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Evaluation of Video Detection Systems and Development of Application Guidelines at Signalized Intersections

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EVALUATION OF VIDEO DETECTION SYSTEMS AND DEVELOPMENT OF APPLICATION GUIDELINES AT SIGNALIZED INTERSECTIONS

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FINAL REPORT

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ABSTRACT

This report documents the results of a study on evaluating three major video imaging vehicle detection systems (VIVDS) currently deployed in Nevada's urban areas. The report first provides a brief review of the features and functions of some major VIVDSs. The evaluation was based on videos collected at selected intersections in both Northern Nevada and Southern Nevada. The dataset included a total of 10 intersections consisting of 30 intersection approaches and about 48 hours of video for each approach. These videos were directly recorded with detection overlays from the VIVDSs at the sites. The detection accuracy was later verified manually by watching video playbacks in the lab. The performance of the VIVDS was assessed based on the accuracy level, taking into account the total missed and false detections. Missed and false detections were the two major sources of error considered in this study. Specific detection errors and possible causes were discussed for each site. Recommendations were provided for potentially reducing video detection errors. A set of guidelines were also provided for improving VIVDS' performance at existing intersections or future deployments.

Keywords: video imaging vehicle detection system, false detection, missed detection, signalized intersections

1. INTRODUCTION

1.1. Background

Video Imaging Vehicle Detection Systems (VIVDSs) have become a popular detection tool for replacing traditional inductive loops at signalized intersections. However, VIVDSs involve several issues which may significantly affect traffic signal operations. Examples include occlusion, range of detection, camera height and angle, shadow, and lighting conditions. VIVDSs by different vendors have been deployed in Nevada's highway intersections. These VIVDSs involve different operating algorithms and detection functions; therefore, they deliver various levels of performance quality. However, many signalized intersections in Nevada's urban areas, where VIVDSs are installed, have been experiencing various problems due to missed or false detections. The agencies who are maintaining and operating the intersections often feel frustrated in diagnosing the problems due to lack of detailed documentation and guidelines regarding parameter selection and detection setup. As a result, some cameras have been removed from several intersections in the Las Vegas area. At locations where accurate detection and performance are critical, deployment of VIVDSs must be thoroughly evaluated to ensure safe and efficient signal operations. This research project was initiated to address such specific needs in the State of Nevada.

The primary goal of this research was to provide an unbiased evaluation of the various VIVDSs deployed in Nevada's urban areas. Three VIVDSs were eventually evaluated, representing the primary systems deployed in Nevada. The original research plan was to have all the VIVDSs installed side-by-side at one or two intersection approaches so that other influencing factors could be eliminated to achieve a more accurate comparison. However, the economic downturn restricted most vendors in their travel and operating budgets, which prohibited carrying out the initial plan. Eventually, a

revised research plan was adopted which involved collecting videos with detection overlays directly from VIVIDs in the field at selected intersections in both Northern Nevada and Southern Nevada. The performance of the VIVIDSs was assessed based on manual verification of the recorded videos with detection overlays. Therefore, it is important to note that the results presented in this report could only be considered as anecdotal. Standard statistical analysis techniques could not be achieved due to many unquantifiable influencing factors, such as traffic volume, camera height and angle, lighting, wind, sun glare, and other weather-related conditions.

1.2. Report Organization

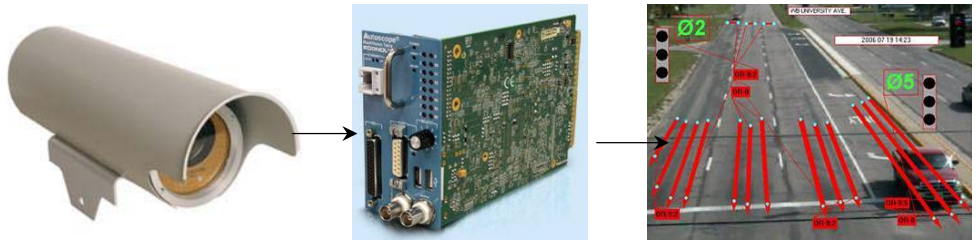
This report consists of five chapters. Chapter 1 introduces the background and the main goal of this project. Chapter 2 includes a literature review of VIVDSs features and applications. Chapter 3 describes the data collection and data analyses processes, as well as the evaluation results. Chapter 4 presents the guidelines derived from previous research and this study. Chapter 5 provides a summary and our conclusions.

2. VIDEO IMAGING VEHICLE DETECTION SYSTEM

In 1928, the first semi-actuated traffic signal control designed by Charles Adler was installed at a Baltimore intersection (*1*). Since then, a variety of detector technologies and devices have been deployed for traffic signal control and operations. A number of commercial VIVDSs are now available and have been implemented in the U.S. to replace traditional inductive loop detectors. Commonly used VIVDSs include Autoscope by Econolite Inc., (*2*), Traficon VIP/D by Traficon N.V. (*3*), Vantage by Iteris, Inc. (*4*), Videotrak by Peek, Inc (*5*), and EagleVision by Siemens (*6*,*7*).

2.1. Overview of the VIVDSs

In the late 1970s, the University of Minnesota first researched the VIVDS funded by the Federal Highway Administration (FHWA), and developed a prototype VIVDS (*8*). During the same period, similar research was also initiated in Europe (*9*,*10*,*11* ,*12*) and Asia (*13*,*14*). However, all the VIVDSs possess similar components, features and functions. A typical VIVDS consists of three key components: one or more video cameras, a central image processor, and detection software (*15*). Video cameras are used to monitor each intersection approach and capture the movements of vehicles in the video; a central image processor unit analyzes the video signals from the cameras. Since programmable detection zones and detectors have already been set up in the central image processor, the detection zones and detectors are activated when vehicles pass the detection zones or detectors. Thus, the central image processor unit could collect various traffic variables, such as traffic volume, speed, occupancy, vehicle type, delay and queue length, through appropriate detector input terminals and adaptors (Figure 2-1).



Video Camera Central Image Processor Software Suite

Figure 2-1 VIVDS Components

In this project, the following three VIVDSs were selected for evaluation: Autoscope, Vantage, and Traficon. The reason for selecting these systems was due to their primary deployment in Nevada. Brief descriptions of the three systems are provided next to establish some basic knowledge to better understand of the analysis results which are presented later in the report.

2.2. VIVDS Performance and Operational Issues

As pointed out earlier, these three VIVDSs have similar functions and features as stated in the manufacture's system specifications (*16*,*17*,*18*,*19*). A number of studies have been conducted to evaluate the performance of these VIVDSs.

Because of inherent features, the performance of VIVDS can be affected by a variety of factors such as camera location, light, weather, and abnormal driving. VIVDS can produce two main categories of error: false detection and missed detection. A false detection occurs when a detector is activated by vehicles in adjacent lanes, vehicle shadow, shadow of buildings or trees, and abnormal driving. False detection usually results in more counts than the true counts in the field. A missed detection occurs when a detector is not properly triggered while a vehicle passes through the detector. One such case is when the system is unable to differentiate between vehicles within a group of vehicles, resulting in fewer counts than actual. Another case is when a detector is not activated at all due to low lighting, inadequate detector setup, or algorithmic issues.

Several factors which may affect the VIVDS performance have been analyzed in this project.

2.2.1. VIVDS Performance

As early as 1989, Michalopoulos et al. (*20*) evaluated the accuracy of volume and speed detection of Autoscope. They tested volume and speed performance at two locations: one at an intersection, and the other at a freeway segment. At the intersection, the volume detection accuracy ranged from 95%-100% throughout the entire day. At the freeway, they indicated that the volume detection accuracy was above 90% for the entire day, except between 15:00 and 17:00 when congestion caused some pairs of vehicles to appear as one vehicle, resulting in lower vehicle counts. For speed, the overall error was 12% and the misses were 17% due to weather conditions and instantaneous speeds. Later, in their preliminary test, they obtained speed accuracies of 94%-96%. In another study (*17*), the overall evaluation of Autoscope's volume accuracy at six different sites was 92.19%-98.32% while the speed accuracy was 94.57%-97.66% (when average speeds were 40 to 65 mph). However, in Cottrell's study (*21*), the research group tested the Autoscope 2002 suite at three different sites. At the first site, they found the volume and speed data from Autoscope appeared erratic for each of the four lanes, whereas the loop data were in a smooth and consistent pattern. For site 2, the percentage of data difference between Autoscope and loop detector was greater than the difference at site 1. For site 3, the percentage of data difference ranged from 2% to 7% (4% for all detectors), much smaller than the differences obtained at sites 1 and 2. The speed was also much lower than other sites though it was off the realistic range from 55 to 65 mph.

Between 1995 and 1997, Kranig et al. (*22*) tested magnetic, sonic, ultrasonic, microwave, radar, infrared and video technologies in a variety of conditions. For video detection, a total of four devices were tested, which were TraffiCam-S (from Rockwell

International), Autoscope 2004 (from Video Image Sensing Systems), EVA 2000S (from ELIOP Trafico S.A.), and Video-Trak-900 (from Peek Transyt). They used loops as baseline data and calculated the correlation coefficient of each device and loop to evaluate their performances in different situations. According to the correlation coefficients presented for each device in both 24-hour and continuous test periods at freeways and intersections, they found that the correlation coefficient of Autoscope 2004 ranged from 88.01% to 99.70% at freeways, and from 69.68% to 99.08% at intersections; EVA 2000S ranged from 90.41% to 98.95% at freeways (there were no EVA 2000S devices at intersections); Video-Trak-900 varied from 93.38% to 99.81% at freeways (there were no Video-Trak-900 devices at intersections); and TraffiCam-S ranged from 77.41% to 97.79% at freeways (there were no TraffiCam-S sensors at intersections). After this research, the Minnesota Department of Transportation conducted further research in this field. In 2001, they presented their goals and objectives in comparing non-intrusive vehicle detection technologies to conventional roadway-based vehicle detection (*16*). Two years later, Martin, et al. (*23*) provided a comprehensive evaluation for different detector technologies, including intrusive and non-intrusive detectors, under a variety of criteria. During this period, Grant et al. (18) also studied the performance of Autoscope 2004 on freeways.

In 1996, Vantage was fully tested by the University of California, Berkeley at three intersections (*24*). They presented the results of vehicle detection accuracy under nine test conditions. The percent of correct detections were in the range of 58.8% to 96.9% under these situations. The results presented were the weighted avarege of Vantage's performance in these nine conditions. Vantage detected 65% of all vehicles at the intersections correctly and 80.9% of all vehicles adequately for the purpose of proper actuation of the signal phases. A condition-weighted average false detection and latched detection rate of 8.3% was observed. There was a condition-weighted average of 64.9% of all red-green transitions, and 64.0% of all green extensions were actuated

correctly. Through this study, it was found that the general accuracy of the system appeared to be good under ideal lighting and light traffic, but degraded in transverse lighting, low night, night, wind, and rain.

Grenard et al. (*25*) adopted two new evaluation procedures for video detection systems with several measures of performance. The first was the comparison of the occupancy times of inductive loop detectors and video detectors to find the amount of discrepancy between the two. The second was calibrating a statistical model in order to determine if weather or traffic characteristics had the greatest effects on the operation of video detectors. In their study, they selected Autoscope and Video-Trak-905 at two test sites under windy and rain conditions. In test 1, the video detection counts error of Autoscope ranged from -73% to 350% for each lane at four different conditions. In test 2, the range was from -84% to 189% for each lane in two situations. For Video-Trak-905, the range was from -76% to 906% in test 1 and from -46% to 1434% in test 2.

Recently, the Utah Traffic Lab (*26*) tested eight locations, including one location running on Autoscope, one location running on Traficon, two locations running on Iteris systems, and four locations running on Peek systems. In their study, they observed that Traficon performed well in all the test conditions with 96.4% correct detection, followed by Autoscope (92.0%) and Iteris (85.2%). Peek performed the worst, with only 75.8% correct detection under all test conditions. The results also indicated that the video detection systems performed well under day and dusk conditions with 87.2% correct detection. In nighttime conditions, correct detection was reduced to 73.4% with 19.9% false calls. In inclement weather conditions, the video detection systems recorded 81.3% correct detection and 14.1% false calls. They also found that missed detection under all conditions ranged from 4.6% to 6.8%. Overall,

video detection systems in this study generated 83% correct calls and 17% discrepant calls.

2.2.2. False Detection

There are six primary causes of false detection: vehicles in adjacent lanes, high buildings or trees, abnormal driving, headlights, wind, and other environmental conditions.

- Vehicles in Adjacent Lanes

Vehicles in adjacent lanes can cause false detection due to activating some detectors or detection zones (Figure 2-2). The four situations of false detection caused by vehicles in adjacent lanes in advanced and stop-bar detectors are shown in Figure 2-3. This phenomenon is called “horizontal occlusion”, which has been addressed in several studies. Some useful guidelines have been developed for reducing the errors by horizontal occlusions. In most studies, the recommendations made regarding camera height and offset were primarily based on empirical data and rule of thumb (*17*,*20*,*22*). A model developed by Hu and Tian can provide quantitative analysis of the errors caused by vehicles in adjacent lanes (*27*).

Figure 2-2 Horizontal Occlusion Caused by Vehicles in Adjacent Lanes

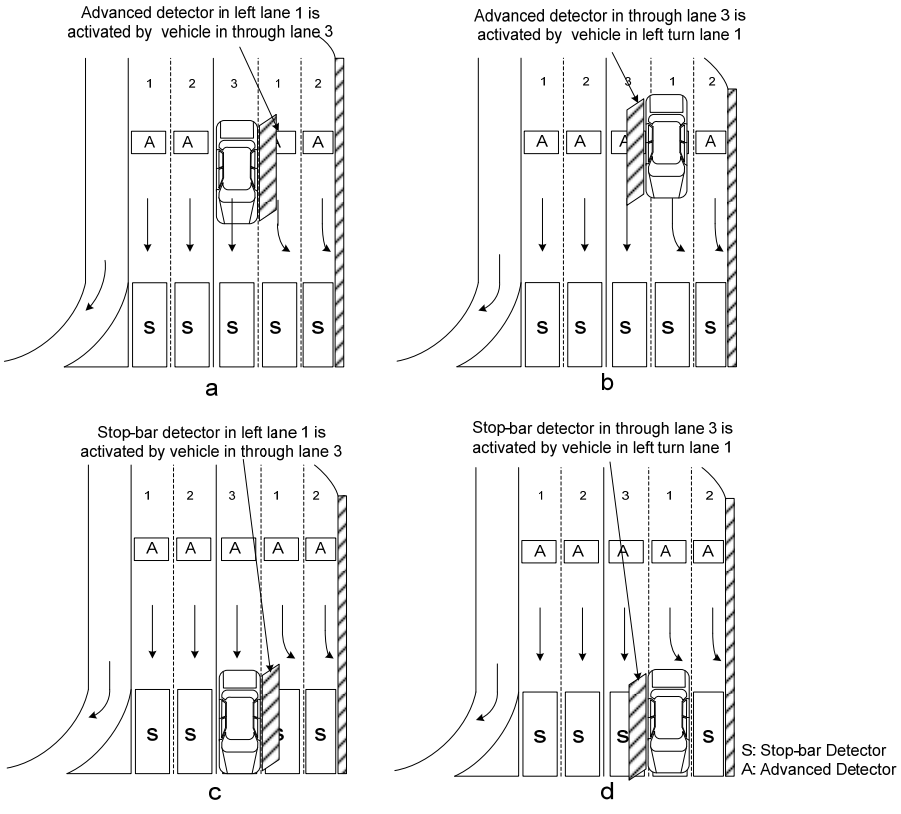


Figure 2-3 Scenarios of False Detections Caused by Vehicles in Adjacent Lanes

- High Buildings or Trees

The shadow of high buildings or trees can also trigger the detection zones or detectors since the pixels in these areas are different from those without shadows. This kind of false detection is solely due to sunlight, where the location and size of the shadows change throughout the day. Comparing with other false detections, the errors caused by high buildings or tress are relatively small. Figure 2-4 illustrates two cases of false detection caused by high buildings or trees.

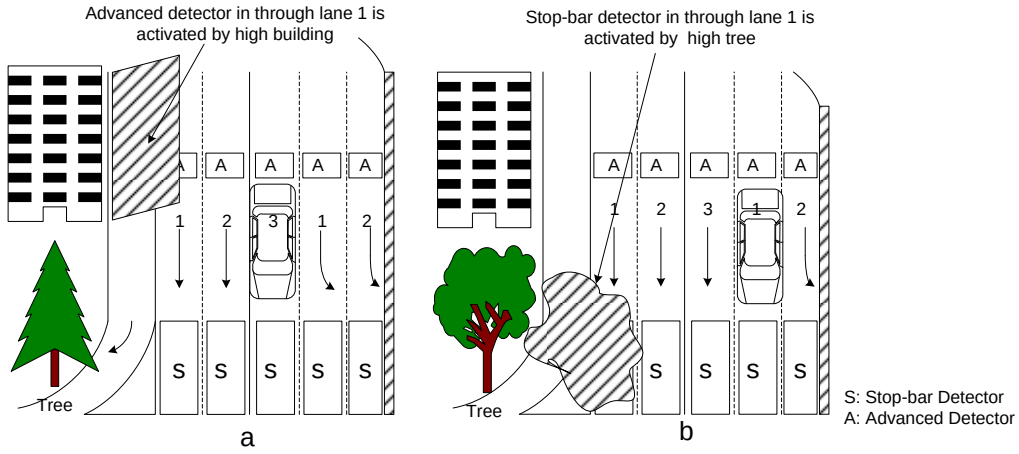


Figure 2-4 Two Situations of False Detection Caused by High Buildings or Trees

- Abnormal Driving – Sudden Lane Change

Sudden lane change while approaching an intersection is another contributing factor to false detection. For instance, a driver may suddenly change his/her decision and turn right at the intersection although the vehicle has already passed the upstream detector placed in the through lane. Some false detection situations caused by such abnormal driving are shown in Figure 2-5.

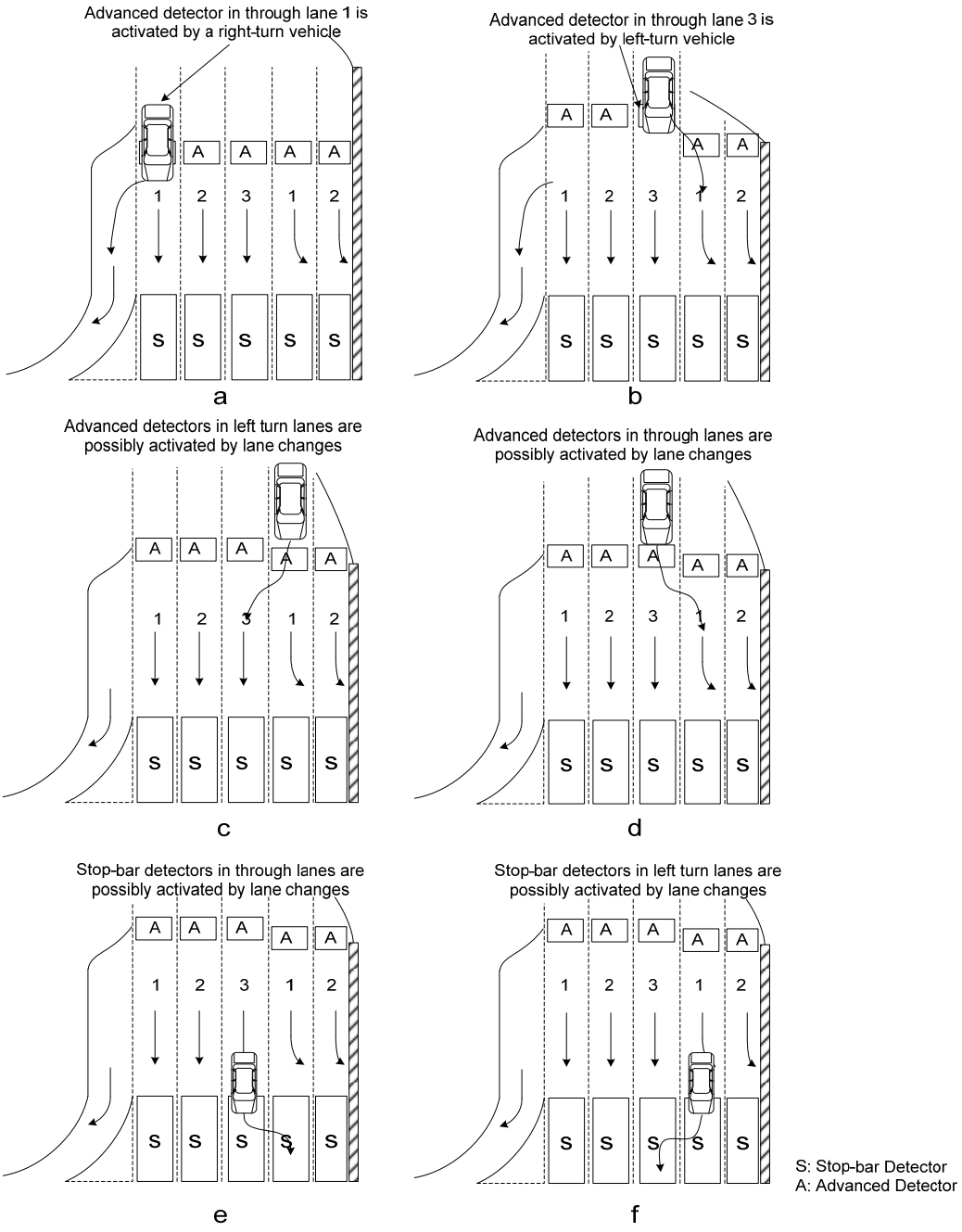


Figure 2-5 Situations of False Detection Caused by Abnormal Driving

- Headlights

Headlights are a main cause of false detections at night. Although most VIVDSs have separate image-processing algorithms to deal with nighttime conditions, detection is

still less accurate in nighttime than in daytime. The daytime algorithm detects vehicle edges and shadows by pixels variation. The nighttime algorithm searches vehicle headlights and part of the pavement that is lighted by the vehicle headlights. Figure 2-6 shows some false detection cases caused by headlights.

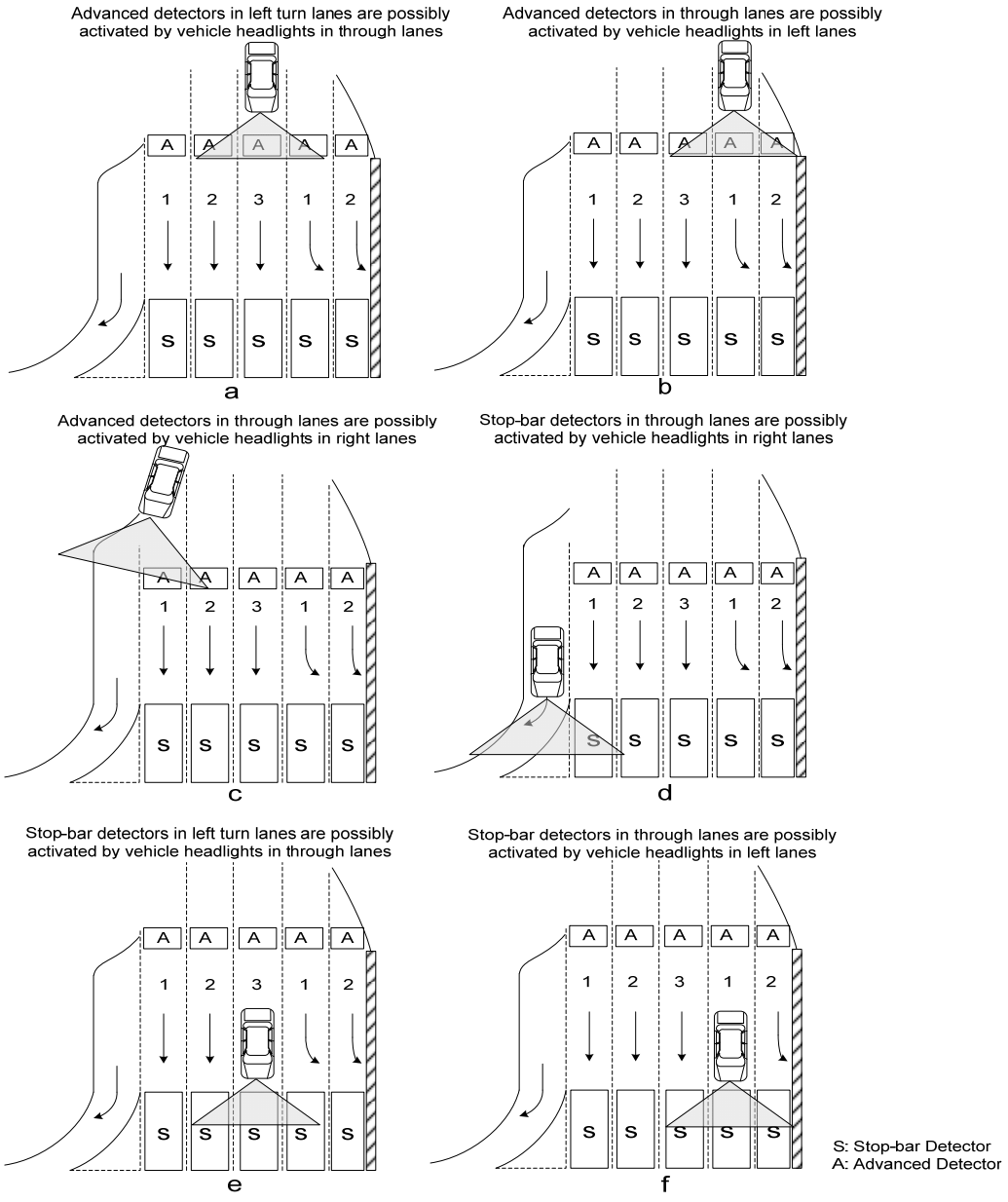


Figure 2-6 False Detection Caused by Vehicle Headlights

- Wind

Wind is also a crucial factor of false detection due to camera movement. The detection zones or detectors in a video image processor are activated due to moving in lane markings or curb of pavement whose colors are different from the pavement. Some examples are provided in Figure 2-7.

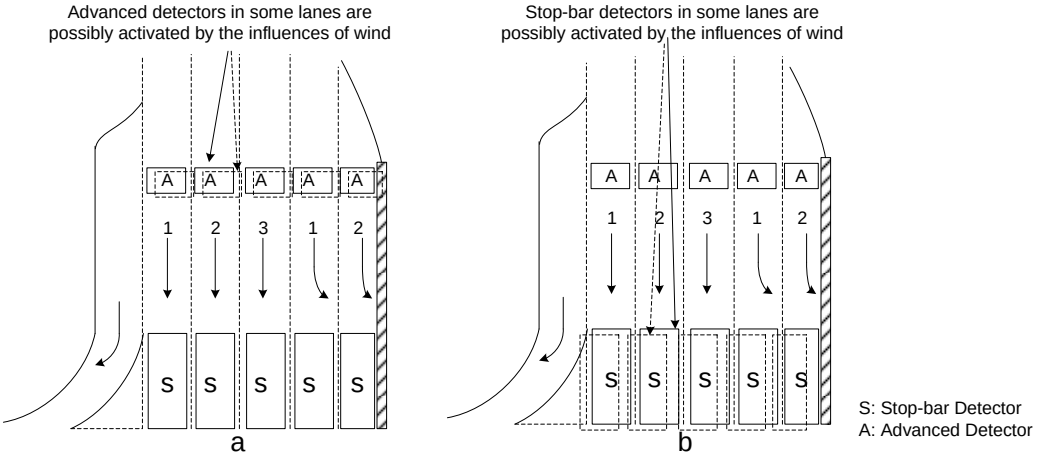


Figure 2-7 Some Examples of False Detection Caused by Wind

- Others

Besides the factors mentioned above, there are other factors causing false detection including snow, rain, and unknown reasons. Snowflakes change the color of pavement occasionally and trigger a detection zone or a detector (Figure 2-8). In addition, when rainwater is on the pavement, light reflecting off the road surface causes increased difficulty in accurately detecting vehicles (*22*, *25*).

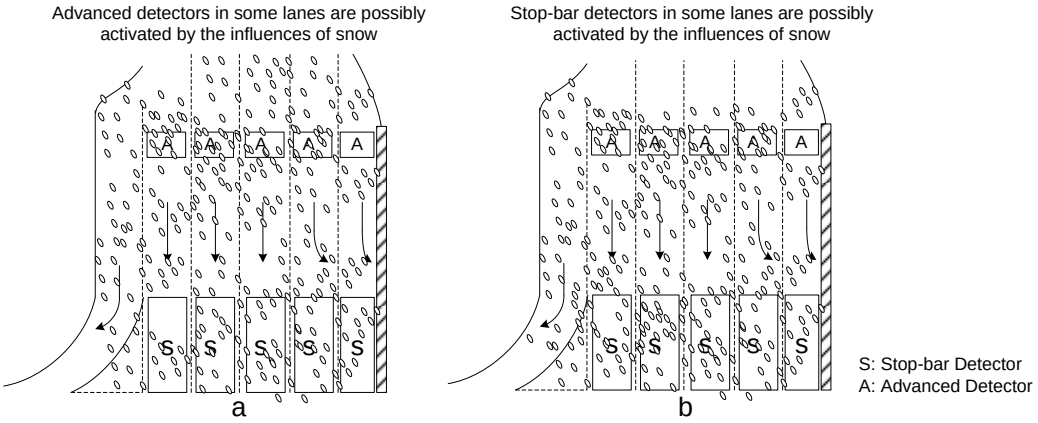


Figure 2-8 False Detections Caused by Snow

2.2.3. Missed Detection

Factors causing missed detections are grouped into three categories: occlusion (longitudinal or horizontal), abnormal driving, and others.

- Occlusion

Occlusion is inherent in VIVDSs and cannot be completely eliminated. There are two types of occlusions: longitudinal and horizontal. Longitudinal occlusion is caused by a vehicle ahead blocking the view of vehicles behind, making the video image processor unable to recognize the closely following vehicles (Figure 2-9). In this case, the traffic count from VIVDSs is less than the true data. This phenomenon has been researched extensively and several guidelines have been developed for reducing occlusion-related errors (*20*,*25*,*26*). However, for vehicle detection purposes at signalized intersections, missed detections due to longitudinal occlusion do not significantly impact signal control by falsely recognizing a longer vehicle instead of several successive vehicles. Therefore, such missed detections will not be considered as missed detections in the data collection and evaluation process which is discussed later in the report. Similarly, horizontal occlusion could result in missed detections, but is not considered in this project as it has negligible impact on signal control.

