CAMBRIDGE SYSTEMATICS

NGSIM Lankershim Data Analysis (8:30 a.m. to 8:45 a.m.)

summary report

prepared for

Federal Highway Administration

prepared by

Cambridge Systematics, Inc.

March 2006

www.camsys.com

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Introduction

This report summarizes a data collection and processing effort undertaken to provide a dataset of arterial vehicle trajectories data completed as part of the Federal Highway Administration's (FHWA) Next Generation Simulation (NGSIM) project, and provides a detailed analysis of a subset of the data. The data analyzed in this report represent vehicle trajectories on a segment of Lankershim Boulevard, located near the interchange with U.S. Highway 101 (Hollywood Freeway) in Los Angeles, California collected between 8:28 a.m. and 8:45 a.m. on June 16, 2005. Aggregate summaries of flow and speed of the vehicles, number of lane changes, headway and gap analysis, and an input-output analysis of flows are provided. The results are aggregated by time and intersection.

Study Area Description

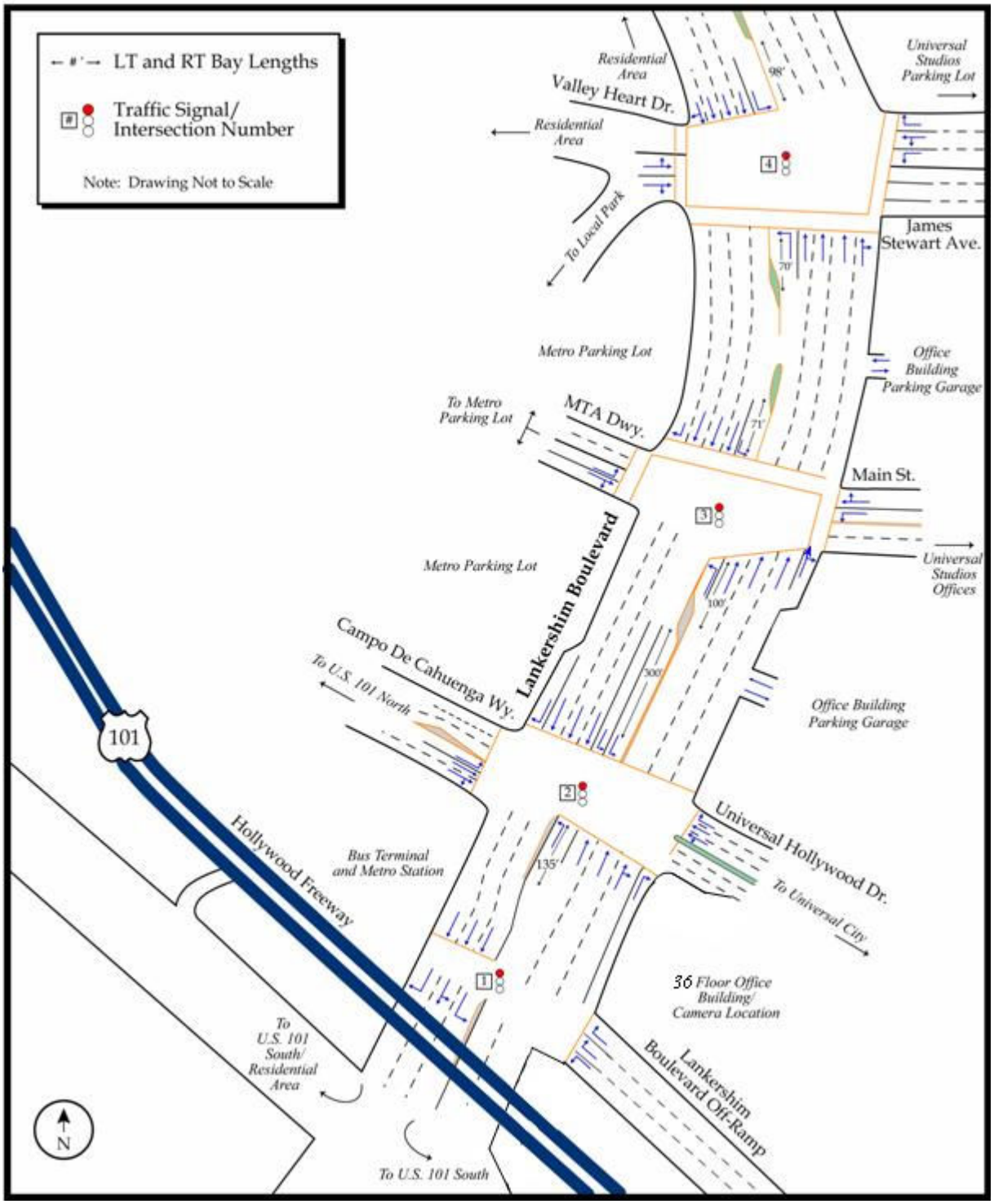
Data presented in this report represent travel on Lankershim Boulevard, an arterial running primarily north-south in Los Angeles, California. The speed limit on the Lankershim Boulevard is 35 mph. These data were collected using video cameras mounted on a 36-story building, 10 Universal City Plaza, which is located adjacent to the U.S. Highway 101 and Lankershim Boulevard interchange in the Universal City neighborhood.

