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DEPARTMENT OF CIVIL ENGINEERING
TRANSPORTATION RESEARCH GROUP

OREGON DEPARTMENT OF TRANSPORTATION

Using Archived Data to Measure Operational Benefits of ITS Investments

D R A F T

**Analysis and Validation of Loop Detector Data
In the I-5 Corridor**

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Research Report PSU-CE-TRG-02-03

May, 2002

INTRODUCTION

The Oregon Department of Transportation (ODOT) currently operates an extensive Advanced Traffic Management System (ATMS) in Region 1 (Portland metropolitan area), including 60 closed circuit television (CCTV) cameras, 16 variable message signs, an extensive fiber optics communications system and 90 ramp meters. The system also includes approximately 400 inductive loop detectors. These loop detectors record vehicle count, occupancy and average speed at 20-second intervals.

In order to assist in developing a baseline assessment of the operation of the current loop detectors, the Transportation Research Group at Portland State University has recently begun collaborating with ODOT toward assisting in the evaluation of several portions of their ATMS. In the interest of mining archived ITS data at the most detailed level possible, ODOT has agreed to preserve loop detector data at the 20-second level for approximately one week per month to facilitate detailed analysis. Table 1 shows the data archive established thus far.

The objectives of this report are to describe the results of a preliminary analysis of the performance of the Portland, Oregon loop detector system along a major multimodal commute corridor. This included analyzing the loop detectors data and validation of loop detector with video data (volume and speed). The report has involved collection of loop detector from the Interstate 5/Barbur Boulevard corridor, providing access into downtown Portland from the south. The northbound and southbound corridors were considered in this study.

Figure 1 shows the site as well as the loop detector locations. Twenty-five stations for the northbound corridor and fifteen stations for the southbound corridor were considered in the study.

TABLE 1 ATMS Data Archive

Week day	Month	Day	Year
Friday	January	19	2001
Saturday	January	20	2001
Sunday	January	21	2001
Monday	January	22	2001
Tuesday	January	23	2001
Wednesday	January	24	2001
Thursday	January	25	2001
Friday	January	26	2001
Saturday	January	27	2001
Sunday	January	28	2001
Monday	January	29	2001
Tuesday	January	30	2001
Tuesday	December	13	2001
Wednesday	December	14	2001
Thursday	December	15	2001
Friday	December	16	2001
Saturday	December	17	2001
Sunday	December	18	2001
Monday	December	19	2001
Monday	January	21	2002
Tuesday	January	22	2002
Wednesday	January	23	2002
Thursday	January	24	2002
Friday	January	25	2002
Saturday	January	26	2002
Sunday	January	27	2002
Monday	January	28	2002
Tuesday	January	29	2002
Wednesday	January	30	2002
Sunday	April	14	2002
Monday	April	15	2002
Tuesday	April	16	2002
Wednesday	April	17	2002
Thursday	April	18	2002
Friday	April	19	2002
Saturday	April	20	2002

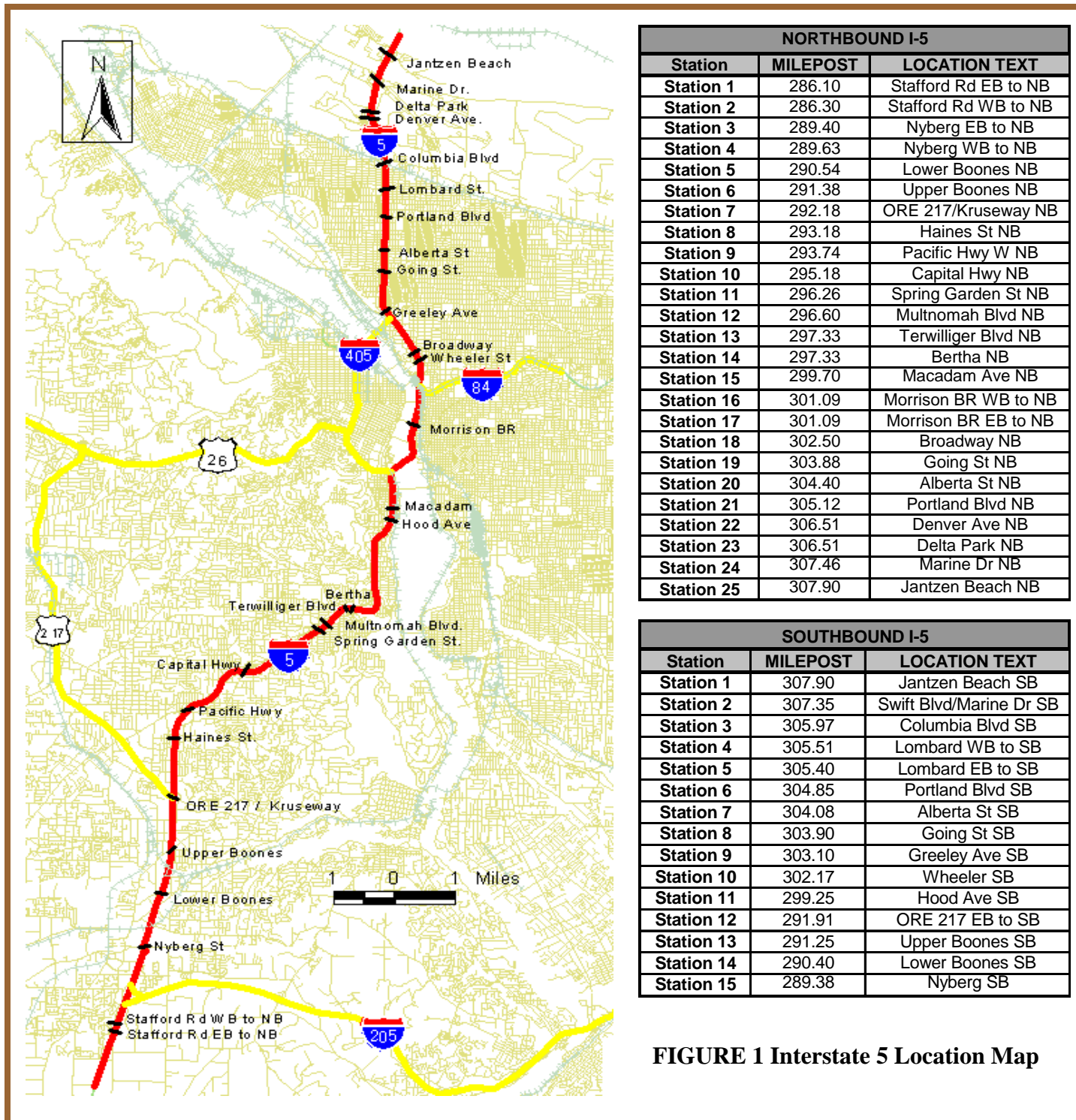


FIGURE 1 Interstate 5 Location Map

LOOP DETECTOR DATA ANALYSIS

The objective is to develop a database of images that will assist in the visualization of traffic conditions on each day in the archive. As a case study, data from Wednesday, December 19, 2001 have been analyzed. This included the observation of 71 loop detectors on the northbound freeway mainline (individual lanes) and 25 loop detectors on the northbound on-ramps. In addition the analysis considered 42 loop detectors on the southbound mainline and 15 loop detectors on the southbound on-ramps. Each loop detector records the count, time mean speed, and occupancy over 20 second intervals. The traffic management software inserts a code into the archived data file when conditions do not result in a valid data point or when communications are lost. The two different types of codes reported in the data are -999 and -1.

Different plotting techniques were used to assist in visualizing the data, including a speed contour diagram shown in Figures 2 and 3 for the northbound and southbound corridor respectively. In the figures the horizontal axis is time, the vertical axis is distance (loop detector stations) and the colors represent speed. In these plots the negative values are shown in blue. To improve visualization, data with -999 or -1 were replaced by -10. On this day, one southbound station (Wheeler, MP 302.17) reported values of 0.

In order to further clarify the visualizations, a filter was applied to remove the negative values, as shown in Figure 4 and 5. The filter used simple averaging techniques to account for a negative value in one lane. If there was a negative reading in one of the lanes, the average speed was calculated using the other lanes. Locations where all lanes included -1, -999 or 0 readings were given the color blue and marked as “No information.”

NORTHBOUND I-5 - 12/19/01



FIGURE 2

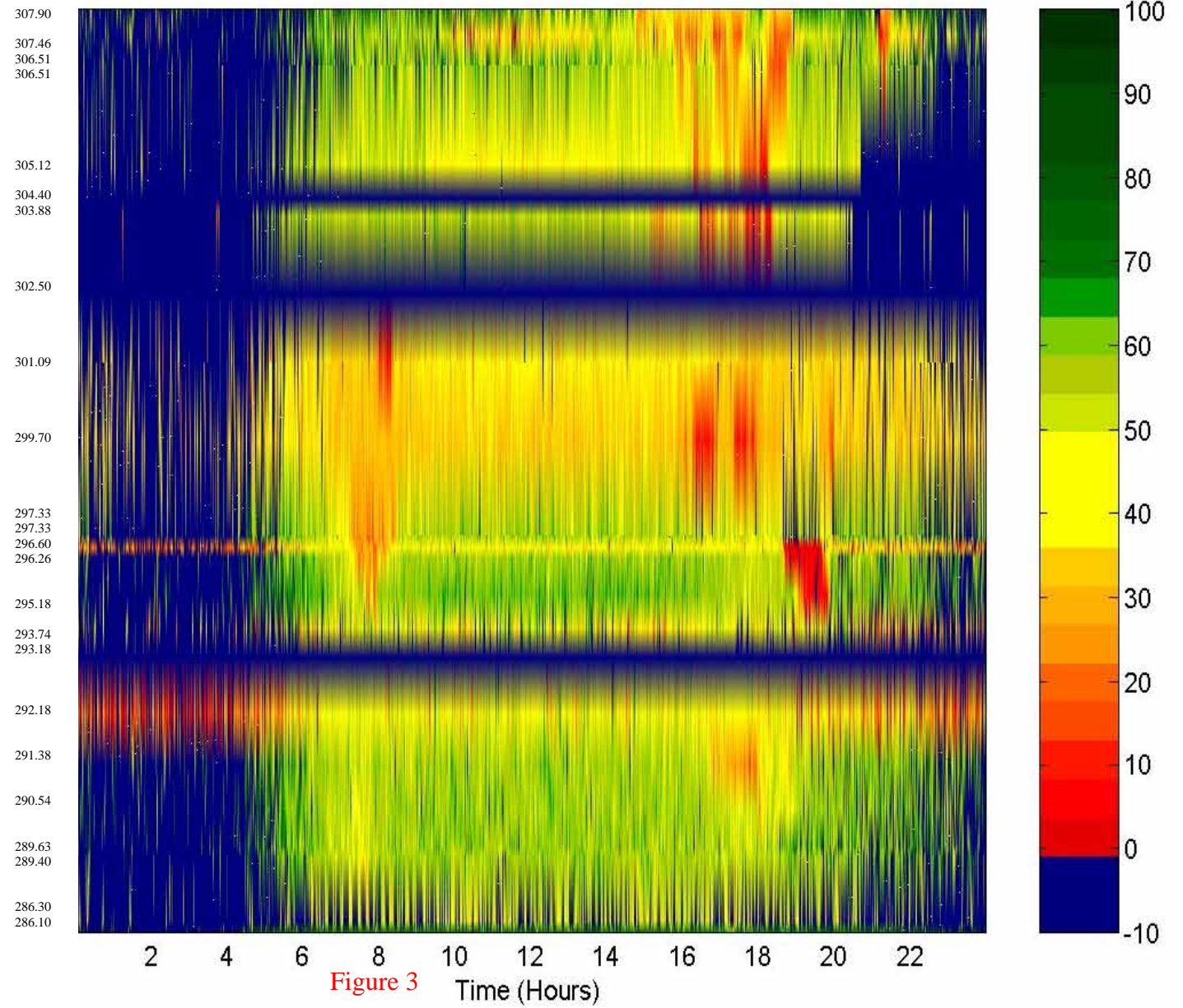
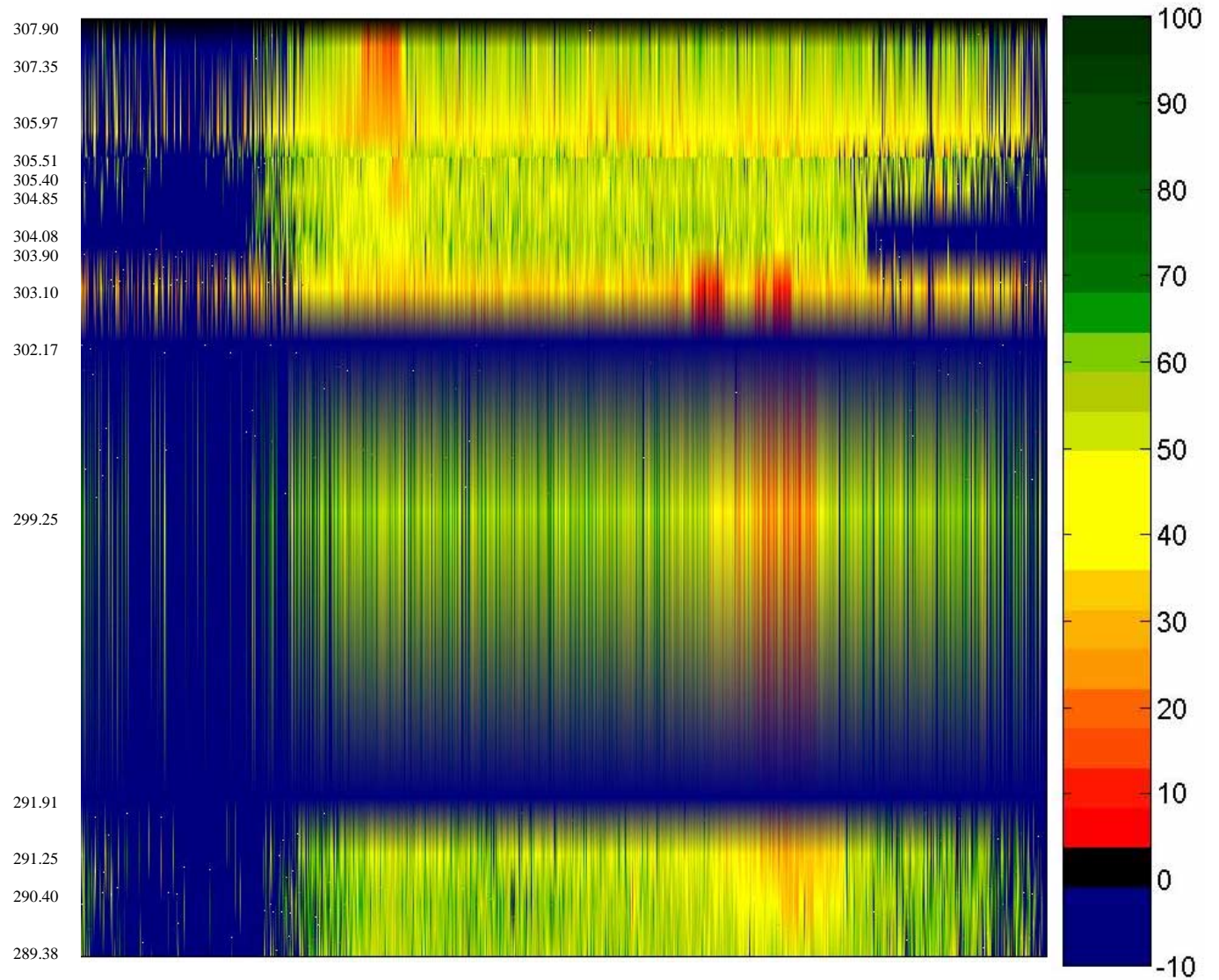


