WIM #26
I-35, MP 30.1
OWATONNA, MN

JANUARY 2011

MONTHLY REPORT

Your Destination...Our Priority

In order to understand the vehicle classes and groupings the Mn/DOT "Vehicle Classification Scheme" and the "Vehicle Class Groupings for Forecasting" are shown on the WIM Reports home page at
http://www.dot.state.mn.us/traffic/data/html/wim_reports.html

For the month of January 2011, the system was operating normally. The data in this report uses the data that was collected for the month, no extrapolation.

VOLUME

For WIM #26 on I-35 at mile post 30.1 south of Owatonna, there were 459,966 vehicles that passed the site for the month of January. The Average Daily Traffic (ADT) and Heavy Commercial Average Daily Traffic (HCADT) for January 2011 were 14,838 and 3,748, respectively. Of the heavy commercial vehicles, the top two in volume were the Class 9's and 5's. Figure 1 shows the average number of vehicles, broken down by direction, versus day of the week. The average numbers of vehicles for northbound (NB) peaked on Fridays and were lowest on Mondays. The average numbers of vehicles for southbound (SB) peaked on Fridays and Sundays and were lowest on Mondays. Figure 2 shows the passenger vehicles (Class 1, 2, and 3), and heavy commercial vehicles (Class 4 to 13) by direction versus hour of day. For January the NB passenger vehicles had a peak between 10 am and 7 pm while the SB passenger vehicles had a peak between 9 am and 7 pm. The passenger vehicles were reviewed for directional volume differences and it appears that there are more going in the SB direction. For January the NB heavy commercial vehicles had a peak between 7 am and 7 pm and the SB heavy commercial vehicles had a peak between 8 am and 8 pm. The heavy commercial vehicles were reviewed for directional volume differences and it appears that there are slightly more heavy commercial vehicles going in the NB direction.

VEHICLE CLASSIFICATION

The traffic volume consisted of 343,778 passenger vehicles (77.8%) and 116,188 heavy commercial vehicles (22.2%). Table 1 summarizes vehicle class volumes and percentages; and overweight vehicles and the percentages as compared to total overweight vehicles.

OVERWEIGHT VEHICLES

In the area of WIM #26, the Winter Load Increases (WLI) went into effect on December 13, 2010. The normal maximum allowable weight for a single axle is 20,000 pounds; tandem axles, spaced 8' or less, can be up to 34,000 pounds; tridem axles, spaced 9' or less, can be up to 43,000 pounds; quad axles, spaced 13' or less, can be up to 51,000 pounds; and the maximum GVW is 80,000 pounds. The WLI allows a 10% across the board increase in axle and gross vehicle weights (GVW) without a permit on US, state routes, and county roads. A permit is required to operate on the interstate at the WLI levels. The WLI means that the maximum allowable weight for a single axle is 22,000 pounds; tandem axles, spaced 8' or less, can be up to 37,400 pounds; tridem axles, spaced 9' or less, can be up to 47,300 pounds; quad axles, spaced 13' or less, can be up to 56,100 pounds; and the maximum GVW is 88,000 pounds.

The data was analyzed with the WLI limits in effect during and that data is presented in the tables and graphs. The total volume and total heavy commercial volume for January 2011 was 459,966 and 116,188, respectively. The total number of vehicles that were overweight was 8,575 or 1.9% of the total traffic or 7.4% of the heavy commercial vehicles. Figure 1 shows the average number of overweight vehicles, broken down by direction, versus day of the week. The average numbers of overweight vehicles for NB peaked on Thursdays and for SB peaked on Mondays. The average numbers of overweight vehicles were lowest on the weekends for both directions. The top two overweight violators by class were the Class 9's and the Class 6's. Overweight vehicles by class versus hour of the day are shown in Figure 3. Two different methods are being used to classify vehicles at the WIM. One system uses a "first fit" to classify the vehicles and the other uses a "best fit" method. With either method, the same number of axles, axle spacing, and axle weights are used. This is why there are some differences concerning the numbers of Class 9, 10, and 13 overweight vehicles. The Class 9 overweight vehicles peaked between 9 am and 6 pm. The overweight vehicles were also reviewed to determine if there is a NB and SB difference. Figure 4 shows the total, NB, and SB overweight vehicles versus hour of the day. Figure 4 shows that for January 2011, over 12% more overweight vehicles were going in the NB direction.

Figure 5 shows the gross vehicle weight for Class 9's and 10's in both the NB and SB direction. From Figure 5 it is apparent that the Class 9's and 10's had more full than empty vehicles in the both directions.