Figure 1 provides an aerial image of the location with the camera coverage. Figure 2 presents a schematic illustration of the location for the vehicle trajectory dataset. The site was approximately 1,600 feet in length, with four signalized intersections and three to four arterial through lanes in each direction through the section. Lane numbering is incremented from the left-most lane. Adjacent land use is also illustrated in Figure 2.

Video data were collected using five video cameras, cameras 1 through 5, with camera 1 recording the southernmost and camera 5 recording the northernmost section of the study area, as shown in Figure 1. Digital video images were collected over an approximate 9-hour period from 7:00 a.m. to 12:00 p.m. and from 3:00 p.m. to 7:00 p.m. on June 16, 2005. Complete vehicle trajectories were transcribed for 32 minutes from 8:28 a.m. to 9:00 a.m. at a resolution of 10 frames per second.

Figure 1. Study Area and Camera Coverage

Figure 2. Study Area Schematic

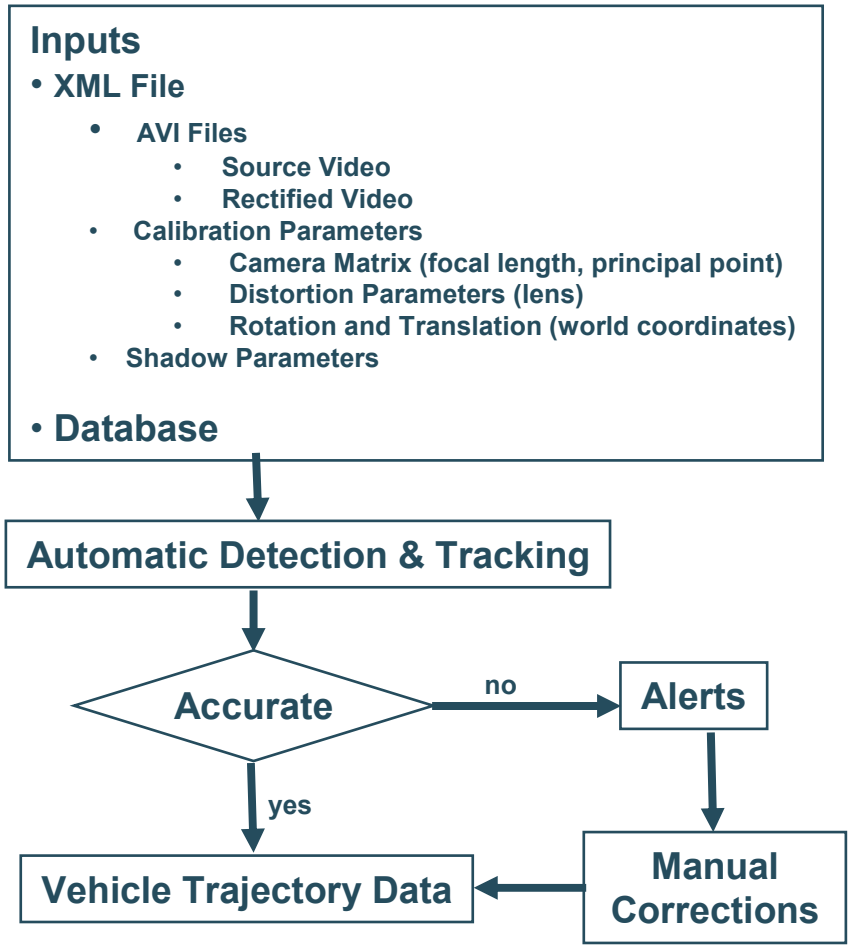


Vehicle Detection and Tracking

Vehicle trajectory data were transcribed from the video data using a customized software application, Next Generation Vehicle Interaction and Detection Environment for Operations (NG-VIDEO), developed for NGSIM. This program detects and tracks vehicles from video images and transcribes the trajectory data to a database.

The flow process for the vehicle transcription is shown in Figure 3. The software detects vehicles in a user-defined detection zone, and then tracks vehicles from the point of detection.

Figure 3. Vehicle Detection and Tracking Process



Tracking was performed for the data from 8:28 a.m. instead of 8:30 a.m. to account for synchronization between the trajectory data and the signal timing data. Immediately after 8:45 a.m., vehicle detection was stopped; however, to account for full vehicle trajectories, tracking continued to allow the vehicles which were already detected to be tracked

completely to the end of the study area. Therefore, for the vehicle trajectory dataset of 8:30a.m. to 8:45 a.m., the actual tracking time is from 8:28:00 a.m. to 8:46:41 a.m.

A total of 32 minutes vehicle trajectories was processed from the video data collected on June 16, 2005, representing the period from 8:28 a.m. to 9:00 a.m. (consisting of primarily congested conditions). The data was divided into one 17-minute period and one 15-minute period for processing and analysis.