Figure 3 Time (Hours)

- Uncongested
- Restricted Movement
- Heavily Congested
- Negative Readings

SOUTHBOUND I-5 - 12/19/01



Figure



NORTHBOUND I-5 - 12/19/01

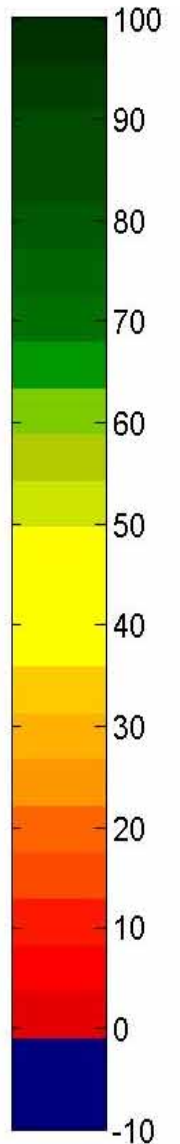
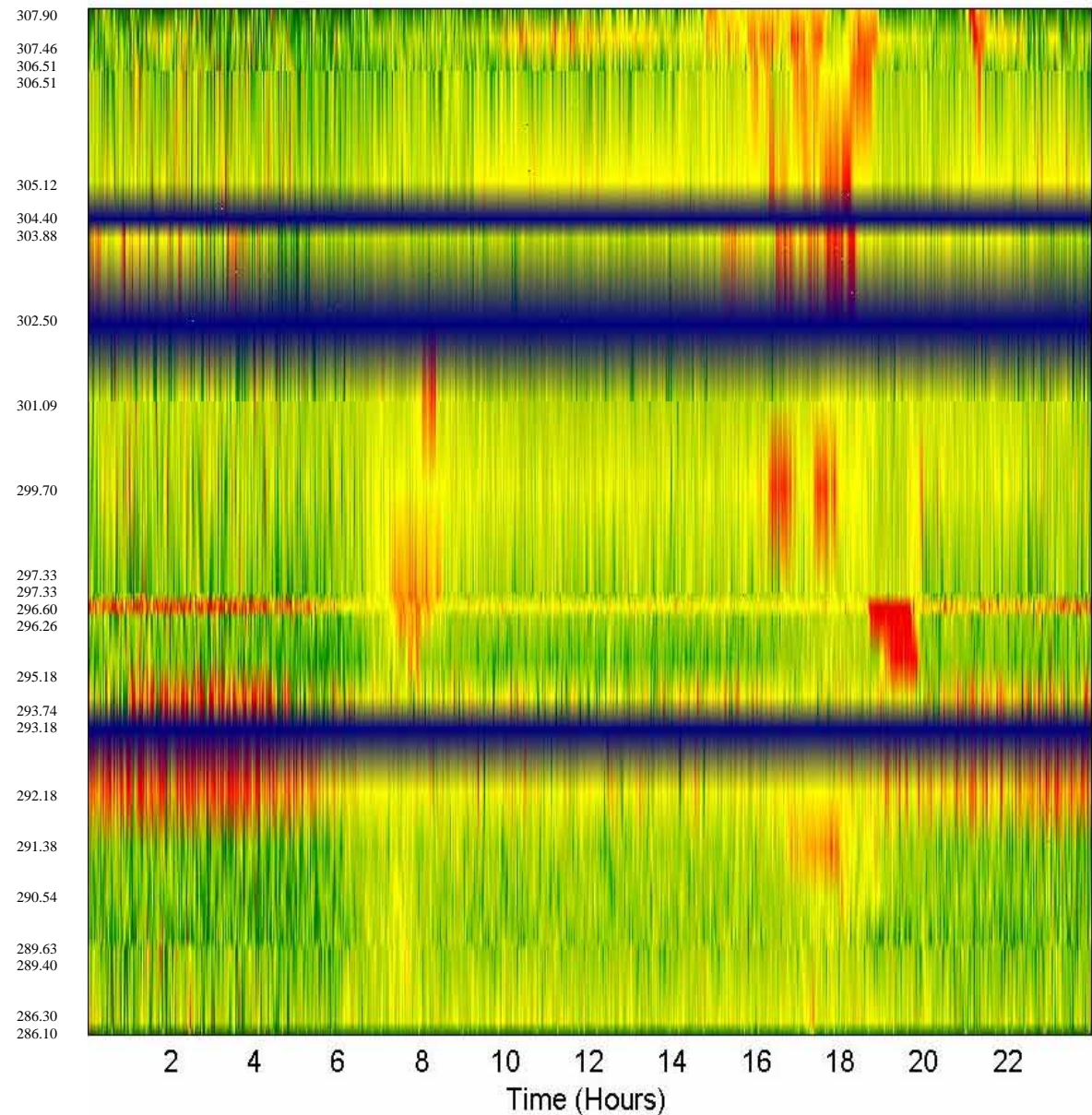


FIGURE 4

■ Uncongested
 ■ Restricted Movement
 ■ Heavily Congested
 ■ No Information

SOUTHBOUND I-5 - 12/19/01

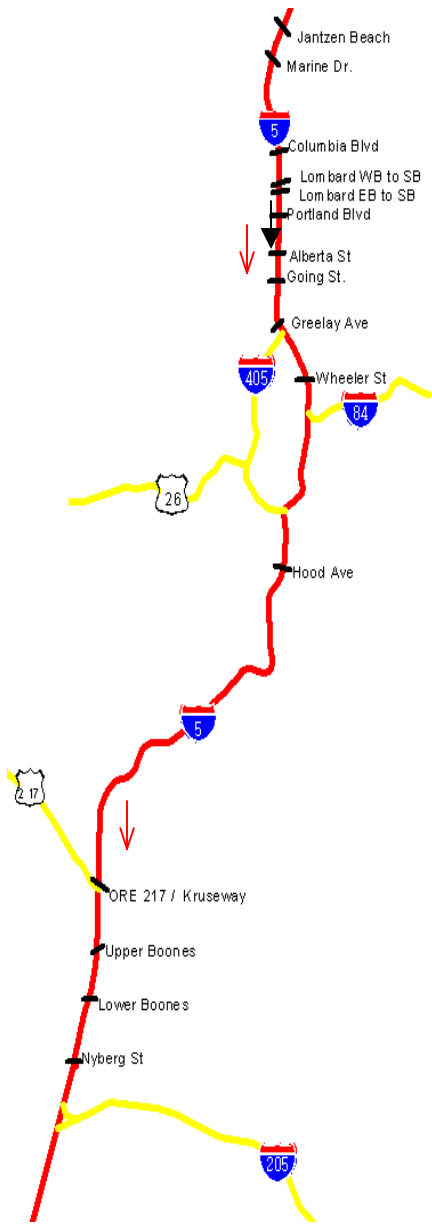
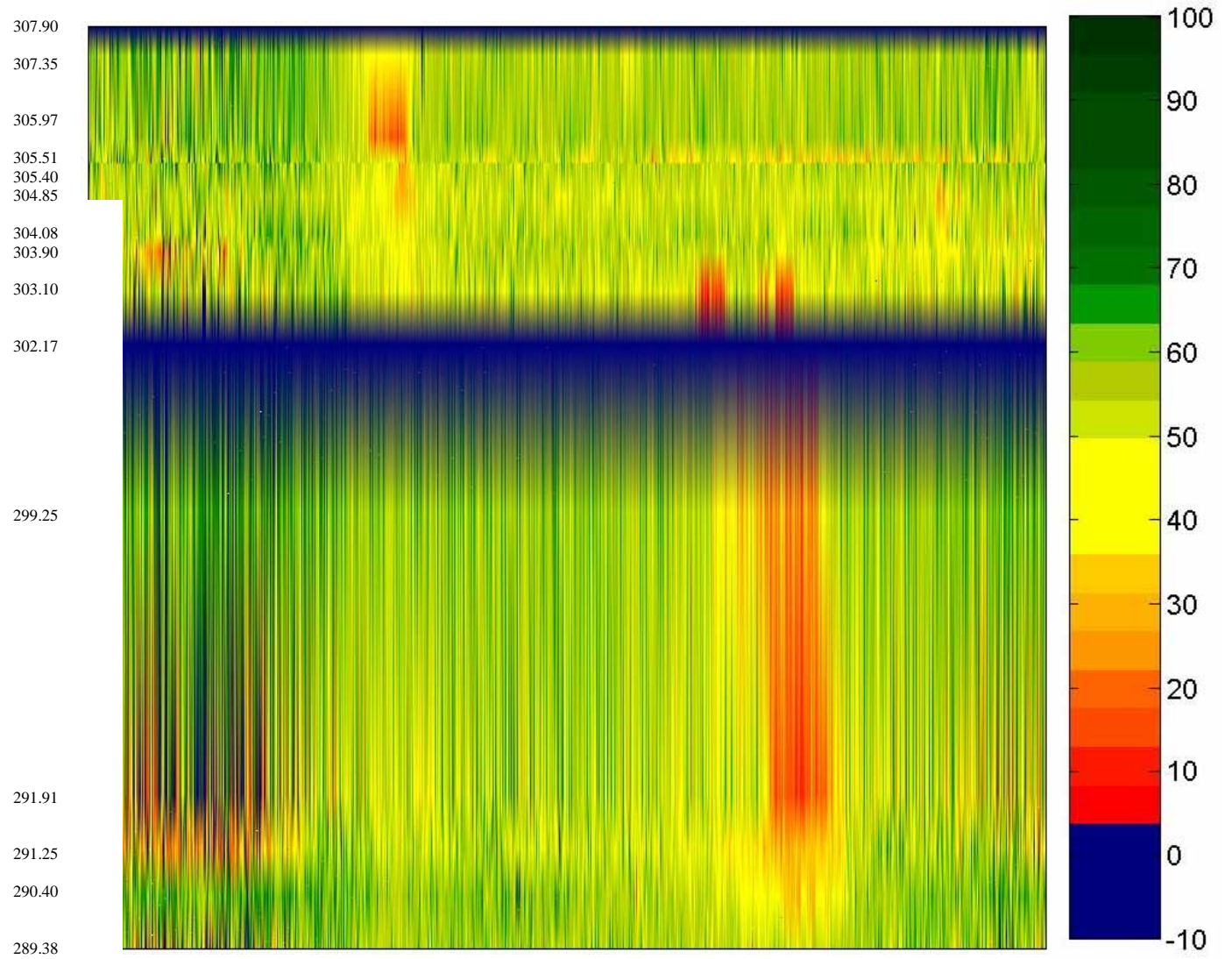


FIGURE 5



■ Uncongested
 ■ Restricted Movement
 ■ Heavily Congested
 ■ No information

In order to understand the sources and impacts of loop detector negative readings, a detailed analysis was performed for one day. Figures 6 and 7 show the total percentage of negative readings on I-5 on the day studied.

