671	Y	Y		DAYLIGHT	DRY	CLEAR	6512	NONE	TUE	1720
ST. LOUIS	IS	255	N	3.675	OUT OF CONTROL	5/7/2008	PROPERTY DAMAGE ONLY	80061582	653666	3.675	Y	Y		DAYLIGHT	WET	RAIN	6512	NONE	WED	1440
ST. LOUIS	IS	55	N	197.033	OUT OF CONTROL	10/4/2008	PROPERTY DAMAGE ONLY	80131812	314900	4.107	Y	Y		DARK W/ STREET LIGHTS ON	DRY	CLEAR	12	MODOT	SAT	300
ST. LOUIS	IS	55	N	197.033	DEER	10/26/2008	PROPERTY DAMAGE ONLY	80135269	314900	4.107	Y	Y		DARK - NO STREET LIGHTS	DRY	CLEAR	12	NONE	SUN	330
ST. LOUIS	IS	55	N	197.033	OUT OF CONTROL	5/19/2008	DISABLING INJURY	3.08E+09	314900	4.107	Y	Y		DAYLIGHT	DRY	CLEAR	12	NONE	MON	1302
ST. LOUIS	IS	55	N	197.033	REAR END	12/10/2008	PROPERTY DAMAGE ONLY	3.08E+09	314900	4.107	Y	Y		DARK W/ STREET LIGHTS ON	DRY	CLEAR	12	NONE	WED	1715
ST. LOUIS	IS	255	N	3.702	SIDESWIPE	1/31/2008	PROPERTY DAMAGE ONLY	80012151	314900	3.702	Y	Y		DAYLIGHT	SNOW	SNOW	6512	NONE	THU	1310
ST. LOUIS	IS	255	N	3.702	REAR END	1/31/2008	PROPERTY DAMAGE ONLY	80012159	314900	3.702	Y	Y		DAYLIGHT	WET	SNOW	6512	NONE	THU	1350
ST. LOUIS	IS	255	N	3.702	REAR END	7/25/2008	PROPERTY DAMAGE ONLY	80101904	314900	3.702	Y	Y		DARK - NO STREET LIGHTS	WET	FOG/MIST	6512	NONE	FRI	2100
ST. LOUIS	IS	55	S	12.889	PASSING	5/3/2008	PROPERTY DAMAGE ONLY	80061496	314884	4.827	Y	Y		DARK W/ STREET LIGHTS ON	DRY	CLEAR	13	NONE	SAT	57
ST. LOUIS	IS	55	S	12.889	REAR END	9/28/2008	PROPERTY DAMAGE ONLY	80131175	314884	4.827	Y	Y		NOT STATED/UNKNOWN	DRY	CLEAR	13	NONE	SUN	9999
ST. LOUIS	IS	55	S	12.889	OUT OF CONTROL	7/15/2008	PROPERTY DAMAGE ONLY	3.08E+09	314884	4.827	Y	Y		DAYLIGHT	DRY	CLEAR	13	NONE	TUE	2010
ST. LOUIS	IS	255	N	3.713	OUT OF CONTROL	6/6/2008	PROPERTY DAMAGE ONLY	80080119	314884	3.713	Y	Y		DARK W/ STREET LIGHTS ON	WET	RAIN	6512	MODOT	FRI	2140
ST. LOUIS	IS	255	N	3.713	FIXED OBJECT	9/24/2008	PROPERTY DAMAGE ONLY	80131090	314884	3.713	Y	Y		DAYLIGHT	DRY	CLEAR	6512	MODOT	WED	1710
ST. LOUIS	IS	255	N	3.713	OUT OF CONTROL	12/18/2008	PROPERTY DAMAGE ONLY	80146795	314884	3.713	Y	Y		DARK W/ STREET LIGHTS ON	WET	RAIN	6512	NONE	THU	2147
ST. LOUIS	IS	255	N	3.713	FIXED OBJECT	6/17/2008	MINOR INJURY	3.08E+09	314884	3.713	Y	Y		DAYLIGHT	DRY	CLEAR	6512	NONE	TUE	1155
ST. LOUIS	IS	255	N	3.713	REAR END	9/27/2008	PROPERTY DAMAGE ONLY	3.08E+09	314884	3.713	Y	Y		DAYLIGHT	DRY	CLEAR	6512	NONE	SAT	900
ST. LOUIS	IS	255	N	3.752	OUT OF CONTROL	2/11/2008	PROPERTY DAMAGE ONLY	80022964	650959	3.752	Y	Y		DARK W/ STREET LIGHTS ON	WET	CLOUDY	6512	NONE	MON	2200
ST. LOUIS	IS	255	N	3.759	OUT OF CONTROL	5/9/2008	PROPERTY DAMAGE ONLY	80061621	650959	3.759	Y	Y		DAYLIGHT	WET	CLOUDY	6512	NONE	FRI	1000
ST. LOUIS	IS	255	N	3.77	PASSING	9/26/2008	PROPERTY DAMAGE ONLY	80131140	314812	3.77	Y	Y		DAYLIGHT	DRY	CLEAR	6512	NONE	FRI	1655
ST. LOUIS	IS	255	N	3.913	REAR END	5/7/2008	PROPERTY DAMAGE ONLY	80061567	0	3.913		Y		DAYLIGHT	WET	RAIN	6512	NONE	WED	700

Comparing crashes on I-270 with other similar routes during the same time period provided more comprehensive and objective view on the overall trend. For this reason, the team also requested and was provided with crash data for other roadways that were similar and closely located to I-270. Table 2.2 lists the highway segments used in this study. The main reason for collecting crash information on the other routes was to provide regional safety influence that used Empirical Bayesian statistical evaluation method. In addition to crash data, Annual Average Daily Traffic (AADT) was also collected for the crash rate analysis for the same routes listed in Table 2.2.

Table 2.2 Highway Segments where Crash Data are acquired

		Starting Pt	Ending pt	miles
Interstate Highway	I-44	Antire Rd	Jefferson Ave	18.31
	I-270	I-55	LILAC AVE	35.05
	I-70	LP 70	Walnut	21.18
	I-170	I-270	Galleria Pkwy	11.13
	I55	Il State Line	MERAMEC BOTTOM RD	17.00
MO Highway	MO366	I44	Grand-Nos	18.86
	MO30	JEFFERSON CO LINE	CITY LIMIT	15.70
	MO100	Baxster Rd	6th St	18.43
	MO115	I70	I70 E JCT	10.25
	MO141	MO340	I55	21.40
	MO180	ST CHARLES ROCK RD	KINGSHIGHWAY	13.92
	MO340	LADUE RD	PENNSYLVANIA	11.30

It should be noted that when a crash at an interchange (or intersection) of a roadway, it could be reported to either of the intersecting roadways. To avoid confusion, MoDOT applies a protocol that the crash would be assigned and listed to the higher classified roadway with reference to secondary roadway. For example, if a crash happened at the interchange of I-270E and MO100E, it is reported on I-270 as the primary roadway and MO100E as a secondary roadway. Depending on the type of roadway used in the analysis, two different results can be obtained. For consistency and a realistic view of what occurred, this report includes crashes occurring on the mainline roadway for the I-270 and I-255 only.

2.3 Traffic Data - Annual Average Daily Traffic (AADT) data from MoDOT

Table 2.3 illustrates a sample of AADT data collected. As seen in the table, AADT information includes segment AADT counts along with segment name, starting and ending continuous logs, and direction.

Table 2.3: AADT Data (Sample)

MoDOT

TR50Y1

Missouri Department of Transportation
Transportation Planning
Traffic Information (TR50)
Sort: Year

June 19,2009
2:46:34 PM

2008 AADT

ST. LOUIS COUNTY

IS 270 E (Travelway Id : 6135)

Traffic Information (TR50)
Sort : Year

Description	Continuous Beg Log	Continuous End Log	Dir	Site ID	St Sys	FC	Section	Year	Quantity
IS 55 to MO 21	0.545	2.145	E		IS	IS	1	2008	77,902
			W		IS	IS			64,237
MO 21 to MO 30	2.145	3.915	E	742	IS	IS	1	2008	74,423
			W		IS	IS			71,448
MO 30 to IS 44	3.915	6.128	E		IS	IS	1	2008	80,396
			W		IS	IS			77,200
IS 44 to BIG BEND BLVD	6.128	7.634	E	736	IS	IS	2	2008	73,831
			W		IS	IS			72,574
BIG BEND BLVD to DOUGHERTY	7.634	8.734	E		IS	IS	2	2008	83,741
			W		IS	IS			82,347
DOUGHERTY FERRY RD to MO 1	8.734	10.260	E		IS	IS	2	2008	78,602
			W		IS	IS			77,290
MO 100 to IS 64	10.260	12.702	E	725	IS	IS	3	2008	84,178
			W		IS	IS			79,379
IS 64 to RT AB	12.702	13.847	E	724	IS	IS	4	2008A	94,920
			W		IS	IS			93,553
RT AB to MO 340	13.847	14.993	E		IS	IS	4	2008	100,940
			W		IS	IS			115,182
MO 340 to MO 364-RT D	14.993	16.810	E	616	IS	IS	5	2008	94,738
			W		IS	IS			87,326

2.4 Hourly Traffic Data

I-270 VSL system was installed and operated since May 22, 2008, which indicates that data required for the post-VSL analysis needs to be collected not for a calendar year (CY) (i.e., 01/2008-12/2008) but for 1 year after the inception of the system (i.e., 05/2008-04/2009). However, MoDOT publishes AADT on a calendar year (CY) basis (e.g., 01/2008-12/2008) and thus AADT was adjusted taking into account the time interval.

MoDOT collects real-time traffic information using 28 Remote Traffic Microwave Sensor (RTMS) detectors installed along 35 miles of I-270 highway. The collected data is saved for future use in 30-seccond time intervals. The RTMS detector data was available through two potential sources HDR (collected MoDOT's RTMS raw traffic data and processed it for part of this evaluation) and Traffic.com. Hourly traffic volumes were determined from these sources and used to calculate hourly crash rates. This information assisted in hourly evaluation of crash data to allow for further investigation of the VSL system during peak hours.

2.5 Crash Information and Crash Rate

Six years of crash data were summarized and reported. However, it should be noted that the six years of data collected, 4-years (2004-2007) were used to develop the baseline information and 1-year (2009) was used as post-VSL information. Year 2008 was omitted in this safety analysis, because VSL started in May 2008. It is hard or even impractical to adjust certain information (e.g., AADT) for the partial year. Also, the seven months (i.e., June-Dec) of 2008 served as a transition period for drivers to adapt to the VSL system.

The crash rate (CR) represents the exposure to being involved with crash relative to total vehicle miles traveled. For example, if roadway A shows a higher crash rate than roadway B, it indicates that roadway A is more exposed to being involved with a crash than roadway B, if traffic volume and the roadway lengths are the same. The Hourly CR (HCR) was developed to assist in the evaluation of annual crashes occurring during specific hours of the day (i.e. 8 AM). This information will help evaluate the VSL system during peak hour periods when the system is most active.

For a given segment of a roadway, crash rate (CR) and Hourly CR (HCR) are expressed as:

$$CR = \frac{100{,}000{,}000 \times Crash}{AADT \times Length \times Days} \tag{17}$$

$$HCR = \frac{100{,}000{,}000 \times HourCrash}{HourDT \times Length \times Days} \tag{18}$$

where:

Crash	= Number of crashes for the section,
Days	= Number of days for the study,
AADT	= Annual Average Daily Traffic, and
Length	= Length of Section.

2.6 Before-After Safety Analysis

The crash analysis discussed in the previous section was the first and initial step that provided an intuitive assessment of the effect of VSL on safety. However, it does not offer any type of statistical information on the estimated values. Considering uncertainty (or randomness) in the crash data, this analysis has a limitation and must be conducted with several years (normally 3 to 5 years) of pre and post-deployment crash data to reduce the randomness of crashes.

Two different observational analyses were carried out, before-after analysis methods and variations that provide statistical inference information. The two methods were: 1) Conventional (Naïve) and 2) Empirical Bayesian methods. These two safety methods better reflect future trends in safety analysis and provide additional information regarding potential changes based on the deployment of the VSL system.

The Conventional (Naïve) methods compare two situations (i.e., before-and-after) under the assumption that the predicted number of crashes could be a function of previous crashes. The Empirical Bayesian approach uses the predicted crash data (rather than the observed crash data) in its comparison. For the prediction of crash data, the multivariate regression model is widely adopted with explanatory variables being length of the segment, number of interchanges, truck percentage, number of ramps, ADT, number of lanes, speed, etc.

A. PROCESS DATA AND ASSESSMENT

1.0 MOBILITY

The mobility data were analyzed and assessed by analyzing four different segments on I-270. The results of the four segments are presented as uncontrolled and controlled analysis in the following sections. Before the details of the analysis are presented, first the four segments are introduced.

Segment 1

I-270 South Bound from I-64 to South of Clayton Road is referred to as Segment 1, presented in Figure S1.1 and data from six detectors were used in its evaluation. These detectors, the VSL signs and their mile posts are presented in Table S1.1 along with their detector IDs. The evaluation of the segment was carried out for clear weather conditions. A separate task evaluated the segment during inclement weather.

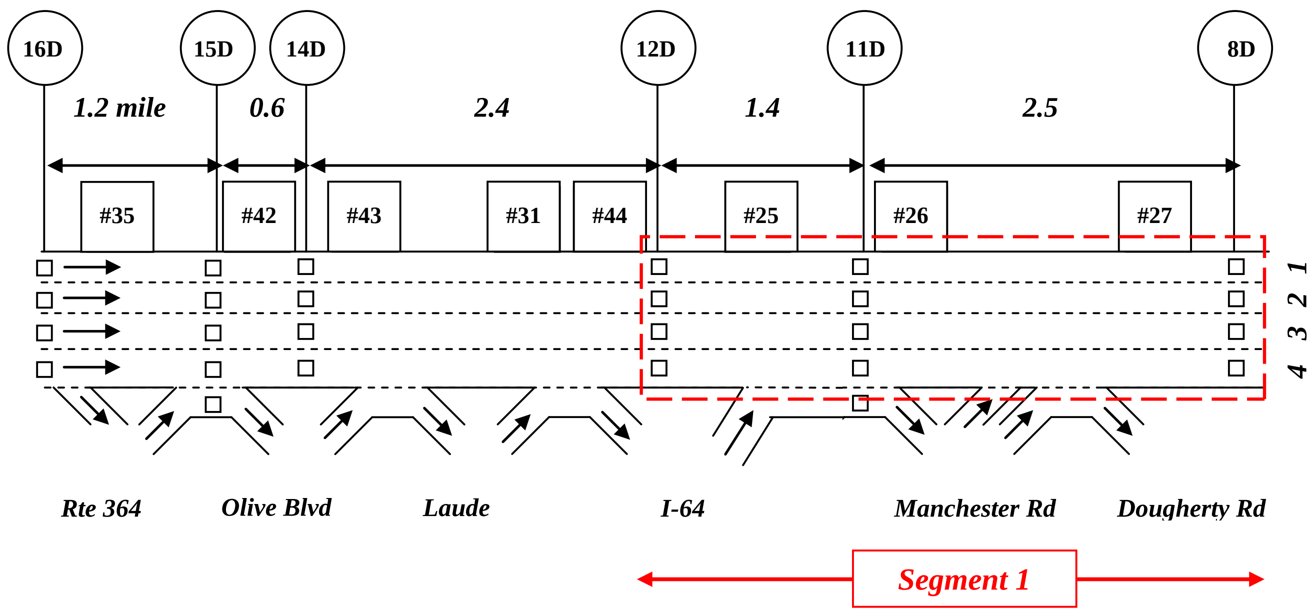


Figure S1.1. Segment 1, I-270 SB

Table S1.1. Detector and VSL Sign Locations and ID on Segment 1

VSL Sign Nos.	Mile posts
#35	15.8
#42	15.2
#43	13.9
#31	13.2
#44	12.6
#25	11.4
#26	10.9
#27	9.0

Detector IDs	Detector Locations
16D	I-270 intersecting North of Route 364/Page Ave
15D	I-270 intersecting South of Route 364/Olive Blvd
14D	I-270 intersecting Route 340/Ladue Rd
12D (logmile 12.4)	**I-270 intersecting I-64**
11D (logmile 11.0)	**I-270 intersecting South of Clayton Road**
8D (logmile 8.5)	**I-270 intersecting Dougherty Ferry**

Bold rows indicate detectors within the segment

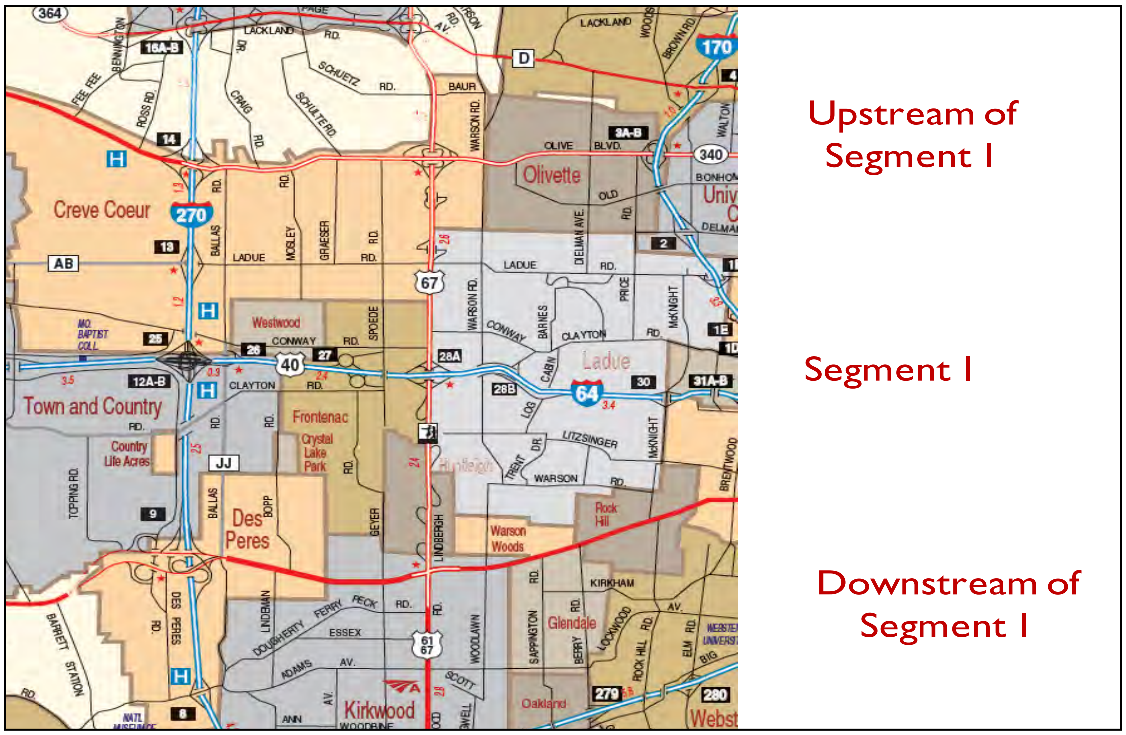


Figure S1.2. Segment 1 between Route I-64 and Route 100

Segment 2

Segment 2, presented in Figure S2.1, represents the highway segment on I-270 NB between the interchanges at Route 30 and I-44. Data from detectors upstream and downstream detectors were not available for analysis. Table S2.1 presents the main segment for which the data was available and used for evaluation. Similar to segment 1 analysis, evaluation of segment 2 was also carried out. The analysis was carried out for the morning peak periods. Detector 3D (log 3.6) data from October 25th, 2007 and October 23rd, 2008 were used to compare the pre- and post-VSL system, respectively.

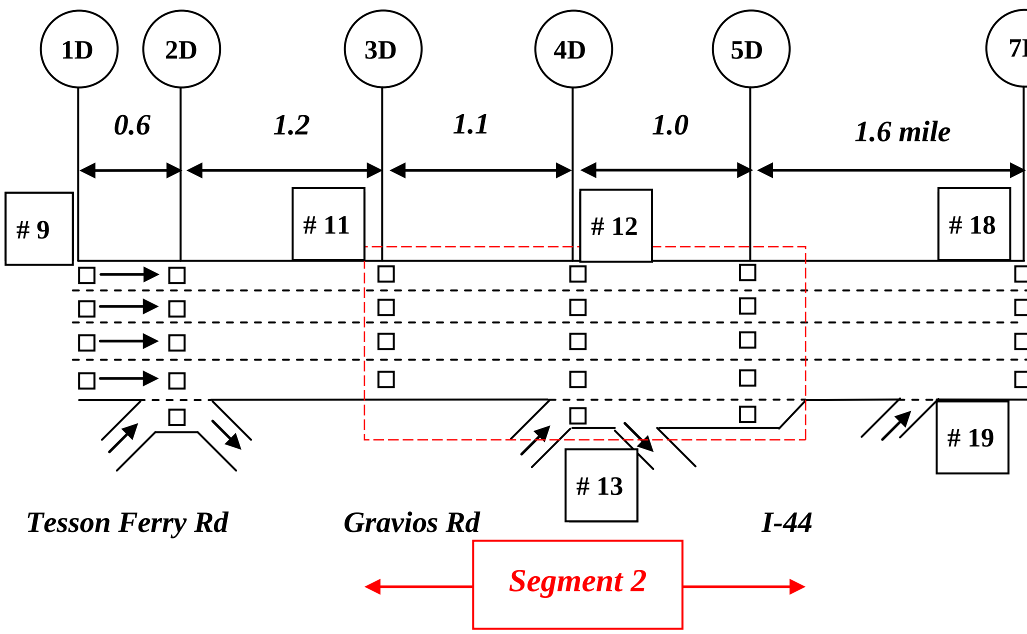


Figure S2.1. Segment 2, I-270 NB

Table S2.1. Detector and VSL Sign Locations and ID on Segment 2

VSL Sign Nos.	Mile posts
#9	1.3
#11	2.8
#12	4.7
#18	7.0

Detector IDs	Detector Locations
1D	I270 EB Rt 21 - Tesson Ferry Rd
2D	I270 EB at Sappington Rd
3D(logmile 3.6)	**I270 NB at Rt 30-Gravois Rd**
4D(logmile 4.7)	**I270 NB at Robyn Rd**
5D(logmile 5.7)	**I270 NB at I44**
7D	I270 NB at Big Bend

Bold rows indicate detectors used in the analysis

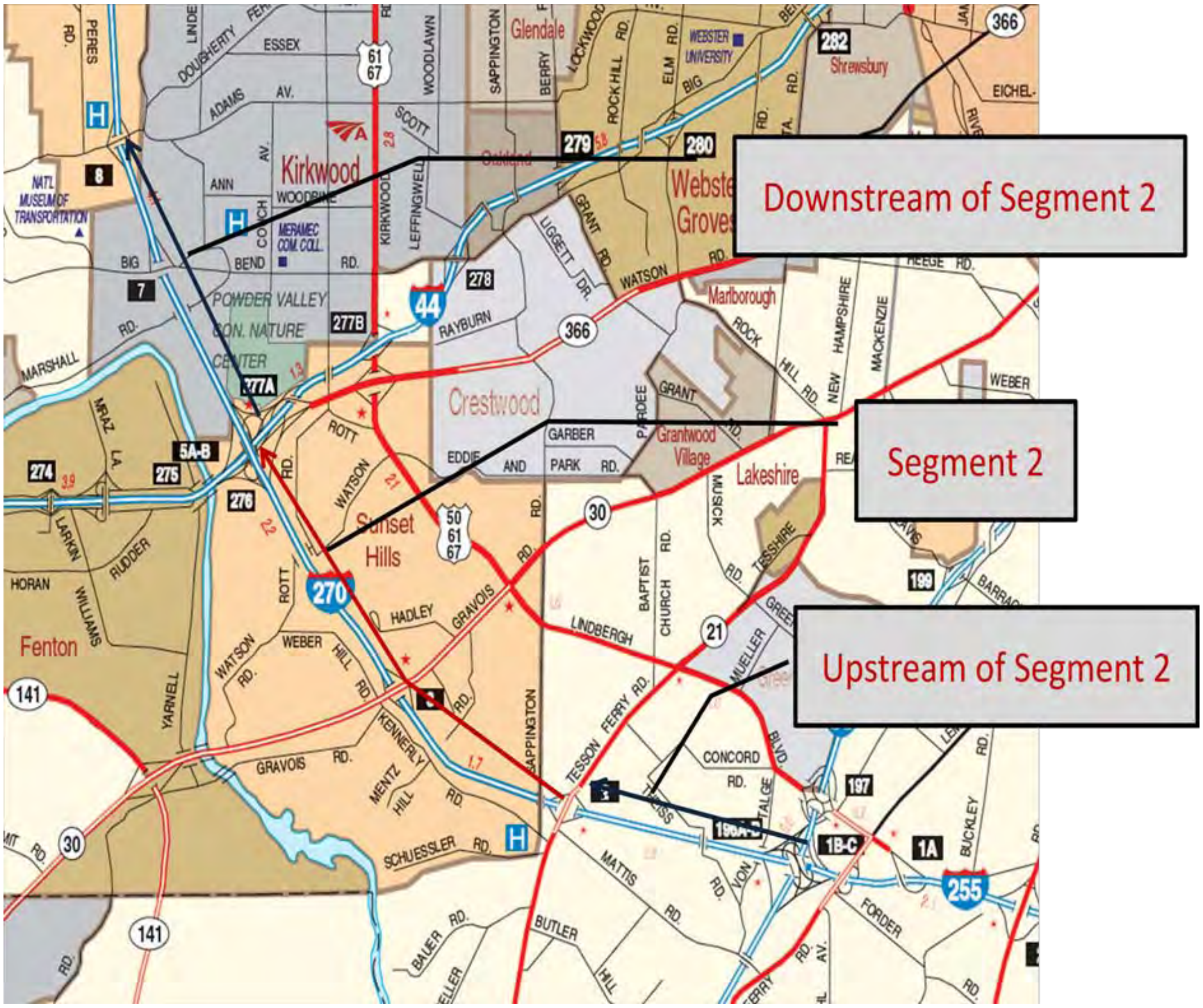


Figure S2.2. Segment 2 between Route Sappington Road and I-44

Segment 3

Segment 3 is located on I-270NB between the interchanges at Route 370 and Route 67. This segment has two functional detectors (21D (logmile 21.4) and 25D (logmile 25)) and the data from these detectors were used for evaluation. Table S3.1 presents the detectors and the VSL signs implemented on segment 3. This highway segment belongs to Zone E. Figures S3.1 and S3.1 present the location and schematic of segment 3 on I-270.

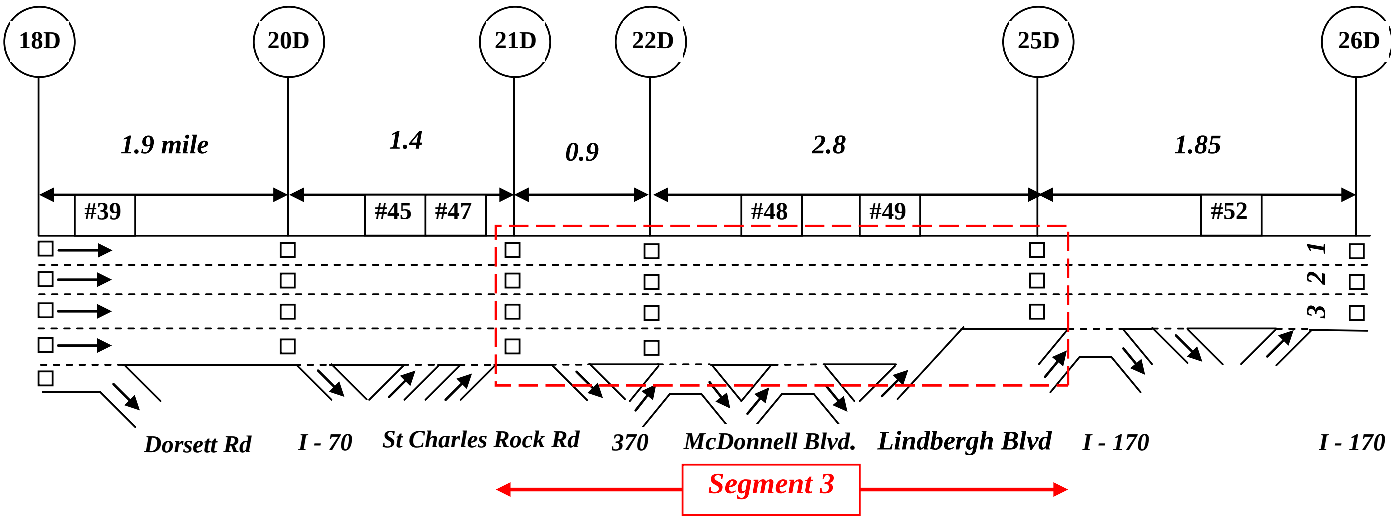


Figure S3.1. Segment 3, I-270 EB

Table S3.1. Detector and VSL Sign Locations and ID on Segment 3

VSL Sign Nos.	Mile posts
#39	18.6
#45	21.5
#47	21.5
#48	23.3
#49	24.4
#50	24.4
#52	26.1

Detector IDs	Detector Locations
18D	I270 NB North of Dorsett Rd
20D	I270 NB at I-70
21D (logmile 21.4)	**I270 NB at Woodford**
22D(logmile 22.3)	**I270 NB at 370**
25D (logmile 25.0)	**I270 EB Rt 67 -Lindbergh Blvd**
26D	I270 EB East of Graham Rd

Bold rows indicate detectors within the segment

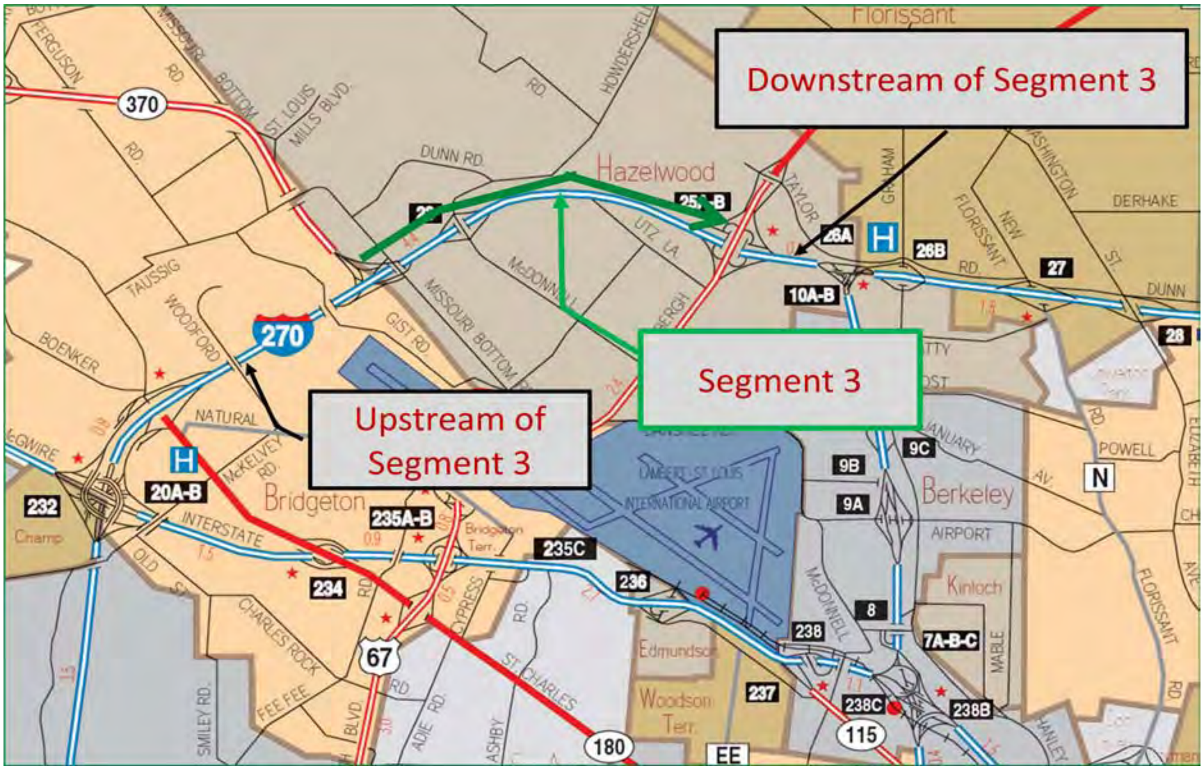


Figure S3.2. Segment 3, between Route 370 and Route 67, Lindbergh Boulevard

Segment 4

Segment 4 is part of I-270 WB between the interchanges at I-170 and Route 367. This segment has five detectors and the data from only two of the detectors (28D (logmile 28.6) and 31D (logmile 31.6)) were available for evaluation. These detectors are presented in Table S4.1 along with their detector ID. Data from a detector downstream and two detectors upstream were not available for evaluation.

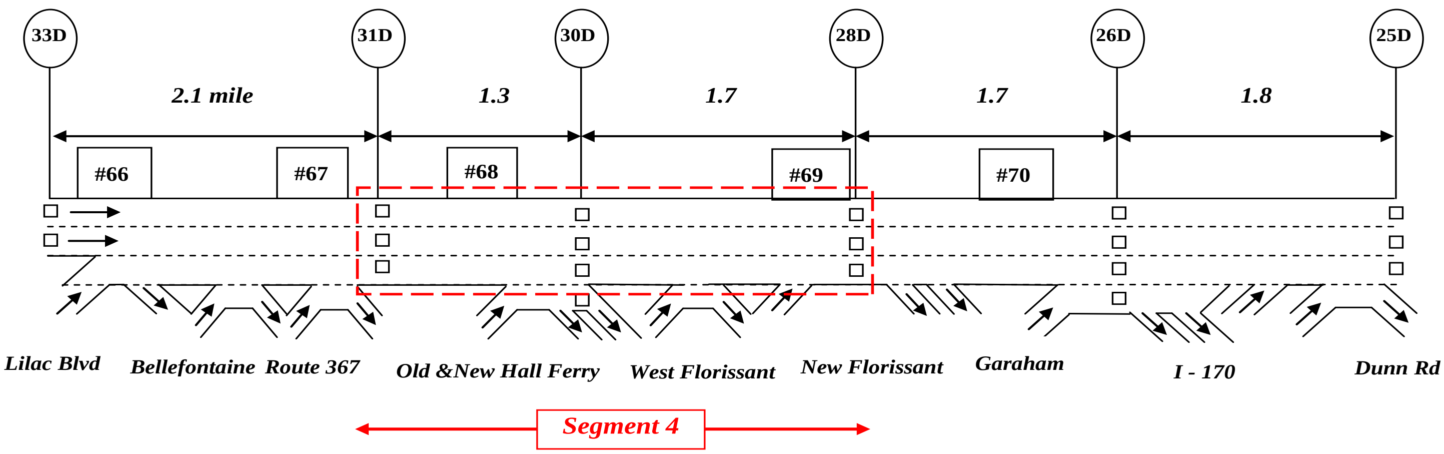


Figure S4.1. Segment 4, I-270 WB

Table S4.1. Detector and VSL Sign Locations and ID on Segment 4

VSL Sign Nos.	Mile posts
#66	33.2
#67	32.1
#68	31.0
#69	29.0
#70	28.0

Detector IDs	Detector Locations
25D (logmile 25)	I-270 at Rte. 67/Lindbergh Blvd.
26D	East of Graham Road
28D (logmile 28.6)	**I-270 west of West Florissant**
30D(logmile 30.3)	**I-270 east of New Halls Ferry**
31D (logmile 31.6)	**I-270 at Rte. 367**
33D	Lilac Ave.

Bold rows indicate detectors within the segment

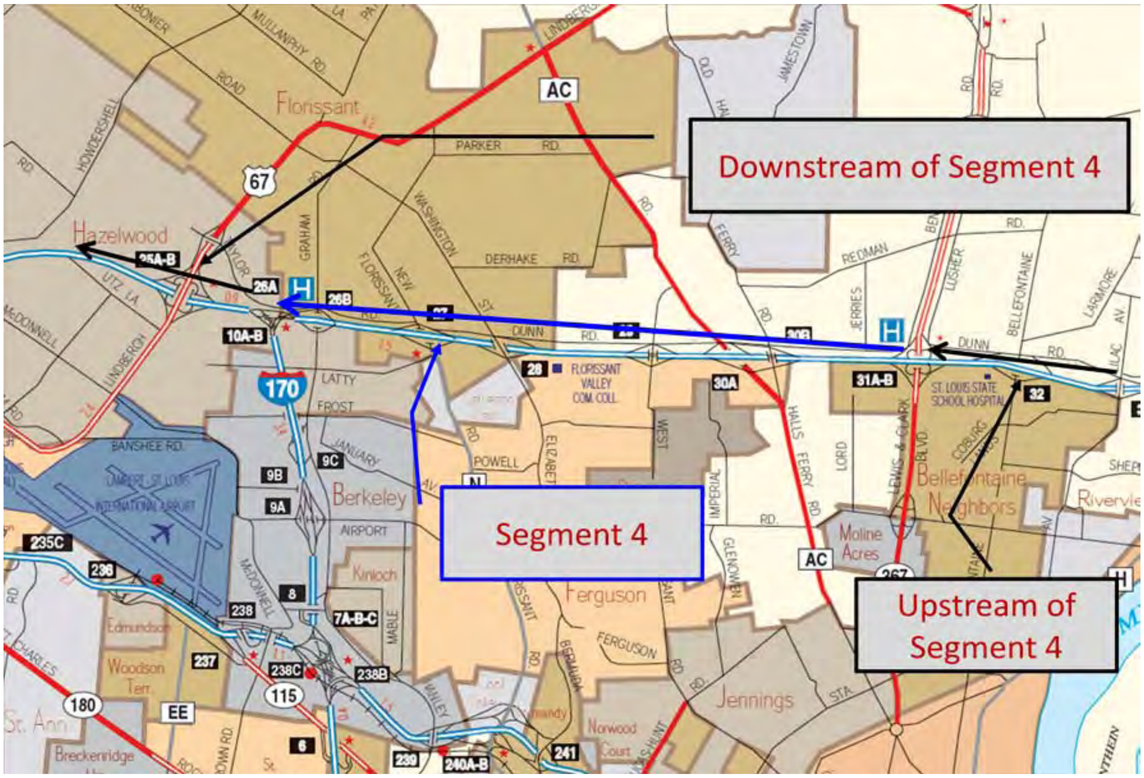


Figure S4.2. Segment 4, between Route 367 and I-170

UN-CONTROLLED DATA ANALYSIS

SEGMENT 1 ANALYSIS

Table S1.1 presents the months that were considered for segment 1 evaluation. Data for these months were considered appropriate for evaluation as the data were available. The months used in this report for comparison between pre- and post-VLS conditions for segment 1 are presented in the table. The days used in the evaluation were Tuesdays, Wednesdays and Thursdays. Mondays, Fridays and weekends were not used in the analysis as their traffic patterns were not similar.

Table S1.1. Months selected for VSL system evaluation

Pre-VSL System	Post-VSL System
October 2007	*October 2008*
November 2007	*November 2008*
April 2008	*April 2009*

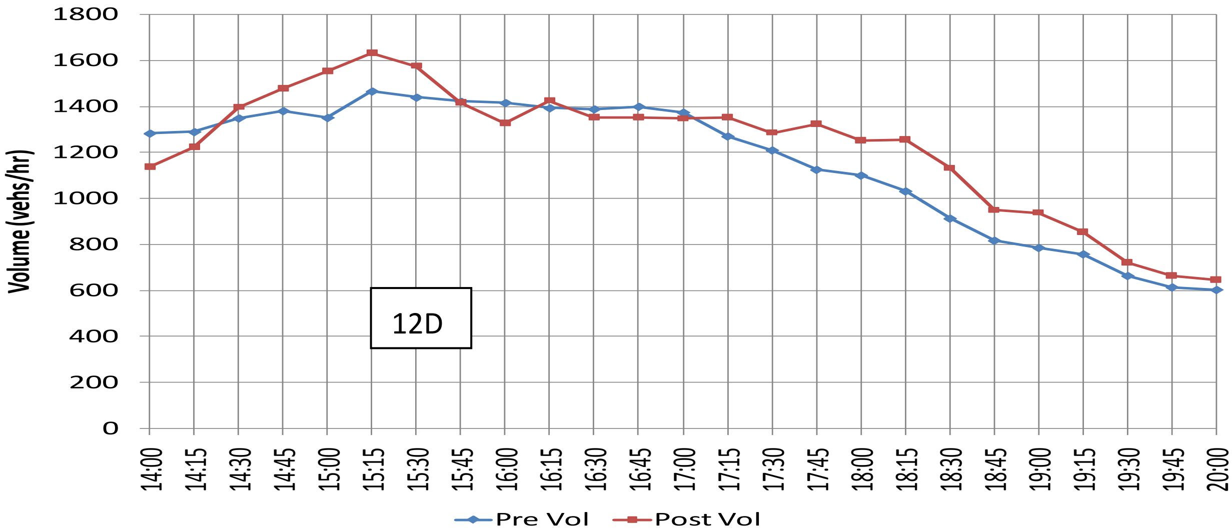
Task 1.1: Volume and Occupancy Analysis

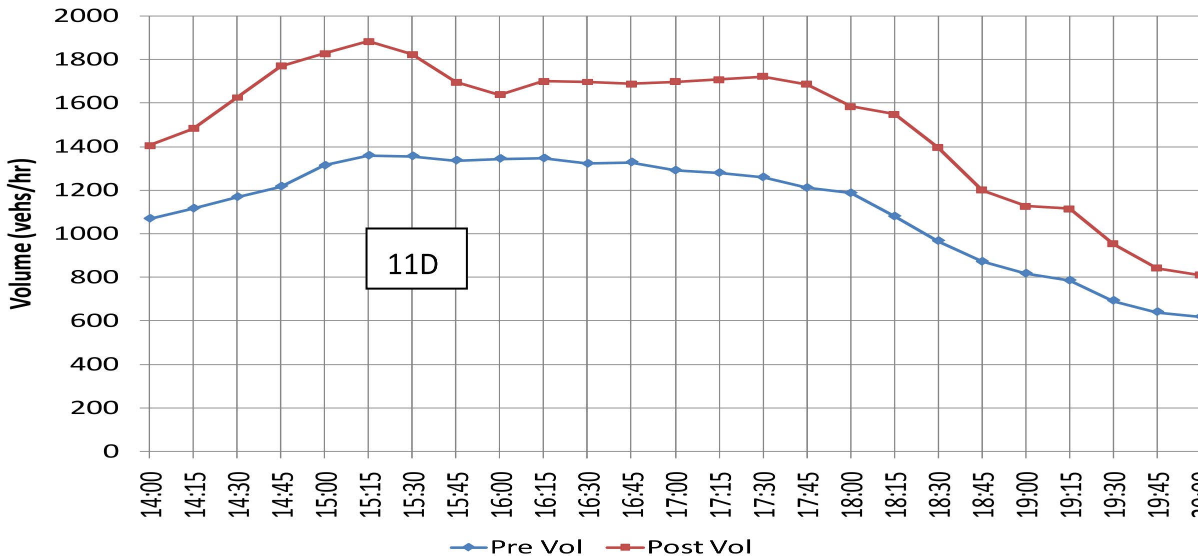
This task consists of two sub-tasks. First, average volume for pre- and post-VSL conditions were compared. Second, occupancy data and the change in flow-occupancy relationship were compared for pre- and post-VSL conditions. The change in volume was accounted to evaluate the effect on average speed, travel time and congestion.

Figures S1.11.1 to S1.11.3 present volume profiles during peak periods for detectors along segment 1 for pre- and post-VSL conditions for October, November and April. Figure S1.11.1 present the volume comparison between pre- and post-VSL system installation for all five lanes for detectors 12D (logmile 12.4), 11D (logmile 11) and 8D (logmile 8.5) for pre (October, 07) and post (October, 08) VSL system installation. Average volumes for 5-minute intervals were compared to account for any change in volume. The figure indicates a 10 percent increase in volume at 11D (logmile 11), and similar volumes at detectors 12D (logmile 12.4) and 8D (logmile 8.5) in post-VSL conditions. Volumes for November and April were very similar, the major increase was observed in October. Table S1.11.1 presents the volume comparison for the time period for analysis. From Table S1.11.1, no significant change in volume was observed. Figures S1.11.4 to S1.11.6 present the occupancy profiles and it can be noticed that occupancy increases with increase in volume and vice versa.

Table S1.11.1. Change In Average Volume For three detectors.

	Pre-VSL	**Post-VSL**	**Pre-VSL**	**Post-VSL**	**Pre-VSL**	**Post-VSL**
	12D		***11D***		***8D***	
Avg Oct	1285.52	1371.92	1264.71	1685.37	1531.33	1519.57
Diff, Percent	***86.40***	***7%***	***420.67***	***33%***	***-11.76***	***-1%***
Avg Nov	1296.95	1305.43	1577.51	1585.52	1462.76	1463.03
Diff, Percent	***8.48***	***1%***	***8.01***	***1%***	***0.27***	***0%***
Avg April	1382.18	1330.02	1683.12	1704.56	1496.74	1519.34
Diff, Percent	***-52.16***	***-4%***	***21.45***	***1%***	***22.60***	***2%***
Avg Vol	1321.55	1335.79	1508.45	1658.49	1496.94	1500.65
Diff, Percent	***14.24***	***1%***	***150.04***	***10%***	***3.70***	***0%***





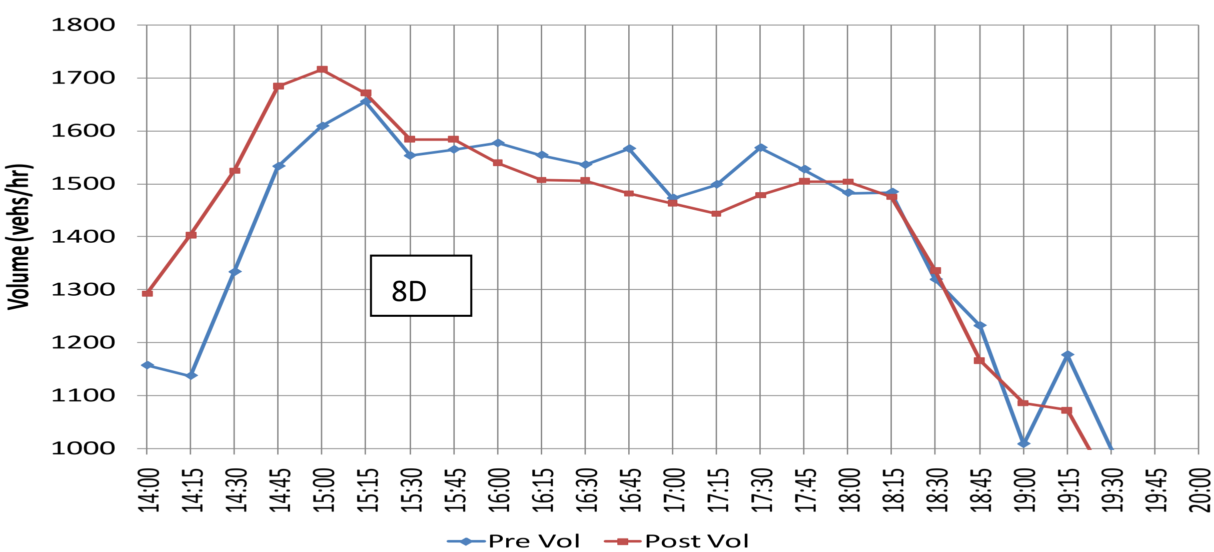
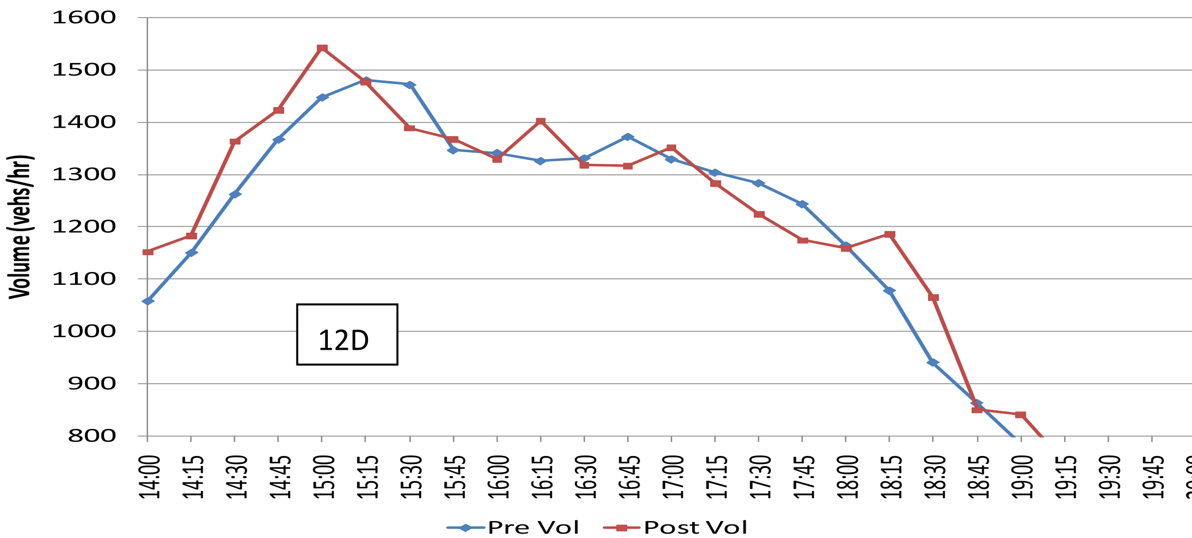
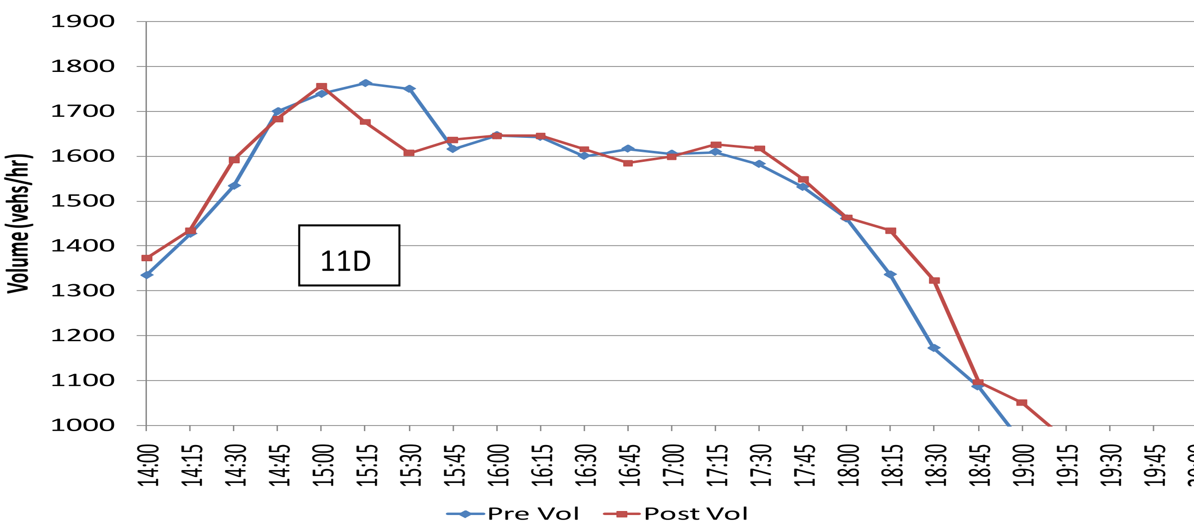


Figure S1.11.1 Comparison of Pre (Oct, 2007) and Post-VSL (Oct, 2008) Volume





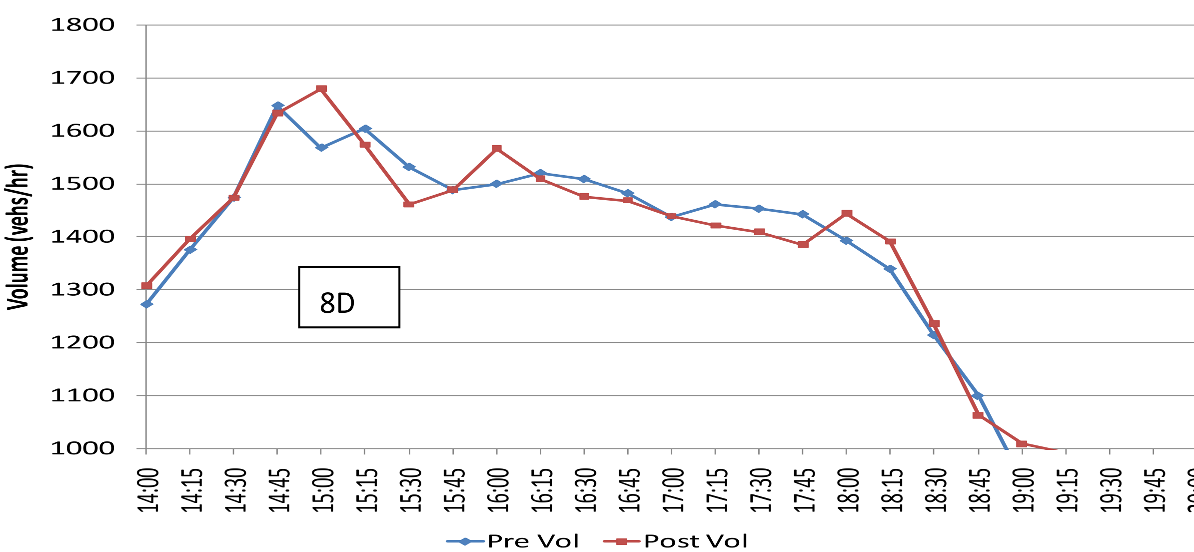


Figure S1.11.2 Comparison of Pre (Nov, 2007) and Post-VSL (Nov, 2008) Volumes

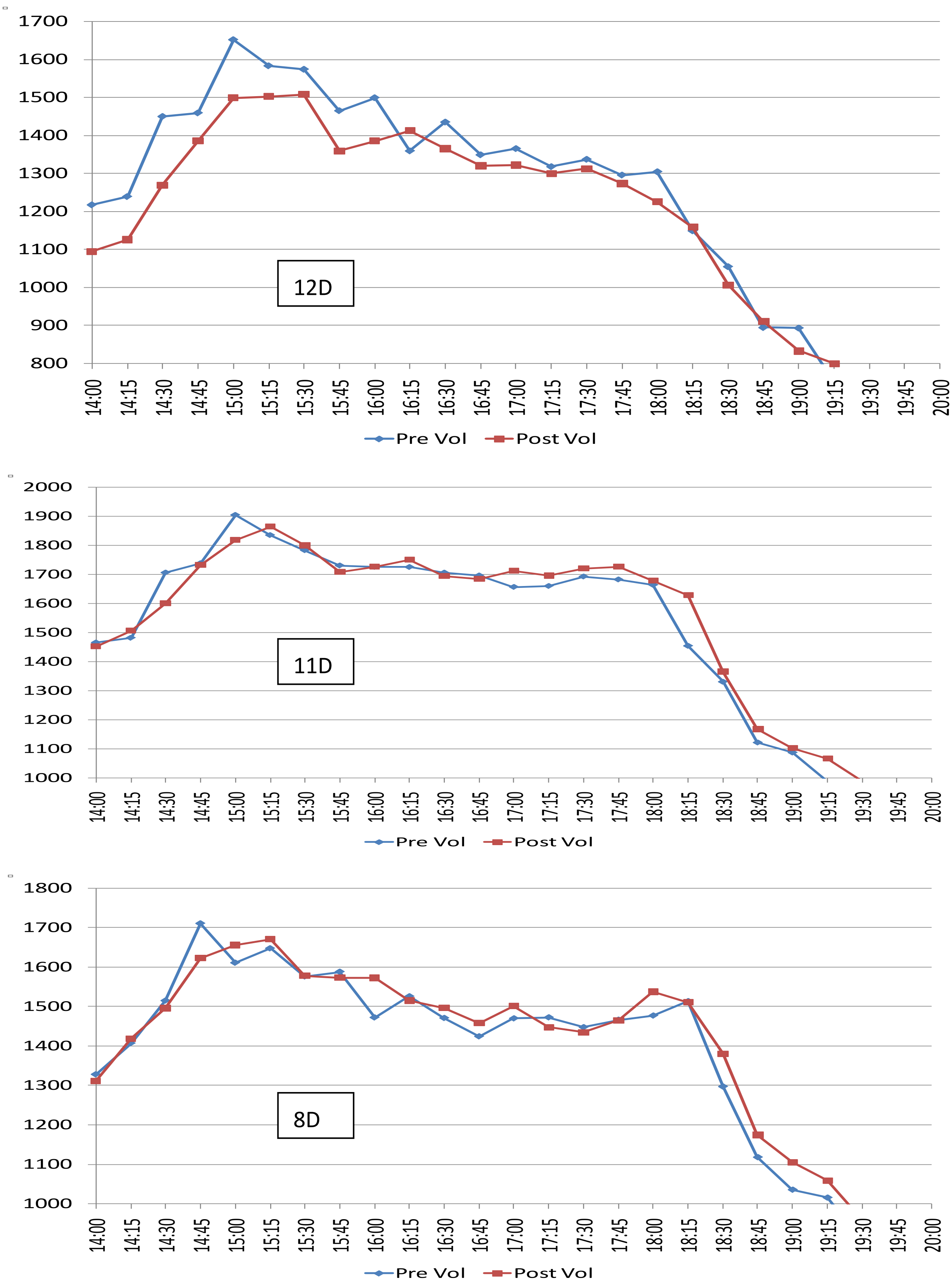
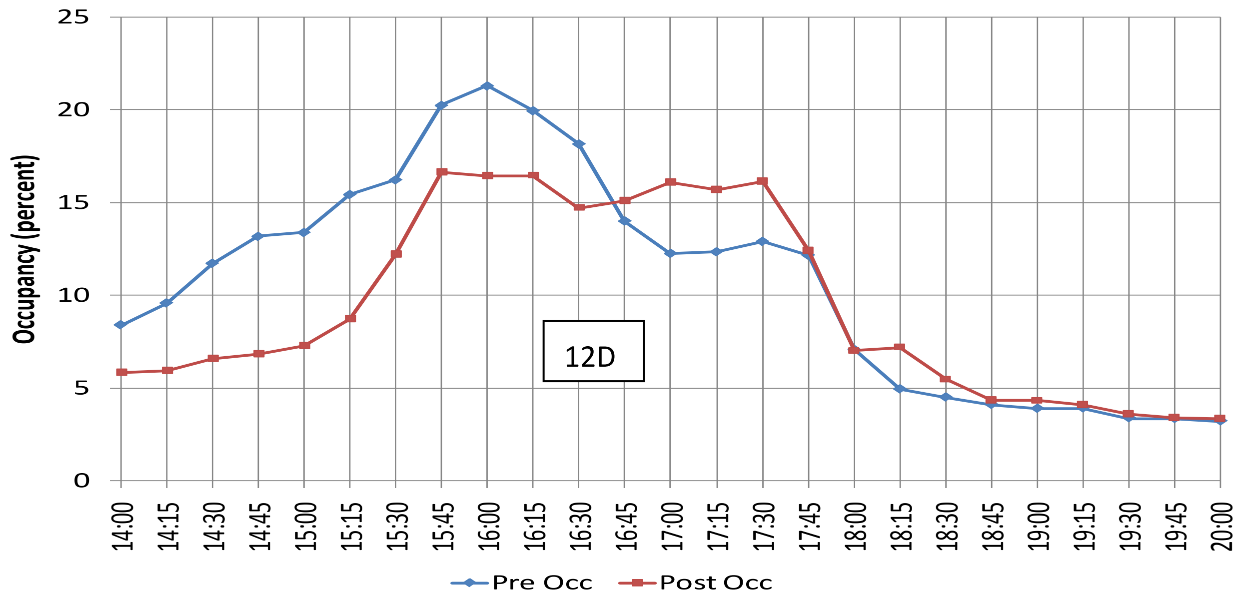
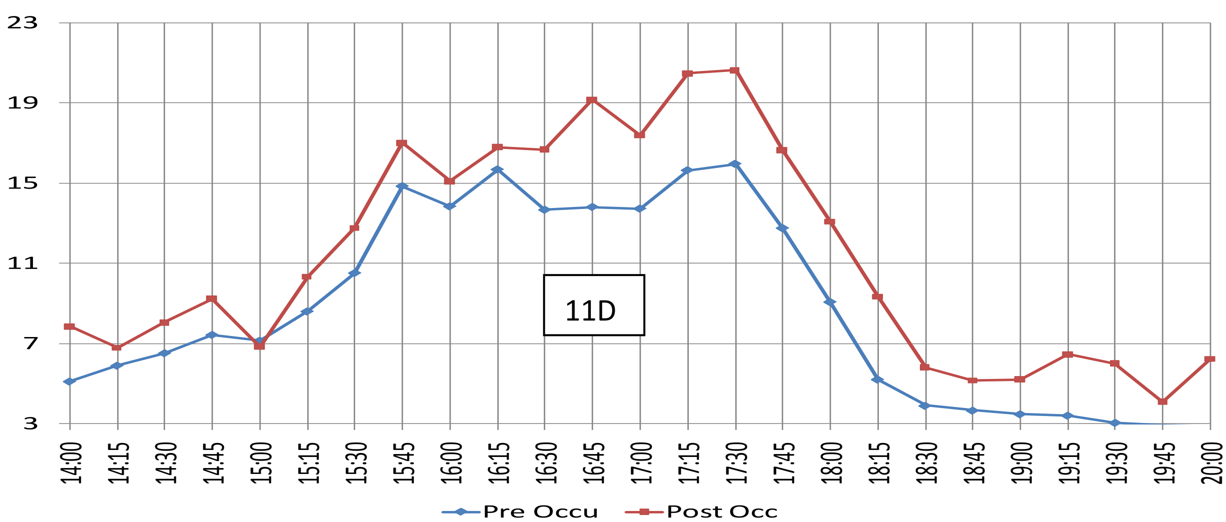


Figure S1.11.3 Comparison of Pre (April, 2008) and Post-VSL (April, 2009) Volumes





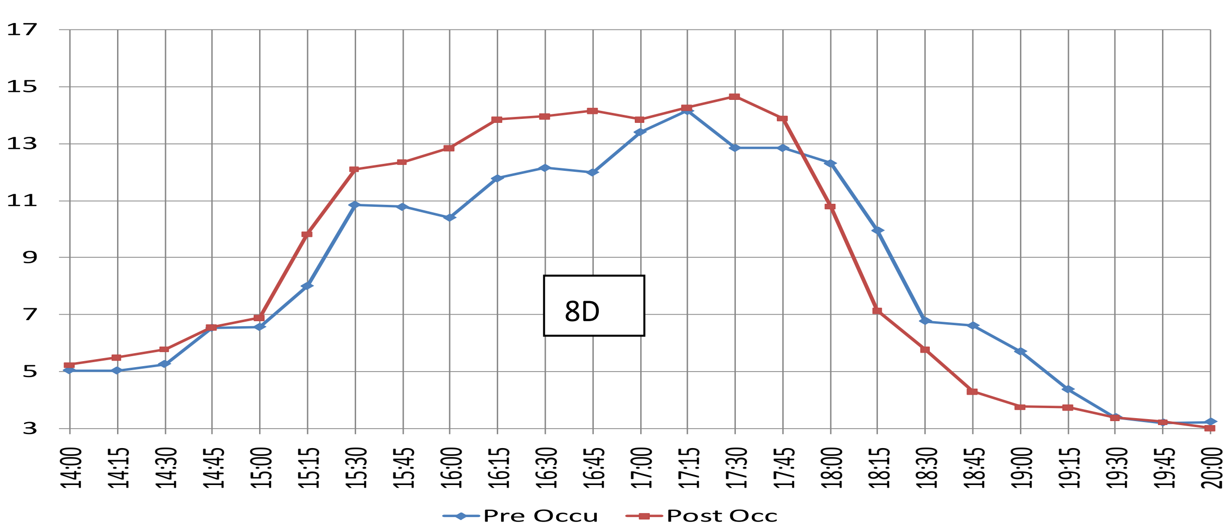
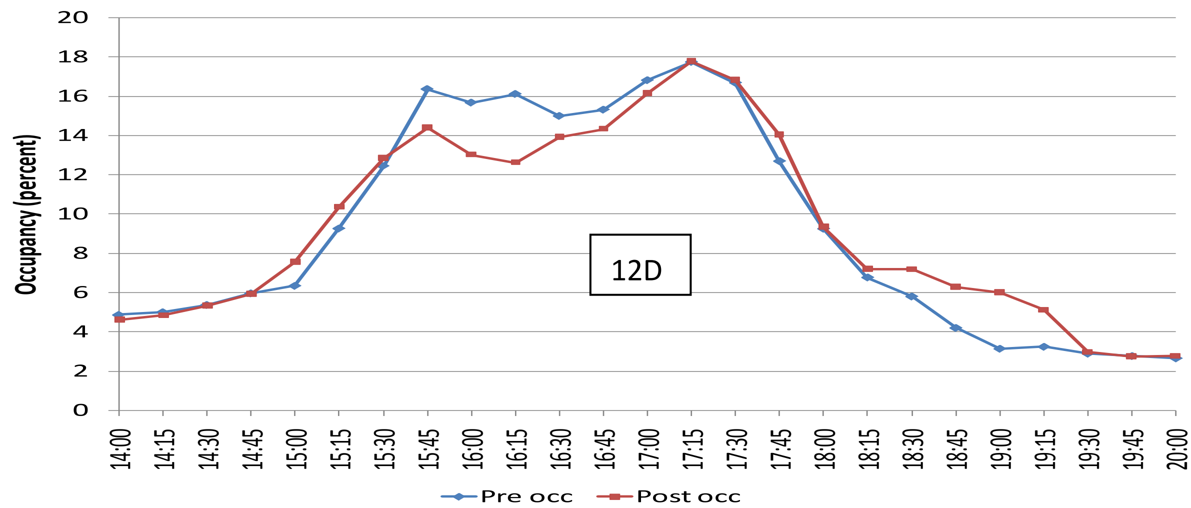
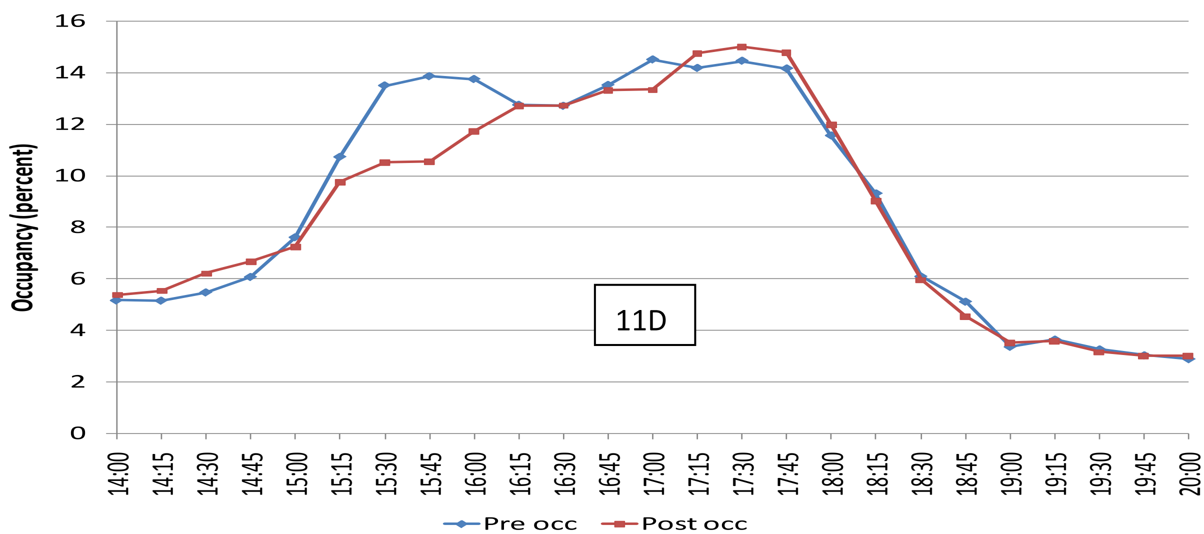


Figure S1.11.4 Comparison of Pre (Oct, 2007) and Post-VSL (Oct, 2008) Occupancy Profile





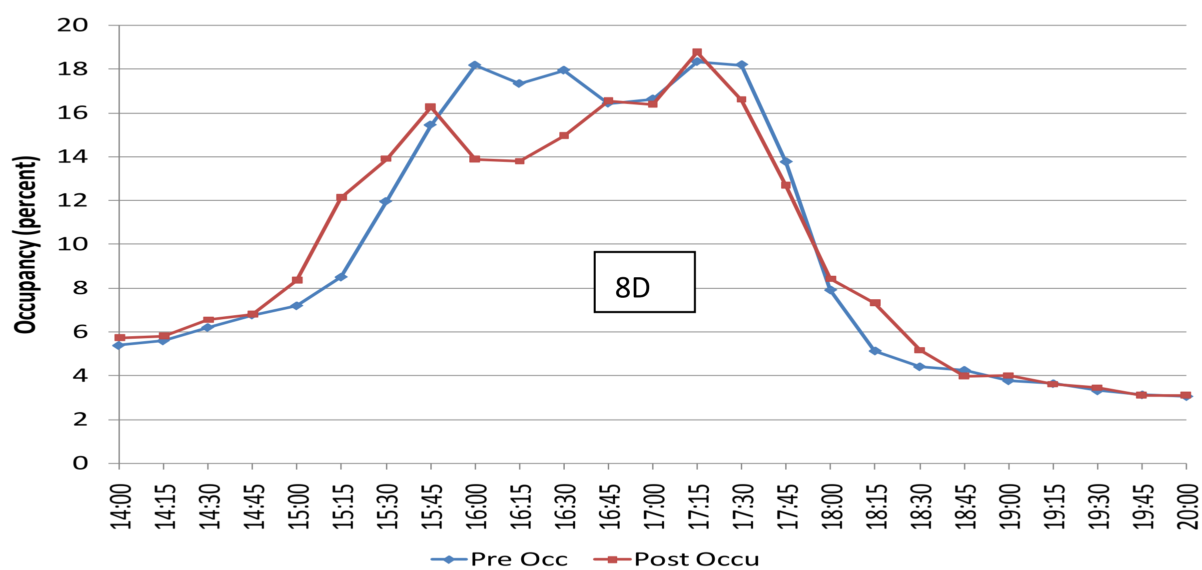


Figure S1.11.5 Comparison of Pre (Nov, 2007) and Post-VSL (Nov, 2008) Occupancy Profile

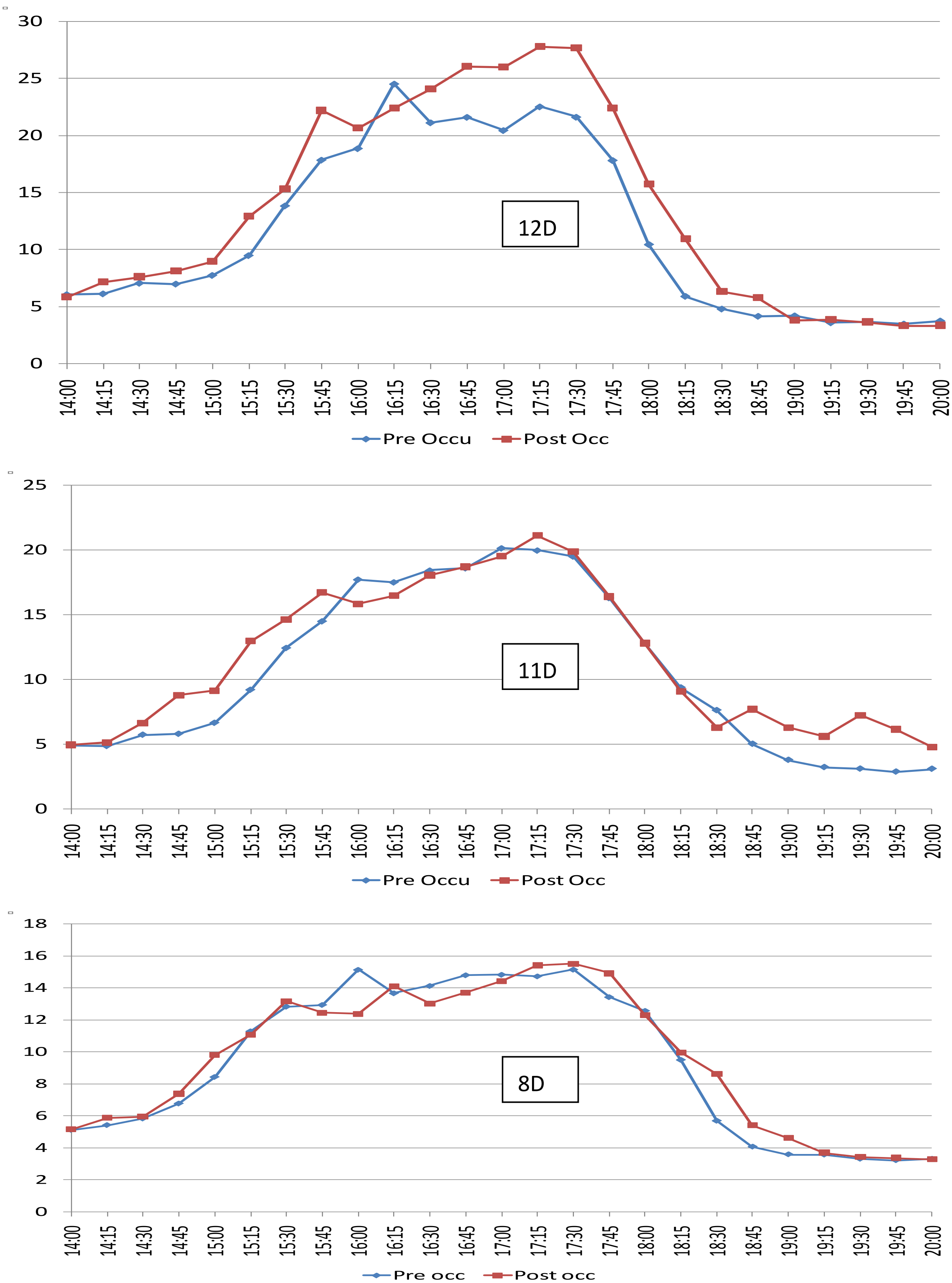


Figure S1.11.6 Comparison of Pre (April, 2008) and Post-VSL (April, 2009) Occupancy Profile

Table S1.11.2. Change In Average occupancy for three detectors.

	Pre-VSL	Post-VSL	Pre-VSL	Post-VSL	Pre-VSL	Post-VSL
	12 D		*11D*		*8D*	
Avg Oct	13.7	12.5	11.6	14.5	11.0	11.8
Diff, Percent	***-1.15***	***-8%***	***2.91***	***25%***	***0.76***	***7%***
Avg Nov	13.1	13.0	12.8	12.5	12.2	11.6
Diff, Percent	***-0.14***	***-1%***	***-0.32***	***-2%***	***-0.63***	***-5%***
Avg April	15.9	19.3	12.8	12.5	12.6	12.7
Diff, Percent	***3.38***	***21%***	***-0.32***	***-2%***	***0.12***	***1%***
Avg Occp	14.23	14.93	12.42	13.18	11.92	12.01
Diff, Percent	***0.70***	***5%***	***0.76***	***6%***	***0.09***	***1%***

Table S1.11.2 presents the occupancy comparison for months analyzed. Average occupancy slightly increased in post-VSL conditions.

<u>Flow Occupancy Relationship</u>

Figures S1.11.7 to S1.11.9 present the flow-occupancy plots for detectors 12D (logmile 12.4), 11D (logmile 11) and 8D (logmile 8.5) in pre- and post-VSL conditions. Data from three months October, November and April were used for the plots in pre-and post-VSL conditions.

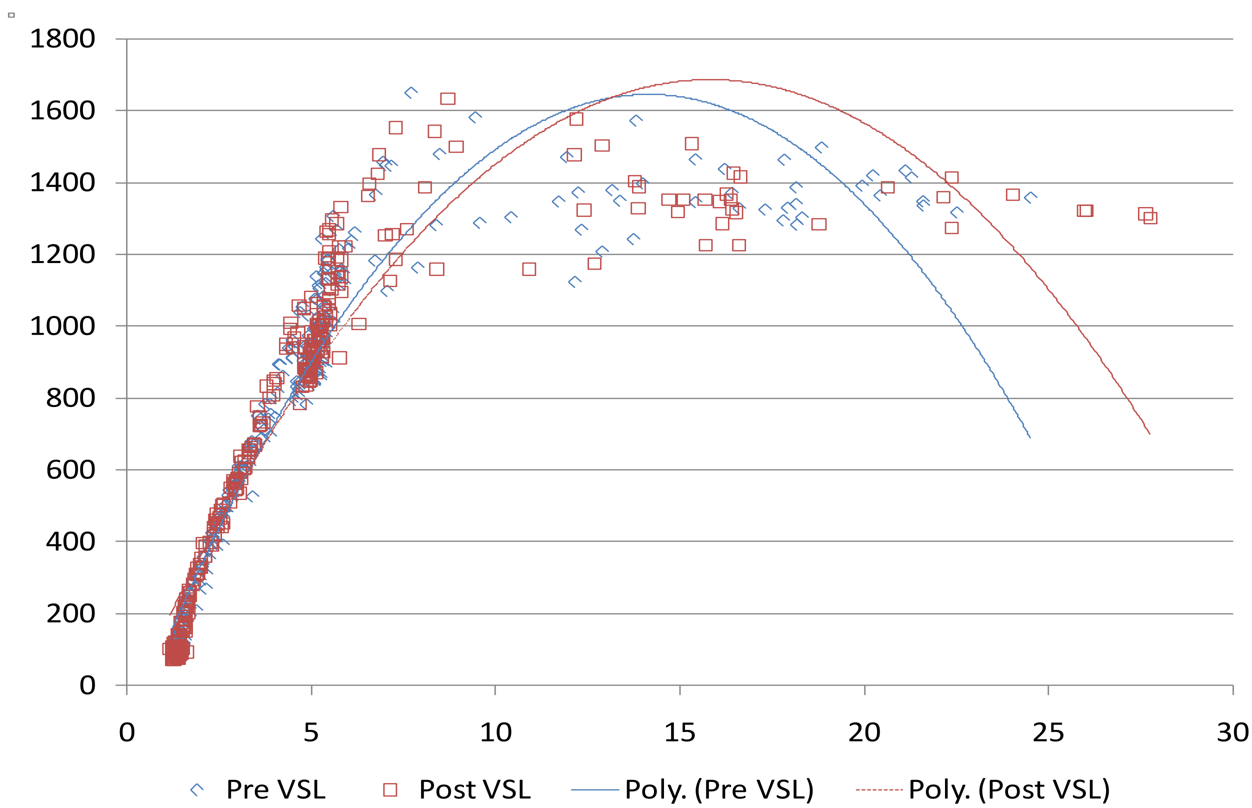


Figure S1.11.7. Flow-Occupancy Plot for three months (Oct, Nov and April) 12D

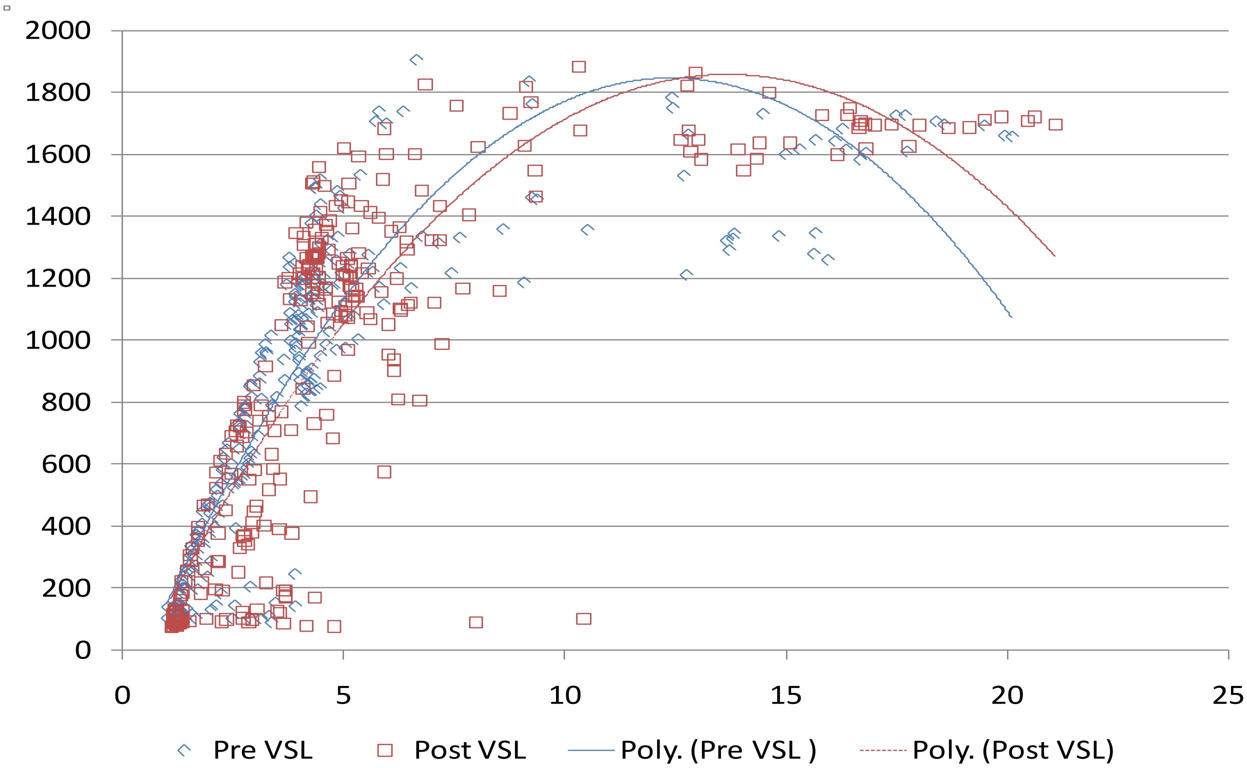


Figure S1.11.8. Flow-Occupancy Plot for three months (Oct, Nov and April) 11D

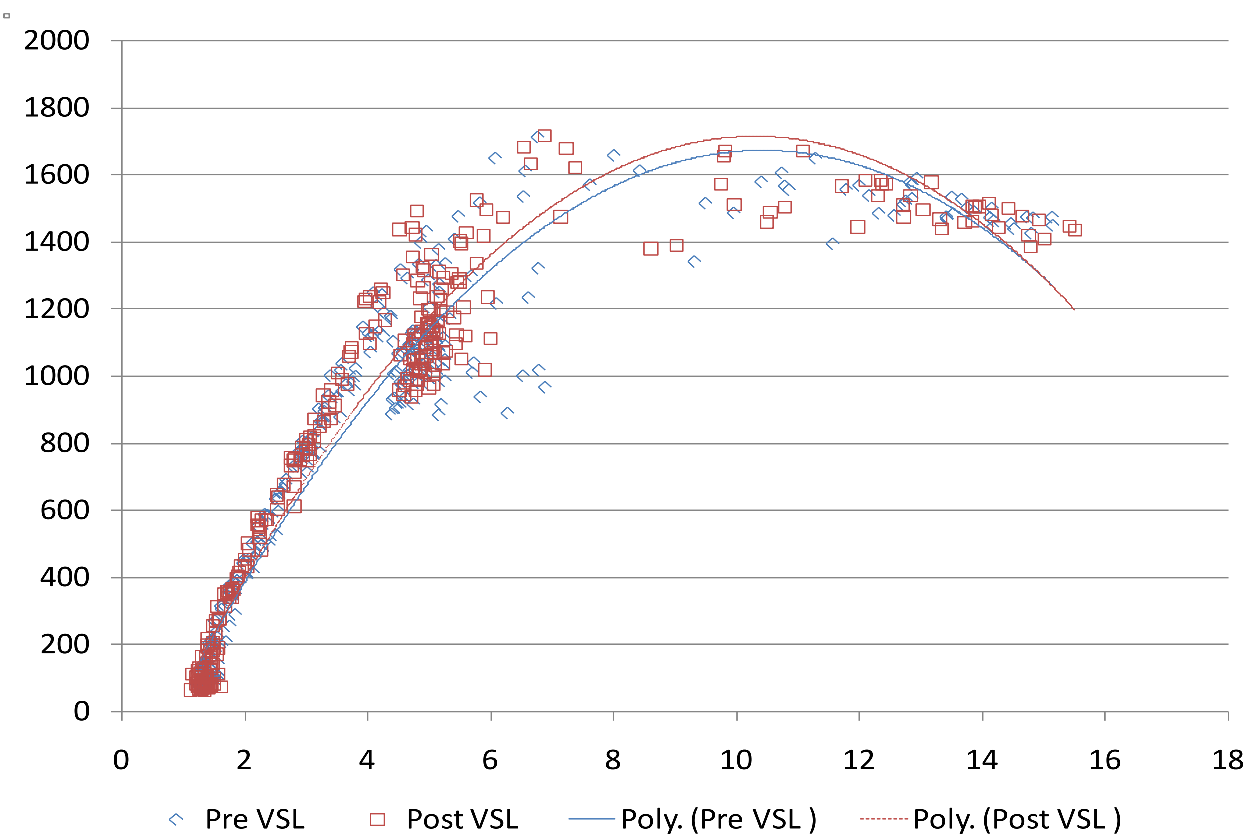


Figure S1.11.9. Flow-Occupancy Plot for three months (Oct, Nov and April) 8D

Figures S1.11.7 to S1.11.9 show the comparison of pre- and post-VSL traffic volume and occupancy plot averaged out for all lanes for three detectors in pre- and post-VSL conditions. Data used for flow-occupancy plot were aggregated for 5-minutes. It can be observed from the figures that average occupancy increased in post-VSL conditions. One of the objectives of the VSL system initiation was to prevent the highway from reaching capacity because after reaching capacity the traffic volume breaks down and it can decrease significantly. Therefore, flow-occupancy comparison indicated benefits of the VSL system initiation. Critical occupancy was similar in both conditions, however, the spread of data points decreased in post-VSL conditions for congested conditions, indicating speed homogeneity. For detector 11D (logmile 11), higher traffic volume was maintained between 1600 and 1800 vehs/hr contrary to pre-VSL conditions which indicated traffic volumes between 1200 and 1400 vehs/hr.

Task 1.2: Average Speed/Lane by Posted Speed Limit During Peak Periods

This task evaluated the difference in average speed by comparing the data before and after the VSL system installation. Speed data averaged for all the lanes for every 5 minutes were used. Figures S1.12.1-S1.12.3 present the average highway speed for detectors 12D (logmile 12.4), 11D (logmile 11) and 8D (logmile 8.5) for the months of October, November and April. The figures indicate that the peak period for traffic on this segment lied between 1500 to 1900 hours based on the average speed for the three months. Henceforth, the figures for peak periods for this segment will be presented for this duration. Also, the pre- and post-VSL speed profile comparison shows reduction in peak period and improvement in average speeds for post-VSL conditions. Table S1.12.1 indicates that the average speed reduced at 12D (logmile 12.4) and 8D (logmile 8.5) but increased at 11D (logmile 11). Although, the difference was very small for all three detectors, it can be said that VSL system indicated benefits for this segment.

Table S1.12.1. Change In Average Speed For three detectors.

	Pre-VSL	Post-VSL	Pre-VSL	Post-VSL	Pre-VSL	Post-VSL
	12D		*11D*		*8D*	
Avg Oct	43.4	45.9	42.0	43.8	46.6	44.5
Diff, Percent	***2.48***	***6%***	***1.79***	***4%***	***-2.06***	***-4%***
Avg Nov	43.9	44.5	39.5	43.8	43.9	44.7
Diff, Percent	***0.68***	***2%***	***4.30***	***11%***	***0.80***	***2%***
Avg April	39.5	32.6	39.7	39.8	42.2	42.3
Diff, Percent	***-6.91***	***-17%***	***0.17***	***0%***	***0.13***	***0%***
Avg Spd	42.26	41.01	40.37	42.46	44.24	43.86
Diff, Percent	***-1.25***	***-3%***	***2.09***	***5%***	***-0.37***	***-1%***

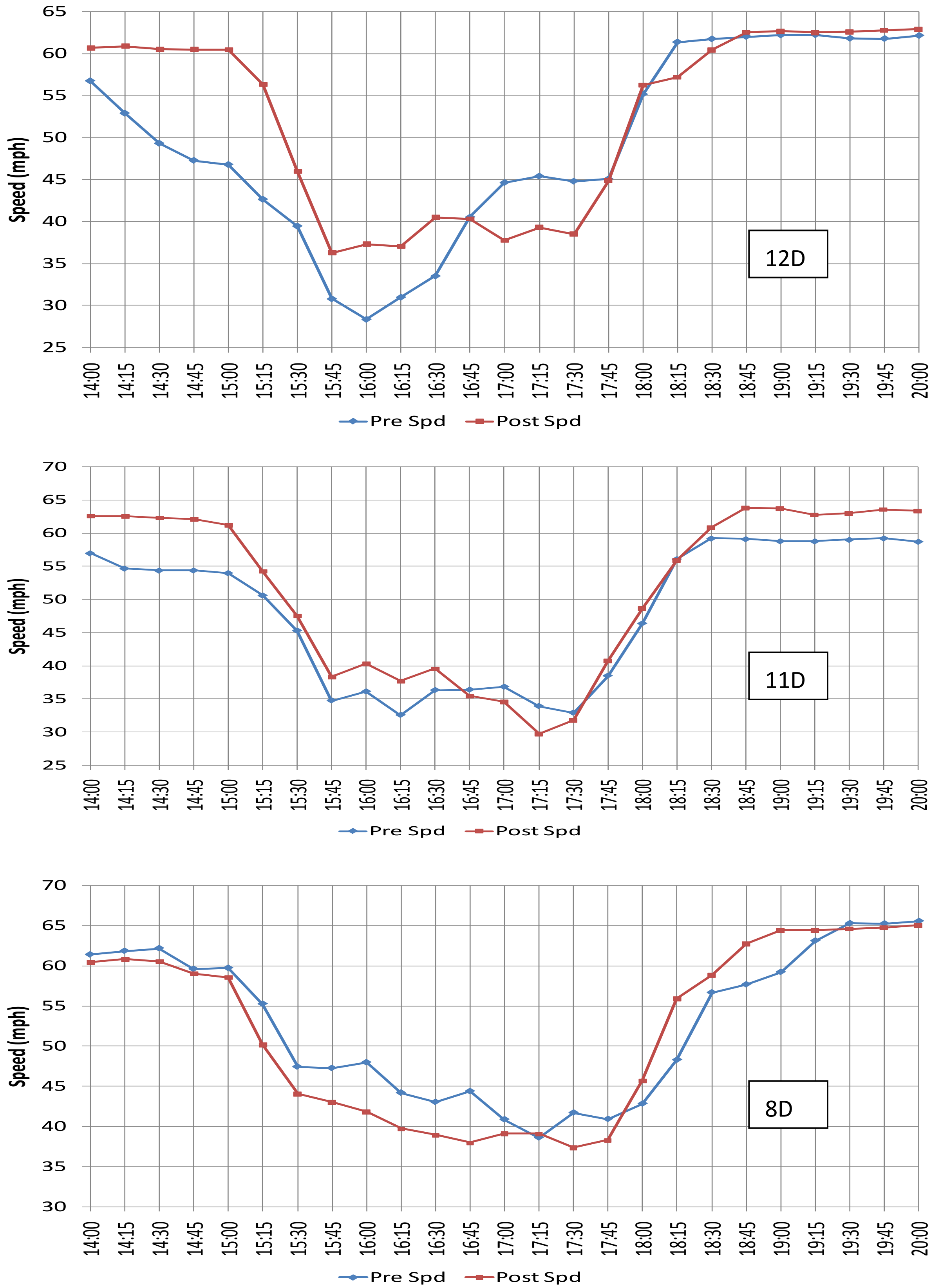


Figure S1.12.1 Comparison of Pre (Oct, 2007) and Post-VSL (Oct, 2008) Speed Profile

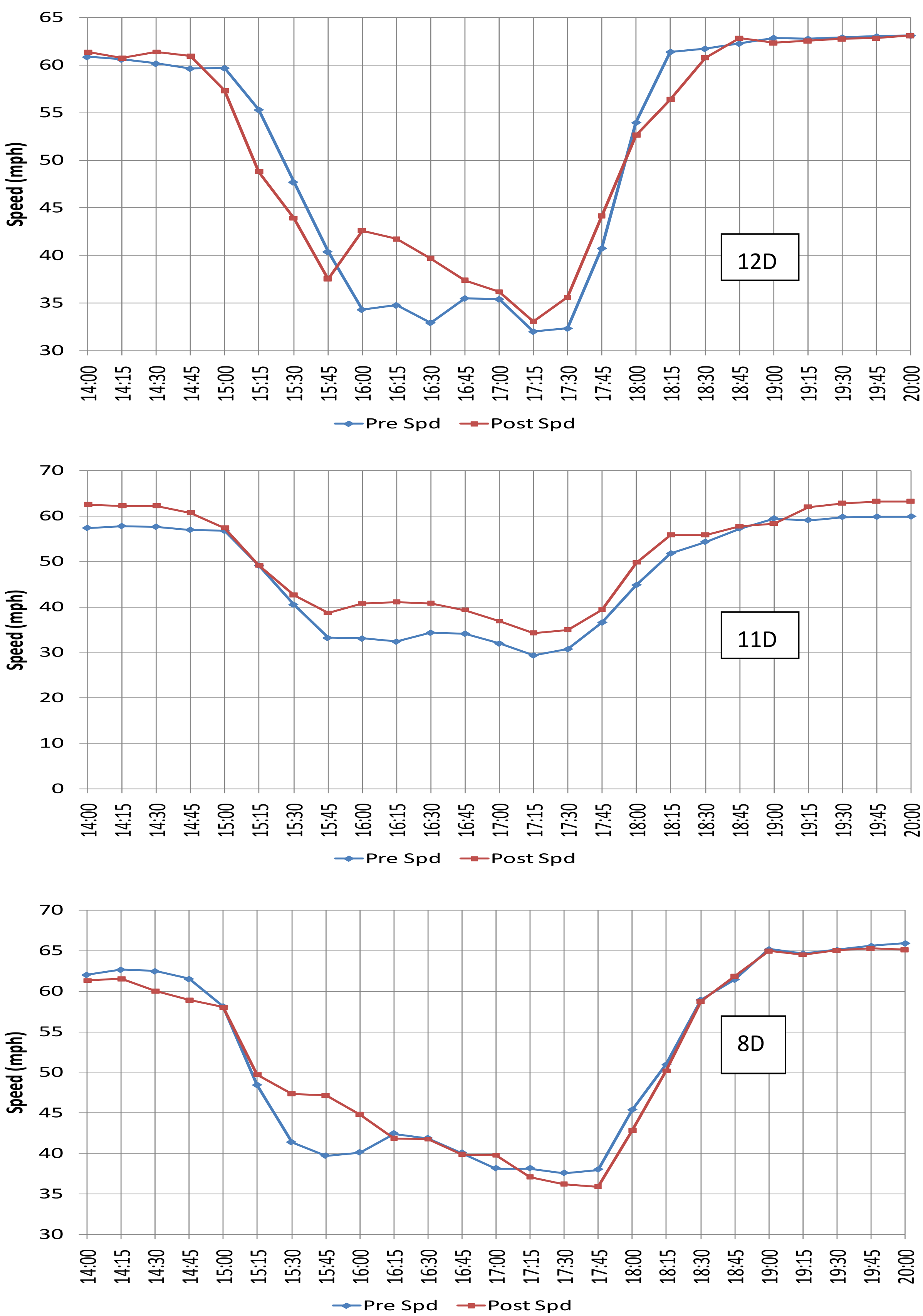


Figure S1.12.2 Comparison of Pre (Nov, 2007) and Post-VSL (Nov, 2008) Speed Profile

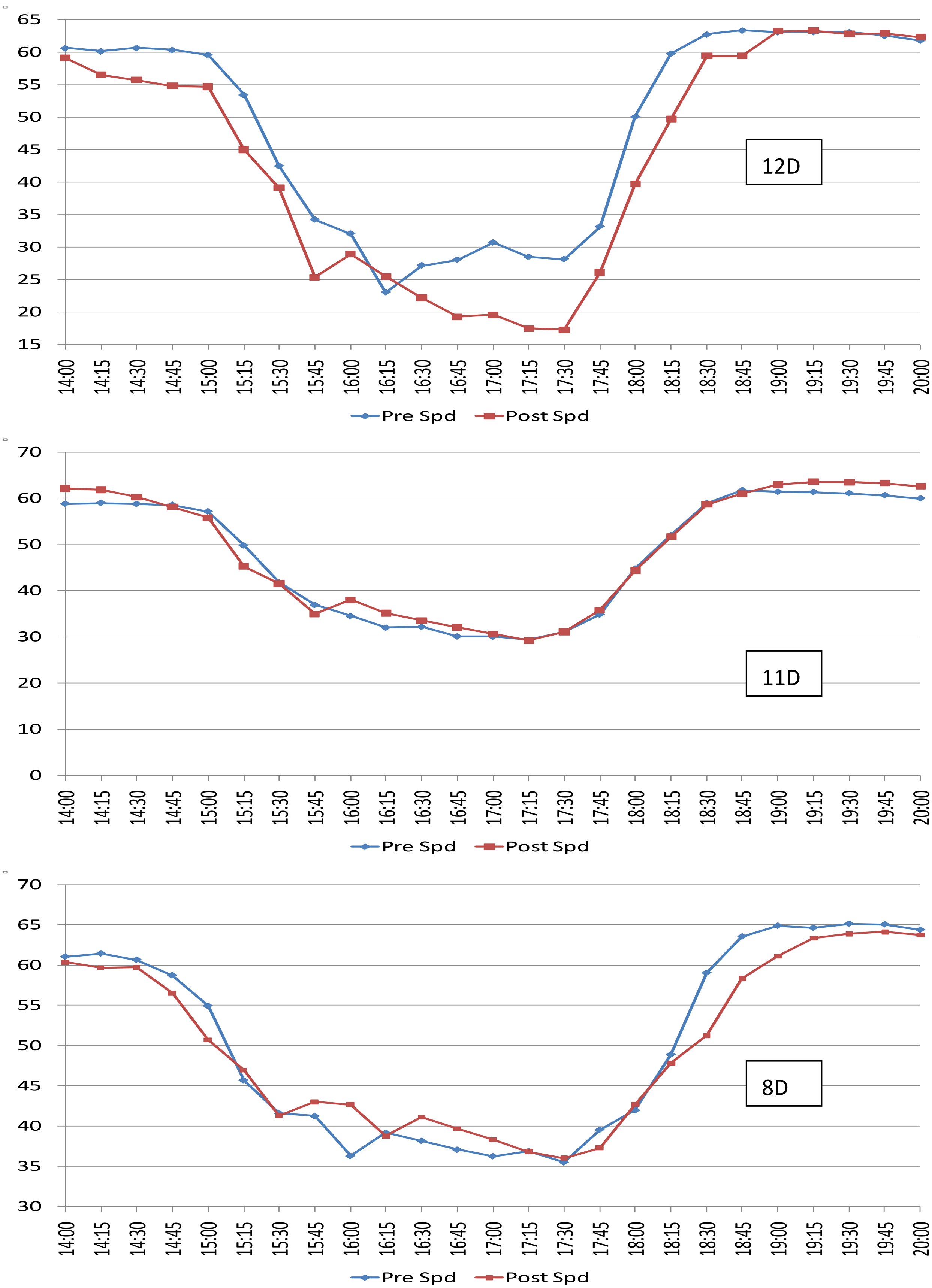


Figure S1.12.3 Comparison of Pre (April, 2008) and Post-VSL (April, 2009) Speed Profile

Comparison of Average Speeds Along the Segment

Figures S1.12.4 to S1.12.6 present the comparison of average speeds aggregated for the peak period averaged for all four/five lanes for pre- and post-VSL system at the six detector locations for the three months. The figure shows detectors upstream, on and downstream of segment 1. The line plots compare the average volume during the peak periods.

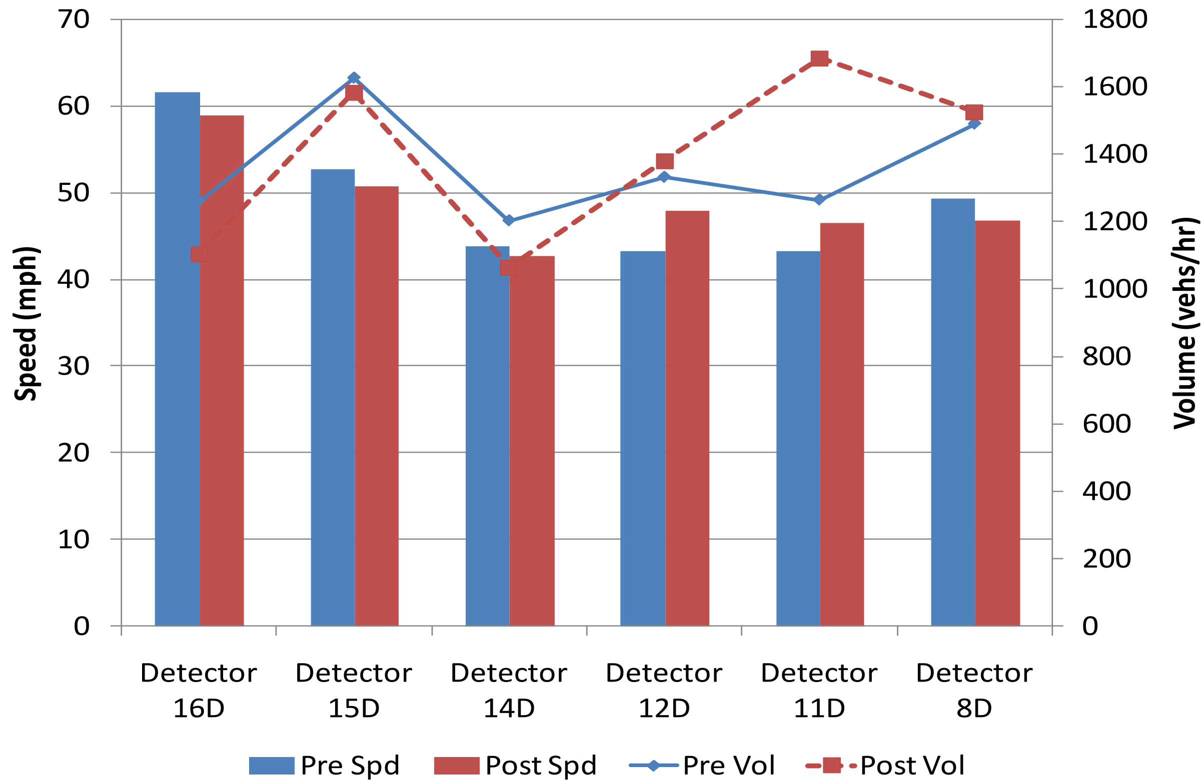


Figure S1.12.4. Comparison of Pre (Oct, 07) and Post-VSL (Oct, 08) Average Speed and Volume

Figure S1.12.4 presents the plot for October comparing the speed volume trend along the segment. It can be observed that the speeds were higher for lower volumes, however, at detector 11D (logmile 11) higher speed was observed with higher volume, indicating system benefits. For the months of November and April, though average volumes were similar, average speeds were slightly improved at some detectors. However no such improvements were observed at other detector locations.

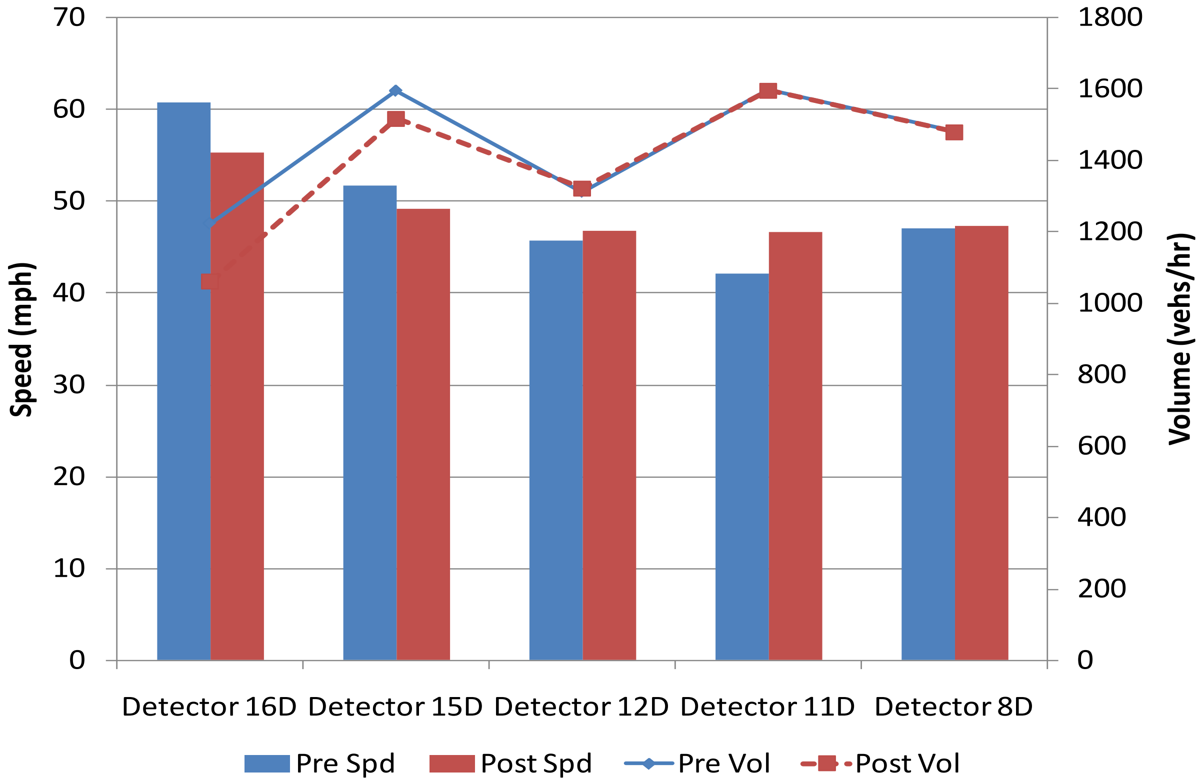


Figure S1.12.5. Comparison of Pre (Nov, 07) and Post-VSL (Nov, 08) Average Speed and Volume

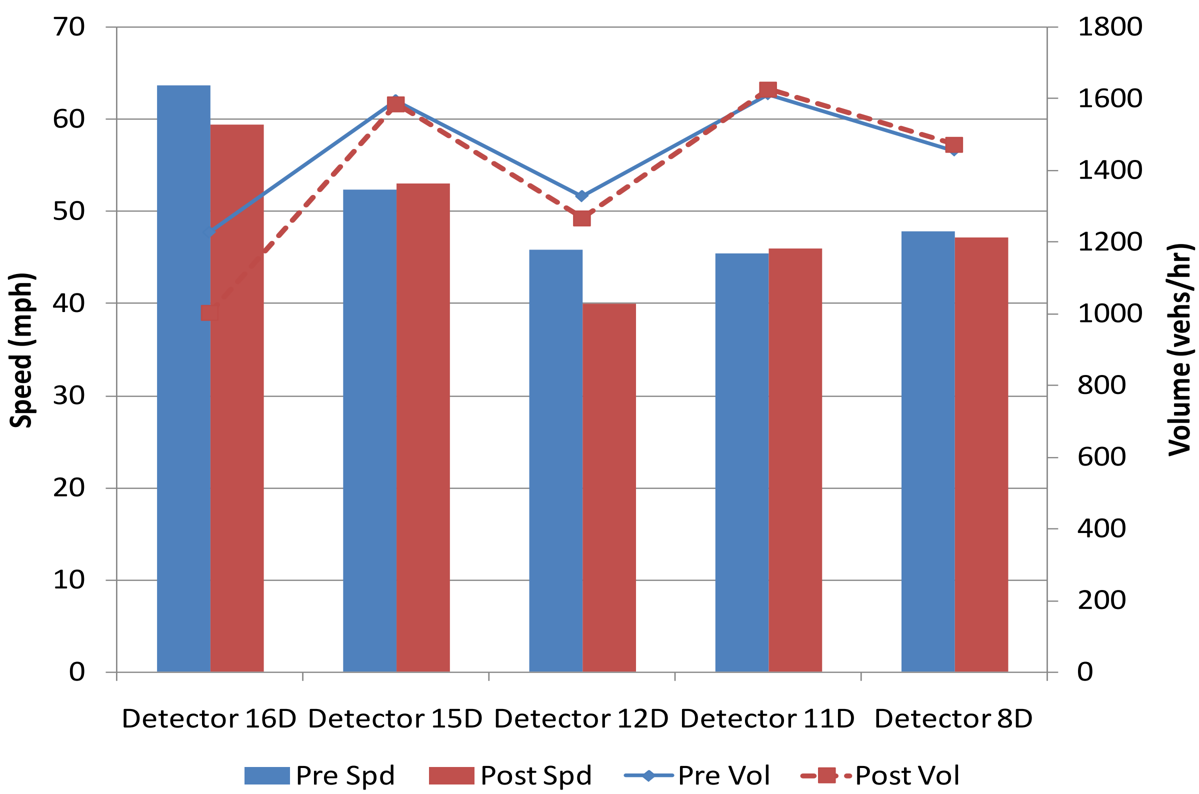


Figure S1.12.6. Comparison of Pre (April, 08) and Post-VSL (April, 09) Average Speed and Volume

Task 1.3: Speed Limit During Peak Periods

The objective of this task was to evaluate the system initiation logic for variable speed limits. This task was not carried out for average monthly data as posted VSLs cannot be averaged for analysis.

Task 1.4: Speed Limit Compliance by Posted Speed Limit

The objective of this task was to analyze driver compliance of the posted variable speed limits. This task was not carried out because accurate analysis requires a day's data for peak period and VSL.

Task 1.5: Evaluation of Highway Capacity

This task compared speed-flow plots for pre- and post-VSL conditions. Figures S1.15.1 to S1.15.3 present the speed flow data for three months in pre- and post-VSL system installation for detector locations 12D (logmile 12.4), 11D (logmile 11) and 8D (logmile 8.5). Data used were aggregated for 5 minute intervals for this task. No change in highway capacity was noticed when the data for pre- and post-VSL conditions was compared. However, fewer data points were observed in the congested regime for detector at 11D (logmile 11) indicating reduced congestion. Overall, it can be said that, no significant benefits were observed from the current state of VSL system initiation. However, the efficiency of system can be improved by prompt initiation.

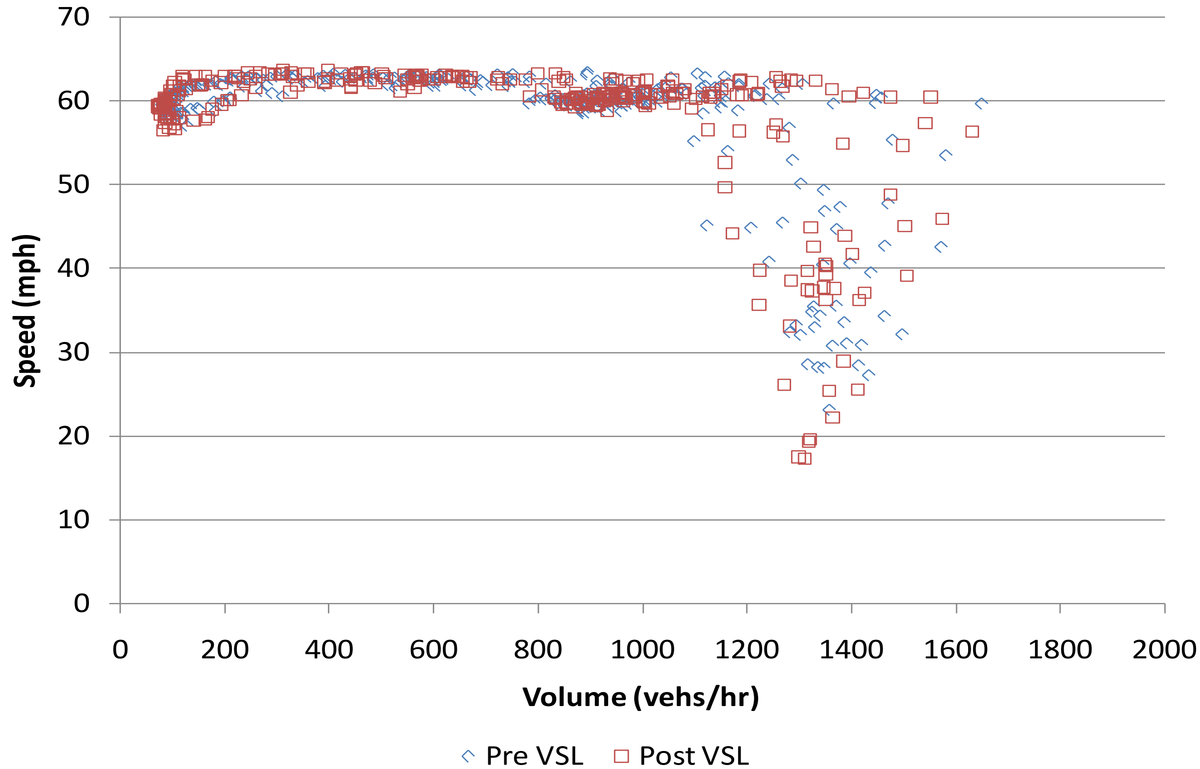


Figure S1.15.1 Speed Flow Plot for three months (Oct, Nov & April) at 12D

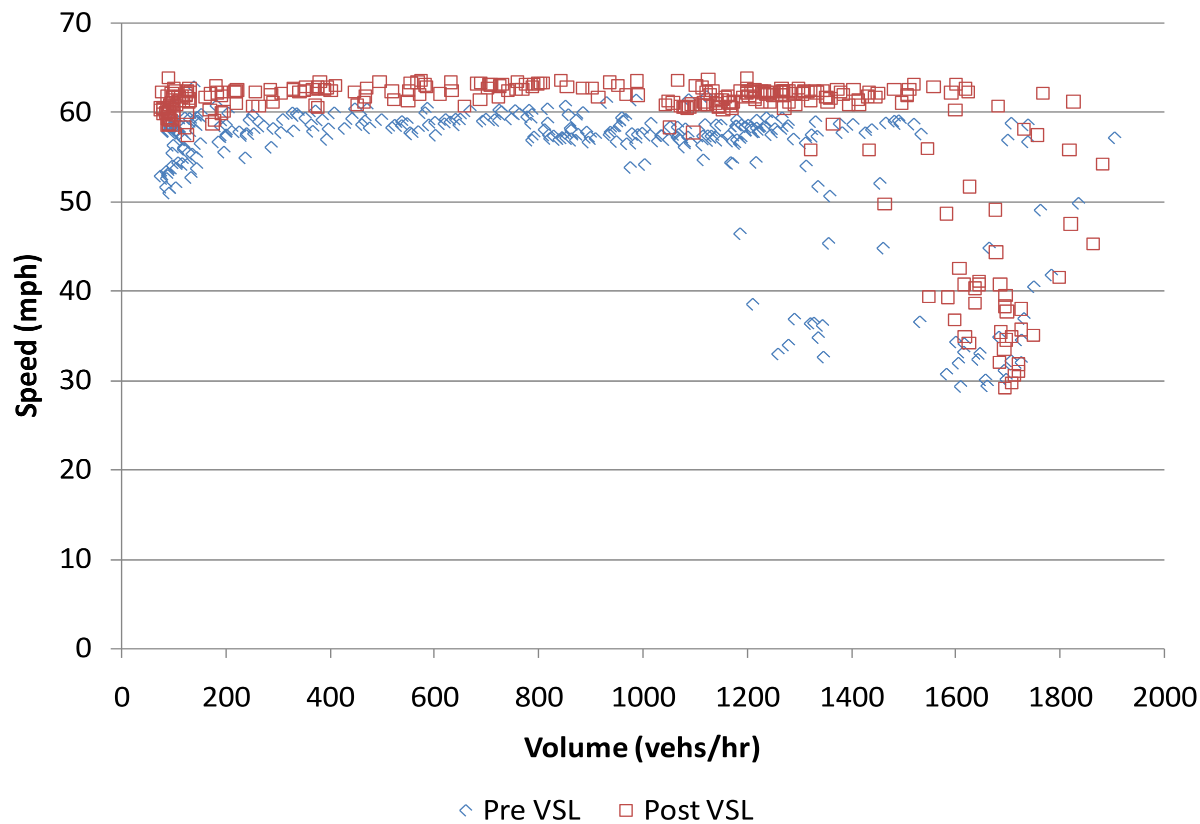


Figure S1.15.2 Speed Flow Plot for three months (Oct, Nov & April) at 11D

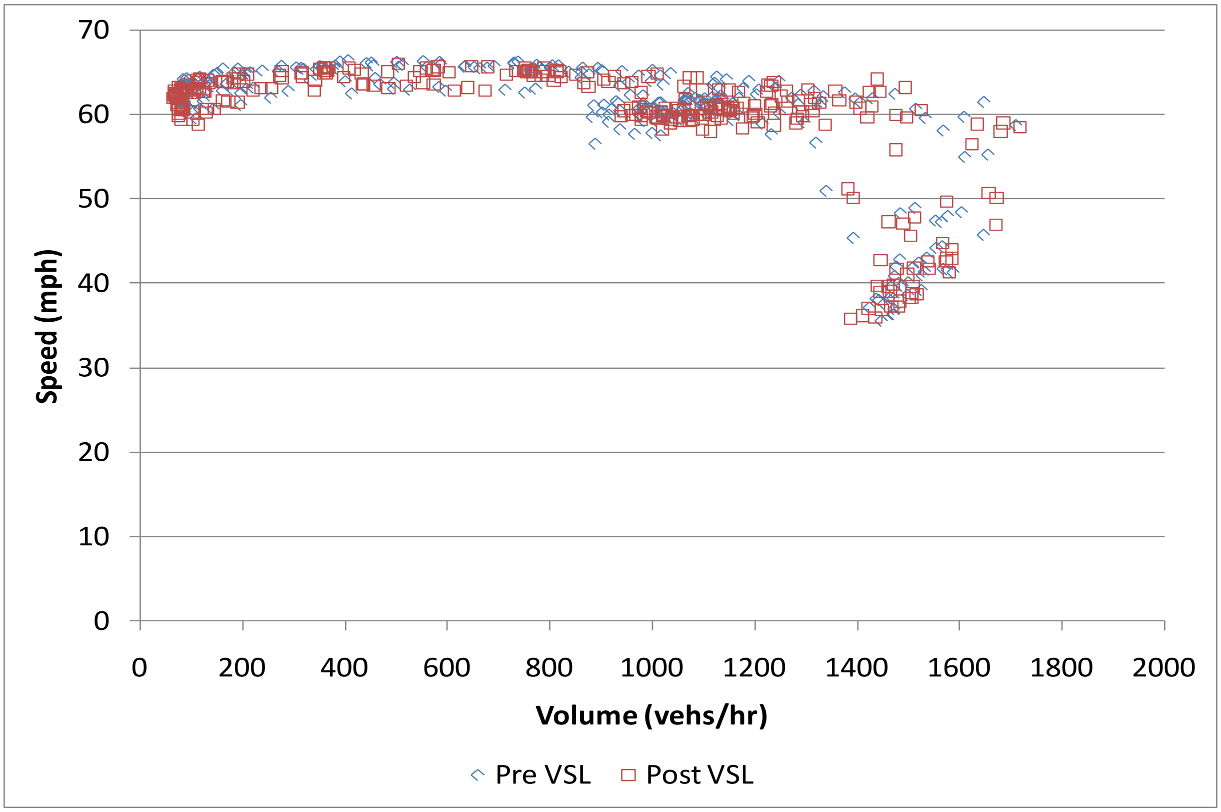


Figure S1.15.3 Speed Flow Plot for three months (Oct, Nov & April) at 8D

Task 1.6: Evaluation of Congestion Measures

To evaluate the congestion measures, travel times and travel time reliability indices, travel delay, and Percent of Congested Delay were compared for pre- and post-VSL conditions. Segment 1 mean and standard deviation of travel times were computed between detectors 12D (logmile 12.4) and 11D (logmile 11), and 11D (logmile 11) and 8D (logmile 8.5), for October, November, and April data.

<u>Mean and Standard Deviation of Travel Times</u>

Travel times were calculated for average of all lanes for each month and then averaged for the months considered. Figures S1.16.1 to S1.16.3 present the comparison of travel times computed for average of all lanes between detectors 12D (logmile 12.4) and 11D (logmile 11). For pre-VSL conditions, it can be observed from Figures S1.16.1 to S1.16.3 that the mean travel times for peak periods ranged from 227 to 290 person-minutes. For post-VSL conditions, the mean travel times during peak period increased from 247 to 326 person-minutes. Tables S1.16.1 and S1.16.2 present the comparison of mean and standard deviation of travel times for the three months and their average. It can be observed from the tables that the percentage change of mean travel time during peak periods for post-VSL compared with pre-VSL conditions varied from -7.4 to 12.9%. Average of three months showed that the mean travel times during peak periods increased 5% after initiation of the VSL system. This 5% increase can be attributed to 5% increase in volume for post-VSL conditions, which means VSL system was not beneficial to decrease travel time in segment 1 between detectors 12D (logmile 12.4) and 11D (logmile 11).

The standard deviation of travel times for average of three months for pre- and post-VSL conditions were very similar, however, for October and November data standard deviation of travel times decreased indicating the VSL system was beneficial in reducing the variation of travel times during the peak periods for these months. For April, when the standard deviation in volume was lower, the standard deviation in travel times went up for post-VSL conditions.

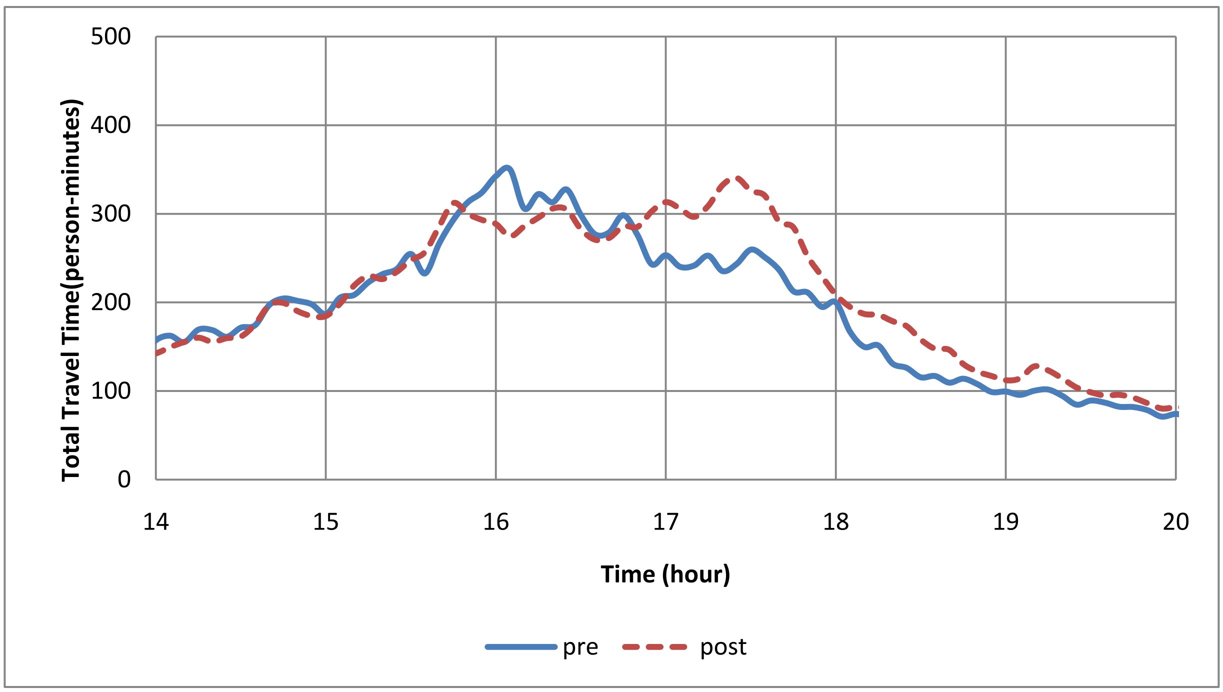


Figure S1.16.1 Comparison of Pre and Post-VSL average travel time data between 12D and 11D (October)

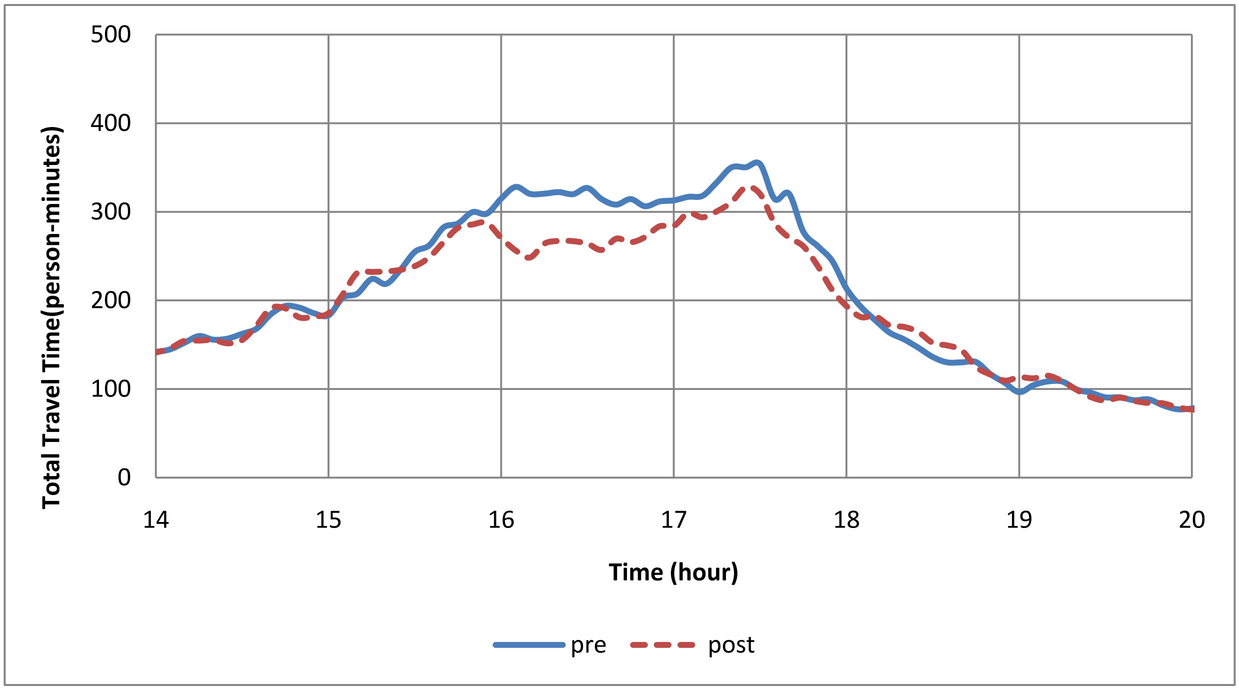


Figure S1.16.2 Comparison of Pre and Post-VSL average travel time data between 12D and 11D (November)

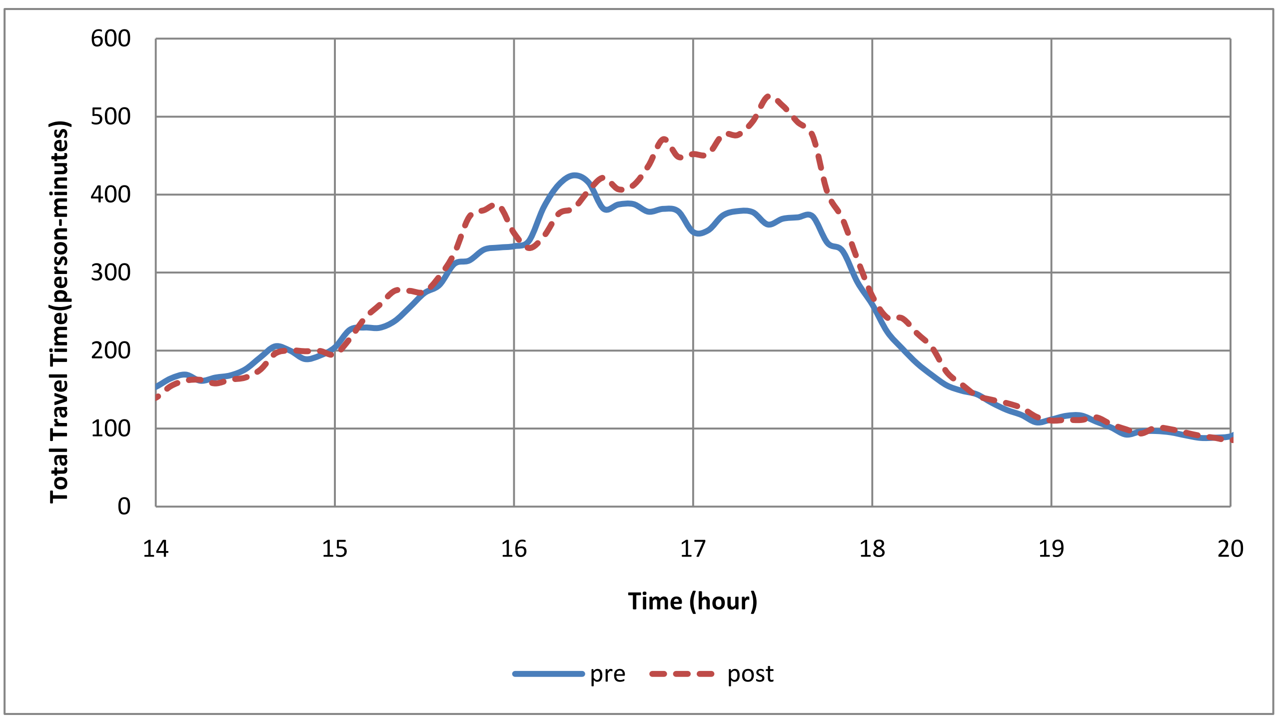


Figure S1.16.3 Comparison of Pre and Post-VSL average travel time data between 12D and 11D (April)

Table S1.16.1 Comparison of mean travel times during peak period for pre- and post VSL

	Between 12D and 11D			
	Travel Time (person-minutes)		Volume (vehicles/hour)	
	Pre-VSL	Post-VSL	Pre-VSL	Post-VSL
October	227.1	247.0	4946	5744
Percentage change	8.8		16.3	
November	253.3	234.6	5347	5387
Percentage change	-7.4		0.7	
April	289.4	326.6	5688	5675
Percentage change	12.9		-0.2	
Average of three months	256.6	269.4	5327	5602
Percentage change	5.0		5.2	

Table S1.16.2 Comparison of standard deviation of travel times during peak period for pre- and post VSL

	Between 12D and 11D			
	Travel Time (person-minutes)		Volume (vehicles/hour)	
	Pre-VSL	Post-VSL	Pre-VSL	Post-VSL
October	75.7	68.5	45.6	46.9
Percentage change	-9.5		2.9	
November	82	63	43.9	46.5
Percentage change	-23.2		5.9	
April	101.4	127.2	42.3	39.9
Percentage change	25.4		-5.7	
Average of three months	86.3	86.2	43.9	44.4
Percentage change	0.1		1.1	

Figures S1.16.4 to S1.16.6 present the comparison of travel times computed for average of all lanes between detectors 11D (logmile 11) and 8D (logmile 8.5). It can be observed from Figures S1.16.4 to S1.16.6 that for pre-VSL conditions, the mean travel times for peak periods ranged from 420 to 500 person-minutes. For post-VSL conditions, the mean travel times during peak period increased from 465 to 500 person-minutes. Tables S1.16.3 and S1.16.4 present the comparison of mean and standard deviation of travel times for the three months of data and their average. It can be observed from the tables that the percentage change in mean travel time during peak periods for post-VSL compared with pre-VSL conditions varied from -6.7 to 11.1%. Average of three months indicated that the mean travel times increased 1.2% with an increase in volume of 4.1% during the peak periods after initiation of the VSL system, which means VSL system was beneficial to decrease travel time (increase in volume was more than three times of travel time) in segment 1 between detectors 11D (logmile 11) and 8D (logmile 8.5). . When the standard deviation of travel times and volume were compared for average of three months, the results indicated decrease in travel time of 5.6% and in volume of 3.9% after initiation of the VSL system. This indicates overall for three months of data observed for detectors 11D (logmile 11) and 8D (logmile 8.5) the mean volumes in post-VSL conditions were slightly higher and as a result the mean travel times were higher as well. The standard deviation in travel times and volume were, however, lower, which overall indicates benefits of the VSL system. Overall results for segment 1 (between detectors 12D (logmile 12.4) and 8D (logmile 8.5) show VSL system was beneficial in decreasing the travel time according to this uncontrolled analysis.

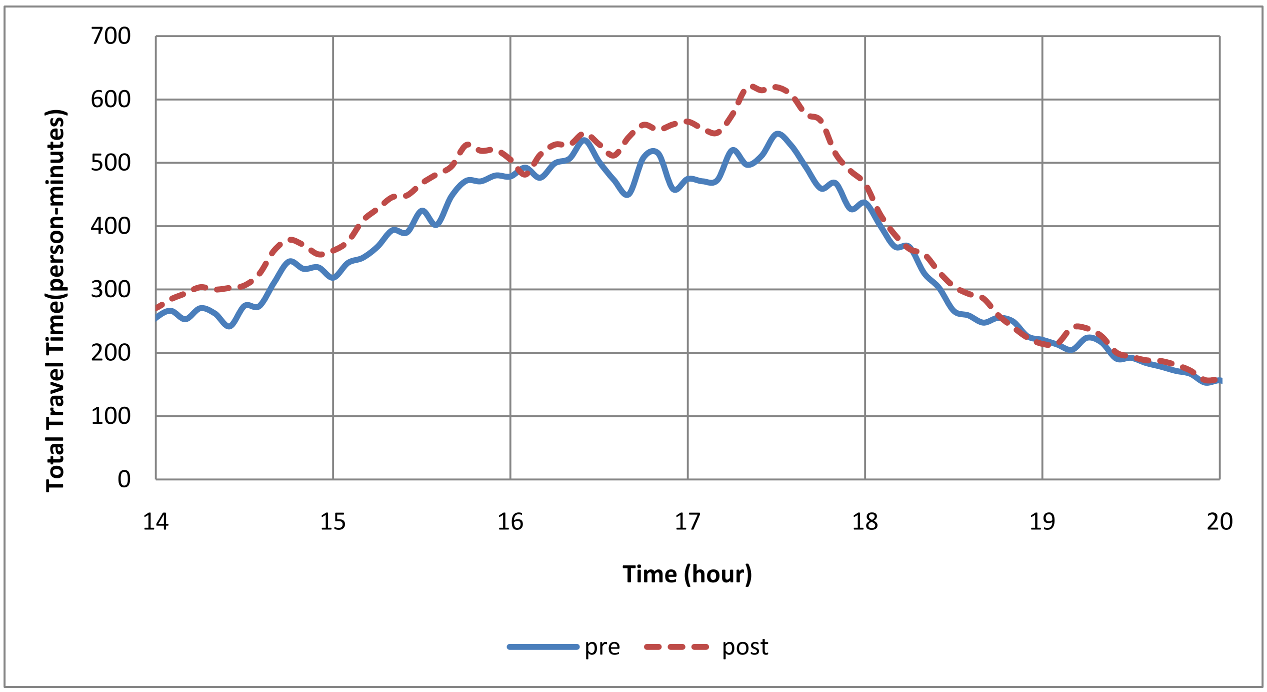


Figure S1.16.4 Comparison of Pre and Post-VSL average travel time data between 11D and 8D (October)

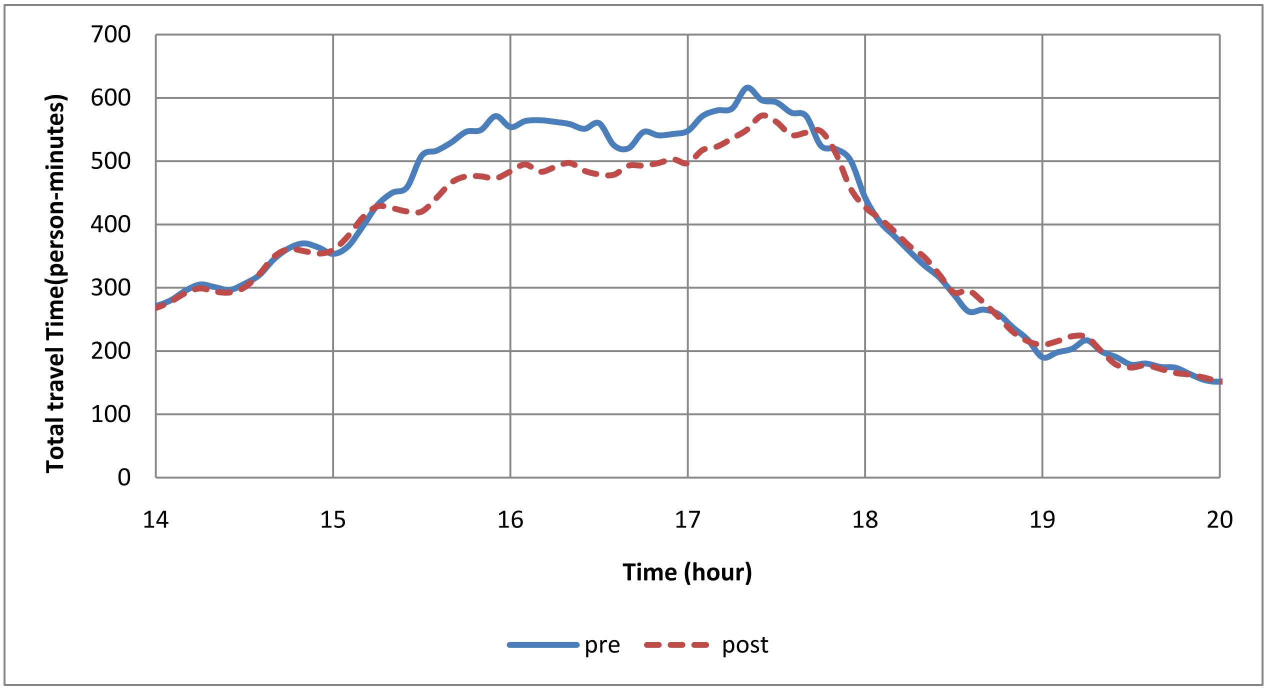


Figure S1.16.5 Comparison of Pre and Post-VSL average travel time data between 11D and 8D (November)

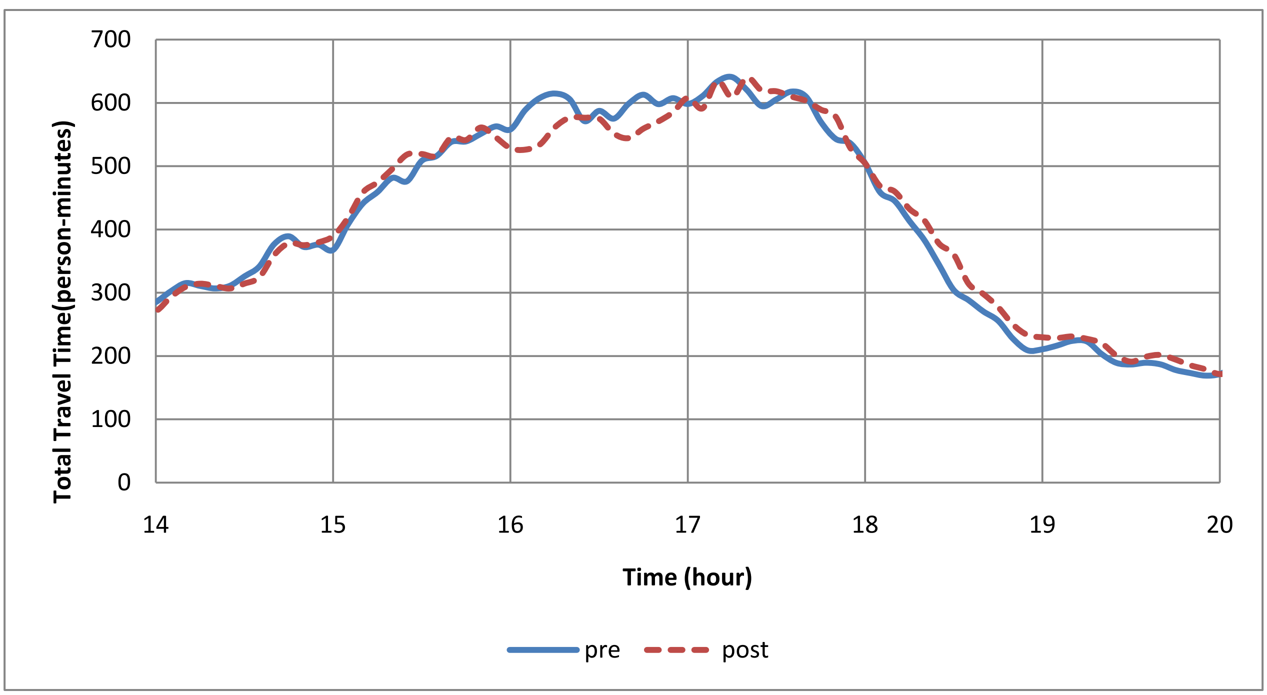


Figure S1.16.6 Comparison of Pre and Post-VSL average travel time data between 11D and 8D (April)

Table S1.16.3 Comparison of mean travel times during peak period for pre- and post VSL

	Between 11D and 8D			
	Travel Time (person-minutes)		Volume (vehicles/hour)	
	Pre-VSL	Post-VSL	Pre-VSL	Post-VSL
October	419.2	465.8	5647	6263
Percentage change	11.1		10.9	
November	469.5	438.0	5927	5945
Percentage change	-6.7		0.3	
April	499.5	500.4	6200	6297
Percentage change	0.2		1.6	
Average of three months	462.7	468.1	5925	6169
Percentage change	1.2		4.1	

Table S1.16.4 Comparison of standard deviation of travel times during peak period for pre- and post VSL

	Between 11D and 8D			
	Travel Time (person-minutes)		Volume (vehicles/hour)	
	Pre-VSL	Post-VSL	Pre-VSL	Post-VSL
October	100.5	119.7	588	637
Percentage change	19.1		8.3	
November	129.4	104.3	715	652
Percentage change	-19.4		-8.8	
April	136.6	122.3	688	625
Percentage change	-10.5		-9.2	
Average of three months	122.2	115.4	663.7	638
Percentage change	-5.6		-3.9	

<u>Individual Measures</u>

The individual measures, TTI, BTI, and PTI were compared with three months of data for the peak periods for pre- and post-VSL conditions. Tables S1.16.5 to S1.16.7 present their comparison for average of all lanes between detectors 12D (logmile 12.4) and 11D (logmile 11), and detectors 11D (logmile 11) and 8D (logmile 8.5). It can be observed from Table S1.16.5 that for post-VSL conditions, TTI between detectors 12 and 11 decreased for October and November data 7.5 and 9.1%, respectively, but it increased for April data 22.5%. The TTI for post-VSL conditions between detectors 11D (logmile 11) and 8D (logmile 8.5) decreased for November and April data, 7.1 and 1.2%, respectively, but it increased for October data 2.8%. But overall results for whole segment 1 shows TTI increased that means pre-VSL conditions was more reliable than post-VSL conditions and there is no benefit after VSL system initiation.

Table S1.16.5. Comparison of Travel Time Index

Individual Measures	Between 12D and 11D		Between 11D and 8D	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
October				
Travel Time Index (TTI)	1.60	1.48	1.45	1.49
Percentage Change	-7.5		2.8	
November				
Travel Time Index (TTI)	1.64	1.49	1.56	1.45
Percentage Change	-9.1		-7.1	
April				
Travel Time Index (TTI)	1.82	2.23	1.61	1.59
Percentage Change	22.5		-1.2	
Average of three months				
Travel Time Index (TTI)	1.69	1.73	1.54	1.51
Percentage Change	2.4		-1.9	

For post-VSL conditions, Table S1.16.6 shows values of BTI decrease for October and November data 16.2 and 3.1%, respectively, but increased for April data by 33.3% between detectors 12D (logmile 12.4) and 11D (logmile 11). The values of BTI between detectors 11D (logmile 11) and 8D (logmile 8.5) increased for October and November data by 47.6 and 4.2%, respectively, but were similar for April data. But overall results for whole segment 1 shows BTI increased that means pre-VSL conditions was more reliable than post-VSL conditions and there is no benefit after VSL system initiation according to this uncontrolled analysis.

Table S1.16.6. Comparison of Buffer Time Index

Individual Measures	Between 12D and 11D		Between 11D and 8D	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
October				
Buffer Time Index (BTI)	0.37	0.31	0.21	0.31
Percentage Change	-16.2		47.6	
November				
Buffer Time Index (BTI)	0.32	0.31	0.24	0.25
Percentage Change	-3.1		4.2	
April				
Buffer Time Index (BTI)	0.39	0.52	0.25	0.25
Percentage Change	33.3		0.0	
Average of three months				
Buffer Time Index (BTI)	0.36	0.38	0.23	0.27
Percentage Change	5.6		17.4	

For post-VSL conditions, from Table S1.16.7 it can be observed that values of PTI between detectors 12D (logmile 12.4) and 11D (logmile 11) decreased for October and November 8.6 and 8.2%, respectively, but it increased for April data by 24%. The values of PTI between detectors 11D (logmile 11) and 8D (logmile 8.5) decreased for November and April data 5.5 and 1.1%, respectively, but increased for October data by 7.8%. It can be stated that the VSL system was beneficial for October and November data between detectors 12D (logmile 12.4) and 11D (logmile 11), and for detectors 11D (logmile 11) and 8D (logmile 8.5), November and April data showed benefit for the VSL system. But overall results for whole segment 1 shows PTI increased that means pre-VSL conditions was more reliable than post-VSL conditions and there is no benefit after VSL system initiation.

Table S1.16.7. Comparison of Planning Time Index

Individual Measures	Between 12D and 11D		Between 11D and 8D	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
October				
Planning Time Index (PTI)	1.96	1.79	1.66	1.79
Percentage Change	-8.6		7.8	
November				
Planning Time Index (PTI)	1.96	1.80	1.80	1.70
Percentage Change	-8.2		-5.5	
April				
Planning Time Index (PTI)	2.21	2.74	1.86	1.84
Percentage Change	24.0		-1.1	
Average of three months				
Planning Time Index (PTI)	2.04	2.11	1.77	1.77
Percentage Change	3.4		0.0	

Higher TTI shows higher ratio between the actual travel rate and Posted Speed Limit (PSL) travel rate, which means the VSL system was not useful in decreasing the difference between the peak period and the PSL travel conditions. Higher BTI indicates increase in difference between 95% travel time and average travel time that means the VSL system was not beneficial in reducing the difference between the 95% travel time and average travel time. Higher PTI indicates higher ratio between 95% travel time and PSL travel time that means the VSL system was not useful in decreasing the difference between 95% and PSL travel time. Overall results for whole segment 1 show all travel time reliability indices (TTI, BTI, and PTI) increased. Increasing in all travel time reliability indices for post-VSL conditions indicate more variability and less consistency between highest value of travel time during the peak period (worst condition) and PSL condition. It can be concluded that post-VSL conditions was less reliable than pre-VSL conditions and there is no benefit after VSL system initiation.

Traffic Delay

For segment 1, the analysis indicates that average Delay calculated for post-VSL system was compared to the pre-VSL system. Delay varied from -0.17 to 0.65 minutes, average increased by 0.32 minutes. Similarly, Percentage of Congested Travel ranged between -7 to 6 percent for post-VSL conditions. From Table S1.16.8 it can be noticed that congestion reduced significantly between 12.4D to 8.5D. However, upstream of 12.4, no such improvement was observed and congestion increased by average of 5 percent.

Table S1.16.8. Average Delay and Change in Percentage of Congested Travel during peak periods before and after VSL system installation

Detector ID	MP 16.6 to MP 15.4	MP 15.4 to MP 12.4	MP 12.4 to MP 11	MP 11 to MP 8.5
	October			
Pre VSL Travel Time (minutes)	1.24	3.63	1.84	3.13
Post VSL Travel Time (minutes)	1.29	3.55	1.73	3.09
Delay (minutes)	0.05	**-0.08**	**-0.11**	**-0.03**
Percent Change in Congested Travel	3.9%	**-2.3%**	**-6.1%**	**-1.0%**
	November			
Pre VSL Travel Time (minutes)	1.25	3.58	1.85	3.25
Post VSL Travel Time (minutes)	1.35	3.63	1.73	3.07
Delay (minutes)	0.10	0.05	**-0.12**	**-0.18**
Percent Change in Congested Travel	7.9%	1.4%	**-6.4%**	**-5.5%**
	April			
Pre VSL Travel Time (minutes)	1.22	3.79	1.95	3.30
Post VSL Travel Time (minutes)	1.25	4.24	2.15	3.26
Delay (minutes)	0.03	0.45	0.20	**-0.03**
Percent Change in Congested Travel	2.7%	12.0%	10.4%	**-1.0%**

*Negative value indicates decrease in Post-VSL congestion measures and vice versa.

Delay Cost Analysis

This task was not carried out for the monthly data aggregate as monthly aggregate analysis did not show clear benefits.

Task 1.7: Analysis of VSL System during Inclement Weather

Task 1.7 was not conducted separately as the monthly analysis included all weather data.

SEGMENT 2 ANALYSIS

Table S2.1 presents the dates that were considered for segment 2 evaluation. Data for these dates were considered appropriate for evaluation as the data were available, and presented clear weather conditions. Days with similar volumes were used for evaluation. The average of five days used in this report for comparison between pre- and post-VLS conditions for segment 2 are highlighted in the table. Some dates did not present VSL benefits while others did. The days in the table are mostly Thursdays unless pointed out in the footnote.

Table S2.1. Time Period selected for VSL system evaluation

Pre-VSL System	Post-VSL System
October 2007	*October 2008*
November 2007	*November 2008*
April 2008	*April 2009*

Task 1.1: Volume and Occupancy Analysis

This task consists of two sub-tasks. First, average volume for pre- and post-VSL conditions are compared. Second, occupancy data for pre- and post-VSL conditions, and the change in flow-occupancy relationship are compared. The change in volume is accounted to evaluate the effect on average speed, travel time and congestion. Figures S2.1S2.11.1 to S2.1S2.11.3 present the volume comparison between pre- and post-VSL system installation for all five lanes for detectors 3D (logmile 3.6) and 5D (logmile 5.7) for pre and post VSL system installation. Average volume for 5-minutes interval on the highway was compared for both conditions to account for any change in volume.

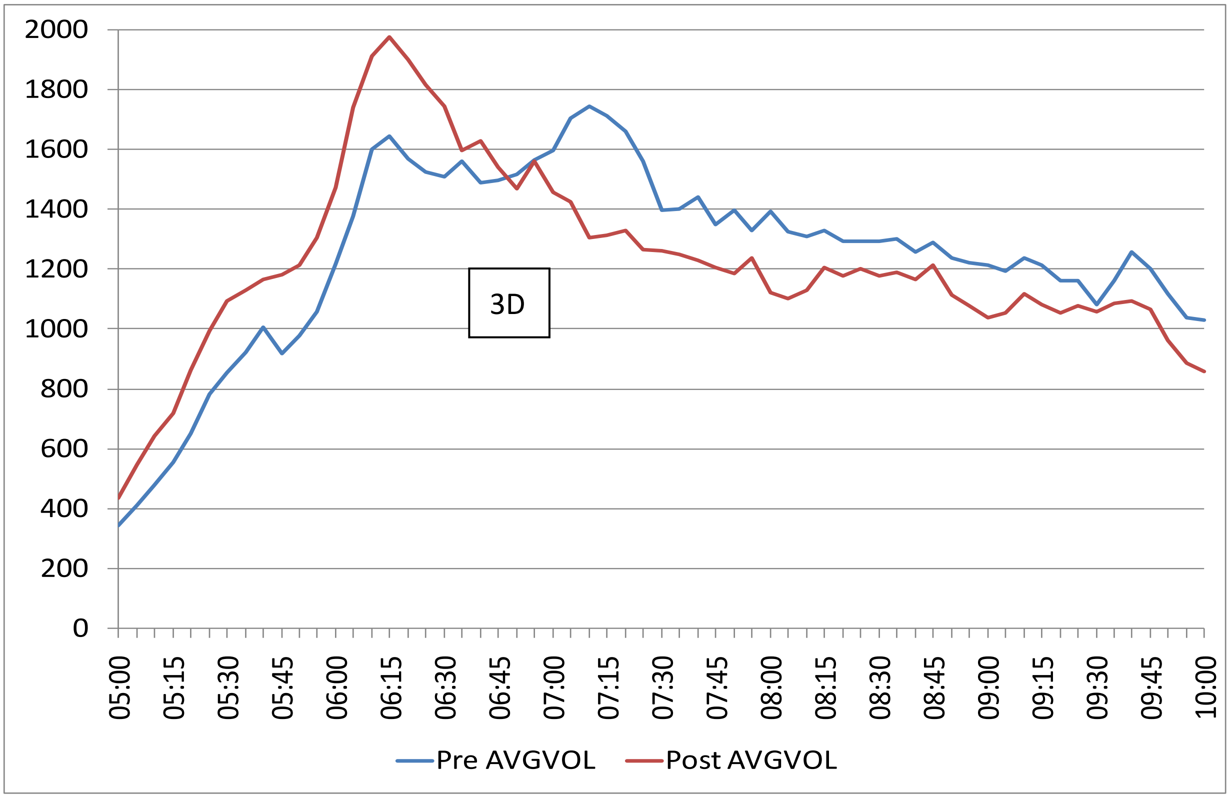
Figures S2.11.1 to S2.11.3 present volume profiles during peak periods for detectors along segment 2 for Pre and post conditions for Oct, Nov and April. Table S2.11.1 indicated 11 percent increase in volume in post-VSL conditions for 5D (logmile 5.7). Figures S2.11.4 to S2.11.6 present the occupancy profiles and from Table S2.11.2 it can be noticed that occupancy decreased by 17 percent at detector 3D (logmile 3.6) but increased by 19 percent for 5D (logmile 5.7).

