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No Trucks Left Lane

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Introduction

The CTR team was asked by TxDOT to examine the need for restricting trucks from use of the left lane on three urban freeway sections. These include US 183, US 290, and Loop 1 (Mopac). All three sections have at least three lanes in both directions and all three are located within the Austin Metropolitan geographic area. US 183 and Loop 1 typically have traffic congestion during peak travel hours on weekdays, however, congested conditions rarely occur on the US 290 section between IH-35 and the west end of the freeway section in Oak Hill. The Austin area freeway IH-35 has the largest travel demand by both cars and trucks. The "No Trucks Left Lane" signage has been posted on IH-35 within the Austin District for more than a decade. The questions posed here is whether traffic operations and safety on US 183, US 290, and Loop 1 could be improved by restricting trucks from using the left lane of these freeway sections. This work has attempted to develop an answer to this question using a synthesis of experiences with such restrictions gathered from both inside and outside Texas, as well as, lane-by-lane traffic counts of both cars and trucks on the three candidate freeways.

Federal Highway Administration Guidance

Lane restrictions fit under the umbrella of lane management. The FHWA Freeway Management and Operations Handbook (FHWA, 2003) defines managed lanes as:

"Certain freeway lanes set aside for a variety of operating strategies that move traffic more efficiently in those lanes."

An emphasis on efficiency is the original objective given by agencies for the introduction of lane restrictions involving trucks. The FHWA Handbook, however, also states "the goals of various forms of truck lanes are to improve traffic operations, improve safety and facilitate the flow of goods".

International Experiences

Outside the US, lane restrictions for trucks are frequently applied. For example, Ontario, Canada restricts trucks from using the left lane on 6+ lane facilities. Belgium and Sweden prohibit trucks from the left lane during selected hours and days of the week, while the United Kingdom restricts trucks from using the outermost lane (right-lane) on motorways with three or more lanes. Since 2009, Victoria, Australia signage restricts NO TRUCKS IN THE RIGHT LANE on the three-lane M1 Princes Freeway. (www.skyscrapercity.com/showthread.php?t=1646168, 2015).

Experiences in the United States

The State of Washington generally prohibits trucks from using the left lane, however, it is one of ten states that prohibit use of the left lane except for specific conditions on facilities with two or more lanes in one direction. Since 2005, the State of Tennessee has had legislation that limits trucks to use of lanes other than the left lane on multi-lane facilities. California has implemented truck left lane restrictions for a number of highways as a means of improving flow and reducing crashes. Yang and Regan (2007) conducted a simulation study of a Los Angeles freeway examining other impacts and found no trucks left lane restrictions beneficial if associated with specific conditions including volumes exceeding 1300 vehicles per hour per lane and more than 10 percent truck traffic. The North Carolina DOT implemented truck lane-use restrictions in a large-scale experiment along 123 miles of interstate highway. On the other hand, the South Carolina DOT implemented truck lane restrictions on a problematic section of I-85 that had heavy truck volumes and noted a 78 percent crash reduction during the test. They subsequently expanded the test to include an additional 106 miles (safety.transportation.org/htmlguides/hvy_trks/HTapp9.htm, 2014).

The FHWA handbook also provides the following summary of experience with truck lane-use restrictions: Florida I-95, Broward County conducted a 6-month, 7 am to 7 pm study in 1988. The public felt safer with lane restrictions for trucks, however

overall accidents increased 6.3 percent (7 am to 7 pm period) while truck accidents decreased 3.3 percent.

In Georgia beginning September 1986, trucks were restricted to the right lane(s) except to pass or to make a left-hand exit. On I-285, trucks were at fault in 72 percent of lane-changing violations. Before the restriction, trucks were observed occupying all lanes thus prohibiting passing.

The New Jersey Turnpike Authority (NJTA) imposed lane restrictions in the 1960's that did not allow trucks in the left lane of turnpike roadways that have three or more lanes by direction. Sources at the NJTA stated that the compliance rate for truck lane restrictions was very high.

Beginning in 1964, Illinois implemented truck lane restrictions. Evaluations indicated the public felt safer, and traffic operations were improved. Virginia implemented truck lane restrictions on the Capital Beltway through four studies, one for 24-months, and the others for 12 months. Public and political perception indicated safer highways, however, an Engineering study recommended removal. Accident rate increased 13.8 percent during the 2-year study.

Finally, Michigan adopted statewide restrictions requiring trucks to use the right two lanes on roadways that have three or more lanes. Establishment was thought to be politically motivated. No studies are available to evaluate the countermeasure.

Radhakrishnan and Wilmot (2009) conducted a review of truck lane restrictions for the Louisiana DOT in which they surveyed the state DOT's to determine how widely used the concept is. The responses they received are summarized as follows:

Arkansas	Yes, left lane truck restriction on six-lane sections of urban interstates.
California	Yes, motor truck or truck-tractor with three or more axles is restricted to designated lanes on locations where signs are erected.
Colorado	Yes, trucks restricted to the right lane at some locations with steep downhill grades.
Florida	Yes, left-most lane restrictions for trucks over three or more axles on roadways with six or more lanes for twenty-four hours a day. Restrictions are applied depending on the amount of truck traffic.

Iowa	No.
Kansas	No.
Kentucky	Yes, trucks with more than six wheels are restricted to the two right-most lanes on rural interstates with three or more lanes in each direction
Maine	Yes, median lane (left-most) restriction for trucks on 40 miles of six-lane highway on Maine Turnpike
Maryland	Yes, left lane truck lane restrictions for trucks over five tons GVW on all freeways with four or more lanes in one direction
Mississippi	No.
Missouri	Yes, left-most lane restriction for trucks with a gross weight of 48,000 pounds or more on interstate highways.
New Hampshire	No.
New Jersey	Yes, trucks weighing 10,000 pounds or more gross weight are restricted from the left-most lane on highways with three or more lanes in one direction.
New York	Yes, on a case-by-case basis. There is a left lane restriction for a ten-mile distance between Exits 24 (Albany) and Exit 26 (Schenectady) on New York State Thruway, which has a minimum of three lanes (single direction).
North Carolina	Yes, the majority of these were implemented as part of a "pilot" effort initially limited to approximately 123 miles of six-lane interstates.
North Dakota	Yes, practice is to restrict trucks on three or more lane (single direction) interstates to the two right most lanes.
South Carolina	Yes, practice is to apply truck lane restriction to the two rightmost lanes on interstate facilities with three or more lanes in one direction.

South Dakota	No.
Texas	Yes, left lane truck lane restrictions on I-10E, SH 225, I- 45N and US 290 in Houston area, I 10/US 90 and I-35 in San Antonio area, I-20 and I-30 in Dallas-Fort Worth area and I-35 in Austin area for trucks with three or more axles.
Virginia	Yes, commercial motor vehicles are restricted from the left-most lane of any interstate highway having more than two lanes in each direction.
Wisconsin	No.

Traffic Counts

Surveillance video of US 183, US 290 and Mopac traffic was requested from the Austin Traffic Control Center. The video was the basis for separately counting cars and trucks lane by lane for 24 hour time periods in both summer and fall conditions. (See Appendices A through C.)

Overall, peak period traffic volumes are large and approach capacity on all three freeways. However, average traffic volumes for US 183, US 290, and Mopac are less than capacity throughout the year. Average lane volumes remain below 2000 vph per lane capacity for all three freeways throughout the whole year (Fig. 25, 26, and 27, Appendix C). Note that the Highway Capacity Manual states approximately 2400 vph per lane capacity as ideal conditions for modern freeways. Additionally, there was less traffic recorded in the summer than in the fall (Fig. 25, 26, and 27, Appendix C). This can be expected since schools are generally not in session and many people are vacationing.

Truck percentages went above 10 percent only on US 183 and 290. All three freeways had an average of less than 10 percent trucks during the summer. Although US 183 did not go over an average of 10 percent trucks, it did have higher percentages of trucks throughout the summer days (Fig. 7, Appendix C). During the fall, truck volumes were larger and there were times where both US 183 and US 290 average truck percentages went above 10 percent (Fig. 19 and 20, Appendix C). Mopac did not ever reach an average of 10 percent trucks in either the summer or fall (Fig. 9 and 21, Appendix C).

Volumes of trucks in each of the three lanes (left, middle or right lanes) are shown in Figures 10, 11, 12, 22, 23, and 24. Significantly, the Figures show that most trucks do not choose to travel in the left lane but middle or right lanes are most frequently chosen.

Application Guidelines

Although most studies of no trucks left lane applications have concentrated more attention on non-quantitative measures of effectiveness and secondarily, crash rates, several did suggest traffic demand conditions that would justify restricting trucks from left lanes. Yang and Regan (2007) performed a simulation based study of the effects of no trucks left lane restrictions and suggested minimum average lane traffic volumes of 1,300 vehicles per hour (vph) and a minimum of 10 percent trucks. Others who have evaluated these restrictions have provided similar guidance since this 2007 study. Clearly, the relative effectiveness of the procedure is dependent upon a minimum number and percentage of large trucks. Most guidelines and laws dealing with the topic define trucks as vehicles having three or more axles, but some exempt all buses. Care must be used when attempting to apply a guideline such as 1,300 vph per lane and 10 percent trucks. If traffic volumes are very large as in the case of IH-35 through Austin (more than 225,000 ADT), the percentage trucks can appear artificially small because the number of autos is so very large. Additionally, traffic volumes vary with times of day so a facility could meet the minimums for some of the hours of a typical day but not all 24 hours.

Recommendation

Generally, although peak period traffic demands cause congestion on US 183, US 290, and Mopac, truck volumes, and truck percentages of total traffic are small. Because the truck volumes are small, the likelihood of seeing positive effects from placing "No Trucks Left Lanes" signs is also small. However, US 183 has the highest truck traffic out of the three observed freeways. Consequently it is most likely to reap benefits of placing no trucks left lane signs. We recommend placing the "No Trucks Left Lane" signage on US 183. Whether these signs successfully provoke positive effects can be measured through observation of traffic operations and accident occurrences. If flows increase and numbers of crashes decrease after implementation of the signs, then it follows that the signs have been successful. Therefore, we secondly recommend monitoring US 183 for changes in operational phenomena and crashes once signs have been placed.

Summary

Based upon the information acquired through this exercise, at least 23 states currently prohibit trucks from using left freeway lanes on at least some facilities. In

some cases, the no trucks left lane prohibition is applied to facilities with only two lanes each direction, however it is most often applied to freeway class facilities with three or more lanes each direction. Although some agencies note that the no trucks left lane specification promotes improved operations, most have observed improved safety documented by crash rate reductions. Such reductions range from just over 3 percent for one application in Florida to 78 percent for a test application in South Carolina. Currently, Texas has about 450 miles of no trucks left lane freeways. Before-after crash studies on IH-20 and IH-30 in the Dallas-Ft Worth area produced 77 percent and 23 percent crash rate reductions for those two major urban freeways. The authors of the NCT-COG study of IH-20 and IH-30 acknowledge that many other components likely acted together to produce the notable crash rate reductions, but the no truck left lane application clearly played a key role.

Appendix A: Traffic Count Data Tables

Tables 1-8 are summer traffic data tables for US 183, US 290, and Mopac, observed on different days. Tables 9-13 are fall traffic data tables for US 183, US 290, and Mopac, observed on different days.