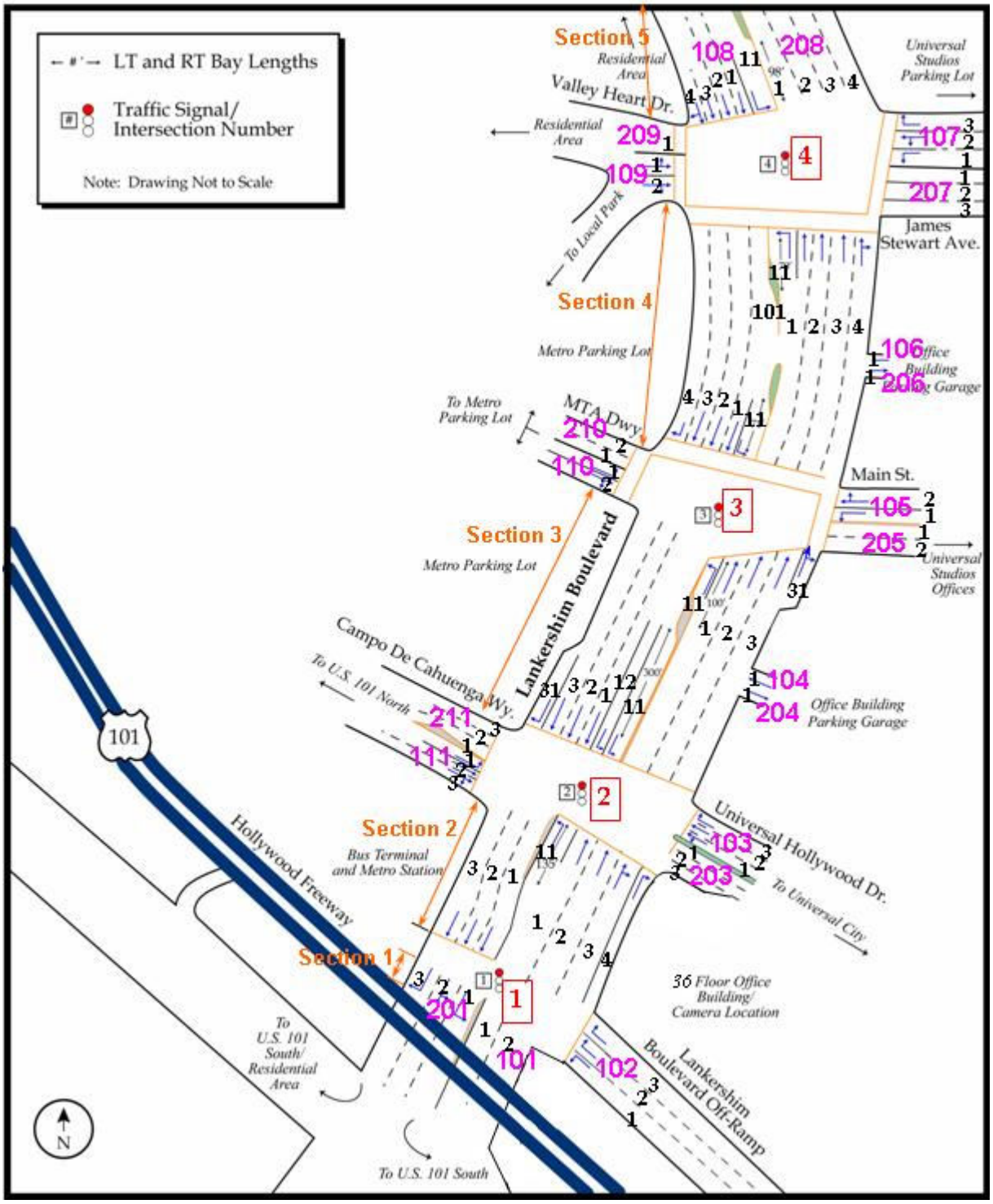
Subsequent sections of this report provide analysis of the transcribed data. This report provides data analysis for the period from 8:28 a.m. to 8:45 a.m. A separate report is available providing the same performance statistics for the succeeding 8:45 a.m. to 9:00 a.m. period.

Data Analysis

Data analysis was performed for specific locations in the study area. Therefore, it is necessary to define those locations herein. Figure 4 shows the study area schematic with identification numbers for origins, destinations, intersections, sections, and lanes.

- **Origin –** These were numbered from 101 through 111. There are 11 origins in the study area.
- **Destination –** There are 10 destinations in the study area, numbered from 201 through 211. Origin 102 is a one-way off-ramp; hence, there is no associated destination number 202.
- **Intersection –** These were numbered from 1 to 4, with intersection 1 at the southernmost, and intersection 4 at the northernmost section of the study area. Intersections 1, 2, 3, and 4 in this report correspond to signal numbers 87, 88, 89, and 90, respectively.
- **Section –** Lankershim Blvd was further divided into five sections between neighboring intersections.
- **Lane –** Lane numbering was incremented from the left-most lane, except for locations where left-turn or right-turn bays exist. Left-turn bays were numbered starting from 11 and were incremented from the left-most left-turn bay. Right-turn bays were numbered starting from 31 and were incremented from the left-most right-turn bay. It was noted that there was a left-turn bay in the mid-block between intersections 3 and 4. To differentiate that left-turn bay with others, it was numbered 101.

Figure 4. Study Area Schematic with Various Identification Numbers



Vehicle Type

Vehicles are classified into three categories: 1) motorcycle, 2) automobile, and 3) truck and buses. The distribution of vehicle types is shown in Table 1.