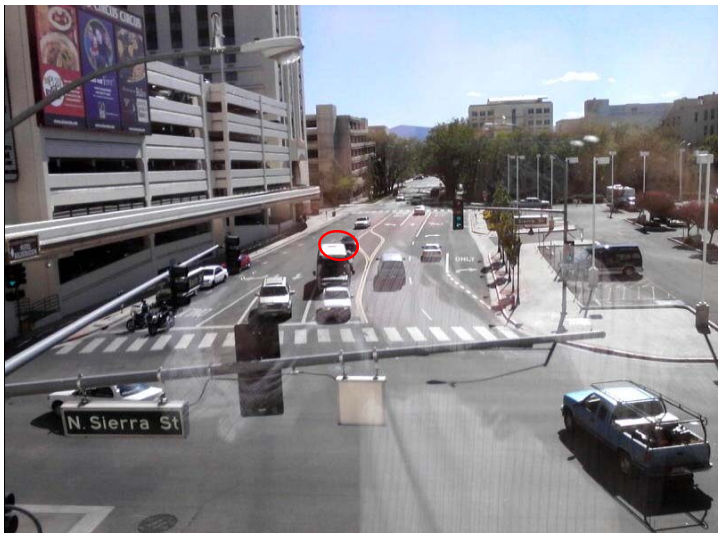


Figure 2-9 Longitudinal Occlusion Caused by Vehicles Ahead

- Abnormal Driving

Missed detections could also occur when drivers exhibit abnormal driving behaviors by making sudden lane changes while approaching an intersection. For example, a left-turn vehicle does not get into the left-turn lane until it passes the advanced detector location, causing a missed detection of this left-turn vehicle by the advanced left-turn lane detector. Some missed detection cases caused by abnormal driving are illustrated in Figure 2-10.

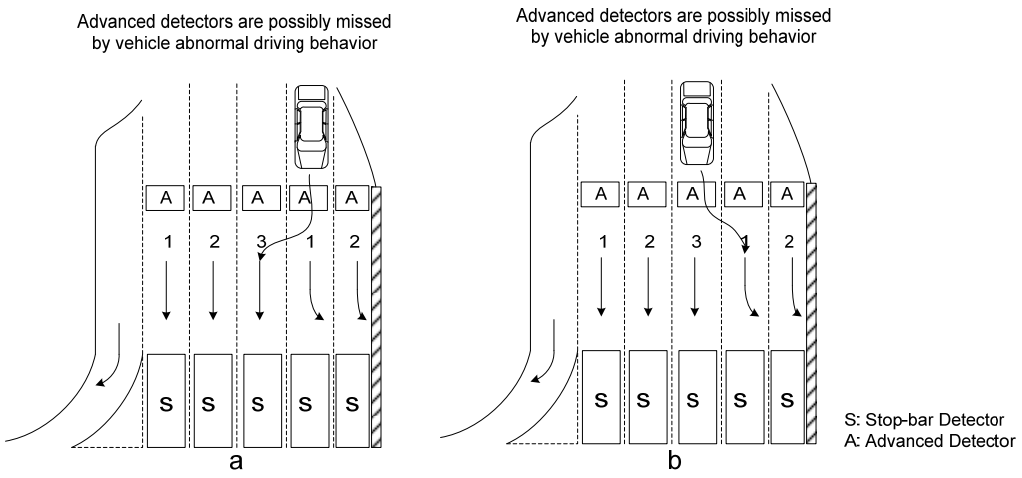


Figure 2-10 Two Examples of Missed Detection Caused by Inability of Distinguishing Colors

- Others

Other factors that may cause missed detections include snow, rain, fog, insensitive detection zones or detectors. Figure 2-11 shows two examples in this category.

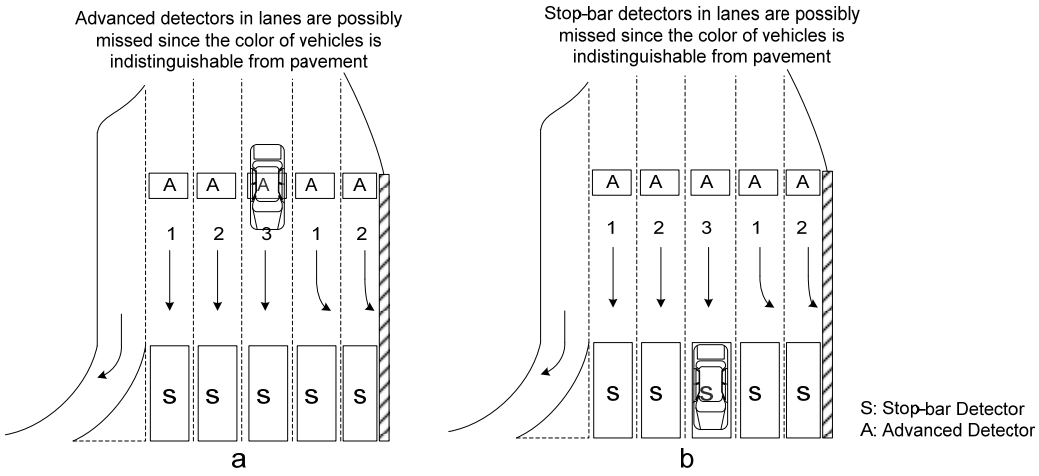


Figure 2-11 Some Situations of Missed Detection Caused by Abnormal Driving

3. DATA COLLECTION AND ANALYSIS

This chapter documents the data collection and analysis process for evaluating each VIVDS. The percentage of false and missed detections were used for comparison. The data was obtained during four time periods: AM, Midday, PM, and Night. The reasons causing false and missed detections were also identified.

The first section of this chapter introduces the methodology and the sample data collection forms. The second section provides detailed information about the data collection sites, and the performance of each VIVDS. Additionally, issues related to VIVDS operations, recommendations, and other facets are presented.

3.1. Data Collection Process

3.1.1. Data Collection Device

Ideally, evaluation of various VIVDSs should be done by setting up all the systems at the same location and recording the data at the same time, so that the exact traffic scenario can be compared. However, due to lack of vendor's participation, this ideal plan could not be carried out. Instead, data were collected at selected intersections and then manually compared with the true data. Two 4-channel Digital Video Recorders (DVR) were purchased and used for recording the videos with detection overlays from the VIVDSs (see Figure 3-1 and Figure 3-2). The two DVRs had 500 GB and 750 GB memories, respectively. And each DVR can provide continuous video recording for 7-10 days. Figure 3-3 shows the DVR setup in the signal cabinet with connection to the VIVDS.

Figure 3-1 4-Channel DVR 500 GB

Figure 3-2 4-Channel DVR 750 GB

Figure 3-3 DVR Setup in a Traffic Signal Cabinet

3.1.2. Data Collection Forms

After collecting the videos from the field, data were extracted from the videos in the lab by members of the UNR research team. In order to efficiently collect and summarize the data from the recorded videos, data collection forms were specifically designed. Table 3-1 shows a sample data collection form. Information such as the number of true counts, false and missed detections caused by various factors are also listed. There were six factors associated with false detections. And there were three factors associated with missed detections. By watching the videos, the number of false and missed detections was recorded in the data collection forms. The reasons that caused the false and missed detections were also recorded.

Each intersection approach was divided into a left-turn group and a through lane group. Each group may contain multiple lanes, representing various geometric conditions. Lanes were numbered incrementally from the right to the left in the direction of travel.

Table 3-1 Sample Data Collection Form for 'One Left Turn Lane, One through Lane'

Data Collection Form

Analyst: Date: Time: No.

Approach: Intersection: City:

		Through Movement Group										Left-Turn Group									
		Lane 1										Lane 1									
Time Period (min)		True Count	False Detection						Missed Detection			True Count	False Detection						Missed Detection		
			Vehicles in Adjacent lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
0--5	Advanced Detector																				
	Stop Bar Detector																				
5--10	Advanced Detector																				
	Stop Bar Detector																				
10--15	Advanced Detector																				
	Stop Bar Detector																				
15--20	Advanced Detector																				
	Stop Bar Detector																				
20--25	Advanced Detector																				
	Stop Bar Detector																				
25--30	Advanced Detector																				
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45--50	Advanced Detector																				
	Stop Bar Detector																				
50--55	Advanced Detector																				
	Stop Bar Detector																				
55--60	Advanced Detector																				
	Stop Bar Detector																				
Total	Advanced Detector																				
Total	Stop Bar Detector																				
Comments:																					

3.1.3. Data Collection Sites

Selection of the data collection sites was based on consideration of the following factors: a good mix of different VIVDSs; jurisdiction, intersection geometry, signal control, and environmental/weather conditions. Table 3-2 lists the sites and associated information. Ten intersections with 30 approaches were included in the data collection. These intersections were located in three major urban areas (Las Vegas, Reno, and Carson City) and one rural area (South Lake Tahoe). Three types of VIVDSs were used at these intersections. At least 48 hours of videos were continuously recorded at each intersection approach. However, due to the extensive labor required for the data extraction, only one-hour video from each time period [AM, Midday (MD), PM, and Night] was extracted and recorded in the data collection forms.

Table 3-2 Data Collection Sites

ID	Intersection	City	Starting Date	Ending Date	VIVDS	No. Of Approaches
1	Kietzke & McCarran	Reno	5-20-2009	5-22-2009	Autoscope	4
2	S. Virginia & McCarran	Reno	7-02-2009	7-04-2009	Autoscope	4
3	Mayberry & McCarran	Reno	8-25-2009	8-27-2009	Autoscope	4
4	Saliman Road & Fairview Drive	Carson City	9-28-2009	9-30-2009	Vantage	2
5	N Carson St & Medical PKWY	Carson City	9-30-2009	10-02-2009	Vantage	2
6	Lake parkway & Highway 50	South Lake Tahoe	10-02-2009	10-05-2009	Traficon	2
7	HWY 207 & Highway 51	South Lake Tahoe	10-05-2009	10-08-2009	Traficon	3
8	E Serene Ave & Maryland PKWY	Las Vegas	10-26-2009	10-28-2009	Autoscope	4
9	S. Dean Martin Dr & W Silverado Ranch Blvd	Las Vegas	11-03-2009	11-05-2009	Vantage	2
10	Koval Lane & Venetion	Las Vegas	11-17-2009	11-19-2009	Vantage	3

3.2. Results and Analyses

The results and analyses are presented by each VIVDS type. Within each VIVDS type, the basic information of each intersection is presented first, followed by the results, an analysis of the major issues, and some recommendations for improving the operations.

3.2.1. Autoscope

Autoscope was the primary VIVDS used in City of Reno. Clark County in the Las Vegas area also had a limited number of Autoscope deployments. Four intersections (three in Reno and one in Las Vegas) were included in the data collection and analyses where Autoscope was implemented. The three intersections in Reno were: S. McCarran Blvd./ Kietzke Ln, S. McCarran Blvd./ S. Virginia St., and McCarran Blvd./ Mayberry Dr. The one intersection in Las Vegas was E. Serene Ave/Maryland Pkwy. Information related to these intersections is shown in Table 3-3. Forty-eight hours of videos were continuously recorded for each intersection approach. One-hour of video from each time period was extracted: AM peak from 6:30 a.m. to 7:30 a.m., MD peak from 12:00 p.m. to 1:00 p.m., PM peak from 4:30 p.m. to 5:30 p.m., and Night from 9:00 p.m. to 10:00 p.m. The results of each intersection are presented next following the sequence of site description, results, and recommendations.

Table 3-3 Intersections Implementing Autoscope

	S. McCarran Blvd./ Kietzke Ln	S. McCarran Blvd./S. Virginia St.	McCarran Blvd./Mayberry Dr.	E. Serene Ave/Maryland
City	Reno	Reno	Reno	Las Vegas
Starting Date	5- 20-2009	7-02-2009	8-25-2009	10-26-2009
Ending Date	5-22-2009	7-04-2009	8-27-2009	10-28-2009
Starting Time	11:05 am	9:00 am	8:15 am	6:00 am
Ending Time	11:05 am	9:00 am	8:15 am	6:00 am
Approaches	4	4	4	4
Weather	Clear	Clear	Clear	Clear

1) S. McCarran Blvd/Kietzke Ln in Reno

The intersection of S. McCarran Blvd/Kietzke Ln is shown in Figure 3-4 and its lane and detector configuration is shown in Figure 3-5. The cameras were mounted on the luminaire arms or signal mast arms facing the traffic approaching the intersection. All the intersection approaches had stop-bar detectors and advanced detectors. No high buildings or trees existed near the intersection.

Figure 3-4 Picture of S. McCarran Blvd/Kietzke Ln Intersection

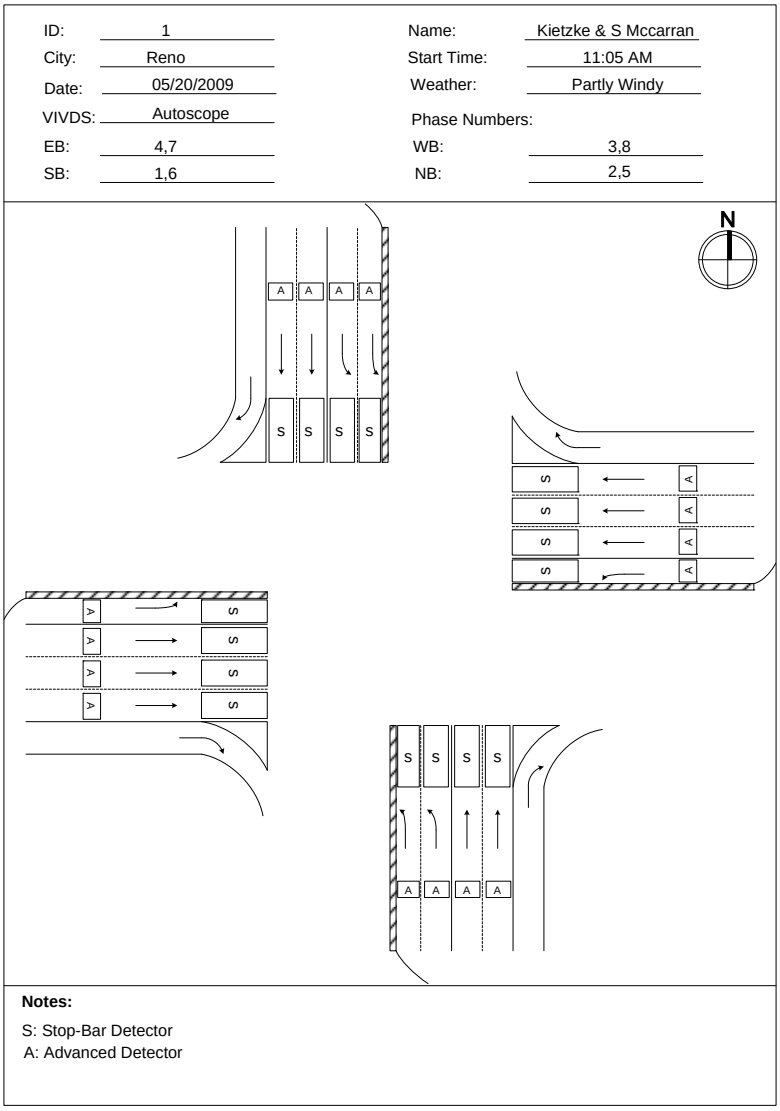

Figure 3-5 Lane and Detection Configuration of S. McCarran Blvd/Kietzke Ln Intersection

- Results

Table 3-4 to Table 3-6 provide results of the data analysis, with Table 3-4 summarizing the results for the through lane detectors, Table 3-5 summarizing the results for the left-turn lane detectors, and Table 3-6 summarizing both through lane and left-turn lane detectors. Analysis of other intersections will follow the exact format. Several items in the tables need to be explained for clarity.

Table 3-4 Autoscope Performance for Through Lane Detectors at S McCarran Blvd/Kietzke Ln Intersection

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
				Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
2	AM	Advanced Detector	521	2	0	1	0	0	0	0	0	0	3	3.4%	0.6%
3		Stop Bar Detector	196	0	0	0	0	0	0	0	0	1	1	20.0%	0.5%
4	MD	Advanced Detector	1304	3	0	2	0	0	0	0	0	0	5	5.6%	0.4%
5		Stop Bar Detector	213	0	0	0	0	0	0	0	0	1	1	20.0%	0.5%
6	PM	Advanced Detector	962	52	0	3	0	0	0	0	0	0	55	**61.8%**	5.4%
7		Stop Bar Detector	185	2	0	0	0	0	0	0	0	0	2	**40.0%**	**1.1%**
8	Day Time	Advanced Detector	2787	57	0	6	0	0	0	0	0	0	63	70.8%	2.2%
9		Stop Bar Detector	594	2	0	0	0	0	0	0	0	2	4	80.0%	0.7%
10	Day Time Percentage	Advanced Detector	97.8%	**2.0%**	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%		
11		Stop Bar Detector	99.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.7%		
12	Day Time Sum Percentage	Advanced Detector	**97.8%**	2.2%						0.0%			2.2%		
13		Stop Bar Detector	**99.3%**	0.3%						0.3%			0.7%		
14	Night Time	Advanced Detector	286	0	0	1	25	0	0	0	0	0	26	29.2%	**8.3%**
15		Stop Bar Detector	294	0	0	0	1	0	0	0	0	0	1	20.0%	0.3%
16	Night Time Percentage	Advanced Detector	91.7%	0.0%	0.0%	0.3%	**8.0%**	0.0%	0.0%	0.0%	0.0%	0.0%	8.3%		
17		Stop Bar Detector	99.7%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%		
18	Night Time Sum Percentage	Advanced Detector	**91.7%**	8.3%						0.0%			8.3%		
19		Stop Bar Detector	**99.7%**	0.3%						0.0%			0.3%		
20	All Day	Advanced Detector	3073	57	0	7	25	0	0	0	0	0	89	100.0%	2.8%
21		Stop Bar Detector	888	2	0	0	1	0	0	0	0	2	5	100.0%	0.6%
22	All Day Percentage	Advanced Detector	97.2%	**1.8%**	0.0%	0.2%	**0.8%**	0.0%	0.0%	0.0%	0.0%	0.0%	2.8%		
23		Stop Bar Detector	99.4%	0.2%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.2%	0.6%		
24	All Day Sum Percentage	Advanced Detector	**97.2%**	**2.8%**						**0.0%**			2.8%		
25		Stop Bar Detector	**99.4%**	0.3%						0.2%			0.6%		

Notes: 1. Value of cell(2,14) equals to value of cell(2,13) over value of cell(20,13), such as 3.4%=3/89; 2. Value of cell(3,15) equals to value of cell(3,13) over sum of cell(3,3) and cell(3,13), such as 0.65%=1/(1+196); 3. The value of other cells in "Percentage" and "Relative Percentage" columns were obtained similarly.

Table 3-5 Autoscope Performance for Left-Turn Lanes at S McCarran Blvd/Kietzke Ln Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	75	3	0	1	0	0	0	0	0	0	4	2.0%	5.1%
	Stop Bar Detector	180	3	0	0	0	0	0	0	0	0	3	**50.0%**	**1.6%**
MD	Advanced Detector	794	0	0	1	0	13	3	0	1	0	18	9.0%	2.2%
	Stop Bar Detector	194	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
PM	Advanced Detector	646	57	0	0	0	106	0	0	1	0	164	**81.6%**	**20.2%**
	Stop Bar Detector	186	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
Day Time	Advanced Detector	1515	60	0	2	0	119	3	0	2	0	186	92.5%	10.9%
	Stop Bar Detector	560	3	0	0	0	0	0	0	0	0	3	50.0%	0.5%
Day Time Percentage	Advanced Detector	89.1%	**3.5%**	0.0%	0.1%	0.0%	**7.0%**	0.2%	0.0%	0.1%	0.0%	10.9%		
	Stop Bar Detector	99.5%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%		
Day Time Sum Percentage	Advanced Detector	**89.1%**	10.8%						0.1%			10.9%		
	Stop Bar Detector	**99.5%**	0.5%						0.0%			0.5%		
Night Time	Advanced Detector	113	1	0	1	13	0	0	0	0	0	15	7.5%	11.7%
	Stop Bar Detector	257	0	0	0	2	0	0	0	1	0	3	**50.0%**	1.2%
Night Time Percentage	Advanced Detector	88.3%	0.8%	0.0%	0.8%	**10.2%**	0.0%	0.0%	0.0%	0.0%	0.0%	11.7%		
	Stop Bar Detector	98.8%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.4%	0.0%	1.2%		
Night Time Sum Percentage	Advanced Detector	**88.3%**	11.7%						0.0%			11.7%		
	Stop Bar Detector	**98.8%**	0.8%						0.4%			1.2%		
All Day	Advanced Detector	1628	61	0	3	13	119	3	0	2	0	201	100.0%	11.0%
	Stop Bar Detector	817	3	0	0	2	0	0	0	1	0	6	100.0%	0.7%
All Day Percentage	Advanced Detector	89.0%	**3.3%**	0.0%	0.2%	0.7%	**6.5%**	0.2%	0.0%	0.1%	0.0%	11.0%		
	Stop Bar Detector	99.3%	0.4%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.1%	0.0%	0.7%		
All Day Sum Percentage	Advanced Detector	**89.0%**	**10.9%**						**0.1%**			11.0%		
	Stop Bar Detector	**99.3%**	0.6%						0.1%			0.7%		

Table 3-6 Autoscope Performance for All Lanes at S McCarran Blvd/Kietzke Ln Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	596	5	0	2	0	0	0	0	0	0	7	2.4%	1.2%
	Stop Bar Detector	376	3	0	0	0	0	0	0	0	1	4	**36.4%**	**1.1%**
MD	Advanced Detector	2098	3	0	3	0	13	3	0	1	0	23	7.9%	1.1%
	Stop Bar Detector	407	0	0	0	0	0	0	0	0	1	1	9.1%	0.2%
PM	Advanced Detector	1608	109	0	3	0	106	0	0	1	0	219	**75.5%**	**12.0%**
	Stop Bar Detector	371	2	0	0	0	0	0	0	0	0	2	18.2%	0.5%
Day Time	Advanced Detector	4302	117	0	8	0	119	3	0	2	0	249	85.9%	5.5%
	Stop Bar Detector	1154	5	0	0	0	0	0	0	0	2	7	63.6%	0.6%
Day Time Percentage	Advanced Detector	94.5%	**2.6%**	0.0%	0.2%	0.0%	**2.6%**	0.1%	0.0%	0.0%	0.0%	5.5%		
	Stop Bar Detector	99.4%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.6%		
Day Time Sum Percentage	Advanced Detector	**94.5%**	5.4%						0.0%			5.5%		
	Stop Bar Detector	**99.4%**	0.4%						0.2%			0.6%		
Night Time	Advanced Detector	399	1	0	2	38	0	0	0	0	0	41	14.1%	**9.3%**
	Stop Bar Detector	551	0	0	0	3	0	0	0	1	0	4	**36.4%**	0.7%
Night Time Percentage	Advanced Detector	90.7%	0.2%	0.0%	0.5%	**8.6%**	0.0%	0.0%	0.0%	0.0%	0.0%	9.3%		
	Stop Bar Detector	99.3%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.2%	0.0%	0.7%		
Night Time Sum Percentage	Advanced Detector	**90.7%**	9.3%						0.0%			9.3%		
	Stop Bar Detector	**99.3%**	0.5%						0.2%			0.7%		
All Day	Advanced Detector	4701	118	0	10	38	119	3	0	2	0	290	100.0%	5.8%
	Stop Bar Detector	1705	5	0	0	3	0	0	0	1	2	11	100.0%	0.6%
All Day Percentage	Advanced Detector	94.2%	**2.4%**	0.0%	0.2%	0.8%	**2.4%**	0.1%	0.0%	0.0%	0.0%	5.8%		
	Stop Bar Detector	99.4%	0.3%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.1%	0.1%	0.6%		
All Day Sum Percentage	Advanced Detector	**94.2%**	**5.8%**						0.0%			5.8%		
	Stop Bar Detector	**99.4%**	0.5%						0.2%			0.6%		

Each table includes data grouped for advanced detectors and stop-bar detectors during different time periods of the day (e.g., AM, MD, PM, and Nighttime). Column 3 includes the ground truth counts and the percentage of correct detections. Columns 4-9 include the number of false detections by category. Columns 10-12 include the number of missed detections by category. Column 13 is the sum of all errorneous (false and missed) detections (both in numbers and percentages). Column 14 is the proportion of erroneous detections in each time period over the entire day. It was obtained by dividing the numbers in Column 13 and the total numbers presented in Row 20/Column 13 for advanced detectors, and Row 21/Column 13 for stop-bar detectors. The highlighted numbers indicate the highest percentage for the two types of detectors. The values in Column 14 indicate which time period contributed the most number of untrue detections over a day. Higher numbers in Column 14 are not necessarily directly related to detection accuracy, but may indicate the critical time period for operations. For example in Table 3-4, PM contributed the highest number of untrue detections over a day (61.8% and 40.0% for the two detector types), which may simply due to high traffic volumes during the PM peak. Column 15 is obtained by dividing the numbers in Column 13 and the sum of the numbers in Column 13 and Column 3, indicating the percent of errors (untrue counts) relative to the actual total counts. The numbers in Column 15 are better measures of detection accuracy.

For the through lane detectors at this intersection, the overall correct detections of the advanced detectors and stop-bar detectors were 97.2% and 99.4%, respectively. During the daytime hours, the correct detections were 97.8% and 99.3%, respectively. And during nighttime, the correct detections were 91.7% and 99.7%, respectively. Compared with missed detection, false detection was dominant among all erroneous detections. For example, almost all the 2.8% erroneous detections were contributed by false detections. With regard to the contributing factors, “vehicles in adjacent lanes” was the main factor causing false detections in daytime and “headlights” was the major

factor at night. False detection occurred more often in the PM period (61.8% and 40.0%), primarily because of the higher traffic volumes. By comparing the relative error percentages for all the time periods (column 14), nighttime appeared to be the worst (at 8.3% for the advanced detectors).

For the left-turn detectors shown in Table 3-5, the overall correct detections of advanced detectors and stop-bar detectors were 89.0% and 99.3%, respectively. During the daytime periods, the correct detections were 89.1% and 99.5%, respectively. During the nighttime hours, the correct detections were 88.3% and 98.8%, respectively. Similarly, false detections were the dominant untrue detections, accounting 10.9% of the entire 11.0% errorneous detections. By examining the contributing factors, “vehicles in adjacent lanes” and “wind” were the two main factors causing false detections during daytime. And “Headlights” was the major factor causing false detections at night. False detections of advanced detectors during the PM peak period counted for about 81.6% of all erroneous detections due to the higher traffic volumes. The highest relative erroneous detection percentage also occurred during the PM peak period (20.2%) followed by the nighttime (11.7%).

The overall correct detections of advanced detectors and stop-bar detectors were 94.2% and 99.4%, respectively. During daytime, the correct detections were 94.5% and 99.4%, respectively. At night, the correct detections were 90.7% and 99.3%, respectively. “Vehicles in adjacent lanes” was the main factor causing false detection of advanced detectors in daytime and “headlights” was the major factor at night. PM period contributed to the majority of the erroneous detections (75.5% and 36.4% for advanced detector and stop-bar detector, respectively). The highest relative erroneous detection percentage of advanced detectors was 12.0% during daytime, followed by 9.3% at night. Therefore, the PM peak and nighttime were the two most critical time periods.

- Problems

The EB, SB, and NB approaches were found to experience problems with the advanced detectors. For the detector in left-turn lane 1 at the EB approach, “headlights” caused 3.2% false detections and “wind” caused 17.3% false detections. The total correct detection of the advanced detectors was 77.7%. For the detector in left-turn lane 1 at the SB approach, “wind” caused 23.4% false detections and “vehicles in adjacent lanes” led to 14.1% false detections. The overall correct detection of advanced detectors was 62.2%. Table 0-9A in Appendix A shows that the “vehicles in adjacent lanes” generated 15.5% false detections and “headlight” caused about 1.4% false detections in through lane 2. The correct detection was 82.8% for this lane.

False and missed detections of the stop-bar detectors were occasionally observed, but they were not as significant compared to the advanced detectors.

- Recommendations

One recommendation is to reduce the size of advanced detectors to avoid false detections caused by wind as shown in Figure 3-6. Alternatively, the “And” function provided by Autoscope could also be used to reduce the possibility of false detection due to strong wind and camera movement (see Figure 3-7). The two detectors linked by the “And” function can only be activated when both detectors are triggered simultaneously and can reduce the number of false detections.

Another recommendation is to relocate the advanced detectors or extend the length of the left-turn storage to avoid false detections in the through lane caused by left-turn vehicles. Most advanced detectors were located near the beginning of the left-turn lanes. The left turning vehicles generally passed and triggered the advanced detectors in the through lanes (see Figure 3-8).

One problem noticed at this intersection was the improper location of the advanced

detector in left-turn lane 1 at the EB approach (shown in Figure 3-9). Sometimes, the advanced detector was triggered by the vehicles in the opposite direction. One recommendation is to redraw the advanced detector to avoid such false detections.

Similar recommendations apply to reduce false detections caused by vehicles in adjacent lanes, i.e., to reduce the size of advanced detectors (Figure 3-6), and to use the "And" function in each lane.

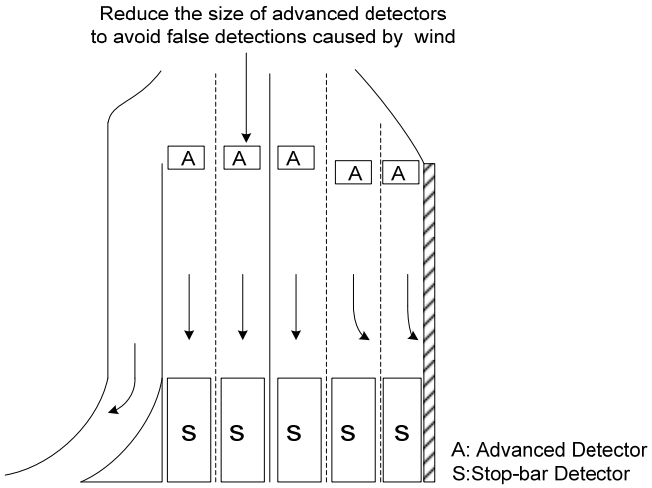

Figure 3-6 Reducing the Size of Advanced Detectors

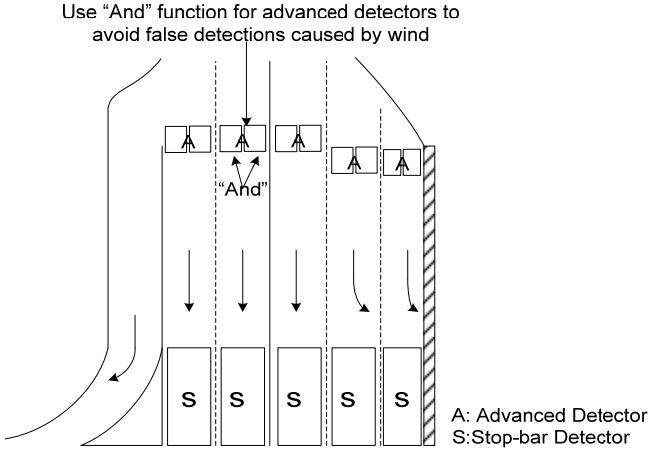

Figure 3-7 Use "And" Function Provided in Autoscope

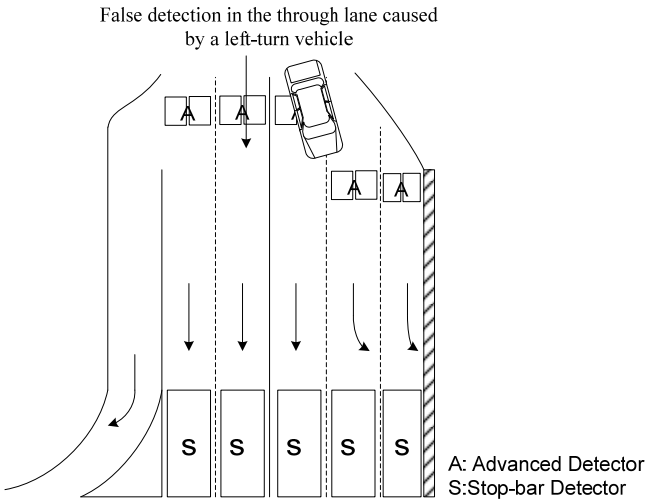

Figure 3-8 False Detection Caused by A Left-Turn Vehicle Due to Inadequate Detector Location

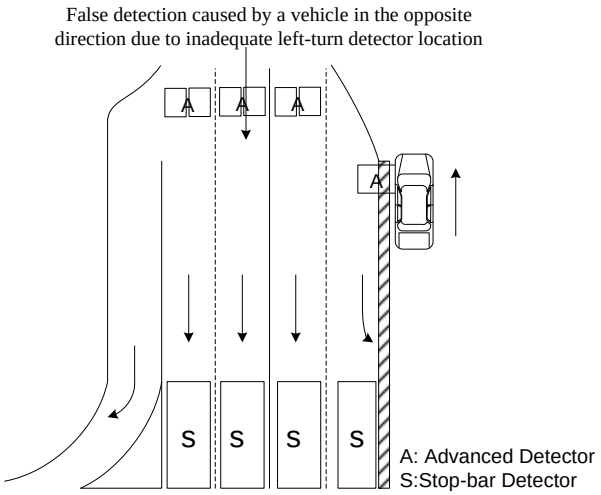

Figure 3-9 Inadequate Left-turn Detector Location

2) S McCarran Blvd/S Virginia

The intersection of S McCarran Blvd/S Virginia is shown in Figure 3-10. Its lane and detector configuration are shown in Figure 3-11.The cameras were mounted on the luminaire arms or signal mast arms facing the traffic approaching the intersection. All the intersection approaches had stop-bar detectors. No high buildings or trees exist near the intersection.