Table S2.11.1. Average Volume for three months

	Pre-VSL	Post-VSL	Pre-VSL	Post-VSL
	3D		*5D*	
Avg Oct	1344.82	1311.268	1034.591	1037.22
Diff, Percent	***-33.55***	***-2%***	***2.63***	***0%***
Avg Nov	1351.11	1256.579	732.1365	1006.28
Diff, Percent	***-94.53***	***-7%***	***274.14***	***37%***
Avg April	1348.62	1382.39	1056.42	1082.07
Diff, Percent	***33.78***	***3%***	***25.65***	***2%***
Avg Vol	1348.18	1316.75	941.05	1041.86
Diff, Percent	***-31.44***	***-2%***	***100.81***	***11%***

Table S2.11.2. Average Occupancy for three months

	Pre-VSL	Post-VSL	Pre-VSL	Post-VSL
	3D		*5D*	
Avg Oct	15.303	13.43918	11.26	14.89
Diff, Percent	***-1.86***	***-12%***	***3.63***	***32%***
Avg Nov	14.523	11.75	10.88	12.91
Diff, Percent	***-2.78***	***-19%***	***2.03***	***19%***
Avg April	15.22	12.36	12.44	13.51
Diff, Percent	***-2.86***	***-19%***	***1.06***	***9%***
Avg Occp	15.02	12.51	11.53	13.77
Diff, Percent	***-2.50***	***-17%***	***2.24***	***19%***



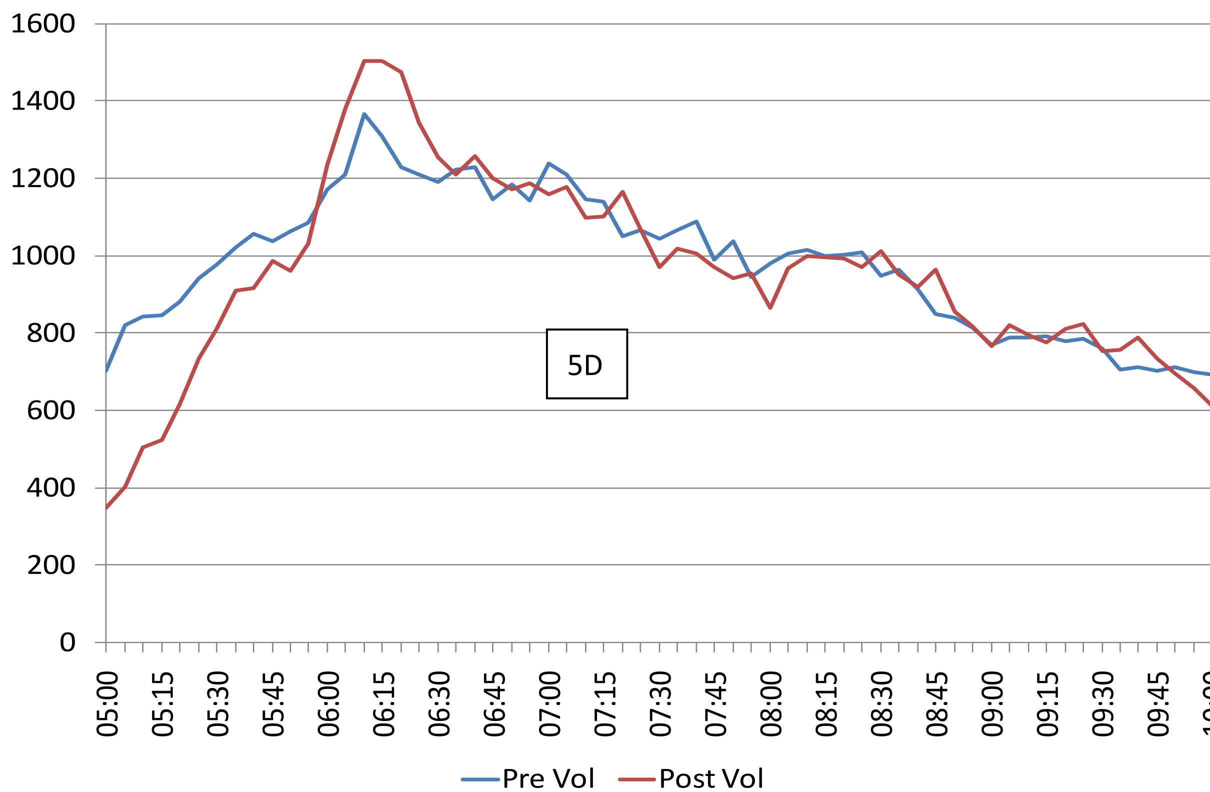
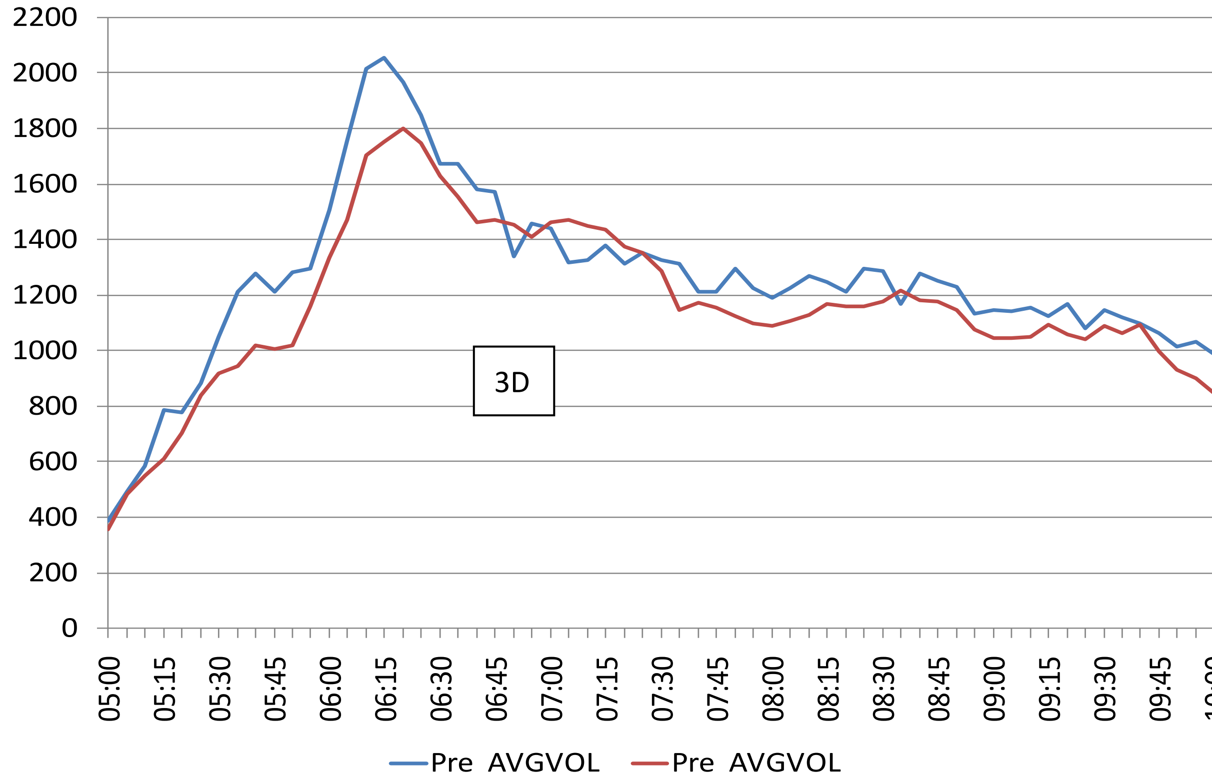


Figure S2.11.3 Comparison of Pre (Oct, 2007) and Post-VSL (Oct, 2008) Volume



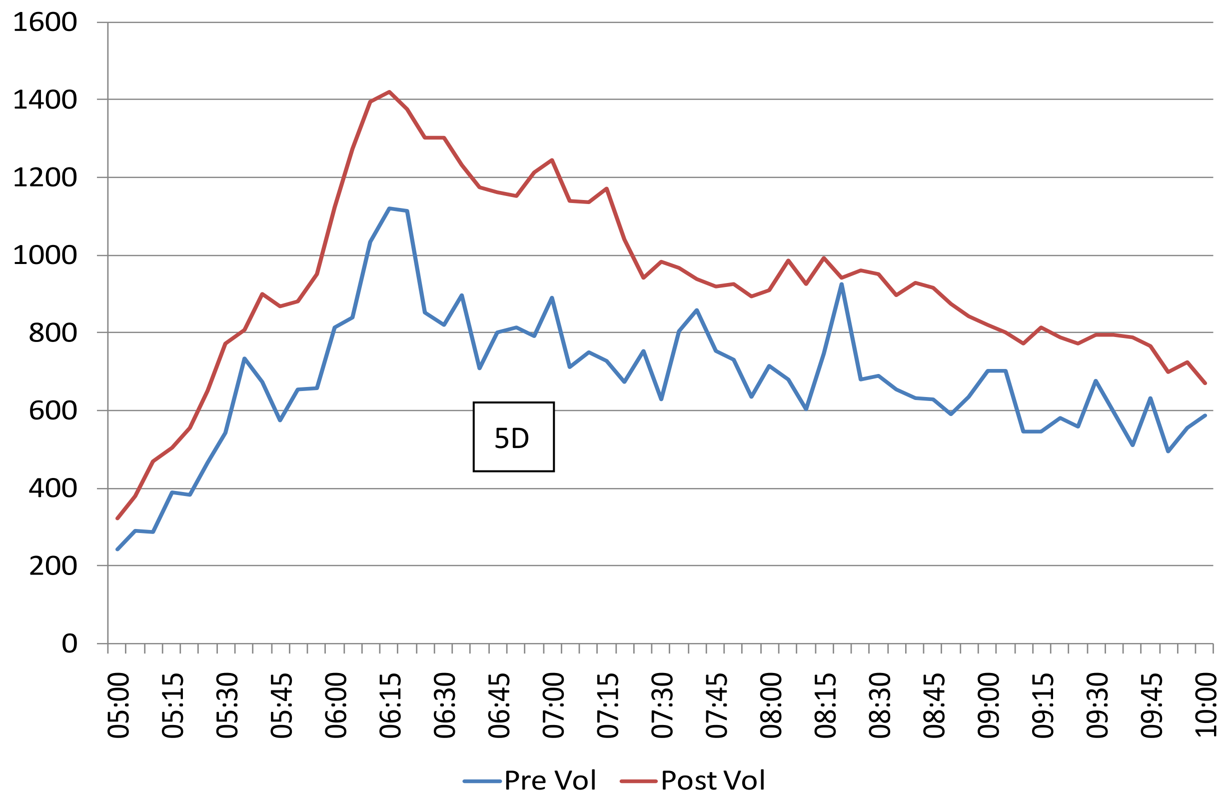


Figure S2.11.3 Comparison of Pre (Nov, 2007) and Post-VSL (Nov, 2008) Volume

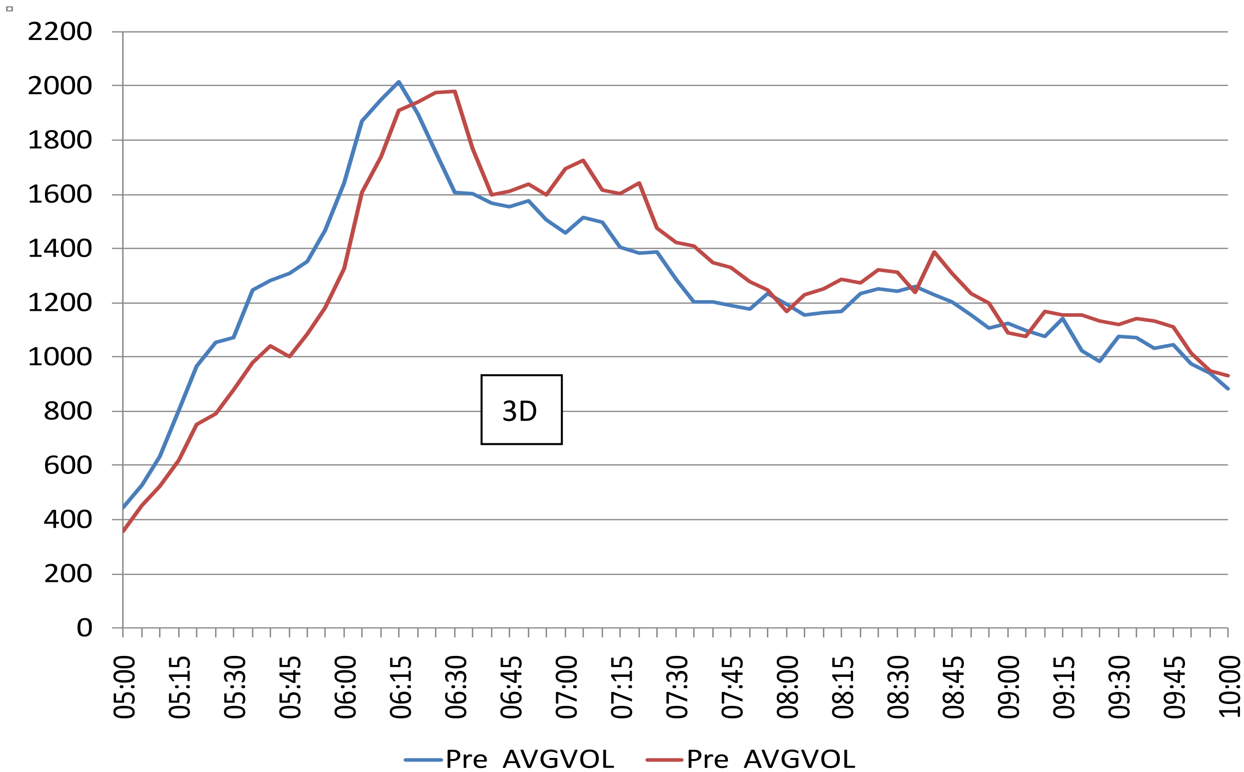
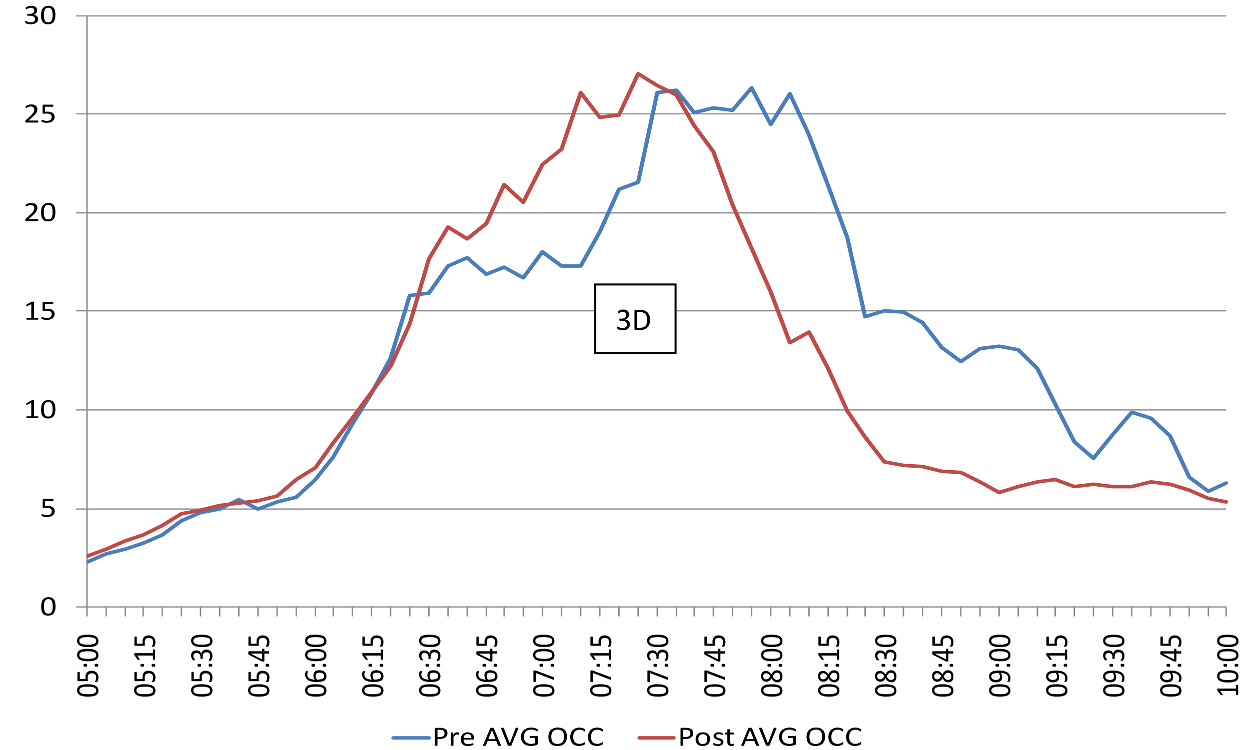


Figure S2.11.3 Comparison of Pre (April, 2008) and Post-VSL (April, 2009) Volumes



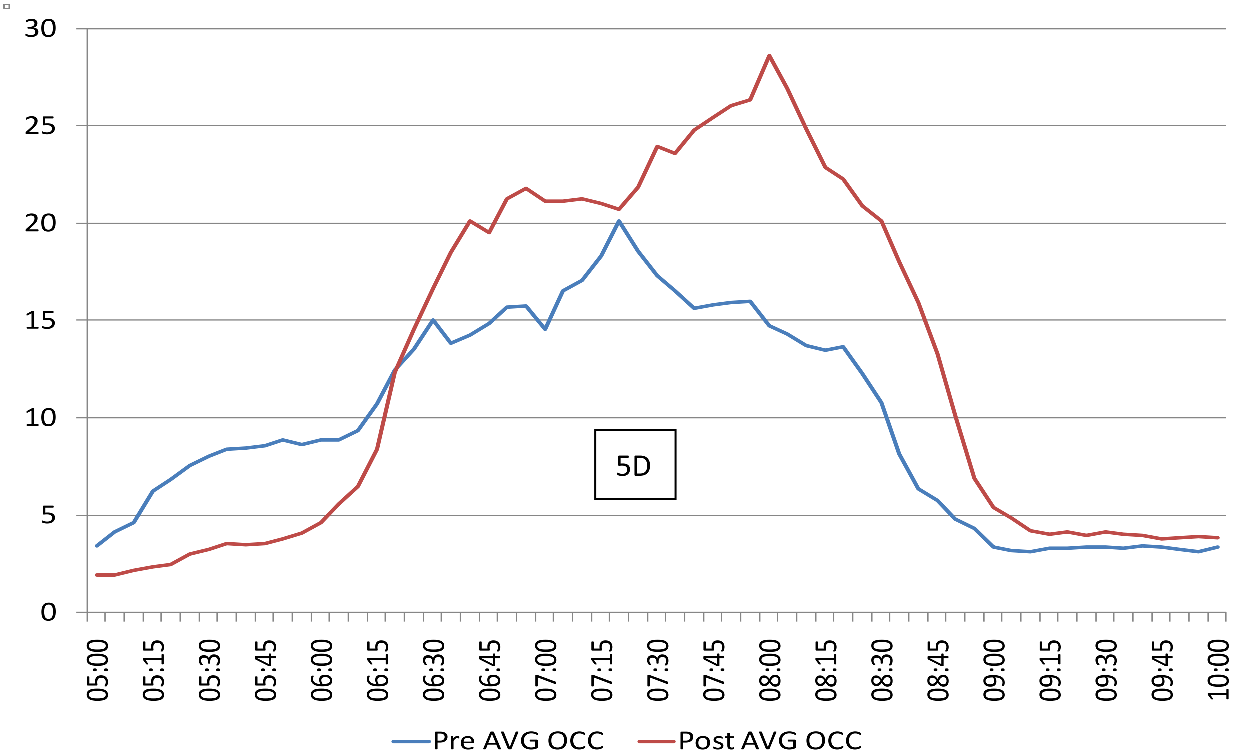
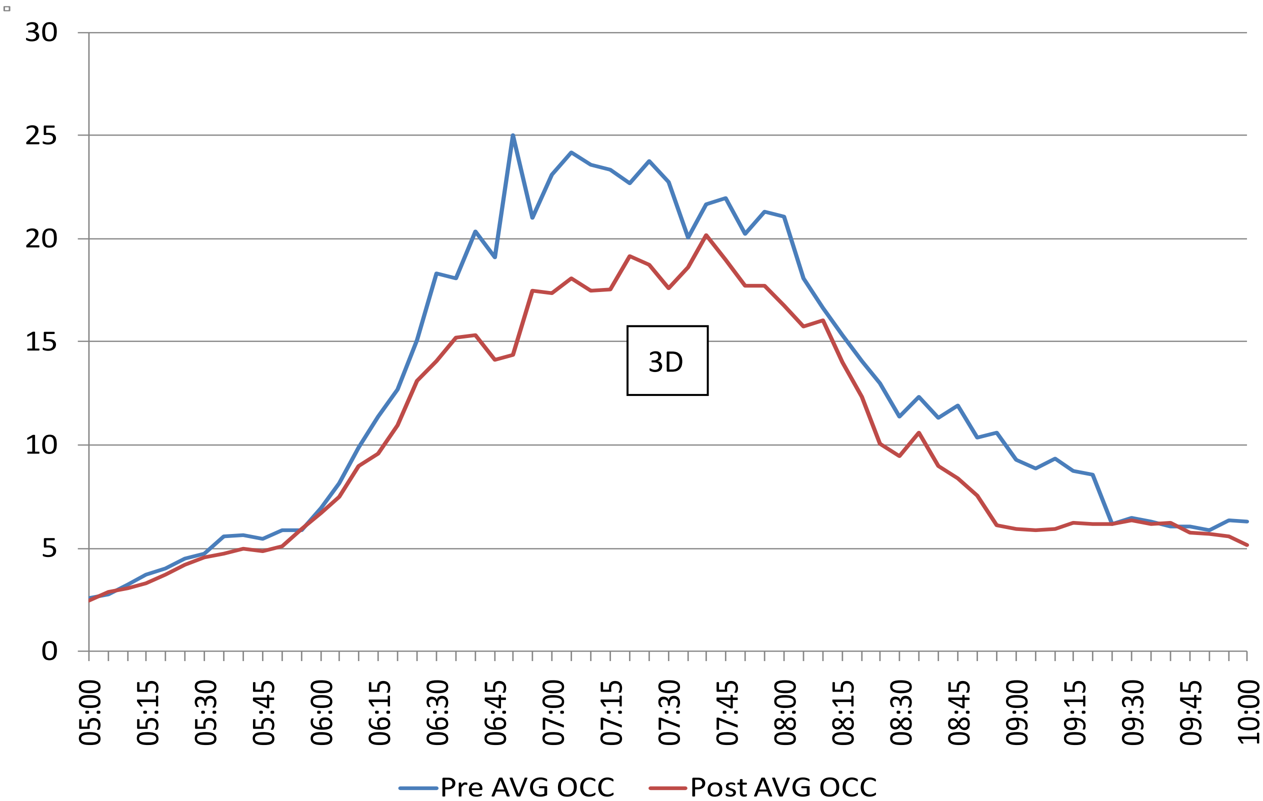


Figure S2.11.4 Comparison of Pre (Oct, 2007) and Post-VSL (Oct, 2008) Occupancy Profile



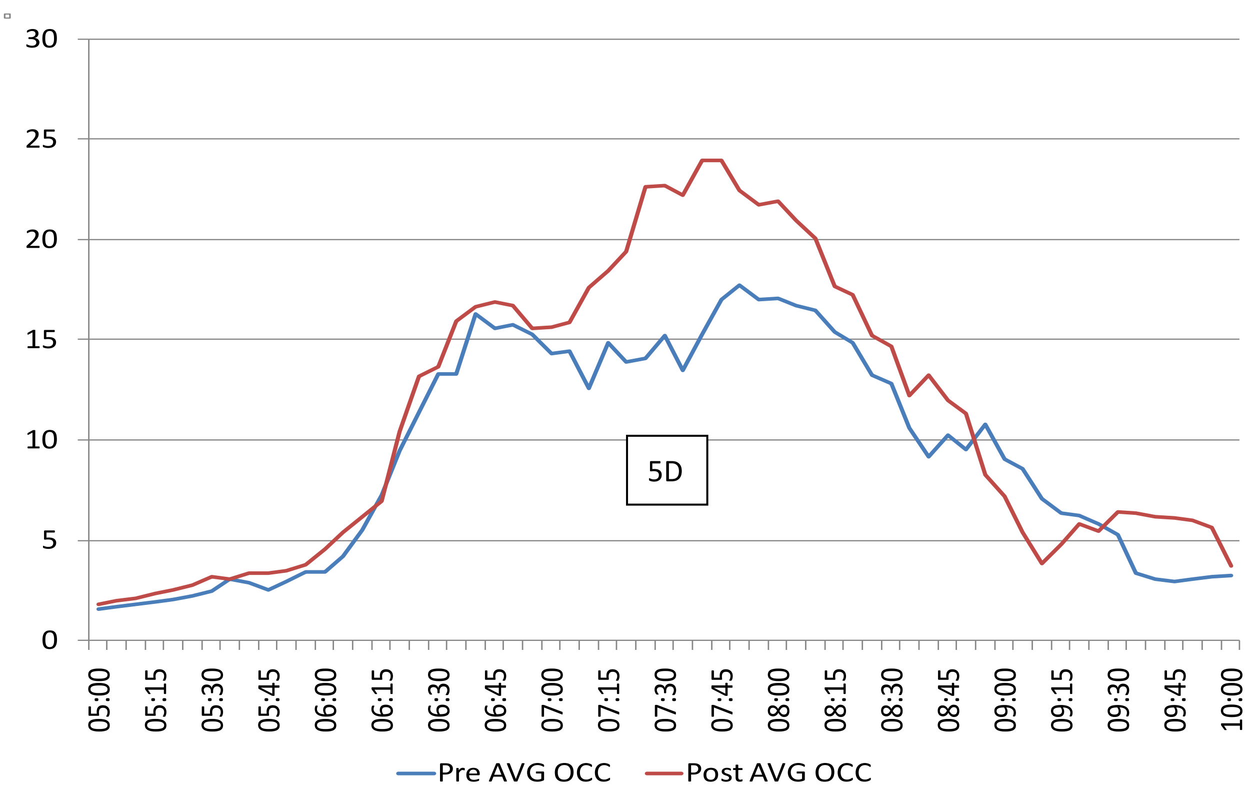
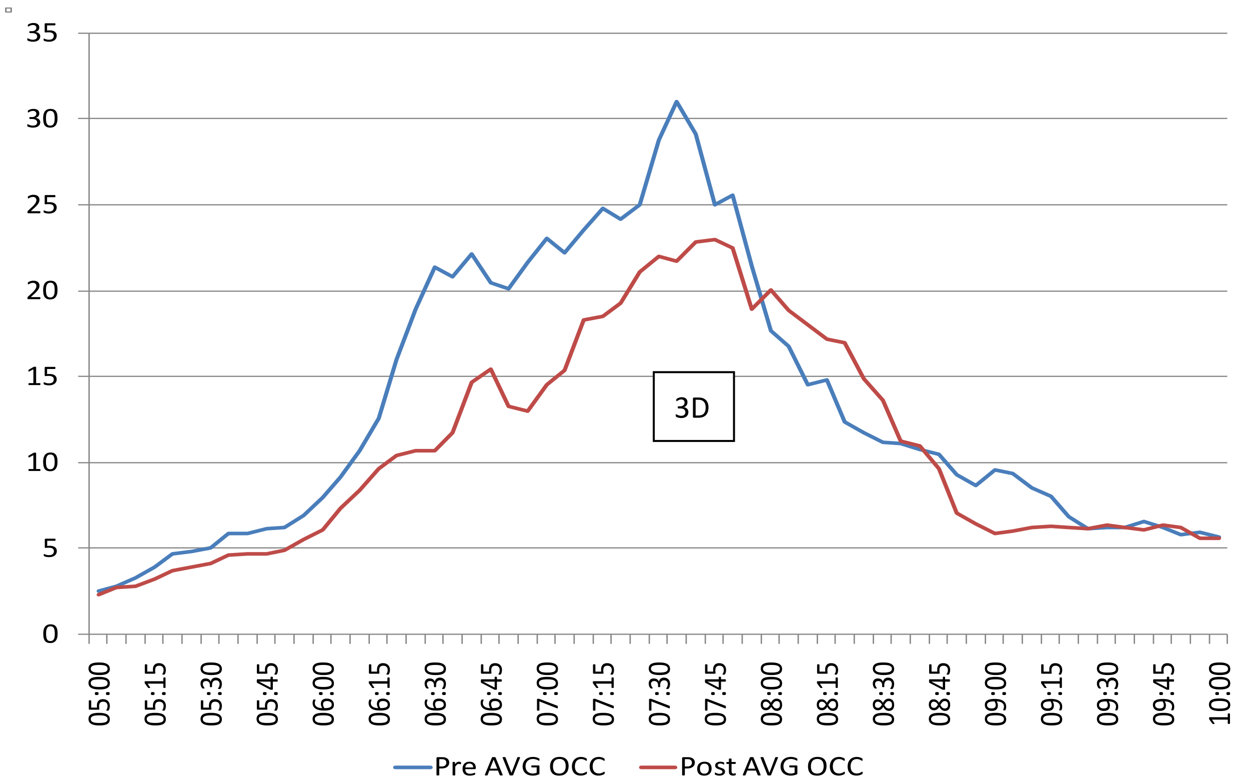


Figure S2.11.5 Comparison of Pre (Nov, 2007) and Post-VSL (Nov, 2008) Occupancy Profile



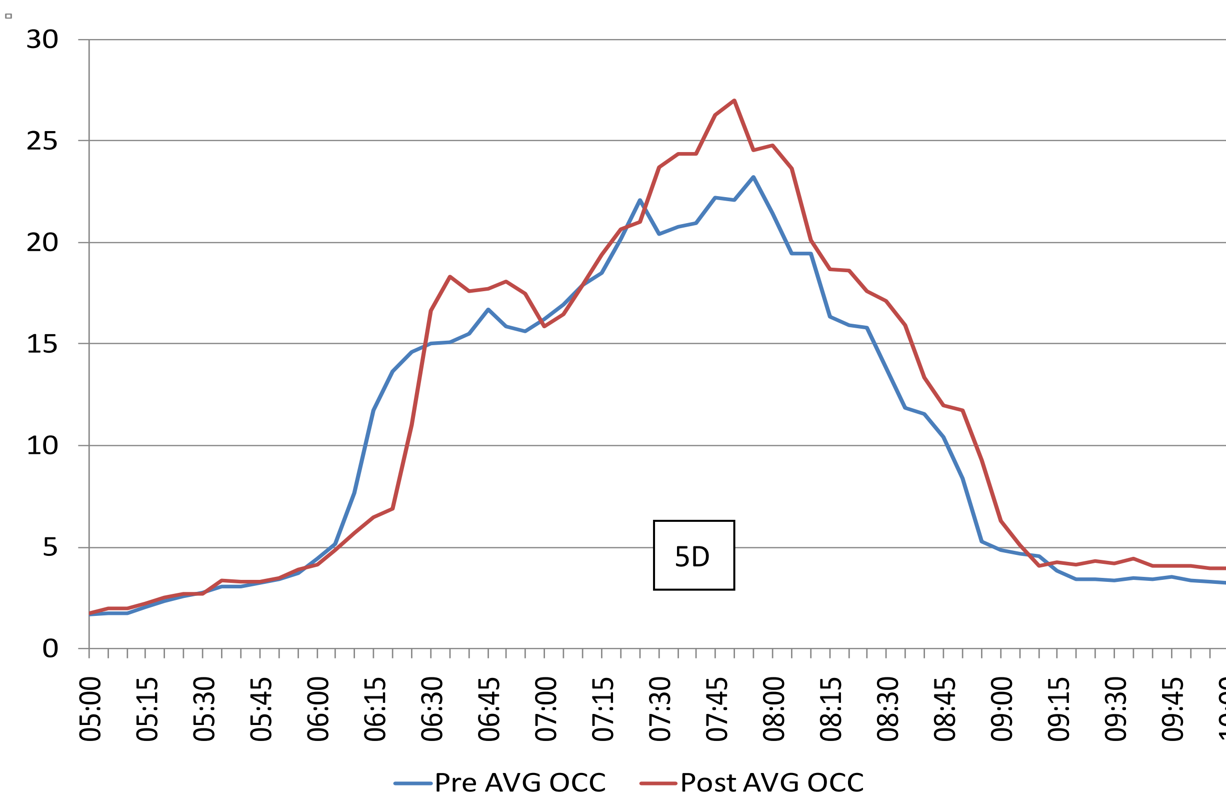


Figure S2.11.6 Comparison of Pre (April, 2008) and Post-VSL (April, 2009) Occupancy Profile

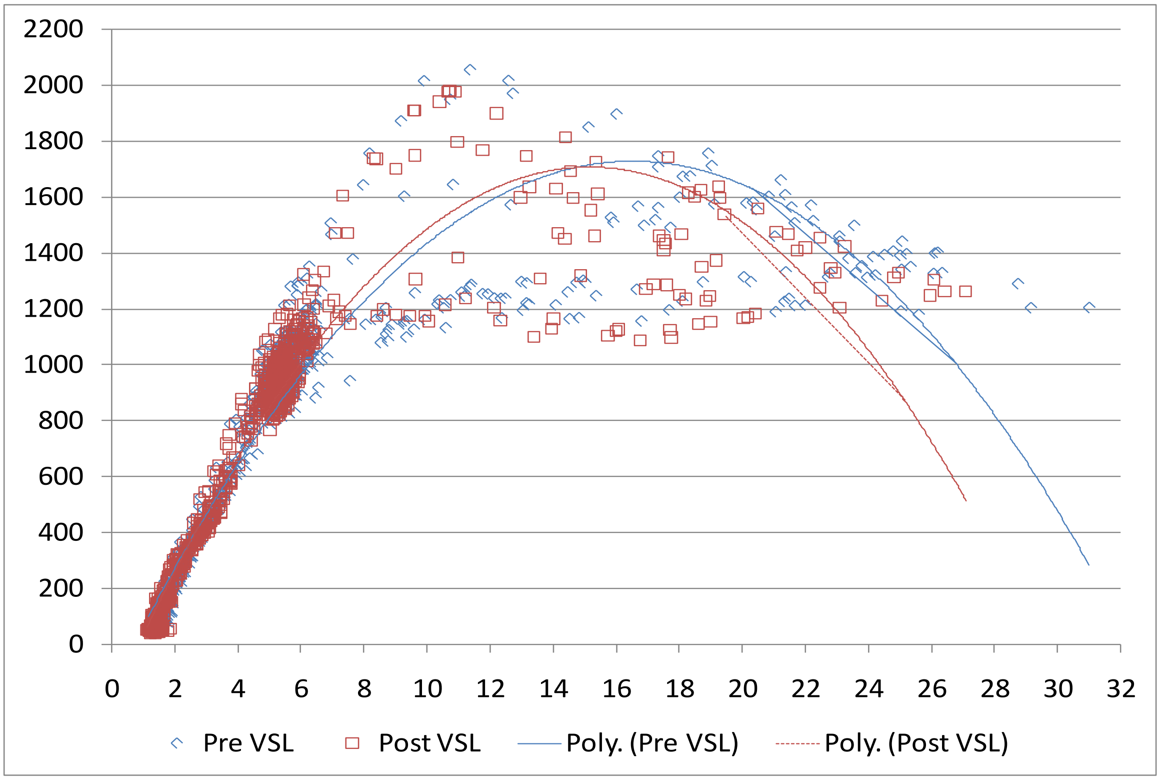


Figure S2.11.7. Flow-Occupancy Plot for three months (Oct, Nov and April) 3D

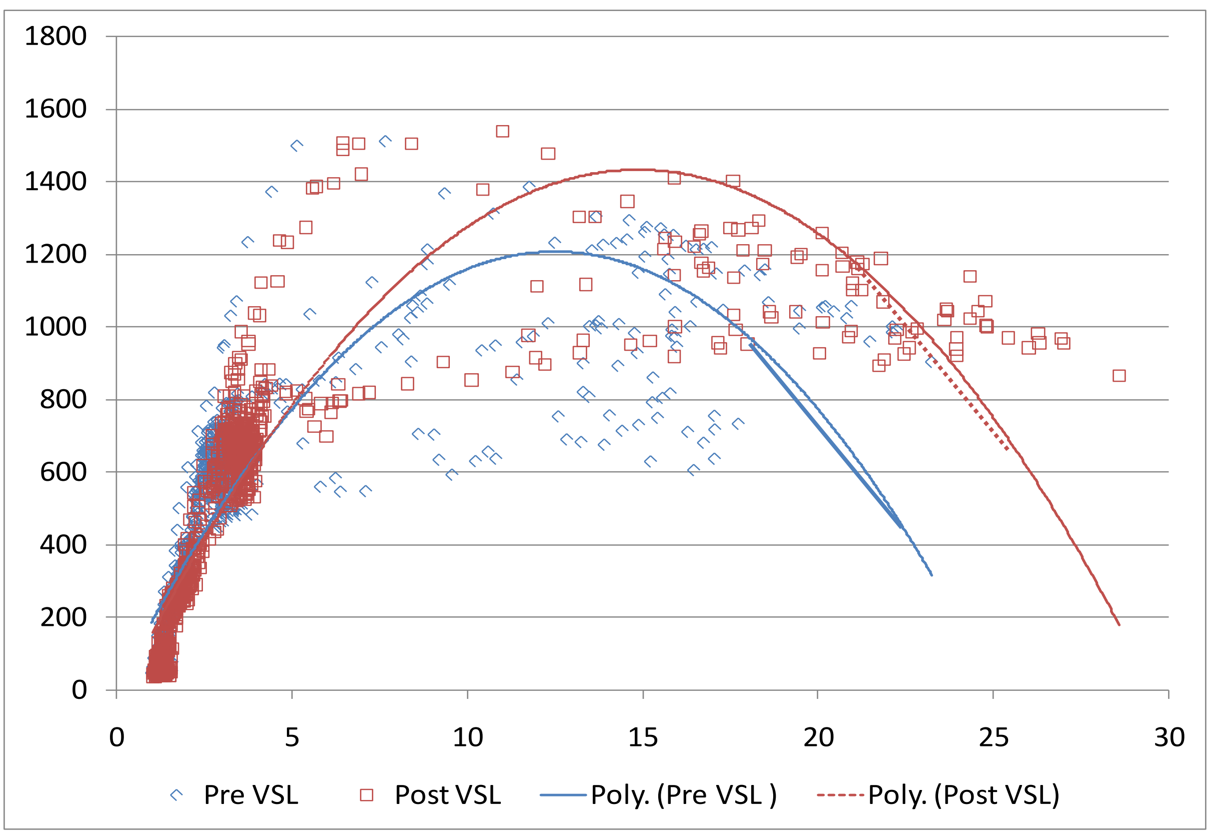


Figure S2.11.8. Flow-Occupancy Plot for three months (Oct, Nov and April) 5D

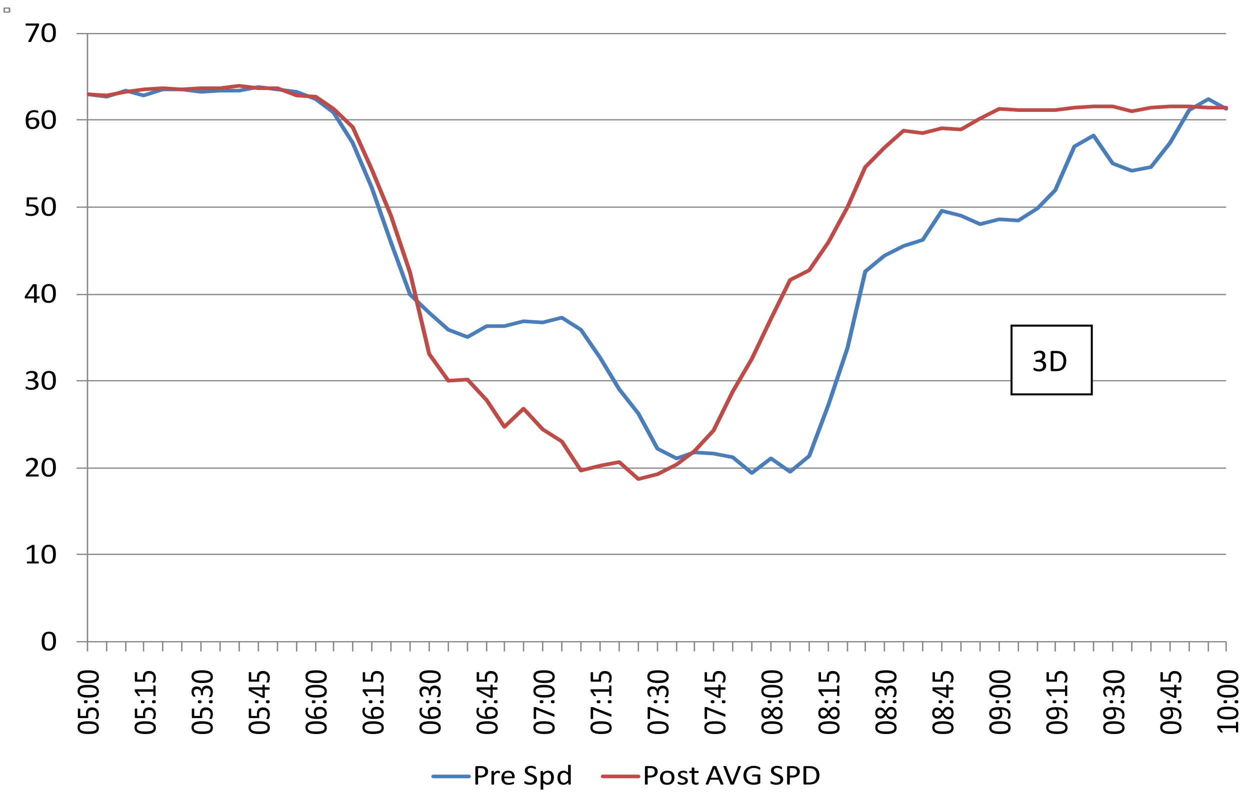
Figures S2.11.7 and S2.11.8 present the flow-occupancy plots for each detector in pre- and post-VSL conditions. Data from three months October, November and April were used for the plots in pre-and post-VSL conditions. Figures show the comparison of pre- and post-VSL traffic volume and occupancy plot averaged out for all lanes for three detectors in pre- and post-VSL conditions. Data used for flow occupancy plot were aggregated for 5 minutes. It can be observed from the figure that maximum occupancy increased in post VSL conditions for 5D (logmile 5.7) by 5 percent and reduced at 3D (logmile 3.6) by 3 percent. One of the objectives of the VSL system initiation was to prevent the highway from reaching capacity since after reaching capacity the volume breaks down and traffic flow can decrease significantly. Therefore, flow-occupancy comparison indicated benefits of the VSL system initiation. Critical occupancy was also similar in both conditions. Data points in congested conditions indicate faster recovery at 5D (logmile 5.7) .

Task 1.2: Average Speed/Lane by Posted Speed Limit During Peak Periods

One of the main objectives of the VSL system was to improve traffic flow and this task evaluated the difference in average speed by comparing the data before and after the VSL system installation. Speed data averaged for all the lanes of segment 1 for every 5 minutes were used. Figures S2.12.1- S2.12.3 present the average highway speed for detector 3D (logmile 3.6) and 5D (logmile 5.7) for pre- and post-VSL conditions in October, November and April. The figures indicate that the peak period for traffic on this segment for pre- and post-VSL conditions lies between 0530 to 0930 hours based on the average speed for all three months. Henceforth, all the figures for peak periods will be presented for this duration. Also, the pre- and post-VSL speed profile comparison over time shows reduction in peak period and improvement in average speeds for post-VSL conditions. Table S2.12.1 indicates that the average speed increased by 4.4mph for 3D (logmile 3.6) and decreased by 8 mph at 5D (logmile 5.7) .

Table S2.12.1. Average Speed for three months

	Pre-VSL	**Post-VSL**	**Pre-VSL**	**Post-VSL**
	3D		***5D***	
Avg Oct	42.05	45.13633	44.92857	34.30694
Diff, Percent	***3.09***	***7%***	***-10.62***	***-24%***
Avg Nov	44.60224	48.75857	46.95041	38.1298
Diff, Percent	***4.16***	***9%***	***-8.82***	***-19%***
Avg April	41.95755	47.92857	42.52163	36.96878
Diff, Percent	***5.97***	***14%***	***-5.55***	***-13%***
Avg Spd	42.87	47.27	44.80	36.47
Diff, Percent	***4.40***	***10%***	***-8.33***	***-19%***



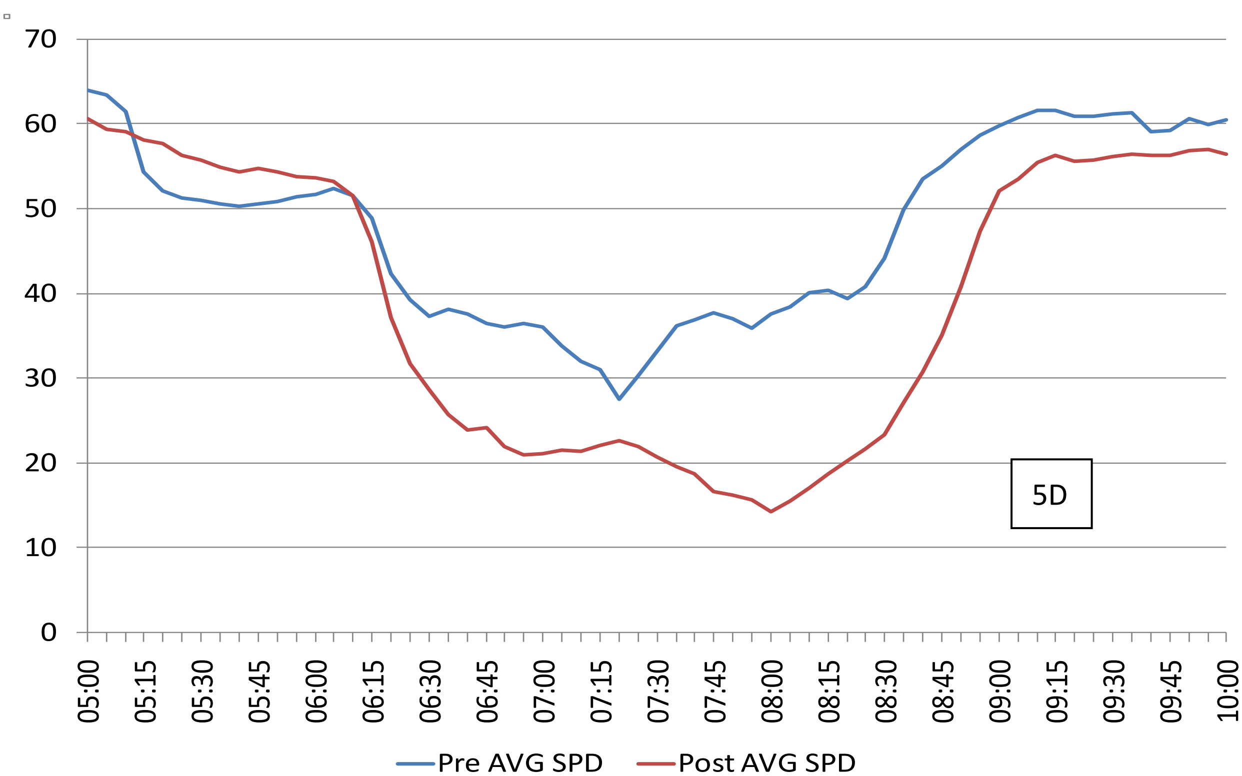
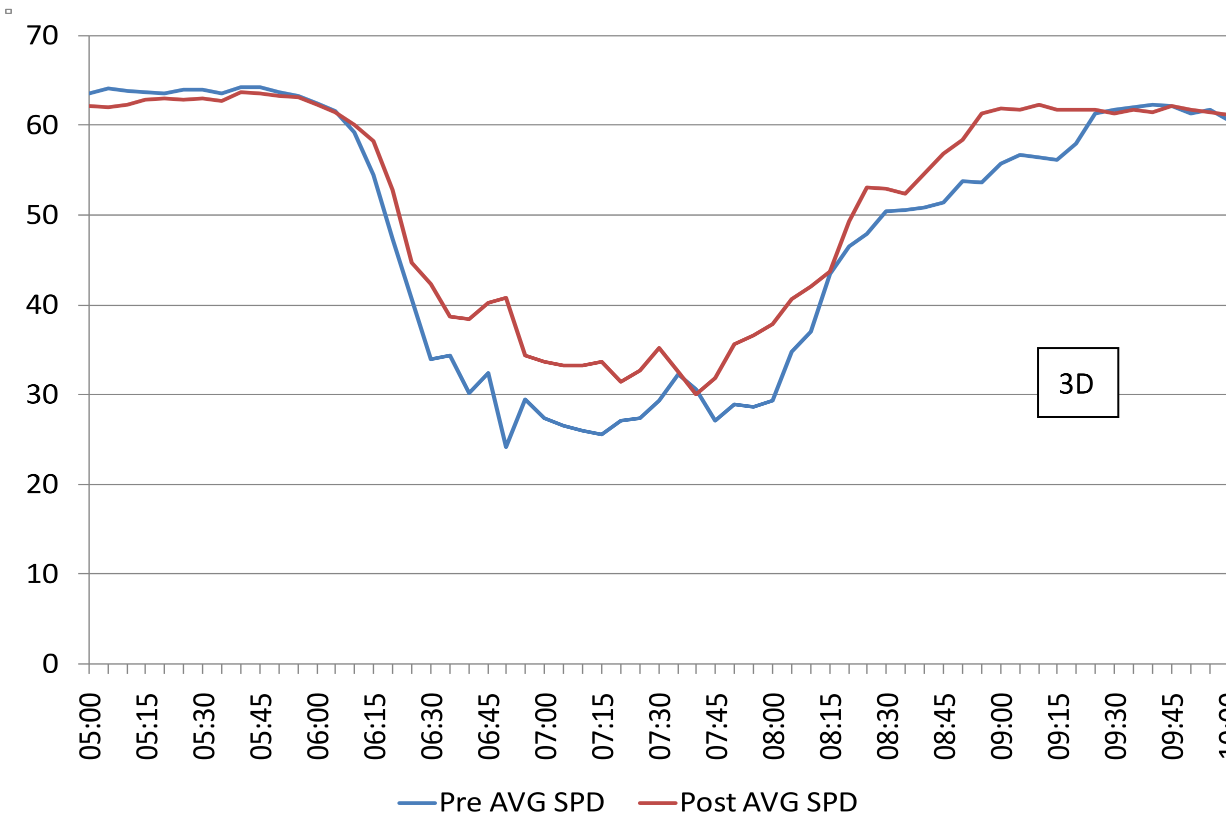


Figure S2.12.1 Comparison of Pre (Oct, 2007) and Post-VSL (Oct, 2008) Speed Profile



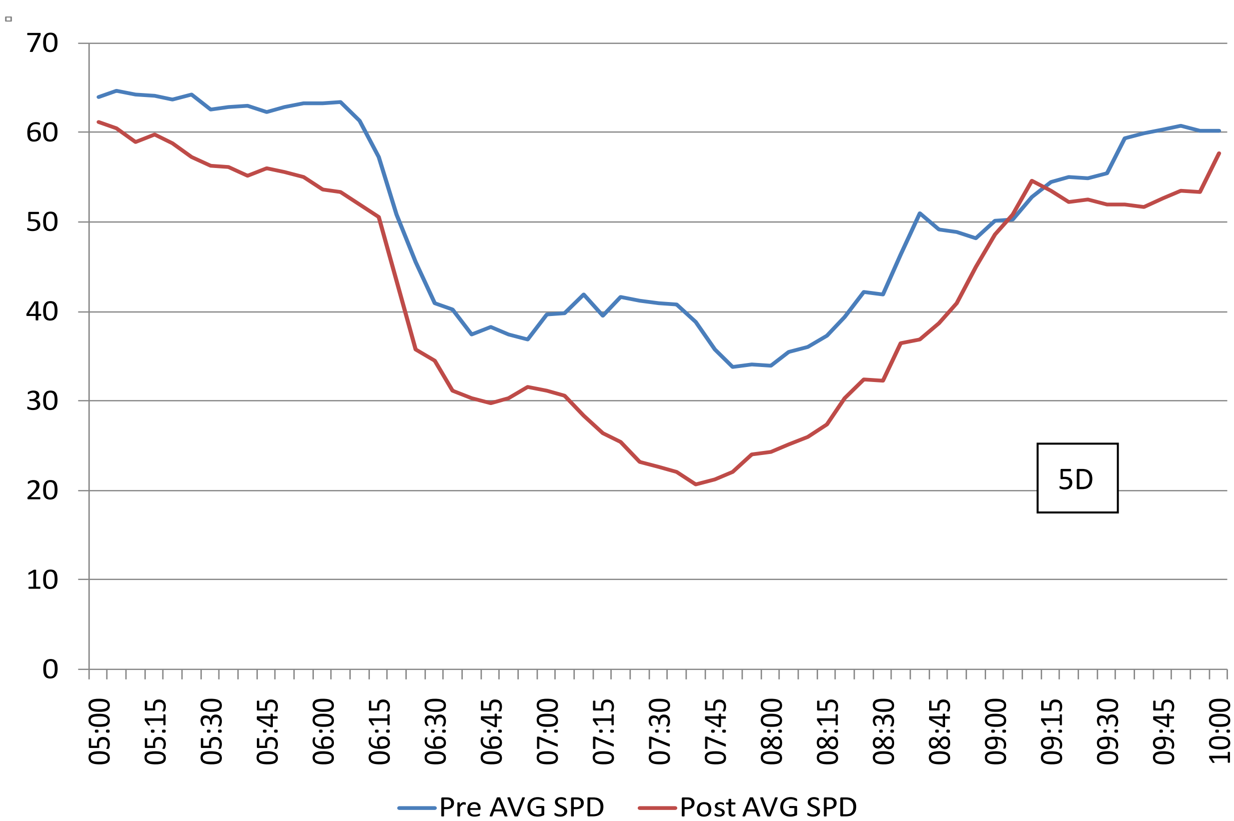
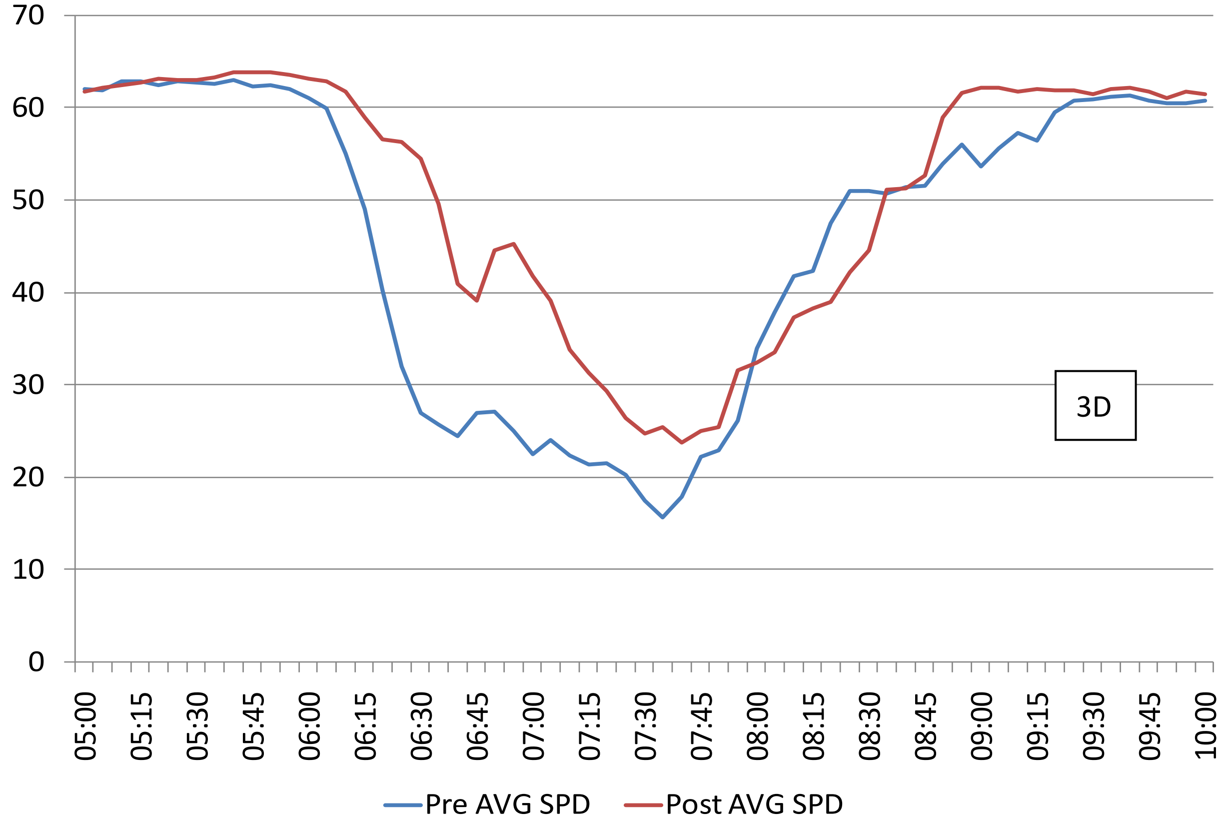


Figure S2.12.2 Comparison of Pre (Nov, 2007) and Post-VSL (Nov, 2008) Speed Profile



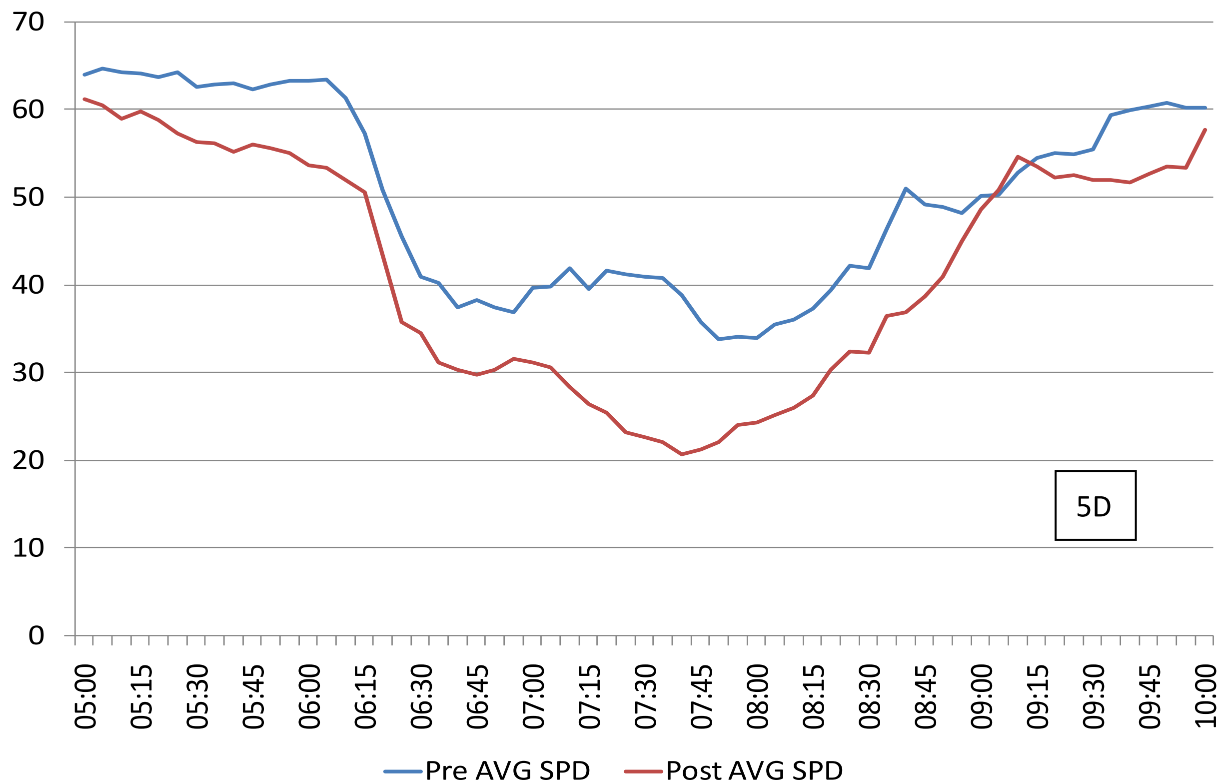


Figure S2.12.3 Comparison of Pre (April, 2008) and Post-VSL (April, 2009) Speed Profile

Comparison of Average Speeds along the Segment

Figures S2.12.4 to S2.12.6 present the comparison of average speeds aggregated for the peak period averaged for all four/five lanes for pre- and post-VSL system at the two detector locations for three months on segment 2. The figure shows detectors upstream, on and downstream of segment 2. The line plots compare the average volume during the peak periods. Figures also present the difference in average speed during peak periods at every detector location.

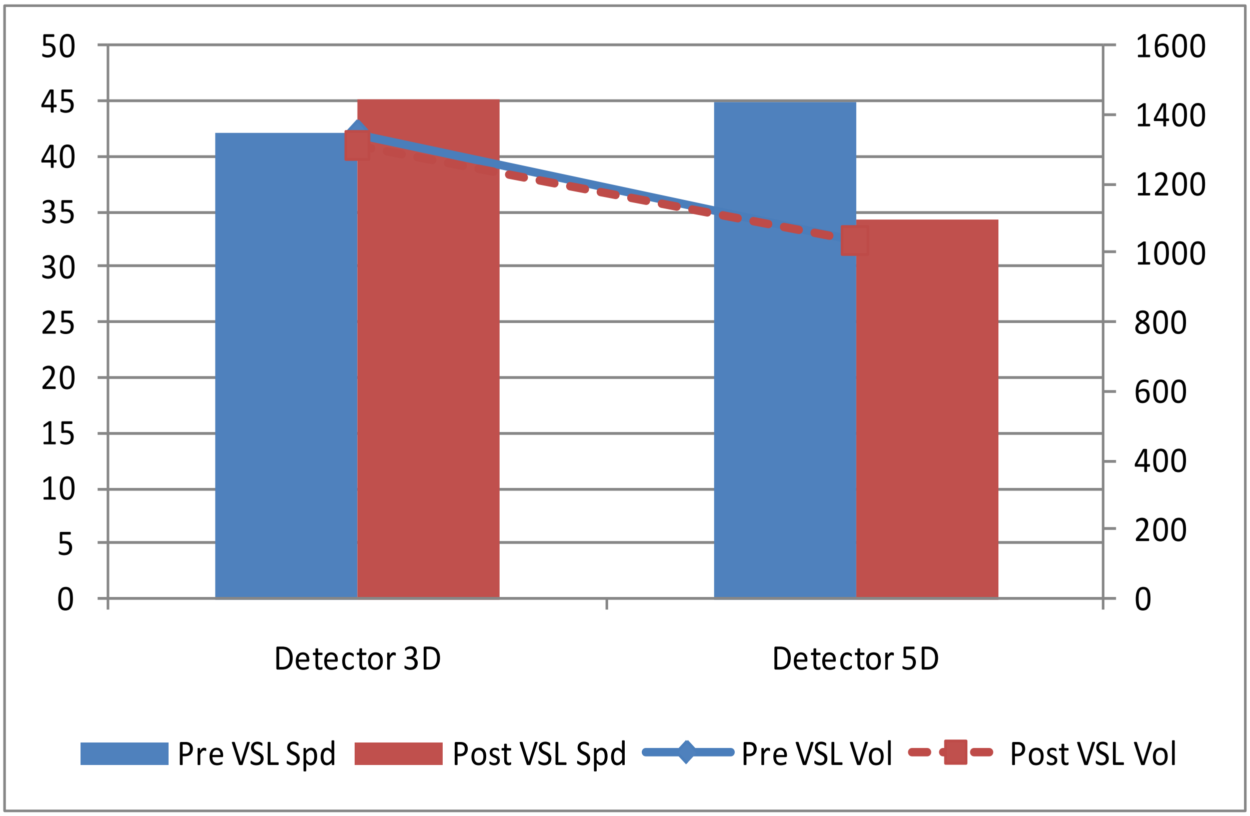


Figure S2.12.4. Comparison of Pre (Oct, 07) and Post-VSL (Oct, 08) Average Speed and Volume

Figures S2.12.4 presents the plot, comparing the speed volume trend along the segment, it can be said that speeds were higher at detector 3D (logmile 3.6) indicating system benefits. However, average speed went lower at detector 5D (logmile 5.7).

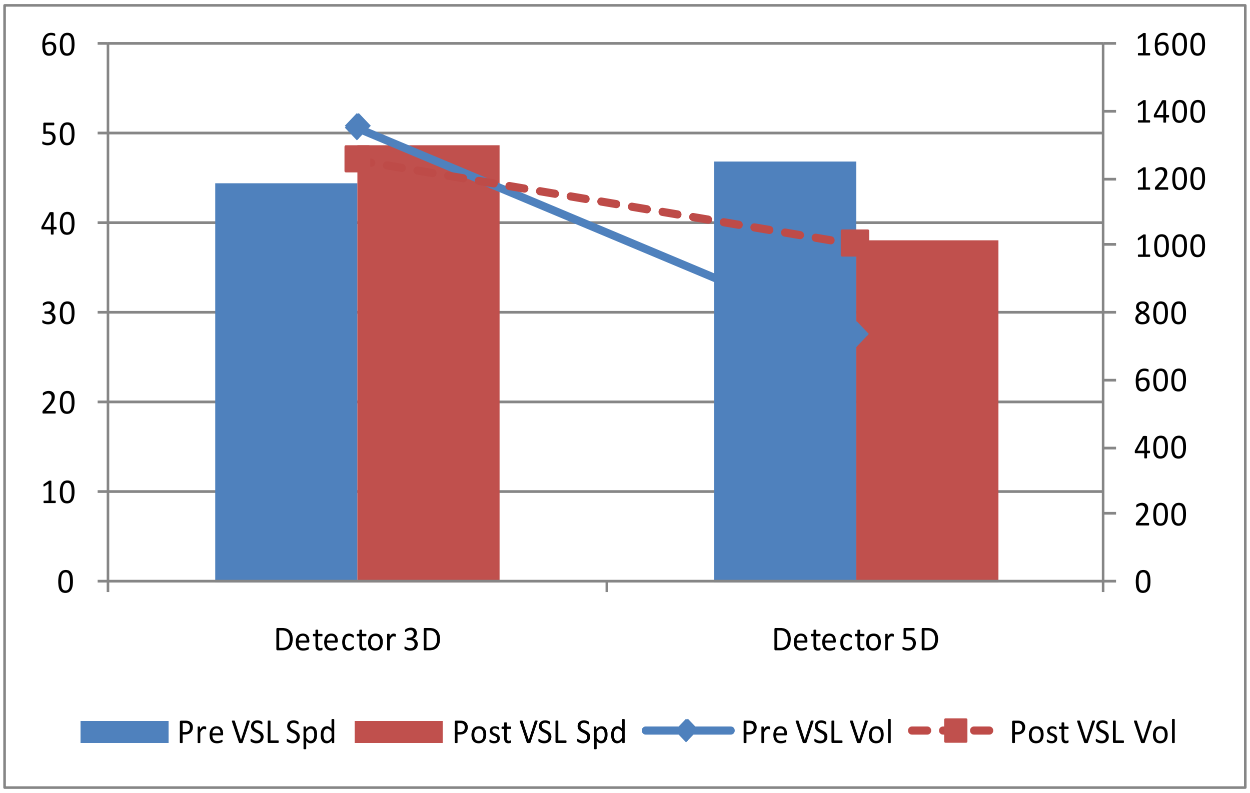


Figure S2.12.5. Comparison of Pre (Nov, 07) and Post-VSL (Nov, 08) Average Speed and Volume

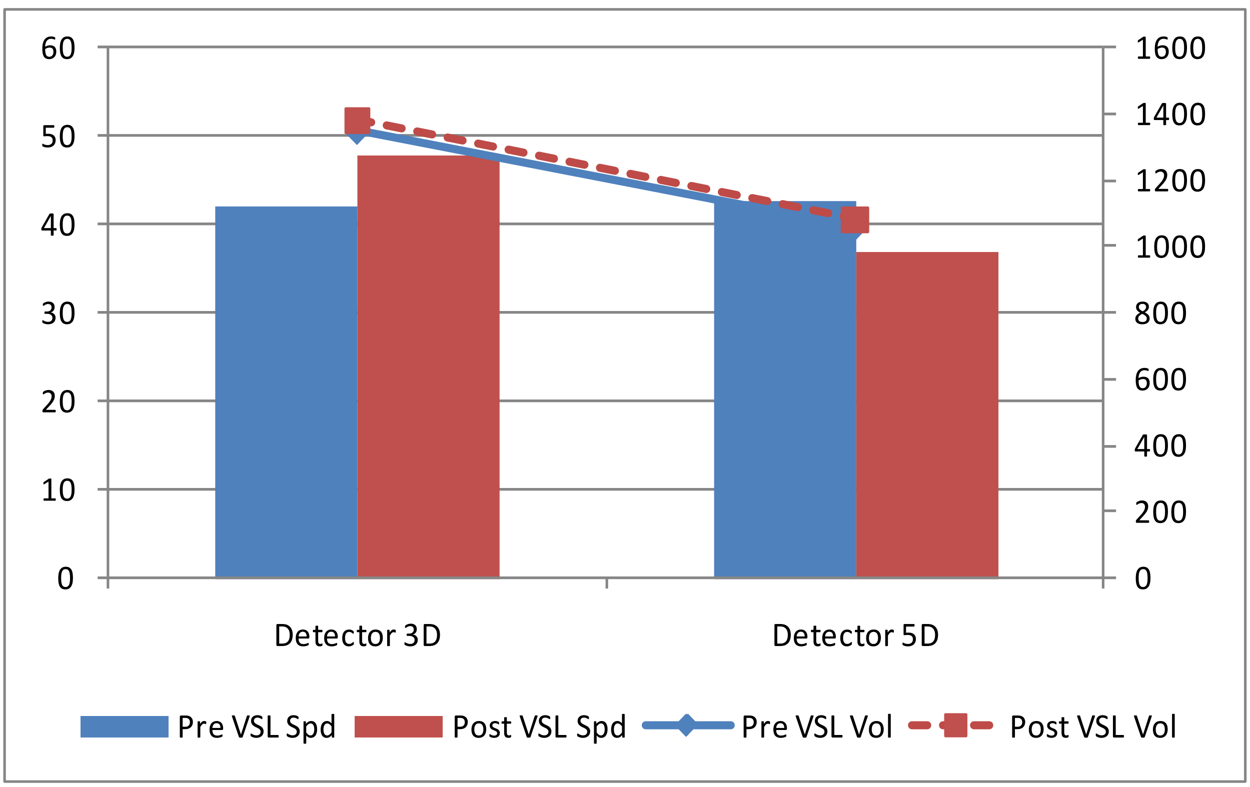


Figure S2.12.6. Comparison of Pre (April, 08) and Post-VSL (April, 09) Average Speed and Volume

Task 1.3: Speed Limit During Peak Periods

The objective of this task was to evaluate the system initiation logic for variable speed limits. This task was not carried out for average monthly data as posted VSLs cannot be averaged for analysis.

Task 1.4: Speed Limit Compliance by Posted Speed Limit

The objective of this task was to analyze driver compliance of the posted variable speed limits. This task was not carried out for average monthly data as posted VSLs cannot be averaged for analysis.

Task 1.5: Evaluation of Highway Capacity

This task compares speed-flow plots for pre- and post-VSL conditions. Figures S2.15.1 to S2.15.2 present the speed flow data for three months in pre- and post-VSL system installation for detector locations 3D (logmile 3.6) and 5D (logmile 5.7). Data used were aggregated for 5 minute intervals for this task. Comparing the data from pre- and post-VSL conditions, no change in highway capacity was noticed.

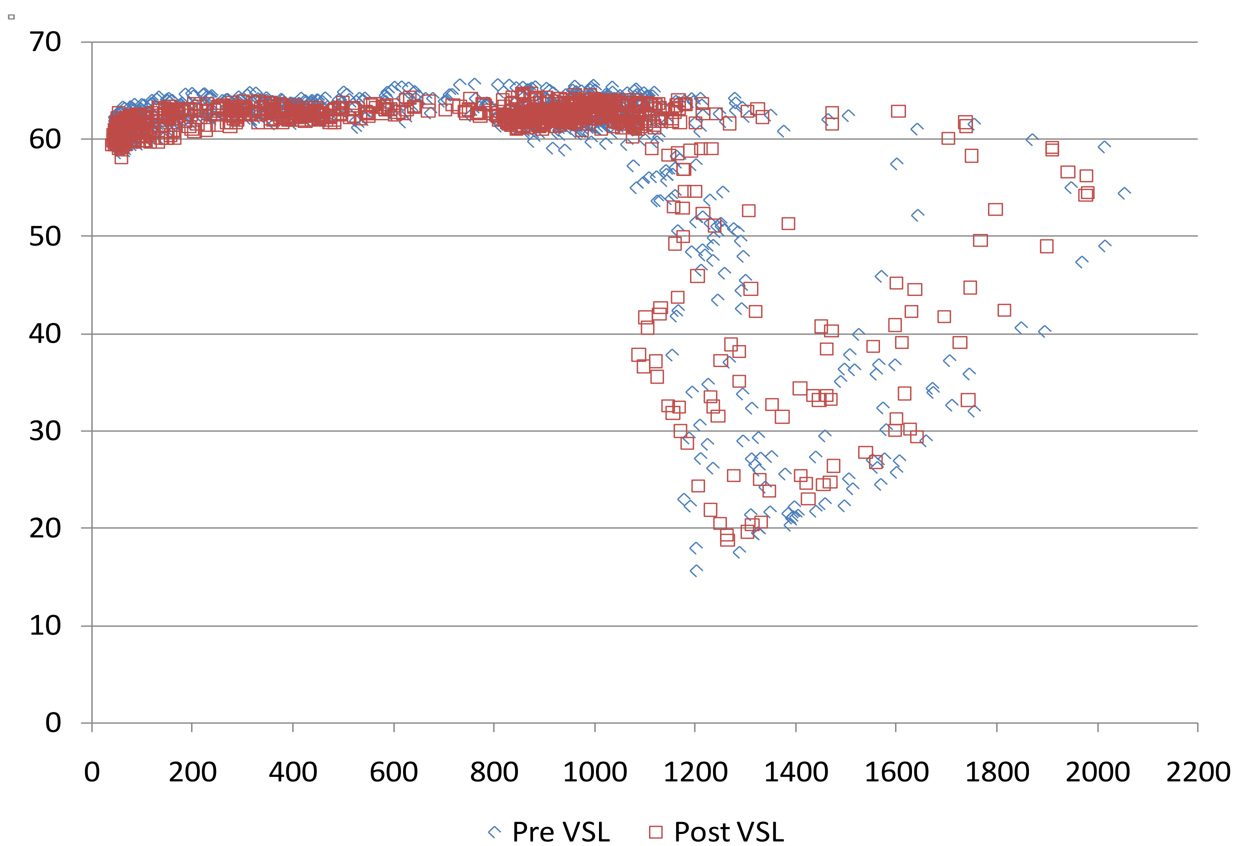


Figure S2.15.1 Speed Flow Plot for three months (Oct, Nov & April) at 3D

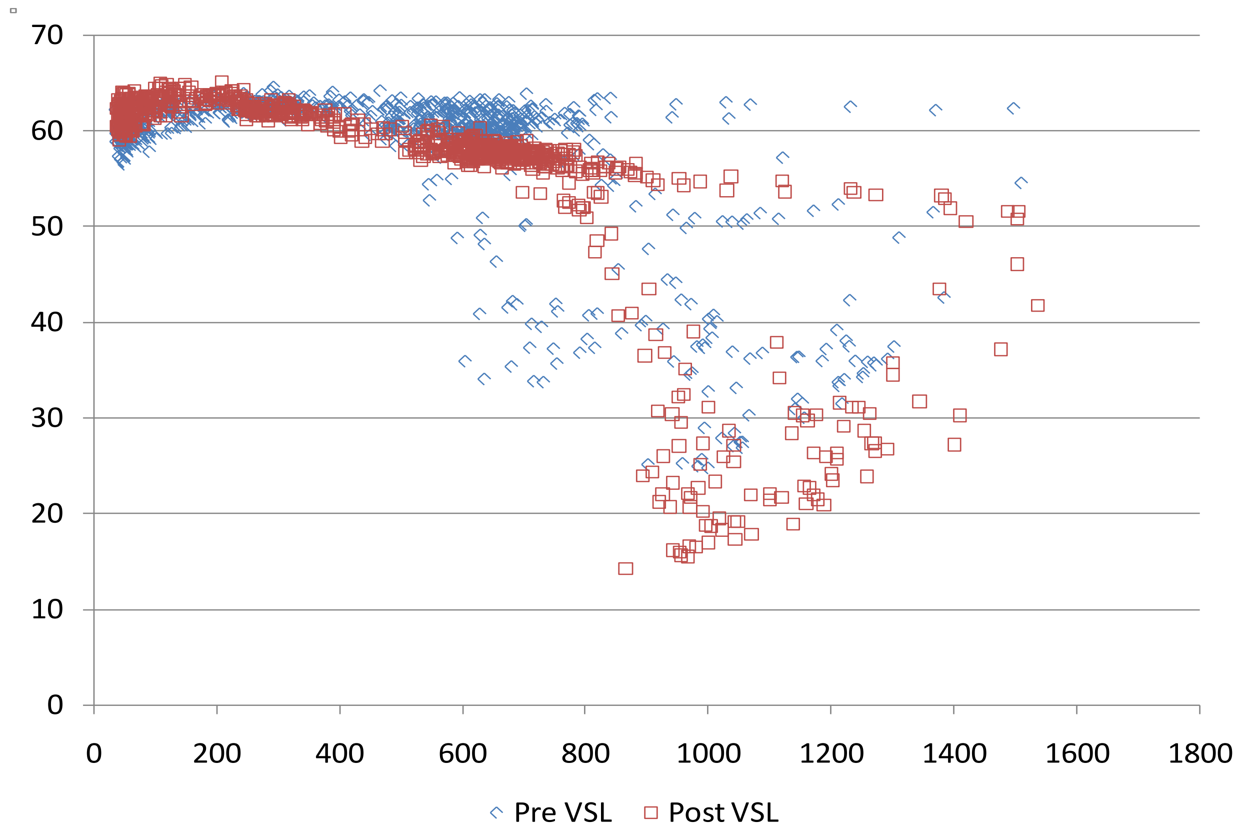


Figure S2.15.2 Speed Flow Plot for three months (Oct, Nov & April) at 5D

Task 1.6: Evaluation of Congestion Measures

To evaluate the congestion measures, travel times and travel time reliability indices, travel delay, and Percent of Congested Delay were compared for pre- and post-VSL conditions. Segment 2 mean and standard deviation of travel times were computed between detectors 3D (logmile 3.6) and 5D (logmile 5.7) for October, November, and April data.

<u>Mean and Standard Deviation of Travel Times</u>

Travel times were calculated for average of all lanes for each month and then averaged for the months considered. Figures S2.16.1 to S2.16.3 present the comparison of travel times computed for average of all lanes between detectors 3D (logmile 3.6) and 5D (logmile 5.7). For pre-VSL conditions, it can be observed from Figures S2.16.1 to S2.16.3 that the mean travel times for peak periods ranged from 333 to 361 person-minutes. For post-VSL conditions, the mean travel times during peak period increased from 316 to 402 person-minutes. Tables S2.16.1 and S2.16.2 present the comparison of mean and standard deviation of travel times for the three months and their average. It can be observed from the tables that the percentage change of mean travel time during peak periods for post-VSL compared with pre-VSL conditions varied from 3.4 to 20.7%. Average of three months showed that the mean travel times during peak periods increased 13.6% after initiation of the VSL system, whereas volume increased 3%, it indicates no benefit for VSL system to decrease travel time, which means VSL system was not beneficial to decrease travel time in segment 2 between detectors 3D (logmile 3.6) and 5D (logmile 5.7). Comparison of standard deviation of travel times for average of three months for pre- and post-VSL indicates it increased 26.1% that means VSL system was not beneficial to decrease variation in travel times during the peak periods. It can be concluded that VSL system was not beneficial to decrease travel time for segment 2.

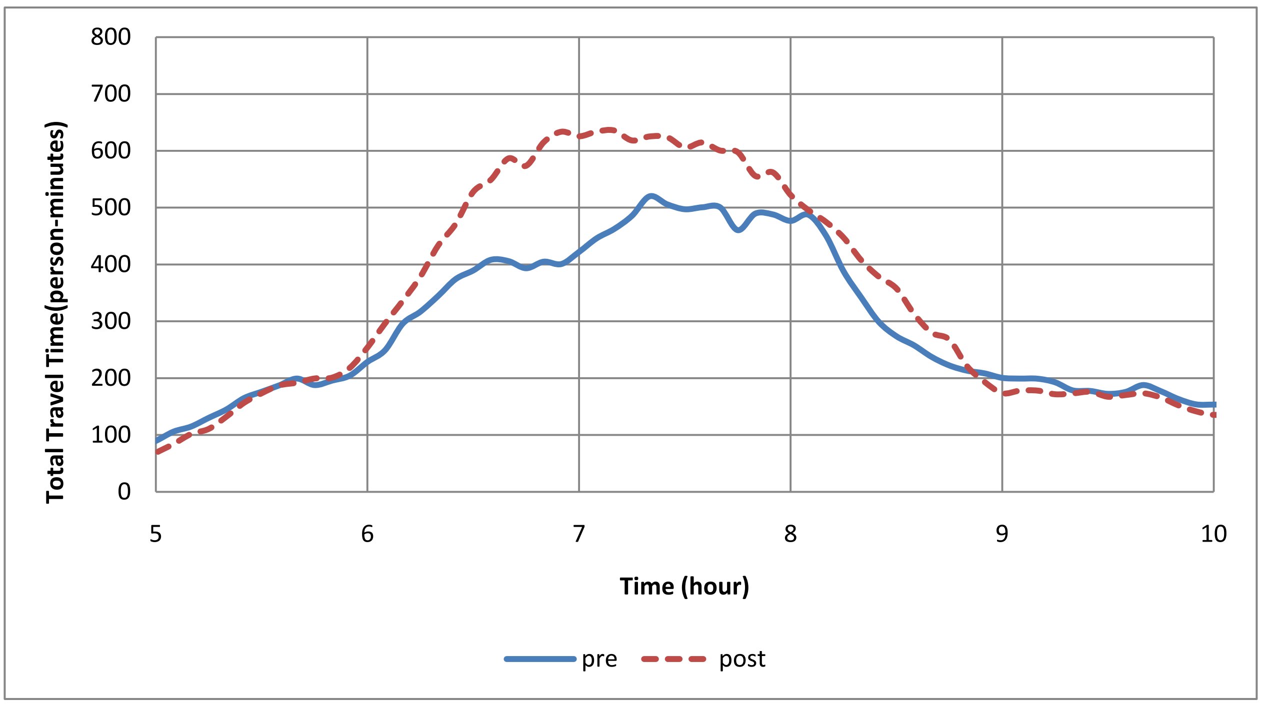


Figure S2.16.1 Comparison of Pre and Post-VSL average travel time data between3D and 5D (October)

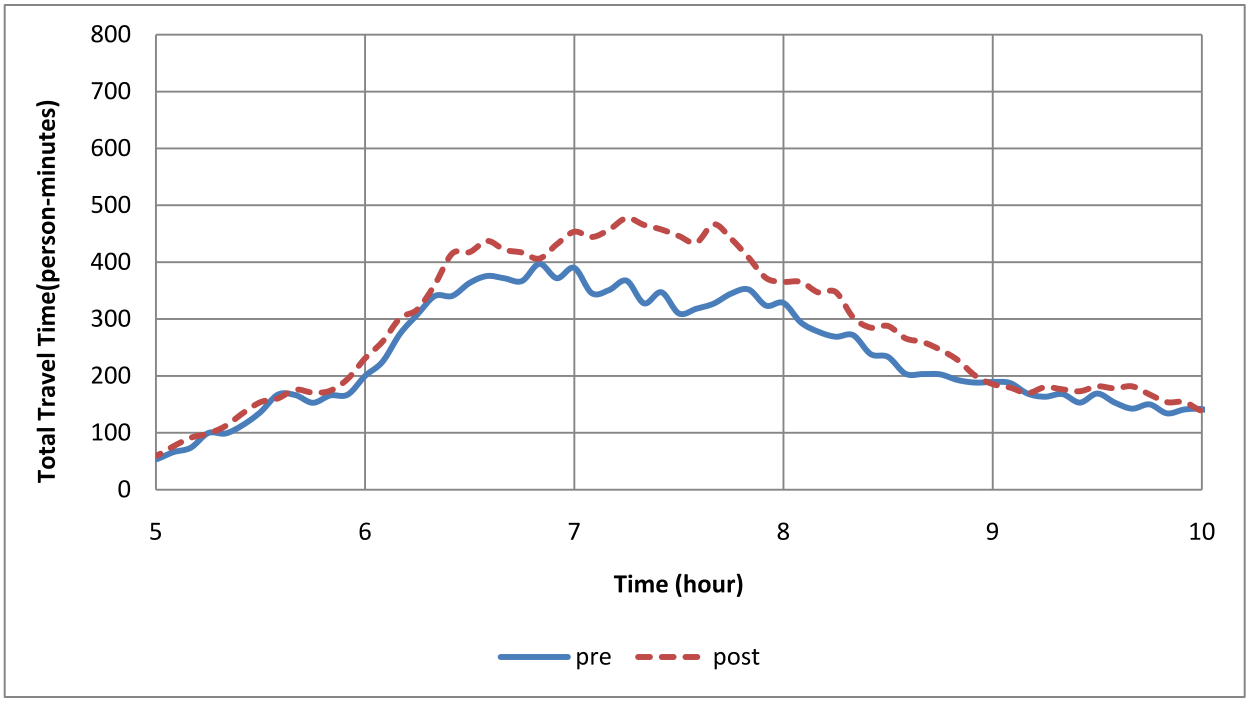


Figure S2.16.2 Comparison of Pre and Post-VSL average travel time data between 3D and 5D (November)

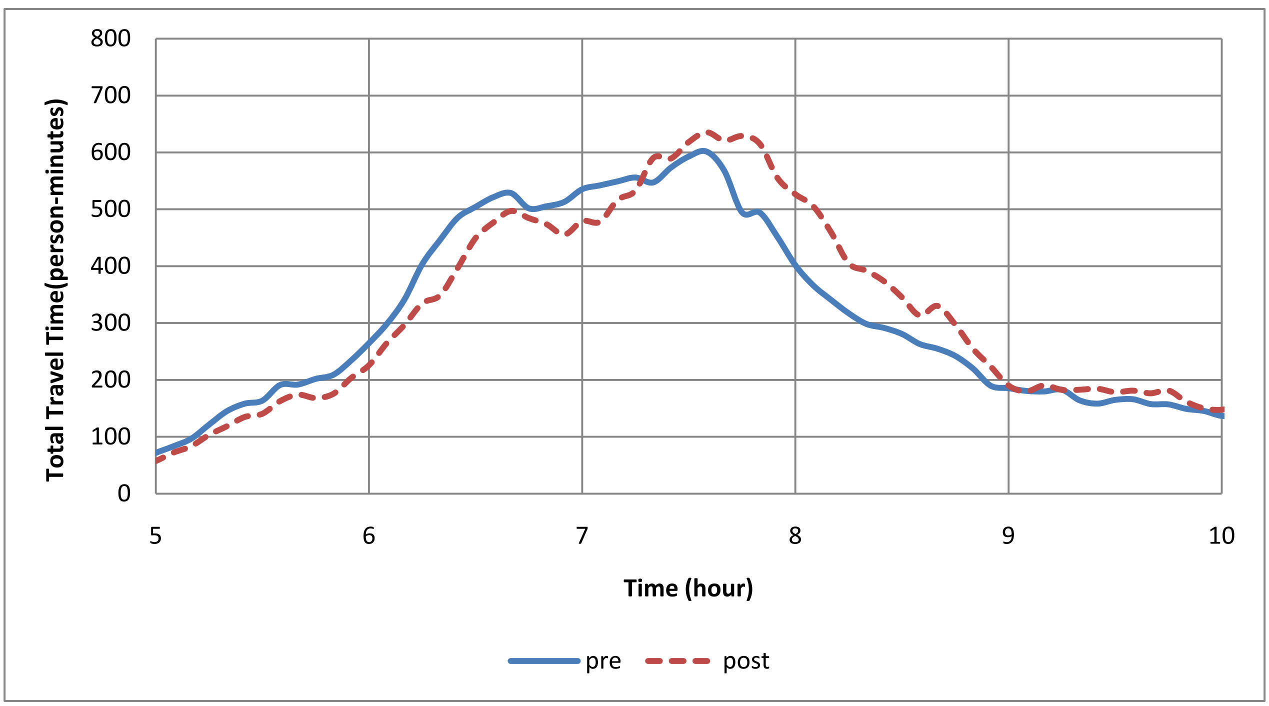


Figure S2.16.3 Comparison of Pre and Post-VSL average travel time data between 3D and 5D (April)

Table S2.16.1 Comparison of mean travel times during peak period for pre- and post VSL

	Travel Time (person-minutes)		Volume (vehicles/hour)	
	Pre-VSL	Post-VSL	Pre-VSL	Post-VSL
October	333.1	402.1	4759	4697
Percentage change	20.7		-1.3	
November	267.3	316.7	4167	4526
Percentage change	18.5		8.6	
April	361.2	373.6	4810	4929
Percentage change	3.4		2.5	
Average of three months	320.5	364.1	4578.7	4717.3
Percentage change	13.6		3.0	

Table S2.16.2 Comparison of standard deviation of travel times during peak period for pre- and post VSL

	Travel Time (person-minutes)		Volume (vehicles/hour)	
	Pre-VSL	Post-VSL	Pre-VSL	Post-VSL
October	121.9	178.7	673	887
Percentage change	46.6		31.8	
November	82.6	111.3	719	811
Percentage change	34.7		12.8	
April	151.4	158.7	879	952
Percentage change	4.8		8.3	
Average of three months	118.6	149.6	757.0	883.3
Percentage change	26.1		16.7	

Individual Measures

The individual measures, TTI, BTI, and PTI were compared with three months of data for the peak periods for pre- and post-VSL conditions. Tables S2.16.3 to S2.16.5 present the comparison of average of individual measures, TTI, BTI, and PTI for average of all lanes between detectors 3 and 5. It can be observed from Tables S2.16.3 to S2.16.5 that for post-VSL conditions TTI, BTI, and PTI increased for all months and average of TTI, BTI, and PTI for all three months increased 17, 20, and 17.7%, respectively.

Table S2.16.3. Comparison of Travel Time Index

Individual Measures	Between 3D and 5D	
	Pre-VSL	Post-VSL
October		
Travel Time Index (TTI)	1.78	2.42
Percentage Change	36.0	
November		
Travel Time Index (TTI)	1.58	1.80
Percentage Change	13.9	
April		
Travel Time Index (TTI)	2.11	2.16
Percentage Change	2.4	
Average of three months		
Travel Time Index (TTI)	1.82	2.13
Percentage Change	17.0	

Table S2.16.4. Comparison of Buffer Time Index

Individual Measures	Between 3D and 5D	
	Pre-VSL	Post-VSL
October		
Buffer Time Index (BTI)	0.47	0.58
Percentage Change	23.4	
November		
Buffer Time Index (BTI)	0.36	0.48
Percentage Change	33.33	
April		
Buffer Time Index (BTI)	0.68	0.74
Percentage Change	8.8	
Average of three months		
Buffer Time Index (BTI)	0.50	0.60
Percentage Change	20.0	

Table S2.16.5. Comparison of Planning Time Index

Individual Measures	Between 3D and 5D	
	Pre-VSL	Post-VSL
October		
Planning Time Index (PTI)	2.25	3.00
Percentage Change	33.3	
November		
Planning Time Index (PTI)	1.93	2.28
Percentage Change	18.1	
April		
Planning Time Index (PTI)	2.79	2.90
Percentage Change	3.9	
Average of three months		
Planning Time Index (PTI)	2.32	2.73
Percentage Change	17.7	

Higher TTI shows higher ratio between the actual travel rate and Posted Speed Limit (PSL) travel rate that means the VSL system was not useful in decreasing the difference between the peak period and the PSL travel conditions. Higher BTI indicates the higher difference between 95% travel time and average travel time and that means the VSL system was not beneficial in reducing the difference between the 95% travel time and average travel time. Higher PTI indicates higher ratio between 95% travel time and PSL travel time that means the VSL system was not useful in decreasing the difference between 95% and PSL travel time.

Overall results for segment 2 show all travel time reliability indices (TTI, BTI, and PTI) increased. Increasing in all travel time reliability indices for post-VSL conditions indicates more variability and less consistency between highest value of travel time during the peak period (worst condition) and PSL condition. It can be concluded that post-VSL conditions was less reliable than pre-VSL conditions and there is no benefit after VSL system initiation according to this uncontrolled analysis.

Traffic Delay

For segment 2, the analysis indicates that average Delay calculated for post-VSL system was much lower compared to the pre-VSL system. Delay increase varied from 0.61 to 0.03 minutes. The average delay increased by 0.29 minutes. Similarly, Percentage of Congested Travel increased by an average of 10% percent, varied from 20 to 1 percent for post-VSL conditions. From Table S2.16.5 it can be noticed that congestion reduced significantly between 3D (logmile 3.6) to 5D (logmile 5.7) .

Table S2.16.5. Average Delay and Change in Percentage of Congested Travel during peak periods before and after VSL system installation

Detector ID	MP 3D to MP 5D
	October
Pre VSL Travel Time (minutes)	2.98
Post VSL Travel Time (minutes)	3.59
Delay (minutes)	0.61
Percent Change in Congested Travel	20.3%
	November
Pre VSL Travel Time (minutes)	2.79
Post VSL Travel Time (minutes)	3.01
Delay (minutes)	0.22
Percent Change in Congested Travel	8.0%
	April
Pre VSL Travel Time (minutes)	3.18
Post VSL Travel Time (minutes)	3.21
Delay (minutes)	0.03
Percent Change in Congested Travel	1.0%

*Negative value indicates decrease in Post-VSL congestion measures and vice versa.

Delay Cost Analysis

This task was not carried out for the monthly data aggregate as monthly aggregate analysis did not present clear benefits of the system

Task 1.7: Analysis of VSL System during Inclement Weather

Task 1.7 was not conducted separately as the monthly analysis included all weather data.

SEGMENT 3 ANALYSIS

Table S3.1 presents the dates that were considered for segment 3 evaluation. Data for these dates were considered appropriate for evaluation as the data were available, and presented clear weather conditions. Days with similar volumes were used for evaluation. The average of five days used in this report for comparison between pre- and post-VLS conditions for segment 3 are highlighted in the table. Some dates did not present VSL benefits while others did. The days in the table are mostly Thursdays unless pointed out in the footnote.

Table S3.1. Time Period selected for VSL system evaluation

Pre-VSL System	Post-VSL System
October 2007	*October 2008*
November 2007	*November 2008*
April 2008	*April 2009*

Task 1.1: Volume and Occupancy Analysis

This task consists of two sub-tasks. First, average volume for pre- and post-VSL conditions are compared. Second, occupancy data for pre- and post-VSL conditions, and the change in flow-occupancy relationship are compared. The change in volume is accounted to evaluate the effect on average speed, travel time and congestion. Figures S3.1S3.11.1 to S3.1S3.11.3 present the volume comparison between pre- and post-VSL system installation for all lanes for detector 25D (logmile 25) for pre and post VSL system installation. Detectors upstream of 25D (logmile 25) did not had any congestion for both conditions and no data was available for downstream detectors, therefore they were not analysed and presented in this report. Average volume for 5-minutes interval on the highway was compared for both conditions to account for any change in volume.

Figures S3.1S3.11.1 to S3.11.3 present volume profiles during peak periods for detectors along segment 3 for Pre and post conditions for October, November and April. Figures indicate increase in volume in post VSL conditions for October November and April. Figures S3.11.4 to S3.11.6 present the occupancy profiles and it can be noticed that occupancy decreased at detector 25D (logmile 25). From Table S3.11.1 it can be clearly noticed that though the average volume increased by 3 percent for post VSL conditions, average occupancy decreased by 10 percent.

Table S3.11.1. Average Volume and Occupancy for three months

	Pre-VSL	**Post-VSL**	**Pre-VSL**	**Post-VSL**
	Volume		Occupancy	
Avg Oct	1451.81	1449.39	13.63	11.78
Diff, Percent	-2.42	0%	-1.85	-14%
Avg Nov	1431.09	1424.03	12.46	10.99
Diff, Percent	-7.06	0%	-1.47	-12%
Avg April	1227.40	1378.78	13.026	12.56
Diff, Percent	151.38	12%	-0.47	-4%
Avg	1370.10	1417.40	13.04	11.78
Diff, Percent	47.30	3%	-1.26	-10%

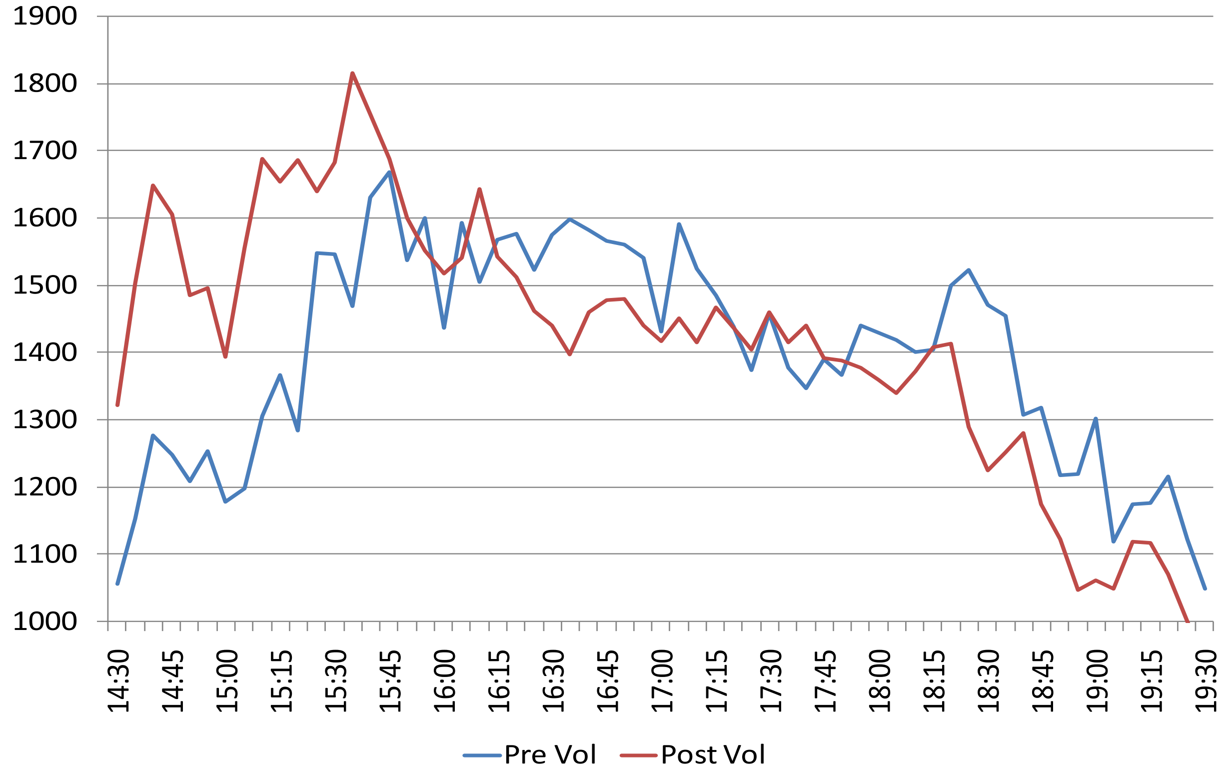


Figure S3.11.1 Comparison of Pre (Oct, 2007) and Post-VSL (Oct, 2008) Volume 25D

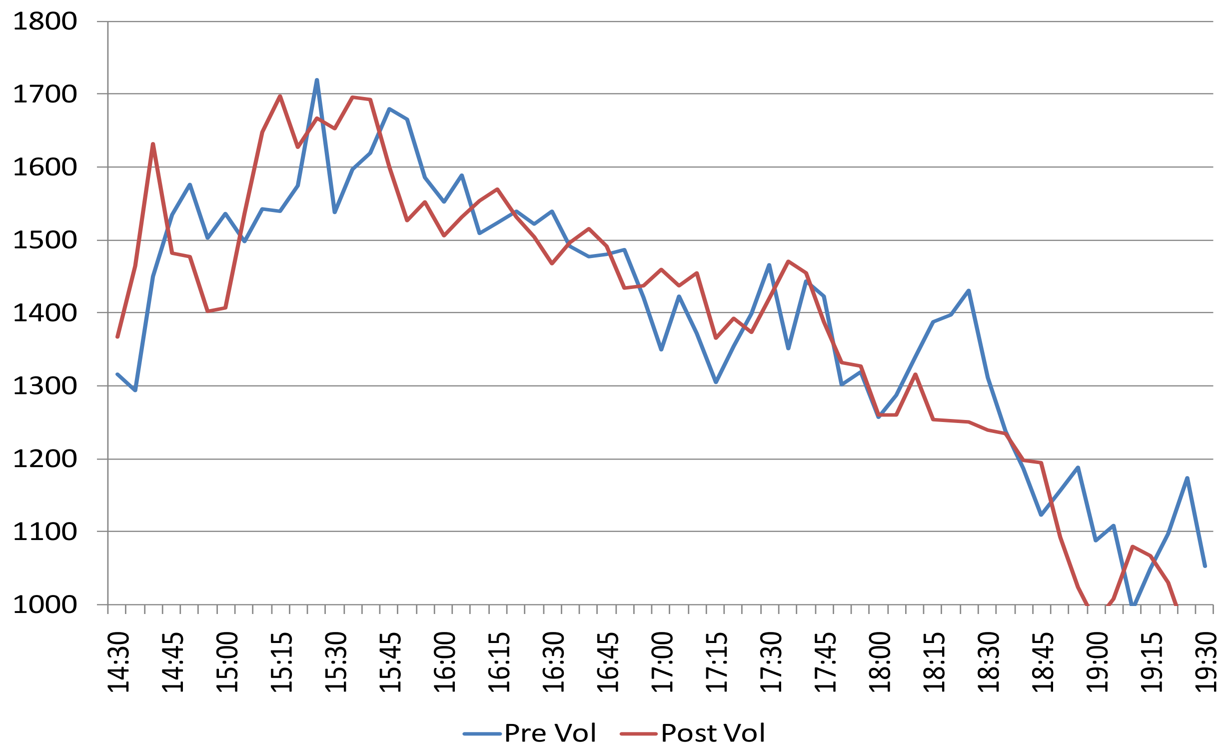


Figure S3.11.3 Comparison of Pre (Nov, 2007) and Post-VSL (Nov, 2008) Volume 25D

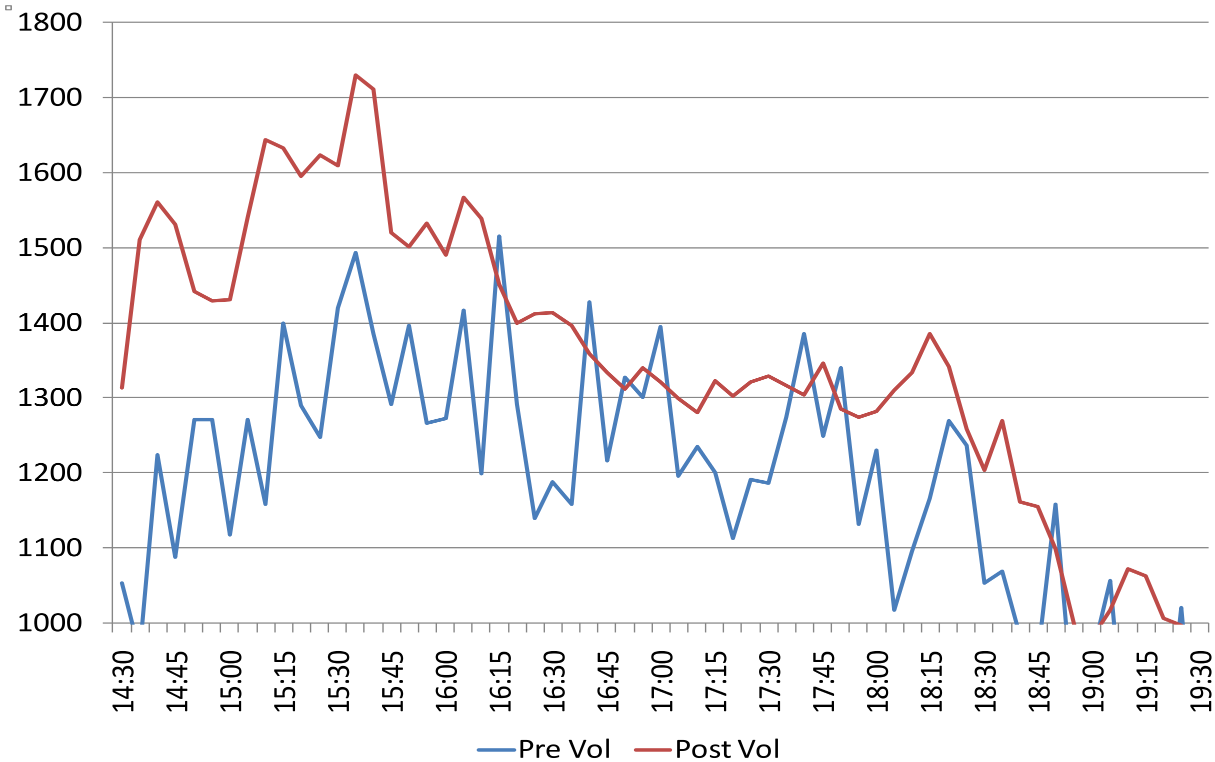


Figure S3.11.3 Comparison of Pre (April, 2008) and Post-VSL (April, 2009) Volumes 25D

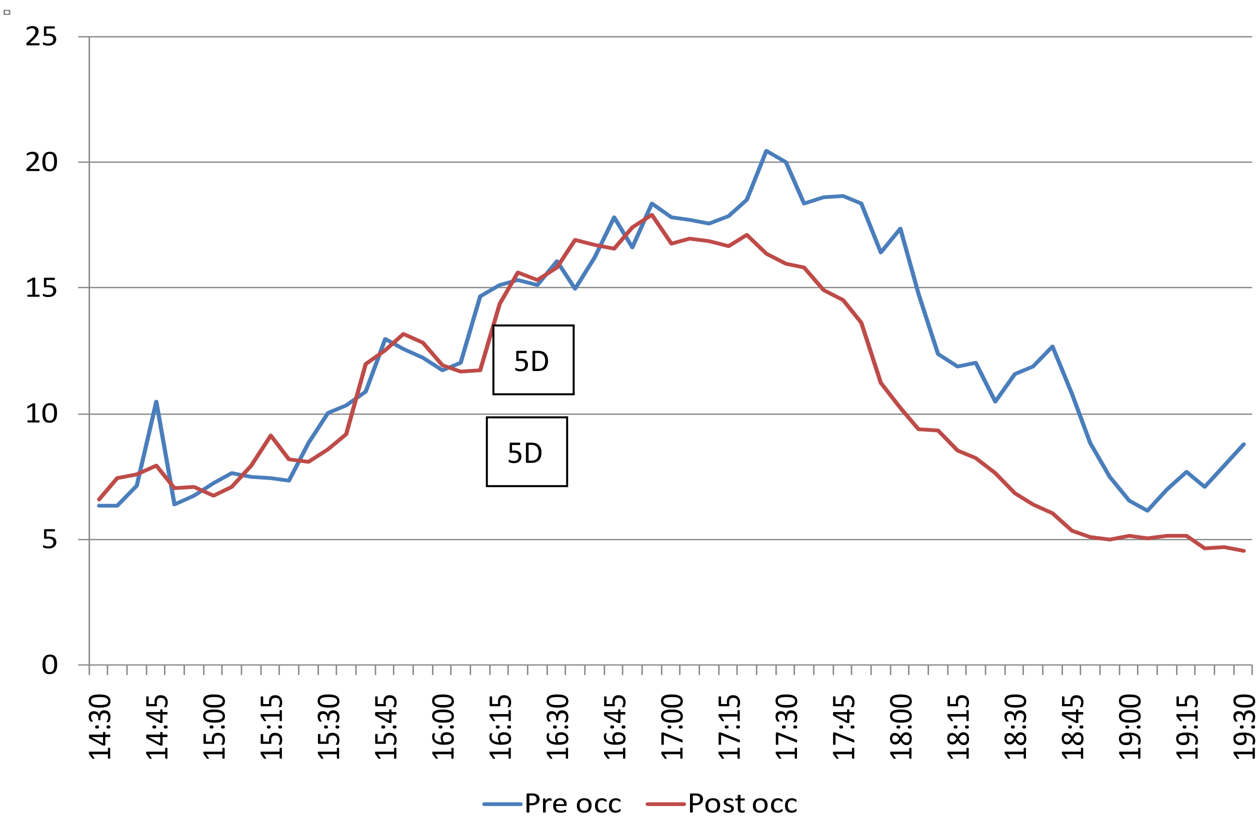


Figure S3.11.4 Comparison of Pre (Oct, 2007) and Post-VSL (Oct, 2008) Occupancy Profile 25D

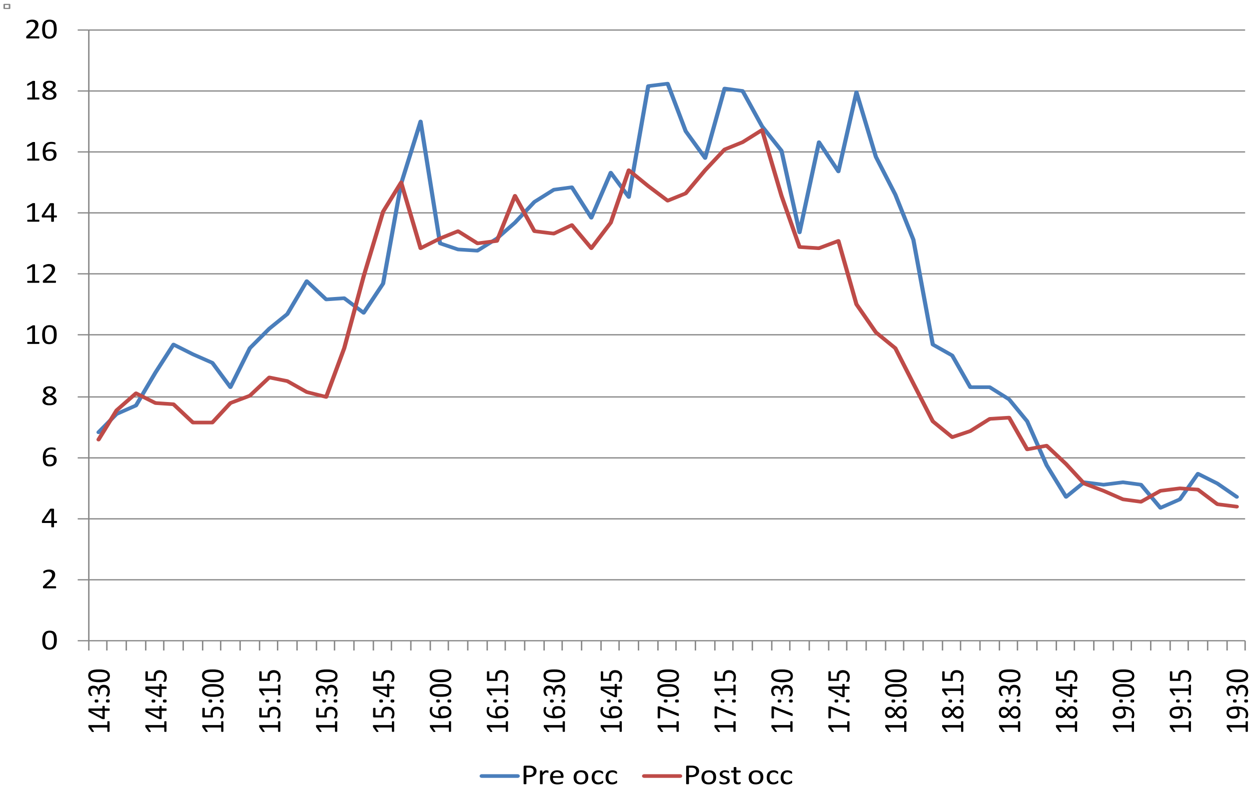


Figure S3.11.5 Comparison of Pre (Nov, 2007) and Post-VSL (Nov, 2008) Occupancy Profile

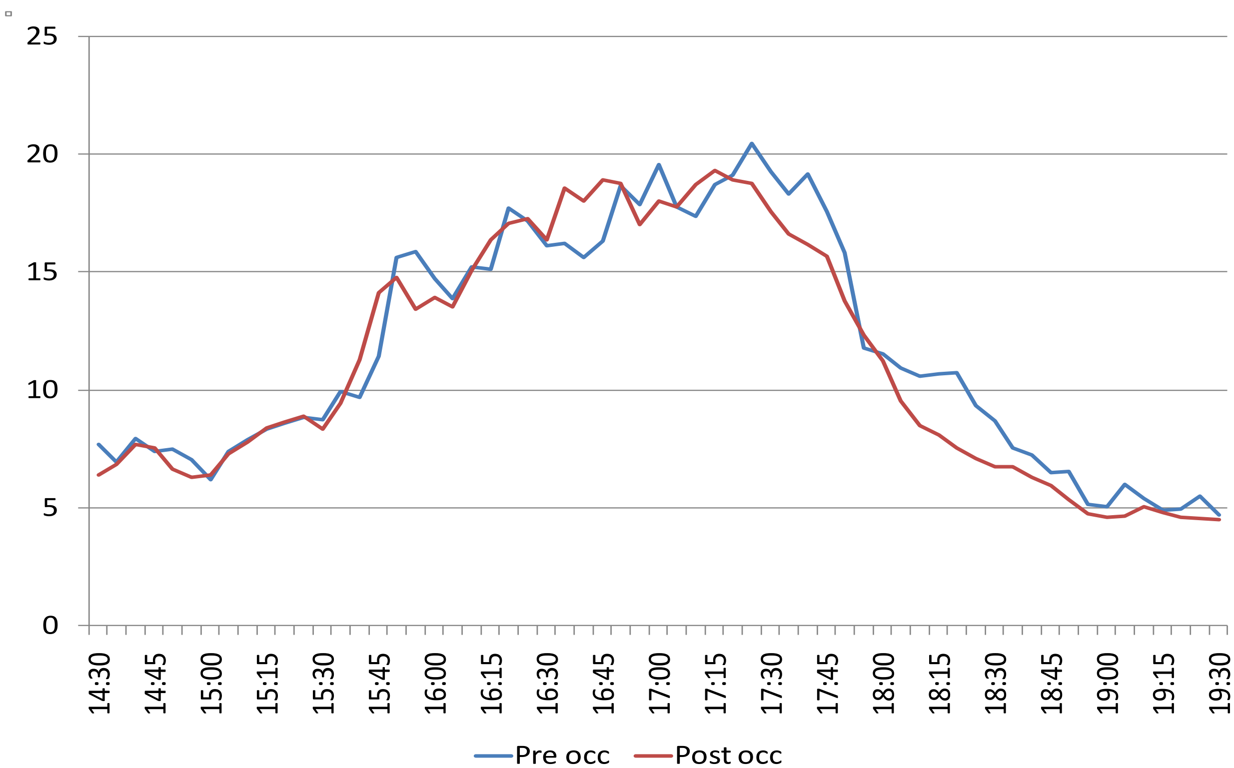


Figure S3.11.6 Comparison of Pre (April, 2008) and Post-VSL (April, 2009) Occupancy Profile

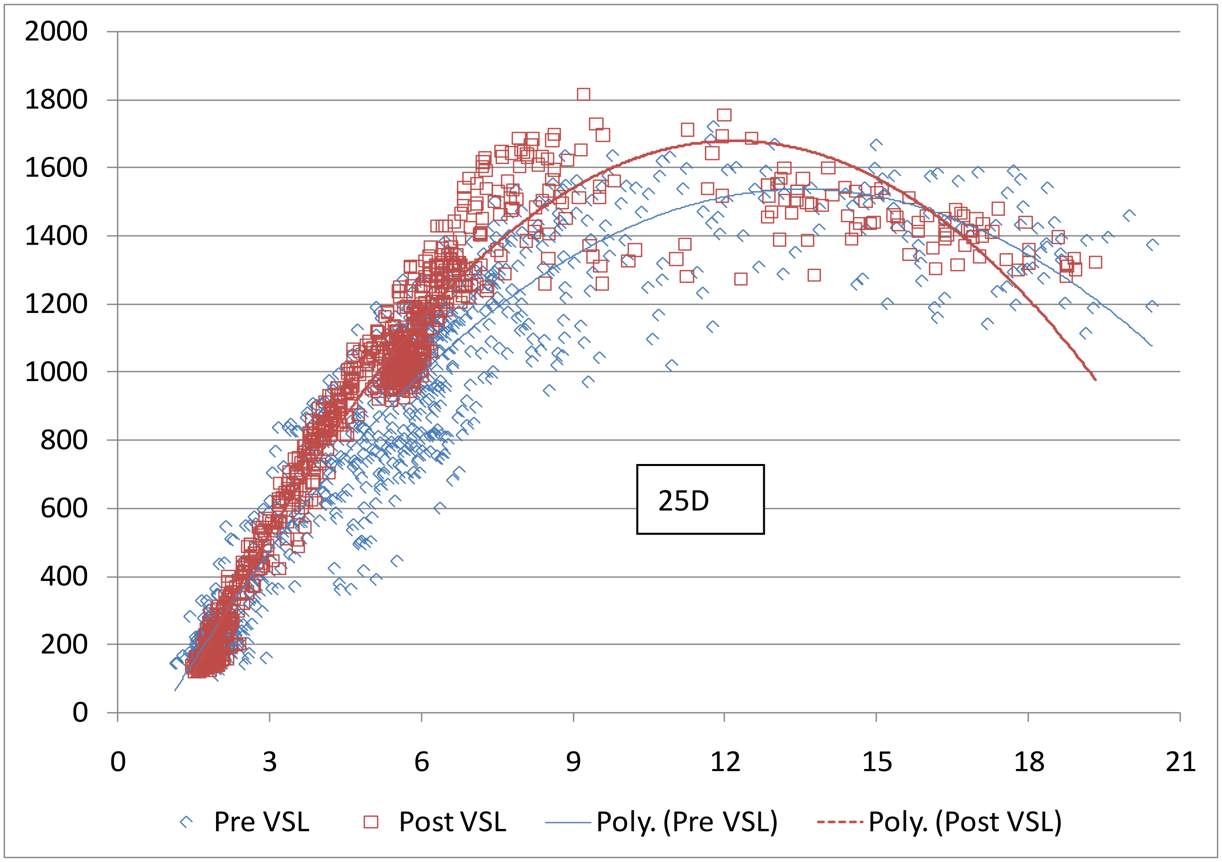


Figure S3.11.7. Flow-Occupancy Plot for three months (Oct, Nov and April) 25D

Figure S3.11.7 presents the flow-occupancy plots for each detector in pre- and post-VSL conditions. Data from three months October, November and April were used for the plots in pre- and post-VSL conditions. Figures show the comparison of pre- and post-VSL traffic volume and occupancy plot averaged out for all lanes for three detectors in pre- and post-VSL conditions. Data used for flow occupancy plot were aggregated for 5 minutes. It can be observed from the figure that maximum occupancy reduced at 25D (logmile 25) by 3 percent. One of the objectives of the VSL system initiation was to prevent the highway from reaching capacity since after reaching capacity the volume breaks down and traffic flow can decrease significantly. Therefore, flow-occupancy comparison indicated benefits of the VSL system initiation. Critical occupancy were also similar in both conditions. However, data spread were narrower in post-VSL conditions indicating speed homogeneity.

Task 1.2: Average Speed/Lane by Posted Speed Limit During Peak Periods

One of the main objectives of the VSL system was to improve traffic flow and this task evaluated the difference in average speed by comparing the data before and after the VSL system installation. Speed data averaged for all the lanes of segment 1 for every 5 minutes were used. Figures S3.12.1- S3.12.3 present the average highway speed for detector 25D (logmile 25) for pre- and post-VSL conditions in October, November and April. The figures indicate that the peak period for traffic on this segment for pre- and post-VSL conditions lies between 1500 to 1900 hours based on the average speed for all three months. Henceforth, all the figures for peak periods will be presented for this duration. Also, the pre- and post-VSL speed profile comparison over time shows reduction in peak period and improvement in average speeds for post-VSL conditions. Figures S3.12.1 to S3.12.3 and Table S3.12.1 indicate that the average speed increased by 5mph.

Table S3.11.1. Average Speed for three months

	Pre-VSL	**Post-VSL**
Avg Oct	37.18	44.06
Diff, Percent	6.89	19%
Avg Nov	40.56	45.36
Diff, Percent	4.80	12%
Avg April	39.34	42.27
Diff, Percent	2.93	7%
Avg	39.03	43.90
Diff, Percent	4.87	12%

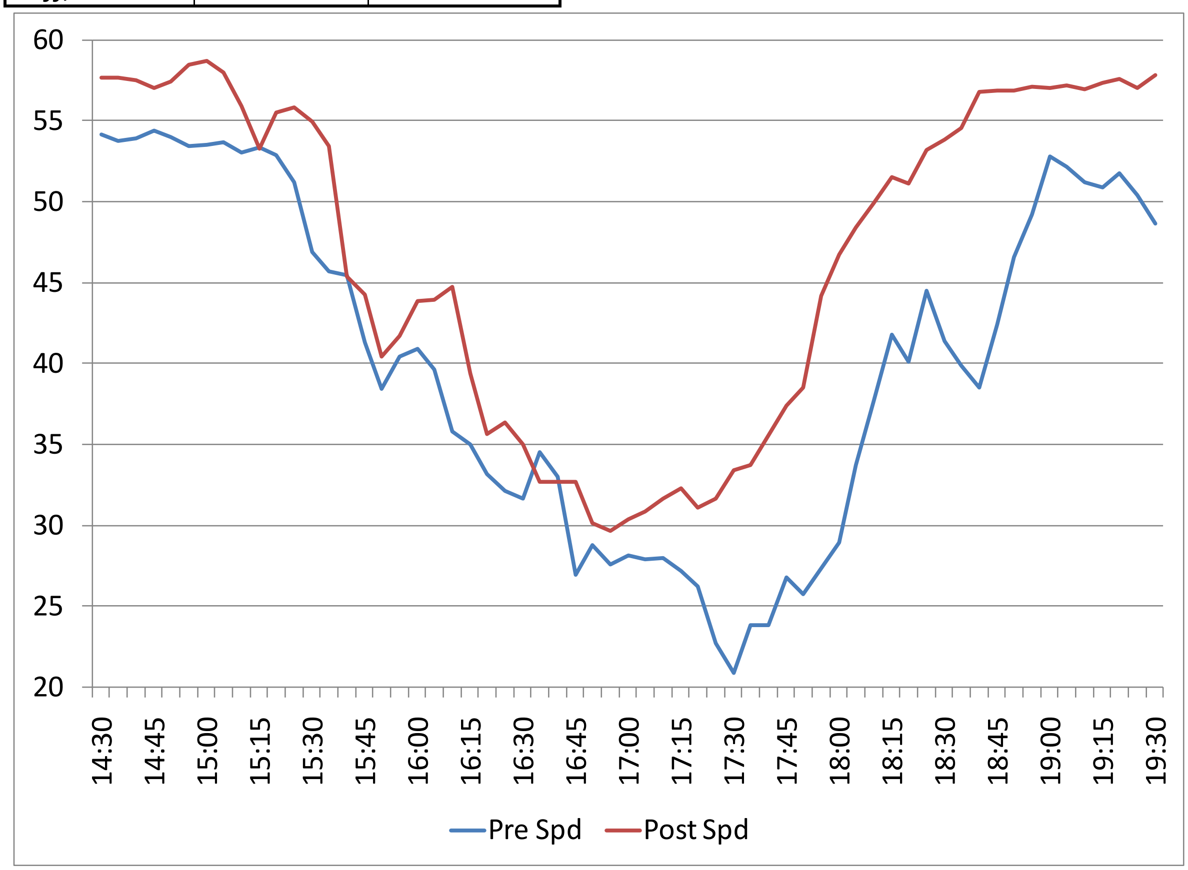


Figure S3.12.1 Comparison of Pre (Oct, 2007) and Post-VSL (Oct, 2008) Speed Profile 25D

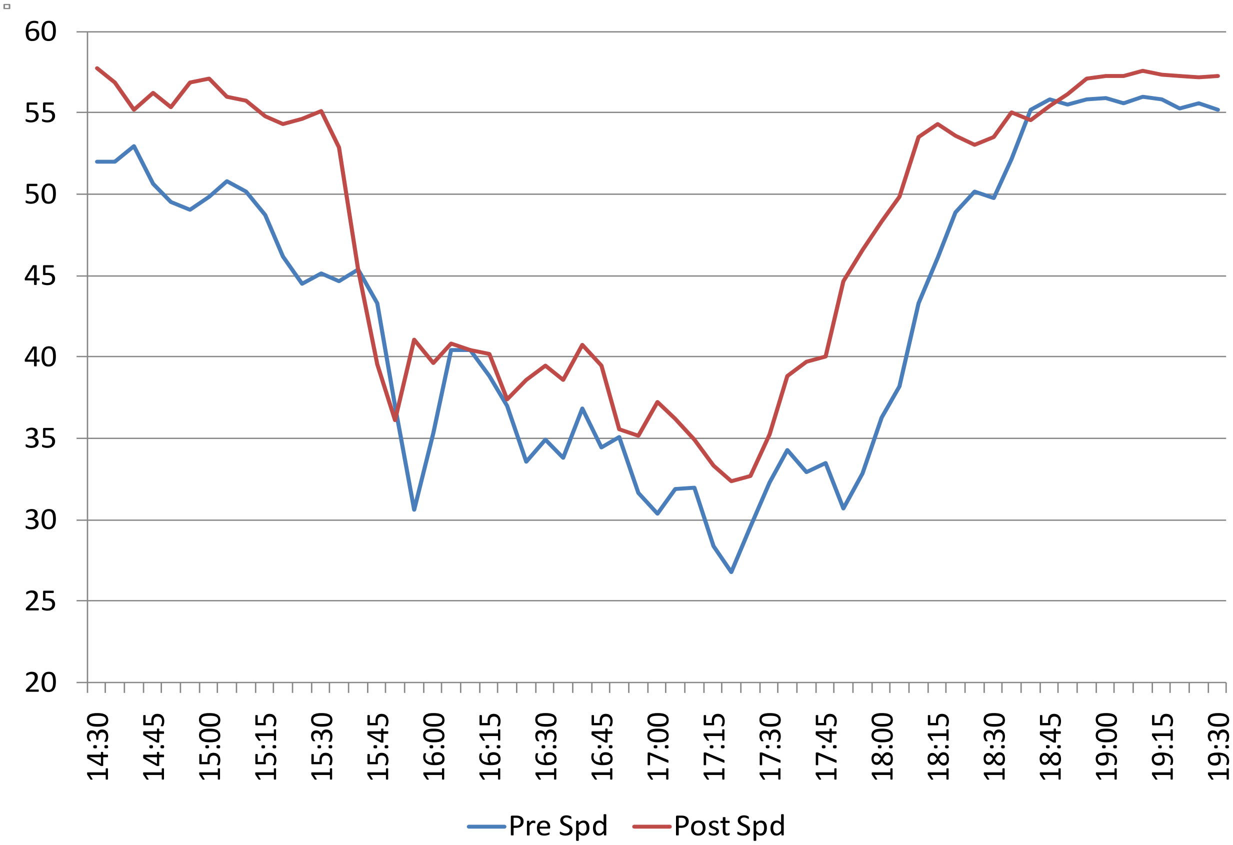


Figure S3.12.2 Comparison of Pre (Nov, 2007) and Post-VSL (Nov, 2008) Speed Profile 25D

Task 1.3: Speed Limit During Peak Periods

The objective of this task was to evaluate the system initiation logic for variable speed limits. This task was not carried out for average monthly data as posted VSLs cannot be averaged for analysis.

Task 1.4: Speed Limit Compliance by Posted Speed Limit

The objective of this task was to analyze driver compliance of the posted variable speed limits. This task was not carried out for average monthly data as posted VSLs cannot be averaged for analysis.

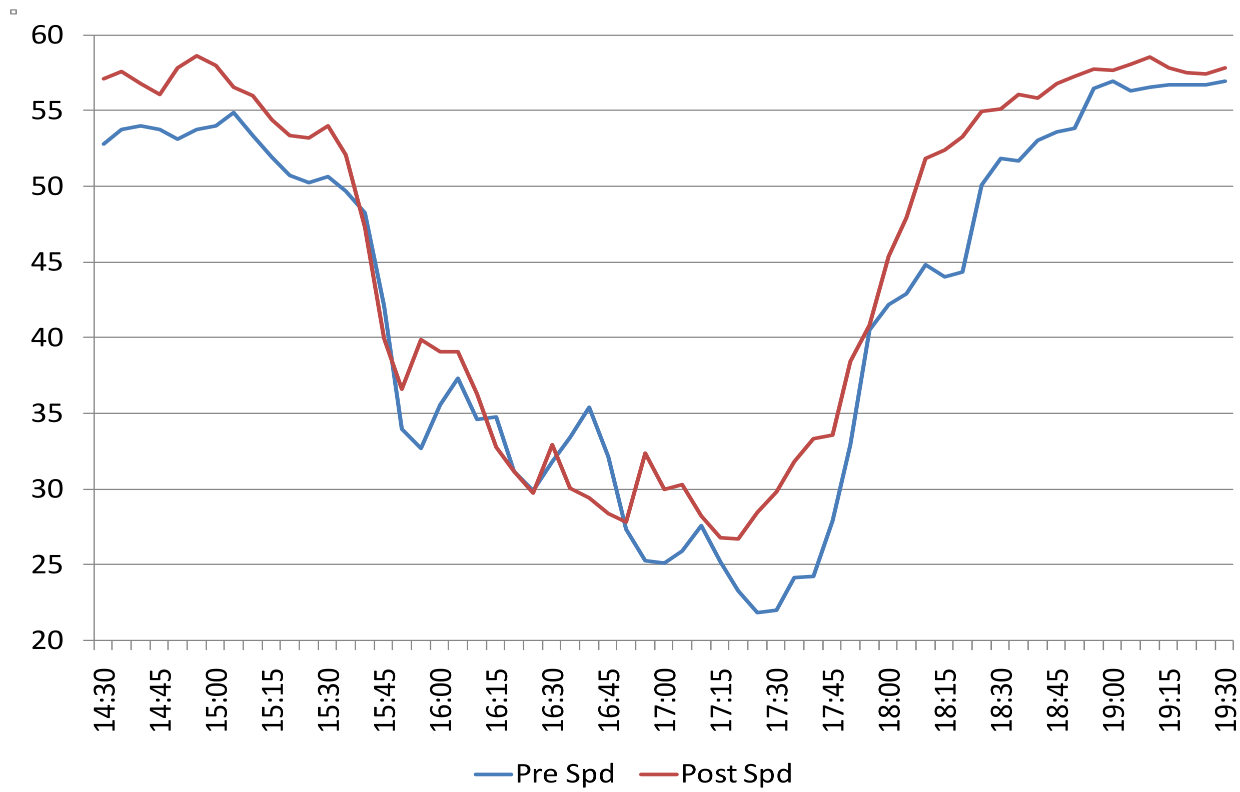


Figure S3.12.3 Comparison of Pre (April, 2008) and Post-VSL (April, 2009) Speed Profile 25D

Task 1.5: Evaluation of Highway Capacity

This task compares speed-flow plots for pre- and post-VSL conditions. Figure S3.15.1 present the speed flow data for three months in pre- and post-VSL system installation for detector locations 25D (logmile 25). Data used were aggregated for 5 minute intervals for this task. Comparing the data from pre- and post-VSL conditions, highway capacity increased by 200 vph. However, fewer data points were observed in congested conditions indicating system benefits.

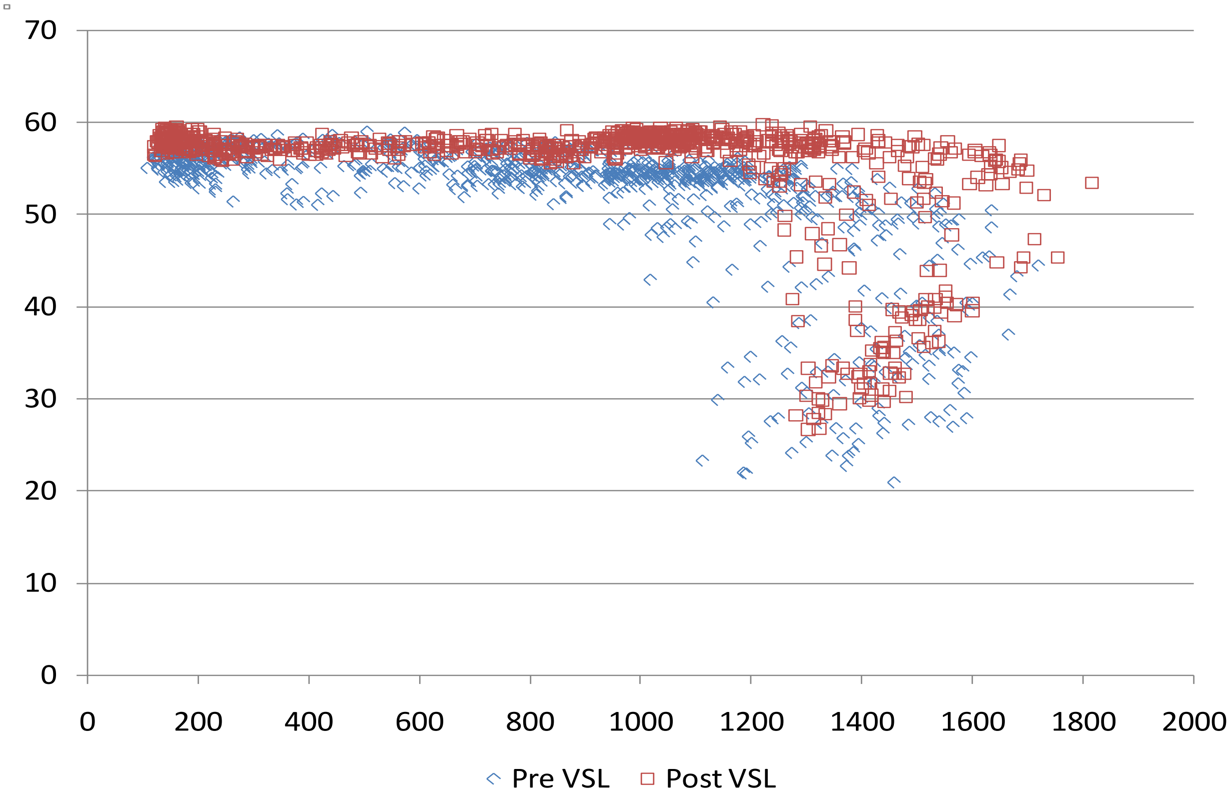


Figure S3.15.1 Speed Flow Plot for three months (Oct, Nov & April) at 25D

Task 1.6: Evaluation of Congestion Measures

To evaluate the congestion measures, travel times and travel time reliability indices, travel delay, and Percent of Congested Delay were compared for pre- and post-VSL conditions. Segment 3 mean and standard deviation of travel times were computed between detectors 21D (logmile 21.4) (logmile 21.4) and 25D (logmile 25) for October, November, and April data.

<u>Mean and Standard Deviation of Travel Times</u>

Travel times were calculated for average of all lanes for each month and then averaged for the months considered. Figures S3.16.1 to S3.16.3 present the comparison of travel times computed for average of all lanes between detectors 21D (logmile 21.4) and 25D (logmile 25). For pre-VSL conditions, it can be observed from Figures S3.16.1 to S3.16.3 that the mean travel times for peak periods ranged from 490 to 540 person-minutes. For post-VSL conditions, the mean travel times during peak period increased from 461 to 492 person-minutes. Tables S3.16.1 and S3.16.2 present the comparison of mean and standard deviation of travel times for the three months and their average. It can be observed from the tables that the percentage change of mean travel time during peak periods for post-VSL compared with pre-VSL conditions varied from 1.6 to 9%.

Average of three months showed that the mean travel times during peak periods decreased 5.6% after initiation of the VSL system, whereas volume increased 0.6%, it indicates VSL system was beneficial to decrease travel time. Comparison of standard deviation of travel times for average of three months for pre- and post-VSL indicates it decreased 8.9% that means VSL system was beneficial to decrease variation in travel times during the peak periods. It can be concluded that VSL system was beneficial to decrease travel time for segment 3.

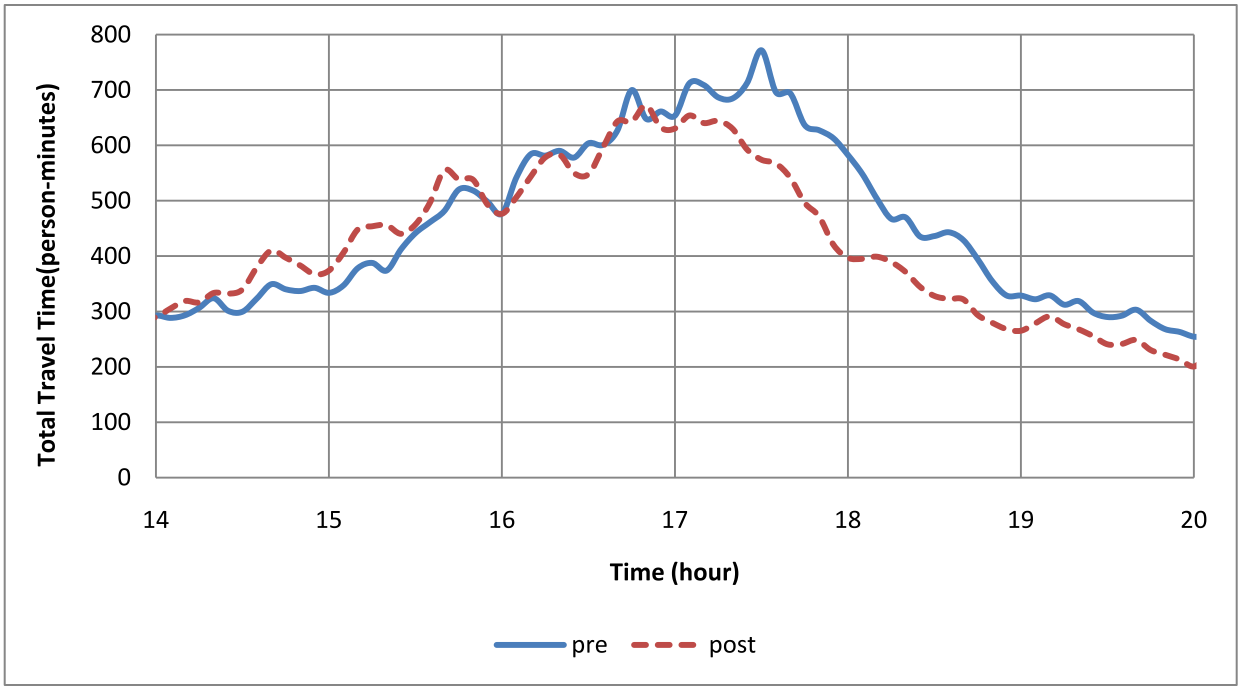


Figure S3.16.1 Comparison of Pre and Post-VSL average travel time data between 21D and 25D (October)

Table S3.16.1 Comparison of mean travel times during peak period for pre- and post VSL

	Travel Time (person-minutes)		Volume (vehicles/hour)	
	Pre-VSL	Post-VSL	Pre-VSL	Post-VSL
October	540.3	491.7	5015	4974
Percentage change	-9.0		-0.8	
November	490.4	461.5	4790	4804
Percentage change	-5.9		0.3	
April	499.1	491.0	4661	4782
Percentage change	-1.6		2.6	
Average of three months	509.9	481.4	4822.0	4853.3
Percentage change	-5.6		0.6	

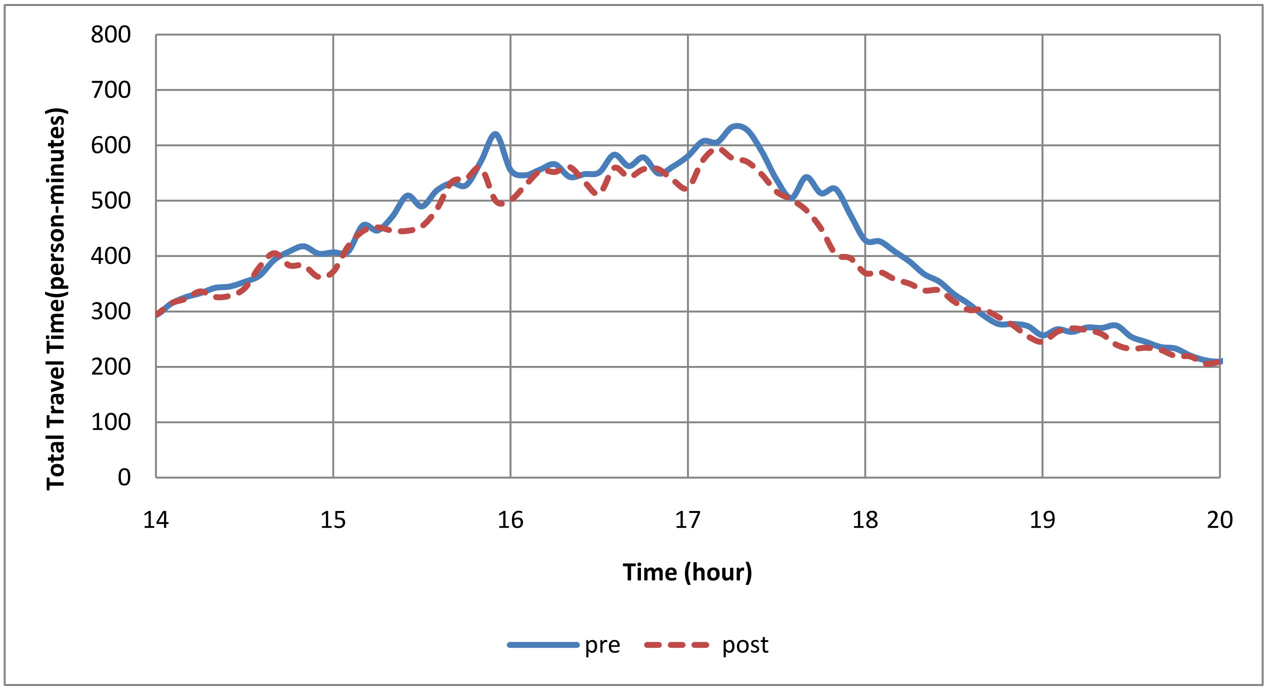


Figure S3.16.2 Comparison of Pre and Post-VSL average travel time data between 21D and 25D (November)

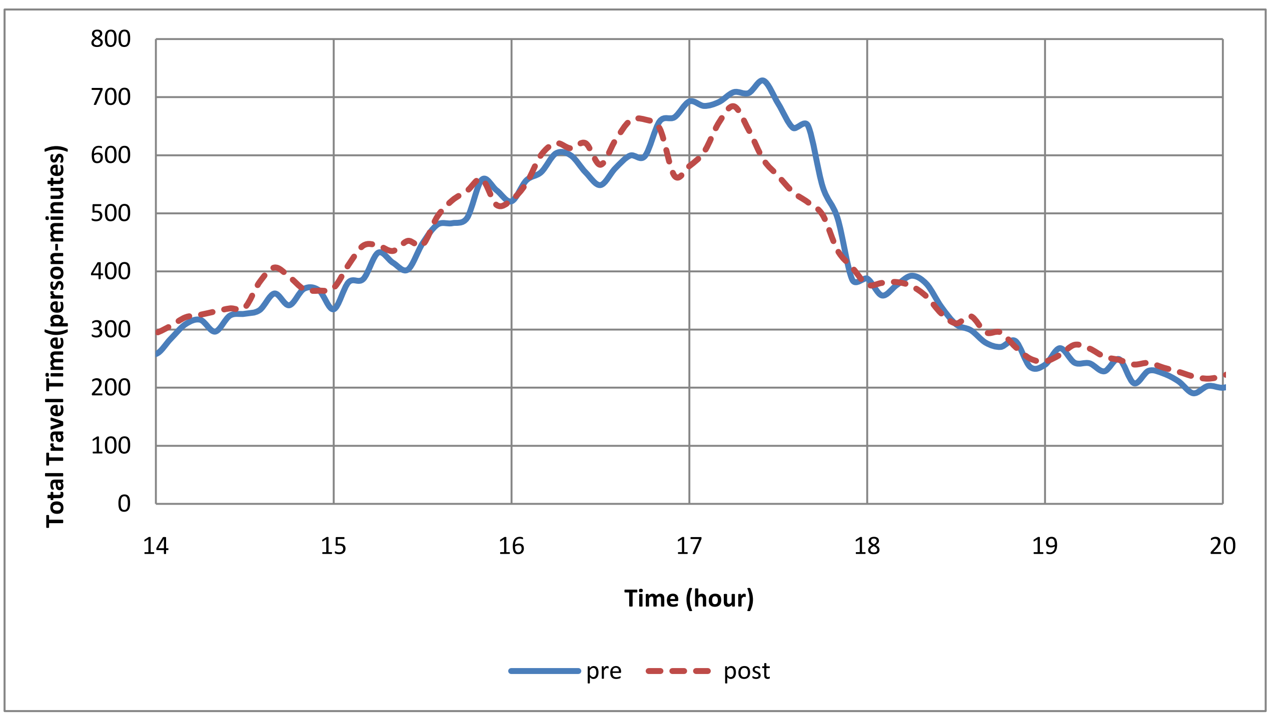


Figure S3.16.3 Comparison of Pre and Post-VSL average travel time data between 21D and 25D (April)

Table S3.16.2 Comparison of standard deviation of travel times during peak period for pre- and post VSL

	Travel Time (person-minutes)		Volume (vehicles/hour)	
	Pre-VSL	Post-VSL	Pre-VSL	Post-VSL
October	121.8	113.5	472.1	673.5
Percentage change	-6.8		42.7	
November	101.6	96.9	593.3	692.2
Percentage change	-4.6		16.7	
April	141.3	121.7	695.8	650.1
Percentage change	-13.9		-6.6	
Average of three months	121.6	110.7	587.1	671.9
Percentage change	-8.9		14.5	

Individual Measures

The individual measures, TTI, BTI, and PTI were compared with three months of data for the peak periods for pre- and post-VSL conditions. Tables S3.16.3 to S3.16.5 present the comparison of average of individual measures, TTI, BTI, and PTI for average of all lanes between detectors 21 and 25. It can be observed from Table S3.16.3 that for post-VSL conditions that TTI decreased for all months from 6.3 to 11.1% and average TTI for all three months decreased 8.6%.

Table S3.16.3. Comparison of Travel Time Index

Individual Measures	Between 21D and 25D	
	PRE-VSL	POST-VSL
October		
Travel Time Index (TTI)	1.44	1.28
Percentage Change	-11.1	
November		
Travel Time Index (TTI)	1.33	1.21
Percentage Change	-9.0	
April		
Travel Time Index (TTI)	1.44	1.35
Percentage Change	-6.3	
Average of three months		
Travel Time Index (TTI)	1.40	1.28
Percentage Change	-8.6	

Table S3.16.4 shows for post-VSL conditions BTI increased for November data 10.5% but it decreased for October and April data 24.1 and 26.5%, respectively, and average BTI for all three months decreased 14.8%. Also, it can be observed from Tables S3.16.5 that for post-VSL conditions PTI decreased for all months from 6.6 to 13.2% and average PTI for all three months decreased 10.1%. It can be concluded VSL system was beneficial for segment 3 to decrease travel time reliability indices.

Table S3.16.4. Comparison of Buffer Time Index

Individual Measures	Between 21D and 25D	
	PRE-VSL	POST-VSL
October		
Buffer Time Index (BTI)	0.29	0.22
Percentage Change	-24.1	
November		
Buffer Time Index (BTI)	0.19	0.21
Percentage Change	10.5	
April		
Buffer Time Index (BTI)	0.34	0.25
Percentage Change	-26.5	
Average of three months		
Buffer Time Index (BTI)	0.27	0.23
Percentage Change	-14.8	

Reduction in TTI shows decrease in ratio between the actual travel rate and Posted Speed Limit (PSL) travel rate that means the VSL system was useful in decreasing the difference between the peak period and the PSL travel conditions. This indicates that travel times for peak periods and PSL are closer to each other in post-VSL conditions. Reduction in BTI indicates decrease in difference between 95% travel time and average travel time that means the VSL system was beneficial in reducing the difference between the 95% travel time and average travel time. Reduction in PTI indicates decrease in ratio between 95% travel time and PSL travel time that means the VSL system was useful in decreasing the difference between 95% and PSL travel time.

Overall results for segment 3 show all travel time reliability indices (TTI, BTI, and PTI) decreased. Reduction in all travel time reliability indices for post-VSL conditions indicates less variability and more consistency between highest value of travel time during the peak period (worst condition) and PSL condition. It can be concluded that post-VSL conditions was more reliable than pre-VSL conditions and there is benefit after VSL system initiation according to this uncontrolled analysis.

Table S3.16.5. Comparison of Planning Time Index

Individual Measures	Between 21D and 25D	
	Pre-VSL	Post-VSL
October		
Planning Time Index (PTI)	1.74	1.51
Percentage Change	-13.2	
November		
Planning Time Index (PTI)	1.52	1.42
Percentage Change	-6.6	
April		
Planning Time Index (PTI)	1.78	1.60
Percentage Change	-10.1	
Average of three months		
Planning Time Index (PTI)	1.68	1.51
Percentage Change	-10.1	

Traffic Delay

For segment 3, the analysis indicates that average Delay calculated for post-VSL system was much lower compared to the pre-VSL system. Delay decreased by 0.62 minutes. Similarly, Percentage of Congested Travel reduced by an average of 6% percent for post-VSL conditions. From Table S3.16.6 it can be noticed that congestion reduced significantly between 21D (logmile 21.4) to 25D (logmile 25).

Table S3.16.6. Average Delay and Change in Percentage of Congested Travel during peak periods

Detector ID	**MP 21D to MP 25D**
	October
Pre VSL Travel Time (minutes)	4.8
Post VSL Travel Time (minutes)	4.4
Delay (minutes)	-0.4
Percent Change in Congested Travel	-8%
	November
Pre VSL Travel Time (minutes)	4.5
Post VSL Travel Time (minutes)	4.3
Delay (minutes)	-0.2
Percent Change in Congested Travel	-5%
	April
Pre VSL Travel Time (minutes)	4.7
Post VSL Travel Time (minutes)	4.5
Delay (minutes)	-0.2
Percent Change in Congested Travel	-3%

*Negative value indicates decrease in Post-VSL congestion measures and vice versa.

Delay Cost Analysis

Table S3.16.7 presents the average annual vehicle cost savings because of post VSL system installation. The analysis was carried out for peak periods. The average vehicle cost was calculated to be $24.82/hr and used in delay cost analysis.

Table S3.16.7. Delay Cost savings due to VSL system installation

Locations I-270 SB	Difference in Delay (people-min)	Average Daily User Cost *	Average Annual User Cost for 250 Workdays per user
MP 21D to 25D	28.5	11.8	$ 2947.38

Table S3.16.7 presents the cost savings because of reduced delay due to post VSL conditions. The cost saving represents 250 work days during peak periods. The cost saving varies depending on the length of the segment as it can be noticed that segment between MP21.6 and MP25.3 has a length of 3.7 miles. This is due to improved average speed for post VSL conditions which allows more travel time saving. The total average annual user cost saving for this segment was observed to be $2947.38 per user travelling 3.7 miles. This indicates benefits of the VSL system installation for segment 3.

Task 1.7: Analysis of VSL System during Inclement Weather

Task 1.7 was not conducted separately as the monthly analysis included all weather data.

SEGMENT 4 ANALYSIS

Table S4.1 presents the dates that were considered for segment 4 evaluation. Data for these dates were considered appropriate for evaluation as the data were available, and presented clear weather conditions. Days with similar volumes were used for evaluation. The average of five days used in this report for comparison between pre- and post-VLS conditions for segment 4 are highlighted in the table. Some dates did not present VSL benefits while others did. The days in the table are mostly Thursdays unless pointed out in the footnote.

Table S4.1. Time Period selected for VSL system evaluation

Pre-VSL System	Post-VSL System
October 2007	*October 2008*
April 2008	*April 2009*

Task 1.1: Volume and Occupancy Analysis

This task consists of two sub-tasks. First, average volume for pre- and post-VSL conditions are compared. Second, occupancy data for pre- and post-VSL conditions, and the change in flow-occupancy relationship are compared. The change in volume is accounted to evaluate the effect on average speed, travel time and congestion. Figures S4.1S4.11.1 to S4.1S4.11.3 present the volume comparison between pre- and post-VSL system installation for all five lanes for detectors 31D (logmile 31.6) and 28D (logmile 28.6) for pre and post VSL system installation. Average volume for 5-minutes interval on the highway was compared for both conditions to account for any change in volume.

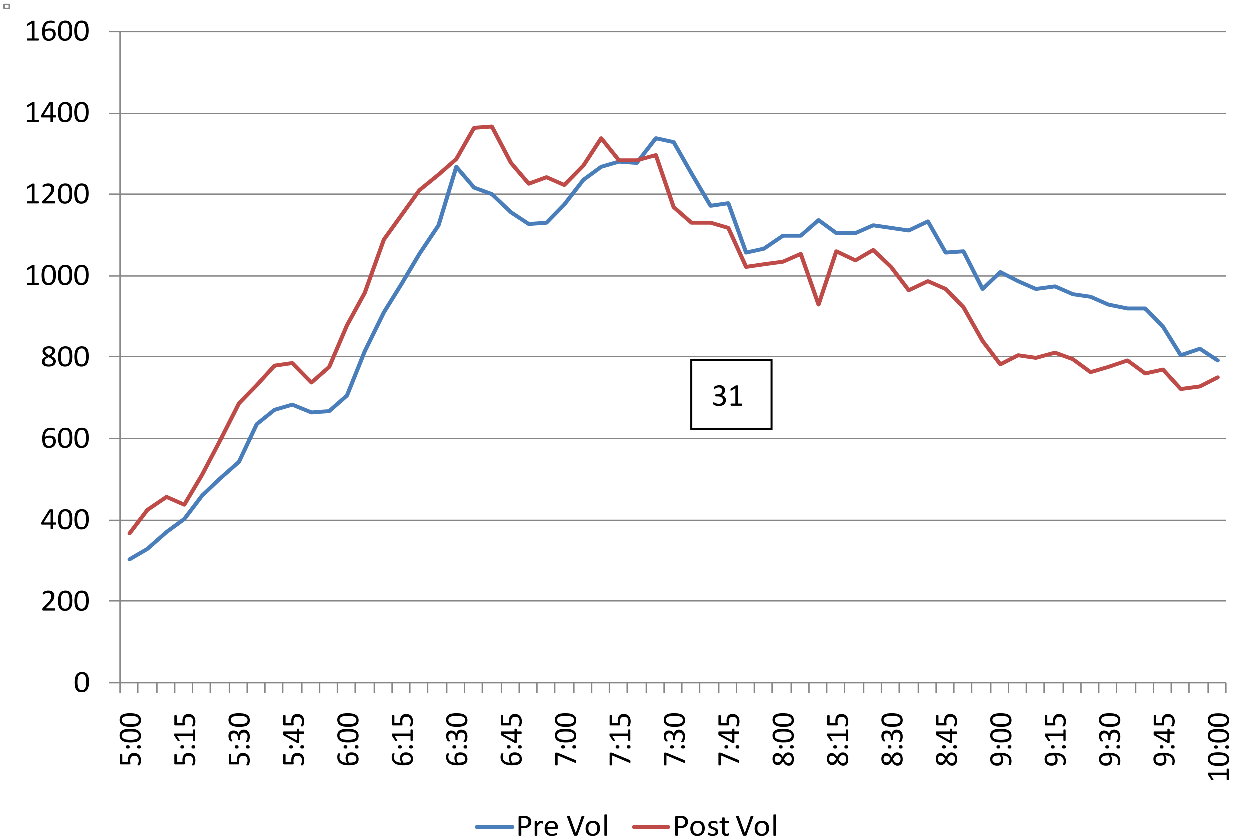
Figures S4.11.1 to S4.11.3 present volume profiles during peak periods for detectors along segment 4 for Pre and post conditions for October, November and April). Table S4.11.1 indicate a 2 percent decrease in volume in post VSL conditions for 31D (logmile 31.6) and no significant change at 28D (logmile 28.6). Figures S4.11.4 to S4.11.6 present the occupancy profiles and from Table S4.11.2 it can be noticed that occupancy decreased by 29% at detector 31D (logmile 31.6) and by 10 percent for 28D (logmile 28.6).