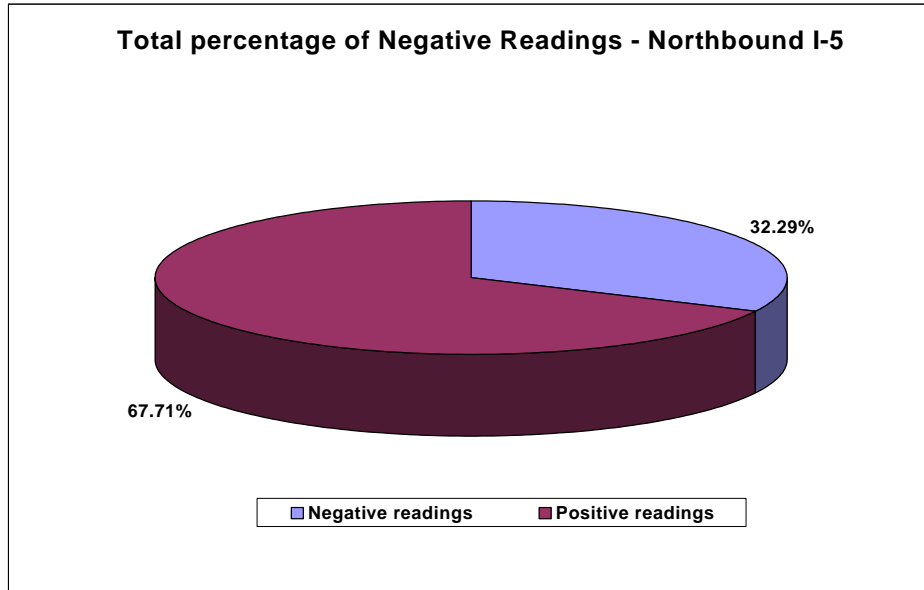


FIGURE 6

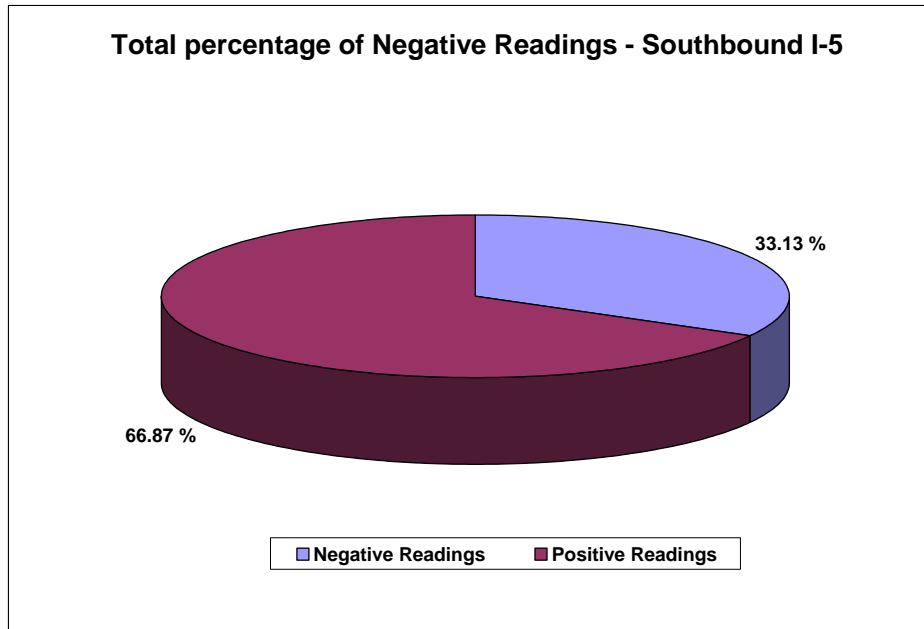


FIGURE 7

There was a great difference in the percentage of negative count values for the ramps and the mainline. Figure 8 and 9 show the distribution of negative readings versus positive readings. For the ramps it can be observed that the negative counts are more than 50% of the total number of counts.

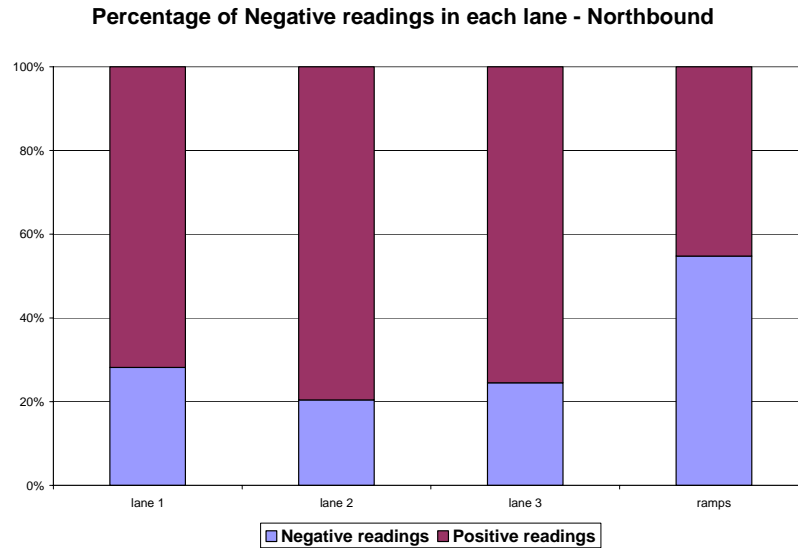


FIGURE 8

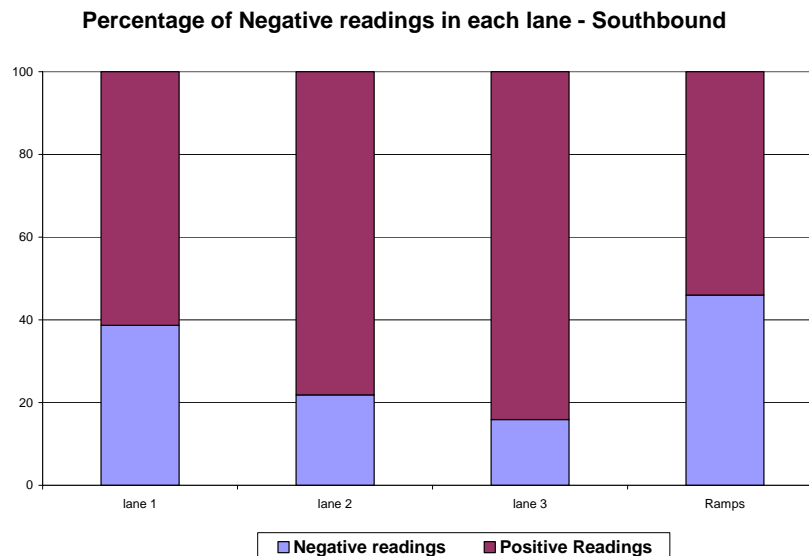


FIGURE 9

A detailed report of negative readings for each detector is included in Appendices 1 and 2 (northbound and southbound respectively). The tables in Appendices 1 and 2 include the loop identification number, the milepost, and the location name in addition to the percentage of negative values.

Individual lanes were also analyzed. Figures 10, 11, 12 and 13 describe the lane-by-lane analysis for northbound I-5 and Figures 14, 15, 16 and 17 describe the lane-by-lane analysis of southbound I-5. There were some loop detectors that reported negative values all day for the northbound and southbound stations; we assumed that these were not functioning during the studied day due to construction or maintenance.