Table 1. US 183 Summer Northbound Traffic (6-13-2014)

Hour	Left Lane		Middle Lane		Right Lane	
	Cars	Trucks	Cars	Trucks	Cars	Trucks
8:00 AM	1615	9	1669	61	1749	55
9:00 AM	1179	4	1395	51	1486	38
10:00 AM	958	13	1318	51	1458	40
11:00 AM	1123	7	1389	47	1521	52
Noon	1221	4	1498	45	1654	43
1:00 PM	1202	15	1618	48	1654	64
2:00 PM	1457	15	1641	53	1735	59
3:00 PM	1684	21	1697	32	1713	54
4:00 PM	1838	8	1765	12	1755	32
5:00 PM	1525	2	1584	9	1634	19
6:00 PM	1067	2	1471	8	1384	18
7:00 PM	873	0	1230	12	1220	8
8:00 PM	602	0	902	8	882	6
9:00 PM	686	2	1067	12	1968	9
10:00 PM	396	0	632	6	661	7

Table 2. US 290 Summer Northbound Traffic (7-8-2014 to 7-9-2014)

Hour	Left Lane		Middle Lane		Right Lane	
	Cars	Trucks	Cars	Trucks	Cars	Trucks
11:00 AM	501	1	933	6	1441	22

Noon	596	3	1147	7	1564	15
1:00 PM	642	1	1160	5	1568	11
2:00 PM	683	0	1091	3	1603	6
3:00 PM	864	1	1191	4	1634	11
4:00 PM	239	1	308	4	387	1
5:00 PM - 2:00 AM	No data					
3:00 AM	4	0	31	0	94	6
4:00 AM	49	0	184	1	213	9
5:00 AM	143	0	381	1	553	7
6:00 AM	471	0	867	3	1131	7
7:00 AM	941	1	1412	1	1595	9
8:00 AM	279	0	414	3	462	1

Table 3. Mopac Summer Southbound Traffic (7-9-2014 to 7-10-2014)

Hour	**Left Lane**		**Middle Lane**		**Right Lane**	
	Cars	Trucks	Cars	Trucks	Cars	Trucks
3:00 PM	387	0	897	1	1242	4
4:00 PM	751	0	1019	1	1393	3
5:00 PM	437	0	1125	1	1619	6
6:00 PM	499	0	1078	1	1489	1
7:00 PM	265	0	754	1	1144	2
8:00 PM	122	0	461	1	735	1
9:00 PM	12	0	285	0	728	2
10:00 PM	0	0	192	1	492	1
11:00 PM	0	0	73	0	251	1
Midnight	0	0	42	0	126	2
1:00 AM	0	0	15	3	80	5
2:00 AM	0	0	11	1	54	1
3:00 AM	0	0	13	0	77	4
4:00 AM	12	0	55	1	135	2
5:00 AM	102	0	376	1	363	3
6:00 AM	995	1	1321	0	1232	5
7:00 AM	1815	0	1799	2	1828	7
8:00 AM	1599	1	1757	4	1954	4
9:00 AM	975	0	1630	3	1922	6
10:00 AM	483	0	1083	2	1490	7
11:00 AM	397	0	994	2	1589	7
Noon	395	0	925	5	1524	5

1:00 PM	395	0	1001	3	1530	5
2:00 PM	428	1	977	0	1466	4
3:00 PM	215	0	498	3	766	1

Table 4. US 183 Summer Southbound Traffic (, 6-16-2014 to 6-17-2014)

Hour	Left Lane		Middle Lane		Right Lane	
	Cars	Trucks	Cars	Trucks	Cars	Trucks
8:00 AM	1658	14	1485	23	1869	34
9:00 AM	1113	9	1237	30	1523	27
10:00 AM	830	9	1166	38	1326	25
11:00 AM	828	13	1236	34	1391	43
Noon	967	17	1311	32	1597	21
1:00 PM	990	16	1510	40	1789	20
2:00 PM	957	14	1290	33	1539	29
3:00 PM	1408	8	1521	28	1637	22
4:00 PM	1679	15	1555	24	1746	16
5:00 PM	1866	9	1696	21	1806	15
6:00 PM	1274	2	1371	25	1605	11
7:00 PM	715	6	1112	17	1145	12
8:00 PM	250	0	503	5	563	5
9:00 PM	415	23	834	10	833	9
10:00 PM	357	5	702	11	538	6
11:00 PM	177	0	449	3	439	4
Midnight	82	0	235	3	250	2
1:00 AM	14	0	126	6	157	5
2:00 AM	12	0	111	6	122	9
3:00 AM	29	0	143	10	115	13
4:00 AM	107	1	277	7	205	11
5:00 AM	348	0	607	14	431	9
6:00 AM	1183	4	1224	22	1333	13
7:00 AM	1178	4	1089	11	1277	10

Table 5. Mopac Summer Southbound Traffic (7-10-2014 to 7-11-2014)

Hour	Left Lane		Middle Lane		Right Lane	
	Cars	Trucks	Cars	Trucks	Cars	Trucks
9:00 PM	68	0	236	0	396	1
10:00 PM	55	0	262	0	438	1
11:00 PM	17	0	121	1	247	1
Midnight	11	0	73	1	145	1

1:00 AM	5	0	36	2	84	1
2:00 AM	2	0	22	2	70	2
3:00 AM	5	0	41	3	57	3
4:00 AM	11	0	72	1	123	3
5:00 AM	104	0	317	1	367	1
6:00 AM	818	0	1205	1	1255	3
7:00 AM	1603	0	1914	2	2102	5
8:00 AM	1293	0	1746	0	2070	3
9:00 AM	801	0	1357	1	1738	3
10:00 AM	463	1	1075	2	1510	4
11:00 AM	398	0	1072	1	1696	3
Noon	415	0	1022	0	1681	4
1:00 PM	464	0	1089	4	1644	4
2:00 PM	457	0	1013	0	1556	1
3:00 PM	450	1	950	1	1402	1

Table 6. US 183 Summer Southbound Traffic (7-7-2014 to 7-8-2014)

Hour	**Left Lane**		**Middle Lane**		**Right Lane**	
	Cars	Trucks	Cars	Trucks	Cars	Trucks
8:00 AM	1374	0	1331	10	1353	12
9:00 AM	1232	1	1430	12	1520	15
10:00 AM	652	4	1010	8	981	11
11:00 AM	734	5	1167	20	1212	25
Noon	966	4	1463	24	1577	19
1:00 PM	945	5	1437	19	1549	26
2:00 PM	939	8	1429	23	1508	17
3:00 PM	1345	2	1631	13	1644	9
4:00 PM	1502	7	1703	6	1622	10
5:00 PM	1841	5	1870	12	1713	5
6:00 PM	1275	3	1574	3	1592	6
7:00 PM	743	2	1179	7	1234	9
8:00 PM	449	2	934	4	933	5
9:00 PM	376	2	817	6	832	4
10:00 PM	259	0	627	4	652	2
11:00 PM	140	1	429	6	367	8
Midnight	69	0	248	4	237	6
1:00 AM	31	0	158	3	150	8
2:00 AM	16	0	104	2	115	3
3:00 AM	34	0	134	2	106	5
4:00 AM	142	1	327	7	182	10

5:00 AM	72	0	150	1	78	4
6:00 AM - 7:00 AM	No data					
8:00 AM	1374	0	1331	10	1353	12
9:00 AM	1232	1	1430	12	1520	15
10:00 AM	652	4	1010	8	981	11

Table 7. Mopac Summer Southbound Traffic (7-11-2014 to 7-12-2014)

Hour	Left Lane		Middle Lane		Right Lane	
	Cars	Trucks	Cars	Trucks	Cars	Trucks
5:00 PM	977	0	957	6	948	3
6:00 PM	1567	1	1710	5	1640	0
7:00 PM	1279	0	1549	1	1390	1
8:00 PM	776	0	1128	0	986	0
9:00 PM	653	0	1083	2	934	1
10:00 PM	484	0	892	4	818	2
11:00 PM	248	0	648	2	514	1
Midnight	155	0	420	4	298	1
1:00 AM	41	0	229	1	183	0
2:00 AM	36	1	152	3	152	0
3:00 AM	19	0	111	10	71	2
4:00 AM	9	0	108	7	64	0
5:00 AM	63	0	259	2	213	4
6:00 AM	216	1	495	11	424	7
7:00 AM	400	4	792	14	666	13
8:00 AM	790	0	1174	5	1078	4
9:00 AM	1109	6	1434	21	1279	16
10:00 AM	1345	1	1664	10	1575	14
11:00 AM	1188	1	1473	14	1296	21

Table 8. US 183 Summer Southbound Traffic (6-15-2014)

Hour	Left Lane		Middle Lane		Right Lane	
	Cars	Trucks	Cars	Trucks	Cars	Trucks
7:00 AM	186	0	527	4	416	8
8:00 AM	483	1	493	8	673	8

9:00 AM	546	0	963	5	940	9
10:00 AM	645	2	1144	5	1163	9
11:00 AM	740	3	1130	7	1143	12
Noon	722	3	1172	7	1258	7
1:00 PM	740	0	1213	6	1286	11
2:00 PM	730	2	1161	8	1229	5
3:00 PM	787	1	1163	4	1226	7
4:00 PM	No data					
5:00 PM	694	2	1208	6	1255	11
6:00 PM	614	3	1129	5	1223	7

Table 9: US 183 Northbound Fall Traffic (10-6-2014 to 10-7-2014)

Hour	**Left Lane**		**Middle Lane**		**Right Lane**	
	Cars	Trucks	Cars	Trucks	Cars	Trucks
11:00 AM	963	3	1280	20	1547	32
Noon	1088	1	1363	21	1664	16
1:00 PM	1078	4	1402	19	1610	35
2:00 PM	1404	32	1489	75	1629	76
3:00 PM	1718	18	1664	46	1638	80
4:00 PM	2045	8	1753	28	1857	44
5:00 PM	1797	3	1634	21	1898	14
6:00 PM	1349	2	1451	5	1463	7
7:00 PM	952	1	1159	8	1165	16
8:00 PM	609	3	973	19	973	13
9:00 PM	436	2	754	12	792	11
10:00 PM	326	1	593	13	558	13
11:00 PM	166	0	428	2	393	4
Midnight	77	0	251	3	209	14
1:00 AM	45	0	194	5	158	9
2:00 AM	34	0	112	14	137	11
3:00 AM	25	0	95	10	97	24
4:00 AM	37	0	159	19	181	21
5:00 AM	269	2	458	39	606	40
6:00 AM	1181	6	1265	66	1461	50
7:00 AM	1827	3	1557	19	1928	17
8:00 AM	1804	16	1584	75	1921	55
9:00 AM	1173	70	1365	104	1648	103
10:00 AM	837	6	1092	17	1357	27

Table 10. US 290 Northbound Fall Traffic (10-7-2014 to 10-9-2014)