Figure 3-10 Picture of S McCarran Blvd /S Virginia Intersection

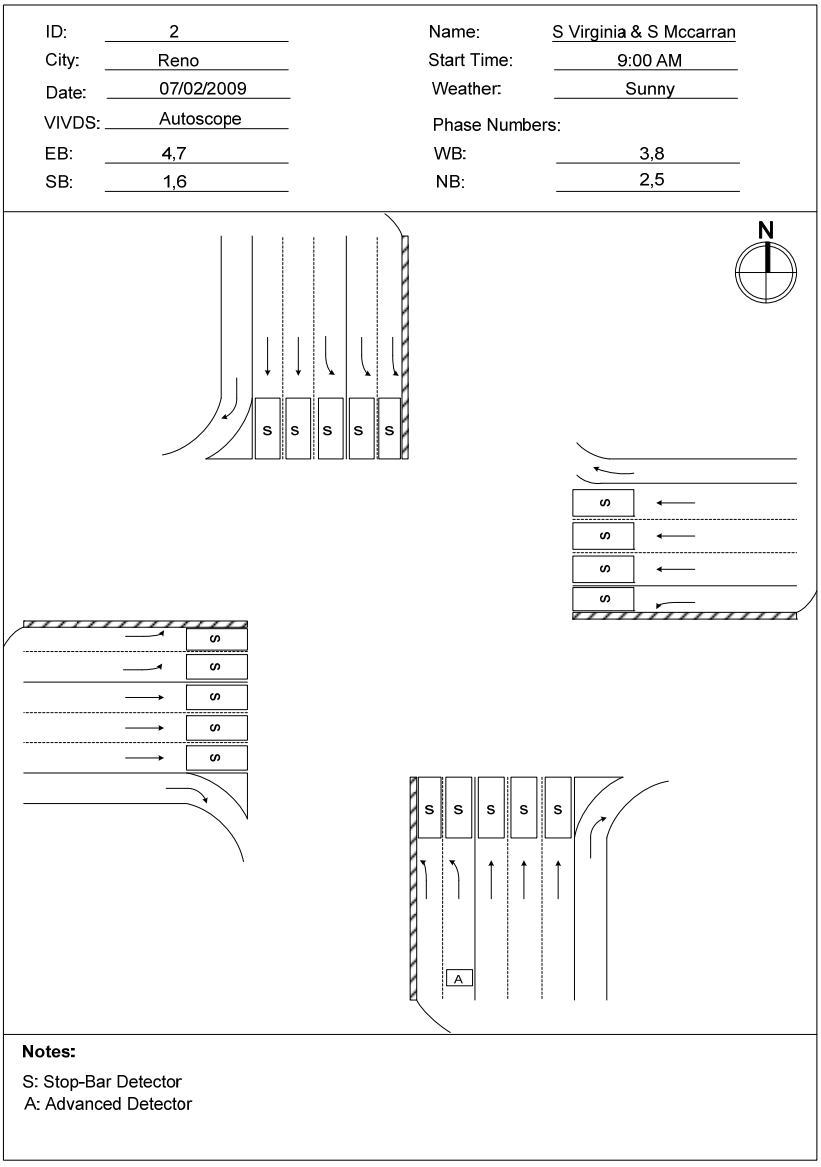

Figure 3-11 Configuration of S McCarran Blvd/S Virginia Intersection

- Results

For this intersection, all the approaches (except for the NB) had only stop-bar detectors. The one left-turn lane at the NB approach had both an advanced detector and a stop-bar detector. Tables 3-7 to Table 3-9 include the summary data for false and missed detections at this intersection, while the tables in Appendix A (Table 0-11A to Table 0-22A) include the detailed results.

Table 3-7 Autoscope Performance for Through Movement Lanes at S McCarran Blvd/S Virginia Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	189	11	0	0	0	0	1	0	0	1	13	40.6%	**6.4%**
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	211	0	0	1	0	0	0	0	0	0	1	3.1%	0.5%
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	217	1	1	0	2	0	0	0	0	0	4	12.5%	1.8%
Day Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	617	12	1	1	2	0	1	0	0	1	18	56.3%	2.8%
Day Time Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	0.0%		
	Stop Bar Detector	97.2%	**1.9%**	0.2%	0.2%	0.3%	0.0%	0.2%	0.0%	0.0%	0.2%	2.8%		
Day Time Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**97.2%**	**2.7%**						0.2%			2.8%		
Night Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	282	1	0	0	12	0	1	0	0	0	14	**43.8%**	4.7%
Night Time Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	0.0%		
	Stop Bar Detector	95.3%	**0.3%**	0.0%	0.0%	**4.1%**	0.0%	0.3%	0.0%	0.0%	0.0%	4.7%		
Night Time Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**95.3%**	**4.7%**						0.0%			4.7%		
All Day	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	899	13	1	1	14	0	2	0	0	1	32	100.0%	3.4%
All Day Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-		
	Stop Bar Detector	96.6%	**1.4%**	0.1%	0.1%	**1.5%**	0.0%	0.2%	0.0%	0.0%	0.1%	3.4%		
All Day Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**96.6%**	**3.3%**						**0.1%**			3.4%		

Table 3-8 Autoscope Performance for Left-Turn Lanes at S McCarran Blvd/S Virginia Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	1	2	0	0	0	0	0	0	0	0	2	5.0%	**66.7%**
	Stop Bar Detector	152	31	0	0	0	0	3	0	0	0	34	**61.8%**	**18.3%**
MD	Advanced Detector	63	5	0	0	0	0	4	0	0	0	9	22.5%	12.5%
	Stop Bar Detector	187	7	0	0	0	0	0	0	0	0	7	12.7%	3.6%
PM	Advanced Detector	38	28	0	0	0	0	1	0	0	0	29	**72.5%**	43.3%
	Stop Bar Detector	196	6	0	0	0	0	0	0	0	0	6	10.9%	3.0%
Day Time	Advanced Detector	102	35	0	0	0	0	5	0	0	0	40	100.0%	28.2%
	Stop Bar Detector	535	44	0	0	0	0	3	0	0	0	47	85.5%	8.1%
Day Time Percentage	Advanced Detector	71.8%	**24.6%**	0.0%	0.0%	0.0%	0.0%	**3.5%**	0.0%	0.0%	0.0%	28.2%		
	Stop Bar Detector	91.9%	**7.6%**	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	8.1%		
Day Time Sum Percentage	Advanced Detector	**71.8%**	**28.2%**						0.0%			28.2%		
	Stop Bar Detector	**91.9%**	**8.1%**						0.0%			8.1%		
Night Time	Advanced Detector	10	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
	Stop Bar Detector	203	8	0	0	0	0	0	0	0	0	8	**14.5%**	3.8%
Night Time Percentage	Advanced Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Stop Bar Detector	96.2%	**3.8%**	0.0%	0.0%	**0.0%**	0.0%	0.0%	0.0%	0.0%	0.0%	3.8%		
Night Time Sum Percentage	Advanced Detector	**100.0%**	0.0%						0.0%			0.0%		
	Stop Bar Detector	**96.2%**	**3.8%**						0.0%			3.8%		
All Day	Advanced Detector	112	35	0	0	0	0	5	0	0	0	40	100.0%	26.3%
	Stop Bar Detector	738	52	0	0	0	0	3	0	0	0	55	100.0%	6.9%
All Day Percentage	Advanced Detector	73.7%	**23.0%**	0.0%	0.0%	0.0%	0.0%	3.3%	0.0%	0.0%	0.0%	26.3%		
	Stop Bar Detector	93.1%	**6.6%**	0.0%	0.0%	**0.0%**	0.0%	0.4%	0.0%	0.0%	0.0%	6.9%		
All Day Sum Percentage	Advanced Detector	**73.7%**	**26.3%**						0.0%			26.3%		
	Stop Bar Detector	**93.1%**	**6.9%**						**0.0%**			6.9%		

Table 3-9 Autoscope Performance for All Lanes at S McCarran Blvd/S Virginia Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	1	2	0	0	0	0	0	0	0	0	2	5.0%	**66.7%**
	Stop Bar Detector	341	42	0	0	0	0	4	0	0	1	47	**54.0%**	**12.1%**
MD	Advanced Detector	63	5	0	0	0	0	4	0	0	0	9	22.5%	12.5%
	Stop Bar Detector	398	7	0	1	0	0	0	0	0	0	8	9.2%	2.0%
PM	Advanced Detector	38	28	0	0	0	0	1	0	0	0	29	**72.5%**	43.3%
	Stop Bar Detector	413	7	1	0	2	0	0	0	0	0	10	11.5%	2.4%
Day Time	Advanced Detector	102	35	0	0	0	0	5	0	0	0	40	100.0%	28.2%
	Stop Bar Detector	1152	56	1	1	2	0	4	0	0	1	65	74.7%	5.3%
Day Time Percentage	Advanced Detector	71.8%	**24.6%**	0.0%	0.0%	0.0%	0.0%	3.5%	0.0%	0.0%	0.0%	28.2%		
	Stop Bar Detector	94.7%	**4.6%**	0.1%	0.1%	0.2%	0.0%	0.3%	0.0%	0.0%	0.1%	5.3%		
Day Time Sum Percentage	Advanced Detector	**71.8%**	**28.2%**						0.0%			28.2%		
	Stop Bar Detector	**94.7%**	**5.3%**						0.1%			5.3%		
Night Time	Advanced Detector	10	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
	Stop Bar Detector	485	9	0	0	12	0	1	0	0	0	22	25.3%	4.3%
Night Time Percentage	Advanced Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Stop Bar Detector	95.7%	**1.8%**	0.0%	0.0%	**2.4%**	0.0%	0.2%	0.0%	0.0%	0.0%	4.3%		
Night Time Sum Percentage	Advanced Detector	**100.0%**	0.0%						0.0%			0.0%		
	Stop Bar Detector	**95.7%**	**4.3%**						0.0%			4.3%		
All Day	Advanced Detector	112	35	0	0	0	0	5	0	0	0	40	100.0%	26.3%
	Stop Bar Detector	1637	65	1	1	14	0	5	0	0	1	87	100.0%	5.0%
All Day Percentage	Advanced Detector	73.7%	**23.0%**	0.0%	0.0%	0.0%	0.0%	**3.3%**	0.0%	0.0%	0.0%	26.3%		
	Stop Bar Detector	95.0%	**3.8%**	0.1%	0.1%	**0.8%**	0.0%	0.3%	0.0%	0.0%	0.1%	5.0%		
All Day Sum Percentage	Advanced Detector	**73.7%**	**26.3%**						0.0%			26.3%		
	Stop Bar Detector	**95.0%**	**5.0%**						**0.1%**			5.0%		

From Table 3-7, the overall correct detections of through-lane stop-bar detectors was 96.6%. The correct detections during daytime and nighttime were 97.2% and 95.3%, respectively. False detections were the dominant erroneous detection type compared to missed detections. With regard to the influencing factors, “vehicles in adjacent lanes” was the main factor causing false detections of stop-bar detectors in daytime, and “headlights” was the major factor causing false detections of stop-bar detectors in nighttime. False detections of stop-bar detectors occurred more often in nighttime (43.8%). The highest relative erroneous detection percentage of stop-bar detectors was 6.4% during the AM peak.

From Table 3-8, the overall correct detections of advanced detectors and stop-bar detectors were 73.7% and 93.1%, respectively. The daytime correct detections were 71.8% and 91.9% and the nighttime correction detections were 100.0% and 96.2%, respectively. Factors of “vehicles in adjacent lanes” and “others” were the two main factors causing false detections both in daytime and nighttime. The highest relative erroneous detection percentages of advanced and stop-bar detectors were 66.7% in PM and 18.3% in AM, respectively.

From Table 3-9, the overall correct detections of advanced detectors and stop-bar detectors were 73.7% and 95.0%, respectively. The daytime results were 71.8% and 94.7% and the nighttime results were 100.0% and 95.7%, respectively. False detections were the dominant erroneous detection type. “Vehicles in adjacent lanes” was the main factor causing false detection in daytime and “headlights” was the major factor in nighttime. The highest relative erroneous detection percentage of advanced and stop-bar detectors were 66.7% in nighttime and 12.1% in PM, respectively

- Problems

For this intersection, most detection errors occurred at the EB, WB, and NB

approaches. “Headlights” caused 5.1% false detections and “vehicles in adjacent lanes” caused 6.1% false detections in through lane 3 shown in Table 0-12A. The total correct detection of stop-bar detectors was 87.8%. For the WB approach (Table 0-16A), “vehicles in adjacent lanes” led to 13.2% false detections in left-turn lane 1. The overall correct detection of stop-bar detectors was 86.8%. Table 0-22A shows that “vehicles in adjacent lanes” generated 23.0% and 14.9% false detections of advanced detectors and stop-bar detectors, respectively.

- Recommendations

The problems observed at this intersection were similar to that at the S McCarran Blvd/Kietzke Ln intersection; therefore, the recommendations should be similar for further mitigating the problems.

3) McCarran Blvd/Mayberry

The intersection of McCarran Blvd/Mayberry is shown in Figure 3-12. Its lane and detector configuration are shown in Figure 3-13. The cameras were mounted on the luminaire arms or signal mast arms facing the traffic approaching the intersection. No high buildings or trees exist near the intersection.

Figure 3-12 Picture of McCarran Blvd/Mayberry Intersection

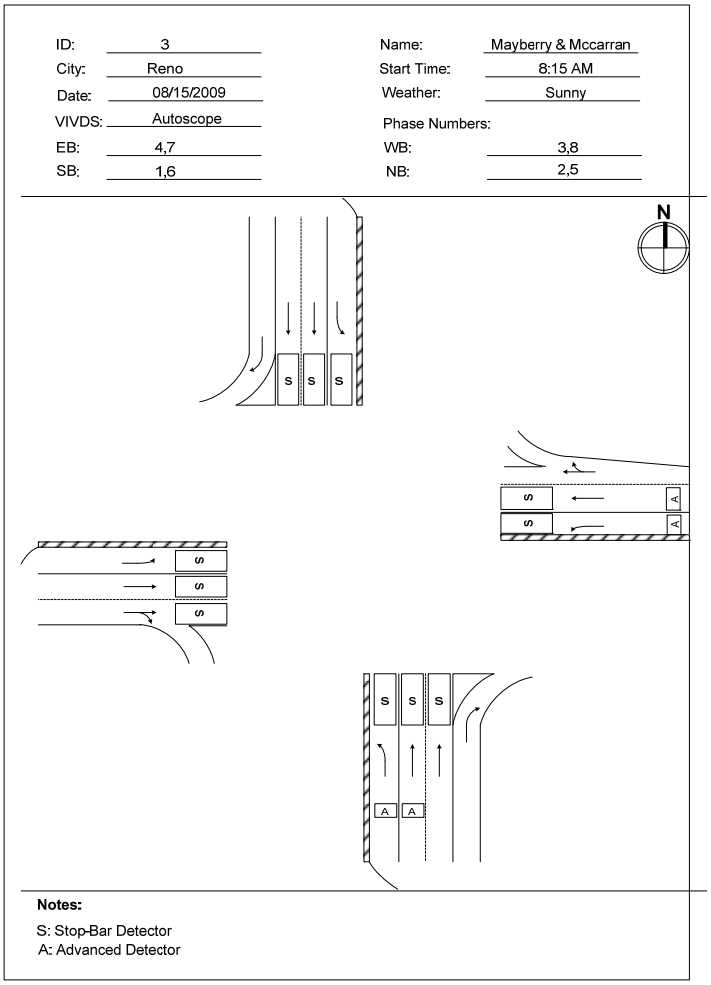

Figure 3-13 Configuration of McCarran Blvd/Mayberry Intersection

- Results

At this intersection, the SB and WB approaches had only stop-bar detectors while the NB and WB approaches had both advanced detectors and stop-bar detectors. Table 3-10 to Table 3-12 include the summary data for false and missed detections at this intersection, while the tables in Appendix A (Table 0-23A to Table 0-30A) include the detailed results.

Table 3-10 Autoscope Performance for Through Movement Lanes at McCarran Blvd/Mayberry Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	201	4	0	0	0	0	2	0	0	0	6	6.7%	2.9%
	Stop Bar Detector	278	0	0	0	2	0	4	0	0	0	6	16.7%	2.1%
MD	Advanced Detector	280	22	0	0	0	0	0	0	0	2	24	26.7%	7.9%
	Stop Bar Detector	270	4	0	0	0	0	1	0	0	0	5	13.9%	1.8%
PM	Advanced Detector	401	20	0	0	0	0	2	0	0	0	22	24.4%	5.2%
	Stop Bar Detector	243	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
Day Time	Advanced Detector	882	46	0	0	0	0	4	0	0	2	52	57.8%	5.6%
	Stop Bar Detector	791	4	0	0	2	0	5	0	0	0	11	30.6%	1.4%
Day Time Percentage	Advanced Detector	94.4%	**4.9%**	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.2%	5.6%		
	Stop Bar Detector	98.6%	0.5%	0.0%	0.0%	0.2%	0.0%	0.6%	0.0%	0.0%	0.0%	1.4%		
Day Time Sum Percentage	Advanced Detector	**94.4%**	**5.4%**						0.2%			5.6%		
	Stop Bar Detector	**98.6%**	1.4%						0.0%			1.4%		
Night Time	Advanced Detector	206	5	0	0	33	0	0	0	0	0	38	**42.2%**	**15.6%**
	Stop Bar Detector	250	0	0	0	25	0	0	0	0	0	25	**69.4%**	**9.1%**
Night Time Percentage	Advanced Detector	84.4%	2.0%	0.0%	0.0%	**13.5%**	0.0%	0.0%	0.0%	0.0%	0.0%	15.6%		
	Stop Bar Detector	90.9%	0.0%	0.0%	0.0%	**9.1%**	0.0%	0.0%	0.0%	0.0%	0.0%	9.1%		
Night Time Sum Percentage	Advanced Detector	**84.4%**	**15.6%**						0.0%			15.6%		
	Stop Bar Detector	**90.9%**	**9.1%**						0.0%			9.1%		
All Day	Advanced Detector	1088	51	0	0	33	0	4	0	0	2	90	100.0%	7.6%
	Stop Bar Detector	1041	4	0	0	27	0	5	0	0	0	36	100.0%	3.3%
All Day Percentage	Advanced Detector	92.4%	**4.3%**	0.0%	0.0%	**2.8%**	0.0%	0.3%	0.0%	0.0%	0.2%	7.6%		
	Stop Bar Detector	96.7%	0.4%	0.0%	0.0%	**2.5%**	0.0%	0.5%	0.0%	0.0%	0.0%	3.3%		
All Day Sum Percentage	Advanced Detector	**92.4%**	**7.5%**						0.2%			7.6%		
	Stop Bar Detector	**96.7%**	**3.3%**						0.0%			3.3%		

Table 3-11 Autoscope Performance for Left-Turn Lanes at McCarran Blvd/Mayberry Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	73	0	0	0	0	0	0	0	1	0	1	16.7%	1.4%
	Stop Bar Detector	237	20	7	0	2	0	4	0	0	1	34	**64.2%**	**12.5%**
MD	Advanced Detector	102	0	0	0	0	0	0	0	1	0	1	16.7%	1.0%
	Stop Bar Detector	274	1	0	0	0	0	0	0	0	0	1	1.9%	0.4%
PM	Advanced Detector	110	0	0	0	0	0	3	0	0	0	3	**50.0%**	2.7%
	Stop Bar Detector	245	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
Day Time	Advanced Detector	285	0	0	0	0	0	3	0	2	0	5	83.3%	1.7%
	Stop Bar Detector	756	21	7	0	2	0	4	0	0	1	35	66.0%	4.4%
Day Time Percentage	Advanced Detector	98.3%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	0.7%	0.0%	1.7%		
	Stop Bar Detector	95.6%	**2.7%**	0.9%	0.0%	0.3%	0.0%	0.5%	0.0%	0.0%	0.1%	4.4%		
Day Time Sum Percentage	Advanced Detector	**98.3%**	1.0%						0.7%			1.7%		
	Stop Bar Detector	**95.6%**	**4.3%**						0.1%			4.4%		
Night Time	Advanced Detector	23	0	0	0	1	0	0	0	0	0	1	16.7%	**4.2%**
	Stop Bar Detector	163	1	0	0	13	0	4	0	0	0	18	34.0%	9.9%
Night Time Percentage	Advanced Detector	95.8%	0.0%	0.0%	0.0%	**4.2%**	0.0%	0.0%	0.0%	0.0%	0.0%	4.2%		
	Stop Bar Detector	90.1%	0.6%	0.0%	0.0%	**7.2%**	0.0%	2.2%	0.0%	0.0%	0.0%	9.9%		
Night Time Sum Percentage	Advanced Detector	**95.8%**	**4.2%**						0.0%			4.2%		
	Stop Bar Detector	**90.1%**	**9.9%**						0.0%			9.9%		
All Day	Advanced Detector	308	0	0	0	1	0	3	0	2	0	6	100.0%	1.9%
	Stop Bar Detector	919	22	7	0	15	0	8	0	0	1	53	100.0%	5.5%
All Day Percentage	Advanced Detector	98.1%	0.0%	0.0%	0.0%	0.3%	0.0%	1.0%	0.0%	0.6%	0.0%	1.9%		
	Stop Bar Detector	94.5%	**2.3%**	0.7%	0.0%	**1.5%**	0.0%	0.8%	0.0%	0.0%	0.1%	5.5%		
All Day Sum Percentage	Advanced Detector	**98.1%**	1.3%						0.6%			1.9%		
	Stop Bar Detector	**94.5%**	**5.3%**						0.1%			5.5%		

Table 3-12 Autoscope Performance for All Lanes at McCarran Blvd/Mayberry Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	274	4	0	0	0	0	2	0	1	0	7	7.3%	2.5%
	Stop Bar Detector	515	20	7	0	4	0	8	0	0	1	40	44.9%	7.2%
MD	Advanced Detector	382	22	0	0	0	0	0	0	1	2	25	26.0%	6.1%
	Stop Bar Detector	544	5	0	0	0	0	1	0	0	0	6	6.7%	1.1%
PM	Advanced Detector	511	20	0	0	0	0	5	0	0	0	25	26.0%	4.7%
	Stop Bar Detector	488	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
Day Time	Advanced Detector	1167	46	0	0	0	0	7	0	2	2	57	59.4%	4.7%
	Stop Bar Detector	1547	25	7	0	4	0	9	0	0	1	46	51.7%	2.9%
Day Time Percentage	Advanced Detector	95.3%	**3.8%**	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.2%	0.2%	4.7%		
	Stop Bar Detector	97.1%	**1.6%**	0.4%	0.0%	0.3%	0.0%	0.6%	0.0%	0.0%	0.1%	2.9%		
Day Time Sum Percentage	Advanced Detector	**95.3%**	**4.3%**						0.3%			4.7%		
	Stop Bar Detector	**97.1%**	**2.8%**						0.1%			2.9%		
Night Time	Advanced Detector	229	5	0	0	34	0	0	0	0	0	39	**40.6%**	**14.6%**
	Stop Bar Detector	413	1	0	0	38	0	4	0	0	0	43	**48.3%**	**9.4%**
Night Time Percentage	Advanced Detector	85.4%	1.9%	0.0%	0.0%	**12.7%**	0.0%	0.0%	0.0%	0.0%	0.0%	14.6%		
	Stop Bar Detector	90.6%	0.2%	0.0%	0.0%	**8.3%**	0.0%	0.9%	0.0%	0.0%	0.0%	9.4%		
Night Time Sum Percentage	Advanced Detector	**85.4%**	**14.6%**						0.0%			14.6%		
	Stop Bar Detector	**90.6%**	**9.4%**						0.0%			9.4%		
All Day	Advanced Detector	1396	51	0	0	34	0	7	0	2	2	96	100.0%	6.4%
	Stop Bar Detector	1960	26	7	0	42	0	13	0	0	1	89	100.0%	4.3%
All Day Percentage	Advanced Detector	93.6%	**3.4%**	0.0%	0.0%	**2.3%**	0.0%	0.5%	0.0%	0.1%	0.1%	6.4%		
	Stop Bar Detector	95.7%	**1.3%**	0.3%	0.0%	**2.0%**	0.0%	0.6%	0.0%	0.0%	0.0%	4.3%		
All Day Sum Percentage	Advanced Detector	**93.6%**	**6.2%**						0.3%			6.4%		
	Stop Bar Detector	**95.7%**	**4.3%**						0.0%			4.3%		

Table 3-10 shows that the through lane detectors encountered problems mostly in nighttime, contributing 42.2% and 69.4% to the total errors by the advanced detectors and stop-bar detectors, respectively. The relative percentages also showed the highest errors for nighttime conditions. Table 3-11 shows that the left-turn detectors encountered most problems during AM, PM, and nighttime periods. Table 3-12 shows that the overall correct detections were 93.6% and 95.7% for the two types of detectors, respectively. Nighttime showed lower accuracy than daytime (85.4% and 90.6% in nighttime vs. 95.3% and 97.1% in daytime). False detections were the dominant erroneous type. "Vehicles in adjacent lanes" was the main factor causing false detection in daytime and "headlights" was the major factor in nighttime.

- Problems

All approaches were found to experience some problems with the advanced detectors and stop-bar detectors. For the EB approach, "vehicles in adjacent lanes" led to 25.7% false detection in through lane 1. The correct detection in this lane was only 71.4%. For the WB approach, "headlights" caused 11.1% false detection and "vehicles in adjacent lanes" caused 7.4% false detection. Other reasons caused 5.6% false detection, primarily due to the sunlight in the morning. The total correct detection of stop-bar detectors was 75.9%.

- Recommendations

The problems encountered at this intersection were similar to the previously discussed sites, so the same general recommendations apply. However, one particular recommendation would be relocating the advanced detectors to avoid false detection in through lane 2 at the WB approach. The current detector location in this lane often resulted in false detections by vehicles turning right in through lane 2 (See Figure 3-14).

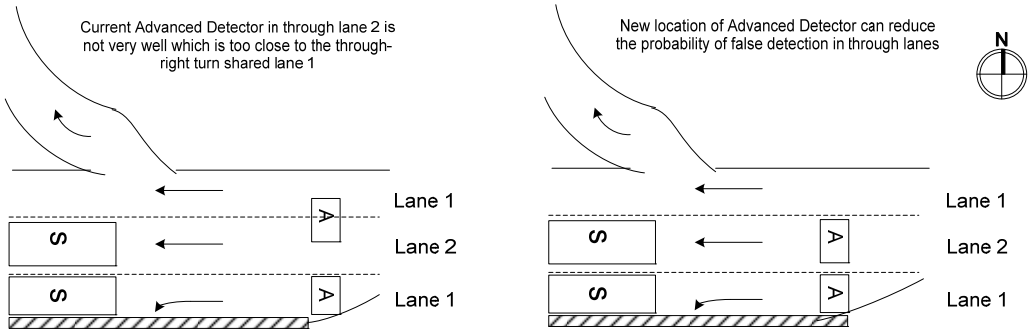

Figure 3-14 Problem of Advanced Detector and Recommended New Location

4) E Serene Ave/Maryland Pkwy

The intersection of E Serene Ave/Maryland Pkwy is shown in Figure 3-15. Its lane and detector configuration is shown in Figure 3-16. All cameras were mounted on signal mast arms. No high buildings or trees exist near the intersection.

Figure 3-15 Picture of E Serene Ave/Maryland Pkwy

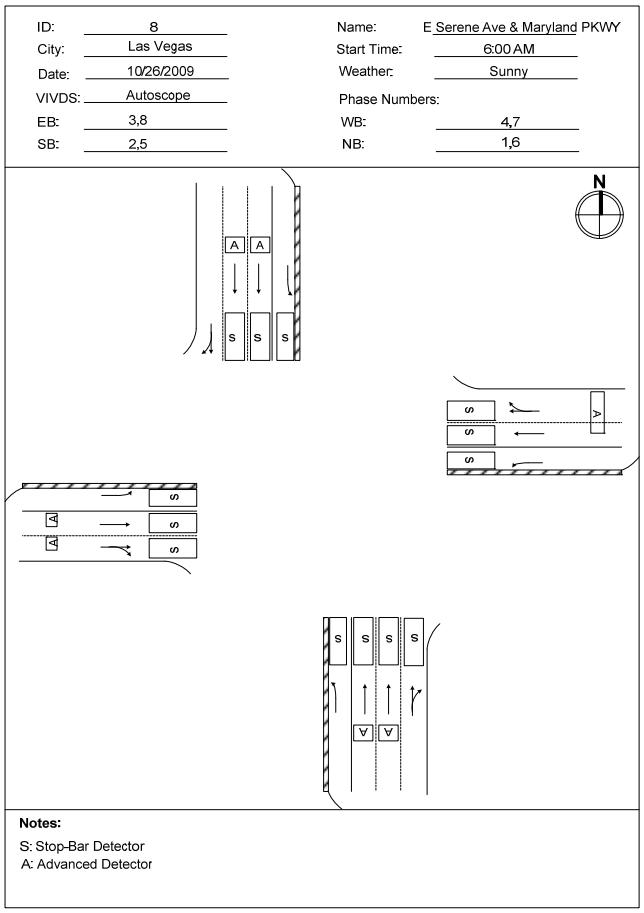

Figure 3-16 Lane and Detection Configuration at E Serene Ave/Maryland Pkwy Intersection

- Results

Table 3-13 to Table 3-15 include the summary data for false and missed detections at this intersection, while the tables in Appendix A (Table 0-31A to Table 0-40A) include the detailed results.