Lane 1 Negative Readings - Northbound

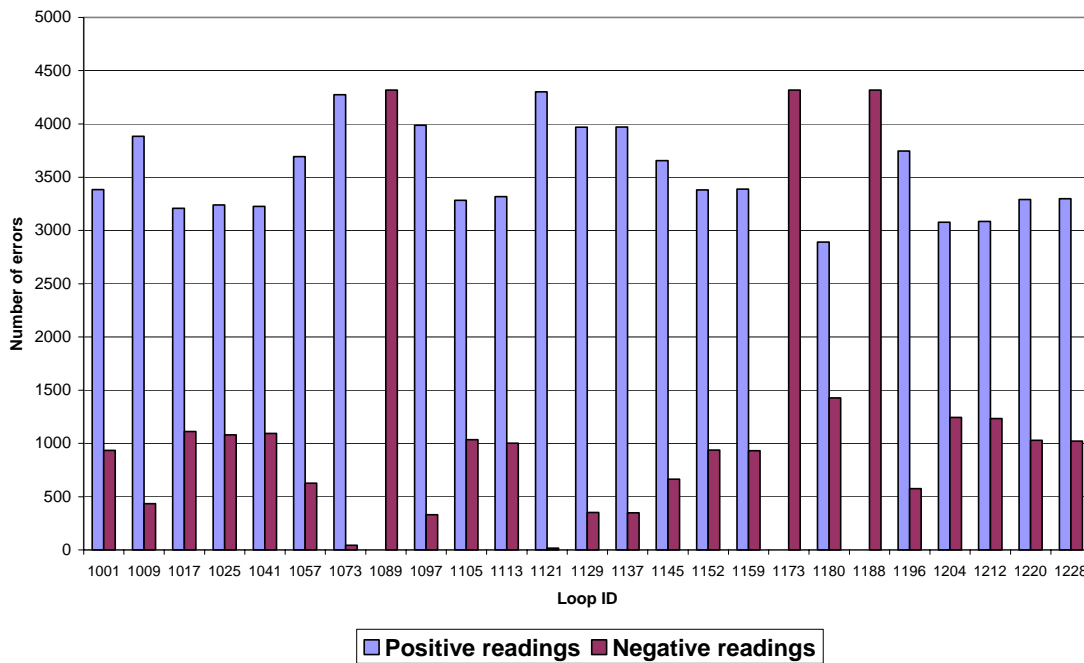


FIGURE 10

Lane 2 Negative Readings - Northbound

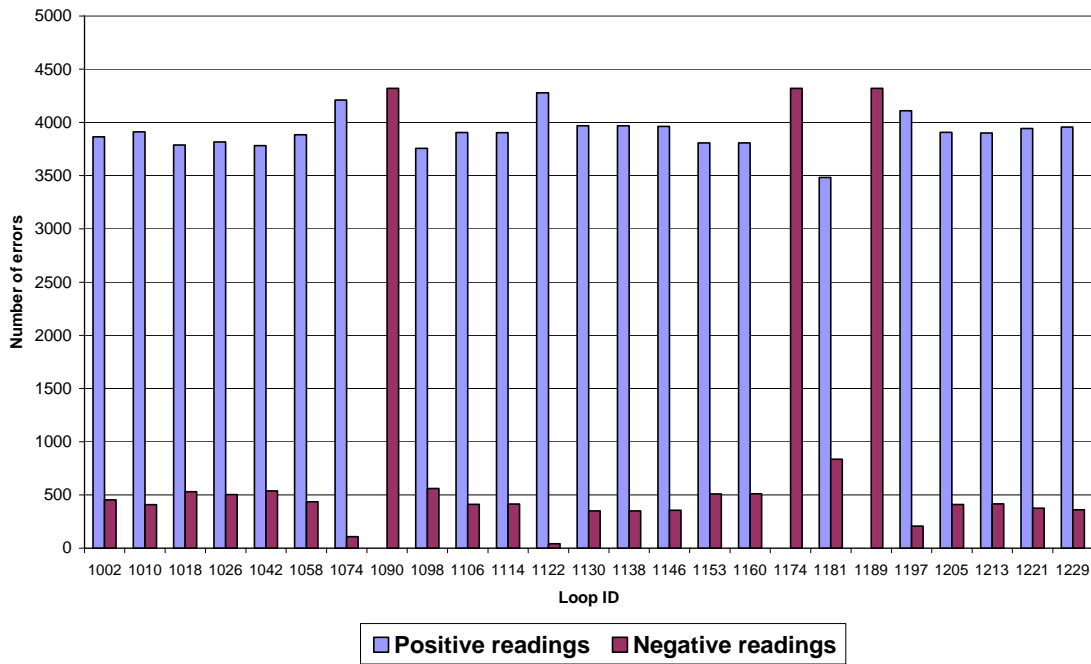


FIGURE 11

Lane 3 Negative Readings - Northbound

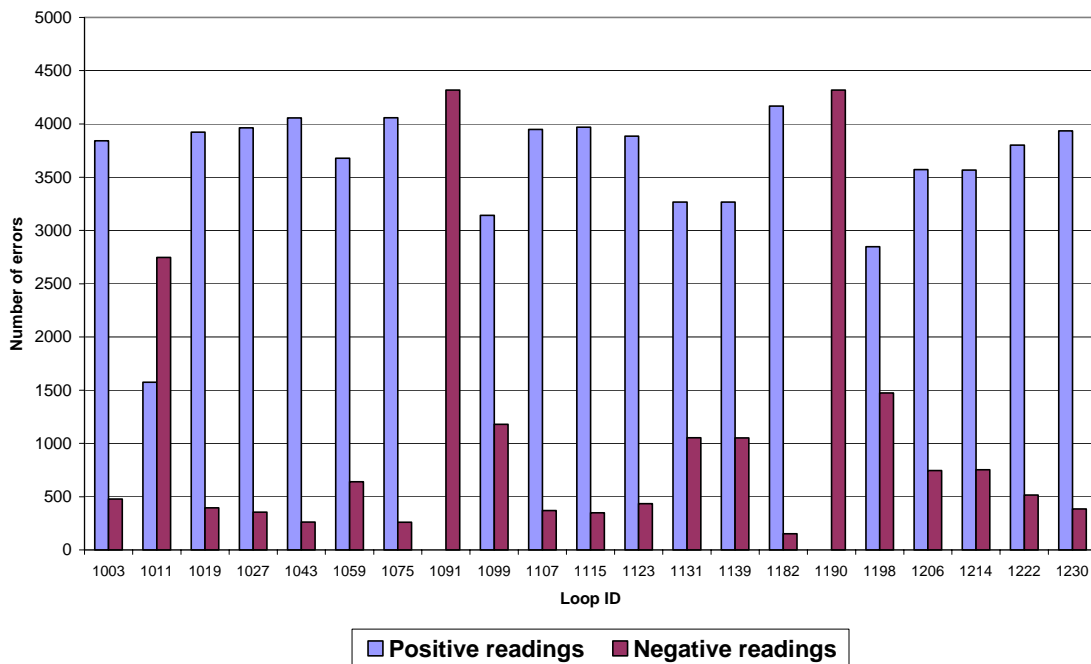


FIGURE 12

Ramps Negative Raedings- Northbound

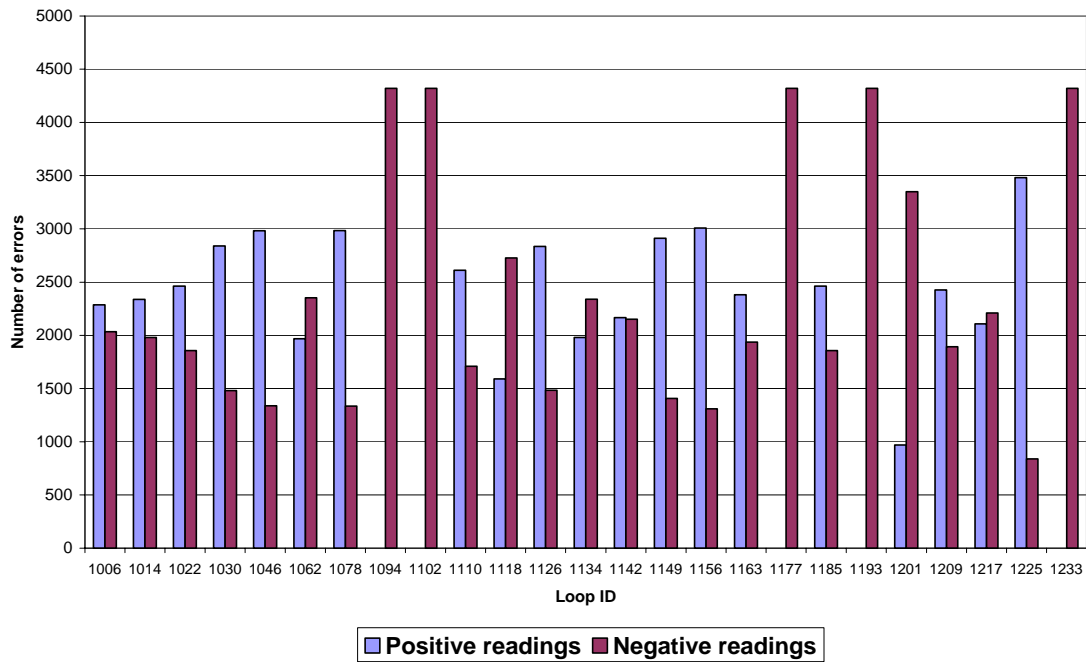


FIGURE 13

Lane 1 Negative Readings - Southbound

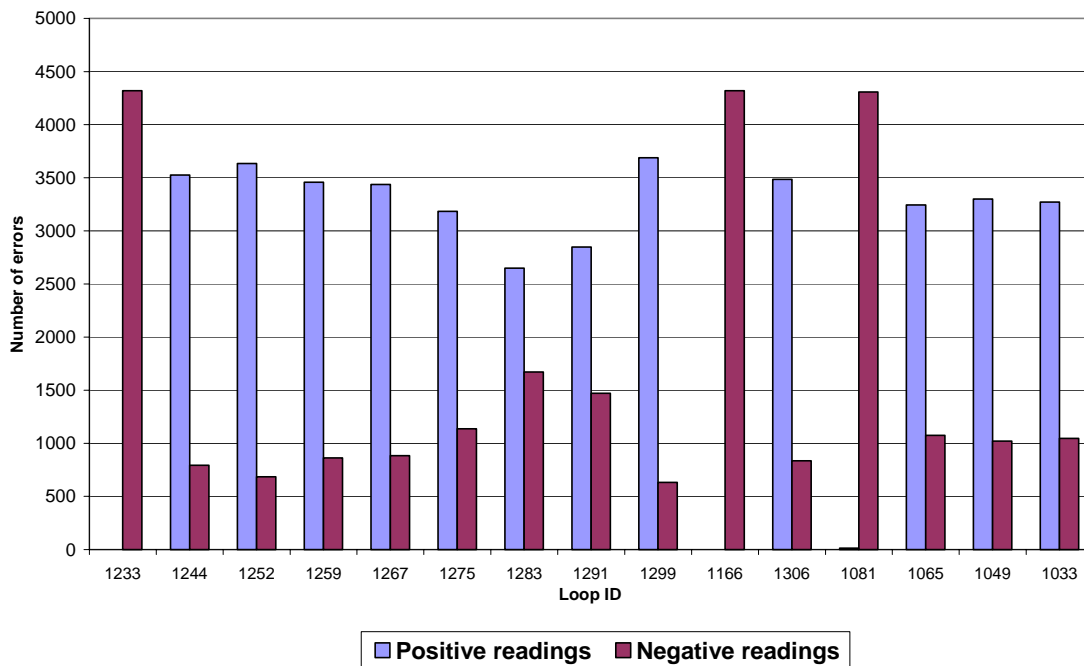


FIGURE 14

Lane 2 Negative Readings - Southbound

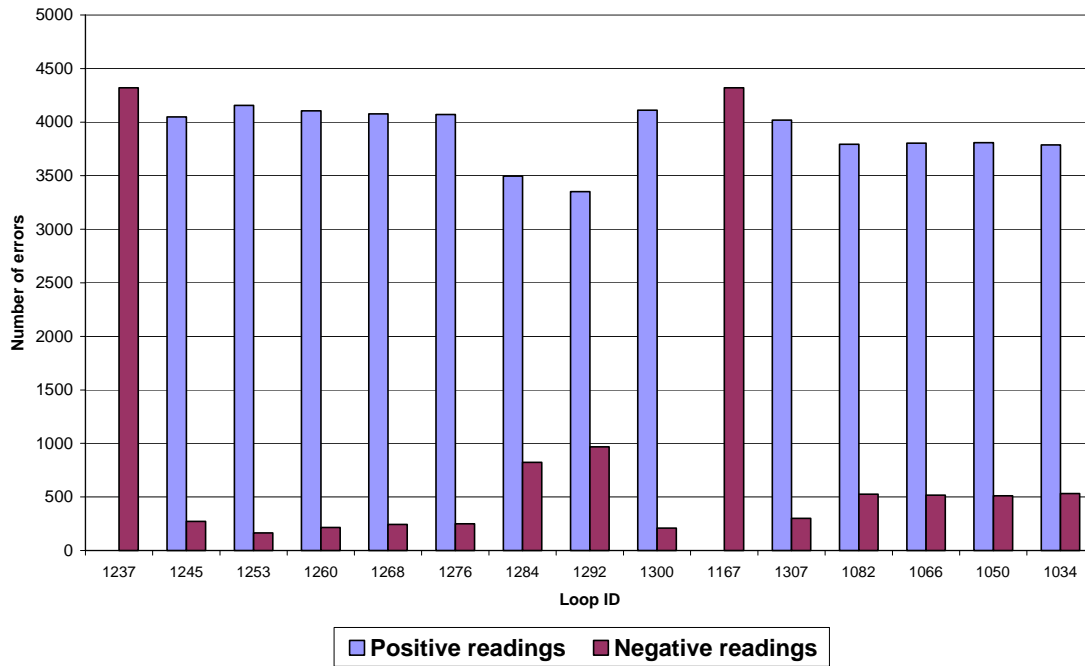


FIGURE 15

Lane 3 Negative Readings - Southbound

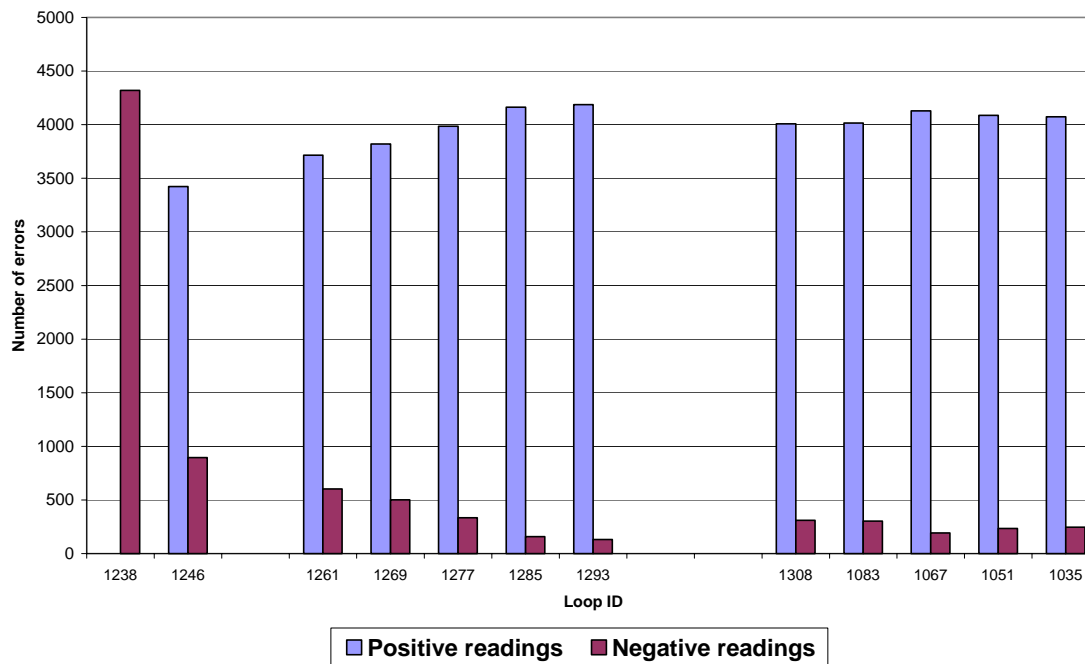


FIGURE 16

Ramps Negative Readings - Southbound

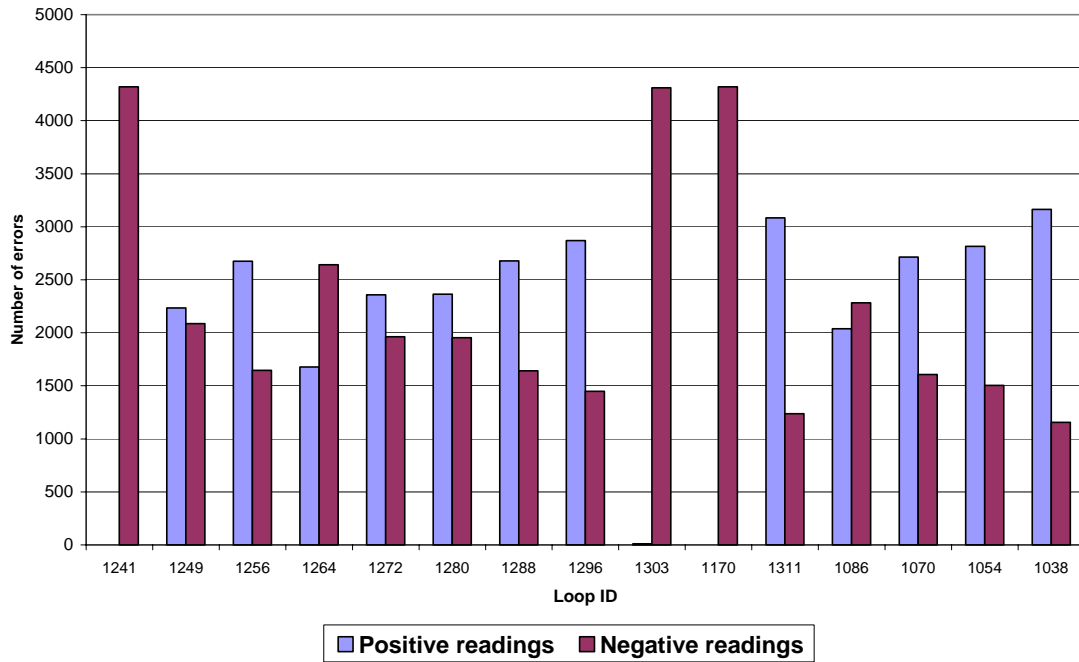


FIGURE 17

Figures 18 and 19 show the distributions of positive and negative readings for northbound I-5 on both the mainline and for the ramps. Similarly, Figures 20 and 21 show the distribution of readings for southbound I-5 on both the mainline and the ramps. It can be observed that the majority of negative values occur during the off-peak hours, approximately from 10:00 pm to 6:00 am.