Table S4.11.1. Average Volume for three months

	Pre-VSL	**Post-VSL**	**Pre-VSL**	**Post-VSL**
	31D		***28D***	
Avg Oct	1068.12	1030.34	1463.84	1449.37
Diff, Percent	-37.79	-4%	-14.47	-1%
Avg April	1056.37	1061.11	1452.40	1480.66
Diff, Percent	4.75	0%	28.27	2%
Avg Vol	1062.25	1045.72	1458.12	1465.02
Diff, Percent	-16.52	-2%	6.90	0%

Table S4.11.2. Average Occupancy for three months

	Pre-VSL	**Post-VSL**	**Pre-VSL**	**Post-VSL**
	31D		***28D***	
Avg Oct	11.24	7.35	5.65	5.00
Diff, Percent	***-3.88***	***-35%***	***-0.65***	***-12%***
Avg April	8.79	6.92	5.15	4.74
Diff, Percent	***-1.88***	***-21%***	***-0.41***	***-8%***
Avg Occp	10.01	7.13	5.40	4.87
Diff, Percent	***-2.88***	***-29%***	***-0.53***	***-10%***



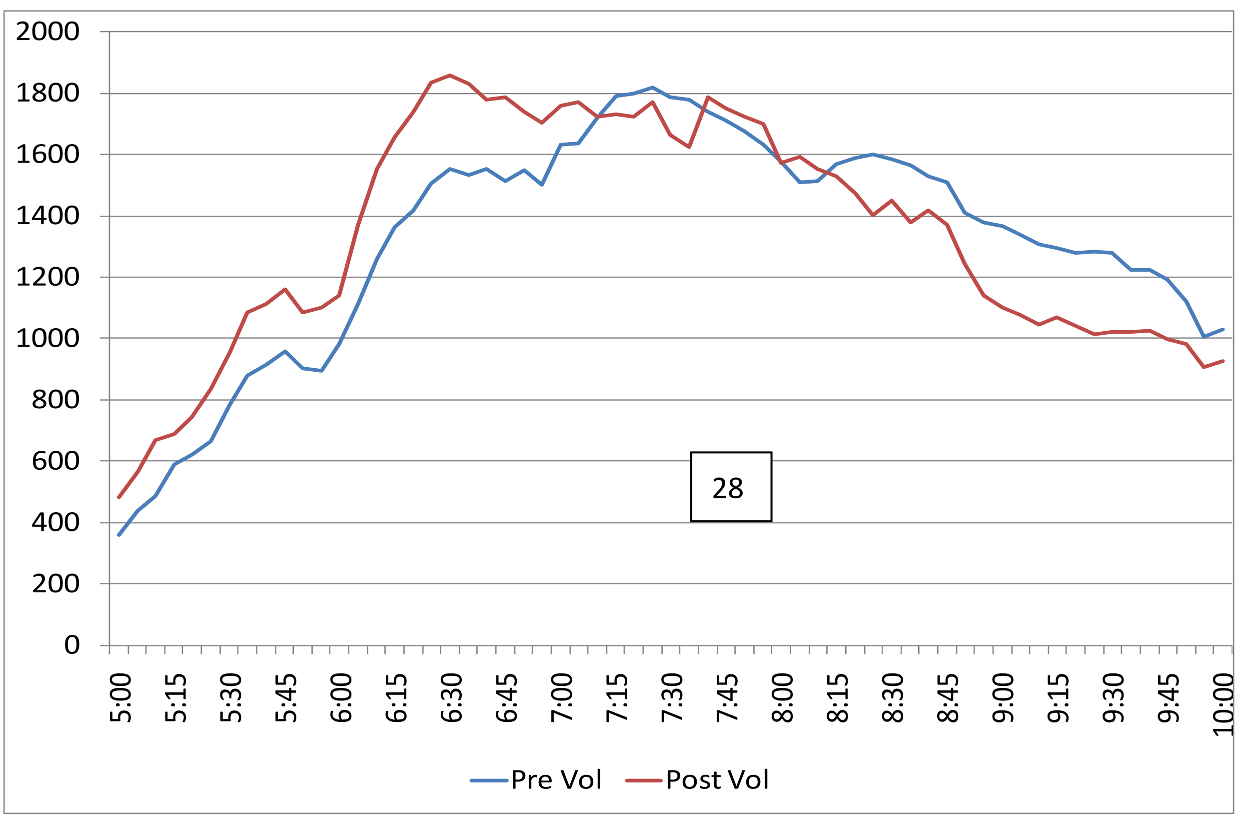
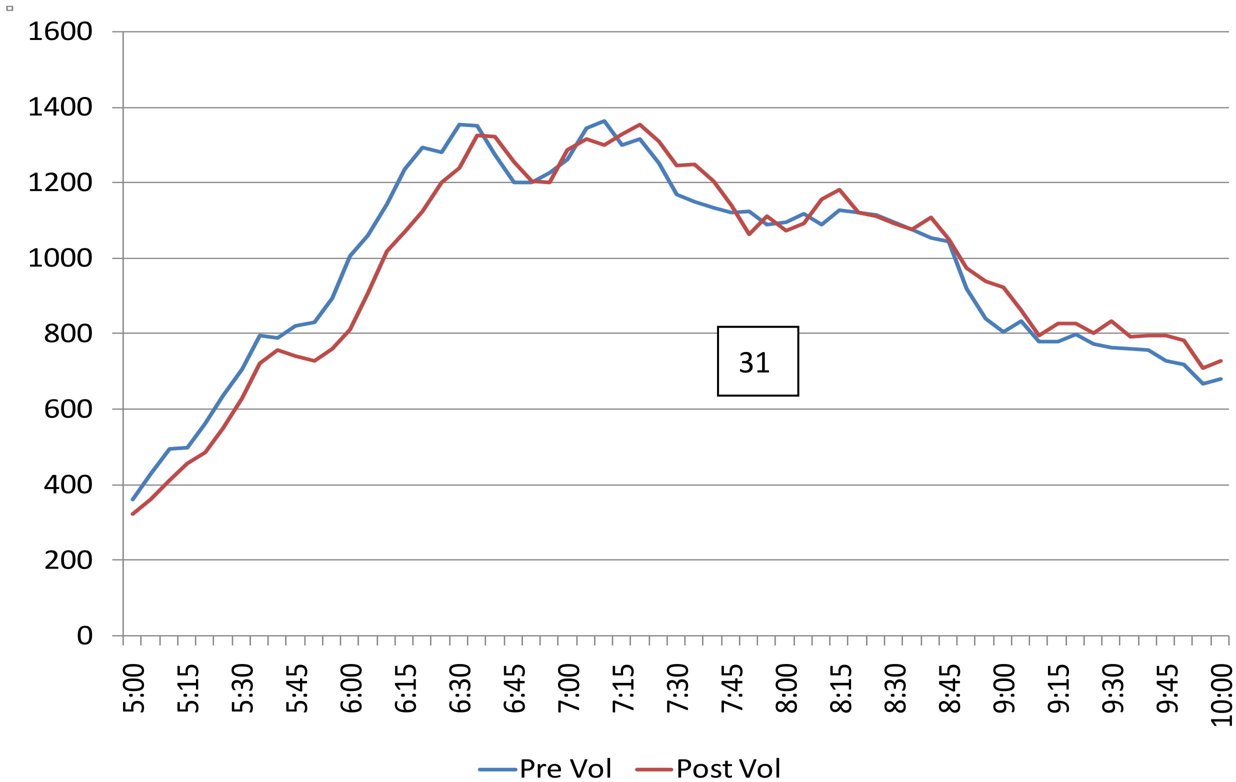


Figure S4.11.3 Comparison of Pre (Oct, 2007) and Post-VSL (Oct, 2008) Volume



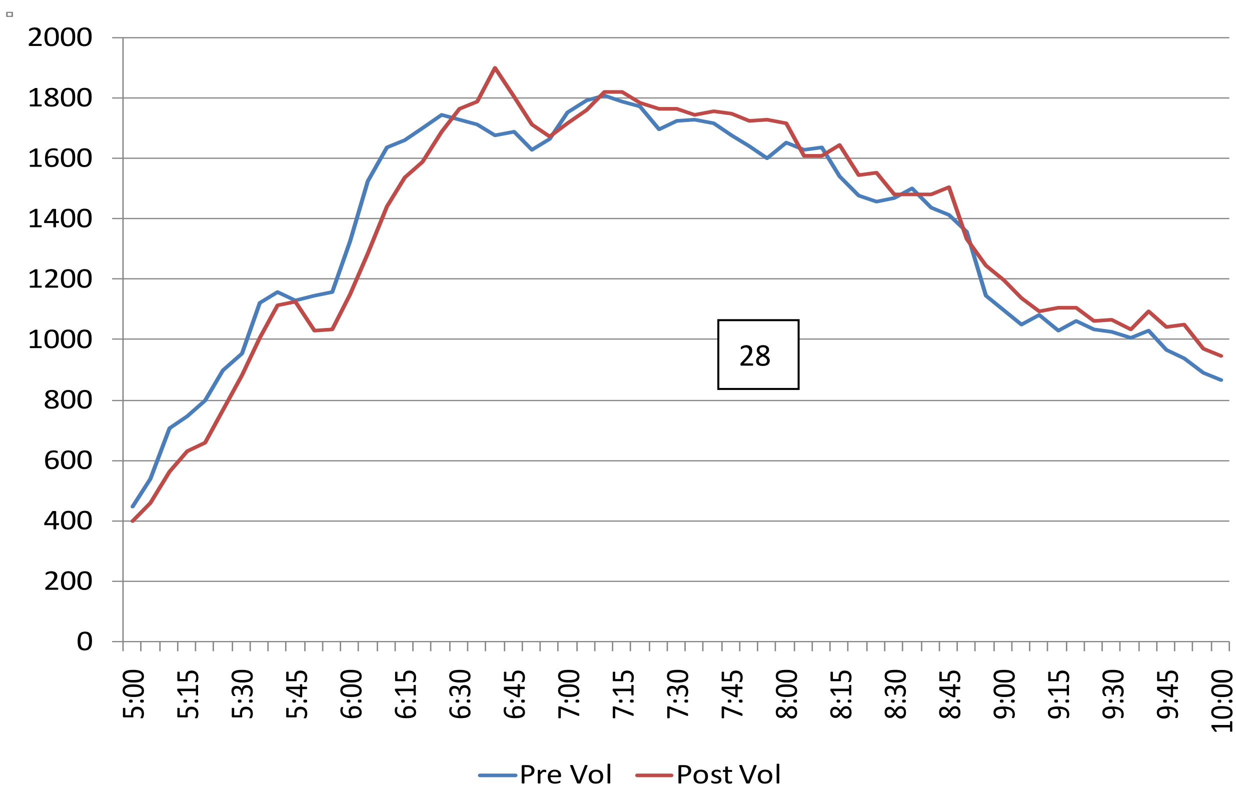
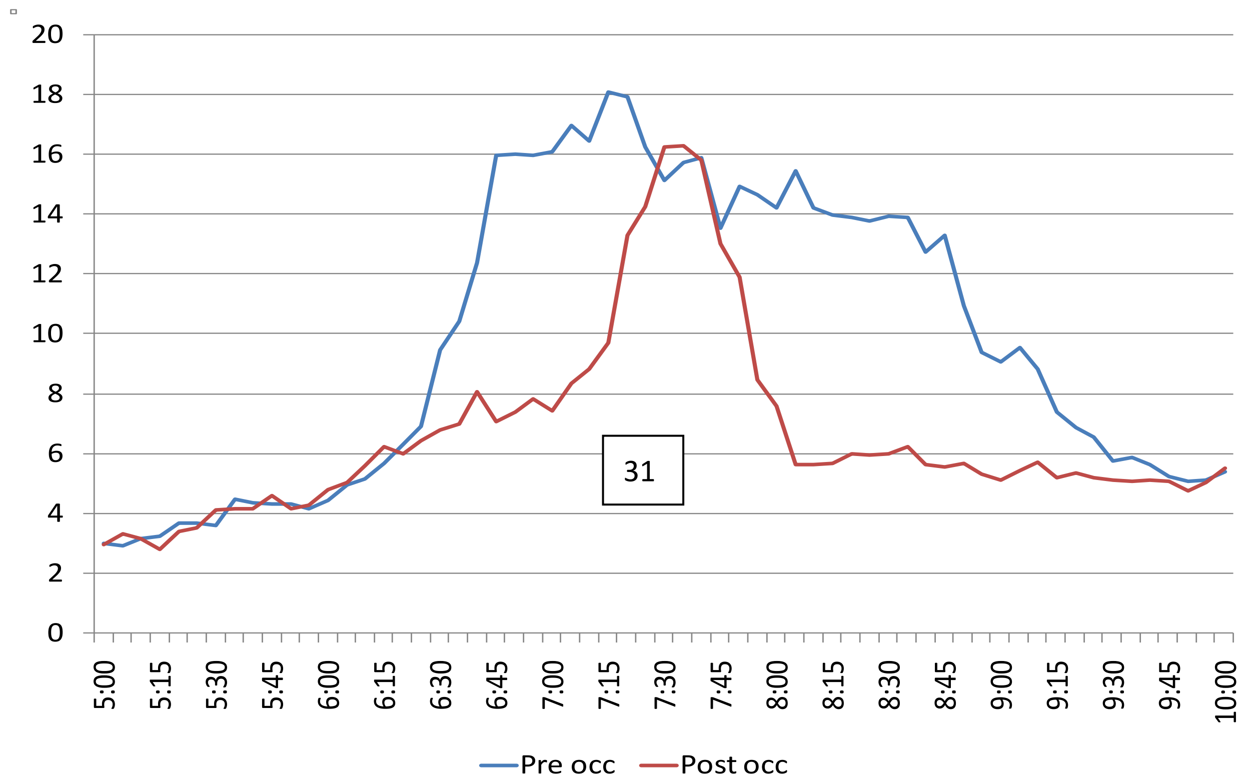


Figure S4.11.2 Comparison of Pre (April, 2008) and Post-VSL (April, 2009) Volumes



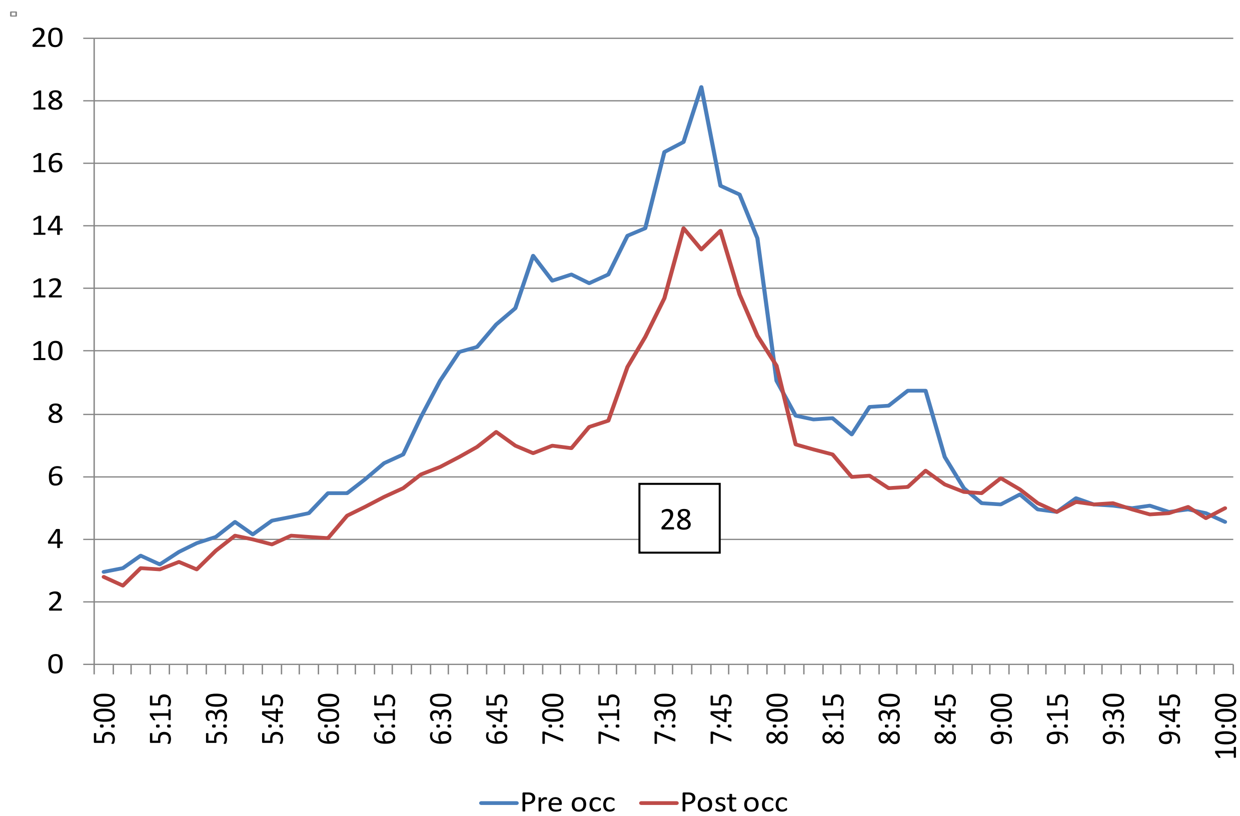
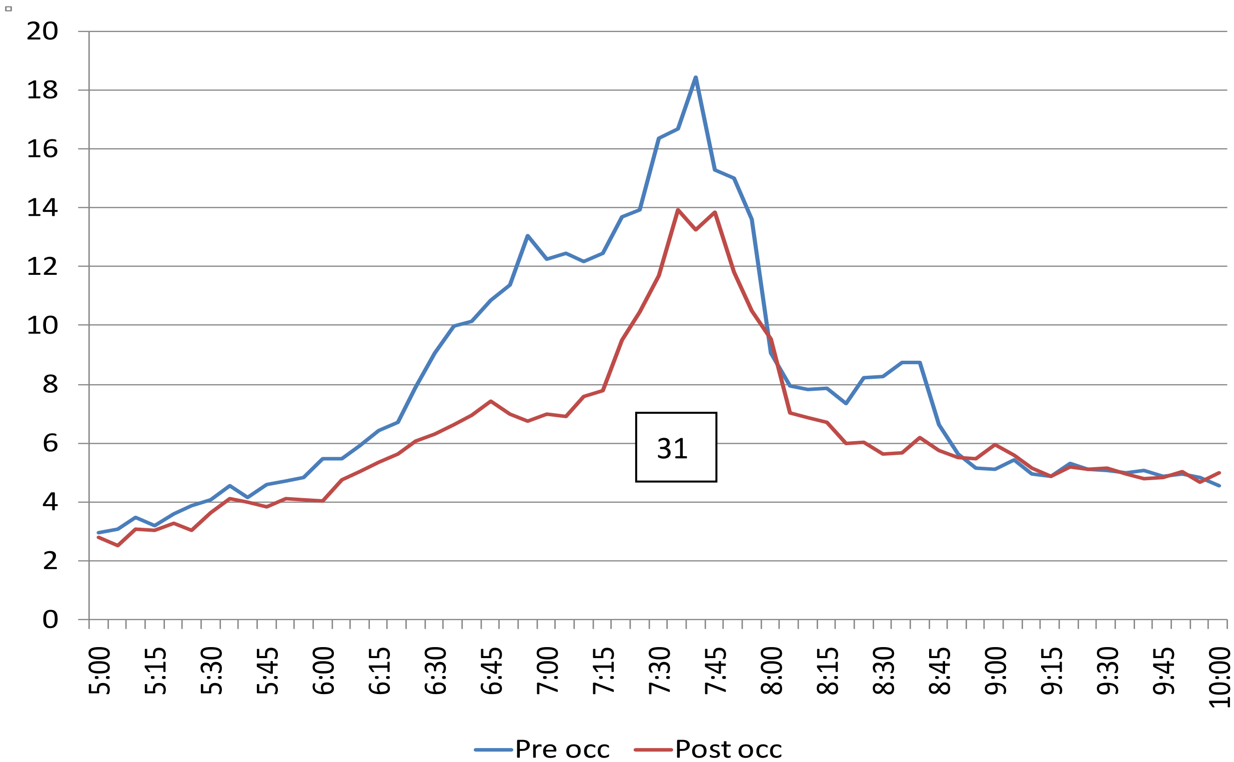


Figure S4.11.3 Comparison of Pre (Oct, 2007) and Post-VSL (Oct, 2008) Occupancy Profile



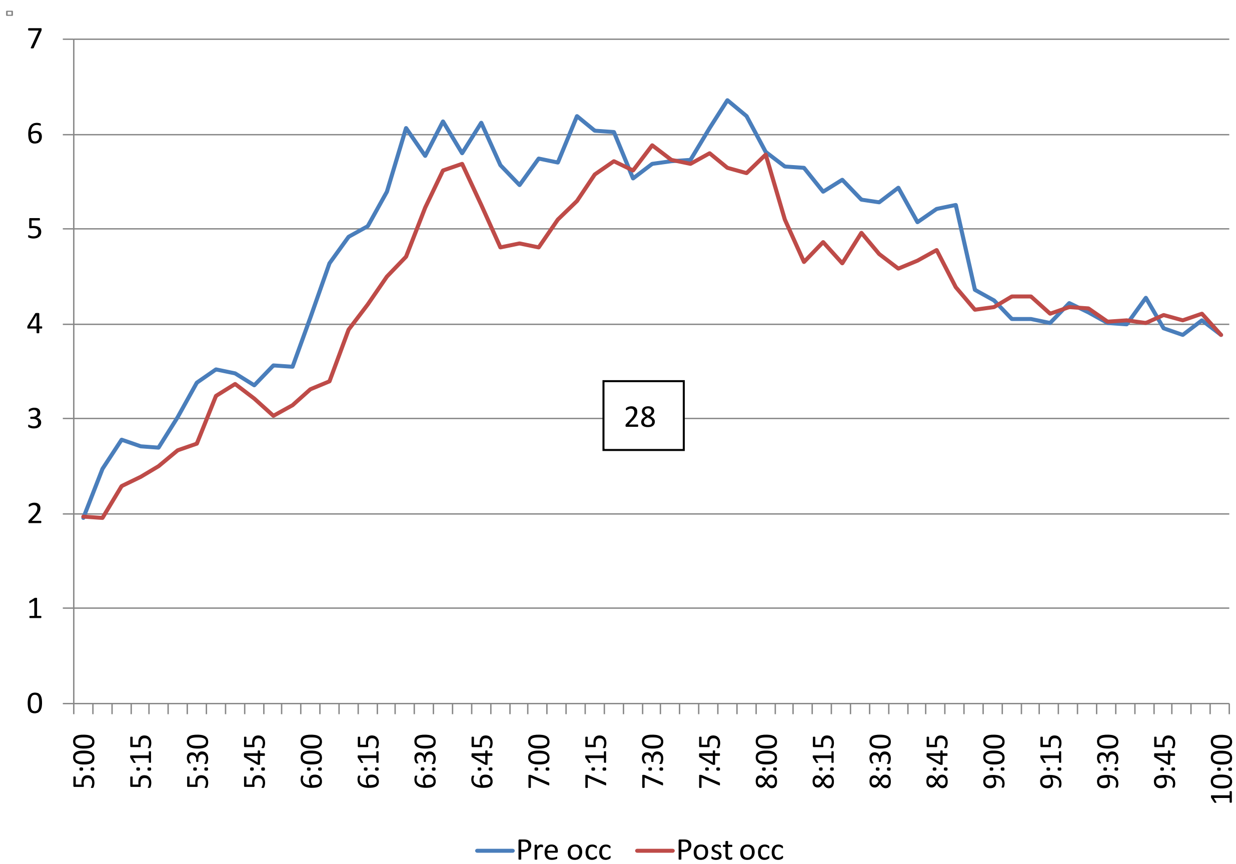


Figure S4.11.4 Comparison of Pre (April, 2008) and Post-VSL (April, 2009) Occupancy Profile

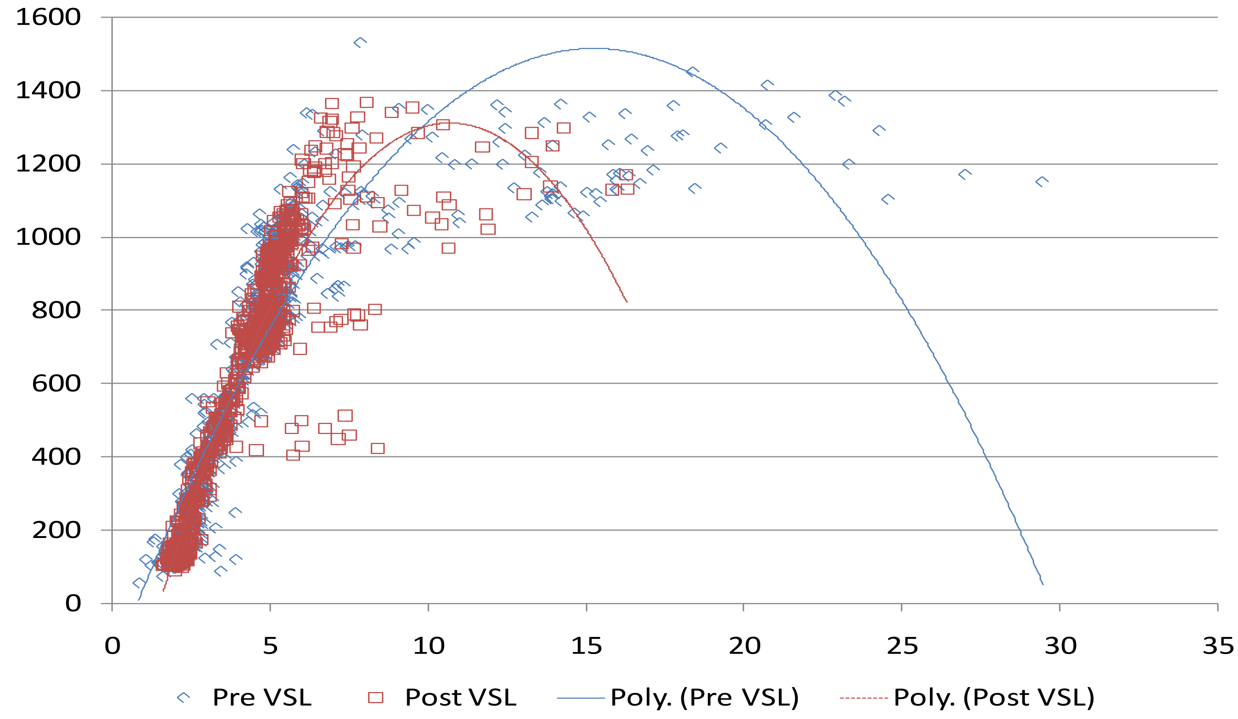


Figure S4.11.5. Flow-Occupancy Plot for three months (Oct, Nov and April) 31D

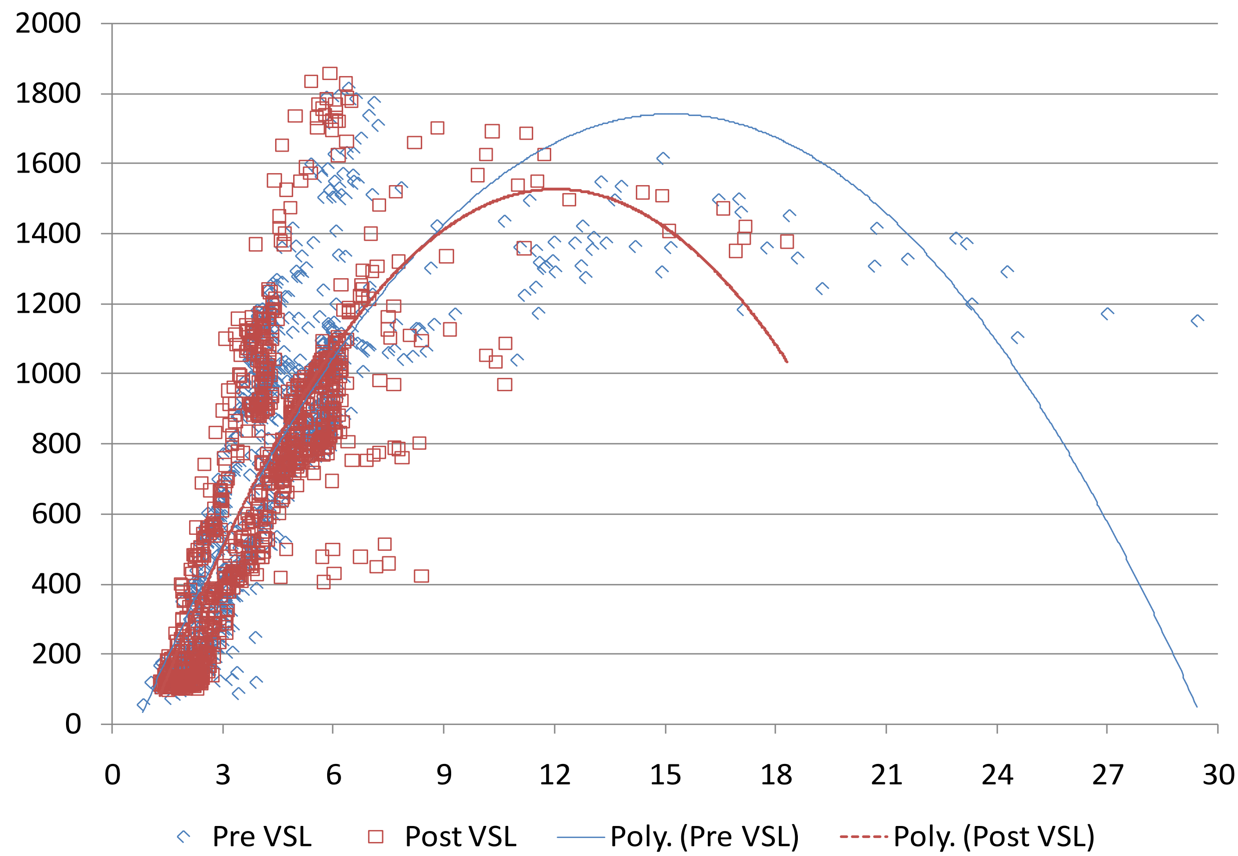


Figure S4.11.6. Flow-Occupancy Plot for three months (Oct, Nov and April) 28D

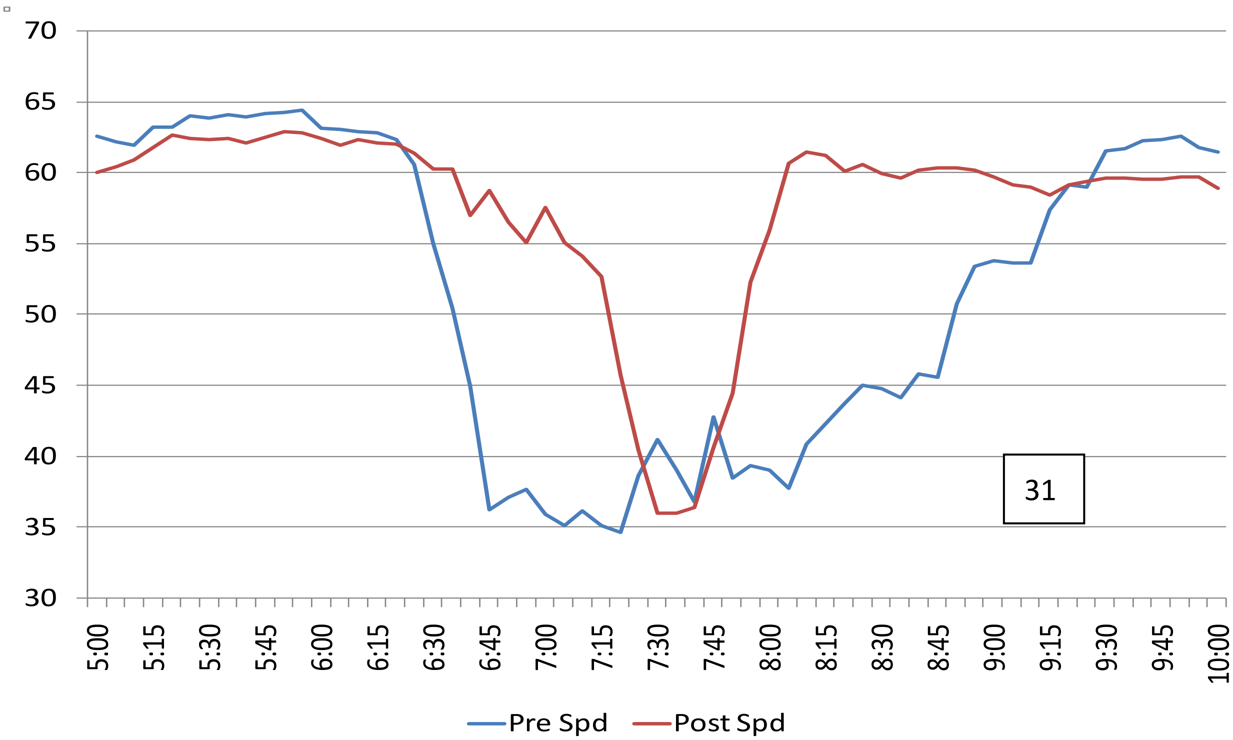
Figures S4.11.7 and S4.11.8 present the flow-occupancy plots for each detector in pre- and post-VSL conditions. Data from three months October, November and April were used for the plots in pre-and post-VSL conditions. Figures show the comparison of pre- and post-VSL traffic volume and occupancy plot averaged out for all lanes for three detectors in pre- and post-VSL conditions. Data used for flow occupancy plot were aggregated for 5 minutes. It can be observed from the figure that maximum occupancy decreased in post VSL conditions for 15 percent. Critical occupancy were also similar in both conditions. Lower data points were observed in congested conditions indicate faster recovery.

Task 1.2: Average Speed/Lane by Posted Speed Limit During Peak Periods

One of the main objectives of the VSL system was to improve traffic flow and this task evaluated the difference in average speed by comparing the data before and after the VSL system installation. Speed data averaged for all the lanes of segment 1 for every 5 minutes were used. Figures S4.12.1- S4.12.3 present the average highway speed for detector 3D (logmile 3.6) and 5D (logmile 5.7) for pre- and post-VSL conditions in October, November and April. The figures indicate that the peak period for traffic on this segment for pre- and post-VSL conditions lies between 1500 to 1900 hours based on the average speed for all three months. Henceforth, all the figures for peak periods will be presented for this duration. Also, the pre- and post-VSL speed profile comparison over time shows reduction in peak period and improvement in average speeds for post-VSL conditions. Table S4.12.1 indicates that the average speed increased by 5 mph at 31D (logmile 31.6) but remained similar at 28D (logmile 28.6) .

Table S4.12.1. Average Speed for three months

	Pre-VSL	**Post-VSL**	**Pre-VSL**	**Post-VSL**
	31D		***28D***	
Avg Oct	48.83	56.38	55.20	55.92
Diff, Percent	***7.55***	***15%***	***0.73***	***1%***
Avg April	54.65	57.81	55.83	56.76
Diff, Percent	***3.16***	***6%***	***0.94***	***2%***
Avg Spd	51.74	57.09	55.51	56.34
Diff, Percent	***5.35***	***10%***	***0.83***	***1%***



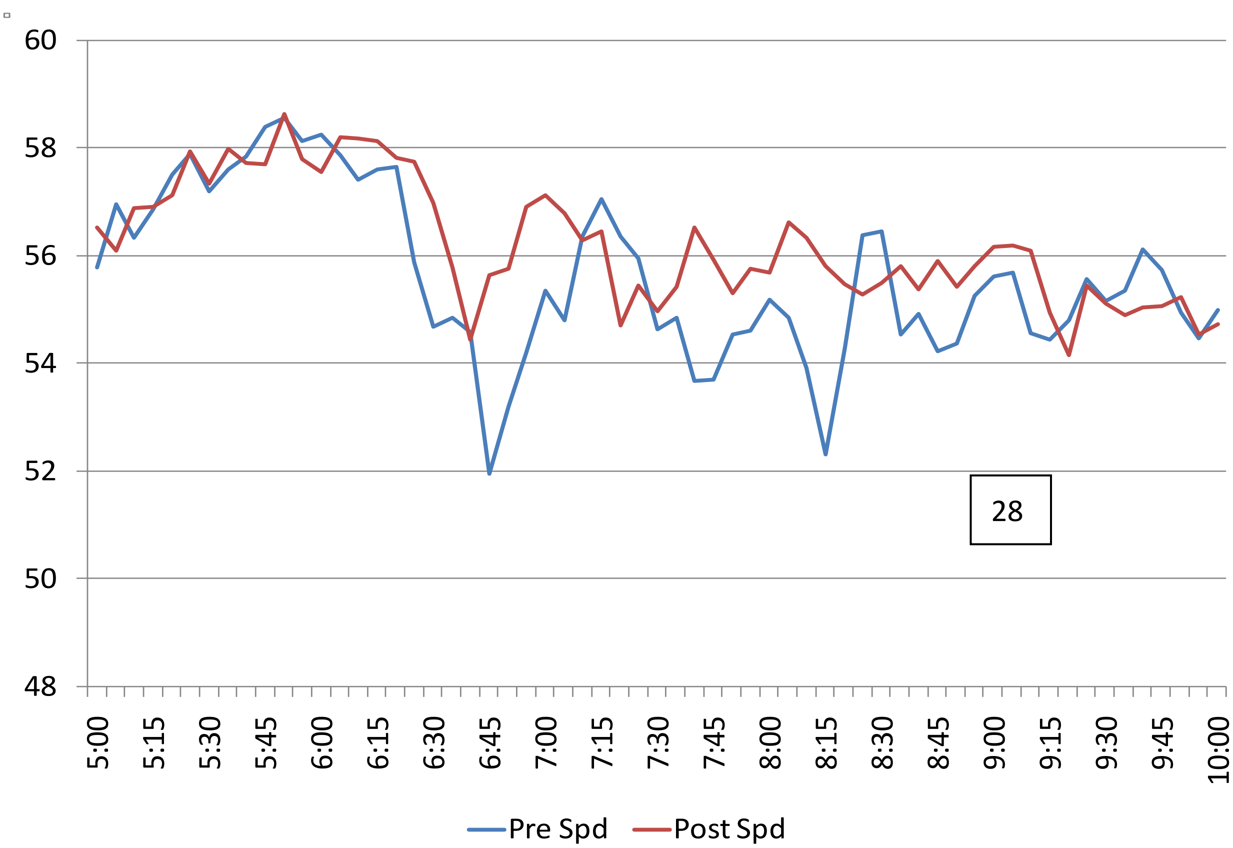
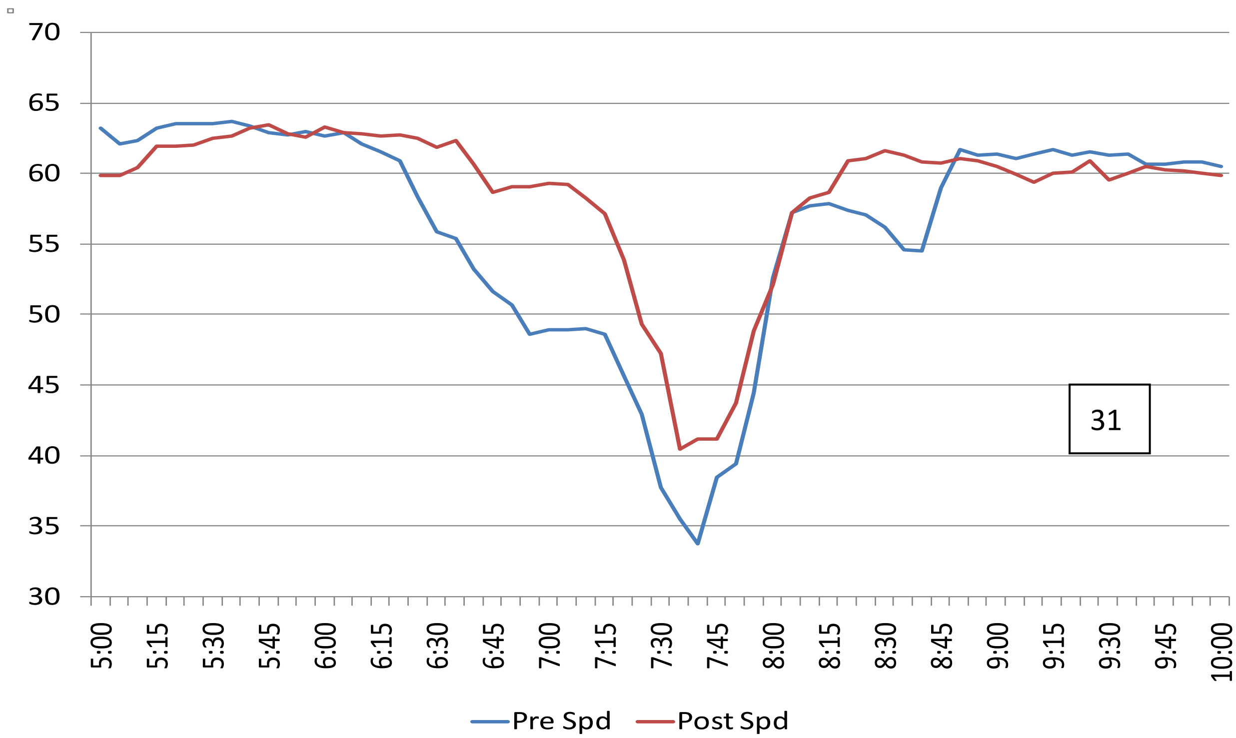


Figure S4.12.1 Comparison of Pre (Oct, 2007) and Post-VSL (Oct, 2008) Speed Profile



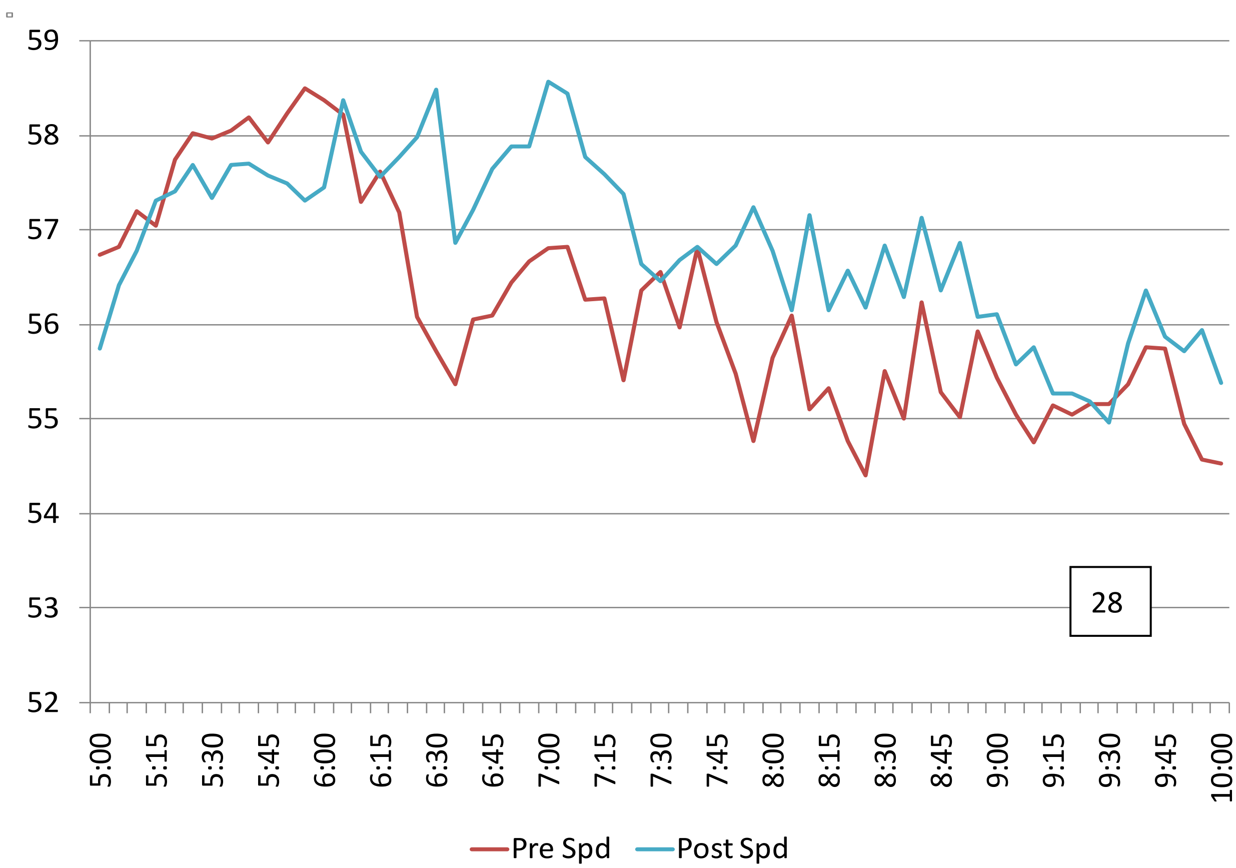


Figure S4.12.2 Comparison of Pre (April, 2008) and Post-VSL (April, 2009) Speed Profile

Comparison of Average Speeds along the Segment

Figures S4.12.3 to S4.12.4 present the comparison of average speeds aggregated for the peak period averaged for all three/four lanes for pre- and post-VSL system at the two detector locations for three months on segment 4. The figure shows detectors upstream, on and downstream of segment 4. The line plots compare the average volume during the peak periods. The figures also present the difference in average speed during peak periods at every detector location.

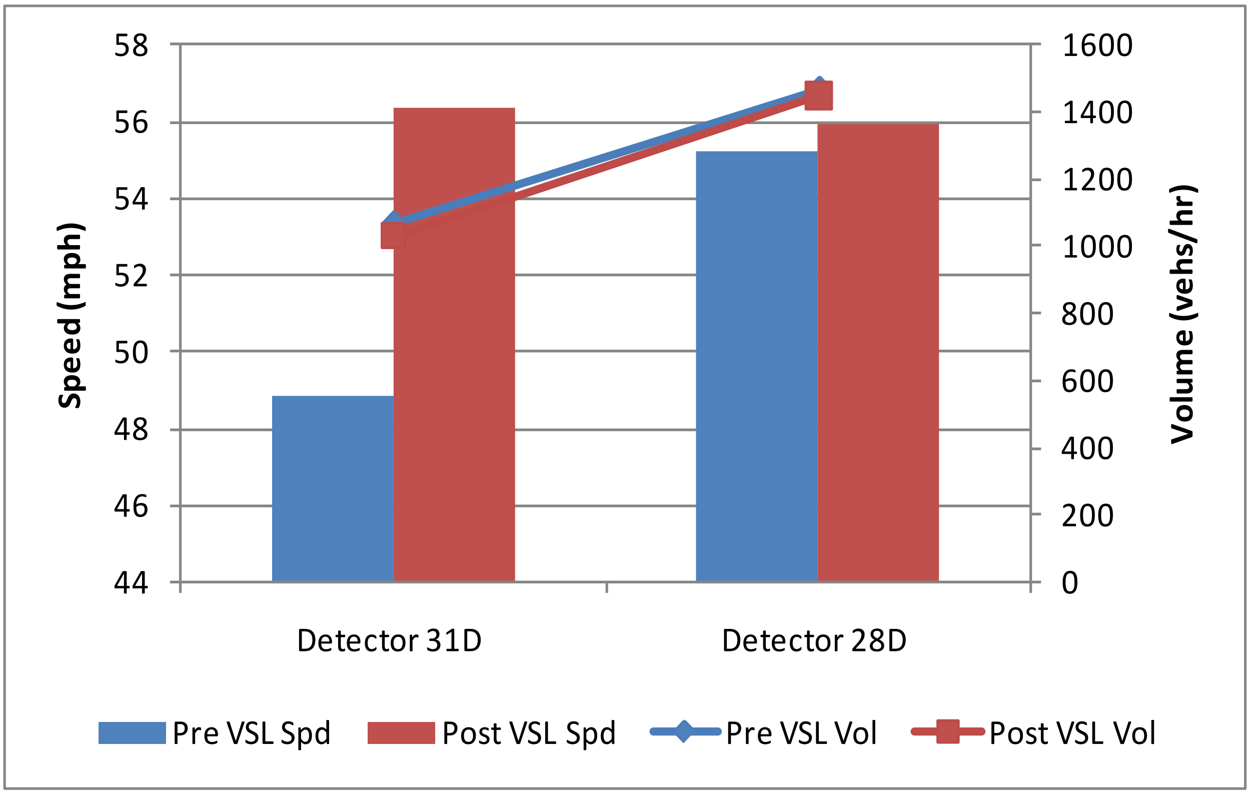


Figure S4.12.3. Comparison of Pre (Oct, 07) and Post-VSL (Oct, 08) Average Speed and Volume

Figures S4.12.3 and S4.12.4 presents the plot, comparing the speed volume trend along the segment, it can be said that the volumes were very similar for both conditions but speed improved by 7mph for 31D (logmile 31.6) and 2mph for 28D (logmile 28.6).

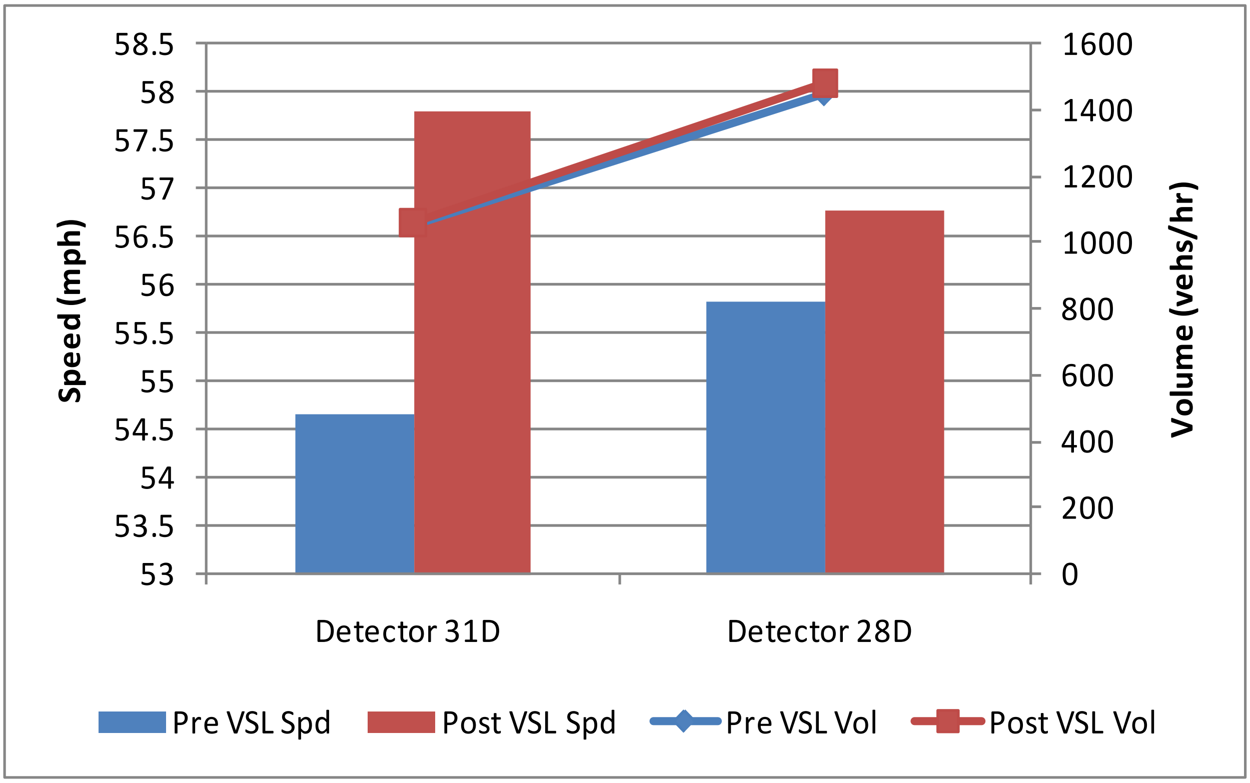


Figure S4.12.4. Comparison of Pre (April, 08) and Post-VSL (April, 09) Average Speed and Volume

Task 1.3: Speed Limit During Peak Periods

The objective of this task was to evaluate the system initiation logic for variable speed limits. This task was not carried out for average monthly data as posted VSLs cannot be averaged for analysis.

Task 1.4: Speed Limit Compliance by Posted Speed Limit

The objective of this task was to analyze driver compliance of the posted variable speed limits. This task was not carried out for average monthly data as posted VSLs cannot be averaged for analysis.

Task 1.5: Evaluation of Highway Capacity

This task compares speed-flow plots for pre- and post-VSL conditions. Figures S4.15.1 to S4.15.2 present the speed flow data for three months in pre- and post-VSL system installation for detector locations 31D (logmile 31.6) and 28D (logmile 28.6). Data used were aggregated for 5 minute intervals for this task. Comparing the data from pre- and post-VSL conditions, no change in highway capacity was noticed. However, fewer data points were observed in congested conditions indicating system benefits.

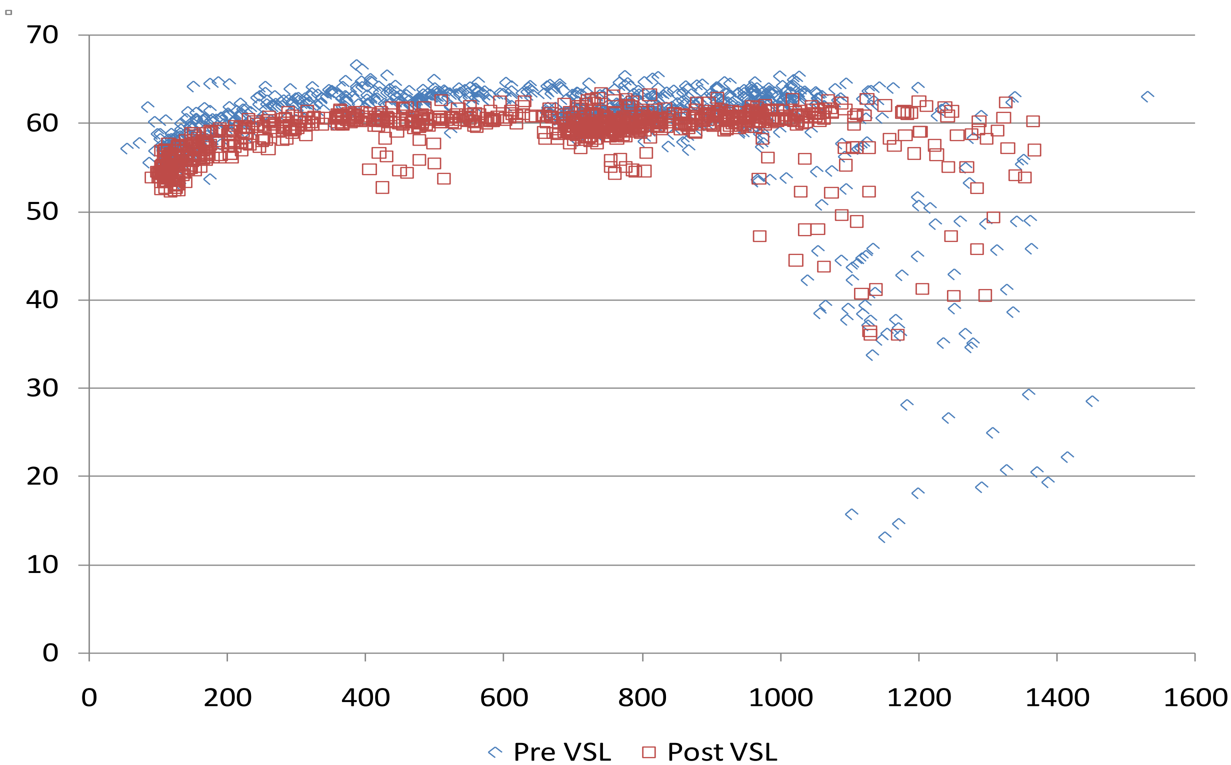


Figure S4.15.1 Speed Flow Plot for three months (Oct, Nov & April) at 31D

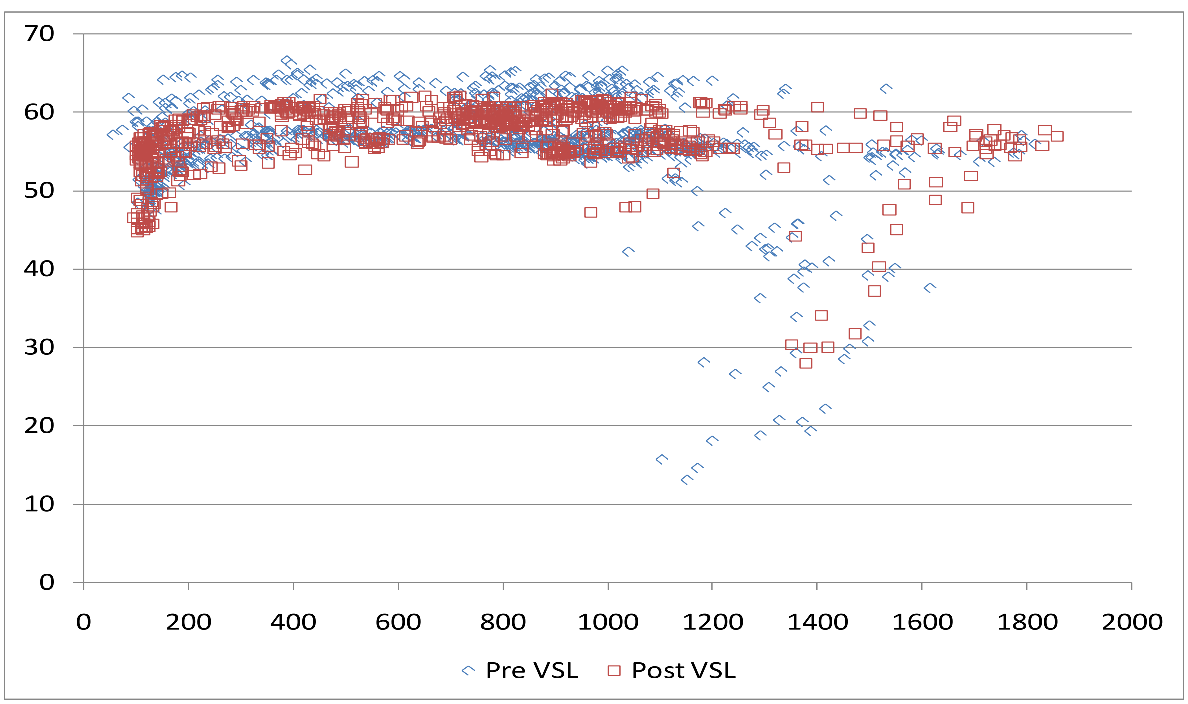


Figure S4.15.2 Speed Flow Plot for three months (Oct, Nov & April) at 28D

Task 1.6: Evaluation of Congestion Measures

To evaluate the congestion measures, travel times and travel time reliability indices, travel delay, and Percent of Congested Delay were compared for pre- and post-VSL conditions. Segment 4 mean and standard deviation of travel times were computed between detectors 28D (logmile 28.6) and 31D (logmile 31.6) for October and April data.

Mean and Standard Deviation of Travel Times

Travel times were calculated for average of all lanes for each month and then averaged for the months considered. Figures S4.16.1 to S4.16.3 present the comparison of travel times computed for average of all lanes between detectors 28D (logmile 28.6) and 31D (logmile 31.6). For pre-VSL conditions, it can be observed from Figures S4.16.1 to S4.16.3 that the mean travel times for peak periods ranged from 293 to 306 person-minutes. For post-VSL conditions, the mean travel times during peak period increased from 201 to 283 person-minutes. Tables S4.16.1 and S4.16.2 present the comparison of mean and standard deviation of travel times for the two months and their average. It can be observed from the tables that the percentage change of mean travel time during peak periods for post-VSL compared with pre-VSL conditions varied from 7.6 to 31%. Average of two months showed that the mean travel times during peak periods decreased 19.1% after initiation of the VSL system, whereas volume decreased 7.8%, it indicates VSL system was beneficial to decrease travel time. Comparison of standard deviation of travel times for average of two months for pre- and post-VSL indicates it decreased 11% that means VSL system was beneficial to decrease variation in travel times during the peak periods. It can be concluded that VSL system was beneficial to decrease travel time for segment 4.

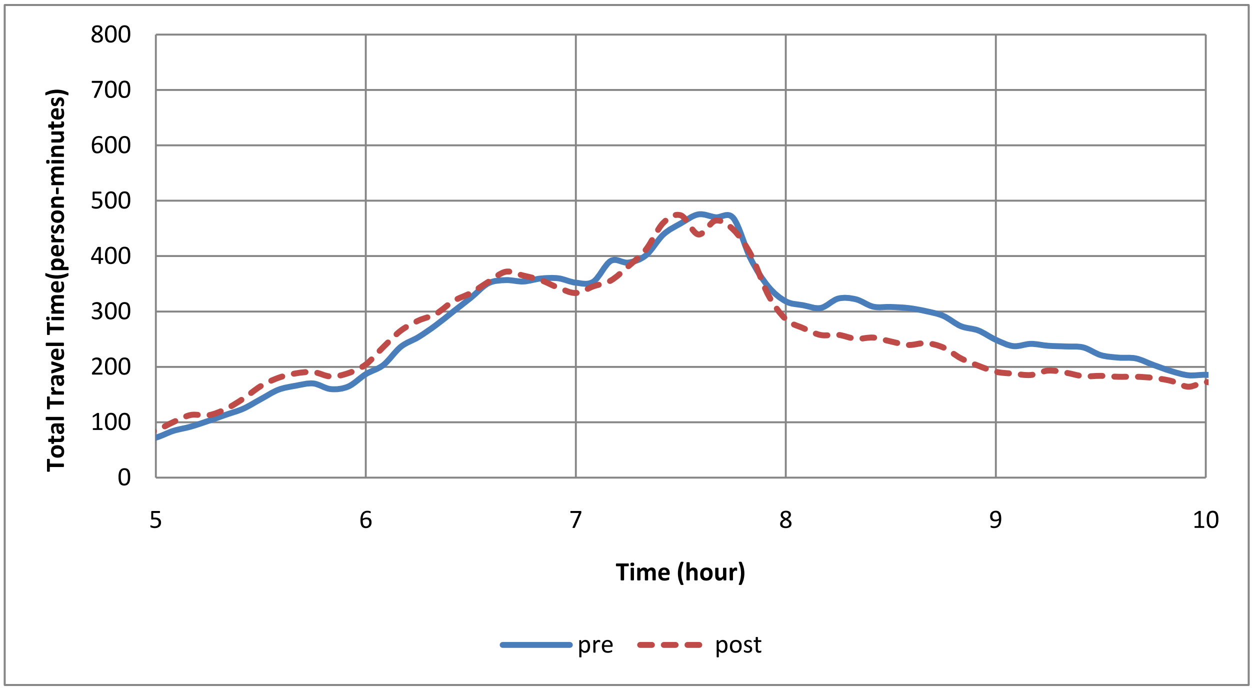


Figure S4.16.1 Comparison of Pre and Post-VSL average travel time data between 28D and 31D (October)

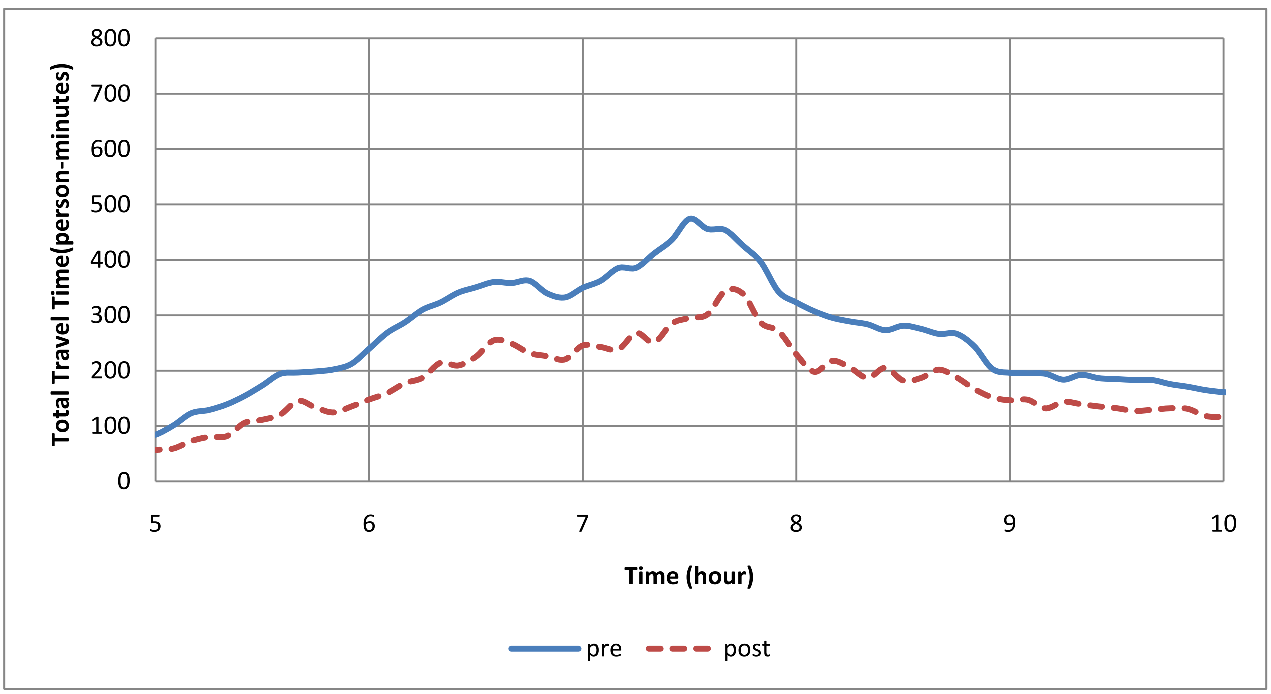


Figure S4.16.2 Comparison of Pre and Post-VSL average travel time data between 28D and 31D (April)

Table S4.16.1 Comparison of mean travel times during peak period for pre- and post VSL

	Travel Time (person-minutes)		Volume (vehicles/hour)	
	Pre-VSL	Post-VSL	Pre-VSL	Post-VSL
October	306.0	282.7	3761	3738
Percentage change	-7.6		-0.6	
April	292.7	201.9	3766	3200
Percentage change	-31.0		-15.0	
Average of two months	299.4	242.3	3764	3469
Percentage change	-19.1		-7.8	

Table S4.16.2 Comparison of standard deviation of travel times during peak period for pre- and post VSL

	Travel Time (person-minutes)		Volume (vehicles/hour)	
	Pre-VSL	Post-VSL	Pre-VSL	Post-VSL
October	80.8	92.4	575	790
Percentage change	14.3		37.4	
April	90.4	60.0	801	670
Percentage change	-33.7		-16.4	
Average of two months	85.6	76.2	688	730
Percentage change	-11.0		6.1	

<u>Individual Measures</u>

The individual measures, TTI, BTI, and PTI were compared with two months of data for the peak periods for pre- and post-VSL conditions. Tables S4.16.3 to S4.16.5 present the comparison of average of individual measures, TTI, BTI, and PTI for average of all lanes between detectors 28 and 31. It can be observed from Table S4.16.3 that for post-VSL conditions TTI decreased for both months from 5.7 to 15.9% and average TTI for two months decreased 10.5%. Table S4.16.4 shows for post-VSL conditions BTI increased for October data 25.5%, but it decreased for April data 15.7%, and average BTI for all two months increased 4.1%. It can be observed from Tables S4.16.5 that for post-VSL conditions PTI increased for October data 1.4%, but it decreased for April data 15.8%, and average PTI for two months decreased 7.2%. It can be concluded VSL system was beneficial for segment 4 to decrease travel time reliability indices.

Table S4.16.3. Comparison of Travel Time Index

Individual Measures	Between 28D and 31D	
	Pre-VSL	Post-VSL
October		
Travel Time Index (TTI)	1.75	1.65
Percentage Change	-5.7	
April		
Travel Time Index (TTI)	1.70	1.43
Percentage Change	-15.9	
Average of two months		
Travel Time Index (TTI)	1.72	1.54
Percentage Change	-10.5	

Reduction in TTI shows decrease in ratio between the actual travel rate and Posted Speed Limit (PSL) travel rate that means the VSL system was useful in decreasing the difference between the peak period and the PSL travel conditions. This indicates that travel times for peak periods and PSL are closer to each other in post-VSL conditions. Reduction in BTI indicates decrease in difference between 95% travel time and average travel time and that means the VSL system was beneficial in reducing the difference between the 95% travel time and average travel time. Reduction in PTI indicates decrease in ratio between 95% travel time and PSL travel time that means the VSL system was useful in decreasing the difference between 95% and PSL travel time. Reduction in all travel time reliability indices for post-VSL conditions indicate less variability and more consistency between highest value of travel time during the peak period (worst condition) and PSL condition.

Table S4.16.4. Comparison of Buffer Time Index

Individual Measures	Between 28D and 31D	
	Pre-VSL	Post-VSL
October		
Buffer Time Index (BTI)	0.47	0.59
Percentage Change	25.5	
April		
Buffer Time Index (BTI)	0.51	0.43
Percentage Change	-15.7	
Average of two months		
Buffer Time Index (BTI)	0.49	0.51
Percentage Change	4.1	

Table S4.16.5. Comparison of Planning Time Index

Individual Measures	Between 28D and 31D	
	Pre-VSL	Post-VSL
October		
Planning Time Index (PTI)	2.22	2.25
Percentage Change	1.4	
April		
Planning Time Index (PTI)	2.21	1.86
Percentage Change	-15.8	
Average of two months		
Planning Time Index (PTI)	2.22	2.06
Percentage Change	-7.2	

Overall results for segment 4 show all travel time reliability indices (TTI, BTI, and PTI) decreased. Reduction in all travel time reliability indices for post-VSL conditions indicates less variability and more consistency between highest value of travel time during the peak period (worst condition) and PSL condition. It can be concluded that post-VSL conditions was more reliable than pre-VSL conditions and there is benefit after VSL system initiation according to this uncontrolled analysis.

Traffic Delay

For segment 4, the analysis indicates that average Delay calculated for post-VSL system was much lower compared to the pre-VSL system. Delay decreased by 0.4 minutes. Similarly, Percentage of Congested Travel reduced by an average of 10% percent for post-VSL conditions. From Table S4.16.6 it can be noticed that congestion reduced significantly between 31D (logmile 31.6) to 28D (logmile 28.6).

Table S4.16.6. Average Delay and Change in Percentage of Congested Travel during peak periods 1

Detector ID	**MP 31D to MP28D**
	October
Pre VSL Travel Time (minutes)	4.53
Post VSL Travel Time (minutes)	4.22
Delay (minutes)	-0.31
Percent Change in Congested Travel	-6.8%
	April
Pre VSL Travel Time (minutes)	4.39
Post VSL Travel Time (minutes)	3.89
Delay (minutes)	-0.50
Percent Change in Congested Travel	-11.3%

*Negative value indicates decrease in Post-VSL congestion measures and vice versa.

Delay Cost Analysis

Table S4.16.7 presents the average annual vehicle cost savings because of post VSL system installation. The analysis was carried out for peak periods. The average vehicle cost was calculated to be $24.82/hr and used in delay cost analysis.

Table S4.16.7. Delay Cost savings due to VSL system installation

Locations I-270 SB	Difference in Delay (people-min)	Average Daily User Cost *	Average Annual User Cost for 250 Workdays per user
MP 31D to 28D	57.2	23.67	$5917.338

* based on average user cost of $24.82/hr

Table S4.16.7 presents the cost savings because of reduced delay due to post VSL conditions. The cost saving represents 250 work days during peak periods. The cost saving varies depending on the length of the segment as it can be noticed that segment between MP31D (logmile 31.6) and MP28D (logmile 28.6) has the savings with a length of three miles. This is due to improved average speed for post VSL conditions which allows more travel time saving. The total average annual user cost saving for this segment was observed to be $5917.338 per user for three miles of travel on segment 4. This indicates benefits of the VSL system installation for segment 4.

Task 1.7: Analysis of VSL System during Inclement Weather

Task 1.7 was not conducted separately as the monthly analysis included all weather data.

CONTROLLED DATA ANALYSIS

SEGMENT 1 ANALYSIS

Table S1.1 presents the dates that were selected for segment 1 evaluation. These dates were considered appropriate for evaluation as the traffic volumes were similar, traffic data was available, no incidents occurred and presented clear weather conditions. The days in the table are mostly Thursdays unless pointed out in the footnote.

Table S1.1. Selected Dates used in VSL system evaluation

Pre-VSL System Installation	Post-VSL System Installation
24th October 2007**	22nd October 2008**
25th October 2007	23rd October 2008
30th October 2007	28th October 2008
7th November 2007**	5th November 2008**
8th November 2007	6th November 2008

* Tuesdays, ** Wednesdays, *** Fridays

Task 1.1: Volume and Occupancy Analysis

This task consists of two sub-tasks. First, average volume for pre- and post-VSL conditions are compared. Second, occupancy data for pre- and post-VSL conditions, and the change in flow-occupancy relationship are compared. The change in volume is accounted to evaluate the effect on average speed, travel time and congestion. Figure S1.11.1 and Table S1.11.1 present the volume comparison between pre- and post-VSL system installation for all five lanes for detector 11D (logmile 11) for pre (October 25th, 07) and post (October 23rd, 08) VSL system installation. Average volume for 5-minutes interval on the highway was compared for both conditions to account for any change in volume.

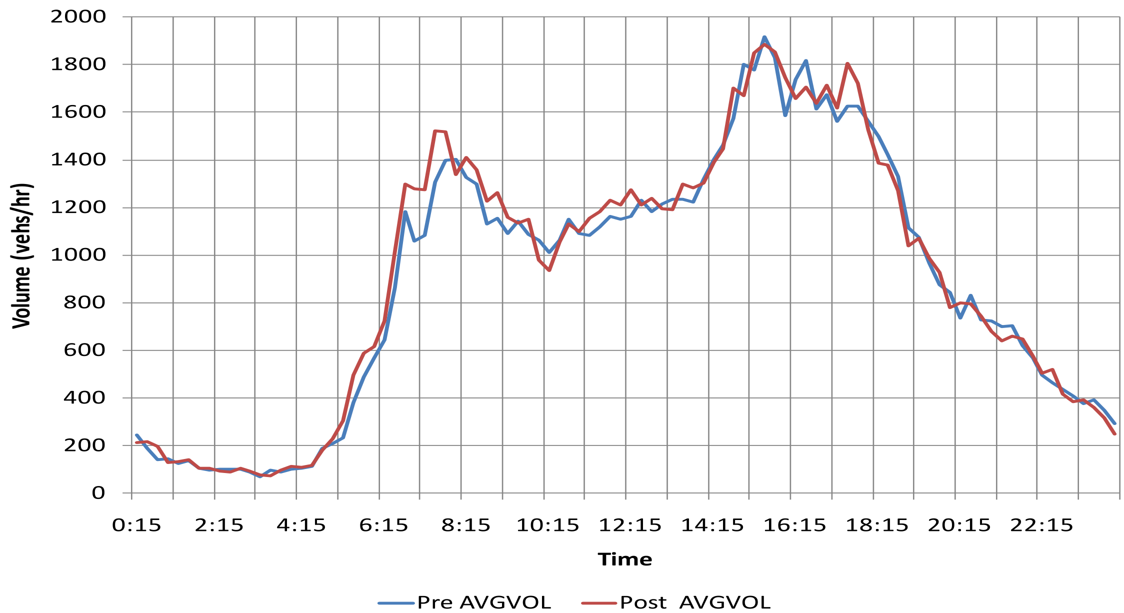


Figure S1.11.1 Comparison of Pre (25th Oct, 2007) and Post-VSL (23rd Oct, 2008) Volume for 11D

In Table S1.11.1, average volume for pre- and post-VSL conditions were compared, average volume varied from -7% to 6%. Two sample mean t-test was carried out to determine if the two samples were significantly different. It was found that at 95 percent confidence interval, pre- and post-VSL mean volumes were not statistically different. Days with different volumes in post-VSL conditions cannot be compared with pre-VSL conditions as it would be difficult to explain the cause of differences in speeds. For high volume in post-VSL condition, improved speed will indicate system benefits whereas similar volumes will provide at par comparison. For segment 1, therefore, days with statistically similar volumes were used for evaluation. Since the change observed in volume was not significant for pre- and post-VSL conditions, no adjustments were required for system evaluation. Similar peak periods were observed for each of the five days, highlighted in Table S1.1, used for evaluation and are presented in Figures S1.11.2 and S1.11.3 for pre- and post-VSL conditions, respectively. The figures present average volume for 5 minutes for average of all lanes.

Table S1.11.1. Average Volume at Detector 11D during Peak Periods

Time	15:00	15:30	16:00	16:30	17:00	17:30	18:00	18:30	Avg Vol	Cum Vol
Pre VSL Vol	1778	1828	1739	1613	1561	1625	1499	1331	1621.75	12974
Post VSL Vol	1851	1855	1657	1636	1618	1720	1387	1270	1624.25	12994
Diff	***4%***	***1%***	***-5%***	***1%***	***4%***	***6%***	***-7%***	***-5%***	***0%***	***0%***

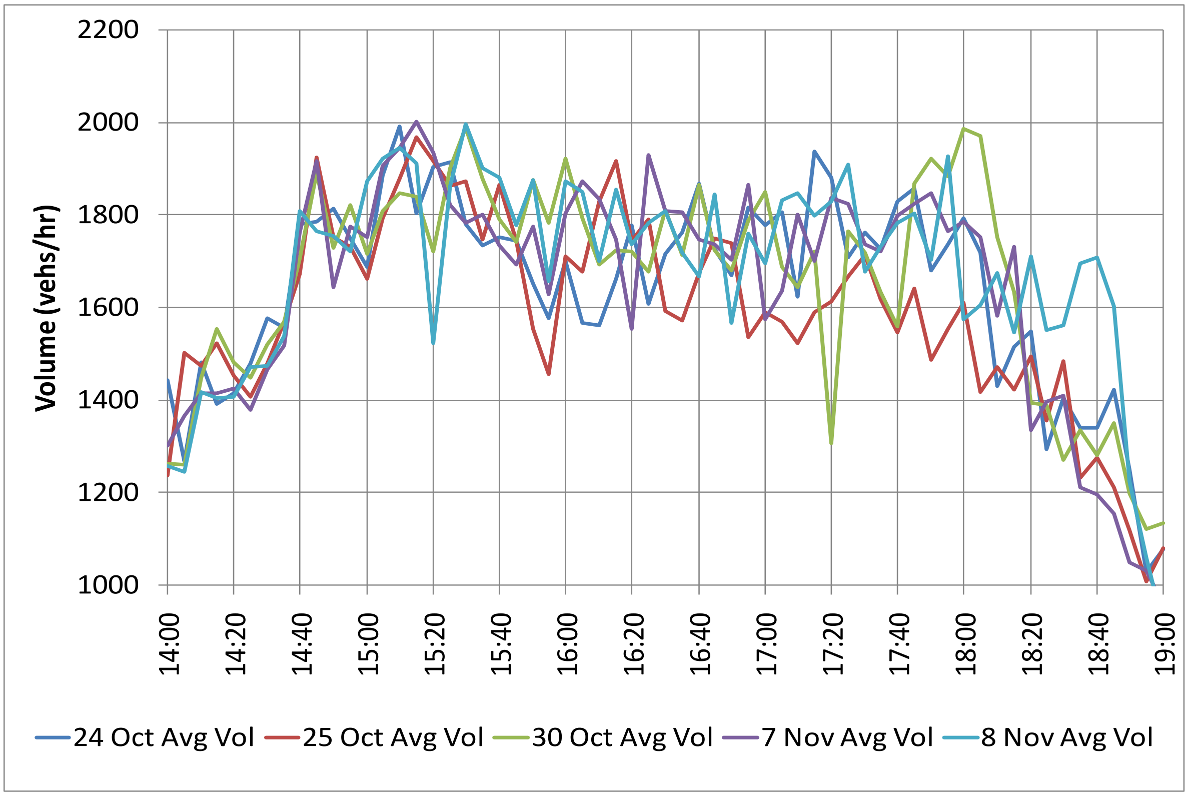


Figure S1.11.2 Pre VSL Volume Profile for five days

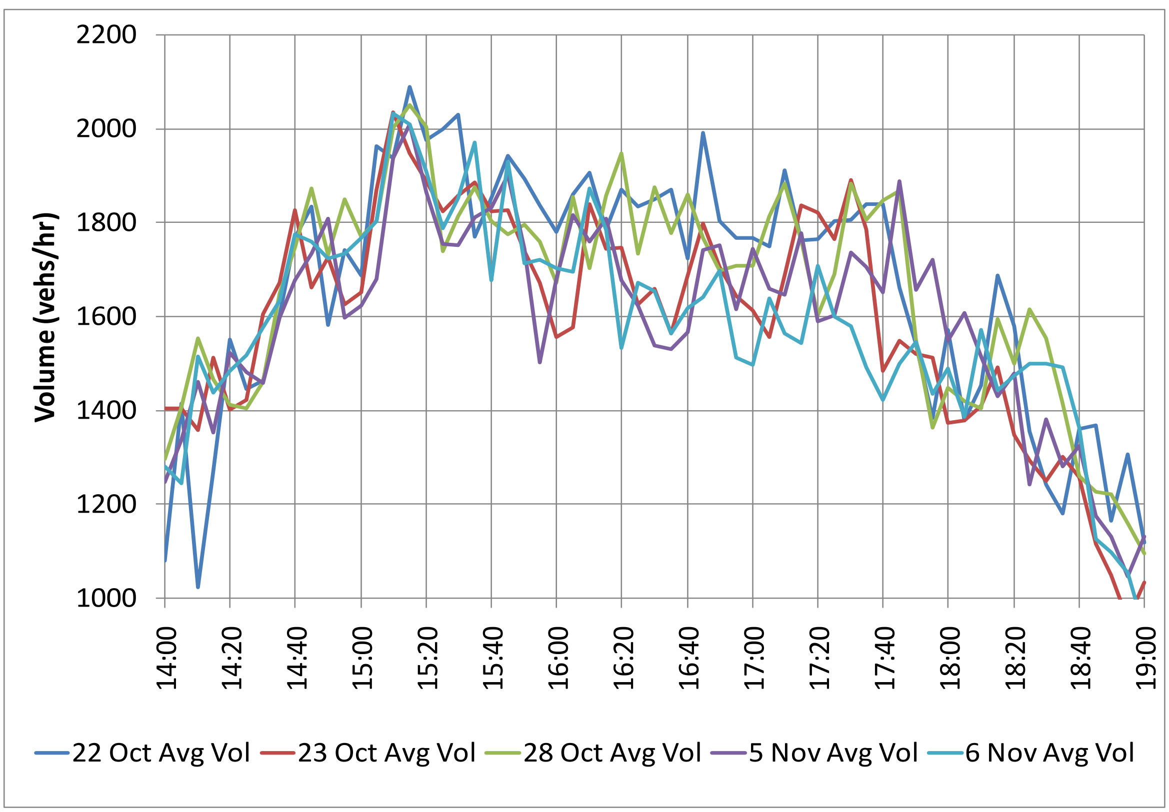


Figure S1.11.3 Post VSL Volume Profile for five days

Figure S1.11.4 presents the average volume profile of all five lanes during the peak period at detector location 11D (logmile 11). It can be observed from the figure that lanes 1 and 2 depict higher volumes and lane 5 has the lowest volumes. This indicates that lane by lane evaluation should be performed for the VSL system as the volumes vary over the lanes. This is further discussed in Task 2.2.

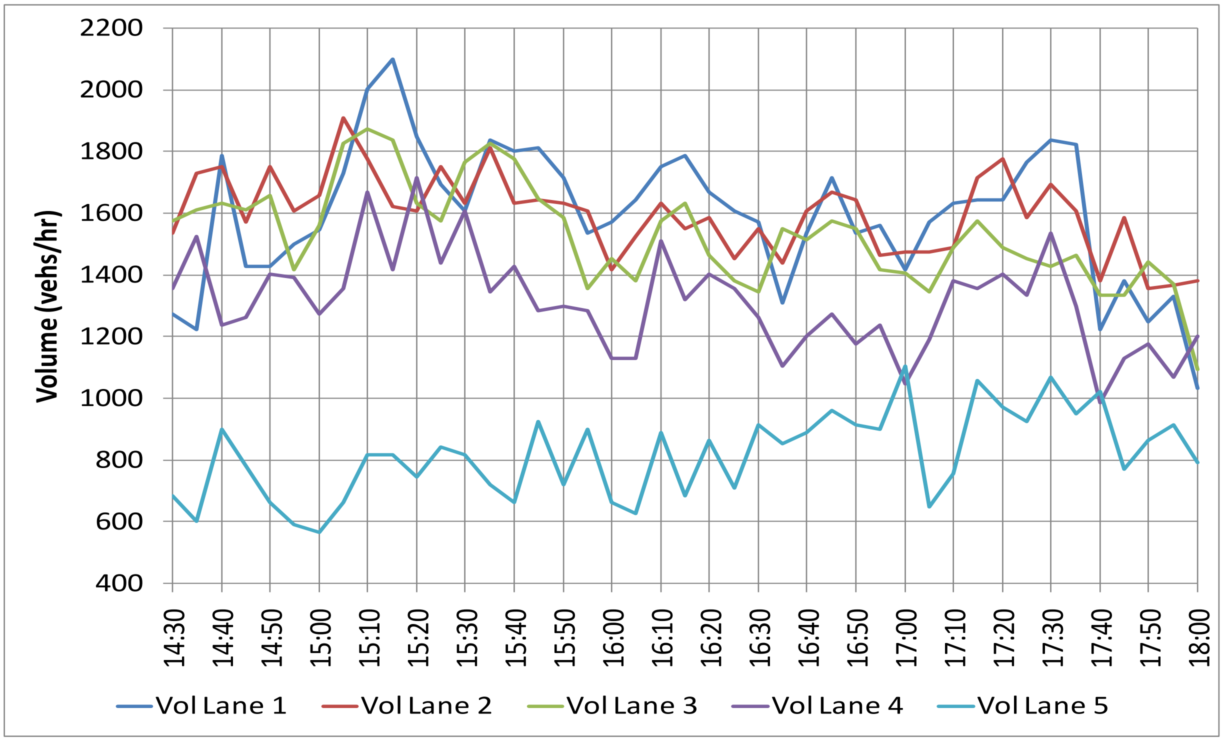


Figure S1.11.4. Post-VSL (23rd Oct, 2008) Volume for all lanes at 11D

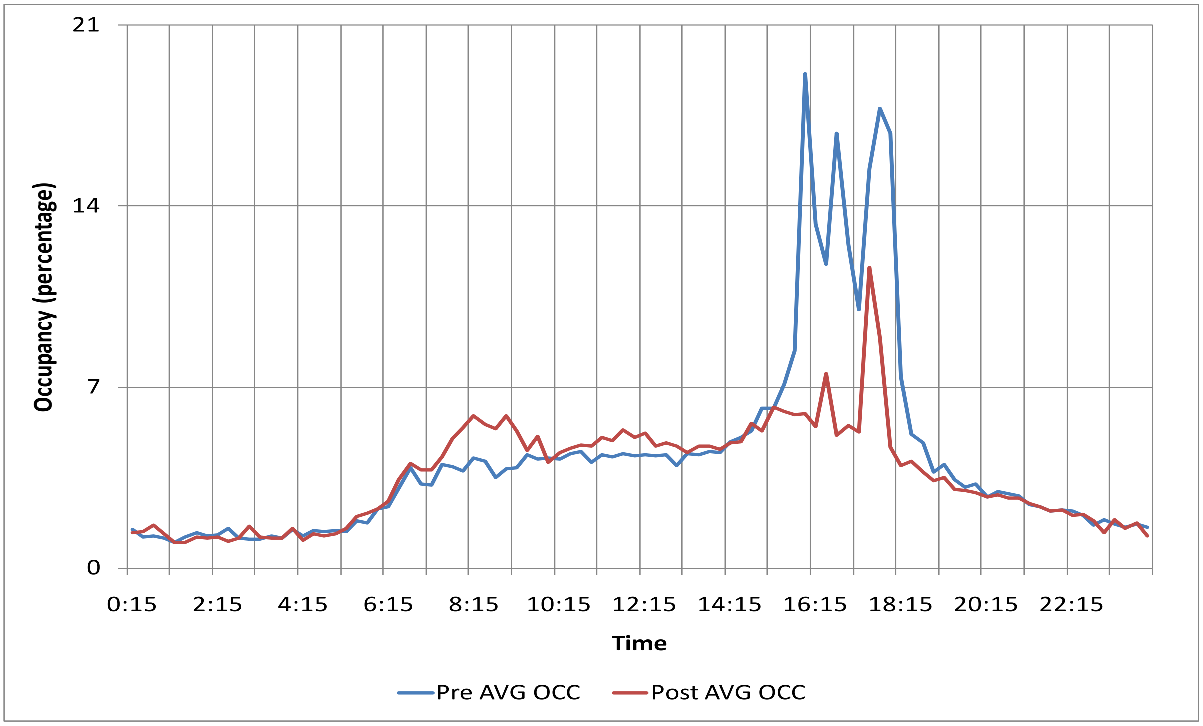


Figure S1.11.5. Comparison of Pre (25th Oct, 2007) and Post-VSL (23rd Oct, 2008) Occupancy of 11D

For the second sub-task, Figure S1.11.5 presents average occupancy for average of all five lanes at detector 11D (logmile 11) for pre (25th October, 07) and post (23rd October, 08) VSL system installation. It can be noted that the peak period reduced from 1600 to 1800 hours after VSL installation compared to pre-VSL condition when it was from 1530 to 1815 hours. Also, it can be noted that the maximum observed occupancy for pre-VSL condition was nearly 30 percent whereas after VSL installation 15 percent was observed. This shows decrease in traffic congestion as a result of lower percent occupancy.

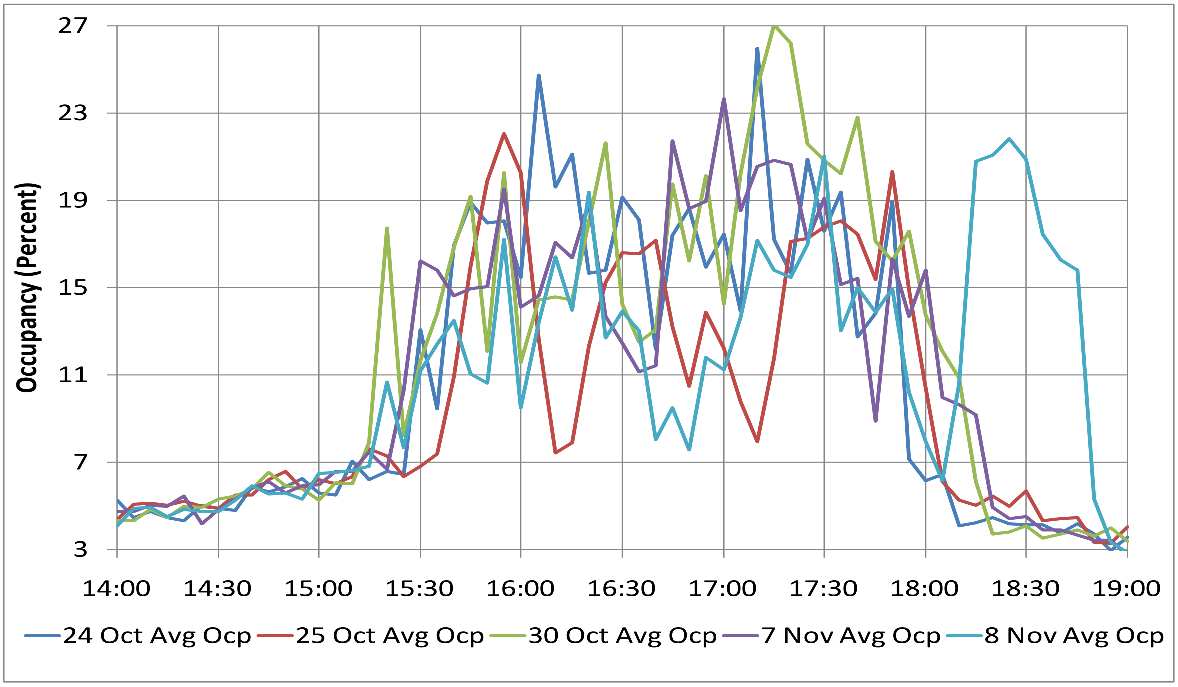


Figure S1.11.6 Pre-VSL Occupancy Profile for five days

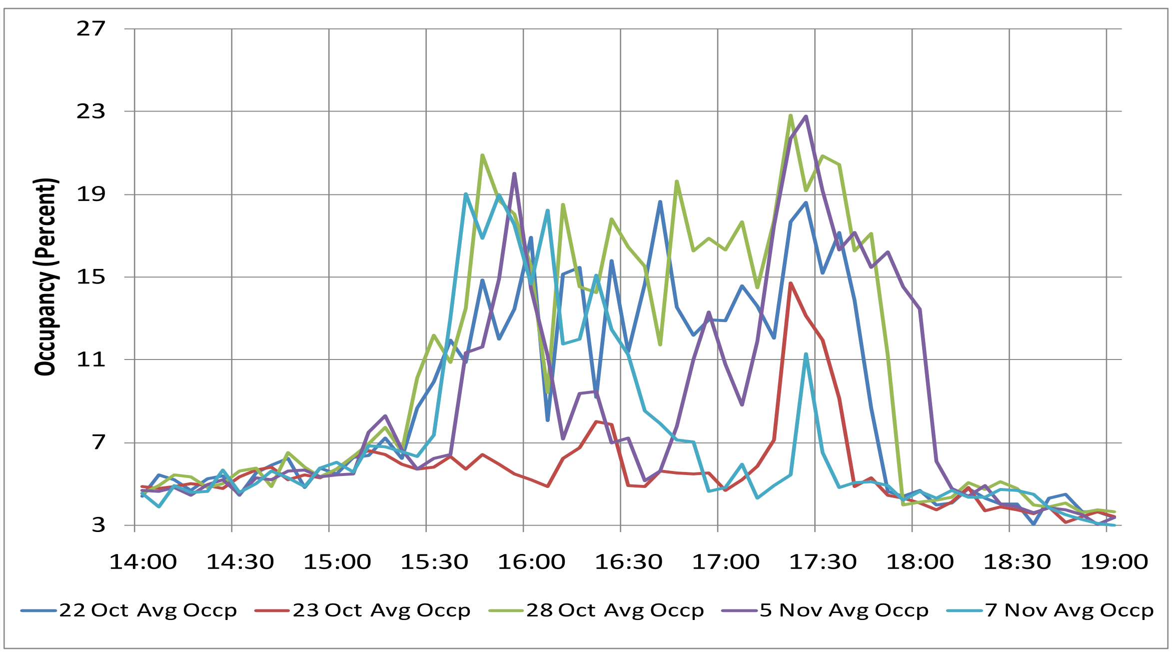


Figure S1.11.7 Post-VSL Occupancy Profile for five days

Figures S1.11.6 and S1.11.7 present the occupancy profiles for each of the five days in pre- and post-VSL conditions. Comparing the two figures, it can be noticed that peak period duration was shorter and occupancies were lower in post-VSL conditions.

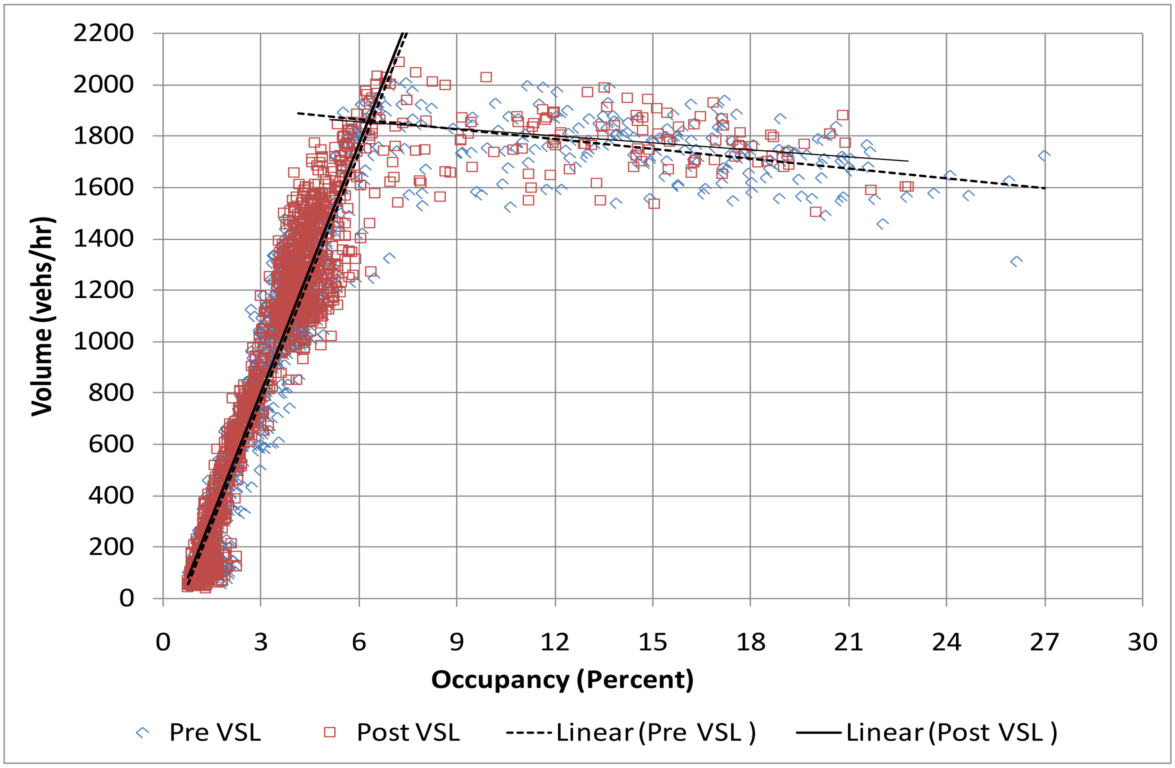


Figure S1.11.8. Flow-Occupancy Plot for 11D for Five days

Figure S1.11.8 shows the comparison of pre- and post-VSL traffic volume and occupancy plot averaged out for all lanes for five days. Data used for flow occupancy plot were aggregated for 5-minute intervals. It can be observed from the figure that after VSL system installation traffic flow has improved as the occupancy is less than 24%. It can also be noticed that for post-VSL conditions, time occupancy reduced from a high value of nearly 27 percent to 22 percent. Also, fewer data points beyond 9% occupancy for post-VSL conditions indicate better traffic flow. One of the objectives of the VSL system initiation is to prevent the highway from reaching capacity since after reaching capacity the volume breaks down and traffic flow can decrease significantly. Therefore, flow-occupancy comparison indicated benefits of the VSL system initiation. Although the critical occupancy and slope at un-congested regime were almost the same, however, slope fitted on the congested regime was slightly flatter in post-VSL conditions which indicate lower average speeds as expected. Therefore, flow-occupancy comparison indicates benefits of the VSL system initiation.

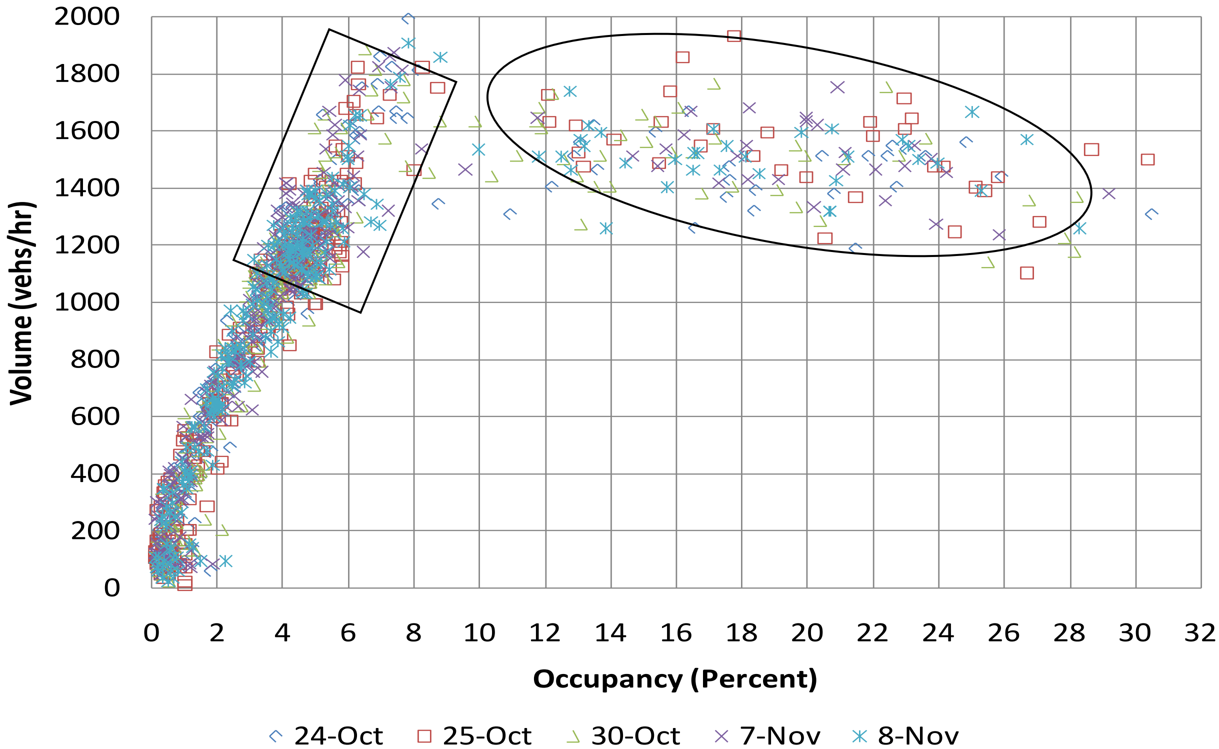


Figure S1.11.9. Comparisons of Pre-VSL Flow Occupancy Curve for five days at 11D (Lane 2)

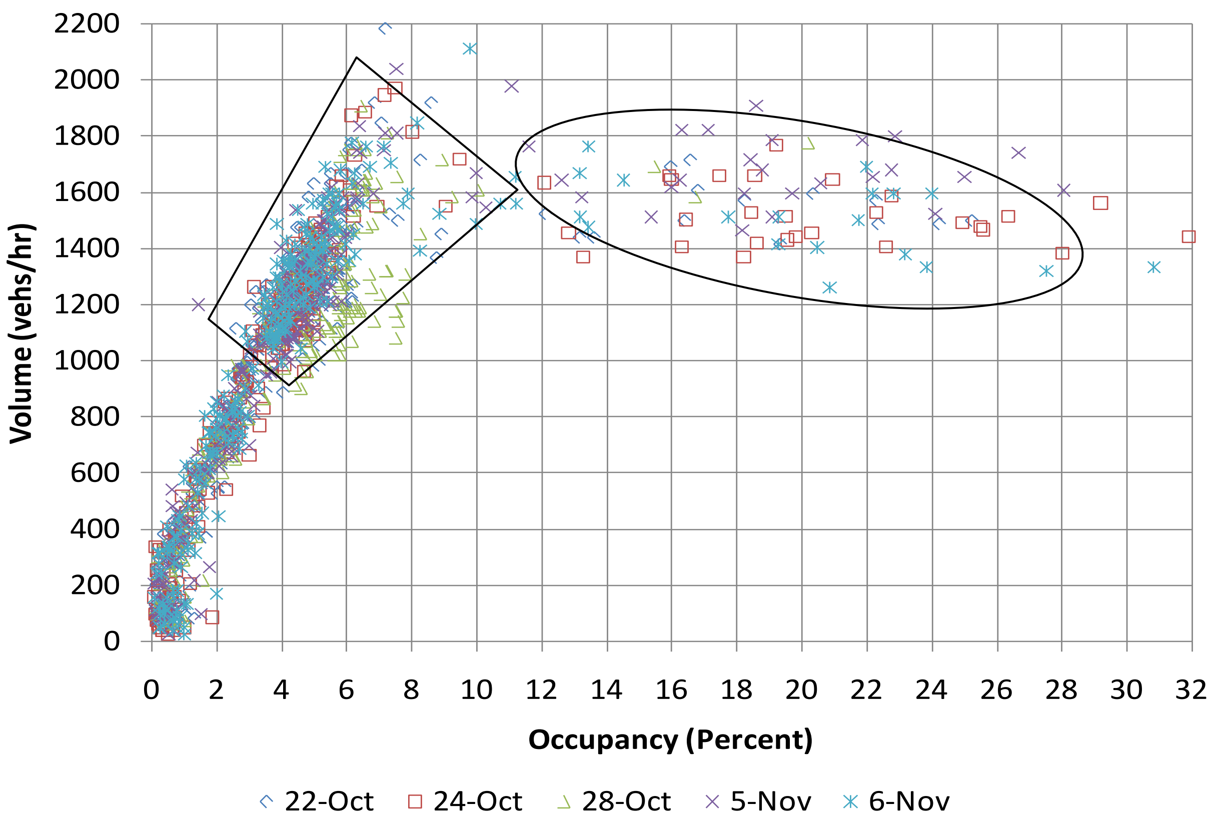


Figure S1.11.10. Comparisons of Post-VSL Flow Occupancy Curve for five days at 11D (Lane 2)

Further, five days of data for lane 2 are presented in Figures S1.11.5 and S1.11.6 for pre- and post-VSL conditions. Comparing the figures, reduction in traffic on congested regime can be noticed in post-VSL conditions as the data points are fewer compared to pre-VSL conditions. Post-VSL plot indicates higher volume as evidenced from volumes higher than 2000 vehs/hr. Comparing the different shapes of un-congested data of to pre- and post-VSL conditions, it can be noted that spread in traffic for post-VSL conditions delayed the traffic break down.

Task 1.2: Average Speed/Lane by Posted Speed Limit during Peak Periods

One of the main objectives of the VSL system was to improve traffic flow and this task evaluated the difference in average speed by comparing the data before and after the VSL system installation. Speed data averaged for all the lanes of segment 1 for every 5-minutes were used. Figure S1.12.1 presents the average highway speed for detector 11D (logmile 11) for pre- and post-VSL conditions. The figure indicates that the peak period for traffic on this segment lied between 1500 and 1840 hours based on the average speed for pre- and post-VSL conditions. Also, the pre- and post-VSL speed profile comparison shows reduction in peak period and improvement in average speeds for post-VSL conditions.

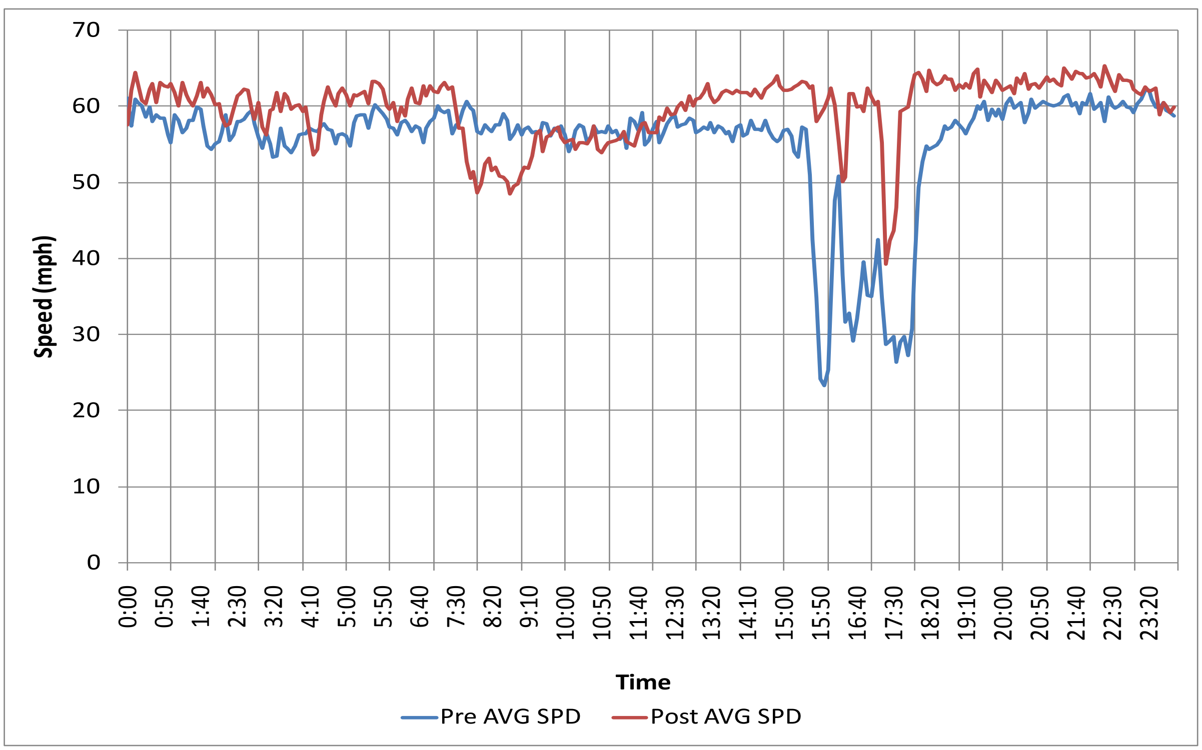


Figure S1.12.1. Comparison of Pre (25th Oct, 07) and Post-VSL (23rd Oct, 08) Speed data for 11D

Figure S1.12.1 indicates that the peak periods for pre-VSL lasted approximately two and half hours and, the average speed reduced to below 30 mph in pre-VSL conditions. Figure S1.12.1

also indicates gradual change in average speed due to the VSL system, compared to sharp decrease in average speed for the pre-VSL system. The average speeds were higher than 40 mph for most of the peak period because of which the variation in average speed over time were lesser than pre-VSL conditions.

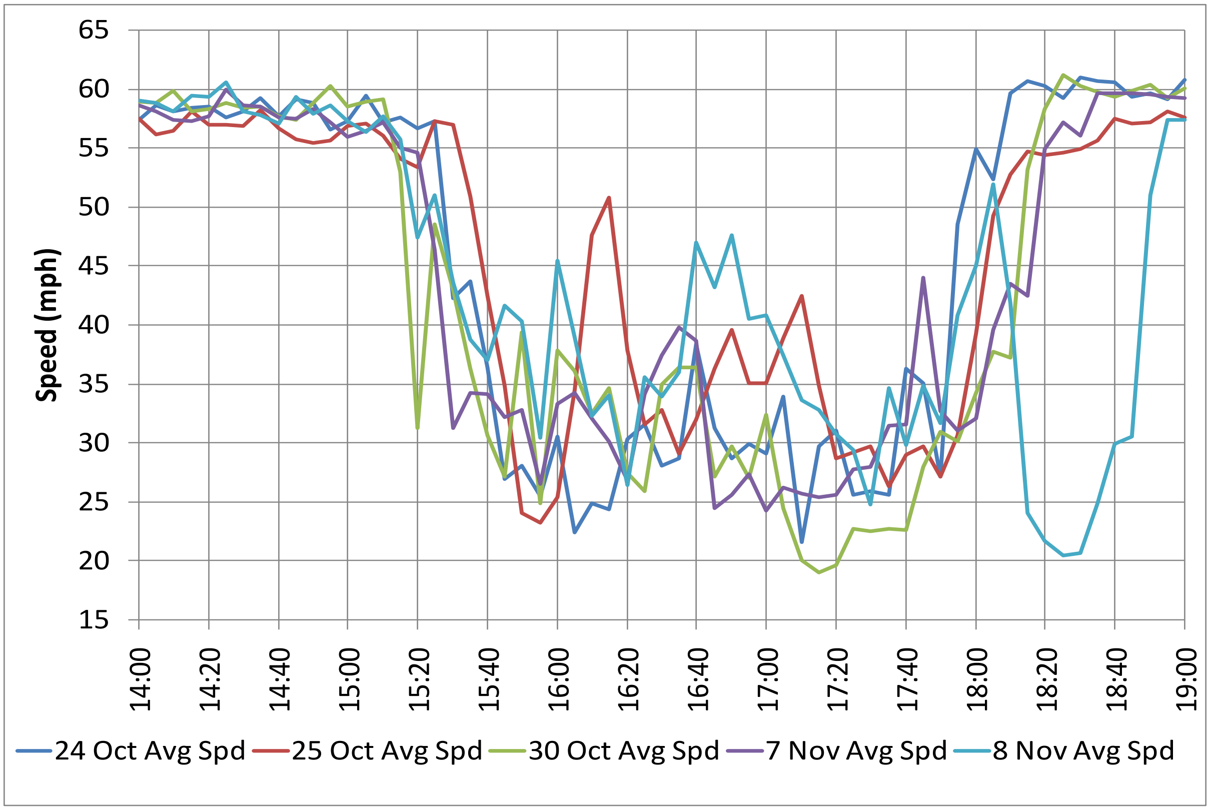


Figure S1.12.2 Pre-VSL Speed Profile for five days at Detector 11

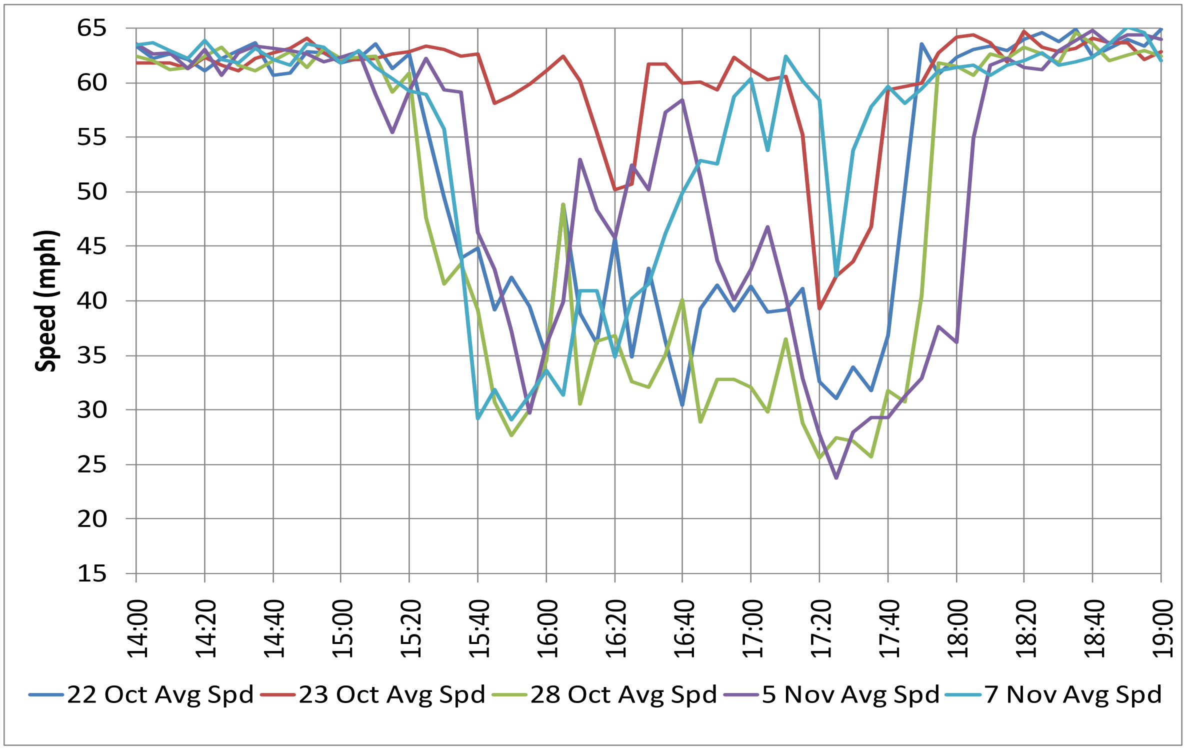


Figure S1.12.3 Post-VSL Speed Profile for five days at Detector 11

To supplement the comparison of speed data presented for one day, Figures S1.12.2 and S1.12.3 present the speed profiles for five days averaged for all lanes in pre- and post-VSL conditions. From the comparison of the two figures, it can be noticed that the peak periods in both conditions were between 1500 and 1840 hours, however, the duration reduced and average speeds improved by 5-10 mph in post-VSL conditions.

Comparison of Average Speeds along the Segment

Figures S1.12.4 and S1.12.5 present the comparison of average speeds aggregated for the peak period averaged for all four/five lanes for pre- and post-VSL system at the six detector locations on segment 1. The figure shows detectors upstream, on and downstream of segment 1. The line plot compares the average volume during the peak periods. Figure S1.12.4 also presents the difference in average speed during peak periods at every detector location.

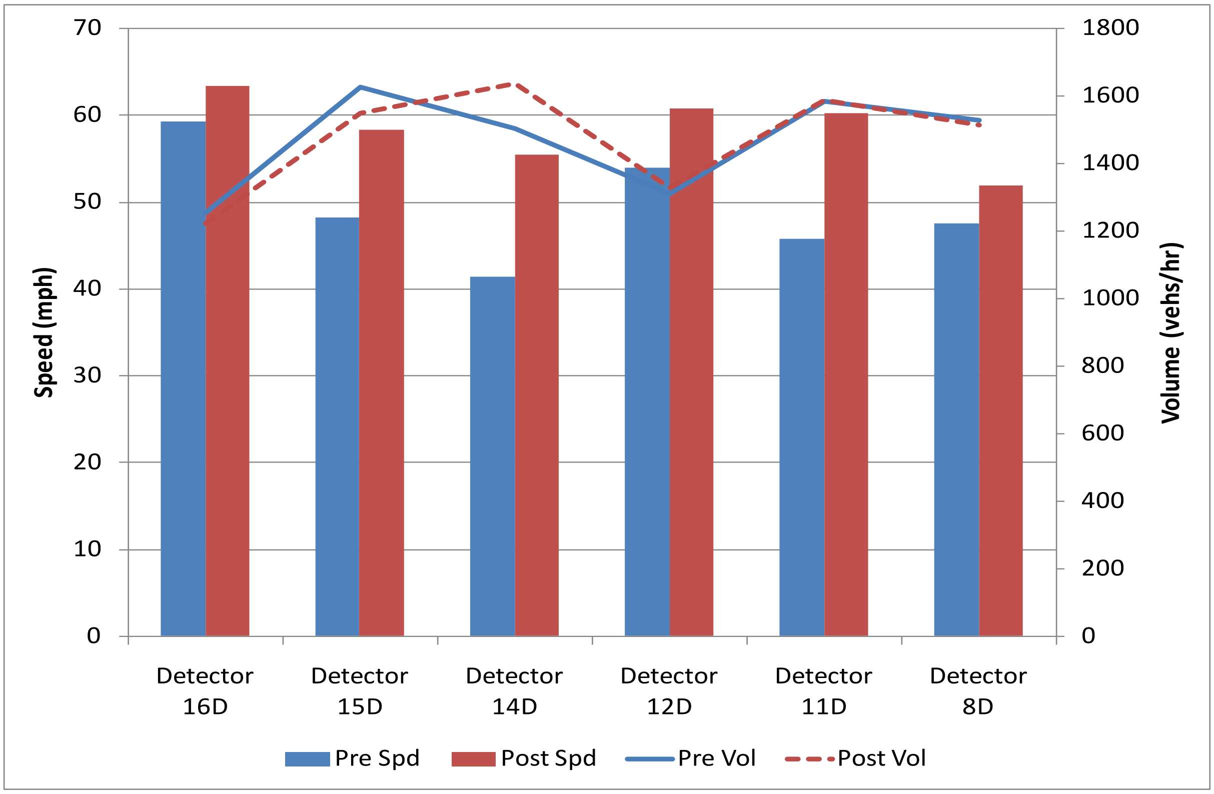


Figure S1.12.4. Comparison of Pre (25th Oct, 07) and Post-VSL (23rd Oct, 08) Average Speed and Volume

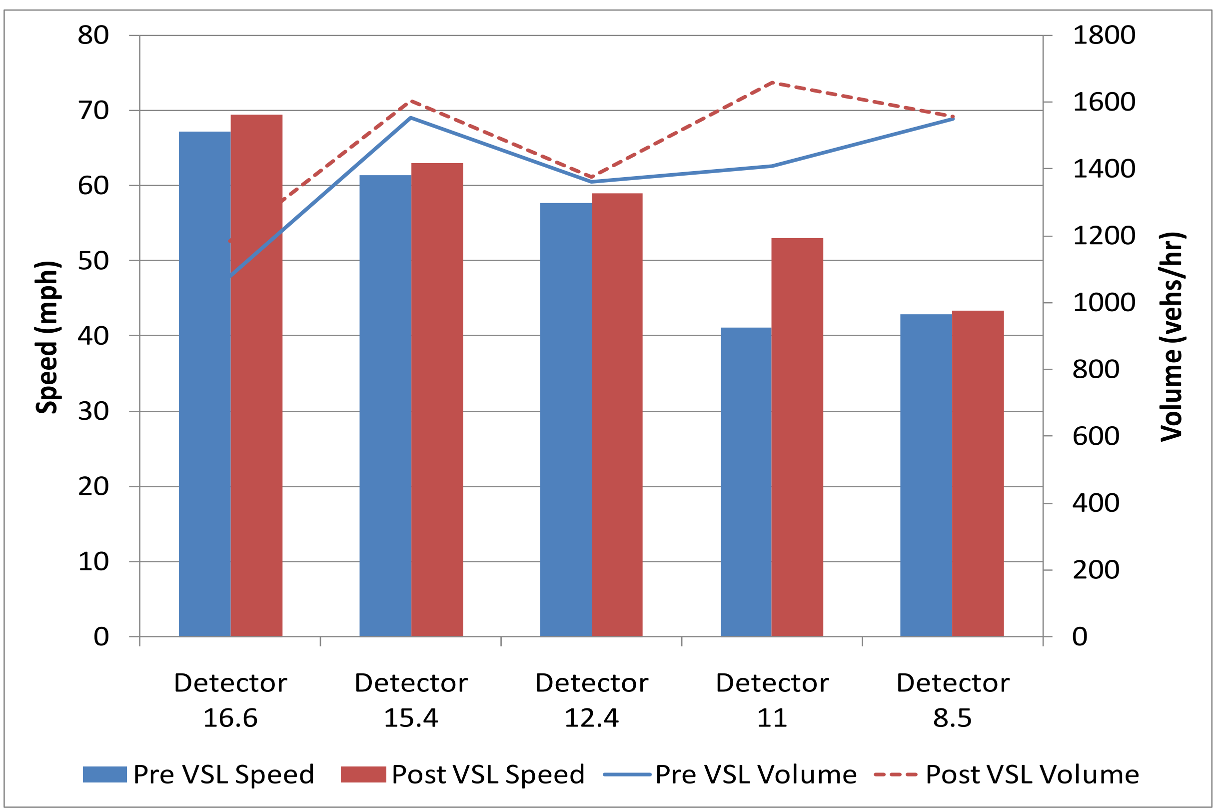


Figure S1.12.5. Comparison of Pre (8th Nov, 07) and Post-VSL (6th Nov, 08) Average Speed and Volume

The results indicate noticeable speed difference during the peak period. Figures S1.12.4 and S1.12.5 present higher values of speeds with similar or higher volumes during the peak period for post-VSL system initiation. It can be observed from the figures that after the installation of the VSL system, higher traffic volume passed the highway segment at different points. For detectors 11D (logmile 11) and 12D (logmile 12.4), the average speeds were 7 to 15 mph higher after the installation of the VSL system compared to pre-VSL conditions. This improvement was due to mainline metering which allowed higher volumes and speeds at every detector.

Comparison of Average Speeds in Pre- and Post-VSL Conditions

Figures S1.12.6 and S1.12.7 present the average highway speed profile (all 5-lanes) comparison for detector 11D (logmile 11) for two days in pre- and post-VSL conditions. Detector 11D (logmile 11) was used as it is located over the segment. Figure S1.12.6 presents the comparison of average speeds for pre (25^{th} October, 2007) and post (23^{rd} October, 2008) VSL system installation. Figure S1.12.6 also indicates gradual change in average speed due to the VSL system compared to sharp decrease in average speed for the pre-VSL system. Similar to Figure S1.12.6, Figure S1.12.7 shows improvement in average speed and decrease in peak period duration. It can also be noticed that lowering the posted speeds allowed the average speeds to recover and avoid traffic break down.

Table S1.12.1 presents the difference in speed pre-and post-VSL conditions

Time	14:00	14:30	15:00	15:30	16:00	16:30	17:00	17:30	18:00	18:30	19:00	Avg Spd
Pre VSL Spd	57.46	56.85	56.78	56.88	25.38	32.84	35.02	29.73	39.3	54.85	57.51	45.7
Post Spd	61.87	61.07	62.15	63.11	61.12	61.69	61.24	43.59	64.24	62.81	62.88	60.5
Diff (mph)	*4.41*	*4.22*	*5.37*	*6.23*	*35.74*	*28.85*	*26.22*	*13.86*	*24.94*	*7.96*	*5.37*	*14.8*

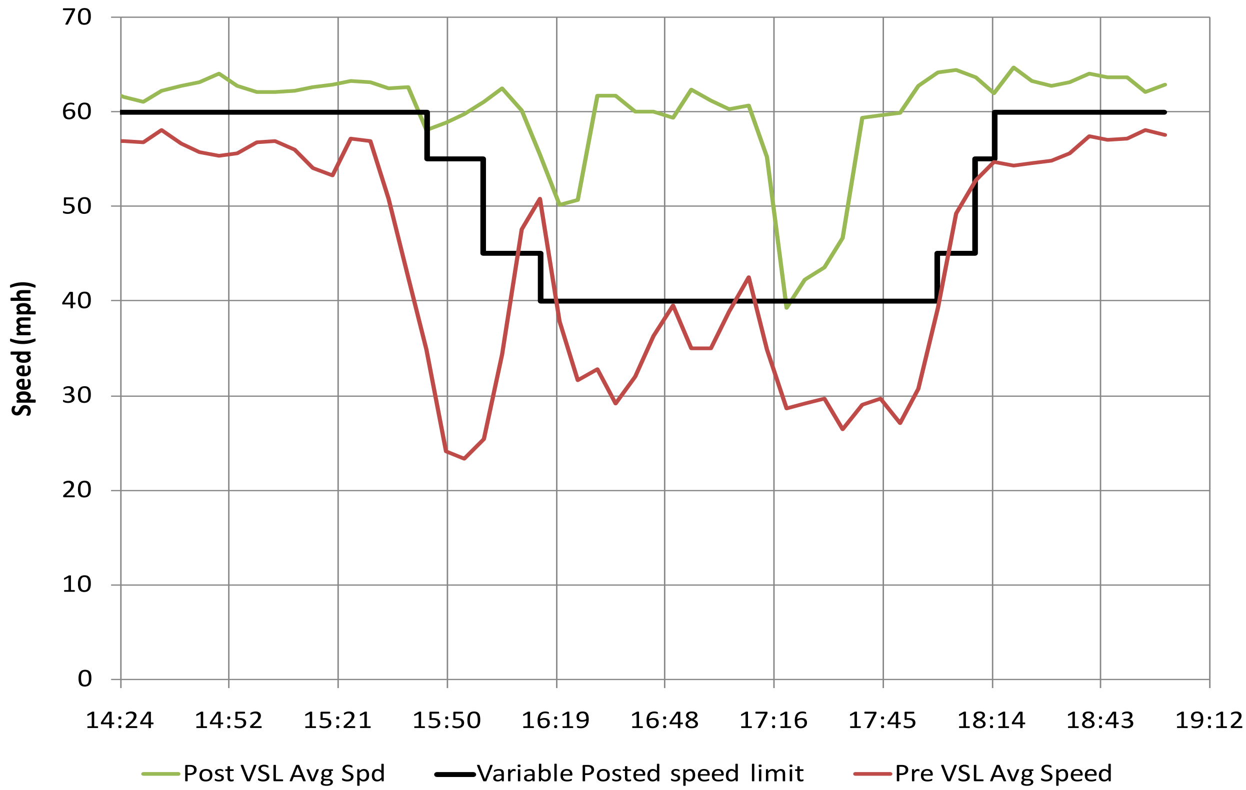


Figure S1.12.6. Comparison of Pre (25th Oct, 07) and Post VSL (23rd Oct, 08) Speed data for 11D

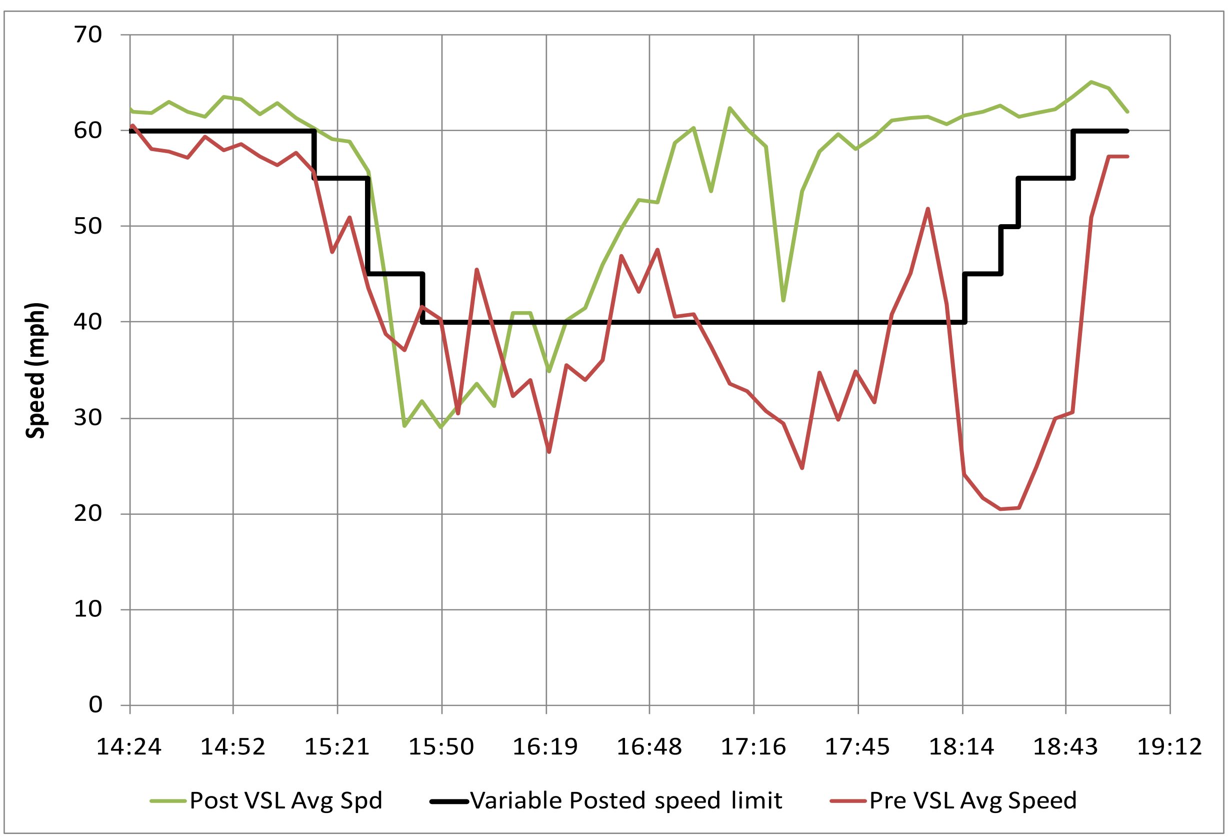


Figure S1.12.7. Comparison of Pre (8th Nov, 07) and Post VSL (6th Nov, 08) Speed data for 11D

Speed Deviation across Lanes

For this sub-task, dispersion of average speeds across lanes was evaluated based on comparison of pre- and post-VSL conditions. Dispersion in speed along the highway over different detectors could not be carried out as the distance between detectors is more than 1 mile. For accurate calculations, the distance between detectors should be 0.8 to a mile.

Figures S1.12.8 and S1.12.9 present the variation in speeds across the lanes at detector 11D (logmile 11) for pre- and post-VSL conditions respectively. This location has five lanes. Lane 1 indicates the left most lane and the lane number increments toward the right lanes. Lane 1 is mostly used as a passing lane and lane 5 is mainly an exit lane. Therefore, in Figures S1.12.8 and S1.12.9 it can be observed that except for lanes 4 and 5, average speeds on other lanes are very similar. It can also be noticed that difference in speeds are low during speed drop and recovery but high in between. Table S1.12.2 presents the calculated standard deviation in speeds and their difference. Posted variable speed limits were plotted over the average speeds, Figure S1.12.9, to observe the deviation in speeds on each lane with the posted speeds.

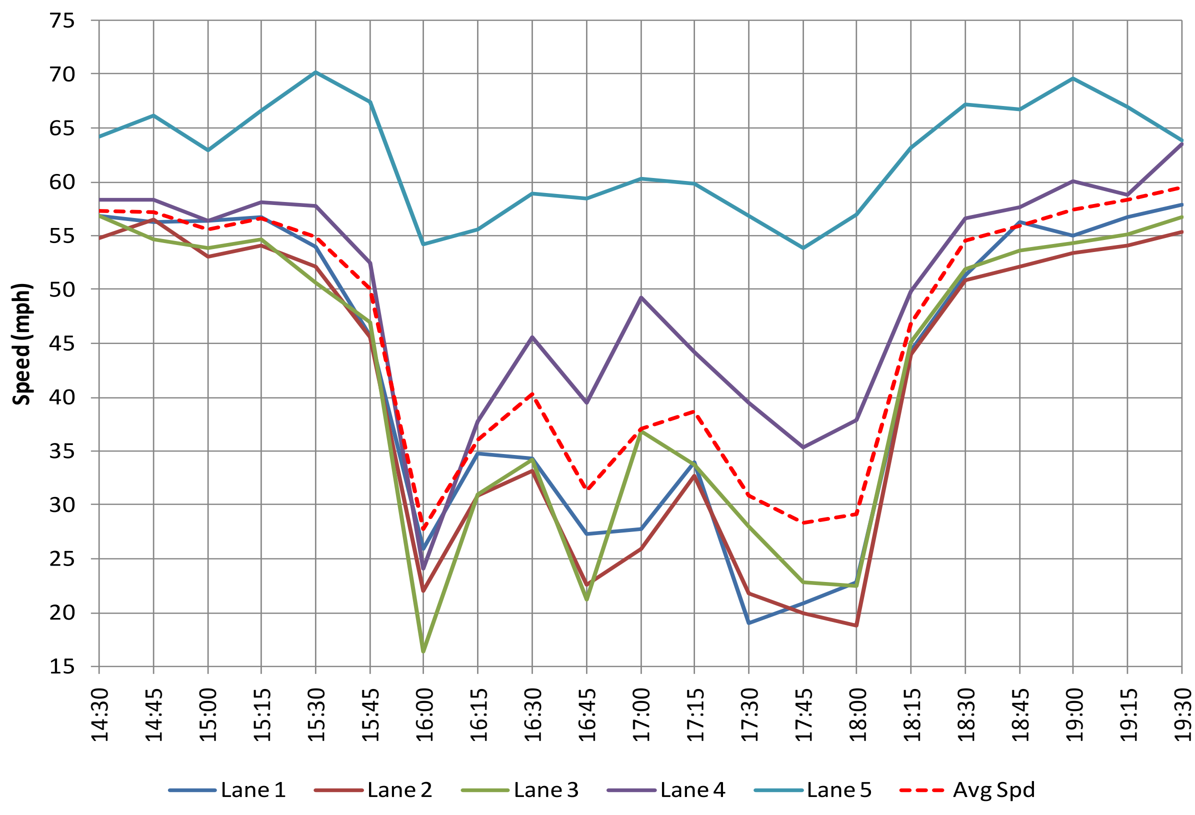


Figure S1.12.8. Pre-VSL (25th Oct, 08) Average Speed data for all lanes (detector 11D)

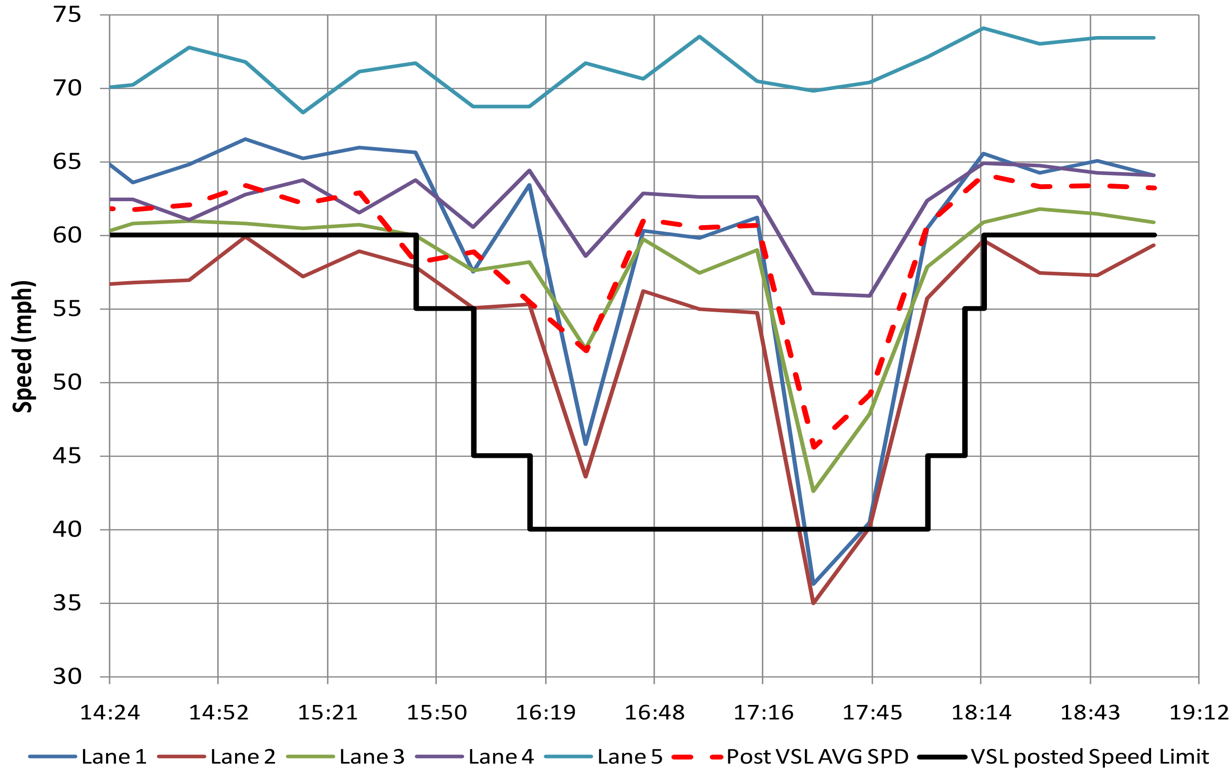


Figure S1.12.9. Post VSL (23rd Oct, 08) Average Speed data for all lanes (detector 11D)

Table S1.12.2 presents the standard deviation of speeds (determined using Equation 2) during the peak period for pre- and post-VSL conditions for detector data at 11D (logmile 11). The difference indicates the change in post-VSL traffic conditions compared to pre-VSL conditions. Negative value indicates decrease in deviation of speeds across the lanes, which indicates increase in speed homogeneity. Standard deviations were calculated for peak periods only. Speed homogeneity can be inferred from the results of the table. Increase in speed homogeneity may cause reduction in traffic crashes which is a positive outcome of the VSL system.

Table S1.12.2. Standard Deviation (SD) of Speeds at Detector 11D during Peak Periods

	Comparison of Pre (24th Oct 07) and Post (22nd Oct 08) SD							
Time	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**
Pre-VSL SD (mph)	3.21	13.80	16.48	13.73	17.37	14.56	7.82	4.18
Post-VSL SD (mph)	4.80	10.56	9.54	12.46	15.50	16.13	7.11	5.25
Difference (mph)*	**1.59**	**-3.24**	**-6.94**	**-1.27**	**-1.87**	**1.57**	**-0.70**	**1.06**
	Comparison of Pre (25th Oct 07) and Post (23rd Oct 08) SD							
Time	**15:15**	**15:45**	**16:15**	**16:45**	**17:15**	**17:45**	**18:15**	**18:45**
Pre-VSL SD (mph)	5.07	9.3	10.26	15.58	11.59	14.44	8.11	5.73
Post-VSL SD (mph)	4.31	5.38	5.3	5.42	5.8	12.63	5.65	5.93
Difference (mph)	**-0.75**	**-3.92**	**-4.96**	**-10.15**	**-5.79**	**-1.81**	**-2.46**	**0.20**
	Comparison of Pre (30th Oct 07) and Post (28th Oct 08) SD							
Time	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**
Pre-VSL SD (mph)	3.89	13.25	14.03	11.13	14.38	13.45	11.36	3.90
Post-VSL SD (mph)	3.06	10.59	10.24	14.36	13.59	11.98	4.68	6.93
Difference (mph)	**-0.83**	**-2.66**	**-3.80**	**-3.23**	**-0.79**	**-1.46**	**-6.68**	**3.02**
	Comparison of Pre (6th Nov 07) and Post (5th Nov 08) SD							
Time	**15:15**	**15:45**	**16:15**	**16:45**	**17:15**	**17:45**	**18:15**	**18:45**
Pre-VSL SD (mph)	9.66	16.43	15.69	11.69	18.44	14.24	9.98	4.55
Post-VSL SD (mph)	3.64	13.73	11.99	11.15	12.80	10.88	5.89	4.54
Difference (mph)	**-6.02**	**-2.70**	**-3.70**	**-0.54**	**-5.64**	**-3.36**	**-4.08**	**-0.01**
	Comparison of Pre (8th Nov 07) and Post (7th Nov 08) SD							
Time	**15:15**	**15:45**	**16:15**	**16:45**	**17:15**	**17:45**	**18:15**	**18:45**
Pre-VSL SD (mph)	6.30	12.88	18.80	14.10	12.76	11.80	14.44	11.47
Post-VSL SD (mph)	4.46	8.52	13.83	10.80	6.52	6.41	6.09	5.90
Difference (mph)	**-1.84**	**-4.36**	**-4.97**	**-3.30**	**-6.24**	**-5.38**	**-8.34**	**-5.57**

*Difference indicates decrease in Post-VSL SD and vice versa.

Task 1.3: Speed Limit during Peak Periods

The objective of this task was to evaluate the system initiation logic for variable speed limits. This was carried out by analyzing the average speeds, traffic flow and occupancy during peak periods using three days of data, i.e. October 23rd, November 6th, and November 13th, 2008. Figures were plotted to show the relationship between average speed, volume and occupancy for peak periods. On Figures S1.13.1 to S1.13.9, two y-axes were used; the y-axis on the left presents average speed, and the y-axis on the right presents average occupancy and volume. Additionally, posted variable speed limits were plotted to analyze the initiation of the VSL system. For the three days, data from detectors 8D (logmile 8.5), 11D (logmile 11) and 12D (logmile 12.4) were plotted. The plots are presented first for 12D (logmile 12.4), then for 11D (logmile 11) and last for 8D (logmile 8.5) indicating the direction of flow. For October 23rd, 2008, Figure S1.13.1 indicates that the system was initiated when the average vehicle speeds fell below 60 mph, and volume and occupancy thresholds have exceeded the specified limits.

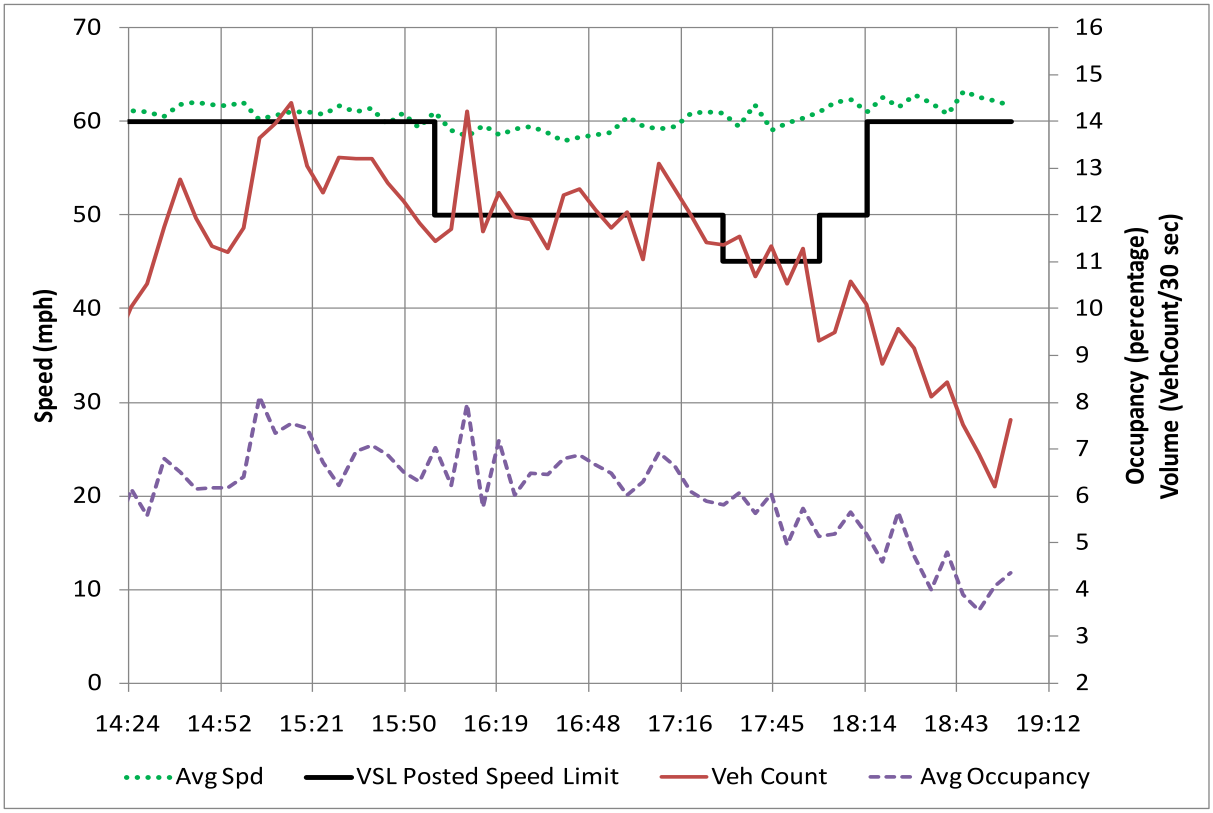


Figure S1.13.1. Post-VSL: VSL System trigger point (23rd October, 08) for detector 12D

Figure S1.13.2 indicates the recovery in average speed after the VSL initiation. The lowering of posted speed limit near detector 11D (logmile 11) delayed the traffic congestion downstream at 8D (logmile 8.5), Figure S1.13.3 and improved the average speeds along the segment. Additionally, it can also be noted that posted speeds upstream were lowered in response to congestion downstream. Therefore, at detector 12D (logmile 12.4), VSL speeds were lowered, although, the average speeds were close to 60 mph and occupancy was less than 7 percent.

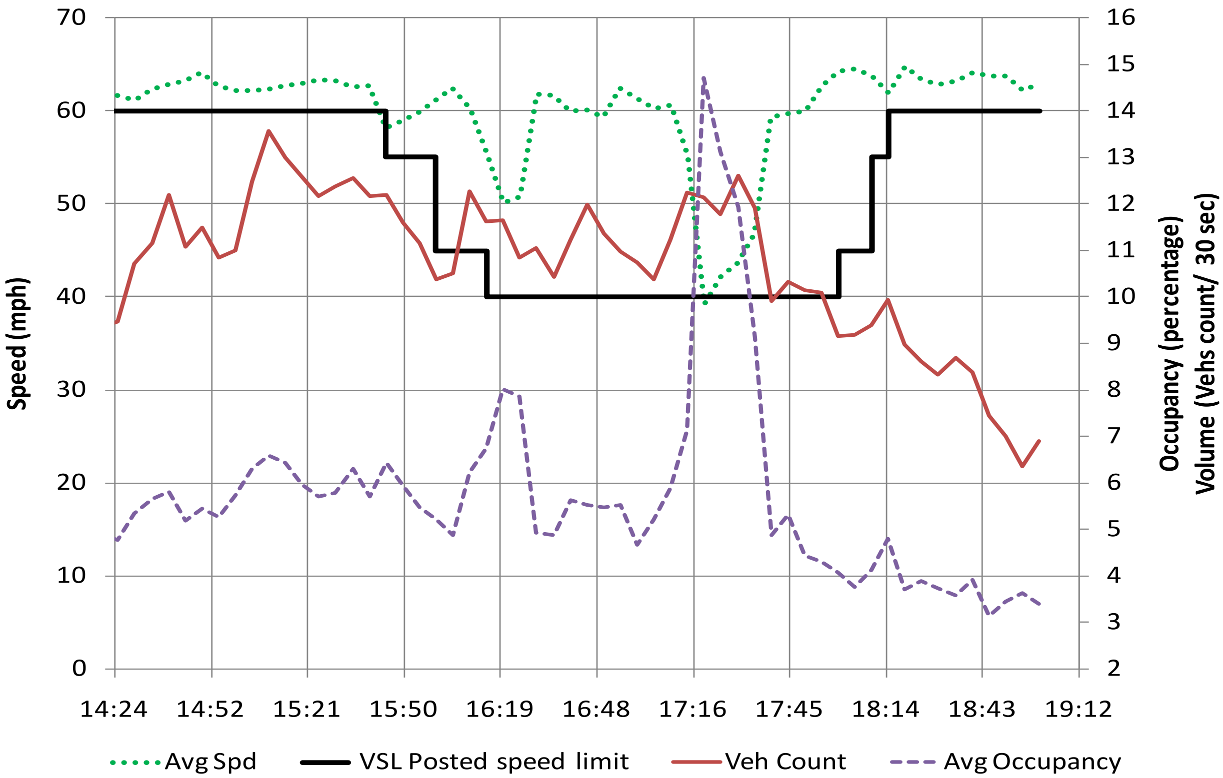


Figure S1.13.2. Post-VSL: VSL System trigger point (23rd October, 08) for detector 11D

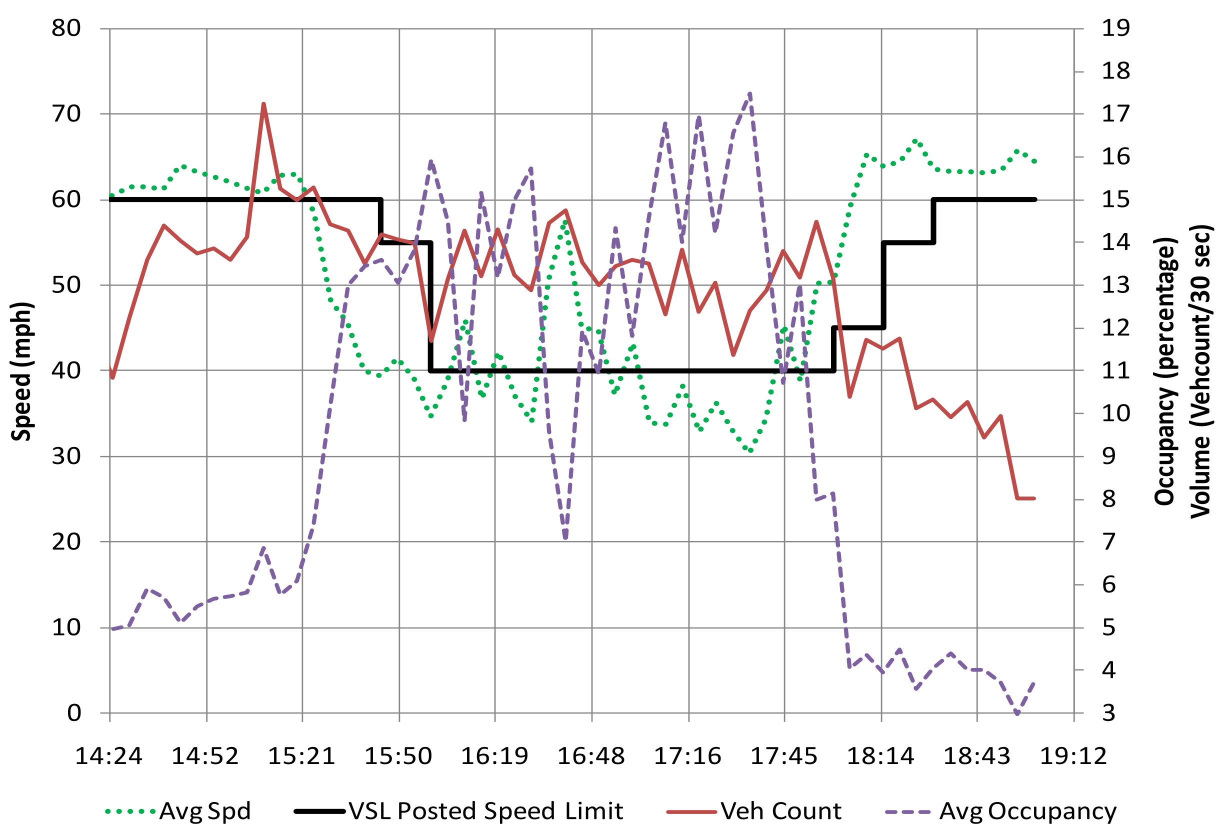


Figure S1.13.3. Post-VSL: VSL System trigger point (23rd October, 08) for detector 8D

Figure S1.13.3 for detector 8D (logmile 8.5) indicates the posted speeds were lowered much later than the average speeds. Average speed was around 40 mph and occupancy was almost 14 percent when the speed limits were reduced. This indicated congested conditions along the highway segment with occupancy much higher than seven percent throughout the peak period. Also, congested conditions at 8D (logmile 8.5) can be observed. When compared to traffic improvements along the highway, this indicates low benefits at detector 8D (logmile 8.5).

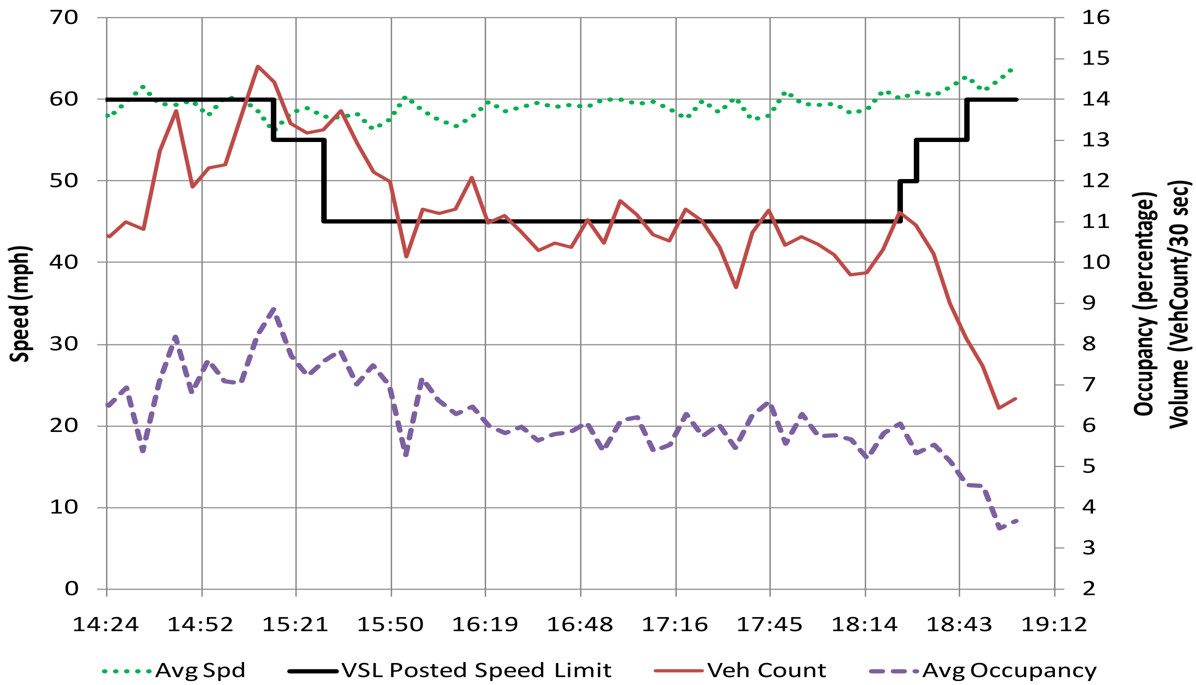


Figure S1.13.4. Post-VSL: VSL System trigger point (6th November 08) for detector 12D

For November 6th, 2008, Figures S1.13.4 to S1.13.6 present the point of initiation for the three detectors: 12D (logmile 12.4), 11D (logmile 11) and 8D (logmile 8.5). These figures indicate that the VSL system was triggered based on average speed. The volume count was already over 10 vehicles and the occupancy had not reached seven percent. From the plots of data for October 23rd and November 6th, 2008, similarities in average speed can be observed. Detector at mile post 12D (logmile 12.4) presented in Figures S1.13.1 and S1.13.4, both indicate average speed was 60 mph. Figure S1.13.5 present the detector at milepost 11D (logmile 11), and it can be noticed that the VSL system was triggered promptly at detector location 11D (logmile 11) as the average speed reduced below 60 mph. This indicated that detector 11D (logmile 11) is a critical point for VSL activation on this segment. It can also be noticed from the plots for detector 8D (logmile 8.5) that VSL activation near this detector location was deferred by five to ten minutes. However, on both days the VSL system activation coincided with the time at which the system near 11D (logmile 11) was triggered.

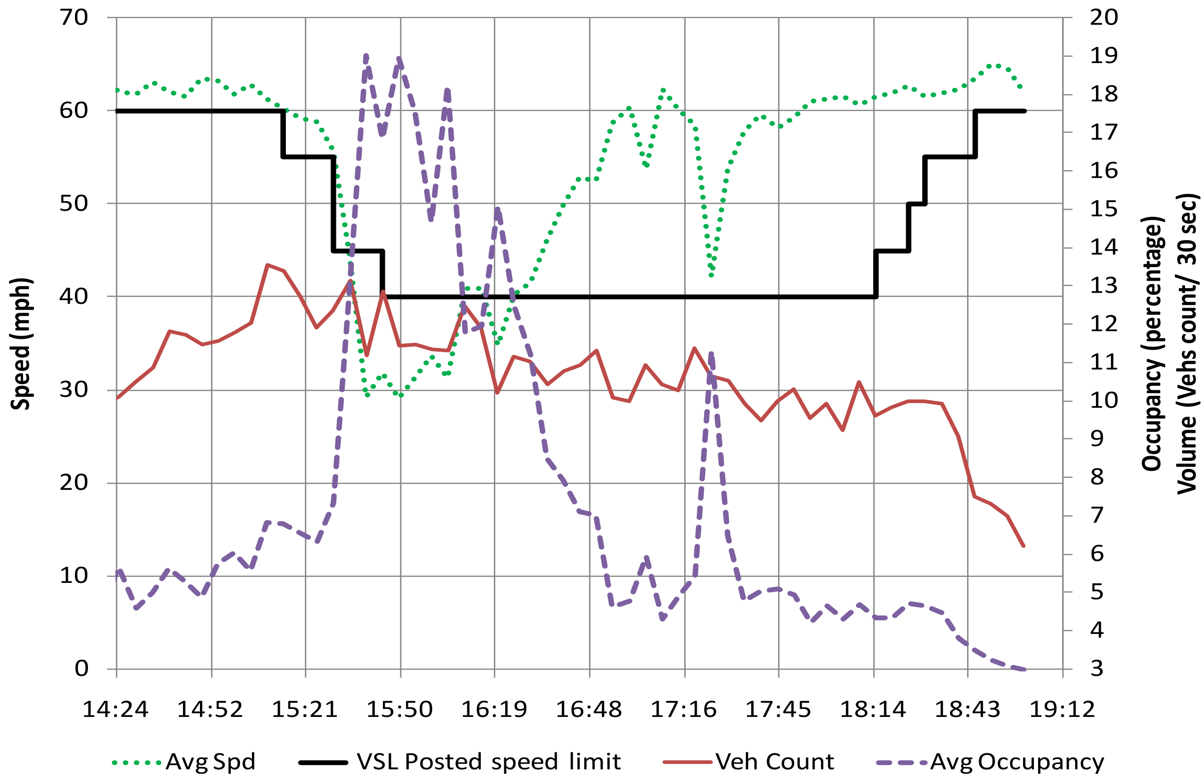


Figure S1.13.5. Post-VSL: VSL System trigger point (6th November 08) for detector 11D

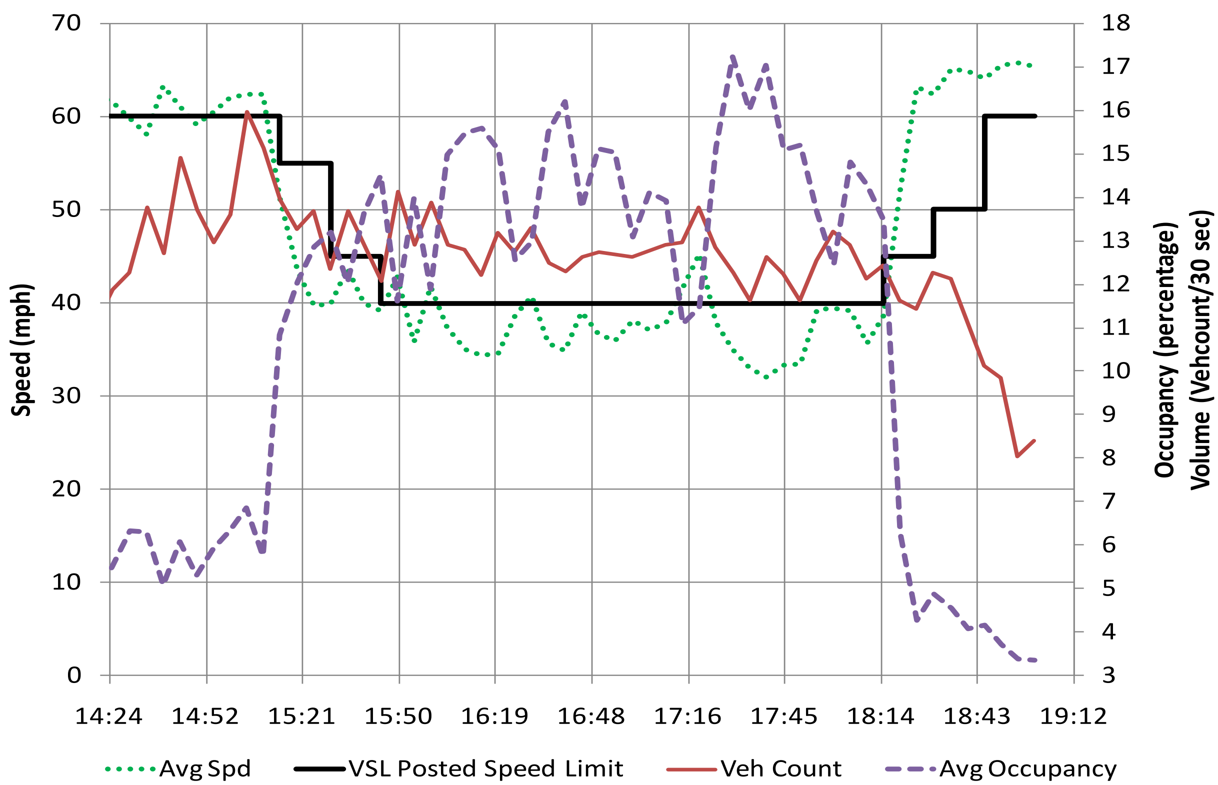


Figure S1.13.6. Post-VSL: VSL System trigger point (6th November 08) for detector 8D

For November 13th 08, Figures S1.13.7 to S1.13.9 present data plots for the three detectors, which indicate severe congestion, not observed on October 23rd and November 6th 2008. Similar to the VSL system activation presented earlier, the posted speed limit follows the average speed of detector at 11D (logmile 11) and the time for activation for 11D (logmile 11) and 8D (logmile 8.5) were the same. The activation at 12D (logmile 12.4) can be justified as a congestion prevention measure upstream of 11D (logmile 11). The VSL system near 12D (logmile 12.4) metered the vehicles upstream of 11D (logmile 11), however, traffic was already severely congested. The variable speed limit system was observed to be reactive to the average speed of vehicles on I-270. The system was initiated after few minutes when the average speed of vehicles reduced to below 60 mph. From the comparison of the different plots, it is recommended to initiate the system more aggressively to possibly prevent traffic congestion.