Table 3-13 Autoscope Performance for Through Movement Lanes at E Serene Ave/Maryland Pkwy Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	462	0	0	0	4	0	67	0	0	15	86	16.1%	**15.7%**
	Stop Bar Detector	264	0	0	0	0	0	3	0	0	0	3	23.1%	1.1%
MD	Advanced Detector	601	0	0	0	0	121	56	0	0	9	186	34.8%	**23.6%**
	Stop Bar Detector	359	0	0	2	0	0	0	0	0	2	4	**30.8%**	1.1%
PM	Advanced Detector	744	1	0	0	0	161	39	0	0	19	220	**41.2%**	22.8%
	Stop Bar Detector	265	0	0	0	0	0	0	0	0	2	2	15.4%	0.7%
Day Time	Advanced Detector	1807	1	0	0	4	282	162	0	0	43	492	92.1%	21.4%
	Stop Bar Detector	888	0	0	2	0	0	3	0	0	4	9	69.2%	1.0%
Day Time Percentage	Advanced Detector	78.6%	0.0%	0.0%	0.0%	0.2%	**12.3%**	7.0%	0.0%	0.0%	1.9%	21.4%		
	Stop Bar Detector	99.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.3%	0.0%	0.0%	0.4%	1.0%		
Day Time Sum Percentage	Advanced Detector	**78.6%**	**19.5%**						1.9%			21.4%		
	Stop Bar Detector	**99.0%**	0.6%						0.4%			1.0%		
Night Time	Advanced Detector	376	0	0	0	1	3	22	0	1	15	42	7.9%	10.0%
	Stop Bar Detector	285	0	0	0	2	0	2	0	0	0	4	**30.8%**	1.4%
Night Time Percentage	Advanced Detector	90.0%	0.0%	0.0%	0.0%	0.2%	0.7%	**5.3%**	0.0%	0.2%	3.6%	10.0%		
	Stop Bar Detector	98.6%	0.0%	0.0%	0.0%	0.7%	0.0%	0.7%	0.0%	0.0%	0.0%	1.4%		
Night Time Sum Percentage	Advanced Detector	**90.0%**	**6.2%**						3.8%			10.0%		
	Stop Bar Detector	**98.6%**	1.4%						0.0%			1.4%		
All Day	Advanced Detector	2183	1	0	0	5	285	184	0	1	58	534	100.0%	19.7%
	Stop Bar Detector	1173	0	0	2	2	0	5	0	0	4	13	100.0%	1.1%
All Day Percentage	Advanced Detector	80.3%	0.0%	0.0%	0.0%	0.2%	**10.5%**	**6.8%**	0.0%	0.0%	2.1%	19.7%		
	Stop Bar Detector	98.9%	0.0%	0.0%	0.2%	0.2%	0.0%	0.4%	0.0%	0.0%	0.3%	1.1%		
All Day Sum Percentage	Advanced Detector	**80.3%**	**17.5%**						2.2%			19.7%		
	Stop Bar Detector	**98.9%**	0.8%						0.3%			1.1%		

Table 3-14 Autoscope Performance for Left-Turn Lanes at E Serene Ave/Maryland Pkwy Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	1	0	0	0	0	0	0	0	0	1	1	**50.0%**	**50.0%**
	Stop Bar Detector	154	2	0	0	1	2	0	0	0	1	6	26.1%	3.8%
MD	Advanced Detector	8	0	0	0	0	0	1	0	0	0	1	**50.0%**	11.1%
	Stop Bar Detector	183	1	0	0	0	0	0	0	0	0	1	4.3%	0.5%
PM	Advanced Detector	2	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
	Stop Bar Detector	166	0	0	0	0	0	0	0	0	3	3	13.0%	1.8%
Day Time	Advanced Detector	11	0	0	0	0	0	1	0	0	1	2	100.0%	15.4%
	Stop Bar Detector	503	3	0	0	1	2	0	0	0	4	10	43.5%	1.9%
Day Time Percentage	Advanced Detector	84.6%	0.0%	0.0%	0.0%	0.0%	0.0%	**7.7%**	0.0%	0.0%	**7.7%**	15.4%		
	Stop Bar Detector	98.1%	0.6%	0.0%	0.0%	0.2%	0.4%	0.0%	0.0%	0.0%	0.8%	1.9%		
Day Time Sum Percentage	Advanced Detector	**84.6%**	**7.7%**						**7.7%**			15.4%		
	Stop Bar Detector	**98.1%**	1.2%						0.8%			1.9%		
Night Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0.0%	-
	Stop Bar Detector	111	0	0	0	11	0	0	0	2	0	13	**56.5%**	**10.5%**
Night Time Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	0.0%		
	Stop Bar Detector	89.5%	0.0%	0.0%	0.0%	**8.9%**	0.0%	0.0%	0.0%	1.6%	0.0%	10.5%		
Night Time Sum Percentage	Advanced Detector	-	0.0%						0.0%			0.0%		
	Stop Bar Detector	**89.5%**	**8.9%**						1.6%			10.5%		
All Day	Advanced Detector	11	0	0	0	0	0	1	0	0	1	2	100.0%	15.4%
	Stop Bar Detector	614	3	0	0	12	2	0	0	2	4	23	100.0%	3.6%
All Day Percentage	Advanced Detector	84.6%	0.0%	0.0%	0.0%	0.0%	0.0%	**7.7%**	0.0%	0.0%	**7.7%**	15.4%		
	Stop Bar Detector	96.4%	0.5%	0.0%	0.0%	**1.9%**	0.3%	0.0%	0.0%	0.3%	0.6%	3.6%		
All Day Sum Percentage	Advanced Detector	**84.6%**	**7.7%**						**7.7%**			15.4%		
	Stop Bar Detector	**96.4%**	**2.7%**						0.9%			3.6%		

Table 3-15 Autoscope Performance for All Lanes at E Serene Ave/Maryland Pkwy Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	463	0	0	0	4	0	67	0	0	16	87	16.2%	15.8%
	Stop Bar Detector	418	2	0	0	1	2	3	0	0	1	9	25.0%	2.1%
MD	Advanced Detector	609	0	0	0	0	121	57	0	0	9	187	**34.9%**	**23.5%**
	Stop Bar Detector	542	1	0	2	0	0	0	0	0	2	5	13.9%	0.9%
PM	Advanced Detector	746	1	0	0	0	161	39	0	0	19	220	41.0%	22.8%
	Stop Bar Detector	431	0	0	0	0	0	0	0	0	5	5	13.9%	1.1%
Day Time	Advanced Detector	1818	1	0	0	4	282	163	0	0	44	494	92.2%	21.4%
	Stop Bar Detector	1391	3	0	2	1	2	3	0	0	8	19	52.8%	1.3%
Day Time Percentage	Advanced Detector	78.6%	0.0%	0.0%	0.0%	0.2%	**12.2%**	**7.1%**	0.0%	0.0%	1.9%	21.4%		
	Stop Bar Detector	98.7%	0.2%	0.0%	0.1%	0.1%	0.1%	0.2%	0.0%	0.0%	0.6%	1.3%		
Day Time Sum Percentage	Advanced Detector	**78.6%**	**19.5%**						1.9%			21.4%		
	Stop Bar Detector	**98.7%**	0.8%						0.6%			1.3%		
Night Time	Advanced Detector	376	0	0	0	1	3	22	0	1	15	42	7.8%	10.0%
	Stop Bar Detector	396	0	0	0	13	0	2	0	2	0	17	**47.2%**	**4.1%**
Night Time Percentage	Advanced Detector	90.0%	0.0%	0.0%	0.0%	0.2%	0.7%	**5.3%**	0.0%	0.2%	3.6%	10.0%		
	Stop Bar Detector	95.9%	0.0%	0.0%	0.0%	**3.1%**	0.0%	0.5%	0.0%	0.5%	0.0%	4.1%		
Night Time Sum Percentage	Advanced Detector	**90.0%**	**6.2%**						3.8%			10.0%		
	Stop Bar Detector	**95.9%**	**3.6%**						0.5%			4.1%		
All Day	Advanced Detector	2194	1	0	0	5	285	185	0	1	59	536	100.0%	19.6%
	Stop Bar Detector	1787	3	0	2	14	2	5	0	2	8	36	100.0%	2.0%
All Day Percentage	Advanced Detector	80.4%	0.0%	0.0%	0.0%	0.2%	**10.4%**	**6.8%**	0.0%	0.0%	2.2%	19.6%		
	Stop Bar Detector	98.0%	0.2%	0.0%	0.1%	0.8%	0.1%	0.3%	0.0%	0.1%	0.4%	2.0%		
All Day Sum Percentage	Advanced Detector	**80.4%**	**17.4%**						2.2%			19.6%		
	Stop Bar Detector	**98.0%**	1.4%						0.5%			2.0%		

Table 3-13 to Table 3-15 show similar results to previously discussed intersections. The overall correct detections of advanced detectors and stop-bar detectors were 80.4% and 98.0%, respectively. Nighttime at this intersection appeared to be less problematic (accuracy of 90.0% and 95.9% in nighttime vs. 78.6% and 98.7% in daytime). “Wind” and “others” were the main factors causing false detections in daytime and “headlights” was the major factor in nighttime. The highest relative untrue detection percentages of advanced and stop-bar detectors were 23.5% in MD and 4.1% in nighttime, respectively.

- Problems

For the EB approach, “others” led to 13.2% false detection of advanced detectors and 4.2% false detection of stop-bar detectors in through lane 1. “Others” mainly referred to a situation where the advanced detector was too small and not in the center of the lane. For the same approach, the correct detection of the advanced detector in through lane 2 was only 67.1%. Three major factors were found to contribute to such poor performance: wind, left-turn lane too short, and advanced detector too small. Wind caused 13.7% false detections. The short left-turn lane often resulted in false activation of the advanced detector in through lane 2 by left-turn vehicles (Figure 3-17(b)). For the WB approach, “wind” resulted in 19.0% false detections. An obvious problem was that the advanced detector was too large and it was located partially in through lane 1 and lane 2. For the SB approach, “wind” caused 15.9% false detection for the advanced detectors. The very short left turn lane also appeared to be problematic with 17.1% false detections.

- Recommendations

Besides the common problems and recommendations associated with “vehicles in adjacent lanes” and “headlights”, one specific recommendation is to relocate the EB

advanced detectors to avoid false detections caused by vehicles entering from or turning into the side street (See Figure 3-17).

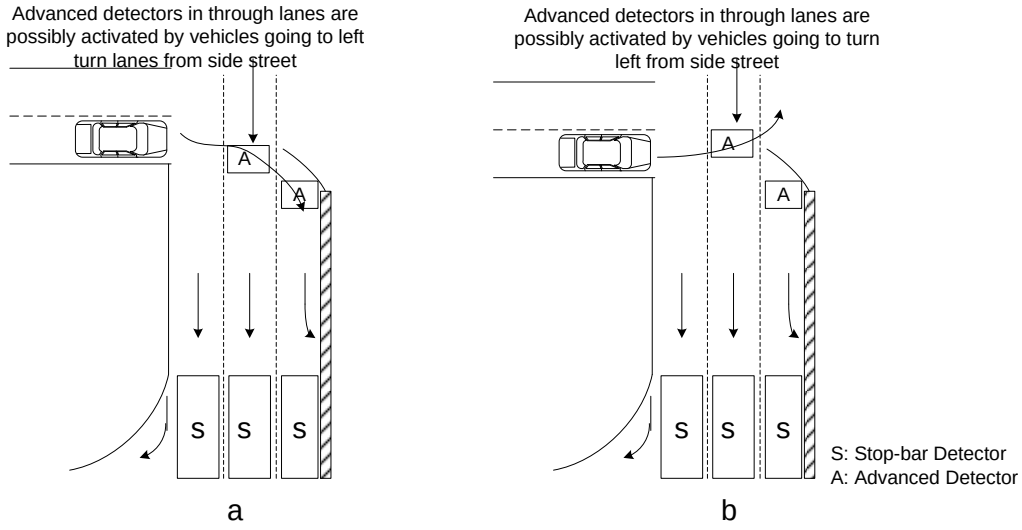

Figure 3-17 Problem Associated with False Detections by the Side Street Vehicles

5) Overall Performance of Autoscope

Table 3-16 to Table 3-18 provide the overall performance of Autoscope for all four intersections. The following major observations can be made based on the results:

- It did not appear that Autoscope exhibited significantly different performance between daytime and nighttime operations. The correct detections during daytime were 89.8% and 97.5% for the advanced detectors and stop-bar detectors, respectively. The numbers for nighttime were 89.3% and 95.5%.
- Stop-bar detectors generally showed more accurate detection than advanced detectors (97.0% vs. 89.7%).
- The daytime peak periods generally contributed the highest number of untrue detections. For example, the PM peak contributed 51.2% of all the erroneous detections with advanced detectors.

Table 3-16 Autoscope Performance for Through Lanes at all Four Intersections

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	1184	6	0	1	4	0	69	0	0	15	95	13.3%	8.0%
	Stop Bar Detector	927	11	0	0	2	0	8	0	0	2	23	26.7%	2.5%
MD	Advanced Detector	2185	25	0	2	0	121	56	0	0	11	215	30.2%	9.8%
	Stop Bar Detector	1053	4	0	3	0	0	1	0	0	3	11	12.8%	1.0%
PM	Advanced Detector	2107	73	0	3	0	161	41	0	0	19	297	**41.7%**	**14.1%**
	Stop Bar Detector	910	3	1	0	2	0	0	0	0	2	8	9.3%	0.9%
Day Time	Advanced Detector	5476	104	0	6	4	282	166	0	0	45	607	85.1%	11.1%
	Stop Bar Detector	2890	18	1	3	4	0	9	0	0	7	42	48.8%	1.5%
Day Time Percentage	Advanced Detector	90.0%	1.7%	0.0%	0.1%	0.1%	**4.6%**	**2.7%**	0.0%	0.0%	0.7%	10.0%		
	Stop Bar Detector	98.6%	0.6%	0.0%	0.1%	0.1%	0.0%	0.3%	0.0%	0.0%	0.2%	1.4%		
Day Time Sum Percentage	Advanced Detector	**90.0%**	**9.2%**						0.7%			10.0%		
	Stop Bar Detector	**98.6%**	1.2%						0.2%			1.4%		
Night Time	Advanced Detector	868	5	0	1	59	3	22	0	1	15	106	14.9%	12.2%
	Stop Bar Detector	1111	1	0	0	40	0	3	0	0	0	44	**51.2%**	**4.0%**
Night Time Percentage	Advanced Detector	89.1%	0.5%	0.0%	0.1%	**6.1%**	0.3%	2.3%	0.0%	0.1%	1.5%	10.9%		
	Stop Bar Detector	96.2%	0.1%	0.0%	0.0%	**3.5%**	0.0%	0.3%	0.0%	0.0%	0.0%	3.8%		
Night Time Sum Percentage	Advanced Detector	**89.1%**	**9.2%**						1.6%			10.9%		
	Stop Bar Detector	**96.2%**	**3.8%**						0.0%			3.8%		
All Day	Advanced Detector	6344	109	0	7	63	285	188	0	1	60	713	100.0%	11.2%
	Stop Bar Detector	4001	19	1	3	44	0	12	0	0	7	86	100.0%	2.1%
All Day Percentage	Advanced Detector	89.9%	1.5%	0.0%	0.1%	0.9%	**4.0%**	**2.7%**	0.0%	0.0%	0.9%	10.1%		
	Stop Bar Detector	97.9%	0.5%	0.0%	0.1%	1.1%	0.0%	0.3%	0.0%	0.0%	0.2%	2.1%		
All Day Sum Percentage	Advanced Detector	**89.9%**	**9.2%**						0.9%			10.1%		
	Stop Bar Detector	**97.9%**	1.9%						0.2%			2.1%		

Table 3-17 Autoscope Performance for Left-Turn Lanes at all Four Intersections

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	150	5	0	1	0	0	0	0	1	1	8	3.2%	5.3%
	Stop Bar Detector	723	56	7	0	3	2	7	0	0	2	77	**56.2%**	**10.7%**
MD	Advanced Detector	967	5	0	1	0	13	8	0	2	0	29	11.6%	3.0%
	Stop Bar Detector	838	9	0	0	0	0	0	0	0	0	9	6.6%	1.1%
PM	Advanced Detector	796	85	0	0	0	106	4	0	1	0	196	**78.7%**	**24.6%**
	Stop Bar Detector	793	6	0	0	0	0	0	0	0	3	9	6.6%	1.1%
Day Time	Advanced Detector	1913	95	0	2	0	119	12	0	4	1	233	93.6%	12.2%
	Stop Bar Detector	2354	71	7	0	3	2	7	0	0	5	95	69.3%	4.0%
Day Time Percentage	Advanced Detector	89.1%	**4.4%**	0.0%	0.1%	0.0%	**5.5%**	0.6%	0.0%	0.2%	0.0%	10.9%		
	Stop Bar Detector	96.1%	**2.9%**	0.3%	0.0%	0.1%	0.1%	0.3%	0.0%	0.0%	0.2%	3.9%		
Day Time Sum Percentage	Advanced Detector	**89.1%**	**10.6%**						0.2%			10.9%		
	Stop Bar Detector	**96.1%**	**3.7%**						0.2%			3.9%		
Night Time	Advanced Detector	146	1	0	1	14	0	0	0	0	0	16	6.4%	11.0%
	Stop Bar Detector	734	9	0	0	26	0	4	0	3	0	42	30.7%	5.7%
Night Time Percentage	Advanced Detector	90.1%	0.6%	0.0%	0.6%	**8.6%**	0.0%	0.0%	0.0%	0.0%	0.0%	9.9%		
	Stop Bar Detector	94.6%	1.2%	0.0%	0.0%	**3.4%**	0.0%	0.5%	0.0%	0.4%	0.0%	5.4%		
Night Time Sum Percentage	Advanced Detector	**90.1%**	**9.9%**						0.0%			9.9%		
	Stop Bar Detector	**94.6%**	**5.0%**						0.4%			5.4%		
All Day	Advanced Detector	2059	96	0	3	14	119	12	0	4	1	249	100.0%	12.1%
	Stop Bar Detector	3088	80	7	0	29	2	11	0	3	5	137	100.0%	4.4%
All Day Percentage	Advanced Detector	89.2%	**4.2%**	0.0%	0.1%	0.6%	**5.2%**	0.5%	0.0%	0.2%	0.0%	10.8%		
	Stop Bar Detector	95.8%	**2.5%**	0.2%	0.0%	0.9%	0.1%	0.3%	0.0%	0.1%	0.2%	4.2%		
All Day Sum Percentage	Advanced Detector	**89.2%**	**10.6%**						0.2%			10.8%		
	Stop Bar Detector	**95.8%**	**4.0%**						0.2%			4.2%		

Table 3-18 Overall Autoscope Performance at all Four Intersections

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	1334	11	0	2	4	0	69	0	1	16	103	10.7%	7.7%
	Stop Bar Detector	1650	67	7	0	5	2	15	0	0	4	100	**44.8%**	**6.1%**
MD	Advanced Detector	3152	30	0	3	0	134	64	0	2	11	244	25.4%	7.7%
	Stop Bar Detector	1891	13	0	3	0	0	1	0	0	3	20	9.0%	1.1%
PM	Advanced Detector	2903	158	0	3	0	267	45	0	1	19	493	**51.2%**	**17.0%**
	Stop Bar Detector	1703	9	1	0	2	0	0	0	0	5	17	7.6%	1.0%
Day Time	Advanced Detector	7389	199	0	8	4	401	178	0	4	46	840	87.3%	11.4%
	Stop Bar Detector	5244	89	8	3	7	2	16	0	0	12	137	61.4%	2.6%
Day Time Percentage	Advanced Detector	89.8%	**2.4%**	0.0%	0.1%	0.0%	**4.9%**	**2.2%**	0.0%	0.0%	0.6%	10.2%		
	Stop Bar Detector	97.5%	1.7%	0.1%	0.1%	0.1%	0.0%	0.3%	0.0%	0.0%	0.2%	2.5%		
Day Time Sum Percentage	Advanced Detector	**89.8%**	**9.6%**						0.6%			10.2%		
	Stop Bar Detector	**97.5%**	2.3%						0.2%			2.5%		
Night Time	Advanced Detector	1014	6	0	2	73	3	22	0	1	15	122	12.7%	12.0%
	Stop Bar Detector	1845	10	0	0	66	0	7	0	3	0	86	38.6%	4.7%
Night Time Percentage	Advanced Detector	89.3%	0.5%	0.0%	0.2%	**6.4%**	0.3%	1.9%	0.0%	0.1%	1.3%	10.7%		
	Stop Bar Detector	95.5%	0.5%	0.0%	0.0%	**3.4%**	0.0%	0.4%	0.0%	0.2%	0.0%	4.5%		
Night Time Sum Percentage	Advanced Detector	**89.3%**	**9.3%**						1.4%			10.7%		
	Stop Bar Detector	**95.5%**	**4.3%**						0.2%			4.5%		
All Day	Advanced Detector	8403	205	0	10	77	404	200	0	5	61	962	100.0%	11.4%
	Stop Bar Detector	7089	99	8	3	73	2	23	0	3	12	223	100.0%	3.1%
All Day Percentage	Advanced Detector	89.7%	**2.2%**	0.0%	0.1%	0.8%	**4.3%**	**2.1%**	0.0%	0.1%	0.7%	10.3%		
	Stop Bar Detector	97.0%	**1.4%**	0.1%	0.0%	1.0%	0.0%	0.3%	0.0%	0.0%	0.2%	3.0%		
All Day Sum Percentage	Advanced Detector	**89.7%**	**9.6%**						0.7%			10.3%		
	Stop Bar Detector	**97.0%**	**2.8%**						0.2%			3.0%		

- False detection was the primary erroneous detection type. For example, among the 10.3% erroneous detections with advanced detectors, 9.6% were false detections, while only 0.7% were missed detections.
- Two leading factors contributing to erroneous detections were "vehicles in adjacent lanes" for daytime and "headlights" for nighttime.

3.2.2. Vantage

Vantage by Iteris Inc. was the primary VIVDS in Nevada, including Clark County in Las Vegas, Carson City, Douglas County, and City of Sparks. Four intersections (two in Carson City and two in Clark County/Las Vegas) were selected for data collection and analysis. Information related to these intersections is shown in Table 3-19. Forty-eight hours of video were continuously recorded for each intersection approach. One-hour of video from each time period was extracted from the videos which were AM peak from 6:30 a.m. to 7:30 a.m., MD peak from 12:00 p.m. to 1:00 p.m., PM peak from 4:30 p.m. to 5:30 p.m., and Night from 9:00 p.m. to 10:00 p.m. The results of each intersection are presented in a similar manner to the Autoscope system.

Table 3-19 Information of Intersections Using Vantage

Intersections	S Sallman Rd/Fairview Dr	N Carson St./Medical Pkwy	S. Dean Martin Dr/W Silverado Ranch Blvd	Koval Lane/ Venetion
Jurisdiction	Carson City	Carson City	Las Vegas	Las Vegas
Starting Date	9-28-2009	9-30-2009	11-03-2009	11-17-2009
Ending Date	9-30-2009	10-02-2009	11-05-2009	11-19-2009
Starting Time	10:40 am	11:10 am	5:51 am	10:33 am
Ending Time	10:40 am	11:10 am	5:51 am	10:33 am
Approaches	2	2	2	3
Weather	Clear	Clear	Clear	Clear

1) S Sallman Rd/Fairview Dr

The intersection of S Sallman Rd/Fairview Dr is shown in Figure 3-18. Its lane and detector configuration are shown in Figure 3-19. The cameras were all mounted on the signal mast arms facing the traffic approaching the intersection. All the intersection approaches only had stop-bar detectors. No high buildings or trees exist near the intersection.

Figure 3-18 Picture of S Sallman Rd/Fairview Dr Intersection

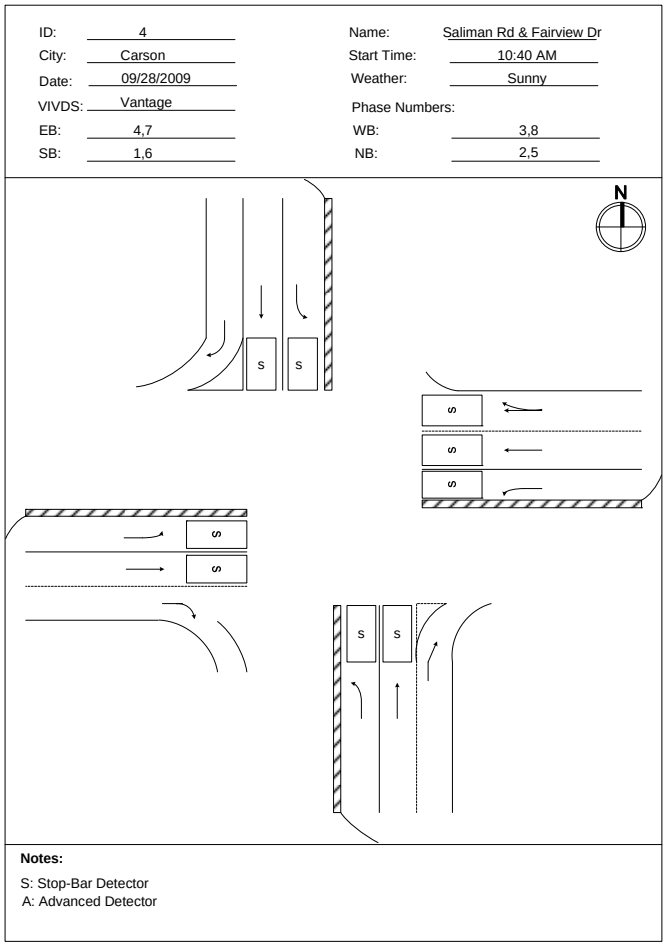

Figure 3-19 Lane and Detection Configuration of S Sallman Rd/Fairview Dr Intersection

- Results

Table 3-20 to Table 3-22 include the summary data for false and missed detections at this intersection, while the tables in Appendix A (Table 0-41A to Table 0-44A) include the detailed results.

Table 3-20 Vantage Performance for Through Movement Lanes at S Sallman Rd/Fairview Dr Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	194	5	0	0	0	0	0	0	0	0	5	12.5%	2.5%
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	205	5	0	1	0	1	0	0	0	0	7	17.5%	3.3%
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	177	1	0	2	2	0	0	0	0	0	5	12.5%	2.7%
Day Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	576	11	0	3	2	1	0	0	0	0	17	42.5%	2.9%
Day Time Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-		
	Stop Bar Detector	97.1%	**1.9%**	0.0%	0.5%	0.3%	0.2%	0.0%	0.0%	0.0%	0.0%	2.9%		
Day Time Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**97.1%**	**2.9%**						0.0%			2.9%		
Night Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	145	6	2	2	12	0	1	0	0	0	23	**57.5%**	**13.7%**
Night Time Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-		
	Stop Bar Detector	86.3%	**3.6%**	1.2%	1.2%	**7.1%**	0.0%	0.6%	0.0%	0.0%	0.0%	13.7%		
Night Time Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**86.3%**	**13.7%**						0.0%			13.7%		
All Day	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	721	17	2	5	14	1	1	0	0	0	40	100.0%	5.3%
All Day Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-		
	Stop Bar Detector	94.7%	**2.2%**	0.3%	0.7%	**1.8%**	0.1%	0.1%	0.0%	0.0%	0.0%	5.3%		
All Day Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**94.7%**	**5.3%**						0.0%			5.3%		

Table 3-21 Vantage Performance for Left-Turn Lanes at S Sallman Rd/Fairview Dr Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	292	6	0	0	0	0	7	0	0	0	13	11.0%	4.3%
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	320	11	0	1	0	8	27	0	0	0	47	**39.8%**	12.8%
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	308	6	0	2	2	0	10	0	0	0	20	16.9%	6.1%
Day Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	920	23	0	3	2	8	44	0	0	0	80	67.8%	8.0%
Day Time Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	0.0%		
	Stop Bar Detector	92.0%	**2.3%**	0.0%	0.3%	0.2%	0.8%	**4.4%**	0.0%	0.0%	0.0%	8.0%		
Day Time Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**92.0%**	**8.0%**						0.0%			8.0%		
Night Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	179	7	2	2	24	0	3	0	0	0	38	32.2%	**17.5%**
Night Time Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	0.0%		
	Stop Bar Detector	82.5%	**3.2%**	0.9%	0.9%	**11.1%**	0.0%	1.4%	0.0%	0.0%	0.0%	17.5%		
Night Time Sum Percentage	Advanced Detector	-	0.0%						0.0%			0.0%		
	Stop Bar Detector	**82.5%**	**17.5%**						0.0%			17.5%		
All Day	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	1,099	30	2	5	26	8	47	0	0	0	118	100.0%	9.7%
All Day Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	0.0%		
	Stop Bar Detector	90.3%	**2.5%**	0.2%	0.4%	**2.1%**	0.7%	**3.9%**	0.0%	0.0%	0.0%	9.7%		
All Day Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**90.3%**	**9.7%**						0.0%			9.7%		

Table 3-22 Vantage Performance for All Lanes at S Sallman Rd/Fairview Dr Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	292	6	0	0	0	0	7	0	0	0	13	11.0%	4.3%
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	320	11	0	1	0	8	27	0	0	0	47	39.8%	12.8%
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	308	6	0	2	2	0	10	0	0	0	20	16.9%	6.1%
Day Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	920	23	0	3	2	8	44	0	0	0	80	67.8%	8.0%
Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	0.0%		
	Stop Bar Detector	92.0%	2.3%	0.0%	0.3%	0.2%	0.8%	4.4%	0.0%	0.0%	0.0%	8.0%		
Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	92.0%	8.0%						0.0%			8.0%		
Night Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	179	7	2	2	24	0	3	0	0	0	38	32.2%	17.5%
Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	0.0%		
	Stop Bar Detector	82.5%	3.2%	0.9%	0.9%	11.1%	0.0%	1.4%	0.0%	0.0%	0.0%	17.5%		
Percentage	Advanced Detector	-	0.0%						0.0%			0.0%		
	Stop Bar Detector	82.5%	17.5%						0.0%			17.5%		
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	1,099	30	2	5	26	8	47	0	0	0	118	100.0%	9.7%
Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	0.0%		
	Stop Bar Detector	90.3%	2.5%	0.2%	0.4%	2.1%	0.7%	3.9%	0.0%	0.0%	0.0%	9.7%		
Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	90.3%	9.7%						0.0%			9.7%		

From the tables above, the correct detections of stop-bar detectors were 90.3% overall, 92.0% in daytime, and 82.5% in nighttime, respectively. Similar to Autoscope, false detections were the dominant erroneous detection type. Factors of "vehicles in adjacent lanes" and "headlights" were the leading causes of false detections. Midday peak contributed the highest number of false detections in a day while nighttime had the highest proportion of false detections.

- Problems

Some problems were noticed for the WB approach. In through lane 1 of this approach, "vehicles in adjacent lanes" caused 4.7% false detections while stop-bar detector and "headlights" resulted in 3.4% false detections. For left turn lane 1 at the WB approach, "vehicles in adjacent lanes" led to 5.7% false detections and "headlights" caused 5.3% false detections. There were about 20.2% false detections with the stop-bar detector at this approach, which were mainly caused by cross street vehicles triggering the detector (see Figure 3-20(a)).