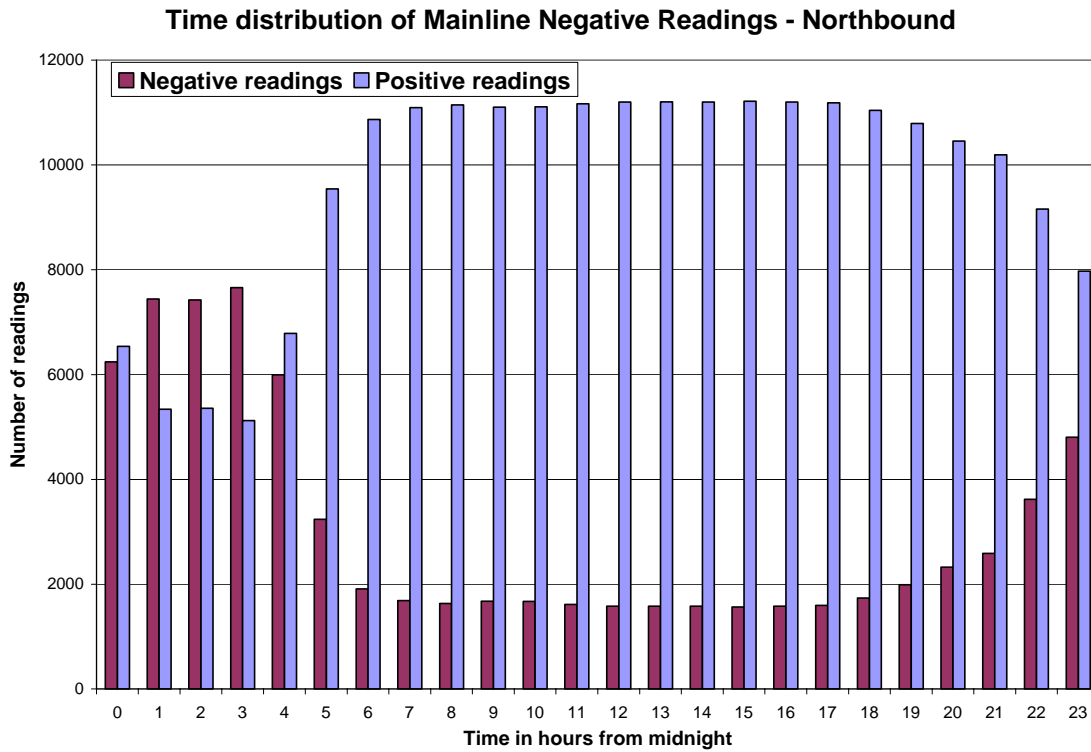


FIGURE 18

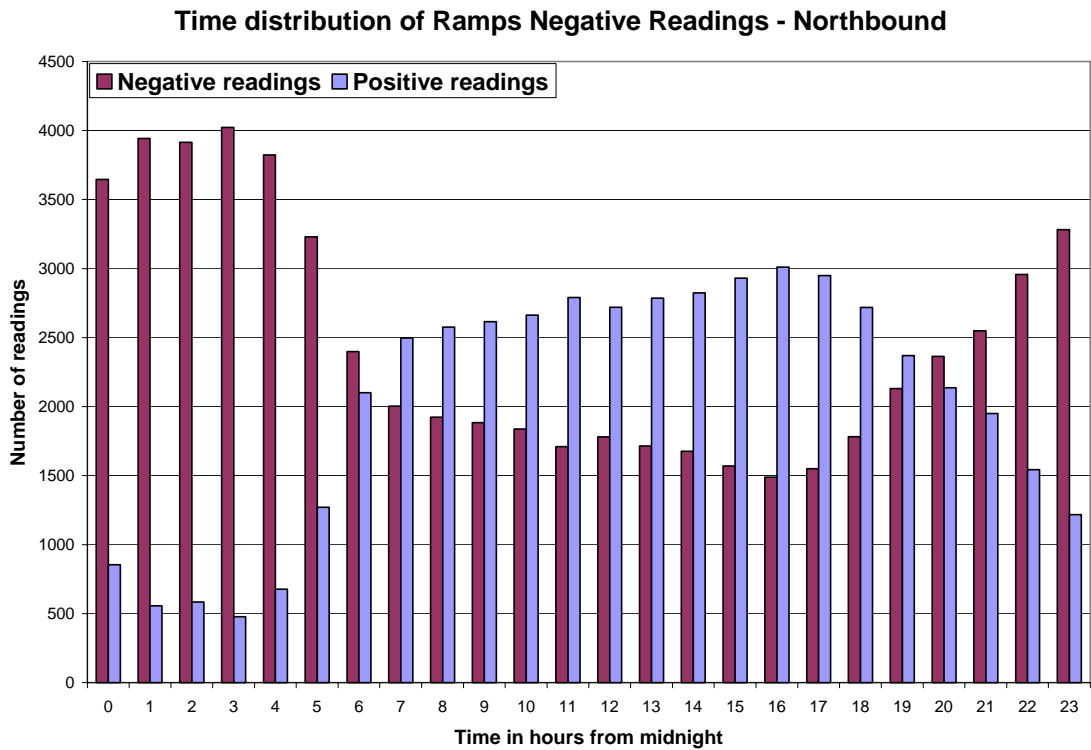


FIGURE 19

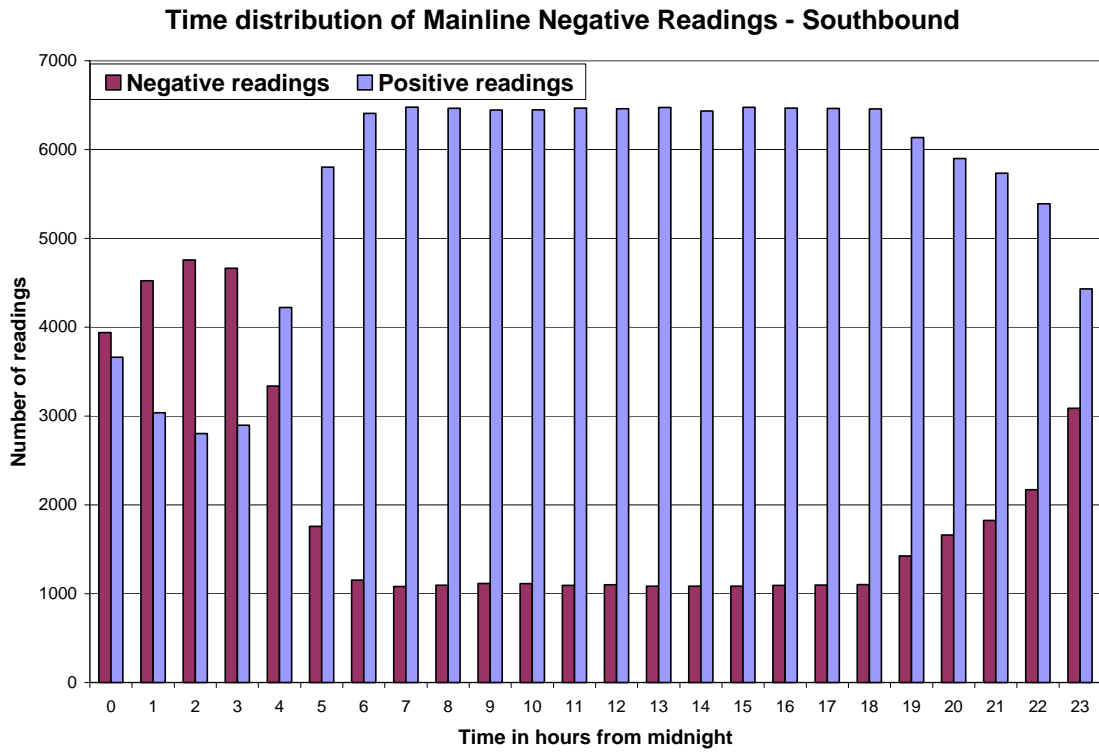


FIGURE 20

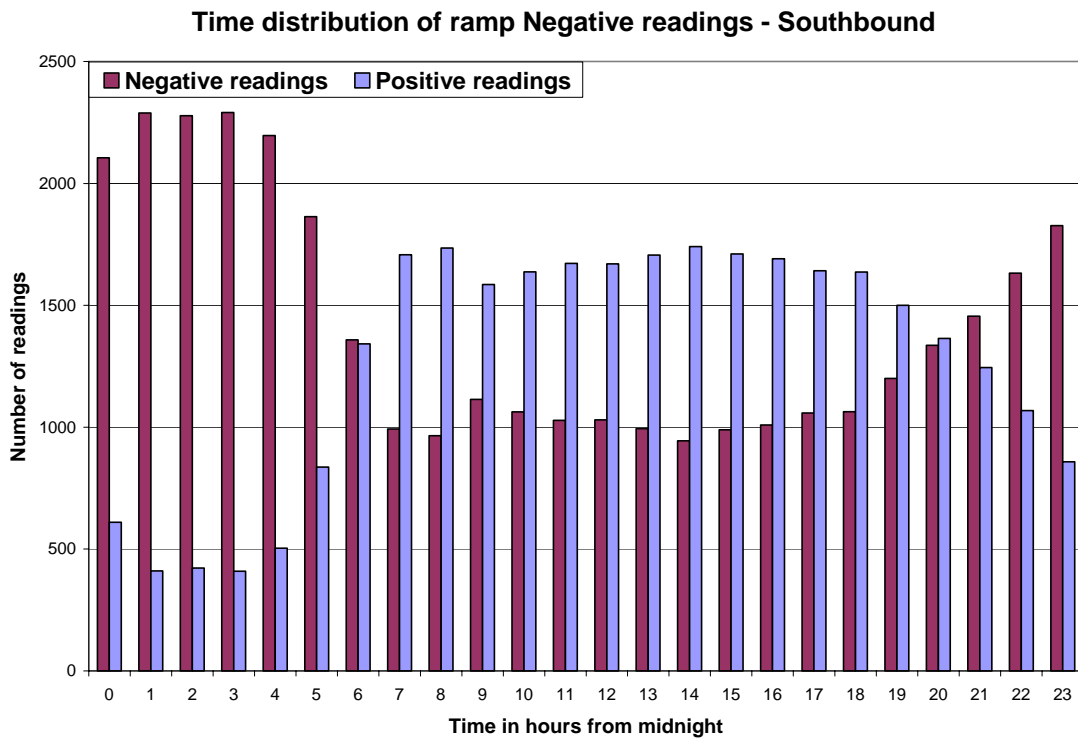


FIGURE 21

In order to prioritize the location stations that will need to be reviewed, Tables 1 and 2 include the total percentage of negative values for each station in the northbound and southbound corridors. Note that the ramps are included in the calculations of the percentage of negative readings.

NORTHBOUND I-5			
Station	MILEPOST	LOCATION TEXT	Percentage Negative Readings
Station 1	286.10	Stafford Rd EB to NB	22.57
Station 2	286.30	Stafford Rd WB to NB	32.24
Station 3	289.40	Nyberg EB to NB	22.54
Station 4	289.63	Nyberg WB to NB	19.78
Station 5	290.54	Lower Boones NB	18.70
Station 6	291.38	Upper Boones NB	23.46
Station 7	292.18	ORE 217/Kruseway NB	10.11
Station 8	293.18	Haines St NB	100.00
Station 9	293.74	Pacific Hwy W NB	36.99
Station 10	295.18	Capital Hwy NB	20.42
Station 11	296.26	Spring Garden St NB	26.02
Station 12	296.60	Multnomah Blvd NB	11.44
Station 13	297.33	Terwilliger Blvd NB	23.69
Station 14	297.33	Bertha NB	22.59
Station 15	299.70	Macadam Ave NB	18.73
Station 16	301.09	Morrison BR WB to NB	21.29
Station 17	301.09	Morrison BR EB to NB	26.09
Station 18	302.50	Broadway NB	100.00
Station 19	303.88	Going St NB	24.72
Station 20	304.40	Alberta St NB	100.00
Station 21	305.12	Portland Blvd NB	32.44
Station 22	306.51	Denver Ave NB	24.85
Station 23	306.51	Delta Park NB	26.72
Station 24	307.46	Marine Dr NB	15.98
Station 25	307.90	Jantzen Beach NB	35.23

TABLE 2

SOUTHBOUND I-5			
Station	MILEPOST	LOCATION TEXT	Percentage Negative Readings
Station 1	307.90	Jantzen Beach SB	100.00
Station 2	307.35	Swift Blvd/Marine Dr SB	23.43
Station 3	305.97	Columbia Blvd SB	19.25
Station 4	305.51	Lombard WB to SB	25.01
Station 5	305.40	Lombard EB to SB	20.78
Station 6	304.85	Portland Blvd SB	21.26
Station 7	304.08	Alberta St SB	24.86
Station 8	303.90	Going St SB	23.28
Station 9	303.10	Greeley Ave SB	39.74
Station 10	302.17	Wheeler SB	100.00
Station 11	299.25	Hood Ave SB	15.54
Station 12	291.91	ORE 217 EB to SB	42.93
Station 13	291.25	Upper Boones SB	19.63
Station 14	290.40	Lower Boones SB	18.92
Station 15	289.38	Nyberg SB	17.27

TABLE 3

LOOP DETECTOR COUNT VALIDATION

The aim of this analysis was to compare loop detector counts with “ground truth” counts obtained from video data in order to determine the level of loop accuracy. Video data from camera 48 on southbound I-5, MP 299.25, was recorded between 4:00 pm and 6:45 pm on Thursday, January 25, 2001. The loop detector data were requested from ODOT for the same location and the same period of time to be used in the validation process. Figure 22 shows the location and the view of the study segment.