Hour	Left Lane		Middle Lane		Right Lane	
	Cars	Trucks	Cars	Trucks	Cars	Trucks
11:00 AM	825	11	1283	52	1221	22
Noon	806	26	1244	93	1304	68
1:00 PM	514	10	854	40	604	21
2:00 PM	489	0	686	2	299	6
3:00 PM	659	0	871	0	397	4
4:00 PM	1186	0	1337	8	1655	18
5:00 PM	1733	6	1739	26	1787	10
6:00 PM	879	0	1223	5	1624	8
7:00 PM	627	1	1053	15	1086	5
8:00 PM	439	1	870	11	934	17
9:00 PM	213	0	613	9	625	6
10:00 PM	162	0	499	5	535	8
11:00 PM	141	0	222	1	305	3
Midnight	19	0	97	0	254	3
1:00 AM	9	0	41	4	128	2
2:00 AM	11	0	68	10	97	19
3:00 AM	14	0	74	23	93	22
4:00 AM	42	0	146	24	166	30
5:00 AM	234	1	477	62	496	56
6:00 AM	967	6	1148	76	1146	69
7:00 AM	1490	9	1524	24	1693	20
8:00 AM	1176	1	1445	1	1512	24
9:00 AM	618	0	1022	4	1342	12
10:00 AM	513	0	917	6	1296	19
11:00 AM	801	12	1157	79	1265	60
Noon	949	21	1282	122	1245	69
1:00 PM	845	21	1180	108	1229	68
2:00 PM	953	24	1269	101	1233	61
3:00 PM	1151	17	1418	65	1302	39
4:00 PM	1513	9	1599	46	1510	39
5:00 PM	1846	4	1802	33	1911	21
6:00 PM	1108	3	1483	16	1426	8
7:00 PM	748	6	1170	15	1093	15
8:00 PM	438	4	929	20	855	9
9:00 PM	243	3	668	7	688	10
10:00 PM	190	5	526	14	476	6
11:00 PM	110	0	363	8	376	15
12:00 AM	42	0	163	8	166	5

Table 11. Mopac Southbound Fall Traffic (10-29-2014 to 10-31-2014)

Hour	Left Lane		Middle Lane		Right Lane	
	Cars	Trucks	Cars	Trucks	Cars	Trucks
3:00 PM	507	4	1142	20	1337	39
4:00 PM	476	0	1118	17	1509	18
5:00 PM	614	0	1247	6	1732	11
6:00 PM	437	0	1081	2	1423	5
7:00 PM	222	0	756	2	992	11
8:00 PM	28	0	153	0	980	13
9:00 PM	0	0	1	2	932	24
10:00 PM	1	0	1	1	596	13
11:00 PM	0	0	0	0	327	15
Midnight	0	0	0	0	159	20
1:00 AM	0	0	0	0	92	17
2:00 AM	1	0	0	0	93	15
3:00 AM	0	0	0	0	86	3
4:00 AM	8	0	50	1	192	1
5:00 AM	125	1	383	5	354	9
6:00 AM	1236	6	1397	37	1289	54
7:00 AM	1818	0	1713	7	1686	16
8:00 AM	1629	0	1793	5	2003	12
9:00 AM	894	1	1533	32	1770	59
10:00 AM	485	2	1061	34	1397	63
11:00 AM	402	2	970	27	1503	38
Noon	328	0	924	16	1317	31
1:00 PM	393	1	1030	25	1436	36
2:00 PM	441	2	1038	31	1380	45
3:00 PM	530	3	1080	26	1321	40
4:00 PM	476	3	1102	9	1443	28
5:00 PM	548	1	1317	7	1617	14
6:00 PM	418	0	1015	4	1491	10
7:00 PM	257	0	764	5	1117	10
8:00 PM	102	0	474	5	647	4
9:00 PM	88	0	403	7	528	6
10:00 PM	59	0	277	6	350	4
11:00 PM	23	1	145	13	205	6
12:00 AM	4	0	90	8	131	9
1:00 AM	8	1	45	12	65	6
2:00 AM	7	0	20	15	68	11
3:00 AM	7	20	68	0	15	11

4:00 AM	4	0	46	5	61	9
5:00 AM	11	0	102	4	117	5
6:00 AM	117	0	373	8	377	13
7:00 AM	1140	1	1342	32	1131	40
8:00 AM	1975	4	1794	42	1779	49
9:00 AM	1291	0	1695	20	1833	31
10:00 AM	742	2	1351	16	1754	36
11:00 AM	432	0	1043	7	1522	24
Noon	357	0	913	3	1373	8
1:00 PM	465	0	1053	3	1634	4
2:00 PM	496	0	1109	5	1596	14
3:00 PM	492	1	1085	38	1384	39
4:00 PM	0	1	0	0	22	4

Table 12. Mopac Southbound Fall Traffic (10-4-2014)

Hour	**Left Lane**		**Middle Lane**		**Right Lane**	
	Cars	Trucks	Cars	Trucks	Cars	Trucks
11:00 AM	595	2	1231	10	1310	7
Noon	665	0	1251	4	1525	2
1:00 PM	592	1	1199	2	1680	0
2:00 PM	438	2	1038	6	1217	8
3:00 PM	371	1	931	6	1262	9
4:00 PM	87	0	231	1	387	2

Table 13. Mopac Northbound Fall Traffic (11-5-2014 to 11-7-2014)

Hour	**Left Lane**		**Middle Lane**		**Right Lane**	
	Cars	Trucks	Cars	Trucks	Cars	Trucks
3:00 PM	1430	7	1444	29	1496	15
4:00 PM	1042	1	1023	6	968	9
5:00 PM	776	1	744	6	706	7
6:00 PM	910	2	745	3	576	1
7:00 PM	1063	2	1086	7	956	1
8:00 PM	555	1	946	6	768	1
9:00 PM	354	0	754	3	618	1
10:00 PM	236	1	600	4	448	4
11:00 PM	71	2	289	2	202	0
Midnight	31	1	173	1	124	1
1:00 AM	14	0	111	1	64	3
2:00 AM	9	1	74	2	47	6
3:00 AM	5	1	68	8	35	4

4:00 AM	48	1	131	12	75	3
5:00 AM	211	3	457	11	330	5
6:00 AM	1328	2	1336	34	1083	12
7:00 AM	2193	6	2101	24	2177	16
8:00 AM	2188	8	2136	47	2201	23
9:00 AM	1932	8	1783	49	1887	41
10:00 AM	1831	9	1752	47	1795	52
11:00 AM	1613	12	1806	45	1802	38
Noon	1468	5	1784	30	1831	19
1:00 PM	1636	10	1798	35	1864	36
2:00 PM	1740	13	1817	45	1913	39
3:00 PM	1838	6	1751	25	1849	22
4:00 PM	1341	0	1367	15	1353	7
5:00 PM	1109	1	1077	6	1076	6
6:00 PM	1278	3	1284	5	1367	7
7:00 PM	888	1	1005	5	1019	4
8:00 PM	689	3	1008	7	876	2
9:00 PM	528	2	924	9	759	1
10:00 PM	280	0	639	2	510	1
11:00 PM	186	0	469	5	405	2
Midnight	59	0	223	5	168	1
1:00 AM	24	0	142	3	88	4
2:00 AM	4	0	87	3	59	2
3:00 AM	7	0	69	6	45	3
4:00 AM	22	3	145	10	85	3
5:00 AM	202	2	434	18	351	8
6:00 AM	1394	8	1392	40	1183	14
7:00 AM	2184	4	1989	37	2027	18
8:00 AM	1533	3	1416	32	1276	22
9:00 AM	1638	18	1564	51	1633	27
10:00 AM	1642	6	1762	40	1864	36
11:00 AM	1610	12	1809	37	2036	44
Noon	1838	17	1955	42	2029	41
1:00 PM	1948	12	1950	39	1921	45
2:00 PM	1823	8	1778	30	1875	26

Appendix B: Traffic Count Summary Tables

Tables 14-19 are summer and fall traffic summary tables for all three freeways.

Table 14. US 183 Summer Traffic Summary

Hour	Truck Volume	Average Volume Per Lane	Average Truck Percentage
8:00 AM	20	1332	0.015
9:00 AM	17	1230	0.014
10:00 AM	18	1072	0.017
11:00 AM	22	1157	0.019
Noon	19	1303	0.015
1:00 PM	23	1350	0.017
2:00 PM	22	1323	0.017
3:00 PM	17	1471	0.012
4:00 PM	14	1699	0.008
5:00 PM	10	1567	0.006
6:00 PM	8	1306	0.006
7:00 PM	8	1058	0.008
8:00 PM	4	673	0.006
9:00 PM	9	878	0.010
10:00 PM	5	541	0.009
11:00 PM	4	337	0.012
Midnight	3	189	0.016
1:00 AM	4	110	0.036
2:00 AM	3	83	0.036
3:00 AM	5	99	0.051
4:00 AM	6	213	0.028
5:00 AM	5	286	0.017
6:00 AM	13	1260	0.010
7:00 AM	8	1190	0.007
8:00 AM	7	1360	0.005

Table 15. US 183 Fall Traffic Summary

Hour	Truck Volume	Average Volume Per Lane	Average Truck Percentage
8:00 AM	-	-	-
9:00 AM	-	-	-
10:00 AM	-	-	-
11:00 AM	18	1282	0.014
Noon	13	1384	0.009

1:00 PM	19	1383	0.014
2:00 PM	61	1568	0.039
3:00 PM	48	1721	0.028
4:00 PM	27	1912	0.014
5:00 PM	13	1789	0.007
6:00 PM	5	1426	0.004
7:00 PM	8	1100	0.007
8:00 PM	12	863	0.014
9:00 PM	8	669	0.012
10:00 PM	9	501	0.018
11:00 PM	2	331	0.006
Midnight	6	185	0.032
1:00 AM	5	137	0.036
2:00 AM	8	103	0.078
3:00 AM	11	84	0.131
4:00 AM	13	139	0.094
5:00 AM	27	471	0.057
6:00 AM	41	1343	0.031
7:00 AM	13	1784	0.007
8:00 AM	49	1818	0.027

Table 16. US 290 Summer Traffic Summary

Hour	Truck Volume	Average Volume Per Lane	Average Truck Percentage
8:00 AM	-	-	-
9:00 AM	-	-	-
10:00 AM	-	-	-
11:00 AM	10	968	0.010
Noon	8	1111	0.007
1:00 PM	6	1129	0.005
2:00 PM	3	1129	0.003
3:00 PM	5	1235	0.004
4:00 PM	2	313	0.006
5:00 PM	-	-	-
6:00 PM	-	-	-
7:00 PM	-	-	-
8:00 PM	-	-	-
9:00 PM	-	-	-
10:00 PM	-	-	-
11:00 PM	-	-	-

Midnight	-	-	-
1:00 AM	-	-	-
2:00 AM	-	-	-
3:00 AM	2	45	0.044
4:00 AM	3	152	0.020
5:00 AM	3	362	0.008
6:00 AM	3	826	0.004
7:00 AM	4	1320	0.003
8:00 AM	1	386	0.003

Table 17. US 290 Fall Traffic Summary

Hour	Truck Volume	Average Volume Per Lane	Average Truck Percentage
8:00 AM	-	-	-
9:00 AM	-	-	-
10:00 AM	-	-	-
11:00 AM	28	1138	0.025
Noon	62	1180	0.053
1:00 PM	24	681	0.035
2:00 PM	3	494	0.006
3:00 PM	1	644	0.002
4:00 PM	9	1401	0.006
5:00 PM	14	1767	0.008
6:00 PM	4	1246	0.003
7:00 PM	7	929	0.008
8:00 PM	10	757	0.013
9:00 PM	5	489	0.010
10:00 PM	4	403	0.010
11:00 PM	1	224	0.004
Midnight	1	124	0.008
1:00 AM	2	61	0.033
2:00 AM	10	68	0.147
3:00 AM	15	75	0.200
4:00 AM	18	136	0.132
5:00 AM	40	442	0.090
6:00 AM	50	1137	0.044
7:00 AM	18	1587	0.011
8:00 AM	9	1386	0.006