Table 1. Vehicle Type

	Motorcycle		Automobile		Truck and Buses		All	
Time Period	**Vehicles**	**Percentage**	**Vehicles**	**Percentage**	**Vehicles**	**Percentage**	**Vehicles**	**Percentage**
8:28 a.m.-8:30 a.m.	0	0.0%	126	94.0%	8	6.0%	**134**	**100.0%**
8:30 a.m.-8:35 a.m.	0	0.0%	328	97.0%	10	3.0%	**338**	**100.0%**
8:35 a.m.-8:40 a.m.	1	0.3%	348	96.1%	13	3.6%	**362**	**100.0%**
8:40 a.m.-8:45 a.m.	2	0.5%	364	96.6%	11	2.9%	**377**	**100.0%**
All	**3**	**0.2%**	**1,166**	**96.3%**	**42**	**3.5%**	**1,211**	**100.0%**

Origin-Destination Distribution

There are 11 origins and 10 destinations in the study area, as illustrated in Figure 4. The distribution of vehicles from origins to destinations is provided in Table 2.

Table 2. Origin-Destination Distribution

	Destination										
Origin	**201**	**203**	**204**	**205**	**206**	**207**	**208**	**209**	**210**	**211**	**Sum**
101	0	54	5	5	1	3	70	2	5	14	**159**
102	19	41	4	5	0	24	157	2	1	1	**254**
103	7	0	2	0	0	0	41	0	1	13	**64**
104	0	1	0	1	0	1	1	0	1	1	**6**
105	4	2	1	0	1	0	5	0	0	1	**14**
106	0	1	0	0	0	0	2	0	0	1	**4**
107	2	1	1	0	0	0	6	1	0	0	**11**
108	365	150	12	11	3	21	0	1	21	25	**609**
109	4	0	0	0	0	0	2	0	0	4	**10**
110	2	1	0	0	0	0	5	0	0	0	**8**
111	4	35	4	3	0	10	16	0	0	0	**72**
Sum	**407**	**286**	**29**	**25**	**5**	**59**	**305**	**6**	**29**	**60**	**1,211**

Start-End Lane Distribution

Start-end lane distribution is provided in Table 3. The start and end lane of a vehicle is the lane in which the vehicle was first and last tracked in the study area, respectively.

Table 3. Start-End Lane Distribution

		Destination																							
		201			203			204	205		206	207			208				209	210		211			
	Lane	1	2	3	1	2	3	1	1	2	1	1	2	3	1	2	3	4	1	1	2	1	2	3	Sum
	101 1	0	0	0	0	0	0	0	1	0	0	0	0	1	10	6	6	7	2	2	3	5	7	2	**52**
	2	0	0	0	1	11	42	5	3	1	1	0	0	2	0	5	15	21	0	0	0	0	0	0	**107**
	102 1	18	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**19**
	2	0	0	0	0	8	25	2	4	0	0	0	0	18	23	21	44	36	2	1	0	1	0	0	**185**
	3	0	0	0	1	1	6	2	0	1	0	0	0	6	1	6	13	13	0	0	0	0	0	0	**50**
	103 1	4	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**7**
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	3	4	**13**
	3	0	0	0	0	0	0	2	0	0	0	0	0	0	3	11	14	13	0	0	1	0	0	0	**44**
	104 1	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	1	**6**
	105 1	3	0	1	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	**8**
	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	3	0	0	0	0	0	0	**6**
	106 1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	**4**
	107 1	0	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**4**
Origin	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	**1**
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	0	0	0	0	0	0	**6**
	108 11	0	0	0	0	0	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0	0	0	0	**21**
	1	80	9	2	49	68	8	11	9	1	3	0	0	0	0	0	0	0	0	0	1	0	0	0	**241**
	2	31	79	32	9	16	0	1	1	0	0	0	0	0	0	0	0	0	0	6	8	0	1	5	**189**
	3	5	8	119	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	3	16	**157**
	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	**1**
	109 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	**2**
	2	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	**8**
	110 1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	1	0	0	0	0	0	0	**5**
	2	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**3**
	111 1	0	0	0	0	0	0	4	1	2	0	0	0	10	0	6	3	7	0	0	0	0	0	0	**33**
	2	0	0	0	9	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**32**
	3	1	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**7**
	Sum	**143**	**102**	**162**	**71**	**134**	**81**	**29**	**20**	**5**	**5**	**21**	**0**	**38**	**38**	**60**	**99**	**108**	**6**	**9**	**20**	**12**	**14**	**34**	**1211**

Traffic Volume Analysis

The tables in this section provide traffic volume for each intersection. Intersections are numbered as 1, 2, 3, and 4, as shown in Figure 4. Traffic volume is grouped by moving direction [i.e., north-bound (NB), south-bound (SB), east-bound (EB), and west-bound (WB)]; by movement [i.e., through (TH), left-turn (LT), and right-turn (RT)]; by lane; and by time period.

Table 4. Traffic Volume at Intersection 1 (in Vehicles)

	NB		SB			WB			
	TH		TH			LT	RT		
Time Period	**1**	**2**	**1**	**2**	**3**	**1**	**2**	**3**	**Sum**
8:28 a.m.-8:30 a.m.	5	15	4	8	19	1	13	10	**75**
8:30 a.m.-8:35 a.m.	15	28	40	29	41	6	34	27	**220**
8:35 a.m.-8:40 a.m.	17	35	41	32	38	3	54	11	**231**
8:40 a.m.-8:45 a.m.	15	24	38	29	50	7	82	2	**247**
8:45 a.m.-8:46:41 a.m.	0	0	5	3	12	2	3	0	**25**
Sum	**52**	**102**	**128**	**101**	**160**	**19**	**186**	**50**	**798**

Table 5. Traffic Volume at Intersection 2 (in Vehicles)