- Camera # 48, Southbound I-5 MP 299.25.
Hood River Ave

FIGURE 22 View From Camera #48

Video Data

The vehicles were counted using video data by establishing a reference point on the video monitor. The arrival time of each vehicle to the reference point was recorded using a simple

computer program that records the time when a computer key is pressed. This method was used to record the number of cars traveling in each lane and on the ramp. Table 3 shows an example of the raw data obtained from the video.

TABLE 4 Sample Video Data

Vehicle Arrival Time			Count
Hours	Minutes	Seconds	
16	14	1.16	1
16	14	2.09	2
16	14	3.25	3
16	14	4.40	4
16	14	6.49	5

Loop Detector Data

The data used were recorded every 20 seconds from loop detectors located at Hood River Ave. on southbound I-5, MP 299.25. Table 5 shows an example of the data where the first column corresponds to the loop detector identification number. Note that the speed and occupancy data needed to be multiplied by 256 in order to obtain the correct values.

TABLE 5 Sample Loop Detector Data

DetectorId	SampleStart	Volume	TimeAveSpeed	TimeOccupancy
1616	4:00:00 PM	3	0.253906	0.015625
1616	4:00:20 PM	2	0.226562	0.003906
1616	4:00:40 PM	5	0.246094	0.027344
1616	4:01:00 PM	2	0.265625	0.003906
1616	4:01:20 PM	1	0.234375	0.003906
1616	4:01:40 PM	5	0.246094	0.007813
1616	4:02:00 PM	3	0.265625	0.019531
1616	4:02:20 PM	3	0.246094	0.003906

Observations

The total number of vehicles reported from the loop detectors and the video data between 4:00 pm and 4:30 pm were established. The final counts for the mainline and the ramp was very similar using both loop detector and video data. However, they show some differences in the total number of vehicles, as shown in Table 6. Lane 1 corresponds to the median lane and Lane 3 corresponds to the shoulder lane. It is possible that the differences are due to lane changing.

TABLE 6 Loop Detector and Video Count Comparison

Total Vehicle Counts			
	Loop Detector	Video	Difference
Lane 1	501	504	3
Lane 2	479	480	1
Lane 3	325	324	1
Ramp	146	145	1

Figure 23 shows a comparison of loop detector and data with vehicle arrival times plotted cumulatively. As shown in the upper figure, the cumulative vehicle arrival curves are aligned almost perfectly. The lower curve uses a skewed axis to magnify the details of the vehicle arrival patterns. As shown, these patterns are also aligned remarkably well, though the individual vehicle level data extracted from the video archive reveals more about the fluctuations in the vehicle arrivals (and headways) than does the loop detector data. Figures 24, 25 and 26 show the comparisons for lanes 2, 3 and the ramp with similar results.

FIGURE 23 Lane 1 Comparison

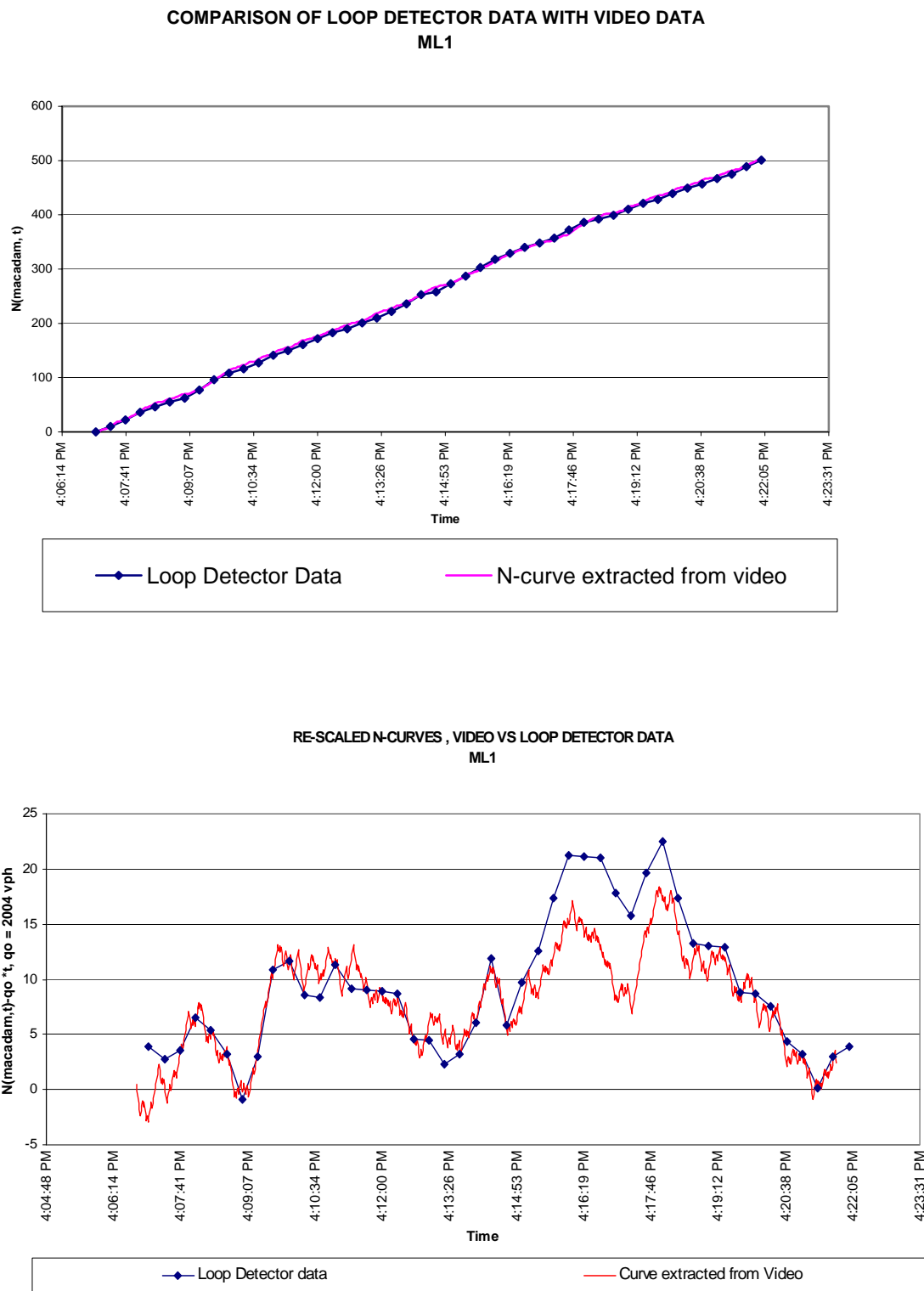


FIGURE 24 Lane 2 Comparison

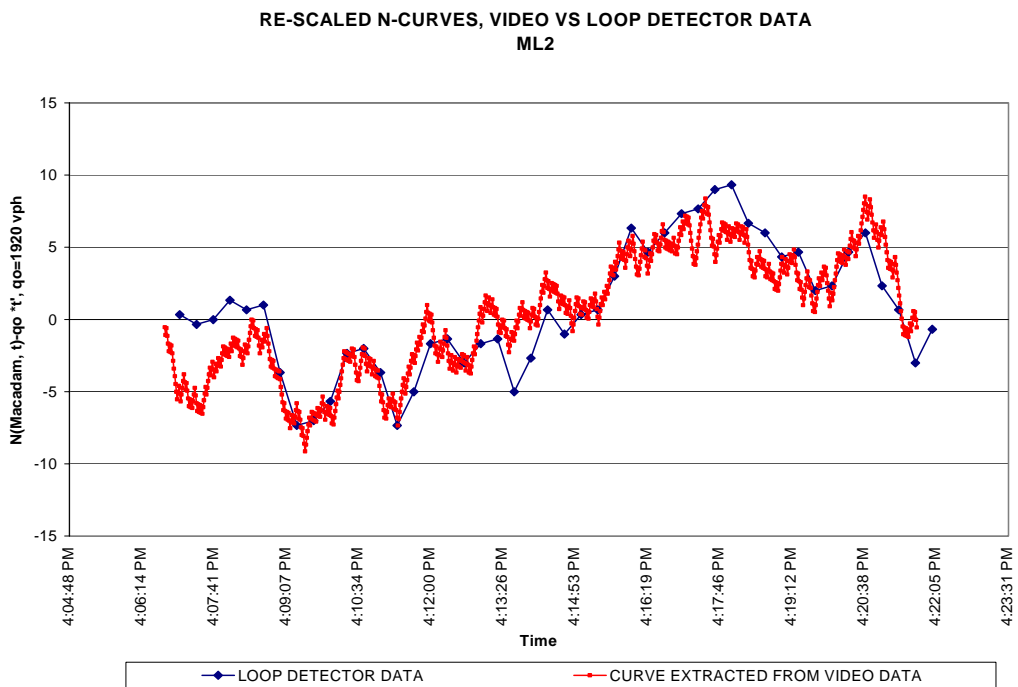
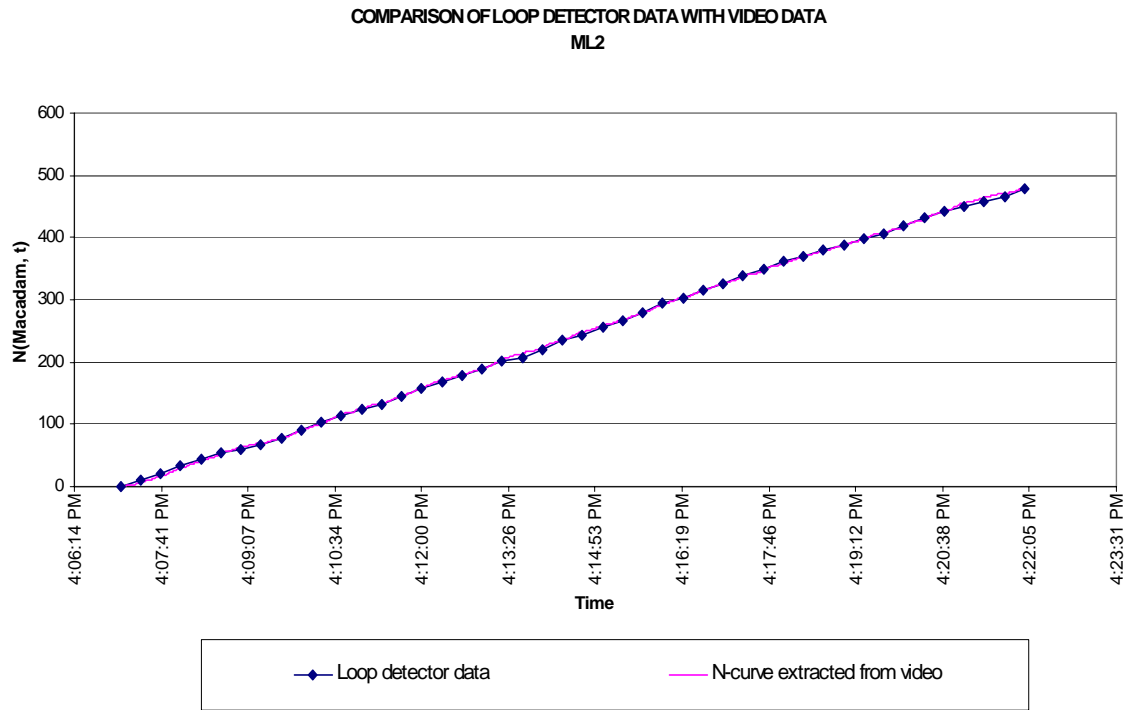