For weight enforcement the WIMs are a screening tool. Currently, piezo-quartz WIM systems are considered to be accurate within 5% to 10% on Gross Vehicle Weight (GVW). During normal load limits and with an accuracy of about 10%, anything over a GVW of 88,000 pounds is overweight. With the 10% WLI and accuracy of about 10%, anything over a GVW of 96,800 pounds is overweight. These may still be permitted loads. For the most efficient use of personnel and equipment, these are the vehicles that should be weighed on static scales and reviewed for permits. In the NB direction during the WLI there were 102 vehicles over 98,000 pounds, 3 were Class 9's, 11 were Class 10's, and 83 were Class 13's. In the SB direction during the WLI there were 61 vehicles over 98,000 pounds, 6 were Class 9's, 11 were Class 10's, and 44 were Class 13's. Table 2 summarizes the Top 10 Gross Vehicle Weights, which ranged from 122,000 pounds to 135,000 pounds, for Class 9 and Class 10 vehicles for the month of January 2011.

SPEED

The speed limit on I-35 at the WIM site is 70 mph. For January 2011 for all four lanes, WIM #26 recorded an average speed of 72 mph, the median speed was 75 mph, and the 85^{th} percentile speed was 80 mph. Table 3 summarizes the vehicle data for the Top 20 speeders that crossed WIM #26 in the month of January. The speed of the Top 20 ranged from 104 mph up to 122 mph. Figure 6 shows the average speed of passenger vehicles and heavy commercial vehicles in both the NB and SB direction by lane. The slowest vehicles are the heavy commercial vehicles in the NB and SB driving lanes and the fastest vehicles are the passenger vehicles in the passing lanes. Depending on the hour of

the day there is between a 9 and 12 mph difference between the average slowest vehicles and the average fastest vehicles. During the overnight hours the volume drops way off, which is why there are unusual dips during those times. Figure 7 shows the average speed versus the day of the week. For January 2011 the average speeds varied between 64 mph and 77 mph. There was a variation in speed by day of the week due to snow storms, otherwise there would be consistent variation in speed throughout the day with the slowest speeds generally between midnight and 6 am. Figure 8 shows the average speed by lane. The passing lanes are consistently about 5 to 6 mph faster than the driving lanes.

BRIDGE

Bridge No.91086, a box culvert, is approximately 0.5 miles north of WIM #26, and Bridge No. 91095, a box culvert, is 6.9 miles south of WIM #26. For the month of January 2011, WIM #26 saw 459,966 vehicles with a total weight of 7,055,000 kips (1 kip = 1,000 pounds). Figure 9 summarizes the total GVW by lane and class and Figure 10 summarizes the percentages each class contributes to the total GVW. Table 4 provides details on the class breakdowns versus lane for GVW.

MATERIALS

For January 2011 a total of 100,664 ESALs passed over the pavement at WIM #26. Approximately 89.7% of the ESALs were in the driving lane, 46.4% NB and 43.3% SB. Figure 11 graphically depicts the total ESALs by class and lane. Figure 12 summarizes the percentages that each vehicle class contributes to the total ESALs. It is interesting to note that the Class 9's provide 86.1% of the ESALs while they are only 67.7% of the total gross vehicle weight. Table 5 provides details on the class breakdowns versus lane for ESALs. Table 5 also provides the flexible ESAL factors for each vehicle class using a terminal serviceability of 2.5 and a structural number of 5.

Reviewing the ESALs in the 4 lanes for January 2011, the largest is Lane 1, the NB driving lane. Therefore, the NB driving lane is the design lane and the growth factor for this section of I-35 in Steele County is 2.5%.

For January 2011 for the NB lane, there were 137 Class 9 trucks and 30 Class 10 trucks over 88,000 pounds. These 167 vehicles generated 702 ESALs. If all of these trucks weighed just 88,000 pounds they would have generated 611 ESALs, 91 ESALs lower. If you take the January NB ESALs of 46,692 and multiply it by 12 to get an annual ESAL number, apply a growth factor of 2.5% for 20 years (1.50) and then multiply it by 20 to get a 20-year BESAL you get 16,809,000. If you go through the same process but start with a monthly value of 46,601, i.e. subtracting out all of the overweight Class 9 and 10 vehicles, you come up with 16,776,000 20-year BESALs. If you take the difference between the 20-year BESAL and divide that by 46,692, the BESALs with the overweight Class 9's and 10's you get 0.70, or the overweight Class 9's and 10's cause the pavement to reach its 20-year design life almost 1 month early.

This is a quick, back of the napkin calculation, this only looks at Class 9's and 10's, not the other 8 heavy commercial classes. As part of a technical implementation research

project we are looking at developing a report function that will perform this calculation for all heavy commercial classes. Because the heavy commercial haulers are looking to move that tonnage of freight we will add additional legal-weight trucks so that the total tonnage being shipped stays the same.