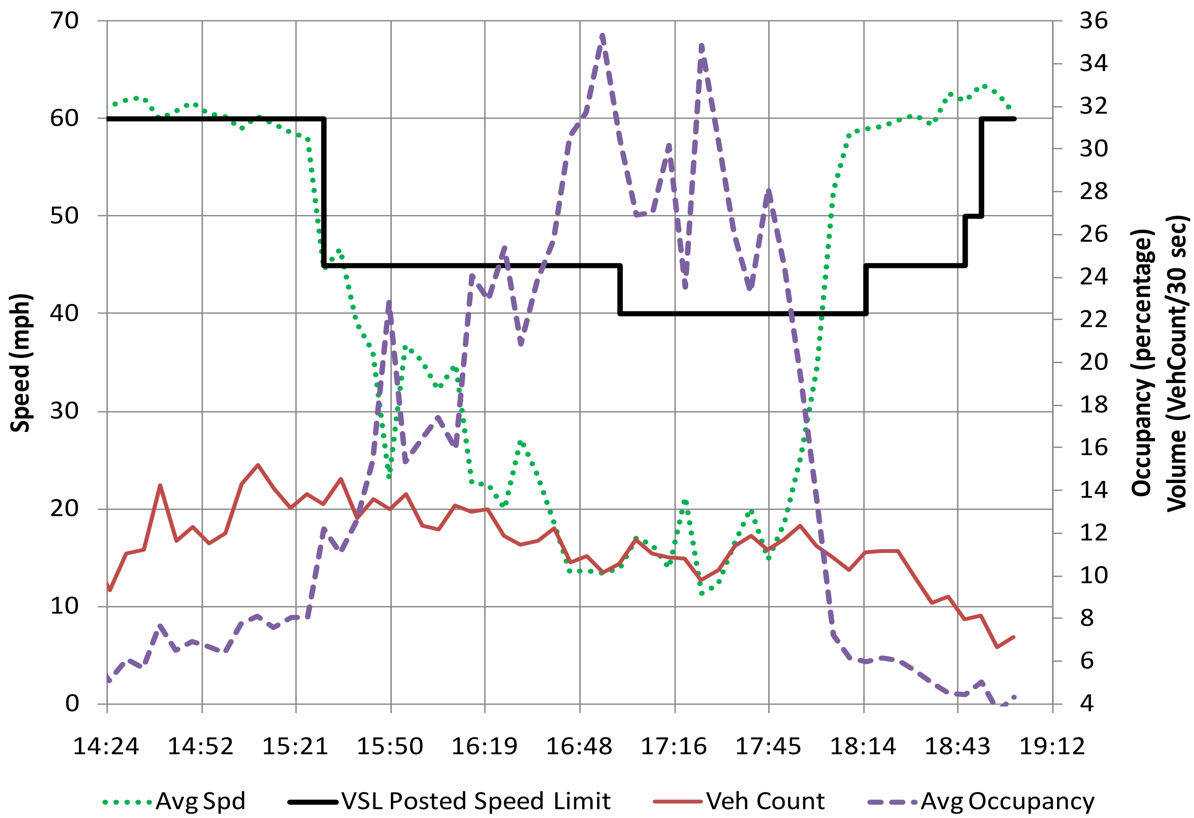


Figure S1.13.7. Post-VSL: VSL System trigger point (13th November 08) for detector 12D

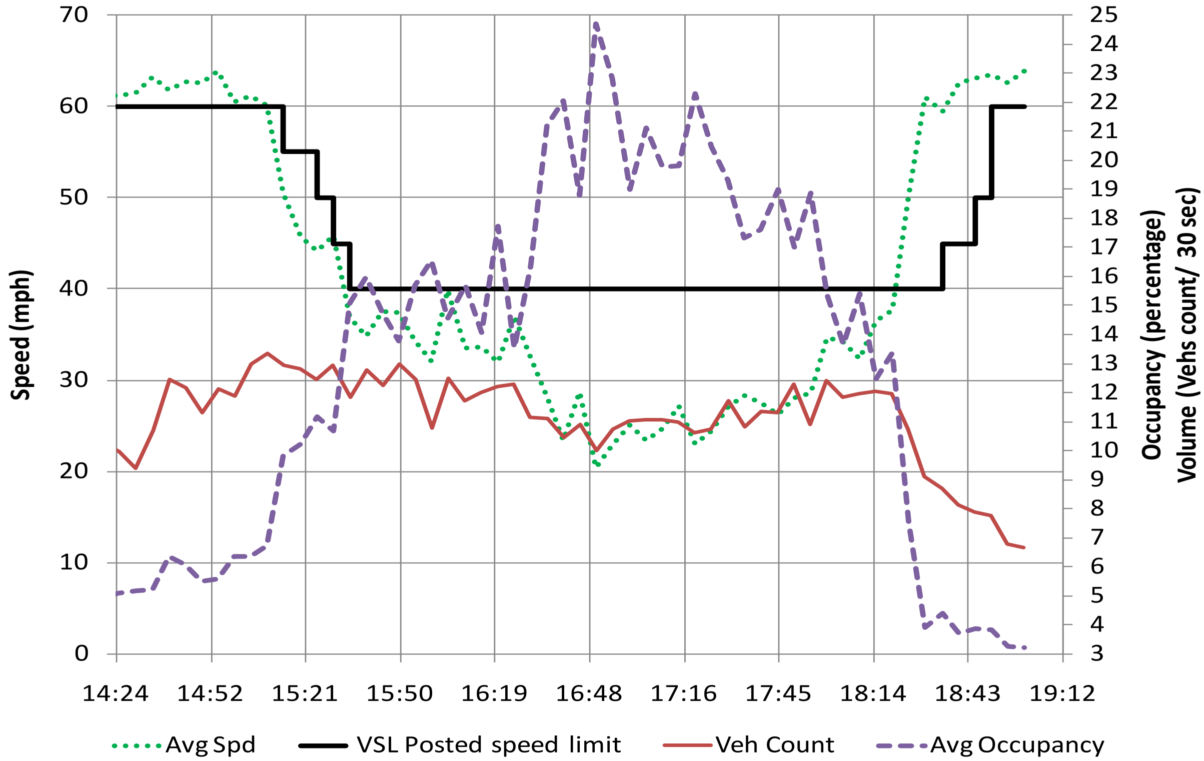


Figure S1.13.8. Post-VSL: VSL System trigger point (13th November 08) for detector 11D

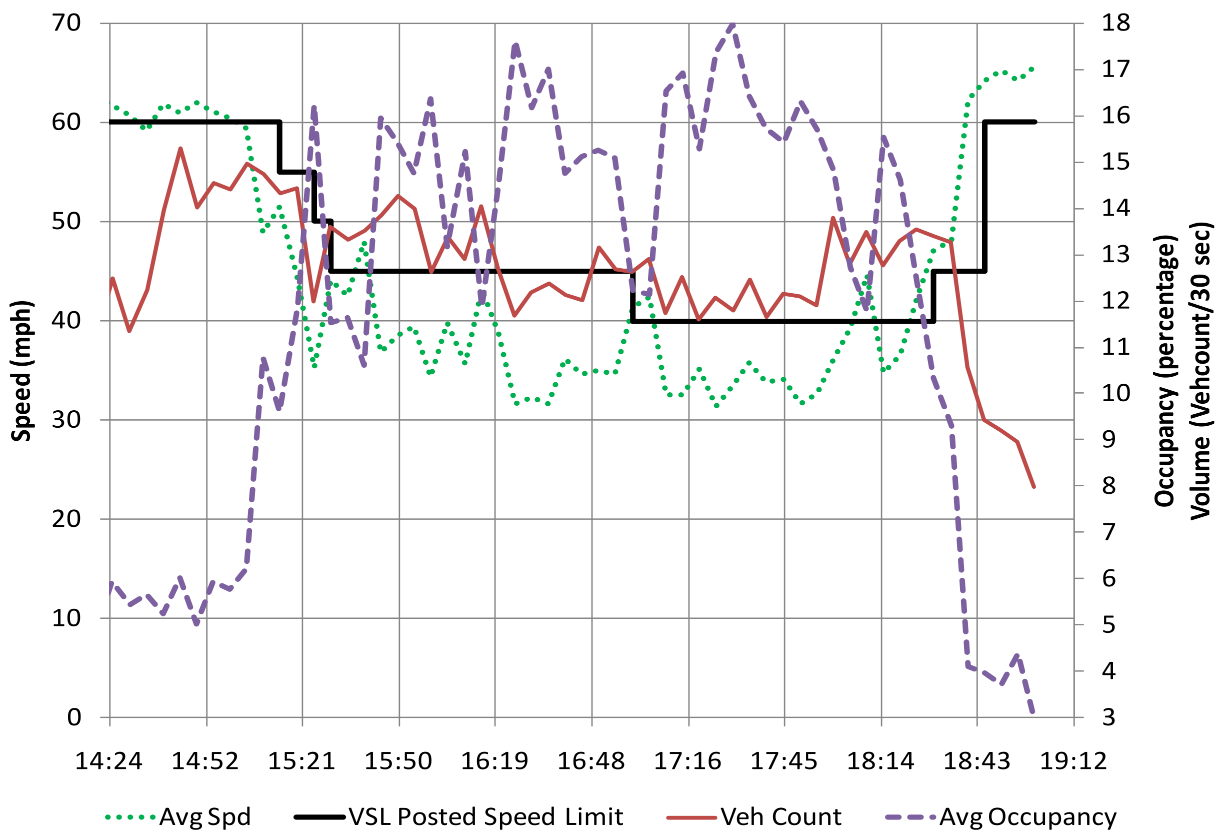


Figure S1.13.9. VSL System trigger point (13th November 08) for detector 8D

Task 1.4: Speed Limit Compliance by Posted Speed Limit

The objective of this task was to analyze driver compliance of the posted variable speed limits. Average speeds and posted VSL for peak periods plotted at detectors 8D (logmile 8.5), 11D (logmile 11) and 12D (logmile 12.4) are presented using different set of colors and line types. Pair of lines with same color indicates same detector location. Drivers' compliance of posted variable speed limits were evaluated using Figures S1.14.1 and S1.14.2, for Oct 23rd and Nov 6th, 2008, respectively. Additionally, drivers' compliance was also calculated for the five days. Table S1.14.2 presents the results of the analysis.

From Figures S1.13.4 and S1.13.5 it can be observed that drivers were not complying at these locations, though Figure S1.13.6 indicates compliance, possibly because of congested traffic conditions. From the figures it can be noticed that as the occupancy exceeded seven percent, average speed dropped below 60 mph indicating congestion. This indicates that during uncongested conditions, drivers drive at their desired speed and during congested conditions they are forced to drive at the average speed of the traffic stream, i.e. most commonly follow the speed of the leading vehicles. Similar trends were observed from Figures S1.13.7 to S1.13.9, from which it can be noted that drivers did not comply with the posted VSL speed limit, but drove at their desired speed.

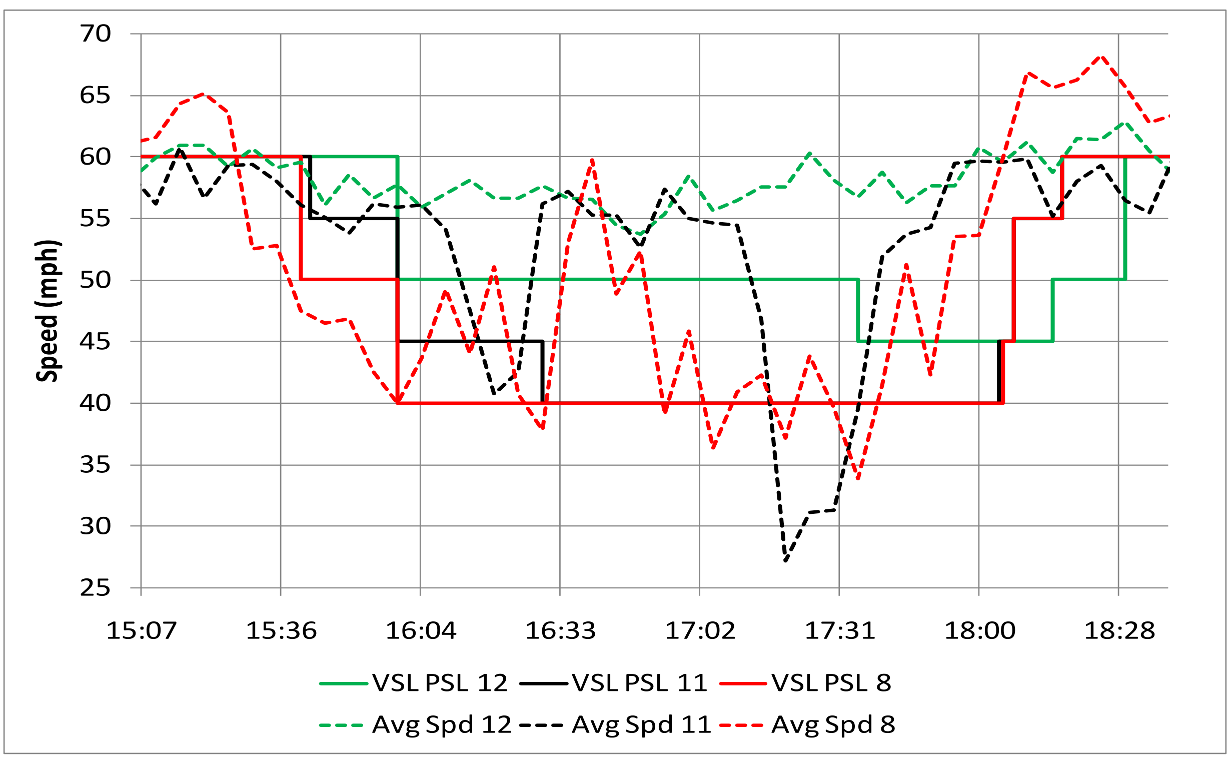


Figure S1.14.1. VSL (23rd October 08)

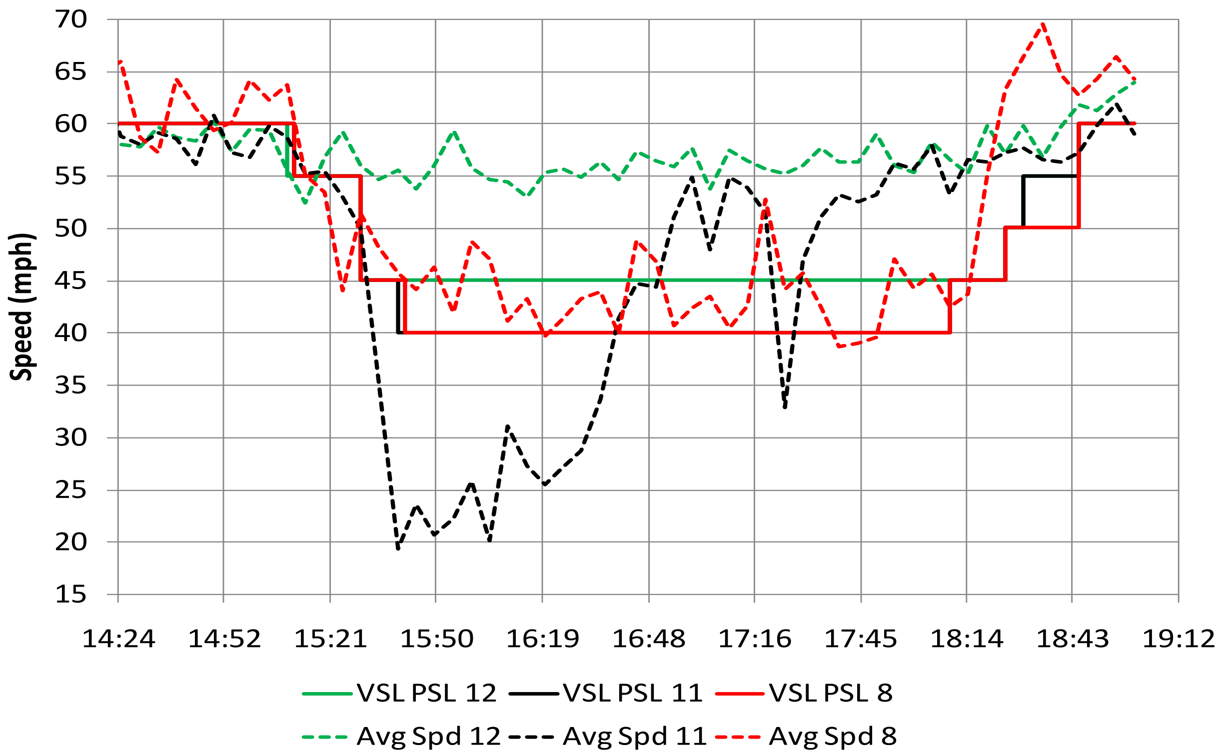


Figure S1.14.2. VSL (6th November 08)

Speed compliance at lane 2 was also evaluated and is presented in Figure S1.14.2. From the above task it was found that data from lane 4 and 5 had higher speed and lower volume interfered with the results, hence speed compliance was calculated for all lanes too. From Figure S1.14.1 it can be noted that while the speed limits were lowered at VSL signs 43 and 44, VSL signs presented in Figure S.1.1, average speeds recorded at detector 12D (logmile 12.4) downstream indicated average speeds remained above 55 mph, indicating little or no compliance. As a result of non-compliance congestion was observed downstream at detector location 11D (logmile 11) (logmile 11). The average speed at detector 11D (logmile 11) indicated that similar to VSL sign upstream, though speed limits were lowered at VSL sign 25 upstream of the detector location, drivers were driving at either their desired speed or speed as a result of traffic congestion. As traffic started to return to normal, the average speed improved, while the posted VSL was 40 mph. Since the drivers were not complying, congestion was again observed at detector 11D (logmile 11). The purpose of VSL system initiation is to improve traffic volume to subsequently reduce congestion, which occurred due to low compliance. It can be further observed from Figures S1.13.1 to S1.13.3 that above seven percent occupancy, the average speed dropped below 60 mph and traffic flow broke down. Similar results were observed for other days which indicated little speed compliance along the highway.

Additionally percent compliance was computed for all lanes at detectors 12D (logmile 12.4), 11D (logmile 11) and 8D (logmile 8.5). It should be noted that data with occupancy more than 30 percent were removed from this computation because it is assumed that more than 30 percent occupancy presents congestion in which case, drivers follow the traffic speed which is below the variable posted speed and could misrepresent compliance.

Table S1.14.2 presents the computed results for all lanes along the segment. It can be noticed from the table that lane 3 had the best compliance result compared to all other lanes and drivers on lane 5 for detector 11D (logmile 11) and lane 1 for detector 8D (logmile 8.5) and 12D (logmile 12.4) had the lowest compliance with the posted speed limits. Additionally, compliance was lowest at detector 12D (logmile 12.4). The congestion downstream could be as a result of low compliance at 12D (logmile 12.4) which is also evident from Figures S1.14.1 and S1.14.2. The higher compliance at other detectors could be result of the state of traffic as the compliance analysis was carried out for the peak period. From the compliance results, it can be stated that this segment is experiencing congestion due to lower compliance near detector 12D (logmile 12.4).

Table S1.14.2 Percent compliance along the highway for all lanes

Lane	Detector 8	Detector 11	Detector 12
October 22nd 2008			
L1	27.05	65.47	33.32
L2	69.16	84.93	85.98
L3	83.47	81.45	90.13
L4	93.12	55.35	43.09
L5	**	0.11	**
Hwy^	67.73	72.09	63.11
October 23rd 2008			
L1	30.30*	34.23	23.93
L2	55.68	57.98	56.73
L3	72.72	47.21	65.99
L4	79.02	30.93	30.59
L5	**	0.50	**
Hwy^	58.73	37.88	44.43
October 28th2008			
L1	37.73	71.48	30.36
L2	65.43	91.36	51.12
L3	80.29	84.63	61.24
L4	88.80	75.97	31.99
L5	**	10.86	**
Hwy^	66.72	70.89	43.78
November 5th 2008			
L1	18.46	54.52	18.1
L2	59.08	75.47	42.62
L3	87.54	68.43	55.64
L4	92.95	45.23	16.07
L5	**	1.58	**
Hwy^	63.69	65.61	33.26
November 6th 2008			
L1	14.87*	44.47	10.19
L2	59.68	63.66	21.28
L3	83.91	47.29	27.06
L4	89.32	26.25	10.82
L5	**	0.37	**
Hwy^	60.43	40.29	17.33

*Percent of drivers complying with the posted variable speed limit

** Not applicable

^ Weighted average of all lanes of the highway

Task 1.5: Evaluation of Highway Capacity

This task compares speed-flow plots for pre- and post-VSL conditions. Figure S1.15.1 presents the speed flow data for five days in pre- and post-VSL system installation for detector 11D (logmile 11). Data used were aggregated for 5-minute intervals for this task. From the figure fewer data points can be observed in the congested regime of the speed-flow curve, as presented by the oval, indicating better traffic flow conditions for the post-VSL conditions compared to the pre-VSL conditions. For post-VSL conditions, the volume at 11D (logmile 11) was also higher.

It should be noted here, that time mean speed is plotted. It is recommended that speed-flow plots are plotted between space mean speed and traffic flow, however, as these plots are used mainly for comparison between pre- and post-VSL conditions, time mean speed can be used. The readers are cautioned that conclusions should be made after due consideration of this fact and careful evaluation.

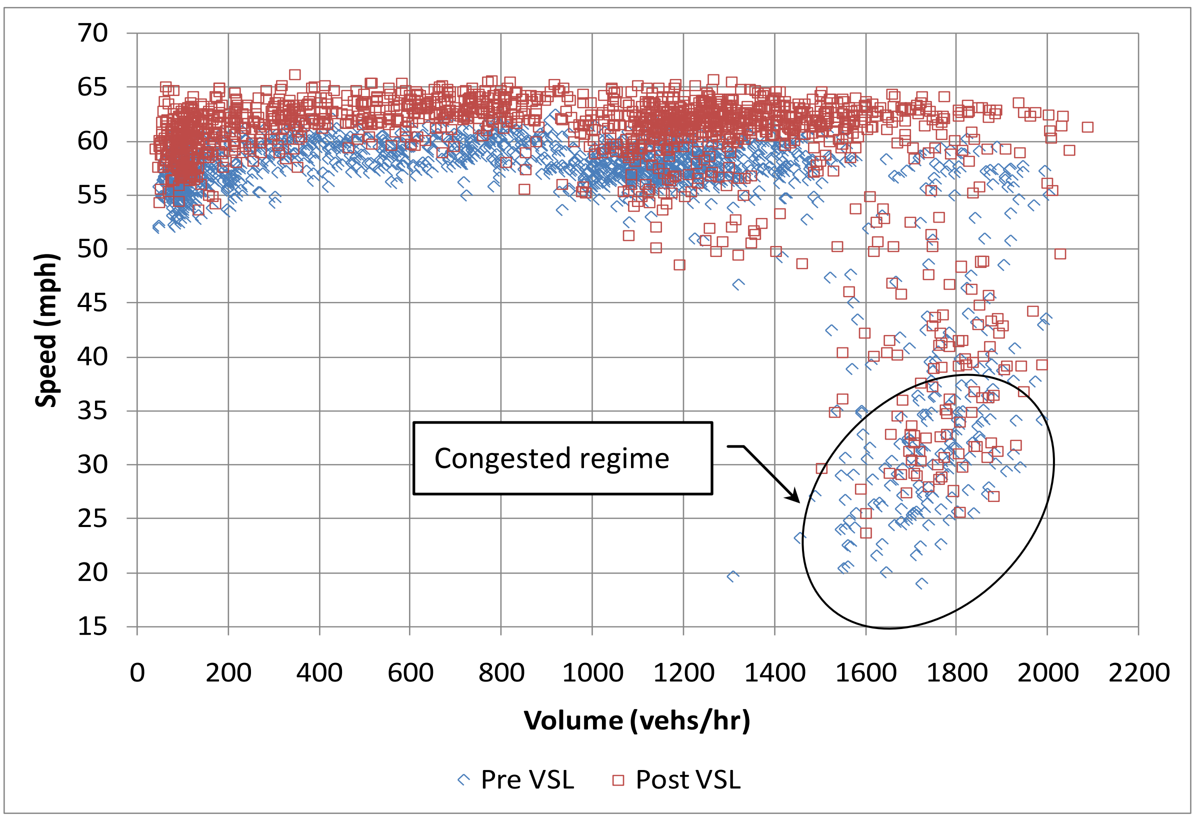


Figure S1.15.1 Speed-Flow Plot at 11D

Figure S1.15.1 presents the speed-flow plot at 11D (logmile 11) and it can be stated that the VSL system initiation propagated the traffic delaying the highway from reaching capacity. Although data indicates benefits of the VSL system, the efficiency of the system can be further improved by possibly preventing traffic from breaking down. This can be achieved by metering the traffic upstream in near real time and preventing the highway from reaching capacity.

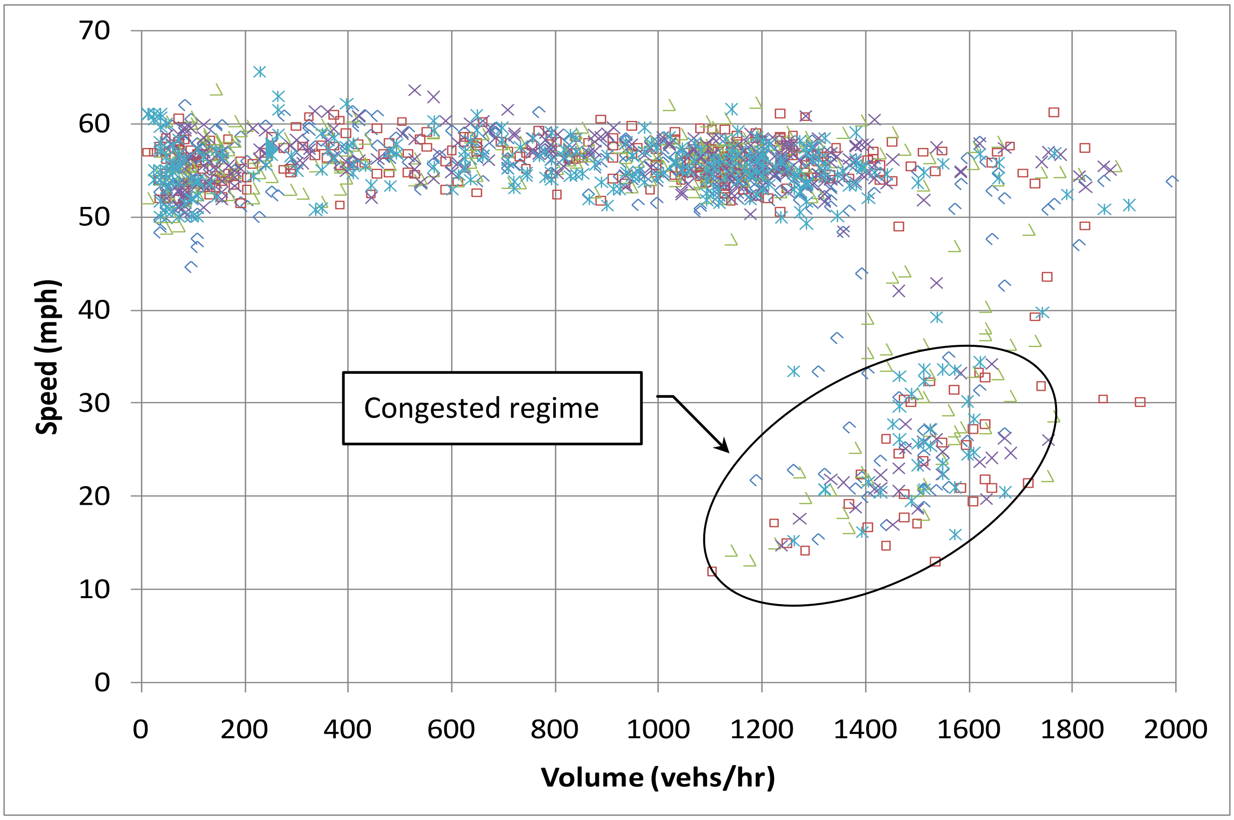


Figure S1.15.2. Speed-Flow for five days on Lane 2 at detector milepost 11 (Pre-VSL)

Evaluation of this task was also performed for lane 2. Results from lane 2 evaluation indicated that results from evaluation of average traffic data presented higher improvement. Figures S1.15.2 and S1.15.3 present the speed flow data for five days at detector 11D (logmile 11) for pre- and post-VSL conditions. Comparing figure S1.15.1 and S1.15.2 it can be noted that pre-VSL conditions has more data points on the congested regime but highest flow in pre-VSL was lower than in post-VSL. Also, speed transition (Figure S1.15.3) can be noticed from post-VSL speed flow plot. It can be stated regarding the figure that reduction in congestion in post-VSL condition was due to transition of data points. Therefore, it can be stated that VSL system reduced congestion and highway capacity was higher for post-VSL conditions. These results are consistent with the results from the speed-flow curve for average highway speed as traffic propagation in post-VSL conditions increased maximum flow and delayed traffic breakdown.

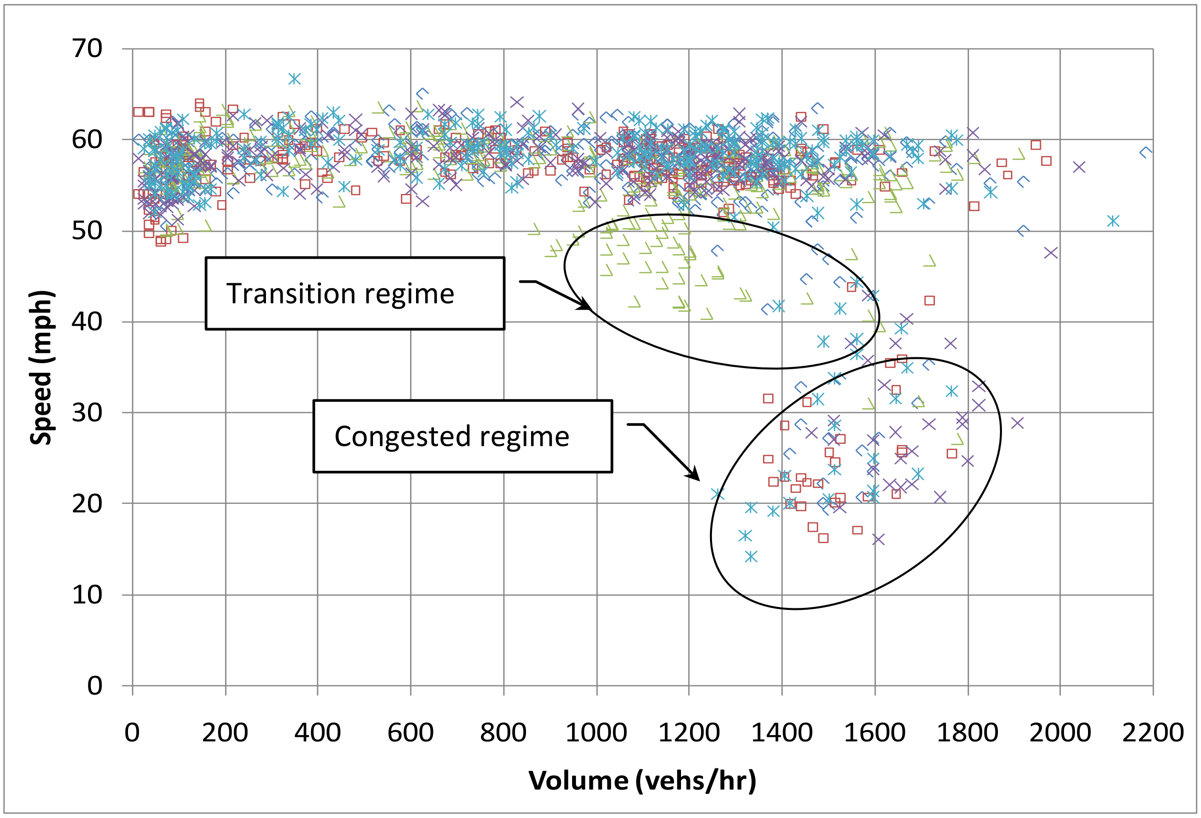


Figure S1.15.3 Speed Flow for five days on Lane 2 at detector milepost 11 (Post-VSL)

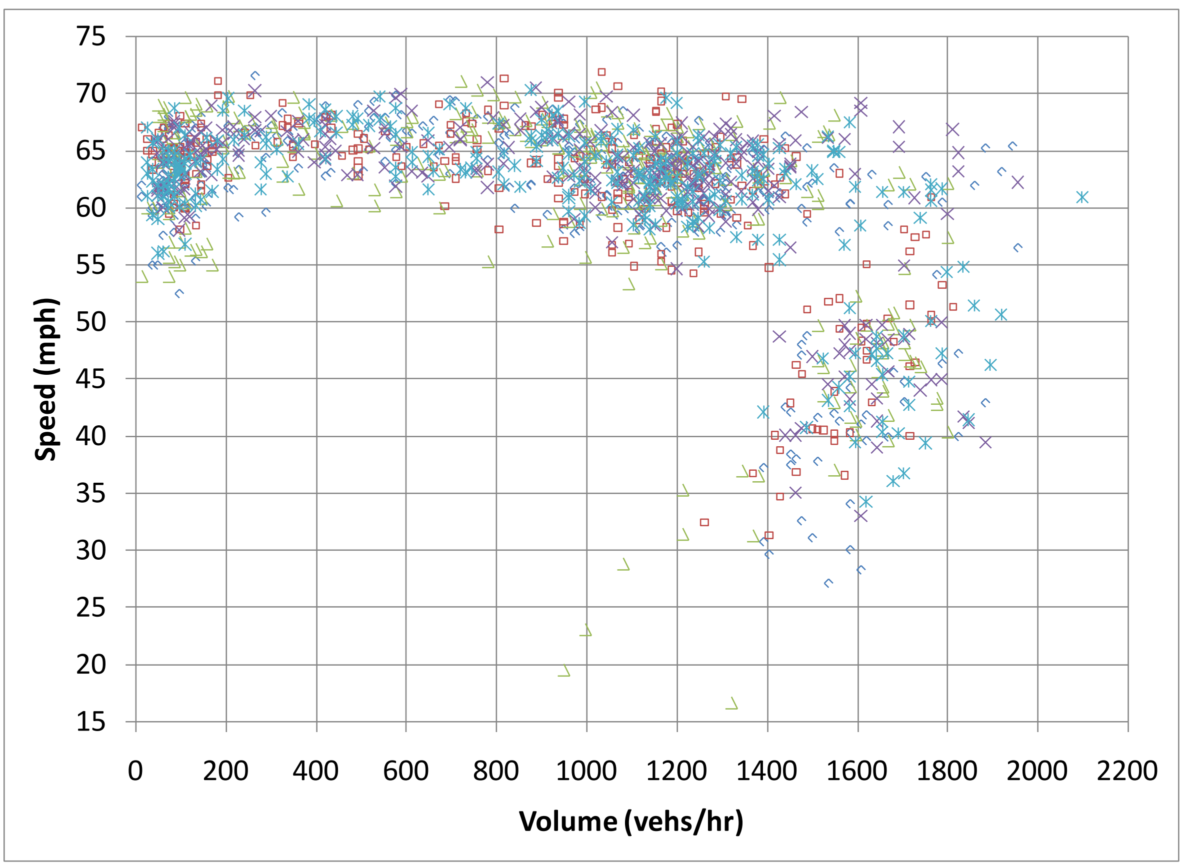


Figure S1.15.4 Speed Flow for five days on Lane 2 at detector milepost 8 (Pre-VSL)

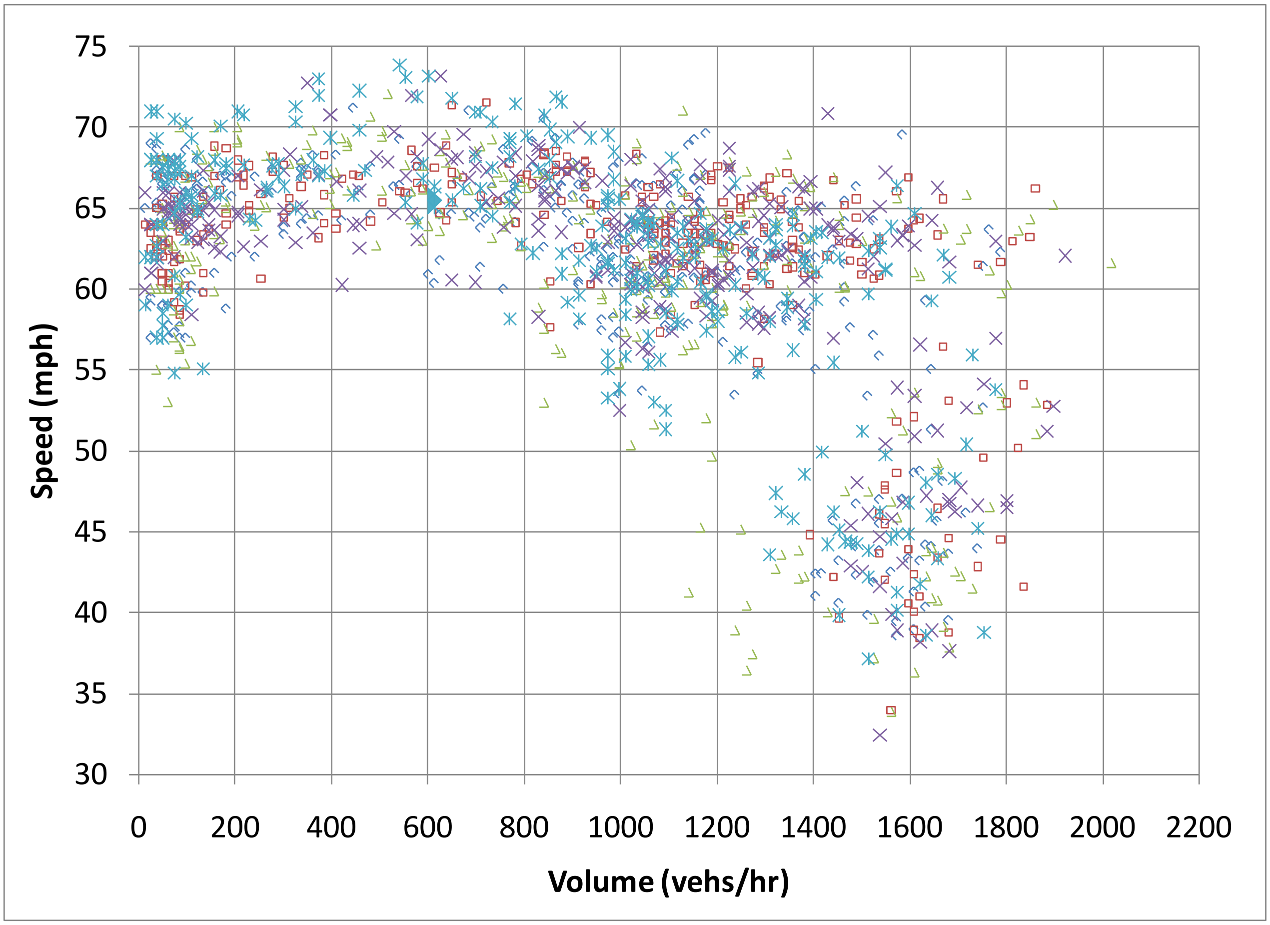


Figure S1.15.5 Speed Flow for five days on Lane 2 at detector milepost 8 (Post-VSL)

Figures S1.15.4 and S1.15.5 present the speed flow data for five days at detector location 8D (logmile 8.5). Similar to the results from detector 11D (logmile 11), comparison of figures indicate traffic propagation in post-VSL conditions indicating consistent results.

Task 1.6: Evaluation of Congestion Measures

To evaluate the congestion measures, travel times, travel time reliability indices, travel delay, Percent of Congested Delay, and extent, duration, and intensity of queues formed were compared for pre- and post-VSL conditions. Segment 1 travel times were computed between detectors 12D (logmile 12.4) and 11D (logmile 11), and 11D (logmile 11) and 8D (logmile 8.5), for five days mentioned in Table S1.1. Travel times were calculated for average of all lanes and average of lane 2 (It had same volume for pre- and post-VSL conditions) for five days and were compared for pre- and post-VSL conditions.

Figures S1.16.1 and S1.16.2 present comparison of average travel times for five days of data for all lanes of the highway between detectors 12D (logmile 12.4) and 11D (logmile 11), and 11D (logmile 11) and 8D (logmile 8.5), respectively. From the figures it can be inferred that for pre-VSL conditions the mean travel time ranged between 65 and 115 person-minutes. For post-VSL conditions, the mean travel time decreased to about 45 and 100 person-minutes. Tables S1.16.1 and S1.16.2 present comparison of average mean and standard deviation of travel times for five days of data for all lanes of the highway between detectors 12D (logmile 12.4) and 11D (logmile 11), and 11D (logmile 11) and 8D (logmile 8.5). It can be observed from the tables that the mean and standard deviation of travel time during peak periods for post-VSL conditions decreased 32 and 16%, and 55 and 25% compared to pre-VSL conditions between detectors 12 and 11 and detectors 11 and 8, respectively. It shows travel times during peak periods decreased significantly after initiation of the VSL system. Also, reduction in standard deviation indicates that VSL system was beneficial as variation in travel times decreased during the peak period.

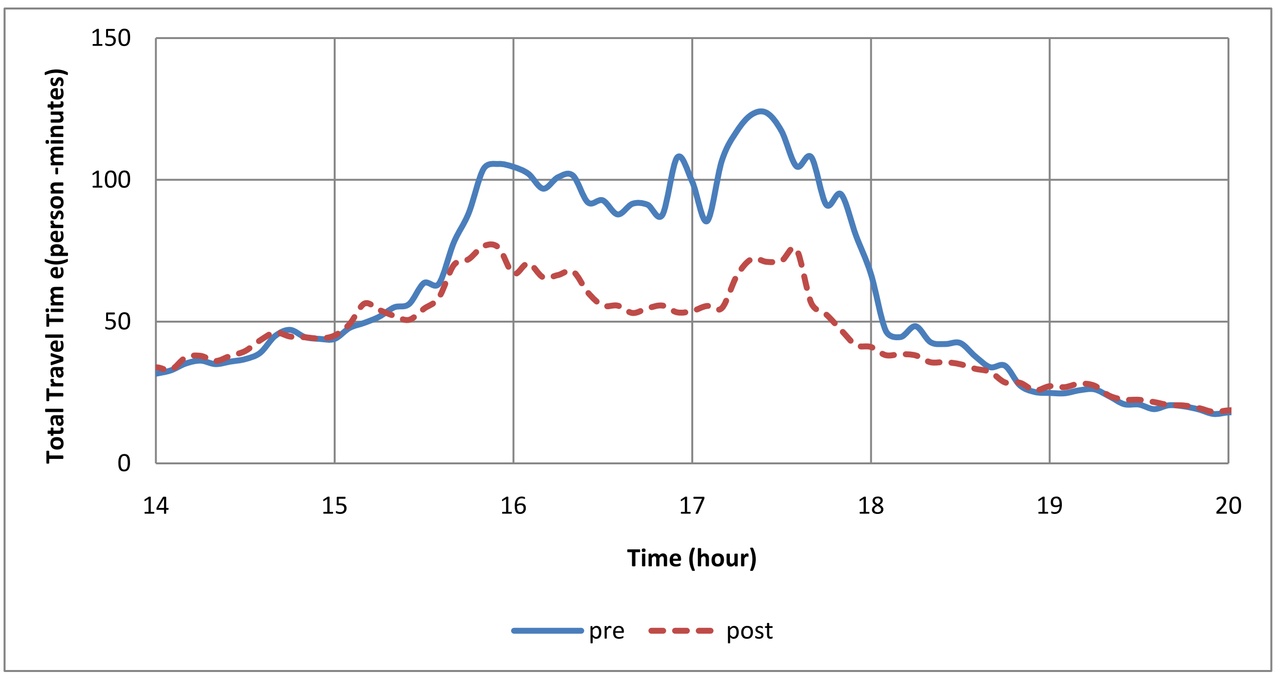


Figure S1.16.1. Comparison of Pre and Post-VSL average travel time data between 12D and 11D (Average of all lanes)

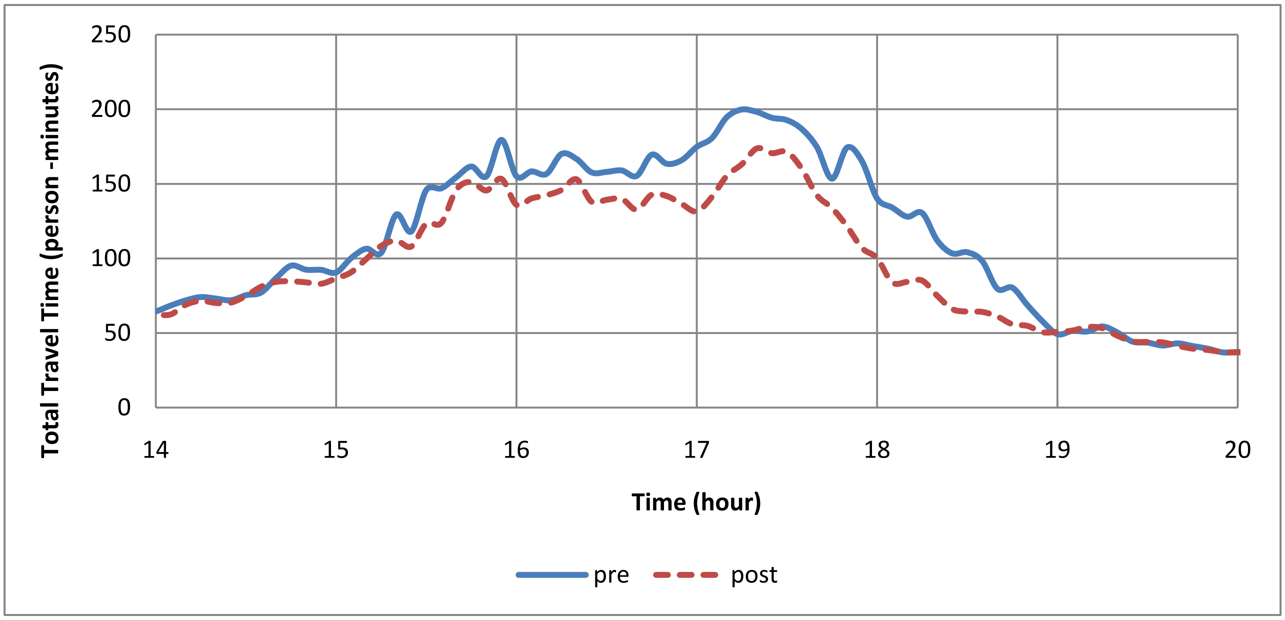


Figure S1.16.2. Comparison of Pre and Post-VSL average travel time data between 11D and 8D (Average of all lanes)

Table S1.16.1 Comparison of mean travel times during peak period for pre- and post VSL (All lanes)

Dates	Between 12D and 11D		Between 11D and 8D	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
24 & 22 October	72.57	45.30	113.81	99.78
25 & 23 October	50.60	36.11	109.09	83.25
30 & 28 October	79.30	53.56	121.98	111.48
7 & 5 November	70.22	45.94	114.06	101.55
8 & 6 November	51.32	40.05	123.34	95.54
Avrg. of five days (person-minutes)	64.80	44.19	116.46	98.23
Difference (person-minutes)	-20.61		-18.23	
Percentage Change	-31.80		-15.65	

Table S1.16.2 Comparison of standard deviation of travel times during peak period for pre- and post VSL (All lanes)

Dates	Between 12D and 11D		Between 11D and 8D	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
24 & 22 October	33.82	10.85	38.98	29.29
25 & 23 October	16.27	5.19	31.25	20.15
30 & 28 October	38.06	19.50	43.06	36.75
7 & 5 November	30.59	16.17	36.39	29.03
8 & 6 November	12.51	9.86	30.82	23.56
Avrg. of five days (person-minutes)	26.52	12.31	36.10	27.76
Difference (person-minutes)	-14.21		-8.34	
Percentage Change	-53.58		-23.10	

Figures S1.16.3 and S1.16.4 present the comparison of travel times computed for average of lane 2 between detectors 12D (logmile 12.4) and 11D (logmile 11), and 11D (logmile 11) and 8D (logmile 8.5), respectively. It can be observed from Figures S1.16.3 and S1.16.4 that for pre-VSL conditions, the mean travel times for peak periods ranged between 90 and 140 person-minutes. For post-VSL conditions, the mean travel times during peak period decreased to about 65 and 120 person-minutes.

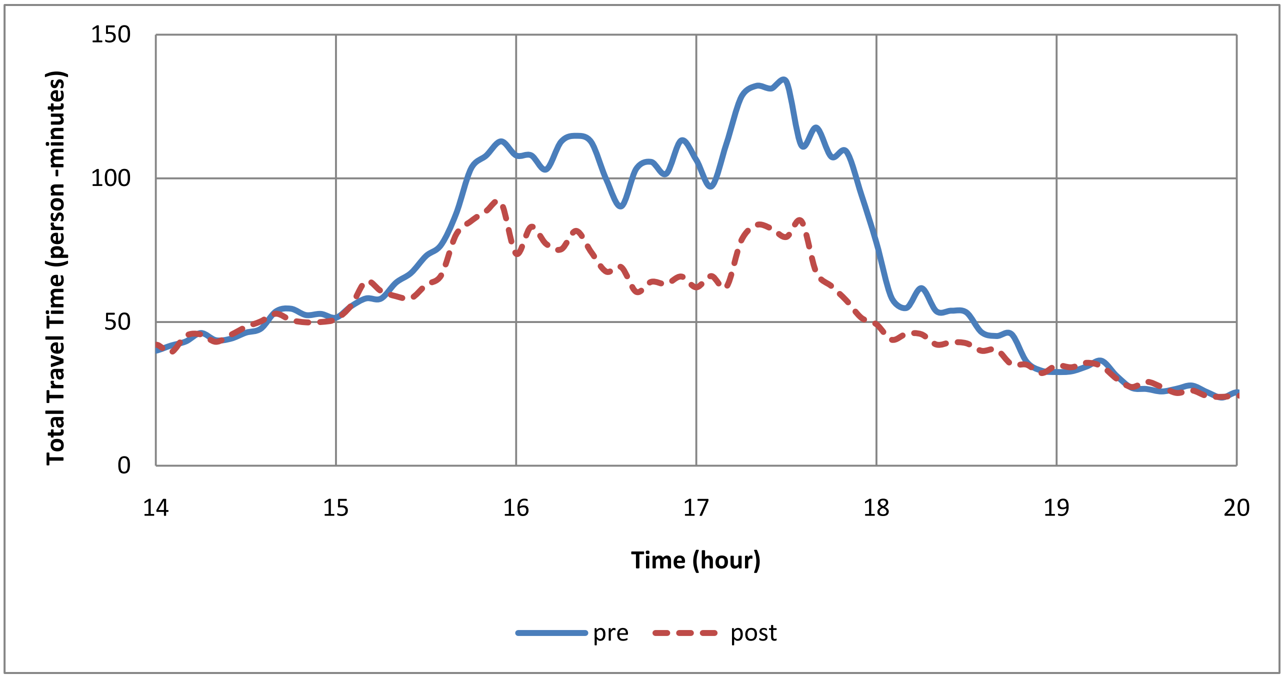


Figure S1.16.3 Comparison of Pre and Post-VSL average travel time data between 12D and 11D (Average of lane 2)

Tables S1.16.3 and S1.16.4 present the comparison of mean and standard deviation of travel times for five day average for lane 2 between detectors 12D (logmile 12.4) and 11D (logmile 11), and detectors 11D (logmile 11) and 8D (logmile 8.5), respectively. It can be observed from the tables that the mean and standard deviation of travel time during peak periods for post-VSL conditions decreased 27 and 14%, and 44 and 19% compared to pre-VSL conditions between detectors 12 and 11, and detectors 11 and 8, respectively. It shows that travel times during peak periods decreased appreciably after initiation of the VSL system. Also, reduction in standard deviation indicates VSL system was beneficial as variation in travel times decreased during the peak periods.

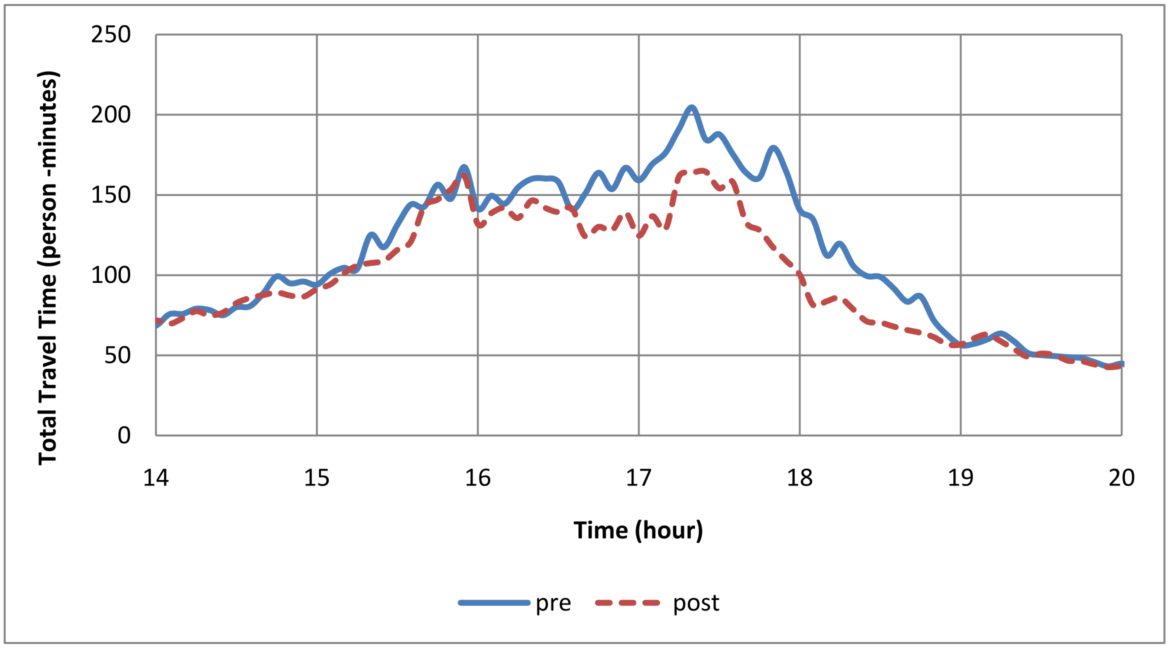


Figure S1.16.4 Comparison of Pre and Post-VSL average travel time data between 11D and 8D (Average of lane 2)

Table S1.16.3 Comparison of mean travel times during peak period for pre- and post VSL (Lane 2)

Dates	Between 12D and 11D		Between 11D and 8D	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
24 & 22 October	95.1	67.92	136.55	128.14
25 & 23 October	72.07	52.14	136.17	102.36
30 & 28 October	104.24	75.73	145.87	134.93
7 & 5 November	94.63	67.97	139.43	123.82
8 & 6 November	72.51	58.45	143.92	114.33
Avrg. of five days (person-minutes)	87.71	64.44	140.39	120.72
Difference (person-minutes)	-23.27		-19.67	
Percentage Change	-26.53		-14.01	

Table S1.16.4 Comparison of standard deviation of travel times during peak period for pre- and post VSL (Lane 2)

Dates	Between 12D and 11D		Between 11D and 8D	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
24 & 22 October	41.18	19.19	43.12	39.65
25 & 23 October	21.98	7.47	40.78	19.29
30 & 28 October	45.30	26.78	48.39	41.49
7 & 5 November	37.17	23.10	41.47	35.28
8 & 6 November	18.30	12.41	28.11	28.72
Avrg. of five days (person-minutes)	32.78	18.39	40.37	32.88
Difference (person-minutes)	-14.39		-7.49	
Percentage Change	-43.90		-18.55	

Individual Measures

The individual measures of travel time reliability, TTI, BTI, and PTI were compared with five days of data for the peak periods for pre- and post-VSL conditions. Table S1.16.5 presents the comparison of average of individual measures, TTI, BTI, and PTI for five days for average of all lanes between detectors 12 and 11, and detectors 11 and 8. It can be observed from Table S1.16.5 that for post-VSL conditions, TTI, BTI, and PTI decreased about 35 and 15%, 30 and 15%, and 40 and 20% for average of all lanes between detector 12 and 11 and detector 11 and 8, respectively.

Table S1.16.5. Comparison of average of travel times reliability factors for pre- and post-VSL (Average of all lanes)

Individual Measures	Between 12D and 11D		Between 11D and 8D	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
Travel Time (TTI)	1.89	1.26	1.78	1.51
Difference (Percentage Change)	-0.63(-33.3)		-0.27(-15.2)	
Buffer Time Index (BTI)	0.77	0.53	0.66	0.57
Difference (Percentage Change)	-0.24(-31.2)		-0.09(-13.6)	
Planning Time Index (PTI)	3.39	1.96	3.01	2.39
Difference (Percentage Change)	-1.43(-42.2)		-0.62(-20.6)	

Table S1.16.6 presents the comparison of average of individual measures for five days of data for average of lane 2 between detectors 12D (logmile 12.4) and 11D (logmile 11), and detectors 11D (logmile 11) and 8D (logmile 8.5). It can be observed from Table S1.16.5 that for post-VSL conditions TTI, BTI, and PTI decreased about 30 and 15%, 20 and 10%, and 35 and 20% for average of lane 2 computed between detectors 12D (logmile 12.4) and 11D (logmile 11), and detectors 11D (logmile 11) and 8D (logmile 8.5), respectively. Comparison between results of lane 2 and all lanes showed reduction travel time reliability indices for all lanes is slightly more than lane 2.

Table S1.16.6. Comparison of travel times reliability factors for pre- and post-VSL (Average of lane 2)

Individual Measures	Between 12D and 11D		Between 11Dand 8D	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
Travel Time (TTI)	1.94	1.37	1.70	1.42
Difference (Percentage Change)	-0.57(-29.4)		-0.28(-16.4)	
Buffer Time Index (BTI)	0.69	0.55	0.56	0.51
Difference (Percentage Change)	-0.14(-20.3)		-0.05(-8.9)	
Planning Time Index (PTI)	3.30	2.13	2.66	2.14
Difference (Percentage Change)	-1.17(-35.5)		-0.52(-19.5)	

Reduction in TTI shows decrease in ratio between the actual travel rate and the Posted Speed Limit (PSL) travel rate, which indicates that the VSL system was useful in decreasing the difference between the peak period and the PSL travel conditions. This indicates that travel times for peak periods and PSL are closer to each other in post-VSL conditions. Reduction in BTI indicates the difference between 95% travel time and average travel time, and the decrease showed that the VSL system was beneficial in reducing the difference between the 95% travel time and average travel time. Reduction in PTI indicates ratio between 95% travel time and PSL travel time, and the decrease shows that the VSL system was useful in decreasing the difference between 95% and PSL travel time.

Overall results for segment 1 show all travel time reliability indices (TTI, BTI, and PTI) decreased. Reduction in all travel time reliability indices for post-VSL conditions indicates less variability and more consistency between highest value of travel time during the peak period (worst condition) and PSL condition. It can be concluded that post-VSL conditions was more reliable than pre-VSL conditions and there is benefit after VSL system initiation.

Additionally, individual measures, TTI, BTI, and PTI, were calculated for each lane separately for five days; thereafter their averages for each lane and average of all lanes were computed. Figure S1.16.5 indicates the comparison of average TTI for five days for average of each lane separately and also average of all lanes between detectors 12D (logmile 12.4) and 11D (logmile 11). It can be inferred from Figure S1.16.5 that the value of TTI reduced (increase reliability) after VSL system installation for all lanes. Therefore, it can be stated that VSL system installation has been beneficial for reducing TTI.

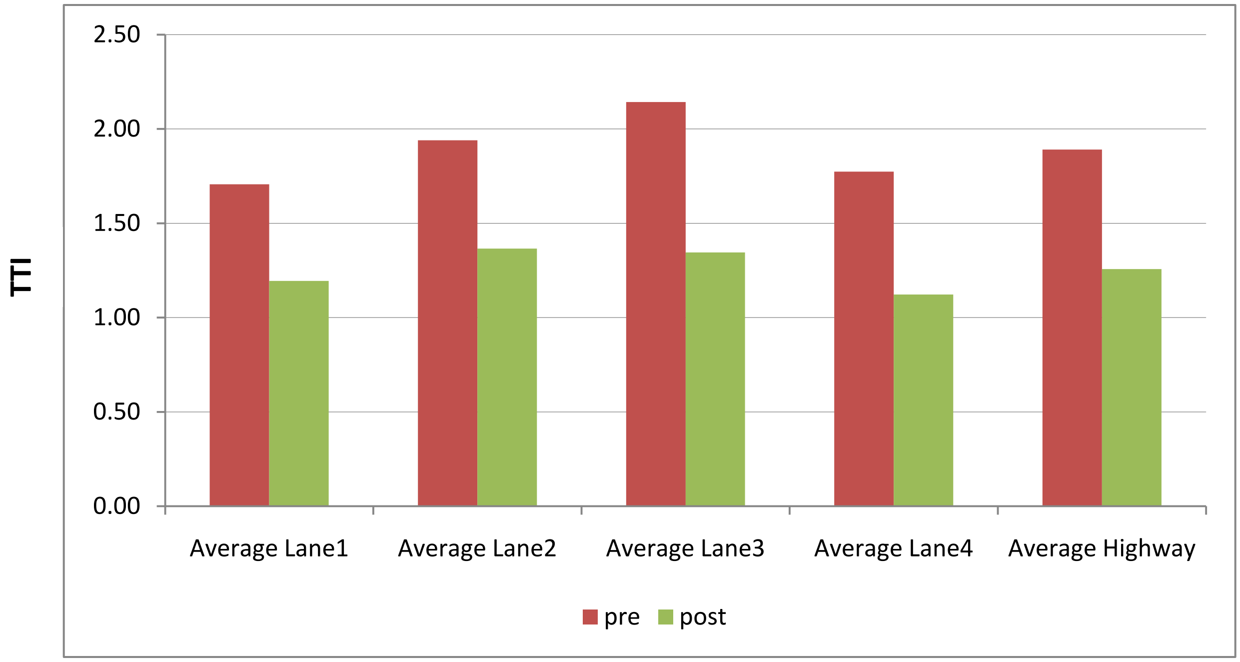


Figure S1.16.5. Comparison of Pre and Post-VSL conditions Travel Time Index (TTI) between 12D and 11D

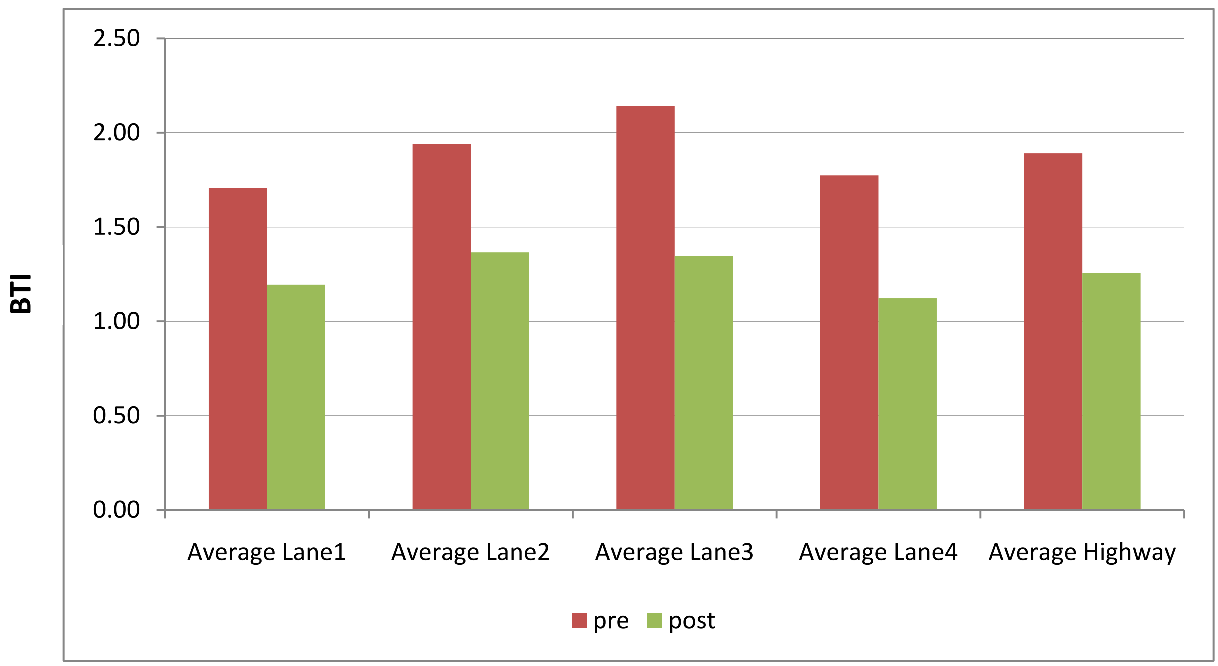


Figure S1.16.6. Comparison of Pre and Post-VSL conditions Buffer Time Index (BTI) between 12D and 11D

Figure S1.16.6 presents the comparison of average of BTI for five days for average of each lane and also average of all lanes between detectors 12D (logmile 12.4) and 11D (logmile 11). It can be noted from Figure S1.16.6 that BTI decreased (increase reliability) after VSL system installation for all lanes. It can be stated that the VSL system installation is beneficial in decreasing BTI.

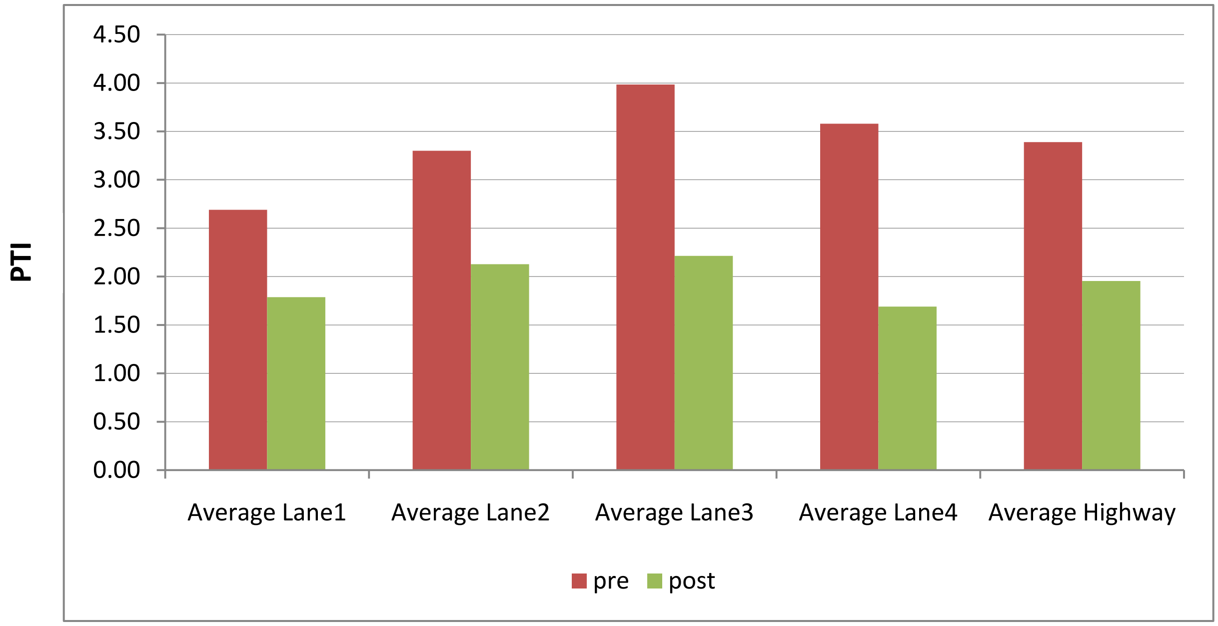


Figure S1.16.7 Comparison of Pre and Post-VSL conditions Planning Time Index (PTI) between 12D and 11D

Figure S1.16.7 shows the comparison of average of PTI for five days for average of each lane and average of all lanes between detectors 12D (logmile 12.4) and 11D (logmile 11). It can be stated from Figure S1.16.7 that PTI has reduced (increase reliability) after VSL system installation for all lanes. It can be inferred that the VSL system installation has been beneficial for reducing PTI. Figures S1.16.5, S1.16.6 and S1.16.7 show that reduction of the indices in all lanes is not similar, but decrease in average of all lanes is very similar to lane 2.

<u>Traffic Delay</u>

For segment 1, the analysis indicates that average Delay calculated for post-VSL system was much lower compared to the pre-VSL system. This reduction in delay, presented in Figure S1.16.8 and Table S1.16.7 was approximately 2.4 minutes for the five days of data used. Similarly, Percentage of Congested Travel reduced by nearly 18 percent for post-VSL conditions. Results indicate decrease in Delay and Percentage of Congested Travel in post-VSL conditions. It can be observed from the results that the VSL system decreased traffic delays which translate into user cost savings. Table S1.16.7 indicates the reduction in average Percentage of Congested Travel and average Delay during peak periods. The next subsection, quantifies the delay as user cost savings.

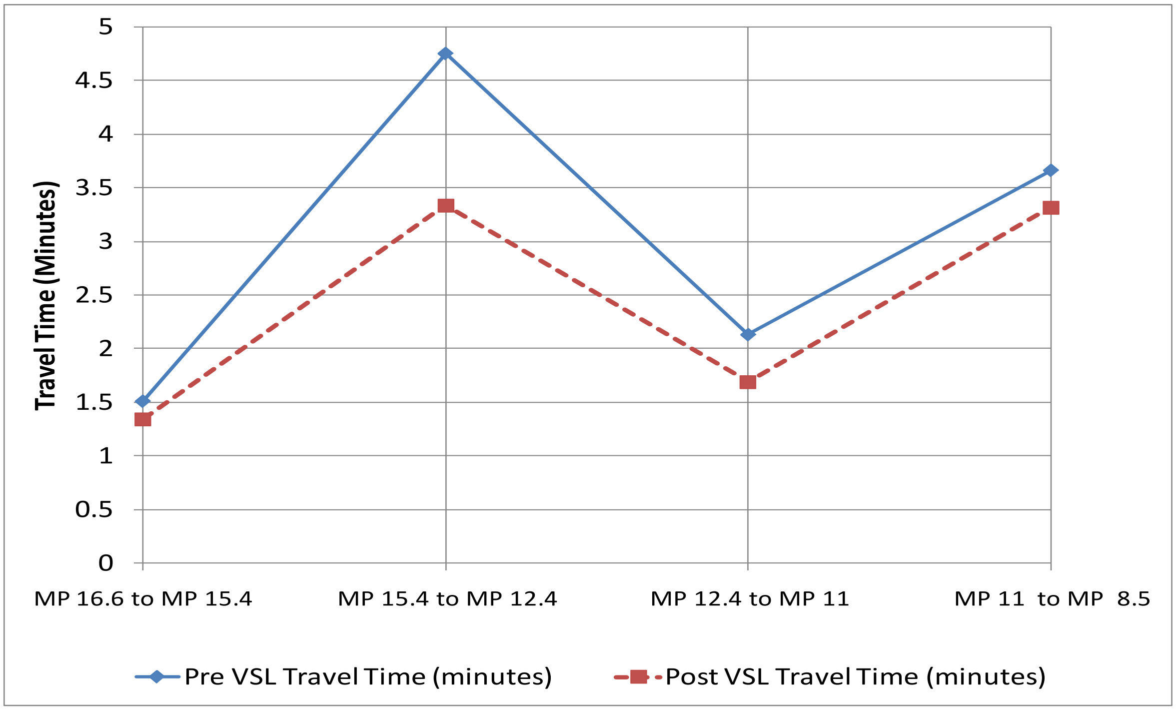


Figure S1.16.8 Comparison of Travel Time for Pre- and Post-VSL condition for Segment 1 for Five days

Table S1.16.7. Average Delay and Change in Percentage of Congested Travel during peak periods before and after VSL system installation

Detector ID	MP 16.6 to 15.4	MP 15.4 to 12.4	MP 12.4 to 11	MP 11 to 8.5	Travel time
	Pre (24th Oct 07) and Post (22nd Oct 08)				
Pre VSL Travel Time (minutes)	1.61	4.80	2.05	3.26	11.72
Post VSL Travel Time (minutes)	1.37	3.05	1.72	3.19	9.33
Delay (minutes)*	-0.23	-1.75	-0.33	-0.07	-2.38
Percent Change in Congested Travel*	-14%	-36%	-16%	-2%	
	Pre (25th Oct 07) and Post (23rd Oct 08)				
Pre VSL Travel Time (minutes)	2.00	6.20	2.20	4.85	15.25
Post VSL Travel Time (minutes)	1.29	4.03	1.51	3.26	10.09
Delay (minutes)	-0.71	-2.17	-0.70	-1.60	-5.18
Percent Change in Congested Travel	-35%	-35%	-32%	-33%	
	Pre (30th Oct 07) and Post (28th Oct 08)				
Pre VSL Travel Time (minutes)	1.44	5.04	2.21	3.49	12.18
Post VSL Travel Time (minutes)	1.46	3.32	1.90	3.25	9.93
Delay (minutes)	0.02	-1.72	-0.32	-0.24	-2.26
Percent Change in Congested Travel	1%	-34%	-14%	-7%	
	Pre (7th Nov 07) and Post (5th Nov 08)				
Pre VSL Travel Time (minutes)	1.34	4.62	2.16	3.22	11.34
Post VSL Travel Time (minutes)	1.46	3.23	1.73	3.44	9.86
Delay (minutes)	0.11	-1.39	-0.43	0.22	-1.49
Percent Change in Congested Travel	9%	-30%	-20%	7%	
	Pre (8th Nov 07) and Post (6th Nov 08)				
Pre VSL Travel Time (minutes)	1.17	3.12	2.04	3.49	9.82
Post VSL Travel Time (minutes)	1.14	3.06	1.59	3.45	9.24
Delay (minutes)	-0.03	-0.07	-0.45	-0.04	-0.59
Percent Change in Congested Travel	-2%	-2%	-22%	-1%	

*Negative value indicates decrease in Post-VSL congestion measures and vice versa.

From Table S1.16.7 it can be noticed that congestion reduced significantly along detectors 15.4D to 11D (logmile 11). Upstream of 15.4D, average speeds were between 55-60 mph in both conditions, hence change observed was low. Along 15.4D to 12.4D and 12.4D to 11D (logmile 11), significant improvement in average speeds and reduction in congestion were observed. Downstream of 11D (logmile 11) and towards detector 8.5D, improvement in average speeds and congestion was low. VSL system meters traffic upstream, which improves traffic flow along the segment, however, at detector 8.5D traffic broke down. Hence, to reduce congestion at 8.5D, it is recommended to initiate the system more aggressively upstream.

Delay Cost Analysis

The average annual vehicle cost savings as a result of post-VSL system benefits are presented in Table S1.16.8. The analysis was carried out for peak periods determined from Task 2.2 (1500 hours to 1830 hours). The average vehicle cost was calculated to be $24.82/hr and used in delay cost analysis.

Table S1.16.8. Delay Cost savings due to VSL system installation average for five days

Locations I-270 SB	Difference in Delay (people-min)	Average Daily User Cost *	Average Annual User Cost for 250 Workdays
MP 16.6 to MP 15.4	187.6226	77.61323	$19,403.31
MP 15.4 to MP 12.4	1888.238	781.1012	$195,275.30
MP 12.4 to MP 11	199.8591	82.67505	$20,668.76
MP 11 to MP 8.5	510.9177	211.3496	$52,837.40
Total			**∑ $288,184.77**

* based on average user cost of $24.82/hr

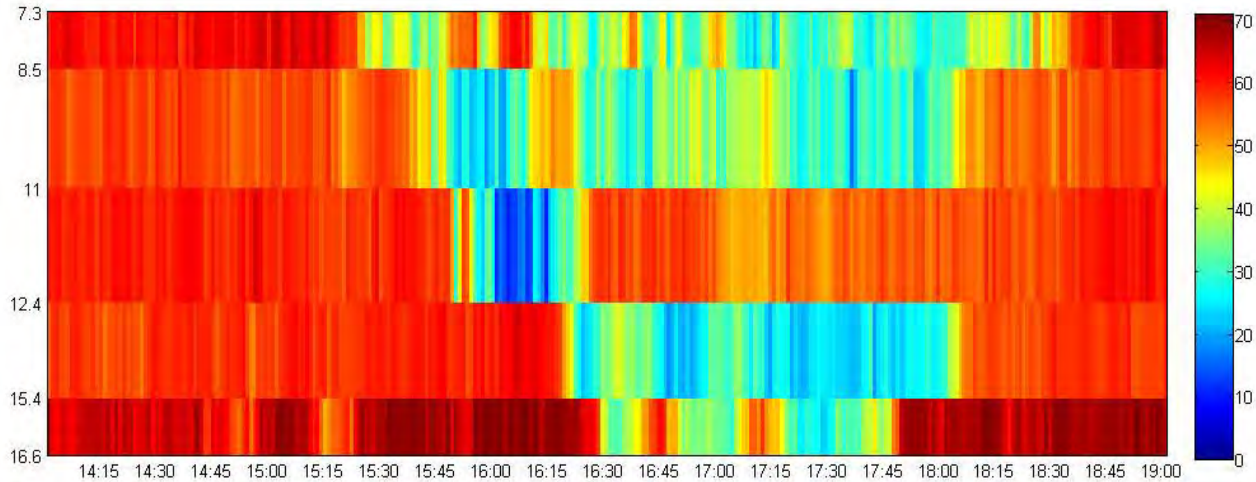
Table S1.16.8 presents the cost savings as a result of reduced delay due to post-VSL conditions from the delay calculated for five days presented in Table S1.1. The average cost savings represent 250 work days during peak periods. The cost saving varies depending on the length of the segment as it can be noticed that the segment between MP15.4 and MP12.4 had the highest savings with a length of three miles. This is due to improved average speed for post-VSL conditions which allows travel time savings. The total average annual user cost saved for this segment was calculated to be $288,185. This indicates benefits of the VSL system installation for segment 1.

Queue Measurement

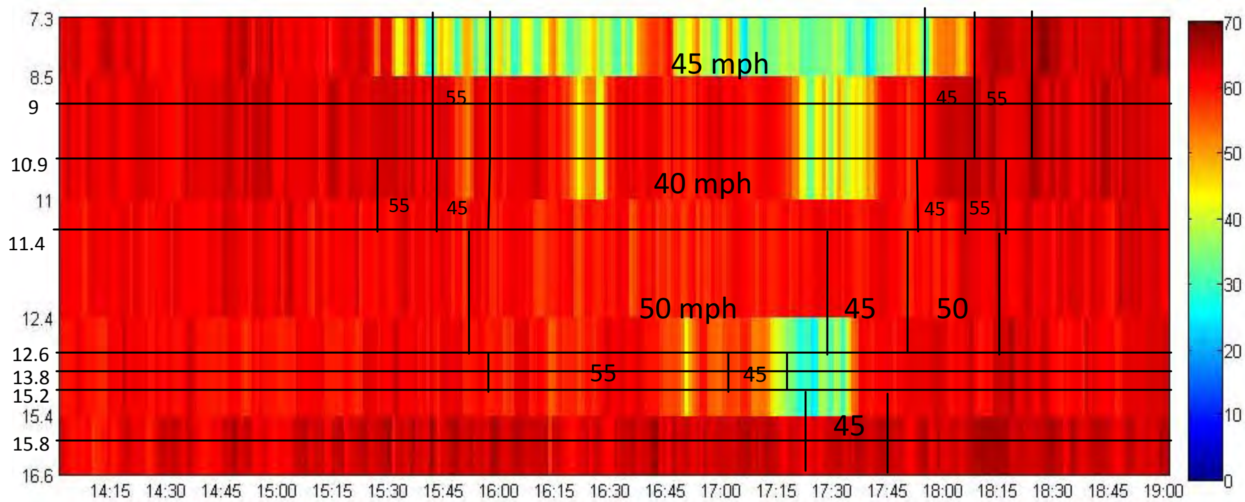
The objective of this subtask was to compare the queue duration, extent and intensity of the segment. This task takes into account the entire highway segment of 8.1 miles from detectors at milepost 16.6D to 8.5D. The time-space plots, presented in Figures S1.16.9 and S1.16.10 compared two different dates for pre- and post-VSL conditions. The results present the average speed at 1-minute time intervals along the highway detectors. Time interval of 1-minute was chosen to obtain accurate results. Mile markers for detectors are presented on the y-axis. The interval indicates the distance between two adjacent detectors and the average speed (in mph) indicates the speed aggregated for 1-minute at the previous detector while travelling downstream. The legend indicates the different colors which represent different values of speed on the segment. As a result, the x-axis indicates the queue duration and y-axis indicates the extent (length) of the queue. The queue intensity or congestion can be qualitatively observed by the difference in the shades of color, which represent values of speed (in mph). The darker blue shade indicates higher intensity in congestion as a result of the queue. Further, time-space plots for lane 2 are presented to compare the results from average data with lane 2 to estimate the difference in change after post-VSL initiation. Lane 2 was evaluated to remove the effects of lane 4 and 5 which had relatively much higher speeds (see Figure S1.16.11) and provide false impression of higher average speed on the highway.

From Figure S1.16.9 the duration, extent and intensity of congestion can be quantified. Additionally, the figure presents the VSL superimposed on the time-space plot. Y-axis indicates the locations of the VSL signs and x-axis can be used to observe the time of change in speed limit. During post-VSL, the duration of congestion reduced appreciably upstream of detector at logmile 8.5. For detectors between logmile 11 and 8.5, the duration of congested state of traffic was reduced approximately from 110 minutes (pre-VSL, 16:00-17:50) to 25 minutes (post–VSL, 17:30-17:55). Similarly, for logmiles from 8.5 to 7.3, the duration reduced by 45 minutes (pre-VSL, 15:40-18:40) and (post-VSL, 15:45-18:00) which indicates improvement in the state of traffic.

Queue extent (length) decreased from 9.3 miles (logmile 16.6 to 7.3) for pre-VSL to 3.3 miles (logmile 11 to 7.3) for post-VSL conditions in Figure S1.16.9. For pre-VSL conditions, Figure 2 (a) clearly indicates the propagation of congestion upstream as average speeds are lower, starting from detector at logmile 7.3 to 16.6 over time. The pre-VSL conditions indicate that congestion started around 15:30 between logmiles 8.5 to 7.3 and propagated upstream to logmile 11 by 15:50, and further to logmile 12.4 by 16:05. This trend continued upstream and reached logmile 15.4 around 16:20 and further to logmile 16.6 by 16:30. In contrast, for post-VSL conditions it was found that the extent of congestion was considerably shorter. Lower speeds were observed at 15:45 between logmiles 8.5 and 7.3 but congestion did not propagate upstream till 16:15, and the recovery was short. Lower speeds were observed second time (still higher compared to pre-VSL conditions) between 17:30 to 17:55. No congestion was observed between logmiles 11 and 12.4, however between logmiles 15.4 and 12.4, congestion was observed for 25 minutes. No congestion was observed upstream of logmile 15.4. Comparing the two plots significant reduction in congestion was observed for post-VSL conditions.



a) Pre-VSL data (25th Oct 07)

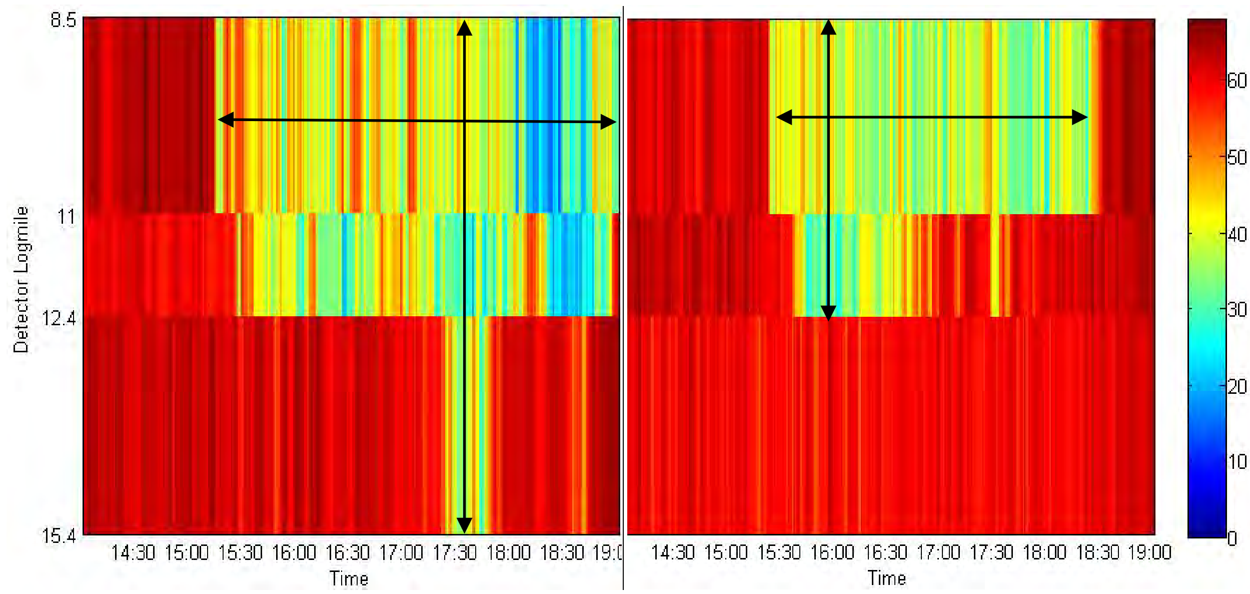


b). Post-VSL data (23rd Oct 08)

Figure S1.16.9 Time space plot for Segment 1

In terms of intensity of congestion in Figure S1.16.9, the pre-VSL condition also indicated lower values of speed compared to post-VSL conditions. The post-VSL plot show fewer yellow and blue patches. Additionally, no dark blue patches can be observed. Hence, congestion intensity reduced considerably in post-VSL conditions.

Figure S1.16.10 presents the time space plot for November 8th, 07 in pre- and November 6th, 08 in post-VSL conditions. Similar to Figure S1.16.9, Figure S1.16.10 also indicates significant reduction in duration, extent and intensity of queue over the segment. The duration reduced by 60 minutes and extent by three miles. Similarly, the intensity of congestion reduced during post-VSL conditions.

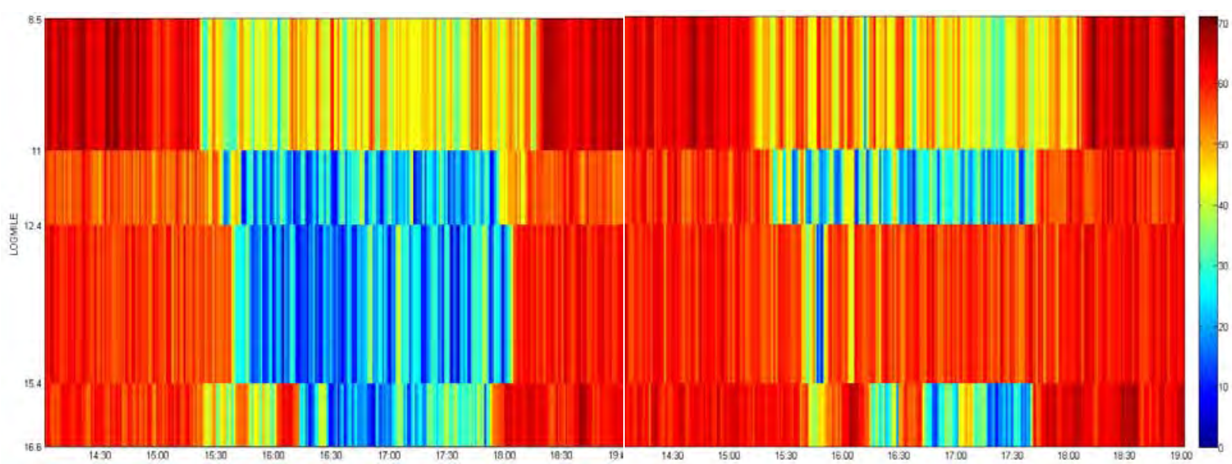


Pre-VSL data (8th Nov, 07) **Post-VSL data (6th Nov, 08)**

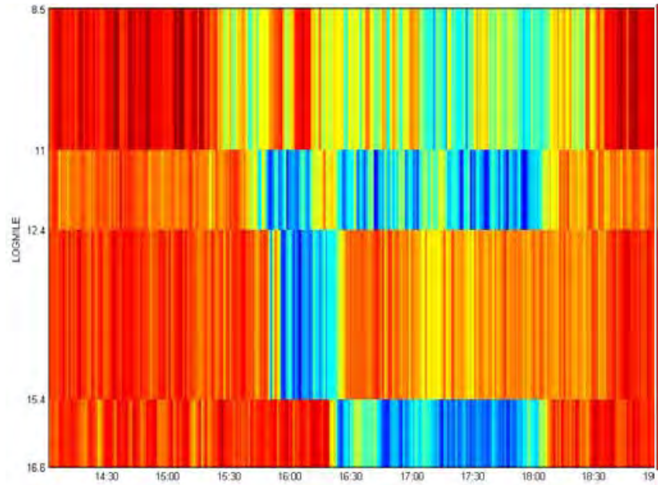
Figure S1.16.10. Time space plot for Segment 1

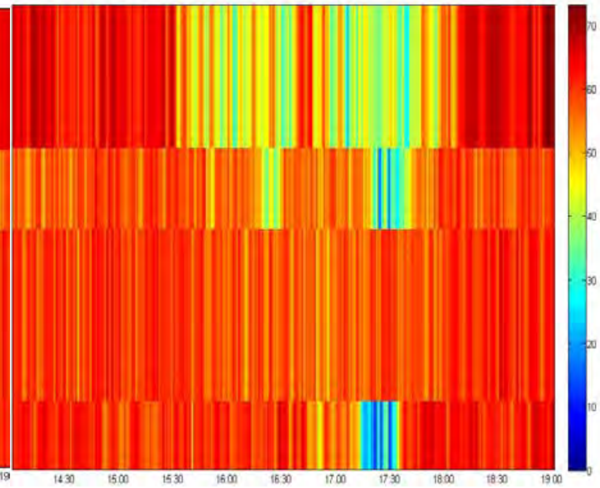
From Figures S1.16.9 and S1.16.10 for October 23rd and November 6th, 2008, it can be noticed that the average speeds improved and the duration of peak period reduced during post-VSL conditions. It is, therefore, evident that the VSL system initiation improved traffic conditions.

Further, lane 2 was evaluated for the same task and Figure (S1.16.11) presents the time-space plots for five different days in pre- and post-VSL conditions.

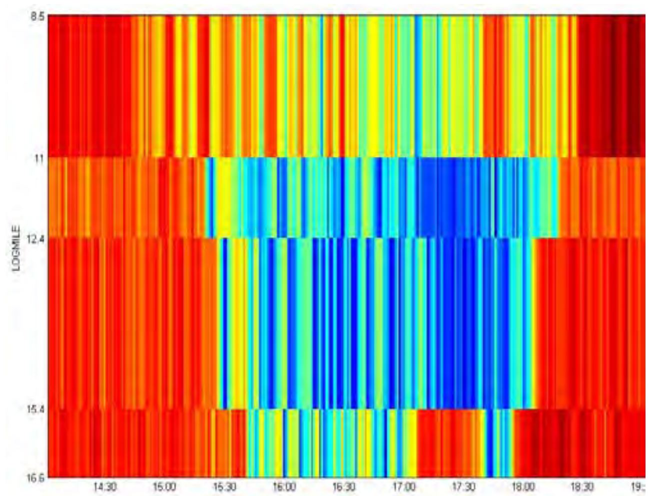


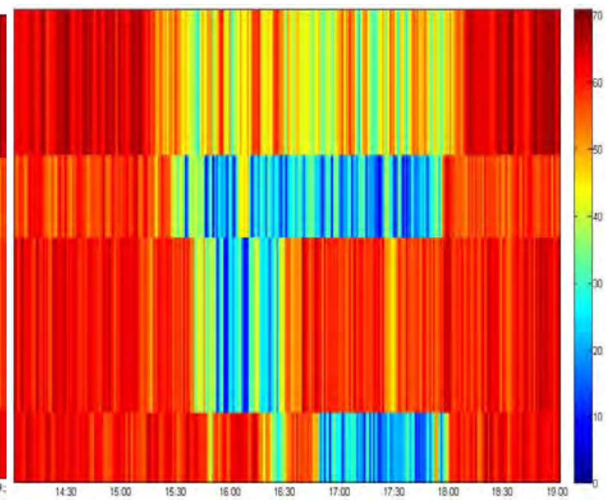
a). Pre-VSL data (24th Oct 07) **Post-VSL data (22rd Oct 08)**



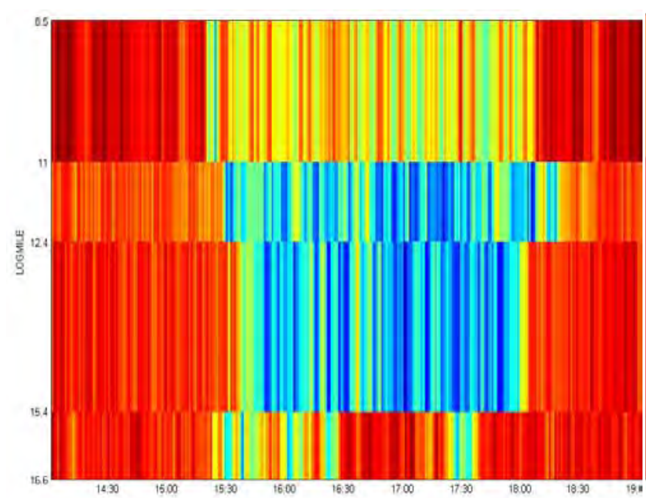


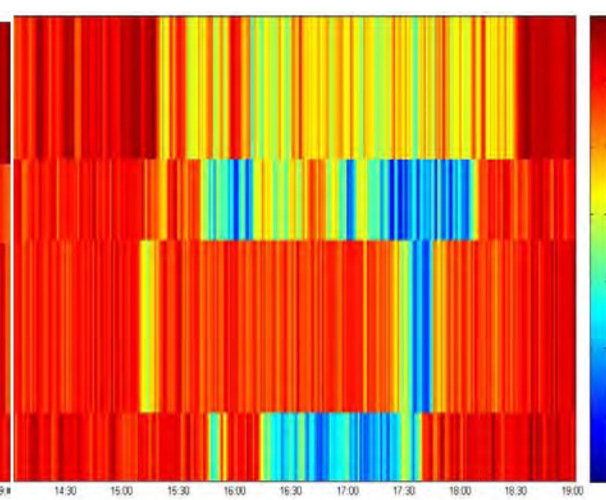
b). Pre-VSL data (25th Oct 07) **Post-VSL data (23rd Oct 08)**



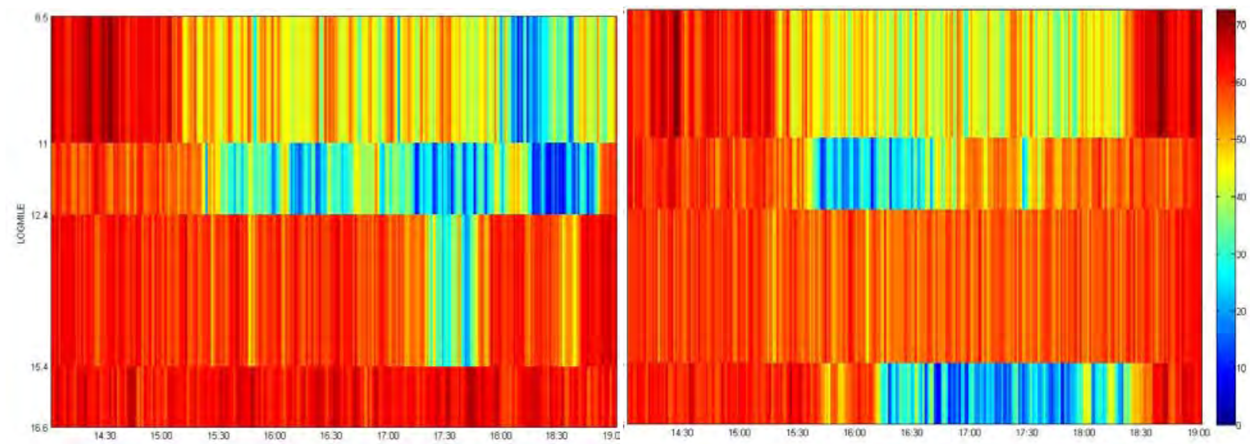


c). Pre-VSL data (30th Oct 07) **Post-VSL data (28rd Oct 08)**





d). Pre-VSL data (7th Nov, 07) **Post-VSL data (5th Nov, 08)**



e). Pre-VSL data (8th Nov, 07) Post-VSL data (6th Nov, 08)

Figure S1.16.11. Time space plot for Segment 1 (Lane 2)

Comparing the pre- and post-VSL figures above, it can be inferred that congestion duration reduced considerably. Also consistent with the results from average speed evaluation, figures indicate traffic propagation along the highway and decrease in queue intensity as well as improved speeds. Comparing the plots in Figure S1.16.11 (a), it can be noticed that the duration reduced approximately from 110 minutes to 35 minutes, and the queue extent decreased from 5.6 miles (Mileposts 16.6 to 11) to 1.4 miles (Mileposts 12.4 to 11). In pre-VSL condition, the queue extent can be observed throughout the segment. Hence, duration and extent of queue was reduced for post-VSL conditions. Additionally, the intensity can be observed from the speed spectrum. The dark blue patches during the pre-VSL condition indicate low values of speed which improved during post-VSL conditions. The yellow patches present the speed between 40-50 mph which indicates traffic between congested and un-congested states. The plots indicate the upstream propagation of congestion starting from detector 8.5D to 16.6D over time. For post-VSL conditions, congested dark blue patches changed to yellow un-congested state. Hence, congestion intensity reduced considerably in post-VSL conditions. Similar improvements can be observed for other days presented in Figures S1.16.11 (b) to (e).

Task 1.7: Analysis of VSL System during Inclement Weather

Data analysis was also carried out to evaluate the VSL system during inclement weather conditions. Similar to clear weather conditions, inclement weather data for volume and average speed were used for comparison of pre- and post-VSL. Three days from post-VSL conditions and two from pre-VSL conditions were chosen for data analysis. Table S1.17.1 presents these dates, the state of the system and the weather conditions. These days indicate weather conditions during the entire day. The figures that follow depict the speed and volume profile plots for detectors along the highway for December 16th, 2008 during post-VSL conditions.

Table S1.17.1. Days with inclement weather conditions selected for VSL system evaluation

Dates	VSL Conditions	Weather Conditions*
February 5th 2008	Pre-VSL	Rain
February 26th 2008	Pre-VSL	Snow
December 16th 2008	**Post-VSL**	**Snow**
December 27th 2008	Post-VSL	Rain
April 19th 2009	Post-VSL	Rain

* http://www.crh.noaa.gov/lsx/hrlywx.php

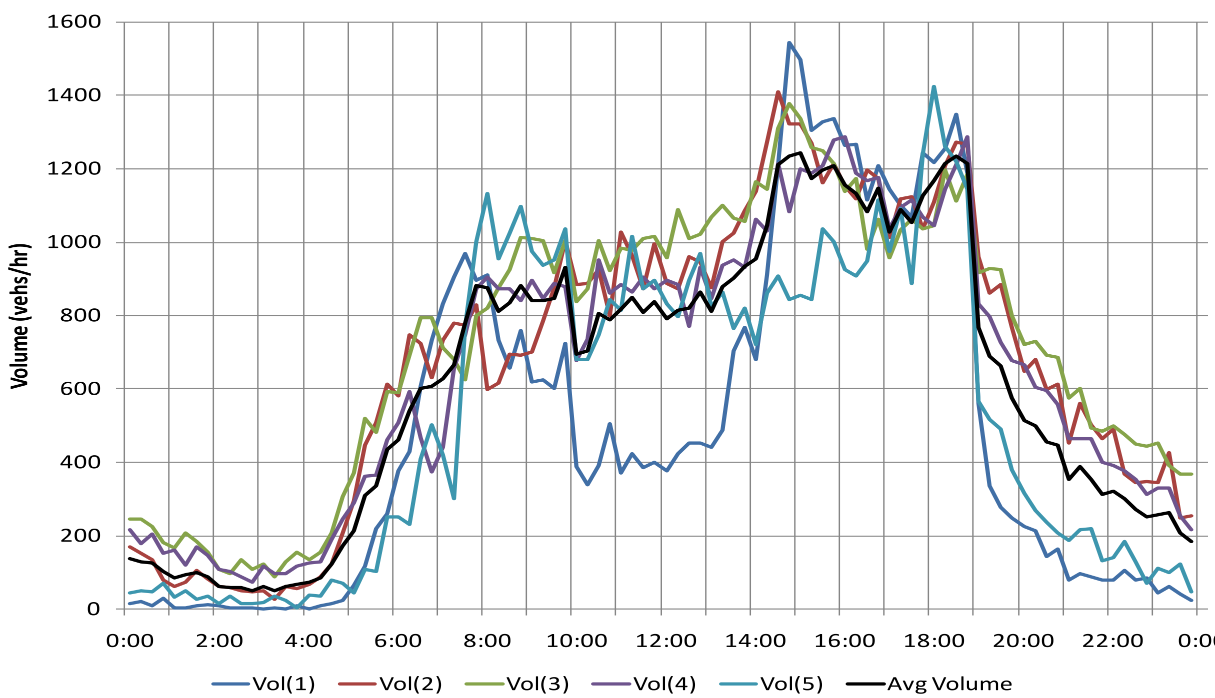


Figure S1.17.1 Post-VSL (Dec. 16th, 08) Average Volume data for all lanes (detector 11D)

Figure S1.17.1 presents the average volume for all lanes and the average highway volume. It can be noticed that the maximum flow was less than 1600 vehs/hr on lane 2 and average volume around 1400 vehs/hr. This indicates low traffic on Dec. 16th, 08, but the speed profile presented in Figure S1.17.2 indicated traffic congestion between 1400-2000 hrs which indicates combined effects of peak period traffic and inclement weather.

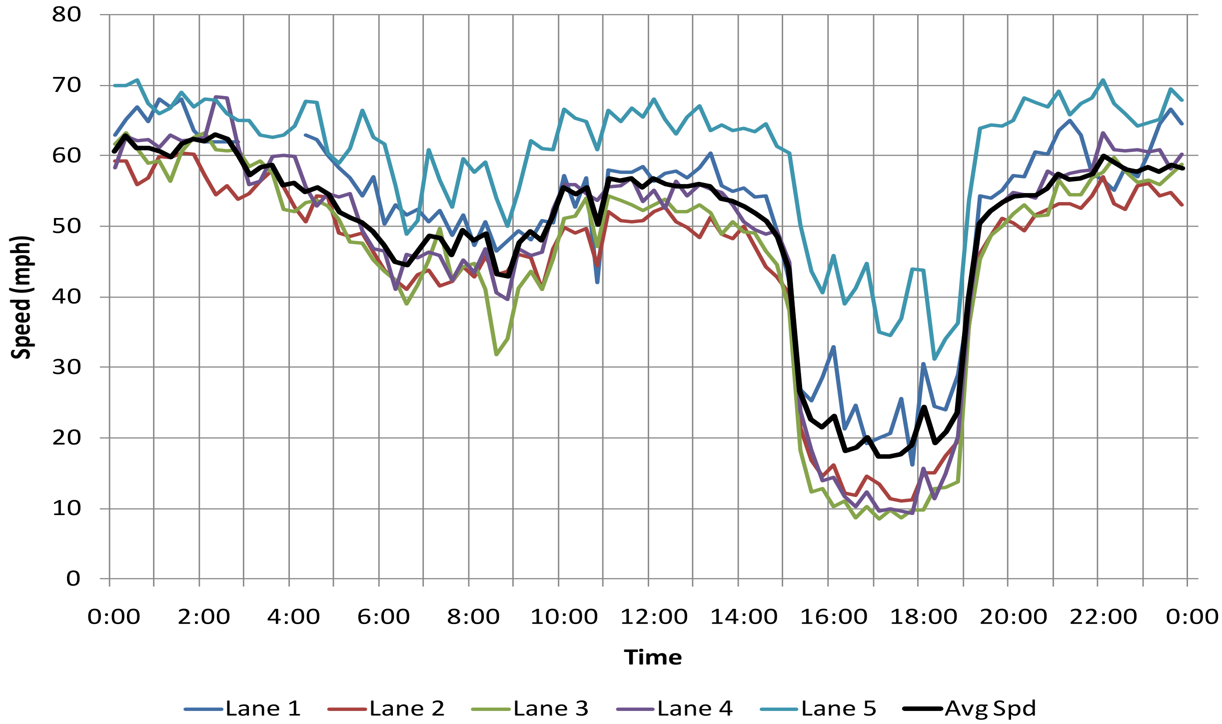


Figure S1.17.2. Post-VSL (Dec. 16th, 08) Average Speed data for all lanes (detector 11D)

Figures S1.17.2 - S1.17.4 present average speed for all lanes and average highway speeds for detectors 12D (logmile 12.4), 11D (logmile 11) and 8D (logmile 8.5) aggregated for five minute intervals. It can be noted that the average speeds for post-VSL conditions at the three detector locations dropped below 20 mph and 30 mph for lane 2. Since the peak periods were distinguished using the observation that peak period usually starts when the speed drops below 60 mph, this was not observed for inclement weather data. During inclement weather, the average speed dropped below 60 mph at 3 am and continued to be below 60 mph for the entire day. From Figures S1.17.2 to S1.17.4, it is evident that no improvement in traffic conditions were observed during snow conditions after VSL initiation.

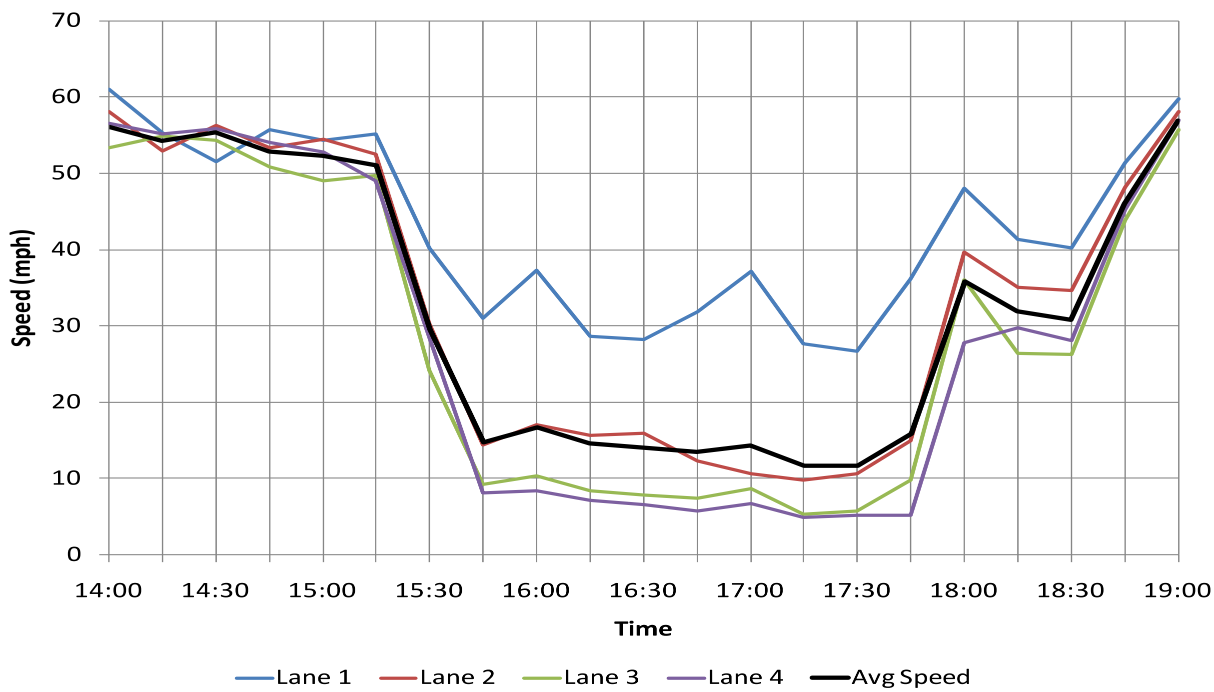


Figure S1.17.3 Post-VSL (Dec. 16th, 08) 12D

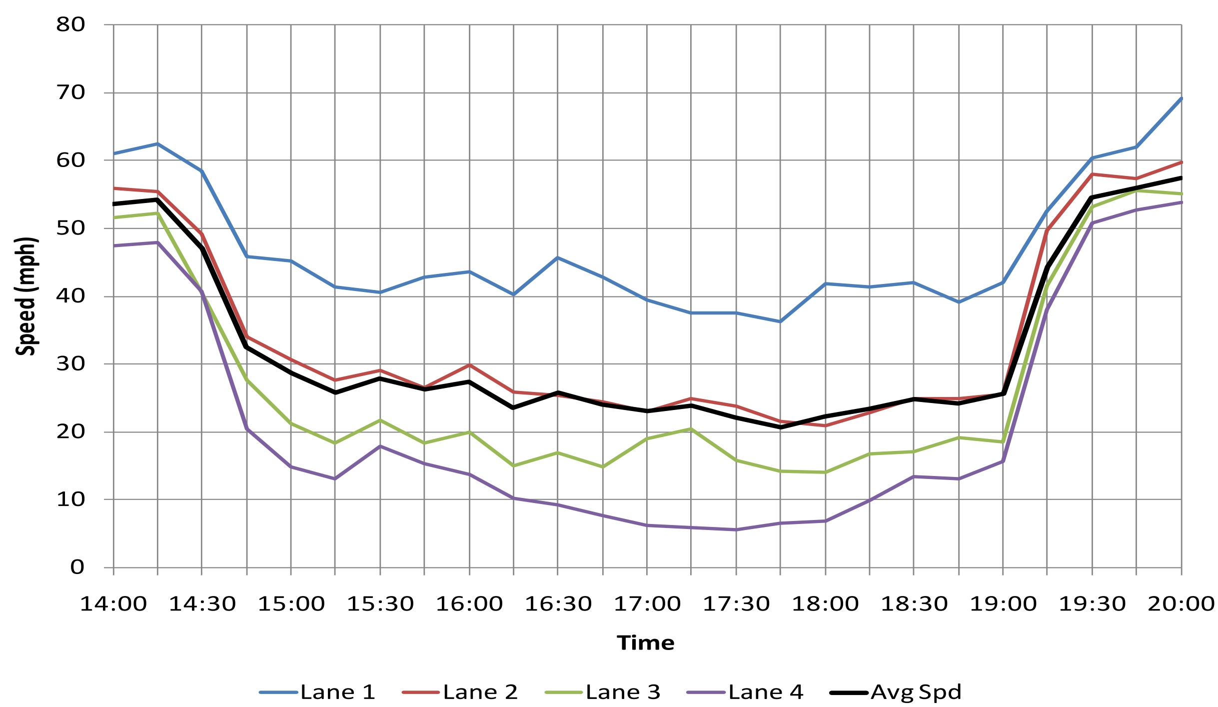


Figure S1.17.4 Post-VSL (Dec. 16th, 08) 8D

It should be noted that the ASTI provided variable speed limit data was not available from December 16th, 2008 till the end of February 2009. Therefore, it cannot be verified whether VSL signs were active during these conditions. Posted speed data for April 19th, 2009, a rainy day, indicated that the speed limit was constant at 60 mph throughout the day, which showed no difference between pre- and post-VSL conditions for inclement weather. Further analysis for weather data could not be carried out as speed limits were not reduced and as such no traffic improvements were observed. Furthermore, additional data was not available to confirm the activation of the VSL system.

SEGMENT 2 ANALYSIS

Table S2.1 presents the dates that were selected for segment 2 evaluation. These dates were considered appropriate for evaluation as the traffic volumes were similar, traffic data was available, no incidents occurred and presented clear weather conditions. The days in the table are mostly Thursdays unless pointed out in the footnote.

Table S2.1. Selected Dates used in VSL system evaluation

Pre-VSL System Installation	Post-VSL System Installation
16th October 2007**	14th October 2008**
31st October 2007*	29th October 2008*
15th November 2007	13th November 2008
8th April 2008*	7th April 2009*
23rd April 2008**	22nd April 2009**

* Tuesdays, ** Wednesdays

Detectors 3D (logmile 3.6) and 5D (logmile 5.7) were used for analysis of this segment. It was found that the peak periods for this segment lie between 0500-1000 hours for all five days. However they were not same for all five days, hence the plots presented in this section are for duration 0500-1000 hours.

Task 1.1: Volume and Occupancy Analysis

This task consists of two sub-tasks. First, average volume for pre- and post-VSL conditions were compared. Second, occupancy data for pre- and post-VSL conditions, and the change in flow-occupancy relationship were compared. The change in volume was accounted to evaluate the effect on average speed, travel time and congestion. Figure S2.11.1 and Table S2.11.1 present the volume comparison between pre- and post-VSL system installation for all lanes for detector 3D (logmile 3.6) for pre (Oct 14th, 07) and post (Oct 16th, 08) VSL system installation. Average volume for 5-minutes interval on the highway was compared for both conditions to account for any change in volume.

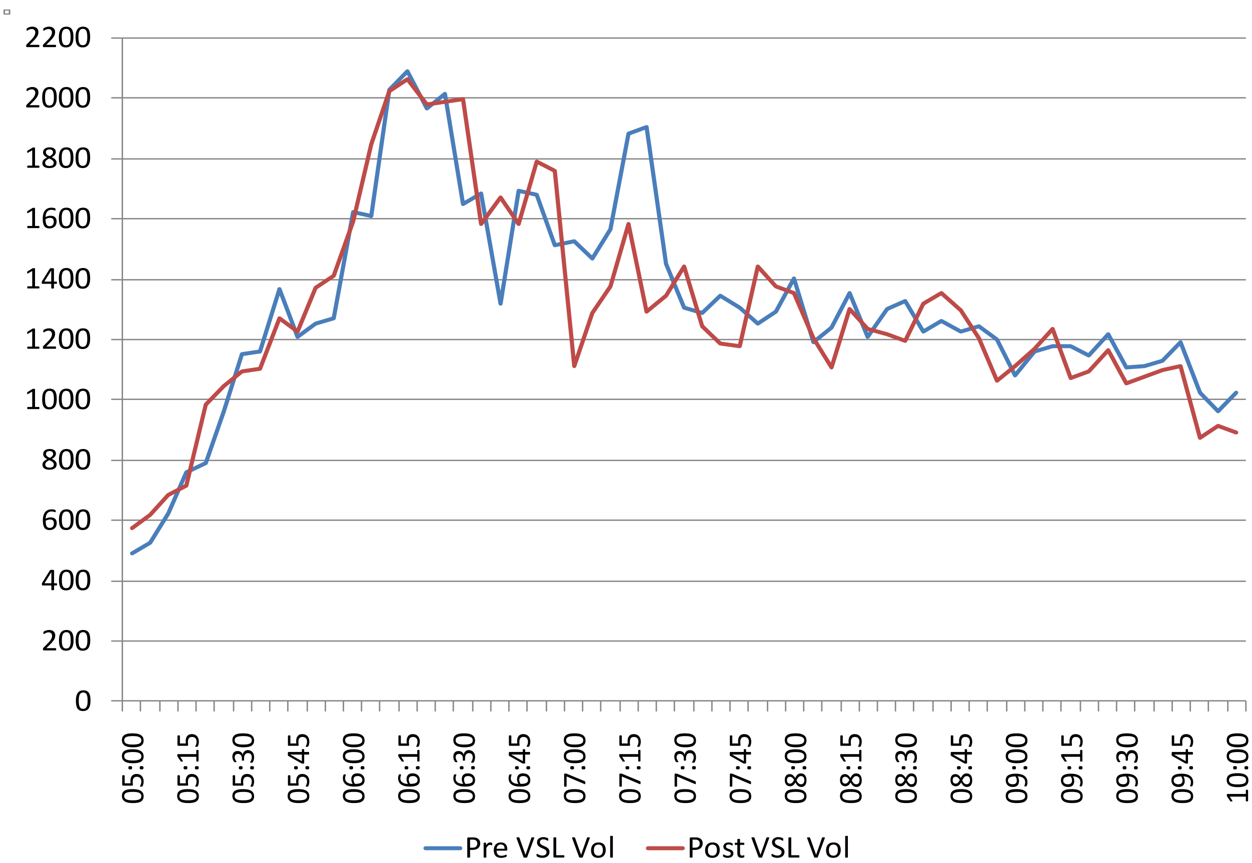


Figure S2.11.1 Comparison of Pre (Oct 14th, 07) and Post-VSL (Oct 16th, 08) Volume for 3D

In Table S2.11.1, average volume for pre- and post-VSL conditions are presented for intervals of 30 minutes. Average volume increased by one percent with data aggregated at 5-minute intervals. Days with different volumes in post-VSL conditions cannot be compared with pre-VSL conditions as it would be difficult to explain the cause of differences in speeds. For high volume in post-VSL condition, improved speed will indicate system benefits, whereas similar volumes will provide at par comparison. For segment 2, therefore, days with statistically similar volumes were used for evaluation. Since the change observed in volume was not significant for pre- and post-VSL conditions, no adjustments were required for system evaluation. Similar peak periods were observed for each of the four days, highlighted in Table S2.11.1, used for evaluation and are presented in Figures S2.11.2 and S2.11.3 for pre- and post-VSL conditions, respectively. The figures present average volume aggregated for 5-minutes for average of all lanes.

Table S2.11.1. Average Volume at Detector 3D during Peak Periods

Time	05:30	06:00	06:30	07:00	07:30	08:00	08:30	09:00	09:30	Avg Vol	Cum Vol
Pre-VSL Vol. (vph)	1152	1623	1650	1527	1305	1404	1329	1083	1107	1353	12180
Post-VSL Vol. (vph)	1095	1590	1995	1113	1440	1356	1194	1110	1056	1328	11949
Diff.	*-5%*	*-2%*	*21%*	*-27%*	*10%*	*-3%*	*-10%*	*2%*	*-5%*	*-2%*	*-2%*

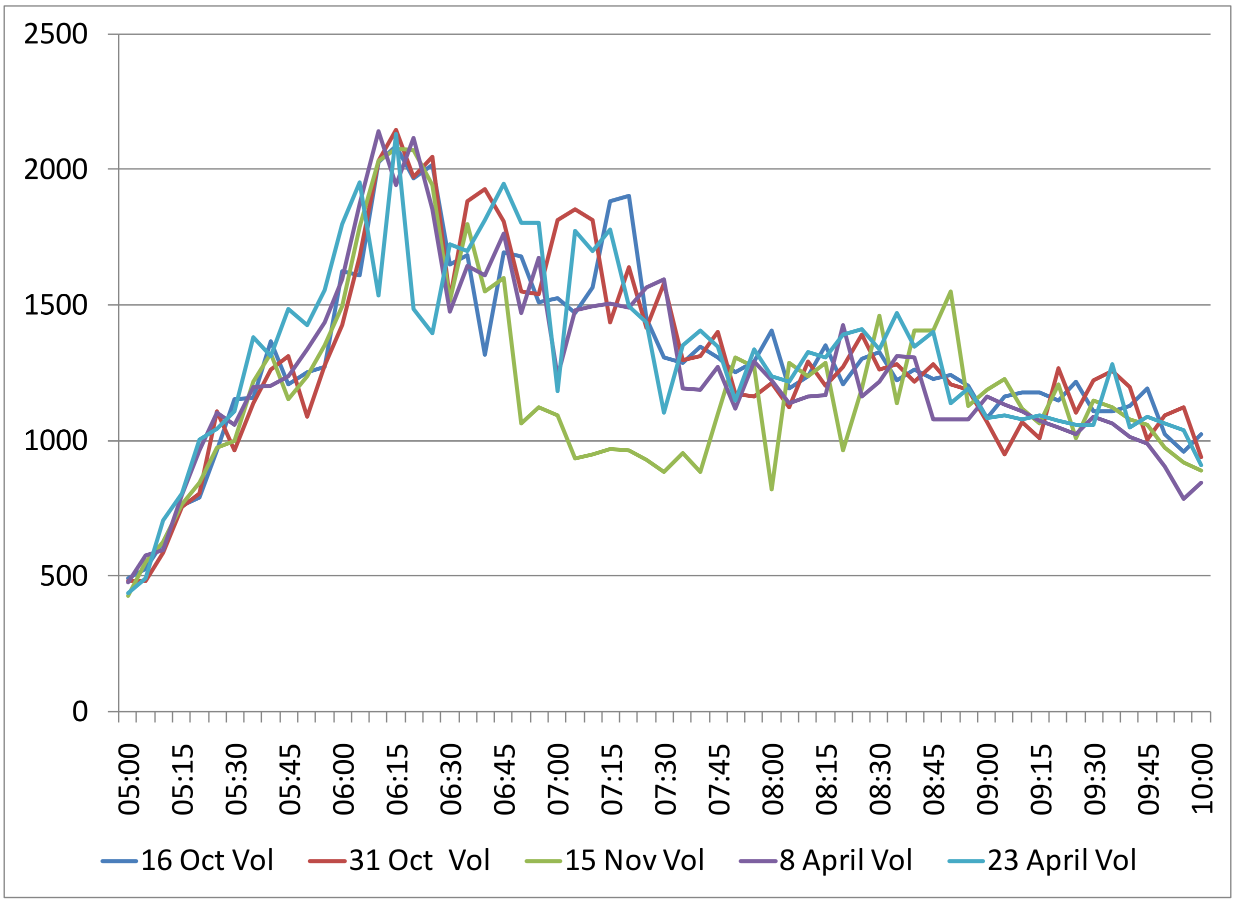


Figure S2.11.2 Pre-VSL Volume Profile for five days

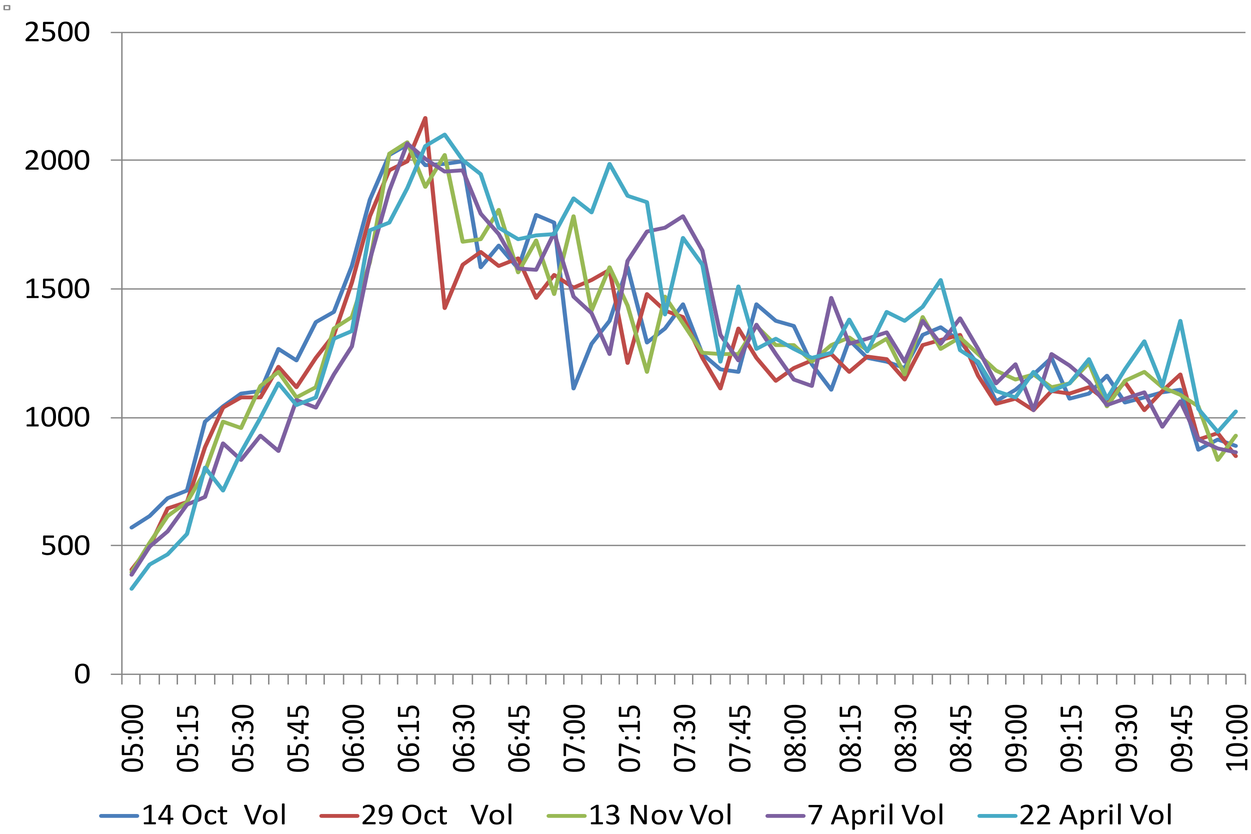


Figure S2.11.3 Post-VSL Volume Profile for five days

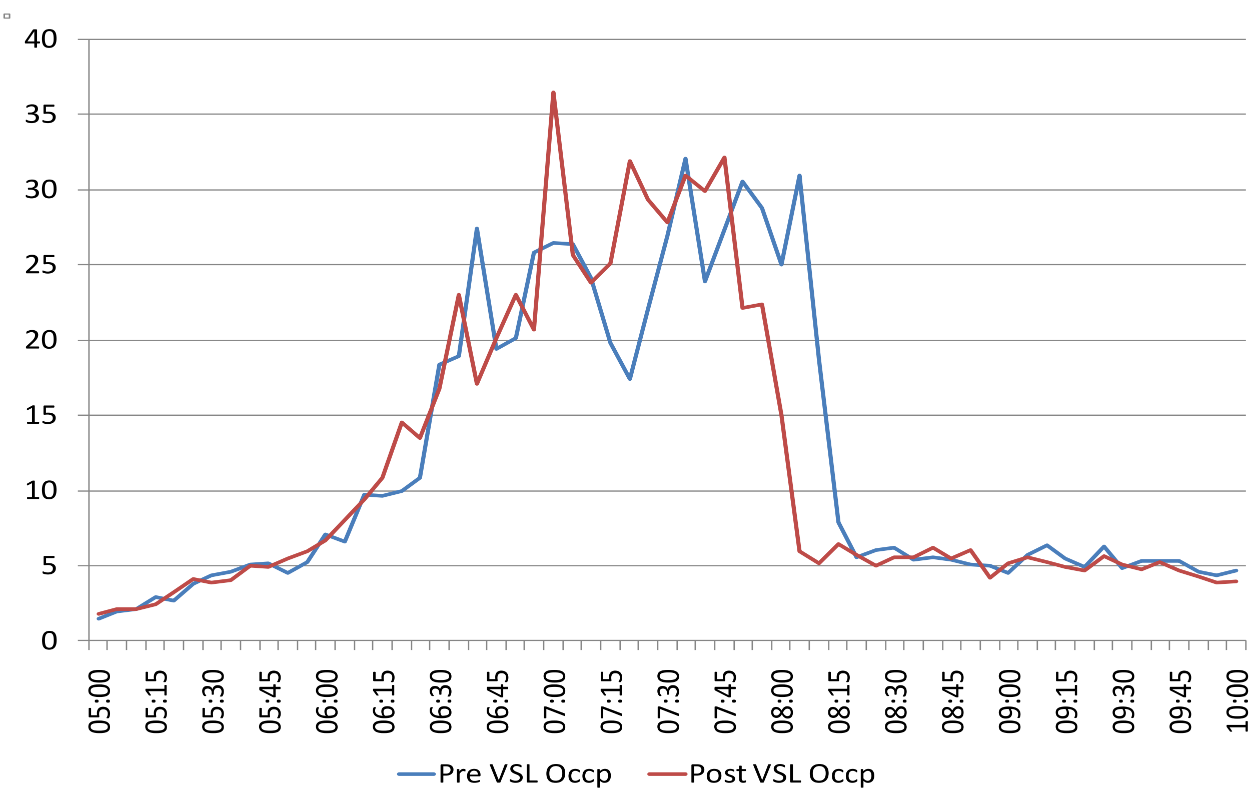


Figure S2.11.4. Comparison of Pre (Oct 14th, 07) and Post-VSL (Oct 16th, 08) Occupancy at 3D

For the second sub-task, Figure S2.11.4 presents average occupancy for average of all lanes at detector 3D (logmile 3.6) for pre (Oct 14th, 07) and post-VSL (Oct 16th, 08) VSL system installation. It can be noted that the peak period reduced from 0630-0830 hours after VSL installation compared to pre-VSL condition when it was from 0630-0800 hours. Also, it can be noted that the maximum observed occupancy for pre-VSL condition was nearly 36 percent which reduced to 32 percent after VSL installation. The figure shows minute decrease in traffic congestion.

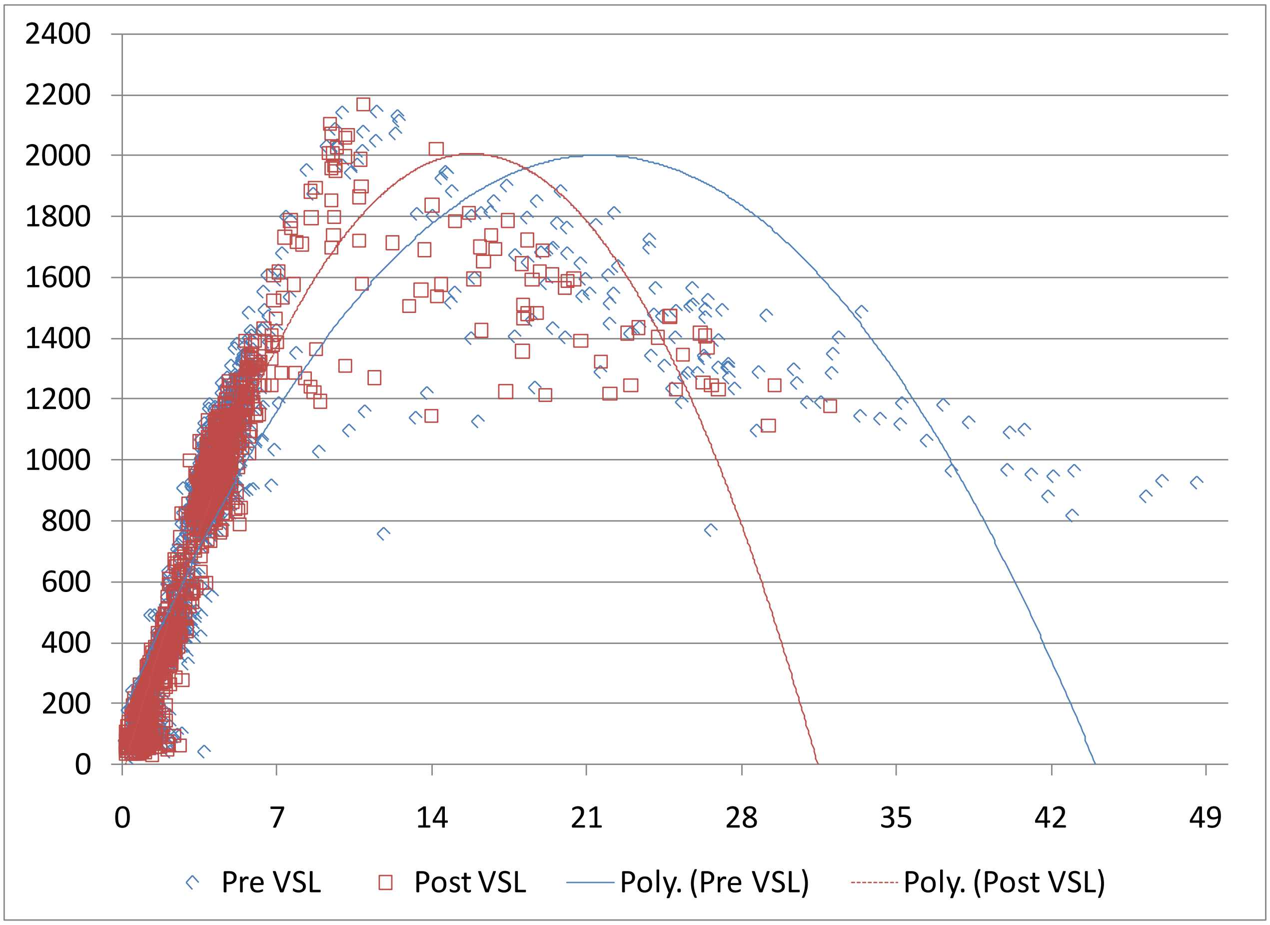


Figure S2.11.5. Flow-Occupancy Plot for 3D for Five days

Figure S2.11.5 shows the comparison of pre- and post-VSL traffic volume and occupancy plot averaged out for all lanes for five days in pre- and post-VSL conditions. Data used for flow occupancy plot were aggregated for 5–minute intervals. It can be observed from the figure that the VSL system installation has improved traffic flow as the occupancy is less than 30%. It can also be noticed that for post-VSL conditions, time occupancy reduced from a high value of nearly 49 percent to 30 percent. Additionally, fewer data points were observed beyond 10 percent occupancy for post-VSL conditions. This clearly indicated better traffic conditions in post-VSL conditions indicating system benefits. However, S2.1Figure S2.11.6 presents the flow-occupancy plots for detector 5D (logmile 5.7) . It can be clearly observed that no such benefits were observed at 5D (logmile 5.7) . The occupancy increase by 15 percent and congestion increased in post-VSL conditions.

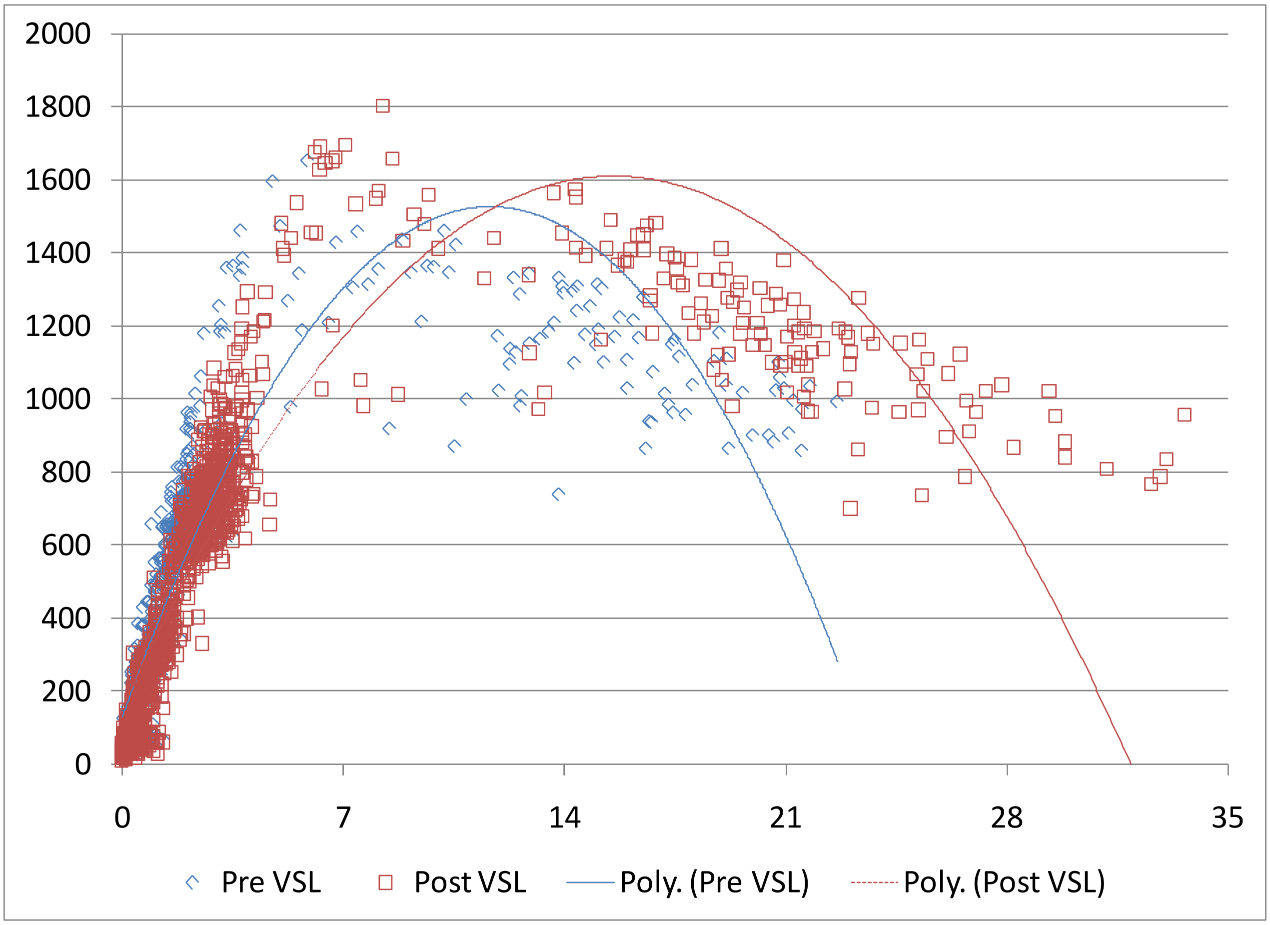


Figure S2.11.6. Flow-Occupancy Plot for 5D for Five days

Task 1.2: Average Speed/Lane by Posted Speed Limit during Peak Periods

One of the main objectives of the VSL system was to improve traffic flow and this task evaluated the difference in average speed by comparing the data before and after the VSL system installation. Speed data averaged for all the lanes of segment 2 for every 5-minutes were used. Figure S2.12.1 presents the average highway speed for detector 3D (logmile 3.6) pre- and post-VSL conditions. The figure indicates that the peak period for traffic on this segment for pre- and post-VSL conditions lies between 0530 to 0930 hours based on the average speed. Henceforth, all the figures for peak periods will be presented for this duration. Also, the pre- and post-VSL speed profile comparison over time shows reduction in peak period and improvement in average speeds for post-VSL conditions.

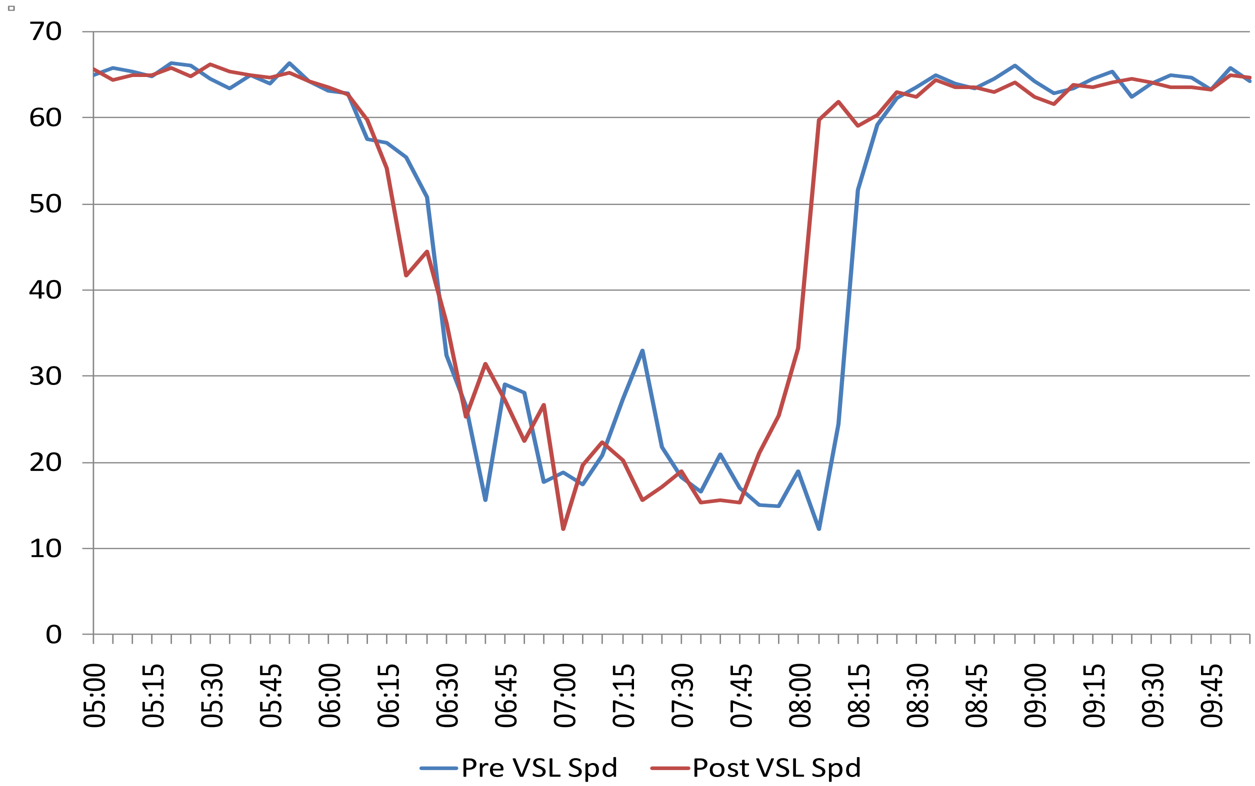


Figure S2.12.1. Comparison of Pre (Oct 14th, 07) and Post-VSL (Oct 16th, 08) Speed data for 3D

Figure S2.12.1 clearly indicates that the peak periods reduced for post-VSL conditions and, the average speed increased by 1 mph which was not very significant. However, peak period reduced 30 minutes. To supplement the comparison of speed data presented for one day, Figures S2.12.2 and S2.12.3 present the speed profiles for five days averaged for all lanes in pre- and post-VSL conditions. From the comparison of the two figures, it can be noticed that the peak periods in both conditions were between 0530-0930 hours, however, the duration and average speeds reduced in post-VSL conditions. Additionally, the peak periods also reduced in post-VSL conditions by 15 minutes. Table S2.12.1 presents the average speeds in pre- and post-VSL conditions and results indicate no significant improvement in the average speed over the peak period.

Table S2.12.1 Comparison of average speeds at Detector 3D

TIME	5:00	5:30	6:00	6:30	7:00	7:30	8:00	8:30	9:00	9:30	Avg
Pre-VSL Spd	64.87	64.48	63.12	32.40	18.90	18.34	18.96	63.49	64.29	63.93	47.28
Post-VSL Spd	65.58	66.21	63.58	36.20	12.25	18.96	33.23	62.39	62.46	64.15	48.50
Diff.	*0.71*	*1.73*	*0.46*	*3.80*	*-6.65*	*0.63*	*14.27*	*-1.10*	*-1.82*	*0.22*	*1.23*

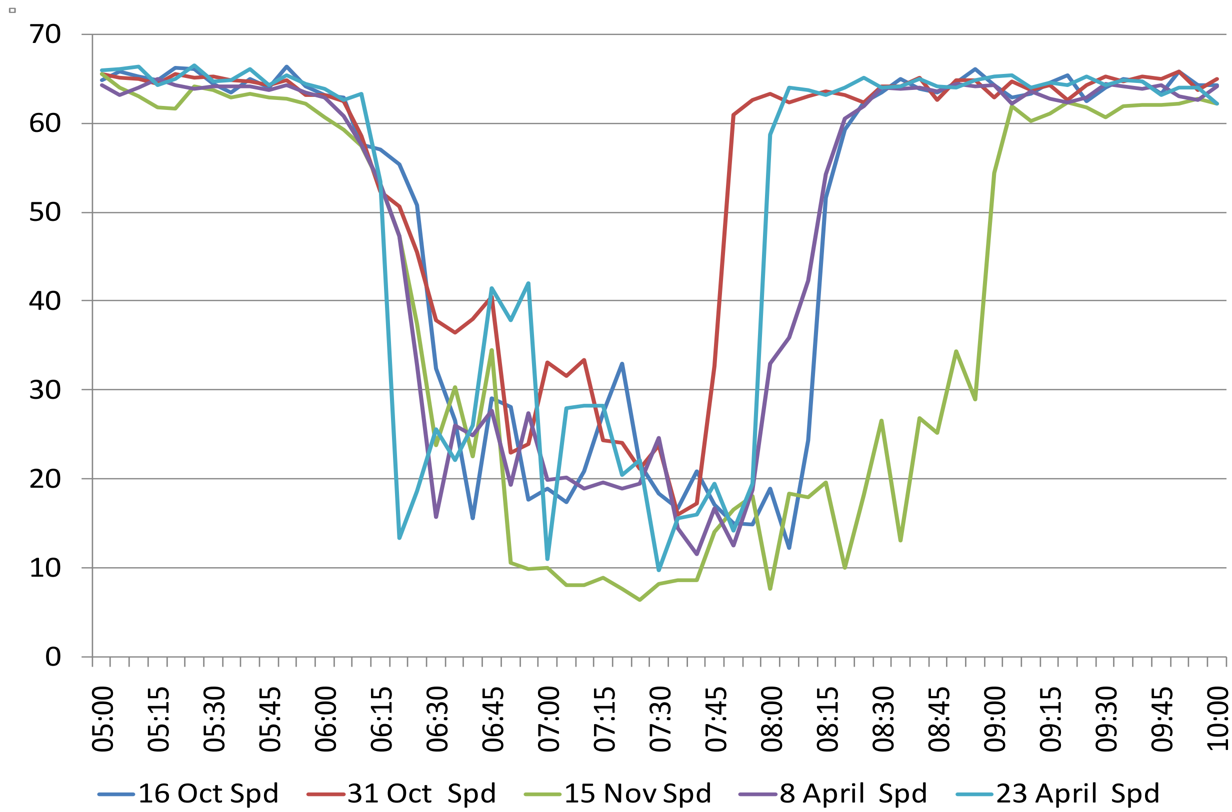


Figure S2.12.2 Pre-VSL Speed Profile for five days at Detector 3D

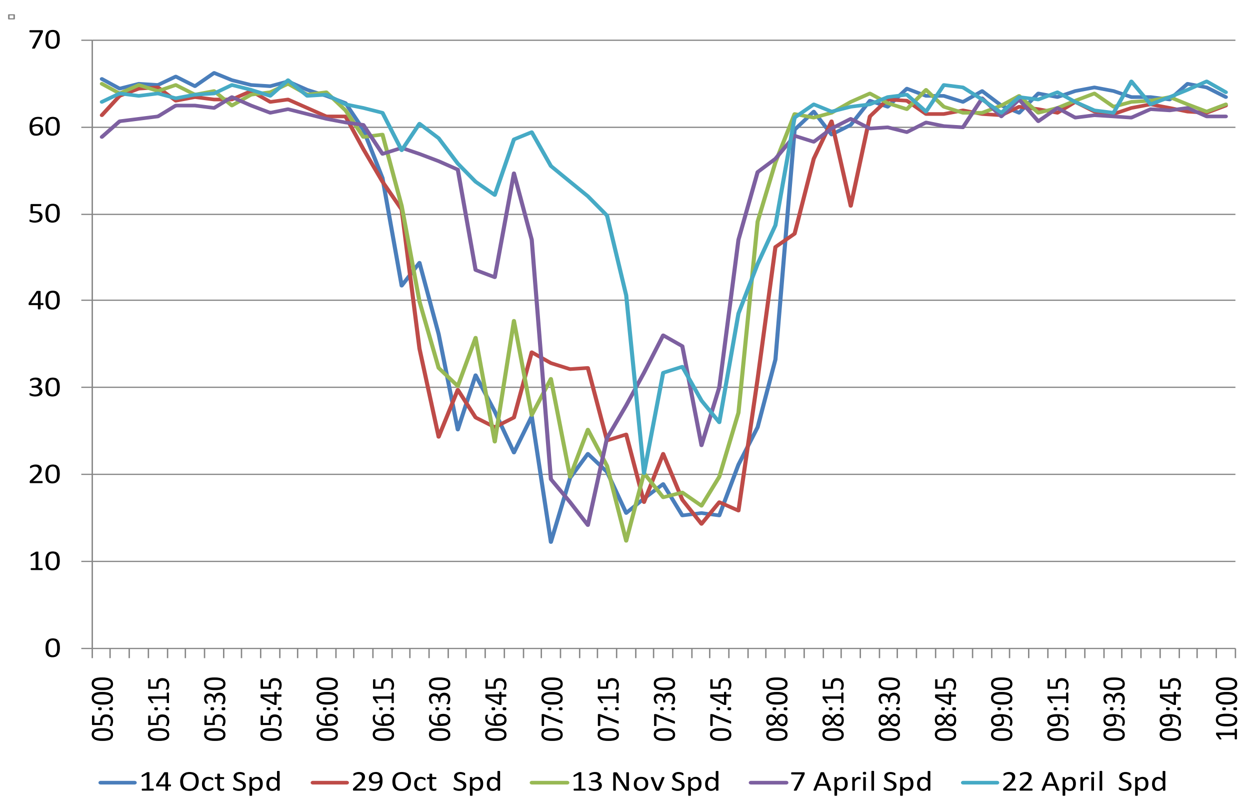


Figure S2.12.3 Post-VSL Speed Profile for five days at Detector 3D

Comparison of Average Speeds along the Segment

This subtask could not be carried out for this segment due to unavailability of sufficient detector data.

Speed Deviation across Lanes

For this sub-task, dispersion of average speeds across lanes is evaluated, based on comparison of pre- and post-VSL conditions. Dispersion in speed along the highway over different detectors could not be carried out as the distance between detectors is more than 1 mile. For accurate calculations, the distance between detectors should be 0.8 to a mile.

Figures S2.12.4 and S2.12.5 present the variation in speeds across the lanes at detector 3D (logmile 3.6) for pre- and post-VSL conditions respectively. This location has four lanes. Lane 1 indicates the left most lane and the lane number increments toward the right lanes. Table S2.12.1 presents the calculated standard deviation in speeds and the difference. Variable posted speeds were plotted over the average speeds to observe the deviation in speeds on each lane with the posted speeds.

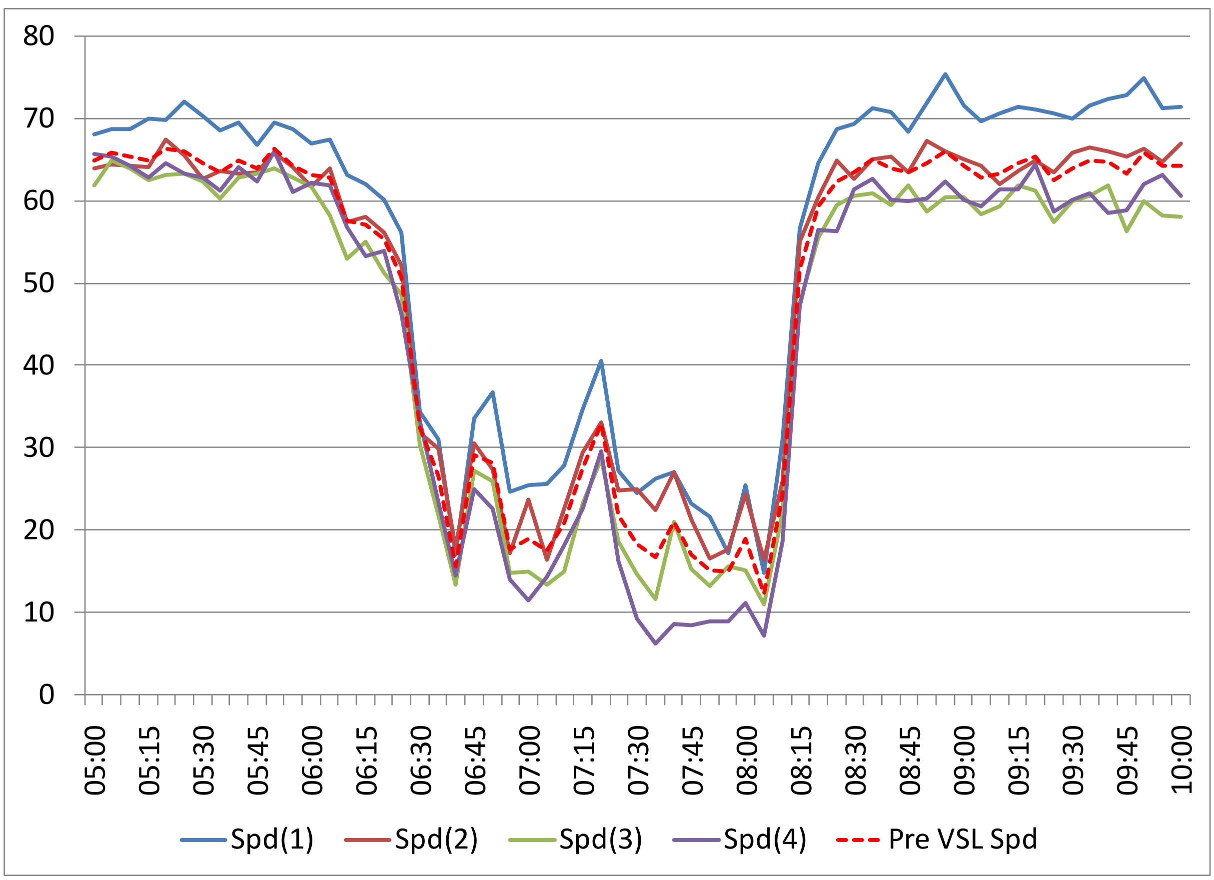


Figure S2.12.4. Pre-VSL (Oct 16th, 07) Average Speed data for all lanes (detector 3D)

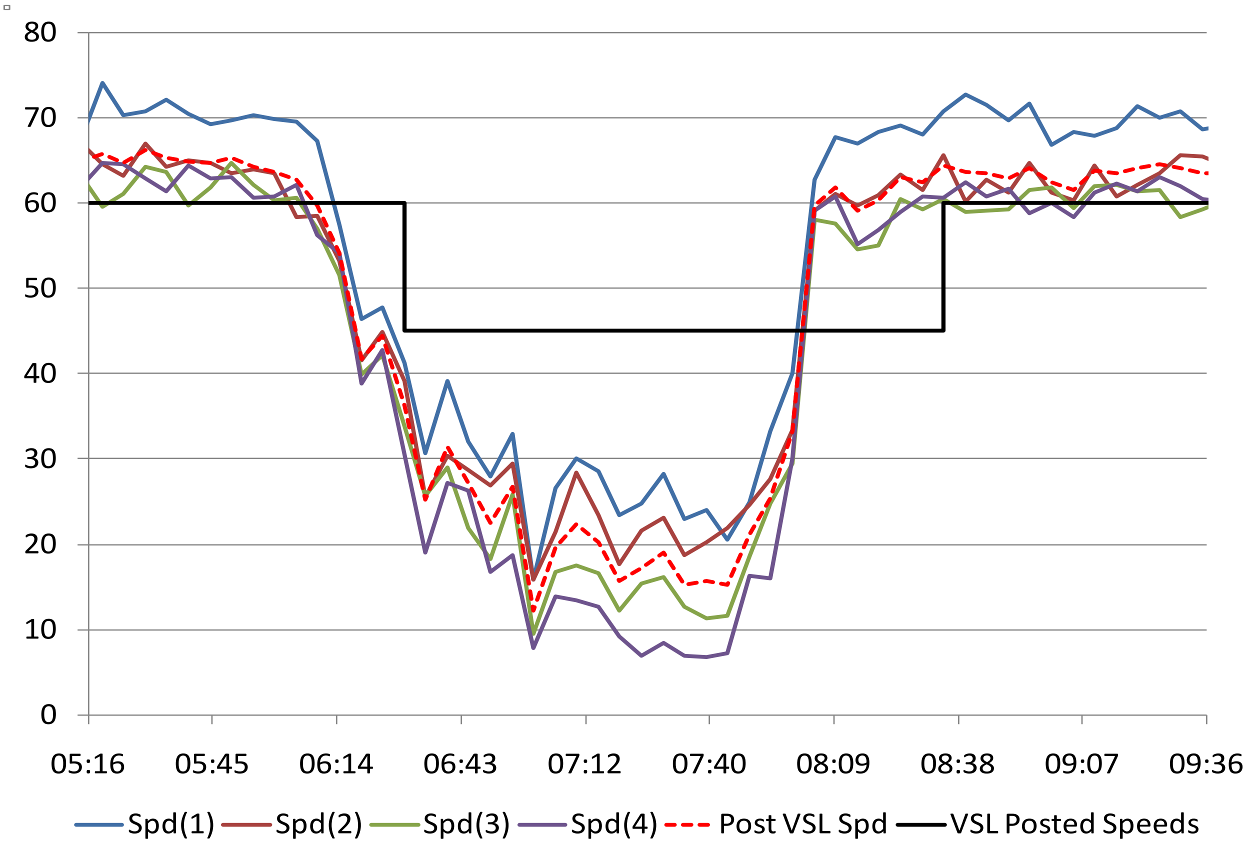


Figure S2.12.5. Post VSL (Oct 14th, 08) Average Speed data for all lanes (detector 3D)

Table S2.12.2 presents the standard deviation of speeds (determined using Equation 2) during the peak period (05:30-09:30) for pre- and post-VSL conditions for detector data at 3D (logmile 3.6) . The difference indicates the change in post-VSL traffic conditions compared to pre-VSL conditions. Standard deviations were calculated for peak periods only. Speed homogeneity can be inferred from the results of the table. Increase in speed homogeneity may cause reduction in traffic crashes which is a positive outcome of the VSL system. Negative value indicates decrease in deviation of speed across the lanes, which indicates increase in speed homogeneity. For this segment, average standard deviation calculated for post-VSL conditions decreased significantly. Results from Table S2.12.2 indicate reduction in standard deviation for the peak periods. This clearly indicated VSL system benefits and increase in speed homogeneity.

Table S2.12.2. Standard Deviation (SD) of Speeds at Detector 3D during Peak Periods

	Comparison of Pre (16th Oct 07) and Post (14th Oct 08) SD								
Time	**05:30**	**06:00**	**06:30**	**07:00**	**07:30**	**08:00**	**08:30**	**09:00**	**09:30**
Pre-VSL SD (mph)	3.82	2.51	1.72	6.71	7.70	7.00	3.99	5.36	4.84
Post-VSL SD (mph)	3.44	4.34	4.93	4.17	8.61	4.85	3.84	3.02	5.35
Difference (mph)*	-0.38	1.83	3.21	-2.53	0.92	-2.15	-0.15	-2.34	0.51
	Comparison of Pre (29th Oct 07) and Post (31st Oct 08) SD								
Time	**05:30**	**06:00**	**06:30**	**07:00**	**07:30**	**08:00**	**08:30**	**09:00**	**09:30**
Pre-VSL SD (mph)	3.79	4.73	1.34	2.02	7.64	4.77	4.82	5.72	5.50
Post-VSL SD (mph)	3.56	4.02	1.92	2.48	3.59	9.49	4.58	4.08	3.52
Difference (mph)	-0.23	-0.72	0.59	0.45	-4.04	4.72	-0.24	-1.64	-1.98
	Comparison of Pre (15th Nov 07) and Post (13th Nov 08) SD								
Time	**05:30**	**06:00**	**06:30**	**07:00**	**07:30**	**08:00**	**08:30**	**09:00**	**09:30**
Pre-VSL SD (mph)	5.44	3.68	3.57	4.87	4.03	4.07	2.98	7.55	5.09
Post-VSL SD (mph)	4.47	2.39	1.20	6.03	5.98	3.55	5.48	3.67	4.19
Difference (mph)	-0.97	-1.29	-2.37	1.16	1.95	-0.53	2.49	-3.88	-0.90
	Comparison of Pre (8th April 08) and Post (7th April 09) SD								
Time	**05:30**	**06:00**	**06:30**	**07:00**	**07:30**	**08:00**	**08:30**	**09:00**	**09:30**
Pre-VSL SD (mph)	4.04	3.07	1.63	3.90	4.13	14.23	5.00	3.95	3.60
Post-VSL SD (mph)	3.93	3.10	3.88	2.33	3.68	4.20	4.65	5.63	3.58
Difference (mph)	-0.12	0.03	2.24	-1.57	-0.45	-10.02	-0.35	1.68	-0.02
	Comparison of Pre (23rd April 08) and Post (22nd April 09) SD								
Time	**05:30**	**06:00**	**06:30**	**07:00**	**07:30**	**08:00**	**08:30**	**09:00**	**09:30**
Pre-VSL SD (mph)	5.17	3.81	7.10	3.61	3.00	6.58	4.78	5.84	6.91
Post-VSL SD (mph)	2.56	3.60	3.31	3.47	3.51	7.75	3.50	4.92	4.22
Difference (mph)	-2.61	-0.22	-3.79	-0.14	0.51	1.16	-1.28	-0.92	-2.69

*Difference indicates decrease in Post-VSL SD and vice versa.

Task 1.3: Speed Limit during Peak Periods

The objective of this task was to evaluate the system initiation logic for variable speed limits. This was carried out by analyzing the average speeds, traffic flow and occupancy during peak periods using two days of data, i.e. April 14st, and April 8th, 2009. Figures were plotted to show the relationship between average speed, volume and occupancy for peak periods. On these plots, Figures S2.13.1 to S2.13.4, two y-axes are used; the y-axis on the left present average speed and average occupancy and the y-axis on the right present volume. Additionally, posted variable speed limits were plotted to analyze the initiation of the VSL system.