FIGURE 25 Lane 3 Comparison

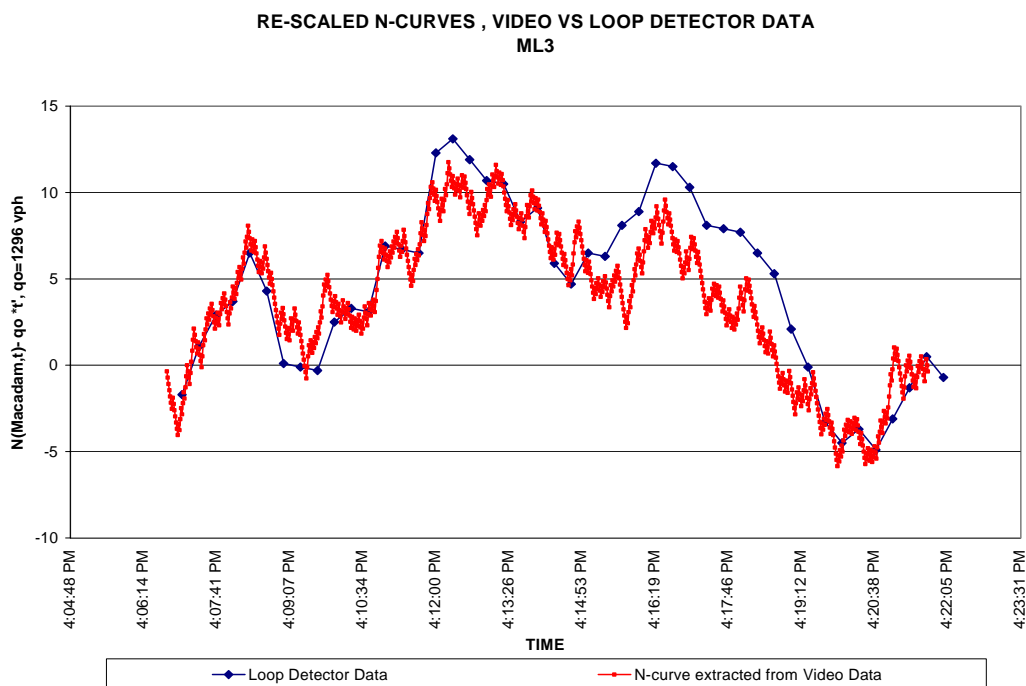
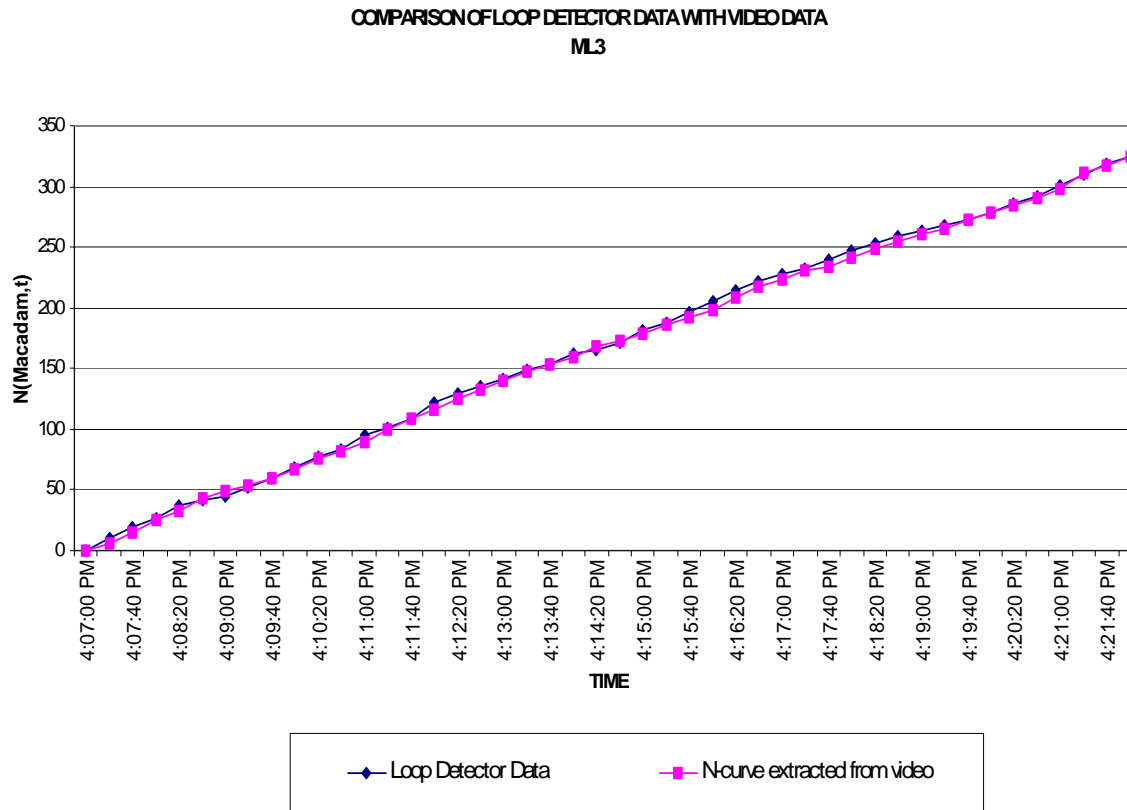
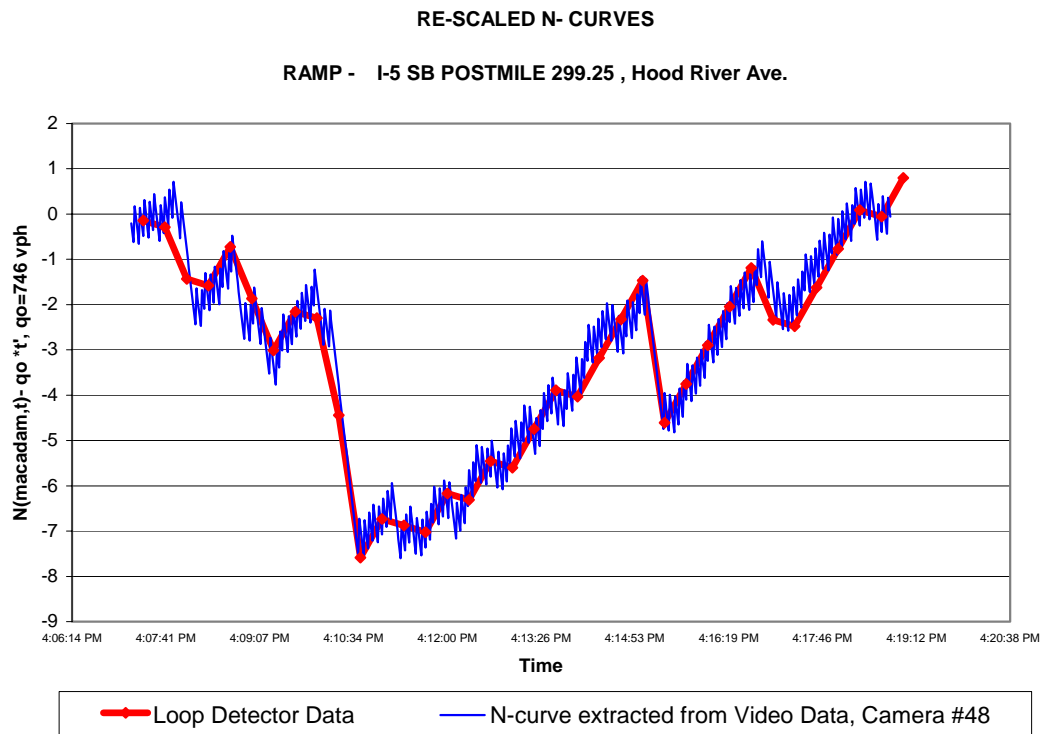
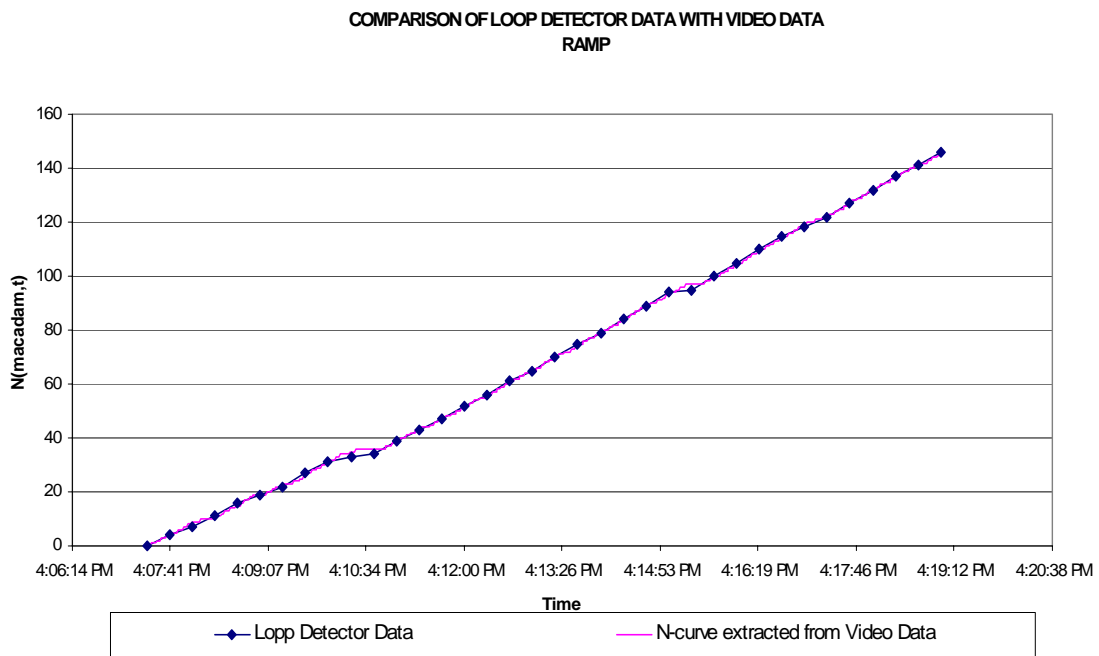


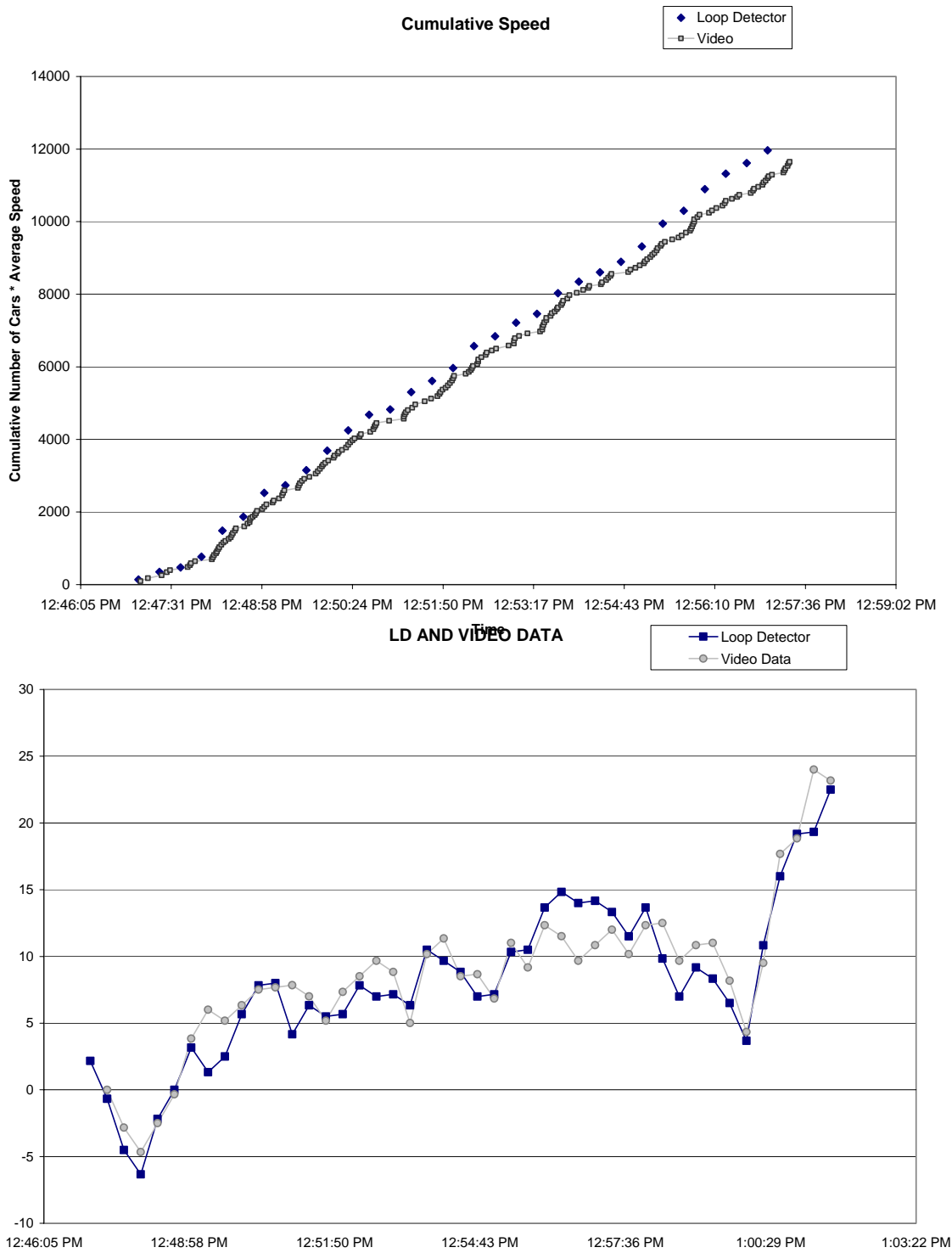
FIGURE 26 Ramp Comparison



LOOP DETECTOR SPEED VALIDATION

Some preliminary analysis of the speed data recorded by the loop detectors is shown in Figure 27. Speeds were recorded manually from video data (arrival and departure times of each vehicle were recorded over a fixed distance). As shown, the speeds were plotted cumulatively, with similar total values over a ten-minute period. The y-axis was then skewed (lower figure) to magnify the details of the fluctuations in speed, and as shown, the two curves are well-aligned. This indicates that the speed data reported by the detectors are valid.