- Recommendations

One particular recommendation related to the problems at the WB approach is to relocate the stop-bar detector, e.g., moving the detector further back.

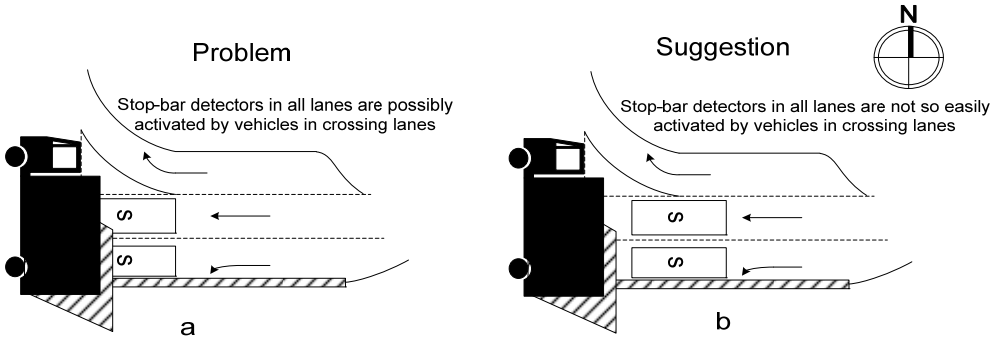

Figure 3-20 Problem and Recommendation for Intersection S Sallman Rd/Fairview Dr

2) N Carson St/ Medical Pkwy

The intersection of N Carson St/Medical Pkwy is shown in Figure 3-21. Its lane and detector configuration are shown in Figure 3-22. The cameras facing the NB and SB traffic were mounted on the signal mast arms while the cameras facing the EB and WB traffic were mounted on luminarie arms. The SB approach had both stop-bar detectors and advanced detectors, but the WB approach only had stop-bar detectors. No high buildings or trees exist near this intersection.

Figure 3-21 Picture of N Carson St./ Medical Pkwy Intersection

- Results

Table 3-23 to Table 3-25 include the summary data for false and missed detections at this intersection, while the tables in Appendix A (Table 0-45A to Table 0-48A) include the detailed results.

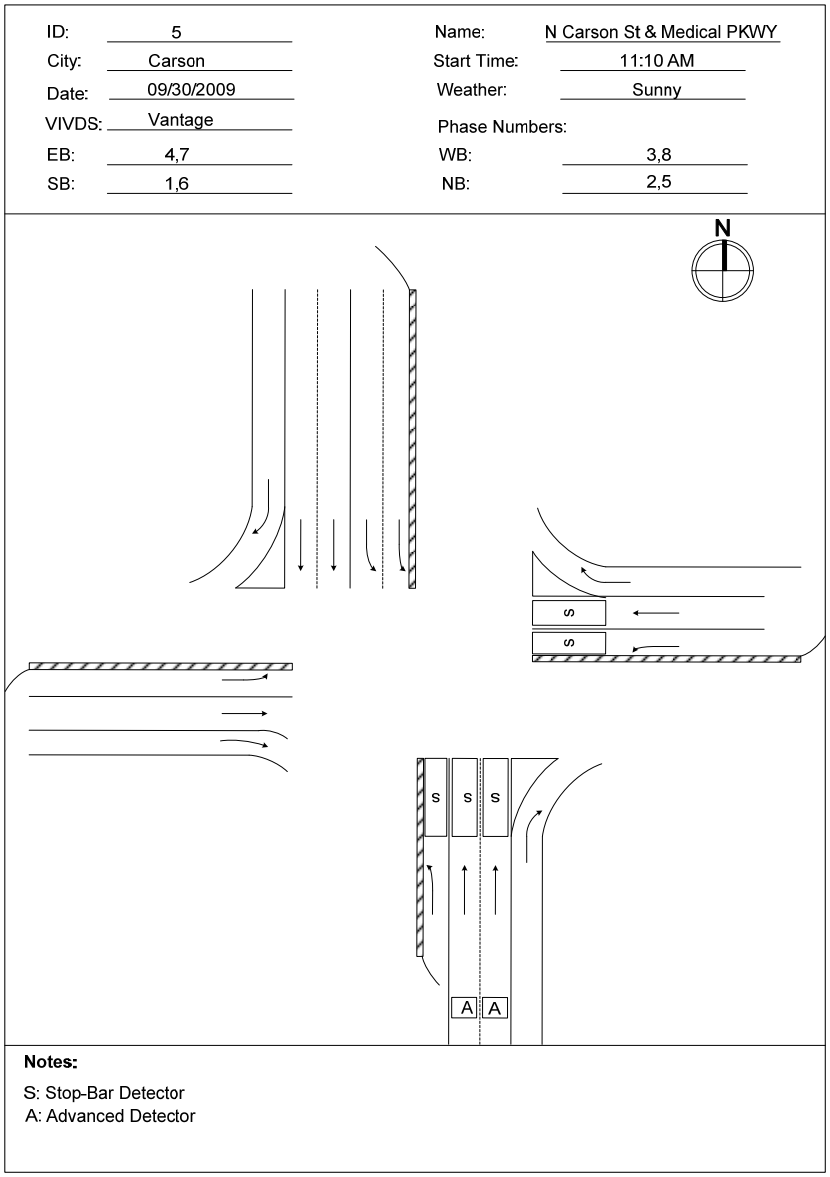

Figure 3-22 Lane and Detection Configuration of N Carson St./ Medical Pkwy Intersection

Table 3-23 Vantage Performance for Through Movement Lanes at N Carson St./ Medical Pkwy Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	97	0	0	0	0	0	0	0	0	0	0	-	0.0%
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	77	0	0	0	0	0	0	0	0	0	0	-	**0.0%**
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	93	0	0	0	0	0	0	0	0	0	0	-	0.0%
Day Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	267	0	0	0	0	0	0	0	0	0	0	-	0.0%
Day Time Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-		
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
Day Time Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**100.0%**	**0.0%**						0.0%			0.0%		
Night Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	76	0	0	0	0	0	0	0	0	0	0	-	-
Night Time Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-		
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
Night Time Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**100.0%**	0.0%						0.0%			0.0%		
All Day	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	343	0	0	0	0	0	0	0	0	0	0	-	-
All Day Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-		
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
All Day Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**100.0%**	**0.0%**						0.0%			0.0%		

Table 3-24 Vantage Performance for Left-Turn Lanes at N Carson St./ Medical Pkwy Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	106	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	80	1	0	0	0	0	0	0	0	0	1	**100.0%**	**1.2%**
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	107	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
Day Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	293	1	0	0	0	0	0	0	0	0	1	100.0%	0.3%
Day Time Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	0.0%		
	Stop Bar Detector	99.7%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%		
Day Time Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**99.7%**	**0.3%**						0.0%			0.3%		
Night Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	78	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
Night Time Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-		
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
Night Time Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**100.0%**	0.0%						0.0%			0.0%		
All Day	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	371	1	0	0	0	0	0	0	0	0	1	100.0%	0.3%
All Day Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	0.0%		
	Stop Bar Detector	99.7%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%		
All Day Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**99.7%**	**0.3%**						0.0%			0.3%		

Table 3-25 Vantage Performance for All Lanes at N Carson St./ Medical Pkwy Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	203	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	157	1	0	0	0	0	0	0	0	0	1	**100.0%**	**0.6%**
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	200	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
Day Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	560	1	0	0	0	0	0	0	0	0	1	100.0%	0.2%
Day Time Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-		
	Stop Bar Detector	99.8%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%		
Day Time Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**99.8%**	**0.2%**						0.0%			0.2%		
Night Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	154	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
Night Time Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-		
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
Night Time Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**100.0%**	0.0%						0.0%			0.0%		
All Day	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	714	1	0	0	0	0	0	0	0	0	1	100.0%	0.1%
All Day Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-		
	Stop Bar Detector	99.9%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%		
All Day Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**99.9%**	**0.1%**						0.0%			0.1%		

The results indicate that this intersection did not experience any major detection problems. The correct detections were 99.9% overall, 99.8% in daytime, and 100.0% in nighttime, respectively.

- Problems

The city signal engineer had reported detection issues at this intersection when the NB left-turn vehicles sometime had to wait for more than several minutes. However, no major problems were observed during the two days of data collection; therefore, no particular recommendations are made for this location.

3) S. Dean Martin Dr/W Silverado Ranch Blvd

The intersection of S. Dean Martin Dr/W Silverado Ranch Blvd is shown in Figure 3-23. Its lane and detector configuration are shown in Figure 3-24. The cameras were all mounted on the signal mast arms facing the traffic approaching the intersection. All the intersection approaches had stop-bar detectors and advanced detectors. However, no advanced detectors were used at the EB through lanes. No high buildings or trees exist near the intersection.

Figure 3-23 Picture of S. Dean Martin Dr/W Silverado Ranch Blvd Intersection

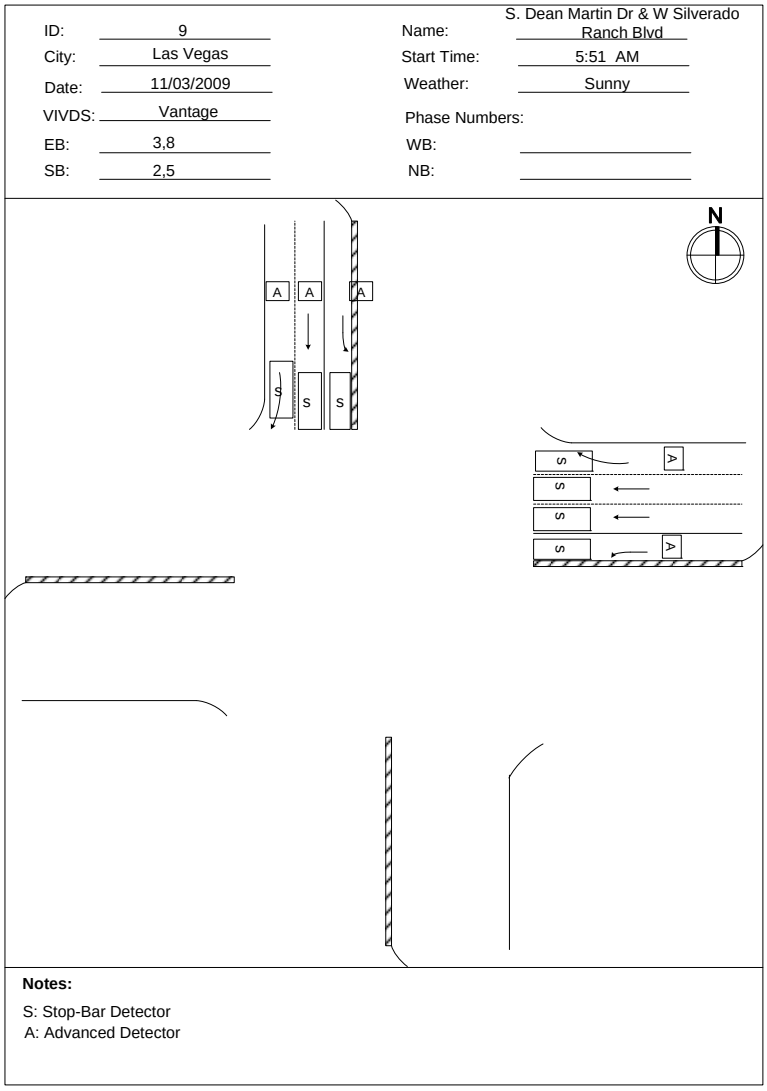

Figure 3-24 Lane and Detection Configuration of S. Dean Martin Dr/W Silverado Ranch Blvd Intersection

- Results

Table 3-26 to Table 3-28 include the summary data for false and missed detections at this intersection, while the tables in Appendix A (Table 0-49A to Table 0-52A) include the detailed results.

Table 3-26 Vantage Performance for Through Movement Lanes at S Sallman Rd/Fairview Dr Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	13	0	0	0	0	0	0	0	0	0	0	-	0.0%
	Stop Bar Detector	75	0	0	0	0	0	0	0	1	0	1	**25.0%**	**1.3%**
MD	Advanced Detector	26	0	0	0	0	0	0	0	0	0	0	-	0.0%
	Stop Bar Detector	89	0	0	1	0	0	0	0	0	0	1	**25.0%**	1.1%
PM	Advanced Detector	59	0	0	0	0	0	0	0	0	0	0	-	0.0%
	Stop Bar Detector	92	0	0	1	0	0	0	0	0	0	1	**25.0%**	1.1%
Day Time	Advanced Detector	98	0	0	0	0	0	0	0	0	0	0	-	0.0%
	Stop Bar Detector	256	0	0	2	0	0	0	0	1	0	3	75.0%	1.2%
Day Time Percentage	Advanced Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Stop Bar Detector	98.8%	0.0%	0.0%	**0.8%**	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	1.2%		
Day Time Sum Percentage	Advanced Detector	**100.0%**	0.0%						0.0%			0.0%		
	Stop Bar Detector	**98.8%**	**0.8%**						0.4%			1.2%		
Night Time	Advanced Detector	17	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	91	0	0	1	0	0	0	0	0	0	1	**25.0%**	1.1%
Night Time Percentage	Advanced Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Stop Bar Detector	98.9%	0.0%	0.0%	**1.1%**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%		
Night Time Sum Percentage	Advanced Detector	**100.0%**	0.0%						0.0%			0.0%		
	Stop Bar Detector	**98.9%**	**1.1%**						0.0%			1.1%		
All Day	Advanced Detector	115	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	347	0	0	3	0	0	0	0	1	0	4	100.0%	1.1%
All Day Percentage	Advanced Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Stop Bar Detector	98.9%	0.0%	0.0%	**0.9%**	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	1.1%		
All Day Sum Percentage	Advanced Detector	**100.0%**	0.0%						0.0%			0.0%		
	Stop Bar Detector	**98.9%**	**0.9%**						0.3%			1.1%		

Table 3-27 Vantage Performance for Left-Turn Lanes at S Sallman Rd/Fairview Dr Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	125	0	0	0	0	0	10	0	0	0	10	**90.9%**	**7.4%**
	Stop Bar Detector	175	0	0	0	0	0	0	0	0	0	0	-	0.0%
MD	Advanced Detector	263	0	0	1	0	0	0	0	0	0	1	9.1%	0.4%
	Stop Bar Detector	118	0	0	0	0	0	0	0	0	0	0	-	0.0%
PM	Advanced Detector	409	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
	Stop Bar Detector	110	0	0	0	0	0	0	0	0	0	0	-	0.0%
Day Time	Advanced Detector	797	0	0	1	0	0	10	0	0	0	11	100.0%	1.4%
	Stop Bar Detector	403	0	0	0	0	0	0	0	0	0	0	-	0.0%
Day Time Percentage	Advanced Detector	98.6%	0.0%	0.0%	0.1%	0.0%	0.0%	**1.2%**	0.0%	0.0%	0.0%	1.4%		
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
Day Time Sum Percentage	Advanced Detector	**98.6%**	**1.4%**						0.0%			1.4%		
	Stop Bar Detector	**100.0%**	0.0%						0.0%			0.0%		
Night Time	Advanced Detector	289	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
	Stop Bar Detector	115	0	0	0	0	0	0	0	0	0	0	-	0.0%
Night Time Percentage	Advanced Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
Night Time Sum Percentage	Advanced Detector	**100.0%**	0.0%						0.0%			0.0%		
	Stop Bar Detector	**100.0%**	0.0%						0.0%			0.0%		
All Day	Advanced Detector	1086	0	0	1	0	0	10	0	0	0	11	100.0%	1.0%
	Stop Bar Detector	518	0	0	0	0	0	0	0	0	0	0	-	0.0%
All Day Percentage	Advanced Detector	99.0%	0.0%	0.0%	0.1%	0.0%	0.0%	**0.9%**	0.0%	0.0%	0.0%	1.0%		
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
All Day Sum Percentage	Advanced Detector	**99.0%**	**1.0%**						0.0%			1.0%		
	Stop Bar Detector	**100.0%**	0.0%						0.0%			0.0%		

Table 3-28 Vantage Performance for All Lanes at S Sallman Rd/Fairview Dr Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	138	0	0	0	0	0	10	0	0	0	10	**90.9%**	**6.8%**
	Stop Bar Detector	250	0	0	0	0	0	0	0	1	0	1	25.0%	0.4%
MD	Advanced Detector	289	0	0	1	0	0	0	0	0	0	1	9.1%	0.3%
	Stop Bar Detector	207	0	0	1	0	0	0	0	0	0	1	25.0%	**0.5%**
PM	Advanced Detector	468	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
	Stop Bar Detector	202	0	0	1	0	0	0	0	0	0	1	25.0%	0.5%
Day Time	Advanced Detector	895	0	0	1	0	0	10	0	0	0	11	100.0%	1.2%
	Stop Bar Detector	659	0	0	2	0	0	0	0	1	0	3	75.0%	0.5%
Day Time Percentage	Advanced Detector	98.8%	0.0%	0.0%	0.1%	0.0%	0.0%	**1.1%**	0.0%	0.0%	0.0%	1.2%		
	Stop Bar Detector	99.5%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.5%		
Day Time Sum Percentage	Advanced Detector	**98.8%**	**1.2%**						0.0%			1.2%		
	Stop Bar Detector	**99.5%**	0.3%						0.2%			0.5%		
Night Time	Advanced Detector	306	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
	Stop Bar Detector	206	0	0	1	0	0	0	0	0	0	1	25.0%	**0.5%**
Night Time Percentage	Advanced Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Stop Bar Detector	99.5%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%		
Night Time Sum Percentage	Advanced Detector	**100.0%**	0.0%						0.0%			0.0%		
	Stop Bar Detector	**99.5%**	0.5%						0.0%			0.5%		
All Day	Advanced Detector	1201	0	0	1	0	0	10	0	0	0	11	100.0%	0.9%
	Stop Bar Detector	865	0	0	3	0	0	0	0	1	0	4	100.0%	0.5%
All Day Percentage	Advanced Detector	99.1%	0.0%	0.0%	0.1%	0.0%	0.0%	**0.8%**	0.0%	0.0%	0.0%	0.9%		
	Stop Bar Detector	99.5%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.5%		
All Day Sum Percentage	Advanced Detector	**99.1%**	**0.9%**						0.0%			0.9%		
	Stop Bar Detector	**99.5%**	0.3%						0.1%			0.5%		

This intersection achieved rather good results too. The correct detections of advanced detectors and stop-bar detectors were 99.1% and 99.5% overall, 98.8% and 99.5% in daytime, 100.0% and 99.5% in nighttime, respectively. Most false detections occurred during the AM period with the advanced detectors (90.9% of all day, and 6.8% relative).

- Problems

The advanced detector in the left-turn lane at the SB approach was often triggered by vehicles in the opposite direction due to improper location of the detector (See Figure 3-25(a)).

- Recommendations

The recommendation for the problem at the SB approach is to relocate the advanced detector in the left-turn lane (See Figure 3-25(b)).

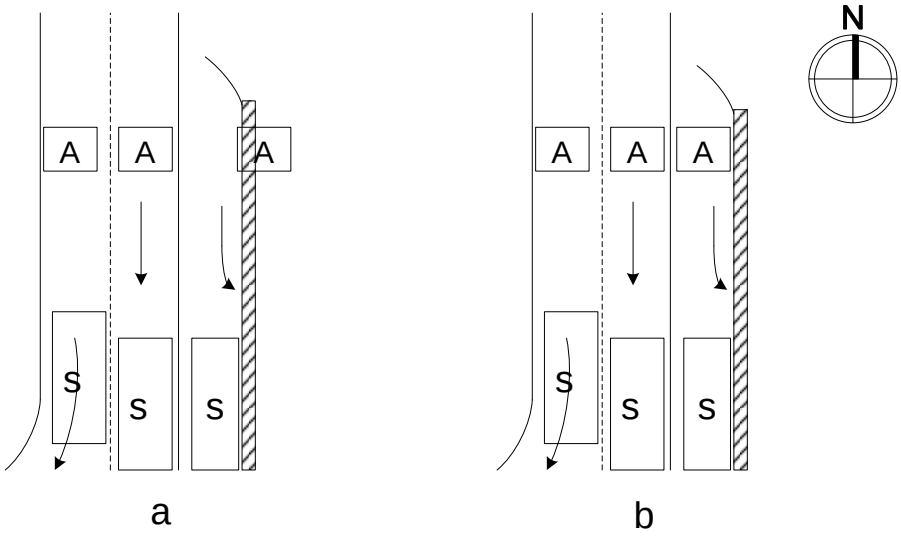

Figure 3-25 Problem and Recommendation for S. Dean Martin Dr/W Silverado Ranch Blvd Intersection

4) Koval Lane/Harrah's Venetion

No picture was taken at this intersection. The lane and detector configuration of this intersection is shown in Figure 3-26. The cameras were mounted on the luminaire arms or signal mast arms facing the traffic approaching the intersection. All the intersection approaches had only stop-bar detectors. Only EB, WB and SB approaches were included in the data collection and analyses.

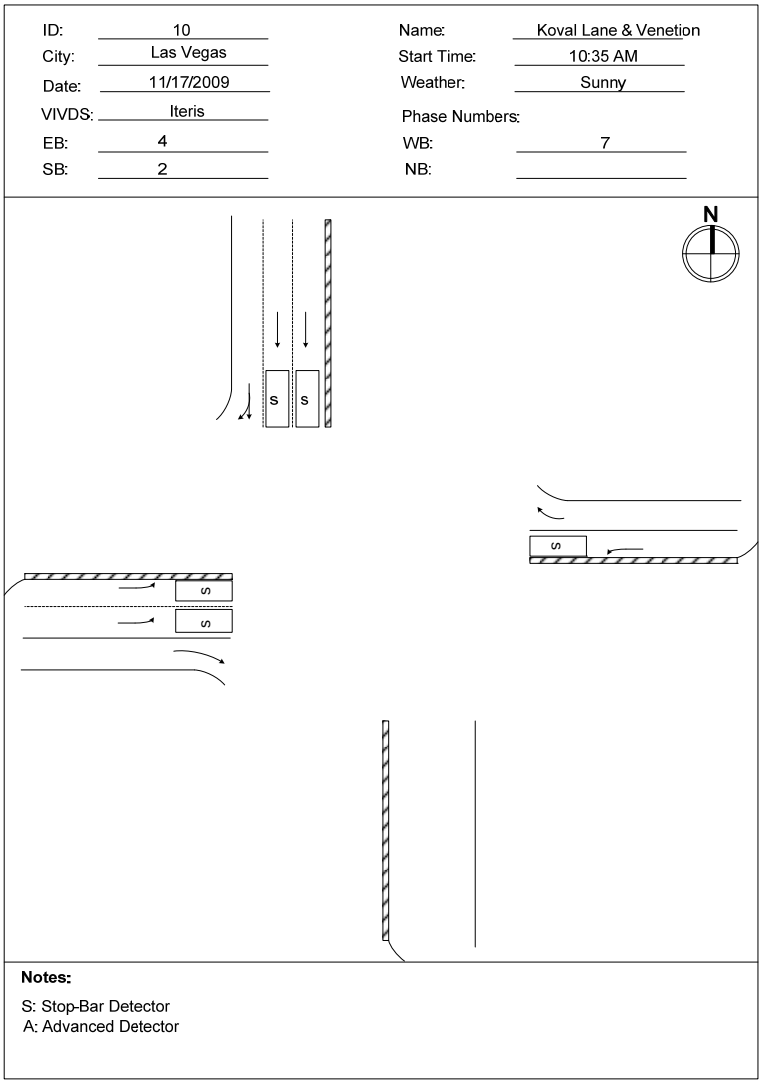

Figure 3-26 Lane and Detector Configuration of Koval Lane/Harrah's Venetion Intersection

- Results

Table 3-29 to Table 3-31 include the summary data for false and missed detections at this intersection, while the tables in Appendix A (Table 0-53A to Table 0-55A) include the detailed results.

The results show that this intersection did not exhibit any detection problems. There were basically no false or missed detections observed at this intersection during the two days of data collection. However, it should be noted that the WB approach was under a bridge where the shadow of the bridge sometimes made the approach too dark to distinguish vehicles and pavement. Additionally, no advanced detectors can be set up for this approach.

Table 3-29 Vantage Performance for Through Movement Lanes at Koval Lane/Harrah's Venetion Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	50	0	0	0	0	0	0	0	0	0	0	-	0.0%
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	39	0	0	0	0	0	0	0	0	0	0	-	0.0%
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	52	0	0	0	0	0	0	0	0	0	0	-	0.0%
Day Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	141	0	0	0	0	0	0	0	0	0	0	-	0.0%
Day Time Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-		
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
Day Time Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**100.0%**	0.0%						0.0%			0.0%		
Night Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	51	0	0	0	0	0	0	0	0	0	0	-	-
Night Time Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-		
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
Night Time Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**100.0%**	0.0%						0.0%			0.0%		
All Day	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	192	0	0	0	0	0	0	0	0	0	0	-	-
All Day Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	0.0%		
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
All Day Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**100.0%**	0.0%						0.0%			0.0%		

Table 3-30 Vantage Performance for Left-Turn Lanes at Koval Lane/Harrah's Venetion Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	66	0	0	0	0	0	0	0	0	0	0	-	0.0%
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	70	0	0	0	0	0	0	0	0	0	0	-	0.0%
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	85	0	0	0	0	0	0	0	0	0	0	-	0.0%
Day Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	221	0	0	0	0	0	0	0	0	0	0	-	0.0%
Day Time Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	0.0%		
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
Day Time Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**100.0%**	0.0%						0.0%			0.0%		
Night Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	59	0	0	0	0	0	0	0	0	0	0	-	-
Night Time Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	0.0%		
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
Night Time Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**100.0%**	0.0%						3.0%			3.0%		
All Day	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	280	0	0	0	0	0	0	0	0	0	0	-	-
All Day Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-		
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
All Day Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**100.0%**	0.0%						0.0%			0.0%		

Table 3-31 Vantage Performance for All Lanes at Koval Lane/Harrah's Venetion Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	116	0	0	0	0	0	0	0	0	0	0	-	0.0%
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	109	0	0	0	0	0	0	0	0	0	0	-	0.0%
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	137	0	0	0	0	0	0	0	0	0	0	-	0.0%
Day Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	362	0	0	0	0	0	0	0	0	0	0	-	0.0%
Day Time Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	0.0%		
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
Day Time Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**100.0%**	0.0%						0.0%			0.0%		
Night Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	110	0	0	0	0	0	0	0	0	0	0	-	-
Night Time Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-		
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
Night Time Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**100.0%**	0.0%						0.0%			0.0%		
All Day	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	472	0	0	0	0	0	0	0	0	0	0	-	-
All Day Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-		
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
All Day Sum Percentage	Advanced Detector	-	0.0%						0.0%			0.0%		
	Stop Bar Detector	**100.0%**	0.0%						0.0%			0.0%		

5) Overall Vantage Performance

Table 3-32 to Table 3-34 provide the overall performance by Vantage for all four intersections. The following major observations can be made based on the results:

- It did not appear that Vantage exhibited significantly different performance between daytime and nighttime operations. The correct detections during daytime were 98.8% and 96.8% for the advanced detectors and stop-bar detectors, respectively. The numbers for nighttime were 100.0% and 94.3%.
- Advanced detectors showed slightly better performance overall (accuracy of 99.1%) than the stop-bar detectors (accuracy of 96.2%).
- The daytime peak periods generally contributed the highest number of erroneous detections. For example, the AM peak contributed 90.9% of all erroneous detections with advanced detectors. The relative error was also the highest (6.8%) followed by the stop-bar detectors at night (5.7%).
- False detection was the primary erroneous detection type. The number of missed detections was almost zero.
- Two leading factors contributing to erroneous detections were “other” for daytime and “headlights” for nighttime. Cases in the “other” category were mostly related to improper advanced detector locations.