	NB						SB						EB				WB				
	LT	TH				RT	LT		TH			RT	LT	TH		RT	LT	TH		RT	
Time Period	**11**	**1**	**2**	**3**	**<***	**4**	**11**	**12**	**1**	**2**	**3**	**31**	**1**	**2**	**3**	**<**	**1**	**<**	**2**	**3**	**Sum**
8:28 a.m.-8:30 a.m.	0	8	7	11	1	11	4	4	11	12	20	3	4	1	0	0	1	0	4	5	**107**
8:30 a.m.-8:35 a.m.	7	17	26	32	0	22	22	30	31	35	35	6	7	9	1	2	1	0	3	11	**297**
8:35 a.m.-8:40 a.m.	4	17	30	73	1	27	14	27	39	33	36	13	6	8	2	0	0	0	2	17	**349**
8:40 a.m.-8:45 a.m.	4	23	32	33	1	29	21	25	32	35	48	9	12	14	0	1	4	0	3	11	**337**
8:45 a.m.-8:46:41 a.m.	0	1	3	2	0	0	0	9	3	3	4	1	0	0	0	0	0	0	1	0	**27**
Sum	**15**	**66**	**98**	**151**	**3**	**89**	**61**	**95**	**116**	**118**	**143**	**32**	**29**	**32**	**3**	**3**	**6**	**0**	**13**	**44**	**1,117**

* > and < symbols are associated with shared lanes.

Table 6. Traffic Volume at Intersection 3 (in Vehicles)

	NB						SB					EB			WB			
	LT	TH				RT	LT	TH			RT	LT	TH	RT	LT	TH	RT	
Time Period	**11**	**1**	**2**	**3**	**31**	**<**	**11**	**1**	**2**	**3**	**4**	**1**	**2**	**<**	**1**	**2**	**<**	**Sum**
8:28 a.m.-8:30 a.m.	0	6	5	10	0	1	1	27	13	25	0	0	0	0	0	0	0	**88**
8:30 a.m.-8:35 a.m.	2	12	23	23	1	2	5	74	44	46	9	1	0	1	2	0	2	**247**
8:35 a.m.-8:40 a.m.	2	12	24	29	0	5	3	71	43	49	7	1	0	1	2	0	2	**251**
8:40 a.m.-8:45 a.m.	4	15	28	35	0	6	2	66	43	63	4	3	0	1	4	0	2	**276**
8:45 a.m.-8:46:41 a.m.	0	4	4	6	0	0	0	1	1	1	0	0	0	0	0	0	0	**17**
Sum	**8**	**49**	**84**	**103**	**1**	**14**	**11**	**239**	**144**	**184**	**20**	**5**	**0**	**3**	**8**	**0**	**6**	**879**

Table 7. Traffic Volume at Intersection 4 (in Vehicles)

	NB						SB						EB				WB				
	LT	TH				RT	LT	TH				RT	LT	TH		RT	LT		TH	RT	
Time Period	**11**	**1**	**2**	**3**	**4**	**<**	**11**	**1**	**2**	**3**	**4**	**<**	**1**	**<**	**2**	**<**	**1**	**2**	**<**	**3**	**Sum**
8:28 a.m.-8:30 a.m.	0	4	6	6	5	4	0	27	16	23	1	0	0	0	0	0	0	0	0	2	**94**
8:30 a.m.-8:35 a.m.	1	11	14	28	26	9	6	77	45	39	11	0	0	0	0	4	0	0	0	2	**273**
8:35 a.m.-8:40 a.m.	0	10	16	29	28	12	4	72	47	46	7	0	2	0	0	3	2	0	0	2	**280**
8:40 a.m.-8:45 a.m.	2	20	19	33	22	10	11	67	50	50	8	1	0	0	0	0	2	0	1	0	**296**
8:45 a.m.-8:46:41 a.m.	0	5	5	8	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**24**
Sum	**3**	**50**	**60**	**104**	**84**	**38**	**21**	**243**	**158**	**158**	**27**	**1**	**2**	**0**	**0**	**7**	**4**	**0**	**1**	**6**	**967**

Speed Analysis

Speed analysis was performed at the midpoints of each section on Lankershim Blvd, which are between two neighboring intersections as shown in Figure 4. The following tables provide average speed for both moving directions (NB and SB) and for each lane.

Table 8. Average Speed in Section 2 (NB) (Feet Per Second)

Movement	TH				TH+RT		RT		
Lane	1		2		3		4		
	Count	Speed	Count	Speed	Count	Speed	Count	Speed	Average
8:28 a.m.-8:30 a.m.	8	29.97	8	36.90	12	30.46	12	24.82	**29.95**
8:30 a.m.-8:35 a.m.	18	29.29	24	24.88	36	23.16	23	31.33	**26.52**
8:35 a.m.-8:40 a.m.	19	29.07	31	25.49	43	23.00	26	31.36	**26.44**
8:40 a.m.-8:45 a.m.	22	26.58	30	24.75	35	24.12	30	33.04	**27.03**
All	**67**	**28.42**	**93**	**26.08**	**126**	**24.07**	**91**	**31.04**	**27.02**

Table 9. Average Speed in Section 2 (SB) (Feet Per Second)