FIGURE 27 Speed Validation



APPENDIX 1

NB I-5 -12-19-01					
Station	DETECTOR ID	MILEPOST	LOCATION TEXT	DETECTOR TITLE	Percentage Negative Readings
Station 1	1001	286.1	Stafford Rd EB to NB	I5N286.10-ML1	21.65
	1002	286.1	Stafford Rd EB to NB	I5N286.10-ML2	10.51
	1003	286.1	Stafford Rd EB to NB	I5N286.10-ML3	11.07
	1006	286.1	Stafford Rd EB to NB	I5N286.10-ENTD1	47.07
Station 2	1009	286.3	Stafford Rd WB to NB	I5N286.30-ML1	10.07
	1010	286.3	Stafford Rd WB to NB	I5N286.30-ML2	9.45
	1011	286.3	Stafford Rd WB to NB	I5N286.30-ML3	63.56
	1014	286.3	Stafford Rd WB to NB	I5N286.30-ENTD1	45.87
Station 3	1017	289.4	Nyberg EB to NB	I5N289.40-ML1	25.75
	1018	289.4	Nyberg EB to NB	I5N289.40-ML2	12.29
	1019	289.4	Nyberg EB to NB	I5N289.40-ML3	9.15
	1022	289.4	Nyberg EB to NB	I5N289.40-ENTD1	42.97
Station 4	1025	289.63	Nyberg WB to NB	I5N289.63-ML1	25.01
	1026	289.63	Nyberg WB to NB	I5N289.63-ML2	11.65
	1027	289.63	Nyberg WB to NB	I5N289.63-ML3	8.22
	1030	289.63	Nyberg WB to NB	I5N289.63-ENTD1	34.27
Station 5	1041	290.54	Lower Boones NB	I5N290.54-ML1	25.31
	1042	290.54	Lower Boones NB	I5N290.54-ML2	12.43
	1043	290.54	Lower Boones NB	I5N290.54-ML3	6.09
	1046	290.54	Lower Boones NB	I5N290.54-ENTD1	30.96
Station 6	1057	291.38	Upper Boones NB	I5N291.38-ML1	14.49
	1058	291.38	Upper Boones NB	I5N291.38-ML2	10.07
	1059	291.38	Upper Boones NB	I5N291.38-ML3	14.82
	1062	291.38	Upper Boones NB	I5N291.38-ENTD1	54.46
Station 7	1073	292.18	ORE 217/Kruseway NB	I5N292.18-ML1	1.02
	1074	292.18	ORE 217/Kruseway NB	I5N292.18-ML2	2.50
	1075	292.18	ORE 217/Kruseway NB	I5N292.18-ML3	6.02
	1078	292.18	ORE 217/Kruseway NB	I5N292.18-ENTD1	30.91
Station 8	1089	293.18	Haines St NB	I5N293.18-ML1	100.00
	1090	293.18	Haines St NB	I5N293.18-ML2	100.00
	1091	293.18	Haines St NB	I5N293.18-ML3	100.00
	1094	293.18	Haines St NB	I5N293.18-ENTD1	100.00
Station 9	1097	293.74	Pacific Hwy W NB	I5N293.74-ML1	7.66
	1098	293.74	Pacific Hwy W NB	I5N293.74-ML2	12.99
	1099	293.74	Pacific Hwy W NB	I5N293.74-ML3	27.30
	1102	293.74	Pacific Hwy W NB	I5N293.74-ENTD1	100.00
Station 10	1105	295.18	Capital Hwy NB	I5N295.18-ML1	23.96
	1106	295.18	Capital Hwy NB	I5N295.18-ML2	9.56
	1107	295.18	Capital Hwy NB	I5N295.18-ML3	8.59
	1110	295.18	Capital Hwy NB	I5N295.18-ENTD1	39.55
Station 11	1113	296.26	Spring Garden St NB	I5N296.26-ML1	23.20
	1114	296.26	Spring Garden St NB	I5N296.26-ML2	9.61
	1115	296.26	Spring Garden St NB	I5N296.26-ML3	8.10
	1118	296.26	Spring Garden St NB	I5N296.26-ENTD1	63.16
Station 12	1121	296.6	Multnomah Blvd NB	I5N296.60-ML1	0.39
	1122	296.6	Multnomah Blvd NB	I5N296.60-ML2	0.97
	1123	296.6	Multnomah Blvd NB	I5N296.60-ML3	10.05
	1126	296.6	Multnomah Blvd NB	I5N296.60-ENTD1	34.36

NB I-5 -12-19-01					
Station	DETECTOR ID	MILEPOST	LOCATION TEXT	DETECTOR TITLE	Percentage Negative Readings
Station 13	1129	297.33	Terwilliger Blvd NB	I5N297.33-ML1	8.13
	1130	297.33	Terwilliger Blvd NB	I5N297.33-ML2	8.10
	1131	297.33	Terwilliger Blvd NB	I5N297.33-ML3	24.38
	1134	297.33	Terwilliger Blvd NB	I5N297.33-ENTD1	54.16
Station 14	1137	297.33	Bertha NB	I5N297.33-ML1	8.08
	1138	297.33	Bertha NB	I5N297.33-ML2	8.10
	1139	297.33	Bertha NB	I5N297.33-ML3	24.36
	1142	297.33	Bertha NB	I5N297.33-ENTD1	49.83
Station 15	1145	299.7	Macadam Ave NB	I5N299.70-ML1	15.37
	1146	299.7	Macadam Ave NB	I5N299.70-ML2	8.24
	1149	299.7	Macadam Ave NB	I5N299.70-ENTD1	32.58
Station 16	1152	301.09	Morrison BR WB to NB	I5N301.09-ML1	21.72
	1153	301.09	Morrison BR WB to NB	I5N301.09-ML2	11.81
	1156	301.09	Morrison BR WB to NB	I5N301.09-ENTD1	30.33
Station 17	1159	301.09	Morrison BR EB to NB	I5N301.09-ML1	21.58
	1160	301.09	Morrison BR EB to NB	I5N301.09-ML2	11.83
	1163	301.09	Morrison BR EB to NB	I5N301.09-ENTD1	44.85
Station 18	1173	302.5	Broadway NB	I5N302.50-ML1	100.00
	1174	302.5	Broadway NB	I5N302.50-ML2	100.00
	1177	302.5	Broadway NB	I5N302.50-ENTD1	100.00
Station 19	1180	303.88	Going St NB	I5N303.88-HOV1	33.06
	1181	303.88	Going St NB	I5N303.88-ML2	19.36
	1182	303.88	Going St NB	I5N303.88-ML3	3.50
	1185	303.88	Going St NB	I5N303.88-ENTD1	42.97
Station 20	1188	304.4	Alberta St NB	I5N304.40-ML2	100.00
	1189	304.4	Alberta St NB	I5N304.40-ML3	100.00
	1190	304.4	Alberta St NB	I5N304.40-HOV1	100.00
	1193	304.4	Alberta St NB	I5N304.40-ENTD1	100.00
Station 21	1196	305.12	Portland Blvd NB	I5N305.12-ML2	13.31
	1197	305.12	Portland Blvd NB	I5N305.12-ML3	4.82
	1198	305.12	Portland Blvd NB	I5N305.12-HOV1	34.11
	1201	305.12	Portland Blvd NB	I5N305.12-ENTD1	77.54
Station 22	1204	306.51	Denver Ave NB	I5N306.51-ML2	28.78
	1205	306.51	Denver Ave NB	I5N306.51-ML3	9.52
	1206	306.51	Denver Ave NB	I5N306.51-HOV1	17.30
	1209	306.51	Denver Ave NB	I5N306.51-ENTD1	43.81
Station 23	1212	306.51	Delta Park NB	I5N306.51-ML2	28.59
	1213	306.51	Delta Park NB	I5N306.51-ML3	9.66
	1214	306.51	Delta Park NB	I5N306.51-HOV1	17.43
	1217	306.51	Delta Park NB	I5N306.51-ENTD1	51.19
Station 24	1220	307.46	Marine Dr NB	I5N307.46-ML1	23.82
	1221	307.46	Marine Dr NB	I5N307.46-ML2	8.71
	1222	307.46	Marine Dr NB	I5N307.46-ML3	11.97
	1225	307.46	Marine Dr NB	I5N307.46-ENTD1	19.40
Station 25	1228	307.9	Jantzen Beach NB	I5N307.90-ML1	23.64
	1229	307.9	Jantzen Beach NB	I5N307.90-ML2	8.38
	1230	307.9	Jantzen Beach NB	I5N307.90-ML3	8.91
	1233	307.9	Jantzen Beach NB	I5N307.90-ENTD1	100.00

APPENDIX 2

SB I-5 -12-19-01					
	DETECTOR ID	MILEPOST	LOCATION TEXT	DETECTOR TITLE	Percentage Negative Readings
Station 1	1233	307.9	Jantzen Beach NB	I5N307.90-ENTD1	100.00
	1237	307.9	Jantzen Beach SB	I5S307.90-ML2	100.00
	1238	307.9	Jantzen Beach SB	I5S307.90-ML3	100.00
	1241	307.9	Jantzen Beach SB	I5S307.90-ENTD1	100.00
Station 2	1244	307.35	Swift Blvd/Marine Dr SB	I5S307.35-ML1	18.38
	1245	307.35	Swift Blvd/Marine Dr SB	I5S307.35-ML2	6.30
	1246	307.35	Swift Blvd/Marine Dr SB	I5S307.35-ML3	20.74
	1249	307.35	Swift Blvd/Marine Dr SB	I5S307.35-ENTD1	48.29
Station 3	1252	305.97	Columbia Blvd SB	I5S305.97-ML1	15.88
	1253	305.97	Columbia Blvd SB	I5S305.97-ML2	3.80
	1256	305.97	Columbia Blvd SB	I5S305.97-ENTD1	38.08
Station 4	1259	305.51	Lombard WB to SB	I5S305.51-ML1	19.95
	1260	305.51	Lombard WB to SB	I5S305.51-ML2	4.98
	1261	305.51	Lombard WB to SB	I5S305.51-ML3	13.98
	1264	305.51	Lombard WB to SB	I5S305.51-ENTD1	61.13
Station 5	1267	305.4	Lombard EB to SB	I5S305.40-ML1	20.46
	1268	305.4	Lombard EB to SB	I5S305.40-ML2	5.63
	1269	305.4	Lombard EB to SB	I5S305.40-ML3	11.60
	1272	305.4	Lombard EB to SB	I5S305.40-ENTD1	45.42
Station 6	1275	304.85	Portland Blvd SB	I5S304.85-ML1	26.30
	1276	304.85	Portland Blvd SB	I5S304.85-ML2	5.76
	1277	304.85	Portland Blvd SB	I5S304.85-ML3	7.73
	1280	304.85	Portland Blvd SB	I5S304.85-ENTD1	45.25
Station 7	1283	304.08	Alberta St SB	I5S304.08-ML1	38.68
	1284	304.08	Alberta St SB	I5S304.08-ML2	19.07
	1285	304.08	Alberta St SB	I5S304.08-ML3	3.66
	1288	304.08	Alberta St SB	I5S304.08-ENTD1	38.01
Station 8	1291	303.9	Going St SB	I5S303.90-ML1	34.07
	1292	303.9	Going St SB	I5S303.90-ML2	22.43
	1293	303.9	Going St SB	I5S303.90-ML3	3.06
	1296	303.9	Going St SB	I5S303.90-ENTD1	33.56
Station 9	1299	303.1	Greeley Ave SB	I5S303.10-ML1	14.63
	1300	303.1	Greeley Ave SB	I5S303.10-ML2	4.84
	1303	303.1	Greeley Ave SB	I5S303.10-ENTD1	99.75
Station 10	1166	302.17	Wheeler SB	I5N302.17-ML1	100.00
	1167	302.17	Wheeler SB	I5N302.17-ML2	100.00
	1170	302.17	Wheeler SB	I5N302.17-ENTD1	100.00
Station 11	1306	299.25	Hood Ave SB	I5S299.25-ML1	19.35
	1307	299.25	Hood Ave SB	I5S299.25-ML2	6.97
	1308	299.25	Hood Ave SB	I5S299.25-ML3	7.22
	1311	299.25	Hood Ave SB	I5S299.25-ENTD1	28.63
Station 12	1081	291.91	ORE 217 EB to SB	I5N291.91-ML1	99.68
	1082	291.91	ORE 217 EB to SB	I5N291.91-ML2	12.18
	1083	291.91	ORE 217 EB to SB	I5N291.91-ML3	7.04
	1086	291.91	ORE 217 EB to SB	I5N291.91-ENTD1	52.82
Station 13	1065	291.25	Upper Boones SB	I5N291.25-ML1	24.91
	1066	291.25	Upper Boones SB	I5N291.25-ML2	11.97
	1067	291.25	Upper Boones SB	I5N291.25-ML3	4.44
Station 14	1049	290.4	Lower Boones SB	I5N290.40-ML1	23.63
	1050	290.4	Lower Boones SB	I5N290.40-ML2	11.83
	1051	290.4	Lower Boones SB	I5N290.40-ML3	5.39
	1054	290.4	Lower Boones SB	I5N290.40-ENTD1	34.84
Station 15	1033	289.38	Nyberg SB	I5N289.38-ML1	24.26
	1034	289.38	Nyberg SB	I5N289.38-ML2	12.34
	1035	289.38	Nyberg SB	I5N289.38-ML3	5.72
	1038	289.38	Nyberg SB	I5N289.38-ENTD1	26.76