Table 3-32 Vantage Performance for Through Lanes at all Four Intersections

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	13	0	0	0	0	0	0	0	0	0	0	-	0.0%
	Stop Bar Detector	416	5	0	0	0	0	0	0	1	0	6	13.6%	1.4%
MD	Advanced Detector	26	0	0	0	0	0	0	0	0	0	0	-	0.0%
	Stop Bar Detector	410	5	0	2	0	1	0	0	0	0	8	18.2%	1.9%
PM	Advanced Detector	59	0	0	0	0	0	0	0	0	0	0	-	0.0%
	Stop Bar Detector	414	1	0	3	2	0	0	0	0	0	6	13.6%	1.4%
Day Time	Advanced Detector	98	0	0	0	0	0	0	0	0	0	0	-	0.0%
	Stop Bar Detector	1240	11	0	5	2	1	0	0	1	0	20	45.5%	1.6%
Day Time Percentage	Advanced Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Stop Bar Detector	98.4%	**0.9%**	0.0%	0.4%	0.2%	0.1%	0.0%	0.0%	0.1%	0.0%	1.6%		
Day Time Sum Percentage	Advanced Detector	**100.0%**	0.0%						0.0%			0.0%		
	Stop Bar Detector	**98.4%**	**1.5%**						0.1%			1.6%		
Night Time	Advanced Detector	17	0	0	0	0	0	0	0	0	0	0	-	0.0%
	Stop Bar Detector	363	6	2	3	12	0	1	0	0	0	24	**54.5%**	**6.2%**
Night Time Percentage	Advanced Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Stop Bar Detector	93.8%	**1.6%**	0.5%	0.8%	**3.1%**	0.0%	0.3%	0.0%	0.0%	0.0%	6.2%		
Night Time Sum Percentage	Advanced Detector	**100.0%**	0.0%						0.0%			0.0%		
	Stop Bar Detector	**93.8%**	**6.2%**						0.0%			6.2%		
All Day	Advanced Detector	115	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
	Stop Bar Detector	1603	17	2	8	14	1	1	0	1	0	44	100.0%	2.7%
All Day Percentage	Advanced Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Stop Bar Detector	97.3%	**1.0%**	0.1%	0.5%	**0.9%**	0.1%	0.1%	0.0%	0.1%	0.0%	2.7%		
All Day Sum Percentage	Advanced Detector	**100.0%**	0.0%						0.0%			0.0%		
	Stop Bar Detector	**97.3%**	**2.6%**						0.1%			2.7%		

Table 3-33 Vantage Performance for Left-Turn Lanes at all Four Intersections

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	125	0	0	0	0	0	10	0	0	0	10	**90.9%**	**7.4%**
	Stop Bar Detector	445	1	0	0	0	0	7	0	0	0	8	10.1%	1.8%
MD	Advanced Detector	263	0	0	1	0	0	0	0	0	0	1	9.1%	0.4%
	Stop Bar Detector	383	7	0	0	0	7	27	0	0	0	41	**51.9%**	**9.7%**
PM	Advanced Detector	409	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
	Stop Bar Detector	433	5	0	0	0	0	10	0	0	0	15	19.0%	3.3%
Day Time	Advanced Detector	797	0	0	1	0	0	10	0	0	0	11	100.0%	1.4%
	Stop Bar Detector	1261	13	0	0	0	7	44	0	0	0	64	81.0%	4.8%
Day Time Percentage	Advanced Detector	98.6%	0.0%	0.0%	0.1%	0.0%	0.0%	1.2%	0.0%	0.0%	0.0%	1.4%		
	Stop Bar Detector	95.2%	1.0%	0.0%	0.0%	0.0%	0.5%	**3.3%**	0.0%	0.0%	0.0%	4.8%		
Day Time Sum Percentage	Advanced Detector	**98.6%**	1.4%						0.0%			1.4%		
	Stop Bar Detector	**95.2%**	**4.8%**						0.0%			4.8%		
Night Time	Advanced Detector	289	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
	Stop Bar Detector	286	1	0	0	12	0	2	0	0	0	15	19.0%	5.0%
Night Time Percentage	Advanced Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Stop Bar Detector	95.0%	0.3%	0.0%	0.0%	**4.0%**	0.0%	0.7%	0.0%	0.0%	0.0%	5.0%		
Night Time Sum Percentage	Advanced Detector	**100.0%**	0.0%						0.0%			0.0%		
	Stop Bar Detector	**95.0%**	**5.0%**						0.0%			5.0%		
All Day	Advanced Detector	1086	0	0	1	0	0	10	0	0	0	11	100.0%	1.0%
	Stop Bar Detector	1547	14	0	0	12	7	46	0	0	0	79	100.0%	4.9%
All Day Percentage	Advanced Detector	99.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	1.0%		
	Stop Bar Detector	95.1%	0.9%	0.0%	0.0%	0.7%	0.4%	**2.8%**	0.0%	0.0%	0.0%	4.9%		
All Day Sum Percentage	Advanced Detector	**99.0%**	1.0%						0.0%			1.0%		
	Stop Bar Detector	**95.1%**	**4.9%**						0.0%			4.9%		

Table 3-34 Vantage Performance for All Lanes at all Four Intersections

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	138	0	0	0	0	0	10	0	0	0	10	**90.9%**	**6.8%**
	Stop Bar Detector	861	6	0	0	0	0	7	0	1	0	14	11.4%	1.6%
MD	Advanced Detector	289	0	0	1	0	0	0	0	0	0	1	9.1%	0.3%
	Stop Bar Detector	793	12	0	2	0	8	27	0	0	0	49	**39.8%**	**5.8%**
PM	Advanced Detector	468	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
	Stop Bar Detector	847	6	0	3	2	0	10	0	0	0	21	17.1%	2.4%
Day Time	Advanced Detector	895	0	0	1	0	0	10	0	0	0	11	100.0%	1.2%
	Stop Bar Detector	2501	24	0	5	2	8	44	0	1	0	84	68.3%	3.2%
Day Time Percentage	Advanced Detector	98.8%	0.0%	0.0%	0.1%	0.0%	0.0%	1.1%	0.0%	0.0%	0.0%	1.2%		
	Stop Bar Detector	96.8%	**0.9%**	0.0%	0.2%	0.1%	0.3%	**1.7%**	0.0%	0.0%	0.0%	3.2%		
Day Time Sum Percentage	Advanced Detector	**98.8%**	1.2%						0.0%			1.2%		
	Stop Bar Detector	**96.8%**	**3.2%**						0.0%			3.2%		
Night Time	Advanced Detector	306	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
	Stop Bar Detector	649	7	2	3	24	0	3	0	0	0	39	31.7%	5.7%
Night Time Percentage	Advanced Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Stop Bar Detector	94.3%	**1.0%**	0.3%	0.4%	**3.5%**	0.0%	0.4%	0.0%	0.0%	0.0%	5.7%		
Night Time Sum Percentage	Advanced Detector	**100.0%**	0.0%						0.0%			0.0%		
	Stop Bar Detector	**94.3%**	**5.7%**						0.0%			5.7%		
All Day	Advanced Detector	1201	0	0	1	0	0	10	0	0	0	11	100.0%	0.9%
	Stop Bar Detector	3150	31	2	8	26	8	47	0	1	0	123	100.0%	3.8%
All Day Percentage	Advanced Detector	99.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.9%		
	Stop Bar Detector	96.2%	0.9%	0.1%	0.2%	0.8%	0.2%	**1.4%**	0.0%	0.0%	0.0%	3.8%		
All Day Sum Percentage	Advanced Detector	**99.1%**	0.9%						0.0%			0.9%		
	Stop Bar Detector	**96.2%**	**3.7%**						0.0%			3.8%		

3.2.3. Traficon

Two intersections with the Traficon detection system were selected in the study. Both intersections had a rural environment and were located in the South Lake Tahoe area. Table 3-35 shows the intersection information. Forty-eight hours of video were continuously recorded for each intersection approach. One-hour of video from each time period was extracted from the videos which were AM peak from 6:30 a.m. to 7:30 a.m., MD peak from 12:00 p.m. to 1:00 p.m., PM peak from 4:30 p.m. to 5:30 p.m., and night from 9:00 p.m. to 10:00 p.m.

Table 3-35 Information of Intersections Using Traficon

Intersection	Lake Parkway/Highway 50	Hwy 207/Highway 50
City	South Lake Tahoe	South Lake Tahoe
Starting Date	10-02-2009	10-05-2009
Ending Date	10-05-2009	10-07-2009
Starting Time	2:00 pm	2:10 pm
Ending Time	2:00 pm	2:10 pm
Approaches	2	3
Weather Condition	Clear, Windy, Snowy	Clear, Windy, and Snow

1) Lake Parkway/Highway 50

The intersection of Lake Parkway/Highway 50 is shown in Figure 3-27. Its lane and detector configuration are shown in Figure 3-28. The cameras were all mounted on the luminaire arms facing the traffic approaching the intersection. All the intersection approaches had stop-bar detectors and advanced detectors. No high buildings or trees exist near the intersection.

Figure 3-27 Picture of Lake Parkway/Highway 50 Intersection

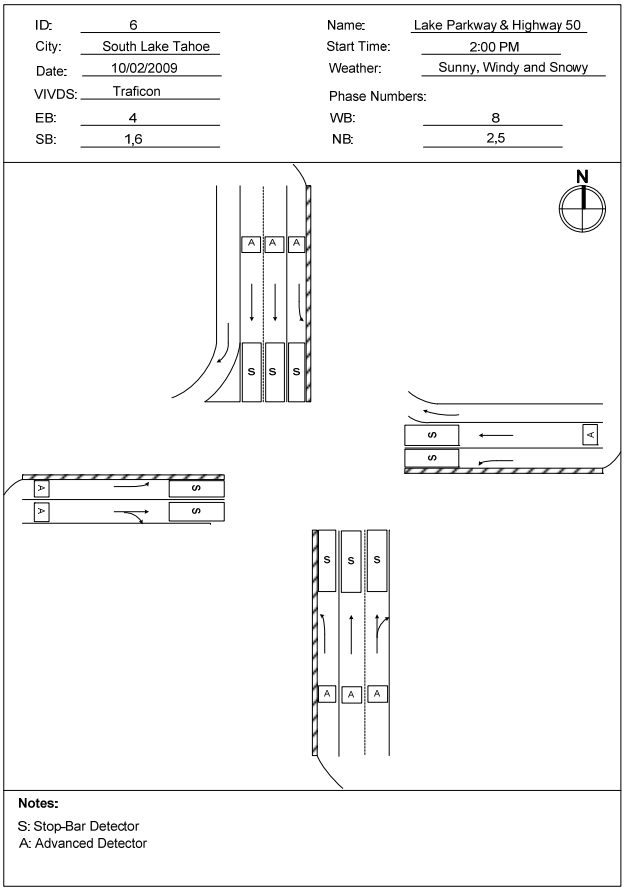

Figure 3-28 Lane and Detection Configuration of Lake Parkway/Highway 50 Intersection

- Results

Table 3-36 to Table 3-38 include the summary data for false and missed detections at this intersection, while the tables in Appendix A (Table 0-56A to Table 0-59A) include the detailed results.

Table 3-38 shows that the correct detections of advanced detectors and stop-bar detectors were 86.3% and 86.2% overall, 95.4% and 89.5% in daytime, 48.3% and 78.7% in nighttime, respectively. While false detections were still dominant with stop-bar detectors, missed detections became dominant with advanced detectors. With regard to the contributing factors, the "others" category became dominant. For example, 49.6% missed detections occurred under this category. The cases associated with this category were mainly due to snow conditions.

- Problems

As pointed out earlier, besides the two common factors of "vehicles in adjacent lanes" and "headlights", snow conditions resulted in a significantly higher number of missed detections at night.

- Recommendations

There are no special recommendations for this intersection. According to the traffic engineering staff that was responsible for this intersection, Traficon has been running well in the past. The low performance of this intersection was mainly due to heavy snow conditions during the two days of data collection.

Table 3-36 Traficon Performance for Through Movement Lanes at Lake Parkway/Highway 50 Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	264	0	0	4	2	0	1	0	0	41	48	17.8%	15.4%
	Stop Bar Detector	26	2	0	0	5	0	4	0	0	0	11	16.4%	**29.7%**
MD	Advanced Detector	641	2	0	0	0	0	0	0	5	3	10	3.7%	1.5%
	Stop Bar Detector	98	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
PM	Advanced Detector	581	0	0	1	0	0	0	0	2	13	16	5.9%	2.7%
	Stop Bar Detector	100	17	4	2	0	3	0	0	0	0	26	38.8%	20.6%
Day Time	Advanced Detector	1486	2	0	5	2	0	1	0	7	57	74	27.4%	4.7%
	Stop Bar Detector	224	19	4	2	5	3	4	0	0	0	37	55.2%	14.2%
Day Time Percentage	Advanced Detector	95.3%	0.1%	0.0%	0.3%	0.1%	0.0%	0.1%	0.0%	0.4%	**3.7%**	4.7%		
	Stop Bar Detector	85.8%	**7.3%**	1.5%	0.8%	1.9%	1.1%	1.5%	0.0%	0.0%	0.0%	14.2%		
Day Time Sum Percentage	Advanced Detector	**95.3%**	0.6%						**4.1%**			4.7%		
	Stop Bar Detector	**85.8%**	**14.2%**						0.0%			14.2%		
Night Time	Advanced Detector	183	0	0	1	7	0	0	0	0	188	196	**72.6%**	**51.7%**
	Stop Bar Detector	92	0	0	3	17	0	10	0	0	0	30	**44.8%**	24.6%
Night Time Percentage	Advanced Detector	48.3%	0.0%	0.0%	0.3%	1.8%	0.0%	0.0%	0.0%	0.0%	**49.6%**	51.7%		
	Stop Bar Detector	75.4%	0.0%	0.0%	2.5%	13.9%	0.0%	**8.2%**	0.0%	0.0%	0.0%	24.6%		
Night Time Sum Percentage	Advanced Detector	**48.3%**	2.1%						**49.6%**			51.7%		
	Stop Bar Detector	**75.4%**	**24.6%**						0.0%			24.6%		
All Day	Advanced Detector	1669	2	0	6	9	0	1	0	7	245	270	100.0%	13.9%
	Stop Bar Detector	316	19	4	5	22	3	14	0	0	0	67	100.0%	17.5%
All Day Percentage	Advanced Detector	86.1%	0.1%	0.0%	0.3%	0.5%	0.0%	0.1%	0.0%	0.4%	**12.6%**	13.9%		
	Stop Bar Detector	82.5%	**5.0%**	1.0%	1.3%	**5.7%**	0.8%	3.7%	0.0%	0.0%	0.0%	17.5%		
All Day Sum Percentage	Advanced Detector	**86.1%**	0.9%						**13.0%**			13.9%		
	Stop Bar Detector	**82.5%**	**17.5%**						0.0%			17.5%		

Table 3-37 Traficon Performance for Left-Turn Lanes at Lake Parkway/Highway 50 Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	51	1	0	0	1	0	12	0	0	0	14	33.3%	**21.5%**
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	138	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
PM	Advanced Detector	36	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	80	2	0	1	0	4	0	0	0	0	7	16.7%	8.0%
Day Time	Advanced Detector	36	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	269	3	0	1	1	4	12	0	0	0	21	50.0%	7.2%
Day Time Percentage	Advanced Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Stop Bar Detector	92.8%	1.0%	0.0%	0.3%	0.3%	1.4%	**4.1%**	0.0%	0.0%	0.0%	7.2%		
Day Time Sum Percentage	Advanced Detector	**100.0%**	0.0%						0.0%			0.0%		
	Stop Bar Detector	**92.8%**	**7.2%**						0.0%			7.2%		
Night Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	97	4	0	0	2	0	15	0	0	0	21	**50.0%**	17.8%
Night Time Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	0.0%		
	Stop Bar Detector	82.2%	3.4%	0.0%	0.0%	1.7%	0.0%	**12.7%**	0.0%	0.0%	0.0%	17.8%		
Night Time Sum Percentage	Advanced Detector	-	0.0%						0.0%			0.0%		
	Stop Bar Detector	**82.2%**	**17.8%**						0.0%			17.8%		
All Day	Advanced Detector	36	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	366	7	0	1	3	4	27	0	0	0	42	100.0%	10.3%
All Day Percentage	Advanced Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Stop Bar Detector	89.7%	1.7%	0.0%	0.2%	0.7%	1.0%	**6.6%**	0.0%	0.0%	0.0%	10.3%		
All Day Sum Percentage	Advanced Detector	**100.0%**	0.0%						0.0%			0.0%		
	Stop Bar Detector	**89.7%**	**10.3%**						0.0%			10.3%		

Table 3-38 Traficon Performance for All Lanes at Lake Parkway/Highway 50 Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	264	0	0	4	2	0	1	0	0	41	48	17.8%	15.4%
	Stop Bar Detector	77	3	0	0	6	0	16	0	0	0	25	22.9%	**24.5%**
MD	Advanced Detector	641	2	0	0	0	0	0	0	5	3	10	3.7%	1.5%
	Stop Bar Detector	236	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
PM	Advanced Detector	617	0	0	1	0	0	0	0	2	13	16	5.9%	2.5%
	Stop Bar Detector	180	19	4	3	0	7	0	0	0	0	33	30.3%	15.5%
Day Time	Advanced Detector	1522	2	0	5	2	0	1	0	7	57	74	27.4%	4.6%
	Stop Bar Detector	493	22	4	3	6	7	16	0	0	0	58	53.2%	10.5%
Day Time Percentage	Advanced Detector	95.4%	0.1%	0.0%	0.3%	0.1%	0.0%	0.1%	0.0%	0.4%	**3.6%**	4.6%		
	Stop Bar Detector	89.5%	**4.0%**	0.7%	0.5%	1.1%	1.3%	**2.9%**	0.0%	0.0%	0.0%	10.5%		
Day Time Sum Percentage	Advanced Detector	**95.4%**	0.6%						**4.0%**			4.6%		
	Stop Bar Detector	**89.5%**	**10.5%**						0.0%			10.5%		
Night Time	Advanced Detector	183	0	0	1	7	0	0	0	0	188	196	**72.6%**	**51.7%**
	Stop Bar Detector	189	4	0	3	19	0	25	0	0	0	51	**46.8%**	21.3%
Night Time Percentage	Advanced Detector	48.3%	0.0%	0.0%	0.3%	1.8%	0.0%	0.0%	0.0%	0.0%	**49.6%**	51.7%		
	Stop Bar Detector	78.8%	1.7%	0.0%	1.3%	**7.9%**	0.0%	**10.4%**	0.0%	0.0%	0.0%	21.3%		
Night Time Sum Percentage	Advanced Detector	**48.3%**	2.1%						**49.6%**			51.7%		
	Stop Bar Detector	**78.8%**	**21.3%**						0.0%			21.3%		
All Day	Advanced Detector	1705	2	0	6	9	0	1	0	7	245	270	100.0%	13.7%
	Stop Bar Detector	682	26	4	6	25	7	41	0	0	0	109	100.0%	13.8%
All Day Percentage	Advanced Detector	86.3%	0.1%	0.0%	0.3%	0.5%	0.0%	0.1%	0.0%	0.4%	**12.4%**	13.7%		
	Stop Bar Detector	86.2%	**3.3%**	0.5%	0.8%	**3.2%**	0.9%	**5.2%**	0.0%	0.0%	0.0%	13.8%		
All Day Sum Percentage	Advanced Detector	**86.3%**	0.9%						**12.8%**			13.7%		
	Stop Bar Detector	**86.2%**	**13.8%**						0.0%			13.8%		

2) Hwy 207/Highway 50

The intersection of Hwy 207/Highway 50 is a 3-leg intersection and is shown in Figure 3-29. Its lane and detector configuration are shown in Figure 3-30. The cameras for the WB and SB approaches were mounted on the luminaire arms. And the camera for the NB approach was mounted on the signal mast arm. The SB and NB approaches had both advanced and stop-bar detectors, but the WB approach only had stop-bar detectors. There are some tall trees near the intersection.

Figure 3-29 Picture of Hwy 207/Highway 50 Intersection

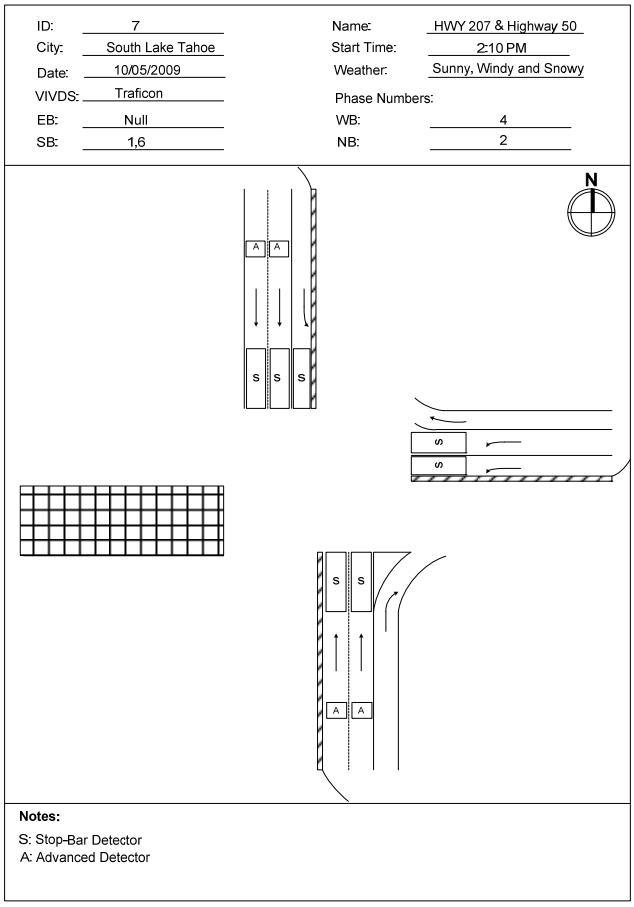

Figure 3-30 Lane and Detection Configuration of Hwy 207/Highway 50 Intersection

- Results

Table 3-39 to Table 3-41 include the summary data for false and missed detections at this intersection, while the tables in Appendix A (Table 0-60A to Table 0-63A) include the detailed results.

Table 3-39 Traficon Performance for Through Movement Lanes at Hwy 207/Highway 50 Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	517	53	0	0	4	0	1	0	0	16	74	21.0%	12.5%
	Stop Bar Detector	179	0	0	0	0	0	1	0	0	0	1	16.7%	0.6%
MD	Advanced Detector	587	49	0	1	0	0	0	0	0	3	53	15.1%	8.3%
	Stop Bar Detector	142	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
PM	Advanced Detector	771	68	0	0	0	0	0	0	0	6	74	21.0%	8.8%
	Stop Bar Detector	174	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
Day Time	Advanced Detector	1875	170	0	1	4	0	1	0	0	25	201	57.1%	9.7%
	Stop Bar Detector	495	0	0	0	0	0	1	0	0	0	1	16.7%	0.2%
Day Time Percentage	Advanced Detector	90.3%	**8.2%**	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	1.2%	9.7%		
	Stop Bar Detector	99.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.2%		
Day Time Sum Percentage	Advanced Detector	**90.3%**	**8.5%**						1.2%			9.7%		
	Stop Bar Detector	**99.8%**	0.2%						0.0%			0.2%		
Night Time	Advanced Detector	413	58	4	0	48	0	0	0	0	41	151	**42.9%**	**26.8%**
	Stop Bar Detector	110	0	0	0	5	0	0	0	0	0	5	**83.3%**	**4.3%**
Night Time Percentage	Advanced Detector	73.2%	**10.3%**	0.7%	0.0%	**8.5%**	0.0%	0.0%	0.0%	0.0%	**7.3%**	26.8%		
	Stop Bar Detector	95.7%	0.0%	0.0%	0.0%	4.3%	0.0%	0.0%	0.0%	0.0%	0.0%	4.3%		
Night Time Sum Percentage	Advanced Detector	**73.2%**	**19.5%**						**7.3%**			26.8%		
	Stop Bar Detector	**95.7%**	**4.3%**						0.0%			4.3%		
All Day	Advanced Detector	2288	228	4	1	52	0	1	0	0	66	352	100.0%	13.3%
	Stop Bar Detector	605	0	0	0	5	0	1	0	0	0	6	100.0%	1.0%
All Day Percentage	Advanced Detector	86.7%	**8.6%**	0.2%	0.0%	2.0%	0.0%	0.0%	0.0%	0.0%	2.5%	13.3%		
	Stop Bar Detector	99.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.2%	0.0%	0.0%	0.0%	1.0%		
All Day Sum Percentage	Advanced Detector	**86.7%**	**10.8%**						2.5%			13.3%		
	Stop Bar Detector	**99.0%**	1.0%						0.0%			1.0%		

Table 3-40 Traficon Performance for Left-Turn Lanes at Hwy 207/Highway 50 Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	229	0	0	0	2	0	0	0	0	0	2	14.3%	0.9%
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	194	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	174	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
Day Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	597	0	0	0	2	0	0	0	0	0	2	14.3%	0.3%
Day Time Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-		
	Stop Bar Detector	99.7%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%		
Day Time Sum Percentage	Advanced Detector	-	**0.0%**						0.0%			0.0%		
	Stop Bar Detector	**99.7%**	0.3%						0.0%			0.3%		
Night Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	178	0	0	0	12	0	0	0	0	0	12	**85.7%**	**6.3%**
Night Time Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-		
	Stop Bar Detector	93.7%	0.0%	0.0%	0.0%	**6.3%**	0.0%	0.0%	0.0%	0.0%	0.0%	6.3%		
Night Time Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**93.7%**	**6.3%**						0.0%			6.3%		
All Day	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	775	0	0	0	14	0	0	0	0	0	14	100.0%	1.8%
All Day Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-		
	Stop Bar Detector	98.2%	0.0%	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%		
All Day Sum Percentage	Advanced Detector	-	-						-			-		
	Stop Bar Detector	**98.2%**	1.8%						0.0%			1.8%		

Table 3-41 Traficon Performance for All Lanes at Hwy 207/Highway 50 Intersection

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	517	53	0	0	4	0	1	0	0	16	74	21.0%	12.5%
	Stop Bar Detector	408	0	0	0	2	0	1	0	0	0	3	15.0%	0.7%
MD	Advanced Detector	587	49	0	1	0	0	0	0	0	3	53	15.1%	8.3%
	Stop Bar Detector	336	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
PM	Advanced Detector	771	68	0	0	0	0	0	0	0	6	74	21.0%	8.8%
	Stop Bar Detector	348	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
Day Time	Advanced Detector	1875	170	0	1	4	0	1	0	0	25	201	57.1%	9.7%
	Stop Bar Detector	1092	0	0	0	2	0	1	0	0	0	3	15.0%	0.3%
Day Time Percentage	Advanced Detector	90.3%	**8.2%**	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	1.2%	9.7%		
	Stop Bar Detector	99.7%	0.0%	0.0%	0.0%	0.2%	0.0%	0.1%	0.0%	0.0%	0.0%	0.3%		
Day Time Sum Percentage	Advanced Detector	**90.3%**	**8.5%**						1.2%			9.7%		
	Stop Bar Detector	**99.7%**	0.3%						0.0%			0.3%		
Night Time	Advanced Detector	413	58	4	0	48	0	0	0	0	41	151	**42.9%**	**26.8%**
	Stop Bar Detector	288	0	0	0	17	0	0	0	0	0	17	**85.0%**	**5.6%**
Night Time Percentage	Advanced Detector	73.2%	**10.3%**	0.7%	0.0%	**8.5%**	0.0%	0.0%	0.0%	0.0%	**7.3%**	26.8%		
	Stop Bar Detector	94.4%	0.0%	0.0%	0.0%	**5.6%**	0.0%	0.0%	0.0%	0.0%	0.0%	5.6%		
Night Time Sum Percentage	Advanced Detector	**73.2%**	**19.5%**						**7.3%**			26.8%		
	Stop Bar Detector	**94.4%**	**5.6%**						0.0%			5.6%		
All Day	Advanced Detector	2288	228	4	1	52	0	1	0	0	66	352	100.0%	13.3%
	Stop Bar Detector	1380	0	0	0	19	0	1	0	0	0	20	100.0%	1.4%
All Day Percentage	Advanced Detector	86.7%	**8.6%**	0.2%	0.0%	2.0%	0.0%	0.0%	0.0%	0.0%	2.5%	13.3%		
	Stop Bar Detector	98.6%	0.0%	0.0%	0.0%	1.4%	0.0%	0.1%	0.0%	0.0%	0.0%	1.4%		
All Day Sum Percentage	Advanced Detector	**86.7%**	**10.8%**						2.5%			13.3%		
	Stop Bar Detector	**98.6%**	1.4%						0.0%			1.4%		

Table 3-41 shows that the correct detections of advanced detectors and stop-bar detectors were 86.7% and 98.6% overall, 90.3% and 99.7% in daytime, 73.2% and 94.4% in nighttime, respectively. Similar to the other intersection, snow conditions resulted in higher number of false and missed detections besides the other two leading factors of "vehicles in adjacent lanes" and "headlights". Nighttime appeared to have mainly affected the overall performance, contributing 42.9% and 85.5% of all the errors by the two types of detectors. However, the poor performance was mainly due to snow conditions; therefore, no particular recommendations have been made.

3) Overview Traficon Performance

Table 3-42 to Table 3-44 provide the overall performance by Traficon for the two intersections. The following major observations can be made based on the results:

- For the two intersections with Traficon, nighttime exhibited significantly decreased performance as compared to daytime. The correct detections during daytime were 92.5% and 96.3% for advanced detectors and stop-bar detectors, respectively. The numbers for nighttime were only 62.3% and 87.5%. The poor performance at night was mainly due to snow conditions.
- Stop-bar detectors generally showed slightly better performance (accuracy of 94.1%) than advanced detectors (accuracy of 86.5%).
- Nighttime generally contributed the highest number of untrue detections. For example, nighttime contributed 55.8% and 52.7% of all the untrue detections with advanced detectors and stop-bar detectors, respectively. The relative errors were also the highest in nighttime (36.8% and 12.5%). The results suggest that snow had more impact at night than during the day.
- False detection was the primary erroneous detection type during daytime while missed detection was the primary erroneous detection type during nighttime.

Table 3-42 Traficon Performance for Through Movement Lanes at the Two Intersections

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	781	53	0	4	6	0	2	0	0	57	122	19.6%	13.5%
	Stop Bar Detector	205	2	0	0	5	0	5	0	0	0	12	16.4%	5.5%
MD	Advanced Detector	1228	51	0	1	0	0	0	0	5	6	63	10.1%	4.9%
	Stop Bar Detector	240	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
PM	Advanced Detector	1352	68	0	1	0	0	0	0	2	19	90	14.5%	6.2%
	Stop Bar Detector	274	17	4	2	0	3	0	0	0	0	26	35.6%	8.7%
Day Time	Advanced Detector	3361	172	0	6	6	0	2	0	7	82	275	44.2%	7.6%
	Stop Bar Detector	719	19	4	2	5	3	5	0	0	0	38	52.1%	5.0%
Day Time Percentage	Advanced Detector	92.4%	**4.7%**	0.0%	0.2%	0.2%	0.0%	0.1%	0.0%	0.2%	**2.3%**	7.6%		
	Stop Bar Detector	95.0%	**2.5%**	0.5%	0.3%	0.7%	0.4%	0.7%	0.0%	0.0%	0.0%	5.0%		
Day Time Sum Percentage	Advanced Detector	**92.4%**	**5.1%**						**2.4%**			7.6%		
	Stop Bar Detector	**95.0%**	**5.0%**						0.0%			5.0%		
Night Time	Advanced Detector	596	58	4	1	55	0	0	0	0	229	347	**55.8%**	**36.8%**
	Stop Bar Detector	202	0	0	3	22	0	10	0	0	0	35	**47.9%**	**14.8%**
Night Time Percentage	Advanced Detector	63.2%	**6.2%**	0.4%	0.1%	**5.8%**	0.0%	0.0%	0.0%	0.0%	**24.3%**	36.8%		
	Stop Bar Detector	85.2%	0.0%	0.0%	1.3%	**9.3%**	0.0%	**4.2%**	0.0%	0.0%	0.0%	14.8%		
Night Time Sum Percentage	Advanced Detector	**63.2%**	**12.5%**						**24.3%**			36.8%		
	Stop Bar Detector	**85.2%**	**14.8%**						0.0%			14.8%		
All Day	Advanced Detector	3957	230	4	7	61	0	2	0	7	311	622	100.0%	13.6%
	Stop Bar Detector	921	19	4	5	27	3	15	0	0	0	73	100.0%	7.3%
All Day Percentage	Advanced Detector	86.4%	**5.0%**	0.1%	0.2%	1.3%	0.0%	0.0%	0.0%	0.2%	**6.8%**	13.6%		
	Stop Bar Detector	92.7%	1.9%	0.4%	0.5%	**2.7%**	0.3%	1.5%	0.0%	0.0%	0.0%	7.3%		
All Day Sum Percentage	Advanced Detector	**86.4%**	**6.6%**						**6.9%**			13.6%		
	Stop Bar Detector	**92.7%**	**7.3%**						0.0%			7.3%		

Table 3-43 Traficon Performance for Left-Turn Lanes at the Two Intersections

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	280	1	0	0	3	0	12	0	0	0	16	28.6%	5.4%
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	332	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
PM	Advanced Detector	36	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	254	2	0	1	0	4	0	0	0	0	7	12.5%	2.7%
Day Time	Advanced Detector	36	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	866	3	0	1	3	4	12	0	0	0	23	41.1%	2.6%
Day Time Percentage	Advanced Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Stop Bar Detector	97.4%	0.3%	0.0%	0.1%	0.3%	0.4%	1.3%	0.0%	0.0%	0.0%	2.6%		
Day Time Sum Percentage	Advanced Detector	**100.0%**	**0.0%**						0.0%			0.0%		
	Stop Bar Detector	**97.4%**	**2.6%**						0.0%			2.6%		
Night Time	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	275	4	0	0	14	0	15	0	0	0	33	**58.9%**	**10.7%**
Night Time Percentage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	0.0%		
	Stop Bar Detector	89.3%	1.3%	0.0%	0.0%	**4.5%**	0.0%	**4.9%**	0.0%	0.0%	0.0%	10.7%		
Night Time Sum Percentage	Advanced Detector	-	**0.0%**						**0.0%**			0.0%		
	Stop Bar Detector	**89.3%**	**10.7%**						0.0%			10.7%		
All Day	Advanced Detector	36	0	0	0	0	0	0	0	0	0	0	-	-
	Stop Bar Detector	1141	7	0	1	17	4	27	0	0	0	56	100.0%	4.7%
All Day Percentage	Advanced Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	Stop Bar Detector	95.3%	0.6%	0.0%	0.1%	**1.4%**	0.3%	**2.3%**	0.0%	0.0%	0.0%	4.7%		
All Day Sum Percentage	Advanced Detector	**100.0%**	**0.0%**						**0.0%**			0.0%		
	Stop Bar Detector	**95.3%**	**4.7%**						0.0%			4.7%		

Table 3-44 Traficon Performance for All Lanes at the Two Intersections

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	781	53	0	4	6	0	2	0	0	57	122	19.6%	13.5%
	Stop Bar Detector	485	3	0	0	8	0	17	0	0	0	28	21.7%	5.5%
MD	Advanced Detector	1228	51	0	1	0	0	0	0	5	6	63	10.1%	4.9%
	Stop Bar Detector	572	0	0	0	0	0	0	0	0	0	0	0.0%	0.0%
PM	Advanced Detector	1388	68	0	1	0	0	0	0	2	19	90	14.5%	6.1%
	Stop Bar Detector	528	19	4	3	0	7	0	0	0	0	33	25.6%	5.9%
Day Time	Advanced Detector	3397	172	0	6	6	0	2	0	7	82	275	44.2%	7.5%
	Stop Bar Detector	1585	22	4	3	8	7	17	0	0	0	61	47.3%	3.7%
Day Time Percentage	Advanced Detector	92.5%	**4.7%**	0.0%	0.2%	0.2%	0.0%	0.1%	0.0%	0.2%	2.2%	7.5%		
	Stop Bar Detector	96.3%	1.3%	0.2%	0.2%	0.5%	0.4%	1.0%	0.0%	0.0%	0.0%	3.7%		
Day Time Sum Percentage	Advanced Detector	**92.5%**	**5.1%**						2.4%			7.5%		
	Stop Bar Detector	**96.3%**	**3.7%**						0.0%			3.7%		
Night Time	Advanced Detector	596	58	4	1	55	0	0	0	0	229	347	**55.8%**	**36.8%**
	Stop Bar Detector	477	4	0	3	36	0	25	0	0	0	68	**52.7%**	**12.5%**
Night Time Percentage	Advanced Detector	63.2%	**6.2%**	0.4%	0.1%	**5.8%**	0.0%	0.0%	0.0%	0.0%	**24.3%**	36.8%		
	Stop Bar Detector	87.5%	0.7%	0.0%	0.6%	**6.6%**	0.0%	4.6%	0.0%	0.0%	0.0%	12.5%		
Night Time Sum Percentage	Advanced Detector	**63.2%**	**12.5%**						**24.3%**			36.8%		
	Stop Bar Detector	**87.5%**	**12.5%**						0.0%			12.5%		
All Day	Advanced Detector	3993	230	4	7	61	0	2	0	7	311	622	100.0%	13.5%
	Stop Bar Detector	2062	26	4	6	44	7	42	0	0	0	129	100.0%	5.9%
All Day Percentage	Advanced Detector	86.5%	**5.0%**	0.1%	0.2%	1.3%	0.0%	0.0%	0.0%	0.2%	**6.7%**	13.5%		
	Stop Bar Detector	94.1%	1.2%	0.2%	0.3%	**2.0%**	0.3%	**1.9%**	0.0%	0.0%	0.0%	5.9%		
All Day Sum Percentage	Advanced Detector	**86.5%**	**6.6%**						**6.9%**			13.5%		
	Stop Bar Detector	**94.1%**	**5.9%**						0.0%			5.9%		

3.2.4. Performance Summary of all Three VIVDSs

The detection performance for all three VIVDSs is presented in Tables 3-45 and 3-46 and Figures 3-31 to 3-33. Table 3-45 provides an aggregated summary of all three VIVDS performances at the ten analyzed intersections, while Table 3-46 and Figures 3-31 to 3-33 illustrate each individual VIVDS performance. Major findings based on the results of these tables and figures are summarized below:

- On average, the three VIVDSs achieved 89.5% accuracy with advanced detectors and 96.3% accuracy with stop-bar detectors. These same measures were 91.2% and 97.1% during daytime; and 80.3% and 93.9% during nighttime. These numbers were in line with what has been found in the literature, although they were generally on the higher end. The numbers also showed that stop-bar detectors generally achieved better performance than advanced detectors.