Table 18. Mopac Summer Traffic Summary

Hour	Truck Volume	Average Volume Per Lane	Average Truck Percentage
8:00 AM	-	-	-
9:00 AM	-	-	-
10:00 AM	-	-	-
11:00 AM	-	-	-
Noon	-	-	-
1:00 PM	-	-	-
2:00 PM	-	-	-
3:00 PM	2	844	0.002
4:00 PM	1	1056	0.001
5:00 PM	3	1013	0.003
6:00 PM	1	1332	0.001
7:00 PM	1	1064	0.001
8:00 PM	0	702	0.000
9:00 PM	1	489	0.002
10:00 PM	1	405	0.002
11:00 PM	1	236	0.004
Midnight	1	142	0.007
1:00 AM	1	76	0.013
2:00 AM	1	57	0.018
3:00 AM	2	46	0.043
4:00 AM	2	67	0.030
5:00 AM	1	242	0.004
6:00 AM	3	888	0.003
7:00 AM	5	1441	0.003
8:00 AM	2	1498	0.001

Table 19. Mopac Fall Traffic Summary

Hour	Truck Volume	Average Volume Per Lane	Average Truck Percentage
8:00 AM	-	-	-
9:00 AM	-	-	-
10:00 AM	-	-	-
11:00 AM	6	1052	0.006
Noon	2	1149	0.002
1:00 PM	1	1158	0.001
2:00 PM	5	903	0.006
3:00 PM	14	1117	0.013

4:00 PM	6	766	0.008
5:00 PM	5	975	0.005
6:00 PM	2	864	0.002
7:00 PM	4	850	0.005
8:00 PM	4	575	0.007
9:00 PM	5	448	0.011
10:00 PM	4	318	0.013
11:00 PM	3	151	0.020
Midnight	4	85	0.047
1:00 AM	4	50	0.080
2:00 AM	4	41	0.098
3:00 AM	3	35	0.086
4:00 AM	3	87	0.034
5:00 AM	6	316	0.019
6:00 AM	24	1302	0.018
7:00 AM	12	1960	0.006
8:00 AM	16	2008	0.008

Appendix C: Traffic Count Graphs

Figures 1-6 are average truck volume graphs for the summer. Figures 7-9 are average truck percentage graphs for the summer. Figures 10- 12 show average truck volumes graphs by for the summer. Figures 13-18 are average truck volume graphs for the fall.
Figures 19-24 are average truck percentage graphs for the fall. Figures 25-27 are combined average traffic volumes graphs for summer and fall.

Figure 1.

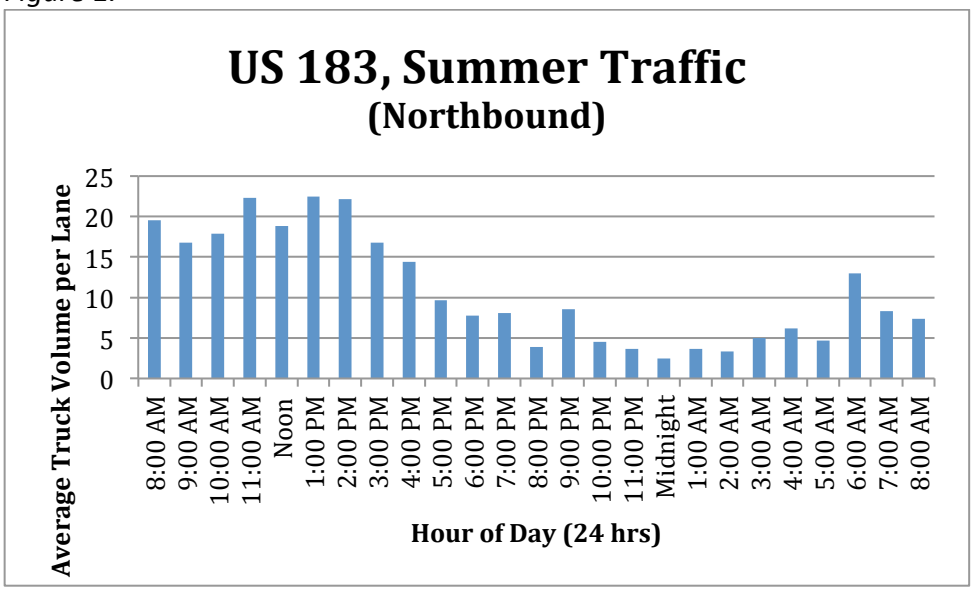
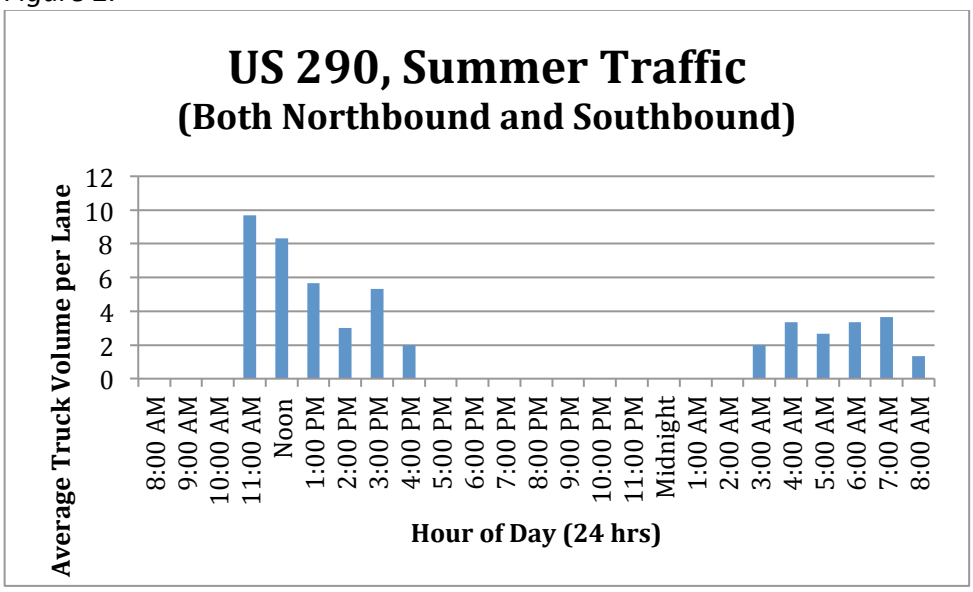


Figure 2.



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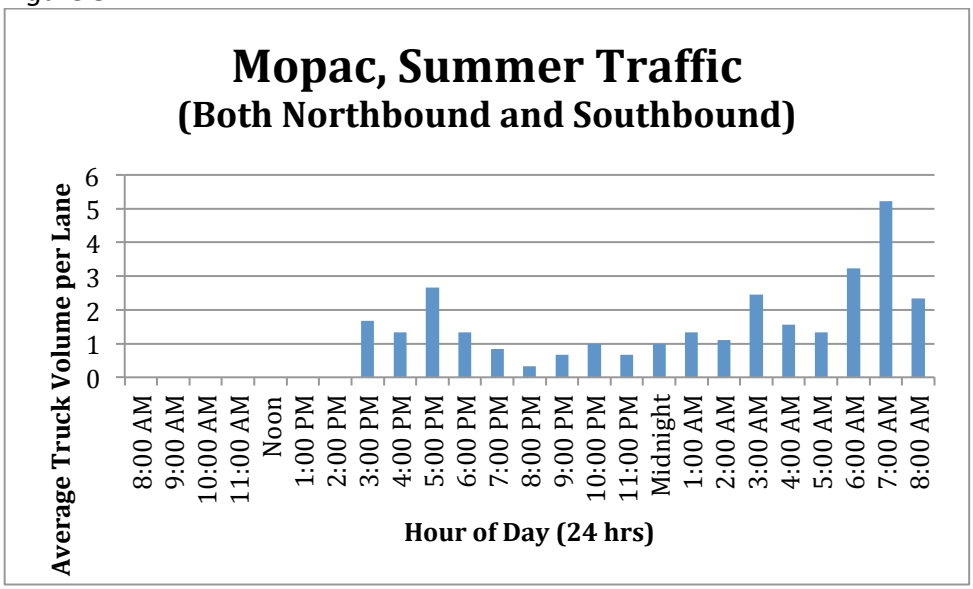

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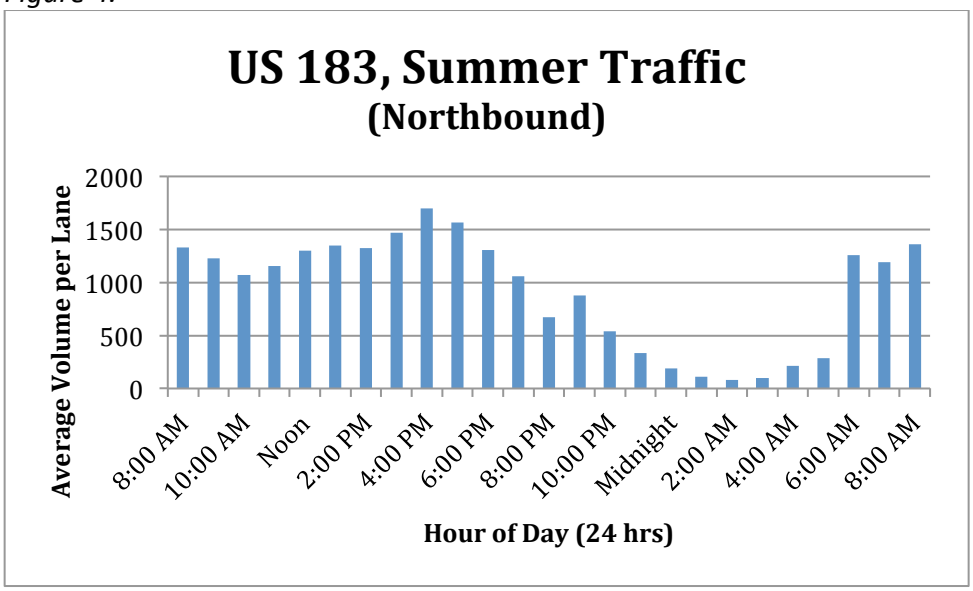

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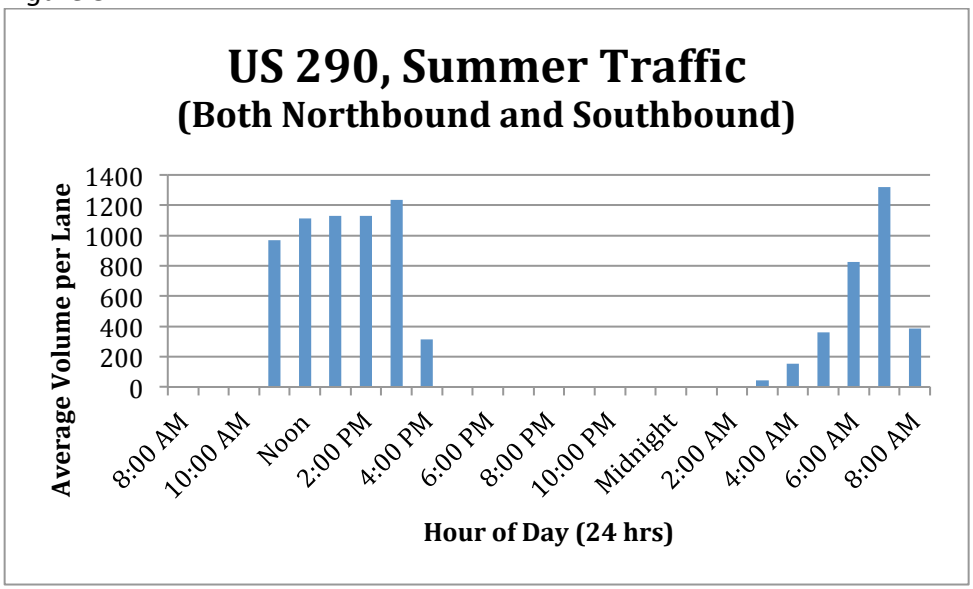