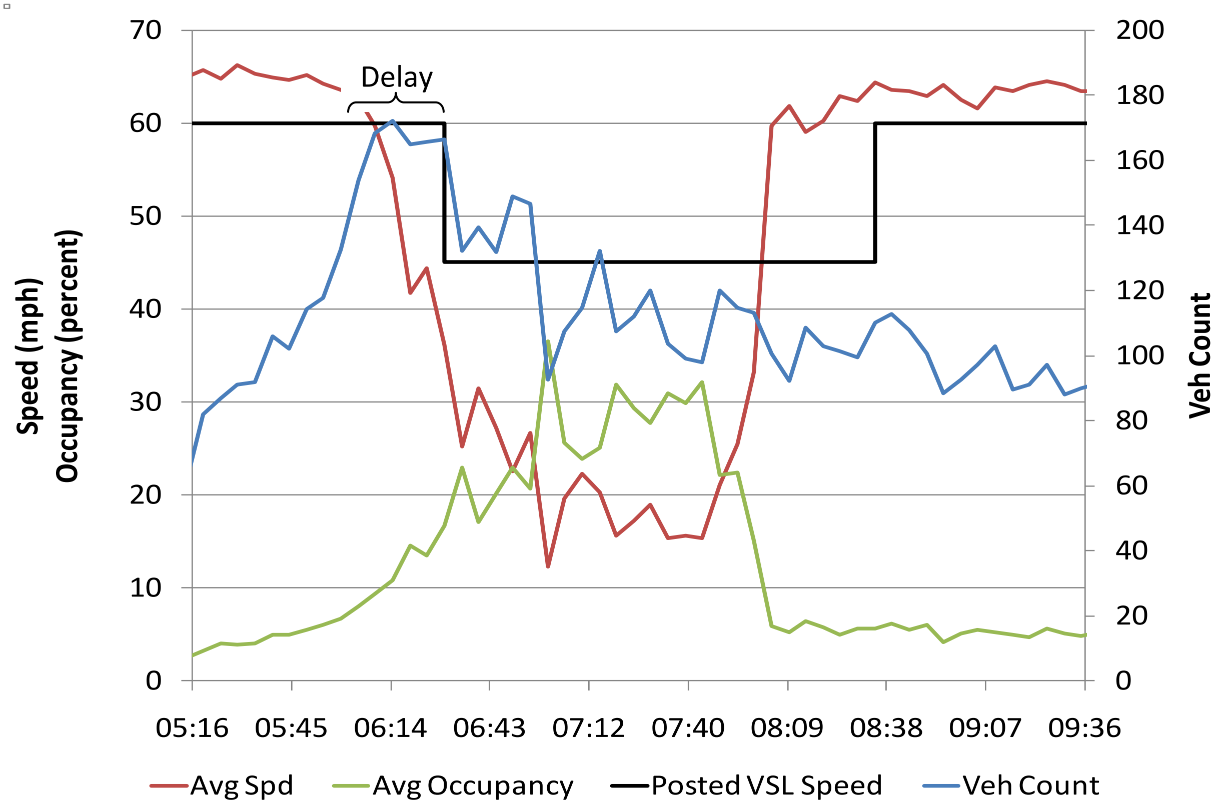


Figure S2.13.1. Post-VSL: VSL System trigger point (Oct 14th, 2007) for detector 3D

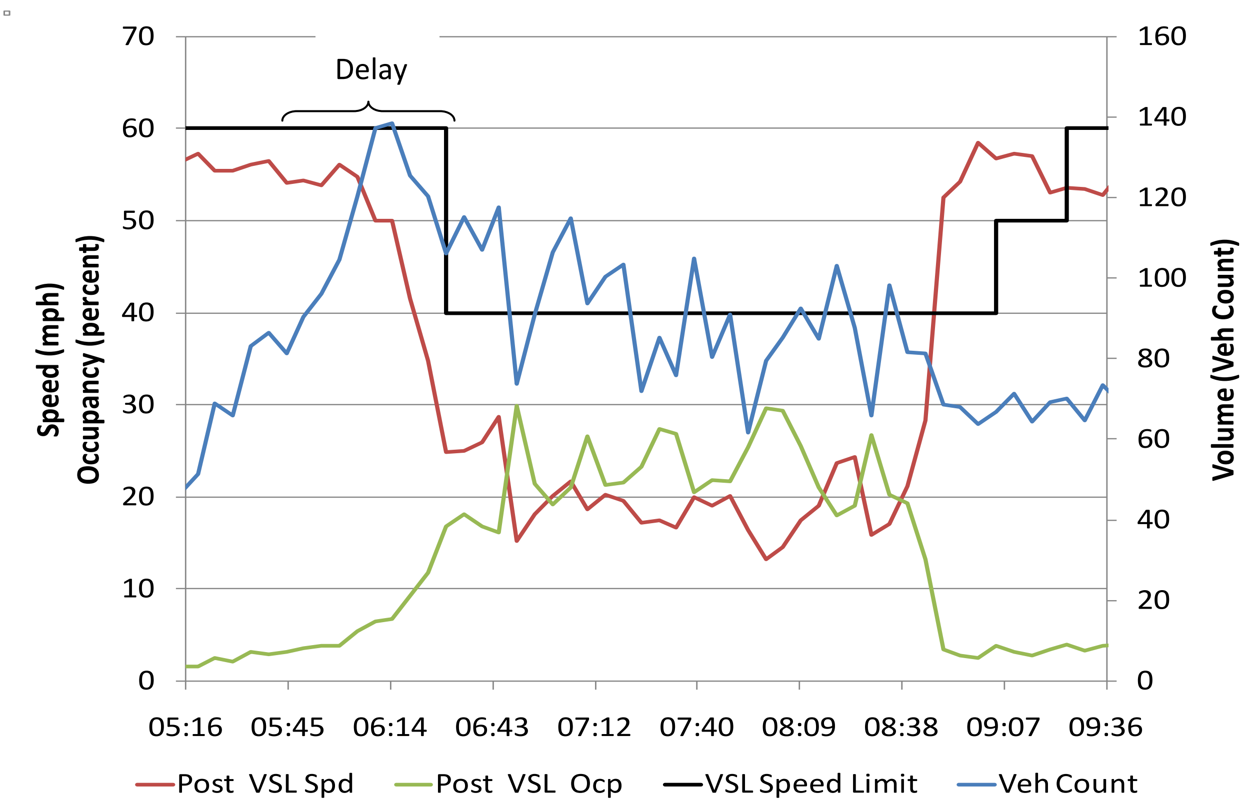


Figure S2.13.2. Post-VSL: VSL System trigger point (Oct 14th, 2007) for detector 5D

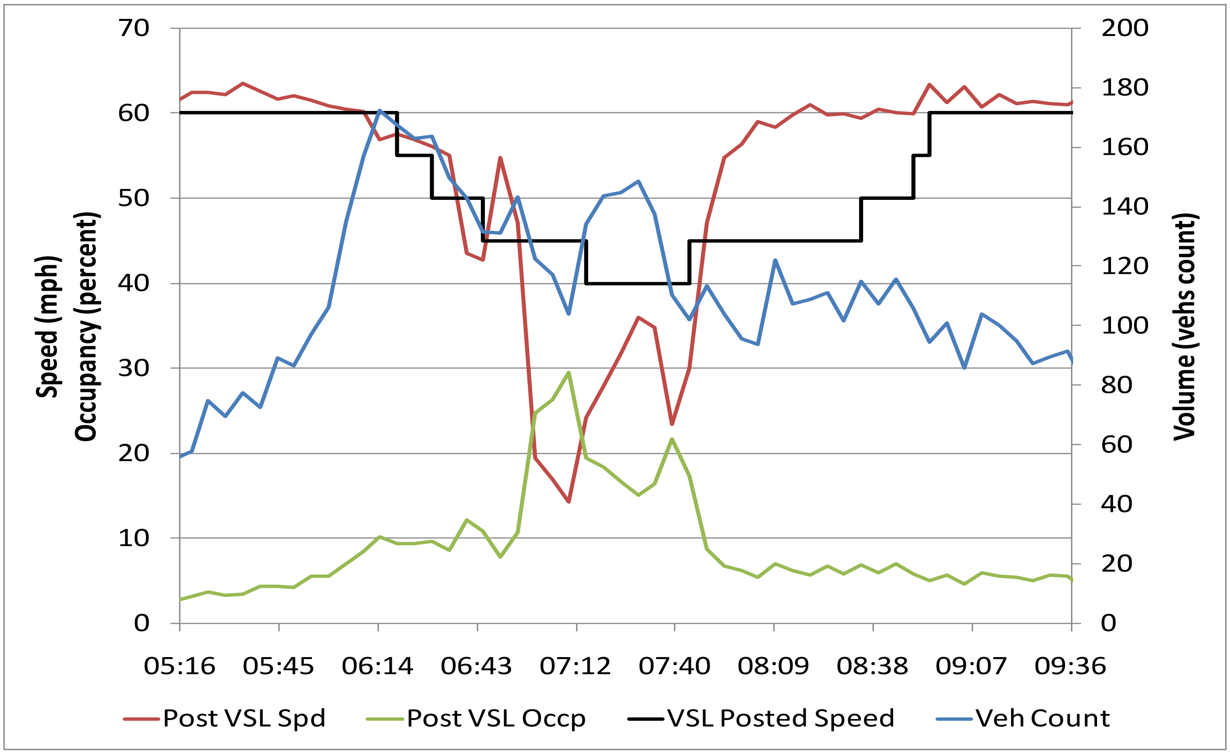


Figure S2.13.3. Post-VSL: VSL System trigger point (8th April, 2008) for detector 3D

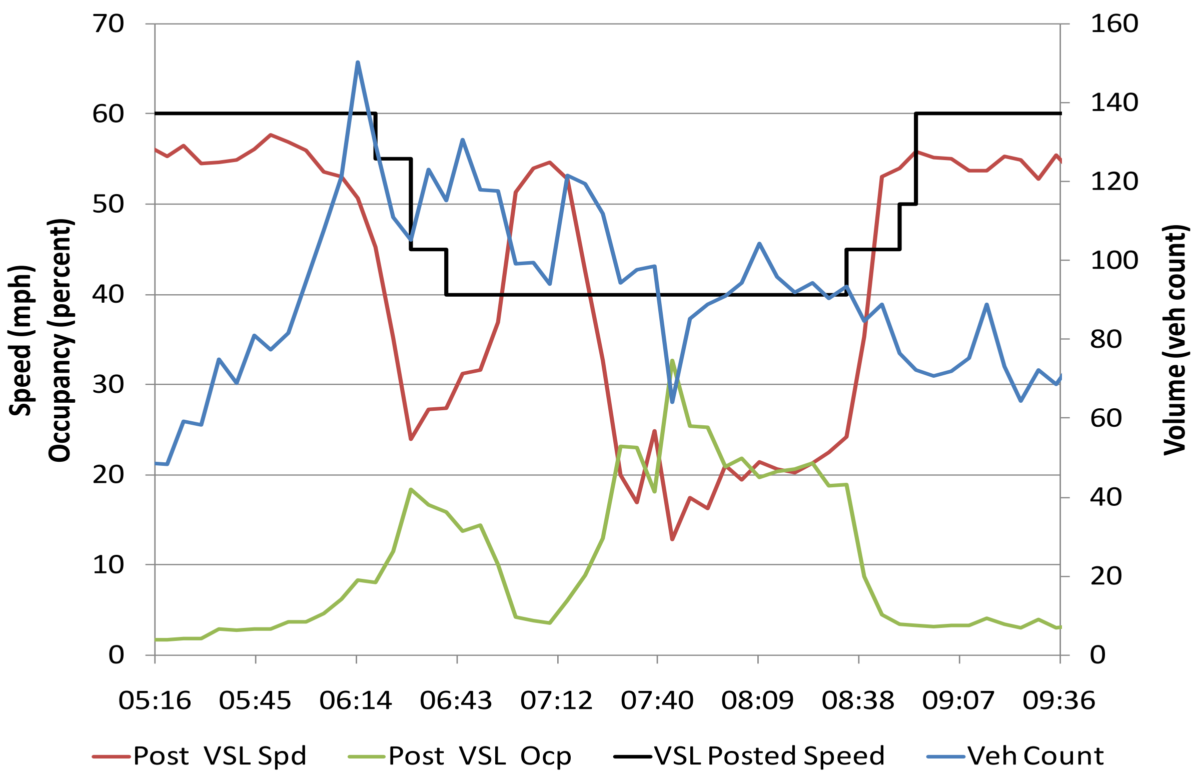


Figure S2.13.4. Post-VSL: VSL System trigger point (8th April, 2008) for detector 5D

For the both days, data from detectors 3D (logmile 3.6) and 5D (logmile 5.7) are presented. For October 14th 2008, Figures S2.13.1 and S2.13.2 indicates that the system was initiated when the average vehicle speeds fell much below 60 mph, and volume and occupancy thresholds have exceeded the specified thresholds. However, for April 8th, 2009, Figures S2.13.3 and S2.13.4 indicated better initiation compared to Oct 14th data. This indicates better traffic recovery when the system was initiated promptly when the speed went below 60 mph.

Task 1.4: Speed Limit Compliance by Posted Speed Limit

The objective of this task was to analyze driver compliance of the posted variable speed limits. Average speeds and posted VSL for peak periods plotted at detectors 3D (logmile 3.6) and 5D (logmile 5.7) are presented using different set of colors and line types. Pair of lines with same color indicates same detector location. Drivers' compliance of posted variable speed limits were evaluated using Figure S2.14.1, and Table S2.14.2, it can be concluded that drivers were driving at low speed due to severe congestion.

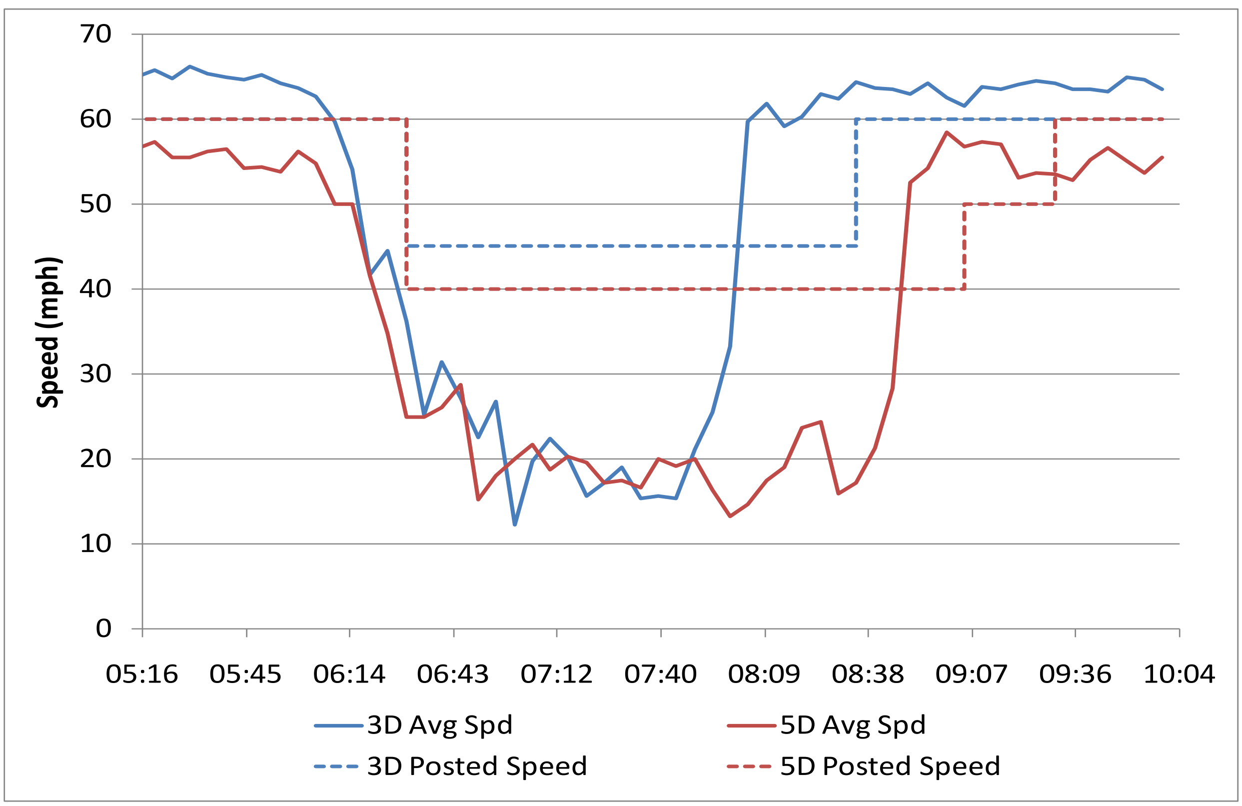


Figure S2.14.1 VSL (Oct 14th, 08)

Table S2.14.2 Percent compliance along the highway for all lanes

Lane	Detector 3D	Detector 4D	Detector 5D
October 14th 2008			
L1	55.88	29.08	100.00
L2	82.91	69.56	98.32
L3	86.59	88.63	99.62
L4	81.69	87.47	94.08
L5	**	70.20	**
Hwy^	77.11	77.83	98.14
October 29th 2008			
L1	59.60	***	100.00
L2	78.03	***	87.38
L3	86.89	***	91.08
L4	82.28	***	87.63
L5	**	***	**
Hwy^	76.70	***	91.46
November 13th 2008			
L1	57.32*	***	100.00
L2	67.86	***	88.74
L3	69.42	***	91.28
L4	63.29	***	90.93
L5	**	***	**
Hwy^	64.69	***	92.68
April 7th 2009			
L1	42.75*	65.04	100.00
L2	66.57	54.84	81.62
L3	78.01	31.04	83.75
L4	71.98	21.20	77.78
L5	**	63.12	**
Hwy^	65.47	56.71	85.74
April 22nd 2009			
L1	25.62*	85.83	100.00
L2	65.97	75.72	90.32
L3	78.31	42.49	94.12
L4	72.8	34.95	80.05
L5	**	57.51	**
Hwy^	61.91	69.10	91.32

*Percent of drivers complying with the posted variable speed limit

** Not applicable

*** Not data available for detector

^ Weighted average of all lanes of the highway

Task 1.5: Evaluation of Highway Capacity

This task compares speed-flow plots for pre- and post-VSL conditions. Figures S2.15.1 and S2.15.2 present the speed flow data for five days in pre- and post-VSL system installation for detectors location 3D (logmile 3.6) and 5D (logmile 5.7). Data used were aggregated for 5 minute intervals for this task. For pre-VSL conditions, the segment volume was also higher. It should be noted here, that time mean speed is used on the y-axis. It is recommended that speed-flow plots are plotted between space mean speed and traffic flow, however, as these plots are used mainly for comparison between pre- and post-VSL conditions, time mean speed can be used. The readers are cautioned that conclusions should be made after due consideration of this fact and careful evaluation.

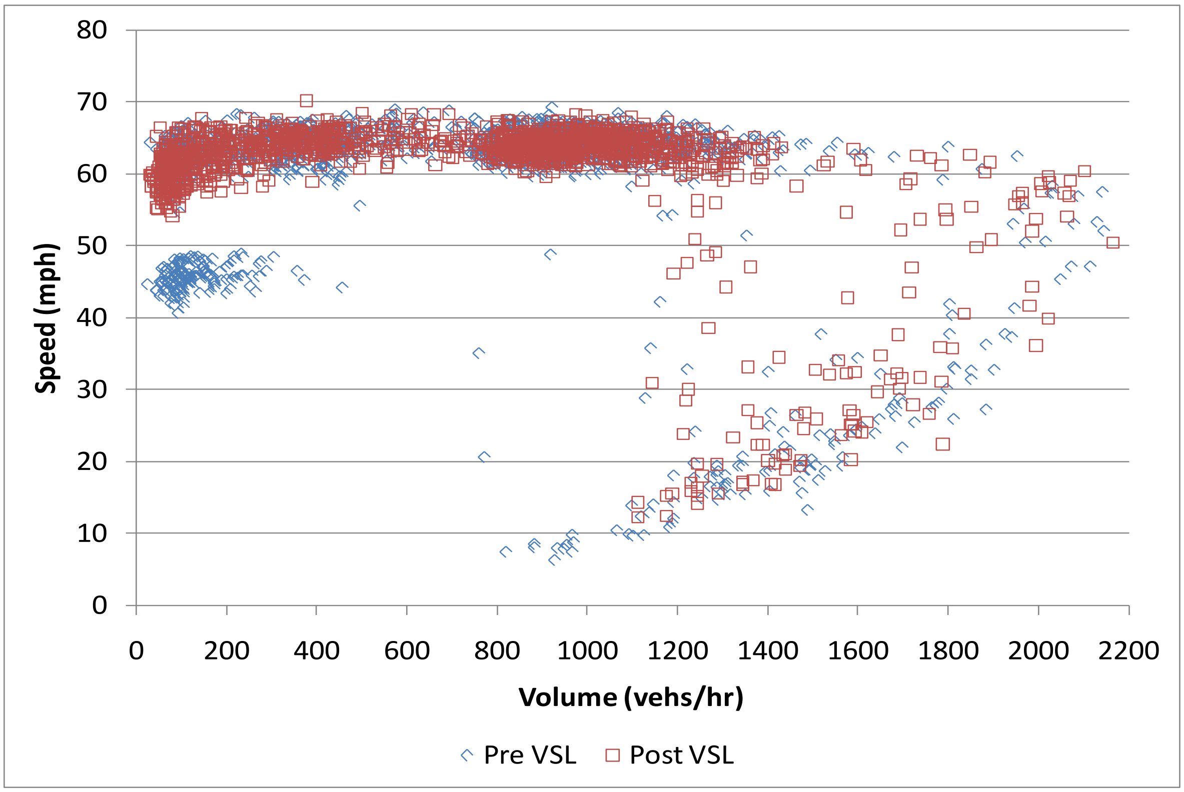


Figure S2.15.1 Speed Flow Plot at 3D

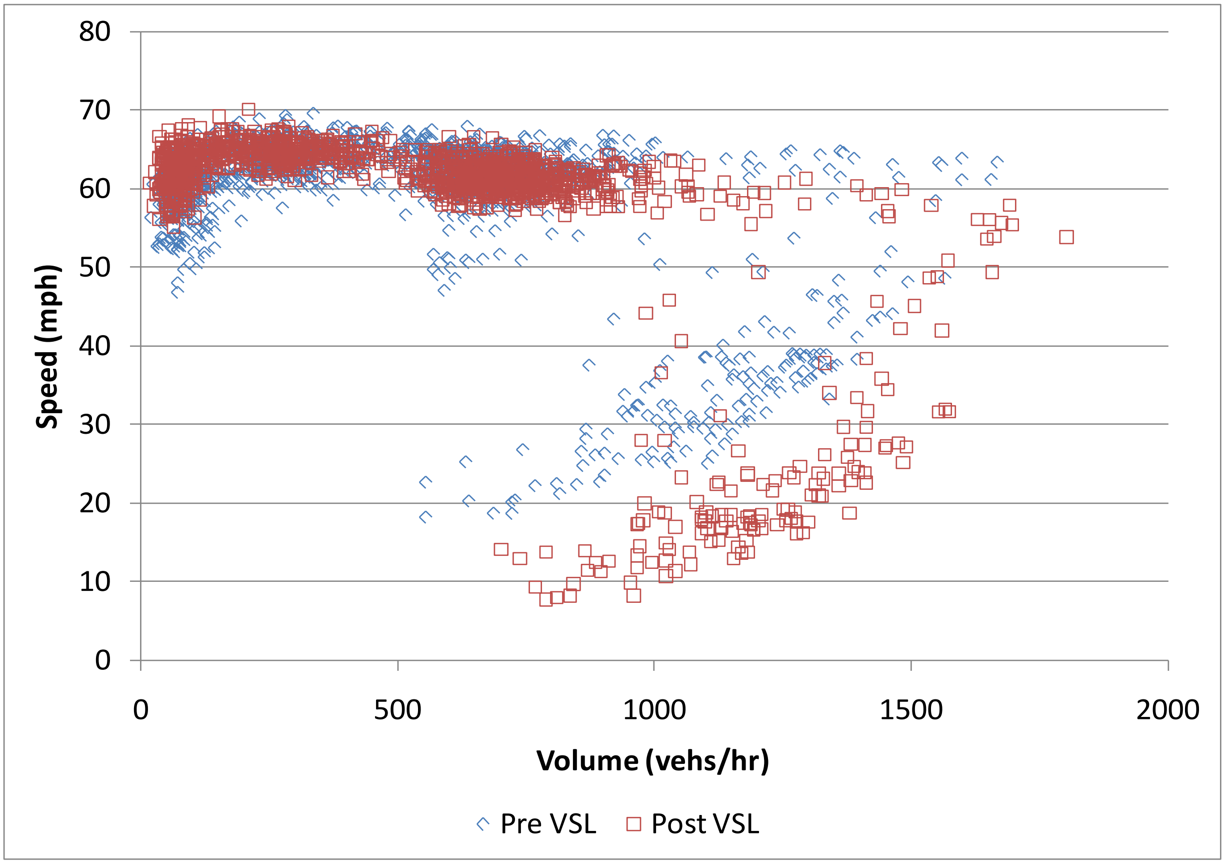


Figure S2.15.2 Speed Flow Plot at 5D

Figures present the speed-flow plot at 3D (logmile 3.6) and 5D (logmile 5.7). For both conditions no benefits were observed. Although traffic data did not indicate benefits of the VSL system, the efficiency of the system can be improved by possibly preventing traffic from breaking down. This can be achieved by metering the traffic upstream in near real time and preventing the highway from reaching capacity.

Task 1.6: Evaluation of Congestion Measures

To evaluate the congestion measures, travel times and travel time reliability indices, travel delay, Percent of Congested Delay, and extent, duration, and intensity of queues formed were compared for pre- and post-VSL conditions. Segment 2 travel times were computed between detectors 3D (logmile 3.6) and 5D (logmile 5.7) for selected days mentioned in Table S2.1. Travel times were calculated for average of all lanes and average of lane 3 (It had same volume for pre- and post-VSL conditions) for five days and were compared for pre- and post-VSL conditions.

Figure S2.16.1 presents comparison of average travel times for five days of data for all lanes of the highway between detectors 3D (logmile 3.6) and 5D (logmile 5.7) . From the figure it can be inferred that for pre-VSL conditions the mean travel time was 105 person-minutes. For post-VSL conditions, the mean travel time increased to about 118 person-minutes. Tables S2.16.1 and S2.16.2 present comparison of average mean and standard deviation of travel times for five days of data for all lanes of the highway between detectors 3D (logmile 3.6) and 5D (logmile 5.7) . It can be observed from the tables that the mean travel time during peak periods for post-VSL conditions increased 12%, but standard deviation of travel time decreased 2.4 % compared to pre-VSL conditions between detectors 3 and 5, respectively. It shows travel times during peak periods decreased significantly after initiation of the VSL system. Also reduction in standard deviation indicates that VSL system was beneficial at decreased variation of travel times during the peak period.

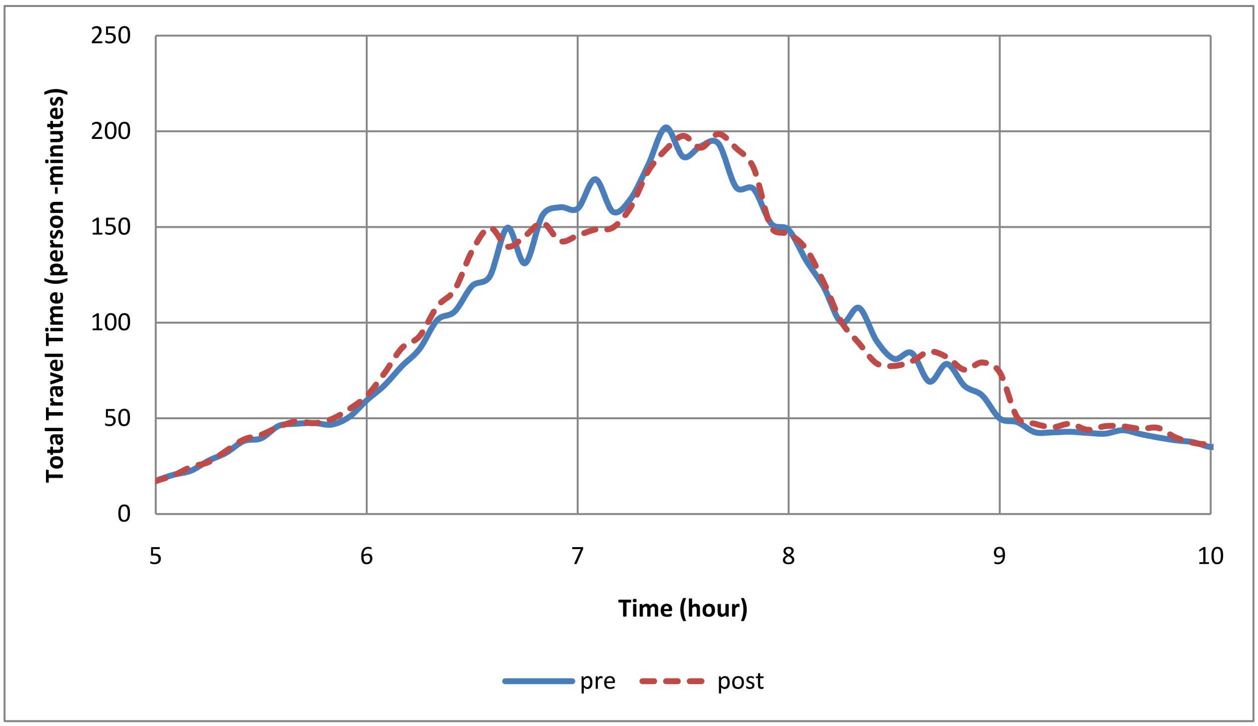


Figure S2.16.1. Comparison of Pre and Post-VSL average travel time data between 3D and 5D (Average of all lanes)

Table S2.16.1 Comparison of mean travel times during peak period for pre- and post VSL (All lanes)

Dates	Between 3D and 5D			
	Travel Time (person-minutes)		Volume (vehicles/hour)	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
October 16 & 14	103.65	139.21	1244	1234
October 31 & 29	83.46	125.78	1252	1228
November 15 & 13	156.39	136.58	1130	1241
April 8& 7	91.93	95.87	1206	1293
April 23& 22	91.94	91.87	1251	1334
Avrg. of five days	105.47	117.86	1217	1266
Difference	+12.39		+49	
Percentage Change	+11.7		+4.0	

Table S2.16.2 Comparison of standard deviation travel times during peak period for pre- and post VSL (All lanes)

Dates	Between 3D and 5D			
	Travel Time (person-minutes)		Volume (vehicles/hour)	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
October 16 & 14	58.69	67.90	229	246
October 31 & 29	45.72	63.72	270	237
November 15 & 13	89.31	64.04	270	240
April 8& 7	43.56	39.94	225	271
April 23& 22	45.70	40.60	219	279
Avrg. of five days	56.59	55.24	243	255
Difference	-1.35		+12	
Percentage Change	-2.4		+4.9	

Tables S2.16.3 and S2.16.4 present the comparison of mean and standard deviation of travel times for selected day average for lane 3 between detectors 3 and 5. It can be observed from the tables that the mean and standard deviation of travel time during peak periods for post-VSL conditions decreased 7 and 5.5% compared to pre-VSL conditions between detectors 3 and 5. It shows that travel times during peak periods decreased slightly after initiation of the VSL system. Also, reduction in standard deviation indicates VSL system was beneficial as variation in travel times decreased during the peak periods.

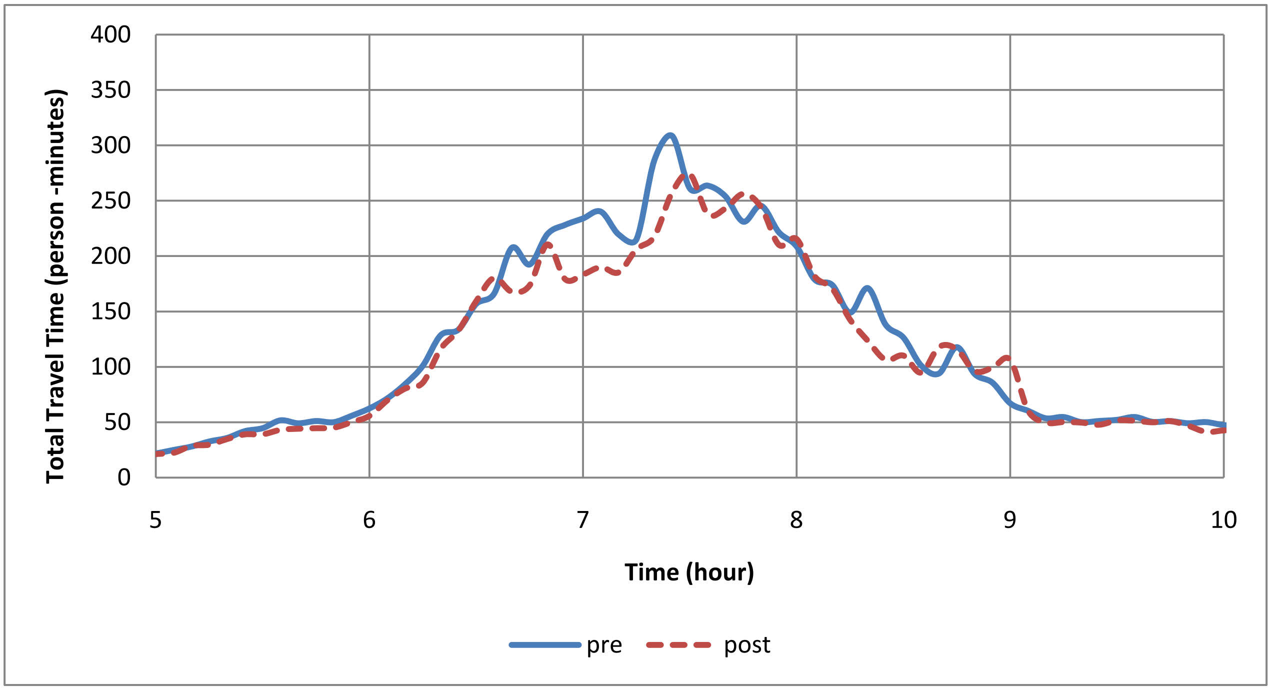


Figure S2.16.2Comparison of Pre and Post-VSL average travel time data between 3D and 5D (Average of lane 3)

Table S2.16.3 Comparison of mean travel times during peak period for pre- and post VSL (Lane 3)

Dates	Between 3D and 5D			
	Travel Time (person-minutes)		Volume (vehicles/hour)	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
October 16 & 14	140.47	172.33	1301	1267
October 31 & 29	109.90	145.21	1293	1224
November 15 & 13	222.28	165.64	1144	1242
April 8& 7	125.58	97.44	1322	1300
April 23& 22	121.55	89.02	1385	1332
Avrg. of five days	143.96	133.93	1289	1273
Difference	-10.03		-16	
Percentage Change	-7.0		-1.2	

Table S2.16.4 Comparison of standard deviation travel times during peak period for pre- and post VSL (Lane 3)

Dates	Between 3D and 5D			
	Travel Time (person-minutes)		Volume (vehicles/hour)	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
October 16 & 14	89.61	108.06	204	233
October 31 & 29	72.34	96.07	257	220
November 15 & 13	139.37	103.35	276	235
April 8& 7	64.89	53.09	222	238
April 23& 22	67.34	49.15	190	236
Avrg. of five days	86.71	81.94	230	232
Difference	-4.77		+2	
Percentage Change	-5.5		+0.9	

Individual Measures

The individual measures, TTI, BTI, and PTI were compared with five days of data for the peak periods for pre- and post-VSL conditions. Table S2.16.5 presents the comparison of average of individual measures, TTI, BTI, and PTI (five days of data) for average of lane 3 between detectors 3 and 5. It can be observed from Table S2.16.5 that for post-VSL conditions TTI, BTI, and PTI decreased about 3, 11, and 5% and 0.4, 13, and 3% for average of lane 3 and average of all lanes computed between detectors 3 and 5, respectively. Reduction in TTI shows decrease in ratio between the actual travel rate and Posted Speed Limit (PSL) travel rate, which indicates that the VSL system was useful in decreasing the difference between the peak period and the PSL travel conditions. This indicates that travel times for peak periods and PSL are closer to each other in post-VSL conditions. Reduction in BTI indicates decrease in difference between 95% travel time and average travel time that means the VSL system was beneficial in reducing the difference between the 95% travel time and average travel time. Reduction in PTI indicates decrease in ratio between 95% travel time and PSL travel time that means the VSL system was useful in decreasing the difference between 95% and PSL travel time.

Table S2.16.5. Comparison of travel times reliability factors for pre- and post-VSL

Individual Measures	Between 3D and 5D			
	Average of lane 3		**Average of all lanes**	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
Travel Time (TTI)	4.12	3.98	2.79	2.78
Difference (Percentage Change)	-0.14(-3.4)		-0.01(-0.4)	
Buffer Time Index (BTI)	0.95	0.85	0.84	0.73
Difference (Percentage Change)	-0.10(-10.5)		-0.11(-13.1)	
Planning Time Index (PTI)	5.06	4.83	3.62	3.51
Difference (Percentage Change)	-0.23(-4.5)		-0.11(-3.0)	

Overall results for segment 2 show all travel time reliability indices (TTI, BTI, and PTI) decreased. Reduction in all travel time reliability indices for post-VSL conditions indicates less variability and more consistency between highest value of travel time during the peak period (worst condition) and PSL condition. It can be concluded that post-VSL conditions was more reliable than pre-VSL conditions and there is benefit after VSL system initiation.

In this part, individual measures, TTI, BTI, and PTI, were calculated for each lane separately for selected days, thereafter their averages for each lane and average of all lanes were computed. Figure S2.16.3 indicates the comparison of average TTI for selected days for average of each lane separately and also average of all lanes between detectors 3 and 5. It can be inferred from Figure S2.16.3 that TTI reduced after VSL system installation for all lanes. Therefore, it can be stated that VSL system installation has been beneficial for reducing TTI.

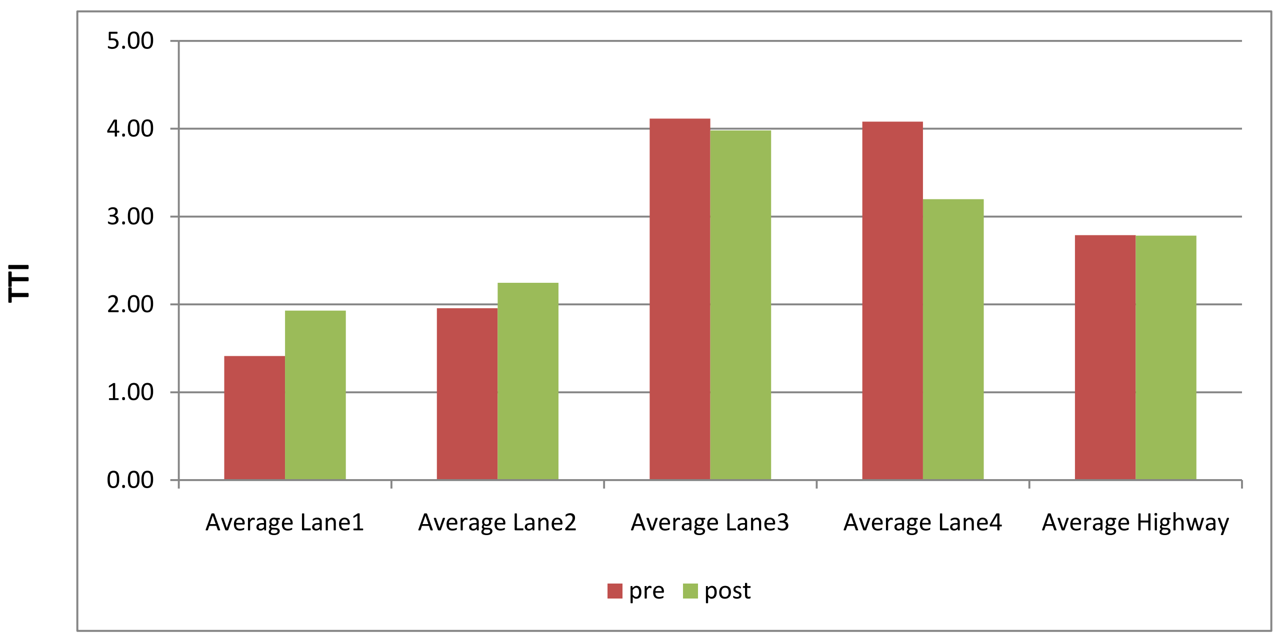


Figure S2.16.3. Comparison of Pre and Post-VSL conditions Travel Time Index (TTI) between 3D and 5D

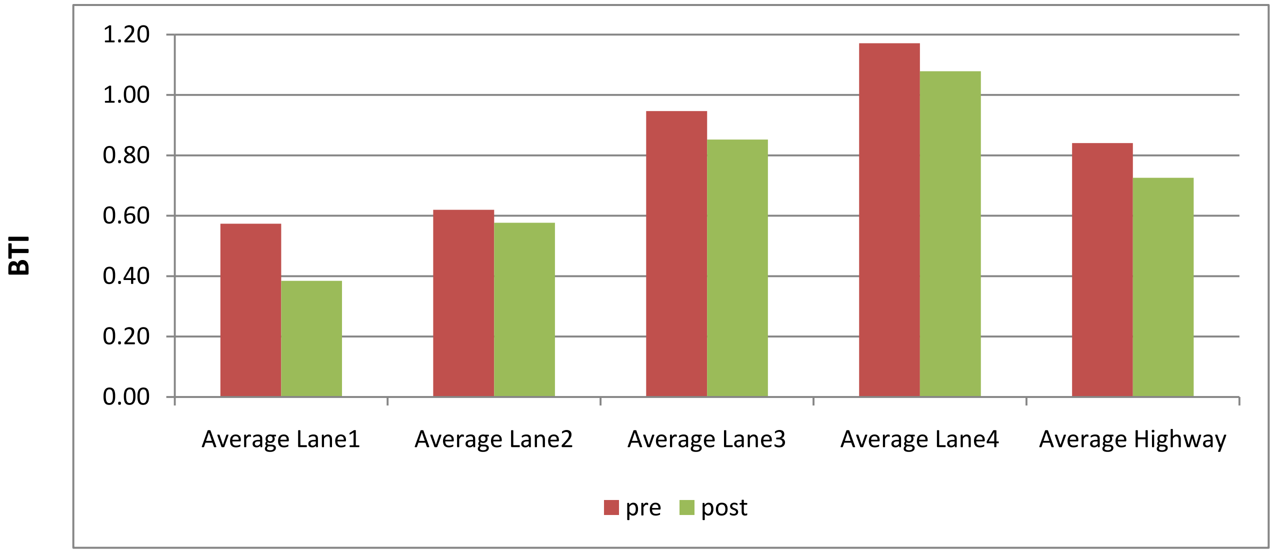


Figure S2.16.4. Comparison of Pre and Post-VSL conditions Buffer Time Index (BTI) between 3D and 5D

Figure S2.16.4 presents the comparison of average of BTI for selected days for average of each lane and also average of all lanes between detectors 3 and 5. It can be noted from Figure S2.16.4 that BTI decreased after VSL system installation for all lanes. It can be said that VSL system installation has benefited for decreasing BTI.

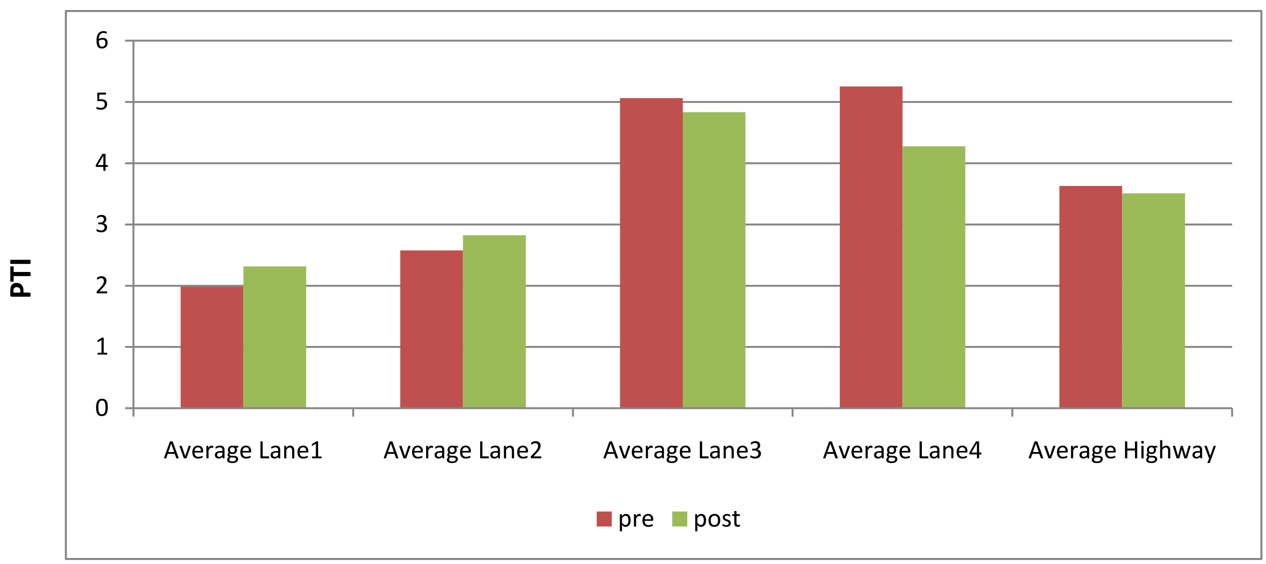


Figure S2.16.5 Comparison of Pre and Post-VSL conditions Planning Time Index (PTI) between 3D and 5D

Figure S2.16.5 shows the comparison of average of PTI for selected days for average of each lane and also average of all lanes between detectors 3 and 5. It can be stated from Figure S2.16.5that PTI has reduced after VSL system installation for all lanes. It can be inferred that the VSL system installation has been beneficial for reducing PTI. Figures S2.16.3, S2.16.4 and S2.16.5 show reduction of the indices in all lanes are not the same.

Traffic Delay

For segment 2, the analysis indicates that average Delay calculated for post-VSL system was much lower compared to the pre-VSL system. This reduction in delay, presented in Table S2.16.5 was approximately one minute for the five days of data used.

Table S2.16.5. Average Delay and Change in Percentage of Congested Travel during peak periods before and after VSL system installation

Detector ID	MP 3D to MP 5D
Pre (16th Oct 07) and Post (14th Oct 08) SD	
Pre VSL Travel Time (minutes)	3.8
Post VSL Travel Time (minutes)	4.8
Delay (minutes)*	1
Percent Change in Congested Travel*	26%
Pre (29th Oct 07) and Post (31st Oct 08)	
Pre VSL Travel Time (minutes)	3
Post VSL Travel Time (minutes)	4.3
Delay (minutes)*	1.3
Percent Change in Congested Travel*	43%
Pre (15th Nov 07) and Post (13th Nov 08)	
Pre VSL Travel Time (minutes)	7.3
Post VSL Travel Time (minutes)	4.7
Delay (minutes)	-2.6
Percent Change in Congested Travel	-36%
Pre (8th April 08) and Post (7th April 09)	
Pre VSL Travel Time (minutes)	3.4
Post VSL Travel Time (minutes)	3.1
Delay (minutes)	-0.3
Percent Change in Congested Travel	-9%
Pre (23rd April 08) and Post (22nd April 09	
Pre VSL Travel Time (minutes)	3.3
Post VSL Travel Time (minutes)	2.9
Delay (minutes)	-0.4
Percent Change in Congested Travel	-12%

*Negative value indicates decrease in Post-VSL congestion measures and vice versa.

Similarly, Percentage of Congested Travel reduced by nearly 12 percent for post-VSL conditions. Results indicate decrease in Delay and Percentage of Congested Travel in post-VSL conditions. It can be observed from the results that the VSL system decreased traffic delays which translate into user cost savings. Values in Table S2.16.5 indicate reduction in average Percentage of Congested Travel and average Delay during peak periods. The next subsection, quantifies the delay as user cost savings.

Delay Cost Analysis

Travel time decreased by 1 minute which corresponds to 12.39 person-minutes of delay. The segment length is 2.1 miles and increase in volume was observed to be 4%. As a result of increase in delay in post-VSL conditions, the delay cost was not calculated for this segment.

Queue Measurement

The objective of this task was to compare the queue duration, extent and intensity on the segment. This subtask could not be carried out for this segment due to unavailability of sufficient detector data.

Task 1.7: Analysis of VSL System during Inclement Weather

Data analysis was also carried out to evaluate the VSL system during inclement weather conditions. Similar to clear weather conditions, inclement weather data for volume, average speed were used for comparison of pre- and post-VSL. Three days from post-VSL conditions and two from pre-VSL conditions were chosen for data analysis. The figures that follow depict the speed and volume profile plot for detectors along the highway for December 16th, 2008 during post-VSL conditions.

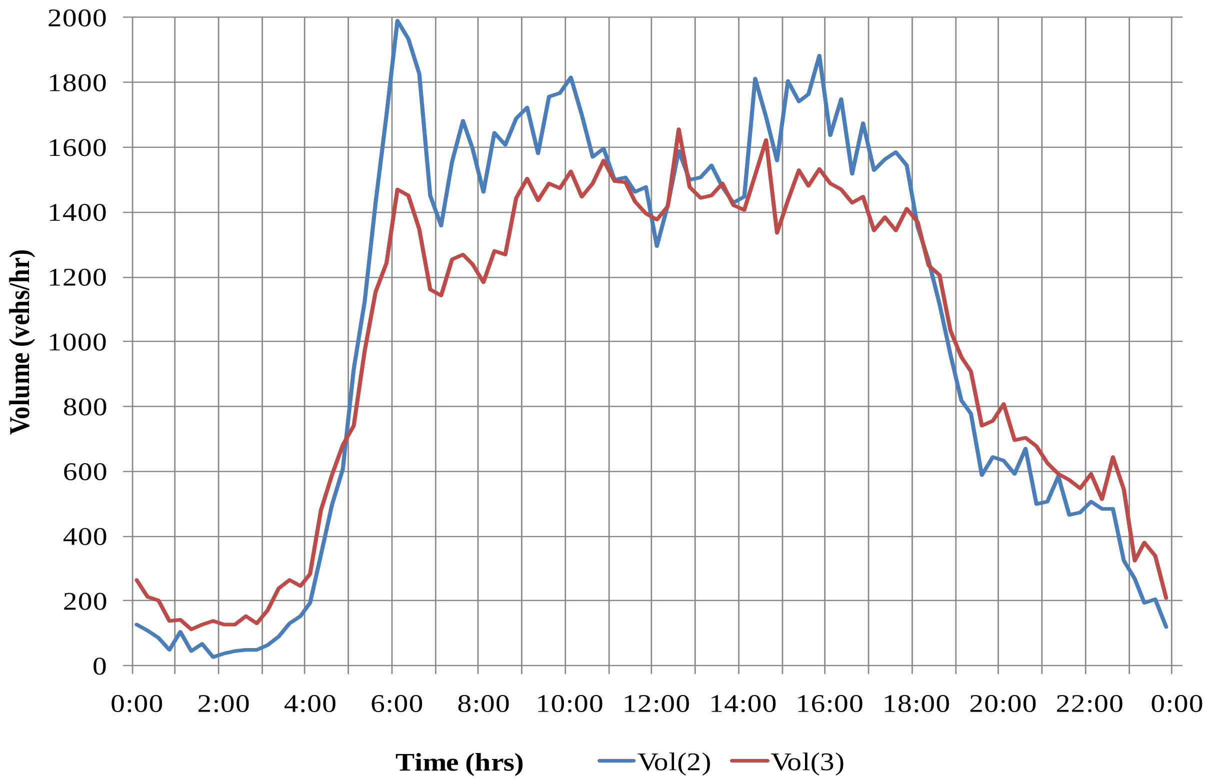


Figure S2.17.1 Post-VSL (Dec. 16th, 08) Average Volume data (detector 3D)

Figure S2.17.1 presents the average volume for lanes 2 and 3. It can be noticed that the maximum flow was less than 2000 vehs/hr on lane 2 and average volume around 1800 vehs/hr. This indicates low traffic on that day but the speed profile indicated traffic congestion between 0500-1000 hrs which indicates combined effects of peak period traffic and inclement weather.

Figure S2.17.2 present average speed for two lanes and average highway speeds for detector 3D (logmile 3.6). It can be noted that the average speeds for post-VSL conditions at the detector locations dropped below 15 mph. Since the peak periods were established using the observation that peak period usually starts when the speed drops below 60 mph, this was not observed for inclement weather data. During inclement weather, the average speed dropped below 60 mph at 4 am and continued to be below 60 mph for the entire day. From Figure S2.17.2 it is evident that no improvement in traffic conditions were observed during snow conditions during the post-VSL initiation period.

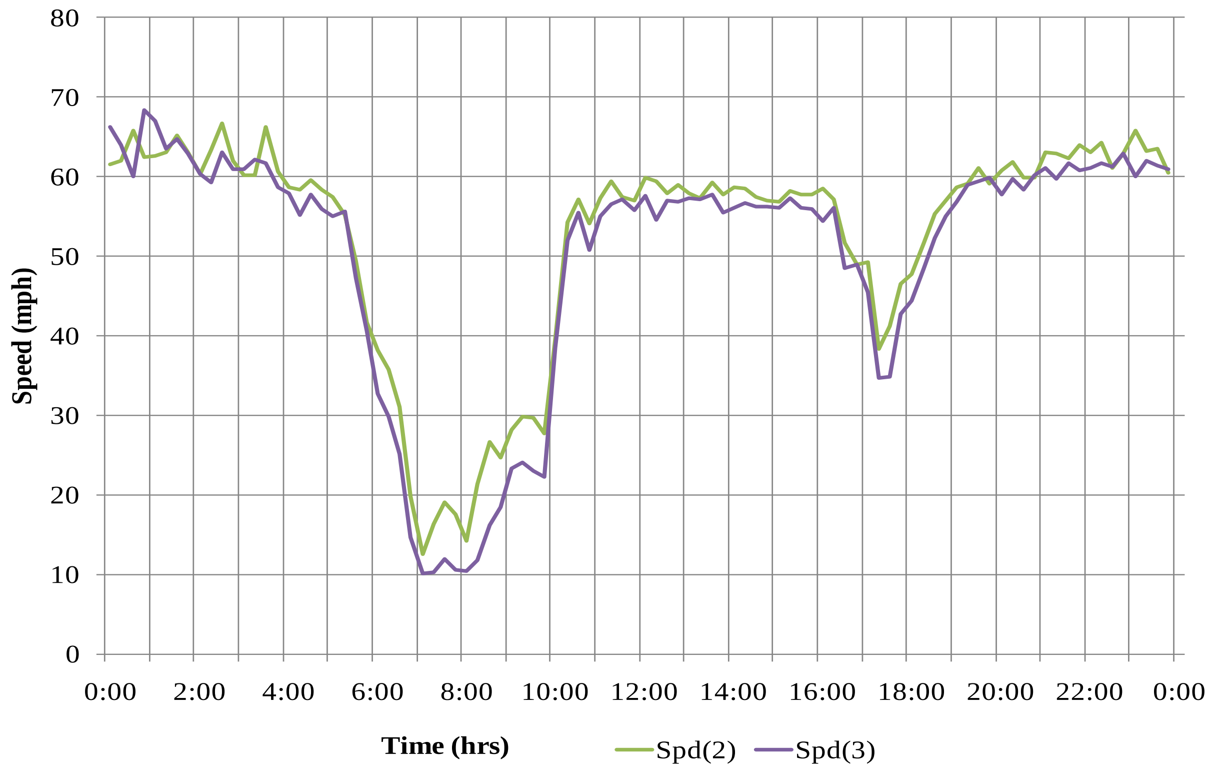


Figure S2.17.2. Post-VSL (Dec. 16th, 08) Average Speed Profile (detector 31D)

It should be noted that the ASTI posted variable speed limit data was not available from December 16th, 2008 till the end of February 2009. Therefore, it cannot be verified whether VSL signs were active during these conditions. Posted speed data for April 19th, 2009, a rainy day, indicated that the speed limit was constant at 60 mph throughout the day, which showed no difference between pre- and post-VSL conditions for inclement weather. Further analysis for weather data could not be carried out as speed limits were not reduced and as such no traffic improvements were observed. Furthermore, additional data was not available to confirm the activation of the VSL system.

SEGMENT 3 ANALYSIS

Table S3.1 presents the dates that were selected for segment 3 evaluation. These dates were considered appropriate for evaluation as the traffic volumes were similar, traffic data was available, no incidents occurred and presented clear weather conditions. The days in the table are mostly Thursdays unless pointed out in the footnote.

Table S3.1. Selected Dates used in VSL system evaluation

Pre-VSL System Installation	Post-VSL System Installation
23rd October 2007*	21st October 2008*
31st October 2007**	29th October 2008**
3rd April 2008	2nd April 2009
30th April 2008**	29th April 2009**
21st May 2008**	20th May 2009**

* Tuesdays, ** Wednesdays

For this segment, sufficient number detectors were not available; therefore, data from detector 25D (logmile 25) were used. Similar to Segment 1, for this segment evening peak period was used. Peak periods were different for different days, all the plot analysis was done for the duration of 1400-2000 hours as it included peak periods for all days. No peak periods or congestion was found for detector 21D (logmile 21.4) and the average speeds remained between 65-55 mph, hence, it was not used for evaluation, however, for certain tasks where at least two detectors were required, data from 21D (logmile 21.4) were used.

Task 1.1: Volume and Occupancy Analysis

This task consists of two sub-tasks. First, average volume for pre- and post-VSL conditions are compared. Second, occupancy data for pre- and post-VSL conditions, and the change in flow-occupancy relationship are compared. The change in volume is accounted to evaluate the effect on average speed, travel time and congestion. Figure S3.11.1 and Table S3.11.1 present the volume comparison between pre- and post-VSL system installation for all lanes for detector 25D (logmile 25) for pre (April 30th, 08) and post (April 29th, 09) VSL system installation. Average volume for 5-minutes interval on the highway was compared for both conditions to account for any change in volume.

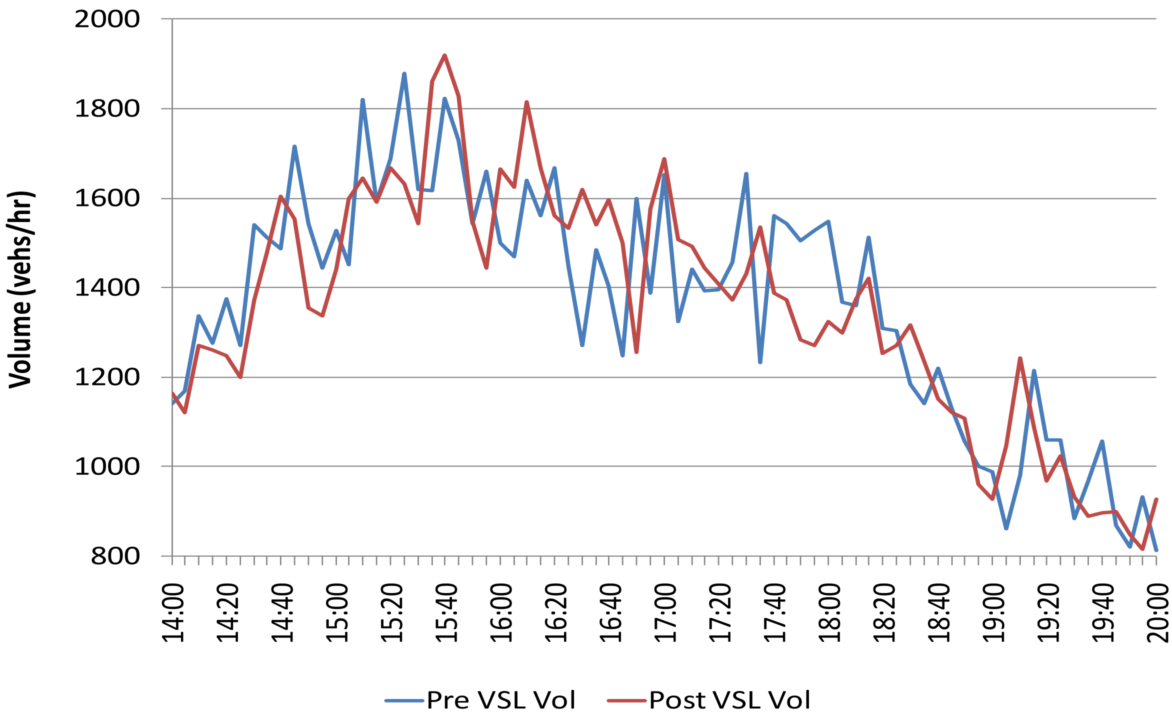


Figure S3.11.1 Comparison of Pre (April 30th, 08) and Post-VSL (April 29th, 09) Volume for 25D

In Table S3.11.1 average volume for pre- and post-VSL conditions are presented for intervals of 30 minutes. Observed change in average volume was 0.04 percent increase for five minute interval data. Days with different volumes in post-VSL conditions cannot be compared with pre-VSL conditions as it would be difficult to explain the cause of differences in speeds. For high volume in post-VSL condition, improved speed will indicate system benefits whereas similar volumes will provide at par comparison. For segment 3, therefore, days with similar volumes were used for evaluation. Since the change observed in volume was not significant for pre- and post-VSL conditions, no adjustments were required for system evaluation. Similar peak periods were observed for each of the four days, highlighted in Table S3.11.1, used for evaluation and are presented in Figures S3.11.2 and S3.11.3 for pre- and post-VSL conditions, respectively. The figures present average volume for 5 minutes for average of all lanes.

Table S3.11.1. Average Volume at Detector 25D during Peak Periods

Time	15:00	15:30	16:00	16:30	17:00	17:30	18:00	18:30	19:00	19:30	Avg
Pre-VSL Vol. (vph)	1528	1620	1500	1272	1652	1656	1248	1548	988	884	1376
Post-VSL Vol. (vph)	1440	1544	1664	1620	1688	1432	1500	1324	928	932	1381
Percentage difference	-6%	-5%	11%	27%	2%	-14%	20%	-14%	-6%	5%	0.3%

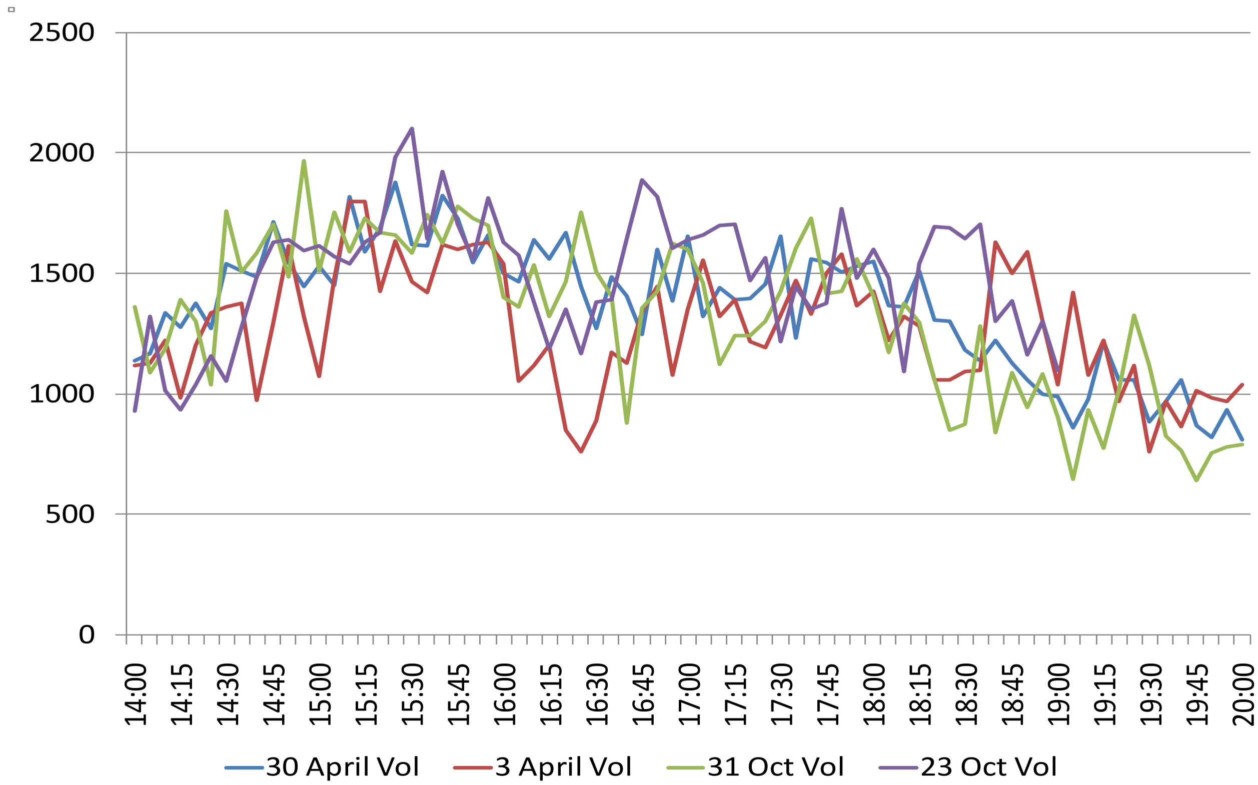


Figure S3.11.2 Pre-VSL Volume Profile for four days

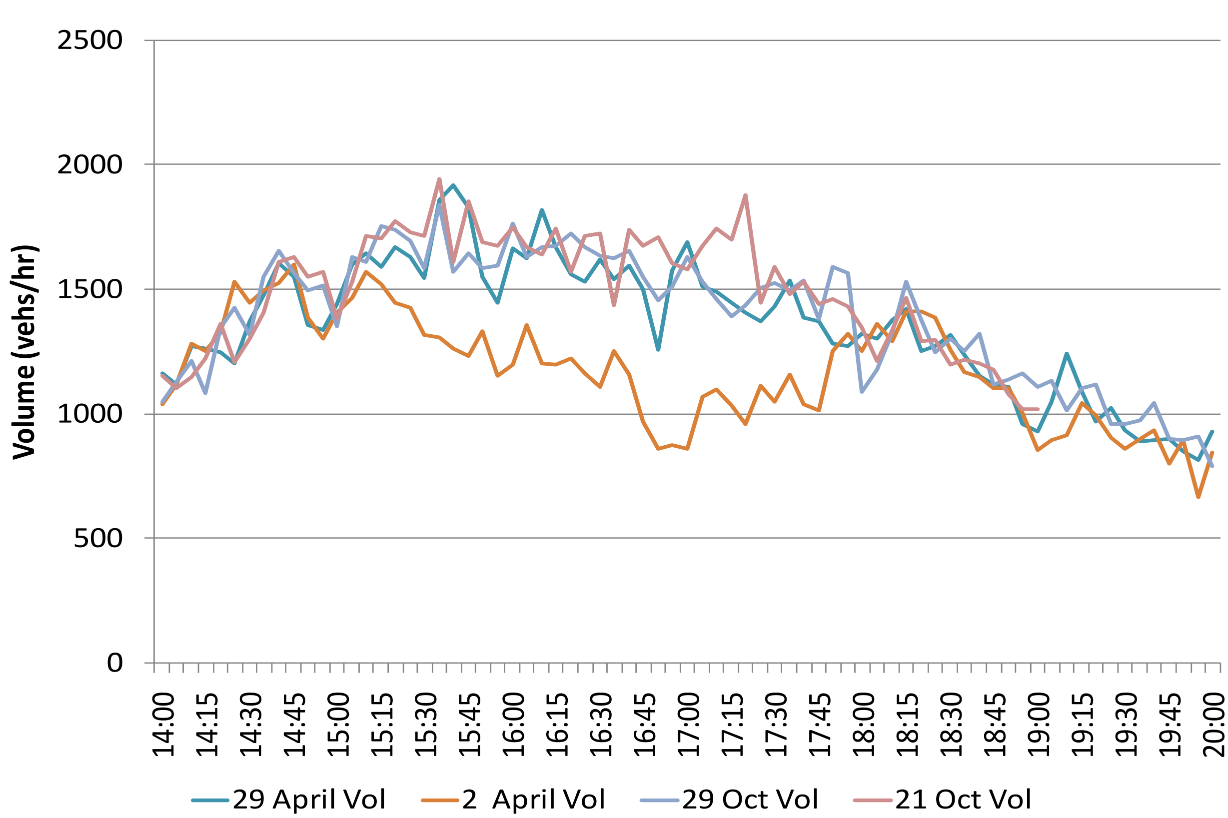


Figure S3.11.3 Post-VSL Volume Profile for four days

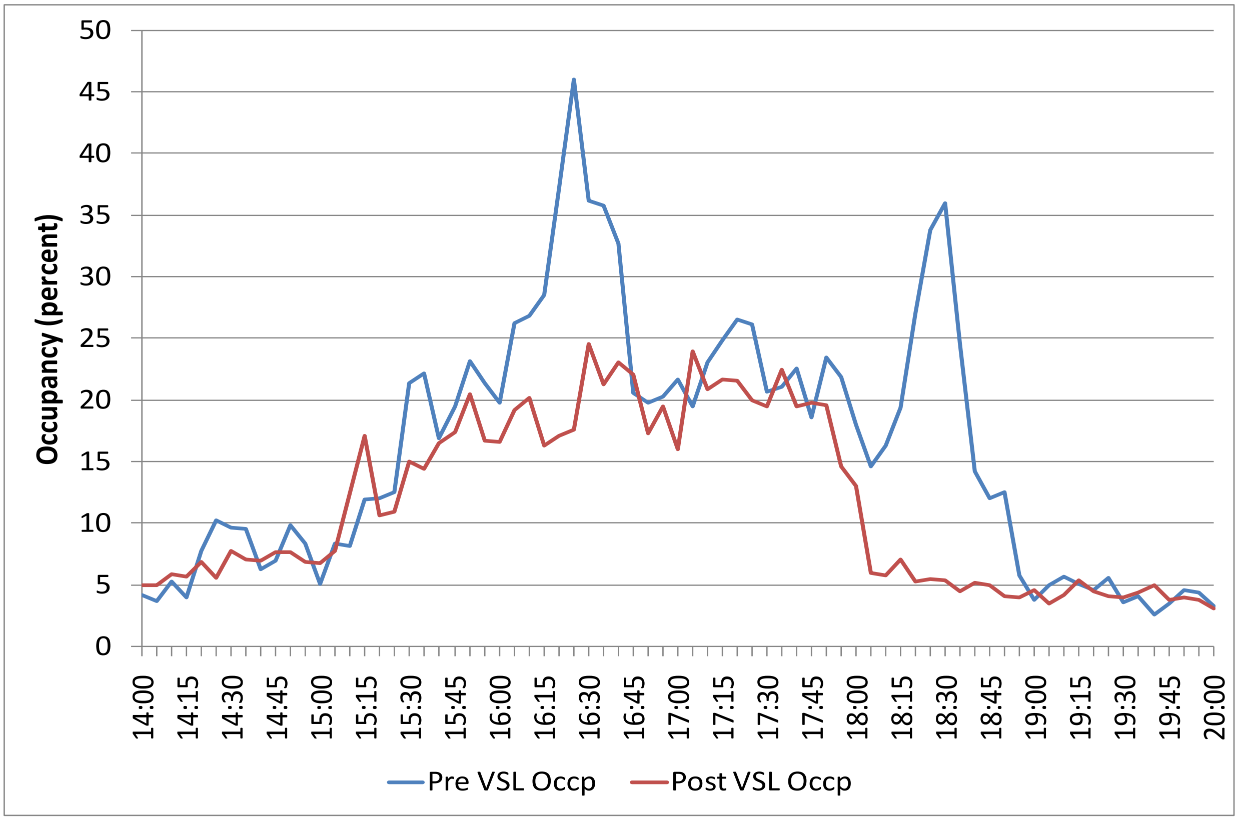


Figure S3.11.4. Comparison of Pre (April 30th, 08) and Post-VSL (April 29th, 09) Occupancy of 25D

For the second sub-task, Figure S3.11.4 presents average occupancy for average of all lanes at detector 25D (logmile 25) for pre (April 30th, 08) and post (April 29th, 09) VSL system installation. It can be noted that the peak period reduced from 1500-1900 hours after VSL installation compared to pre-VSL condition when it was from 1500-1800 hours. Also, it can be noted that the maximum observed occupancy for pre-VSL condition was nearly 46 percent which reduced to 25 percent after VSL installation. This indicated decrease in traffic congestion as a result of reduction in percent occupancy.

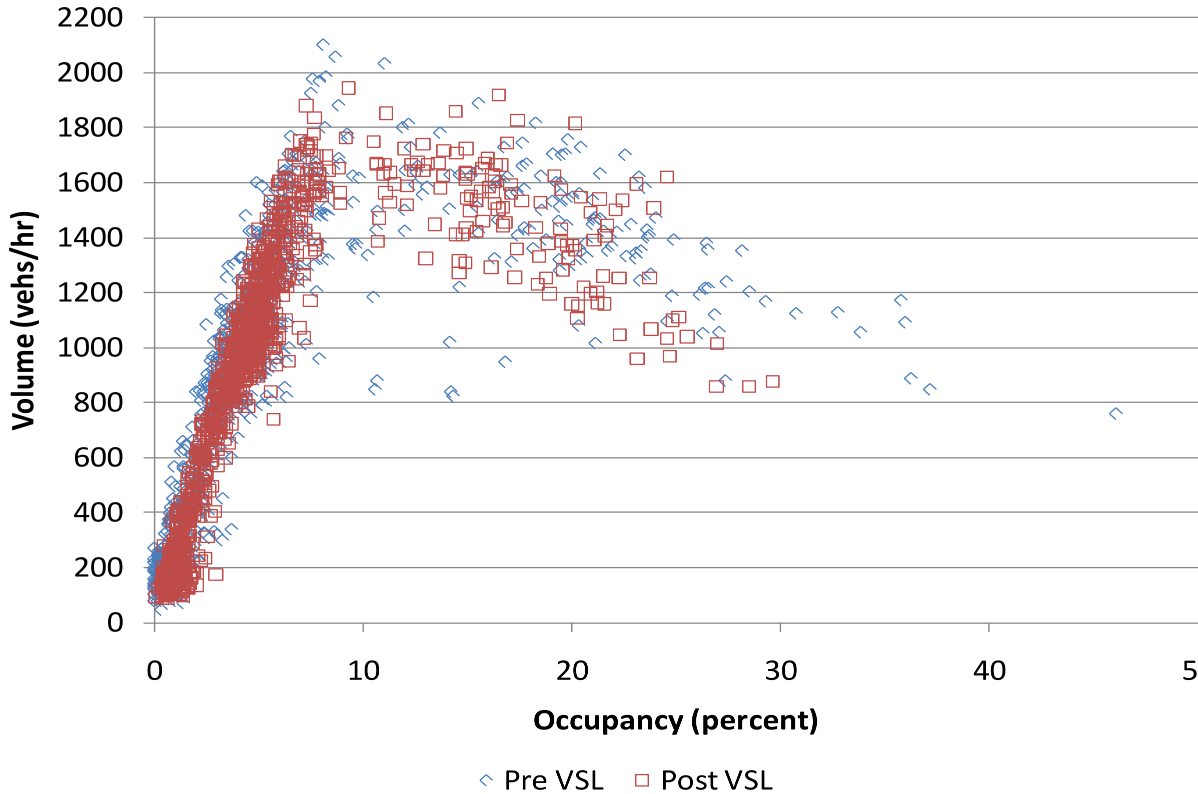


Figure S3.11.5. Flow-Occupancy Plot for 25D for Four days

Figure S3.11.5 shows the comparison of pre- and post-VSL traffic volume and occupancy plot averaged out for all lanes for four days in pre- and post-VSL conditions. Data used for flow occupancy plot were aggregated for 5 minutes. It can be observed from the figure that the VSL system installation has improved traffic flow as the occupancy is less than 30% compared to pre-VSL occupancy of more than 40 percent. This clearly indicated better traffic conditions in post-VSL conditions indicating system benefits.

Task 1.2: Average Speed/Lane by Posted Speed Limit during Peak Periods

One of the main objectives of the VSL system was to improve traffic flow and this task evaluated the difference in average speed by comparing the data before and after the VSL system installation. Speed data averaged for all the lanes of segment 3 for every 5 minutes were used. Figure S3.12.1 presents the average highway speed for detector 25D (logmile 25) pre- and post-VSL conditions. The figure indicates that the peak period for traffic on this segment for pre- and post-VSL conditions lies between 1430 to 1900 hours based on the average speed. Henceforth, all the figures for peak periods will be presented for this duration. Also, the pre- and post-VSL speed profile comparison over time shows reduction in peak period and improvement in average speeds for post-VSL conditions.

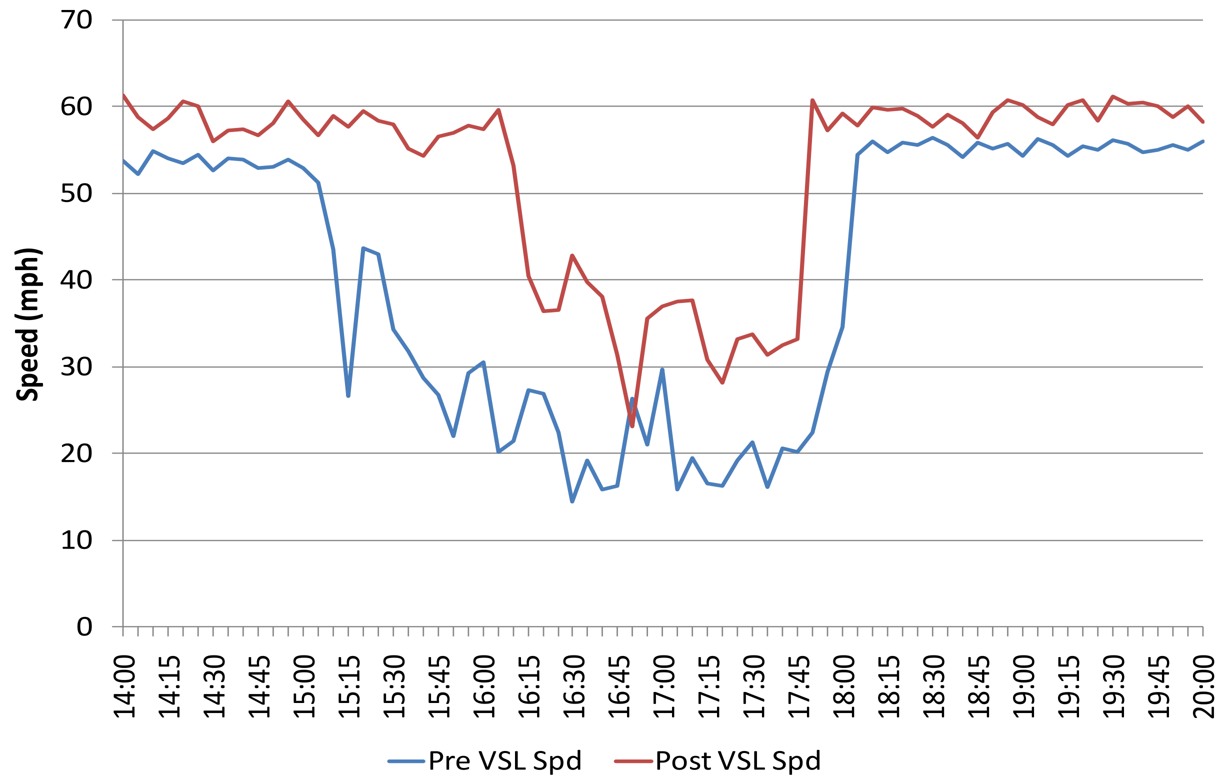


Figure S3.12.1. Comparison of Pre (April 30th, 08) and Post-VSL (April 29th, 09) Speed data for 25D

Figure S3.12.1 clearly indicates that the peak periods reduced for post-VSL conditions and, the average speed increased in post-VSL conditions. The difference between pre-and post- VSL speeds varied from 5 to 25 mph during the peak period. To supplement the comparison of speed data presented for one day, Figures S3.12.2 and S3.12.3 present the speed profiles for four days averaged for all lanes in pre- and post-VSL conditions. From the comparison of the two figures, it can be noticed that the peak periods in both conditions were between 1400-1900 hours, however, the duration and average speeds reduced in post-VSL conditions. Additionally, the average speeds improved by 6 mph in post-VSL conditions.

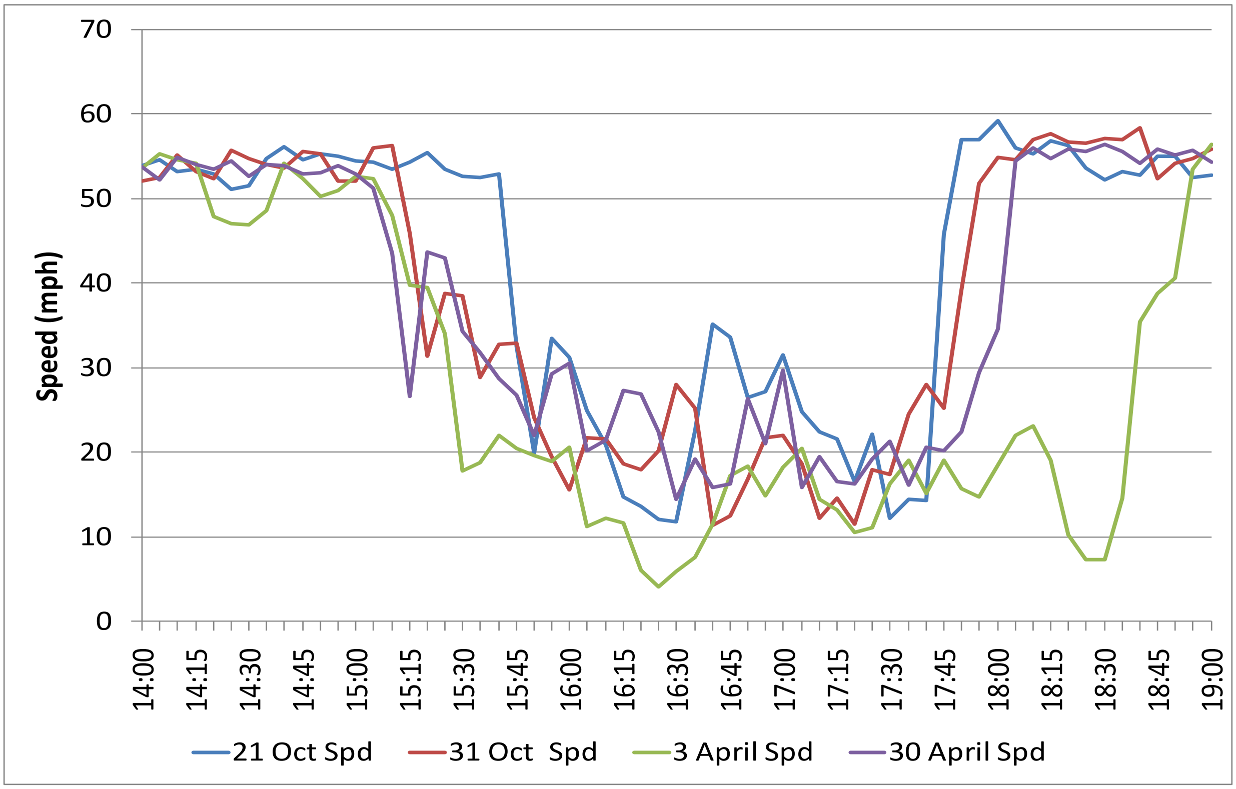


Figure S3.12.2 Pre-VSL Speed Profile for four days at Detector 25D

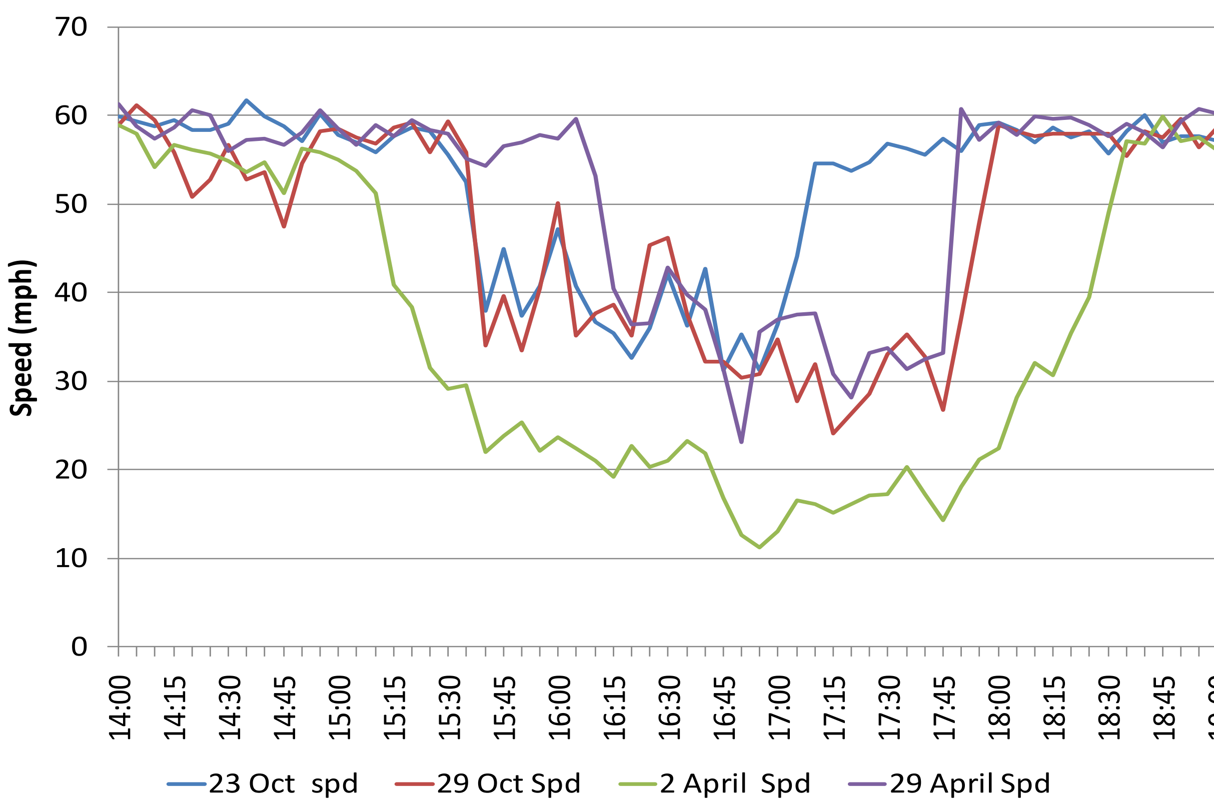


Figure S3.12.3 Post-VSL Speed Profile for four days at Detector 25D

Comparison of Average Speeds along the Segment

This subtask could not be carried out for this segment due to unavailability of sufficient detector data.

Speed Deviation across Lanes

For this sub-task, dispersion of average speeds across lanes is evaluated, based on comparison of pre- and post-VSL conditions. Dispersion in speed along the highway over different detectors could not be carried out as the distance between detectors is more than 1 mile. For accurate calculations, the distance between detectors should be 0.8 to a mile.

Figures S3.12.4 and S3.12.5 present the difference in average speeds across the lanes at detector 25D (logmile 25) for pre- and post-VSL conditions respectively. This location has three lanes. Lane 1 indicates the left most lane and the lane number increments toward the right lanes. Variable posted speeds were plotted over the average speeds to observe the deviation in speeds on each lane with the posted speeds. Table S1.32.1 presents the calculated standard deviation in speeds and the difference.

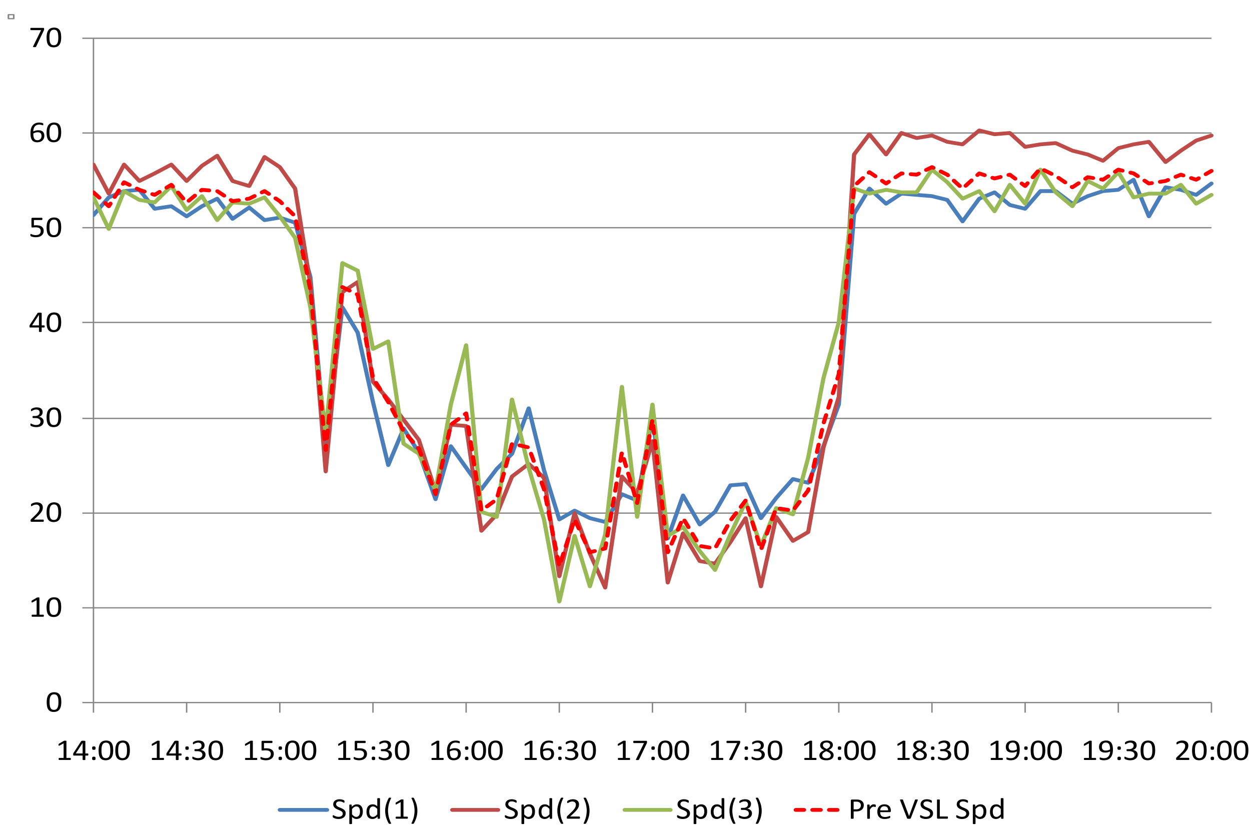


Figure S3.12.4. Pre-VSL (30th April, 08) Average Speed data for all lanes (detector 25D)

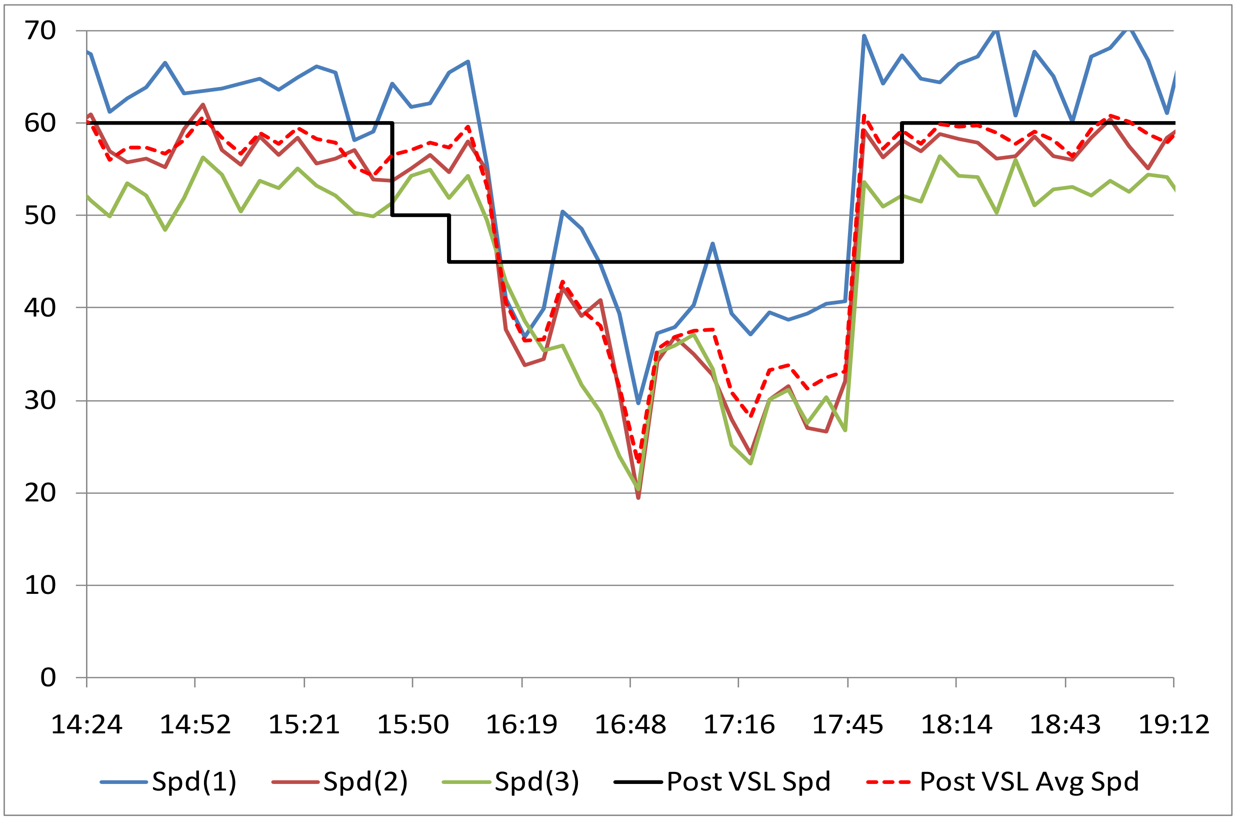


Figure S3.12.5. Post VSL (29th April, 09) Average Speed data for all lanes (detector 25D)

Table S3.12.1 presents the standard deviation of speeds (determined using Equation 2) during the peak period for pre- and post-VSL conditions for detector at 25D (logmile 25). The difference indicates the change in post-VSL traffic conditions compared to pre-VSL conditions. Standard deviations were calculated for peak periods only. Negative value indicates decrease in deviation of speed across the lanes, which indicates speed homogeneity. Speed homogeneity may cause reduction in traffic crashes which is a positive outcome of the VSL system. For this segment, average standard deviation calculated for post-VSL conditions clearly showed no improvement in speed homogeneity for post-VSL conditions.

Table S3.12.1. Standard Deviation (SD) of Speeds at Detector 25D during Peak Periods

	Comparison of Pre (23rd Oct 07) and Post (21st Oct 08) SD								
Time	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	**19:00**
Pre-VSL SD (mph)	*3.05*	*3.47*	*1.93*	*4.82*	*1.19*	*1.94*	*2.47*	*3.79*	*3.13*
Post-VSL SD (mph)	*5.27*	*5.83*	*4.73*	*5.13*	*3.86*	*5.41*	*8.98*	*6.85*	*6.48*
Difference (mph)*	***2.21***	***2.36***	***2.81***	***0.30***	***2.67***	***3.46***	***6.51***	***3.06***	***3.35***
	Comparison of Pre (31th Oct 07) and Post (29thOct 08) SD								
Time	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	**19:00**
Pre-VSL SD (mph)	*6.97*	*7.73*	*7.00*	*5.06*	*2.12*	*7.68*	*4.82*	*3.51*	*5.82*
Post-VSL SD (mph)	*7.53*	*8.24*	*2.39*	*3.59*	*7.33*	*7.29*	*5.71*	*6.25*	*10.73*
Difference (mph)	***0.56***	***0.51***	***-4.61***	***-1.48***	***5.22***	***-0.39***	***0.89***	***2.75***	***4.91***
	Comparison of Pre (3rd April 08) and Post (2nd April 09) SD								
Time	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	**19:00**
Pre-VSL SD (mph)	2.89	1.10	3.68	1.35	6.13	5.97	1.99	1.50	4.19
Post-VSL SD (mph)	3.17	2.18	7.34	4.78	5.13	6.68	9.45	2.46	4.29
Difference (mph)	***0.28***	***1.08***	***3.66***	***3.43***	***-1.01***	***0.71***	***7.45***	***0.97***	***0.10***
	Comparison of Pre (30th April 08) and Post (29thApril 09) SD								
Time	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	**19:00**
Pre-VSL SD (mph)	*3.04*	*2.80*	*6.56*	*4.43*	*1.96*	*1.81*	*4.78*	*3.26*	*3.59*
Post-VSL SD (mph)	*4.80*	*6.83*	*7.15*	*7.24*	*0.98*	*4.25*	*7.58*	*2.65*	*9.28*
Difference (mph)	***1.76***	***4.03***	***0.59***	***2.81***	***-0.98***	***2.44***	***2.80***	***-0.62***	***5.68***

*Difference indicates decrease in Post-VSL SD and vice versa.

Task 1.3: Speed Limit during Peak Periods

The objective of this task was to evaluate the system initiation logic for variable speed limits. This was carried out by analyzing the average speeds, traffic flow and occupancy during peak periods using two days of data, i.e. 2nd April, and 29 April, 2009. Figures were plotted to show the relationship between average speed, volume and occupancy for peak periods. On these plots, Figures S3.13.1 to S3.13.2, two y-axes were used; the y-axis on the left presents average speed, and the y-axis on the right presents average occupancy and volume. Additionally, posted variable speed limits were plotted to analyze the initiation of the VSL system. For the both days, data from detector 25D (logmile 25) are presented. For 2nd April, 2009, Figure S3.13.1 indicates that the system is initiated when the average vehicle speeds fell much below 60 mph, and volume and occupancy thresholds have exceeded the specified thresholds. However, Figure S3.13.2 indicated better initiation compared to Figure S3.13.1. This also improved traffic recovery when the system was initiated promptly as the speed fell below 60 mph.

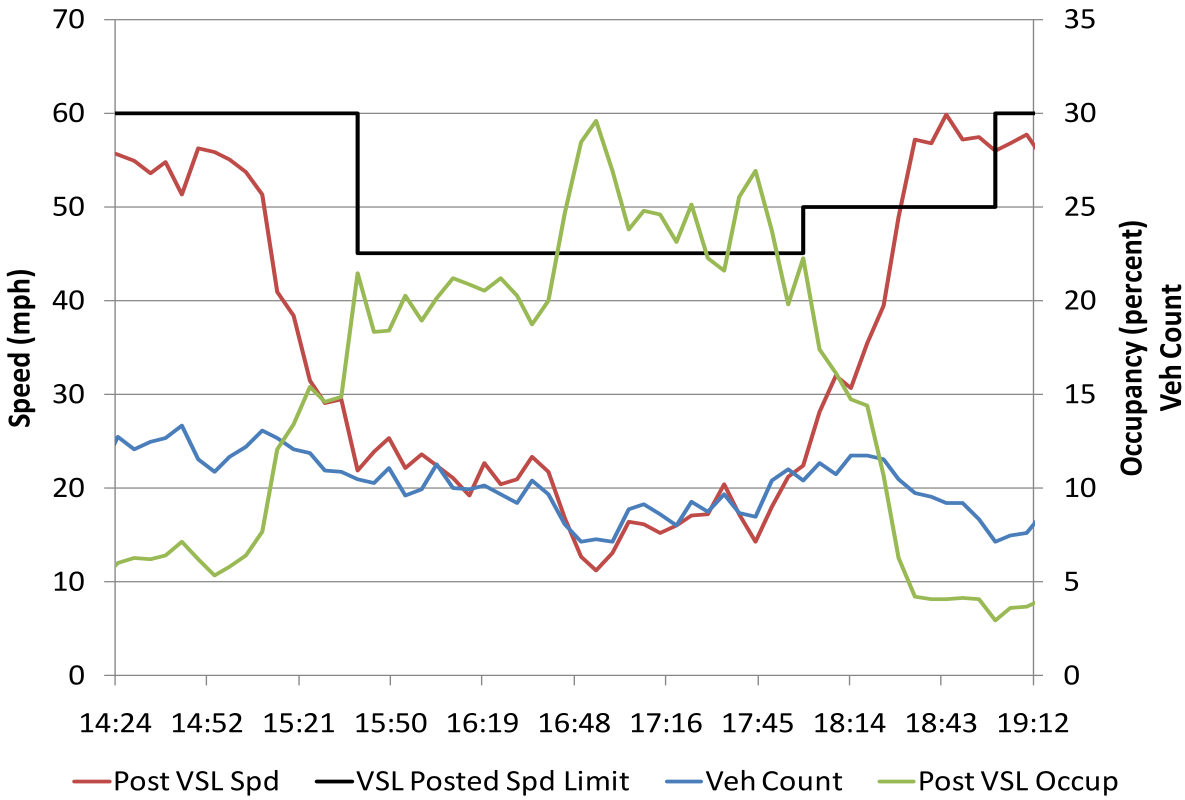


Figure S3.13.1. Post-VSL: VSL System trigger point (2nd April, 2009) for detector 25D

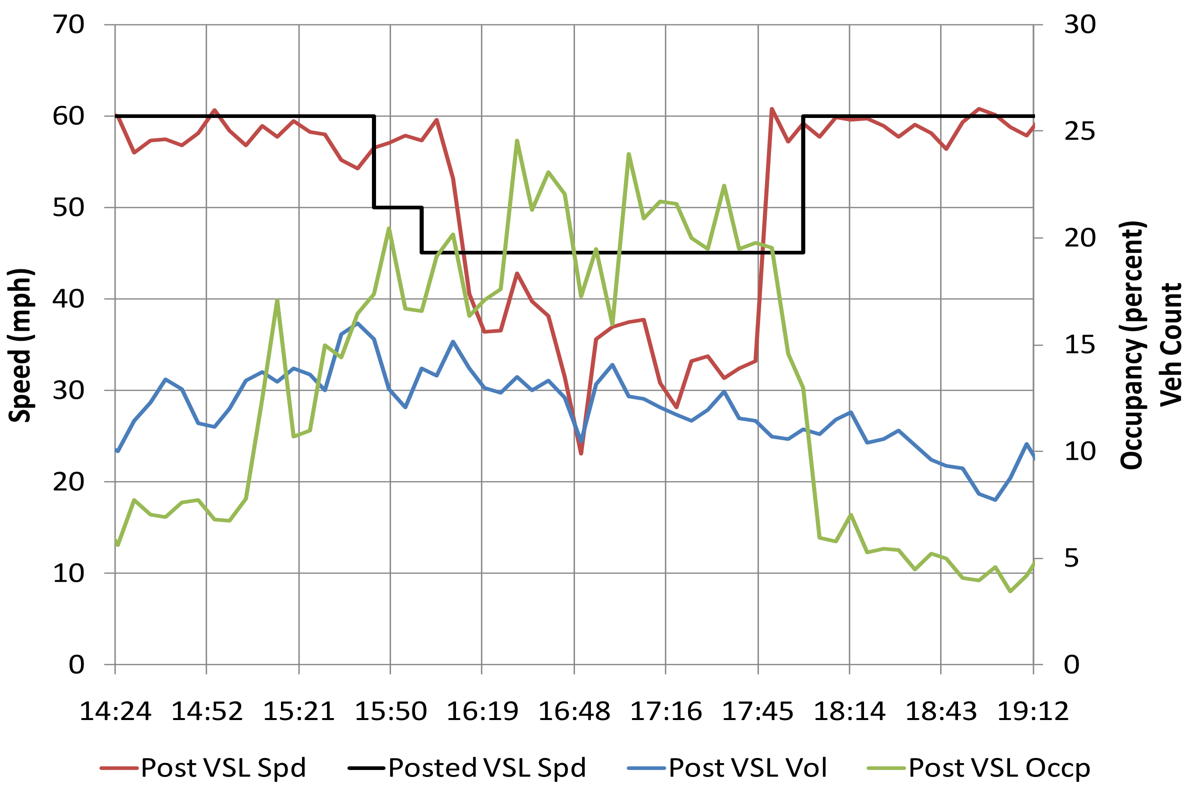


Figure S3.13.2. Post-VSL: VSL System trigger point (29th April, 2009) for detector 25D

Task 1.4: Speed Limit Compliance by Posted Speed Limit

The objective of this task was to analyze driver compliance of the posted variable speed limits. Average speeds and posted VSL for peak periods plotted at detector 25D (logmile 25). Figure S3.14.1 presents the average speed and posted speed limit for detector 25D (logmile 25) and it was found that similar to other segments, speed compliance observed was due to congestion at the detector location. It can be noticed from the Table S3.1 that lane 3 had the best compliance result compared to all other lanes and drivers on lane 1 had the lowest compliance with the posted speed limits. Additionally, compliance was lowest at detector 21D (logmile 21.4).

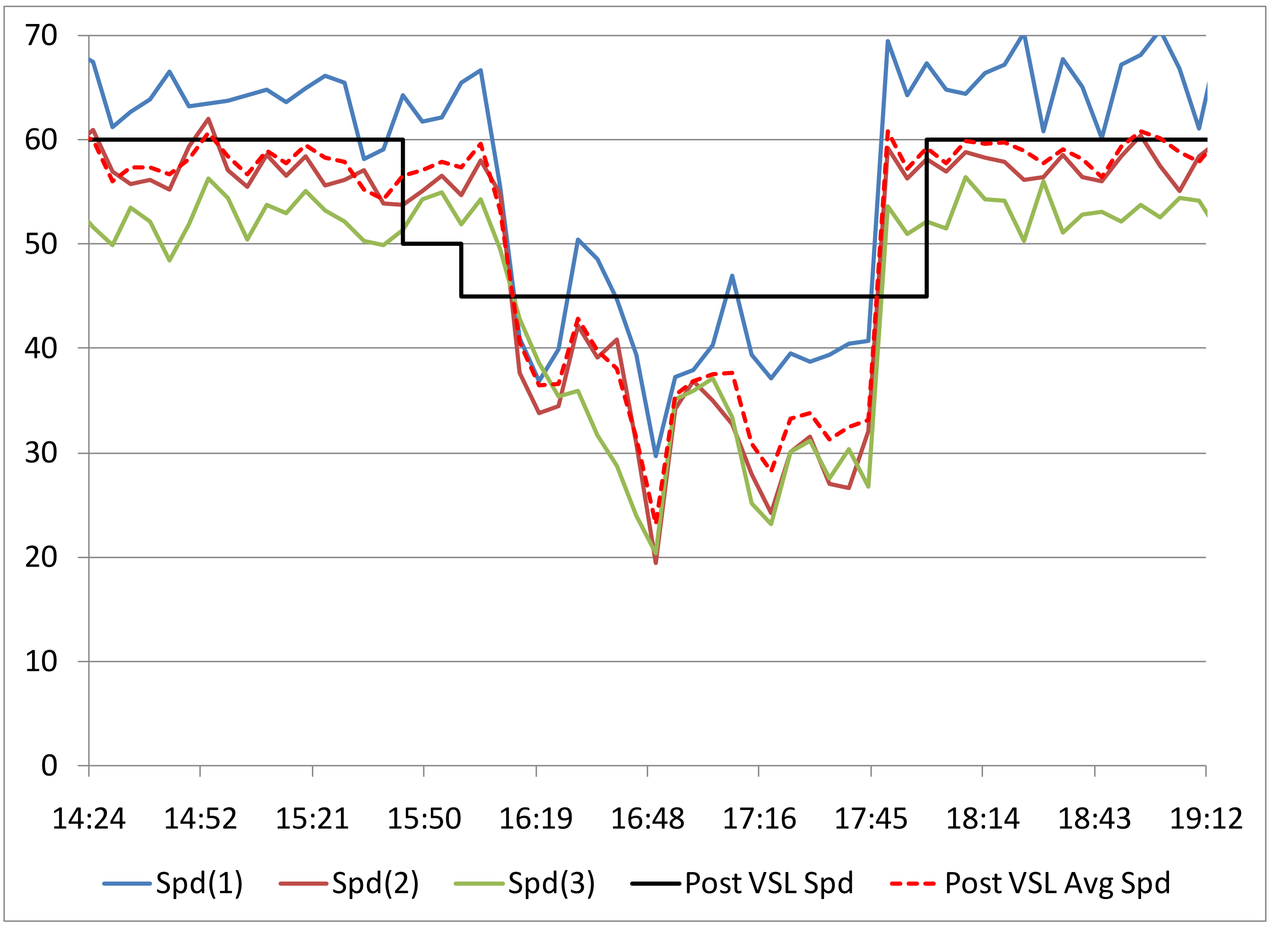


Figure S3.14.1 VSL (29th April, 09)

Table S3.1 Percent compliance along the highway for all lanes

Lane	Detector 21	Detector 25
October 21st 2008		
L1	29.40*	60.14
L2	59.73	85.25
L3	62.70	95.59
L4	25.67	**
L5	98.65	**
Hwy^	55.90	79.37
October 29th 2008		
L1	42.43*	69.27
L2	65.95	80.43
L3	65.42	89.17
L4	40.59	**
L5	100.00	**
Hwy^	63.92	78.95
April 2nd 2009		
L1	25.61*	88.41
L2	42.08	93.50
L3	40.45	98.15
L4	30.82	**
L5	42.14	**
Hwy^	36.73	92.89
April 29th 2009		
L1	26.44*	55.73
L2	54.07	80.35
L3	58.75	90.44
L4	31.57	**
L5	99.68	**
Hwy^	54.61	74.80
May 20th 2009		
L1	3.99*	83.71
L2	7.94	99.67
L3	8.50	100.00
L4	3.59	**
L5	59.38	**
Hwy^	17.14	94.24

*Percent of drivers complying with the posted variable speed limit

** not applicable

^ Weighted average of all lanes of the highway

Task 1.5: Evaluation of Highway Capacity

This task compares speed-flow plots for pre- and post-VSL conditions. Figure S3.15.1 presents the speed flow data for four days in pre- and post-VSL system installation for detector location 25D (logmile 25). Data used were aggregated for 5 minute intervals for this task. For post-VSL conditions, fewer data points can be observed in the congested regime of the speed-flow curve indicating better traffic flow conditions and speedy recovery compared to pre-VSL conditions. For pre-VSL conditions, the segment volume was also higher. It should be noted here, that time mean speed is used on the y-axis. It is recommended that speed-flow plots are plotted between space mean speed and traffic flow, however, as these plots are used mainly for comparison between pre- and post-VSL conditions, time mean speed can be used. The readers are cautioned that conclusions should be made after due consideration of this fact and careful evaluation.

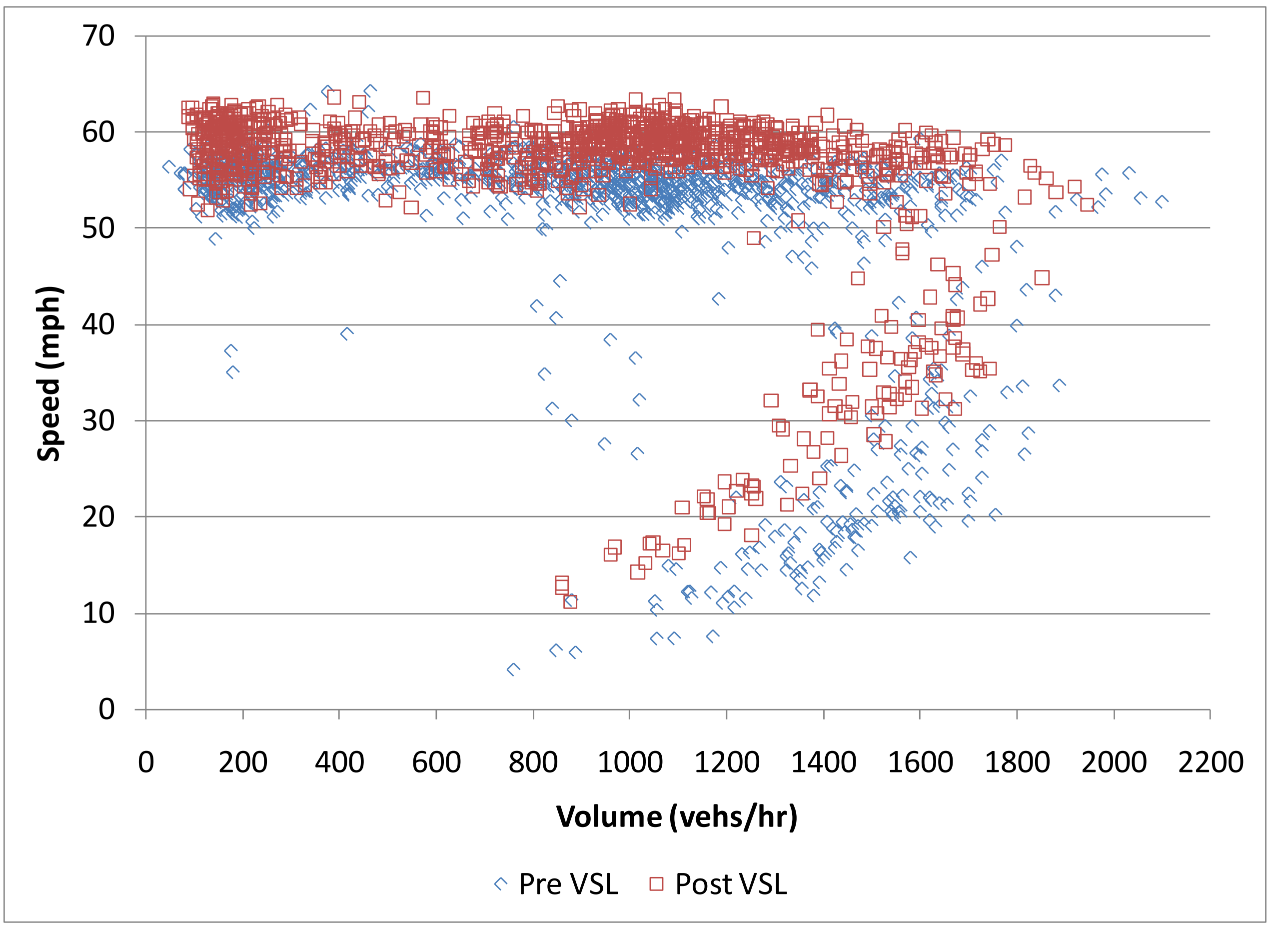


Figure S3.15.1 Speed-Flow Plot at 25D for four days of data

Task 1.6: Evaluation of Congestion Measures

To evaluate the congestion measures, travel times and travel time reliability indices, travel delay, Percent of Congested Delay, and extent, duration, and intensity of queues formed were compared for pre- and post-VSL conditions. Segment 3 travel times were computed between detectors 21D (logmile 21.4) and 25D (logmile 25), for selected days mentioned in Table S3.1. Travel times were calculated for average of lane 2 (It had same volume for pre- and post-VSL conditions) and average of all lanes for selected days and were compared for pre- and post-VSL conditions.

Figure S3.16.1 presents comparison of average travel times for selected days of data for all lanes of the highway between detectors 21D (logmile 21.4) and 25D (logmile 25). From the figure it can be inferred that for pre-VSL conditions the mean travel time ranged between 120 and 250 person-minutes. For post-VSL conditions, the mean travel time decreased to about 110 and 160 person-minutes. Tables S3.16.1 and S3.16.2 present comparison of average mean and standard deviation of travel times for selected days of data for all lanes of the highway between detectors 21D (logmile 21.4) and 25D (logmile 25). It can be observed from the tables that the mean and standard deviation of travel time during peak periods for post-VSL conditions decreased 27 and 58%, compared to pre-VSL conditions between detectors 21 and 25. It shows travel times during peak periods decreased significantly after initiation of the VSL system. Also reduction in standard deviation indicates that VSL system was beneficial at decreased variation of travel times during the peak period.

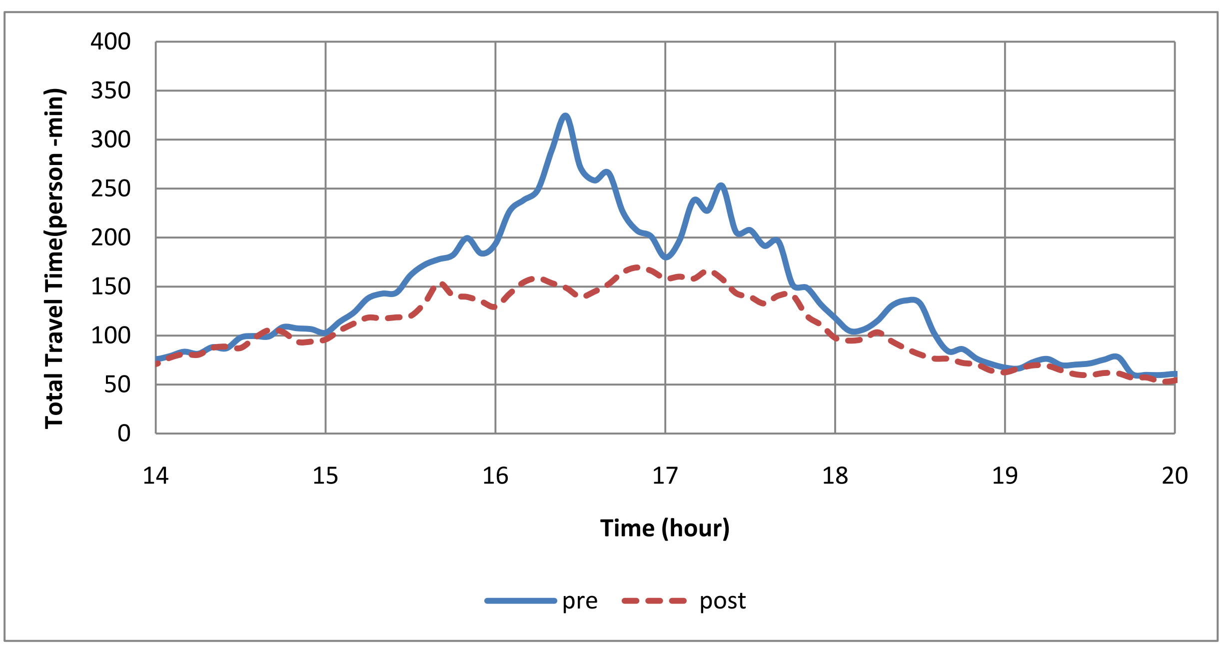


Figure S3.16.1. Comparison of Pre and Post-VSL average travel time data between 21D and 25D (Average of all lanes)

Table S3.16.1 Comparison of mean travel times during peak period for pre- and post VSL (Average of all lanes)

Dates	Between 21D and 25D			
	Travel Time (person-minutes)		Volume (vehicles/hour)	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
October 23 & 21	164.3	119.9	1300	1310
October 31 & 29	173.9	128.0	1221	1281
April 3& 2	247.0	161.2	1174	1070
April 30 & 29	169.5	116.8	1281	1253
May 21 & 20	122.4	110.5	1161	1151
Avrg. of five days	175.4	127.3	1227	1213
Difference	-48.1		-14	
Percentage Change	-27.4		-1.1	

Table S3.16.2 Comparison of standard deviation of travel times during peak period for pre- and post VSL (Average of all lanes)

Dates	Between 21D and 25D			
	Travel Time (person-minutes)		Volume (vehicles/hour)	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
October 23 & 21	72.1	27.5	173	213
October 31 & 29	79.4	30.7	251	180
April 3& 2	115.1	44.5	157	126
April 30 & 29	60.4	26.6	215	187
May 21 & 20	38.7	23.7	151	175
Avrg. of five days	73.2	30.6	189	176
Difference	-42.6		-13	
Percentage Change	-58.2		-6.8	

Figure S3.16.2 presents the comparison of travel times computed for average of lane 2 between detectors 21D (logmile 21.4) and 25D (logmile 25). It can be observed from Figure S3.16.2 that for pre-VSL conditions, the mean travel times for peak periods ranged between 130 and 260 person-minutes. For post-VSL conditions, the mean travel times during peak period decreased to about 120 and 180 person-minutes.

Tables S3.16.3 and S3.16.4present the comparison of mean and standard deviation of travel times for selected days average for lane 2 between detectors 21 and 25. It can be observed from the tables that the mean and standard deviation of travel time during peak periods for post-VSL conditions decreased 25 and 63% compared to pre-VSL conditions between detectors 21 and 25. It shows that travel times during peak periods decreased appreciably after initiation of the VSL system. Also, reduction in standard deviation indicates VSL system was beneficial as variation in travel times decreased during the peak periods. The comparison of results of lane 2 and average of all lanes shows reduction of mean and standard deviation of travel time for five days in all lanes is similar to lane 2.

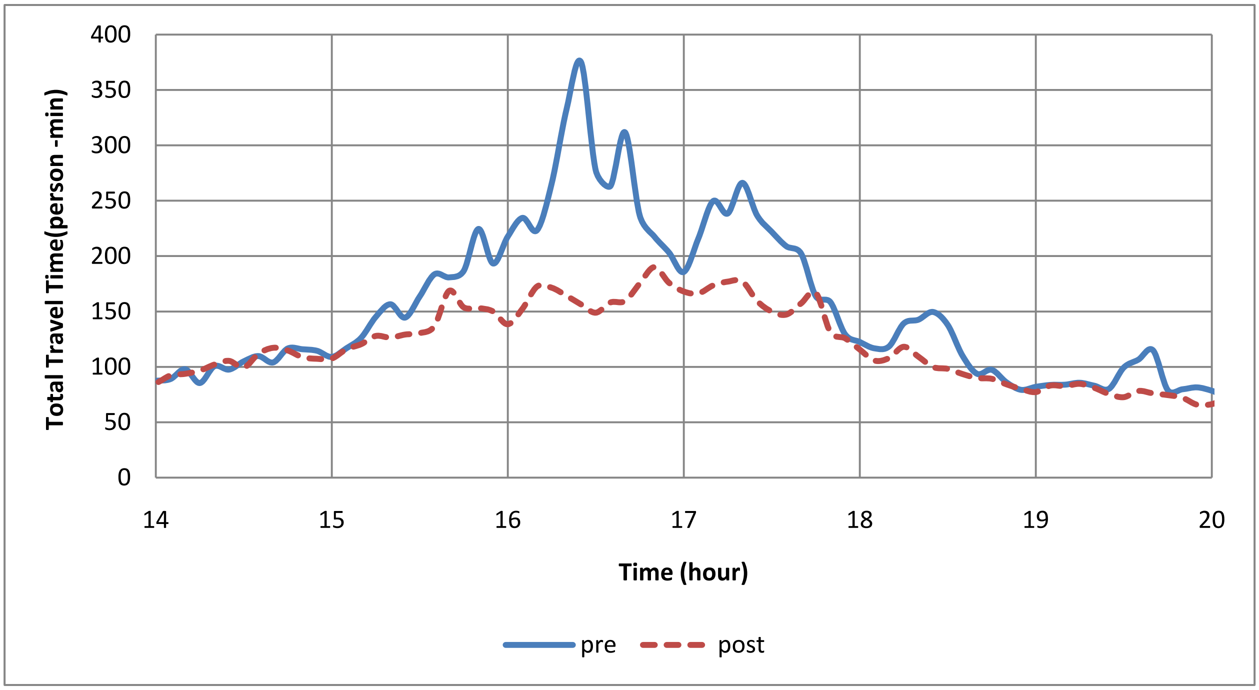


Figure S3.16.2 Comparison of Pre and Post-VSL average travel time data between 21D and 25D (Average of lane 2)

Table S3.16.3 Comparison of mean travel times during peak period for pre- and post VSL (Lane 2)

Dates	Between 21D and 25D			
	Travel Time (person-minutes)		Volume (vehicles/hour)	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
October 23 & 21	171.7	131.9	1369	1403
October 31 & 29	189.7	139.5	1306	1361
April 3& 2	260.2	180.4	1236	1124
April 30 & 29	182.1	128.1	1352	1352
May 21 & 20	133.3	120.7	1279	1256
Avrg. of five days	187.4	140.1	1308	1299
Difference	-47.3		-9	
Percentage Change	-25.2		-0.7	

Table S3.16.4 Comparison of standard deviation of travel times during peak period for pre- and post VSL (Lane 2)

Dates	Between 21Dand 25D			
	Travel Time (person-minutes)		Volume (vehicles/hour)	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
October 23 & 21	82.0	26.8	153	163
October 31 & 29	98.6	30.2	239	147
April 3& 2	138.6	51.2	165	123
April 30 & 29	64.6	25.3	156	149
May 21 & 20	40.7	22.9	130	157
Avrg. of five days	84.9	31.3	169	148
Difference	-53.6		-21	
Percentage Change	-63.2		-12.4	

Individual Measures

The individual measures, TTI, BTI, and PTI were compared with selected days of data for the peak periods for pre- and post-VSL conditions. Table S3.16.5 presents the comparison of average of individual measures, TTI, BTI, and PTI (selected days of data) for average of lane 2 between detectors 21 and 25. It can be observed from Table S3.16.5 that for post-VSL conditions TTI, BTI, and PTI decreased about 34 and 50, 37 % for both average of lane 2 and average of all lanes computed between detectors 21 and 25. Reduction in TTI shows decrease in ratio between the actual travel rate and Posted Speed Limit (PSL) travel rate that means the VSL system was useful in decreasing the difference between the peak period and the PSL travel conditions. This indicates that travel times for peak periods and PSL are closer to each other in post-VSL conditions. Reduction in BTI indicates decrease difference between 95% travel time and average travel time that means the VSL system was beneficial in reducing the difference between the 95% travel time and average travel time. Reduction in PTI indicates decrease ratio between 95% travel time and PSL travel time that means the VSL system was useful in decreasing the difference between 95% and PSL travel time.

Overall results for segment 3 show all travel time reliability indices (TTI, BTI, and PTI) decreased. Reduction in all travel time reliability indices for post-VSL conditions indicates less variability and more consistency between highest value of travel time during the peak period (worst condition) and PSL condition. It can be concluded that post-VSL conditions was more reliable than pre-VSL conditions and there is benefit after VSL system initiation.

Table S3.16.5. Comparison of travel times reliability indices for pre- and post-VSL

Individual Measures	Between 21D and 25D			
	Average of lane 2		**Average of all lanes**	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
Travel Time (TTI)	2.21	1.47	2.10	1.38
Difference (Percentage Change)	-0.74(-33.5)		-0.72(-34.3)	
Buffer Time Index (BTI)	0.71	0.36	0.60	0.30
Difference (Percentage Change)	-0.35(-49.3)		-0.30(-50.0)	
Planning Time Index (PTI)	2.91	1.83	2.70	1.69
Difference (Percentage Change)	-1.08(-37.1)		-1.01(-37. 4)	

Comparison between results of lane 2 and all lanes showed reduction of mean and standard deviation of travel times and also travel time reliability indices for all lanes is similar to lane 2.In this part, individual measures, TTI, BTI, and PTI, were calculated for each lane separately for selected days; thereafter their averages for each lane and average of all lanes were computed. Figure S3.16.3 indicates the comparison of average TTI for selected days for average of each lane separately and also average of all lanes between detectors 21 and 25. It can be inferred from Figure S3.16.3 that TTI reduced after VSL system installation for all lanes. Therefore, it can be stated that VSL system installation has been beneficial for reducing TTI.

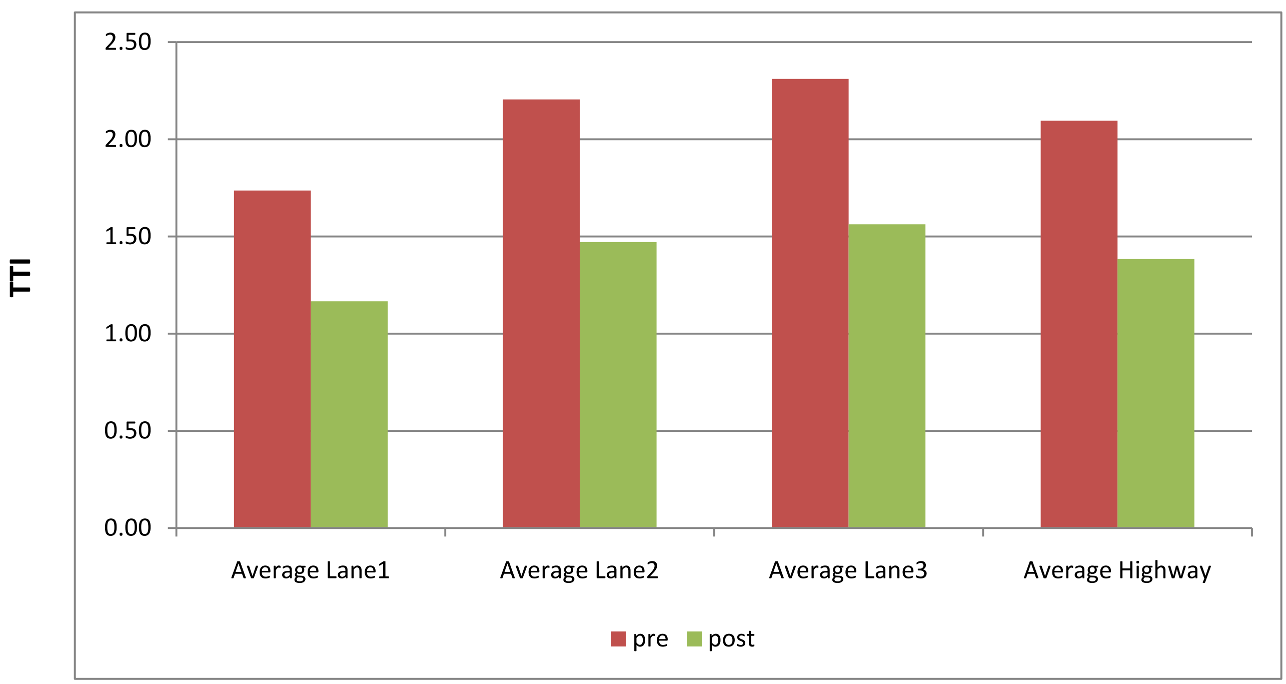


Figure S3.16.3. Comparison of Pre and Post-VSL conditions Travel Time Index (TTI) between 21D and 25D

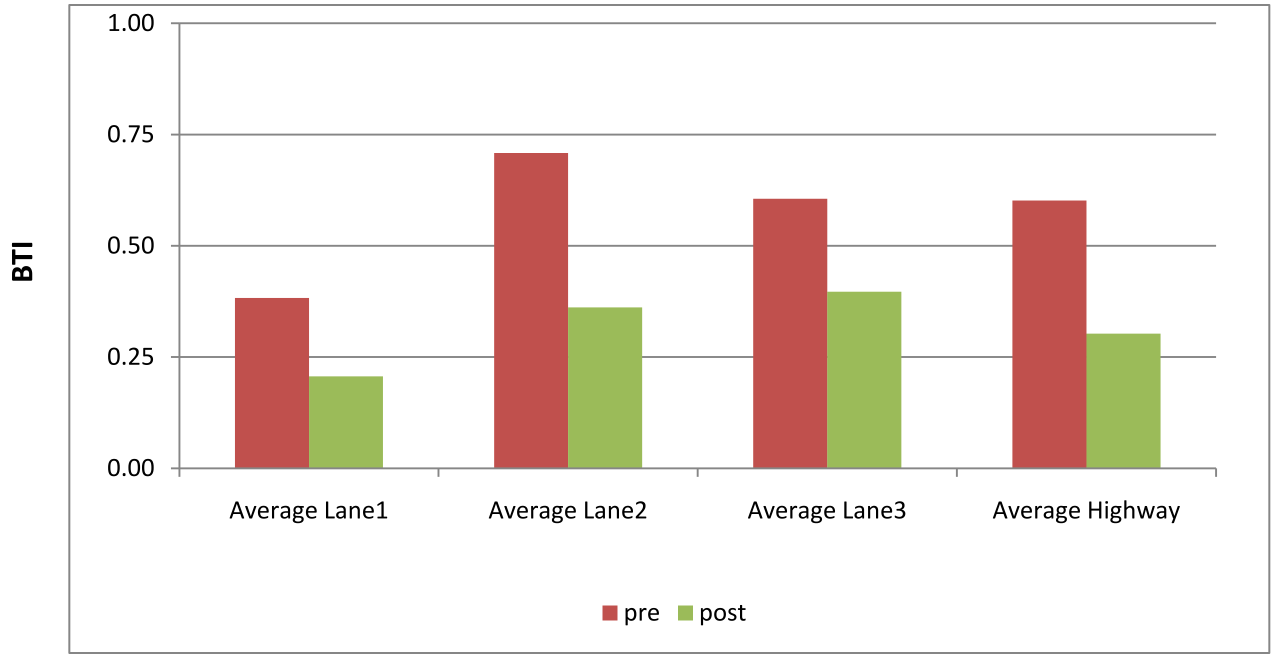


Figure S3.16.4. Comparison of Pre and Post-VSL conditions Buffer Time Index (BTI) between 21Dand 25D

Figure S3.16.4 presents the comparison of average of BTI for selected days for average of each lane and also average of all lanes between detectors 21 and 25. It can be noted from Figure S3.16.4 that BTI decreased after VSL system installation for all lanes. It can be said that VSL system installation has benefited for decreasing BTI.

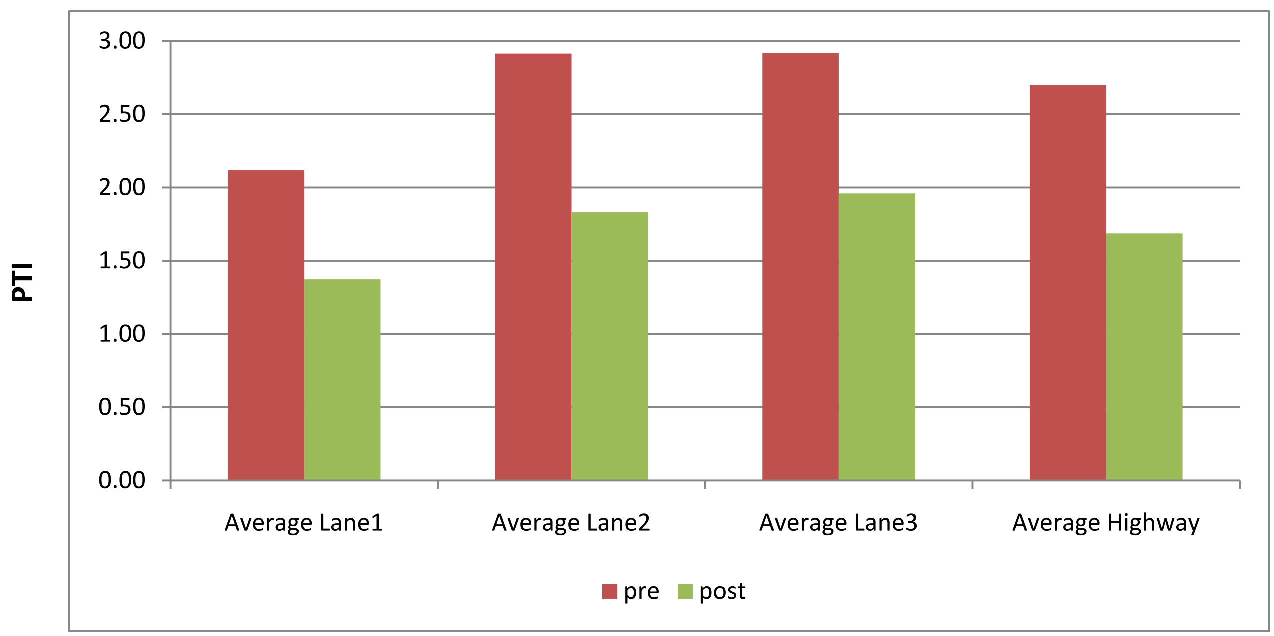


Figure S3.16.5 Comparison of Pre and Post-VSL conditions Planning Time Index (PTI) between 21D and 25D

Figure S3.16.5 shows the comparison of average of PTI for selected days for average of each lane and also average of all lanes between detectors 21 and 25. It can be stated from Figure S3.16.5 that PTI has reduced after VSL system installation for all lanes. It can be inferred that the VSL system installation has been beneficial for reducing PTI. Figures S3.16.3, S3.16.5 and S3.16.6 show reduction of the indices in all lanes are not the same, but decrease in average of all lanes is very similar to lane 2.

Traffic Delay

For segment 3, the analysis indicates that average Delay calculated for post-VSL system was much lower compared to the pre-VSL system. This reduction in delay, presented in Table S3.16.5 was approximately 2.1 minutes for the four days of data used.

Similarly, Percentage of Congested Travel reduced by nearly 28 percent for post-VSL conditions. Results indicate decrease in Delay and Percentage of Congested Travel in post-VSL conditions. It can be observed from the results that the VSL system decreased traffic delays which translate into user cost savings. Values in Table S3.16.5 indicate reduction in average Percentage of Congested Travel and average Delay during peak periods. The next subsection, quantifies the delay as user cost savings.

Table S3.16.5. Average Delay and Change in Percentage of Congested Travel during peak periods before and after VSL system installation

Detector ID	MP 21 to MP 25
Pre (23rd Oct 07) and Post (21st Oct 08)	
Pre VSL Travel Time (minutes)	5.8
Post VSL Travel Time (minutes)	4.2
Delay (minutes)*	-1.6
Percent Change in Congested Travel*	-28%
Pre (31th Oct 07) and Post (29thOct 08)	
Pre VSL Travel Time (minutes)	6.3
Post VSL Travel Time (minutes)	4.6
Delay (minutes)	-1.7
Percent Change in Congested Travel	-28%
Pre (3rd April 08) and Post (2nd April 09)	
Pre VSL Travel Time (minutes)	10
Post VSL Travel Time (minutes)	7.0
Delay (minutes)	-3
Percent Change in Congested Travel	-30%
Pre (30th April 08) and Post (29thApril 09	
Pre VSL Travel Time (minutes)	5.9
Post VSL Travel Time (minutes)	4.3
Delay (minutes)	-1.7
Percent Change in Congested Travel	-28%

*Negative value indicates decrease in Post-VSL congestion measures and vice versa.

<u>Delay Cost Analysis</u>

Table S3.16.6 presents the average annual vehicle cost savings as a result of post-VSL system benefits. The analysis was carried out for peak periods determined from Task 2.2 (1500 hours to 1900 hours). The average vehicle cost was calculated to be $24.82/hr and used in delay cost analysis.

Table S3.16.6. Delay Cost savings due to VSL system installation average for five days

Locations I-270 SB	Difference in Delay (people-min)	Average Daily User Cost *	Average Annual User Cost for 250 Workdays
MP 21 to MP 25	48.1	$19.89737	$4974.342

* based on average user cost of $24.82/hr

Table S3.16.6 presents the cost savings as a result of reduced delay due to post-VSL conditions from the delay calculated for four days in pre- and post- VSL conditions. The average cost savings represent 250 work days during peak periods. The cost saving at this segment was calculated to be $4974 per user per year.

<u>Queue Measurement</u>

The objective of this task was to compare the queue duration, extent and intensity on the segment. This subtask could not be carried out for this segment due to unavailability of sufficient detector data.

Task 1.7: Analysis of VSL System during Inclement Weather

Data analysis was also carried out to evaluate the VSL system during inclement weather conditions. Similar to clear weather conditions, inclement weather data for volume and average speed were used for comparison of pre- and post-VSL. The figures that follow depict the speed and volume profile plot for detectors along the highway for December 16th, 2008 during post-VSL conditions.

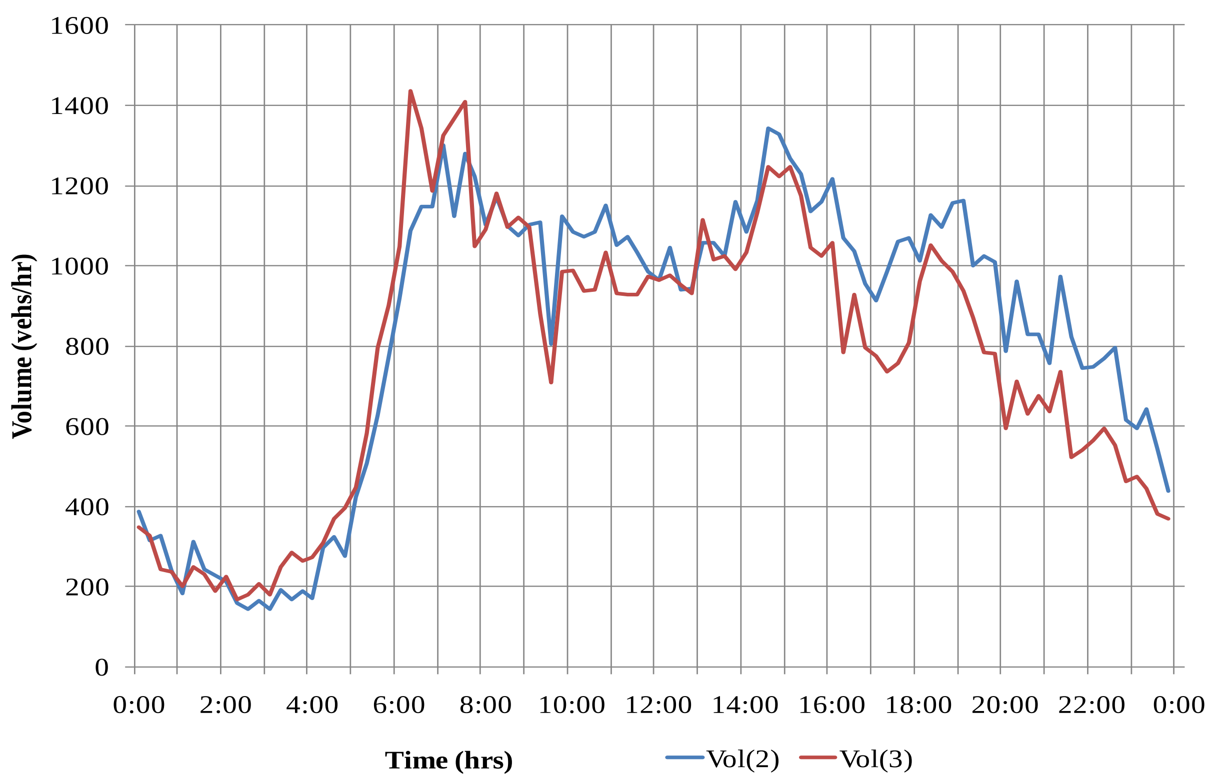


Figure S3.17.1 Post-VSL (Dec. 16th, 08) Average Volume data (detector 25D)

Figure S3.17.1 presents the average volume for lanes 2 and 3. It can be noticed that the maximum flow was less than 1400 vehs/hr on lane 2 and average volume around 1300 vehs/hr. This indicates low traffic on that day but the speed profile indicated traffic congestion between 1400-1900 hrs which indicates combined effects of peak period traffic and inclement weather.

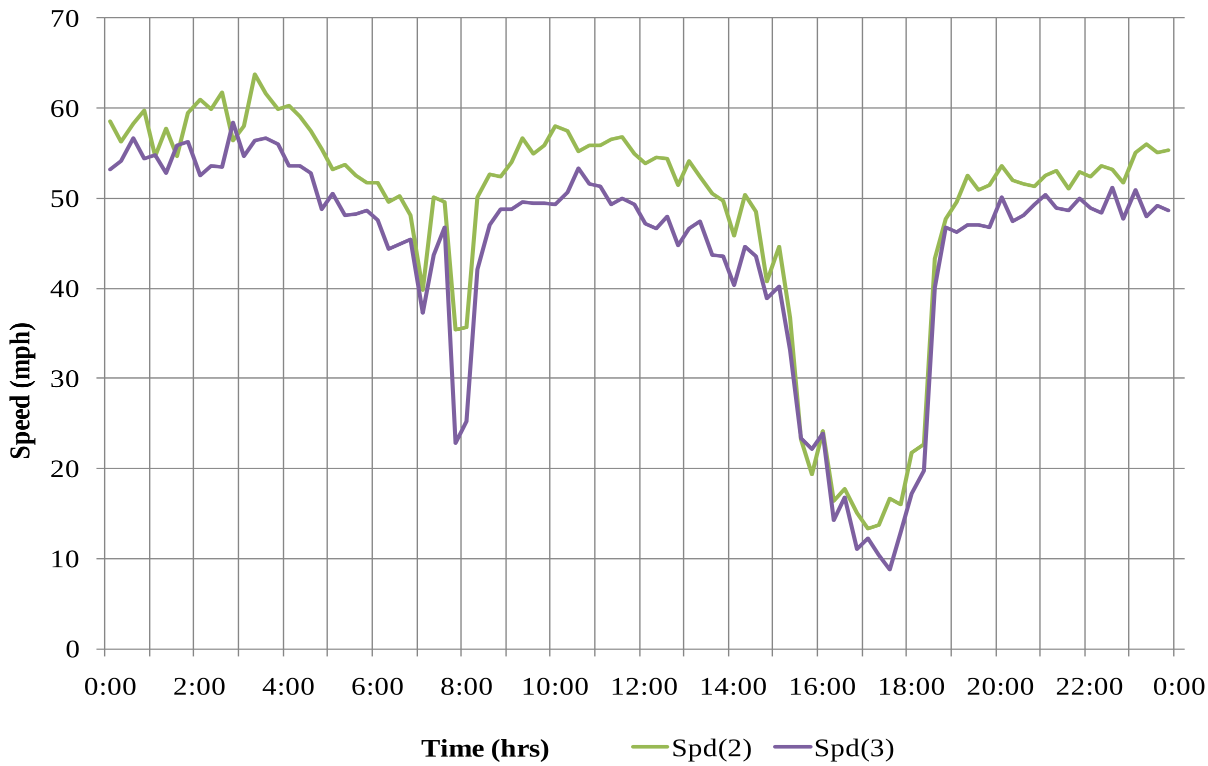


Figure S3.17.2. Post-VSL (Dec. 16th, 08) Average Speed Profile (detector 25D)

Figure S3.17.2 present average speed for two lanes for detector 25D (logmile 25). It can be noted that the average speeds for post-VSL conditions at the detector locations dropped below 20 mph. Since the peak periods were distinguished using the observation that peak period usually starts when the speed drops below 60 mph, this was not observed for inclement weather data. During inclement weather, the average speed dropped below 60 mph at 3 am and continued to be below 60 mph for the entire day. From Figure S3.17.2 it is evident that no improvement in traffic conditions were observed during snow conditions during the post-VSL initiation period.

It should be noted that the ASTI posted variable speed limit data was not available from December 16th, 2008 till the end of February 2009. Therefore, it cannot be verified whether VSL signs were active during these conditions. Posted speed data for April 19th, 2009, a rainy day, indicated that the speed limit was constant at 60 mph throughout the day, which showed no difference between pre- and post-VSL conditions for inclement weather. Further analysis for weather data could not be carried out as speed limits were not reduced and as such no traffic improvements were observed. Furthermore, additional data was not available to confirm the activation of the VSL system.

SEGMENT 4 ANALYSIS

Table S4.1 presents the dates that were selected for segment 4 evaluation. These dates were considered appropriate for evaluation as the traffic volumes were similar, traffic data was available, no incidents occurred and presented clear weather conditions. The days in the table are mostly Thursdays unless pointed out in the footnote.

Table S4.1. Selected Dates used in VSL system evaluation

Pre-VSL System Installation	Post-VSL System Installation
18th October 2007	16th October 2008
23rd October 2007*	21st October 2008*
8th April 2008*	7th April 2009*
9th April 2008**	8th April 2009**
22nd April 2008*	21st April 2009*

* Tuesdays, ** Wednesdays

For this section sufficient detectors were not available, data from detector location 31D (logmile 31.6) were used. However, for certain tasks where at least two detectors were required, detector data from 28D (logmile 28.6) downstream were used. No peak periods or congestion was found for this detector and the average speeds remained between 65-55 mph, hence data were not used for evaluation.

Task 1.1: Volume and Occupancy Analysis

This task consists of two sub-tasks. First, average volume for pre- and post-VSL conditions are compared. Second, occupancy data for pre- and post-VSL conditions, and the change in flow-occupancy relationship are compared. The change in volume is accounted to evaluate the effect on average speed, travel time and congestion. Figure S4.11.1 and Table S4.11.1 present the volume comparison between pre- and post-VSL system installation for all lanes for detector 31D (logmile 31.6) for pre (April 22nd, 08) and post (April 21st, 09) VSL system installation. Average volume for 5-minutes interval on the highway was compared for both conditions to account for any change in volume.

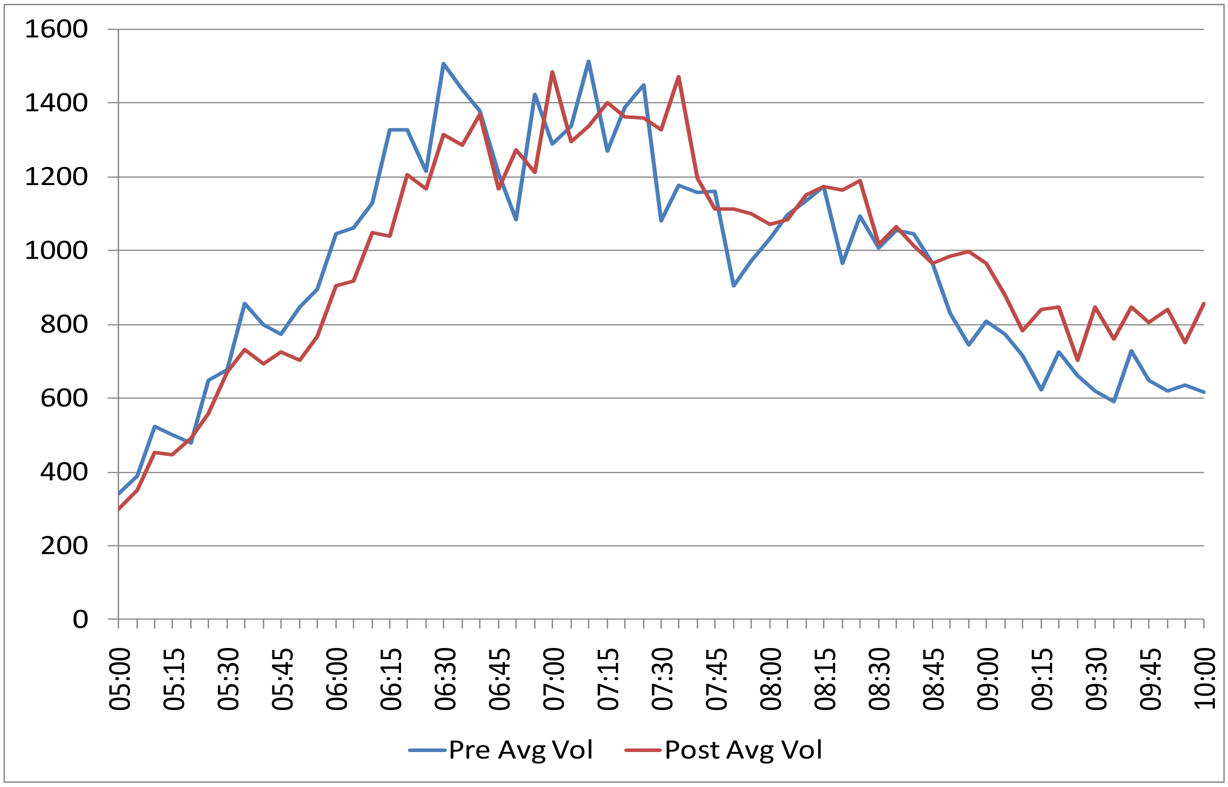


Figure S4.11.1 Comparison of Pre (April 22nd, 08) and Post-VSL (April 21st, 09) Volume for 31D

In Table S4.11.1 average volume for pre- and post-VSL conditions are presented for interval of 30 minutes. Observed change in average volume was four percent increase for five minute interval data. Days with different volumes in post-VSL conditions cannot be compared with pre-VSL conditions as it would be difficult to explain the cause of differences in speeds. For high volume in post-VSL condition, improved speed will indicate system benefits whereas similar volumes will provide at par comparison. For segment 4, therefore, days with statistically similar volumes were used for evaluation. Since the change observed in volume was not significant for pre- and post-VSL conditions, no adjustments were required for system evaluation. Similar peak periods were observed for each of the four days, highlighted in Table S4.11.1, used for evaluation and are presented in Figures S4.11.2 and S4.11.3 for pre- and post-VSL conditions, respectively. The figures present average volume for 5 minutes for average of all lanes.

Table S4.11.1. Average Volume at Detector 31D during Peak Periods

Time	06:00	06:30	07:00	07:30	08:00	08:30	09:00	09:30	10:00	Avg
Pre-VSL Vol. (vph)	1044	1508	1288	1080	1032	1008	808	620	616	1035
Post-VSL Vol. (vph)	904	1316	1484	1328	1072	1016	964	848	856	1083
Percentage difference	-13%	-13%	15%	23%	4%	1%	19%	37%	39%	4%

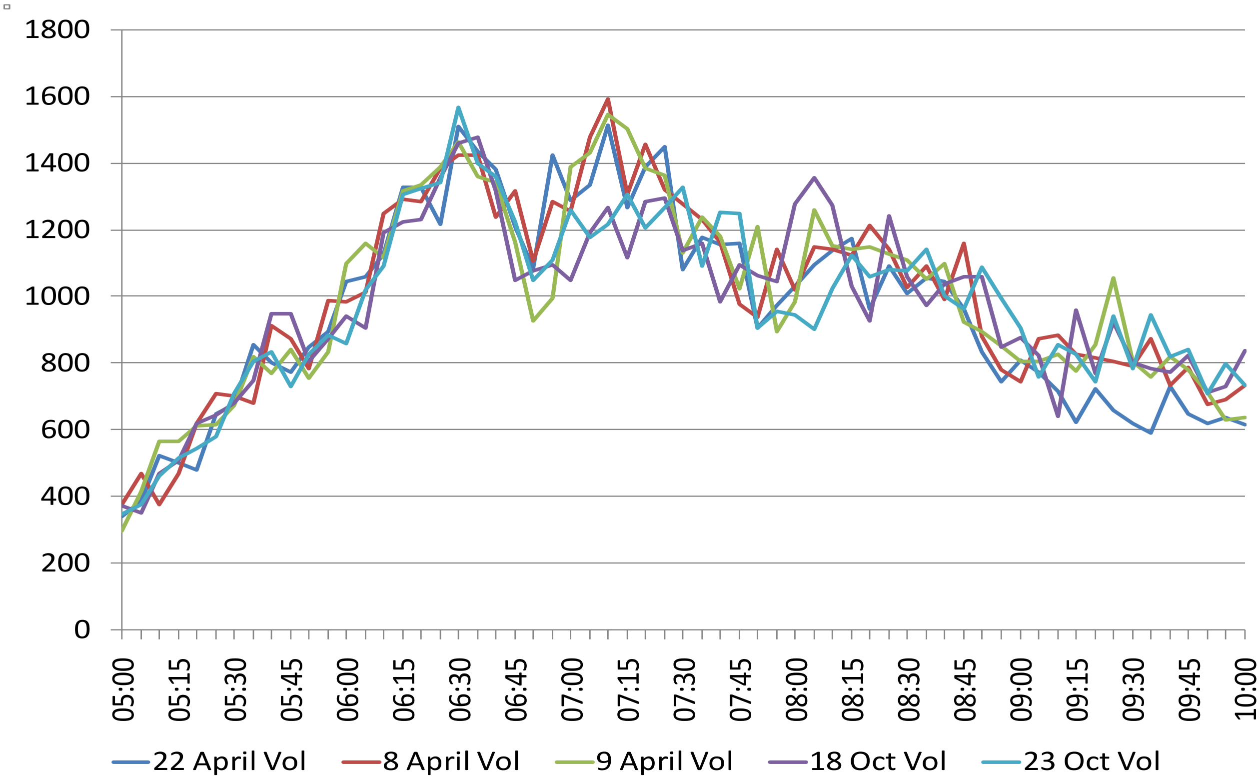


Figure S4.11.2 Pre VSL Volume Profile for five days

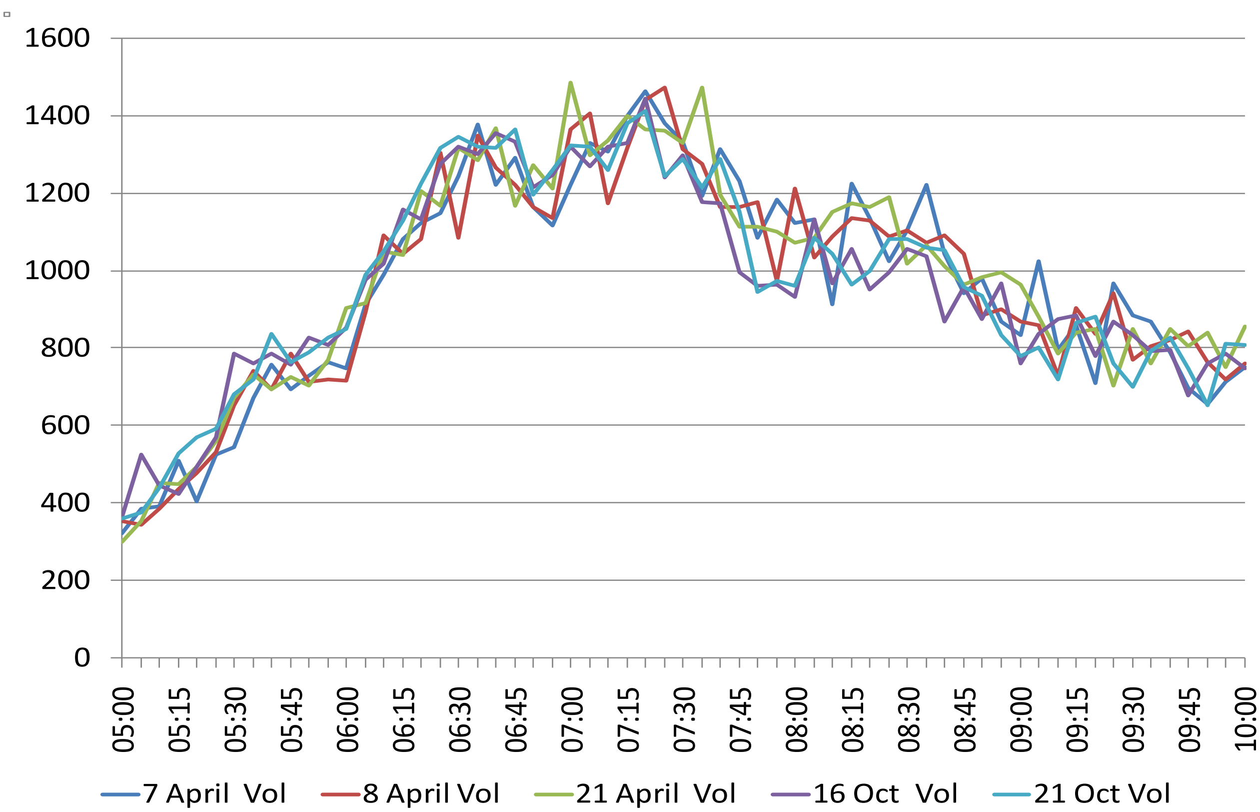


Figure S4.11.3 Post VSL Volume Profile for five days

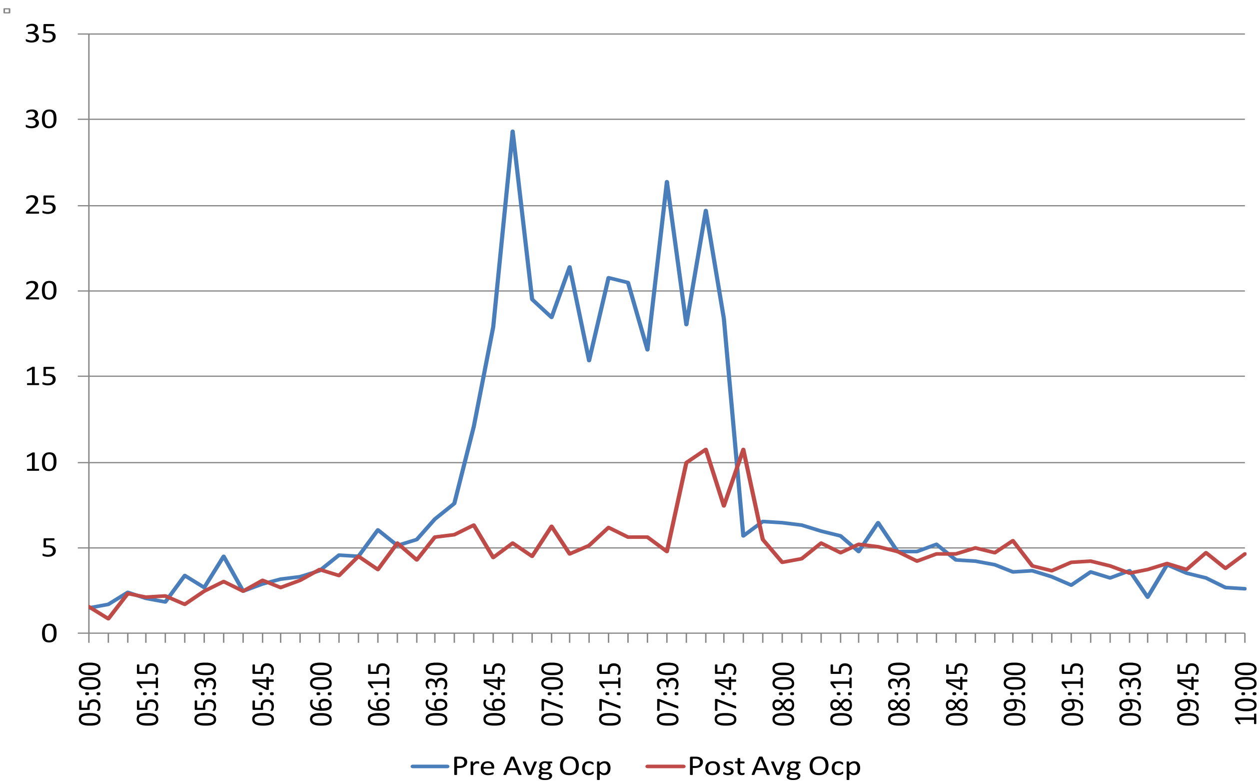


Figure S4.11.4. Comparison of Pre (April 22nd, 08) and Post-VSL (April 21st, 09) Occupancy of 31D

For the second sub-task, Figure S4.11.4 presents average occupancy for average of all lanes at detector 31D (logmile 31.6) for pre (April 22nd, 08) and post (April 21st, 09) VSL system installation. It can be noted that the peak period reduced considerably from 0630-0750 hours after VSL installation compared to pre-VSL condition when it was from 0730-0800 hours. Also, it can be noted that the maximum observed occupancy for pre-VSL condition was nearly 30 percent which reduced to 11 percent after VSL installation. The figure shows decrease in traffic congestion as a result of reduction in percent occupancy. This clearly indicated VSL system benefits.