- Although the above results show better performance during daytime than nighttime, the data may be biased by the two intersections that used the Traficon system where snow conditions significantly affected the detection system. Excluding these two intersections, the difference between daytime and nighttime becomes negligible.

- False detection was the primary source of error with VIVDSs compared with missed detection. Although nighttime results showed higher proportion of missed detection too, the data was mainly due to the two intersections that used the Traficon system where snow conditions existed. A significantly higher number of missed detections occurred at the two intersections at night because of snow conditions.

- The major contributing factors to the detection errors were “vehicles in adjacent lanes”, “headlights”, “wind”, and “others-snow”. The factor of “vehicles in adjacent lanes” was the leading cause of false detection during daytime, while

"headlights" was the main cause of false detection at night. Although the sites used in this study exhibited limited variability of weather-related conditions, the snow condition at two intersections showed significant impact on the VIVDS with a high number of missed detections at night.

- By examining the performance of the three VIVDSs, the results were similar except for the Traficon system. The snow conditions discussed previously was the main cause of its poor performance, which should not be judged and compared with the other two systems. Between Autoscope and Vantage, Vantage produced slightly better results than Autoscope. However, the less optimal performance of Autoscope was mainly due to advanced detectors (accuracy of 89.7%). These advanced detectors were noticed to have improper locations at two intersections. For example, the detectors were not in the center of the travel lanes. It should be mentioned that there are other factors that have not contributed in the analysis such as camera height and offset.

Table 3-45 Overall Performance for all Three VIVDSs

Time Period	Detectors	True Counts	False Detection						Missed Detection			Total Untrue Detection	Percentage	Relative Percentage
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others			
AM	Advanced Detector	2,253	64	0	6	10	0	81	0	1	73	235	14.7%	9.4%
	Stop Bar Detector	2,996	76	7	0	13	2	39	0	1	4	142	29.9%	4.5%
MD	Advanced Detector	4,669	81	0	5	0	134	64	0	7	17	308	19.3%	6.2%
	Stop Bar Detector	3,256	25	0	5	0	8	28	0	0	3	69	14.5%	2.1%
PM	Advanced Detector	4,759	226	0	4	0	267	45	0	3	38	583	36.6%	10.9%
	Stop Bar Detector	3,078	34	5	6	4	7	10	0	0	5	71	14.9%	2.3%
Day Time	Advanced Detector	11681	371	0	15	10	401	190	0	11	128	1126	70.6%	8.8%
	Stop Bar Detector	9330	135	12	11	17	17	77	0	1	12	282	59.4%	2.9%
Day Time Percentage	Advanced Detector	91.2%	**2.9%**	0.0%	0.1%	0.1%	**3.1%**	1.5%	0.0%	0.1%	1.0%	8.8%		
	Stop Bar Detector	97.1%	**1.4%**	0.1%	0.1%	0.2%	0.2%	0.8%	0.0%	0.0%	0.1%	2.9%		
Day Time Sum Percentage	Advanced Detector	91.2%	**7.7%**						1.1%			8.8%		
	Stop Bar Detector	97.1%	**2.8%**						0.1%			2.9%		
Night Time	Advanced Detector	1,916	64	4	3	128	3	22	0	1	244	469	**29.4%**	**19.7%**
	Stop Bar Detector	2,971	21	2	6	126	0	35	0	3	0	193	**40.6%**	**6.1%**
Night Time Percentage	Advanced Detector	80.3%	**2.7%**	0.2%	0.1%	**5.4%**	0.1%	0.9%	0.0%	0.0%	**10.2%**	19.7%		
	Stop Bar Detector	93.9%	0.7%	0.1%	0.2%	**4.0%**	0.0%	1.1%	0.0%	0.1%	0.0%	6.1%		
Night Time Sum Percentage	Advanced Detector	80.3%	**9.4%**						**10.3%**			19.7%		
	Stop Bar Detector	93.9%	**6.0%**						0.1%			6.1%		
All Day	Advanced Detector	13597	435	4	18	138	404	212	0	12	372	1595	100.0%	10.5%
	Stop Bar Detector	12301	156	14	17	143	17	112	0	4	12	475	100.0%	3.7%
All Day Percentage	Advanced Detector	89.5%	**2.9%**	0.0%	0.1%	0.9%	**2.7%**	1.4%	0.0%	0.1%	2.4%	10.5%		
	Stop Bar Detector	96.3%	1.2%	0.1%	0.1%	1.1%	0.1%	0.9%	0.0%	0.0%	0.1%	3.7%		
All Day Sum Percentage	Advanced Detector	89.5%	**8.0%**						**2.5%**			10.5%		
	Stop Bar Detector	96.3%	**3.6%**						0.1%			3.7%		

Table 3-46 Overall Performance of Each VIVDS

Detectors	Detection Type	Autoscope	Vantage	Traficon
Advanced Detector	False Detection	9.6%	0.9%	6.6%
	Missed Detection	0.7%	0.0%	6.9%
	Correct Detection	89.7%	99.1%	86.5%
Stop-Bar Detector	False Detection	2.8%	3.7%	5.9%
	Missed Detection	0.2%	0.0%	0.0%
	Correct Detection	97.0%	96.2%	94.1%

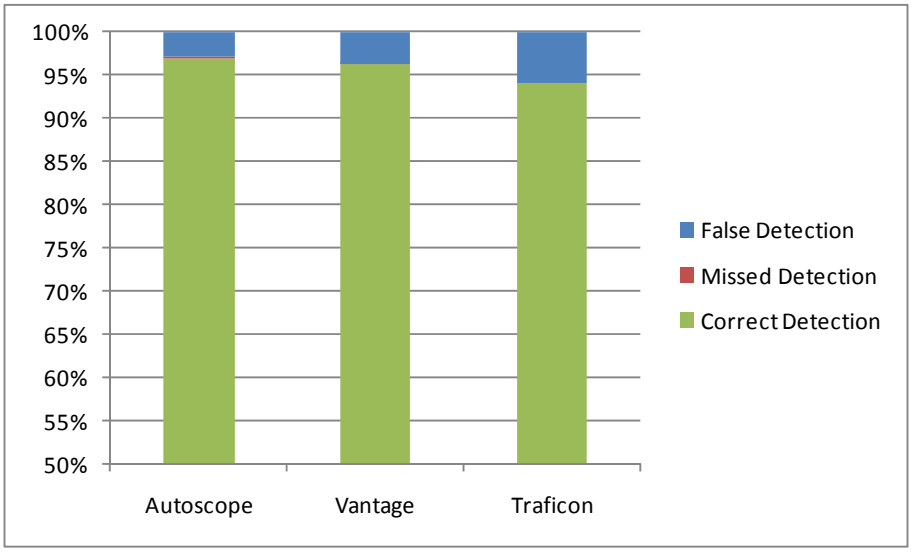

Figure 3-31 Performance of Advanced Detection of Each VIVDS

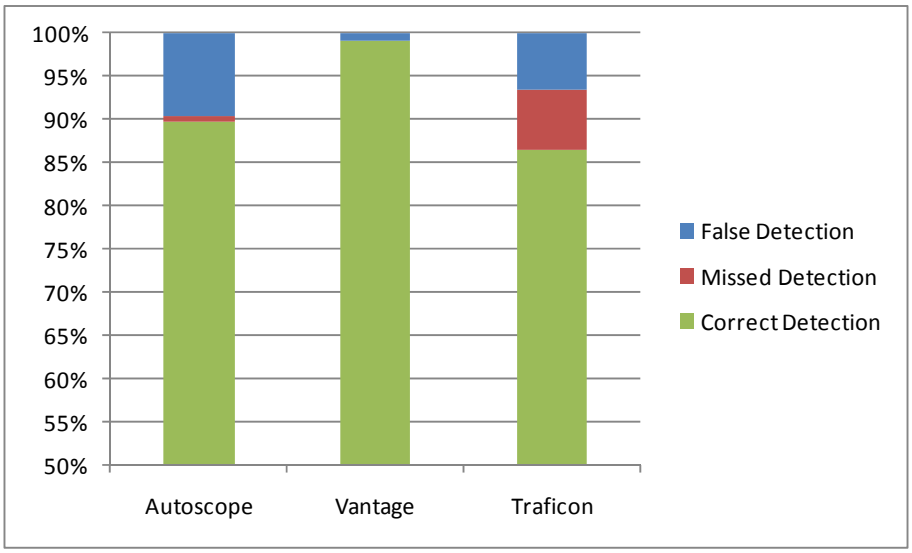

Figure 3-32 Performance of Stop-Bar Detection of Each VIVDS

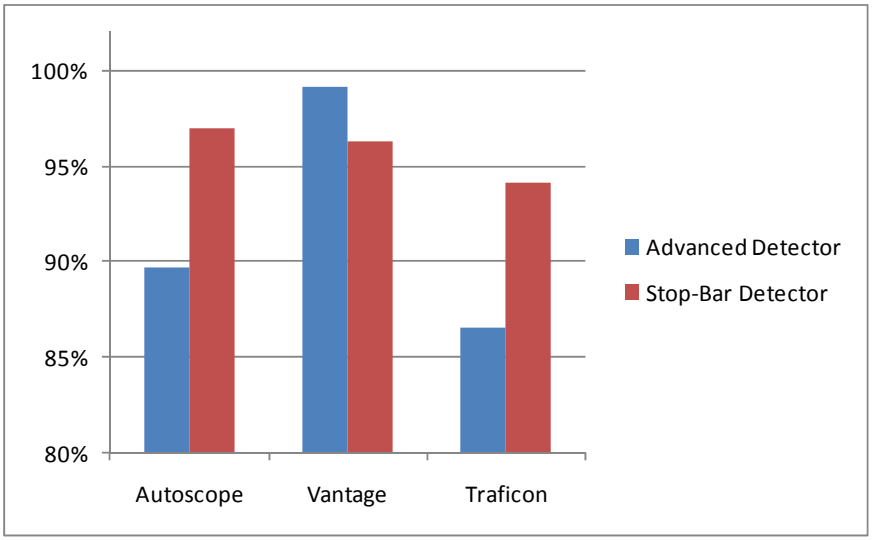

Figure 3-33 Overall Performance of Each VIVDS

4. GUIDELINES FOR VIVDS APPLICATIONS

Some general guidelines were developed for VIVDS applications in Nevada. These guidelines are primarily based on past research and limited findings from this study. The guidelines mainly cover three aspects of VIVDSs: camera setup, detection zone layout, and general calibration and maintenance issues.

4.1. Camera Setup

4.1.1 Camera Height

The camera height has a profound impact on horizontal occlusion (i.e., adjacent-lane occlusion) and longitudinal occlusion (i.e., same-lane occlusion). The minimum camera height is recommended to be between 20 ft and 42 ft to alleviate occlusion occurrences (*15*). In particular, the minimum heights needed to reduce horizontal occlusion are provided in Table 4-1. This table also indicates that the minimum camera height is obtained when a camera is located on a mast arm in the center of an approach. The minimum heights needed for advance detection are presented in Table 4-2. Another simple way to determine the minimum camera height for advanced detection is a "10 ft to 1 ft" rule recommended by several VIVDS manufactures. This rule states that the maximum VIVDS monitoring distance increases 10 ft for every 1 ft increase in camera height (*28*). Reference (*15*) also indicated that a ratio of 17 to 1 can yield acceptable performance. The optimal camera height should be equal to the maximum value in Table 4-1 and Table 4-2 so that both requirements are satisfied.

On the other hand, studies have shown that increasing camera height tends to improve accuracy only if there is no major camera motion (*25*, *29*, *30*). These studies indicate that camera height of 34 ft or more will likely have enough motion to cause false or missed detections unless the camera is fixed on a stable pole.

Table 4-1 Minimum Camera Height to Reduce Horizontal Occlusion (*15*)

Camera Location	Lateral Offset [1], ft	No Left-Turn Lanes			One Left-Turn Lane			Two Left-Turn Lanes		
		Through+Right Lanes [2]			Through+Right Lanes [2]			Through+Right Lanes [2]		
		1	2	3	1	2	3	1	2	3
		Minimum Camera Height (H_o) [3,4], ft								
Left Side of Approach	-75	54	50	45	59	54	50	63	59	54
	-65	47	42	38	51	47	42	56	51	47
	-55	39	35	30	44	39	35	48	44	39
	-45	32	27	23	36	32	27	41	36	32
	-35	24	20	20	29	24	20	33	29	24
	-25	20	20	20	21	20	20	26	21	20
	-15	20	20	20	20	20	20	20	20	20
	-5	20	20	20	20	20	20	20	20	20
Center	0	20	20	20	20	20	20	20	20	20
Right Side of Approach	5	20	20	20	20	20	20	20	20	20
	15	20	20	20	20	20	23	20	20	20
	25	20	20	20	21	26	30	20	21	26
	35	20	20	20	29	33	38	24	29	33
	45	20	20	20	36	41	45	32	36	41
	55	20	20	20	44	48	53	39	44	48
Left Side (y_v), ft		-3	-9	-15	3	-3	-9	9	3	-3
Right Side (y_v), ft					-3	-9	-15	3	-3	-9

Notes:
1 - Lateral offset of camera measured from the center of the approach traffic lanes (including turn lanes). Cameras to the left of center have a negative offset.
2 - Total number of through and right-turn lanes on the approach.
3 - Based on a vehicle height h_v of 4.5 ft and a vehicle width w_v of 6.0 ft.
4 - Underlined values in each column correspond to typical lateral offsets when the camera is mounted within 10 ft of the edge of traveled way.

Table 4-2 Minimum Camera Height for Advance Detection (*15*)

Distance Between Camera and Stop Line [1], ft	Approach Speed Limit [2], mph			
	45	50	55	60
	Minimum Camera Height (H_o) [3,4], ft			
50	24	26		
60	24	27		
70	25	27		
80	25	28	30	32
90	26	28	31	33
100	27	29	31	34
110	27	30	32	34
120	28	30	32	35
130	28	31	33	35
140	29	31	34	36
150	30	32	34	36
Distance to Furthest Zone (x_1) [5], ft	353	392	431	470

Notes:
1 - Distance between the camera and the stop line, as measured parallel to the direction of travel.
2 - Approach speed limit is assumed to equal the 85th percentile speed V_{85}.
3 - Based on a distance-to-height ratio R of 17:1.
4 - Shaded cells indicate conditions where the stop line is not in view after the lens is zoomed to ensure that the height of a vehicle at the most distant detector is at least 3.0 percent of the vertical image height.
5 - Distances based on 5.0-s travel time at the 95th percentile speed (= 1.07 x V_{85}).

4.1.2 Camera Location

Ideally, the camera should be near the center of the approach being monitored. When left-turn lane(s) exists, the camera should be pointed to the division line of left-turn(s) and through lane(s) (see locations "A" and "B" in Figure 4-1). At locations "A" and "B", the camera is generally mounted 3-5 ft above the signal mast arm. However, the ideal location may not always be possible due to geometric or other intersection constraints. Alternative locations are also shown in Figure 4-1. For example, locations "C" and "D" are where the camera is mounted on luminaries arms or signal poles (*31*).

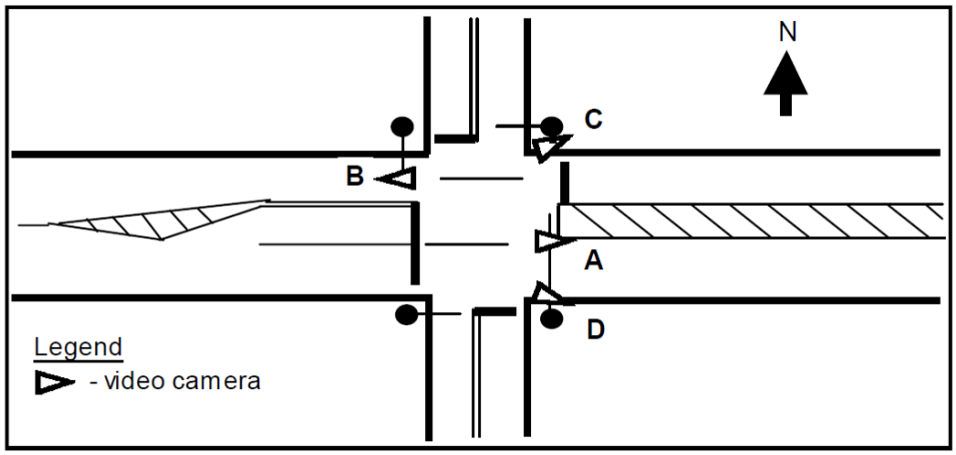

Figure 4-1 Alternative Camera Locations (*31*).

4.1.3 Camera Field of View

An optimal camera field of view is one that the stop line parallels to the bottom edge of view. The optimal view should include all approach traffic lanes and the image size of field of view should be suitable for setting detection zones. Larger vehicle images provide more pixel information for VIVDS processor to analyze, thus more accurate detection can be achieved.

As part of this research effort, the research team developed a quantitative model which

can estimate the probability of false and missed detections caused by longitudinal or horizontal occlusions given certain information such as traffic volume, traffic composition, vehicle height, camera height, and camera offset (*27*). An important finding from this model is that there exist a range of camera height and lateral offset where the performance of VIVDS is not affected, i.e., it would be fruitless trying to further reduce vehicle occlusions by increasing the camera height or by reducing the lateral offset distance.

4.2. Detection Zone Setup

4.2.1 Detection Zone Layout

Similar to inductive loops, VIVDSs support both stop-bar (or stop-line) detection and advanced detection. Stop-bar detection zones are typically used at low-speed intersection approaches. Because VIVDSs generally perceive vehicles longer than their actual size, lower passage time values must be used to achieve efficient phase gap out. Table 4-3 provides the recommended detection location and length with a 0.0 s controller passage time. Table 4-4 has the recommended values for advanced detection.

Table 4-3 Recommended Stop-Line Detection Zone Length (*15*)

Distance Between Camera and Stop Line[1], ft	Camera Height, ft				
	24	28	32	36	40
	Stop-Line Detection Zone Length[2], ft				
50	100	100	100	100	100
100	90	90	95	95	95
150	80	85	85	90	90

Notes:
1 - Distance between the camera and the stop line, as measured parallel to the direction of travel.
2 - Lengths shown are based on a 0.0-s passage time setting.

Table 4-4 Recommended Advanced Detection Zone Layout (*15*)

Approach Speed Limit, mph	Distance to 1st Det. Zone [1], ft	Distance Between Camera and Stop Line [2], ft	Camera Height, ft									
			24	28	32	36	40	24	28	32	36	40
			Distance to 2nd Det. Zone [1], ft					Extension on 2nd Det. Zone, s				
60	470	80	280	295	305	310	315	0.0	0.0	0.0	**0.5**	**0.5**
		150	270	285	295	300	310	0.0	0.0	0.0	0.0	**0.5**
55	430	80	255	265	275	280	285	0.0	0.0	0.0	**0.5**	**0.5**
		150	245	255	265	275	280	0.0	0.0	0.0	0.0	**0.5**
50	390	50	235	245	250	255	260	0.0	0.0	**0.5**	**0.5**	**0.5**
		150	220	230	240	245	250	0.0	0.0	0.0	0.0	**0.5**
45	350	50	210	215	220	225	230	0.0	0.0	**0.5**	**0.5**	**0.5**
		150	190	200	210	215	220	0.0	0.0	0.0	0.0	**0.5**

Notes:
1 - Distances shown are based on a 20-ft detection zone length and a 1.0-s passage time setting.
2 - Distance between the camera and the stop line, as measured parallel to the direction of travel.

4.2.2 Detection Mode

Most VIVDSs provide additional functions to improve detection accuracy. For example, VIVDSs can be set to detect vehicles only in one direction by using directional detectors or detection zones. In addition, VIVDSs provide Boolean functions such as “AND” and “OR” to reduce false detections caused by shadows. Use of such additional functions is typically determined based on site-specific conditions.

4.3. Summary of Guidelines

A summary of the guidelines for VIVDS applications is provided below:

4.3.1 Camera Setup

- Tables 4-1 and 4-2 should be used for determining the minimum camera height based on normal conditions.
- Camera height should not exceed 34 ft unless it is mounted on a stable object to avoid camera movement under windy conditions.
- Figure 4-1 should be referred for camera location with the ideal locations at “A”

or “B” and alternative locations at “C” or “D”.

4.3.2 Detection Setup

- Tables 4-3 and 4-4 should be used to determine detection zone length and location.
- Additional features and functions (e.g., directional detector, “AND” and “OR” Boolean functions) should be explored for each VIVDS to reduce false and missed detections.

4.3.3 Calibration and Maintenance

- System calibration may require several revisits of the system after its initial setup to ensure stable operations during all time periods and all weather conditions.
- Camera lens needs to be regularly cleaned to maintain good quality video image. Updating to the latest firmware and software is also necessary for improved performance.

5. SUMMARY AND CONCLUSIONS

Three major VIVDSs, used in Nevada, were evaluated for their performance at signalized intersections: Autoscope by Econolite, Traficon by Traficon N.V., and Vantage by Iteris. A total of ten intersections with 40 approaches were selected for data collection and analysis. These ten intersections were located in the urban areas of Las Vegas, Reno, Carson City, and a rural area in South Lake Tahoe. Videos with detection overlays were collected using two DVRs at these intersections. At least 48 hours of video was collected at each intersection approach; however, due to extensive labor needed to extract the data, only one-hour video of each time period was extracted. The four time periods were: AM peak, MD peak, PM peak, and Night. The number of false detections and missed detections were manually recorded from the videos, which were used as the primary measure for evaluating the three systems. Factors that caused the false or missed detections were also recorded and used for identifying conditions when VIVDSs may experience operational problems. Based on previous research and this study, guidelines were developed that agencies in Nevada can use for VIVDSs applications.

Based on the limited data collected through this project, the following preliminary conclusions were reached:

- On average, the three selected VIVDSs achieved 89.5% accuracy with advanced detectors and 96.3% accuracy with stop-bar detectors. These same measures were 91.2% and 97.1% during daytime; and 80.3% and 93.9% during nighttime. These numbers were in line with what were found in the literature, although some studies have reported much worse results. The numbers also showed that stop-bar detectors generally achieved better performance than advanced detectors.

- Although the above results showed better performance during daytime than nighttime, the data may be biased by the two intersections that used Traficon system where snow conditions significantly affected the operations. When these two intersections were excluded, the difference between daytime and nighttime became negligible.

- False detection was the primary source of error with VIVDSs compared with missed detection. Although nighttime results showed high proportion of missed detection, the data was mainly due to the two intersections that used the Traficon system where snow conditions existed. A significantly higher number of missed detections occurred at the two intersections at night because of snow conditions.

- Major contributing factors to the detection errors were “vehicles in adjacent lanes”, “headlights”, “wind”, and “others-snow”. The factor of “vehicles in adjacent lanes” was the leading cause of false detection during daytime, while “headlights” was the main cause of false detection at night. Although the study sites involved very limited cases of weather-related conditions, the snow condition at two intersections showed significant impact on the VIVDS with a high number of missed detections at night.

- The three VIVDSs produced similar detection accuracy results except for the Traficon system. The snow condition at the two intersections that used Traficon was the main cause of its poor performance, which should not be judged and compared with the other two systems. Between Autoscope and Vantage, Vantage produced slightly better results than Autoscope. However, the less optimal performance of Autoscope was mainly due to issues with the advanced detectors setup. These advanced detectors were noticed to have improper locations at two intersections. For example, the detectors were not in the center of the travel lanes.

There were others that may have not been counted in the analyses such as the camera height and offset.

- Because of the many differences among the study sites, not all influencing factors were considered and analyzed. Therefore, it is important to note that the results presented in this report could only be considered as anecdotal evidences. Standard statistical analysis could not be carried out due to many unquantifiable influencing factors, such as traffic volume, camera height and angle, lighting, wind, sun glare, and other weather-related conditions.

6. REFERENCES

1. Klein, L. A., Mills, M. K., and Gibson, D. *Traffic Detector Handbook: Third Edition-Volume 1*, FHWA-HRT-06-108, Federal Highway Administration, 2006.
2. Econolite, *Autoscope Software Suite User Manual*, 2006 Image Sensing Systems, Inc., 2006.
3. Traficon, *http://www.traficon.com/*, accessed by April 2008.
4. Iteris, *http://www.iteris.com/*, accessed by April 2008.
5. http://www.peek-traffic.com/index.htm accessed by November 2009.
6. Siemens, http://www.industry.siemens.de/traffic/en/news/presseinformationen., htm? newsid=2556 _1457969.htm, accessed by April 2008.
7. Siemens, *http://www.itssiemens.com/*, accessed by April 2008.
8. US Department of Transportation, *Virginia State Route 7 Video Detection System Performance Assessment*, February 2006, http://www.thenewspaper.com/ rlc/docs/2006/fhwa-route7.pdf, Accessed by April 2008.
9. Waterfall, R.C. and Dickinson, K.W. *Image Processing Applied to Traffic: Practical Experience*, Trafic Eng. Contr., pp 60-67, 1984.
10. Houghton, A. D., Hobson, G.S., Seed, N. L. and Rozer, R.C. *Automatic Vehicle Recognition*, in Inst. Elec. Eng. 2nd Int. Conf. Road Traffic Monitoring, Pub. no. 299, 1989, pp.
11. Hoose, N. *Queue Detection Using Computer Image Processing*, in Inst. Elec. Eng. 2nd Int. Conf. Road Traffic Monitoring, pub. No. 299, 1989, pp. 71-78.
12. Beucher, S., Blosseville, J.M. and Lenoir, F. *Traffic Spatial Measurements Using*

Video Image Processing, SPIE Proc. Intelligent Robots and Comp. Vision, vol. 848, 1987.

13. Takaba S. *Measurement of Traffic Flow Using Real-Time Processing of Moving Pictures*, in Proc. IEEE Veh. Technol. Soc. 32nd Annu. Conf., San Diego, CA, 1982, pp. 488-494.

14. Takaba S. *Measurement of Traffic Flow Using Real-Time Processing of Moving Pictures*, in Proc. IEEE Veh. Technol. Soc. 32nd Annu. Conf., San Diego, CA, 1982, pp. 488-494.

15. Bonneson, J. and Abbas, M. *Video Detection For Intersection And Interchange Control*, FHWA/TX-03/4285-1, Texas Transportation Institute, Texas Dept. of Transportation, FHwA, College Station, Tex., 2002.

16. Paul, S. *Evaluation of Non-Intrusive Technologies for Traffic Detection*, Minnesota Department of Transportation, Oct. 2001.

17. Michalopoulos, P.G., *Vehicle Detection Through Video Image Processing: The AUTOSCOPE System*, IEEE Transactions on Vehicular Technology, Vol. 40, No. 1, Feb. 1991, pp. 21-29.

18. Grant, C., Gillis, B. and Guensler, R. *Collection of Vehicle Activity Data by Video Detection for Use in Transportation Planning*, ITS Journal, Volume 5, Number 4, 1999.

19. Lawrence, A., Klein, M. K., and Gibson, D. *Traffic Detector Handbook: Third Edition-Volume 1*, FHWA-HRT-06-108, Federal Highway Administration, 2006.

20. Michalopoulos, P.G., Wolf, B. and Fitch, R., *Development and Evaluation of a Breadboard Video Imaging System for Wide Area Vehicle Detection*, Transportation Research Record No. 1225, 1989, pp. 140-149.