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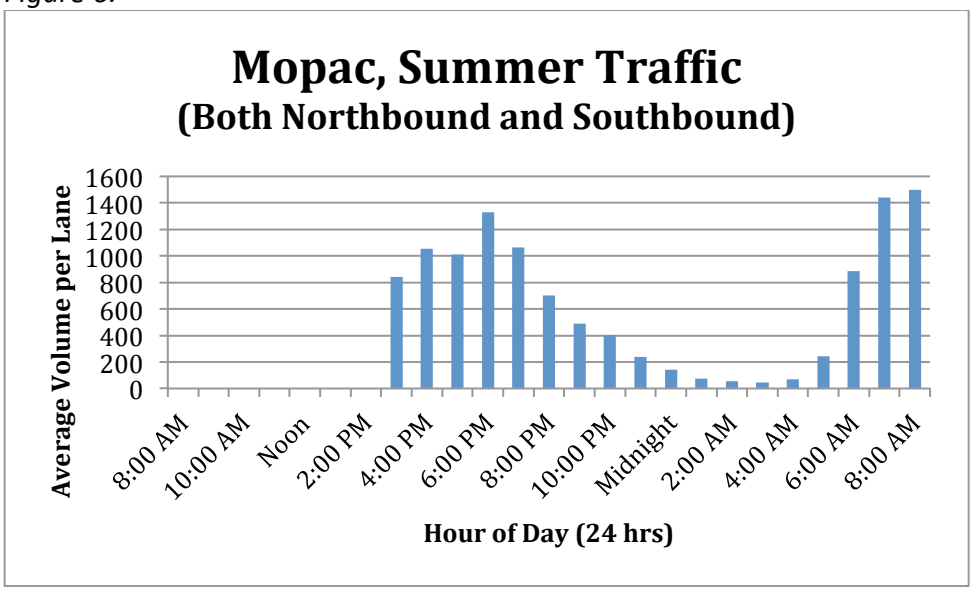

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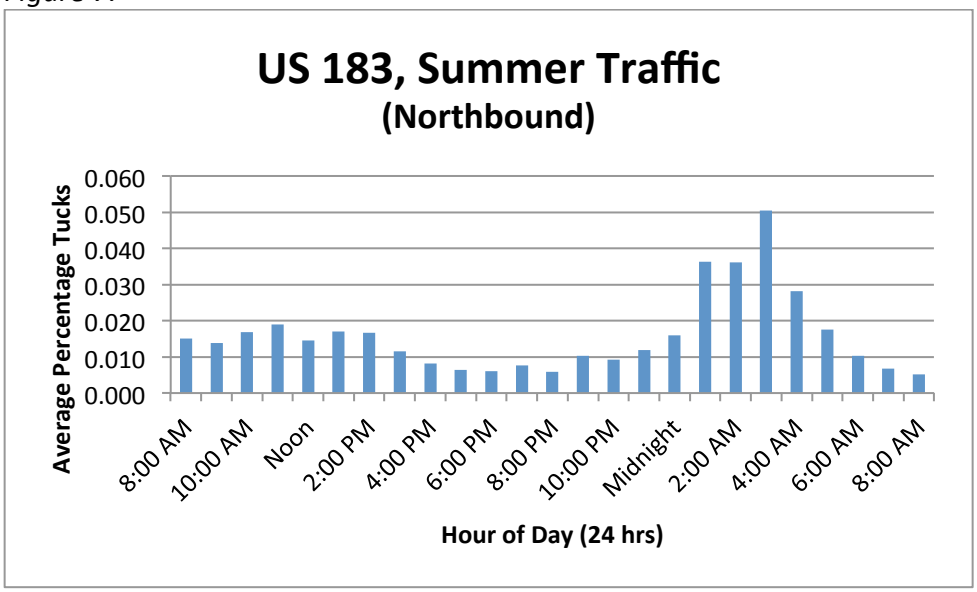
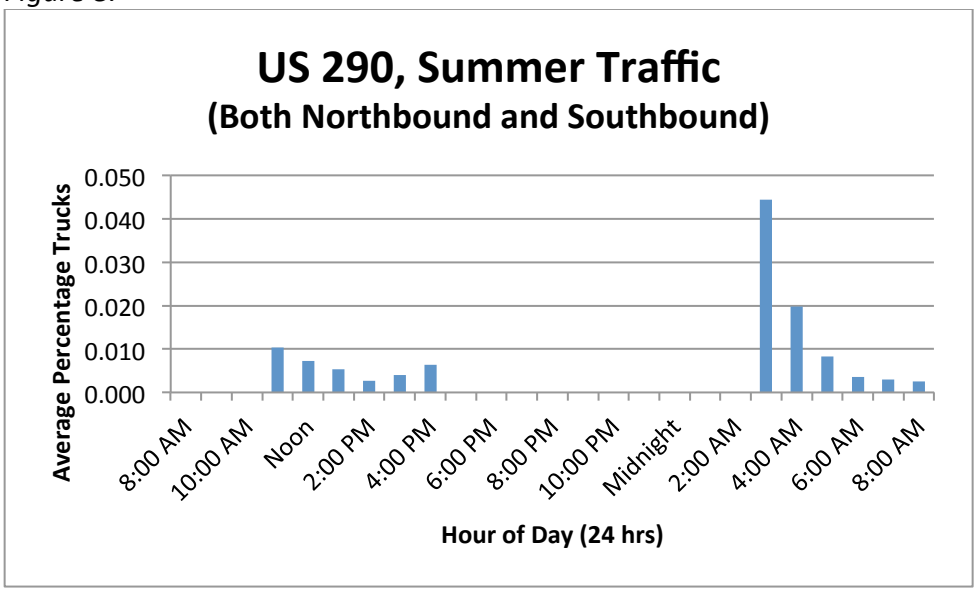


Figure 8.



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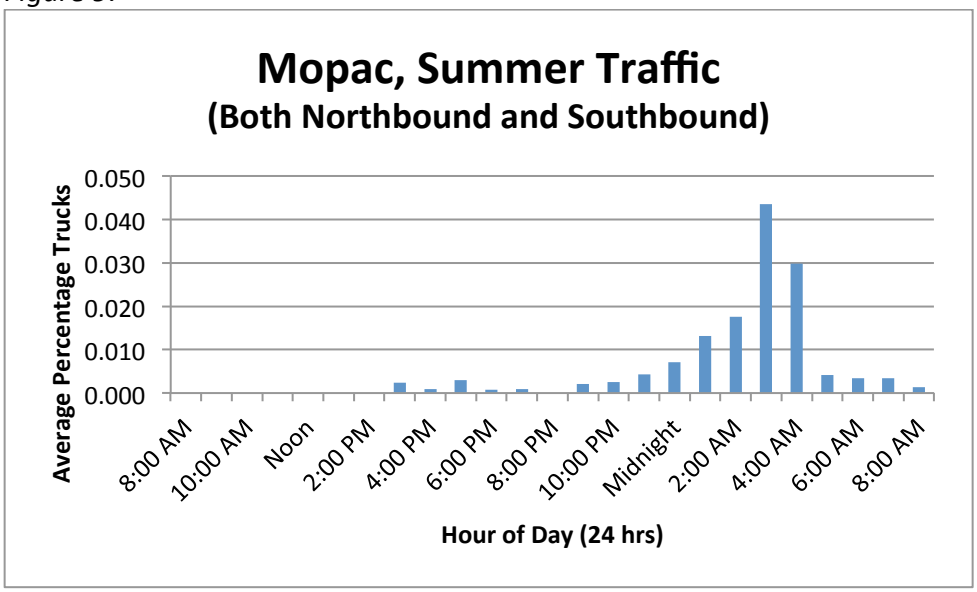
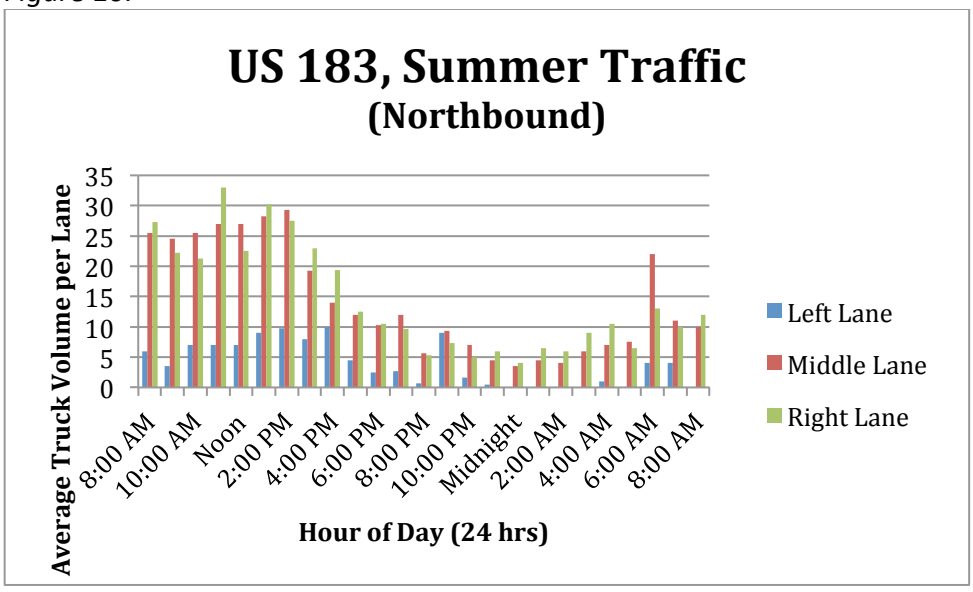


Figure 10.