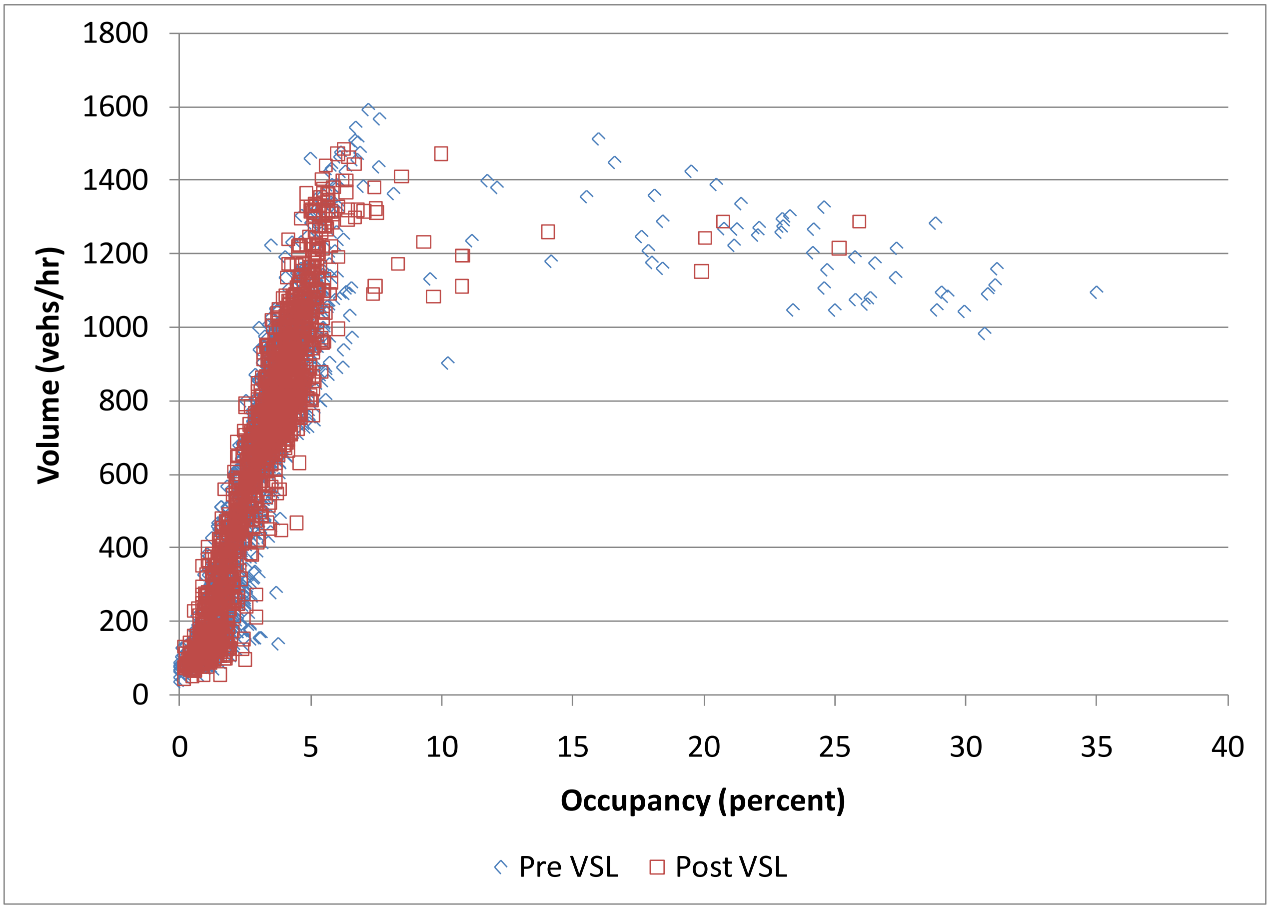


Figure S4.11.5. Flow-Occupancy Plot for 31D for Five days

Figure S4.11.5 shows the comparison of pre- and post-VSL traffic volume and occupancy plot averaged out for all lanes for four days in pre- and post-VSL conditions. Data used for flow occupancy plot were aggregated for 5 minutes. It can be observed from the figure that the VSL system installation has improved traffic flow as the occupancy is less than 25%. It can also be noticed that for post-VSL conditions, time occupancy reduced from a high value of nearly 32 percent to 25 percent. Additionally, fewer data points were observed beyond 10 percent occupancy for post-VSL conditions. This clearly indicated better traffic conditions in post-VSL conditions indicating system benefits.

Task 1.2: Average Speed/Lane by Posted Speed Limit during Peak Periods

One of the main objectives of the VSL system was to improve traffic flow and this task evaluated the difference in average speed by comparing the data before and after the VSL system installation. Speed data averaged for all the lanes of segment 4 for every 5 minutes were used. Figure S4.12.1 presents the average highway speed for detector 31D (logmile 31.6) pre- and post-VSL conditions. The figure indicates that the peak period for traffic on this segment for pre- and post-VSL conditions lies between 0500 to 1000 hours based on the average speed. Henceforth, all the figures for peak periods will be presented for this duration. Also, the pre- and post-VSL speed profile comparison over time shows reduction in peak period and improvement in average speeds for post-VSL conditions.

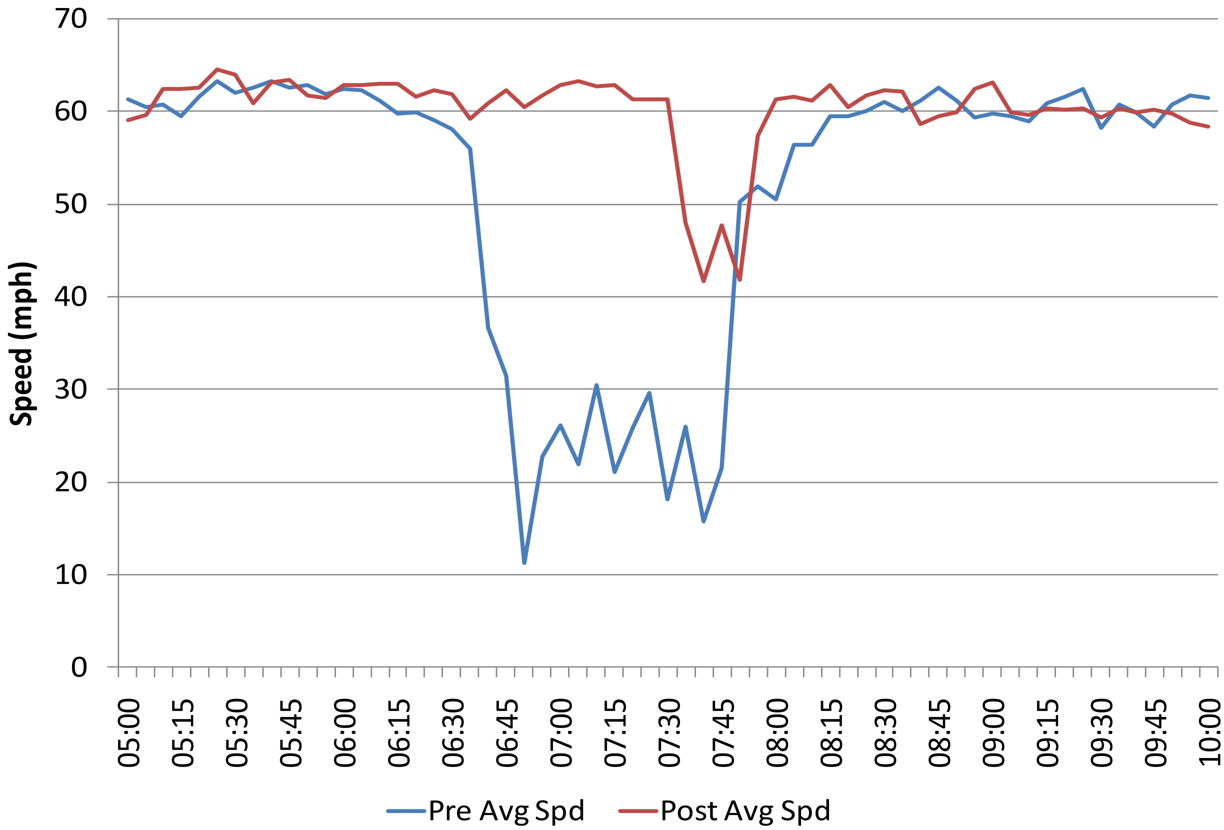


Figure S4.12.1. Comparison of Pre (April 22nd, 08) and Post-VSL (April 21st, 09) Speed data for 31D

Figure S4.12.1 clearly indicates that the peak periods reduced for post-VSL conditions and, the average speed reduced by 10 mph in post-VSL conditions. The difference between pre-and post-VSL speeds varied from 25mph to 5 mph during the peak period. To supplement the comparison of speed data presented for one day, Figures S4.12.2 and S4.12.3 present the speed profiles for four days averaged for all lanes in pre- and post-VSL conditions. From the comparison of the two figures, it can be noticed that the peak periods in both conditions were between 0600-0900 hours, however, the duration and average speeds reduced in post-VSL conditions. Additionally, the average speeds improved by 20 mph in post-VSL conditions.

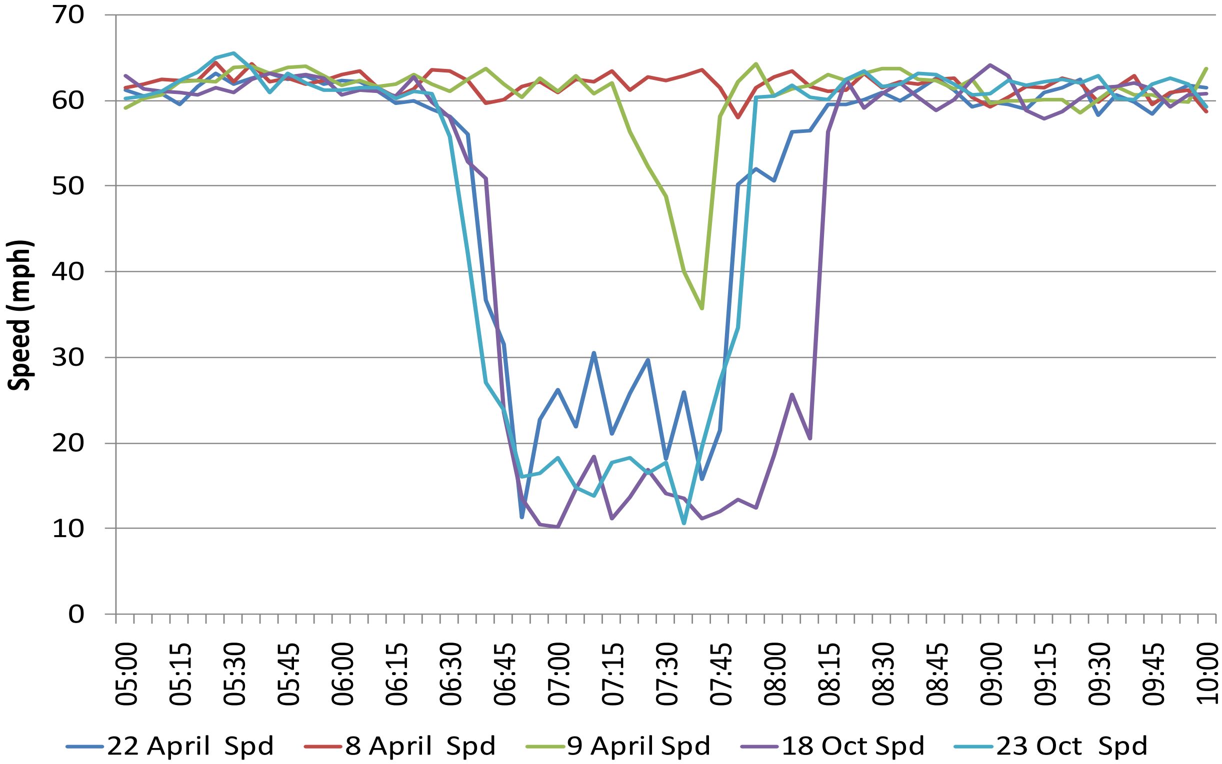


Figure S4.12.2 Pre-VSL Speed Profile for five days at Detector 31D

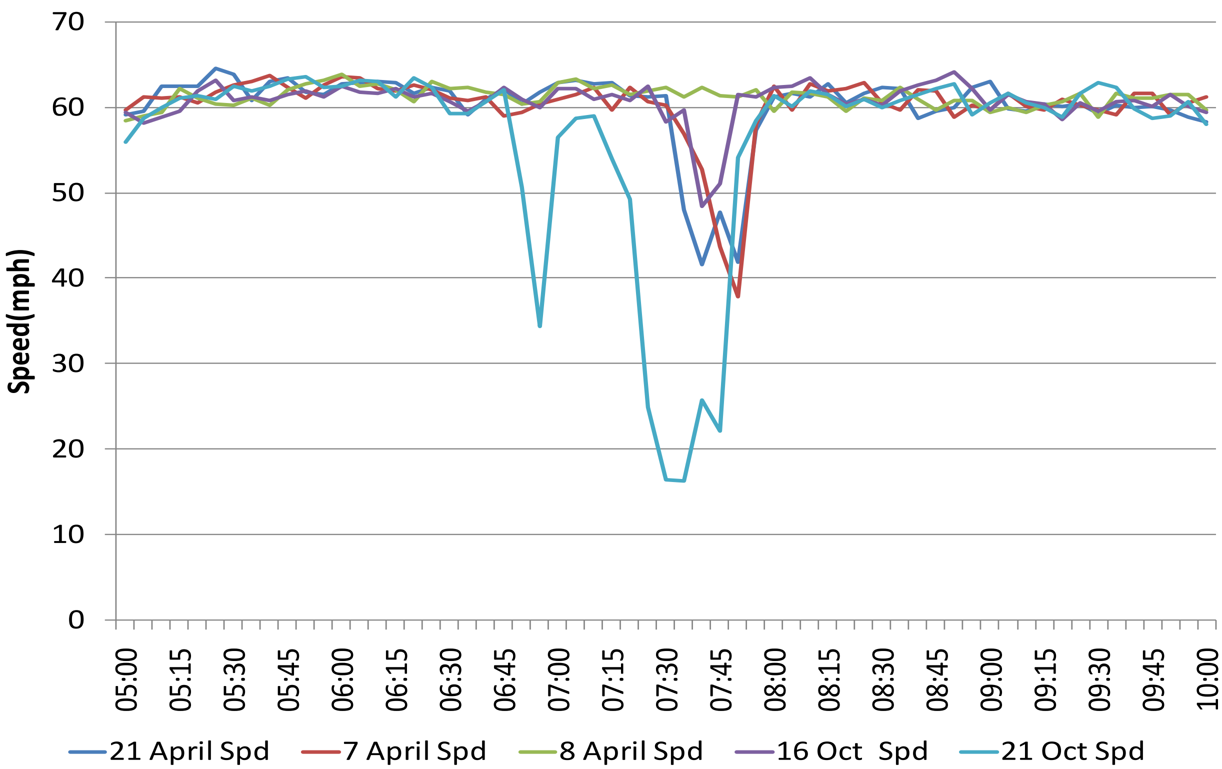


Figure S4.12.3 Post-VSL Speed Profile for five days at Detector 31D

Comparison of Average Speeds along the Segment

This subtask could not be carried out for this segment due to unavailability of sufficient detector data.

Speed Deviation across Lanes

For this sub-task, dispersion of average speeds across lanes is evaluated, based on comparison of pre- and post-VSL conditions. Dispersion in speed along the highway over different detectors could not be carried out as the distance between detectors is more than 1 mile. For accurate calculations, the distance between detectors should be 0.8 to a mile.

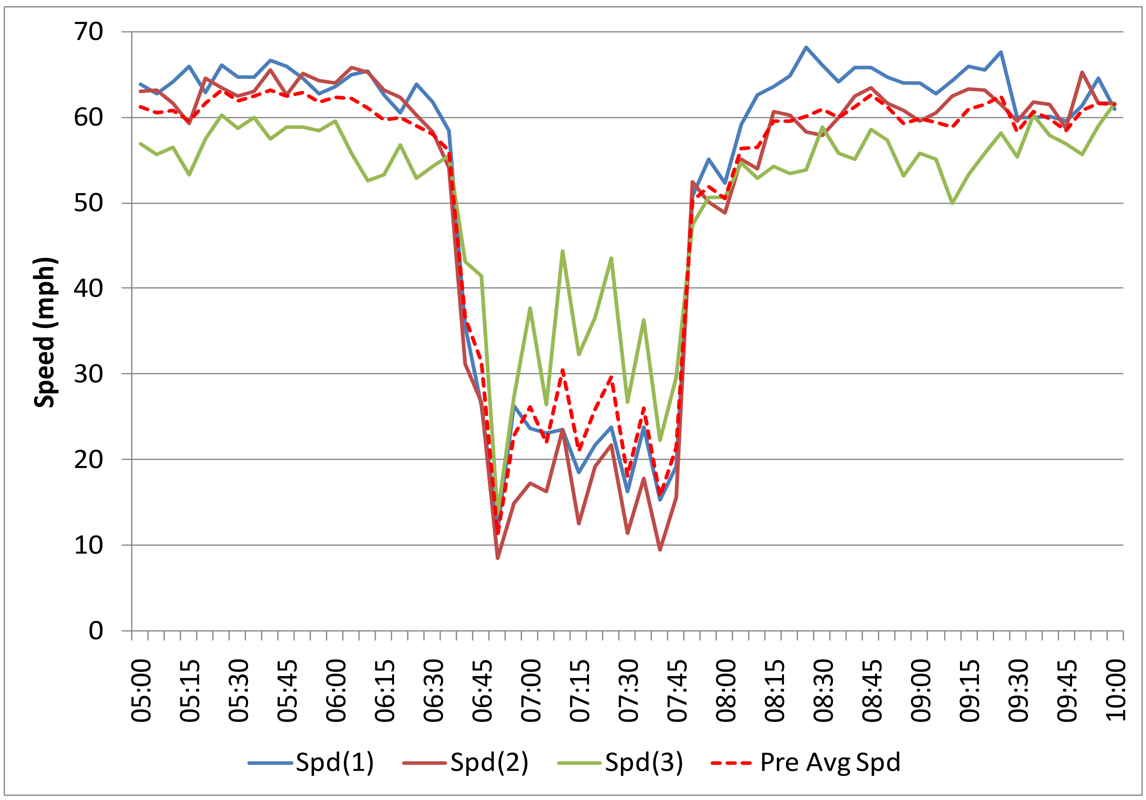


Figure S3.32.4. Pre-VSL (22nd April, 08) Average Speed data for all lanes (detector 31D)

Figures S4.12.4 and S4.12.5 present the variation in speeds across the lanes at detector 31D (logmile 31.6) for pre- and post-VSL conditions respectively. This location has three lanes. Lane 1 indicates the left most lane and the lane number increments toward the right lanes. Table S4.12.1 presents the calculated standard deviation in speeds and the difference. Variable posted speeds were plotted over the average speeds to observe the deviation in speeds on each lane with the posted speeds.

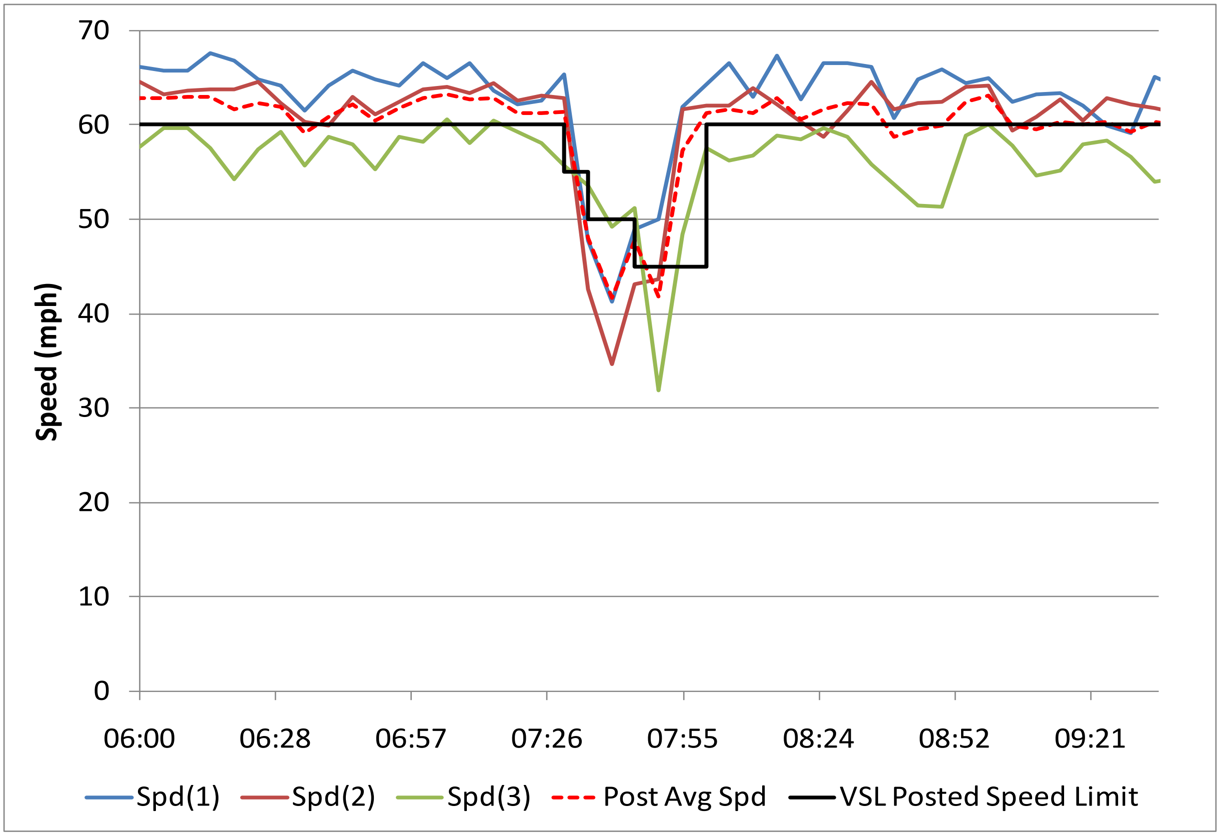


Figure S4.12.5. Post VSL (21st April, 09) Average Speed data for all lanes (detector 31D)

Table S4.12.1 presents the standard deviation of speeds (determined using Equation 2) during the peak period for pre- and post-VSL conditions for detector data at 31D (logmile 31.6). The difference indicates the change in post-VSL traffic conditions compared to pre-VSL conditions. Standard deviations were calculated for peak periods only. Speed homogeneity can be inferred from the results of the table. Increase in speed homogeneity may cause reduction in traffic crashes which is a positive outcome of the VSL system. Negative value indicates decrease in deviation of speed across the lanes, which indicates increase in speed homogeneity. For this segment, average standard deviation calculated for post-VSL conditions decreased significantly. Results from Table S4.12.1 indicate reduction in standard deviation for the peak periods. This clearly indicated VSL system benefits.

Table S4.12.1. Standard Deviation (SD) of Speeds at Detector 31D during Peak Periods

	Comparison of Pre (18th Oct 07) and Post (16th Oct 08) SD								
Time	**06:00**	**06:30**	**07:00**	**07:30**	**08:00**	**08:30**	**09:00**	**09:30**	**10:00**
Pre-VSL SD (mph)	4.31	2.90	2.54	3.45	4.05	3.89	5.48	4.57	5.55
Post-VSL SD (mph)	1.74	0.66	2.09	0.80	5.07	6.36	4.41	2.97	3.12
Difference (mph)*	**-2.57**	**-2.23**	**-0.45**	**-2.65**	**1.02**	**2.47**	**-1.08**	**-1.60**	**-2.43**
	Comparison of Pre (23rd Oct 07) and Post (21st Oct 08) SD								
Time	**06:00**	**06:30**	**07:00**	**07:30**	**08:00**	**08:30**	**09:00**	**09:30**	**10:00**
Pre-VSL SD (mph)	5.30	8.49	6.49	1.77	5.84	7.11	6.17	4.53	6.78
Post-VSL SD (mph)	2.22	5.54	2.60	5.32	4.85	3.90	3.10	2.74	5.46
Difference (mph)	-3.07	-2.95	-3.89	3.55	-0.99	-3.22	-3.07	-1.78	-1.32
	Comparison of Pre (8th April 08) and Post (7th April 09) SD								
Time	**06:00**	**06:30**	**07:00**	**07:30**	**08:00**	**08:30**	**09:00**	**09:30**	**10:00**
Pre-VSL SD (mph)	3.56	5.71	5.40	5.30	3.89	4.75	3.46	3.97	4.02
Post-VSL SD (mph)	0.89	3.48	5.51	3.80	1.78	1.32	6.85	3.77	3.76
Difference (mph)	**-2.67**	**-2.23**	**0.12**	**-1.50**	**-2.10**	**-3.43**	**3.39**	**-0.20**	**-0.26**
	Comparison of Pre (9th April 08) and Post (8th April 09) SD								
Time	**06:00**	**06:30**	**07:00**	**07:30**	**08:00**	**08:30**	**09:00**	**09:30**	**10:00**
Pre-VSL SD (mph)	4.04	4.24	4.59	4.34	7.49	5.55	7.01	4.87	5.42
Post-VSL SD (mph)	3.45	2.91	3.00	1.61	4.16	5.18	3.87	6.42	3.70
Difference (mph)	**-0.59**	**-1.33**	**-1.59**	**-2.72**	**-3.33**	**-0.37**	**-3.14**	**1.54**	**-1.72**
	Comparison of Pre (22nd April 08) and Post (21st April 09) SD								
Time	**06:00**	**06:30**	**07:00**	**07:30**	**08:00**	**08:30**	**09:00**	**09:30**	**10:00**
Pre-VSL SD (mph)	2.47	3.77	10.46	7.81	1.75	4.43	4.09	2.57	0.41
Post-VSL SD (mph)	4.45	2.48	4.26	5.00	3.45	3.99	2.65	2.76	2.40
Difference (mph)	**1.98**	**-1.29**	**-6.21**	**-2.82**	**1.70**	**-0.44**	**-1.44**	**0.18**	**1.99**

*Difference indicates decrease in Post-VSL SD and vice versa.

Task 1.3: Speed Limit during Peak Periods

The objective of this task was to evaluate the system initiation logic for variable speed limits. This was carried out by analyzing the average speeds, traffic flow and occupancy during peak periods using two days of data, i.e. 21st April, and 8th April, 2009. Figures were plotted to show the relationship between average speed, volume and occupancy for peak periods. On these plots, Figures S4.13.1 to S4.13.2, two y-axes are used; the y-axis on the left present average speed and average occupancy and the y-axis on the right present volume. Additionally, posted variable speed limits were plotted to analyze the initiation of the VSL system.

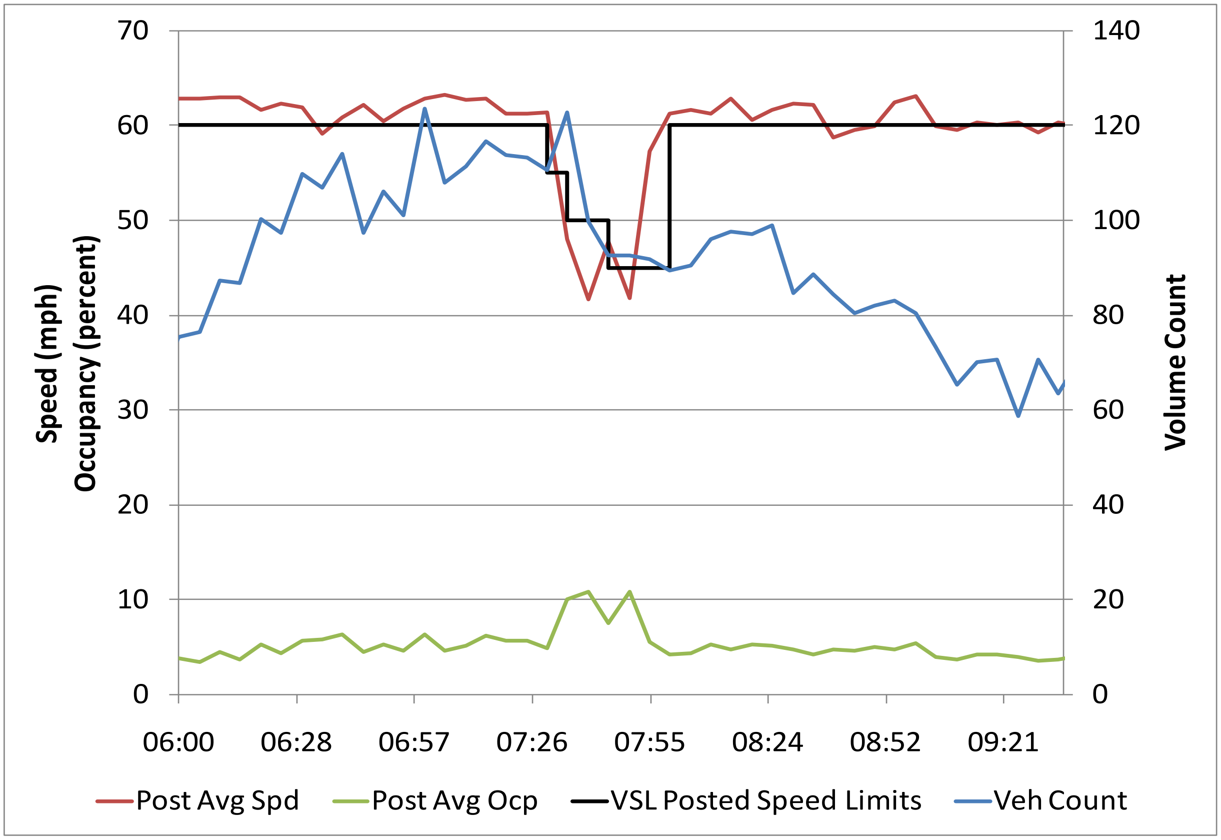


Figure S4.13.1. Post-VSL: VSL System trigger point (21st April, 2009) for detector 31D

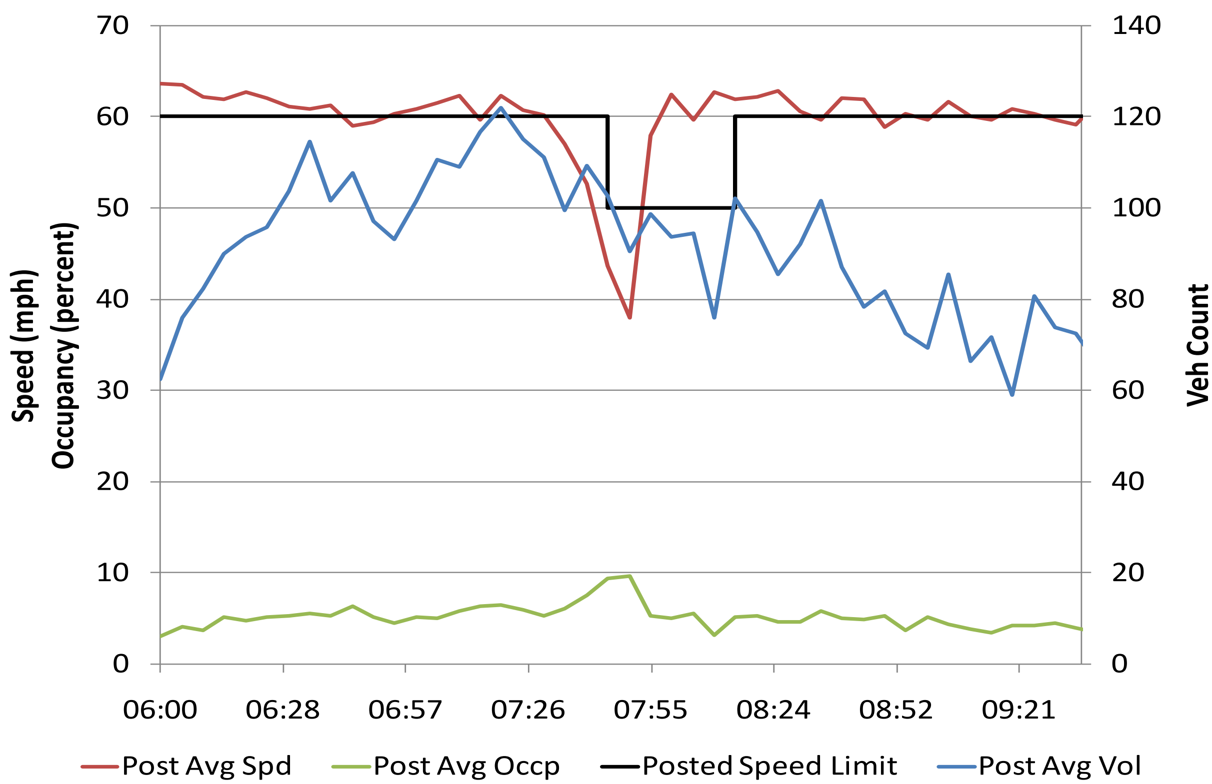


Figure S4.13.2. Post-VSL: VSL System trigger point (8th April, 2009) for detector 31D

For the both days, data from detector 31D (logmile 31.6) are presented. For 8th April, 2009, Figure S4.13.2 indicates that the system is initiated when the average vehicle speeds fell much below 60 mph, and volume and occupancy thresholds have exceeded the specified thresholds. However, Figure S4.13.1 indicated better initiation compared to Figure S4.13.2. This indicates better traffic recovery when the system was initiated promptly when the speed went below 60 mph.

Task 1.4: Speed Limit Compliance by Posted Speed Limit

The objective of this task was to analyze driver compliance of the posted variable speed limits. Average speeds and posted VSL for peak periods plotted at detector 31D (logmile 31.6). Figure S4.14.1 presents the average speed and posted speed limit and it was found that, average speed reduced due to congestion. It can also be noticed from Table S4.14.2 that lane 3 had the best compliance result compared to all other lanes and drivers on lane 1 had the lowest compliance with the posted speed limits. Additionally, compliance was lowest at detector 30D.

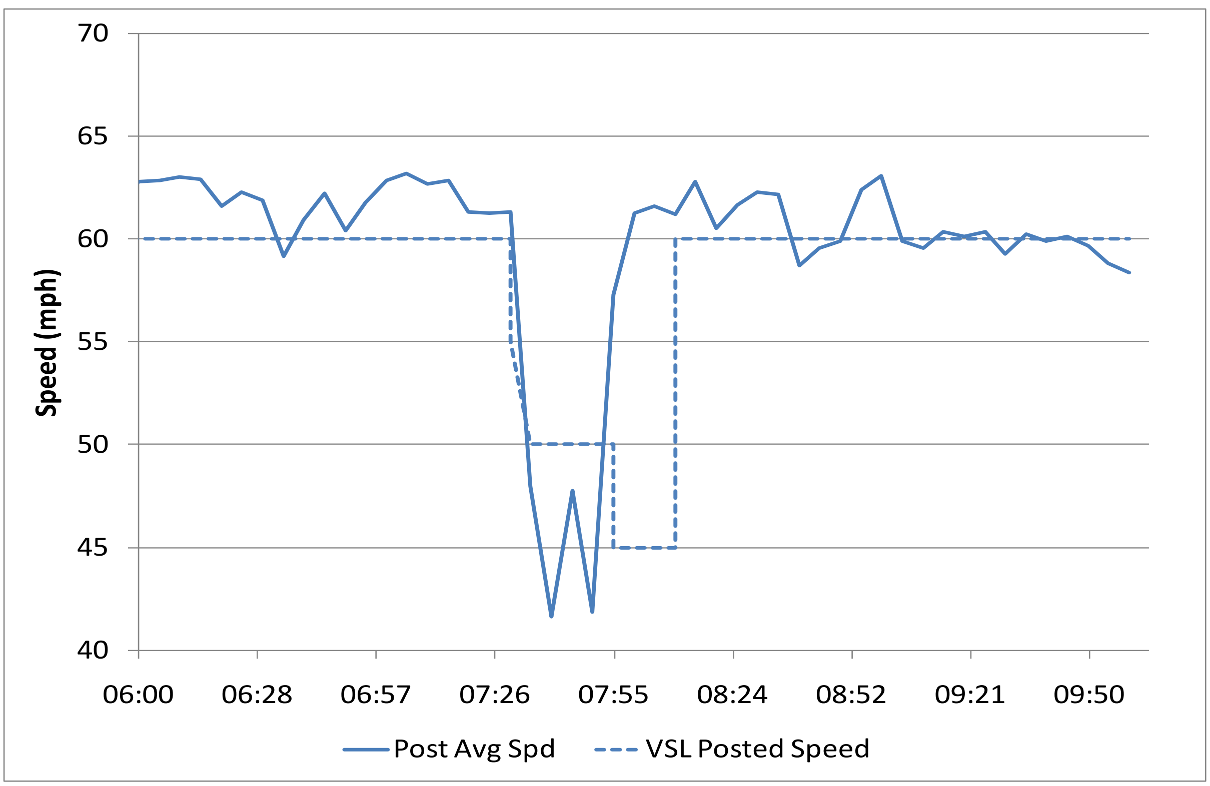


Figure S4.14.1 VSL (21st April, 09)

Table S4.14.2 Percent compliance along the highway for all lanes

Lane	Detector 28	Detector 30	Detector 31
October 16th 2008			
L1	94.68*	53.64	77.73
L2	47.91	94.29	94.42
L3	100	96.34	100
Hwy^	77.07	80.21	90.35
October 21st 2008			
L1	87.26*	79.06	79.55
L2	78.56	90.92	95.02
L3	100	92.36	100
Hwy^	86.37	87.01	91.13
April 7th 2009			
L1	37.61*	18.20	67.88
L2	36.9	58.2	90.15
L3	94	62.25	98.64
Hwy^	48.94	44.84	84.82
April 8th 2009			
L1	77.46*	21.00	42.26
L2	64.96	63.80	70.67
L3	97.89	65.53	98.17
Hwy^	76.51	48.05	68.18
April 21st 2009			
L1	55.65*	**	57.92
L2	51.68	**	75.91
L3	91.49	**	89.95
Hwy^	61.40	**	73.46

*Percent of drivers complying with the posted variable speed limit

** Bad detector data

^ Weighted average of all lanes of the highway

Task 1.5: Evaluation of Highway Capacity

This task compares speed-flow plots for pre- and post-VSL conditions. Figure S4.15.1 presents the speed flow data for five days in pre- and post-VSL system installation for detector location 31D (logmile 31.6) Data used were aggregated for 5 minute intervals for this task. From the figure fewer data points can be observed in the congested regime of the speed-flow curve indicating better traffic flow conditions, and speedy recovery for the post-VSL conditions compared to the pre-VSL conditions. For pre-VSL conditions, the segment volume was also higher. It should be noted here, that time mean speed is used on the y-axis. It is recommended that speed-flow plots are plotted between space mean speed and traffic flow, however, as these plots are used mainly for comparison between pre- and post-VSL conditions, time mean speed can be used. The readers are cautioned that conclusions should be made after due consideration of this fact and careful evaluation.

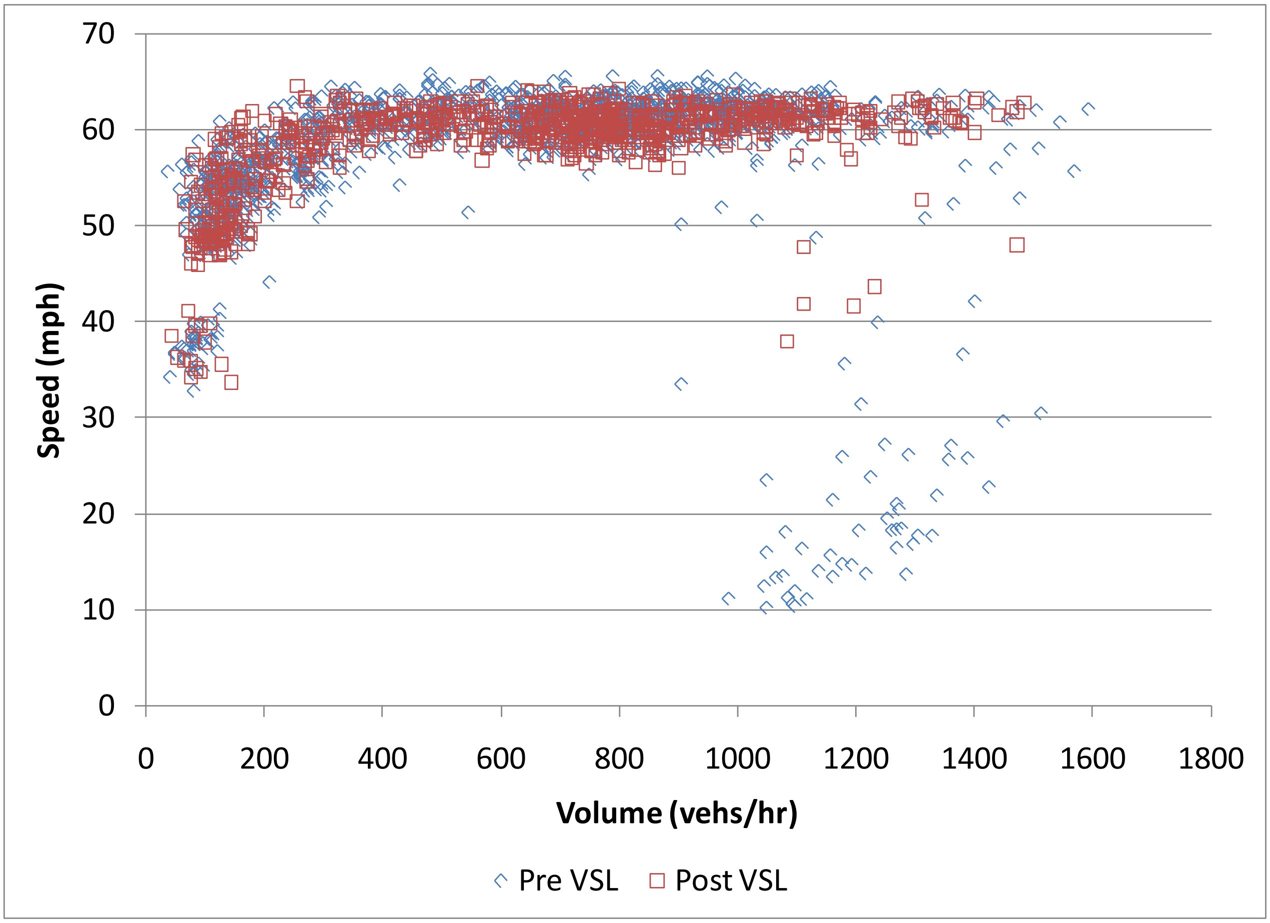


Figure S4.15.1 Speed Flow Plot at 31D

Task 1.6: Evaluation of Congestion Measures

To evaluate the congestion measures, travel times and travel time reliability indices, travel delay, Percent of Congested Delay, and extent, duration, and intensity of queues formed were compared for pre- and post-VSL conditions. Segment 4 travel times were computed between detectors 21D (logmile 21.4) and 25D (logmile 25), for selected days mentioned in Table S4.1. Travel times were calculated for average of lane 3 (had same volume for pre- and post-VSL conditions) and average of all lanes for selected days and were compared for pre- and post-VSL conditions.

Figure S4.16.1 presents comparison of average travel times for selected days of data for all lanes of the highway between detectors 28D (logmile 28.6) and 31D (logmile 31.6). From the figure it can be inferred that for pre-VSL conditions the mean travel time ranged between 87 and 130 person-minutes. For post-VSL conditions, the mean travel time decreased to about 87 and 105 person-minutes. Tables S4.16.1 and S4.16.2 present comparison of average mean and standard deviation of travel times for selected days of data for all lanes of the highway. It can be observed from the tables that the mean and standard deviation of travel time during peak periods for post-VSL conditions decreased 13 and 29%, compared to pre-VSL conditions. It shows travel times during peak periods decreased significantly after initiation of the VSL system. Also reduction in standard deviation indicates that VSL system was beneficial at decreased variation of travel times during the peak period.

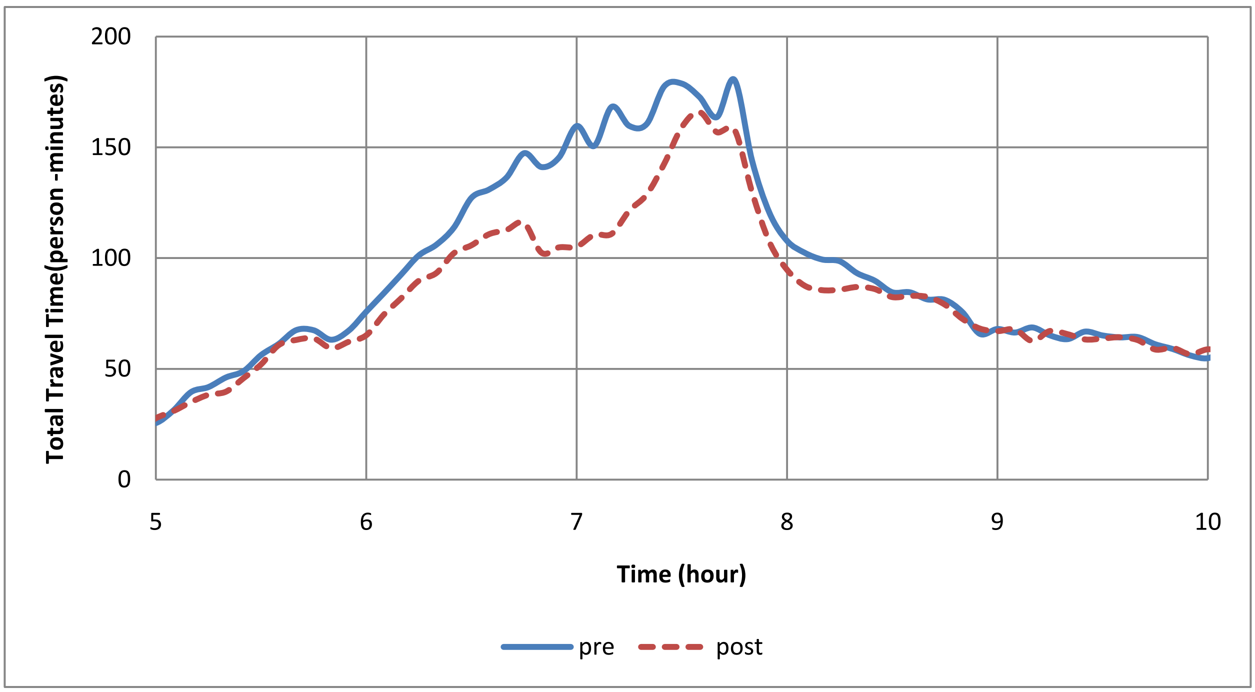


Figure S4.16.1. Comparison of Pre and Post-VSL average travel time data between 28D and 31D (Average of all lanes)

Table S4.16.1 Comparison of mean travel times during peak period for pre- and post VSL (Average of all lanes)

Dates	Between 28D and 31D			
	Travel Time (person-minutes)		Volume (vehicles/hour)	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
October 18 & 16	128.4	96.9	1243	1256
October 23 & 21	129.4	105.0	1254	1263
April 8& 7	91.5	89.7	971	969
April 9& 8	97.6	87.4	971	970
April 22& 21	86.3	87.4	1293	1297
Avrg. of five days	106.6	94.9	1146	1151
Difference	-13.4		5	
Percentage Change	-13.4		0.4	

Table S4.16.2 Comparison of standard deviation of travel times during peak period for pre- and post VSL (Average of all lanes)

Dates	Between 28D and 31D			
	Travel Time (person-minutes)		Volume (vehicles/hour)	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
October 18 & 16	67.7	37	248	269
October 23 & 21	71.6	48.3	239	275
April 8& 7	24.9	27.5	233	205
April 9& 8	32.0	22.5	227	201
April 22& 21	19.0	17.9	280	254
Avrg. of five days	43.0	30.6	245	241
Difference	-12.4		-4	
Percentage Change	-28.8		-1.6	

Figure S4.16.2 presents the comparison of travel times computed for average of lane 3 between detectors 28D (logmile 28.6) and 31D (logmile 31.6). It can be observed from Figure S 4.16.2 that for pre-VSL conditions, the mean travel times for peak periods ranged between 68 and 120 person-minutes. For post-VSL conditions, the mean travel times during peak period decreased to about 67 and 80 person-minutes. Tables S4.16.3 and S4.16.4 present the comparison of mean and standard deviation of travel times for selected days average for lane 3. It can be observed from the tables that the mean and standard deviation of travel time during peak periods for post-VSL conditions decreased 14 and 38% compared to pre-VSL conditions. It shows that travel times during peak periods decreased appreciably after initiation of the VSL system. Also, reduction in standard deviation indicates VSL system was beneficial as variation in travel times decreased during the peak periods. The comparison of results of lane 3 and average of all lanes shows reduction of mean and standard deviation of travel time for five days in lane 3 is more than all lanes.

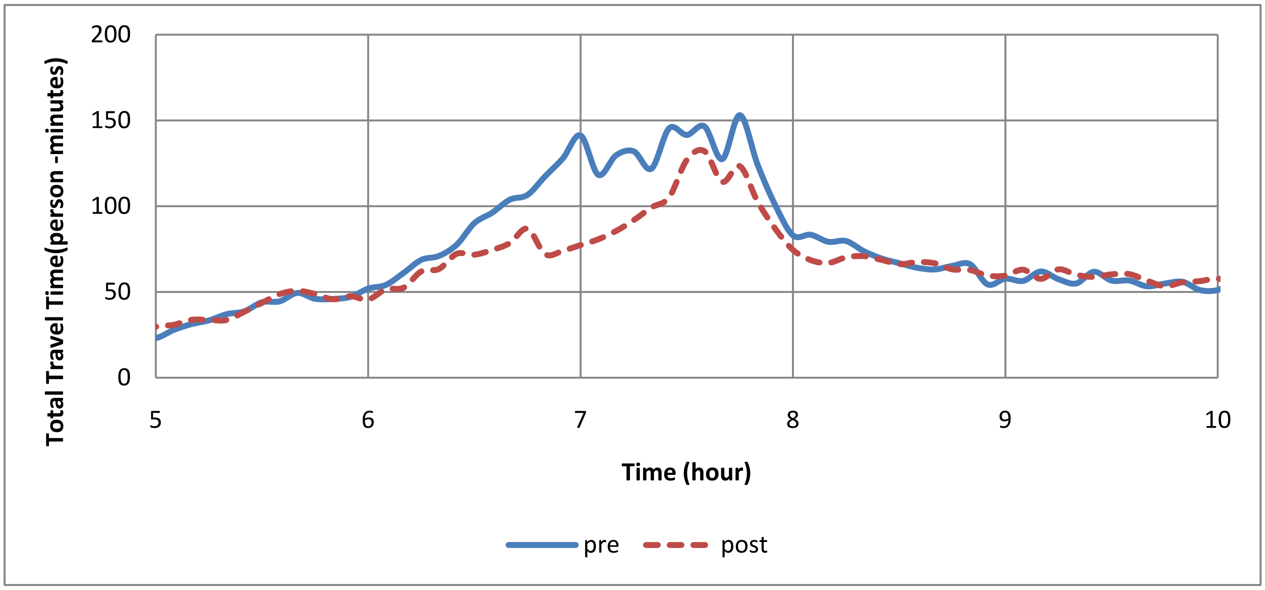


Figure S4.16.2 Comparison of Pre and Post-VSL average travel time data between 28D and 31D (Average of lane 3)

Table S4.16.3 Comparison of mean travel times during peak period for pre- and post VSL (Lane 3)

Dates	Between 28D and 31D			
	Travel Time (person-minutes)		Volume (vehicles/hour)	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
October 18 & 16	121.8	78.6	955	930
October 23 & 21	96.3	81.7	943	938
April 8& 7	68.0	69.4	682	689
April 9& 8	73.0	67.5	694	690
April 22& 21	67.8	69.0	889	891
Avrg. of five days	85.4	73.2	833	828
Difference	-12.2		-5	
Percentage Change	-14.2		-0.60	

Table S4.16.4 Comparison of standard deviation of travel times during peak period for pre- and post VSL (Lane 3)

Dates	Between 28D and 31D			
	Travel Time (person-minutes)		Volume (vehicles/hour)	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
October 18 & 16	78.0	29.8	163	142
October 23 & 21	51.8	33.9	175	156
April 8& 7	15.2	21.3	121	110
April 9& 8	21.6	15.4	135	107
April 22& 21	11.0	11	138	124
Avrg. of five days	35.5	22.3	146	128
Difference	-13.2		-18	
Percentage Change	-37.2		-12.3	

<u>Individual Measures</u>

The individual measures, TTI, BTI, and PTI were compared with selected days of data for the peak periods for pre- and post-VSL conditions. Table S4.16.5 presents the comparison of average of individual measures, TTI, BTI, and PTI (selected days of data) for average of lane 3 between detectors 28D (logmile 28.6) and 31D (logmile 31.6). It can be observed from Table S4.16.5 that for post-VSL conditions TTI, BTI, and PTI decreased about 18 and 29, 21 % and 18 and 13, 17 % for average of lane 3 and average of all lanes, respectively. Reduction in TTI shows decrease in ratio between the actual travel rate and Posted Speed Limit (PSL) travel rate that means the VSL system was useful in decreasing the difference between the peak period and the PSL travel conditions. This indicates that travel times for peak periods and PSL are closer to each other in post-VSL conditions. Reduction in BTI indicates decrease difference between 95% travel time and average travel time that means the VSL system was beneficial in reducing the difference between the 95% travel time and average travel time. Reduction in PTI indicates decrease ratio between 95% travel time and PSL travel time that means the VSL system was useful in decreasing the difference between 95% and PSL travel time.

Table S4.16.5. Comparison of travel times reliability indices for pre- and post-VSL

Individual Measures	Between 28D and 31D			
	Average of lane 3		**Average of all lanes**	
	PRE-VSL	POST-VSL	PRE-VSL	POST-VSL
Travel Time (TTI)	1.53	1.25	1.41	1.15
Difference (Percentage Change)	-0.28 (-18.3)		-0.26 (-18.4)	
Buffer Time Index (BTI)	0.48	0.34	0.48	0.42
Difference (Percentage Change)	-0.14 (-29.2)		-0.06 (-12.5)	
Planning Time Index (PTI)	2.01	1.59	1.89	1.57
Difference (Percentage Change)	-0.42 (20.9)		-0.32 (-16.9)	

Overall results for segment 4 show all travel time reliability indices (TTI, BTI, and PTI) decreased. Reduction in all travel time reliability indices for post-VSL conditions indicates less variability and more consistency between highest value of travel time during the peak period (worst condition) and PSL condition. It can be concluded that post-VSL conditions was more reliable than pre-VSL conditions and there is benefit after VSL system initiation.

Comparison between results of lane 3 and all lanes showed reduction of mean and standard deviation of travel times and also travel time reliability indices for all lanes are not similar to lane 3.In this part, individual measures, TTI, BTI, and PTI, were calculated for each lane separately for selected days; thereafter their averages for each lane and average of all lanes were computed. Figure S4.16.3 indicates the comparison of average TTI for selected days for average of each lane separately and also average of all lanes between detectors 28D (logmile 28.6) and 31D (logmile 31.6). It can be inferred from Figure S4.16.3 that TTI reduced after VSL system installation for all lanes. Therefore, it can be stated that VSL system installation has been beneficial for reducing TTI.

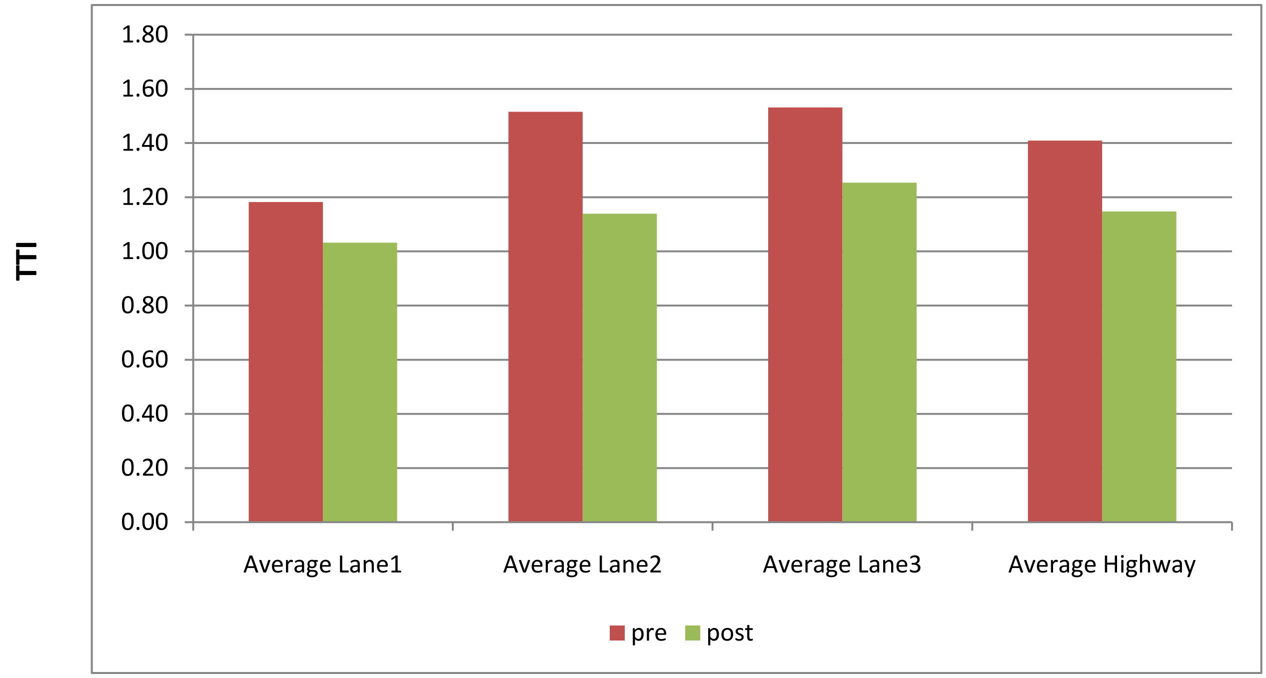


Figure S4.16.3. Comparison of Pre and Post-VSL conditions Travel Time Index (TTI) between 28D and 31D

Figure S4.16.4. Comparison of Pre and Post-VSL conditions Buffer Time Index (BTI) between 28D and 31D

Figure S4.16.4 presents the comparison of average of BTI for selected days for average of each lane and also average of all lanes. It can be noted from Figure S4.16.4 that BTI decreased after VSL system installation for all lanes. It can be said that VSL system installation has benefited for decreasing BTI.

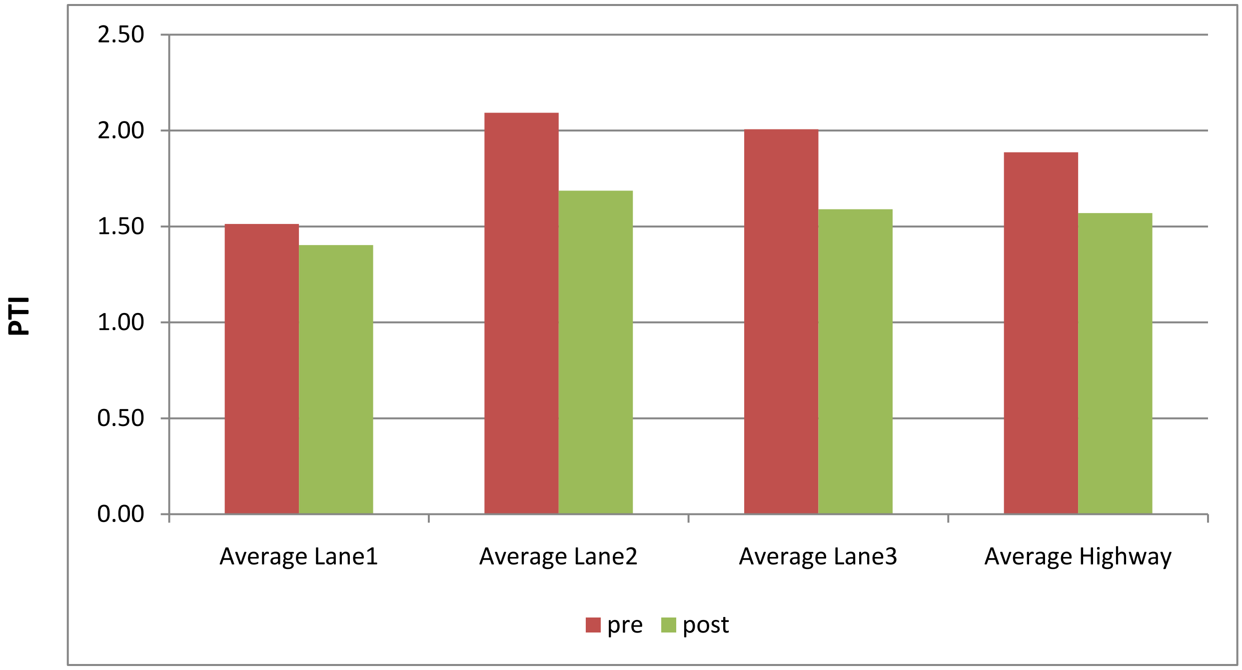


Figure S4.16.5 Comparison of Pre and Post-VSL conditions Planning Time Index (PTI) between 28D and 31D

Figure S4.16.5 shows the comparison of average of PTI for selected days for average of each lane and also average of all lanes. It can be stated from Figure S4.16.5 that PTI has reduced after VSL system installation for all lanes. It can be inferred that the VSL system installation has been beneficial for reducing PTI. Figures S4.16.3, S4.16.5 and S4.16.6 show reduction of the indices in all lanes are not the same.

Traffic Delay

For segment 4, the analysis indicates that average Delay calculated for post-VSL system was much lower compared to the pre-VSL system. This reduction in delay, presented in Table S4.16.5 was approximately 2.1 minutes for the four days of data used.

Table S4.16.5. Average Delay and Change in Percentage of Congested Travel during peak periods before and after VSL system installation

Detector ID	MP 31 to MP 28
Pre (18th Oct 07) and Post (16th Oct 08) SD	
Pre VSL Travel Time (minutes)	2.6
Post VSL Travel Time (minutes)	1.9
Delay (minutes)*	-0.7
Percent Change in Congested Travel*	-27%
Pre (23rd Oct 07) and Post (21st Oct 08) SD	
Pre VSL Travel Time (minutes)	2.3
Post VSL Travel Time (minutes)	1.9
Delay (minutes)*	-0.4
Percent Change in Congested Travel*	-18%
Pre (8th April 08) and Post (7th April 09) SD	
Pre VSL Travel Time (minutes)	3.2
Post VSL Travel Time (minutes)	3.1
Delay (minutes)	0.1
Percent Change in Congested Travel	-3%
Pre (9th April 08) and Post (8th April 09) SD	
Pre VSL Travel Time (minutes)	3.4
Post VSL Travel Time (minutes)	3.1
Delay (minutes)	0.3
Percent Change in Congested Travel	-9%
Pre (22nd April 08) and Post (21st April 09) SD	
Pre VSL Travel Time (minutes)	3.2
Post VSL Travel Time (minutes)	3.2
Delay (minutes)	0
Percent Change in Congested Travel	0

*Negative value indicates decrease in Post-VSL congestion measures and vice versa.

Similarly, Percentage of Congested Travel reduced by nearly 28 percent for post-VSL conditions. Results indicate decrease in Delay and Percentage of Congested Travel in post-VSL conditions. It can be observed from the results that the VSL system decreased traffic delays which translate into user cost savings. Values in Table S4.16.5 indicate reduction in average Percentage of Congested Travel and average Delay during peak periods. The next subsection, quantifies the delay as user cost savings.

Delay Cost Analysis

Table S4.16.6 presents the average annual vehicle cost savings as a result of post-VSL system benefits. The analysis was carried out for peak periods determined from Task 2.2 (0600 hours to 1000 hours). The average vehicle cost was calculated to be \$24.82/hr and used in delay cost analysis.

Table S4.16.6. Delay Cost savings due to VSL system installation average for five days

Locations I-270 SB	Difference in Delay (people-min)	Average Daily User Cost *	Average Annual User Cost for 250 Workdays
MP 31 to MP 28	13.4	5.6	\$1385.783

* based on average user cost of \$24.82/hr

Table S4.16.6 presents the cost savings as a result of reduced delay due to post-VSL conditions from the delay calculated for four days in pre and post- VSL conditions. The average cost savings represent 250 work days during peak periods. The cost saving at this segment was calculated to be \$1386 per user.

Queue Measurement

The objective of this task was to compare the queue duration, extent and intensity on the segment. This subtask could not be carried out for this segment due to unavailability of sufficient detector data.

Task 1.7: Analysis of VSL System during Inclement Weather

Data analysis was also carried out to evaluate the VSL system during inclement weather conditions. Similar to clear weather conditions, inclement weather data for volume and average speed were used for comparison of pre- and post-VSL. The figures that follow depict the speed and volume profile plot for detectors along the highway for December 16th, 2008 during post-VSL conditions.

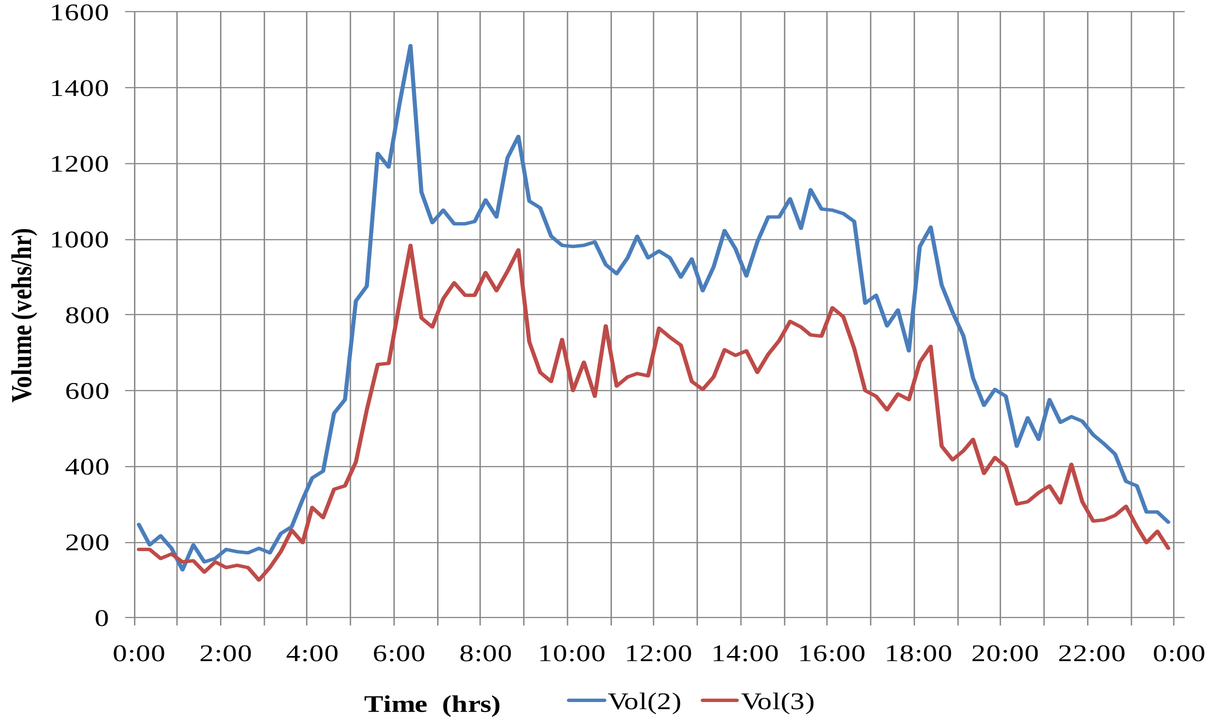


Figure S4.17.1 Post-VSL (Dec. 16th, 08) Average Volume data (detector 31D)

Figure S4.17.1 presents the average volume for lanes 2 and 3. It can be noticed that the maximum flow was less than 1600 vehs/hr on lane 2 and average volume around 1000 vehs/hr. This indicates low traffic on that day but the speed profile indicated traffic congestion between 0500-1000 hrs which indicates combined effects of peak period traffic and inclement weather.

Figure S4.17.2 present average speed for two lanes and average highway speeds for detector 31D (logmile 31.6). It can be noted that the average speeds for post-VSL conditions dropped below 15 mph. Since the peak periods were distinguished using the observation that peak period usually starts when the speed drops below 60 mph, this was not observed for inclement weather data. During inclement weather, the average speed remained below 60 mph for the entire day. From Figure S4.17.2 it is evident that no improvement in traffic conditions were observed during snow conditions during the post-VSL initiation period.

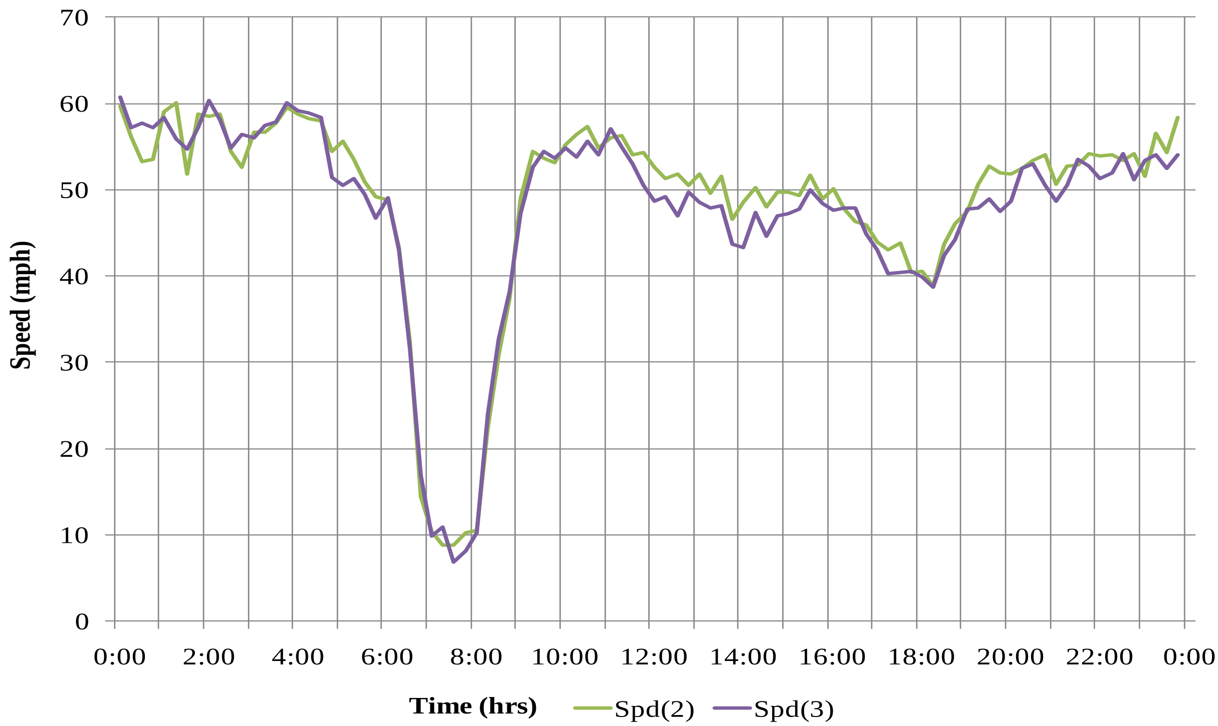


Figure S4.17.2. Post-VSL (Dec. 16th, 08) Average Speed Profile (detector 31D)

It should be noted that the ASTI posted variable speed limit data was not available from December 16th, 2008 till the end of February 2009. Therefore, it cannot be verified whether VSL signs were active during these conditions. Posted speed data for April 19th, 2009, a rainy day, indicated that the speed limit was constant at 60 mph throughout the day, which showed no difference between pre- and post-VSL conditions for inclement weather. Further analysis for weather data could not be carried out as speed limits were not reduced and as such no traffic improvements were observed. Furthermore, additional data was not available to confirm the activation of the VSL system.

2.0 ROADWAY SEGMENT ASSESSMENT

This task provides information on the assessment of roadway segments. The VSL system uses traffic data collected from permanent roadside detection units (referred to as detectors) that are spaced approximately every mile along the I-270 corridor. The traffic data is collected every 30 seconds and includes average speed and occupancy for the past 30-second time period. The Transportation Management Center (TMC) polls each detector and collects traffic data by each lane and direction of travel. This traffic data is sent by a Virtual Private Network (VPN) connection to the VSL system vendor. The vendor uses the traffic data to evaluate the need to change the speed limit (reduction or increase) based on the traffic data and the current speed limit displayed. The vendor sends proposal speed limit changes back to the TMC for implementation based on a speed limit change protocol.

These detectors play an important role in the operation of the VSL system. The roadway segment assessment does the following:

- Compared traffic data collected from actual field GPS travel runs (referred to as GPS runs) to detectors
- Assesses differences between GPS runs and detectors and explores potential reasons why
- Identify potential enhancement to improve VSL operations

During the last two weeks of June 2010, 119 field GPS vehicle travel runs were conducted on Tuesday, Wednesday and Thursday during peak periods of traffic flow (AM Peak 6:00 through 10:00 and PM Peak 3:00 through 7:00). These peak hour periods were selected to help ensure the traffic data collected was during a period time that the VSL system would be actively changing speed limits. Four (4) roadway segments were identified based on the mobility evaluation and are described in Tables 2.1 and 2.2.

Table 2.1 Location of Segments and Peak Period

Segments	I-270 between	Start MM*	End MM	Direction	Peak Period
1	I-64 and Route 100	12.4	10	SB	3:00 - 7:00 PM
2	Route 30 to I-44	3.6	5.7	NB	5:30 - 9:30 AM
3	Route 370 to I-170	21.4	25.1	EB	3:00 - 7:00 PM
4	Route 367 to I-170	31.6	26.9	WB	6:00 - 10:00 AM

*MM = mile markers

Table 2.2 Detectors and Exits Numbers

Segments	First	Last	Exit Numbers	
1	12	10	13	9
2	3	5	2	5B
3	21	25	20A	25B
4	31	26	31B	26B

Comparison of detectors' traffic data was done at both a high-level and run-level assessment. The high-level assessment compares cumulative hourly traffic data from designated detectors and conducted GPS runs during the same hourly peak hour time periods. The run-level assessment compares data from individual GPS run to data from the detector for the same specific time period of the GPS run.

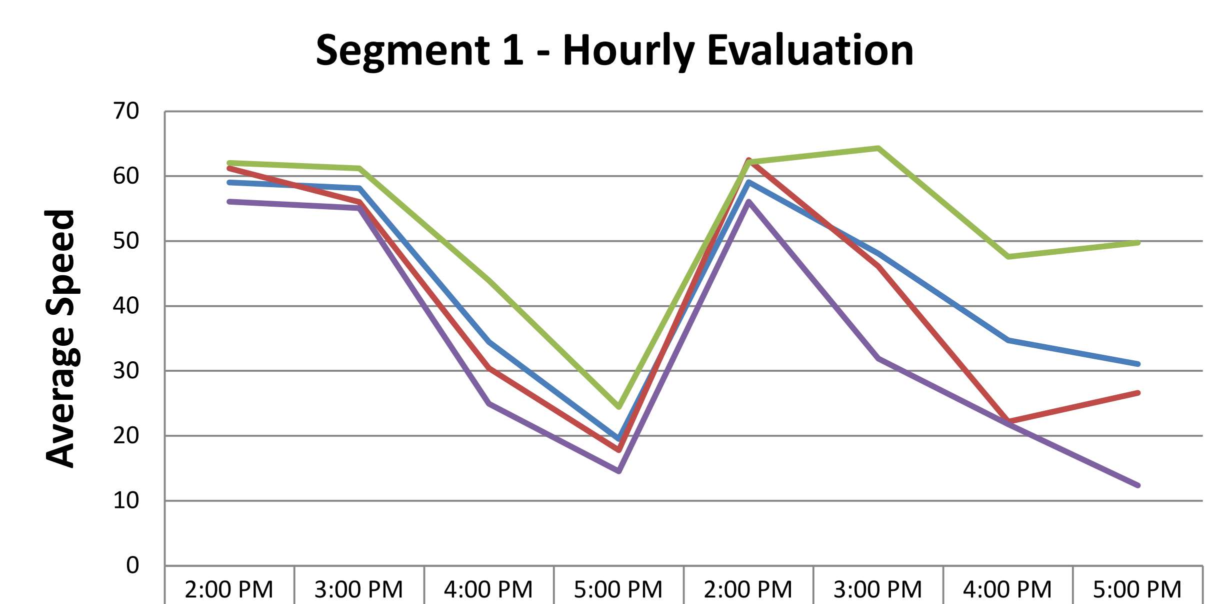
The high level assessment included the calculation of the variances across the hour for the detectors, since there are approximately 120 traffic data collection periods per hour. This variance information does give the variation of data across the hour period that shows the level of consistency in traffic flow. It also provided a quick assessment to determine, if GPS runs were within one standard deviation as initial check between the data sources. Table 2.3 provides dates, times and number of GPS runs for the 119 GPS runs:

Table 2.3. Field GPS Run List

Segment	Date	Time	# of GPS Runs	Segment	Date	Time	# of GPS Runs
1	6/29/2010	2 PM	4	3	6/30/2010	2 PM	4
1	7/1/2010	2 PM	5	3	7/1/2010	2 PM	4
1	6/29/2010	3 PM	4	3	6/22/2010	3 PM	3
1	7/1/2010	3 PM	4	3	6/23/2010	3 PM	4
1	6/30/2010	4 PM	3	3	6/24/2010	5 PM	3
1	7/1/2010	4 PM	2	3	6/29/2010	5 PM	3
1	6/30/2010	5 PM	3	3	6/30/2010	3 PM	3
1	7/1/2010	5 PM	3	3	7/1/2010	3 PM	3
2	6/29/2010	6 AM	3	3	7/1/2010	4 PM	3
2	6/30/2010	6 AM	3	3	7/1/2010	5 PM	2
2	7/1/2010	6 AM	4	4	6/22/2010	6 AM	3
2	6/29/2010	7 AM	3	4	6/23/2010	6 AM	3
2	6/30/2010	7 AM	2	4	6/24/2010	6 AM	4
2	7/1/2010	7 AM	2	4	6/30/2010	8 AM	2
2	6/30/2010	8 AM	1	4	7/1/2010	8 AM	3
2	7/1/2010	8 AM	1	4	6/22/2010	7 AM	3
3	6/22/2010	2 PM	3	4	6/23/2010	7 AM	2
3	6/23/2010	2 PM	3	4	6/24/2010	7 AM	3
3	6/24/2010	4 PM	2	4	6/30/2010	9 AM	1
3	6/29/2010	4 PM	3	4	7/1/2010	9 AM	4

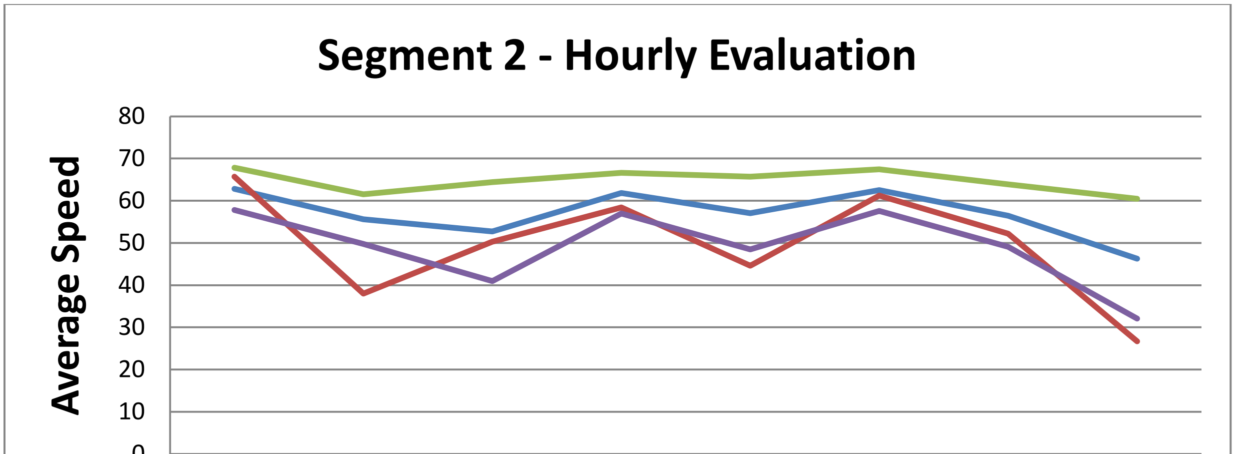
GPS runs were conducted by three different drivers to reduce potential single driver influence on the collected traffic data. The drivers were instructed to travel in either lane 2 or lane 3 to be consistent with the mobility controlled evaluation. They were instructed to travel with the flow of other motorists and limit lane changes to maintaining a consistent traffic flow with other motorists. Detector traffic data was received from the TMC.

The high-level assessment results for traffic data (average speed) that combines lanes 2 and 3 are shown in figures 1 through 4 for the 4 segments. Since average speed is what is received from the detectors and is an available output from the GPS unit, the evaluation was comparing real VSL data inputs rather than calculate values like travel times. An electronic data file containing the high-level assessment for lane 2 only, lane 3 only and combined lane 2 plus lane 3 along with travel times (a product of average speed for detectors) will be provided to MoDOT. This additional data produced similar results as shown below are not presented in this section to help manage the report size. Please note the following abbreviations used – **DS** → Detectors (TMC provided), **GPS** → GPS Runs, **SD** – Standard Deviation shown was calculated from detector hourly traffic data and is shown as plus or minus standard deviation around the detector's mean hourly average speed.



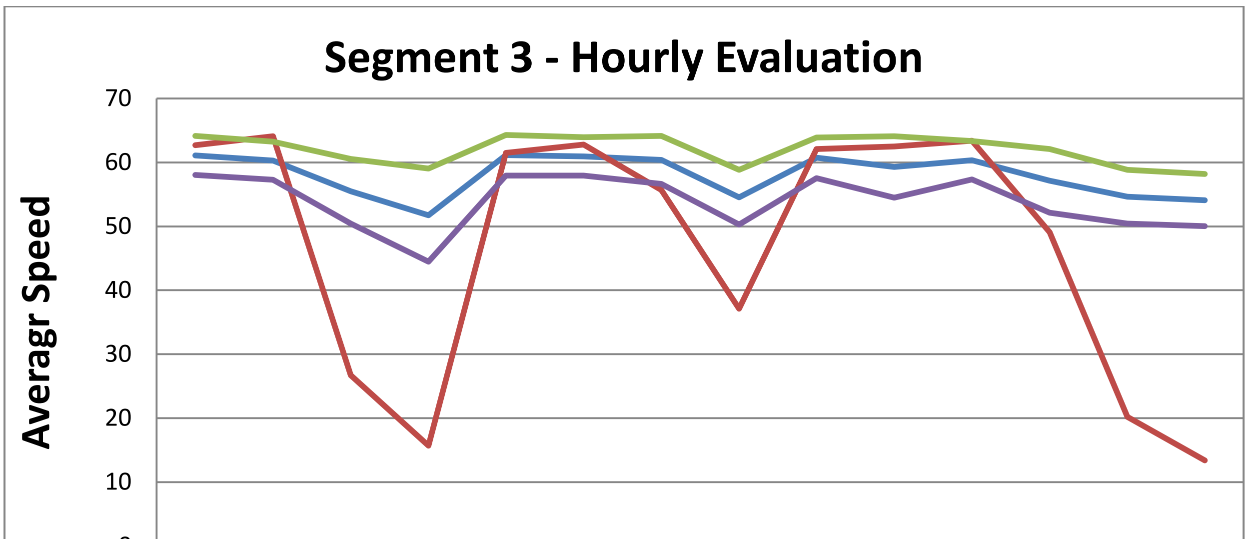
	2:00 PM	3:00 PM	4:00 PM	5:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM
DS	59.1	58.2	34.5	19.5	59.1	48.1	34.7	31.1
GPS	61.2	56.0	30.4	17.8	62.5	46.1	22.2	26.6
SD +	62.1	61.2	44.0	24.5	62.2	64.3	47.6	49.8
SD -	56.1	55.1	25.0	14.6	56.1	31.9	21.8	12.4

Figure 2.1. Segment #1 – Average Speed Comparison for Two Days' - PM Peak Periods



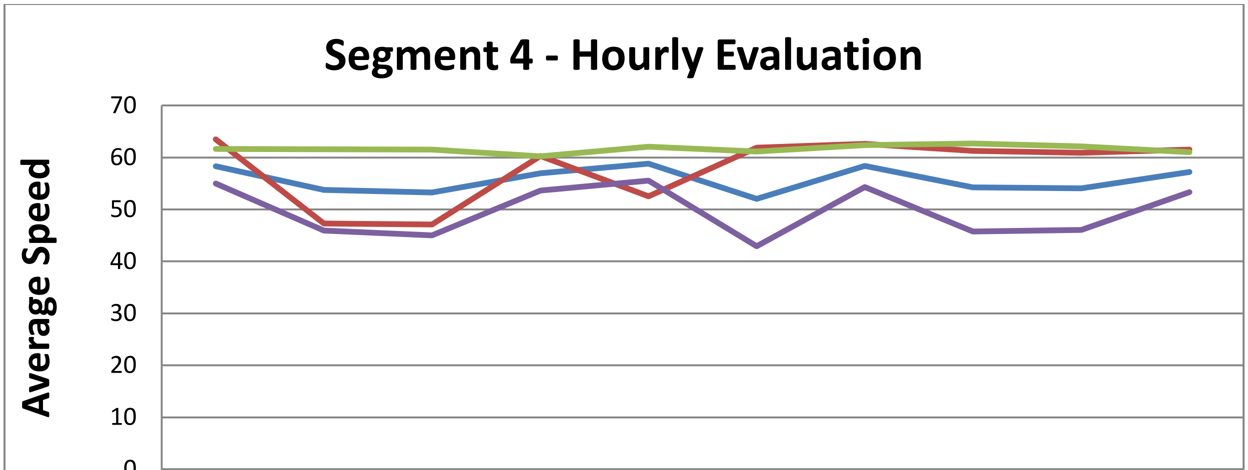
	6:00 AM	7:00 AM	8:00 AM	6:00 AM	7:00 AM	6:00 AM	7:00 AM	8:00 AM
DS	62.9	55.6	52.7	61.8	57.1	62.5	56.5	46.3
GPS	65.7	38.0	50.3	58.4	44.6	61.2	52.2	26.7
SD +	67.9	61.5	64.5	66.7	65.7	67.4	63.9	60.5
SD -	57.9	49.8	41.0	57.0	48.5	57.6	49.1	32.1

Figure 2.2. Segment #2 – Average Speed Comparison for Three Days' - AM Peak Periods



	2:00 PM	3:00 PM	4:00 PM	5:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	2:00 PM	3:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM
DS	61.1	60.3	55.5	51.8	61.1	61.0	60.4	54.6	60.7	59.3	60.4	57.1	54.6	54.1
GPS	62.7	64.1	26.7	15.7	61.5	62.8	55.7	37.1	62.1	62.5	63.4	49.1	20.2	13.4
SD +	64.1	63.3	60.5	59.0	64.3	63.9	64.2	58.8	63.9	64.1	63.3	62.1	58.8	58.2
SD -	58.0	57.3	50.4	44.5	57.9	58.0	56.6	50.3	57.5	54.5	57.4	52.1	50.4	50.0

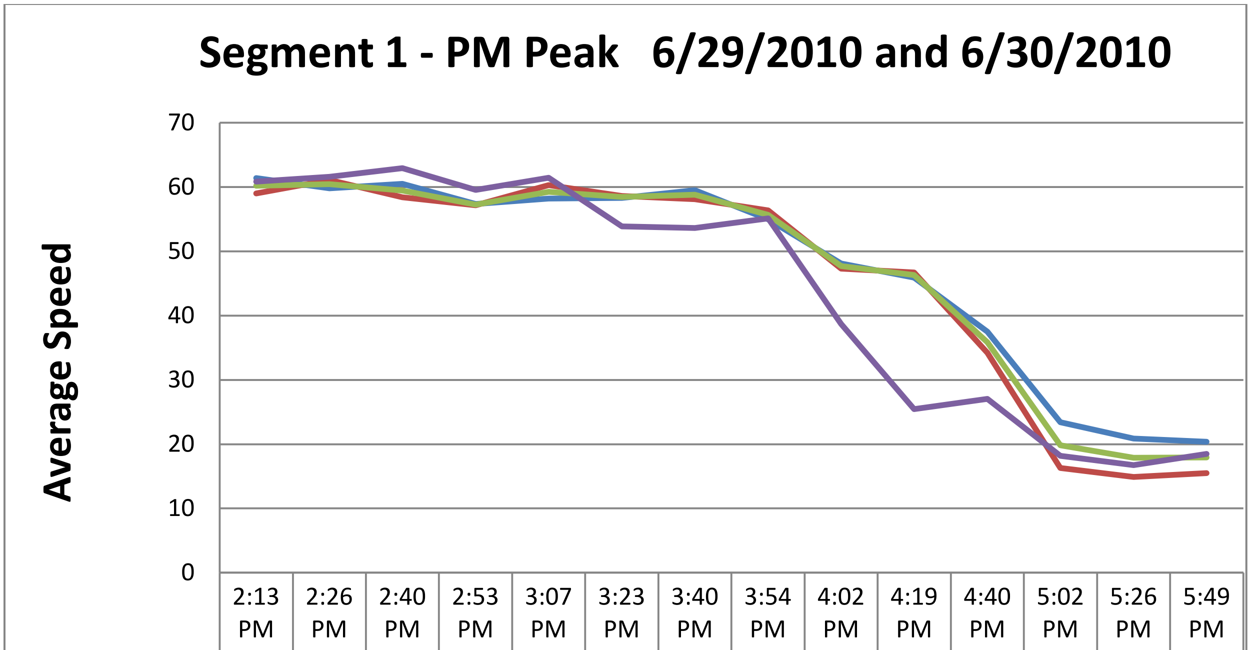
Figure 2.3. Segment #3 – Average Speed Comparison for Three Days' - AM Peak Periods



	6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
DS	58.3	53.8	53.3	56.9	58.8	52.0	58.4	54.2	54.1	57.2
GPS	63.5	47.3	47.1	60.3	52.5	61.9	62.6	61.3	60.9	61.5
SD +	61.6	61.6	61.5	60.2	62.1	61.2	62.4	62.7	62.1	61.0
SD -	55.0	46.0	45.0	53.6	55.5	42.9	54.3	45.8	46.0	53.4

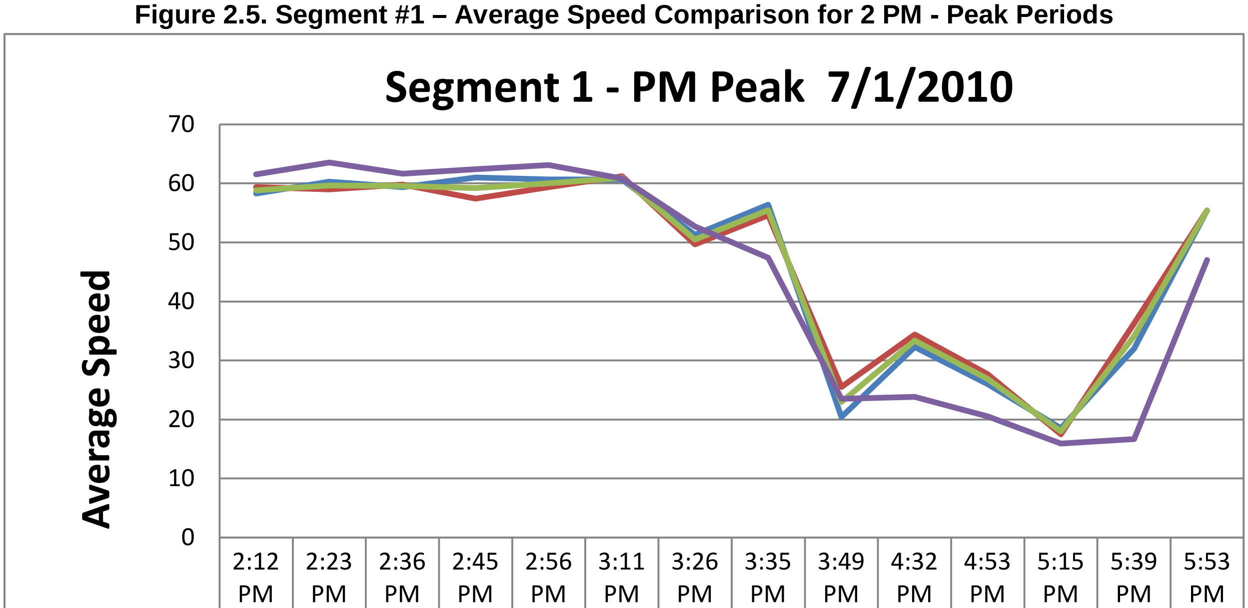
Figure 2.4. Segment #4 – Average Speed Comparison for Three Days' - AM Peak Periods

The run-level assessment results show average speed for Lane 2, Lane 3, Combined (Lanes 2 and 3) and actual individual actual field GPS vehicle travel run. Figures 5 through 17 shows and compares various days for the 4 identified segments. Run-level assessment took each GPS run (119) and compared them to permanent vehicle detection station data. One minute data before the GPS run began and one minute data after the GPS run was used to allow for any potential time variance between the different data sources.



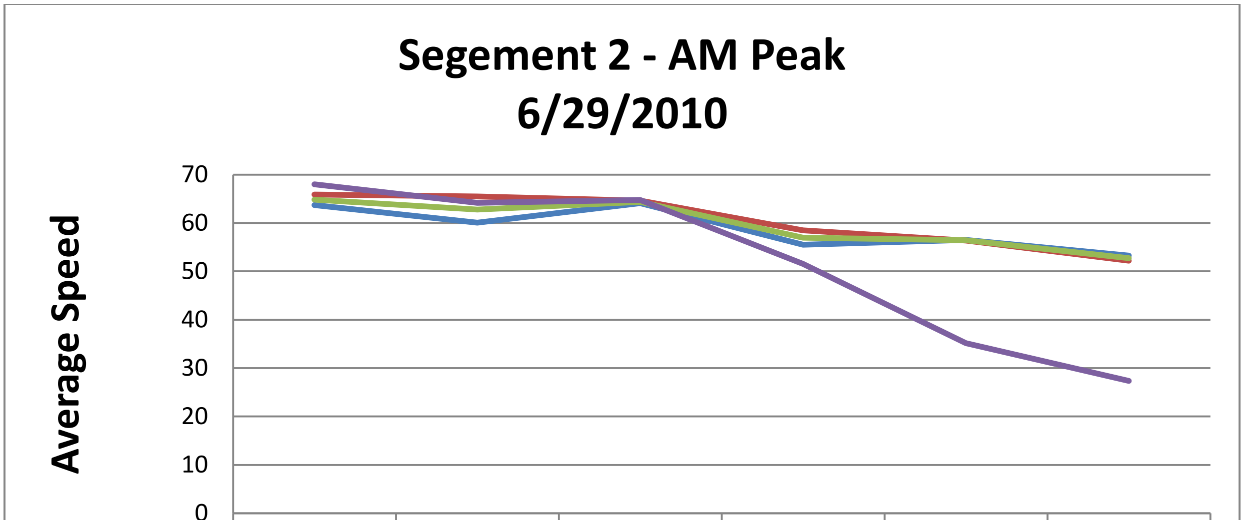
	2:13 PM	2:26 PM	2:40 PM	2:53 PM	3:07 PM	3:23 PM	3:40 PM	3:54 PM	4:02 PM	4:19 PM	4:40 PM	5:02 PM	5:26 PM	5:49 PM
Lane 2	61.4	59.8	60.5	57.4	58.2	58.3	59.5	55.0	48.1	45.9	37.5	23.4	20.9	20.4
Lane 3	59	61.1	58.4	57.2	60.3	58.6	58.1	56.4	47.3	46.7	34.2	16.3	14.9	15.5
Combined	60.2	60.5	59.5	57.3	59.3	58.5	58.8	55.7	47.7	46.3	35.9	19.9	17.9	18.0
GPS Run	60.9	61.6	62.9	59.5	61.5	53.9	53.6	55.2	38.7	25.4	27.0	18.2	16.7	18.5

Figure 2.5. Segment #1 – Average Speed Comparison for 2 PM - Peak Periods



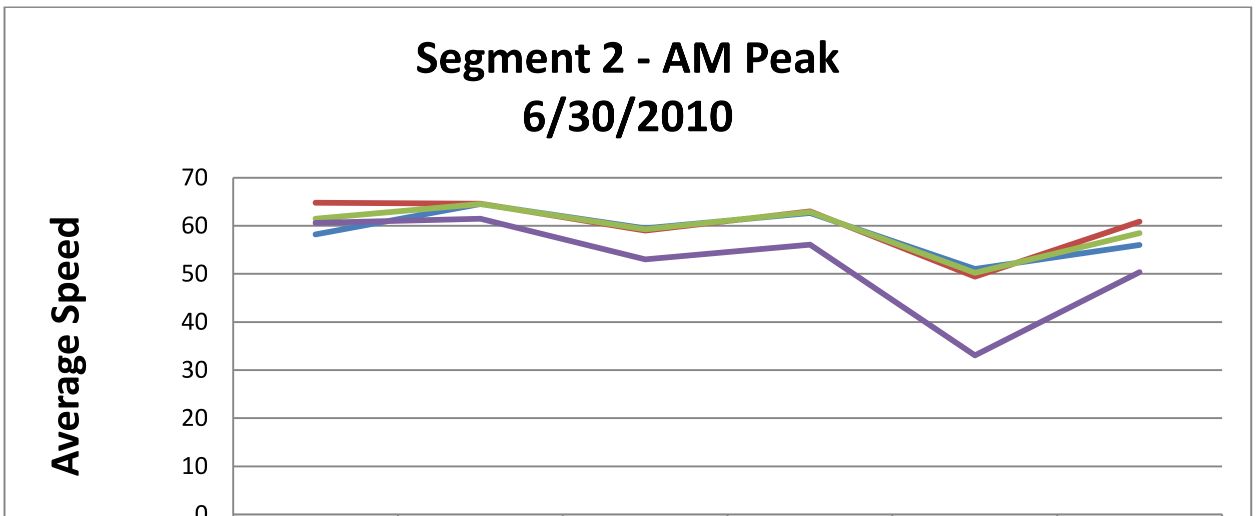
	2:12 PM	2:23 PM	2:36 PM	2:45 PM	2:56 PM	3:11 PM	3:26 PM	3:35 PM	3:49 PM	4:32 PM	4:53 PM	5:15 PM	5:39 PM	5:53 PM
Lane 2	58.3	60.3	59.4	61.0	60.7	60.7	51.3	56.4	20.4	32.3	26.0	18.5	32.0	55.4
Lane 3	59.4	59.0	59.8	57.4	59.4	61.2	49.7	54.6	25.5	34.4	27.7	17.5	36.3	55.4
Combined	58.9	59.7	59.6	59.2	60.1	61.0	50.5	55.5	23.0	33.4	26.9	18.0	34.2	55.4
GPS Run	61.5	63.6	61.7	62.4	63.1	60.9	52.7	47.4	23.5	23.8	20.5	15.9	16.7	47.0

Figure 2.6. Segment #1 – Average Speed Comparison for a PM Peak Period



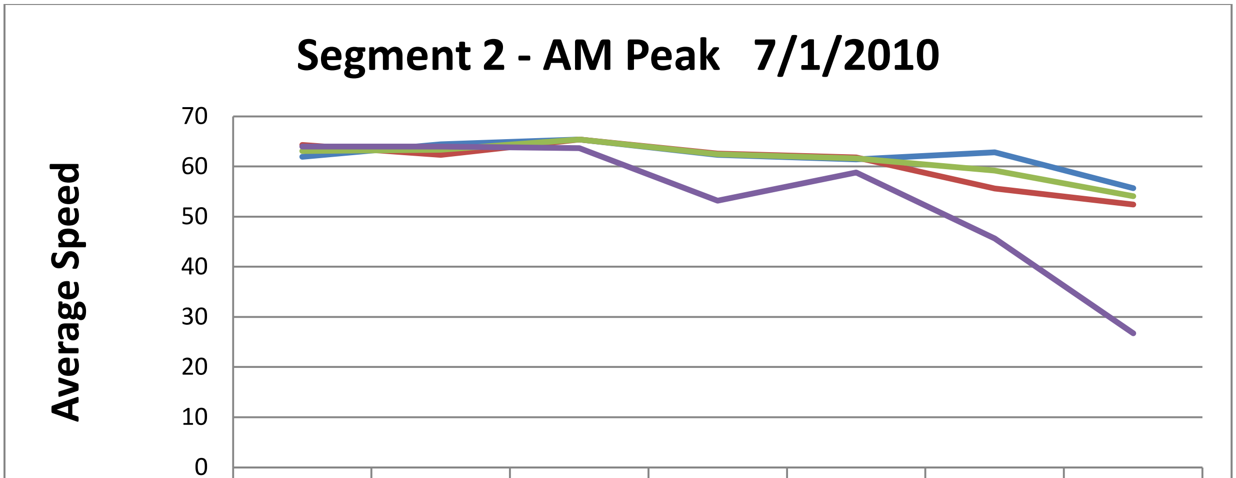
	6:02 AM	6:22 AM	6:41 AM	7:01 AM	7:26 AM	7:54 AM
Lane 2	63.7	60.1	64.1	55.5	56.5	53.3
Lane 3	65.9	65.5	64.6	58.5	56.4	52.2
Combined	64.8	62.8	64.35	57	56.45	52.75
GPS Run	68.0	64.2	64.8	51.5	35.2	27.3

Figure 2.7. Segment #2 – Average Speed Comparison for an AM Peak Period



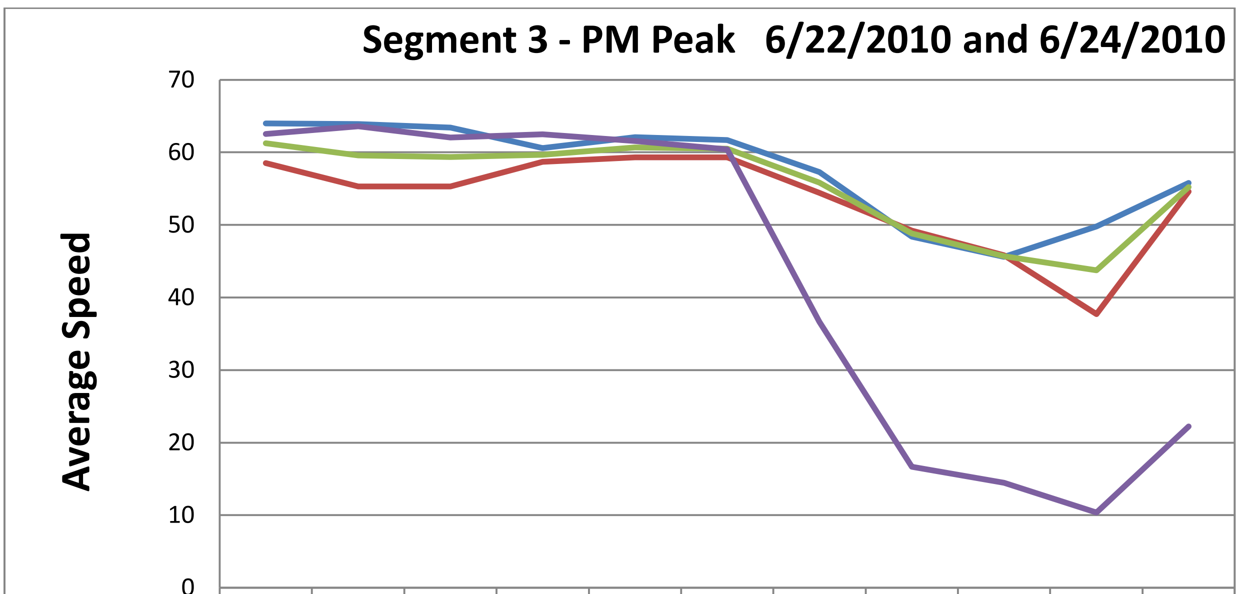
	6:12 AM	6:32 AM	6:54 AM	7:15 AM	7:40 AM	8:05 AM
Lane 2	58.2	64.5	59.5	62.7	51	56
Lane 3	64.8	64.6	59	63	49.4	60.9
Combined	61.5	64.55	59.25	62.85	50.2	58.45
GPS Run	60.6	61.4	53.0	56.1	33.1	50.3

Figure 2.8. Segment #2 – Average Speed Comparison for an AM Peak Period



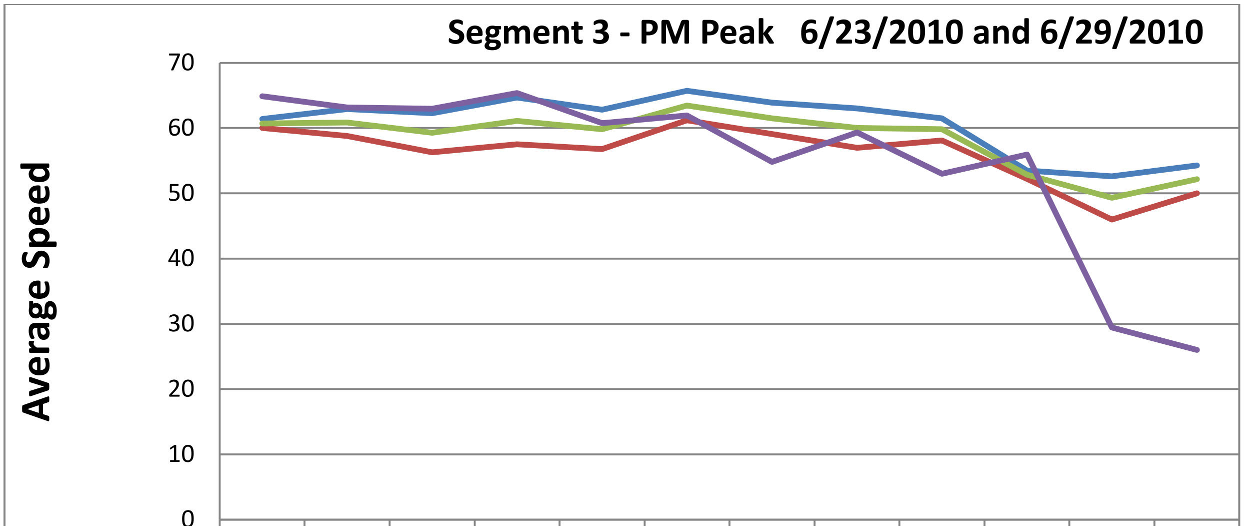
	6:07 AM	6:22 AM	6:36 AM	6:54 AM	7:11 AM	7:29 AM	8:04 AM
Lane 2	61.9	64.4	65.4	62.3	61.4	62.8	55.7
Lane 3	64.3	62.3	65.4	62.6	61.8	55.6	52.4
Combined	63.1	63.35	65.4	62.45	61.6	59.2	54.05
GPS Run	64.0	63.9	63.6	53.2	58.8	45.7	26.7

Figure 2.9. Segment #2 – Average Speed Comparison for an AM Peak Period



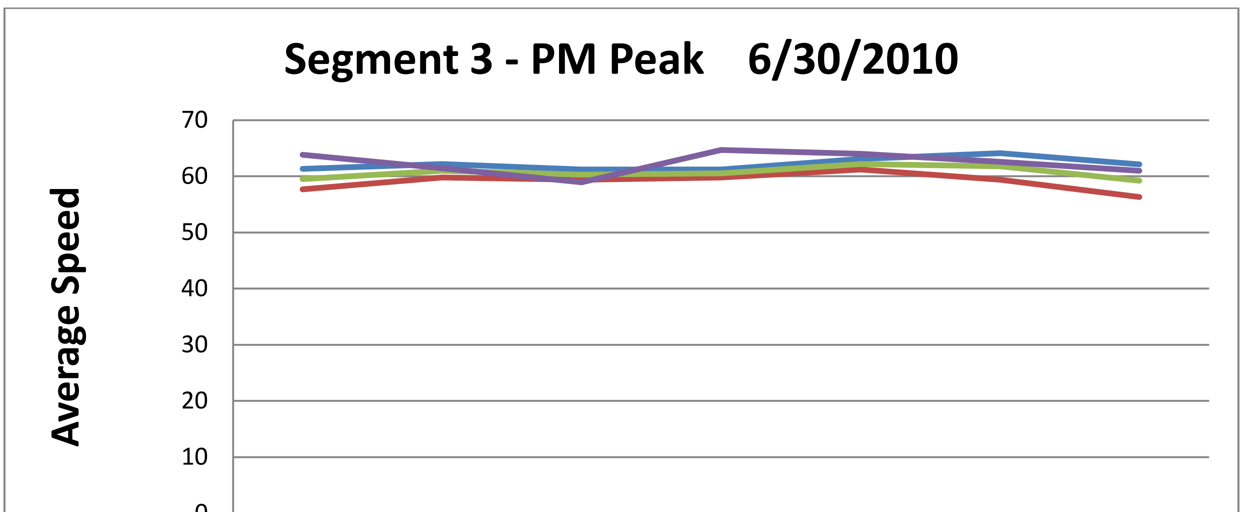
	2:08 PM	2:27 PM	2:44 PM	3:05 PM	3:29 PM	3:43 PM	4:14 PM	4:37 PM	5:04 PM	5:34 PM	5:53 PM
Lane 2	64	63.9	63.4	60.6	62.1	61.7	57.3	48.4	45.6	49.8	55.8
Lane 3	58.5	55.3	55.3	58.7	59.3	59.3	54.4	49.2	45.8	37.7	54.6
Combined	61.3	59.6	59.4	59.7	60.7	60.5	55.9	48.8	45.7	43.8	55.2
GPS Run	62.5	63.6	62.1	62.5	61.6	60.4	36.7	16.7	14.5	10.4	22.2

Figure 2.10. Segment #3 – Average Speed Comparison for 2 - PM Peak Periods



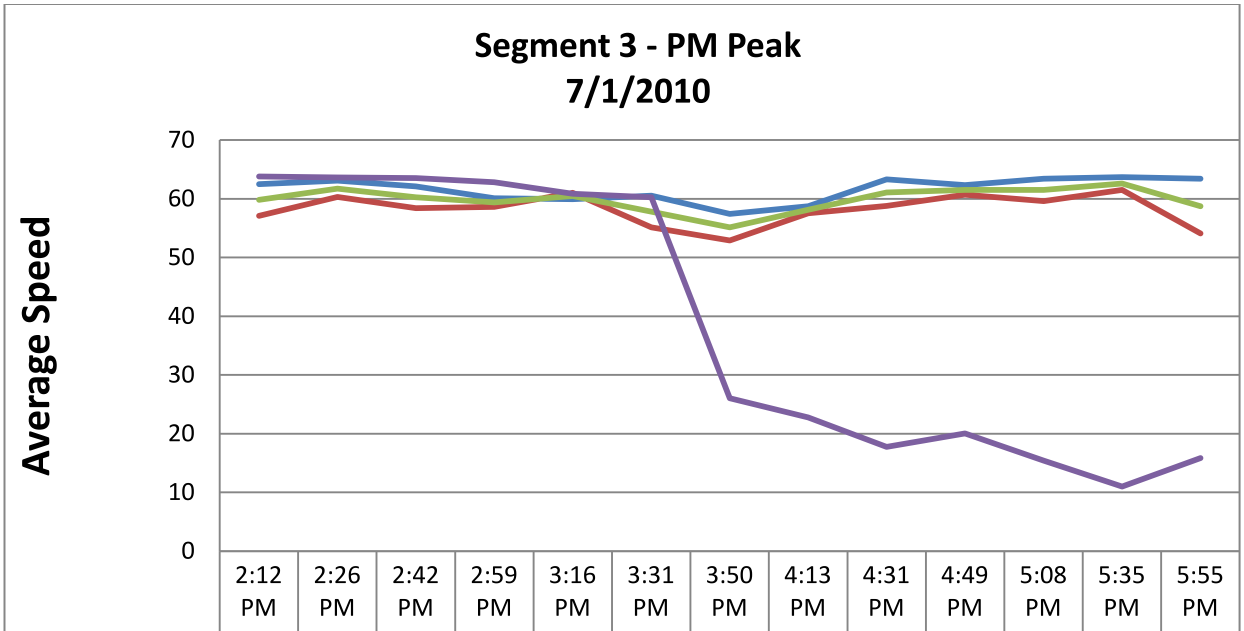
	2:12 PM	2:25 PM	2:40 PM	2:52 PM	3:11 PM	3:25 PM	4:16 PM	4:32 PM	4:48 PM	5:06 PM	5:24 PM	5:44 PM
Lane 2	61.4	62.9	62.3	64.7	62.8	65.7	63.9	63	61.5	53.5	52.6	54.3
Lane 3	60	58.8	56.3	57.5	56.8	61.2	59.1	57	58.1	52.2	46	50
Combined	60.7	60.9	59.3	61.1	59.8	63.5	61.5	60.0	59.8	52.9	49.3	52.2
GPS Run	64.9	63.2	63.0	65.4	60.8	61.9	54.8	59.3	53.0	55.9	29.5	26.0

Figure 2.11. Segment #3 – Average Speed Comparison for 2 - PM Peak Periods



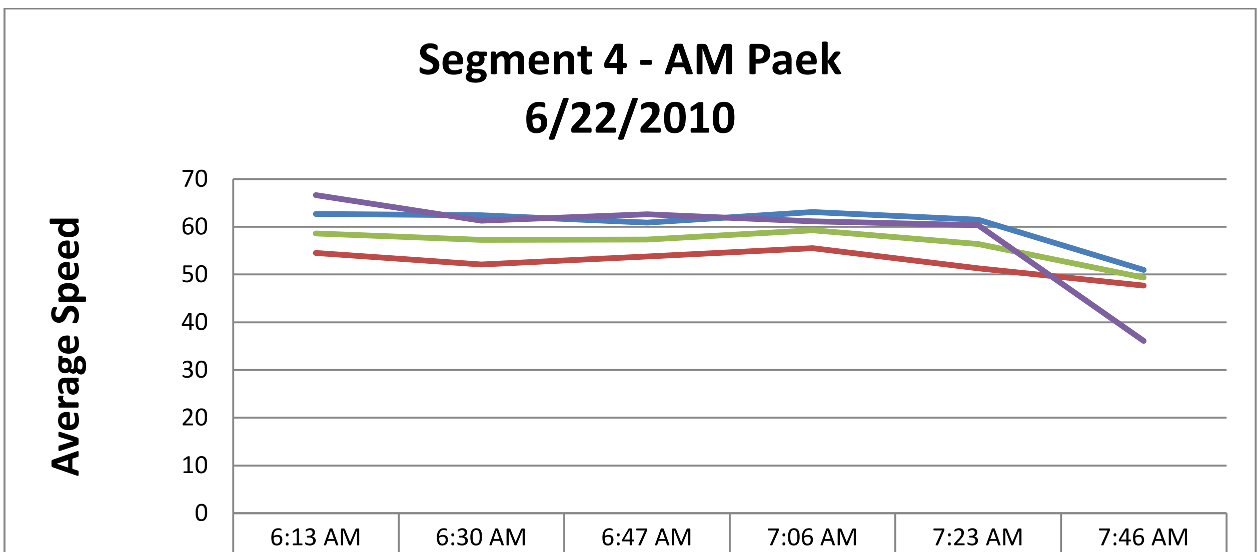
	2:05 PM	2:21 PM	2:37 PM	2:51 PM	3:07 PM	3:21 PM	3:36 PM
Lane 2	61.3	62.2	61.2	61.2	63.1	64.1	62.1
Lane 3	57.7	59.8	59.4	59.8	61.2	59.4	56.3
Combined	59.5	61.0	60.3	60.5	62.2	61.8	59.2
GPS Run	63.8	61.4	58.9	64.7	64.0	62.6	60.9

Figure 2.12. Segment #3 – Average Speed Comparison for a PM Peak Period



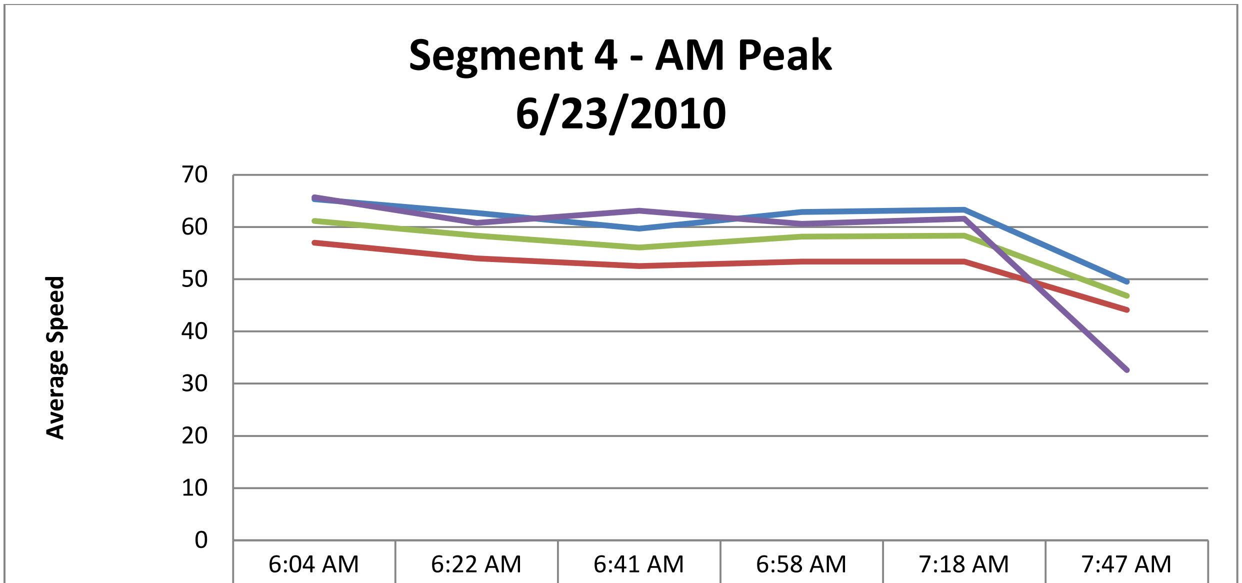
	2:12 PM	2:26 PM	2:42 PM	2:59 PM	3:16 PM	3:31 PM	3:50 PM	4:13 PM	4:31 PM	4:49 PM	5:08 PM	5:35 PM	5:55 PM
Lane 2	62.5	63.1	62.1	60.1	59.9	60.5	57.4	58.7	63.3	62.3	63.4	63.7	63.4
Lane 3	57.1	60.3	58.4	58.6	61	55.1	52.9	57.5	58.8	60.7	59.6	61.5	54.1
Combined	59.8	61.7	60.3	59.4	60.5	57.8	55.2	58.1	61.1	61.5	61.5	62.6	58.8
GPS Run	63.8	63.6	63.5	62.8	60.9	60.2	26.0	22.7	17.7	20.1	15.4	11.0	15.9

Figure 2.13. Segment #3 – Average Speed Comparison for a PM Peak Period



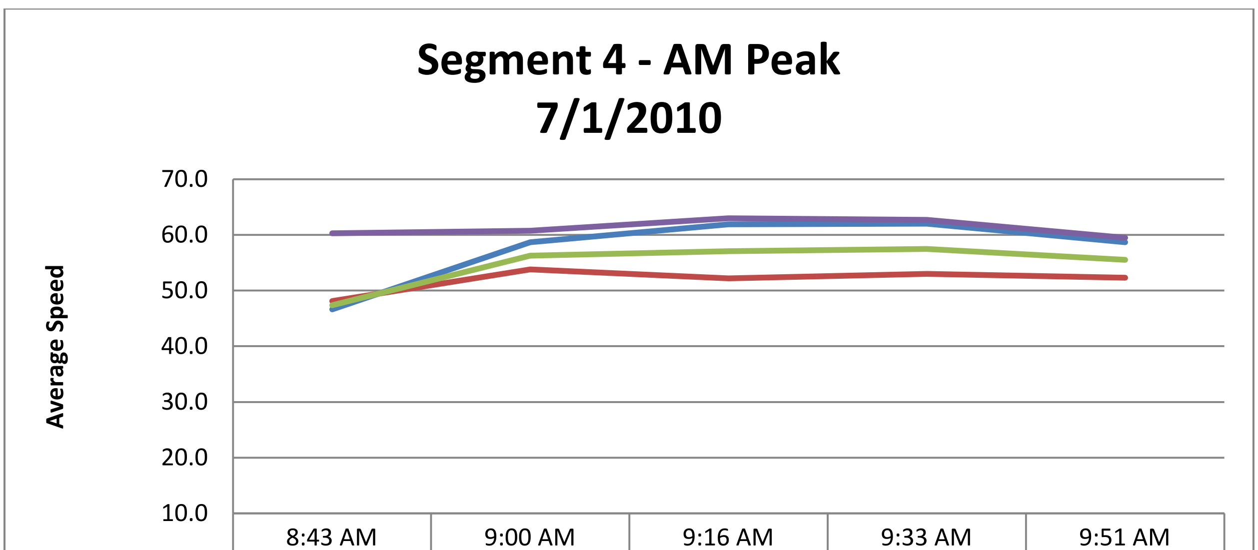
	6:13 AM	6:30 AM	6:47 AM	7:06 AM	7:23 AM	7:46 AM
Lane 2	62.7	62.4	60.9	63.1	61.5	51
Lane 3	54.5	52.1	53.8	55.5	51.3	47.7
Combined	58.6	57.3	57.4	59.3	56.4	49.4
GPS Run	66.6	61.3	62.6	61.1	60.4	36.1

Figure 2.14. Segment #4 – Average Speed Comparison for an AM Peak Period



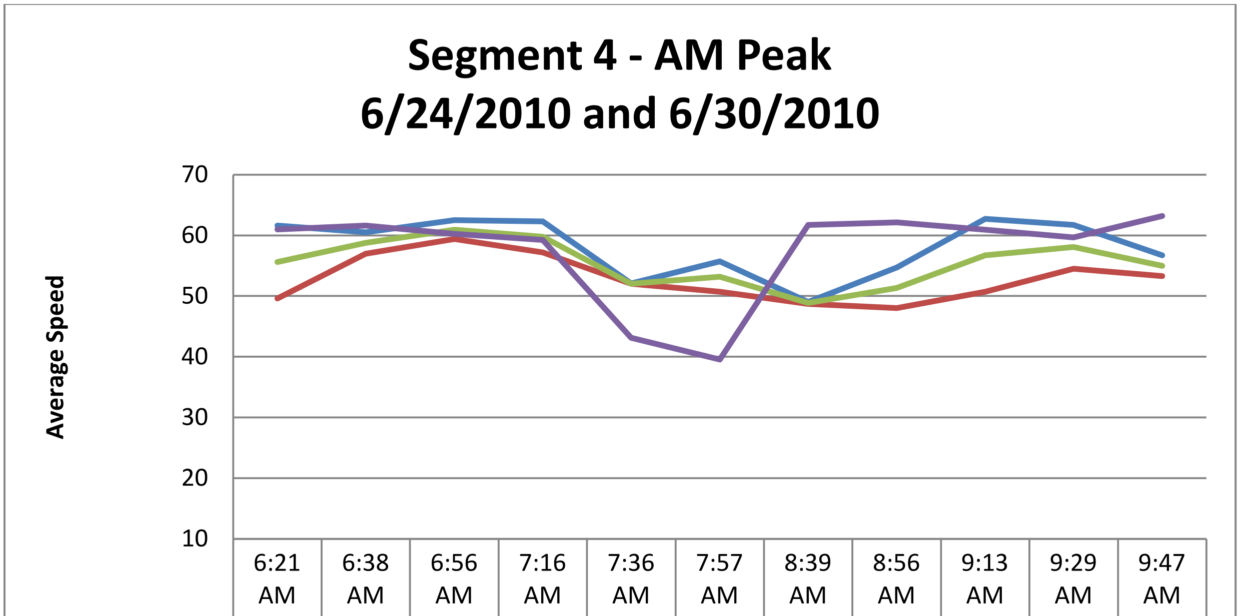
	6:04 AM	6:22 AM	6:41 AM	6:58 AM	7:18 AM	7:47 AM
Lane 2	65.3	62.7	59.7	62.9	63.3	49.5
Lane 3	57	54	52.5	53.4	53.4	44.1
Combined	61.2	58.35	56.1	58.15	58.35	46.8
GPS Run	65.7	60.8	63.1	60.6	61.6	32.6

Figure 2.15. Segment #4 – Average Speed Comparison for an AM Peak Period



	8:43 AM	9:00 AM	9:16 AM	9:33 AM	9:51 AM
Lane 2	46.6	58.7	61.9	62	58.7
Lane 3	48.1	53.8	52.2	53	52.3
Combined	47.35	56.25	57.05	57.5	55.5
GPS Run	60.3	60.7	63.0	62.7	59.5

Figure 2.16. Segment #4 – Average Speed Comparison for 2 - AM Peak Periods



	6:21 AM	6:38 AM	6:56 AM	7:16 AM	7:36 AM	7:57 AM	8:39 AM	8:56 AM	9:13 AM	9:29 AM	9:47 AM
Lane 2	61.6	60.5	62.5	62.3	52.1	55.7	49	54.7	62.7	61.7	56.7
Lane 3	49.6	57	59.4	57.2	52	50.7	48.7	48	50.7	54.5	53.3
Combined	55.6	58.75	60.95	59.75	52.05	53.2	48.85	51.35	56.7	58.1	55
GPS Run	61.0	61.6	60.3	59.2	43.1	39.5	61.7	62.2	60.9	59.7	63.2

Figure 2.17. Segment #4 – Average Speed Comparison for an AM Peak Period

Findings – High-level and Run-level Assessments

1. When average speeds were over 50 mph (free to minor impacted traffic flow), the permanent detectors and the GPS run data were reasonable the same or within one standard deviation.
2. When average speeds were over 50 mph, the variance (one standard deviation) was normally low between 2 to 5 mph meaningconsistent traffic flow.
3. GPS runs normally showed traffic congested earlier and showed a greater average speed reduction than the detector data.
4. Near congested areas, the straight-line determination of average speed across the distance between two detectors (sub-segment sections) may not actually reflect what is truly happening operationally. Traffic backing up from daily or incident related traffic congestion across these sub-segments does produce slower actualy average speeds as shown in run-level assessments (i.e. Figure 2.16 above).
5. Cumlative Average Speed Variance across a designated time period (i.e. 15 minutes) maybe be another good indicator of congestion or restrictive traffic flow and that could be a potential trigger to change (reduction or increase) in the variable speed limit system.

6. Congested areas with the greatest impact on traffic flow were easily identified like in segment #3 – the area near detector number 25 experiences a slowdown with little to no impact on areas near upstream detectors numbers 21 and 22.
7. When average speeds were below 45 mph, travel time differences between detectors and GPS runs showed the greater differences

Discussion of Findings and Recommendations (bold text)

During free or minor impacted traffic flow (greater than 50 mph), there were good consistency in average speed (normally less than one standard deviation) between detectors and the GPS run data. The variance of speed across a time period (one hour) is normally less than 5 mph meaning over 68% of the vehicular traffic is traveling at a very consistent similar speed. Consistent vehicle speeds normally relates to improved traffic flow and safety.

Occunpancy, average speed and 30-second traffic counts now manages the VSL system algorthm. **Cumlative variance assessment and historical traffic data should be considered as a potential enhancement areas to the VSL system algorithm.**

In finding #6, it was mentioned that the identification of congested areas with the greatest impact on traffic flow was easily detected. These areas are normally caused by roadway conditions that range from heavy entering traffic at major interchanges (i.e. I-270 at Route 100 – Manchester Road) or roadway geometrics (i.e. reduction of lanes – I-270 Nothbound north of I-44 or roadway uphill grades) or potential other conditions. **Enhancements in the VSL algorithm could help identify these traffic impacts sooner resulting in a quicker VSL system response.**

Travel time reliability is very important to the transportation users. Information shared through enroute travel applications (DMS, radio, navigational unit, etc.) should reflect as closer to real-time traffic flow conditions as possible. Advance advisory speed information systems that gives a driver meaningful information without the threat of enforcement could motorists of approach ing traffic flow conditions. Advisory speeds are not restricted by “Minimum Speed Limit” regulations and could be more acceptable by both the public and police. **Should the variable speed limit system move towards a system that provides information on average or previlaing speed ahead instead a regulator speed limit?**

- **VSL system algorithm enhancements should consider cumlative variance assessment of recent traffic data collected and historical traffic data for the same time period and day of the week to better determine potential speed limits or advisory speeds.**

- **Develop a method to detect and better predict the average speed between two detectors. This method could create a self-adjusting system that can respond quicker to traffic conditions both recurring and non-recurring.**
- **Evaluate the potential benefits for a regulatory system (speed limit) and non-regulatory system (advisory speed) to determine what might be the most beneficial.**

The following three task accomplishments were mentioned earlier in this section:

- Compared traffic data collected from actual field GPS travel runs (referred to as GPS runs) to detectors
- Assesses differences between GPS runs and detectors and explores potential reasons why
- Identify potential enhancement to improve VSL operations

Traffic data validation between GPS runs and detectors is good at and above average speeds of 50 mph and greater (represents about 80% of the time). Near congested areas, the average speeds of GPS runs are normally lower than detectors. It is normally within one standard deviation below 50 mph; however, the standard deviation does increase two to three times making the variations in average speeds greater and traffic flow less consistent.

Sub-segment operation between two detectors is good when uniform speed exists and the straight-line method of calculating average speed is applicable. However, if traffic congestion is developing upstream and the straight-line method is not applicable, then a more self-adjusting method should be developed to better predict average speeds. Advancements in data collection (probe technologies) might provide some assistance with this issue in the future. There are also benefits in calculating and displaying more accurate travel times on Dynamic Message Signs.

C. LITERATURE REVIEW

1.0 MOBILITY

Variable Speed Limit (VSL) signs are used across I-255/I-270 in St. Louis County to reduce speed limit during peak hours to avoid congestion. The evaluation of this new technology was carried out to analyze the effect on different measures of performance. The literature review presented in the following includes previous research carried out in this field and/or related to one of the tasks used in evaluating the system.

Several studies in Europe indicated that implementation of variable speed limit system is effective and it helps in decreasing vehicle crashes. Speed flow occupancy relationships, capacity estimation and travel time calculations were also carried out to analyze the different aspects of the VSL system. These parameters were the measures of effectiveness for this new technology.

Papageorgiou et al. (2006) examined whether the speed limits modify the shape of the flow–occupancy curve. More than 800 km of VSL-equipped motorway in the United Kingdom were used in the evaluation. The VSL system was found to shift the critical occupancy to higher values in the flow–occupancy curve and when applied at under-critical occupancies, speed limits have the effect of decreasing the slope of the flow–occupancy curve. The difference in flow was found to be very small. Further research and fine tuning of the system was recommended to obtain better results. Steel et al. (2005) carried out evaluation of the VSL system on I-90 in the US across the Snoqualmie Pass operated by the Washington State Department of Transportation. The comparison indicated decrease in the mean operating speed but increase in the deviation. They recommended increase in speed enforcement to minimize the deviation.

Riffkin et al. (2008) evaluated VSL in Utah by analyzing the speed data. The data collected was hourly speed data for the duration of twelve weeks. They compared the daily average speed at different locations. Three months' of daily averaged speed data was compared for day and night conditions. They also tested the hypothesis whether the change in speed was due to randomness or variable speed limit initiation. Similar comparison was also carried out by Mott MacDonald, a consulting firm from the United Kingdom. Data analyzed were for one year before and after the VSL implementation but the results were reported for 6 months. The data were categorized into weekdays and weekends based on traffic flow. Graphical comparison was carried out for speed compliance and capacity analysis. The level of non-compliance was calculated by taking the total number of offences at the Association of Chief Police Officers (ACPO) threshold for each speed limit (70 mph to 40 mph), at all sites, as a percentage of the sum of the total number of vehicles at each site per month. The results obtained were consistent. When considering the ACPO threshold of enforcement (speed limit + 10% + 2 mph), compliance on the main carriageway was on average 94%, or better, at the 70, 60, and 50 mph speed limits and 84%, or better, at the 40 mph speed limit between January 2006 and September 2007. The 80th percentile of the cumulative frequency for the 15 minute maximum flow observed over 24 hours was used as a measure to estimate the change in capacity between the 'Before' and 'After' cases. It was assumed that the top 20% of the observed 15 minute maximum flows represent cases of unsustainable flow or unusual high throughput, due to a temporal change in traffic conditions. Increase in capacity and compliance in speed indicated improvement in the traffic condition.

Bertini et al. (2006) compared the VSL system and traveler information presented to commuters with actual traffic conditions on the highway. Detector data used for comparison were extracted from a segment of German Autobahn near Munich, Germany. Results indicated strong correlation between two data sets. Results indicated that when drivers were warned of downstream congested conditions, the speed limits were reduced before bottleneck activation. The system reduced the speed limit to control the congested but still flowing traffic, and traffic continued to flow during congested periods at low speeds (19 and 25 mph). Comparison of flow and speed data with fundamental diagrams of speed–flow and flow–density indicated that reducing the speed limits upstream reduced congestion downstream.

Demetsky and Mazzenga (2009) studied the effectiveness of active traffic management strategies for reducing recurring congestion on a simulated model of I-95 and I-66 in Northern Virginia to determine which congestion mitigation techniques have the highest likelihood of success at reducing recurring congestion. Study results indicated that VSL system reduced congestion. Further it was observed that VSL and use of hard shoulder work well together and reduced congestion by increasing average speeds, shortening queue lengths, lowering occupancies, improving average fuel economy, and reducing travel delay.

Waller et al. (2009) assessed the feasibility of implementing speed harmonization and peak-period shoulder use in Texas. Evaluation results indicated no change in highway capacity, reduced delay for travelers on the VSL corridor but increased delay for travelers entering or exiting the freeway in the middle of the test section. Further, it decreased the traffic speed of the section and reduced speed variability.

Speed harmonization study was conducted in the state of Washington to address the significant variations in speed due to the combined effects of vehicle mix, inclement weather, and challenging road geometrics (Ulfarsson et al. 2005). Based on environmental data and pavement conditions, speed limits were reduced from 65 mph to as low as 35 mph in 10 mph decrements. Under conditions of high speed and low speed variations, it was found that the mean speed was reduced, while variations were more prevalent. On the other hand, under conditions of low speed and high speed variations, both mean speeds and speed variations were reduced. Hence the experiment showed that speed harmonization gave optimal effects only under certain traffic conditions.

Speed harmonization was implemented on IH-40 (eastbound) in Albuquerque, New Mexico in 1989, with the main goal of minimizing accident risk and informing motorists of downstream hazards. Traffic data were collected from inductive loop detectors placed in each lane perpendicular to the roadside station equipment, at an average spacing of 1.5 miles. Data were collected every 10 seconds and processed to calculate speed, volume, length of vehicle and standard deviation of speeds. A slight reduction in crash rates was reported as a result of data analysis.

Aultman-Hall et al. (2007) studied to identify information technology systems that could improve operations to facilitate the safe and effective movement of traffic through and around work zones and incident areas in Connecticut. It was concluded that reducing the speed near work zone avoids traffic congestion as well as incidents.

Binkowski et al. (1998) evaluated the 70 mph speed limit in Michigan before and after the change from 65 mph to 70 mph. The study was based on the changes in 50th and 85th percentile speeds and its effect on traffic. The 50th percentile speed was the median speed and 85th percentile the most appropriate operating speed. Speed data for 17 days in July were used to represent the before period, and data from the months of August, September and October represented the after period. The results showed very minute changes in the 50th and 85th percentile speeds but major changes in volume before and after the change in speed limit. Using data from two different months may have caused differences in the results. Data from similar conditions should be used for the analysis to get more accurate results.

Zhou and Hall (1999) studied the relationship between speed and flow within congestion i.e., the lower portion of the speed flow curve to determine the speed flow relationship. Data for the analysis were obtained from the Gardiner Expressway RESCU System and Highway 401 COMPASS System. Three steps were used for the analysis to process the raw twenty second data to the five minute average data. The initial step was to identify and remove the bad data. Secondly, it was used to confirm that using five minutes of average data did not lead to huge variations in the operations. The congested data was then separated out. Regression analysis was used to study the relationship between speed and flow. Certain days of the month were selected for the analysis as it contained widest range of data like February 6th. Regression analysis used four types of functions, quadratic, cubic, exponential, and power. They concluded from the analysis the importance of utilizing data from a full range of flows in order to fit a curve to represent congestion. Different curves exist for different freeways and the speed-flow relationship varies. Finally, care should be taken in selecting the sites and conditions before combining the data.

Van Nes et al. (2008) studied the effect of variable speed limit systems on homogeneity of driving speed. A total of 46 subjects drove twice 12 road sections in a driving simulator using different conditions and speed limits. Results indicated that the homogeneity was higher with variable speed limit systems than with the regular static speed limit system.

Agent et al. (1998) evaluated the speed limits in Kentucky. Two types of speed data were collected: a) radar data along the sections of highways using the moving mode of operation, and b) data collected at specific locations before and after changes in the speed limit. Data collected were used for the calculation of average change in number of accidents and percent of drivers driving over the speed limit. The data collected from the moving radar mode showed that travel speeds for most types of highways were substantially above the posted speed limit indicating driver non-compliance. In addition, it was observed that the speeds of cars are slightly above than that of trucks. Data taken before and after the speed limit changes indicated that the operating speeds were changed much less than the change in speed limit which supports the theory that motorist drive at the speed they consider appropriate for the roadway geometry and environment, regardless of the speed limit. Crash data collected did not show a large difference in the crash frequency due to change in speed limit. However, the percentage increase was higher as a result of the increase in one location due to large speed difference before and after entering that roadway segment.

Minderhoud et al. (1996) estimated roadway capacity by four different methods. They collected the volume, headway, speed, density and occupancy at a highway segment. To obtain maximum flow the measurement point was located downstream of a bottleneck. The data obtained for analysis was 15 min interval data. Capacity estimation with headway or volume was preferred in the analysis. They also carried out capacity estimation with other parameters, such as speed and density. The headway estimations were based on the theory that driver-vehicle elements in any traffic stream can be divided into two groups: the constrained drivers (followers) and the free drivers (leaders). The distribution of tracking headways of constrained drivers at the capacity level of the road was expected to be the same as for un-constrained drivers in any stable (stationary) traffic stream. Therefore, the capacity at a roadway cross section could be estimated as the reciprocal of the mean time headway of constrained vehicles. However, later it was found that headway models substantially overestimated observed road capacity. Capacity estimated with traffic volume was distribution based. Bimodal distribution estimated the capacity based on the assumption that the highway attains maximum capacity at some point of time. Therefore, it was difficult to estimate capacity for below-capacity probability density function. Estimation with traffic volume and speed was based on the product limit method. This is based on the assumption that if traffic breakdown is regarded as a failure event, the methods for lifetime data analysis can be used to estimate the capacity, which is the analog of the lifetime (T). However, the usefulness of the method is dubious because there is no information about the quality (reliability, precision) of the estimated capacity value. Estimation with traffic volume, speeds and density was based on the fundamental traffic flow concept. Different models were used to fit the data; hence choice of curve is critical. The capacity value was determined from the fundamental diagram. A major disadvantage of the method is the requirement of a mathematical model that fits the observed data pairs. Moreover, the parameters of the chosen model should be obtained for each location anew, because prevailing conditions differ. Furthermore, it is necessary to collect sufficient data over a broad range of intensities to make a reliable curve fitting possible.

Ozbay et al. (2007) estimated parameters of the various probability distribution functions that are likely to represent the probabilistic nature of freeway traffic capacity. Two freeway sites used in this study were sections of I-880 in California, and Gardiner Expressway in Toronto/Canada. The data for these sites included five and seventeen days of observations for I-880 and Gardiner Expressway, respectively. Weibull distribution was chosen as a reasonable model that represents the probability distribution of traffic capacity and Bayesian techniques were applied to verify this assumption. The steepness of the curve was directly related to the quality and quantity of the data which changes in the scale and shape parameters of the distributions. Since the flow data included right-censored observations, it was impossible to obtain the actual breakdown probability distribution of the capacity. Thus, confidence intervals obtained via Bayesian analysis indicated that a 2-parameter Weibull distribution obtained with MLE (maximum likelihood estimation) can be used effectively for the estimation of the capacity function.

In the study by Garber et al. (2002), capacity was estimated using the relationship between flow and occupancy. The study in Polus and Pollatschek (2002) used the relationship between flow and speed to estimate capacity. In both studies, only one relationship (either between flow and occupancy or between flow and speed) was used. In addition, the relationship representing the congested and non-congested conditions was estimated separately. Capacity was determined as the intersecting point of the functions representing the two conditions. In addition to capacity estimate, Polus and Pollatschek explored the stochastic nature of capacity. They assumed that the two curves representing the congested and un-congested traffic conditions could be linear or polynomial. Because these two curves are estimated based on measured speed and flow data and their parameters follow certain probability distributions, the intersecting point would follow a corresponding probability distribution. Using the Monte Carlo simulation method, the distribution of the intersecting point was determined and the other properties of the intersecting point were derived correspondingly.

Lorenz and Elefteriadou (2001) proposed a direct approach to define freeway capacity as a function of breakdown probability. Rather than looking at the traffic data collected in the field only, their study observed actual breakdowns in a freeway system. With these breakdowns analyzed, they derived the distribution of traffic flows at which the freeway system broke down and the probability when the system will break down. Related to capacity estimation, there are many issues. One issue is about the form of the functions to represent the relationship between traffic variables. Jun et al. (2009) estimated the highway capacity using simultaneous spline regression model. The data were 30-second data for speed, flow and occupancy at a selected detector location. Results obtained were more reliable than the capacity estimated when only one of the speed-flow or occupancy-flow relationships were used. This model was flexible in accommodating different functions. The model also provided a unique solution from two different flow curves. In most of the cases, only one relationship, either between speed and flow or between occupancy and flow, was used. In this study, the spline regression model was proposed in which the intersecting point and the parameters of the functions representing the uncongested and congested conditions can be estimated at the same time.

For estimating travel time, extrapolation is considered to be the simplest and widely accepted method. This is based on the assumption that the speeds between any two detectors are constant. This is not the case in congested conditions, however and the accuracy drops considerably. A number of studies, Ferrier (1999); Quiroga (2000); Lindveld et al. (2000); Li et al. (2006) have reported that the performance of extrapolation methods drop with increasing flow and congested conditions. Hence, it does not capture congestion between the detectors. Several other methods based on statistical models and traffic flow theory models have been proposed to overcome this problem. Models developed by Nam and Drew (1996) and Oh et al. (2003) are applicable for normal free flow conditions, while some other models Nam and Drew (1998) are applicable for congested traffic flow conditions only. Petty et al.

(1998) contends that their arrival distribution based method works for both uncongested and congested conditions, but they acknowledge that their model assumptions break down during traffic flow state transitions.

Vanajakshi et al. (2009) developed a model that can be used for both uncongested and congested traffic flow conditions as well as during transition into and out of congestion. They collected data on I-35 in San Antonio. The travel time was calculated as the area between the cumulative volume curves from loop detectors at either end of the link. AVI (Audio Video Interleave**)** data from the same location were used for validating the results. Simulated data from CORSIM were also used for validation of the results. The results indicate that the proposed model is a promising tool for continuous estimation of travel time from loop detector data under the full spectrum of traffic flow conditions.

2.0 SAFETY

Theoretical Background

The crash and crash rate analysis provides an intuitive assessment of the effect of any treatment VSL on the safety. However, it does not offer any type of statistical information on the estimated values. Considering uncertainly (or randomness) involved in the crash data, this is a vital limitation of the same type of analysis. In this section, we review two types of observational before-after analysis methods and variations that provide statistical inference information required and thus are accepted by practitioners and researchers. The two methods are: 1) Conventional and 2) Empirical Bayesian methods.

Estimations involved in traffic safety analysis: Hauer neatly summarizes that any type of observational before-and-after road safety[1] study involves estimation of following statistics together with its precision (i.e., variance): 1) the expected number of after-period crashes on the treated roadway if the treatment had not implemented (=π), 2) the expected number of after-period crashes on the treated roadway (=λ), 3) the difference ($\delta = \pi - \lambda$) and/or the ratio ($\theta = \lambda / \pi$) of the two expected number of crashes (i.e., π and λ).

Let's denote the estimates of the statistics using '^'. For example, $\hat{\pi}$ denotes the estimate of what the expected number of after-period crashes would have been if the treatment had not been implemented. In statistics, the terminology of 'expected' implies 'normal', 'usual' and 'average' of the data (i.e., crash counts in our case). In general, the true expected number of crashes (i.e., π) is unknown[2] and thus an estimate of the expected number of crashes (= $\hat{\pi}$) is obtained from the crash count data collected from sampled roadways. Here, the variance of the estimate (= var($\hat{\pi}$)) is defined as the difference between the unknown true expected crashes (= π) and the estimate of the crashes (=$\hat{\pi}$), i.e., var($\hat{\pi}$) =π- $\hat{\pi}$. Since π is unknown, the var($\hat{\pi}$) is also an unknown parameter to be estimated. An 'estimate of the variance' (=

[1] For the sake of explanation, let us define the traffic safety as the number of crashes.

[2] Being treated as a random variable, the true expected number of crashes assumed to follow a certain probability density function (pdf). For example, Poisson and Negative Binomial models are pdf's that are widely adopted in describing the distribution of the true expected number of crashes.

$\widehat{\mathrm{var}}(\hat{\pi})$) is also obtained from the count data[3]. It is obvious that the better data and the better method is used in estimating $\hat{\pi}$, the lesser the variance of the estimate will be. This is why the quality of crash count data and the appropriateness of the estimation method are critical in correct and accurate assessment of the roadway safety. In essence, the ultimate goal of an observational safety study is to find unbiased estimates of π and λ (i.e. unbiased $\hat{\pi}$ and $\hat{\lambda}$), and unbiased estimates of δ and θ (i.e., unbiased $\hat{\delta}$ and $\hat{\theta}$) together with their estimates of precisions (i.e., $\widehat{\mathrm{var}}(\hat{\pi})$, $\widehat{\mathrm{var}}(\hat{\lambda})$, $\widehat{\mathrm{var}}(\hat{\delta})$ and $\widehat{\mathrm{var}}(\hat{\theta})$).

In this section, we will briefly review the conventional estimation methods and address practical issues involved in the methods. Then, we present so-called 'Empirical Bayesian (EB)' method which is suggested as a better method to overcome the limitations of the conventional methods.

<u>Conventional prediction methods</u>: There are four practical way for predicting[4] what the safety would have been if no treatment had been applied. The methods are: 1) just using the previous year's crashes, 2) using the average of previous three years' crashes, 3) using a trend line fitted using the least square method, and 4) using change rates of crashes in nearby roadways where the treatment was not implemented.

Here, the first two methods are (perfectly conditioned) laboratory minded predictions in that it assumes there has been little change in factors influencing the safety. The third method is an extrapolation of the time series data believing that the time trend reflects the complex dynamic interaction among influencing factors. In this method, any change in safety is attributed to only the passage of time. The last method is a variation of the experimental design method where the prediction is based on data collected from the treatment and comparison (i.e., untreated) groups that are randomly selected. In literature, the approaches that do not use any other comparison group in the analysis are called as *Naïve* method**,** whereas the approach that use information of untreated roadway is called as the *comparison-group* (*C-G*) method.

Following the notation by Hauer, let K(1), K(2), …, K(n) be the before-period crash counts, and L(1), L(2), …, L(n) be the after-period crash counts in entities numbered 1,2, …, n. Suppose that the expected total number of after-period crashes without the treatment is predicted by the total before-period crash counts, i.e., $\hat{\pi} = \Sigma_j K(j)$. It is customary to use the after-period crash counts as an estimate of the expected number of the after-period crashes on the treated roadway, i.e., $\hat{\lambda} = \Sigma_j L(j)$. In practice, it is frequently

[3] More precisely speaking, the 'estimate of the variance' (= $\widehat{\mathrm{var}}(\hat{\pi})$) is obtained from the crash count data and the assumed distribution model of the number of crash counts as well. For example, if the crash count data is assumed to follow Poisson distribution, the estimate of the variance (= $\widehat{\mathrm{var}}(\hat{\pi})$) is same as the estimate of the expected number of the crashes (= $\hat{\pi}$).

[4] Some literature differentiate 'prediction' from 'estimation'. 'Prediction' is used to denote obtaining the expected number of after-period crashes on the treated roadway if the treatment had not implemented (=π) whereas 'estimation' is used to denote the expected number of after-period crashes on the treated roadway (=λ).

assumed that the number of crashes (=x) is Poisson[5] distributed with a certain mean crash rate. Being a one-parameter distribution, a Poisson distribution has its mean being same as its variance[6]. In other words, for a Poisson distribution with a given parameter λ, mean(X) = var(X) = λ. Using the assumed distribution and the estimated expected number of count data, the following estimates can be derived.

$$\hat{\pi} = \Sigma_j K(j),\ \widehat{\mathrm{var}}(\hat{\pi}) = \Sigma_j K(j) \tag{1}$$

$$\hat{\lambda} = \Sigma_j L(j),\ \widehat{\mathrm{var}}(\hat{\lambda}) = \Sigma_j L(j),$$

$$\delta = \pi - \lambda,\ \mathrm{var}(\hat{\delta}) = \mathrm{var}(\hat{\pi}) - \mathrm{var}(\hat{\lambda}),$$

$$\theta = (\lambda/\pi)/[1+ \mathrm{var}(\hat{\pi})/\pi^2], \text{ and } \widehat{\mathrm{var}}(\hat{\theta}) = \theta^2[(\mathrm{var}(\hat{\lambda})/\lambda^2) + (\mathrm{var}(\hat{\pi})/\pi^2)] / [1+ \mathrm{var}(\hat{\pi})/\pi^2]^2$$

(Here, $\hat{\delta}$, $\hat{\theta}$, $\widehat{\mathrm{var}}(\hat{\delta})$ and $\widehat{\mathrm{var}}(\hat{\theta})$ can be obtained using $\hat{\pi}$, $\hat{\lambda}$, $\widehat{\mathrm{var}}(\hat{\pi})$, and $\widehat{\mathrm{var}}(\hat{\lambda})$.)

Limitations of Naïve methods: Among other limitations, it is hard to believe that all influencing factors remain constant during the before and the after periods (as assumed in the 1st and 2nd methods). Also, it is less convincing to argue that the historical crash trend can be addressed only by the time ignoring other influencing variables such as traffic volumes, weather condition, etc. (as assumed in the 3rd method).

Researches demonstrate that there are several types of factors that influence the traffic safety. The first type of factors includes those that change autonomously over time such as traffic, weather, driver behavior, vehicle fleet, etc. Obviously, the changes in safety from before to after period reflect the effects of these factors in addition to the effect due to the treatment. Secondly, besides the treatment of interest, other treatments may have been implemented during the before and after period. Another type of influencing factors includes those that are un-recognizable, unmeasured and not well understood. Ignoring these influencing factors make the Naïve method questionable. However, the Naïve method is still frequently employed in practice and literature mainly because the method is a natural starting point and offers a useful upper bound of the prediction of what the safety would have been if no treatment had been applied.

Improving Naive method: In efforts to overcome the limitations of conventional methods, researches suggested a couple of ways to account for the influencing factors within the conventional method framework. First, certain influencing factors that are recognized, measured and well understood can be

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[5] The probability to observe x crashes during a given time interval is given by $P(X=x) = e^{-\lambda} \cdot \lambda^x/x!$. Here, the random variable X is the number of crashes occurring during the time interval, and the parameter λ is the average number of crashes that occur during the time interval.

[6] Because of this customary practice, Poisson regression model is commonly adopted to model crash data. However, crash data often exhibit over-dispersion where a variance is larger than the mean. The over-dispersed count data can be better modeled by the Negative Binomial (NB) model where the mean of the Poisson distribution is treated as a random variable following the Gamma distribution. Being a convoluted distribution of Poisson and Gamma distributions, the NB distribution has two parameters which obviously enable the model to handle the over-dispersed count data more accurately.

explicitly considered by adopting a safety performance function (SPF). An example of SPF being as a function of the traffic flow[7] (e.g., AADT) is given by:

$$\text{Number of crashes} = \alpha(\text{traffic flow})^{\beta} \tag{2}$$

where: α and β are parameters to be estimated.

Let K and TF_b be the crash count and the traffic flow during the before-period, and L and TF_a be the crash count and the traffic flow during the after-period. Then, the following estimates are derived using the safety performance function:

$$\hat{\pi} = \widehat{r_{tf}}\mathrm{K},\ \widehat{\mathrm{var}}(\hat{\pi}) = \widehat{r_{tf}}^{\,2}\mathrm{K} + \mathrm{K}^2\widehat{\mathrm{var}}(\widehat{r_{tf}}), \tag{3}$$
$$\hat{\lambda} = \mathrm{L},\ \widehat{\mathrm{var}}(\hat{\lambda}) = \mathrm{L},$$
$$\delta = \pi - \lambda,\ \mathrm{var}(\hat{\delta}) = \mathrm{var}(\hat{\pi}) - \mathrm{var}(\hat{\lambda}), \text{ and}$$
$$\theta = (\lambda/\pi)/[1+ \mathrm{var}(\hat{\pi})/\pi^2],\ \widehat{\mathrm{var}}(\hat{\theta}) = \theta^2[\,(\mathrm{var}(\hat{\lambda})/\lambda^2) + (\mathrm{var}(\hat{\pi})/\pi^2)]\,/\,[1+ \mathrm{var}(\hat{\pi})/\pi^2]^2.$$

Here, $\widehat{r_{tf}} = \widehat{\mathrm{TF}_\mathrm{a}}/\widehat{\mathrm{TF}_\mathrm{b}}$ and $\widehat{\mathrm{var}}(\widehat{r_{tf}}) = r_{tf}^2(\mathrm{v}^2(\widehat{\mathrm{TF}_\mathrm{a}}) + \mathrm{v}^2(\widehat{\mathrm{TF}_\mathrm{b}}))$. v is the coefficient of variations which is decided by an empirical equation given by $v = 1+7.7/(\text{number of count days}) + 1650/\mathrm{AADT}^{0.82}$. Then, remaining estimates $\hat{\theta}$, $\widehat{\mathrm{var}}(\hat{\delta})$ and $\widehat{\mathrm{var}}(\hat{\theta})$ are obtained using $\hat{\pi}$, $\hat{\lambda}$, $\widehat{\mathrm{var}}(\hat{\pi})$, and $\widehat{\mathrm{var}}(\hat{\lambda})$.

Another approach to improve the Naïve method is so-called comparison-group (C-G) method. Originally, the C-G method is devised to account for those factors (referred as 'sundry' factors) that are unrecognized, unmeasured and ill-understood. Unlike the aforementioned Naïve method improved with SPF function, the C-G method uses crash counts on other roadways that are similar to the treated roadways but remained untreated. (The untreated roadways are called as the comparison group.) The main premise underlying C-G method is that the 'sundry' factors have changed from the before- to after-period in the same manner on both the treated and the untreated roadways. Then, the expected number of after-period crashes can be predicted as

$$\hat{\pi} = r_c\,\mathrm{K}, \tag{4}$$

where, r_c is the ratio of the expected number of after- to the expected number of before-period crashes on the comparison group.

In essence, C-G method assumes that if the treated roadways had remained untreated, the ratio of expected number of after- and before-period crashes on the tread roadway would be r_c which is same as the ratio obtained from the untreated roadways. It should be noted that the Naïve approach, even the improved Naïve approach that accounts for the traffic flow, cannot distinguish the impact of treatment

[7] There is a belief that the change in traffic flow is automatically accounted for by the crash rate (discussed in the previous chapter). However, this belief is correct only when the expected crashes are (linearly) proportional to the traffic flow, which is not always true in many practices.

on the safety from the impact of other factors. On the other hand, C-G method can separate the effect of treatment for all other factors at the expense of the statistical precision (i.e., increase of the variance).

<u>Critics on conventional methods</u>: In spite of the efforts for improving the conventional estimation methods, critics are raised by researchers on the methods. Among others, the most important critic is that before-period traffic counts, K, may not a sensible estimate of the expected value of after-period crashes. This issue always exists when the before-period crashes is the main reason why the treated roadways are selected to be taken care of. For instance, the intersections to be treated with a certain safety device (e.g. four-way stop sign) are usually selected based on the historical crash record. In case of C-G method, comparison (i.e., untreated) groups are selected after the treated group was selected based on the certain crash record. In many cases, the comparison group is allocated even after the treatment is implemented. Selecting the treated group not randomly but based on safety performance violates the main underlying assumption of the experiment design method which is applied in the C-G method. The non-randomly selected roadways create the famous 'regression-to-mean' bias which results in exaggeration of the effect of the treatment. Another critic is on data collected for few years (e.g., 3 or 4 years) of before-period. It is criticized that relatively short period of before-period crash counts is not long enough to show any certain time-trend.

<u>Empirical Bayesian Approach</u>: Empirical Bayesian (EB) approach is proposed to address the practical issues stemmed from the regression-to-mean bias and using relatively short before-period of crash counts as well. In essence, EB approach predicts the expected number of after-period crashes (=k) on the roadway without the treatment by weighted average of two different crash counts: 1) average crash counts (=E(k)) of so-called reference population which consists of roadways sharing similar traits of the roadway of interest, and 2) crash counts of the roadway of interest (=K). Here, the traits of road way can be roadway type, traffic, geometry, etc. The weight is function of variance (=var(k)) of crash counts of reference population.

Hauer [2002] explains the rationale of EB method using a simple but intuitive example: "Consider Mr. Smith, a novice driver in Ontario who had no accidents during his first year of driving. Let it also be known that the average novice driver in Ontario has 0.08 accidents/year. It would be silly that Mr. Smith is *expected* zero accident counts/year based on his record only. It would also be peculiar to estimate his accident to be 0.08 accident/year by disregarding his accident record. A sensible estimate must be a mixture of the two clues. Similarly, to estimate the crashes of a specific roadway, one should use not only the crash counts of the roadway of interest, but also the knowledge of the typical crash frequency of such roadways in the same jurisdiction." Being accepted as a method increasing the estimation precision and correcting the regress-to-mean bias, EB method is applied in the Interactive Highway Safety Design Model (IHSDM) and Comprehensive Highway Safety Improvement Model (CHSIM).

Following equations are estimate of k and its variance derived applying the Bayesian theorem:

$$\hat{k} = E(k|K) = \alpha E(k) + (1-\alpha)K, \text{ where, } \alpha = 1/(1+var(k)/E(k)). \quad (5)$$

$\text{Var}(\hat{k}) = \text{Var}(k/K) = (1-\alpha)E(k|K)$.

It should be noted that the weight factor (=α) decreases as the var(k) increases. This means that if the precision of the reference group crash data decreases, the estimate of the expected number of after-period crashes (=k) relies more on the crash counts of the roadway of interest (=K). Estimates of parameters, $\hat{\pi}$, $\hat{\lambda}, \hat{\delta}$ and $\hat{\theta}$, and their variances can be obtained using the exactly same equation set (1) with replacing K with $\hat{k}$ in equation (4).