21. Cottrell, B.H. *Evaluation of A Video Image Detection System*, VTRC 94-R22, May 1994. http://ntl.bts.gov/DOCS/cottre.html, accessed by April 2008.

22. Kranig J., E. Minge, and C. Jones, *Field Test of Monitoring of Urban Vehicle Operations Using Non-Intrusive Technologies*, FHWA-PL-97-018, Federal Highway Administration, U.S. Department of Transportation, Washington, D.C., May 1997.

23. Martin, P. T., Feng, Y. and Wang, X. *Detector Technology Evaluation*, University of Utah, 2003.

24. MacCarley, A. *Advanced Traffic Control System Field Operational Test Evaluation: Task C Video Traffic Detection System*, California PATH Research Report: UCB-ITS-PRR-98-32, September 1998.

25. Grenard, J., Bullock, D., and Tarko, A. *Evaluation of Selected Video Detection Systems at Signalized Intersections*, FHWA/IN/JTRP-2001/22, Purdue University, 2001.

26. Martin, P. T., G. Dharmavaram, and A. Stevanovic, *Evaluation of UDOT's Video Detection Systems: System's Performance in Various Test Conditions*, University of Utah Traffic Lab, 2004.

27. Hu, P. and Tian, Z. *Traffic Counting Errors Due to Occlusion in Video Image Vehicle Detection*, Unpublished Yet Until to November 2009.

28. Iteris Vantage, *Video Traffic Detection Systems: Installation and User Guide*. Version 2.2 Iteris, Anaheim, California, April 2000.

29. Autoscope, *Wide Area Video Vehicle Detection System: 2004 Installation Guide.* Econolite Control Products, Inc., Anaheim, California, 2002

30. Traficon, *Video Image Processor Manual*. Version V 3.03. Traficon NV, Meensesteenweg 449/2, B-8501 Kortrijk-Bissegem, Belgium, May 2001.

31. Bonneson, J. and Abbas, M. *Intersection Video Detection Manual*, FHWA/TX-03/4285-2, Texas Transportation Institute, The Texas A&M University Institute, College Station, Tex., 2002.

APPENDIX A

DETAILED RESULTS

Table 0-1A Traffic Data for Every Lane in EB of Intersection S McCarran Blvd/Kietzke Ln-I

Movement		Through																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	62	1	0	0	0	0	0	0	0	0	102	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	9	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	144	0	0	1	0	0	0	0	0	0	96	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	19	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	46	0	0	1	0	0	0	0	0	0	86	3	0	0	0	0	0	0	0	0
	Stop Bar Detector	10	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	19	0	0	0	11	0	0	0	0	0	43	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	20	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	271	1	0	2	11	0	0	0	0	0	327	3	0	0	0	0	0	0	0	0
	Stop Bar Detector	58	0	0	0	0	0	0	0	0	0	50	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	95.1%	0.4%	0.0%	0.7%	3.9%	0.0%	0.0%	0.0%	0.0%	0.0%	99.1%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-2A Traffic Data for Every Lane in EB of Intersection S McCarran Blvd/Kietzke Ln-II

Movement		Through																			
Lanes		Lane 3										Lane 4 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	155	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	156	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	46	0	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	516	6	0	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	127	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	97.7%	1.1%	0.0%	0.4%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-3A Traffic Data for Every Lane in EB of Intersection S McCarran Blvd/Kietzke Ln-III

Movement		Left																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	28	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	128	0	0	1	0	13	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	80	1	0	0	0	35	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	3	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	42	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	216	2	0	1	9	48	0	0	2	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	161	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	77.7%	0.7%	0.0%	0.4%	3.2%	17.3%	0.0%	0.0%	0.7%	0.0%	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	98.2%	1.2%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-4A Traffic Data for Every Lane in WB of Intersection S McCarran Blvd/Kietzke Ln-I

Movement		Through																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	40	1	0	0	0	0	0	0	0	0	67	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	7	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	102	0	0	0	0	0	0	0	0	0	199	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	10	0	0	0	0	0	0	0	0	1	17	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	70	0	0	0	0	0	0	0	0	0	296	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	7	0	0	0	0	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	23	0	0	0	1	0	0	0	0	0	45	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	30	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	235	1	0	0	1	0	0	0	0	0	607	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	54	0	0	0	0	0	0	0	0	1	80	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	99.2%	0.4%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Stop Bar Detector	98.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-5A Traffic Data for Every Lane in WB of Intersection S McCarran Blvd/Kietzke Ln-II

Movement		Through																			
Lanes		Lane 3										Lane 4 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	17	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	230	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	99.1%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-6A Traffic Data for Every Lane in WB of Intersection S McCarran Blvd/Kietzke Ln-III

Movement		Left																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	40	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	216	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	122	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	55	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	355	14	0	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	183	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	95.2%	3.8%	0.0%	0.0%	0.3%	0.0%	0.8%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	98.9%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-7A Traffic Data for Every Lane in SB of Intersection S McCarran Blvd/Kietzke Ln-I

Movement		Through																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	20	0	0	1	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	40	0	0	0	0	0	0	0	0	1	20	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	215	0	0	0	0	0	0	0	0	0	128	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	36	0	0	0	0	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	96	0	0	1	0	0	0	0	0	0	60	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	33	0	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	17	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	42	0	0	0	0	0	0	0	0	0	35	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	348	0	0	2	0	0	0	0	0	0	212	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	151	0	0	0	0	0	0	0	0	1	92	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	99.4%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Stop Bar Detector	99.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-8A Traffic Data for Every Lane in SB of Intersection S McCarran Blvd/Kietzke Ln-II

Movement		Left																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	18	0	0	1	0	0	0	0	0	0	9	2	0	0	0	0	0	0	0	0
	Stop Bar Detector	29	0	0	0	0	0	0	0	0	0	27	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	83	0	0	0	0	0	0	0	0	0	69	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	18	0	0	0	0	0	0	0	0	0	36	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	68	43	0	0	0	71	0	0	0	0	55	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	24	0	0	0	0	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	20	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	29	0	0	0	1	0	0	0	0	0	52	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	189	43	0	1	0	71	0	0	0	0	150	2	0	0	0	0	0	0	0	0
	Stop Bar Detector	100	0	0	0	1	0	0	0	0	0	136	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	62.2%	14.1%	0.0%	0.3%	0.0%	23.4%	0.0%	0.0%	0.0%	0.0%	98.7%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Stop Bar Detector	99.0%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-9A Traffic Data for Every Lane in NB of Intersection S McCarran Blvd/Kietzke Ln-I

Movement		Through																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	4	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	8	0	0	0	0	0	0	0	0	0	37	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	55	1	0	0	0	0	0	0	0	0	105	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	21	0	0	0	0	0	0	0	0	0	31	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	23	0	0	0	0	0	0	0	0	0	73	45	0	1	0	0	0	0	0	0
	Stop Bar Detector	17	0	0	0	0	0	0	0	0	0	32	2	0	0	0	0	0	0	0	0
Night	Advanced Detector	5	0	0	0	3	0	0	0	0	0	56	0	0	0	4	0	0	0	0	0
	Stop Bar Detector	13	0	0	0	0	0	0	0	0	0	43	0	0	0	1	0	0	0	0	0
Total	Advanced Detector	87	1	0	0	3	0	0	0	0	0	240	45	0	1	4	0	0	0	0	0
	Stop Bar Detector	59	0	0	0	0	0	0	0	0	0	143	2	0	0	1	0	0	0	0	0
Perce-ntage	Advanced Detector	95.6%	1.1%	0.0%	0.0%	3.3%	0.0%	0.0%	0.0%	0.0%	0.0%	82.8%	15.5%	0.0%	0.3%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	97.9%	1.4%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-10A Traffic Data for Every Lane in NB of Intersection S McCarran Blvd/Kietzke Ln-II

Movement		Left																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	17	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	30	0	0	0	0	0	0	0	0	0	26	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	171	0	0	0	0	0	0	0	0	0	127	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	28	0	0	0	0	0	0	0	0	0	27	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	183	0	0	0	0	0	0	0	0	0	138	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	34	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	33	0	0	0	3	0	0	0	0	0	39	0	0	1	0	0	0	0	0	0
	Stop Bar Detector	41	0	0	0	0	0	0	0	0	0	38	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	404	0	0	0	3	0	0	0	0	0	314	0	0	1	0	0	0	0	0	0
	Stop Bar Detector	133	0	0	0	0	0	0	0	0	0	104	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	99.3%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	99.7%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-11A Traffic Data in EB of Intersection S McCarran Blvd /S Virginia-I

Movement		Through																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	11	1	0	0	0	0	0	0	0	0	12	1	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	11	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	19	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	9	0	0	0	1	0	0	0	0	0	19	0	0	0	2	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	50	1	0	0	1	0	0	0	0	0	68	1	0	0	2	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	96.2%	1.9%	0.0%	0.0%	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	95.8%	1.4%	0.0%	0.0%	2.8%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-12A Traffic Data in EB of Intersection S McCarran Blvd/S Virginia-II

Movement		Through																			
Lanes		Lane 3										Lane 4 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	13	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	31	0	0	0	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	86	6	0	0	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	87.8%	6.1%	0.0%	0.0%	5.1%	0.0%	1.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-13A Traffic Data in EB of Intersection S McCarran Blvd/S Virginia-III

Movement		Left																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	63	1	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	48	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	49	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	65	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	225	1	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	99.6%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-14A Traffic Data in WB of Intersection S McCarran Blvd/S Virginia-I

Movement		Through																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	22	0	0	0	0	0	0	0	0	1	10	0	0	0	0	0	1	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	27	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	19	1	0	0	0	0	0	0	0	0	16	0	1	0	2	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	36	1	0	0	1	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	104	2	0	0	1	0	0	0	0	1	58	0	1	0	2	0	1	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	96.3%	1.9%	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.9%	93.5%	0.0%	1.6%	0.0%	3.2%	0.0%	1.6%	0.0%	0.0%	0.0%

Table 0-15A Traffic Data in WB of Intersection S McCarran Blvd/S Virginia-II

Movement		Through																			
Lanes		Lane 3										Lane 4 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	18	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	19	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	71	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	94.7%	0.0%	0.0%	1.3%	4.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-16A Traffic Data in WB of Intersection S McCarran Blvd/S Virginia-III

Movement		Left																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	24	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	52	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	51	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	44	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	171	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	86.8%	13.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-17A Traffic Data in SB of Intersection S McCarran Blvd/S Virginia-I

Movement		Through																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	30	0	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	31	0	0	0	0	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	34	0	0	0	0	0	0	0	0	0	22	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	37	0	0	0	0	0	0	0	0	0	38	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	132	0	0	0	0	0	0	0	0	0	99	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-18A Traffic Data in SB of Intersection S McCarran Blvd/S Virginia-II

Movement		Left																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	14	0	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	24	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	22	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	15	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	75	0	0	0	0	0	0	0	0	0	46	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-19A Traffic Data in SB of Intersection S McCarran Blvd/S Virginia-III

Movement		Left																			
Lanes		Lane 3										Lane 4 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-20A Traffic Data in NB of Intersection S McCarran Blvd/S Virginia-I

Movement		Through																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	8	3	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	31	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	27	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	29	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	95	3	0	0	0	0	0	0	0	0	35	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	96.9%	3.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-21A Traffic Data in NB of Intersection S McCarran Blvd/S Virginia-II

Movement		Through																			
Lanes		Lane 3										Lane 4									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	14	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	4	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	13	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	12	0	0	0	0	0	0	0	0	0	23	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	43	0	0	0	0	0	0	0	0	0	58	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-22A Traffic Data in NB of Intersection S McCarran Blvd/S Virginia-III

Movement		Left																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	22	21	0	0	0	0	2	0	0	0	5	0	0	0	0	0	1	0	0	0
MD	Advanced Detector	63	5	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	31	2	0	0	0	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	38	28	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	38	1	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	50	1	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	112	35	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	141	25	0	0	0	0	2	0	0	0	55	0	0	0	0	0	1	0	0	0
Perce-ntage	Advanced Detector	73.7%	23.0%	0.0%	0.0%	0.0%	0.0%	3.3%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	83.9%	14.9%	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%	0.0%	0.0%	98.2%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%

Table 0-23A Traffic Data in EB of Intersection McCarran Blvd/Mayberry-I

Movement		Through																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	26	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	39	22	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	51	17	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	9	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	37	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	125	45	0	0	0	0	3	0	0	2	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	204	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	71.4%	25.7%	0.0%	0.0%	0.0%	0.0%	1.7%	0.0%	0.0%	1.1%	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	99.0%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-24A Traffic Data in EB of Intersection McCarran Blvd/Mayberry-II

Movement		Left																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	79	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	209	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	256	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	99.6%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-25A Traffic Data in WB of Intersection McCarran Blvd/Mayberry-I

Movement		Through																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	6	0	0	0	1	0	2	0	0	0	54	0	0	0	1	0	2	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	15	4	0	0	0	0	1	0	0	0	54	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	13	0	0	0	0	0	0	0	0	0	49	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	7	0	0	0	5	0	0	0	0	0	49	0	0	0	4	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	41	4	0	0	6	0	3	0	0	0	206	0	0	0	5	0	2	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	75.9%	7.4%	0.0%	0.0%	11.1%	0.0%	5.6%	0.0%	0.0%	0.0%	96.7%	0.0%	0.0%	0.0%	2.3%	0.0%	0.9%	0.0%	0.0%	0.0%

Table 0-26A Traffic Data in WB of Intersection McCarran Blvd/Mayberry-II

Movement		Left																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	50	1	1	0	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	38	0	0	0	8	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	212	1	1	0	10	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	93.0%	0.4%	0.4%	0.0%	4.4%	0.0%	1.8%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-27A Traffic Data in SB of Intersection McCarran Blvd/Mayberry-I

Movement		Through																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	48	0	0	0	0	0	0	0	0	0	32	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	37	0	0	0	0	0	0	0	0	0	33	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	40	0	0	0	0	0	0	0	0	0	23	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	43	0	0	0	11	0	0	0	0	0	25	0	0	0	2	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	168	0	0	0	11	0	0	0	0	0	113	0	0	0	2	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	93.9%	0.0%	0.0%	0.0%	6.1%	0.0%	0.0%	0.0%	0.0%	0.0%	98.3%	0.0%	0.0%	0.0%	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-28A Traffic Data in SB of Intersection McCarran Blvd/Mayberry-II

Movement		Left																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	67	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	39	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	238	0	0	0	5	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	97.1%	0.0%	0.0%	0.0%	2.0%	0.0%	0.4%	0.0%	0.0%	0.4%	-	-	-	-	-	-	-	-	-	-

Table 0-29A Traffic Data in NB of Intersection McCarran Blvd/Mayberry-I

Movement		Through																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	175	3	0	0	0	0	0	0	0	0
	Stop Bar Detector	48	0	0	0	0	0	0	0	0	0	35	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	241	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	39	0	0	0	0	0	0	0	0	0	36	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	350	3	0	0	0	0	1	0	0	0
	Stop Bar Detector	35	0	0	0	0	0	0	0	0	0	27	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	197	0	0	0	33	0	0	0	0	0
	Stop Bar Detector	51	0	0	0	0	0	0	0	0	0	38	0	0	0	1	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	963	6	0	0	33	0	1	0	0	0
	Stop Bar Detector	173	0	0	0	0	0	0	0	0	0	136	0	0	0	1	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	96.0%	0.6%	0.0%	0.0%	3.3%	0.0%	0.1%	0.0%	0.0%	0.0%
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	99.3%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-30A Traffic Data in NB of Intersection McCarran Blvd/Mayberry-II

Movement		Left																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	8	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	42	19	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	15	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	63	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	13	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	51	1	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	99	0	0	0	1	0	3	0	2	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	213	20	6	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	94.3%	0.0%	0.0%	0.0%	1.0%	0.0%	2.9%	0.0%	1.9%	0.0%	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	88.0%	8.3%	2.5%	0.0%	0.0%	0.0%	1.2%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-31A Traffic Data in EB of Intersection E Serene Ave/Maryland PKWY -I

Movement		Through																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	21	0	0	0	0	0	0	0	0	1	102	0	0	0	0	0	10	0	0	11
	Stop Bar Detector	8	0	0	0	0	0	0	0	0	0	62	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	22	0	0	0	0	0	0	0	0	2	110	0	0	0	0	43	20	0	0	7
	Stop Bar Detector	15	0	0	0	0	0	0	0	0	2	74	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	37	1	0	0	0	0	0	0	0	10	91	0	0	0	0	21	15	0	0	8
	Stop Bar Detector	11	0	0	0	0	0	0	0	0	0	56	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	11	0	0	0	0	0	0	0	0	1	11	0	0	0	0	0	8	0	0	11
	Stop Bar Detector	12	0	0	0	0	0	0	0	0	0	53	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	91	1	0	0	0	0	0	0	0	14	314	0	0	0	0	64	53	0	0	37
	Stop Bar Detector	46	0	0	0	0	0	0	0	0	2	245	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	85.8%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	13.2%	67.1%	0.0%	0.0%	0.0%	0.0%	13.7%	11.3%	0.0%	0.0%	7.9%
	Stop Bar Detector	95.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.2%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-32A Traffic Data in EB of Intersection E Serene Ave/Maryland PKWY -II

Movement		Left																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	38	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	26	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	161	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	97.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	1.2%	-	-	-	-	-	-	-	-	-	-

Table 0-33A Traffic Data in WB of Intersection E Serene Ave/Maryland PKWY -I

Movement		Through																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	72	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	25	0	0	0	0	0	0	0	0	0	35	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	111	0	0	0	0	33	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	22	0	0	1	0	0	0	0	0	0	60	0	0	1	0	0	0	0	0	0
PM	Advanced Detector	119	0	0	0	0	54	5	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	13	0	0	0	0	0	0	0	0	0	52	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	64	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	12	0	0	0	0	0	1	0	0	0	64	0	0	0	1	0	1	0	0	0
Total	Advanced Detector	366	0	0	0	0	90	18	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	72	0	0	1	0	0	1	0	0	0	211	0	0	1	1	0	1	0	0	0
Perce-ntage	Advanced Detector	77.2%	0.0%	0.0%	0.0%	0.0%	####	3.8%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	97.3%	0.0%	0.0%	1.4%	0.0%	0.0%	1.4%	0.0%	0.0%	0.0%	98.6%	0.0%	0.0%	0.5%	0.5%	0.0%	0.5%	0.0%	0.0%	0.0%

Table 0-34A Traffic Data in WB of Intersection E Serene Ave/Maryland PKWY -II

Movement		Left																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	48	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	63	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	62	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	50	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	223	3	0	0	12	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	93.3%	1.3%	0.0%	0.0%	5.0%	0.0%	0.0%	0.0%	0.0%	0.4%	-	-	-	-	-	-	-	-	-	-

Table 0-35A Traffic Data in SB of Intersection E Serene Ave/Maryland PKWY -I

Movement		Through																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	57	0	0	0	0	0	2	0	0	0
	Stop Bar Detector	15	0	0	0	0	0	0	0	0	0	23	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	88	0	0	0	0	19	0	0	0	0
	Stop Bar Detector	21	0	0	0	0	0	0	0	0	0	32	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	145	0	0	0	0	2	0	0	0	0
	Stop Bar Detector	23	0	0	0	0	0	0	0	0	0	23	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	99	0	0	0	1	0	1	0	0	0
	Stop Bar Detector	8	0	0	0	0	0	0	0	0	0	36	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	389	0	0	0	1	21	3	0	0	0
	Stop Bar Detector	67	0	0	0	0	0	0	0	0	0	114	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	94.0%	0.0%	0.0%	0.0%	0.2%	5.1%	0.7%	0.0%	0.0%	0.0%
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-36A Traffic Data in SB of Intersection E Serene Ave/Maryland PKWY-II

Movement		Through																			
Lanes		Lane 3										Lane 4 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	59	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	94	0	0	0	0	13	29	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	154	0	0	0	0	72	14	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	19	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	46	0	0	0	0	0	8	0	1	3	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	35	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	353	0	0	0	0	85	91	0	1	3	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	121	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	66.2%	0.0%	0.0%	0.0%	0.0%	15.9%	17.1%	0.0%	0.2%	0.6%	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	97.6%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	1.6%	-	-	-	-	-	-	-	-	-	-

Table 0-37A Traffic Data in SB of Intersection E Serene Ave/Maryland PKWY-III

Movement		Left																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	161	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-38A Traffic Data in NB of Intersection E Serene Ave/Maryland PKWY-I

Movement		Through																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	101	0	0	0	4	0	1	0	0	3
	Stop Bar Detector	22	0	0	0	0	0	2	0	0	0	25	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	93	0	0	0	0	0	1	0	0	0
	Stop Bar Detector	36	0	0	0	0	0	0	0	0	0	29	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	108	0	0	0	0	9	0	0	0	1
	Stop Bar Detector	31	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	86	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	16	0	0	0	0	0	0	0	0	0	33	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	388	0	0	0	4	9	2	0	0	4
	Stop Bar Detector	105	0	0	0	0	0	2	0	0	0	100	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	95.3%	0.0%	0.0%	0.0%	1.0%	2.2%	0.5%	0.0%	0.0%	1.0%
	Stop Bar Detector	98.1%	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-39A Traffic Data in NB of Intersection E Serene Ave/Maryland PKWY-II

Movement		Through																			
Lanes		Lane 3										Lane 4 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	50	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	23	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	83	0	0	0	0	13	5	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	90	0	0	0	0	3	5	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	59	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	282	0	0	0	0	16	17	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	92	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	89.5%	0.0%	0.0%	0.0%	0.0%	5.1%	5.4%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	98.9%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-40A Traffic Data in NB of Intersection E Serene Ave/Maryland PKWY-III

Movement		Left																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	9	0	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	8	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	11	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	69	0	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	84.6%	0.0%	0.0%	0.0%	0.0%	0.0%	7.7%	0.0%	0.0%	7.7%	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	95.8%	0.0%	0.0%	0.0%	0.0%	2.8%	0.0%	0.0%	0.0%	1.4%	-	-	-	-	-	-	-	-	-	-

Table 0-41A Traffic Data in EB of Intersection S Sallman Rd/Fairview Dr-I

Movement		Through																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	65	0	0	0	0	0	0	0	0	0	62	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	44	0	0	0	0	0	0	0	0	0	68	0	0	1	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	42	0	0	0	0	0	0	0	0	0	49	0	0	1	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	25	0	0	0	0	0	0	0	0	0	43	0	0	1	2	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	176	0	0	0	0	0	0	0	0	0	222	0	0	3	2	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	97.8%	0.0%	0.0%	1.3%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-42A Traffic Data in EB of Intersection S Sallman Rd/Fairview Dr-II

Movement		Left																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	228	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-43A Traffic Data in WB of Intersection S Sallman Rd/Fairview Dr-I

Movement		Through																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	67	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	93	5	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	86	1	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	77	6	2	1	10	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	323	17	2	2	12	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	90.2%	4.7%	0.6%	0.6%	3.4%	0.3%	0.3%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-44A Traffic Data in WB of Intersection S Sallman Rd/Fairview Dr-II

Movement		Left																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	55	1	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	44	6	0	0	0	7	27	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	46	5	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	5	1	0	0	12	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	150	13	0	0	12	7	46	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	65.8%	5.7%	0.0%	0.0%	5.3%	3.1%	20.2%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-45A Traffic Data in WB of Intersection N Carson St./ Medical Pkwy -I

Movement		Through																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	158	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-46A Traffic Data in WB of Intersection N Carson St./ Medical Pkwy -II

Movement		Left																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	32	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	157	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	99.4%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-47A Traffic Data in NB of Intersection N Carson St./ Medical Pkwy -I

Movement		Through																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	24	0	0	0	0	0	0	0	0	0	28	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	18	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	22	0	0	0	0	0	0	0	0	0	34	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	19	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	83	0	0	0	0	0	0	0	0	0	102	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-48A Traffic Data in NB of Intersection N Carson St./ Medical Pkwy -II

Movement		Left																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	27	0	0	0	0	0	0	0	0	0	35	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	29	0	0	0	0	0	0	0	0	0	19	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	26	0	0	0	0	0	0	0	0	0	29	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	31	0	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	113	0	0	0	0	0	0	0	0	0	101	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-49A Traffic Data in EB of Intersection S. Dean Martin Dr/W Silverado Ranch Blvd -I

Movement		Through																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	30	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	18	0	0	1	0	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	22	0	0	0	0	0	0	0	0	0	22	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	27	0	0	1	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	97	0	0	2	0	0	0	0	0	0	66	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	98.0%	0.0%	0.0%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-50A Traffic Data in EB of Intersection S. Dean Martin Dr/W Silverado Ranch Blvd -II

Movement		Left																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	113	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	107	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	238	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	372	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	275	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	998	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	298	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	99.9%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-51A Traffic Data in SB of Intersection S. Dean Martin Dr/W Silverado Ranch Blvd -I

Movement		Through																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	34	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	48	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	184	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	98.9%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-52A Traffic Data in SB of Intersection S. Dean Martin Dr/W Silverado Ranch Blvd -II

Movement		Left																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	12	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	88	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	89.8%	0.0%	0.0%	0.0%	0.0%	0.0%	10.2%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-53A Traffic Data in EB of Intersection Koval Lane/Harrah's Venetion -I

Movement		Left																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	21	0	0	0	0	0	0	0	0	0	37	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	11	0	0	0	0	0	0	0	0	0	44	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	22	0	0	0	0	0	0	0	0	0	31	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	11	0	0	0	0	0	0	0	0	0	43	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	65	0	0	0	0	0	0	0	0	0	155	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-54A Traffic Data in WB of Intersection Koval Lane/Harrah's Venetion -I

Movement		Left																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-55A Traffic Data in SB of Intersection Koval Lane/Harrah's Venetion -I

Movement		Through																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	29	0	0	0	0	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	22	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	40	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	43	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	134	0	0	0	0	0	0	0	0	0	58	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-56A Traffic Data in WB of Intersection Lake Parkway/Highway 50-I

Movement		Through																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	2	2	0	0	5	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	15	17	4	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	6	0	0	3	15	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	33	19	4	5	20	3	14	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	33.7%	19.4%	4.1%	5.1%	20.4%	3.1%	14.3%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-57A Traffic Data in WB of Intersection Lake Parkway/Highway 50-II

Movement		Left																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	15	0	0	0	1	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	42	2	0	1	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	49	0	0	0	2	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	154	2	0	1	3	4	27	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	80.6%	1.0%	0.0%	0.5%	1.6%	2.1%	14.1%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-58A Traffic Data in SB of Intersection Lake Parkway/Highway 50-I

Movement		Through																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	141	0	0	3	0	0	1	0	0	23	123	0	0	1	2	0	0	0	0	18
	Stop Bar Detector	8	0	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	324	2	0	0	0	0	0	0	4	2	317	0	0	0	0	0	0	0	1	1
	Stop Bar Detector	48	0	0	0	0	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	277	0	0	1	0	0	0	0	1	2	304	0	0	0	0	0	0	0	1	11
	Stop Bar Detector	41	0	0	0	0	0	0	0	0	0	44	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	69	0	0	0	0	0	0	0	0	123	114	0	0	1	7	0	0	0	0	65
	Stop Bar Detector	50	0	0	0	0	0	0	0	0	0	36	0	0	0	2	0	0	0	0	0
Total	Advanced Detector	811	2	0	4	0	0	1	0	5	150	858	0	0	2	9	0	0	0	2	95
	Stop Bar Detector	147	0	0	0	0	0	0	0	0	0	136	0	0	0	2	0	0	0	0	0
Perce-ntage	Advanced Detector	83.4%	0.2%	0.0%	0.4%	0.0%	0.0%	0.1%	0.0%	0.5%	15.4%	88.2%	0.0%	0.0%	0.2%	0.9%	0.0%	0.0%	0.0%	0.2%	9.8%
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	98.6%	0.0%	0.0%	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-59A Traffic Data in SB of Intersection Lake Parkway/Highway 50-II

Movement		Left																			
Lanes		Lane 1										Lane 2 (None)									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	36	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	48	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	212	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	97.7%	2.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-60A Traffic Data in WB of Intersection Hwy 207/Highway 50-I

Movement		Left																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	63	0	0	0	2	0	0	0	0	0	89	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	29	0	0	0	0	0	0	0	0	0	79	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	17	0	0	0	0	0	0	0	0	0	72	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	87	0	0	0	12	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	196	0	0	0	14	0	0	0	0	0	261	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Stop Bar Detector	93.3%	0.0%	0.0%	0.0%	6.7%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-61A Traffic Data in SB of Intersection Hwy 207/Highway 50-I

Movement		Through																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	135	7	0	0	0	0	1	0	0	14	108	45	0	0	0	0	0	0	0	1
	Stop Bar Detector	57	0	0	0	0	0	0	0	0	0	38	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	240	5	0	0	0	0	0	0	0	1	167	44	0	1	0	0	0	0	0	2
	Stop Bar Detector	52	0	0	0	0	0	0	0	0	0	38	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	214	10	0	0	0	0	0	0	0	3	166	51	0	0	0	0	0	0	0	3
	Stop Bar Detector	48	0	0	0	0	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	108	8	0	0	1	0	0	0	0	41	83	49	4	0	0	0	0	0	0	0
	Stop Bar Detector	34	0	0	0	0	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	697	30	0	0	1	0	1	0	0	59	524	189	4	1	0	0	0	0	0	6
	Stop Bar Detector	191	0	0	0	0	0	0	0	0	0	137	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	88.5%	3.8%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	7.5%	72.4%	26.1%	0.6%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 0-62A Traffic Data in SB of Intersection Hwy 207/Highway 50-II

Movement		Left																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	318	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stop Bar Detector	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-

Table 0-63A Traffic Data in NB of Intersection Hwy 207/Highway 50-I

Movement		Through																			
Lanes		Lane 1										Lane 2									
Time Period	Detectors	True Counts	False Detection						Missed Detection			True Counts	False Detection						Missed Detection		
			Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others		Vehicles in Adjacent Lanes	High Buildings or Trees	Abnormal Driving	Headlights	Wind	Others	Vehicle Ahead	Abnormal Driving	Others
AM	Advanced Detector	129	1	0	0	4	0	0	0	0	1	145	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	35	0	0	0	0	0	1	0	0	0	49	0	0	0	0	0	0	0	0	0
MD	Advanced Detector	93	0	0	0	0	0	0	0	0	0	87	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	23	0	0	0	0	0	0	0	0	0	29	0	0	0	0	0	0	0	0	0
PM	Advanced Detector	204	7	0	0	0	0	0	0	0	0	187	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	29	0	0	0	0	0	0	0	0	0	57	0	0	0	0	0	0	0	0	0
Night	Advanced Detector	95	1	0	0	47	0	0	0	0	0	127	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	16	0	0	0	5	0	0	0	0	0	39	0	0	0	0	0	0	0	0	0
Total	Advanced Detector	521	9	0	0	51	0	0	0	0	1	546	0	0	0	0	0	0	0	0	0
	Stop Bar Detector	103	0	0	0	5	0	1	0	0	0	174	0	0	0	0	0	0	0	0	0
Perce-ntage	Advanced Detector	89.5%	1.5%	0.0%	0.0%	8.8%	0.0%	0.0%	0.0%	0.0%	0.2%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Stop Bar Detector	94.5%	0.0%	0.0%	0.0%	4.6%	0.0%	0.9%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

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