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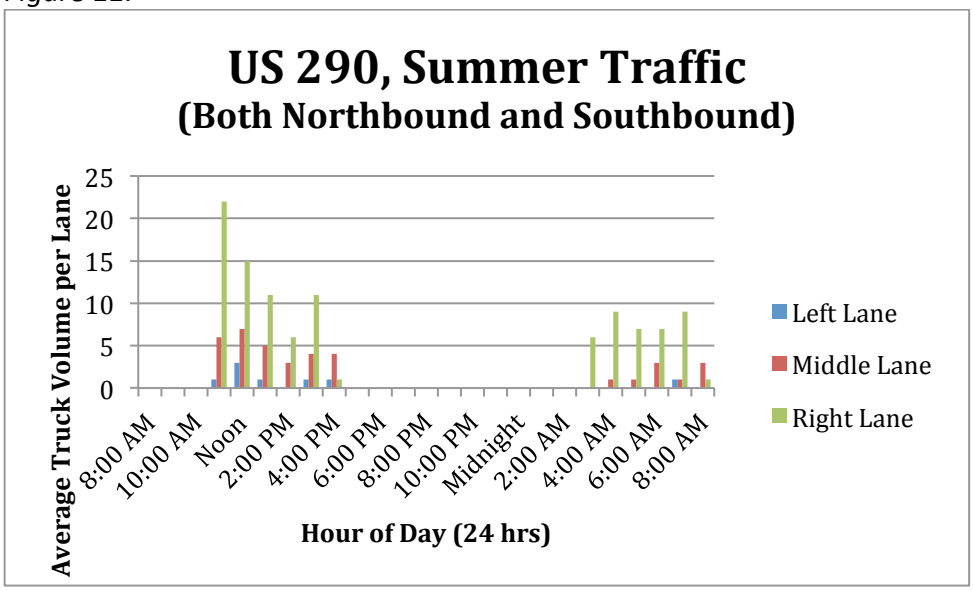

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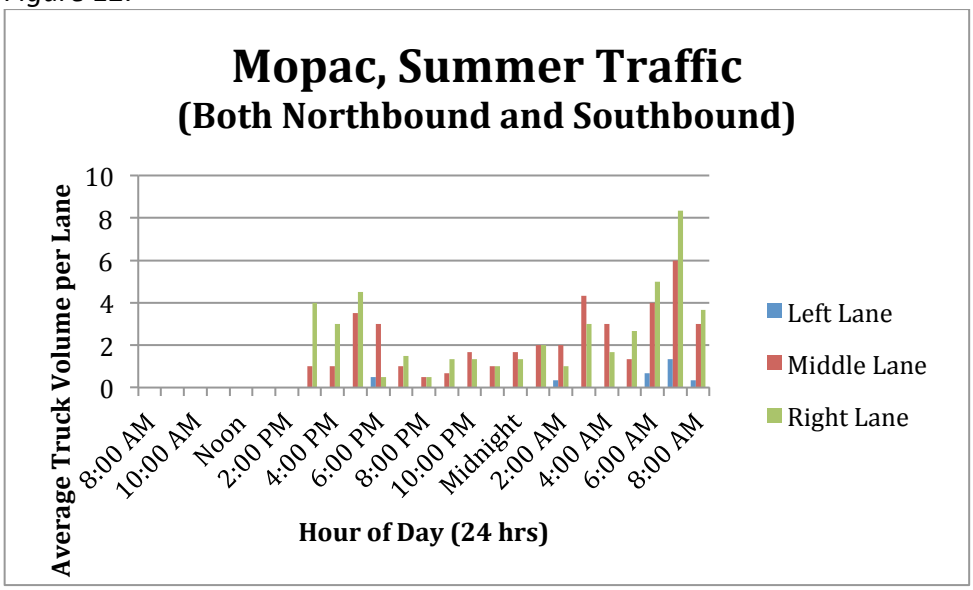


Figure 13.

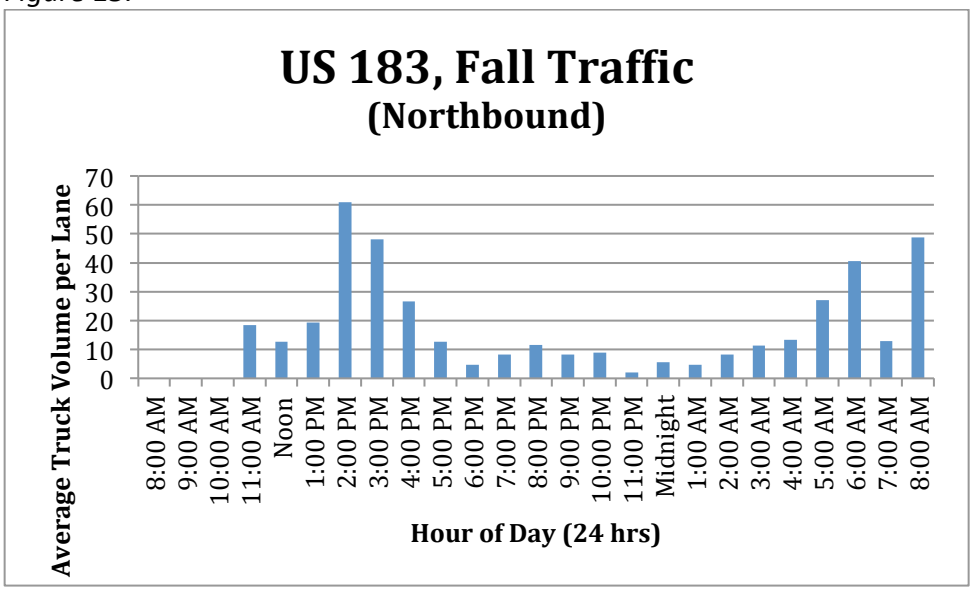
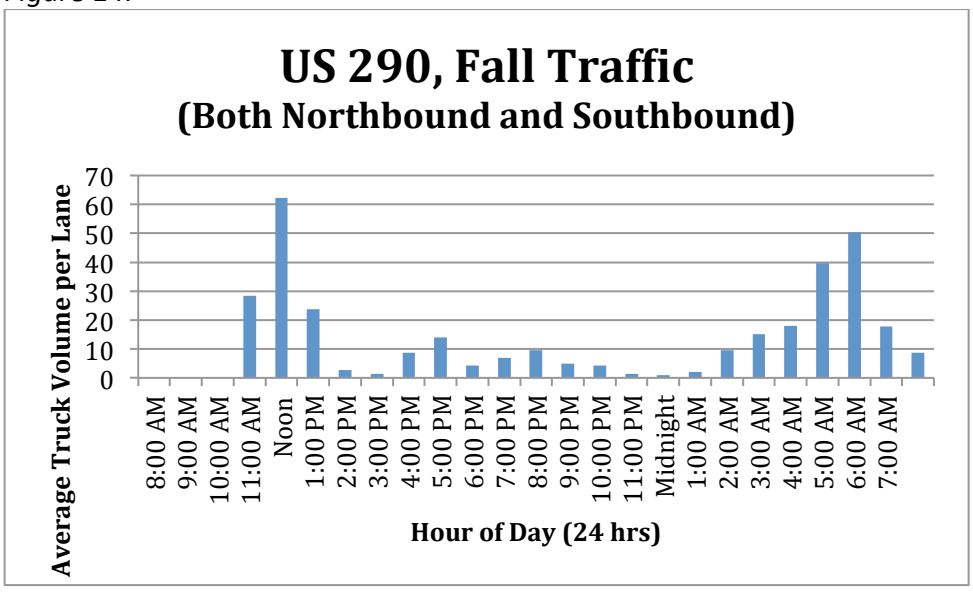


Figure 14.



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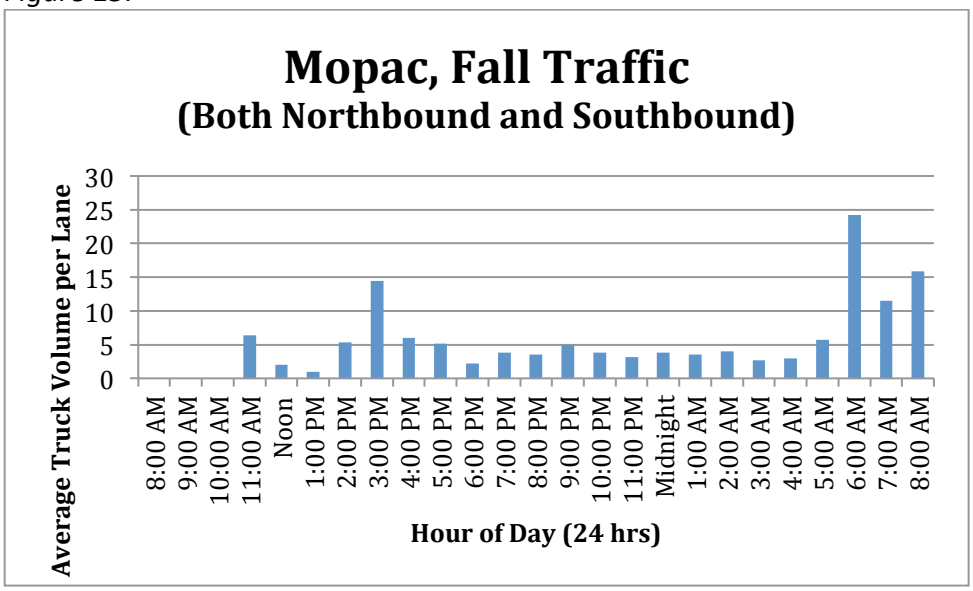

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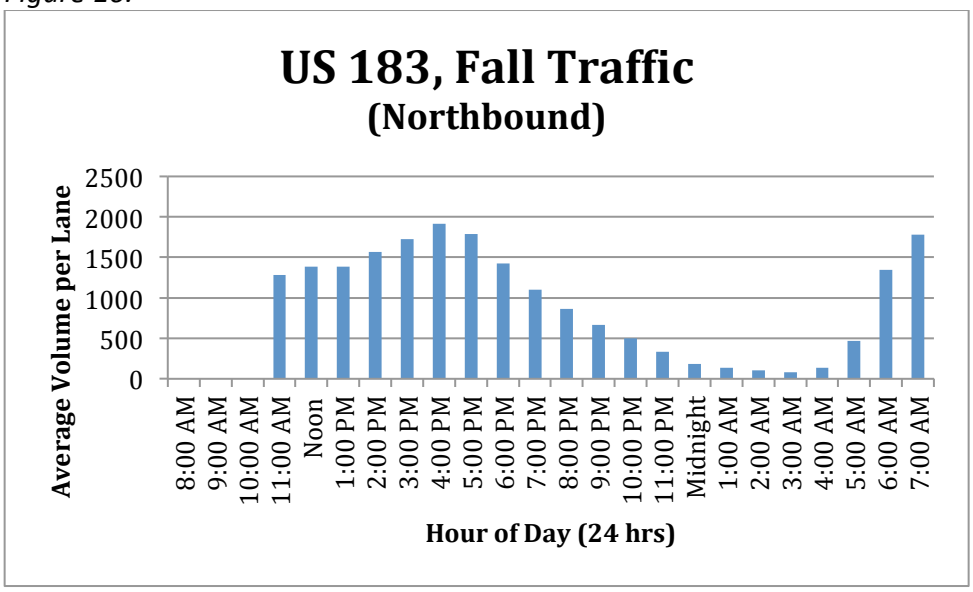


Figure 17.