3.0 STAKEHOLDER PERCEPTIONS: PLANNING AND CHANGE RESISTANCE

Publicly funded transportation management systems such as VSL are heavily dependent on stakeholder acceptance for full success. These systems are forms of sociotechnical systems and can be analyzed using system heuristics and guidelines normally used for projects requiring significant stakeholder participation and "buy-in". Sociotechnical systems are defined as "technical works involving significant social participation, interests, and concerns." (Maier and Rechtin, 2002) Stakeholders function as consumers in this case assigning value to the VSL initiative similar to that found with the introduction of new products. Value is often based more in perception than fact and can negatively bias implementation results (Kleijnen, 2009; Maier and Rechtin, 2002).

This simplistic version of change does not describe the level of resistance that many individuals experience with change to familiar products and experiences, especially those including the introduction of innovative technologies (Kleijnen, 2009; Robbins and Coulter, 2005; Woodward and Hendry, 2004). Resistance can stem from many sources including a disparity in what constitutes sufficient awareness of the benefits of the proposed change. Individuals are far more resistant to change when it involves loss of control over long-standing patterns of behavior. The form of the resistance varies according to the systemic culture and can include the passive form: "if you wait it out, it will eventually go away" (Clegg and Walsh, 2004; Woodward and Hendry, 2004).

A comprehensive analysis of change resistance may prove useful in identifying potential areas of disconnect. Such approaches use lessons learned from new product development marketing theory and outline a series of steps that often increase the chances of achieving successful change. Change models of this type give keen insight into motivations for change. Is it driven by internal or external factors? What are the goals for change and the best methodology for achieving the change? Stakeholders frequently demonstrate resistance to change owing to feelings of uncertainty, threatened self-interests, different perspectives, or feelings of loss. These intangibles can be offset by increased stakeholder participation levels in the planning and implementation phases (Long and Spurlock, 2008; Sales, 1973). The literature suggests that trust is one of the most critical factors in assuring acceptance of change (Sayles, 1973; Lines, et al, 2005).

Resistance to technological innovation can be mapped to three main consumer reaction types: rejection, postponement and opposition. Briefly, rejection details active resistance driven by consumer attitudes that an innovation will not work. Postponement refers to consumer lags in acceptance based on their desire for an innovation to be more fully tested. Opposition, the strongest form of resistance is typically rooted in objections based on principles or values (Kleijnen, 2009). Linkages of these patterns to the VSL implementation in St. Louis were explored in the analysis of stakeholder data.

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E. DATA COLLECTED: PUBLIC AND LAW ENFORCEMENT OPINIONS

PUBLIC OPINION ONLINE RESPONSES, YEARS ONE AND TWO:

Key:

Online survey repetition of survey, Awareness of the change in Speed Limit along I-270

Scale	Meaning
1	No
2	Yes

Questions 1-17

Abbreviation	Expansion of abbreviation
QVSL_A_1	Reduced travel time in the evening
QVSL_A_2	Reduced travel time in the morning
QVSL_A_3	Clearly visible at night
QVSL_A_4	Clearly visible in the evening
QVSL_A_5	Clearly visible in the day
QVSL_A_6	Increase speed limit 70 mph during NPH (non peak hours)
QVSL_A_7	Well implemented
QVSL_A_8	Should be expanded
QVSL_A_9	Should be eliminated
QVSL_A_10	Well explained to public
QVSL_A_11	Increased public safety
QVSL_A_12	Increased driver compliance with law
QVSL_A_13	Reduced the stop and go traffic
QVSL_A_14	Uniform traveling speed
QVSL_A_15	Reduced severity of crashes
QVSL_A_16	Reduced number of crashes
QVSL_A_17	Relieved congestion

Scale	Meaning
1	Strongly agree
2	Slightly agree
3	Slightly disagree
4	Strongly disagree
5	Too soon to tell

Gender

Scale	Meaning
1	Male
2	Female

Age

Scale	Meaning
1	Under 16
2	16-25
3	26- 40
4	41-65
5	over 65

Income

Scale	Meaning
1	< $20K
2	$20K - $40K
3	$40K - $60K
4	$60K - $90K
5	$90K - $120K
6	$120K - $150K
7	$150K - $200
8	> $200K
9	Don’t Know

Ethnic Response

Scale	Meaning
1	American Indian
2	Asian
3	Black or African-American
4	Hispanic or Latino
5	White or Caucasian
6	Other

Dataset on repetition of survey, awareness of the change in Speed Limit along I-270, questions 1-

S.No	PdcAppVer	PdcProjectID	QRepeat	QAware	QVSL_A_1	QVSL_A_2	QVSL_A_3	QVSL_A_4	QVSL_A_5	QVSL_A_6	QVSL_A_7	QVSL_A_8	QVSL_A_9	QVSL_A_10	QVSL_A_11	QVSL_A_12	QVSL_A_13	QVSL_A_14	QVSL_A_15	QVSL_A_16	QVSL_A_17
1	7.0.044	VSLDRAFT	1	2	3	3	3	3	3	3	3	4	2	3	3	2	3	3	3	3	3
2	7.0.044	VSLDRAFT	1	2	5	5	5	5	5	5	5	5	5	5	3	2	2	1	1	5	5
3	7.0.044	VSLDRAFT	1	2	2	5	5	3	3	3	5	2	3	5	2	4	1	1	1	5	5
4	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	3	3	2	2	2	2	2	4	4
5	7.0.044	VSLDRAFT	1	2	3	3	2	3	3	3	3	1	3	5	5	1	2	2	2	3	3
6	7.0.044	VSLDRAFT	1	2	3	5	5	2	3	4	2	2	5	3	2	1		1	1	2	2
7	7.0.044	VSLDRAFT	1	2	2	5	5	2	2	3	5	2	5	3	3	2	2	2	2	5	5
8	7.0.044	VSLDRAFT	1	2	2	3	2	4	4	4	5	2	2	4	4	2	1	1	1	3	4
9	7.0.044	VSLDRAFT	1	1	5	3	3	5	3	4	2	3	3	5	3	1	1	1	2	5	5
10	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	1	1		4	4	1	1	1	4	4
11	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4		1	3	1	1	4	4
12	7.0.044	VSLDRAFT	1	2	5	5	5	5	5	5	5	1	3	2	2	1	1	1	1	5	5
13	7.0.044	VSLDRAFT	1	2	4	3	2	4	4	4	3	4	1	4	4	3	3	2	2	4	4
14	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	1	1	1	4	4
15	7.0.044	VSLDRAFT	1	2	2	2	2	3	3	3	3	2	3	5	5	5	2	2	2	3	3
16	7.0.044	VSLDRAFT	1	2	3	5	5		3	5	3	2	5	3	3	1	2	2	2	3	3
17	7.0.044	VSLDRAFT	1	2	5	5	5	5	5	5	5	2	4	5	2	2	1		1	5	5
18	7.0.044	VSLDRAFT	1	2	3	3	3	3	4	3	3	2	5	5	5	2	2	2	1	3	3
19	7.0.044	VSLDRAFT	1	2	4	3	2	4	3	4	3	4	1	4	2	1	2	2	2	4	4
20	7.0.044	VSLDRAFT	1	2	5	5	5	5		3	5	3	5	5		3	3	3	3	5	5
21	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	1	4	3	1	4	4	4	4	4
22	7.0.044	VSLDRAFT	1	2	4	5	5	5	4	5	5	2	5	5	2	1	2	2	2	4	4
23	7.0.044	VSLDRAFT	1	2	5	5	5	5	5	4	5	1	4	2	1	4	1	1	1	3	3
24	7.0.044	VSLDRAFT	1	2	3	3	3	4	4	4	3	2	3	3	3	3	2	2	2	2	3
25	7.0.044	VSLDRAFT	1	2	5	5	5	5	5	3	2	2	4	1	1	1	1	1	1	2	2
26	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	1	1	1	4	4
27	7.0.044	VSLDRAFT	1	2	2	2	2	2	2	3	2	3	3	2	3	1	3	3	3	2	2
28	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	3	1	2	1	1	4	4
29	7.0.044	VSLDRAFT	1	2	3	5	5	3	3	3	3	4	1	4	2	2	2	2	2	4	4
30	7.0.044	VSLDRAFT	1	2	3	3	3	3	4	2	2	2		4	2	1	2	2	1	3	3
31	7.0.044	VSLDRAFT	1	2	5		5	5	4	1	5	4	5	5	5	5	1	1	1	4	4
32	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	5	5	2	4	2	3	1	4	4
33	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	2	1	2	2	2	4	4
34	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	2	3	2	2	1	1	1	5	5

35	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	4	4	1	4	4	2	3	2	1	4
36	7.0.044	VSLDRAFT	1	2	3	3	3	3	3	4	3	2	2	4	3	4	1	1	1	4
37	7.0.044	VSLDRAFT	1	2	4		3		4	4	4	4	1	4	4	2	2	2	2	4
38	7.0.044	VSLDRAFT	1	2	3	5		3	3	3	3	3	1	4	3	1	2	2	2	3
39	7.0.044	VSLDRAFT	1	2	1	2	2	1	2	4	2	3	4	1	2	1	3	2	2	1
40	7.0.044	VSLDRAFT	1	2	5	5	5	5	5	4	5	4	2	1	2	2	4	4	4	4
41	7.0.044	VSLDRAFT	1	2	3	5	5	4	3	4	2	2	4	1	2	1	1	1	1	5
42	7.0.044	VSLDRAFT	1	2	4	3	3	3	3	3	2	3	2	3	2	2	1	1	1	3
43	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	1	1	1	4
44	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	1	1	1	4
45	7.0.044	VSLDRAFT	1	1	3	2	2	4	4	3	2	4	5	5	3	1	1	3	3	4
46	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4		2	1	4	2	3	3	3	3	4
47	7.0.044	VSLDRAFT	1	2	3	2	2	4	4	4	3	3	5	5	3	1	3	1	1	5
48	7.0.044	VSLDRAFT	1	1	3	5	5	4	4	4	5	3	5	5	3		1	1	1	4
49	7.0.044	VSLDRAFT	1	2	3	3	5	3	3	4	3	3	1	4	4	1	2	2	2	4
50	7.0.044	VSLDRAFT	1	2	3	2	2	3	3	3	2	1	2	3	3	1	2	2	1	5
51	7.0.044	VSLDRAFT	1	2	2	2	5	2	2	3	2	3	2	5	3	4	3	2	2	2
52	7.0.044	VSLDRAFT	1	2	3	3	5	3	4	4	5	3			3	2	1	1	1	2
53	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	2	1	3	2	2			4
54	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	4	4	4	2	4	4	4	4
55	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	5	2	1	4	5	1	1	1	1	4
56	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	2	4	3	2	4	3	2	
57	7.0.044	VSLDRAFT	1	1	1	2	2	4	5	3	2	4	2	5	4	1	4	4	4	4
58	7.0.044	VSLDRAFT	1	2	3	3	5	3	3	2	2	2	5	5	5	1	1	1	1	5
59	7.0.044	VSLDRAFT	1	2	4	4	4	4		4	4	1	1	4	4	1	1	1		1
60	7.0.044	VSLDRAFT	1	2	3	5	5	3	3	3	5	2	2	3	3	2	2	2	2	3
61	7.0.044	VSLDRAFT	1	2	4	5	2	4	4	4	2	3	3	3	3	4	2	2	2	3
62	7.0.044	VSLDRAFT	1	2	3	5	5	3	3	4	3	3	2	3	3	3	2	1	1	3
63	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	3	1	4	4	1	2	1	1	4
64	7.0.044	VSLDRAFT	1	2	2	3	3	3	4	3	3	3	3	4	3	1	2	1	1	4
65	7.0.044	VSLDRAFT	1	2	4			4	4	4	4	2	1	4	2	4	2	1	1	4
66	7.0.044	VSLDRAFT	1	1	4		5	4	4	4	4	4	3	5	4	4	2	1	1	5
67	7.0.044	VSLDRAFT	1	2	2	5	5	2	3	3	5	2	5	5		1	2	1	1	5
68	7.0.044	VSLDRAFT	1	2	4	3	5	4	4	4	3	2	2	4	3	1	3		1	3
69	7.0.044	VSLDRAFT	1	2	3	3	3	3	3	4	3	3	2	3	3	2	2	2	2	3

70	7.0.044	VSLDRAFT	1	2	4	5		4	4	3	3	2	2	3	2	1	1	1	1	4	4
71	7.0.044	VSLDRAFT	2	2	4	4	4	4	4	4	4	3	1	4	3	3	2	2	2	4	4
72	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	3	1	4	4	1	2	2	2	4	4
73	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	1	4	4	2	2	1	1	4	4
74	7.0.044	VSLDRAFT	1	2	5	5	5	5	5	5	2	1	4	1	1	2	1	1	1	5	5
75	7.0.044	VSLDRAFT	1	2	3	3	3	3	3	2	3	3	3	3	3	3	2	2	2	3	3
76	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	1	4	4	2	2	2	2	4	4
77	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	2	4	4	1	4	3	1	4	4
78	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	2	2	2	4	4
79	7.0.044	VSLDRAFT	1	2	2	2	2	2		2	2	4	3	2	3	2	3	3	3	3	3
80	7.0.044	VSLDRAFT	1	2	4	5		3	3	4	3	3	2	4	3	3	3		3	3	4
81	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	4	4	4	4	4
82	7.0.044	VSLDRAFT	1	2	4		2	2	2	2	2	3	1	3	2	1	3	3	2	2	5
83	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	1	1	1	1	4	4
84	7.0.044	VSLDRAFT	1	1	3	5	5	4	4	4	5	3	5	3	4	5	3	2	2	3	3
85	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	5	4	4	1	4	3	1	2	1	1	4	4
86	7.0.044	VSLDRAFT	1	2	3	3	2	3	3	4	3	3	1	4	4	1	3	3	3	4	4
87	7.0.044	VSLDRAFT	1	2	2	3	3	2	3	5	4	4	3	2	2	1	4	3	3	3	2
88	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	2	3	4	1	1	1	1	4	4
89	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	1	4	3	1	3	1	1	4	4
90	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	3	2	1	4	2	1	2	2	2	4	4
91	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	1	4	1	4	1	1	1	4	4
92	7.0.044	VSLDRAFT	1	2	4	5		4	4	4	4	3	2	3	2	1	3	3	3	4	4
93	7.0.044	VSLDRAFT	1	2	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	3	3
94	7.0.044	VSLDRAFT	1	2												1					
95	7.0.044	VSLDRAFT	1	2	4	3	2	4	4	4	4	4	1	4	4	1	3	3	3	4	4
96	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	1	4	2	1	1	1	1	4	4
97	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	4	4	4	4	4
98	7.0.044	VSLDRAFT	1	2	2	5	5	2	2	3	5	4	3	5	5	1	1	1	1	5	3
99	7.0.044	VSLDRAFT	1	2	5	5	5	5	4	4	5	2	2		2	1	3	2	2	4	4
100	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	3	3	2	2	3	3	2	1	1	1	4	4
101	7.0.044	VSLDRAFT	1	1	2		2	2	2		3	2	4	2	2	2	2	2	2	2	2
102	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	3	5	5	1	4	4	3	2	2	2	4	4
103	7.0.044	VSLDRAFT	1	2	5	5	5	4	4	4	5	2	5	2	5	3	1		1	5	5
104	7.0.044	VSLDRAFT	1	2	2	3	2	4	4	3	2	2	4	2	2	3	2	2	3	4	4
105	7.0.044	VSLDRAFT	1	2	5	5	5	3	4	4	3	4	2	3	3	1	4	2	2	3	3
106	7.0.044	VSLDRAFT	1	2	5	5	5	3	3	4	4	4	1	4	4	1	2	1	1	3	3
107	7.0.044	VSLDRAFT	1	2	3	3	3	3	3	3	3	4	4	3	3	1	3	3	3	4	4
108	7.0.044	VSLDRAFT	1	2	4	3	3	3	3	4	2	2	4	2	1	3	1	1	1	3	3
109	7.0.044	VSLDRAFT	1	2	3	3	3	3	4	4	3	2	5	3	2	1	1	1	1	3	3
110	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	3	4	2	1	4	4	1	3	2	2	4	4

111	7.0.044	VSLDRAFT	1	2	4	3	5	4	4	4	5	3	1	4	3	4	1	1	1	4	4
112	7.0.044	VSLDRAFT	1	2	3	5	5	4	3	4	4	4	1	4	4	1	4	2	2	3	3
113	7.0.044	VSLDRAFT	1	2	3	3	3	4	4	4	4	2	1	4	3	2	2	2	2	3	3
114	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	4	4	3	1	2	2	2	4	4
115	7.0.044	VSLDRAFT	1	2	3			4	4	4	3	2	1	4	2	1	1	1	1	4	4
116	7.0.044	VSLDRAFT	1	1	4	4	3	4	4	4	4	4	1	4	4	1	2	2	2	4	4
117	7.0.044	VSLDRAFT	1	1	4	3	3	4	4	4	3	3	1	4	4	1	2	2	2	3	3
118	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	3	2	3	4	3	1	2	2	2	3	3
119	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	1	3	1	1	1	4	4
120	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	4	4	2	1	4	4
121	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	3	3	2	4	3	2	3	3	3	4	4
122	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	2	4	3	1		2	2	4	4
123	7.0.044	VSLDRAFT	1	2	3	3	3	2	3	4	3	2	3	2	3	4	4	3	3	3	3
124	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	3	3	2	2	4	4
125	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	3	3	3	3	4	4
126	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	5	5	3	5	5	3	2	2	2	2	4	4
127	7.0.044	VSLDRAFT	1	2	3	3		4	4	3	3	2	2	4	2	1	2	2	2	4	4
128	7.0.044	VSLDRAFT	1	2	2	5	5	3	4	3	3	4	2	4	4	3	2	2	2	3	3
129	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	1	4	2	1	1	1	1	4	4
130	7.0.044	VSLDRAFT	1	2	3	2	2	4	4	1	2	1	2	4	2	2	1	1	1	4	4
131	7.0.044	VSLDRAFT	1	2	2	2	2	2	2	3	2	2	4	2	2	3	2	2	2	5	5
132	7.0.044	VSLDRAFT	1	2	4	4	3	3	2	4	3	5	1	3	2	5	1	2	2	4	4
133	7.0.044	VSLDRAFT	1	1	4		5	4	4	5	3	4	1	4	4	1	3	3	3	3	4
134	7.0.044	VSLDRAFT	1	2	4	2	2	4	4	4	4	4	4	2	3	2	2	2	2	3	3
135	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	3	4	1	4	2	1	2	2	1	3	3
136	7.0.044	VSLDRAFT	1	2	3	3	3	3	3	4	4	4	1	3	4	1	2	4	4	3	3
137	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	3	2	1	4	4	4	1	1	1	4	4
138	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	4	3	1	4	4
139	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	4	3	3	3	4	1	2	2	2	4	4
140	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	3	2	2	2	2	4	4

141	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	4	1	1	1	4	4
142	7.0.044	VSLDRAFT	1	2	3	3	3	4	4	4	3	4	1	4	4	1	2	2	2	3	4
143	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	1	2	1	5	2	2	2	2	4	4
144	7.0.044	VSLDRAFT	2	1	2	2	2	2	2	2	2	3	3	2	3	3	2	2	2	2	2
145	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	3	3	1	4	2	1	1	1	1	4	4
146	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	1	1	2	1	1	1		4	4
147	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	5	4	3	5	3	5	3	2	2	2	4	4
148	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	4	4	4	4	4
149	7.0.044	VSLDRAFT	1	2	2	5	5	2	2	3	5	1	3	2	2	1	3	3	3	2	2
150	7.0.044	VSLDRAFT	1	1	4		4	4	4	4	4	3	1	4	3	1	2	2	2	4	4
151	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	1	4	3	1	1	1	1	4	4
152	7.0.044	VSLDRAFT	1	2	4	2	2	3	3	4	2	2	5	5	2	1	4	2	2	4	4
153	7.0.044	VSLDRAFT	2	2	4	5	5	4	4	4	5	4	1	5	4	1	3	3	3	4	4
154	7.0.044	VSLDRAFT	1	2	3	3	5	4	3	4	3	4	2	4	3	1	1	1	1	4	4
155	7.0.044	VSLDRAFT	1	2	5	5	5	5	4	4	4	4	1	4	4		1	4	4	4	5
156	7.0.044	VSLDRAFT	1	2	4		4		4	4	4	4	2	4	3	1		3	2	3	3
157	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	1	4	4	4	4	4
158	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	3	2	1	1	1	4	4
159	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	2	4	4	4	1	1	1	4	4
160	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	5	2	1	4	2	1	2	2	2	4	4
161	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	5	1	4	4	1	4	3	1	4	4
162	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	1	4	4	4	1	1	1	4	4
163	7.0.044	VSLDRAFT	1	2	2	2	1	3	1	4	2	4	4	1	4	1	1	1	1	2	2
164	7.0.044	VSLDRAFT	1	2	2	3	3	3	2	3	3	2	4	5	2	3	3	3	3	3	3
165	7.0.044	VSLDRAFT	1	1	3	5	5	4	4	3	5	3	1	4	2	1	2	2	2	4	4
166	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	2	1	4	4	1	1	1	1	4	4
167	7.0.044	VSLDRAFT	1	2	4	3	2	4	4	4	3	2	1	5	3	1	2	2	2	4	4
168	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	2	2	3	3	4	4
169	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	1	3	2	3	4	4
170	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	3	2	3	2	2	4	4
171	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	4	3	5	3	2	1	1	1	4	4
172	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	1	4	4	1	1	1	1	4	4
173	7.0.044	VSLDRAFT	1	2	5	3		4	4	4	4	2	5	1	2	1	1	1	1	5	5
174	7.0.044	VSLDRAFT	1	2	3	3	3	2	2	3	2	2	5	3	2	4	2	2	2	2	2
175	7.0.044	VSLDRAFT	1	2	3	3	3	4	4	4	4	4	5	5	4	2	1	1	1	3	3
176	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	4	4	4	4	4	4
177	7.0.044	VSLDRAFT	1	2	5	5	5	5	5	5	5	4	4	1	1	1	1	1	1	5	5
178	7.0.044	VSLDRAFT	1	2	4	3	5	4	4	4	4	2	1	4	4	1		2	1	4	4
179	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	4	2	3	1	4	4	4	4	4

180	7.0.044	VSLDRAFT	1	2	5	5	5	5	5	2	5	4	5	5	2	5	2	2	2	5	5
181	7.0.044	VSLDRAFT	1	2	2	5	5	2	3	4	3	4	3	2	4	4	3	3	3	3	3
182	7.0.044	VSLDRAFT	1	2	3	2	1	3	3	2	2	2	2	3	2	1	1	1	1	3	3
183	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	1	4	2	1	2	2	2	4	4
184	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	3	4	1	4	3	2	3	2	2	4	4
185	7.0.044	VSLDRAFT	1	2	4	4	3	4	4	4	4	3	1	4	4	1	3	2	2	4	3
186	7.0.044	VSLDRAFT	1	2	5	5	5	3	3	3	3	2	3	2	2	1	1	1	1	3	3
187	7.0.044	VSLDRAFT	1	2	4	4	3	4	4	4	4	1	1	4	2	1	1	1	1	4	4
188	7.0.044	VSLDRAFT	1	2	5	5	5	2	2	5	5	4	5	5	3	2	1	1	1	2	2
189	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	2	5	2	1	1	1	1	4	4
190	7.0.044	VSLDRAFT	1	2	1	1	2	1	2	2	1	5	4	1	1	2	5	2	1	2	1
191	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	2	3	3	1	4	4	1	2	2	2	4	4
192	7.0.044	VSLDRAFT	1	2	4	4	5	4	4	4	5	1	1	4	2	3	1	1	1	4	5
193	7.0.044	VSLDRAFT	1	2	4	5	5	4	3	4	4	3	1	4	4	1	2	2	1	4	4
194	7.0.044	VSLDRAFT	1	2	4	2	5	4	4	3	3	2	5	5	5	2	3	3	3	4	3
195	7.0.044	VSLDRAFT	1	2	3	3	3	3	3	2	2	2	1	1	2	1	2	2	2	2	2
196	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	3	1	1	1	1	4	4
197	7.0.044	VSLDRAFT	1	2	3	3	5	3	4	4	2	1	5	5	2	1	1	1	1	3	3
198	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	2	2	2	4	4
199	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	1	1	1	1	1	4	4
200	7.0.044	VSLDRAFT	1	2											3	1	2	1	1		
201	7.0.044	VSLDRAFT	1	2	5	5	5	2	4	3	2	4	5	2	2	1	1	2	2	4	4
202	7.0.044	VSLDRAFT	1	2	4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
203	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	1	4		4	2	2	2	4	4
204	7.0.044	VSLDRAFT	1	2	3	4	4	3	4	4	3	2	1	4	3	1	2	2	2	4	4
205	7.0.044	VSLDRAFT	1	2	3	2	2	1	2	4	2	1	4	2	1	2	2	2	2	5	5
206	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	3	1	1	1	1	3	4
207	7.0.044	VSLDRAFT	1	2	5	5	5	2	5	2	5	3	3	2	2	2	2	2	1	5	5
208	7.0.044	VSLDRAFT	1	2	4	4	3	4	4	4	4	4	1	4	3	3	3	3	3	4	4
209	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	1	4	2	3	1	1	1	4	4
210	7.0.044	VSLDRAFT	1	2	4	2	2	3	4	2	2	3	5	5	2	3	3	2	1	3	4
211	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	3	2	2	2	4	4
212	7.0.044	VSLDRAFT	1	2	4	4	3	4	4	4	3	3	1	4	4	3	1	1	1	4	4
213	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	3	1	1	1	4	4
214	7.0.044	VSLDRAFT	1	2	3	3	3	4	3	4	3	5	4	4	4	1	4	3	3	4	4
215	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	4	3	3	2	4	4
216	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	2	2	2	2	4	4
217	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	3	3	3	4	4
218	7.0.044	VSLDRAFT	1	1	4	4		4	3	3	4	3	1	4	4	1	3	2	2	4	4
219	7.0.044	VSLDRAFT	1	2	3	2		4	4	4	3	3	1	4	3	1	3	1	1	3	4

220	7.0.044	VSLDRAFT	1	2	3	3	3	4	3	4	2	2	3	2	1	1	1	1	1	3	3
221	7.0.044	VSLDRAFT	1	2	3	4	4	4	4	5	4	3	1	4	3	2	2	2	2	4	4
222	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	4	4	1	4	4	2	3	3	3	4	4
223	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	2	1	1	1	4	4
224	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	3	1	4	4	2	1	1	1	1	4	4
225	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	1	1	4	1	3	2	1	4	4
226	7.0.044	VSLDRAFT	1	2	3	3		4	3	4	4	4	1	4	3	2	3	2	2	3	3
227	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	4	4	3	4	1	1	1	4	4
228	7.0.044	VSLDRAFT	1	2	4	5	5	5	4	4	4	2	3	2	3	3	1	1	1	4	4
229	7.0.044	VSLDRAFT	1	2	2	3	3	4	3	4	2	2	3	2	2	1	2	2	2	4	4
230	7.0.044	VSLDRAFT	1	2	4	4	5	4	4	4	4	5	1	4	5	2	2	2	2	4	4
231	7.0.044	VSLDRAFT	1	2	5	5	5	2	2	2	3	4	3	2	2	4	2	2	2	4	2
232	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	3	1	3	2	2	4	4
233	7.0.044	VSLDRAFT	1	2	4	3	5	4	4	5	3	2	1	4	2	4	2	1	1	5	5
234	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	3	2	2	2	4	4
235	7.0.044	VSLDRAFT	1	2	3	2	3	3	3	4	3	3	3	3	2		3	1	1	3	3
236	7.0.044	VSLDRAFT	1	2	1	1	1	3		1	1	1	1	1	1	1	1	1	1	1	1
237	7.0.044	VSLDRAFT	1	2	3	3	3	4	4	4	4		2	3	4	1	1	1	1	2	3
238	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	3	4	3	1	4	3	1	1	1	1	4	4
239	7.0.044	VSLDRAFT	1	2	4	5	5	2	4	4	5	2	1	4	4	1	1	1	1	4	4
240	7.0.044	VSLDRAFT	1	2	4	3	3	4	3	5	4	4	2	4	4	3	3	4	4	3	3
241	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1		3	2	4	4
242	7.0.044	VSLDRAFT	1	2	2	2	2	3	4	3	3	2	4	1	2	1	1	1	1	4	4
243	7.0.044	VSLDRAFT	1	2	2	2	2	3	4	3	3	2	4	1	2	1	1	1	1	4	4
244	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	3	3	4	4	4	2	2	2	2	4	4
245	7.0.044	VSLDRAFT	1	2	5	5		4	4		3	2	4	2	3	4	1	1	1	3	3
246	7.0.044	VSLDRAFT	1	2	4	4	4		3	4	4	2	4	5	2	1	1	1	1	5	2
247	7.0.044	VSLDRAFT		2	4	5	5	4	4	4	4	4	2	3	4	1	2	1	1	4	4
248	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	1	1	1	1	1	4	4
249	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	2	3	2	2	2	4	4
250	7.0.044	VSLDRAFT	1	2	4	5	5	3	3	4	5	3	1	4	2	1	1	1	1	3	3

251	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	5	1	2	3	2	1	1	1	1	4	4
252	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	3	3	3	1	4	3	1	1	1	1	4	4
253	7.0.044	VSLDRAFT	1	2	3	3	2	4	4	3	3	2	2	3	2	3	2	2	2	4	3
254	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	4	1	4	4	1	2	2	1	3	3
255	7.0.044	VSLDRAFT	1	1	4	3	3	3	3	4	3	4	1	4	4	1	4	4	4	4	4
256	7.0.044	VSLDRAFT	1	2	4	4		4	4	4		4	2	4	3	4	1	1	1	4	4
257	7.0.044	VSLDRAFT	1	2	3	5	5	4	4	4	3	2	1	4	3	2	1	1	2	5	3
258	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	1	5	5	2	5	1	1	1	5	5
259	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4		4	4	1	4		1		4
260	7.0.044	VSLDRAFT	1	1	4	3	5	4	4	4	5	2	1	4	4	3	2	2	2	3	3
261	7.0.044	VSLDRAFT	1	2	2	3	5	2	2	5	5	2	5	5	5	2	2	2	2	2	2
262	7.0.044	VSLDRAFT	1	2	5	5	5	2	5	2	2	2	5	5	2	1	3	3	3	5	5
263	7.0.044	VSLDRAFT	1	2	4	4	3	4	4	4	3	1	3	5	2	1	2	1	1	4	4
264	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	2	1	2	1		4	4
265	7.0.044	VSLDRAFT	1	2	1	1	1	1	2	1	1	1	4	1	1	4	2	1	1	1	1
266	7.0.044	VSLDRAFT	1	2	5	5	5	3	3	4	3	3	4	5	3	2	4	3	3	3	3
267	7.0.044	VSLDRAFT	1	1	4	4	4														
268	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	5	1	1	4	3	1	1	1	1	4	4
269	7.0.044	VSLDRAFT	1	2	5	2	2	2	2	3	1	3	4	1	2	3	2	2	5	5	5
270	7.0.044	VSLDRAFT	1	2	4	2	2	4	4	4	3	4	4	4	4	4	1	1	1	4	4
271	7.0.044	VSLDRAFT	1	2	4		2	4	4	3	3	2	1	4		2	1	1	1	4	4
272	7.0.044	VSLDRAFT	1	2	3	3	3	4	4	3	3	3	2	4	2	1	2	2	1	3	4
273	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	4	1	4	3	1	1	1		4	4
274	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	2	4	4	1	1	1	1	4	4
275	7.0.044	VSLDRAFT	1	2	5	5	3	3	3	4	4	4	3	2	2	1	1	2	2	3	3
276	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	2	2	2	4	4
277	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	4	4	4	1	4	3	3	4	4
278	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	1	1	1	1	4	4
279	7.0.044	VSLDRAFT	1	2	4	4	4	3	4	4	4	4	1	4	3	2	1	2	3	4	4
280	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	2	2	2	2	4	4
281	7.0.044	VSLDRAFT	1	2	2	2	2	2	2	2	1	1	4	1	1	1	1	1	1	1	1
282	7.0.044	VSLDRAFT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
283	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	2	2	1	4	5	1	3	2	2	3	3
284	7.0.044	VSLDRAFT	1	1	4	5	5	4	4	4	4	4	1	4	4	1	2	2	2	4	4
285	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	4	2	2	2	4	4
286	7.0.044	VSLDRAFT	1	2	5	5	5					3		3		2	1	1	1		
287	7.0.044	VSLDRAFT	1	2	4	3	2	4	4	4	3	4	2	4	3	1	4	4	4	4	4
288	7.0.044	VSLDRAFT	1	2	2	3	2	3	4	4	4	3	5	5	2	2	2	1	1	3	4
289	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	3	2	1	4	3	4	2	1	1	4	4
290	7.0.044	VSLDRAFT	1	2	4	2	5	4	4	4	5	2	5	5	2	1	1	1	1	4	

291	7.0.044	VSLDRAFT	2	2	5	5	5	5	4	4	5	2	5	2	2	5	1	1	1	3	3
292	7.0.044	VSLDRAFT	1	2	4	3	3	4	3	4	4	1	1	1	2	1	1	1	1	4	4
293	7.0.044	VSLDRAFT	1	2	4	3	3	3	4	4	3		2	4	3	4	2	2	2	3	3
294	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	4	2	2	2	4	4
295	7.0.044	VSLDRAFT	1	2	1	1	1	1	1	2	1	2	4	1	1	4	1	1	1	3	3
296	7.0.044	VSLDRAFT	1	2	5	5	5	5	5	5	5	1	3	5	3	5	2	1	1	5	5
297	7.0.044	VSLDRAFT	1	2	5			4		4	3	1	4	2	1	1	1	1	1	4	4
298	7.0.044	VSLDRAFT	1	2	5	5	5	2	2	4	5	2	3	5	2	3	2	2	2	3	3
299	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	1	4	4	1	2	2	2	4	4
300	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	3	1	1	1	4	4
301	7.0.044	VSLDRAFT	1	2	4	3	5	3	4	4	5	2	5	5	5	2	1	1	1	2	3
302	7.0.044	VSLDRAFT	1	2	5	3	3	4	3	4	5	3	2	4	3	2	1	1	1	3	3
303	7.0.044	VSLDRAFT	1	2	4	2		3	4	4	3	3	2	4	3	4	2	2	2	3	3
304	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	4	2	2	2	4	4
305	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	1	4	4	2	4	4	4	4	4
306	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	1	1	1	4	4
307	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	2	4	2	1	3	2	1	4	4
308	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	3	3	4	1	4	4	3	2	1	1	4	4
309	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	2	1	4	2	1	3	1	1	4	4
310	7.0.044	VSLDRAFT	1	1	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1
311	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	1	2	2	2	4	4
312	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	2		1	4	4	4	4	4	4	4	4
313	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	3	4	2	2	4	2	1	1	1	1	4	4
314	7.0.044	VSLDRAFT	1	2	4	3	3	3	4	4	4	4	1	4	2	1	2	2	1	3	3
315	7.0.044	VSLDRAFT	1	2	2	3	2	2	3	3	2	1	3	3	2	4	3	2	2	2	3
316	7.0.044	VSLDRAFT	1	1	4	3	3	4	4	4	4	4	1	4	4	1	3	3	3	4	4
317	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	4	2	1	4	4	1	4	2	2	4	4
318	7.0.044	VSLDRAFT	1	1	3	3	3	3	3	3	3	3	2	3	2	1	2	2	2	3	3
319	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	3	3	3	4	4
320	7.0.044	VSLDRAFT	1	2	2	1	2	2	2	4	2	2	3	2	2	1	1	1	1	2	2
321	7.0.044	VSLDRAFT	1	2	3	2	3	3	4	3	3	3	2	3	3	1	2	3	3	4	4
322	7.0.044	VSLDRAFT	1	2	4	4	4	3	4	4	4	2	1	4	4	1	1	1	1	4	4
323	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	1	1	1	4	4
324	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	4	4	4	4	4	4
325	7.0.044	VSLDRAFT	1	2	5	5	5	4	4	4	5	4	1	4	4	2	4	4	4	5	5
326	7.0.044	VSLDRAFT	1	2	4	4	5	4	4	4	5	4	2	4	4	5	2	2	2	3	4
327	7.0.044	VSLDRAFT	1	1	4	5	5	4	4	4	4	4	1	4	4	1	1	1	1	4	4
328	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	4	4	4	4	4
329	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	4	1	1	1	4	4
330	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	4	2	1	4	2	1	2	2	2	4	4

331	7.0.044	VSLDRAFT	2	1	4	3	3	4	4	3	3	2	4	4	2	2	1	1	1	4	4
332	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	1	4	4	1	2	2	2	4	4
333	7.0.044	VSLDRAFT	1	1	3	3	3	2	4	4	4	4	1	4	4	1	3	3	3	3	4
334	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	1	4	3	2	1	1	1	4	4
335	7.0.044	VSLDRAFT	1	2	4	4	4	4	3	4	4	2	1	4	1	1	1	1	1	4	4
336	7.0.044	VSLDRAFT	1	2	2	5	5	3	4	4	2		5	4	2	2	2	3	3	4	3
337	7.0.044	VSLDRAFT	1	1	3	5	5	3	3	4	4		4	4	3	1	3	3	3	4	4
338	7.0.044	VSLDRAFT	1	2	2	5	5	4	3	3	2	4	2	3	3	4	4	4	4	3	3
339	7.0.044	VSLDRAFT	1	2	4	4	3	4	4	4	3	4	2	5	3	4	4	2	1	4	2
340	7.0.044	VSLDRAFT	1	2	4	2	2	4	4	3	2	2	2	3	2	1	1	1	1	3	3
341	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	1	1	1	4	4
342	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	5	5	3	1	2	2	2	4	4
343	7.0.044	VSLDRAFT	1	2	3	2	2	3	4	2	3	2	1	4	4	1	2	1	1	4	3
344	7.0.044	VSLDRAFT	1	2	4	2	2	4	4	4	2	1	5	5	1	1	1		1	4	4
345	7.0.044	VSLDRAFT	1	2	4	4	2	4	4	3	3	3	4		1	4	4	1	1		4
346	7.0.044	VSLDRAFT	1	1	5	3	5	3	4	3	2	3	5	5	5	2	2	1	1	3	3
347	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	2	2	2	4	4
348	7.0.044	VSLDRAFT	1	2	4	4	3	4	4	4	4	2	1	4	3	4	1	1	1	4	4
349	7.0.044	VSLDRAFT	1	2	3	2	2	3	3	2	2	5	3	5	2	1	1	1	1	5	5
350	7.0.044	VSLDRAFT	1	1	3	4	3	3	4	4	3	4	3	3	3	3	4	4	4	5	5
351	7.0.044	VSLDRAFT	1	2	4	5	5	4	2	4	4	4	1	4	4	1	3	3	2	4	4
352	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	3	4	2	4	4	1	1	1	1	4	4
353	7.0.044	VSLDRAFT	1	2	3		5	4	4	4	5	3	4	2	4	4	2	1	1	3	3
354	7.0.044	VSLDRAFT	1	2	3	5	5	4	4	4	4	2	2	3	2	3	1	1	1	3	3
355	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	1	4	4	2	4	1	2	4	4
356	7.0.044	VSLDRAFT	1	2	1	1	1	1	1	1	1	1	1	1	1	1		1		1	1
357	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	4	4		4	4
358	7.0.044	VSLDRAFT	1	2	3	3	5	4	4	4	5	2	5	3	3	2	3	3	3	4	4
359	7.0.044	VSLDRAFT	1	2	3	5	5	3	4	5	5	4	1	4	1	1	2	2	2	4	4
360	7.0.044	VSLDRAFT	1	2	4	3	3	3	4	4	3	2	1	4	4	3	2	3	2	4	4
361	7.0.044	VSLDRAFT	1	2	5		5			4								3	3		
362	7.0.044	VSLDRAFT	1	2	4	4	3	4	4	4	4	4	1	4	3	2	1	1	1	4	4
363	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	5	4	1	4	1	1	2	2	2	4	4
364	7.0.044	VSLDRAFT	1	1	5	3	3	3	4	4	4	4	3	3	4	1	2	2	2	4	4
365	7.0.044	VSLDRAFT	1	2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
366	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4		1	1	4	2	1	3	2	1	4	4
367	7.0.044	VSLDRAFT	1	2	3	5	5	3	3	3	3	3	5	4	2	4	3	3	3	4	4
368	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	2	2	2	3	2	1	1	1	1	4	4
369	7.0.044	VSLDRAFT	1	2	3	5	5	3	3		4	3	1	4	4	5	3	3	3	3	3
370	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	1	4	3	4	1	1	1	4	2

371	7.0.044	VSLDRAFT	1	2	3	2	2	4	4	3	2	2	3	3	2	2	1	1	1	3	3
372	7.0.044	VSLDRAFT	1	2	4	4	3	4	4	4	4	1	1	4	2	3	1	1	1	4	4
373	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	5	4	1	4	4	1	2	2	2	4	4
374	7.0.044	VSLDRAFT	1	2	5	5	5	5	5	5	5	5	5	5	5	5	5	5		5	5
375	7.0.044	VSLDRAFT	1	2	3	3	3	2	3	4	3	2	3	5	2	1		2	2	3	5
376	7.0.044	VSLDRAFT	1	1	4	5	5		3	5	5	5	5	5	5	2	2	2	2	3	
377	7.0.044	VSLDRAFT	1	2	2	2	2	3	2	4	2	4	4	3	3	1	1	2	2	2	2
378	7.0.044	VSLDRAFT	2	2	2	5	5	4	2	4	4	4	4	4	4	4	4	4	4	4	4
379	7.0.044	VSLDRAFT	1	2	3	3	3	4	4	4	3	4	5	1	2	4	1	1	1	3	3
380	7.0.044	VSLDRAFT	1	2	3	2	1	3	4	3	3	4	1	4	4	1	2	3	2	3	3
381	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	2	2	2	2	4	4
382	7.0.044	VSLDRAFT	1	1	3	5	5	3	3	3	3	4	1	4	4	1	3	3	3	3	3
383	7.0.044	VSLDRAFT	1	2	5	5	5	2	2	4	2	2	3	2	2	1	4	4	4	3	3
384	7.0.044	VSLDRAFT	1	2	3	3	3	3	3	3	3	3	3	1	3	1	2	3	2	3	3
385	7.0.044	VSLDRAFT	1	2	3		2	2	3	3	2	3	4	1	2	3	2	2	5	2	3
386	7.0.044	VSLDRAFT	1	2	4	5	5	3	3	4	3	4	1	4	3	1	1	2	1	3	3
387	7.0.044	VSLDRAFT	1	2	4	4	3	4	4	3	4	3	1	4	3	2	3	1	1	4	4
388	7.0.044	VSLDRAFT	1	2	4	5	5	2	4	4	4	2	2	3	3	1	2	2	2	4	4
389	7.0.044	VSLDRAFT	1	1	4	5	5		4	4	4	4	5	5	4	1	1	1	1	4	4
390	7.0.044	VSLDRAFT	1	2	1	1	1	1	2	3	1	3	4	1	1	1	1	1	2	2	1
391	7.0.044	VSLDRAFT	1	2	4	5	5	4	3	4	3	2	4	2	2	1	1	1	1	4	4
392	7.0.044	VSLDRAFT	1	1	4	4	2	4		4	4	4	5	1	4	2	2	2	2	4	4
393	7.0.044	VSLDRAFT	1	2	1	5	5	1	1	3	1	4	4	1	3	1	2	1	1	5	5
394	7.0.044	VSLDRAFT	1	2	4	4	5	4	4	4	4	1	1	4	3	1	1	1	1	4	4
395	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	1	4	4	1	1	1	1	4	4
396	7.0.044	VSLDRAFT	1	2	3	3	3	2	3	3	3	4	2	3	3	1	2	2	2	3	3
397	7.0.044	VSLDRAFT	1	2	4	3	3	3	4	4	3	2	1	4	3	3	2	2	2	4	4
398	7.0.044	VSLDRAFT	1	2	3	5	5	5	3	4	5	2	1	4	2	2	1	1	1	5	5
399	7.0.044	VSLDRAFT	1	2	3	3	2	4	4	4	4	3	1	3	3	2	3	3	4	5	5
400	7.0.044	VSLDRAFT	1	2	3	2	2	2	4	2	2	1	2	4	3	1	3	2	2	3	3
401	7.0.044	VSLDRAFT	1	2	4	2	2	4	4	3	2	2	3	2	2	1	2	2	2	4	4
402	7.0.044	VSLDRAFT	1	2	5	5	5	3	4	4	4	2	2	3	4	2	3	3	3	4	4
403	7.0.044	VSLDRAFT	1	1																	
404	7.0.044	VSLDRAFT	1	1	4	5	5	4	3	4	4	4	1	4	4	1	1	1	1	5	5
405	7.0.044	VSLDRAFT	1	2	3	2	2	2	3	4	2	4	4	3	2	1	2	2	2	3	4
406	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	5	1	3	3	4	4
407	7.0.044	VSLDRAFT	1	2	2	5	5	2	3	4	5	2	4	2	2	4	2	2	1	3	3
408	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	2	1	4	4	1	2	2	2	4	4
409	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	4	2	1	4	4
410	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	1	4	4	1	2	2	2	4	4

411	7.0.044	VSLDRAFT	1	2	2	5	2	2	4	2	2		4	5	4	4	2	1	1	2	1
412	7.0.044	VSLDRAFT	1	2	4	4	3	4	4	4	4	3	1	4	4	1	1		1	4	4
413	7.0.044	VSLDRAFT	1	1	3		3	3	4	3	3	3	1	4	3	3	2	2		3	4
414	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	3	2	3	4	1	1	3	2	2	4	4
415	7.0.044	VSLDRAFT	1	2	4	5	3	2	5	4	2	4	4	2	5	5	1	1	1	2	3
416	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	2	1	1	1	1	4	4
417	7.0.044	VSLDRAFT	1	1	5	5	5	5	5	3	5	4	5	5	5	1	2	2	2	5	5
418	7.0.044	VSLDRAFT	1	2	5	2	2	2	4	2	2	3	5	5	3	2	1	1	1	3	4
419	7.0.044	VSLDRAFT	1	2	3	3	3		3	3	3		2		2	2	3	2	2	3	3
420	7.0.044	VSLDRAFT	1	2	3	2	2	4	3	4	2	3	5	5	5	1	2	2	2	5	5
421	7.0.044	VSLDRAFT	1	2	5	5	5	5	4	4	4	4	1	4	4	1	3		3	4	4
422	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	3	1	1	4	4	1	1	1	1	4	4
423	7.0.044	VSLDRAFT	1	2	2	2	5	1	2	2	2	1	4	1	1	1	1	1	1	2	2
424	7.0.044	VSLDRAFT	1	2	4	2	2	4	4	4	3	2	1	3	3	2	2	2	2	4	4
425	7.0.044	VSLDRAFT	1	2	1		1		1		1	1		1		1		2		5	1
426	7.0.044	VSLDRAFT	1	2	4	2	2	3	4	3	3	2	2	4		1	1	1	1	4	4
427	7.0.044	VSLDRAFT	1	1	3	5	5	4	4	4	5	4	5	5	4	1	2	2	2	4	4
428	7.0.044	VSLDRAFT	1	2	4		4	4		4		2		4		1		4		4	
429	7.0.044	VSLDRAFT	1	2	5	4	4	4	4	4	4	4	5	5	2	1	1	1	1	4	4
430	7.0.044	VSLDRAFT	1	2	4	5	3	4	4	4	5	2	5	5	2	3	1	1	1	4	4
431	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	1	1	1	4	4
432	7.0.044	VSLDRAFT	1	1	2	3		1	4	2		4	4	1	3	4	1	3	4	3	3
433	7.0.044	VSLDRAFT	1	2	4		4	4	4	4	4	4	4	4	4	1	2	2	2	4	4
434	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	2	5	3	1	4	4	3	4	4
435	7.0.044	VSLDRAFT	1	2	3	5	5	3	4	2	2	3	2	4	2	2	2	2	2	4	3
436	7.0.044	VSLDRAFT	1	1	3	3	2	3	3	2	2	3	5	3	3	4		3	3	3	3
437	7.0.044	VSLDRAFT	1	2	4	4	3	4	4	4	4	2	1	4	3	2	4	3	2		4
438	7.0.044	VSLDRAFT	1	2	2	3	3	3	3	4	4	1	5	5	2	4	1	1	1	3	3
439	7.0.044	VSLDRAFT	1	1	3	3	3	4	4	4	3	4	2	4		3	2	2	2	4	4
440	7.0.044	VSLDRAFT	1	1	4	3	2	3	4	4	2	3	1	4	4	1	4	4	4	4	4

441	7.0.044	VSLDRAFT	1	1	3	5	5	3	3	3	5	3	5	5	3	2	3	2	2	3	3
442	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4		1	4	4	1	4	4	1	4	4
443	7.0.044	VSLDRAFT	1	2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
444	7.0.044	VSLDRAFT	1	2	4	4		4	4	4	4	4	1	4	3	3	3	3	3	4	4
445	7.0.044	VSLDRAFT	1	2	2	5	5	2	5	4	5	5	1	4	5	1	2	2	2	5	5
446	7.0.044	VSLDRAFT	1	2	4	2	2	3	4	4	2	2	3	2	2	1	1	1	1	4	4
447	7.0.044	VSLDRAFT	1	2	3	3	2	3	4	4	2	3	2	4	3	1	2	2	2	3	3
448	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	3	4	3	2	4	1	1	1	1	3	3
449	7.0.044	VSLDRAFT	1	1												1					
450	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	3	2	2	2	3	4	4	4	4	2	4
451	7.0.044	VSLDRAFT	1	1	3	3	3	3	3	2	2	2	1	4	1	1	2	2	2	3	3
452	7.0.044	VSLDRAFT	1	2	2	3	2	3	2	4	2	4	2	4	5	1	2	2	1	3	3
453	7.0.044	VSLDRAFT	2	2	2	2	1	3	3	3	2	3	2	3	3	3	2	2	2	3	3
454	7.0.044	VSLDRAFT	1	1	4	5	5	4	4	4	5	3	5	4	3	1	3	3	2	4	4
455	7.0.044	VSLDRAFT	1	2	2	2	2	1	3	5	2	1	4	1	1	1	1	1	1	3	3
456	7.0.044	VSLDRAFT	2	2	4	4		5	5	4	3	4	2	4	4	1	3	1	1	4	4
457	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	4	4	2	4	4	3	4	3	3	4	4
458	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	1	4	4	1	4	4	2	4	4
459	7.0.044	VSLDRAFT	1	2	2	3	3	3	3	3	2	2	1	2	2	1	1	1	1	1	1
460	7.0.044	VSLDRAFT	1	2	4	4	4	3	4	4	4	5	1	4	4	1	4	1	1	4	4
461	7.0.044	VSLDRAFT	1	2	4	3	3	4	3	4	4	4	1	4	4	2	3	3	3	3	3
462	7.0.044	VSLDRAFT	1	2	4	4	5	4	4	4	4	4	1	4	4	1	2	2	2	4	4
463	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	1	2	2	2	4	4
464	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	2	3	4	4	4	4
465	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	2	1	4	2	3	4	3	3	4	4
466	7.0.044	VSLDRAFT	1	2	5	5	5	3	4	4	5	4	3	5	2	1	1	1	1	5	4
467	7.0.044	VSLDRAFT	1	1	4	4	3	4	4	4	4	4	1	4	4	1	3	2	2	4	4
468	7.0.044	VSLDRAFT	1	2	4	3	2	4	4	4	4	3	1	4	4	1	2	2	2	4	4
469	7.0.044	VSLDRAFT	1	2	4	4	2	4	4	4	2	4	1	4	4	1	3	3	3	4	4
470	7.0.044	VSLDRAFT	1	2	3	5	5	4	4	4	3	3	2	4	3	1	1	1		4	4
471	7.0.044	VSLDRAFT	1	1	2	1	1	2	2	2	2	3	4	1	2	2	1	1	1	5	5
472	7.0.044	VSLDRAFT	1	2	5	5	5	5	5	5	5	4	1	4	3	4	4	3	1	5	5
473	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	3	1	1	1	1	4	4
474	7.0.044	VSLDRAFT	1	2	4	5	5	3	4	4	3	4	1	4	3	1	4	3	3	4	4
475	7.0.044	VSLDRAFT	1	2	3	5	3	4	4	3	3	4	2	4	3	1	2	2	2	4	3
476	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	1	1	1	4	4
477	7.0.044	VSLDRAFT	1	1	4	5	5	4	4	4	4	2	1	4	1	2	3	3	3	4	4
478	7.0.044	VSLDRAFT	1	2	4	2	5	2	4	2	5	2	3	5	5	4	2	2	2	2	4
479	7.0.044	VSLDRAFT	1	2	3	3	3	4	4	4	5	3	1	4	3	4	1	1	1	4	4
480	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	3	3	3	1	4	4	3	3	2	2	4	4

481	7.0.044	VSLDRAFT	1	2	4	3	5	3	4		3	4	1	4	3	1	1	1		4	3
482	7.0.044	VSLDRAFT	1	2	4	2	5	3	4	4	3	2	3	4	3	2	1	1	1	3	4
483	7.0.044	VSLDRAFT	1	2	4	3	3	4	3	3	3	3	4	2	3	2	3	2	2	4	4
484	7.0.044	VSLDRAFT	1	2	5	5	5	3	4	4	3	5	2	4	5	2	1	1	1	4	4
485	7.0.044	VSLDRAFT	1	2	3	3	3	3	3	3	3	3	1	4	4	3	3	4	4	4	4
486	7.0.044	VSLDRAFT	1	2	3	4	3	4	4	4	5	2	1	4	3	1	1	1		4	4
487	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	3	3	4	1	2	3	1	4	4
488	7.0.044	VSLDRAFT	1	2	5	5	5	4	4	4	4	2	5	5	1	1	1	1	1	5	5
489	7.0.044	VSLDRAFT	1	2	3	3	3	4	4	4	3	2	3	3	3	4	1	1	1	4	4
490	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	1	4	4	2	2	2	2	4	4
491	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	2	4	4	2	2	2	2	4	4
492	7.0.044	VSLDRAFT	1	2	4	4	5	4	4	4	4	4	1	4	3	1	3	2	2	4	4
493	7.0.044	VSLDRAFT	1	2				4	4	4	4	4	1	4	4	1	2			4	4
494	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	1	1	1	4	4
495	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	3	1	1	1	4	4
496	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	5	4	4	4	2	2	2	4	4
497	7.0.044	VSLDRAFT	1	1	4	5	2	4	3	3	2	4	5	5	4	1	3	3	3	3	3
498	7.0.044	VSLDRAFT	1	2	3	5		4	4	4	4	4	1	4	3	1	2	1	1	3	3
499	7.0.044	VSLDRAFT	1	2	4	3	2	4	4	4	3	2	2	3	3	1	1	1	1	4	4
500	7.0.044	VSLDRAFT	1	2	2	2	2	3	3	3	2	2	2	4	2	1	1	1	1	3	3
501	7.0.044	VSLDRAFT	1	2	4	2	3	4		4	2	2	1	4	3	1		1	1	4	4
502	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	1	4	4	4	1	1	1	4	4
503	7.0.044	VSLDRAFT	1	2	2	3	5	3	4	4	5	3	5	2	3	2	1	2	2	5	3
504	7.0.044	VSLDRAFT	1	1	3	3	3	3	3	4	3	4	1	4	4	1	3	3	3	3	3
505	7.0.044	VSLDRAFT	1	2	3	3		4	4	5	3	4	1	4	3	2	1	1	1	4	4
506	7.0.044	VSLDRAFT	1	2	4	5	5	3	3	4	2	2	3	2	2	1	1	1	1	3	3
507	7.0.044	VSLDRAFT	1	2	3	3	3	4	4	4	3	1	5	5	2	3	3	3	3	3	3
508	7.0.044	VSLDRAFT	1	2	3	3		3	3		4	3	1	4	3	1	2	2	2	3	4
509	7.0.044	VSLDRAFT	1	2	4	4	4	2	3	4	4	3	3	3	3	1	3	2	2	3	3
510	7.0.044	VSLDRAFT	1	2	4		3	4	4	4	3	2	1	4	3	1	1	1	1	3	3
511	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	2	3	4	4	3	3	3	4	4
512	7.0.044	VSLDRAFT	1	2	4	3	3	3	4	3	3	4	2	3	3	2	2	2	2	4	4
513	7.0.044	VSLDRAFT	1	2	3	5	5	3	3	3	3	2	1	4	4	3	2	2	2	3	3
514	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	4	4	3	4	4
515	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4		1	3	1	1	4	4
516	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3		5	3	4	2	1	1	4	4
517	7.0.044	VSLDRAFT	1	2	3	2	2	3	4	3	3	3	2	4	3	1	1	1	1	3	3
518	7.0.044	VSLDRAFT	1	2	5	5	5	1	3	2	2	4	1	1	1	1	1	1	1	2	2
519	7.0.044	VSLDRAFT	1	2	4	4	4	4	2	4	4	2	1	4	3	2	2	2	1	4	4
520	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	1	4	4	1	3	3	3	4	4

521	7.0.044	VSLDRAFT	1	2	4	3	3	3	3	4	3	3	1	4	3	1	4	3	2	3	3
522	7.0.044	VSLDRAFT	1	2	4	5	5	4	3	4	4	4	1	4	4	1	2	2	2	4	4
523	7.0.044	VSLDRAFT	1	2	4	2	2	4	4	4	3	3	1	3	4	1	2	2	2	3	4
524	7.0.044	VSLDRAFT	1	2	3	3	3	3	3	4	3	2	5	4	5	3	1	1	1	3	3
525	7.0.044	VSLDRAFT	1	2	3	3	3	4	4	4	4	4	1	4	4	2	3	3	3	4	4
526	7.0.044	VSLDRAFT	1	2	3	3	3	4	3	4	4	2	1	4	3	1	4	4	3	4	4
527	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	3	3	3	5	5	3	1	1	1	1	3	4
528	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	3	4	3	1	4	4	1	2	2	3	4	4
529	7.0.044	VSLDRAFT	1	2	5	2	2	2	3	4	3	1	3	2	2	1	2	2	1	5	2
530	7.0.044	VSLDRAFT	1	2	4	4	3	4	4	4	2	4	1	4	4	4	2	2	2	4	4
531	7.0.044	VSLDRAFT	1	1	5	5	5	2	1	4	5	4	2	4	4	2	3	4		5	5
532	7.0.044	VSLDRAFT	1	2	3	5	3	4	4	4	4	1	1	4	2	1	1	1	1	3	3
533	7.0.044	VSLDRAFT	1	2	2	3	3	3	4	3	3	4	5	5	3	4	2	2	2	4	4
534	7.0.044	VSLDRAFT	1	2	5	3	5	3	5	5	2	1	4	4	1	4	1	1	1	2	2
535	7.0.044	VSLDRAFT	1	1	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
536	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4		1	4	4	1	1	1	1	4	4
537	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	5	2	4	4	3	1	1	1	1	5	3
538	7.0.044	VSLDRAFT	1	2	3	4	3	4	4	4	4	2	3	5	2	1	1	1	1	4	4
539	7.0.044	VSLDRAFT	1	2	4	4	2	4	4	4	4	3	1	1	4	1	1	1	1	3	3
540	7.0.044	VSLDRAFT	1	2	2	3	3	4	2	4	3	2	1	4	2	1	3	1	1	3	2
541	7.0.044	VSLDRAFT	1	2	2	4	3	3	2	4	5	3	3	2	1	1	1	1	1	3	2
542	7.0.044	VSLDRAFT	1	1	4	3		4	4	3	4	4	4	2		2	2	2	3	4	4
543	7.0.044	VSLDRAFT	1	1	2	2	2	2	1	3	3	3	2	3	2	1	2	2	2	3	3
544	7.0.044	VSLDRAFT	1	1	4	4		4	4	4	4	4	1	4	4	3	4	4	4	4	4
545	7.0.044	VSLDRAFT	1	2	2	2	1	1	1	2	1	3	4	4	5	2	3	2	2		
546	7.0.044	VSLDRAFT	1	2	3	5	5	3	2	2	3	3	2	3		1	1		1	3	3
547	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	5	3	1	4	4	1	2	2	2	4	4
548	7.0.044	VSLDRAFT	1	2	3	4		3	4	3		3	1	1	4	1	2	3	2	1	1
549	7.0.044	VSLDRAFT	1	2	4	5		3	3	4	5		1	4	4	1	2	2		4	2
550	7.0.044	VSLDRAFT	1	2	4	4	2	4	4	4	4	2	1	4	4	1	4	4	4	4	4

551	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	3	4	4	1	3	3	1	4	4	3	4	4
552	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	2	1	1	1	1	4	4
553	7.0.044	VSLDRAFT	1	2	2	2		1	2	4	2	1	4	1	3	3	2	1	1	3	3
554	7.0.044	VSLDRAFT	1	2	2	2	5	3	3	4	3	3	1	4	2	1	2	2	2	5	5
555	7.0.044	VSLDRAFT	1	2	4	2	3	4	4	4	3	2	1	4	3	3	1	1	1	4	4
556	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	1	4	4	2	2	1	1	4	4
557	7.0.044	VSLDRAFT	1	2	2	3	3	4	4	4	4	2	1	4	4	4	1	1	1	4	4
558	7.0.044	VSLDRAFT	1	2	5	5	5	5	5	4	1	1	4	1	1	4	1	1	1	5	5
559	7.0.044	VSLDRAFT	1	2	2	3		2	1	3	2	1	4	1	2	3	2	1	1	2	3
560	7.0.044	VSLDRAFT	1	2	4	3		4	4	4	4	2	1	4	4	3	2	2	1	4	4
561	7.0.044	VSLDRAFT	1	2	4	2	2	2	4	4	3	4	1	4	4	1	3	3	2	4	4
562	7.0.044	VSLDRAFT	1	2	3	3	3	3	3	4	3	4	2	5	4	1	4	4	4	3	3
563	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	1	4	2	4	1	1	1	4	4
564	7.0.044	VSLDRAFT	1	2	2	5	5	2	2	5	2	4	5	4		4	2	2	1	1	2
565	7.0.044	VSLDRAFT	1	2	3	3	3	4	3	4	3	2	5	3	2	3	1	1	1	4	4
566	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	1	4	4	1	1	1	1	4	4
567	7.0.044	VSLDRAFT	1	2	3	2	2	4	4	4	3	3	1	4	3	1	1	1	1	3	4
568	7.0.044	VSLDRAFT	1	2	2	5	5	2	2	3	5	2	4	2	2	4	3	3	3	3	3
569	7.0.044	VSLDRAFT	1	2	2		2	2		4	2	1	4	4	1	1	1	1	1	2	2
570	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	2	2	2	2	4	4
571	7.0.044	VSLDRAFT	1	2	4	3	4	4	4	4	3	4	1	4	4	1	1	1	1	4	4
572	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	5		3	2	1	4	4
573	7.0.044	VSLDRAFT	1	2	5	5	5	5	3	5	5	4	1	4	5	1	2	2	2	5	3
574	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1		4	2	4	4	2	4	4
575	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	4	3	3	3	4	4
576	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	4	1	4	4	2	1	1	1	2	2
577	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	1	4	4	1	1	1	1	4	4
578	7.0.044	VSLDRAFT	1	2	5	5	5	2	2	2	2	3	5	5	2	1	2	2	2	5	5
579	7.0.044	VSLDRAFT	1	2																	
580	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	1	1	4	4	4	4	4	4	4
581	7.0.044	VSLDRAFT	1	2	4	3	5	4	4	4	4	3	2	2	4	1	1	2	2	4	4
582	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	4	4	1	4	4	1	2	1	1	4	4
583	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	3	1	1	1	1	4	4
584	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	4	4	1	4	4	4	3	3	3	4	3
585	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	3	1	1	5	2	1	1	2	2	5	5
586	7.0.044	VSLDRAFT	1	2	3	3	4	4	4	3	3	3	5	5	5	3	2	2		4	4
587	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	2	1	4	4	1	2	2	2	4	4
588	7.0.044	VSLDRAFT	1	2	3	3	3	3	4	4	3	3	2	4	3	2	3	3	3	3	3
589	7.0.044	VSLDRAFT	3	1	4		4	4	4	4	4	3		4		1	2	2		4	
590	7.0.044	VSLDRAFT	1	2	4	5	5	3	4	4	2	3	3	2	2	1	3	1	1	5	5

591	7.0.044	VSLDRAFT	2	2	4	4	4	4	4	4	4	3	1	4	4	1	2	2	2	4	4
592	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	4	1	4	5	1	2	2	2	2	4	4
593	7.0.044	VSLDRAFT	1	2	5	5	5	3	5	4	5	2	5	5	2	2	1	1	1	5	5
594	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	5	3	5	3	2	4	3	3	2	5	4
595	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	1	4	1	1	1	1	1	4	4
596	7.0.044	VSLDRAFT	1	2	4		3		4	4	2	4	1	3	4	1	4	3	3	4	4
597	7.0.044	VSLDRAFT	1	2	4	4	5	4	4	4	4	4	1	4	4	1	4	3	3	4	4
598	7.0.044	VSLDRAFT	1	1	3	2		2	2	2	5	4	5	5	5	2	3	2	1	2	2
599	7.0.044	VSLDRAFT	1	2	3	3	3	3	3	4	3	2	2	3	3	1	1	1	1	3	3
600	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	1	2	4	4	4	4
601	7.0.044	VSLDRAFT	1	2	2	1	2	2	2	2	2	1	4	5	2	1	2	2	1	2	2
602	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	4	4		1		1	1	4	4
603	7.0.044	VSLDRAFT	1	2	2	5	5	3	2	3	5	5	3	2	2	1	1	1	1	5	5
604	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	3	1	1	4	4
605	7.0.044	VSLDRAFT	1	2	5	5	5	2	2	2	2	2	3	2	2	2	3	2	2	5	5
606	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	1	2	1	3	1	1	4	4
607	7.0.044	VSLDRAFT	1	2	4	3	3	4	3	4	5	4	4	5	2	4	2	2	2	3	3
608	7.0.044	VSLDRAFT	1	2	4	3	5	4	4	4	4	2	1	4	4	1	1	1	1	4	4
609	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	5	4	5	5	4	5	3	2	1	4	4
610	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	5	2	1	4	4	5	1	1	1	4	4
611	7.0.044	VSLDRAFT	1	2	5	2	2	3	4	5	2	3	4	1	3	1	3	2	2	5	5
612	7.0.044	VSLDRAFT	1	2	3	3		3	3	3	3	3	2	4	3	2	2	2	2	3	3
613	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	1	4	4	1	3	3	3	4	4
614	7.0.044	VSLDRAFT	1	1	4	3	3	3	3	4	3	2	5	1	5	1	1	1	1	3	3
615	7.0.044	VSLDRAFT	1	2	4	2	2	4	4	4	3	4	2	4	3	1	2	4	4	4	4
616	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	3		4	4	5	2	2	2	2	4	4
617	7.0.044	VSLDRAFT	1	2	4			4	4	4		4	2	5	4	1	1	1	4	4	
618	7.0.044	VSLDRAFT	1	2	3											1	2	2	2		
619	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	2	3		4	3	2	2	4	4
620	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	1	4	3	1	2	2	2	3	3
621	7.0.044	VSLDRAFT	1	2	4	4	3	4	4	4	3	4	1	4	4	1	1	2	2	4	4
622	7.0.044	VSLDRAFT	1	2	3	2	2	3	2	3	1	3	3	4	2	1	1	1	1	2	3
623	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	3	2	1	1	1	3	3
624	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	4	4	4	1	4	4	4	4	4
625	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	1	4	3	1	1	1	1	4	4
626	7.0.044	VSLDRAFT	1	2	5	5	5	3	3	3	3	4	5	5	4	4	4	2	2	3	4
627	7.0.044	VSLDRAFT	1	2	3	3	3	4	4	2	3	2	1	4	5	1	2	3	3	4	4
628	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	2	1	4	4	1	1	1	1	4	4
629	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	1	4	4	4	1	1	1	4	4
630	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	1	1	1	4	4

631	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	1	4	4	1	4	4	4	4	4
632	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	3	3	2	1	1	3	4
633	7.0.044	VSLDRAFT	1	1	4			4		4			1	5		1	1	1	1	4	4
634	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	4	1	1	1	4	4
635	7.0.044	VSLDRAFT	1	2	5	3	3	3	3	5	5	2	2	4	2	1	4	4	4	5	5
636	7.0.044	VSLDRAFT	1	1	5	5	5		4	4	4	4	4	2	4	1	1	1	1	4	4
637	7.0.044	VSLDRAFT	1	2	3	5	2	5	4	3	5	3	5	4	3	3	3	2	2	5	5
638	7.0.044	VSLDRAFT	1	2	2	2	2	1	2	4	2	4	4	1	2	2	2	2	2	3	3
639	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	5	2	1	3	3	4	1	1	2	4	4
640	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	5	5	4	1	4	3	3	4	4
641	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	2	1	4	3	1	2	3	4	4	4
642	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
643	7.0.044	VSLDRAFT	1	2	3	4	4	4	3	4	4	4	1	3	2	4	2	2	1	3	3
644	7.0.044	VSLDRAFT	1	2	3	3	3	4	4	3	3	2	1	4	3	1	1	1	1	3	3
645	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	1	3	3	3	4	4
646	7.0.044	VSLDRAFT	1	2	4	3	2	4	4	4	3	3	5	5	4	1	1	1	1	4	4
647	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	2	3	3	3	4	4
648	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	3	5	1	1	4	2	1	1	1	1	4	4
649	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	2	4	4	2	2	2	2	4	4
650	7.0.044	VSLDRAFT	1	2	3	4		2	4	4	4	3	1	4	3	2	2	1	1	4	4
651	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	4	2	1	4	4	4	3	3	3	4	4
652	7.0.044	VSLDRAFT	1	2	4	5		4	4	4	5	1	5	5	5	5	3	2	2	5	5
653	7.0.044	VSLDRAFT	1	2	2	1	1	2	1	3	2	3	5	1	2	1	2	4	4	2	2
654	7.0.044	VSLDRAFT	1	2	4	4	5	4	4	4	4	2	1	4	3	1	2	3	2	4	4
655	7.0.044	VSLDRAFT	1	2	4	3	3	3	4	4	4	2	5	2	3	1	4	3	3	4	4
656	7.0.044	VSLDRAFT	1	2	2	2	2	1	3	3	3	1	4	1	2	4	1	1	1	3	
657	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	4	1	4	4	4	1	1	1	3	4
658	7.0.044	VSLDRAFT	1	2	5	5	5	5	5	5	5	5	4	1	5	4	2	1	1	5	5
659	7.0.044	VSLDRAFT	1	2	3	3	2	4	4	4	3	4	1	4	4	2	2	2	2	4	4
660	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4		4	3	1	1	4	4
661	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	3	3	3	4	4
662	7.0.044	VSLDRAFT	1	1	4	2	2	2	2	2	1	3	4	2	2	1	1	1	1	4	4
663	7.0.044	VSLDRAFT	2	2	4	5	3	4	4	4	3	2	1	4	3	1	3	3	1	4	4
664	7.0.044	VSLDRAFT	1	1	5	5	5	5	3	4	5	3	5	5	3	1	4	3	3	5	5
665	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	1	5	5		4	4	2	4	4
666	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	3	5	1	4	3	2	2	3	3	4	4
667	7.0.044	VSLDRAFT	1	2	3	5	5	3	3	4	3	2	2	4	3	4	3	3	3	3	4
668	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	1	4	4	1	2	2	2	4	4
669	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	3	4	5	3	4	2	2	2	5	4	4
670	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	1	4	4	3	1	1	1	4	4

671	7.0.044	VSLDRAFT	1	2	3	5	5	4	4	4	3	2	5	3		1	2	2	2	4	4
672	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	1	1	1	4	4
673	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	1	4	4	4	1	1	1	4	4
674	7.0.044	VSLDRAFT	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	2	2	2	2
675	7.0.044	VSLDRAFT	1	2	4	2	5	4	4	4	2	2	2	3	2	1	2	2	1	4	4
676	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	1	4	4	4	1	1	1	4	4
677	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	2	4	4	2	1	1	1	4	4
678	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	4	2	2	2	4	4
679	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	3	4	3	1	4	2	1	3	3	2	4	4
680	7.0.044	VSLDRAFT	1	1	2	2	3	3	4	4	2	4	2	4	4	1	3	4	4	3	4
681	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	3	4	1	3	4	2	3	2	2	4	4
682	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	2	3	3	3	4	4
683	7.0.044	VSLDRAFT	1	2	3	3	3	4	3	4	3	3	2	4	3	2	2	2	2	3	4
684	7.0.044	VSLDRAFT	1	2	5	5	5	3	3	4	3	2	5	5	3	4	2	2	2	3	3
685	7.0.044	VSLDRAFT	1	1	2		2	2	2	2	2		4	4	1	1	1	1	1	2	2
686	7.0.044	VSLDRAFT	1	2	4	4	5	4	4	4	5	4	1	4	4	1	1	1	1	4	4
687	7.0.044	VSLDRAFT	1	2	3	3	3	4	3	4	3	2	1	4		1	1	1	1	3	3
688	7.0.044	VSLDRAFT	1	2	4	1	1	2	2	2	1	4	3	5	3	1	2	2	2	4	4
689	7.0.044	VSLDRAFT	1	2	3	5	5	3	3	4	5	2	3	4	2	1	1	2	1	3	3
690	7.0.044	VSLDRAFT	1	2	2	5	5	2		2	1	1	4	2	1	4	1	1	1	3	2
691	7.0.044	VSLDRAFT	1	2	2	2	2	2	2	3	2	3	4	2	2	1	2	3	2	2	2
692	7.0.044	VSLDRAFT	1	2	4	4	4	2	4	4	2	4	3	4	4	4	4	3	3	4	4
693	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	3	1	4	4	1	3	2	2	4	4
694	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	2	2	2	4	4
695	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	3	4	4	1	4	3	3	1	1	1	4	4
696	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	3	2	4	4	3	1	1	1	4	4
697	7.0.044	VSLDRAFT	1	2	2	2	2	3	2	2	2	3	3	3	2	3	1	1	1	2	2
698	7.0.044	VSLDRAFT	1	2	3	5		3	4	3	3	4	1	4		1	1	1	1	5	5
699	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3		4	4	1	2	2	2	4	4
700	7.0.044	VSLDRAFT	1	1	5	3	3	4	4	4	4	1	1	1	1	4	1	1	1	4	4
701	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	3	3	2	3	3	1	1	1	1	3	3
702	7.0.044	VSLDRAFT	1	2	4	3	3	4	3	4	3	2	1	4	4	3	3	2	1	3	3
703	7.0.044	VSLDRAFT	1	2	5	5	5	5	5	5	5	4	5	5	5	1	1	1	1	5	5
704	7.0.044	VSLDRAFT	1	2	3	3		3	3	4	5	4	5	4	3	2	3	2	2	5	5
705	7.0.044	VSLDRAFT	2	2	1	1	1	1	1	2	1	1	4	1	1	4	1	1	1	2	2
706	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	1	4	4	1	4	4	2	4	4
707	7.0.044	VSLDRAFT	1	2		4	2	4	4	4	2	4	2	3		4	3	2	1	5	5
708	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	4	1	3	2	1	1	1	4	4
709	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	5	4	4	5	5	5	1	2	2	2	4	4
710	7.0.044	VSLDRAFT	1	2	3	3	3	4	4	4	4	2	1	4	4	1	2	1	1	4	4

711	7.0.044	VSLDRAFT	1	2	3	5	5	4	4	4	5	4	1	4	3	2	2	2	2	4	4
712	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	3	1	2	4	3	1	1	1	1	3	4
713	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	1	4	4	4	2	2	2	4	4
714	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	2	1	4	2	4	2	2	2	4	4
715	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	1	1	1	1	1	4	4
716	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	2	3	2	2	2	4	4
717	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	4	1	4	4	1	1	1	1	4	4
718	7.0.044	VSLDRAFT	1	1	2	2	2	3	3	3	2	4	3	3	4	2		3		2	2
719	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	4	1	3	3	2	1	4	3	2	2	4
720	7.0.044	VSLDRAFT	1	2	4	3	5	4	4	4	5	4	1	4	3	3	3	2	1	4	4
721	7.0.044	VSLDRAFT	1	2	4	2	2	4	4	4	2	2	1	4	2	4	2	2	2	3	3
722	7.0.044	VSLDRAFT	1	2	4		4	4	4	4	4	4	1	4	3	4	1	2	2	4	4
723	7.0.044	VSLDRAFT	1	2	2	5	5	5	2	3	3	3	5	4	2	3	2	2	2	5	3
724	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	1	2	2	2	4	4
725	7.0.044	VSLDRAFT	1	2	4	4		4	4	4	4	4	1	4	4	2	4	3	3	4	4
726	7.0.044	VSLDRAFT	1	2	2	2	2	3	3	3	2	2	3	2	2	3	3	3	2	2	3
727	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	2	1	2	1	1	4	4
728	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	1	1	4	4	4
729	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	4	1	1	1	4	4
730	7.0.044	VSLDRAFT	1	2	1	1	1	1	1	3	2	2	4	5	2	1	3	1	1	2	1
731	7.0.044	VSLDRAFT	1	2	4	5	5	5	4	4	5	1	5	1	1	1	1	1	1	3	3
732	7.0.044	VSLDRAFT	1	2	3	5	5	2	1	2	2	4	5	1	2	4	2	2	3	3	2
733	7.0.044	VSLDRAFT	1	2	2	2	5	3	3	3	5	3	2	4	5	4	2	2	2	3	3
734	7.0.044	VSLDRAFT	1	2	2	5	5	1	2	4	5	1	4	2	2	4	1	1	1	2	2
735	7.0.044	VSLDRAFT	1	2	2	2	1	1	1	3	2	4	3	3	3	1	2	3	2	5	4
736	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	1	4	4	1	4	3	3	4	4
737	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	1	1	1	4	4
738	7.0.044	VSLDRAFT	1	2	4	3	3	4	3	4	3	3	1	4	3	1	2	2	2	3	4
739	7.0.044	VSLDRAFT	1	2	4	4	2	4	4	4	5	2	1	4	4	2	2	2	2	4	4
740	7.0.044	VSLDRAFT	1	2	4	5	5	4	3	4	4	4	1	4	4	1	2	2	2	5	5
741	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	3	3	3	4	4
742	7.0.044	VSLDRAFT	1	2	4	4	2	4	4	4	2	4	1	4	4	1	1	1	1	4	4
743	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	1	4	2	2	1	1	1	4	4
744	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	2	2	2	4	4
745	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	2	1	1	1	1	4	4
746	7.0.044	VSLDRAFT	1	2	3	3	3	3	2	4	3	4	2	3	4	1	3	3	3	3	3
747	7.0.044	VSLDRAFT	1	2	3	5	5	3	4	5	5	2	2	3	3	1	3	2	2	4	3
748	7.0.044	VSLDRAFT	2	2	4	4	4	4	4	4	2	1	1	4	2	3	1	1	1	4	4
749	7.0.044	VSLDRAFT	1	2	3	5	5	3	3	4	3	2	1	3	2	2	2	2	2	2	3
750	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	3	2		4	3	1	2	1	1	3	4

751	7.0.044	VSLDRAFT	1	2	4		4	4	4	4	4	1	3	5	1	1	1	1	1	5	5
752	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	4	2	3	1	2	2	2	4	4
753	7.0.044	VSLDRAFT	1	2	3	2	2	4	3	4	1	4	4	1	4	4	1	1	1	4	4
754	7.0.044	VSLDRAFT	1	2	3	3	2	3	3	4	3	2	2	4		4	2	2	2	3	4
755	7.0.044	VSLDRAFT	1	2	2	5	5	1	2	2	2	1	4	1	2	1	4	3	2	2	2
756	7.0.044	VSLDRAFT	1	2	4	2	1	4	4	1	5	2	5	3	2	1	4	4	4	4	4
757	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	1	4	3		2	1	1	5	5
758	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	1	4	2	1	1	2	2	4	4
759	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	1	3	2	2	4	4
760	7.0.044	VSLDRAFT	1	2	3	3	3	4	2	4	4	1	4	5	2	4	1	1	1	5	5
761	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	1	1	1	1	4	4
762	7.0.044	VSLDRAFT	1	2	3	3	3	4	3	4	3	1	2	3	2	3	2	1	1	3	3
763	7.0.044	VSLDRAFT	1	1	4	3	3	4	5	4	3	3	2	3	3	2	1	1	1	5	3
764	7.0.044	VSLDRAFT	1		4	5	5	4	3	4	4	1	4	2	2	4	1	1	1	3	3
765	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	1	4	4	1	2	2	2	4	4
766	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	5	2	2	4	2	3	1	1	1	4	4
767	7.0.044	VSLDRAFT	1	1																	
768	7.0.044	VSLDRAFT	1	2	4	4	5	4	4	4	5	4	1	4	4	1	1	1	1	4	4
769	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	1	4	4	1	1	1	1	4	4
770	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	2	4	4	3	1	1	1	4	4
771	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	3	5	4	3	2	2	2	4	4
772	7.0.044	VSLDRAFT	1	2	5	5	5	5	5	3	2	1	4	1	2	1	1	1	1	5	5
773	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	2	4	2	1	4	4	3	3	3	3	4	4
774	7.0.044	VSLDRAFT	1	2	1		2	1	1	5	2	4	4	1	1	4	2	2	2	5	5
775	7.0.044	VSLDRAFT	1	2	3	3	3		4	3	3	2	1	4	3	4	3	3	3	4	4
776	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	3	2	1	4	4	1	1	1	1	4	4
777	7.0.044	VSLDRAFT	1	2	3	2	2	3	3	4	2		3	3	2	1	1	1	1	3	3
778	7.0.044	VSLDRAFT	1	2	3	3	3	3	3	4	3	4	3	4	4	2	3	3	2	3	2
779	7.0.044	VSLDRAFT	1	1	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
780	7.0.044	VSLDRAFT	1	2	3	2	2	3	2	1	1	1	4	2	3	3	2	3	3	2	3
781	7.0.044	VSLDRAFT	1	2																	
782	7.0.044	VSLDRAFT	1	2	3	3	3	2	3	3	2	2	3	3	2	3	2	2	2	3	3
783	7.0.044	VSLDRAFT	1	2	3	3		3	3	3	2	3	1	4	4	2	4	2	2	4	4
784	7.0.044	VSLDRAFT	1	2	2	5	5		3	4	5	3	5	5	3	2	1	1	1	5	5
785	7.0.044	VSLDRAFT	1	2	2	2	5		4	4	4	2	4	1	2	2	2	2	2	5	5
786	7.0.044	VSLDRAFT	1	2	3	5	5	4	3	4	2	3	3	3	3	1	3	2	2	4	4
787	7.0.044	VSLDRAFT	1	2	3	3	3	4	3	4	3	3	1	3	5	1	1	1	1	4	4
788	7.0.044	VSLDRAFT	1	2	4	3	3	3	3	3	3	4	5	4	3	1	1	1	1	3	3
789	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	5	1	4	4	1	1	1	1	4	4
790	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	3	1	4	3	3	2	2	2	4	4
791	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	3	2	2	2	4	4

792	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
793	7.0.044	VSLDRAFT	1	2	2	2	2	3	2	3	2	3	2	1	3	2	2	2	2	3	2
794	7.0.044	VSLDRAFT	1	2	2	2	2	3	2	3	2	3	2	1	3	2	2	2	2	3	2
795	7.0.044	VSLDRAFT	2	2	4	4	3	4	4	4	4	2	1	4	4	1	3	3	2	3	4
796	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	3	2	3	3		4	4
797	7.0.044	VSLDRAFT	1	2	2	2	2	2	2	3	2	2	4	1	1	1	1	1	1	1	1
798	7.0.044	VSLDRAFT	1	2	2	2	2	3	2	3	2	2	3	3	3	1	3	2	1	3	2
799	7.0.044	VSLDRAFT	1	2	4	3	5	4	4	4	4	2	1	4	3	2	2	1	1	4	4
800	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	2	2	2	4	4
801	7.0.044	VSLDRAFT	1	2	2	5	5	2	2	5	2	3	5	5	3	1	2	3	5	2	2
802	7.0.044	VSLDRAFT	1																		
803	7.0.044	VSLDRAFT	1	2	3	3	2	3	2	3	2	2	5	5	3	4	1	1	1	3	3
804	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	1	4	3	1	2	2	2	4	4
805	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	1	3	1	1	1	1	4	4
806	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	1	4	4	1	1	1	1	4	4
807	7.0.044	VSLDRAFT	1	1	5	5	3	2	3	3	2	2	3	2	2	2	1	1	1	3	3
808	7.0.044	VSLDRAFT	1	2	5	5	5	5	5	5	5	1	1	4	5	1	1	1	1	5	5
809	7.0.044	VSLDRAFT	1	2	2	2	2	2	1	4	3	3	4	2	3	4	2	1	1	2	3
810	7.0.044	VSLDRAFT	1	2	3	4	4	4	4	4	4	1	2	5	1	4		1	1	3	3
811	7.0.044	VSLDRAFT	1	2	3		3	3	4	4	3	3	4	2	3	1	3	1			2
812	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	3	2	2	1	4	1	1	1	1	3	4
813	7.0.044	VSLDRAFT	1	1	3	2	2	3	3	4	2	2		2	2	1	1	1	1	4	4
814	7.0.044	VSLDRAFT	2		3	4	4	4	4	4	4	2	1	4	4	1	2	1	1	4	4
815	7.0.044	VSLDRAFT	1	2	4	5		4	4	4	4	4	1	5	1	1	1	1	1	4	4
816	7.0.044	VSLDRAFT	2	2	5	5	5	3	2	4	5	1	4	1	1	1	1	1	1	5	5
817	7.0.044	VSLDRAFT	1	2	3	3	3	3	3	4	4	4	2	3	4	1	1	1	1	4	4
818	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	4	4	4	4	4
819	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	1	4	4	1		3	3	4	
820	7.0.044	VSLDRAFT	1	1	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

821	7.0.044	VSLDRAFT	1	2																	
822	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	2	2	2	4	4
823	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	1	1	4	4	2	1	1	1	4	4
824	7.0.044	VSLDRAFT	1	2																	
825	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	4	2	4	4	3	2	2	2	2	3	3
826	7.0.044	VSLDRAFT	1	2	3	3	3	4	4	2	3	2	1		4	4	3	3	4	4	4
827	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	3	1	4	3	1	3	2	2	3	3
828	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	2	1	1	1	1	4	4
829	7.0.044	VSLDRAFT	1	2	4	3	2	4	4	4	4	3	1	3	4	1	1	1	1	4	4
830	7.0.044	VSLDRAFT	1	2	5	5	5	5	5	5	5	3	2	5	5	1	2	1	5	5	5
831	7.0.044	VSLDRAFT	1	2	2	2	2	3	3	4	2	3	2	3	2	1	1	1	1	2	2
832	7.0.044	VSLDRAFT	2	2	4	3	2	4	4	4	4	2	2	3	3	1	1	1	1	4	2
833	7.0.044	VSLDRAFT	1	2	5	5	5	4	4	5	5	2	5	5	5	2	2	2	2	4	4
834	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	4	1	4	4	1	1	1	1	1	1
835	7.0.044	VSLDRAFT																			
836	7.0.044	VSLDRAFT	1	2	2	2	1	1	2	4	3	3	4	4	3	4	4	3	2	3	3
837	7.0.044	VSLDRAFT	1	2	3	3	3	3	2	3	2	2	1	3	3	1	2	2	2	3	3
838	7.0.044	VSLDRAFT	1	2	4	4	5	4	4	4	4	4	1	4	4	1	2	1	1	4	4
839	7.0.044	VSLDRAFT	1	2	2	2	2	2	4	4	3	4	4	5	3	1	4	3	4	3	3
840	7.0.044	VSLDRAFT	1	2	5	5	5	5	5	4	5	2	5	5	5	1	3	3	3	5	5
841	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	3	2	2	1	4	4
842	7.0.044	VSLDRAFT	1	2	1	1	1	4	2	3	1	2	4	1	1	2	1	1	1	5	2
843	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	2	4	2	2	4	4
844	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	4	2	2	2	4	4
845	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	5	3	1	4	3	1	2	2	2	4	3
846	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	3	2	2	2	2	4	4
847	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	5	2	4	4	4	4	4	4	4
848	7.0.044	VSLDRAFT	1	2	3	3	3	4	4	4	3	2	2	3	3	2	2	2	2	3	3
849	7.0.044	VSLDRAFT	1	2	5	5	5	3	3	4	3	2	1	4	4	1	2	2	1	3	3
850	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	1	1	4	4	1	3	3	3	5	5
851	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	4	1	4	4	2	3	3	3	4	4
852	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	4	1	4	4	2	3	3	3	4	4
853	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	1	4	3	3	1	2	2	4	4
854	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	4	1	1	4	3	1	1	1	1	4	4
855	7.0.044	VSLDRAFT	1	2	4	3	3	3	4	4	3	3	2	3	3	1	3	3	3	4	5
856	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	3	3	2	1	4	3	1	2	2	2	4	4
857	7.0.044	VSLDRAFT	1	2	3	3	4	4	4	4	4	4	1	4	4	1	1	1	1	4	4
858	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	3	4	1	4	2	1	3	3	3	4	4
859	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	2		2	2	2	4	4
860	7.0.044	VSLDRAFT	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

861	7.0.044	VSLDRAFT	1	2	2	2	2	2	3	3	2	2	3		3	1	3	2	2	5
862	7.0.044	VSLDRAFT	1	2	3	5	5	3		4	5	4	5	5	3	4	2	1	1	5
863	7.0.044	VSLDRAFT	1	2	4	4	5	4	4	4	4	4	5	2	3	1	2	1	1	3
864	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	5	4	2	4	4	2	2	1	1	5
865	7.0.044	VSLDRAFT	1	1	4	4	5	4	4	4	4	4	1	4	4	1	2	2	3	4
866	7.0.044	VSLDRAFT	1	2	4	4		4	4	4	4	3	1	4	4	1	2	2	2	4
867	7.0.044	VSLDRAFT	2	2	1	1	1	1	1	1	1	3	4	2	1	4	3	1	1	1
868	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	1	4	4	3	1	1	1	4
869	7.0.044	VSLDRAFT	1	2	2	5	5	2	2	2	5	3	4	2	2	3	2	2	2	5
870	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	1	4	4	1	3	3	4	4
871	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	4	4	1	4	4	3	2	2	2	3
872	7.0.044	VSLDRAFT	1	2	4	4	3	4	4	4	4	4	1	4	4	4	4	4	2	4
873	7.0.044	VSLDRAFT	1	2	3	4	4	4	4	4	4	3	1	4	4	1	1	1	1	4
874	7.0.044	VSLDRAFT	1	2	3	3	3	3	3	3	3	4	2	3	3	4	1	1	1	3
875	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	4	4	4	1	2	2	2	4
876	7.0.044	VSLDRAFT	1	2	5	5	3	3	3	4	3	3	5	4	5	2	1	1	1	3
877	7.0.044	VSLDRAFT	1	2	3	5	5	4	4	4	3	2	2	3	3	2	3	2	2	3
878	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	4	1	1	1	4
879	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	1	1	4	4	1	3	2	1	4
880	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	3	3	1	1	1	2	2	4	2	1	4
881	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4		1	4	4	4	4
882	7.0.044	VSLDRAFT	1	2	4	3	5	4	4	4	4	2	3	2	4	2	2	2	2	4
883	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	1	4	4	1	3		3	4
884	7.0.044	VSLDRAFT	1	2	3	3	3	4	3	4	3	4	1	4	4	2	4	4	4	3
885	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	4	4	3	4
886	7.0.044	VSLDRAFT	1	2	4	4	2	4	4	4	4	4	1	4	4	1	4	2	2	4
887	7.0.044	VSLDRAFT	1	2	2	2	2		1	1	1	2	4	2	2	1	3	2	2	2
888	7.0.044	VSLDRAFT	1	1	3	3	3	3	3	4	3	4	2	3	2	4	1	1		4
889	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	3	3	2	4	3	2	1	1	1	4
890	7.0.044	VSLDRAFT	1	2	2	3	2	3	3	4	2	2	4	1		1	1	1	1	3
891	7.0.044	VSLDRAFT	2	2																
892	7.0.044	VSLDRAFT	1	2	2	2	2	3	2	4	2	2	2	2	2	1	1	1	1	2
893	7.0.044	VSLDRAFT	1	2	5	5	2	3	2	5	5	5	4	1	5	2	1	1	1	5
894	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	4	2	1	4	3	4	2	2	1	4
895	7.0.044	VSLDRAFT	1	2	4	4	4	4	3	4	4	4	1	4	4	1	4	4	4	4
896	7.0.044	VSLDRAFT	2	2	4		4	4	4		4	4	1	4	4	1	4	4	4	4
897	7.0.044	VSLDRAFT	1	2	2	2	2	2	3	3	2	3	2	2	3	2	1	1	1	3
898	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	3	3	5	5	3	3	1	1	1	4
899	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	3	2	2	4
900	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	1	4	4	4	3	3	3	4

901	7.0.044	VSLDRAFT	1	2	3	3	3	4	3	4	3	2	2	4	2	1	1	1	1	4	4
902	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	1	4	3	2	1	1	1	4	4
903	7.0.044	VSLDRAFT	1	2	3	5	2	2	4	4	2	3	2	3	3	1	4	3	2	4	4
904	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	1	1	1	1	1	4	4
905	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	1	1	1	4	4
906	7.0.044	VSLDRAFT	3	2	4	3	3	4	3	4	4	4	1	4	4	1	4	2	1	3	3
907	7.0.044	VSLDRAFT	1	2	3	2	2	3	2	4	2	3	5	3	3	2	3	2	2	3	3
908	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	4	2	2	3	2	3	1	1	1	4	4
909	7.0.044	VSLDRAFT	1	2	1	1	1		1	1	1	5	5	1	2	5		2	2	5	5
910	7.0.044	VSLDRAFT	1	2	4	5		4	4	4	4	4	1	4	4	1	4	3	3	4	4
911	7.0.044	VSLDRAFT	1	2	4	5		4	4	4	4	4	1	4	4	1	4	3	3	4	4
912	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	2	4	4	2	2	2	3	3	3
913	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	3	3	1	4	4	1	3	3	1	3	4
914	7.0.044	VSLDRAFT	1	2	3	3	3	3	3	3	3	3	3	3	3	1	3	3	3	3	3
915	7.0.044	VSLDRAFT	1	1	4	3	3	4	4	4	3	3	4	4	4	1	3	3	3	4	4
916	7.0.044	VSLDRAFT	1	2	2	5	2	2	2	4	2	1	3	3	2	1	2	1	1	2	2
917	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	1	1	1	4	4
918	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	4	4	4	4	4
919	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	1	4	1	1	1	1	1	4	4
920	7.0.044	VSLDRAFT	1	2	4	4	3	4	4	4	3	3		4	4	1	3	2	2	4	4
921	7.0.044	VSLDRAFT	1	2																	
922	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	4	4	4	4	4
923	7.0.044	VSLDRAFT	1	2	4	4	2	4	4	4	3	4	1	4	4	1	2	2	1	4	4
924	7.0.044	VSLDRAFT	1	2	3	2	3	2	3	2	3	2	2	2	3	1	2	2	2	4	4
925	7.0.044	VSLDRAFT	1	2	2	2	2	2	2	3	2	3	3	3	2	1	3	2	2		
926	7.0.044	VSLDRAFT	1	1	4	3	3	4	4	4	4	5	2	4		1	2	2	2	4	4
927	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	2	4	1	4	4	1	2	2	2	4	4
928	7.0.044	VSLDRAFT	1	2	3	3	5	3	4	4	3	4	3	4	4	1	4	3	3	3	3
929	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	4	1	1	4	4	4
930	7.0.044	VSLDRAFT	1	2	4	3	3	3	4	3	3	2	1	4	3	1	2	2	2	3	3
931	7.0.044	VSLDRAFT	1	2	4	3	4	4	4	3	3	4	2	2	2	2	2	2	2	4	4
932	7.0.044	VSLDRAFT	1	2	1	2	2	1	2	2	1	2	4	1	1	2	3	2	1	0	2
933	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	2	2	2	4	4
934	7.0.044	VSLDRAFT	1	2	4	2	2	4	4	4	2	3	1	4	1	2	1	1	1	3	3
935	7.0.044	VSLDRAFT	1	2	3	3	3	4	4	4	3	2	1	4	2	4	1	1	1	5	5
936	7.0.044	VSLDRAFT	3	2	3	2	2	4	4	4	2	2	3	3	4	0	2	1	1	4	4
937	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	3	3	2	4	3	3	1	1	1	4	4
938	7.0.044	VSLDRAFT	1	2	3	2	2	3	3	2	3	4	3	3	3	2	1	1	1	3	3
939	7.0.044	VSLDRAFT	1	2	2	5	5	2	3	4	5	4	4	3	4	4	1	1	1	2	3
940	7.0.044	VSLDRAFT	3	2	4	4	3	4	4	4	4	3	1	4	3	4	4	2	1	4	4

941	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	2	1	1	4	4
942	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	4	4	4	4	4
943	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	4	1	4	3	1	1	1	1	4	4
944	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	4	1	1	1	4	4
945	7.0.044	VSLDRAFT	1	2	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
946	7.0.044	VSLDRAFT	1	2	5	5	5	5	0	5	0	5	0	4	0	2	4	0	0	3	3
947	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	0	4	0	4	4
948	7.0.044	VSLDRAFT	1	2	3	4	3	2	4	4	4	3	5	2	3	2	1	1	2	4	4
949	7.0.044	VSLDRAFT	1	1	5	5	5	5	5	5	5	4	1	4	4	1	3	3	3	5	5
950	7.0.044	VSLDRAFT	1	2	3	3	3	2	3	3	3	2	2	3	3	2	1	1	1	3	3
951	7.0.044	VSLDRAFT	1	2	1	2	2	2	3	3	2	4	4	3	0	3	0	1	1	3	2
952	7.0.044	VSLDRAFT	3	2	2	2	2	3	3	3	3	3	5	3	2	4	1	1	1	2	2
953	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	4	3	1	4	4	2	2	1	1	4	4
954	7.0.044	VSLDRAFT	2	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	4
955	7.0.044	VSLDRAFT	1	2	3	3	3	2	3	4	3	3	4	4	3	1	2	2	2	2	4
956	7.0.044	VSLDRAFT	1	2	4	4	4	2	3	4	3	1	4	2	4	3	2	2	1	2	2
957	7.0.044	VSLDRAFT	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	5	2	1
958	7.0.044	VSLDRAFT	1	2	3	2	2	3	3	4	2	4	1	4	3	1	3	2	1	5	2
959	7.0.044	VSLDRAFT	1	2	3	3	2	3	4	4	3	4	1	4	3	2	1	1	1	4	4
960	7.0.044	VSLDRAFT	1	2	2	2	2	2	4	4	4	2	5	2	2	3	2	2	2	5	3

961	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	1	4	1	2	2	1	1	4	4
962	7.0.044	VSLDRAFT	1	2	3	2	3	2	4	3	2	2	4	4	2	3	1	1	1	3	3
963	7.0.044	VSLDRAFT	1	1	5	5	5	2	3	5	5	5	5	2	5	1	3	3	2	5	5
964	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	1	4	4	1	2	2	2	4	4
965	7.0.044	VSLDRAFT	1	1	3	2	3	4	4	4	5	4	1	4	4	1	2	2	2	4	4
966	7.0.044	VSLDRAFT	1	2	3	3	3	3	0	4	3	2	1	4	3	1	2	1	1	3	3
967	7.0.044	VSLDRAFT	1	1	2	2	2	2	2	3	2	3	2	3	2	3	3	3	3	3	3
968	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	1	2	2	2	4	4
969	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	4	2	1	4	2	3	1	1	1	4	4
970	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	5	2	1	4	2	2	3	1	1	4	4
971	7.0.044	VSLDRAFT	1	1	4	3	3	4	4	4	3	4	1	4	0	2	3	3	3	4	4
972	7.0.044	VSLDRAFT	1	1	4	3	3	4	4	4	3	4	1	4	0	2	3	3	3	4	4
973	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	1	4	4	1	2	2	2	4	4
974	7.0.044	VSLDRAFT	1	2	2	2	2	2	2	2	2	1	4	1	1	1	1	1	1	2	2
975	7.0.044	VSLDRAFT	1	2	3	3	3	3	3	4	3	4	1	4	3	2	2	2	2	3	3
976	7.0.044	VSLDRAFT	1	2	3	3	2	3	3	4	3	3	4	3	4	2	3	2	2	3	3
977	7.0.044	VSLDRAFT	1	1	4	5	0	4	4	4	2	4	3	2	4	1	1	1	1	3	4
978	7.0.044	VSLDRAFT	2	2	1	1	1	1	1	1	1	1	4	1	1	1	1	1	1	1	1
979	7.0.044	VSLDRAFT	1	1	2	1	1	0	1	4	1	4	4	2	2	1	1	1	1	2	2
980	7.0.044	VSLDRAFT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
981	7.0.044	VSLDRAFT	1	2	4	0	2	4	4	4	2	3	4	4	3	3	2	2	2	4	4
982	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	2	2	3	2	1	1	1	4	0
983	7.0.044	VSLDRAFT	1	2	4	5	5	4	4	4	3	3	5	5	4	4	1	1	1	4	4
984	7.0.044	VSLDRAFT	1	1	4	5	5	4	4	3	4	4	1	4	3	1	2	3	3	3	3
985	7.0.044	VSLDRAFT	1	2	4	4	3	4	4	4	3	2	1	4	4	3	2	2	1	4	4
986	7.0.044	VSLDRAFT	1	2	3	3	0	4	4	4	3	4	1	4	4	1	4	3	3	4	4
987	7.0.044	VSLDRAFT	1	2	4	4	2	4	4	4	4	2	1	4	2	2	1	1	1	4	4
988	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	2	2	2	4	4
989	7.0.044	VSLDRAFT	1	2	2	5	5	4	4	4	4	4	1	4	4	4	2	2	2	3	4
990	7.0.044	VSLDRAFT	2	2	5	3	1	1	1	2	1	3	3	3	3	1	1	1	0	4	4
991	7.0.044	VSLDRAFT	1	2	3	2	2	3	2	3	2	2	3	3	2	2	2	1	1	2	2
992	7.0.044	VSLDRAFT	1	2	4	3	3	4	3	4	3	3	2	4	2	3	2	2	2	3	3
993	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	1	2	2	2	4	4
994	7.0.044	VSLDRAFT	1	2	4	3	4	4	4	4	4	4	1	4	4	1	1	1	1	4	4
995	7.0.044	VSLDRAFT	1	2	3	0	0	3	3	4	3	2	1	4	3	3	2	2	2	0	0
996	7.0.044	VSLDRAFT	1	2	4	3	3	4	3	4	3	1	1	4	2	4	1	1	1	1	1
997	7.0.044	VSLDRAFT	1	2	3	5	5	4	4	3	5	3	2	3	3	1	3	3	3	3	3
998	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	4	4	1	4	4	2	3	3	3	4	4
999	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	3	3	3	4	3	2	2	4	4
1000	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	4	1	1	1	1	4	4

1001	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	3	1	4	4	1	3	3	2	4	4
1002	7.0.044	VSLDRAFT	1	2	3	3	3	3	3	4	3	3	5	3	2	2	2	2	1	3	3
1003	7.0.044	VSLDRAFT	1	2	3	5	5	4	4	4	4	3	2	4	0	3	1	1	1	4	4
1004	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	4	1	4	4	4	1	1	1	4	4
1005	7.0.044	VSLDRAFT	1	1	2	2	2	3	3	4	2	3	2	3	2	1	2	2	3	3	4
1006	7.0.044	VSLDRAFT	1	1	2	2	2	3	3	4	3	4	2	2	2	1	4	3	3	4	4
1007	7.0.044	VSLDRAFT	1	2	5	5	5	4	5	4	2	3	5	5	5	4	2	2	2	5	5
1008	7.0.044	VSLDRAFT	1	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
1009	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	3	3	1	4	4	1	1	2	2	4	4
1010	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	3	1	2	4	3	1	2	2	2	4	4
1011	7.0.044	VSLDRAFT	1	1	4	4	2	4	4	4	4	4	1	4	2	1	1	1	1	4	4
1012	7.0.044	VSLDRAFT	1	2	4	4	4	3	4	4	5	4	1	4	4	3	2	2	1	4	4
1013	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	0	1	4	4	1	1	1	1	4	4
1014	7.0.044	VSLDRAFT	1	2	5	5	5	3	3	4	5	4	2	4	5	1	1	1	1	5	5
1015	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	1	1	3	4	1	1	1	1	4	4
1016	7.0.044	VSLDRAFT	1	2	3	5	5	3	3	4	3	3	2	4	3	4	3	3	3	3	3
1017	7.0.044	VSLDRAFT	1	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
1018	7.0.044	VSLDRAFT	1	1	2	0	3	3	3	4	4	4	5	2	5	1	2	2	2	5	5
1019	7.0.044	VSLDRAFT	1	2	4	5	0	4	4	4	5	4	1	4	5	1	1	1	1	5	5
1020	7.0.044	VSLDRAFT	1	2	4	4	4	4	4	4	4	2	1	4	2	1	1	1	1	4	4
1021	7.0.044	VSLDRAFT	1	2	4	4	3	4	4	4	4	4	1	4	4	2	2	2	2	4	4
1022	7.0.044	VSLDRAFT	1	2	3	3	3	3	3	4	3	4	2	3	3	2	0	2	2	3	3
1023	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	4	4	4	1	4	4	3	2	4	3	4	4
1024	7.0.044	VSLDRAFT	1	2	4	3	3	3	3	4	3	3	1	4	3	1	2	2	2	4	4
1025	7.0.044	VSLDRAFT	1	2	4	3	3	4	4	4	3	3	1	4	3	1	1	1	1	3	3
1026	7.0.044	VSLDRAFT	1	2	4	3	2	4	4	4	3	3	1	4	4	1	1	2	2	4	4
1027	7.0.044	VSLDRAFT	1	1	4	3	2	4	4	4	4	4	2	3	3	4	1	1	1	4	4
1028	7.0.044	VSLDRAFT	1	2	2	2	2	3	2	3	2	2	1	4	4	4	2	2	2	3	2
1029	7.0.044	VSLDRAFT	1	1	4	4	4	4	4	3	4	0	1	4	4	1	2	2	0	4	4
1030	7.0.044	VSLDRAFT	1	1	4	3	3	4	4	4	3	4	4	4	4	4	4	2	2	4	4

Dataset on gender, age group, income, zip code, ethnicity

S.No	QGender	QAge Group	QIncome	QZip_1	QZip_2	QEthnic_1	QEthnic_2	QEthnic_3	QEthnic_4	QEthnic_5	QEthnic_6	Date
1	1	5	3	63021						1		Fri Jan 09 2009 16:04:34
2	2	4	3	63010	63017					1		Fri Jan 09 2009 19:01:18
3	2	3	4	63026	63017					1		Mon Jan 12 2009 09:23:30
4	2	4	5	63122	63017					1		Mon Jan 12 2009 09:25:24
5	2	3	4	62234	63017					1		Mon Jan 12 2009 09:25:32
6	2	4	3	63031	63136					1		Mon Jan 12 2009 09:26:23
7	1	4	5							1		Mon Jan 12 2009 09:27:20
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14	1	3	3	63088	63128					1		Mon Jan 12 2009 09:40:58

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26	2	3	3	63021	63131					1		Mon Jan 12 2009 10:03:05
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39	1	3	4	63042	63017				1	1		Mon Jan 12 2009 10:46:07
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58	1	3	3	63136	63017						1	Mon Jan 12 2009 12:04:40
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60	1	3	4	63016	63017					1		Mon Jan 12 2009 12:19:33
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72	1	3	5	63119	63026					1		Mon Jan 12 2009 13:13:54
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79	1	4	6	63129	62243					1		Mon Jan 12 2009 13:33:01
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83	1	4	5	63044	63125					1		Mon Jan 12 2009 13:36:32
84	2	3	2									Mon Jan 12 2009 13:38:05
85	2	3	9	63129	63368					1		Mon Jan 12 2009 13:38:45
86	2	2	3	63010	63122					1		Mon Jan 12 2009 13:39:23
87	1	3	3	63146	63144					1		Mon Jan 12 2009 13:39:49
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157	1	3	4	63111	63141					1		Mon Jan 12 2009 15:26:48
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205	2	4	7	63129	63102					1		Mon Jan 12 2009 17:28:11
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209	1	4	9	63031	63042					1		Mon Jan 12 2009 17:43:42
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216	2	4	6	63131	sefl employed travel to airport regula					1		Mon Jan 12 2009 18:37:01

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244	1	3	8	63017	63114					1		Mon Jan 12 2009 22:01:06
245	1	4	7	63129						1		Tue Jan 13 2009 00:22:58
246	1	4	5	63129	63129					1		Tue Jan 13 2009 02:54:58
247	1	3	3	63143	62221					1		Tue Jan 13 2009 06:03:07
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												06:46:21
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273	1	4	4	63021	63141					1		Tue Jan 13 2009 14:46:34
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275	2	3	2	63144	63110					1		Tue Jan 13 2009 15:22:51
276	1	4	8	63122	63141					1		Tue Jan 13 2009 16:29:58
277	1	4	5	63025	63043					1		Tue Jan 13 2009 16:40:52
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279	1	3	7							1		Tue Jan 13 2009 17:33:31
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291	1	4	5	63026	63026					1		Wed Jan 14 2009 09:32:16
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865	1	3	9								1	Mon Jun 01 2009 02:30:28
866	1	3	4	63366	63126					1		Mon Jun 01 2009 11:50:51
867	1	2	2						1			Mon Jun 01 2009 17:47:35
868	1	4	3	63034	63043					1		Fri Jun 05 2009 07:53:27
869	2	4	4	63115	63114			1				Fri Jun 05 2009 11:06:02
870	2	3	6	63303	63102					1		Fri Jun 05 2009 14:00:29
871	1	4	5	63011	63101		1					Mon Jun 08 2009 17:33:05
872	1	4	4									Tue Jun 09 2009 15:17:15
873	1	3	2	63028						1		Mon Jun 15 2009 20:46:13
874	1	3	4	63303	63043					1		Wed Jun 17 2009 13:57:31
875	2	4		63376	63141					1		Thu Jun 18 2009 08:55:09

876	1	4	4	63043	63123					1		Thu Jun 18 2009 09:01:32
877	2	3	4	63301	63121					1		Thu Jun 18 2009 14:44:08
878	1	4	4	63017	varies					1		Thu Jun 18 2009 20:58:53
879	1	3	4	63376	63110					1		Fri Jun 19 2009 11:30:02
880	1	4	5	63303	63105					1		Mon Jun 22 2009 18:00:51
881	2	4	7	63128	63146					1		Wed Jun 24 2009 12:18:53
882	1	3	2	63033	63005					1		Thu Jun 25 2009 12:41:45
883	1	4	6	63367	63166					1		Mon Jun 29 2009 15:12:46
884	1	2	2	63304	63121					1		Mon Jun 29 2009 20:49:07
885	2	4	4	63028	63131					1		Fri Jul 03 2009 08:12:26
886	2	3	2							1		Sat Jul 04 2009 05:21:11
887	1	3	4	63068	63011					1		Mon Jul 13 2009 13:30:29
888	1	4	4	63129	63017					1		Mon Jul 13 2009 22:26:57
889	2	2	1	62034	63146					1		Tue Jul 14 2009 10:22:17
890	1	4	3	63069	63017					1		Tue Jul 21 2009 06:09:09
891				test	test							Tue Jul 21 2009 13:09:38
892	1	3	2	63128	63099					1		Tue Jul 21 2009 14:37:39

893	1	3	1	66209	64108					1		Wed Jul 22 2009 17:01:53
894	1	4	6							1		Thu Jul 23 2009 13:13:27
895	1	4	9	63129						1		Tue Jul 28 2009 17:46:04
896	2	2	2	63138	63141			1				Tue Jul 28 2009 18:00:14
897	2	4		63146	63043					1		Fri Jul 31 2009 10:13:36
898	1	4	5	63125	63141					1		Mon Aug 03 2009 11:24:45
899	1	3	2	63146	63101	1				1		Mon Aug 03 2009 11:57:25
900	1	4	5									Fri Aug 07 2009 09:37:59
901	1	4										Mon Aug 10 2009 09:19:35
902	1	3	3	63005	62040					1		Wed Aug 12 2009 10:54:31
903	1	3	2	63116	63031					1		Wed Aug 19 2009 10:31:17
904	1	2	2	63146	63146			1				Thu Aug 20 2009 09:35:30
905	1	3	3	63051	63128					1		Fri Aug 21 2009 15:39:29
906	1	4	1	63129						1		Sun Aug 23 2009 15:19:44
907	1	3	3	63051	63114					1		Tue Sep 01 2009 03:39:43
908	2	3	3	63010	63146					1		Tue Sep 01 2009 16:12:33
909	1	4	9	66061	66202					1		Tue Sep 08 2009 16:46:33

910	2	3	4	63031						1		Tue Sep 08 2009 18:00:15
911	2	3	4	63031						1		Tue Sep 08 2009 18:00:26
912	1	4	4							1		Tue Sep 08 2009 20:54:49
913	1	3	4	63376	63141					1		Fri Sep 11 2009 17:20:29
914	1	2	3	62025	63104					1		Fri Sep 11 2009 17:30:28
915	2	3	2	63043	62025					1		Fri Sep 18 2009 18:42:54
916	1	4	7	63031	63099					1		Thu Sep 24 2009 10:56:26
917	1	3	4	63128	63124					1		Sun Sep 27 2009 22:45:31
918	1	2	2	63010	63045					1		Mon Sep 28 2009 10:29:02
919	1	3	7							1		Fri Oct 02 2009 14:11:04
920	2	4	2	63111	63017					1		Thu Oct 08 2009 14:31:13
921												Sat Oct 10 2009 04:11:25
922	1	4	5	63026	63145					1		Mon Oct 12 2009 08:24:25
923	2	2	1	63123	63045					1		Thu Oct 15 2009 13:18:54
924	1	3	4				1					Thu Oct 15 2009 17:43:24
925	1	4	5	65401	65566					1		Thu Oct 15 2009 18:21:51
926	1	3	4	63376						1		Mon Oct 19 2009 23:23:11

927	2	2	1	63043	63141	1		1		1		Fri Oct 23 2009 13:21:06
928	1	4	4	63011		1	1			1		Wed Oct 28 2009 04:08:00
929	2	2	4	63052	63105					1		Wed Oct 28 2009 14:47:12
930	1	2	0			0	0	0	0	0	0	Mon Nov 02 2009 00:24:32
931	2	4	8	63131	63147	0	0	0	0	1	0	Mon Nov 02 2009 16:51:37
932	1	3	5	65203	65201	0	0	0	0	1	0	Tue Nov 03 2009 09:15:45
933	2	3	3	62260	63385	0	0	0	0	1	0	Tue Nov 03 2009 09:22:57
934	1	3	5	63129	63132	0	0	0	0	1	0	Tue Nov 03 2009 18:12:26
935	1	3	3	63143	63125	0	0	0	0	1	0	Tue Nov 03 2009 23:30:22
936	2	4	9	63043	63011	0	0	0	0	1	0	Wed Nov 04 2009 09:43:32
937	2	3	9	63146	63042	0	0	0	0	1	0	Fri Nov 06 2009 00:22:45
938	2	3	3	63105		0	0	0	0	1	0	Fri Nov 06 2009 10:43:41
939	2	2	1	63141	63104	0	0	0	0	1	0	Sat Nov 07 2009 08:00:50
940	1	4	3		63017	0	0	0	0	1	0	Mon Nov 09 2009 08:51:35
941	1	3	3	63043	63124	0	0	0	0	1	0	Mon Nov 09 2009 15:19:13
942	2	3	2	63010	63045	0	0	0	0	1	0	Fri Nov 13 2009 18:32:21
943	1	3	3	63366	63044	0	0	0	0	1	0	Sat Nov 14 2009 12:58:09

944	1	4	6	63051	63141	0	0	0	0	1	0	Wed Nov 18 2009 08:59:58
945	2	4	3	63385	63123	0	0	0	0	1	0	Thu Nov 19 2009 00:17:41
946	1	4	4	63031	63114	0	0	0	0	1	0	Sun Nov 22 2009 11:54:52
947	1	4	5	63025	63042	0	0	0	0	1	0	Tue Nov 24 2009 14:55:20
948	1	2	4	63033	63043	0	0	0	0	1	0	Thu Nov 26 2009 23:55:33
949	1	3	8			0	0	0	0	1	0	Sun Nov 29 2009 17:14:00
950	1	4	5	62034	63141	0	0	0	0	1	0	Mon Nov 30 2009 12:17:19
951	2	4	6	63126	63146	0	0	0	0	1	0	Mon Nov 30 2009 20:06:24
952	1	5	0	63042	retired	0	0	0	0	1	0	Tue Dec 01 2009 20:06:55
953	1	3	4	63088	63042	0	0	0	0	1	0	Tue Dec 01 2009 22:45:34
954	1	4	2	63376	63301	0	0	0	0	1	0	Thu Dec 03 2009 10:27:15
955	0	0	0			0	0	0	0	0	0	Sun Dec 06 2009 10:46:11
956	2	4	4	63031	63131	0	0	0	0	1	0	Sun Dec 06 2009 13:31:05
957	0	0	9			1	0	0	0	0	0	Sun Dec 06 2009 22:41:01
958	2	2	2	63139	63301	0	0	0	0	1	0	Sun Dec 06 2009 23:04:10
959	1	4	3	63125		0	0	0	0	1	0	Mon Dec 07 2009 11:07:54
960	1	4	2	63021	63103	0	0	0	0	1	0	Mon Dec 07 2009 14:07:31

961	1	4	6	63017	63118	0	0	0	0	1	0	Tue Dec 08 2009 23:05:15
962	1	2	3	63012	63010	0	0	0	0	1	0	Fri Dec 11 2009 15:35:30
963	1	3	3			0	0	0	0	0	0	Mon Dec 14 2009 22:05:39
964	1	4	7	63114	63103	0	0	0	0	1	0	Thu Dec 17 2009 17:48:00
965	0	3	3			0	0	0	0	0	0	Fri Dec 18 2009 21:44:13
966	1	4	4	63122	63128	0	0	0	0	1	0	Mon Dec 21 2009 16:38:02
967	1	3	2			0	0	0	0	1	0	Sat Dec 26 2009 20:16:22
968	1	3	3	63376	63146	0	0	0	0	1	0	Wed Dec 30 2009 23:10:41
969	2	4	5	63123	63146	0	0	0	0	1	0	Fri Jan 01 2010 10:53:12
970	1	3	3	63146	63146	0	0	0	0	1	0	Wed Jan 06 2010 23:12:45
971	2	4	0	63043	63122	0	0	0	0	1	0	Thu Jan 07 2010 04:23:18
972	2	4	0	63043	63122	0	0	0	0	1	0	Thu Jan 07 2010 04:23:24
973	1	4	5	63109	63105	0	0	0	0	1	0	Thu Jan 07 2010 11:56:00
974	1	2	4	65202	65202	0	0	0	0	1	0	Fri Jan 08 2010 11:12:20
975	1	4	5	63130	63301	0	0	0	0	1	0	Fri Jan 08 2010 15:48:34
976	1	4	5	63129	63045	0	0	0	0	1	0	Mon Jan 11 2010 14:17:57
977	1	4	7	63131	63131	0	0	0	0	1	0	Sat Jan 16 2010 22:35:30

978	1	3	4	62023	63119	0	0	0	0	1	0	Tue Jan 19 2010 22:50:31
979	1	3	2			0	0	0	0	1	0	Tue Jan 26 2010 23:39:24
980	0	0	0			0	0	0	0	0	0	Wed Jan 27 2010 13:07:47
981	1	4	5	63017	63106	0	0	0	0	1	0	Thu Jan 28 2010 21:45:31
982	1	3	4	63125	63099	0	0	0	0	1	0	Fri Jan 29 2010 18:41:38
983	1	4	6	63146	63042	0	0	0	0	1	0	Tue Feb 09 2010 13:20:20
984	1	4	1	64063	64063	0	0	0	0	1	0	Tue Feb 09 2010 14:39:28
985	2	3	4	63034	63044	0	0	0	0	1	0	Mon Feb 15 2010 14:18:16
986	1	3	4	63376	63114	0	0	0	0	1	0	Wed Feb 17 2010 08:21:04
987	2	3	6	63128	63166	0	0	0	0	1	0	Tue Feb 23 2010 15:07:19
988	1	3	5			0	0	0	0	1	0	Tue Feb 23 2010 21:52:12
989	1	3	9	63135		0	0	0	0	1	0	Thu Feb 25 2010 22:59:14
990	1	1	3	63146	63017	0	0	0	0	1	0	Mon Mar 01 2010 22:24:22
991	1	3	4	63116	63111	0	0	0	0	1	0	Sun Mar 07 2010 18:23:16
992	1	3	3	63128	63114	0	0	0	0	1	0	Mon Mar 08 2010 15:32:43
993	1	4	5	63146	63146	0	0	0	0	1	0	Wed Mar 10 2010 14:30:29
994	1	4	6	63044	63125	0	0	0	0	1	0	Sat Mar 13 2010 17:40:27

995	1	4	5	63385	63147	0	0	0	0	1	0	Sat Mar 13 2010 19:55:35
996	1	4	7	63034	63141	0	0	0	0	1	0	Sat Mar 20 2010 15:26:24
997	2	4	7	63034	63043	0	0	0	0	1	0	Sat Mar 20 2010 15:35:54
998	1	3	4	63050	63043	0	0	0	0	1	0	Mon Mar 22 2010 15:44:03
999	2	3	5	63043	63122	0	0	0	0	1	1	Mon Mar 22 2010 17:08:55
1000	1	4	7	63026		0	0	0	0	1	0	Tue Mar 23 2010 13:43:29
1001	2	3	3	63012	63109	0	0	0	0	1	0	Wed Mar 24 2010 17:33:49
1002	1	3	4	63044	63146	0	0	0	0	1	0	Thu Mar 25 2010 10:52:17
1003	1	2	5	63123	63043	0	0	0	0	1	0	Fri Mar 26 2010 21:13:29
1004	1	4	3	63123	63040	0	0	0	0	1	0	Sat Mar 27 2010 07:57:09
1005	1	4	4	63304	63010	0	0	0	0	1	0	Sun Mar 28 2010 13:01:34
1006	1	4	4	50158	50158	0	0	0	0	1	0	Mon Mar 29 2010 20:34:29
1007	1	4	3	62521	62523	0	0	0	0	1	0	Tue Mar 30 2010 15:16:41
1008	2	3	3	63123	63146	0	0	0	0	0	1	Tue Mar 30 2010 19:09:22
1009	1	2	5	63052	63010	0	0	0	0	1	0	Tue Mar 30 2010 21:01:41
1010	0	0	0			0	0	0	0	0	0	Wed Mar 31 2010 14:18:37
1011	1	4	7	63129	63141	0	0	0	0	1	0	Mon Apr 12 2010 13:57:36

1012	1	4	5	63069	63146	0	0	0	0	1	0	Tue Apr 13 2010 12:01:56
1013	1	3	0	63021	63105	0	0	0	0	0	0	Wed Apr 14 2010 12:12:41
1014	1	2	3	63121	63121	0	0	0	0	1	0	Wed Apr 14 2010 12:39:31
1015	0	0	0	63017	63134	0	0	0	0	0	0	Fri Apr 16 2010 00:07:30
1016	2	3	2	63123	63031	0	0	0	0	1	0	Mon Apr 19 2010 10:01:51
1017	1	4	4	62040	63105	0	0	0	0	1	0	Tue Apr 20 2010 16:10:20
1018	1	4	7			0	0	0	0	1	0	Tue Apr 20 2010 19:47:45
1019	1	4	9			0	0	0	0	1	0	Wed Apr 21 2010 12:54:44
1020	1	4	7	63131	63042	0	0	0	0	1	0	Wed Apr 21 2010 13:53:03
1021	1	3	4	63303	63141	0	0	0	0	1	0	Wed Apr 21 2010 15:22:59
1022	1	4	2	63123	63127	0	0	0	0	0	0	Thu Apr 22 2010 17:22:06
1023	1	5	6	63146	63049	0	0	0	0	1	0	Sat Apr 24 2010 16:26:12
1024	1	3	5	63304	63042	0	0	0	0	1	0	Mon Apr 26 2010 17:58:12
1025	1	3	1	63028	63129	0	0	0	0	1	0	Mon Apr 26 2010 21:49:23
1026	1	3	8			0	0	0	0	0	0	Tue Apr 27 2010 13:01:23
1027	1	3	4	63043	63101	0	0	0	0	1	0	Wed Apr 28 2010 15:00:11
1028	2	4	3			0	0	0	0	1	0	Sat May 01 2010 21:42:19

1029	1	4	7	63376	63042	1	0	0	0	0	0	Tue May 04 2010 23:18:52
1030	2	4	4	63368	63131	0	0	0	0	1	0	Tue May 11 2010 14:27:45

Comments

S.No	QComment
1	From my observation traffic moves along at a speed that is almost independent of the changing speed signs, and more in tune with the speed of the traffic mass. It the traffic mass is moving at a speed of 70 MPH, a flashing 60 MPH sign has little effect. The first person to slow down or hit his brakes is likely to be run over. People are more likely to respond to threat (radar trap, for example) than to a non-threatening sign.
2	No comment yet.
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11	since there is a general disregard for ANY speedlimits on 270, these signs are even more irrelevant than a standard speed limit
12	
13	The whole idea in my opinion is ridicoulous. You change the speed limit from 60 to 40 and the traffice still creeps along at 10 MPH.....the whole idea is absurd.
14	
15	
16	I don't think they make much of a difference
17	
18	My experience is that traffic flows at whatever pace it can during peak times the varaible speed limit is posted at 45 and traffic is flowing at 20 to 35. During non peak posted at 60 and tarffice is flowing at 65 to 70. Not sure you need the speed limit to be adjust as traffic is adjusting to accomodate more vehicles?
19	Excessive cost with limited benefit!
20	
21	
22	There are several signs in the median that are dark. These need to be fixed because it looks bad and it makes it harder to know what the speed limit is if you get caught by a truck and can't see the signs on the right side. Also, raising the limit to 70 should have been part of this project from the beginning. I am sure the local police departments fought this, but the majority

	of drivers are already driving 70 or more, why not make it legal to do at least 70? If the police are afraid the average speed will rise more if the limit is raised then thy should lower their tolerance threshold.
23	
24	It appears to me that less than 5% of the drivers follow these speed limits so I don't think that they make much of a difference. More enforcement might be the key to getting drivers to notice the changing speed limits.
25	The skip lines are very visable. I can even see them in the rain. Must be new technology or something.
26	
27	More and better compliance with the variable speed limit would be obtained if there were more visible law enforcement activity. I believe that once drivers adhere to the controled speed limit, the overall level of service would improve. It may take some time for the dumb drivers to realize this but, law enforcement should be more active. The signs for variable speed limits are sometimes unseeable because of truck traffic. And there could be better or more advertisement of this system.
28	The entire program is a wasted effort, since the foundation is based on the false premise that speed limits are obeyed. Until both of the following are implemented, do not waste any more money on these: 1) Allow for higher than 60 mph limits during off peak times to gain driver respect, then 2) Auto-enforcement of the appropriate limits.
29	I think the variable message signs have had no impact on my daily commute. There are times that the VMB read 40 mph and everyone is traveling 60+ and other times that they read 60 mph and everyone is at a standstill.
30	
31	I drive 270/255 everyday including M-F workdays during am and pm rush-hour. During rush hour, traffic is already so backed up that the variable signs have no bearing. Also, please factor in the I-170/HWY 64 projects are not completed. I'm not sure that myself and other 270 commuters will see the effect of the posted variable speeds until ALL major St. Louis traffic-way construction is complete.
32	Nobody enforces the speed limit. With no enforcement, nobody pays attention.
33	
34	Congestion between I-64 and I-44, SB in evening is consistently poor. I see no change in my commute by having variable speed limits posted.
35	Last week 1/6/09 got on I-270 @ Page said 40MPH all the way to getting off at I-44 exit. Kept thinking there would be an accident or something somewhere ahead, but nothing??
36	
37	Variable speed limits are not enforced. The signs are ingnored.
38	

39	While the variable speed limits are frequently ignored, they do seem to provide a significant level of warning. Drivers may only slow down to 55 when they see a 45 sign, but they do slow down and they do seem to be more aware of what is up ahead. Probably the biggest issue is that the signs can be confusing and contradictory at times. Signs on the left might be 5 mph higher than signs on the right. Is this intentional or has one not updated itself yet? If the limit is not 60, has it moved up recently or down recently (are conditions worsening or improving)? Related to this, it might be useful to have speed limits signs designated to different sides of I-270, particularly when approaching the I-70 exits. The speeds can be significantly different between the right exit lanes and left through lanes, and knowing the difference can help congestion for both sets of lanes.
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46	This has been a waste of money.
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52	Variable speed limits would be more effective with additional sign postings about the new law, and a more uniform enforcement by the police and hightway patrol. I realize that it would be difficult to pull over every motorist that does not comply, but there should be a police presence, at the very least, by the new law signs or the electronic speed limit signs. As a MoDOT employee, I am aware of the reasons for the variable S.L., and adjust my speed for my benefit, but we may need more PS messages to educate the public about these benefits.
53	
54	
55	People ignore them, just like every other speed limit sign. If I were to actually obey a 40 mph speed limit on I-270, I would get killed. Besides, usually when the speed limit has dropped to 40, everyone is at a standstill already anyway.
56	In theory this is a good idea, but without enforcement speeding will continue. Designating the left lane as a thru lane in the middle corridor (44 – 364) might cut down on the number of drivers changing lanes at the last minute to exit. Too bad the exits weren't built with two lanes 270 to 364 and 270 to 44. 270 to 70 has improved greatly since 364 opened up.
57	
58	The variable speed limits sometimes seem to be more of a problem than a solution to the problem. Often drivers will slam on their brakes immediatly when the speed changes causing others behind them to have to do the same. The 40mph speed limit is entirely too slow for highway driving.
59	No one obeys the lighted speed limit! It goes too slow.....45 mph when traffic needs to move quicker. It would help to raise it

	up when traffic is moving. Perhaps to 65 mph.
60	
61	not enough drivers actually comply with the speed limit so it is ineffective. more compliance needs to happen.
62	I feel the variable speed limit system is a waste because drivers pay no more attention to the lowered limits than they do to a fixed limit. Also, the speed limit signs do not attract sufficient attention to allow people to note when the numbers have changed. I do appreciate prohibiting semis from using the left lane, and I applaud the law that requires people involved in a minor collision to clear the road.
63	When I get on 270 after work, there is 0 traffic and the signs are always showing less then 60, as I get towards traffic, the signs go back to 60. No one follows these things.
64	
65	
66	Hardly any of the drivers are obeying the signs !. If the sign shows 50mph or 45 mph i have drivers running up on the rear of my vehicle and tailgating me even in the slow lane, they just drive whatever speed they want to, and where is the police ?, it seems to me if you wanted to write speeding tickets hwy 270 would be the place to do it !. If im obeying the posted speed limit of say .. 50 mph there is probably about 90 percent of the drivers still doing 60-70 mph running right up on me and zooming past me just to get up ahead and wait in traffic, i mean DUH how smart is that ?. I honestly feel like im going to get rearended everyday, this happens everyday.
67	I would like to see more variability in the speed limits. For instance, during heavy rain or snow, it may be unsafe to travel faster than 25-30 mph and the speed limit should be adjusted accordingly. On the other hand, there are off-peak times (Sunday mornings, for example) that could justify 65-70 mph speeds. The speed limit is already 65 or 70 mph on most of I-435 in Missouri, Kansas City's equivalent of I-270.
68	it seems to be a moot point. By the time you get to the reduced speed, traffic is already jammed
69	
70	The message boards posting commute times are usually very inaccurate, with posted times needing to be doubled or tripled to meet reality.
71	I think the idea is good in theory. I don't see anyone slow down until traffic get jamed ahead. It is not safe to go slower than everyone else on 270.
72	I have seen no change in traffic congestion as a result of the variable speed limit signs. People are going to continue to go as fast as they can until they hit the road block. It seems to me that a majority of the backups are caused by the merging of major roads and interstates. One such place is where 44 merges with 270, there are 3 lanes that have to merge into the existing lanes of 270 in a relatively short distance. Eliminating one lane from west bound 44 to north bound 270 should actually increase speeds as there aren't as many people needing to merge in. It might increase backups a little bit on 44, but I would think it would help 270 flow better. Either that, or increase the length of the merge lanes so people have more time to get over.
73	The variable speed limit has not changed anything on 270
74	Evaluating them before they have been installed and the public has gotten used to them is pointless.
75	People don't seem to pay attention. More enforcement is needed.
76	

77	has not changed the traffic at all!
78	
79	
80	From what I've seen I think most people go with the flow of what traffic will allow as far as speed limits and don't follow variable speeds.
81	
82	
83	It does not matter what speed limit you implement on 270. The highway is not big enough to handle the volume. They are building another big office complex at 270 and Dorsett so more traffic will be using the highway when it is up and running. Most drivers did not obey the 60 mph speed limit so a variable speed limit is useless unless you start enforcing the speed limit. I drive from 270 and 70 to 270 and 55 everyday and RARELY do I see a law enforcement officer patroling for drivers violating the law. In my opinion the people who tailgate, weave in and out of traffic, talk on the their cells phones, SHAVE, PUT ON MAKE UP, READ, EAT, TEXT, TYPES E-MAILS, DO THEIR HAIR (I have seen these and other things many times in my 20 years of driving this highway) are more of a danger than people who drive 10-15 miles over the speed limit who drive defensively
84	
85	The variable speed limit doesn't seem to make any difference at all - most of the time when the speed is set at 40 the max speed you are able to go is 20mph. This had not changed the gridlock on the roads during rush hour - it is still a nightmare to get to south county - normally it takes me 90 minutes from Chesterfield to the area. I have noticed no change with the changes - perhaps expanding the roads to include another lane or two, like what was doen on 44 would have been more helpful than the hi-tech signs.
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87	When the speed limit first changes in a particular area, the sign flashes -- this makes the new limit quite visible. This should continue (if feasible) whenever the limit is set at less-than-the-posted-maximum, in this case, 60. This would increase visibility and hopefully compliance.
88	Chalk this up to a pessimist's question, but how can these variable limits be effective? At any point that the signs display any speed limit other than 60, either weather conditions or general congestion prevent any sort of effective enforcement initiative (and if one were tried, those nifty, shiny, flashing lights would cause traffic to become even worse since the Good Lord knows no one has ever seen someone pulled over before). In any case, the signs seem to work like this: If the sign says 60, traffic is flowing normally; if the sign says 50, traffic is already stop-and-go at 15-30 mph; if the sign says 40, no one is moving. Also, until someone can address the mystery that is why the frack people have to come to a stop around the Dougherty Ferry exit (NB in the morning and SB in the evening), no amount of fancy signage is going to make rush hour traffic any less annoying than it already is.
89	

90	I drive rush hour to and from work everyday from Illinois to Westport. People (me included) drive with the flow of traffic whether that's above or below what's posted on the signs. I try and stay at or below 70 unless traffic dictates a slower speed. I do use the variable signs as an indication of traffic ahead, but that's about it. I'm not certain what the statistics are showing, but I haven't seen a marked improvement in the time it takes me to get to or from work. With that being said, Project 64 is also playing a role in this. So the variable speed could be working and just not bearing fruit because of an increase in drivers on 270 because of the 64 closure???? I think the biggest improvement has been keeping semi's out of the left lane. That should be implemented for everyone though and not just semi's. Some people feel they should play traffic controller by riding in the left lane instead of using it as a passing lane.
91	The money could have been better spent instead of wasting it on variable speed limit project. Something needs to be done as traffic on 270 is very bad.
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95	This was a completely moronic idea to start with. It ranks right up there with placing mile markers every 0.2 miles. What an absolute waste of taxpayer money. I'm sure whoever came up with idea received huge bonuses and recognition. And you folks wonder why the taxpayers vote against additional taxes.
96	
97	This variable speed limit is a JOKE. Should be eliminated what a waste of money, time and effort.
98	the variable speed limits do seem to work when traffic is heaviest. However, it goes largely unnoticed when traffic is moving. On a related note, the interchange at I270 and I-64 is still bad. Too many people are cutting in well past the solid white line and the conjestion (my experience from NB 270) is getting worse with the partial re-opening of I-64. Don't know if most of this is due to diverted traffic or not.
99	
100	The variable speed limits will work only if EVERYONE complies. That is not happening - so I don't feel it is very effective.
101	
102	First, I view the variable speed limits project as a complete waste of budgetary money that would be put to better use if applied to bridge maintenance or general road repair. Money gripes aside - the variable speed limit sign are completely useless. Not only do they distract drivers from focusing on the road and current traffic conditions by making drivers feel the need to check each sign to insure you are traveling within the variable speed limit, but they also seem like a distracting and unnecessary way to reinforce facts that should be quite apparent to drivers on the road. If traffic conditions are poor (i.e. icy or snowy road) I see no need to lower the speed limit, any experienced driver will understand the road conditions and how their own vehicle handles and slow down their pace ON THEIR OWN. MoDOT has also advertised that the variable limits are used to slow traffic as it approaches the site of an accident. It seems apparent to me that a motorist would also be quite aware that there are a pile of stopped cars ahead, why posting a lower speed limit would help at all with this situation is beyond me. Unless the stopped traffic is well over 10 miles ahead, lowering the speed limit by 20 MPH will not be of much assistance. Whether I am traveling 60 MPH or 40 MPH I am going to hit a slowdown that is 3 miles ahead in a matter of minutes either way, it is only more distracting when the variable limit is imposed and there is a bit of confusion on the road until all the drivers catch on to the new speed limit. In conclusion, I have yet to hear anything convincing from MoDOT or to see the actual justification for this system myself. I drive to and from work everyday on 270/255. Thank you for your

	time and the opportunity to express my opinion.
103	I think that the variable limits are a good idea. They would work better if tehy were enforced more rigorusly(?)
104	
105	I understand the concept behind the variable speed limits. However, I have not seen a difference. With the variable limits, it is difficult to determine how long it will take you to arrive at your destination because the speed limit is unknown until you see the sign. Highways are designed for higher speeds and should remain that way. Also, it seems a bit dangerous when you have one car going "slower" as the signs indicate, but the rest of the cars are still driving 60 mph, if not more.
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108	I feel that the variable speed limit concept is a good idea but it needs to be enforced.
109	I think it was worth it to try the experiment but the traffic on 255/270 will continue as long as entrance/exit ramps have shared road.
110	I don't think it's had the effect that was hoped for
111	It doesn't seem as if the variable speed limits have had any impact on congestion during peak travel times. The early morning and early evening commuters need to be the ones to embrace this. By the time I travel on I-270 (8 a.m. and 5:30-6 p.m.) it's already a mess.
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116	What an asinine idea. I take 270 to and from work every single day. Some times the speed limit will be 40mph even though there is a clear pocket and other times the speed limit will be 60mph when there is bumper-to-bumper traffic. The highway itself is an abomination. It routinely takes me an hour to travel 17 miles in the morning and evening (Tesson Ferry to Page).
117	instead of putting money on variable speed limits you should put money into making more lanes of traffic
118	
119	The biggest problem on southbound 270 is the 55/Lemay Ferry exit. I see more accidents here than any other single spot on 270 and it has nothing to do with speed limits. It is due to the fact that the lane configuration causes the center lane to back up. Then you have the folks who are too good to wait in line cutting in from the left and the folks in the 55-southbound lanes cutting over from the right. The result is everyone slams on their brakes and you have pile ups. You should move the Lemay Ferry exit to leave the highway after the 55 northbound ramp peels off. This would reduce the number of cars in the center lane at the 55 exit. It would only take about 10 feet of concrete over the grass and you'd be done. You could also try the "no

	crossing solid white line" like you did on northbound 270 at 70. It worked there, it will probably help here.
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122	I think the speed limits are a good warning sign there is congestion up ahead that I might not be able to see now. But what I think is the MOST useful is the travel time signs. Especially the one by 370 warning me of what lies ahead if I were to proceed to the Lindbergh exit. I'd like more to be done to alleviate the congestion on North 270 by Page and by Lindbergh. I'd love 70mph speed limits on off peak times.
123	
124	
125	The idea is great and could work if it was enforced! I *tried* to go the recommended speed when the signs were first put up and felt like I was being pushed off the road. People were passing me left and right and/or riding my bumper.
126	I have lived in North Jefferson County all my life and have used I255/I270/I244, whatever you want to call it and I've never been able to avoid stop and go traffic in the morning and evening rush times in the I 44 area. Even rebuilding the overpass at I44 had no impact. Neither did the Page extension. I start at I55 at about 7:30 AM and by the time I reach Tesson Ferry or Gravois I have to slow to 20 MPH or less until I reach Manchester. The volume of cars is extremely high and there is no effective way to smooth the flow by adjusting speed limits. I'm a fan of technology but honestly this is probably a waste of rsources.
127	
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129	255/270 is an odd road where speed seems to be more a function of what is possible than what is allowed. The on-ramps and exits (st least down south) are all well executed, so it just depends how many people are using the highway and how fast they are trying to switch lanes. The places where people go really fast is in spots where they feel safe doing so and where the enforcement is minimal. There would not seem to be much benefit to enforcing it more because it appears to be safe. The accident prone parts are where there is a lot of lane switching like other interstates or main roads. there are lust a lot of people using the road and the problem is not the speed limit, it is that people need to be routed differently to change the flow of traffic. Still can not figure out why traffic opens up going south at Big Bend (a very minor exit) but it always does.
130	I haven't noticed the traffic is just as heavy as before the signs. the only change was when the 40 opened. I haven't any body doing any different than before the new signs.
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134	Seems like the speed limits are on a timer, if traffic is stop and go at gravois all the way back to tesson ferry but the speed limits are not lowered yet seems to indicate they are on a timer.
135	

136	
137	I-270's most problematic location is the intersection with I-44. This would best be corrected with an additional merge lane from eastbound I-44 to northbound I-270, and possibly a force of the merger to occur subsequent to the Marshall Road overpass to permit the merging traffic to come to speed prior to merging. As an additional observation, I believe the recent rebuild of the Dougherty Ferry Road overpass was extremely short-sighted, as the project had the opportunity to incorporate future lane width expansion, and failed to do so.
138	
139	It seems as if most drivers completely ignore the variable speed limit signs. The only time I have ever seen traffic traveling at the posted speed was when a patrol car was monitoring the drive. I do believe it was a good thought but doesn't seem to be working as intended.
140	Only see people following them when there is already a backup and the speeds due to traffic are already lower than what is posted on the vairiable speed limit signs.
141	Stupid idea!!!
142	The variable speed limits are a joke. The monitoring is so far behind real time - trafic will be clear and moving at 70-75 mph and the signs still read 40 due to an earlier incident. Drivers themselves, while a few are truly awful, are much better at controlling flow than these changes. And if the law could be enforced to keep slow moving traffic from the left lane, traffic flow would be much better - that is the real problem!
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149	I'm not sure how many people are actually abiding by the speed limit.
150	In my opinion, the variable speed limit signs have absolutely no affect on my daily commute. The speed of traffic is typically dictated by the flow, whether that be 60, 65, 70 or above. I would be suprised if anyone actually even pays attention to these signs, other than off-peak hours where a police presence would be more noticeable.
151	
152	270 up in North St. Louis County sucks anymore!!!! Noone took into consideration what closing highway 40 or other roadways would do to traffic up there. And the banning trucks over a certain weight from the fast lane was just stupid! Now, instead of 1 show and 1 fast and the middle lane, we now have the slow lane and the 2 slower lanes! You can't see the variable speed limit signs, or any other electric signage for that matter, half the time because the sun is shining on it and its unreadable. Very dangerous to take your eyes off the road to read the sign any way. Just as bad as taking them off the road to text or talk on the phone. The I-170/270 exit going East needs a yield sign. Every jerk that stays in the far right lane thinks they have the right of way and they aren't even in a marked lane. Many almost accidents. Better signage for exit to New Florissant Road WAY BEFORE you get to the actual exit.
153	
154	When there is no traffic or during off-peak hours, I think the speed limit should be increased to 65-70 MPH.

155	
156	Travel from South Broadway to Eureka Mo. each day. Traffic seems to be heavy in the morning going north on 270 to 44.
157	I find it hard to believe that these work anywhere else. They certainly haven't worked here. It's at least as congested as before if not more so.
158	I'm not certain the variable speed limit project would have any effect regardless, but since no one is complying with the variable limits, the project has been ineffective.
159	No speed limits are much regarded by the drivers on these roads. If I drive 65 when the limit is set at 60, I'll pass drivers doing 45 and be passed by drivers doing 80 or above. Bottom line, the only way these limits will have any affect at all is if we have more police visibility out there. I admit that I go months at a time during rush hour that I don't see any trace of police at all. Without deterrent, these speed limits serve no purpose whatsoever. We need more officers to make the roads safer. I could report dozens of dangerous drivers daily. Surely enough money could be generated in tickets that would support the hiring of more officers.
160	
161	I've noticed several instances where the signs are completely dark. I understand the need for solar power, but solar power does no good the minute the solar panels get knocked around and lose the sunlight. The travel times and congestion on I-270 have not changed one bit since the installation of the signs.
162	The installation of these variable speed limit signs was a huge waste of money. I try to do 45MPH in the morning, but can't stand the pressure to speed up or be the subject of road rage.
163	
164	I believe in the concept behind these variable speed limits, but I have not really seen the speeds enforced. True, if police start pulling people over for speeding during rush hour, it will anger commuters because of increased delays. However, if they are not enforced, people will continue to disregard the variable speeds. In my opinion, though variable speed limits hold some promise, I think the real problem lies in expanding the interchanges between 270 and other highways. My own commute is always terrible at 270/44, and I do not understand why 270 is not listed on MODOT's wish list.
165	
166	It was a waist of MONEY, the signs will say you can travel 40mph when you are stitting at a dead stop and you are lucky to go 10-15mph for 20miles of HWY
167	People drive to keep up with the flow of traffic. The lower speed limits don't seem to change that, and they aren't being enforced.
168	I really don't understand the thought process of lowering the speed limit during traffic peaks. The people who go slow (like 40 mph) just screw up traffic. They cause more accidents than people going faster (say, the speed limit). And, they are usually driving 40 in the fast lanes causing people to have to change lanes to get around them. I've been in situations during rush hour where I'm driving the speed limit in the left lane and come up on someone driving very slow and then I have to try and get around them and, of course, there is no where to go because of traffic in the other lanes. I'm not saying the speed limit should be 80 but for goodness sake don't lower it!!!!!!! I thought the idea was to keep traffic moving not screw it up more.
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171	I don't know what you are looking for here, but I don't think you're asking the right questions...and the answers to the questions I think you want to ask are better determined by practical measurements, not a "I think it's this way" response to the survey. Specifically, I think your question should go back to your original premise for variable speed limits. Why were they implemented? Was empirical data gathered about what you wanted to improve before they were installed. Once installed, did you measure the same data -- across like conditions? Traffic flows differently in adverse conditions vs cloudy days vs the sunshine slowdowns. Are accidents reduced? Was an observer placed in some of the major trouble spots? (How about the on/off ramps of 44/270) The "feel" for me is that the flows of Northbound 270 at 44 are worse now then they were prior to the installation... but we're also experiencing issues with the 64 closures, and how much is that impacting what I "feel" about how congested 270 gets? Our "feel" (other than whether it's made us feel better about traffic on 270) is irrelevant here.
172	In Theory the Variable Speed Limit sounds like a great idea. The biggest problem that I can see, is the actual enforcement of the Variable Speed Limit. Without strict enforcement of the Speed Limit in the non congested areas, this will never work. I regularly travel 270 from HWY 40 to Telegraph and Telegraph to HWY 40, the Variable Speed Limit has has no effect on the normal jam area of 270 at HWY 40 to HWY 44 or Gravois to HWY 40, I can guarantee this is because no one is slowing down until they reach the congested areas.
173	
174	The variable speed limit has not done a thing to reduce the congestion getting on/off the I270 - Page Extension exits. They are responsible for a lot of congestion and a lot of accidents. When is MODOT going to consider putting in flyovers? I realize that they are expensive, but I do not think we should all suffer because MODOT screwed up on the design from day one. Please consider flyovers as soon as you can!
175	
176	The variable speed limit signs are a huge failure. There should be more money spent on Drivers Education. I took the class many years ago and am constantly finding drivers whom don't know the basics of driving.
177	There are many intervals where the signs are sparce. Increase the number of signs.
178	I drive from Page to Manchester on 270 every morning. If I can get to one of the two left lanes before Olive I can usually make decent time. Otherwise, I'm stuck in stop and go traffic in the right lanes. On the way home I enter 270 from the horribly designed JJKelley ramp then pray for an opening to get to the left. The lane waiting to get onto 40 is usally at a dead stop and the lane just to the left of it is very stop and go as people attempt to get over for the exit. I usually go on up to Page unless a traffic report or errand changes my mind. I have never seen all lanes moving at a consistent speed and I rarely see even one of them anywhere near the posted variable speed limit. My co-workers and I actually joke about the ineffectiveness. Who's going to still drive 40 after an accident is cleared just because you'll only bump it by 5mph every 5 minutes? My speed is based on actual traffic and road conditions, not what some engineer who isn't on the highway thinks they are. Save the money and take them away.
179	The signs need to be VERY visible such as accident announcements are. Look to Germany and the Autobahn for examples. Overhead signs are best and can even show faster limits on the inside lanes to encourage slow traffic to move right.
180	Off topic: Highway 270 comes SO close to the abutting neighborhoods in the section between I-70 and 40. Those areas need soundwalls very badly. This would also serve to keep driver's eyes on the road.

181	The signs are difficult to see, especially if there are large SVUs, Hummers, or Semis in the lanes closest to the signs. Few vehicles obey the signs and there are few police officers to punish those who speed. More entrance and exit only ramps would make a difference in traffic, also better traffic flow on the frontage roads and under overpasses.
182	
183	I laugh every time I'm sitting in stop and go rush hour traffic and I pass a variable speed limit sign that says something like 45 mph when I'm not even getting up to 5 mph. If the roads are packed with cars, you can put any speed limit you want up there (40, 55, 70) and it's not going to make any difference. You can only go as fast as the car in front you is going, if that, keeping in mind a safe stopping distance and all those good driver rules. I certainly understand the intent, but in practice, it's a farce.
184	I have never understood how MODot can expect a group of people who didn't follow the speed limits when the signs were static to suddenly follow them because the signs appear to magically change for no apparent reason. I also don't undersand how suddenly dropping the speed limit by 15 miles per hour reduces accidents on the interstate.
185	Variable speed limit signs only work if the drivers cooperate. About 99% of the drivers don't, and I don't think they ever will.
186	
187	I do understand the science behind the idea, but the variable speed limit signs are essentially ignored. I think if they were enforced, it might just work.
188	
189	
190	Can you put on interstate 44 in Springfield, on MO rout 249 in Joplin MO. I think it is very good Idea that some came out with. Yes it will readi car wreck and more safe. Time will go on. More & more people will be driving. It up to you. If we should put up changeable speed lime sign up. I think out thower state of mo. On the Major Highway and interstate that include interstate 49 & More message sign on the Major Highway interstate As well as Mo Rout 249. One more thing some Live Traffic Cameras will also help in the morning and the evening rush hour traffic. Or as for me I just look at the traffic. By Doing there 3 things. Changeable speed lime, message sign and Live Traffic Cameras will save in time, Live and some green… I am very sorry for the bad spelling… Mo Helper. To Help save MO Lives.
191	waste of tax dollars
192	from I-255 to 270 and 44 no one obeys the posted limit. If traffic can flow faster it will. Take the money you get and please do something about 270 especially the dreaded "Southwest Corner". Any look at a outer belt - such as a federal I-370?
193	In my opinion this was the biggest waste of money for the state yet. no one pays any attention to the signs. the posted speed limit on missouri hiways is just a suggestion to most of the drivers out there (and that is the low end of what they want to do) more police presence is needed and they need to pull people over for actually going over the speed limit and i mean over the speed limit not looking just for the idiots doing 80-90 + i spend many hours on the roads of Missouri every week and it seems to get worse every day.
194	
195	
196	Bad idea that hasn't changed anything. 270 is miserable to travel on.

197	The problem is that there simply are too many people that fail to obey the speed limit. When the speed is dropped to 45MPH, and there is an open stretch of road, the traffic quickly increases in speed to 60+MPH. I feel there needs to be more police when the speed limit is changed to help enforce the lower speeds. More police are not needed indefinitely, just at certain intervals. Almost like speed traps, there needs to be a lot of police for a 1 week period, then back to normal for 4 weeks, then a lot of police again.
198	
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200	Speed limits should be managed more agressively.
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203	I never heard about them until they appeared. They are slow to respond to changes and NOBODY seems to follow them. This was a HUGE waste of money.
204	
205	
206	i constantly see these speed limits go down to 45-50mph when there is no traffic or light traffic. ridiculous. nobody pays attention to it. get rid of this crap.
207	During congested periods, the variable speed has been posted at 40 mph. However, even under constrained conditions, it appears unlikely that motorists will comply with that low of a speed.
208	I think that if the volume of traffic allows travel at 60mph then that is the speed that traffic will move at. If there is congestion and 60mph isn't possible then traffic will have to slow down. We don't need a sign saying that we can't travel at 60mph. The reasons for congestion are accidents and the fact that the highway isn't wide enough for the volume of traffic sometimes.
209	You are counting on people to obey the speed limit. They did not obey the limit before and they certainly will not obey the limit now. This is a huge waste of my tax dollars!
210	
211	I travel from South County to Chesterfield daily. I have been commuting this for 16+ years. The variable speed limits are extremely ineffective. If the signs post 40MPH, it typically means STOP/GO and so average speed is probably 20-30MPH. If traffice is clear and the speed limits posted are 60MPH, most drivers are driving 65MPH+. I believe the frustration level of STOP/GO traffic, i.e., if moving one drives a fast as possible, will not be alleviated by the variable speed limits. Finally, to my knowledge, law enforcement is not (or cannot) enforcing the 40MPH limit. Perhaps strict enforcement would help.
212	I am viewing no impact which variable speed limits are having on speed limits on 270. If the freeway is clear and you have vsl set at 45 people are still doing 65-75 because they can. If an accident happens, people are still going to go normal speed until traffic backs up. One concern I have is whether this is a way to get higher speeding fines imposed on people who can do 60 but are going over a certain stated variable speed limit. And there are too many signs that aren't functioning to give a clear indication of speed dropping over distances.

213	The problem I see in the morning is at 270 & 44. 270NB. Ther are 3 lanes trying to merge onto 270 NB from 44. Need to Take down to two, (one from west, one from east) And then add a lane that goes on up to Doretty Ferry, to give them time to merge. Every one is trying to get on 270, then trying to get over a couple lanes in too short of distance. Then maybe make like the 270-70 accident reduction zone....no crossing double white lines. As far as the variable speed limits, They do nothing. I can never even go the speed limit when they are less than 60. ie if they say 40, I am going 20. If they say 50, I am going 30. ....The same speeds as before the variable.
214	
215	It is a waist of money. Surely, you cna come up with a betterapproach to dealing with the congerstion on I-270, as this is not working.
216	This project seems like a waster of tax dollars. I don't see any difference in the way people drive. No one pays attention to the "regulated" speed limit signs. I've seen the signs say 45 mph during snow and ice when there's no possible way to go that fast and I see them say 60 mph when there's no traffic and you could be driving faster. Bottom line -- no one pays attention to the signs anyway. I've traveled this route for 14 years, it's just traffic -- try living in Los Angeles or Dallas -- they have traffic -- St. Louis is a piece of cake compared to most large cities. I see no reason to keep the signs. This money could be much better spend on road repair than on this useless attempt to regulate traffic.
217	As far as I can tell, they are a waste of money. If things are jammed up, people have to go slower. Nobody notices them anyway--I don't, even though someone brought them to my attention when they were first put up. They can't be enforced anyway. Stopping speeders can disrupt traffic for miles and cause accidents. How about selling them to New Jersey and giving us a tax refund?
218	They are a complete mistake, I like the original idea, but most of the time the speeds are reduced prematurely, are not consistent from one sign to next either on one or both sides of same direction and are at times just plan stupid(ie at times following the signs would cause not prevent an accident) Finally, it is my opinion that they are only designed and implemented in the manner in which they are to increase police revenues and this I consider sad.
219	none
220	
221	I think getting information as soon as possible in regards to any wrecks or highway issues on the road on which you are traveling or will be traveling is a great asset to us all but I think the government is already watching us at the stop signs. Now they are telling us how fast we can drive and when. Next they will be riding in our cars with us. But of course it will only be for our own safety. When do we take our own responsibility?
222	Waste of resources.
223	I have driven 270 for over 8 years now back and forth to work . There is NO change what so ever with the new speed limit project. I think it is a waste of tax payers dollars. I also think your "timed" signs that show how long to the next exit. That is a waste of money as well . The only time that is correct is on "off peak" hours. It tells you 9 min to I-44. Then when 10 min have pasted you get to the next sign and it says 8 min to I-44. It makes me angry everyday looking at all the money that was wasted.
224	Great idea, however, there is no enforcement of the speed limits. Everyone generally ignores the signs and drives fast until they catch up to stopped traffic. I have tried to drive the suggested lower speed limit, but it does not help when everyone else is driving well over the speed limit and catching up with the stopped traffic. This idea works in theory but without enforcement of the speed limits, it will never work.