Movement	TH						
Lane	1		2		3		
	Count	Speed	Count	Speed	Count	Speed	Average
8:28 a.m. -8:30 a.m.	7	23.89	11	30.59	21	35.76	**32.17**
8:30 a.m.-8:35 a.m.	38	34.67	31	37.10	39	36.90	**36.17**
8:35 a.m.-8:40 a.m.	40	41.62	33	41.51	34	39.35	**40.86**
8:40 a.m.-8:45 a.m.	39	37.72	33	40.95	47	42.64	**40.56**
All	**124**	**37.26**	**108**	**38.96**	**141**	**39.23**	**38.50**

Table 10. Average Speed in Section 3 (NB) (Feet Per Second)

Movement	TH						
Lane	1		2		3		
	Count	Speed	Count	Speed	Count	Speed	Average
8:28 a.m.-8:30 a.m.	7	58.55	13	55.12	12	48.67	**53.45**
8:30 a.m.-8:35 a.m.	17	49.39	33	54.63	42	46.94	**50.15**
8:35 a.m.-8:40 a.m.	16	50.04	44	50.80	48	43.48	**47.43**
8:40 a.m.-8:45 a.m.	24	53.58	42	50.98	44	45.48	**49.35**
All	**64**	**52.13**	**132**	**52.24**	**146**	**45.50**	**49.34**

Table 11. Average Speed in Section 3 (SB) (Feet Per Second)

Movement	LT				TH						
Lane	11		12		1		2		3		
	Count	Speed	Count	Speed	Count	Speed	Count	Speed	Count	Speed	Average
8:28 a.m.-8:30 a.m.	3	35.22	16	30.43	10	40.45	13	43.72	23	30.70	**34.95**
8:30 a.m.-8:35 a.m.	24	25.46	32	24.24	31	35.38	40	41.52	40	31.23	**32.30**
8:35 a.m.-8:40 a.m.	9	33.06	27	45.67	40	43.06	37	48.29	48	41.83	**43.77**
8:40 a.m.-8:45 a.m.	11	30.55	36	37.86	29	40.83	41	41.02	59	39.06	**39.03**
All	**47**	**28.73**	**111**	**34.76**	**110**	**40.07**	**131**	**43.49**	**170**	**36.87**	**37.93**

Table 12. Average Speed in Section 4 (NB) (Feet Per Second)

Movement	TH						TH+RT		
Lane	1		2		3		4		
	Count	Speed	Count	Speed	Count	Speed	Count	Speed	Average
8:28 a.m.-8:30 a.m.	5	59.23	6	61.69	9	59.94	8	48.36	**56.88**
8:30 a.m.-8:35 a.m.	12	50.31	17	50.37	31	49.83	31	46.27	**48.78**
8:35 a.m.-8:40 a.m.	10	51.89	19	48.97	34	44.34	36	42.69	**45.39**
8:40 a.m.-8:45 a.m.	19	47.71	24	45.39	35	45.40	25	44.25	**45.55**
All	**46**	**50.55**	**66**	**49.19**	**109**	**47.53**	**100**	**44.64**	**47.40**

Table 13. Average Speed in Section 4 (SB) (Feet Per Second)

Movement	TH						RT		
Lane	1		2		3		4		
	Count	Speed	Count	Speed	Count	Speed	Count	Speed	Average
8:28 a.m.-8:30 a.m.	28	46.71	13	51.45	25	48.41	1	46.87	**48.26**
8:30 a.m.-8:35 a.m.	79	40.46	44	47.88	46	46.54	9	42.58	**43.97**
8:35 a.m.-8:40 a.m.	74	41.40	43	45.78	49	42.79	7	41.14	**42.87**
8:40 a.m.-8:45 a.m.	66	42.61	45	43.10	61	44.72	6	46.33	**43.58**
All	**247**	**42.02**	**145**	**46.09**	**181**	**45.17**	**23**	**43.31**	**44.02**

Travel Time Analysis

Average travel times for vehicles traveling NB on Lankershim Blvd from the southernmost to the northernmost section of the study area (average travel length is about 1,588 feet) are provided in Table 14. Also, average travel times for vehicles traveling SB on Lankershim Blvd from the northernmost to the southernmost section of the study area (average travel length is about 1,556 feet) are provided in Table 15.

Table 14. Average Travel Time on Lankershim Blvd (NB) (in Seconds)

From Lane	1				2				
To Lane	1	2	3	4	1	2	3	4	Average
8:28 a.m.-8:30 a.m.	–	37.4	76.7	32.2	–	–	71.4	68.4	**57.2**
8:30 a.m.-8:35 a.m.	52.9	39.7	67.9	33.7	–	49.1	76.8	89.4	**58.5**
8:35 a.m.-8:40 a.m.	61.3	68.1	86.9	74.9	–	67.5	86.1	96.2	**77.3**
8:40 a.m.-8:45 a.m.	73.1	63.2	85	58.3	–	102.8	52.9	78.3	**73.4**
Average	**62.4**	**52.1**	**79.1**	**49.8**	–	**73.1**	**71.8**	**83.1**	**67.3**