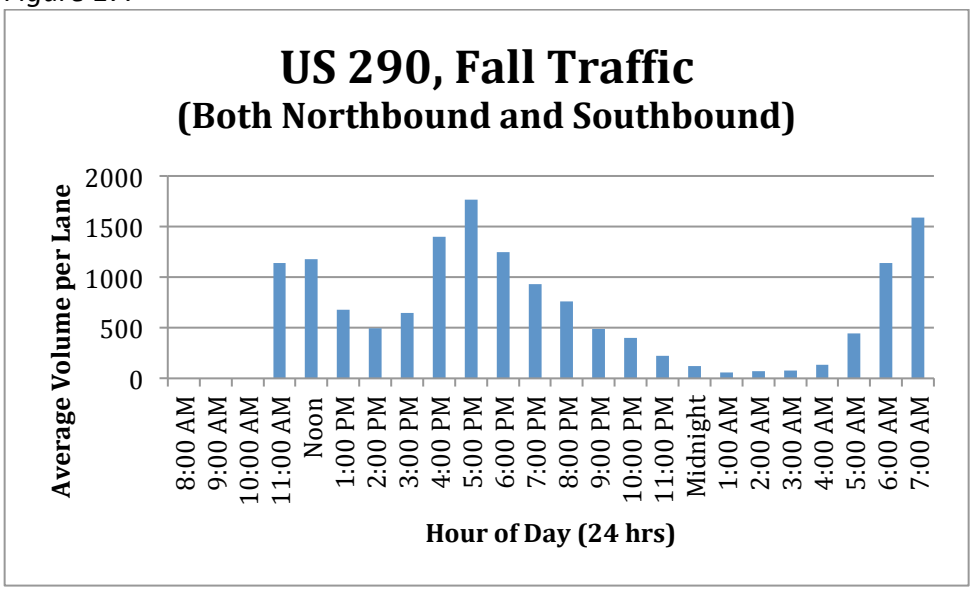
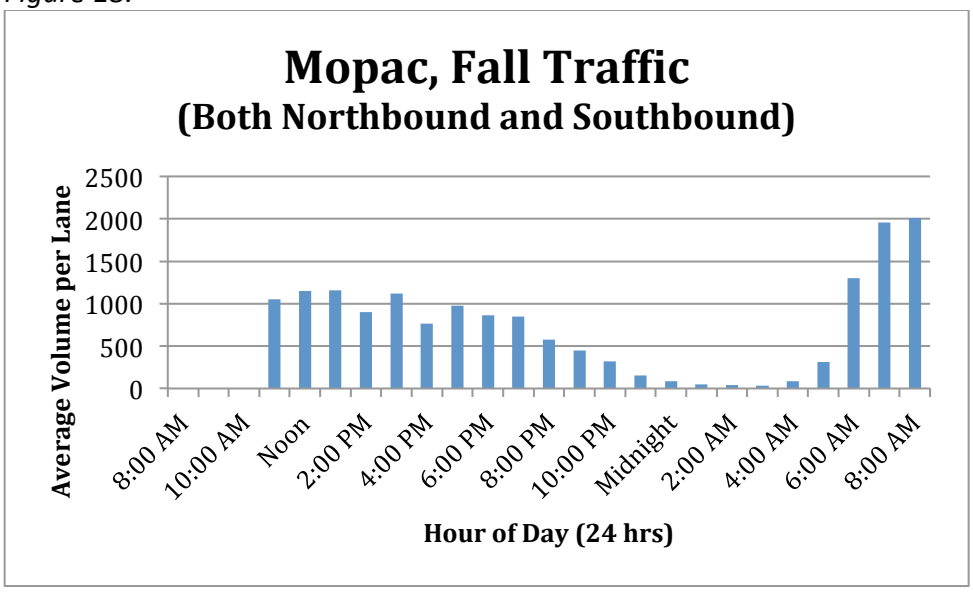


Figure 18.



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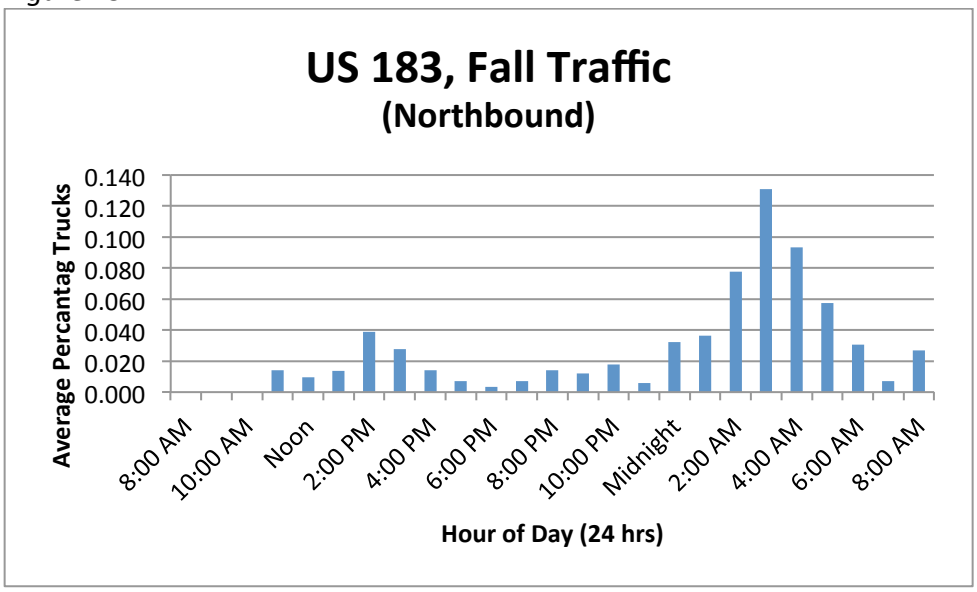

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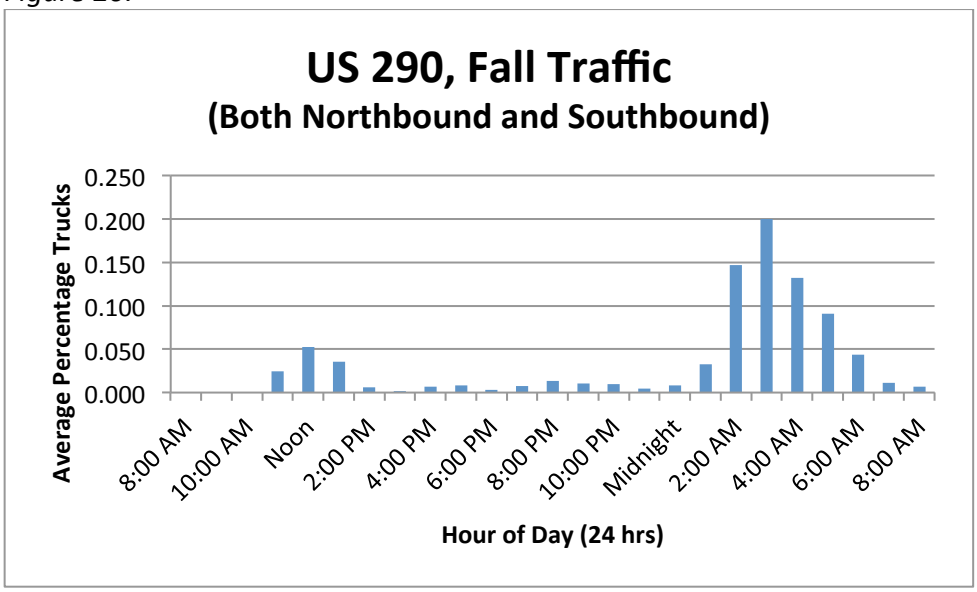

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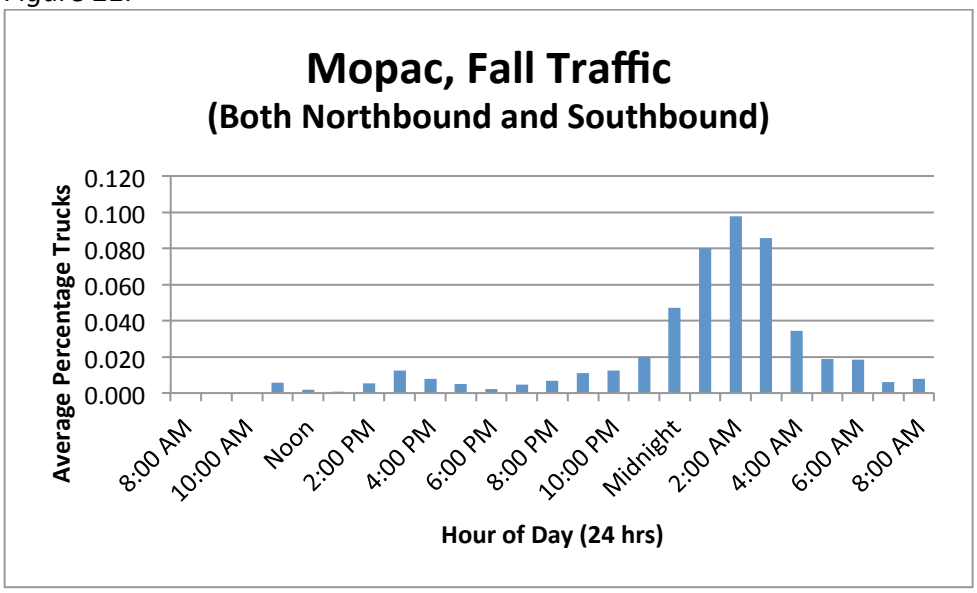

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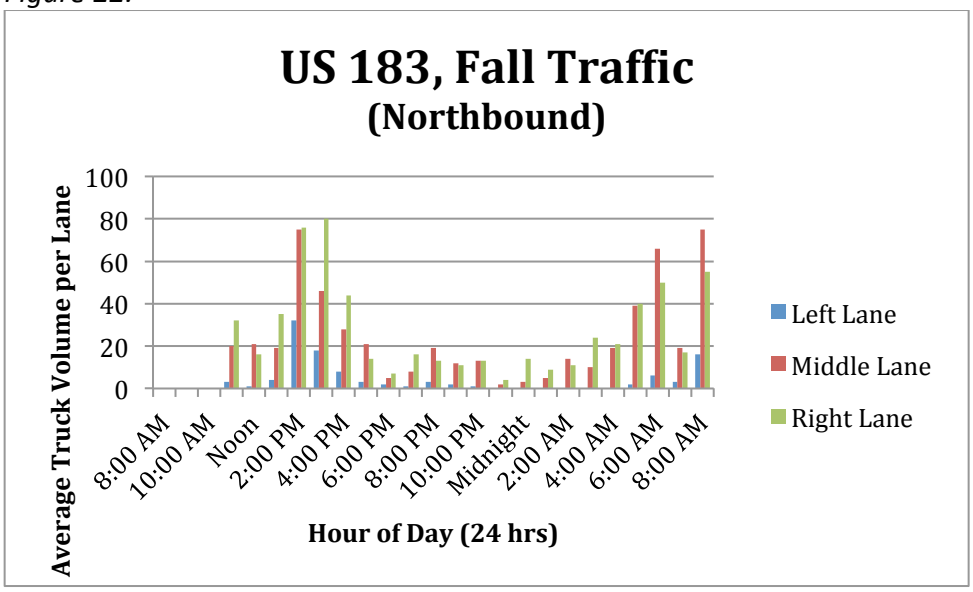

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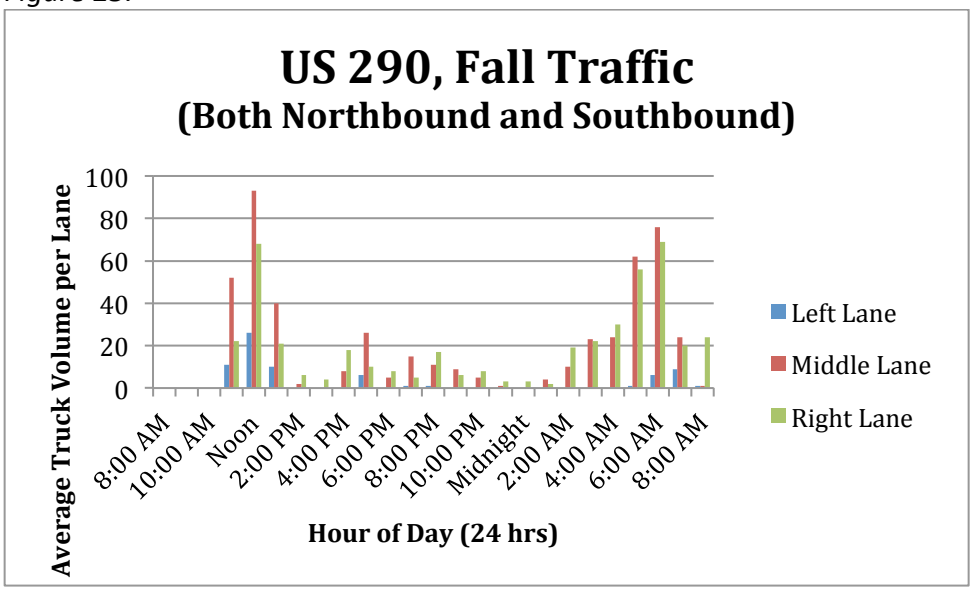