225	I think variable speed limits should only be used when weather conditions are bad and affecting the roadways. For example, if it is snowing bad or raining heavily, the speed limit should be reduced by increments of 10mph depending on the severity. It would relieve more traffic during the non peak hours, if the speed limit went up to 70mph or 80mph, when there are barely any vehicles on the road. It makes no sense to slow people down, when there is not much traffic. I believe the Autobahn in Germay does this already and they have a very low crash rate.
226	I drive i270 everyday between ladue and mac donnell. No one follows the variable speed limit making it very dangerous for any one to obey. You cannot randomly change the speed limits on highways. Why do I have to drive slower because 6 miles after I get off of the highway there may be a traffic problem. Traffic dictates the speed people drive not the signs.
227	In my opinion the money spent on this (and yes I know it was cheaper than expanding lanes) was a direct misuse of our tax dollars. Looks like it is wireless or over fiber and either way a wast of money and yes costly. If you take into account the non-esential spending like the rediculous expensive signs to tell me there is congestion ahead and the sound barriers (they knew when they bought the house there was a highway there) da, along with this stupid idea you could have covered the cost of the expanded lanes. Lets stop bowing down to the Feds tacticts of "If you dont pass this we will reduce funds. We voted down the seat belt, voted down the .08 alchohol limit and they forced us into them. Next is cell phone usage. Oh ya it's coming. Let's start listening to the people who pay your salary. In addition I know you will look at my zip codes and question my use of thhis highway but I am in sales and put 25,ppp mikes a year on my car in St. Louis.
228	
229	
230	I drive 270 everday from south county to west county and back, knowing the set speed limit is 60mph. When the varible speed is reduced it is usually because the traffic congestion calls for it and that is obvious to drivers. When I am forced to drive 40 mph I do not need a digital sign that I passed a quater mile ago to tell me that - the congestion and cars in front of me do the job for me. I have also noticed some mornings post rush hour the sign will say 40mph for no obvious reason and then I have to keep driving 40mph until I see another sign so I don't break the law. I think the majority of people that travel 270 everyday do not pay attention to the digital signs. Please please address the daily congestion on north bound in the am and south bound in the pm and the 40 east/270 south pm mess.
231	I think the idea is a great one, too soon to tell (from my perspective) if it's working.
232	Does not work.
233	I haven't seen the varieable speed limits reduce congestion at all. I think the real purpose of them was to write out more tickets.
234	It really aggrevates me when they still say 60 mph while traffic crawls past them, but as soon as traffic opens up and I go 60, the signs say 40mph. I haven't seen that they have changed the speed at which people drive and I don't think that police are willing to try to enforce them because it would be too easy to challenge in court.
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237	AS A LAW ENFORCEMENT OFFICER AND AND PART OF THE DRIVING PUBLIC I DONT FEEL THIS PROGRAM IS WORKING AS PLANNED. BUT I AGREE IT WAS WELL INTENTONED BUT POORLY IMPLEMENTED.
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239	It does not appear that this project has helped morning or evening commute. In fact, my experience is that it has gotten worse. The MoDOT should be focusing it's time and money on alleviated the traffic on 270-255. Variable speed limits is not the answer. The project also doesn't seem to react quickly enough to problems on the road. 15-20 min. after accidents the speed limits haven't always changed. If the limit is still 60, people aren't going to slow down until they see break lights. A suggestion would be better signage for accidents with alternative route suggestions.
240	The speed limit signs are not always operational. Suggest all signs work ALL the time.
241	Stupidest thing I have ever experienced. Speed limits should remain consistent. Nothing but a revenue generator for the local municipalities. By the way - I have not received a citation from the variable speed limits - yet!
242	highway 270 at 44 traffic is a night mare monday-friday morning work on that
243	highway 270 at 44 traffic is a night mare monday-friday morning work on that
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245	Too many drivers are passing to the right side of "slower" drivers. The variable speed limits need to be better enforced. The drivers that are constantly changing lanes need to be the focus of the enforcement. There are ways to "speed safely" and ways to cause problems. Get the "weavers" to alter their behavior and safety on the local interstate highways will be improved.
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249	what a waste of money for something that does now work
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251	99.9% of drivers ignore these new signs. It's every man for himself! The problems on 270 during rush hour are caused by the following: Drivers changing lanes to cut over to the left "fast" lane, causing other drivers to brake Drivers slowing while going up inclines (270E at 367), (270W at 70), (270E and W at Granite City Route 3) etc. Slower drivers refusing to move out of the left lane
252	Whenever I go 60 mph I am nearly ran over by everyone else in the morning who are swerving and changing lanes to avoid me so that they can continue to drive 70, 80, 90 mph. During the evening commute home if the variable speed sign says to go 45 mph because of congestion ahead, no one does that - they just continue to go as fast as they can till they come to the congestion. I believe that it is dangerous to drive the posted variable speed, it is better to keep up with at least the majority of the traffic. When I do try to go the variable speed posted I am passed by everyone else, rarely do I pass anyone. Where is the law enforcement officers? I can tell you from experience driving I-270 every day from I-55 to I-70 that speed limit enforcement in non-existent. Very rarely do I see a police officer or state trooper working I-270. I think the variable speed limit project has been a complete failure. What ought to be done is replace a lane or two with light rail, this would reduce congestion on I-270, reduce pollution, reduce gasoline consumption, save mileage and wear-tear on our vehicles. I wish I had another mode of transportation from my home in Jefferson County to Riverport other than my car. I checked once on the bus service which would require me to change buses about 3 times and would take 4 hours to get to work - that is not a solution. I attempt to car pool whenever possible with everyone's work schedule. I say that 95% of the vehicles on I-270 have only one occupant, the driver. If more van pools were established to serve various areas of I-270 that would help tremendously to reduce vehicle traffic also. Another problem is when traffic accidents occur the vehicles are not moved off the highway lanes quick enough. And to keep everyone else from slowing down to take a look why not put up a large screen

	or tarp wall around the accident and emergency equipment on the shoulder to block the view then there is nothing to gawk at and traffic can begin flowing again.
253	I drive 270 during the morning and evening rush and I have not noticed any improvement in the morning. It isn't that people aren't willing to follow the adjusted speed. There are so many cars entering 270, that you have to stop or slow your speed to allow the cars to enter. Going slower or faster doesn't matter - there are too many cars entering the intersate during rush hour. The adjusted speed does not always make sense. Sometimes the speed says 40 mph and there is no traffic and at times it says 60 mph and there is a real jam.
254	I didn't fully understand until yesterday (1/12) what the variable speed limits were supposed to do for traffic. If every driver observed the signs, the variable speeds would provide a good solution to the traffic problem. However, I've never seen anyone actually slow down when the variable speed limit was 40 until traffic came to a slow down and stop further up the line. No human is going to go 45 or even 60 if he or she can get away with going 70 or more -- and that includes tractor trailers! Without enforcement, the speed limit MoDOT posts is only a recommendation. Enforcement, unless done by camera, would simply cause more tie-ups.
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256	The concept seems fine. The problem that I see is that people do not pay attention to the speed limit when it is reduced. When it goes from 60 to 45 in the afternoon between the Page Extension and Doughtery Ferry, people do not slow down at all until they hit congestion. I don't see any Highway Patrol presence either unless there is an accident.
257	I drive from the Page exit North to McDonnell every morning, and the opposite way in the evening. Whenever the speed limit is less than 60 no one obeys it, they still drive 65-70. In addition, the few times that there have been backups that affected me, the speed limit wasn't dropped to 40/45 until right at the backup, not all the way along the road, so traffic coming up to the backup would not 'slow down' until it was too late. My wife said it best, "the amount of traffic will dictate how fast people will go". If you want to keep the variable limits you need to reduce speeds sooner and farther along the road whenever there is an accident/backup, and there must be cops there all the time. Without that people, myself included, will just keep driving at our normal speeds because to slow down so much would impede the flow of traffic. It was an interesting experiment, but I don't think it accomplished much.
258	From my observations VSL receive very little compliance.
259	There aren't enough speed limit signs in the left-hand lanes. Variabe speed limit can't make up for the lack of continuous on-off ramps.
260	While I understand the concept of the variable street signs, there is no enforecement that I have seen on I-270 in the South County area. No one obeys those signs in the morning thus causing the same congestion at 270 and 44. I also know that enforcement would be very difficult given the number of cars. it seems to me the money is somewhat wasted on these signs and from what I understand are on a trial basis. it's jjust not working.
261	From what I've seen, most people don't slow down if the traffic isn't stopped in front of them.
262	I think the signs do not standout enough and people are not really paying attention to them. It will take time to get use to them.

263	The variable speed limit needs to be enforced more vigorously. People are still driving at 60MPH when they should be doing 40, thus creating the kind of bottlenecks the program was designed to eliminate.
264	I do not think they work well. I have seen 60 on one side and 4o on the other. I have also seen traffic going 0 to 5 per hour and seen the speed limit sign say 60.
265	Think it's a great idea and should be expanded throughout the St. Louis, Kansas City and Springfield areas.
266	Would like to see larger signs telling people to slow down and why. Signs need to be more visible.
267	don't really have alot of time to look for one more thing on the highway. Avoiding accidents is enough
268	It appears to have been a waste of money - I RARELY see anyone going the posted limit.
269	For the past 1-2 years I have traveled Lindbergh to and from work, (Tesson Ferry to McDonnell BLVD and vice versa), during the rush hours because it's quicker than if I travel 270. It takes 1 hour to travel one way for a total of 2 hours per day to travel Lindbergh. I only travel 270 to and from work when it is not rush hour. I will try 270 again for a few days to see if it's any better and I can retake the survey if you would like. Thank you, Sharon S Dodel sharon.dodel@fbol.com
270	another waste of taxpayer's $. Half of the traffic is observing the posted speeds and the rest are RACING as fast as possible, regardless of the posted speed and in any and all lanes
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273	The speed limits are unenforceable during peak traffic hours. Most of the traffic moves a the pace of the herd, not what is displayed on the sign. Any flashing lights from law enforcement or emergency vehicles immediately causes a standing wave of traffic. More "information boards" about traffic conditions ahead could help route traffic through side streets. As it is, the VSL signs at least give some indication of how fast traffic is moving about a half mile up the road from me. Raising the speed limit to 70 would also help move traffic through and get it to their destination and off the road faster. The main problem of congestion is caused by slower drivers in the passing lanes and faster drivers that are changing lanes to avoid the slower drivers. If slower traffic would keep to the right (as the law says it should) instead of spreading out all over the available lanes, then the faster cars could get through and off the road quicker.
274	biggest waste of taxpayer money. nobody pays attention to the posted speed limit on 270 anyway. the variable speed limit signs do nothing more than confuse drivers, because there is no consistency to them. sometimes when traffic is backed up, they still read 60, and when its clear they read 55 or even 50 with no problems any where. the only time people slow down on 270 is when somebody is getting a speeding ticket, then their just glad it wasn't them
275	Gets ignored. I travel at the limit and continually get passed and treated like a moving roadblock. Especially if it's dropped due to more congestion. People always behave as if the limit is 70. Sometimes that's safe (and the limit should be raised if it is), but sometimes it's not.
276	Whoever came up with extraordinarily STUPID idea should be fired and the cost of the system should come out of the idiot's severanace. Why dont you focus on somethin useful, like banning hand held cell phones??? This causes way more accidents.
277	I think the whole concept has been a fiasco, and huge wast of tax dollars. Most drivers are totally unaware of the speed limits, or just disregard the speed limit and drive at a speed which is compatible with traffic around them, whether it is 5, 10, 20, or more miles per hour above the speed limit.
278	WASTE OF MONEY!!!!!!!!!! COULD HAVE BEEN USED TOWARDS MORE USEFUL PROJECTS.

279	The people who obey the law willing continue to do so, as for the rest, all your interferance does is punish the ones who do fall the rules. Butt out... and get rid of the "no trucks licensed over 24 tons in the left lane". All your doing is trying to kill the rule followers rather than the ones who don't give a damn anyway. Try enforcing the limits you have already have on the books before you come out with some cock and bull no trucks in the left lane or variable speed limits crap.
280	I drive I-270 everyday 5 days a week and as far as I'm concerned the vaiable speed limit signs were a waist of my tax dollars! They have done nothing to change the mess on I-270 because NO ONE pays any attention to them. It doesn't matter if they say the speed limit is 40 MPH or 60 MPH, people do whatever the traffic allows them to. If there is room to do 60 and the signs say 40, doesn't matter! People are going to go 60 or faster and if you don't you get honked at and run down! In my mind now that the money has been waisted already the only way to make them work is to get the highway patrol out there to start giving people tickets! Again, I am out there everyday and there are no highway patrol out there and no one obeys the signs.
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283	I have not seen a slow down in traffic at all on I-270 in either direction. Rush hour is still the same crawl in basically the same areas. If there are several police cars then that is a much better deterent than the signs. I think it is a huge waste of money. The 4 -5 lanes lends itself to going faster than 60mph. The signs are too small also. I really think that most drivers are ignoring them because the police aren't going to give tickets to anyone going 6-10 mph over the speed limit. They usually start their lights around 12-15 mph over.
284	MoDot is the least responsive Missouri Agency to concerns of the public and taxpayers. Anything they do is what they want to do and they have absolutly no concern of the effect on the public, the economy and evn more importnt the lack of "greeness" they create with their traffic congestion and confusion. The variable speed limits on 270 are just one more example of wasted money and care not on the part of MoDot. The public totally ignores the posted speed limits and even the Police have apparently given up on issuing tickets, as thy would hve to ticket 99% of the drivers on the highway. A highway supports just so much traffic and when that point is reached, regardless of the speed limit, it backs up and comes to a stop.
285	My biggest problem with the variable speed limits is that no one, but me follows them. I try to follow them, and everyone and I mean everyone around me continues going 65 or 70 until they reach the congestion. They are dangerous to me. I follow the speed limits, but people pass me on the right and left then turn right in front of me to get back in the lane. Sometimes there is one passing on the right and one passing on the left trying to get back in the lane and nearly collide. If you are going to have them, they need to be enforced. I travel I-270 north in the morning and south at night every week day and this happens every day. I try to stay in the 2nd lane from the center in the morning and the 3rd from the center at night. In the morning the variable speed limits usually stay on 60 from 40 to McDonnell Blvd. I can usually set it on 60 and never have to worry about slowing down because everyone is going 70 at least. I have had problems south of 40 where there is no reason for the speed limit to be less than 60, but the last sign before Hwy 40 has 45. The next sign says 60, but I go 45 until I reach the next sign. I get lots of tail gaters because of it. Something needs to be done. More signs are needed and they need to be enforced big time if you have them. The next time I hear someone from Modot say people are following the variable speed limits I am inviting one of you to ride with me.
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287	There should be more signs to indicate the speed. The public should know at what time the speeds change.

288	To be honest, I do not usually follow the variable speed limits. I do try to but the flow of traffic generally does not follow the speed limit! I do see the purpose of them and feel that if more drivers would obey the signs they would serve their purpose. Since hearing your report on KMOX I have tried harder to obey the VSLs. I travel 270 (North and South) from I-55 to I-64 everyday, I would like to assist with anything you may need to help improve traffic flow! Thanks for your time!
289	I'll try and keep it simple. When the limit is 60mph the average speed is probably close to 70mph anyway. When you have the speed changed to 40mph the traffic is already at 10mph so whats the point. I have NEVER seen traffic flowing on 270/255 at 40mph when you have the speed set at 40. NEVER. It has always been about 10-20 mph or so. Don't waste our money with this project.
290	Drivers are not complying with the speed limits. A true test of the system will come only when compliance is enforced. If results are then positive, enforcement may not be necessary because then drivers would have seen the positive effects. As it is, I have not seen that it's done any good so far.
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292	I find that the congestion at I-44 and I-270 is a real issue. If there were variable speed limit signs put up to decrease the flow of cars on to I-270 at this junction, I feel like we would not have as great of an issue at that critical junction. I drive from Gravois to Page each day and I can count on a 10 minute slow down from the traffic before and after 44 - sometimes but not always Dougherty Ferry/Manchester. Occasionally a small slowdown around 40.
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294	Think they are ridiculous - we drive as fast as traffic will allow. Many time I see the signs say 40 and we are creeping along below 10. A huge waste of money.
295	This project has worked much better than I had envisioned, probably because it keeps drivers just a bit more attentive.
296	Raising the speed limit to 70mph made me pause, but I would have strongly agreed to raising it to 65 mph. Are there plans to examine some of the parallel routes to see if we could attract more traffic to them? I think the speed limit on a good portion of Lindbergh is too low, especially from I-70 north to I-270.
297	It's a very good idea but the lower southwest quadrant is far too congested
298	I would like to see the message boards across the state utilized much more. I am able to get much more relevent and up-to-date information from radio station than from the message boards. When no traffic incidents are present (90% of the time) please put something relevent on the boards. I would suggest the current time and temperature/weather. This would get everyone looking at them more and thus, when there is important information, they would see the boards more than they do now. Then, also put on there "all traffic normal" or "no traffic incidents". There are so many message boards around St. Louis (which is a good thing), yet they are so very under utilized.
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300	While I understand the theory, it is not implented nor would it really help. I feel mocked when the speed limit sign says 40 MPH while I'm in stop and go traffic. People will drive at the rate that is necessary given the traffic conditions, we don't need to be told that. 270 is just a heavily congested highway and we all need to just accept that.
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303	It seems the idea was good but it will not work because drivers continue to drive at the speed of traffic with little regard to the variable speed limit. I drive a semi truck around St. Louis and if I obeyed the variable speed limit I would be a hindrance to the flow of traffic that is continuing at a speed about 20 mph above the posted speed limit.

304	No one pays any attention to the lower speed limits. From what Ive seen, everyone goes as fast as they can until everything comes to a complete halt. It really would work, but no one is cooperating. I can't blame them though. With the closure of hwy 40 and multiple other lane closures and construction that the drivers here is St. Louis are subjected to, I don't think anyone gives a care about what modot says or does.
305	I think the entire idea of having a "variable speed limit" is completely redundant....I have seen no change on 270 what-so-ever, hence why I am calling it redundant....there's no difference at all....what was the point in implementing this system anyways??
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308	the 270 corridor is still a nightmare during rush hour traffic......increase police patrol is more of a deterrent than the variable speed limit signs. A particular frustrating area is 270/364 exit, the lanes are backed up for over a mile because of the merge onto and off of 270. An additional traffic/exit lane might possibly relieve this dilemma? I would be great to see MoDOT work on this area.
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311	Instead of making people slow down, how about letting us speed up? How about no merging within a certain distance of an exit? Have any of you ever driven 170 North to 270 West to Lindbergh in the evening rush? Folks drive the left lane of 170 at 45 or so waiting to break back into the right lane so they can go East - VERY DANGEROUS. How about no lane changes on 170 North from the Boeing-only exit all the way down? Have any of you ever taken Lindbergh to 270 East to 170 South in the morning? How about if you're not going to take 170 then you're not allowed in the right lane? How about adding 50 or so feet to that lane and making it an exit only to 170?
312	The variable speed limits have been a hindrance to traffic.
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317	The variable speed limit changes on highway I-270 has increased my traveling time from home to work. It now takes me 20-25 more minutes to reach my home coming from work. Traffic between St. Charles Rock road to highway 367 is horrible between the times of 3:00 to 7:00 pm.
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319	My travel time has not been reduced as a result of these signs. It still takes the same amount of time for me to travel from Fenton to Bridgeton each morning and evening. Half the time you either cannot go the speed limit due to traffic or there is no need to reduce speed limits because we are all traveling 60 mph. It was a waste of money. The worst part of my commute is at 44 and 270 in the morning and after Olive to Dougherty Ferry in the evening. Maybe there should be better alternate routes between South county and North county besides Lindbergh with all of the trafiic lights!
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321	I don't understand why the middle lanes on 270 ALWAYS stopping and sometimes dead stop...you need to do something about 270 and 55 turn off going south..those people have no clue where they are going and last minute change lanes..that is causes the stopping and causing accidents..you changed from 2 lanes going to telegraph and 55 north to 1 lane...that sucks..again people wait last minute and change lanes , we have to make sudden stops and we almost get hit from behind or rear end someone else...and in the morning going toward 44 that needs to changed..44 270..ALWAYS backed up..I get off at 44 but if I had to go to manchester or farther..I would quit my job too stressful..and too much time getting to work. waste of gas....
322	It's more dangerous becouse people going over the speed limit still are going over the speed limit putting slower traffic in danger. Raise it to 70 and get out of the way!
323	A very huge waste of time and tax payers money!!!
324	This is a waste of taxpayer money and time.
325	
326	I don't think that the "speed limit" has anything to do with traffic flow. I cost of this project was not necessary. I believe that people travel as fast or as slow as they choose. I don't think the signs have had any affect on the flow of traffic on I-270.
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330	The traffic is still crazy and the adjustments to the speed limits are not making anything better. It still takes to long to get to work and then you sit in it on the way home.
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332	I don't see anyone following the variable speed limits. When I'm in stop and go traffic, the speed limit sign will say anywhere from 40mph to 60mph. Kind of a joke when we are barely going 5mph.
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334	Nobody obeyed a static 60mph speed limit. What made MODOT think anyone would obey a variable one?
335	Not a fan of variable speed limits. Speed limit changes are often changed for short stretches of the highway and appear to be used in conjunction with speed checks by law enforcement. Very effective tool for them. Other comment is that human beings will change their speed when they visibly see traffic bunching up and don't buy into lowering their speed to keep from bottlenecking.
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337	Variable speed limits are a bad idea. Somebody sitting at a desk changes the speed limit on a whim, and I'm suddenly a law-breaker? Why don't you change the direction of the lanes while your at it.
338	If anything that speed limit near Dougherty Ferry sign reminds people now they may speed up or the most appropriate speed for the congestion. I believe the problems that involve congestion are more due a person's ability to drive at certain points on highway 270. This is no more apparent (to me) then near 44 and 270. That bend there before (either going north or south) drivers should proceed with caution but most importantly (to traffic flow) accelerate faster when it's safe to do so. Maybe they don't because distance to the traffic ahead isn't clearly visible but I know from driving that stretch it always opens up.
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344	I think the variable speed limits are fine. I have not seen much of an impact. I do think the congestion of the 44/270 interchange needs to be addressed. The morning commute is bad whether you come up 44 to 270 north or take 270 north from 55 and it all backs up at that interchange. Worse in the morning because of that two lane merge from 44. There has to be a better way, but can't say I know what it is.
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347	Only impact on driving is to confuse the drivers as to the actual speed limit. When will MODOT fix the I-270 I-44 bottle necks?
348	Very few motorist obey the limits. I have tried to, but I feel it is hazardeous for me to be driving 40 (when the signs show 40) and everyone else is driving 60+.
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352	They are laughable. Wide open highway with a speed limit of 45, really? Crowded highway with speed limit of 45, everyone still drives 70, The real speed limit on 270 local cops have told me personally you have to break 70 to get a ticket. The real problem IMHO are the blind spots. The southbound turn at Dougherty Ferry and either of the southbound hills at Olive and Manchester. Same for northbound at page, olive, and i-70 interchange. Speaking of page something has to be done regarding the interchange on to page from 270 N, its borderline suicidal.
353	Majority of motorists do not obey the posted speed. Whether it is posted at 40 because of traffic situations ahead or posted at 60 for normal traffic - most are going 70 or faster. Never any law enforcement present and I travel the 255 -270 route 5 days a week. Even when there was major construction at the 255 area in south county last year and posted speed limit was 40 or 45 - most drivers were going above 65 and did not even slow down through construction zones - knowing that there would be no law endforcement there to enforce it. I think the variable speed limit project is a great idea in theory - but drivers do not obey it at all. Guess it was a waste of money.
354	I commute on I270, north in the morning and south in the evening on a daily basis, and have not noticed any significant change in traffic flow, commute times, etc. I do see enforcement activity during non-peak hours. Not sure how that helps. The biggest issues I see is the congestion caused by the merging of traffic, particularly around I44, Daughterty Ferry, I64 and Olive. I think better control of the exit traffic, such as constructing a lane on Olive to compel eastbound Olive traffic to take the right hand lane instead of waiting on the exit ramp for a break that allows them to transverse 3 lanes to make an immediate left, would help decongest the traffic backed up on the exit ramps and I270 shoulder.
355	one day the speed limit was 60 the next it was 40 i had to idea that this was happening until it happened. the community should have voted on this subject. people dont follow the 60mph speed limit now what makes you think they will follow a 40mph.
356	

357	270 IS A NIGHTMARE ROAD IT REALLY NEEDS TO BE EXPANDED. I COMMUTE FROM ILLINOIS AND 270 IS ALWAYS BUSY DOESNT MATTER WHEN. IF THERE IS AN ACCIDENT IT TAKES FOREVER TO CLEAR IT UP....THEN WHEN CLEAR THE DAMAGE IS ALREADY DONE AND YOU ARE SITTING IN TRAFFIC FOREVER
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359	I find that people are driving along then we have a sudden series of brake lights while people slow down to the new speed...especially when its down to 45. If you're not paying attention, its dangerous because people are dropping their speeds 15+ mph in just a few feet for fear of getting a ticket.
360	I haven't seen any change in traffic flow from the new speed limits. It serves as an indicator of traffic jams (when you see a lower speed) but most people seem to ignore the signs.
361	no one pays attension when the speed limit changes. stronger inforcement would help
362	what a waste of taxpayer money
363	The variable speeds have not been used well, based on what I have seen. There have been times when it has been raining and dark, and the speed limit is still 60, and there have been times when traffic is flowing well and could easily be traveling at 60 and the limit has been 45 or even 40.
364	It has not been well introduced or explained. i also don't understand how slowing traffic down is going to reduce congestion....??????
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368	No one pays any attention to the variable speed changes. The bottom line is, either a 170 like route between 64 and 44 east of 270 needs to be built or another highway , essentially offering more lanes, needs to be built just west of 270 offering an alternate path from north county to south county.
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370	I DRIVE A 18 WHEELER, I DRIVE @ 65 MPH, PLUS/MINUS 5 TOLERANCE OF POSTED SPEED LIMIT, AUTOMOBILES ARE ALREADY DRIVING 10 TO 20 MPH OVER THE LIMIT @ ALL TIMES. YOU SET THE LIMIT @ 70 MPH, IMAGINE HOW FAST YOU THINK THEY CAN DRIVE NOW, PLUS NO TRUCKS IN LEFT LANE WOULD WORK BETTER IF IT WAS DURING PEAK HOURS FOR THE DIRECTION YOUR GOING AT THAT TIME OF DAY.
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372	I do not find that the speed limit changing has helped at all. During high traffic time if you go the speed limit that is posted and you have the chance of going faster you will get run off the road. It happens almost every morning. I decided it is not worth my life so i just go with the flow of traffic even if that means going 65-70 MPH.
373	I travel I270 North from I55 every weekday morning and the cars do not abide by the posted speed limits and there are no police writing tickets. I feel that more of the variable signs are needed and need to see police writing tickets to those not complying with the variable speed as posted.
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377	I have never seen any formal explanation of the system, but I have noticed that the speed limits are always lower when it's congested. I think that's a good idea as it alerts me to congestion. However, I don't like the idea that if a semi truck obscures your view of the variable speed sign as you pass it, you might miss a speed limit drop and get pulled over. However, I STRONGLY think that the speed limit needs to INCREASE (to 70 minimum, or even 75) when there's little traffic, just like it drops to 45 when traffic is congested.
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379	reducing the speed limit won't do any good unless it is enforced. They use cameras in Canada to catch speeders like we do red light runners. It works great. Would work well on 270
380	
381	I drive 270 back and forth to work every day and see absolutely no driver compliance with the variable speed limits. I find that one or more of the speed limit signs are not working every day. I find that the variable speed limits don't make a lot of sense. I propose that the typical 270 driver does not go completely around the loop. Over a 10 mile stretch of road say from North County to West County the reduced speed means you reach the traffic jam about 2 minutes later than you would at the normal speed. How does this help improve the flow? The cars in the traffic jam have traveled less than 1/3 of a mile in that time. I believe improved on/off ramp merge procedures at the major interchanges would be a better way to spend some money. (Longer/more merge lanes, coordination of traffic lights, stop/go on-ramp traffic lights, etc.)
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384	The solid white line is constatnly being abused and I have seen officers pass commuters committing this act, and not doing anything regarding this matter. More enforcement in North County should be given especially at the interchange of I270 & I170.
385	I drive I-270 North bound 5 days a week. When the speed limit is lowered it ususally means there is a problem ahead. (ususally and accident) I like that idea, but I am not sure that the lowered speed limit is changed quickly enough, but I understand that it can only be changed once the problem has been reported. I would like to see more signs that indicate where or what the problem is. (lighted billboards) Then drivers can make a decision to use an alternate route, if available. Make available on your web site several alternate routes off of 270 for drivers that do not know how to use those alternate route, with a plan for the police in those jurisdications to know there is a problem on I-270 and the traffic in the precinct would be heavier than normal and to possibly help out with guiding individuals instead of hiding in corners giving out unncesscary tickets.
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387	The project was a waste of money.During rush hour the limit is 40 MPH, anyone who travels rush hour on a regular basis knows you cant go any faster than 40 MPH because of the congetion and volume, so the signs do not regulate traffic no more than the traffic itself does without the signs. Sorry but the money could have been spent on a lot better road items than that....unless the money to do this project was donated.....oh wait it was donated from us the tax payers, thanks for letting us have a say in the matter. Normally you guys are good about issues relating to the roads but you dropped the ball on this one.
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392	Everyday it takes me an hour to get home sitting in bumper to bumper traffic. From 40 to Gravois, it's an hour drive.....something else has to desperately change
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394	I drive 270 M-F from I-55 to Page. The variable speed signs have not helped one bit. The biggest problem is no one follows them. For example, if the speed is reduced to 50, most people are still going 60+. The poor person obeying the speed limit is nearly run over. When the signs are at 40, it's very frustrating because ueually you are only able to go 5 miles an hour (if you are lucky) and wondering what good the variable speed signs are. It's not that I mind having the variable speed, but virtually nobody follows them so they aren't effective. I also don't foresee people following them. Expample, you need to drive 2 miles on 270. The speed is set at 45 mph because of an issue 5+ miles away. There is no traffic around you preventing you from doing 60. The vast majority of people will do 60. My suggestion would be to have a carpool lane, at least during peak hours. That could potentially cut down on the number of cars and be an incentive to carpool. I would also look at the I-270 I-44 interchange. There is always a back up there. It is so frustrating seeing the traffic reports in the morning. The norm is that all avenues are wide open except for I-270 N. MODOT has done wonderful work on E-W routes (ex 370, 40, 70), but nothing for N-S routes. You should also look at the possibility of expanding I-170.
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397	Waste of money. People will drive as fast as possible (as law allows) when they have the opportunity to, regardless of what a sign is telling him or her. 270 is always congested. A few signs will not help anything.
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400	I remember when they put the double white lines down for the I-270 and I-70 interchange and I loved it. there is nothing more frustrating than waiting in traffic and someone comes flying up besides you and cust into traffic. The reason I mention this is because I believe this needs to be implemented in several spots throughout St.Louis. Everytime I drive 170 this happens. Going Northbound passed I-70 the left lane is an exit only (for boeing I believe) and people race down that lane all the way to the end and then cut over which makes traffic bottle neck and causes accidents. Also when getting on I-270 from 170 there are two lanes on the bridge that merge to one and people get in the right lane and automaticly think it is there lane at the end. I have seen multiple car accidents and road rage thru there. thanks
401	If there is anyway to fix the conjestion from Hwy 21 to I44 to 40 east and west bound on 270, west (morning rush) east (afternoon rush) would be great. Nothing that you have done with the variable speed has changed this problem. thanks,
402	This causes drivers to have to look at the signs to see what the speed limit is versus keeping their eyes on the road. For this system to be successful the signs needed to be better positioned, maybe higher like the Metro signs on I-44. On 270 and other highways drivers are forced to go with the flow of traffic regardless what the speed limit is.
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404	I have changed my work hours to avoid 270 during high-traffic times, which is an inconvenience to me but saves me over an hour of extra travel time a day. On the few occasions that I have encountered a back-up with the new variable speed signs I have to laugh at how ridiculous they really are! When traffic is at a dead stop I can not abide by the 40mph sign... you just have to go with the flow of traffic no matter what the sign says! When traffic starts to pick back up after having been slowed/stopped, no one increases their speed to just 40mph to avoid breaking the law... we just begin going as fast as possible to keep up with traffic, which is often 60mph or above. So in essence, the variable speed traffic signs have NO impact on the speed that I drive... I base my speed on those driving around me and the road conditions at the time. What STL needs is another highway that will allow you to drive the same route as 270. Lindberg & Hwy 141 are a good bi-pass, but they have too many stop lights and the speeds aren't as fast... we should have saved tax payer's money and utilized it for another highway like 270 or even for metro-link to run the "270 loop".
405	I don't understand how changing the speed limit at 270 and 170 to 45 mph when traffic is moving at 10 mph helps anything. The problems in this area are caused because people do not realize what lane they need to be in, since the right lane of 270 eastbound turns into the southbound Lindbergh exit, people realize it too late and all try to change lanes at the same time people are moving left to get into the same lane to exit on the northbound Lindbergh. Perhaps bolder signs placed before the McDonnel exit warning of the lane ending would help thanks for providing this Kent Miller Florissant, MO
406	I DRIVE 270 EVERYDAY TO AND FROM WORK DURING RUSH HOURS. THE VARIABLE SPEED LIMIT PROJECT IS A COMPLETE FAILURE. EXAMPLE, I AM STOPPED ON THE HIGHWAY, AND THE VARIABLE SPPED SIGN IS TELLING ME I SHOULD BE GOING 50 MPH. THIS PROJECT SOUNDS GOOD IN THEORY, BUT IS NOT WORKING IN REAL LIFE. A COMPLETE WASTE OF TAX PAYERS MONEY.
407	I would like to see more enforcement of the posted speeds. Big trucks running right up to my tail scare me to death. It really doesn't matter what the posted speed is because most people are doing 80-90 mph. When I'm going 70, people still whiz by me like I'm standing still. The only thing that's going to make us safer is having more police presence and more warnings and tickets.
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409	Big waste of money. I drive 270 daily commuting to and from work and have only seen the speed limit lowered once.
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413	I think that the new signs are a waste of tax payers money If traffic is heavy most of the time you can not drive the posted limit anyway. I have been on the highway at a complete stop and the signs have the 60mpr still on it. It seems that most of the drivers drive over the limit anyway.
414	I see no difference in the traffice before and after the implimenting of the variable speed limits. If they were actually enforced, that would change everything completely. Right now, there is still no reason to slow to 40 if the sign says 40. People have no deterrent to speeding on I-270. It seems like there is no speed enforcement at all anymore.
415	I don't see the purpose of the different speeds because the timing is never the same so on days when traffic is fine, we are driving slower. 270 to Illinois....that area of the highway is a mess as it is and you make it worse by making people drive 45 to 55. From where I get on the highway and get off..on a normal day should take me 15 minutes but in the evening from 4:30 to 5:00..you move the speeds around and sometimes take 30 minutes.

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422	I don't believe the variable speed limits has changed anything. The traffic is still the same as it has always been. What I would like to see more of are the boards on the side of the highway that tell if there are accidents ahead and how long to a certain highway. I believe those are helpful.
423	this may not be exactly what you are asking for but I do have a comment concerning the 364 (page) north bound exit ramp and the west bound commutors trying to get to south bound 270, this area is a great concern commutors come up on it and something needs to be done, when the 364 project was opened noone thought of the huge congestion it would cause and now it is getting worse.
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426	No one really follows these variable speed limits. Traffic on 270 is as bad or worse than ever.
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429	Another expensive knee jerk SWAG (Scientific Wild Assed Guess) by MODOT. The money could have been much better spent by putting it into a fund to add lanes to these highways. Nothing is going to help until drivers are educated on how to drive smoothly instead of switching lanes and tailgating to try to go faster. And my suspicion is that education will be impossible. The only reasonable answer is to add lanes to all these highways since it is difficult to change human nature.
430	
431	What a total waste of time and money
432	
433	I should travel 270 everyday from 55, but instead I take the longest route which is 70 and hit the express lanes, quicker in time, but much less traffic. 270 has been a problem since I can remember, somehow someway we need express lanes or a double decker highway to improve travel time. This is the worst highway for traffic and safety. I have damaged 2 seperate vehicles on this highway from 55 to 70 from debris on roads, costing several amounts of dollars to have repairs done to the vehicles, I have struck bed liners, tires and much more and when in traffic you cannot swerve, something needs to be done and this is why I refuse to travel this stretch anymore.
434	I drive IL 143 to 255 South to 270 to 270 / Olive. For the westbound 270 morning commute, the problem still exists with bottle-necking and highly variable speeds required to accommodate cars exiting and onramping. This occurs from 367 on all exits before and approaching the 170 interchange. Similarly, for my evening commute on 270 northbound you have a severely bottlenecking issue at Page / 270 which sees a considerable amount of collisions (some high-speed) and very dangerous to exit from Olive onto 270 in any adverse weather conditions before cars attempt to move into Page exit traffic lanes.
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437	Sorry folks but what a joke! Signs say 40 mph everyone is whizzing along at 60+ - signs say 60 then traffic is jammed up and at times nearly stopped. This has been ABSOLUTELY NO HELP!!! I have to drive from Oakville to Chesterfield each day and it stinks -- I am of the opinion the highway department really doesn't think anyone of any importance comes from south county so just let the commute stink and let projects take much longer there to complete than in west and north county and the "city"!
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444	I drive 270 everyday and I understand the overall concept of the variable speed limit. BUT there are several issues - One: When the speed is reduced on the signs the majority of the drivers are still driving at 60 MPH or higher. There are several times when I have reduced to 40-50 and more or less have cars flying up on me at a higher rate of speed. Two: The signs are not always visible as they may be block by other vehicle or the sunlight glares them out. Three: The speed is reduced but there are no issues or signs are set at all different speeds causing confusion
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446	I think they are good for giving you an idea of whats ahead. If there is congestion or an accident maybe have them flash 40. If they stay lit (not flash) with nothing to grab your attention many people just cruise at there own speeds (speeding). The signs over time become ignored and become part of the landscape just like regular speed limit signs (the cheaper version).
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448	I think the variable speed limits are being largely ignored. Increased enforcement may help with this problem but so would education of drivers. People see a 45mph speed limit on a sunny day and assume that either the signs don't work or that MoDOT doesn't know what they are doing. I'd bet that most people don't know that these are designed to relieve congestion. I didn't know until very recently, and I noticed the variable signs months ago.
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450	If you pay attention to the posted speed limit, people behind you honk their horn and wave you to go on, faster. I don't think anyone really pays attention to the 60 MPH speed limit, for example. The big trucks don't, for sure. If there were a way to enforce the variable speed limit I think it would be more helpful.
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452	Conceptually, the variable speed limits are a decent idea. However, the high end is to low during less congested times and the speeds during high volume times are either to slow to change or not set to a value to gain the most benefit.
453	Not very many drivers pay any attention to the speed limit signs or the signs will say 50mph and the traffic is at a stand still. I will agree that new signs do get attention when flashing, that is a great help. It is alost cause around the 67 and 270 or 367 and 270 juctions. These areas are the wrost at any point.

454	In my experience, no one follows the variable speed limit signs. In most instances, if a driver tried to follow the speed limit they would probably get ran over. I believe the posted limit is too low for most areas of I-270 and I-255. I would like to see the speed limit raised to 70 mph in all areas where it is possible. Everyone is already driving 70 plus mph most of the time.
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462	I don't think it has helped a thing. The number of accidents does not appear to have changed, not has it helped to reduce stop-and-go situations or congestion. During peak times, you NEVER go as fast as the signs say. It's always much slower. During non-peak times, it needs to be moved up to at least 70.
463	I love how the MO Dot wokers installed some solar panels under the signs blocking the suns rays. They are not sign panels, they are solar panels which means they need direct sun light to recharge their batteries. All MO Dot is doing is distroying battery life and costing the tax payers money.
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465	This was a huge waste of tax-payer dollars. More norht/south major roads are needed, instead. No-one, and I mean no-one, changes their speed as indicated on these signs. I have seen signs at the same location; one on left-side and one on right-side of traffice with two different speed limits posted. How is that supposed to work? Drivers in far left lane drive one speed, drivers in right lane another and then what do the drivers in the two middle lanes drive?
466	The speed limit should be up to 70 mph when the conditions are right otherwise people are going to speed anyway.
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468	its a waste of money to put those stupid signs up. people don't even pay attention to the changes. So in the end just another way to waste money in missouri.
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470	The issue really has nothing to do with the speed limit. The biggest problem since the reopening of I-64 has been merging left at I-44, Big Bend, and Manchester in the morning. We need another lane there so that the right lane doesn't disappear and force a quick merge. In the evening, the highway is jammed from the Manchester exit until I-44. Traffic seems to move quickly off at Manchester. It's the through traffic lanes that jam. Again, I think we need another lane.
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472	I have trouble seeing the lighted signs during the day. It is annoying to have to look at every speed limit sign just in case it has changed. The signs I have seen are never any different than 60 mph. So what's the purpose?
473	I travel north on 270 every morning from I-55 to Olive Blvd. I have seen no change in traffic patterns since the implementation of the variable speed limit signs. Some days the signs will read 45 and everybody is doing 70, while other days it is stop and go at 20 MPH. I don't see the benefit in these, and neither has my drive time. I still spend 40 - 60 minutes each way sitting in traffic(depending on the time of morning).

474	The signs are very hard to see. I have also never seen a sign change. More speed signs are needed. An increase to more than 60 should be implimented in off peak times. Message boards explaining what is ahead are much more effective than variable speed signs that can't be seen. BTW I am a Traffic Commisioner with the biggest city in St. Charles Co.
475	
476	I believe this project was a complete waste of tax payers money. Speed on highways are determined by flow of traffic, not by a sign telling me its 40MPH. 270 Would not bottleneck as much if the 44/270 merge was designed properly for the volume of traffic. Everyday traffic slows down at Gravoise based on volume of 44 traffic merging onto highway 270. Fix that and alot of morning traffic would be eliminated. Spending all this money on signs that can be changed from a central location is a complete waste of money, this money should be used for more police patrolling the streets for public safety. Put more police presence on the highways people will obey the law.
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479	can not understand how it has helped. travel 270 at 7.30 am and 4.pm still traffic problems
480	I drive 270 daily east, to work, and west home and there has been no change in traffic patterns as for as stop and go, or slowing of traffic at rush hour
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484	There are 2 very clear problems on Hwy 270. The commuters entering 270 from Hwy 44 who insist on entering the traffic flow as soon as possible and not properly utilizing the quarter-mile of multi-lane on ramp, and the commuters heading south who slow down for no reason when approaching the hill between Tesson Ferry and the 44 interchange. If the hwy dept could study and resolve the issues that cause motorists to create these two slowdowns, they could resolve most the problems causing delays in the morning and evening commutes. Variable speed signs, for the most part, are useless. People ignore them.
485	As far as I can tell, no one pays any attention to the variable speed limit signs. They are very inaccurate. Traffic will be at a hault, but the speed limit is 50. I pay more attention to the overhead signs and the traffic reports that tell you where there's an accident ahead. The problems in traffic are the people reading, putting on makeup, talking on the phone and drinking coffee. Then there are people who road race -- usually Illinois drivers. Some drivers can't stand to have ANYONE in front of them irregardless of how long the line of traffic is -- they will weave in and out of traffic cutting off people to get a couple of cars ahead in traffic. I am thankful that the trucks are now out of the fast lane -- my main fear is getting rearended by a semi that isn't paying attention to the flow of traffic.
486	I can completely understand the concept of slowing down traffic to eliminate "stop and go" traffic. However, I have not really witnessed much change. I also don't believe that many motorists are really following the variable limits. I-270 motorists have never really obeyed the limit. Because of the lack of regard for speed limits, it seems to me that trying to elminate traffic jams via a mechanism that is pretty much ignored (speed limit) is futile by nature. I don't have a solution for you. I would like to see a ban on cell phones. I have witnessed many lane drifters that are consumed by their cell phone or makeup application. The best is the driver that manages to smoke and hold a cell phone at the same time.

487	Most people have not complied with the speed limit and I don't feel the police have enforced it very well. Of course when police do pull someone over during rush hour it backs up traffic anyway. If you want people to obey the variable speed limit, I think you should have police presence along 270 with Radar guns in hand for 2 weeks straight pulling people over left and right during rush hour. It will screw up traffic but people would know you mean business and may start to comply. After 2 weeks do a spontaneous radar day once every other week just to keep people on their toes.
488	The variable speed limit project is a nice idea, but people don't seem to be driving any faster or slower than what traffic allows. Even then you still have some hot dog idiots that weave in between lanes to keep their speed up, but only creates traffic hazards for us law-abiding drivers.
489	I believe the variable speed limit would work if people would actually obey it. I do not think that St. Louis drivers actually obey what the signs say. They go 60 mph (70 or 80 in some cases) whenever they can, no matter what the signs say. If they were forced to obey the signs, congestion would be better and stop and go traffic would be reduced. So, figure out how to make everyone obey the 40-60 mph speed limit and this might actually be a huge help. I am also hoping that when all of 64/40 is reopened, traffic on 270 will be slightly better. But, I have my doubts.
490	These variable speed limit signs are of no use whatsoever. The only thing I get from them is that when they read "45" , I know there is going to be a traffic jam ahead. No one pays any attention to them and, anyway, doesn't the amount and flow of traffic pretty well regulate the speed we travel anyway!!?? This was a very expensive experiment that doesn't work and I would hope it would not be duplicated on any other highway.
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492	It has not worked because half the drivers do not pay attention to the change and go whatever speed they want anyway.
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495	Implementation of the variable speed signs was and is a waste of time and money. Traffic continues at whatever speed the flow will allow, no matter what the speed limit stated on the sign. Someone sold MODOT a bill of goods. The advantages received are limited to the manufacturer, installers, and equipment maintainers. The tax payers are bearing the costs and receiving absolutely no advantage. I recommend return to the old static, painted speed limit signs that were also ignored, but didn’t cost near what the new signs cost.
496	Nobody follows the variable limits. I agree with the premise of variable limits, but if the "why they will work" is not explained for a better understanding, no one will follow the plan.
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498	Every day I drive 270, everyone seems to completely ignore the variable speed limits, so while I am abiding by them others zip past me with no heed for the reduced speed. It only creates a more dangerous situation with those following the law and those ignoring it completely.
499	The variable speed limit has done nothing to decrease the amount of traffic issues during peak hours. My understanding was that the variable speed during peak hours was to keep traffic moving, even if it was at a slower speed. I do think that the speed limit should be raised to 70 during none peak hours when I-270 is empty.
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502	I do not understand the idea behind the variable speed limits. No one abides by them to even see if they work. I think during morning and evening commutes there is entirerly too much traffic to have the variable speed limits affect anything. If you slow the go early, then the back up will only begin earlier. I think a HUGE problem with 270 and 40 interchange as well as many other highway interchanges is that there should be a "double white line rule" for all of these interchanges. Very similar to 270 and 70. The people who are most frustrated with these slow-goes are the people that get into line to switch highways well before the interchange but only do this to wait in line longer because of all of the people that rush up and cut in line ahead. This is soooo dangerous because instead of having a steady flow of traffic, there are constant sudden stops needed for the five cars that just jumped in front. This also makes people try to ride close to the person in front of them so people cannot get into the line. VERY UNSAFE!!!!!!
503	It is not the speed limits that is the problem. It is the enforcement. You go the posted limits or a little above and people constantly tailgate and get angry with you when you do it. They then weave in and out of traffice.
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506	If the limits were actually obeyed, it may help with congestion, but because most people ignore them and just stay with traffic, or traffic is already down to a crawl by the time the speed limit is decreased, they aren't haven't much of an effect. It's almost as if the speed needs to be reduced sooner before the congestion hits so the traffic doesn't build up as fast behind the accident, or whatever is causing the slowdown. Once one person stops, it triggers a huge chain reaction where the whole interstate just clogs up. Either more enforcement of them (which is tricky because how does the officer know what the speed limit is and what you actually saw on the last sign), or an additional solution is needed, such as HOV lanes to encourage more carpooling, etc.
507	The congestion at I-44 and I-270 is still too slow in the mornings, but seems to have been relieved by the partial opening of 40. Also, Manchester and 270 always seems to be at a crawl from 4:30 to 6:15, no matter the speed limits.
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511	I do not believe that the implementation of variable speed limits has had any impact on traffic levels. Drivers simply do not pay any attention to the varying speed limits.
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516	I believe that the variable speed limit project might just work.I have to travel I-255/I-270(northbound during rush hour).I enter the highway at Telegraph.No one, and I mean "No One"!! is paying any attention to the signs.They drive as fast as they can(over 60 mph's) until they get to Tesson Ferry Rd. where they "have" to slow down as they get closer to I-44. Would like an aggresive approach by law enforcement at least for a short period of time in that stretch of the highway to see what effect it has on traffic flow. I certainly think it is worth a try because again I think it' something that can work.

517	The main problem on 270 is drivers not paying attention. When people are in the far left lane and wait until the last minute to get to the far right lane. So this causes people behind them to slam on their brakes. That and people not using turn signals or cutting people off. I don't think the speed limit signs are going to make a difference until law enforcement starts pulling people over for unsafe driving or lane changing. I am sure they can come up with something. If people were caught driving crazy they would start to be more careful. Then the signs would be helpful in controlling the flow of traffic. Good luck!! You are going to need it.
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520	I know NO ONE and see NO ONE that follows these signs when they matter. Then, when the traffic is lite and should be higher speed, some IDIOT is driving 10 miles slower in the passing lane. ARRRGGGHHH!!!! LOL Here is the way to fix traffic issues. Ticket drivers that misues the PASSING lane and DO NOT move to right lanes when they are driving slower. Ticket drivers that are on CELL PHONES. Ticket drivers that are CARELESS AND WRECKLESS. Why not? We hammer the heck out of drunks. Which I agree. Why not STUPID?
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522	These are a safety hazard for a number of reasons - below I've listed my top two: 1) I used to know what the speed limit was and I followed it. Now you have increased the cognitive load on drivers. Not just do I have to be aware that the speed limit may be different than normal, but in addition I have to check EVERY speed limit sign. Given how much else there is to focus on while driving, this was needless and expensive as well as making driving in general more dangerous. 2) The speeds start dropping LONG before there is any visible sign of why they are dropping and on occasion whatever reason may have been there for the decreased limit is gone before you ever arrive there. As a result, people continue at the expected rate of speed until they have a visual cue to slow down (i.e. brake lights in front of them). So in reality - people still respond best to the same cues they always did - what they see. But here's the problem, now you have some people slowing down when the signs say and some when they see a reason to slow down... ultimately this makes it more dangerous. Let's face it, when there was traffic or a wreck, people did slow down... did we really need variable speed limits to tell them to? Honestly, general public opinion (with which I generally tend to agree) is that this system was put in place as a revenue generator. More tickets will be issued and our tax dollars got to pay for that privilege. Doesn't seem fair or honest. If the government was trying to increase the "us against them" mentality, they have succeeded and made it more dangerous for us in the process.
523	Entrance and exit at lindbergh needs to be modified as that is where the congestion start and gets work as you move toward illinois
524	I believe the variable speed limit program would have positive results only if drivers actually paid attention to the change in speed limit or in that case, the road itself. If the speed limit were lowered to 50mph while some drivers are still going 65+mph, accidents can occur. An alternative, cost efficient, although unpopular method of reducing congestion and traffic accidents would be for Missouri to pass a no cell phone while driving law.
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528	I think if there is traffic and congestion of course driver wouldnt be able to drive the limit, but i think it should be left at one set speed, cause if you drive a highway all the time you already know the limit and having to look and find the changing signs in

	traffic can cause accidents itself.
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532	it usually seems that the speed limit is only reduced after you get to the bad traffic and the few times i have seen it BEFORE the traffic the commuters were not paying any attention to it anyway.
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534	everyone does not travel at the reduced posted speed limit. Perhaps lowering the speed limit on 270 down to 55.
535	
536	I drive 20 miles on I270 every morning and every evening. Morning traffic has never been an issue. Evening traffic is the same as before the variable speed limits were installed. People, myself included, still drive as fast as they feel is appropriate based on the driving conditions, no matter what the speed limit signs say. On many occasions I have had to drive 65 to 70 miles per hour to keep up with traffic, only to see a posted speed limit of 40 MPH. In this situation it would be very dangerous for me to slow down to obey the posted speed. I also have not noticed any more speed limit enforcement than before the change. Although the idea of variable speed limits seems to make sense in theory, it doesn't work in reality. I certainly would not suggest spending tax dollars to purchase and install these signs anywhere else.
537	The speed limit of 60 MPH is too slow. Most people are traveling faster than that anyway, so I really don't think having at 60 mph really matters.
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540	I travel 270 between Florissant and Earth City every weekday for work and I think it would be beneficial to have some kind of police presence going eastbound in the evenings to slow down or ticket the drivers that still go 70 when the posted speed limit is 45. Every evening that the speed limit is lowered, there are at least 2 cars that weave in and out of traffic going way too fast for the variable speed limit. There are many close calls and I'm surprised there haven't been more accidents. Thank you!
541	I BELIEVE IT HAS MADE PEOPLE MORE CONCIOUS OF TRAFFIC AHEAD OF THEM. I TRAVEL ON 270 EVERY MORNING IN SOUTH COUNTY. I KNOW BY THE SPEED LIMIT WHAT THE TRAFFIC WILL BE LIKE AHEAD AND WHETHER I MAY TAKE A SOONER EXIT TO AVOID IT.
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543	I think the 60mph speed limit coming across the Jefferson Barrack's bridge into South County is too slow. This is especially true during morning commute. Speed should be 70mph during the day and slowed to 60mph at night.
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545	Get local news channels to explain the project to the public, in words of one syllable. Variable speed limits work well in other countries, America needs to catch up, but it needs to be explained to people so they can understand the "Why" and the "How it works".
546	What is it about trafic between South bound 270 between Manchester and Big Bend No Acidents and traffic is a crawl. After you get past Big Bend it clears up as if there was no trafic at all. Have MoDot eplain PLEASE.

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548	I think this project was a waste of taxpayers money!
549	Something better has to be done. I live in south and work at Olive and 270. Its so bad in the morning that I am looking at moving my office or home. I dont even try to get on before Big Bend. South bound in the evening is nuts, why do we sit at 6:30p all the way to Big Bend and then find an empty highway all the way to 55? It cant be I-44, because it breaks free before you get that far. I am wasting time right now...6p in my office because I don't want to spend over an hour driving home.
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552	Here are my thoughts on this. 1, I think the variable speed limit change has good intentions. 2, whether we have regular signs or electronic signs, MOST people are still speeding, and I mean like 15 to 20 over. I drive the speed limit as much as possible 95% of the time while on the interstate. At 60mph it's nearly impossible sometimes. The speed NEEDS to be raised to at least 70 but no higher. People HAVE to slow down though. I would say that 60% of people who drive on 270 North/South are going at least 75 to 80 most of the time. No matter what MoDOT does or how many police are out, people are doing dangerous things. So while this variable speed limit is okay, it's done nothing but make things a little worse. It's going to change nothing either. If the speed limit is raised to 70, I think alot of people would do that more so than 60. To be honest 60 is too slow for an interstate like 270 when there isn't alot of traffic. One more thing. I don't think it's a speed trap to have the variable speed limits although I do think alot of people get pulled over for speeding and they should be.
553	The main problem on I-270 southbound during the evening rush hour is the Doughtery Ferry acceleration ramp. It seems traffic breaks loose at the Big Bend exit. bend
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555	Waste of time and money to install this system. Most drivers don't pay attention to the speed limits. Still drive over limits until they incounter the traffic jam, then traffic comes to stand still and craws along just like before the system was installed.
556	This has without a doubt been one of the biggest waists of tax payer money I have witnessed. When traffic is light, and the signs say 60mph, you get run over by vehicles going 80+ mph, even if you are going 70, which is already over the speed limit by 10mph. When speed signs have been reduced to 50 or 40 and the traffic is light, you still have people going 80+mph. When traffic is heavy, as it always is on eastbound 270 near 170 in the evening, the signs will say 45 or 40 mph, and are very easy to read, as traffic is bumper to bumper and going 5 mph. You RARELY see any attempt to enforce speed laws in this northern section of 270. In addition, there is no attempt to keep vehicles that are going far below the speeds of other traffic from using the highway. There is a minimum speed set in law during normal traffic, and yet I have seen people on many occasions going along at as slow as 30mph, when the main traffic flow is pushing 60+ mph. This is a great threat as those who come up on these slow moving vehicles then try to get around them and have to try to accelerate into much faster traffic. Here is a better idea, that could even pay for itself. Install a set of speed cameras over each lane on every overpass in the 270, 70, 170. 55, 64 and 44 loops. Then when a driver exceeds the posted speed limit by over 10mph, take his/her picture and send them a $200 ticket. Add $100 for every additional 5mph. If the same car is still going over the limit a mile further down the road, give them a second, third, fourth ticket. I my humble opinion, if you can't get wherever you need to at 70 mph or less; then you damn well should have left the house sooner. If they are going under the average speed by over 10mph, give them a ticket for impeding the flow of traffic. This is

	especially important for those that feel they should go 50mph in the passing lane, and hang there for miles. This will keep all vehicles moving at closer to the same speed, and thus make everyone safer. Most of the cameras would not even have to be real, as long as some of them were and you did not know which ones would give you a ticket. Send the ticket to the registered owner, and he has to pay unless he can bring in the actual driver. You do not have to be the one to park a car to get a parking ticket, same should apply to this.
557	Variable speed limit is not working well between I 255 at Mississippi River and Hwy 30. If I do the posted speed limit (7:00AM-7:30AM), I would be a threat and a menace to the traffic around me.
558	There are way too many drivers who ignore speed limit signs, whether variable or not. The idea is sound, however, there need to be police to reinforce it. And FYI all highways in and around the St. Louis area need more police reinforcing the speed limits.
559	The plan is a great idea and worked wonderfully in the beginning when everyone obeyed the changing speed limits, my travel time was cut by 15-20 minutes. But now there are MANY drivers who do not pay attention to the changing speed limits and will run you over. This may be due to the police not patrolling Hwy 270 as they did in the beginning. My drive time NOW is only cut by about 5 minutes, there are still accidents on the highway and traffic is once again becoming horrendous. If everyone would only OBEY the posted speed limits, it would work fine.
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561	During rush hour in the areas that are congested the speed limit goes down to 45mph but on areas of the highway where there is no congestion the speed limit is still 45mph. This is a problem! If I wanted to drive 45mph I would get on a side street and not the interstate highway. I believe that a higher speed limit should be posted when congestion begins to subside. The "regular" speed on the interstate should be 70mph not 65mph. Because that is what the majority of cars are doing anyway. Thank you.
562	My biggest complaint is that, when the speeds are below normal, it isn't always obvious. The signs need to flash or something to highlight the the speeds have been lowered. It is too easy to get into old habits and assume the speeds are 60.
563	Drivers are totally ignoring the speed limit. More police enforcement is needed.
564	I comply with them, but I usually drive between 55 and 60 anyway. I still see morons speeding, changing lanes abruptly and being stupid. Variable speed limits won't fix stupid. I say keep them for the time being. Quite frankly, I've never seen them set at anything but 60 -- I drive I-270/I-255 from I-44 east to the J B Bridge, in Missouri. I think they have evened out the traffice flow. If that's what they are supposed to do, they are succeeding.
565	I feel traffic is the same with the signs up; Howver, I feel like it is a hazard at times because I will drive 50mph (the posted limit) and many other vehicles will zoom past me. If the speeders were eliminated it may be better. Overall I don't notice a change in my commute time during rush hour or a large reduction in accidents. I don't feel they are a bad idea but saftey of those who comply with the new speeds should be considered before placing tham on every roadway.
566	

567	Variable speed limits were not the way to limit congestion and provide free-flowing traffic on the loop interstates. I have never seen them enforced, and I am not sure how they would be supported if a speeding driver were to go to court over the issue: "The cop says the limit was 40, I say it was 60..." and the burden of proof is on the state--prove that at that moment, at that location, the speed limit was reduced. AND--prove that the signs were functioning, not out (like around 270 and Dorsett for so long). Most people ignore them anyway. If the sign says 60, they go 75. If the sign says 45, they go 75 until they hit the congestion. If you wanted to reduce congestion and provide free-flowing traffic, the only way to do that would be to implement ramp-metering. Limit the volume and the surging due to cross-street signals. If you want to grab some revenue (and who doesn't, especially in the name of public safety!), use red-light cameras along with the ramp meters (if legal).
568	Still way too many drivers do not pay attention to the speed limit signs as well as other infractions..Tailgating, weaving in and out of lanes w/o using turn signals, go from a middle of left lane across to an exit lane without regard to for other drivers and could go on and on..make the digital signs Brighter and consider re-testing ALL drivers when thier licence comes up for renewal, both the written and driving test, tou will be amazed how many would FAIL
569	I travel I-70 quite a lot and I believe there needs to be speed control there as well. People are traveling way to fast in that area.
570	without enforcement why bother
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572	Most of the times when the speed limit has changed to 40 we are parked on the highway due to some type of congestion. As soon as the traffic breaks up people resume 60-70 mph. Some people are traveling 40 mph and so are being passed on the right. It seems more people are weaving in and out of the traffic lanes at this time.
573	variable speeds are confusing. You get into a routine and if everyday it could be different, a large number of people will drive at the slower speed out of fear of a ticket and cause more backups and accidents. Pick a speed a stick to it. Also if I was new to town or visiting I may not notice those signs. Use your big information signs to put out brief messages regarding the speeds, not just your seat belt slogans.
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575	I understand the theory, but my experience shows when the road is 'open' and the limit is posted 45, people drive 60+. I drive with traffic afraid that meeting the lower speed limit will be a danger to myself and others. People will drive the speed traffic allows regardless of what is posted. There is slow down every day at Gravois and 44, I think detemining why that occurs and resolving that would be a better way to keep traffice moving.
576	Speed trap.
577	I don't think the variable speed limit signs have helped at all. When I see a sign change to 40mph I know that traffic is at a stop ahead, but if I have clear view I still go 65. And so do all the other cars. I speed limit needs to be increased and we need to figure a way to keep the cars going slow or at 60 out of the fast lane.
578	There used to be a real time speed limit information on www.stlspeedlimit.com when the project was initiated. It was very useful for me before taking the trip. However, its been unavailable for the last 4 months. Please make it available asap so that the VSL approval will increase even more.
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580	people go to to fast. no one uses their turn singles when changing lanes or getting on or off exits. its just a mess. i hate 270.
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582	I find that the speed limit variations typically don't keep up with traffic. It seems the traffic is stopped or crawling and the speed limit says 45 mph, or vice versa. It seems to have been a waste of time and money.
583	The variable speed limits actually make me feel less safe on the road. When I comply with the lower speed limits during rush hour traffic, most other motorists still are going the 60mph limit, if not faster, and end up swerving and rapidly changing lanes to avoid running up on me and other cars going the slower speed limit. I agree with the notion that VSL's should help provide a more uniform traffic flow, but not enough enforcement has been taken to ensure that drivers actually slow down to conform to the lower limits. The presence of local police and/or state troopers needs to be more evident during the rush hours to enforce the set limits.
584	why weren't these placed on the overhead road signs instead of the side of the road. Too small to see. When highways are extremely busy (which is about 20 hours/day!) it would be much easier to see if overhead. Tough enough having to watch the fools on the road and look for a tiny speed sign. A lot of money spent unwisely - again!
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586	I never see them say anything other than 60.
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591	Morning commute - you get ran over if you only do 60 mph - I usually leave my house before 6 am otherwise it will be stop and go on I-270 from Gravois to Ladue heading north Evening commute - usually I am sitting in the I-270 parking lot doing 0-5 mph next to your sign that says I should be going 45 mph heading south between 3:30 pm and 6 pm How about designating a lane for those with 2 or more passengers so at least the carpoolers (which there are very few of) could move more freely - better yet have bus service or light rail along the I-270 corridor. I never see a bus on I-270 - seems to me they would have a lot of business if there were a few stops along the way with connecting bus service to arterial roads.
592	Since the investment in the variable speed limit has been made, lets ENFORCE it. I will probably be the first to get a ticket, but no one is driving the speed limit. I tried to go 40 mph the first couple weeks - but it was very scary having people come up on you at 80 mph. So I just go with the traffic 70 - 80 (or 2 - 10 mph). It is so frustrating. I think if you let the public know that you will begin enforcing the VSL on 270, they (I) will slow down. Thank you for showing signs of concern for the South County residents.
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462	I don't think it has helped a thing. The number of accidents does not appear to have changed, not has it helped to reduce stop-and-go situations or congestion. During peak times, you NEVER go as fast as the signs say. It's always much slower. During non-peak times, it needs to be moved up to at least 70.

463	I love how the MO Dot wokers installed some solar panels under the signs blocking the suns rays. They are not sign panels, they are solar panels which means they need direct sun light to recharge their batteries. All MO Dot is doing is distroying battery life and costing the tax payers money.
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465	This was a huge waste of tax-payer dollars. More norht/south major roads are needed, instead. No-one, and I mean no-one, changes their speed as indicated on these signs. I have seen signs at the same location; one on left-side and one on right-side of traffice with two different speed limits posted. How is that supposed to work? Drivers in far left lane drive one speed, drivers in right lane another and then what do the drivers in the two middle lanes drive?
466	The speed limit should be up to 70 mph when the conditions are right otherwise people are going to speed anyway.
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468	its a waste of money to put those stupid signs up. people don't even pay attention to the changes. So in the end just another way to waste money in missouri.
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470	The issue really has nothing to do with the speed limit. The biggest problem since the reopening of I-64 has been merging left at I-44, Big Bend, and Manchester in the morning. We need another lane there so that the right lane doesn't disappear and force a quick merge. In the evening, the highway is jammed from the Manchester exit until I-44. Traffic seems to move quickly off at Manchester. It's the through traffic lanes that jam. Again, I think we need another lane.
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472	I have trouble seeing the lighted signs during the day. It is annoying to have to look at every speed limit sign just in case it has changed. The signs I have seen are never any different than 60 mph. So what's the purpose?
473	I travel north on 270 every morning from I-55 to Olive Blvd. I have seen no change in traffic patterns since the implementation of the variable speed limit signs. Some days the signs will read 45 and everybody is doing 70, while other days it is stop and go at 20 MPH. I don't see the benefit in these, and neither has my drive time. I still spend 40 - 60 minutes each way sitting in traffic(depending on the time of morning).
474	The signs are very hard to see. I have also never seen a sign change. More speed signs are needed. An increase to more than 60 should be implimented in off peak times. Message boards explaining what is ahead are much more effective than variable speed signs that can't be seen. BTW I am a Traffic Commisioner with the biggest city in St. Charles Co.
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476	I believe this project was a complete waste of tax payers money. Speed on highways are determined by flow of traffic, not by a sign telling me its 40MPH. 270 Would not bottleneck as much if the 44/270 merge was designed properly for the volume of traffic. Everyday traffic slows down at Gravoise based on volume of 44 traffic merging onto highway 270. Fix that and alot of morning traffic would be eliminated. Spending all this money on signs that can be changed from a central location is a complete waste of money, this money should be used for more police patrolling the streets for public safety. Put more police presence on the highways people will obey the law.
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479	can not understand how it has helped. travel 270 at 7.30 am and 4.pm still traffic problems
480	I drive 270 daily east, to work, and west home and there has been no change in traffic patterns as for as stop and go, or

	slowing of traffic at rush hour
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484	There are 2 very clear problems on Hwy 270. The commuters entering 270 from Hwy 44 who insist on entering the traffic flow as soon as possible and not properly utilizing the quarter-mile of multi-lane on ramp, and the commuters heading south who slow down for no reason when approaching the hill between Tesson Ferry and the 44 interchange. If the hwy dept could study and resolve the issues that cause motorists to create these two slowdowns, they could resolve most the problems causing delays in the morning and evening commutes. Variable speed signs, for the most part, are useless. People ignore them.
485	As far as I can tell, no one pays any attention to the variable speed limit signs. They are very inaccurate. Traffic will be at a hault, but the speed limit is 50. I pay more attention to the overhead signs and the traffic reports that tell you where there's an accident ahead. The problems in traffic are the people reading, putting on makeup, talking on the phone and drinking coffee. Then there are people who road race -- usually Illinois drivers. Some drivers can't stand to have ANYONE in front of them irregardless of how long the line of traffic is -- they will weave in and out of traffic cutting off people to get a couple of cars ahead in traffic. I am thankful that the trucks are now out of the fast lane -- my main fear is getting rearended by a semi that isn't paying attention to the flow of traffic.
486	I can completely understand the concept of slowing down traffic to eliminate "stop and go" traffic. However, I have not really witnessed much change. I also don't believe that many motorists are really following the variable limits. I-270 motorists have never really obeyed the limit. Because of the lack of regard for speed limits, it seems to me that trying to elminate traffic jams via a mechanism that is pretty much ignored (speed limit) is futile by nature. I don't have a solution for you. I would like to see a ban on cell phones. I have witnessed many lane drifters that are consumed by their cell phone or makeup application. The best is the driver that manages to smoke and hold a cell phone at the same time.
487	Most people have not complied with the speed limit and I don't feel the police have enforced it very well. Of course when police do pull someone over during rush hour it backs up traffic anyway. If you want people to obey the variable speed limit, I think you should have police presence along 270 with Radar guns in hand for 2 weeks straight pulling people over left and right during rush hour. It will screw up traffic but people would know you mean business and may start to comply. After 2 weeks do a spontaneous radar day once every other week just to keep people on their toes.
488	The variable speed limit project is a nice idea, but people don't seem to be driving any faster or slower than what traffic allows. Even then you still have some hot dog idiots that weave in between lanes to keep their speed up, but only creates traffic hazards for us law-abiding drivers.
489	I believe the variable speed limit would work if people would actually obey it. I do not think that St. Louis drivers actually obey what the signs say. They go 60 mph (70 or 80 in some cases) whenever they can, no matter what the signs say. If they were forced to obey the signs, congestion would be better and stop and go traffic would be reduced. So, figure out how to make everyone obey the 40-60 mph speed limit and this might actually be a huge help. I am also hoping that when all of 64/40 is reopened, traffic on 270 will be slightly better. But, I have my doubts.
490	These variable speed limit signs are of no use whatsoever. The only thing I get from them is that when they read "45" , I know there is going to be a traffic jam ahead. No one pays any attention to them and, anyway, doesn't the amount and flow of traffic pretty well regulate the speed we travel anyway!!?? This was a very expensive experiment that doesn't work and I would hope it would not be duplicated on any other highway.
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492	It has not worked because half the drivers do not pay attention to the change and go whatever speed they want anyway.
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495	Implementation of the variable speed signs was and is a waste of time and money. Traffic continues at whatever speed the flow will allow, no matter what the speed limit stated on the sign. Someone sold MODOT a bill of goods. The advantages received are limited to the manufacturer, installers, and equipment maintainers. The tax payers are bearing the costs and receiving absolutely no advantage. I recommend return to the old static, painted speed limit signs that were also ignored, but didn’t cost near what the new signs cost.
496	Nobody follows the variable limits. I agree with the premise of variable limits, but if the "why they will work" is not explained for a better understanding, no one will follow the plan.
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498	Every day I drive 270, everyone seems to completely ignore the variable speed limits, so while I am abiding by them others zip past me with no heed for the reduced speed. It only creates a more dangerous situation with those following the law and those ignoring it completely.
499	The variable speed limit has done nothing to decrease the amount of traffic issues during peak hours. My understanding was that the variable speed during peak hours was to keep traffic moving, even if it was at a slower speed. I do think that the speed limit should be raised to 70 during none peak hours when I-270 is empty.
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502	I do not understand the idea behind the variable speed limits. No one abides by them to even see if they work. I think during morning and evening commutes there is entirerly too much traffic to have the variable speed limits affect anything. If you slow the go early, then the back up will only begin earlier. I think a HUGE problem with 270 and 40 interchange as well as many other highway interchanges is that there should be a "double white line rule" for all of these interchanges. Very similar to 270 and 70. The people who are most frustrated with these slow-goes are the people that get into line to switch highways well before the interchange but only do this to wait in line longer because of all of the people that rush up and cut in line ahead. This is soooo dangerous because instead of having a steady flow of traffic, there are constant sudden stops needed for the five cars that just jumped in front. This also makes people try to ride close to the person in front of them so people cannot get into the line. VERY UNSAFE!!!!!!
503	It is not the speed limits that is the problem. It is the enforcement. You go the posted limits or a little above and people constantly tailgate and get angry with you when you do it. They then weave in and out of traffice.
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506	If the limits were actually obeyed, it may help with congestion, but because most people ignore them and just stay with traffic, or traffic is already down to a crawl by the time the speed limit is decreased, they aren't haven't much of an effect. It's almost as if the speed needs to be reduced sooner before the congestion hits so the traffic doesn't build up as fast behind the accident, or whatever is causing the slowdown. Once one person stops, it triggers a huge chain reaction where the whole interstate just clogs up. Either more enforcement of them (which is tricky because how does the officer know what the speed limit is and what you actually saw on the last sign), or an additional solution is needed, such as HOV lanes to encourage more carpooling, etc.

507	The congestion at I-44 and I-270 is still too slow in the mornings, but seems to have been relieved by the partial opening of 40. Also, Manchester and 270 always seems to be at a crawl from 4:30 to 6:15, no matter the speed limits.
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511	I do not believe that the implementation of variable speed limits has had any impact on traffic levels. Drivers simply do not pay any attention to the varying speed limits.
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516	I believe that the variable speed limit project might just work.I have to travel I-255/I-270(northbound during rush hour).I enter the highway at Telegraph.No one, and I mean "No One"!! is paying any attention to the signs.They drive as fast as they can(over 60 mph's) until they get to Tesson Ferry Rd. where they "have" to slow down as they get closer to I-44. Would like an aggresive approach by law enforcement at least for a short period of time in that stretch of the highway to see what effect it has on traffic flow. I certainly think it is worth a try because again I think it' something that can work.
517	The main problem on 270 is drivers not paying attention. When people are in the far left lane and wait until the last minute to get to the far right lane. So this causes people behind them to slam on their brakes. That and people not using turn signals or cutting people off. I don't think the speed limit signs are going to make a difference until law enforcement starts pulling people over for unsafe driving or lane changing. I am sure they can come up with something. If people were caught driving crazy they would start to be more careful. Then the signs would be helpful in controlling the flow of traffic. Good luck!! You are going to need it.
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520	I know NO ONE and see NO ONE that follows these signs when they matter. Then, when the traffic is lite and should be higher speed, some IDIOT is driving 10 miles slower in the passing lane. ARRRGGGHHH!!!! LOL Here is the way to fix traffic issues. Ticket drivers that misues the PASSING lane and DO NOT move to right lanes when they are driving slower. Ticket drivers that are on CELL PHONES. Ticket drivers that are CARELESS AND WRECKLESS. Why not? We hammer the heck out of drunks. Which I agree. Why not STUPID?
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522	These are a safety hazard for a number of reasons - below I've listed my top two: 1) I used to know what the speed limit was and I followed it. Now you have increased the cognitive load on drivers. Not just do I have to be aware that the speed limit may be different than normal, but in addition I have to check EVERY speed limit sign. Given how much else there is to focus on while driving, this was needless and expensive as well as making driving in general more dangerous. 2) The speeds start dropping LONG before there is any visible sign of why they are dropping and on occasion whatever reason may have been there for the decreased limit is gone before you ever arrive there. As a result, people continue at the expected rate of speed until they have a visual cue to slow down (i.e. brake lights in front of them). So in reality - people still respond best to the same cues they always did - what they see. But here's the problem, now you have some people slowing down when the signs say and some when they see a reason to slow down... ultimately this makes it more dangerous. Let's

	face it, when there was traffic or a wreck, people did slow down... did we really need variable speed limits to tell them to? Honestly, general public opinion (with which I generally tend to agree) is that this system was put in place as a revenue generator. More tickets will be issued and our tax dollars got to pay for that privilege. Doesn't seem fair or honest. If the government was trying to increase the "us against them" mentality, they have succeeded and made it more dangerous for us in the process.
523	Entrance and exit at lindbergh needs to be modified as that is where the congestion start and gets work as you move toward illinois
524	I believe the variable speed limit program would have positive results only if drivers actually paid attention to the change in speed limit or in that case, the road itself. If the speed limit were lowered to 50mph while some drivers are still going 65+mph, accidents can occur. An alternative, cost efficient, although unpopular method of reducing congestion and traffic accidents would be for Missouri to pass a no cell phone while driving law.
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528	I think if there is traffic and congestion of course driver wouldnt be able to drive the limit, but i think it should be left at one set speed, cause if you drive a highway all the time you already know the limit and having to look and find the changing signs in traffic can cause accidents itself.
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532	it usually seems that the speed limit is only reduced after you get to the bad traffic and the few times i have seen it BEFORE the traffic the commuters were not paying any attention to it anyway.
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534	everyone does not travel at the reduced posted speed limit. Perhaps lowering the speed limit on 270 down to 55.
535	
536	I drive 20 miles on I270 every morning and every evening. Morning traffic has never been an issue. Evening traffic is the same as before the variable speed limits were installed. People, myself included, still drive as fast as they feel is appropriate based on the driving conditions, no matter what the speed limit signs say. On many occasions I have had to drive 65 to 70 miles per hour to keep up with traffic, only to see a posted speed limit of 40 MPH. In this situation it would be very dangerous for me to slow down to obey the posted speed. I also have not noticed any more speed limit enforcement than before the change. Although the idea of variable speed limits seems to make sense in theory, it doesn't work in reality. I certainly would not suggest spending tax dollars to purchase and install these signs anywhere else.
537	The speed limit of 60 MPH is too slow. Most people are traveling faster than that anyway, so I really don't think having at 60 mph really matters.
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540	I travel 270 between Florissant and Earth City every weekday for work and I think it would be beneficial to have some kind of police presence going eastbound in the evenings to slow down or ticket the drivers that still go 70 when the posted speed limit is 45. Every evening that the speed limit is lowered, there are at least 2 cars that weave in and out of traffic going way too fast for the variable speed limit. There are many close calls and I'm surprised there haven't been more accidents. Thank you!
541	I BELIEVE IT HAS MADE PEOPLE MORE CONCIOUS OF TRAFFIC AHEAD OF THEM. I TRAVEL ON 270 EVERY MORNING IN SOUTH COUNTY. I KNOW BY THE SPEED LIMIT WHAT THE TRAFFIC WILL BE LIKE AHEAD AND WHETHER I MAY TAKE A SOONER EXIT TO AVOID IT.
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543	I think the 60mph speed limit coming across the Jefferson Barrack's bridge into South County is too slow. This is especially true during morning commute. Speed should be 70mph during the day and slowed to 60mph at night.
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545	Get local news channels to explain the project to the public, in words of one syllable. Variable speed limits work well in other countries, America needs to catch up, but it needs to be explained to people so they can understand the "Why" and the "How it works".
546	What is it about trafic between South bound 270 between Manchester and Big Bend No Acidents and traffic is a crawl. After you get past Big Bend it clears up as if there was no trafic at all. Have MoDot eplain PLEASE.
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548	I think this project was a waste of taxpayers money!
549	Something better has to be done. I live in south and work at Olive and 270. Its so bad in the morning that I am looking at moving my office or home. I dont even try to get on before Big Bend. South bound in the evening is nuts, why do we sit at 6:30p all the way to Big Bend and then find an empty highway all the way to 55? It cant be I-44, because it breaks free before you get that far. I am wasting time right now...6p in my office because I don't want to spend over an hour driving home.
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552	Here are my thoughts on this. 1, I think the variable speed limit change has good intentions. 2, whether we have regular signs or electronic signs, MOST people are still speeding, and I mean like 15 to 20 over. I drive the speed limit as much as possible 95% of the time while on the interstate. At 60mph it's nearly impossible sometimes. The speed NEEDS to be raised to at least 70 but no higher. People HAVE to slow down though. I would say that 60% of people who drive on 270 North/South are going at least 75 to 80 most of the time. No matter what MoDOT does or how many police are out, people are doing dangerous things. So while this variable speed limit is okay, it's done nothing but make things a little worse. It's going to change nothing either. If the speed limit is raised to 70, I think alot of people would do that more so than 60. To be honest 60 is too slow for an interstate like 270 when there isn't alot of traffic. One more thing. I don't think it's a speed trap to have the variable speed limits although I do think alot of people get pulled over for speeding and they should be.
553	The main problem on I-270 southbound during the evening rush hour is the Doughtery Ferry acceleration ramp. It seems traffic breaks loose at the Big Bend exit. bend

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555	Waste of time and money to install this system. Most drivers don't pay attention to the speed limits. Still drive over limits until they incounter the traffic jam, then traffic comes to stand still and craws along just like before the system was installed.
556	This has without a doubt been one of the biggest waists of tax payer money I have witnessed. When traffic is light, and the signs say 60mph, you get run over by vehicles going 80+ mph, even if you are going 70, which is already over the speed limit by 10mph. When speed signs have been reduced to 50 or 40 and the traffic is light, you still have people going 80+mph. When traffic is heavy, as it always is on eastbound 270 near 170 in the evening, the signs will say 45 or 40 mph, and are very easy to read, as traffic is bumper to bumper and going 5 mph. You RARELY see any attempt to enforce speed laws in this northern section of 270. In addition, there is no attempt to keep vehicles that are going far below the speeds of other traffic from using the highway. There is a minimum speed set in law during normal traffic, and yet I have seen people on many occasions going along at as slow as 30mph, when the main traffic flow is pushing 60+ mph. This is a great threat as those who come up on these slow moving vehicles then try to get around them and have to try to accelerate into much faster traffic. Here is a better idea, that could even pay for itself. Install a set of speed cameras over each lane on every overpass in the 270, 70, 170. 55, 64 and 44 loops. Then when a driver exceeds the posted speed limit by over 10mph, take his/her picture and send them a $200 ticket. Add $100 for every additional 5mph. If the same car is still going over the limit a mile further down the road, give them a second, third, fourth ticket. I my humble opinion, if you can't get wherever you need to at 70 mph or less; then you damn well should have left the house sooner. If they are going under the average speed by over 10mph, give them a ticket for impeding the flow of traffic. This is especially important for those that feel they should go 50mph in the passing lane, and hang there for miles. This will keep all vehicles moving at closer to the same speed, and thus make everyone safer. Most of the cameras would not even have to be real, as long as some of them were and you did not know which ones would give you a ticket. Send the ticket to the registered owner, and he has to pay unless he can bring in the actual driver. You do not have to be the one to park a car to get a parking ticket, same should apply to this.
557	Variable speed limit is not working well between I 255 at Mississippi River and Hwy 30. If I do the posted speed limit (7:00AM-7:30AM), I would be a threat and a menace to the traffic around me.
558	There are way too many drivers who ignore speed limit signs, whether variable or not. The idea is sound, however, there need to be police to reinforce it. And FYI all highways in and around the St. Louis area need more police reinforcing the speed limits.
559	The plan is a great idea and worked wonderfully in the beginning when everyone obeyed the changing speed limits, my travel time was cut by 15-20 minutes. But now there are MANY drivers who do not pay attention to the changing speed limits and will run you over. This may be due to the police not patrolling Hwy 270 as they did in the beginning. My drive time NOW is only cut by about 5 minutes, there are still accidents on the highway and traffic is once again becoming horrendous. If everyone would only OBEY the posted speed limits, it would work fine.
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561	During rush hour in the areas that are congested the speed limit goes down to 45mph but on areas of the highway where there is no congestion the speed limit is still 45mph. This is a problem! If I wanted to drive 45mph I would get on a side street and not the interstate highway. I believe that a higher speed limit should be posted when congestion begins to subside. The "regular" speed on the interstate should be 70mph not 65mph. Because that is what the majority of cars are doing anyway. Thank you.

562	My biggest complaint is that, when the speeds are below normal, it isn't always obvious. The signs need to flash or something to highlight the the speeds have been lowered. It is too easy to get into old habits and assume the speeds are 60.
563	Drivers are totally ignoring the speed limit. More police enforcement is needed.
564	I comply with them, but I usually drive between 55 and 60 anyway. I still see morons speeding, changing lanes abruptly and being stupid. Variable speed limits won't fix stupid. I say keep them for the time being. Quite frankly, I've never seen them set at anything but 60 -- I drive I-270/I-255 from I-44 east to the J B Bridge, in Missouri. I think they have evened out the traffice flow. If that's what they are supposed to do, they are succeeding.
565	I feel traffic is the same with the signs up; Howver, I feel like it is a hazard at times because I will drive 50mph (the posted limit) and many other vehicles will zoom past me. If the speeders were eliminated it may be better. Overall I don't notice a change in my commute time during rush hour or a large reduction in accidents. I don't feel they are a bad idea but saftey of those who comply with the new speeds should be considered before placing tham on every roadway.
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567	Variable speed limits were not the way to limit congestion and provide free-flowing traffic on the loop interstates. I have never seen them enforced, and I am not sure how they would be supported if a speeding driver were to go to court over the issue: "The cop says the limit was 40, I say it was 60..." and the burden of proof is on the state--prove that at that moment, at that location, the speed limit was reduced. AND--prove that the signs were functioning, not out (like around 270 and Dorsett for so long). Most people ignore them anyway. If the sign says 60, they go 75. If the sign says 45, they go 75 until they hit the congestion. If you wanted to reduce congestion and provide free-flowing traffic, the only way to do that would be to implement ramp-metering. Limit the volume and the surging due to cross-street signals. If you want to grab some revenue (and who doesn't, especially in the name of public safety!), use red-light cameras along with the ramp meters (if legal).
568	Still way too many drivers do not pay attention to the speed limit signs as well as other infractions..Tailgating, weaving in and out of lanes w/o using turn signals, go from a middle of left lane across to an exit lane without regard to for other drivers and could go on and on..make the digital signs Brighter and consider re-testing ALL drivers when thier licence comes up for renewal, both the written and driving test, tou will be amazed how many would FAIL
569	I travel I-70 quite a lot and I believe there needs to be speed control there as well. People are traveling way to fast in that area.
570	without enforcement why bother
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572	Most of the times when the speed limit has changed to 40 we are parked on the highway due to some type of congestion. As soon as the traffic breaks up people resume 60-70 mph. Some people are traveling 40 mph and so are being passed on the right. It seems more people are weaving in and out of the traffic lanes at this time.
573	variable speeds are confusing. You get into a routine and if everyday it could be different, a large number of people will drive at the slower speed out of fear of a ticket and cause more backups and accidents. Pick a speed a stick to it. Also if I was new to town or visiting I may not notice those signs. Use your big information signs to put out brief messages regarding the speeds, not just your seat belt slogans.
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575	I understand the theory, but my experience shows when the road is 'open' and the limit is posted 45, people drive 60+. I drive with traffic afraid that meeting the lower speed limit will be a danger to myself and others. People will drive the speed traffic allows regardless of what is posted. There is slow down every day at Gravois and 44, I think detemining why that occurs and resolving that would be a better way to keep traffice moving.
576	Speed trap.
577	I don't think the variable speed limit signs have helped at all. When I see a sign change to 40mph I know that traffic is at a stop ahead, but if I have clear view I still go 65. And so do all the other cars. I speed limit needs to be increased and we need to figure a way to keep the cars going slow or at 60 out of the fast lane.
578	There used to be a real time speed limit information on www.stlspeedlimit.com when the project was initiated. It was very useful for me before taking the trip. However, its been unavailable for the last 4 months. Please make it available asap so that the VSL approval will increase even more.
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580	people go to to fast. no one uses their turn singles when changing lanes or getting on or off exits. its just a mess. i hate 270.
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582	I find that the speed limit variations typically don't keep up with traffic. It seems the traffic is stopped or crawling and the speed limit says 45 mph, or vice versa. It seems to have been a waste of time and money.
583	The variable speed limits actually make me feel less safe on the road. When I comply with the lower speed limits during rush hour traffic, most other motorists still are going the 60mph limit, if not faster, and end up swerving and rapidly changing lanes to avoid running up on me and other cars going the slower speed limit. I agree with the notion that VSL's should help provide a more uniform traffic flow, but not enough enforcement has been taken to ensure that drivers actually slow down to conform to the lower limits. The presence of local police and/or state troopers needs to be more evident during the rush hours to enforce the set limits.
584	why weren't these placed on the overhead road signs instead of the side of the road. Too small to see. When highways are extremely busy (which is about 20 hours/day!) it would be much easier to see if overhead. Tough enough having to watch the fools on the road and look for a tiny speed sign. A lot of money spent unwisely - again!
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586	I never see them say anything other than 60.
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591	Morning commute - you get ran over if you only do 60 mph - I usually leave my house before 6 am otherwise it will be stop and go on I-270 from Gravois to Ladue heading north Evening commute - usually I am sitting in the I-270 parking lot doing 0-5 mph next to your sign that says I should be going 45 mph heading south between 3:30 pm and 6 pm How about designating a lane for those with 2 or more passengers so at least the carpoolers (which there are very few of) could move more freely - better yet have bus service or light rail along the I-270 corridor. I never see a bus on I-270 - seems to me they would have a lot of business if there were a few stops along the way with connecting bus service to arterial roads.

592	Since the investment in the variable speed limit has been made, lets ENFORCE it. I will probably be the first to get a ticket, but no one is driving the speed limit. I tried to go 40 mph the first couple weeks - but it was very scary having people come up on you at 80 mph. So I just go with the traffic 70 - 80 (or 2 - 10 mph). It is so frustrating. I think if you let the public know that you will begin enforcing the VSL on 270, they (I) will slow down. Thank you for showing signs of concern for the South County residents.
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702	I think it's a ridiculous idea to set the speed limit at 45 when there's no accident or jam up ahead. It seems that if the traffic was that bad, or there was a wreck, ahead, the traffic reporters would hear about it.
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706	Although the intention of variable speed limits is good, it is confusing to those of us who consistently use I-270 and I-255, and haven't seen much of an issue prior to its placement. There will always be drivers traveling too fast, or too slow, and making constant changes to the speed limits will not prevent that. It is confusing, and irritating, to be traveling at 60 MPH, cruising comfortably, then to suddenly be dropped to 55, then 50, then 45. It is frustrating especially during the twilight hours, when visibility is severely lessened already.
707	the variable speed is confusing some times. I270 is like parking lot and variable speed sign posted will be 55 miles. when roads are clear traffic is smooth the varaible speed sign posted speed is 45 or 40 some times which does not make sense at all. when I270 is parking lot after gravious exit before I44 why the speed should be 55 no body knows. in the at Manchester roads are free and we can drive at 60 it say 45 or 40. this wastes lot of fuel as yuo do not know what will be speed and lot of cops being around you have to be really careful to watch the variable speeds
708	The variable speed limits do no good if they are not enforced.
709	I just have not seen any real difference in the traffic or the overall safety of this road since this speed limit project has been implemented. You can basically count on the same heavy traffic in the same areas every morning and evening that there always was. No drivers even pay attention to any of the variable speed limits causing the road to be just as unsafe as it always has been.
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711	Nobody complies with variable speed limits, myself included, so it seems like a waste of taxpayer's money. I will drive 65 mph whenever possible. I have not seen any appreciable change in the congestion at all of the expected places. Might be a good 'theoretical' solution to the problem, but there are way to many variables associated with the issue to address effectively with this Band Aid. The physical reality of the infrastructure will result in traffic jams, and I don't think the attempt to slow people down as they approach the problem areas will effectively reduce the severity. I would probably cringe at the cost to taxpayers for this 'solution'. What do you think?
712	I haven't seen a big difference in decreasing the speed. It seems like everyone is still going to do whatever speed they want, no matter what time of day it is. Maybe putting up red/green lights at the entrances would help more as far as congestion in certain areas. I think the speed variation is completely pointless and have yet to see a difference because of it. However, if it were here to stay, I would like to see the speed vary up as well as varying down. If the speed limit is 45mph during peak times, it should be higher than 60mph during off peak times.
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714	In theory it seems a good idea. In reality, especially during rush hour, people will go as fast as traffic flow allows. It seems at time the variable speed limit is 'lagging' reality. For example, the sign may say 60 when there is conjestion or it may say 40 when there is free flowing traffic. It has the potential for creating problems because a person may see the 60 sign and think they can go that speed without having to worry about a stoppage up ahead and they may have a false sense of security.
715	At first I was excited about variable speed limits. I had assumed that MoDOT was going to increase the speed limit during non peek times because it wasn't like we were moving very fast during peek times anyway. This seemed like good logical sense. Instead speed limits were reduced. Traffic is heavy and not moving very well anyway, now the limit is reduced? We can't go any faster anyway! Then in some parts of the highway there is less traffic and it opens up. Only to see the speed limit is 45. How incredibly frustrating to drive on a highway that is designed for speeds of 70+, with no traffic on them telling me I should drive 45. I would obey speed limits if the speeds were intelligently set. Leaving the speed at 60 during peek hours and increasing to 70 during non peek hours is what I'd like to see. If not that, then I'd like the system to be scrapped. If we want to reduce accidents and traffic congestion, 2 big wins would be to go after people talking on their cell phone while driving, and to enforce the slower traffic move right law. How many times have we seen congestion because somebody is driving slower in the left lanes who refuse to move over. Thanks for this outlet, I've been wanting to share these thoughts with somebody in charge for quite some time.
716	No one pays attention to the variable speed limits. Absolutely no effect on traffic. None.
717	it's confusing and not helping with traffic flow.
718	Sometimes the signs are not visible or you see the sign after you slow down because of traffic.
719	It still has not helped traffic along East I-270 during the evening rush hour. The problem along that stretch of road is the bottleneck caused by the bridges over the Mississippi River and the Chain of Rock canal. Making the interstate three or four lanes wide in each direction there would help a lot, both in the morning and in the afternoon.
720	The signs are pretty much ignored. Traffic flow dictates traffic speed during the rush hours not signs. I understand the concept and it is good in theory but it doesn't work. I think it was a waste of my tax dollars. Some marketing guy for an electronic sign manufacturer did a good job of convincing someone to buy a number of their units to boost their sales. I am uncomfortable with the fact that law enforcement could change a speed limit at will. Normally laws aren't changed without some form of approval process and this allows the speed limit law to change instantaneously. The 40/64 project has had more influence on the traffic on 270 each day. Now that the first 1/2 has opened traffic has gotten a little better during rush hours.
721	My opinion is that drivers on 270 drive as fast as they can based upon the traffic in from of them. I have never seen any statistics on enforcement of the reduced limit. The variable speed limit signs are another example of wasteful spending by MODOT.
722	I have been traveling each day on 255/270 since 1993. What a waste of money to install the variable speed limit signs. The biggest problem on that highway is that is is extremely crowded and people are not courteous and do not use their turn signals.
723	I'm just not completely sold on the idea. As a general indicator of the road situation up ahead, it is very useful. Kind of like the message boards and their helpful information. I just don't know how much the variable speeds are adhered to. I find myself speeding, according to the signage, from time to time.
724	Super Huge waste of money - if there is traffic you can only go so fast anyway - someone should loose their job for this stupid idea

725	Speed limits posted not current with real time. Travel speed within limits is dictated by flow of traffic rather than posting on variable speed limit sign. I have not noticed any difference in travel time. I have seen many times on North and South I-270; speed limit posted as 40 when surrounding traffic flow is easily 60 plus and vice versa. I do find this discrepancy confusing.
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728	I don't think the problem is with speed, the problem is with congestion, there are simply too many vehicles trying to access I-270 at peak times.
729	Variable speed limits have had no impact on traffic on the stretch of I-270 that I drive on a daily basis and would seem to be a waste of money.
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731	have on the St. Louis Metro Highways and make the speed increase to 70 mpr on 70, 40, 55, 44, 170, and 270
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735	those changeable speed limits have sort of helped traffic flow, but they should go up to 70 mph during light traffic. they are a pain though because they unexpectedly change sometimes, and if i'm going 60, the previous speed limit, then the next second i may be going 15, 20 mph over the speed limit.
736	The variable speed limits have NOT reduced the jams, have further confused drivers--- especially out-of-town drivers at a time when other interstates are under construction and they are suddenly instructed to take an alternate route. Drivers are going down the interstate and suddenly come upon a much lower speed limit... then slam on their brakes. Worse still, those who are trying to comply get cut off and run up on by others who don't seem to notice that traffic is slowing for no apparent reason. This is the worst idea I have ever seen and believe it is in part to bring in revenue by changing speed limits and issuing tickets. This should be OUTLAWED... how can you be ticketed when the limits change in front of your eyes? Furthermore, drivers in other states and countries have had less volume of accidents with higher speed limits, but more rules on lane usage and so forth. The interstate is meant to be a highway and not a pedestrian area, not something to go slowly on.... if people go too slowly & impede the flow of traffic, they should be the ones to get tickets, especially if they are cutting in front of other drivers and then going slowly
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739	I travel 270 every day. The speed limit may be set at 45 but if the opportunity to do 60 is actually possible during the morning or evening commute, I'll do it. The variable speed limit has done nothing to help traffic problems on 270. The main problem is in the intersection of 270 and 44 where drivers coming from 44 think they need to jump 4 lanes of traffic right when they get on 270.
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741	It was a bad idea, because on I-270, 90% of the people pay no attention to the speed limit signs anyway. Set up law enforcement traps on a large scale to make drivers aware that there is a spee limit on 270 instead of wasting money on lighted signs.

742	1. If there is a FINITE amount of highway and the number of cars trying to use that highway exceed the availability THEN the answer to traffic congestion would be to SPEED TRAFFIC UP, NOT SLOW IT DOWN, thereby reducing the amount of time any given car is on the road. Slowing down traffic in an effort to reduce traffic jams makes as much sense as building a dam across the Mississippi in order to reduce flooding just north of the dam. Duh. 2. The fact that it takes an act of the United States Congress to set the speed limit on federal interstates, but it only takes one knee-jerk unelected twit to change the speed limit on a whim... What the heck is THAT? That simply cannot be legal. You are one class action lawsuit away from reality.
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744	It is a total waste of money!! Nobody pays any attention to the signs. They need to increase the speed limit to at least 65 or 70. During rush hour we drive as fast as the cars in front of us allow. This obviously was not well thought out. I know of no one who thinks this was a good idea!! I drive this highway everyday and very rarely even pay attention to the signs!!
745	Speed Consistency will keep traffic flowing. This slower, speed up does stop the congestion on 270 towards Manchester at all. Maybe 270 should be patroled more often and stop the people that are driving well over the speed limit and making it an unsafe freeway. Patroling and ticketing will stop road rage and wreckless speeding limits and then you will see a safer interstate.
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748	I wanted to send another opinion because I thought MODOT did the right thing on Tuesday evening during the snowstorm in the St. Louis area. I saw the variable speed limit signs at 40mph. (even though no one was doing close to that). I thought, hey, if they keep the VSL at 40mph all night long it MIGHT help a bit. Well, that did not happen because about 45 minutes later while traveling hwy 270 in the same area the VSL was back up to 60mph. So much for a good idea.
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751	I travel 270 n@s bound everyday and I very rareley do the speed limit I feel if Im not going fast you get ran over Ithink the bigger problem is people cutting in off of exit ramps at the very last minute its more dangers than speeders.
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754	I travel 270 between the river and Lindbergh in the morning and evening. The variable speed limits are generally ignored by drivers. Slowing down to 50 or less when traffic is moving is inviting road rage and possibly an accident. I understand the goal of variable speed limits, but it is difficult to obey them.
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758	new speed limits were a waste of money doesn"t help one bit
759	The speeds are inconsistent. When there are few cars on the road, the limit might be less than 60. It seems to take forever for the adjustments to occur. It hasn't helped the congestion at all. It has provided a windfall for the lurking policemen who seem to pounce at will.
760	police officers need to enforce the speed limits better but then again most of them drive faster than posted limits.

761	just a ticket writing,revenue money maker!!!!!! stop it
762	While I understand the concept and agree it should help, I don't believe it has made much of an impact, if any at all. Enforcement is the biggest issue. This, however, can have a the same effect on the stop and go with drivers hitting their brakes when they see an officer and/or a vehicle pulled over along the road. Better educating the public as to how the signs are attempting to accomplish (elmination of the "slinky" effect), is probably the only other item that might provide benefit to the rush hour issues.
763	No matter what the traffic on I-270 will always be a mess, but the various speed limits really make it worse in the morning commute. People already need to learn how to drive properly they do not need different speed limits to help confuse them even more.
764	Wihtout enforcement, variable speed limits make no difference. Even if you want to comply, you will be killed if you try to stay within speed limits by all the cars and trucks driving over. You either move with the traffic or die. I've driven 270 N every morning for almost 12 years and you must move with the traffic.
765	In my opinion, you'll only get relief from 270 traffic (either direction) if more lanes are added. I live in rural Waterloo, IL and travel to Weldon Springs, MO every day. There is not much of a break in traffic during any time of the day on 270. If it was possible for me to take any Metro service, whether it be bus and/or Metrolink, I would. Metrolink people cannot even come up with a viable solution for me to get to work via public transportation. This is due to the lack of public facilities and routes. My schedule is flexible enough to try public transportation, however, the schedule of the Metrolink and Bus transfers in the West County area is very limited.
766	I don't believe that anyone really follows posted speed limits during rush hour traffic on 270. They just follow along with traffic. Most people also know where it starts stopping and are prepared to slow and stop no matter what speed they are traveling.
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768	Make them variable to ensure smooth traffic flow, not willy nilly 45 in the morning and 60 at all other times. It's ok to go above 60 and below 45 if traffic demnds it.
769	The speed limit signs do not help with congestion at all. People do not abide by the speed limit signs anyway. More than half the time, the number posted is faster than the speed in which traffic is moving anyway. The signs should be removed. What a waste of tax money! Also, people get in accidents no matter what the speed limit sign says because in today's world, people are on cell phones, eating, putting on make-up, etc. while driving, and not paying attention to the road in front of them.
770	Since the speed limits are NOT enforced, what is the point. Travelers do not acknowledge the speed limit changes. That's all the varible speed limit does is: indirectly informs me of up coming congestion.
771	The variable speed limits in theory are a great idea. The problem comes from enforcement. I travel 270 twice a day, from 55 to manchester rd (to and from work). I usually, when possible, do around 65 mph. To most, I should be in the slow lane. Everyday, I witness people doing 70+ when the variable limit is at 40. If it were monitored better, start writing citiations, more police presence, this would work. Perhaps we should attempt to do as many municipalities are doing with stoplights, and using cameras, etc to write citiations? At the very least, put out a couple of county cops, or state troopers doing the speed limit for a true assesment of wether this will actually work. Space them out about 10 minutes apart, etc.
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773	I have not noticed a difference in driver behavior. During rush hour, drivers will go as fast as traffic allows and often when the signs read 40, you're sitting bumper to bumper in stop and go traffic anyway
774	Implement them in Kansas City!

775	Hate the variable speeds!
776	There is no reason the speed limit should be reduced to 40 or 45 between Hwy 40 & Manchester Road when there are no accidents. It causes a huge backup and people tend to slam on their brakes to attempt to adhere to the posted speed limit. I travel between Hwy 70 & Hwy 44 on 270 Northbound in the morning and southbound in the afternoon. I have seen the speed limit at 45 when there was light traffic. That is absolutely ridiculous. Maryland Heights uses it as a revenue cash cow between 70 & Page.
777	The concept of varible speed limits is a good idea. The problems is not having enough law enforcement around the clock to inforce the posted limit. Drivers are well aware of when and where the police are and only slow down at those points. A no toloernce approch to speeding will be a rude awaking that is needed to help the protential for this project. If a driver know he will be ticketed for speeding, he won't do it. If he thinks he can get away with it, he most definitely will. Maybe think about photo radar cameras along the routes that catch the speeder and mails a ticket to them.
778	The variability of the individual driving speeds has a greater effect than the actual speeds. While lowering the speed limit should lower the variability of the individual driving speeds, it likely has the opposite effect due to disobedience (plus it greatly increases the outliers that move from lane to lane and cause significant traffic disruptions). Additionally, the variable speed limits are likely implemented to late. To get the desired effect (if possible), the speed limits need to be lowered in advance of the traffic; however, drivers are highly unlikely to obey a lowered speed limit when there is lower traffic levels.
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784	I like the idea its just getting people to enforce the variable speed limits. I've seen the speed limit at 45mph and people still going over 70mph if the option is there
785	I would welcome seeing more law enforcement officers on the road as well to hopefully deter speeders. I see them all day on 55, 255 and 270. 44 isn't as bad, probably because the smaller lanes.
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791	The variable speed limit has had ABDOLUTELY NO POSITIVE IMPACT ON TRAFFIC. When the sign says 40 mph, that means traffic is bumper to bumper and that just adds to driver's frustrations. When it says 60 mph, people drive what ever speed they normally drive on the highway. I've comutted on I-270 from Telegraph to I-44 and to Page for the past 16 years. The morning solution on N bound I-270 at I-44 is to meter the traffic onto I-270 from E & W bound I-44 like other major cities have. The evening backup on S bound I-270 is volume backup thru the Big Bend curve. Unless the volume is reduced or the highway is straigtened, S bound will continue to backup in the evenings. The signs installed in the last year or so are a very big help with traffic estimates - even if it is bad news.
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795	When the signs aren't functioning, no one will follow them. And we all know St. Louis drivers won't drive the speed limit (except for the one person in the far left lane that everyone else passes on the right), no matter how low or high it is. To reduce congestion, reduce volume. Public transit or ramp meters. Get rid of out-of-date weave-prone cloverleaf intersections (like SB I-270 to 364--NB is in progress but why was SB ignored?) Increase the number of slip ramps (exit-only on ramps) throughout the region to provide more time for merging.
796	This was a waste of time and money. Enforcement of the speed limits on I-270 is almost completely ignored save for a few small munis. I am routinely passed by cars traveling at speeds in excess of 80 mph. Many of those are 'weavers,' rapidly switching from one lane to the next. Perhaps the 270 loop should be renamed the St Louis Autobahn and have the speed limits dropped. While it would not make the roads any safer, it would more accurately reflect the type of roadway it is.
797	I have only traveld the route once scence this was implemented. I relly think that it has helped.
798	I find that there should be more signage on the highways if you decided to impliment it all across the St. Louis area. There is no reason why this shouldn't work but there needs to be signage for the posted speed limit on EACH on ramp and directly after each interchange.
799	I have noticed that my drive time in to work has increased by about 4 or 5 minutes. I am traveling north on 270 from Watson to Olive Blvd. The 4 or 5 minutes may not seem like much but it appears a lot more congested for a further distance. I merge onto 270 between 6:45 am and 7:00 am. For the commute home it seems to be more stop and go than before the speed limit signs were put up. My commute home is south on 270 from Olive Blvd. to Gravois. I usually start my commute between 5:20 and 5:40 pm. I have noticed that the traffic is a lot more congested than my commute into work. It also appears to be more stop and go than before the variable speed limits. However, I must note that the drive home commute time appears to be the same.
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804	The variable limits are ignored by virtually all drivers or traffic is too congested to travel at the variable limit.
805	The changing speed limits during rush hour has no effect on the speed of cars. People are going to drive as fast as the rest of traffic will allow them to and are not going to change their behavior. This is a huge waste of money.
806	Sorry but I feel this is the biggest waste of money I have ever seen MODOT make. Nobody pays attention to them and enforcement of the limits is almost impossible with the volume that goes through.
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808	It's a nice idea but the simple fact remains that the motoring public doesn't follow the laws--especially the speed limit laws--anyway. I also have concerns as to what happens when I encounter a period of light traffic in a heavy traffic period and the speed limit is reduced to say, 50 mph. If I can safely travel 60 mph, why can't I? I do, however, promote raising the speed limit to 70 mph during off peak hours. Although, there are people who will perceive that 70 mph is an excuse to go even faster. That's something that will have to be considered, obviously.

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811	It has no effect if not enforced by law enforcement. I believe if it was enforced, it would do what you hope. Until you enforce or put up cameras with photo enforcement the public will still disregard the changing speeds.
812	Please make similar changes to I-70 with in St Louis County. The 55 mph speed limit was originally mandated by the federal government during the energy crisis of the 1970's. In 1995 congress abolished the law due to universal contempt among motorist. It is no secret that the low speed limit causes a significant speed gradient among commuters, hence more aggressive driving and the obvious attempts by local police to enforce the speed limit. In the past 39 years automobile safety standards have improved drastically with the help safety features such as anti lock braking systems, air bags, vehicle stability control and many others. So why hasn't Missouri department of transportation\St Louis city division done anything to abolish the 39 year old speed limit. Why is it that on any given day the vast majority of commuters take the risk of a moving violation to save a minutes everyday or hours every week. Thank you Local Resident and Daily Commuter
813	more needs to be done to enforce these speed limit laws!!!!!!
814	I travel 270 south in the mornings and north in the evenings between Page and Manchester. The traffic is better, but coincides with the timing of the changing closures on 40, not the speed limit signs. I very rarely see the posted limit matching the flow of traffic. Just in the last week I saw the signs still ready 45mph when traffic was moving over 60 because an accident had already cleared. Last night the signs said somewhere in the 50-60 range while I crept along at under 30. What a waste of electricity and monitoring costs when we're all driving based on traffic conditions instead of fancy schmancy new signs. When will this report be available? I'm very curious about the public consensus because I have yet to talk to anyone who thinks these signs are worthwhile.
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823	On several occasions I have experienced traffic slow downs during rush hour and the variable signs still said 60 mph.
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826	I-270 and I-255 should have a speed limit of 55 MPH at all times. That is the only way to reduce accidents and improve safety. These interstates were designed for 55 MPH when the speed limit was the federal law. It should remain that way.
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829	Great idea in theory but no one follows the change in speed limits and the backups continue.

830	I think most drivers will adjust their speed to the situation at the moment and location regardless of the posted speed limit. It is rarely I notice the posted speed limits. I drive early rush morning and early rush afternoon.
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837	People drive the way they want and how they want. The state can enforce it but there are not enough officers to make people slow down. We are in such a hurry these days that people just don't care. Save my tax dollars and forget the signs.
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839	The black background with white numbers being opposite that of a normal speed limit sign make it hard for people to view the signs like a regular speed limit. Why not reverse the lights and background so the sign simulates a regular speed limit sign. Also, many times one or two of the signs are not lit up,, not enough sun to charge them???
840	I have found that traffic on I-270 (or any interstate) rarely follows the set speed limit. During off peak hours traffic will exceed the speed limit and during rush hour traffic moves slower then the speed limit. I also think the speed limit signs should be larger and higher, perhaps overhead of traffic; during heavy traffic most people will be focused on the cars around them and traffic ahead, not be looking for smaller speed limits signs on the edge of the road.
841	I think the problem with the variable speed is that the speed limit is not enforced. The speed limit was well not enforced on 270 before the variable speed was introduced, and it is not enforced well now. I do think we need more time for everyone to get used to the change, yet if you don't enforce the speed limit laws, it will never work. G
842	I don't think fellow travellers pay much attention, but the times are important to me as i travel to alton from des peres. times and the accident notices enable me to detour to save time. also decreased speeds tell me traffic is starting to backup, which is great anticipatory info for slowing down. THANK YOU for this INVALUABLE tool, add it everywhere in ALL metro or congested areas PLEASE!!!
843	no one seems to pay any attention to the speed limit on 270
844	Traffic on I-270 moves at the same general speeds now as it did before this major investment. The volume of traffic dictates speed, not the speed limit signs. For example, southbound traffic in the afternoon will move at lower speeds no matter WHAT the variable speed signs say. I feel that the money spent on this project was wasted.
845	I don't feel the variable speed limit system works at all. Drivers will drive what they want, simple as that, I've driven 270 numerous times and seen some people going the speed limit, some people going slightly above and others still who still fly down the road at 10 to 15 miles per hour over the speed limit.
846	There is no point in the variable speed limits. Due to the sheer volume of vehicles on the highway during morning and evening rush hours, one is still going to be stuck crawling along at 25 mph, whether the speed limit is 45 or 60. This is purely a waste of money. It's not like anyone really pays attention to speed limits enough to make variable limits worthwhile or useful. It's a plain and simple waste of money.

847	I knew of the variable speed signs but they are really not that noticable. Honestly most people just ignore and drive whatever they feel unless police are posted out tracking and their visible will people really slow up. Try working on an idea better than the solild exit line when your sitting in highway exit row for those individuals who mess up the flow when they drive up and cut in alot of time there are very close fender hits (History the Hwy 270 South exits to Hwy 70)
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849	No one follows them. They are helpful in providing a gauge of how much congestion might be ahead.
850	I have been in stop&go (<5mph) traffic and viewed the speed signs reading 60mph more than once. The cost of these signs were justified with the explination that lowering the speed on the sign would reduce the congestion. The speed on the signs never changed and the congestion was terrible. Try better planning when building a road in the first place....a common sence way to save money in the long run!
851	I have never been on I-270 when the speed limit was anything OTHER than 60 mph and I've been on it when we're moving nicely along and when we're like a parking lot. I think it was money poorly spent.
852	I have never been on I-270 when the speed limit was anything OTHER than 60 mph and I've been on it when we're moving nicely along and when we're like a parking lot. I think it was money poorly spent.
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854	I have found the variable speeds a nuisance rather than a help. There have been several times that signs are not lit an all with a speed. It is also a distrction when entering the highway in the morning/evening to remember to check what the speed is for that day/time. I think that drivers trying to take into account the variable speed have just one more thing to concentrate on rather than keeping their mind on driving.
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856	Have seen signs that state 40 mph speed limits and there is no traffic. Have been stuck in stop and go traffic and the signs read 50 mph.
857	Complete waste of tax payers money. The manufacturer of the signs must have took an elected official to a golf courses to get this approved.
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862	I only drive I270 during afternoon commutes. I usually have my permit-driver son drive the car and I tell him to obey the speed limit. It is very difficult to drive 45-50 mph as per the electronic sign when everyone else on the road is doing 60-70 mph. It's not really a safe condition. MoDOT has not done a good job of explaining how these variable limits actually benefit anything. I'm an enginner and I'm not sure I understand the logic. You need a better message, perhaps something animated based on computer simulation.
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864	I am a traffic engineer and understand that - in concept - the variable speed limit signs should reduce congestion IF drivers acknowledge the advanced reduced speeds and behave accordingly. However MoDOT has done a poor job of educating the populace on just how this scheme is supposed to work. The implementation of the variable speed limit signs is essentially a form of behavior modification via legislation (i.e.: change or receive a ticket). This tactic is seldom effective - particularly without proper education. In the absence of education, drivers see a 45 mph speed limit posted in an area where traffic is going 65 mph and think: WTF??? It makes no sense to them, so they ignore it and encounter the slowdown several miles ahead. On average I have sensed some slight reduction in congestion on I-255/270 over the past year (I've been driving from Oakville to Riverport and back 5 times a week for 4 years), but it would be hard to quantify if it can be attributed to the variable signs or to changing patterns associated with the I-64 construction. I don't think MoDOT can make a firm asessment of the effectiveness of the signs until I-64 is complete. In my professional opinion, they are currently worthless. They will remain this way untill the public becomes educated on their purpose and intent, and modifies their behavior accordingly.
865	I think this is just a bad idea in general. If traffic is slower anyway, changing the speed limit to 40 isn't going to speed anything up or slow it down. Really, this sounds like a way for local municipalities to pad their income. I haven't seen it helping at all and only slowing down the commute. This is just a bad experiment that needs to end.
866	I have yet to see the signs change from 60 mph
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868	What a waste of Money. I have tried to follow the lower limits, only to have someone come up so fast on my rear bumper, that I have a dimple in the plastic from his license plate bolt when he hit me at the 45MPH I was following one evening on northbound 270 at the Rock Road. I pulled to the side, he drove on, and I did not get his plate number. Needless to say, I now just follow the general flow of traffic as nobody ever slows down to the lower posted limits. Maybe if there had been greater enforcement and better reporting of the enforcement, this idea might have worked, but I do not see any benefit or changes to my northbound travel from Maryland Heights to Florissant. Listening to traffic reports, do not seem to be any difference along the whole lenght of 270, same slowdowns as before.
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871	First of all I believe that too much emphasis is given to speeding as the cause of accidents. I notice too many people changing lanes unsafely and driving while distracted on their cell phones. These I believe are equally important causes of accidents that are ignored by law enforcement. Secondly, variable speed limit as a way of reducing congestion ? No way ! There are many ways to reduce congestion: improve mass transit, tax incentives to bring businesses closer to where people work, incentives to encourage telecommuting, adding lanes, improving traffic light coordination to provide a smooth uninterrupted traffic flow in the peak direction etc. Variable speed limits do diddly squat to help with traffic congestion. Do people drive slower in rush hour because a stupid sign tells them to ? Or because they are forced to ? When the car in front and on either side are going at 30 mph how does one drive faster ?!
872	near total failure. a waste of time, effort, and resources - money would have been better spent hiring more inspectors to make sure highway repairs were done right the first time (instead of 2 or 3 times as is the current wont)

873	If you have the ability to change the speed limit it needs to be done more proactivly by slowing speeds farther ahead of problem spots. To many times I have seen these signs read 60mph while at a dead stop in traffic. You also should be able to increase the speed limit during late night and overnight hours when there is very few mortorist on the road. I have no problems with using changing speed limits, but let's really use it other wise it's just a really big waste of our money. Thank You, Nathan R.
874	I don't travel on I-270 often during peak travel times, but the few times I have, I haven't seen increased enforcement of the variable speed limit. The signs could be lowered all the way to 40 mph, but people will still drive 65 mph if the 40 mph speed limit isn't enforced. I like the variable speed limit concept, but the enforcement of it is lacking.
875	The speed limit signs have no effect on the speed that people travel. If traffic is heavy, people drive slower, if traffic is light and the sign says 60, everyone is driving 70. The speed on the signs NEVER has anything to do with the speed people can or do drive. The signs said drive 40mph the other day and traffic was stopped. What's the point of all that expense???
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877	i think this could work if people would follow the posted limits--but everyone drives fast as they can, no matter what. So if I want to follow the variable speeds I essentially get run over by those going 75 to catch up to the stopped traffic ahead.
878	waste of money, i really do not know what the reason for them was. no one pays attention to them everyone drives the speed the same as the rest of the traffic.
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880	Personally I don't thinmk people pay that much attention to the signs - especially in daylight hours. Often if there is an incident, the traffic has already backed up prior to the sign/speeds being reduced. And often they stay on lower limits well after traffic has cleared. My preference would be "congestion ahead" signs that would indicate that you will be running into somsort of trouble. Flashing if there is a REAL slowdown. The variable limit signs seem to try to micro manage the traffic flow without enough sensors or quick response to do so.
881	the speed limit project has not help. The signs posted to provide commute times are almost always wrong and do not seem to adjust well at all during peak commute times. There must be a plan for better solutions to the travel problems on 270 - it is a nightmare. There are no good alternatives, unlike the folks that travel east/west who have multiple choices to travel - those of us who travel north/south have one! 141 is not an option due to the heavy congestion and stoppage in the Big Bend and Valley part areas. Lindbergh is forever with the lights and etc. And of course, the lovely 170- stops at 40 - thanks for that from those of us who need to travel further south. How about making some adjustments and let 170 go down to 55? How about less lights within short spans on 141? How about adding lanes to the worst highway in the city (270)? It's really sad when the radio and tv annoucers state on a daily basis - "as usual we are jammed on 270 from Olive to Daugherty Ferry". Please consider some improvements to the 270 nightmare that does not appear to be on your radar screen.
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884	Variable speed limit (VSL) signs are difficult to read as implemented. The "5" and "6" numbers on VSL signs are often hard to read, leading to difficulty in determining if the speed limit is 50 or 60 MPH in a given area. VSL signs can be difficult to read from the central lanes of the interstate. Speed limits have a tendency to change frequently during rush hour traffic, adding to the difficulty of speed limit tracking. These factors make speed limit tracking a distracting and potentially unsafe practice while driving in the interstate's central lanes. VSLs are problematic for traffic entering the interstate. Drivers entering the interstate can not immediately determine the speed limits as the limit can vary dramatically throughout the day and VSL signs are often located a considerable distance away from the entrance ramp. Drivers on the interstate tend to ignore or otherwise disregard the VSL and use the previously default speed limit of 60 MPH. The program does not appear to have an impact on traffic patterns, travel times, or public safety.
885	This is a joke! I travel on 270 every morning. Well I have stopped now due to this variable speed limit. No one even pays attention to it. You have the speed limit set to 40 when you can go 60 and then set to 60 when traffic is at a dead stand still!!! This is a ridiculous idea! It doesn't work and should be eliminated. Hello...we don't live in Europe where this idea was copied from.
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887	I think that the variable speed signs should also be placed above the highways next to highway signs. I would like to see more city highways have slower or faster speeds with traffic.
888	The variable speed limit IDEA is nice, but in application it is basically useless as i see it. People pretty much ignore the speed limit and only congestion 'regulates' traffic speed during peak times. I have however experienced several times over the years that if a marked police vehicle is in the vicinity - either moving or on the side of the highway - traffic slows to the speed limit and flows MUCH better.
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890	I believe the concept would work, but the lack of enforcement from the law has not made it work to its potential.
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894	I travel this roadway at least twice daily and often four or more times. Since this program was implemented I have yet to see the posted speed limit change from 60 mph. Anyone who travels this road knows that by driving only 60 mph a person is taking a great risk of being run down from behind. Very seldom does anyone drive at speeds less than 70 mph except for elderly drivers that restrict themselves to the far right hand lane. I fail to see the benefit of so called "variable speed limits" on this road when as I stated, I have never once seen the limit vary from 60 mph. Thank you.
895	i feel this program was a waste of money
896	The changing of speeds on 270 seems to cause more accidents because are going one speed and do not know where the speed changes from 50 to 60. Also when there is stalled traffic the speed signs still say the speed is like 60 but traffic is not going more than 15 mph. I think the speed signs are a waste of money. Use the funds to put an express lane on 270.
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898	There is minimal compliance by the travelers on the road. While observing the reduced speed limit, most travelers continue to exceede the original 60 MPH speed limit. In theory this should help. A major issue is on northbound I-270 once joined by I-44 there are 7 lanes and within 1 mile, those 7 lanes are reduced to 4 lanes. Enforcement of the reduced speed limit may

	help.
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900	People don't pay any attention to the signs, they go as fast as surrounding traffic is going. The signs are a waste of time, effort, and money.
901	My general experience is that the driving public are NOT paying attention or conforming to the changing speed limits. The posted speed limit changes (from 60 to 50 in most cases) are not being observed and the resulting congestion / safety issues have not been positively influenced.
902	This is a waste of time and money the state could be spending on more pressing matters. The signs have no impact on the speed of traffic on the interstate. When it's at 50mph, for example, you could be going 65 or 35, depending on the traffic. A better tool for motorists would be for the traffic alert signs to better reflect current conditions. They often cist an estimated time at, for example, 9 minutes, when it's closer to 20 minutes to that spot.
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904	I dont understand the point. Why wouldn't the speed limit increase a tad when there are more cars to keep traffic moving. Have they improved congestion no. Redesigning the exits would take care of that problem. Many of these accidents occur when people are entering and exiting the property. Great waste of money on this one. Two thumbs down.
905	They are nothing more than a speed trap. Trying going 45 on a highway when all the rest of the traffic is going 70. You will get killed. the theroy is good. The traffic stills runs up on jams and than slams on thier breaks. They do not slow down 2 miles ahead to help break congestion. People will not follow any posted speed limits, anywhere. the only way to get them to is to post several cops with thier job being strickly enforcing these speed limits. Although once the cop is gone, the people will speed again. 90+ in the fast lanes. And how much money did we waste on this, or whos senaters son got the contract for the work. People do not obey speed limits. Install cameras and start enforcing the speed limits with tickets and then the program will work. Stop wasting our money. And repair the crumbling roads, and bridges in missouri.
906	I FEEL THAT THE SIGNS IF USED SHOULD BE USE 24/7 NOT JUST AT PEAK TIMES. THIS WOULD CLEAR UP ANY CONFUSION. I THINK THAT THEY SHOULD BE BETTER MONITORED. IN MANY CASES THERE HAVE BEEN RECKS AND TKE SPEED LIMIT NOT CHANGED. ALSO AT 270/255/55 THERE ARE BACK UPS AT TIMES AND THE SIGNS STILL SAY 60 MPH.
907	Trying to figure out were the enforcement to comply with the limits are? Its great for easing congestion, two miles up the road, but when one is doing the posted 40MPH in the third lane of traffic and someone else flys by in the fouth lane at 65 or 70. How safe is that?
908	The majority of drivers have continued to drive the speed that they wish to. I understand the objective of the project, but there are too many drivers who will not comply with this. Sometimes there isn't traffic on the highway, but yet the speed limit is too low.
909	THis need to implemented in other places in MO if it works.
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914	I have always seen the speed at 60. I have never seen it be 55 or 65 or anything but 60 so I don't think it is really serving its purpose. When I drive at night and there is no traffic it says 60 and then during rush hour it still says 60. Change it or stop wasting money.
915	The changing of speeds has not created a safer road way. Instead, I feel it has confused people as the speeds change from one section of 270 to another. People end up slamming on their breaks because they are traveling one peed and then quickly have to reduce their speed to match the new speed limit and flow of traffic. I can see how this could lead to more accidents. Furthermore, decreasing speed has caused congestion in areas where the speed is decreased. I have noticed this during my daily travels on 270.
916	I still think some people ignore the signs on 270. 70 mph is still pretty common in the morning rush on southbound 270 especially in the left most lane south of 64. Also would recommend increasing the speed to 70 mph during non-peak hours/overnight.
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918	Awful. Complete Failure.
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920	People do not pay attention to the signs and if the sun is shinning you can not even see the signs. I went from a 20 - 30 minute ride to a 45 - 1 hour ride.
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928	The vast majority of traffic on I-270/I-255 does not voluntarily observe the speed limits, variable or not. I have joked at times that the solution to the energy crisis is to slow down and put vehicle in neutral. Those riding your bumpers would keep you up to speed. However, speed is not the primary law enforcement/public safety issue. Aggressive driving and improper lane changes are much more likely to create or aggravate incidents on these highways. This has become more prevalent due to the extended I-64 project over the past two years. Decreasing the lane size as well has also become an issue beyond throughput. I come at this after 20+ years in law enforcement supervision. If I were to ask one thing, have law enforcement spend less time in the money generating speed enforcement and more time in enforcement of aggressive driving and improper lane changes.
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930	I thought this program reduced speed limits in inclement weather. I've driven on this roadway in a bad blinding rainstorm when the speed is 60 mph and in clear and dry weather the speed limit is 40 mph. Eliminate the program... it's a waste of our taxpayers money.
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932	These signs are wonderful and well needed in other areas around the state. I live in the Columbia area and even though they are not as big of a need in the central part of the state, I do think they should be expanded to cover more of the KC, Springfiled and more of the St. Louis Metro area. I would comment that as LED technology improves, to update these signs with stronger and brighter grade LED's, simmilar to the grade used on emergency vehicles. This will help in the daytime.
933	money not well spent.
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936	I travel 270 south in the morning and north in the evening. the sign can show 1 speed limit and the traffice is smoothly running the opposite. Example. sign has 60, i am barely doing 40. the sign has 40 and i am doing 60.
937	The signs are difficult to obey. Even with the gradual 5 mph decrease, it seems like a rather extreme speed change. Most drivers don't appear to pay any more attention to them than static signs, so if one does try to comply, most everyone else is speeding past at 10 miles over the standard speed limit. Then everyone still gets to a slow down point and has to stop abruptly, as always. So this problem hasn't been eliminated at all. (The large signs announcing accidents are much more useful for specific information, although sometimes they are hard to read with the flashing warning regarding the 40/64 shutdown, which should be eliminated soon.) I hesitate to say these signs should be completely removed, as they might come in a variety of scenarios. But people, by and large, especially during rush hour, do not appear to take them seriously at all. I also know several people who have commented they feel like a speed trap waiting to happen and have concerns about being pulled over because they missed seeing a changed sign.
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939	I feel that if people would actually follow the variable speed limit signs, that there would be less stop and go traffic during peak times. Most people are in such a hurry to get places, and think the variable speed limit is pointless. Where in fact, it could actually cut down on some traffic time.
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941	These variable speed limit signs have done nothing but pad the bottom line for municipalities looking to fund their school districts after the drop in property values. The primary problem is that they lag about twenty minutes behind actual traffic. They stay high when there's congestion, and then stay low when its over. They often change from 60 to 40 when my vehicle has already reached a dead stop. This doesn't help anyone. This causes people to blatantly disregard them, as they have no practical purpose, which further reduces their effectiveness.
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943	Limiting speed on the most congested highway in the St Louis region to 40mph for congestion is just crazy. People in this region rarely if ever obey speed limits so all you have created is a drastic difference in the speed vehicles are going. You will have some drivers that obey speed limits then you will have many who do not on 270. So you have a situation where a vehicle traveling 70mph rides up the back of another vehicle following the 40mph limit even though congestion isn't as bad as it was previously. I am also of the opinion that the speed limit on 270 should be 70mph max and 55minimum. Traffic often times is already moving at that speed if not faster.
944	It is a waste of taxpayer's money. I drive 270 every day. The posted speeds never correctly reflect traffic situations. I sit in traffic jams not moving looking at a speed limit sign posting 55 MPD and visa versa. It is a useless waste of money.
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947	From my observations, traveling during both morning and evening rush hours, from I-44 to Page, this has been a huge fiasco, causing nothing but confusion, and never really setting the speed limits, but rather adjusting the speed limits downward (Which no one pays attention to) after congestion occurs. I see little to no change to the speed limits at all, with the exception of an occassioanl driver that is unfamiliar with rush hour traffic.
948	The only time that I have noticed the signs being changed to something aside from 60mph is when I am already at a stop. The idea of a changeable speed limit is great, but just something that Missouri will have a hard time grasping. Perhaps utilize the large informational billboards to convey reasons for a slower speed limit ahead and have the State Troopers strictly enforce the lowered limits. There are times where I have wanted to move at the speed shown, but it would be a safety hazard with all other traffic moving at 60mph. It is quite a hurdle, but STL needs to move out of the mindset that faster is 100% of the time better. That is a very difficult thing to change, especially in a short period of time.
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951	The estimated times, especially between Page and Manchester 100 Southbound are better. At first they did not come even close. The main problem is peoples' lack of awareness of how stopping in merge lanes to immediately enter left lanes adversely affects traffic flow. Case in point, 1-44 merging to Northbound i-270 in the morning, Manchester and I-64 merging on to Southbound i-20 in the evening. Why can there not be some kind of public awareness about this. Also, the people who weave in and out of lanes slow things down significantly. I would like to see citations issued for that.
952	People arent going to obey the limits if no ones out there to enforce them.We need radar during rushhours.
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956	More useful if stronger enforcement was in place. Many times I have fear of obeying the speed signs for risk of being rear ended. I agree with the concept but few people follow the speed limits.
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964	I don't see anyone driving differently because of the variable speed limit signs. To me and others I know, it is a joke. During traffic, people drive as fast as they can go (usually below the speed limit due to volume of traffic.)
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968	This was a very stupid idea...whoever thought of it should be shot

969	The variable speed limit has no effect on the actual flow of traffic. Speed is always determined by the amout of traffic and the actual flow of that traffic. Regardless of the speed limits, some people will travel faster or slower than what is posted. We notice that even the county police travel faster than the posted variable limit based on the actual flow of the traffic. Traveling at the posted variable limit when traffic is actually moving faster is a hazard. Traveling slower than the posted variable limit due to congestion just makes drivers angry that the variable limits have no real impact. The money spent on this project was a complete waste of the taxpayers money. Just having the normal signs of 40 minimum and 60 maximum would serve the purpose. Tbe real issues on the highway are driver inattention due to cell phones, texting, shaving, reading the paper, etc.
970	Too many of the signs periodically go blank for an indefinate amount of time (until I guess someone from MODOT drives by and happens to notice). I've also noticed that traffic still tends to bunch up more in the usual places.
971	Have seen troopers at 7-730 am on sunday mornings; no traffic, have the limit reduced to 45 mph and looking for speeders. Revenue seeking??? Usually seen N-270 just before I-64/40 interchange.
972	Have seen troopers at 7-730 am on sunday mornings; no traffic, have the limit reduced to 45 mph and looking for speeders. Revenue seeking??? Usually seen N-270 just before I-64/40 interchange.
973	
974	This is a great system. It is used on the German Autobahns and works flawlessly. I would like to see this system implemented on I-70 accross the state. I think this would be a great asset to the state. Speed limits during non peak hours could be increased(maybe higher than 70 MPH in some very rural stretches) and when traffic is congested it could be slowed down. Sometimes in Columbia at 5PM traffic on I-70 needs slowed down. Sometimes 60 MPH is too fast when the highway becomes really congested. I am all for the variable speed limits as long as they are used for safety and not as a revenue generator for the state. This means, we should not be lowering speed limits when there is no need. Great Job MoDOT!
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976	It is unfair to really speak on this project because it does not appear speed limits during the rush hour peaks are enforced. I find myself traveling 10 mph or faster over the posted limit to accomodate the flow of traffic and still have people passing me on the right or left or riding my bumper. I drive from Oakville (Telegraph) to Earth City (I270 - I70) M-F 8-9am & home MF 6pm-7pm.
977	The concept of variable speed limit should be explained to the public in detail. In theory, variable speed limits work but in practice they have NOT worked on I-270. I travel the section of I-270 from HWY-100 to Tesson Ferry about twice a day. Many times, cars are stop-and-go when the speed limit is 50 mph or they have not slowed down when the limit is 40. What happends then, is that this creates a traffic jam a mile down. In short, education with videos are necessary for the public to understand how this works. Just because you can speed to 50mph, you should NOT if the posted limit is 40mph!!!
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979	I am new to the area and think the variable speeds are great. But several people dont realize they change or lack of enforcment is present. People still whiz by at 70+ when signs drop to 55 or 45. I find them very helpfull in reducing speed of traffic when approaching accidents or bad weather. Keep it up.
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982	While my survey results may not indicate it I actually like the variable speed limit. The problem seems to be that nearly everyone ignores it. I think a big effort should be made to enforce the lower speed limits during busy times. Once people

	started getting tickets or even just warnings I believe the program will be more effective.
983	I travel I-270 between Page and McDonnell Blvd five days per week, morning and evening, and have for many years. I have yet to see any evidence that drivers are actually obeying the variable speed limits, particularly when the speed limit is less than 60 mph. Also I have yet to see any signficant enforcement efforts. When traffic is moving well, few drivers want to slow down to 50 or even 45 mph, just because the sign says to. No enforcement means no compliance, and no compliance means no benefits.
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985	Variable speed limits were supposed to help the terrible congestion at I-270 and Lindbergh in North County. It has done nothing that I can see and traffic back up is just as bad or worse. If I see the speed limit at 40 mph, that's just a signal for me to get off 270 and take local roads to get where I'm going.
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989	I tried this new variable speed system tonight on 270. Three signs were 45 and I was the only one doing it! I saw everyone fly by me! I felt VERY UNSAFE! IF I GET IN AN ACCIDENT DO I GET TO SUE MODOT!?! Once I got to 270 & 170 the highway was all blocked up and the speed limit was posted @ 60mph! Who could do that now that we were all in a jam!? Get rid of it... a Pilot program doesn't last for YEARS... This pilot has crashed... pickup the pieces and move on!
990	Nice Idea. But needs improvments.
991	
992	
993	This has to be one of the sillier ideas I have seen. Nobody pays any attention to these speed limit or any other speed limit sign that I know of. Please use the money to fix the roads rather than run these silly signs.
994	If you travel that stretch enough you'll notice that you can often drive 70 mph when the speed limit is 40 and sometimes you have to drive 30 mph when the post speed limit is 60. I personally disregard the spped limit signs and drive with traffic as I always have. I think the process is a joke and truly a waste of money. We certainly should not spend any more trax dollars on this systems expansion.
995	Seems counterintuitive that when you reduce speed that alone will increase capacity or reduce congestion.
996	
997	As a commuter on I270, what I see is a mix of people complying with the reduced speed and others that ignore it, so you end up with a wider variety of speeds which to me seems more dangerous. What I prefer are the big boards that indicate travel time to the upcoming interchanges and broadcast warnings about closures. I think putting a warning about congestion ahead would catch the attention of drivers more than these variable speed signs - which depending on what vehicles are around you when you're near one you may not even see them. Also there have been mornings where the speed goes from 60 to 55 to 50 to 55 during the 10 mile stretch I drive which has made absolutely no sense.
998	

999	The speed limit might have changed but the driving habits of people have not. They go whatever speed the flow allows (or they weave in and out). I RARELY see ANY police on 270. I travel 270 at 7:30AM M-F southbound from Dorsett to Manchester and then back northbound around 5:30PM M-F. I have not noticed any reduction in accidents and I certainly have not noticed any general reduction in speed. I don't know if people don't SEE the signs, don't care or are perfectly aware of the LACK of enforcement. I just know that I dread the drive every work day because of inconsiderate drivers.
1000	The travel speed is self regulating. The varialbe speed limits do nothing to control the speed.
1001	
1002	I'd have to say that most motorists do not pay attention to the variable speed limit most of the time. If there isn't a jam, their speed limit is between 65 and 70 conservatively until they come up on the jam.
1003	
1004	
1005	My first impression was that the variable speed limits were somewhat arbitrary in their use and location, causing more distractions and confusion. Coupled with the new opportunities to take advantage of unsuspecting motorists by the State Troopers and local municipality police, which just appears to be another device to generate more revenue through the issuing of traffic violation citations, their presence and activities still only serve to add to the distractions encountered, causing further and escalating instances of panic reactions and accidents. Whether this method of speed limit regulation ends up actually raiding the traffic flow or reducing the number of delays in peak travel periods remains to be seen. So far, it still only appears to be another form of over-regulation at the behest of insurance companies and bureaucratic self-involvement. Per the old saying of "Figures never lie, but liars figure", I presume the data will be manipulated to be presented in it's best light.
1006	
1007	
1008	
1009	
1010	It was worth trying, but I don't think it worked out very well.
1011	i travel 270 every weekday morning around 645 am and again around 4pm. the variable speed has made zero difference, people still flow at the speed mostly of those around them. Slowing the speed limit had had no effect whatsoever.
1012	Don't think anyone obeys and there is no enforcewment except the maximun speed limit.
1013	The idea that rush-hour congestion can be solved by enforcing lower speed limits during a time when people are stuck in stop-and-go traffic is ludicrous. Please end this revenue-grabbing gimmick ASAP.
1014	While I don't like the pain of having to keep track of variable speed limits, if the data suggests that they've helped ease congestion, then I suppose I'm in favor. I will withhold judgment until I see that information. However, I would suggest that there be a carrot to go with the lowering speed limit 'stick': increase the speed limits to 70 or so at night when traffic is light...I believe this would make the program far more popular and increase public support for it - at this time I assume it is generally unpopular.
1015	MoDOT should remove the variable speed limit signs and replace them with fixed speed limit signs that more closely reflect the average speed of traffic during good conditions. I use I-270 regularly between I-64 and I-70 during different parts of the day. Traffic usually seems to flow around 65 or 70 MPH regardless of what any signs say. MoDOT would do everyone on I-270 a favor by *raising* the speed limit to 65 or 70 MPH.

1016	It doesn't make a difference. The only time the speed drops is when there is congestion and you couldn't possible go any faster anyways. That fact combined with haven droven the interstate for years, I forget to pay attention to the signs. I know it should be 60, so I assume if traffic is moving and allowing me to do 60 than the speed limit is set for 60. Although, I haven't noticed a difference in crashes, if it has reduced it, then I guess it's worth it.
1017	
1018	
1019	
1020	
1021	
1022	I dont really think it has changed anything at all. People dont obey them and its impossible to enforce in my opinion.
1023	The speed limitrs have never been noticed to change. This waqs and is a complete waste of money and should not be expanded.
1024	
1025	
1026	
1027	It has no effect especially on the I-270 South traffic and probably mostly due to drivers ignoring the signs.
1028	
1029	
1030	People in general still do not obey not only the speed limit but the changing lanes, merging properly, etc.

LAW ENFORCEMENT DATA, YEARS ONE AND TWO:

KEY:

AGENCY	Code
Bellefonte Neighbors PD	1
Bridgeton PD	2
Creve Coeur PD	3
Des Peres PD	4
Florissant PD	5
Ferguson PD	6
Hazelwood PD	7
Kirkwood PD	8
Maryland Heights PD	9
MSHP Troop C	10
REJIS	11
St. Louis County PD	12
Sunset Hills PD	13
St. Louis Metro PD	14
Town and Country PD	15

Q2- Awareness about VSL	Code
Less than 10%	1
10% to 25%	2
26% to 50%	3
51% to 75%	4
76% to 90%	5
More than 90%	6

Questions 1-13

Abbreviation	Expansion of abbreviation
QVSL_A_1	Increase speed limit 70 mph during NPH
QVSL_A_2	Require more effort of police
QVSL_A_3	Well implemented
QVSL_A_4	Should be expanded
QVSL_A_5	Should be eliminated
QVSL_A_6	Well explained to pubic
QVSL_A_7	Well explained to law enforcement
QVSL_A_8	Increased public safety
QVSL_A_9	Increased driver compliance with law
QVSL_A_10	Reduced the stop & go traffic
QVSL_A_11	Uniform traveling speed
QVSL_A_12	Reduced number of crashes
QVSL_A_13	Relieved congestion

Scale	Meaning
1	Strongly agree
2	Slightly agree
3	Slightly disagree
4	Strongly disagree

Question 1 - 13

S.No	NCS Header	Agency	Q2	Q3to151	Q3to152	Q3to153	Q3to154	Q3to155	Q3to156	Q3to157	Q3to158	Q3to159	Q3to1510	Q3to1511	Q3to1512	Q3to1513
1	9700001130010224090015371 #0001 N	6	2	2	4	3	2	4	3	2	2	2	1	2	1	1
2	9700001100010224090015371 #0001 N	6	5	1	1	1	1	1	1	2	2	5	3	2	1	1
3	9700000450010224090015371 #0001 N	12	2	3	5	3	4	4	4	2	2	1	4	2	1	1
4	9700001190010224090015371 #0001 N	6		4	4	4	4	4	3	2	3	1	4	2	1	1
5	9700000870010224090015371 #0001 N	7	2	4	3	3	4	3	3	2	3	2	4	3	1	1
6	9700001000010224090015371 #0001 N	6	3	4	4	4	4	3	4	4	4	3	4	3	1	1
7	9700000080010224090015371 #0001 N	10	1	4	4	4	4	4	4	4	4	5	5	4	1	1
8	9700000090010224090015371 #0001 N	9	3	5	5	3	4	4	5	2	2	5	5	5	1	1
9	9700001340010224090015371 #0001 N	8	4	3	2	2	2	4	3	2	5	4	2	2	2	1
10	9700001230010224090015371 #0001 N	8		4	4	4	4	4	4	2	2	3	3	2	2	1
11	9700000360010224090015371 #0001 N	3	6	5	5	2	4	4	3	2	3	1	4	2	2	1
12	9700000990010224090015371 #0001 N	6	1	5	5	3	4	4	2	2	3	2	2	3	2	1

13	970000172001022409001 5371 #0001 N	1	1	3	3	2	2	3	2	2	3	2	4	3	2	1
14	970000065001022409001 5371 #0001 N	15	2	3	4	4	3	3	3	2	3	2	3	4	2	1
15	970000162001022409001 5371 #0001 N	1	1	3	4	4	3	4	4	4	4	1	4	4	2	1
16	970000114001022409001 5371 #0001 N	6	3	3	3	2	3	3	3	4	4	5	5	4	2	1
17	970000034001022409001 5371 #0001 N	3	5	2	2	1	3	3	2	3	2	3	2	5	2	1
18	970000122001022409001 5371 #0001 N	8	4	3	2	2	2	2	2	2	2	3	2	2	3	1
19	970000011001022409001 5371 #0001 N	2	4	2	3	2	2	3	2	3	3	4	2	2	3	1
20	970000071001022409001 5371 #0001 N	15	1	3	3	3	3	4	4	1	2	3	4	2	3	1
21	970000107001022409001 5371 #0001 N	6	2	2	5	5	2	3	3	3	3	3	2	3	3	1
22	970000101001022409001 5371 #0001 N	6	2	3	3	4	3	4	3	4	4	5	2	3	3	1
23	970000116001022409001 5371 #0001 N	6	6	5	5	4		5	3	5	3	5	4	4	3	1
24	970000127001022409001 5371 #0001 N	8	3	4	4	4	4	4	4	1	1	1	4	2	4	1

25	970000053001022409001 5371 #0001 N	2	3	2	2	1	2	3	2	4	4	4	5	2	4	1
26	970000126001022409001 5371 #0001 N	8		4	4	4	4	4	4	2	3	2	3	3	4	1
27	970000062001022409001 5371 #0001 N	2	5	4	5	4	4	4	3	2	1	3	4	3	4	1
28	970000044001022409001 5371 #0001 N	12	1	4	4	4	4	4	4	1	1	1	4	4	4	1
29	970000133001022409001 5371 #0001 N	8	4	2	5	1	2	3	2	2	2	5	2	2	5	1
30	970000029001022409001 5371 #0001 N	3		2	3	3	3	3	2	2	2	1	4	2	5	1
31	970000143001022409001 5371 #0001 N	8		5	3	3	4	2	2	2	2	5	5	2	5	1
32	970000154001022409001 5371 #0001 N	1	2	2	4	5	2	5	5	2	5	2	4	3	5	1
33	970000025001022409001 5371 #0001 N	3	2	5	5	5	5	5	5	3	4	5	5	5	5	1
34	970000006001022409001 5371 #0001 N	13	1	4	5	4	4	4	4	1	4	1	4	4		1
35	970000057001022409001 5371 #0001 N	2		5	3	4	3	5	5	1	2	5	2	2	1	2
36	970000157001022409001 5371 #0001 N	1	3	2	2	2	2	2	2	2	2	2	2	2	2	2
37	970000048001022409001 5371 #0001 N	2	3	2	3	2	2	3	3	4	3	3	3	3	2	2
38	970000010001022409001 5371 #0001 N	2		4	4	4	4	4	3	4	4	1	4	3	2	2
39	970000145001022409001 5371 #0001 N	8	2	4	2	3	4	5	5	4	3	1	4	4	2	2
40	970000153001022409001 5371 #0001 N	1		4	4	4	4	4	5	4	4	5	5	4	2	2
41	970000102001022409001 5371 #0001 N	6		4	4	4	4	4	4	3	3	5	5	5	2	2
42	970000115001022409001 5371 #0001 N	6	4	2	3	2	2	3	2	2	2	3	2	2	3	2
43	970000128001022409001 5371 #0001 N	8		4	5	3	3	4	3	2	3	2	3	3	3	2
44	970000169001022409001 5371 #0001 N	1	3	3	3	3	3	3	2	2	4	2	3	3	3	2
45	970000060001022409001 5371 #0001 N	2	4	4	4	3	3	4	3	2	3	2	4	3	3	2
46	970000089001022409001 5371 #0001 N	7	2	3	3	3	4	4	3	3	3	2	4	3	3	2
47	970000135001022409001 5371 #0001 N	8		3	5	3	4	4	3	1	2	5	5	3	3	2

44	970000169001022409001 5371 #0001 N	1	3	3	3	3	3	3	2	2	4	2	3	3	3	2
45	970000060001022409001 5371 #0001 N	2	4	4	4	3	3	4	3	2	3	2	4	3	3	2
46	970000089001022409001 5371 #0001 N	7	2	3	3	3	4	4	3	3	3	2	4	3	3	2
47	970000135001022409001 5371 #0001 N	8		3	5	3	4	4	3	1	2	5	5	3	3	2
48	970000007001022409001 5371 #0001 N	12	1	4	4	3	4	4	4	4	4	2	3	4	3	2
49	970000059001022409001 5371 #0001 N	2	2	3	4	3	3	4	3	2	3	5	3	4	3	2
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83	970000147001022409001 5371 #0001 N	5		2	3	2	3	3	2	1	3	5	1	2	1	4
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86	970000074001022409001 5371 #0001 N	15	1	4	4	4	4	4	4	2	2	1	4	3	1	4
87	970000149001022409001 5371 #0001 N	1	1	4	4	4	4	4	4	3	4	1	4	4	1	4
88	970000052001022409001 5371 #0001 N	2	1	4	4	4	3	4	3	4	4	1	4	4	1	4
89	970000041001022409001 5371 #0001 N	12	1	4	4	4	4	4	4	4	4	1	4	4	1	4
90	970000130001022409001 5371 #0001 N	8	4	2	1	2	3	3	1	1	2	4	2	1	2	4

91	970000106001022409001 5371 #0001 N	6	3	3	3	3	3	3	3	2	3	2	2	2	2	4
92	970000161001022409001 5371 #0001 N	1	2	4	4	3	2	3	4	3	5	3	2	2	2	4
93	970000046001022409001 5371 #0001 N	12	2	4	5	4	3	4	5		1	1	4	2	2	4
94	970000076001022409001 5371 #0001 N	15	1	3	5	4	3	3	5	2	3	2	5	2	2	4
95	970000163001022409001 5371 #0001 N	1	2	2	4	2	4	4	3	1	3	2	2	3	2	4
96	970000084001022409001 5371 #0001 N	7	2	4	3	3	3	3	3	4	3	2	3	3	2	4
97	970000085001022409001 5371 #0001 N	7	2	4	3	3	3	3	3	4	3	2	3	3	2	4
98	970000090001022409001 5371 #0001 N	7	2	4	3	3	3	3	3	4	3	2	3	3	2	4
99	970000141001022409001 5371 #0001 N	8		5	5	5	5	5	5	2	2	1	4	3	2	4
100	970000038001022409001 5371 #0001 N	3	1	4	4	4	4	4	4	1	2	2	4	3	2	4
101	970000131001022409001 5371 #0001 N	8	4	4	4	4	4	3	4	2	2	2	4	3	2	4
102	970000146001022409001 5371 #0001 N	5	3	4	2	4	4	4	3	2	4	4	1	4	2	4
103	970000140001022409001 5371 #0001 N	8	2	3	4	2	5	3	2	3	2	3	3	4	2	4
104	970000067001022409001 5371 #0001 N	15	2	4	4	4	4	4	4	3	4	1	4	4	2	4
105	970000075001022409001 5371 #0001 N	15	3	4	4	3	4	3	3	2	2	2	4	4	2	4
106	970000170001022409001 5371 #0001 N	1	1	1	2	2	5	3	5	2	5	4	2	5	2	4
107	970000081001022409001 5371 #0001 N	15		4	4	4	4	4	4	2	5	1	4	5	2	4
108	970000018001022409001 5371 #0001 N	3	1	2	2	2	4	3	3	3	4	2	2	2	3	4
109	970000124001022409001 5371 #0001 N	8	3	5	5	2	3	5	5	2	2	3	2	2	3	4
110	970000148001022409001 5371 #0001 N	5	4	2	2	2	2	3	2	1	2	4	2	2	3	4

111	970000042001022409001 5371 #0001 N	12	2	3	4	3	4	4	4	1	2	4	3	2	3	4
112	970000017001022409001 5371 #0001 N	3	3	2	4	5	3	3	3	1	2	1	4	2	3	4
113	970000080001022409001 5371 #0001 N	15	3	4	4	4	4	4	4	1	2	2	4	2	3	4
114	970000068001022409001 5371 #0001 N	15	4	2	3	3	3	2	2	2	3	3	2	3	3	4
115	970000037001022409001 5371 #0001 N	3	3	2	5	2	2	4	2	4	4	4	2	3	3	4
116	970000024001022409001 5371 #0001 N	3	4	2	2	2	3	2	3	4	4	3	3	3	3	4
117	970000137001022409001 5371 #0001 N	8	3	2	2	2	2	2	2	3	3	4	3	3	3	4
118	970000167001022409001 5371 #0001 N	1	4	4	3	2	4	3	3	2	3	1	4	3	3	4
119	970000118001022409001 5371 #0001 N	6		3	3	3	3	3	3	3	3	1	4	3	3	4
120	970000040001022409001 5371 #0001 N	3		4	4	3	3	4	3	3	3	2	5	3	3	4
121	970000012001022409001 5371 #0001 N	3	2	2	5	2	3	3	3	2	3	5	4	5	3	4
122	970000055001022409001 5371 #0001 N	2	2	2	3	1	3	4	2	3	2	4	1	1	4	4
123	970000092001022409001 5371 #0001 N	7	2	4	4	4	4	4	4	1	4	4	1	1	4	4
124	970000047001022409001 5371 #0001 N	12	2	2	3	4	3	3	3	1	1	5	5	1	4	4
125	970000073001022409001 5371 #0001 N	15		2	3	2	2	4	3	3	3	2	2	2	4	4
126	970000098001022409001 5371 #0001 N	7	2	2	2	2	3	2	2	3	3	4	2	2	4	4
127	970000004001022409001 5371 #0001 N	15		4	4	4	4	4	4	1	2	1	4	2	4	4
128	970000019001022409001 5371 #0001 N	3		2	5	5	5	3	2	2	2	5	5	2	4	4
129	970000139001022409001 5371 #0001 N	8	1	4	4	4	4	4	3	2	3	2	3	3	4	4
130	970000082001022409001 5371 #0001 N	7		4	4	4	4	4	4	2	3	1	4	3	4	4

131	970000070001022409001 5371 #0001 N	15	1	3	3	3	3	4	4	2	3	2	4	3	4	4
132	970000142001022409001 5371 #0001 N	8	4	3	3	3	3	3	3	4	4	5	5	3	4	4
133	970000027001022409001 5371 #0001 N	3	3	5	5	5	5	5	5	5	4	5	5	3	4	4
134	970000150001022409001 5371 #0001 N	1	2	3	4	5	4	4	5	1	2	5	2	4	4	4
135	970000049001022409001 5371 #0001 N	2	2	4	4	4	4	4	4	1	1	1	4	4	4	4
136	970000063001022409001 5371 #0001 N	2		4	4	4	4	4	4	4	2	1	4	4	4	4
137	970000066001022409001 5371 #0001 N	15	1	4	4	4	4	4	4	1	3	1	4	4	4	4
138	970000039001022409001 5371 #0001 N	3		4	4	4	4	4	4	3	3	1	4	4	4	4
139	970000083001022409001 5371 #0001 N	7	3	4	2	4	3	4	2	1	4	1	4	4	4	4
140	970000077001022409001 5371 #0001 N	15	1	4	4	3	4	4	4	1	4	1	4	4	4	4
141	970000094001022409001 5371 #0001 N	7	3	4	4	4	4	4	4	1	4	1	4	4	4	4
142	970000064001022409001 5371 #0001 N	15	6	4	4	4	4	4	4	2	4	1	4	4	4	4
143	970000158001022409001 5371 #0001 N	1	1	4	4	4	4	4	4	4	4	1	4	4	4	4
144	970000091001022409001 5371 #0001 N	7		4	4	4	4	4	4	4	4	1	4	4	4	4
145	970000028001022409001 5371 #0001 N	3	3	5	4	4	4	4	4	2	4	2	4	4	4	4
146	970000030001022409001 5371 #0001 N	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4
147	970000093001022409001 5371 #0001 N	7	3	4	4	4	4	4	4	4	4	4	4	4	4	4
148	970000111001022409001 5371 #0001 N	6		4	4	4	4	4	4	4	4	4	4	4	4	4
149	970000171001022409001 5371 #0001 N	1	3	4	4	4	4	4	3	3	3	5	5	4	4	4
150	970000013001022409001 5371 #0001 N	3	4	3	3	3	3	4	3	3	4	5	3	5	4	4

151	970000164001022409001 5371 #0001 N	1	2	3	4	4	3	4	3	2	3	5	2	2	5	4
152	970000031001022409001 5371 #0001 N	3	1	2	3	5	5	5	5	2	2	5	5	2	5	4
153	970000132001022409001 5371 #0001 N	8	3	5	5	5	5	5	5	2	5	5	5	2	5	4
154	970000020001022409001 5371 #0001 N	3		2	5	2	5	4	3	5	5	5	5	2	5	4
155	970000095001022409001 5371 #0001 N	7	6	4	5	4	4	4	5	1	2	5	5	3	5	4
156	970000056001022409001 5371 #0001 N	2	1	4	4	3	4	4	5	3	4	5	5	4	5	4
157	970000054001022409001 5371 #0001 N	2	2	4	4	4	4	4	4	4	5	5	1	5	5	4
158	970000117001022409001 5371 #0001 N	6	3	3	4	5	3	4	5	1	3	5	5	5	5	4
159	970000112001022409001 5371 #0001 N	6	3	3	5	3	3	3	5	2	3	5	5	2	2	5
160	970000152001022409001 5371 #0001 N	1	2	5	3	4	3	4	5	1	3	1	4	5	2	5
161	970000033001022409001 5371 #0001 N	3	2	3	3	2	4		5	4	4	2	4	5	2	5
162	970000160001022409001 5371 #0001 N	1	6	5	5	2	2	2	5	1	1	4	1	1	4	5
163	970000125001022409001 5371 #0001 N	8	5	5	3	5	5	4	5	1	5	4	5	1	4	5
164	970000108001022409001 5371 #0001 N	6	1	2	5	5	5	4	4	2	2	5	5	5	4	5
165	970000151001022409001 5371 #0001 N	1		5	5	3	2	2	5	2	1	3	5	2	5	5
166	970000138001022409001 5371 #0001 N	8	4	2	2	2	2	3	5	1	2	5	5	2	5	5
167	970000136001022409001 5371 #0001 N	8	1	5	5	5	5	5	5	5	5	5	5	5	5	5
168	970000035001022409001 5371 #0001 N	3	2	5	5	5	5	5	5	5	5	5	5	5	5	5
169	970000078001022409001 5371 #0001 N	15	2	5	5	5	5	5	5	5	5	5	5	5	5	5
170	970000159001022409001 5371 #0001 N	1		5	5	5	5	5	5	5	5	5	5	5	5	5
171	970000001001022409001 5371 #0001 N	3	5		5	3	5	4	2			5	4			

S.No	NCS Header	Agency	Q2	Q3to 151	Q3to 152	Q3to 153	Q3to 154	Q3to 155	Q3to 156	Q3to1 57	Q3to 158	Q3to 159	Q3to 1510	Q3to 1511	Q3to 1512	Q3to 1513
172	97000000100105151000150370 #0001 N	14	4	4	4	3	4	4	4	1	2	1	4	2	4	4
173	97000000200105151000150370 #0001 N	6		2	3	3	2	2	3	3	3	3	3	3	3	4
174	97000000300105151000150370 #0001 N	6		3	3	3	3	4	4	4	3	3	3	4	4	4
175	97000000400105151000150370 #0001 N	6		3	3	3	4	4	4	4	3	3	3	3	4	4
176	97000000500105151000150370 #0001 N	6		3	3	4	4	4	3	3	3	3	4	4	4	4
177	97000000600105151000150370 #0001 N	6		3	4	3	4			3	4	3	4	3	4	4
178	97000000700105151000150370 #0001 N	6		3	3	3	3	3	3	3	3	3	3	3	3	3
179	97000000800105151000150370 #0001 N	6		4	4	4	3	3	3	3	3	4	4	3	4	4
180	97000000900105151000150370 #0001 N	6		4	4	4	4	4	4	4	4	2	4	3	4	4

181	970000010001051510001 5370 #0001 N	6		4	4	4	3	3	3	3	2	2	4	4	4	4
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184	970000013001051510001 5370 #0001 N	6		3	3	3	3	4	4	4	4	2	4	3	4	4
185	970000014001051510001 5370 #0001 N	6		3	3	3	4	4	4	3	4		4	4	4	4
186	970000015001051510001 5370 #0001 N	6		3	3	3	3	3	3	2	3	2	3	3	3	4
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188	970000017001051510001 5370 #0001 N	7	1	4	4	4	4	4	4	4	4	4	4	4	4	4
189	970000018001051510001 5370 #0001 N	7	3	5	5	5	5	5	5	5	5	5	5	5	2	1
190	970000019001051510001 5370 #0001 N	7	1	4	4	4	4	4	4	4	4	1	4	4	2	1

191	970000020001051510001 5370 #0001 N	7	2	2	3	3	3	3	3	3	3	2	3	3	2	2
192	970000021001051510001 5370 #0001 N	7		2	3	3	3	3	3	3	3	3	3	3	3	1
193	970000022001051510001 5370 #0001 N	7	4	3	3	3	3	3	3	1	3	2	4		2	4
194	970000023001051510001 5370 #0001 N	7		2	2	2	2	2	2	4	3	3	2	2	4	3
195	970000024001051510001 5370 #0001 N	7	2	4	4	4	4	4	4	2	4	1	4	4	4	1
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197	970000026001051510001 5370 #0001 N	9	2	2	2	2	2	5	2	2	3	3	2	3	2	3
198	970000027001051510001 5370 #0001 N	9	2	4	4	4	4	4	4	2	4	1	4	4	1	4
199	970000028001051510001 5370 #0001 N	9	5	2	2	2	2	2	2	1	2	3	3	3	1	1
200	970000029001051510001 5370 #0001 N	9	4	3	3	3	4	4	3	2	3	2	3	3	3	2

201	970000030001051510001 5370 #0001 N	9	4	4	4	4	4	4	4	3	4	1	4	4	2	1
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203	970000032001051510001 5370 #0001 N	9	3	3	2	3	2	4	2	2	5	4	2	2	2	4
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205	970000034001051510001 5370 #0001 N	9		3	3	3	3	3	3	2	2	1	5	2	2	
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207	970000036001051510001 5370 #0001 N	9	2	2	2	3	4	4	4	2	4	5	5	3	1	1
208	970000037001051510001 5370 #0001 N	9	4	2	2	2	1	3	2	1	2	4	1	2	3	3
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214	970000043001051510001 5370 #0001 N	9	4	3	5	3	3	3	3	2	2	1	4	2	2	4
215	970000044001051510001 5370 #0001 N	8		4	4	4	4	4	4	2	3	1	4	4	4	3

216	970000045001051510001 5370 #0001 N	8		4	5	2	4	3	2	4	4	4	4	4	4	2
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218	970000047001051510001 5370 #0001 N	8	1	3	3	4	4	4	3	4	4	1	4	3	1	2
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224	970000053001051510001 5370 #0001 N	8	2	1	1	1	1	1	1	1	1	1	1	1		1
225	970000054001051510001 5370 #0001 N	8	1	4	4	4	4	4	4	4	4	1	4	4	2	4

226	970000055001051510001 5370 #0001 N	8	1	4	4	4	4	4	4	4	4	1	4	4	2	4
227	970000056001051510001 5370 #0001 N	8	2	5	3	4	4	3	5	3	3	2	4	3	1	2
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230	970000059001051510001 5370 #0001 N	8	4	3	3	3	3	3	3	1	5	2	4	2	1	2
231	970000060001051510001 5370 #0001 N	15	3	2	3	3	4	3	3	2	2	2	3	3	3	2
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238	970000067001051510001 5370 #0001 N	15	2	3	4	4	4	4	4	3	4	1	4	3	3	2
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