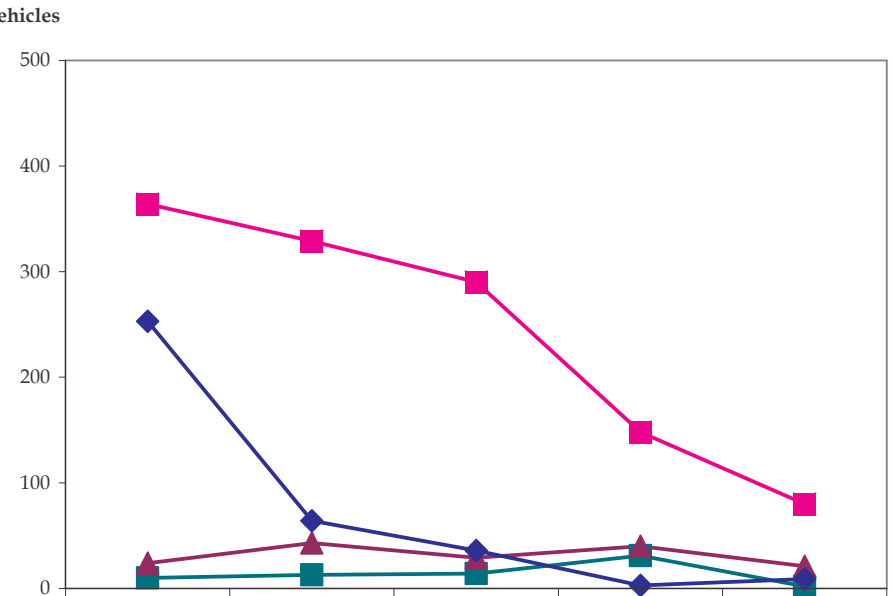
Table 15. Average Travel Time on Lankershim Blvd (SB) (in Seconds)

From Lane	1			2			3			4			
To Lane	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**Average**
8:28 a.m.-8:30 a.m.	79.8	–	–	78.5	55.0	59.6	84.3	77.6	58.1	–	–	–	**69.0**
8:30 a.m.-8:35 a.m.	67.2	54.5	41.1	46.3	62.0	73.3	45.3	88.0	67.7	–	–	–	**60.6**
8:35 a.m.-8:40 a.m.	64.5	75.8	76.8	47.7	44.2	44.0	25.8	33.8	48.9	–	–	–	**51.3**
8:40 a.m.-8:45 a.m.	56.0	70.1	-	71.6	56.6	52.2	55.0	64.7	57.9	–	–	–	**60.5**
Average	**66.9**	**64.9**	**59.0**	**61.0**	**54.5**	**57.3**	**52.6**	**66.0**	**58.2**	–	–	–	**60.3**

Lane Change Analysis

An analysis of lane changes occurring in the study area is provided in this section. It should be noted that vehicles making either left turns or right turns to the closest receiving lane were not counted as lane changes. The number of lane changes per vehicle for all vehicles in the study area is shown in Figure 5. The number of lane changes by each O-D pair is provided in Table 16. Table 17 provides the average lane changes by each O-D pair, which were calculated by dividing the number of lane changes by the number of vehicles for that O-D pair.

Figure 5. Number of Lane Changes Per Vehicle



	0	1	2	3	4+
All	364	329	290	148	80
From Southernmost to Northernmost Section on Lankershim Blvd	10	13	14	31	2
From Lankershim Off-Ramp to Northernmost Section on Lankershim Blvd	24	43	29	40	21
From Northernmost to Southernmost Section on Lankershim Blvd	253	64	36	3	9

Table 16. Number of Lane Changes by O-D Pairs

	Destination										
Origin	**201**	**203**	**204**	**205**	**206**	**207**	**208**	**209**	**210**	**211**	**Sum**
101	0	115	5	17	2	8	144	5	12	25	**333**
102	1	75	2	16	0	71	325	2	4	1	**497**
103	8	0	0	0	0	0	72	0	4	14	**98**
104	0	1	0	2	0	1	5	0	4	5	**18**
105	2	2	4	0	1	0	8	0	0	2	**19**
106	0	3	0	0	0	0	3	0	0	4	**10**
107	3	2	2	0	0	0	3	0	0	0	**10**
108	193	240	22	13	3	24	0	1	40	41	**577**
109	6	0	0	0	0	0	5	0	0	10	**21**
110	3	4	0	0	0	0	7	0	0	0	**14**
111	6	23	8	11	0	42	48	0	0	0	**138**
Sum	**222**	**465**	**43**	**59**	**6**	**146**	**620**	**8**	**64**	**102**	**1,735**

Table 17. Average Lane Changes by O-D Pairs

	Destination										
Origin	**201**	**203**	**204**	**205**	**206**	**207**	**208**	**209**	**210**	**211**	**Avg.**
101	0.0	2.1	1.0	3.4	2.0	2.7	2.1	2.5	2.4	1.8	**2.1**
102	0.1	1.8	0.5	3.2	0.0	3.0	2.1	1.0	4.0	1.0	**2.0**
103	1.1	0.0	0.0	0.0	0.0	0.0	1.8	0.0	4.0	1.1	**1.5**
104	0.0	1.0	0.0	2.0	0.0	1.0	5.0	0.0	4.0	5.0	**3.0**
105	0.5	1.0	4.0	0.0	1.0	0.0	1.6	0.0	0.0	2.0	**1.4**
106	0.0	3.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	4.0	**2.5**
107	1.5	2.0	2.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	**0.9**
108	0.5	1.6	1.8	1.2	1.0	1.1	0.0	1.0	1.9	1.6	**0.9**
109	1.5	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.0	2.5	**2.1**
110	1.5	4.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	**1.8**
111	1.5	0.7	2.0	3.7	0.0	4.2	3.0	0.0	0.0	0.0	**1.9**
Avg.	**0.5**	**1.6**	**1.5**	**2.4**	**1.2**	**2.5**	**2.0**	**1.3**	**2.2**	**1.7**	**1.4**

Headway Analysis

Tables 18 and 19 provide average headway of vehicles traveling on Lankershim Blvd NB and SB, respectively. In addition to average headway for each time period, headways were also analyzed based on vehicle speed (i.e., less than 5 mph, 5 to 20 mph, and more than 20 mph).