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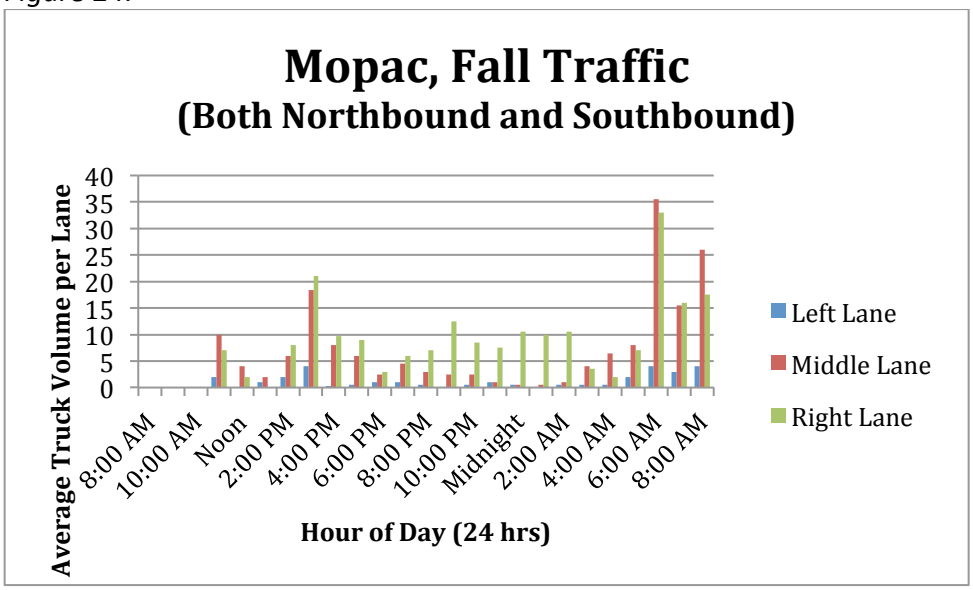

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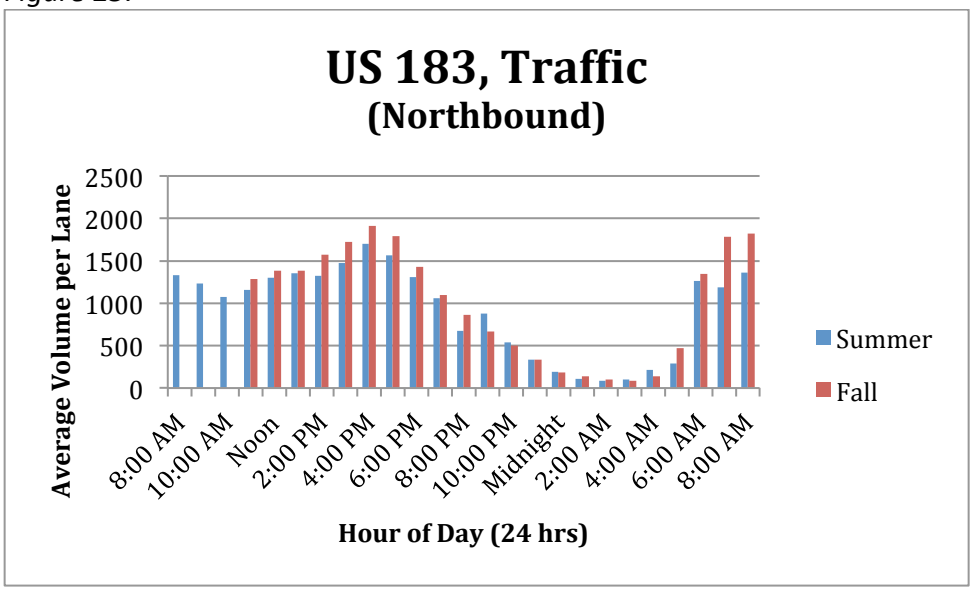

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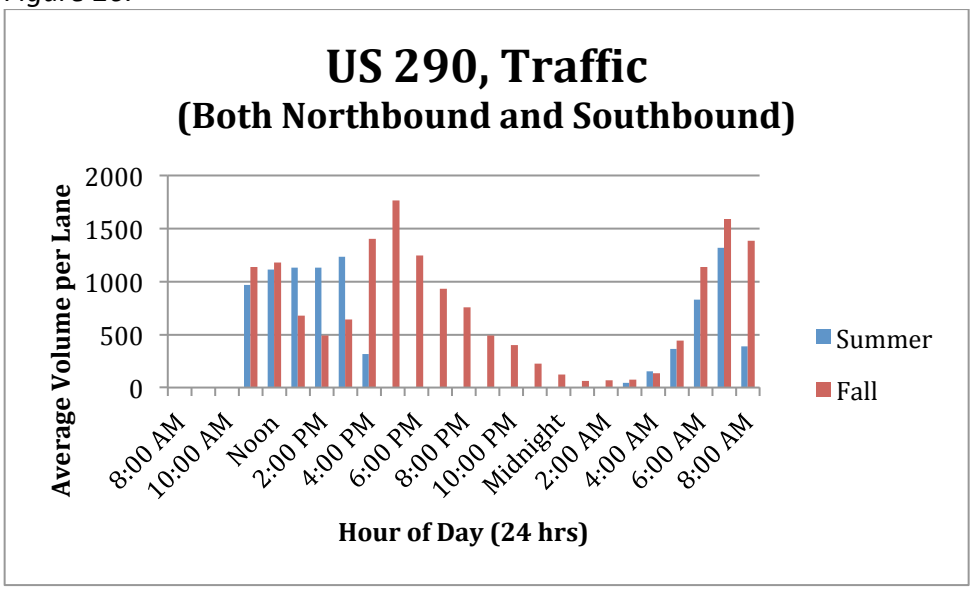

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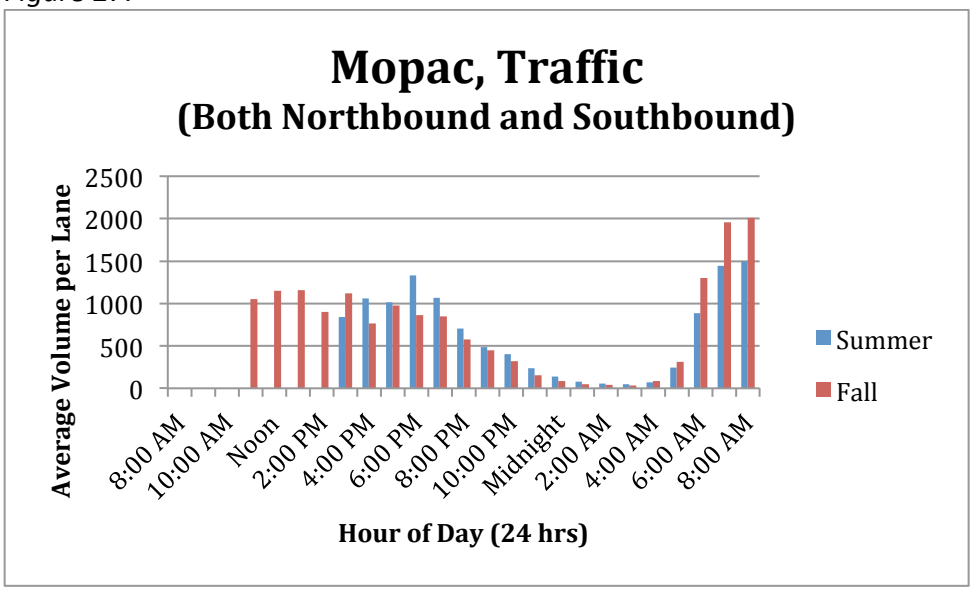
Mopac, Traffic
(Both Northbound and Southbound)
Average Volume per Lane
2500
2000
1500
1000
500
0
8:00 AM
10:00 AM
Noon
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
Midnight
2:00 AM
4:00 AM
6:00 AM
8:00 AM
Hour of Day (24 hrs)
Summer
Fall

REFERENCES

Cate, Matthew and Thomas Urbanik, Jr. *Another View of Truck Lane Restrictions*, Texas Transportation Institute, Presented at the TRB 2004 Annual Meeting.

Gan, Albert and Sijong Jo, *Operational Performance Models for Truck-Lane*(sic) *Restrictions*, Florida International University, Miami, FL, April 2003.

FHWA. *Freeway Management and Operations Handbook: Final Report.* FHWA Report No. FHWA-OP-04-003. Federal Highway Administration Freeway Management Program. Office of Transportation Management. Washington, D.C. 2003. Available at: ops.fhwa.dot.gov.

FHWA. "The Safety Impacts of Differential Speed Limits on Rural Interstate Highways." Report No. FHWA-HRT-04-156. Federal Highway Administration. September 2004. Available at: http://www.tfhrc.gov/safety/pubs/04156/. Accessed 7/7/2015.

Kerns, Josh. "Hey left-lane campers: June is 'Left Lane Awareness Month.'" *KIRO Radio via My Northwest.* June 2, 2014 at 3:31PM. Available at: http://mynorthwest.com/11/2535777/Hey-leftlane-campers-June-is-Left-Lane-Awareness-Month. Accessed 7/7/2015.

McCarthy, Kevin. "Trucks-Speed Limits and Lane Restrictions." Office of Legislative Research, Connecticut General Assembly. Report No. 2005-R-0814. November 2004. Available at: http://cga.ct.gov/2005/rpt/2005-R-0814.htm. Accessed: 7/7/2015.

Novotny, Nicole. "Impacts of Differential Speed Limits." Issue Brief to the Wyoming Legislative Service Office. January 2005. Available at: http://legisweb.state.wy.us/PubResearch/2005/05IB002.pdf. Accessed: 7/7/2015.

Slack, Kevin and CH2M Hill Staff. "Heavy Trucks: Appendix 9 Use of Lane Restrictions Involving Trucks (E)." *The American Association of State Highway and Transportation Officials Strategic Highway Safety Plan.* National Cooperative Highway Research Program 17-18(3). 2004. Available at: safety.transportation.org/htmlguides/hvy_trks/HTapp9.htm. Accessed July 7, 2015.

TnDOT. Chapter 1680-2-5. *Rules of Tennessee Department of Transportation*.

Radhakrishnan, Mini and Chester G. Wilmot. "Impact of Left Lane Truck Restriction Strategies on Multilane Highways in Louisiana—A Literature Review." Technical Assistance Report No. 09-ITA. Louisiana Transportation Research Center. April

2009. Available at: http://www.researchgate.net/publication/242366771_Impact_of_Left_Lane_Truck_Restriction_Strategies_on_Multilane_Highways_in_LouisianaA_Literature_Review. Accessed: 7/7/2015.

Yang, Choon-Heon and Amelia Regan. "Impacts of Left Lane Truck Restrictions on Urban Freeways." University of California Transportation Center. 2007. Available at: https://escholarship.org/uc/item/5jd8h01t. Accessed: 7/7/2015.