Table 18. Average Headway on Lankershim Blvd (NB) (in Seconds)

Time Period	Speed (mph)			Average Headway
	<5	5-20	>20	
8:28 a.m.-8:30 a.m.	22.22	6.43	3.98	**6.96**
8:30 a.m.-8:35 a.m.	30.97	7.19	3.94	**8.85**
8:35 a.m.-8:40 a.m.	44.04	5.58	4.10	**12.59**
8:40 a.m.-8:45 a.m.	41.59	5.87	3.89	**10.07**
Average Headway	**38.81**	**6.14**	**3.96**	**10.80**

Table 19. Average Headway on Lankershim Blvd (SB) (in Seconds)

Time Period	Speed (mph)			Average Headway
	<5	5-20	>20	
8:28 a.m.-8:30 a.m.	21.03	4.61	3.30	**5.14**
8:30 a.m.-8:35 a.m.	28.73	4.94	3.15	**7.28**
8:35 a.m.-8:40 a.m.	37.42	7.22	3.28	**5.54**
8:40 a.m.-8:45 a.m.	28.95	6.51	3.32	**5.96**
Average Headway	**31.00**	**5.73**	**3.26**	**6.55**

Spacing Analysis

Spacing, or distance headway, was analyzed for each time period and for each speed group. Tables 20 and 21 provide average spacing of vehicles traveling on Lankershim Blvd NB and SB, respectively.

Table 20. Average Spacing on Lankershim Blvd (NB) (in Feet)

Time Period	Speed (mph)			Average Spacing
	<5	5-20	>20	
8:28 a.m.-8:30 a.m.	28.87	121.32	173.32	**110.12**
8:30 a.m.-8:35 a.m.	40.28	114.67	160.13	**104.21**
8:35 a.m.-8:40 a.m.	39.48	103.90	170.50	**97.62**
8:40 a.m.-8:45 a.m.	49.64	97.16	162.05	**106.54**
Average Spacing	**41.92**	**105.86**	**165.22**	**102.62**

Table 21. Average Spacing on Lankershim Blvd (SB) (in Feet)

Time Period	Speed (mph)			Average Spacing
	<5	5-20	>20	
8:28 a.m.-8:30 a.m.	27.31	83.62	141.35	**111.41**
8:30 a.m.-8:35 a.m.	26.97	82.17	132.55	**91.85**
8:35 a.m.-8:40 a.m.	28.41	102.99	139.25	**119.47**
8:40 a.m.-8:45 a.m.	28.42	113.27	136.82	**114.98**
Average Spacing	**27.99**	**92.84**	**137.34**	**106.19**

Gap Analysis

Tables 22 and 23 present the accepted lead and lag gaps by vehicles during lane-changing on Lankershim Blvd NB and SB, respectively. In addition to average gaps for each time period, lead and lag gaps were also analyzed based on vehicle speed (i.e., less than 5 mph, 5 to 20 mph, and more than 20 mph).

Table 22. Average Lead and Lag Gaps on Lankershim Blvd (NB) (in Feet)

	Lead Gap (Feet)				Lag Gap (Feet)			
Time Period	**<5 mph**	**5-20 mph**	**>20 mph**	**Average**	**<5 mph**	**5-20 mph**	**>20 mph**	**Average**
8:28 a.m.-8:30 a.m.	–	60.00	104.20	**96.83**	–	163.00	67.20	**83.17**
8:30 a.m.-8:35 a.m.	–	60.33	86.47	**79.65**	–	62.50	59.71	**60.43**
8:35 a.m.-8:40 a.m.	–	27.40	66.21	**61.23**	–	88.00	57.68	**61.56**
8:40 a.m.-8:45 a.m.	–	50.33	81.03	**78.67**	–	88.33	67.97	**69.54**
Average	–	**46.40**	**75.38**	**71.20**	**–**	**73.73**	**62.06**	**63.74**

Table 23. Average Lead and Lag Gaps on Lankershim Blvd (SB) (in Feet)

	Lead Gap (Feet)				Lag Gap (Feet)			
Time Period	**<5 mph**	**5-20 mph**	**>20 mph**	**Average**	**<5 mph**	**5-20 mph**	**>20 mph**	**Average**
8:28 a.m.- 8:30 a.m.	–	65.33	79.64	**76.57**	–	49.33	75.82	**70.14**
8:30 a.m.-8:35 a.m.	–	48.50	54.78	**54.45**	–	56.00	51.36	**51.61**
8:35 a.m.-8:40 a.m.	–	17.00	50.95	**49.33**	–	9.00	57.60	**55.29**
8:40 a.m.-8:45 a.m.	9.00	42.50	58.71	**55.53**	132.00	31.00	45.77	**46.53**
Average	**9.00**	**40.57**	**55.09**	**53.55**	**132.00**	**35.00**	**50.70**	**50.41**