FREIGHT

For WIM #26 for January 2011, it was calculated that approximately 1,213,000 tons of freight crossed the sensors. Slightly more freight was shipped NB (614,000 tons) versus SB (599,000 tons). Table 6 summarizes number of vehicles by class and the number of empty vehicles. Table 6 and Figure 13 summarize the freight shipment by class, direction, and tonnage.

CALIBRATION

WIM #26 was calibrated on January 20, 2011. As part of the on-going monitoring to assure the performance between calibrations, gross vehicle weights and front axle weights of Class 2's, 3's, and 9's are being monitored on a monthly basis. Table 7 summarizes the gross vehicle weight of the Class 2's and 3's. Currently, all Class 2's and 3's are included in this data. In the future, the goal would be to only monitor the Class 2's and 3's that are not pulling trailers. Table 8 summarizes the front axle weight of the Class 2's, 3's, and 9's by lane. The current goal of the calibration is to first have the GVW for each class and each lane stay within a range of ±5% and then secondly to have each individual axle stay within a range of ±9%. As you can see in Tables 7 and 8, the GVW changed slightly with the new calibration. A chart showing the January 20 calculation of the new calibrated factors is included after Table 9 in the attachments.

Past WIM research indicates that an unloaded Class 9 should weigh 28 to 32 kips. Data from the MnROAD site indicates that this unloaded range may have moved a little higher. The range for loaded Class 9's is generally in the 70 to 80 kip range but varies more by site and season. Figures 14 to 17 show histograms of the monthly GVW of Class 9's over the last 4 months for Lanes 1 to 4. Figure 18 is a graph of the unloaded and loaded peaks by lane versus date. There are enough Class 9's in Lanes 1 to 4 that a weekly histogram can be developed. WIM #26 has been working fine and is generally staying within the calibration range.

SUMMARY

For January 2011 the average volumes peaked on Fridays in the NB and SB directions. The overweight vehicles peaked in the NB direction on Thursdays and in the SB direction on Mondays and were lowest on the weekends. The average numbers of overweight vehicles were 12% higher for the NB direction than the SB direction. The overweight vehicles peaked from 9 am to 6 pm. For January 2011, for the Class 9's, 8.6% of them were overweight and for the Class 10's, 12.5% of them were overweight. The speed of the traffic varies slightly based on vehicle class, lane, and hour of the day and some differences in speed were observed due to snow storms. The GVW was a little higher in the SB direction 3,584,000 kips versus 3,470,000 kips NB. The NB ESALs were higher 51,173 versus 49,491 SB. The tonnage of freight was higher in the NB direction 614,000 versus 599,000 SB. For January 2011, the overweight Class 9's and 10's were shortening

the 20-year BESAL design life by almost 1 month. Table 9 provides a monthly summary of some of the key data for the site during 2010.

Attach: Table 1 – Vehicle Classification Data
Table 2 – Top 10 Gross Vehicle Weight, Class 9 and Class 10
Table 3 – Top 20 Speeders
Table 4 – Gross Vehicle Weight by Class and Lane
Table 5 – ESALs by Class and Lane and Flexible ESAL Factors
Table 6 – Freight Summary
Table 7 – Gross Vehicle Weight by Class and Lane
Table 8 – Front Axle Weight by Class and Lane
Table 9 – Site Summary
Chart – January 20, 2011 Calibration Results
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Figure 2 – Passenger and Heavy Commercial Vehicles vs. Hour of the Day
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Figure 4 – Overweight Vehicles by Direction vs. Hour of the Day
Figure 5 – Class 9's and 10's by Direction vs. Gross Vehicle Weight
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Figure 8 – Average Speed by Lane and Direction vs. Hour of the Day
Figure 9 – Total Gross Vehicle Weight by Class and Lane
Figure 10 – Total Gross Vehicle Weight by Class
Figure 11 – Total ESALs by Class and Lane
Figure 12 – ESALs by Class
Figure 13 – Freight Tonnage and Percentage by Direction and Class
Figure 14 – Monthly Class 9 GVW Histogram – Lane 1 (NB Driving)
Figure 15 – Monthly Class 9 GVW Histogram – Lane 2 (NB Passing)
Figure 16 – Monthly Class 9 GVW Histogram – Lane 3 (SB Passing)
Figure 17 – Monthly Class 9 GVW Histogram – Lane 4 (SB Driving)
Figure 18 – Unloaded and Loaded Peaks by Lane vs. Date

TABLE 1 - VEHICLE CLASSIFICATION DATA
WIM #26 - OWATONNA
January 2011

VEHICLE CLASS	MONTHLY AVERAGE DAILY VOLUME	MONTHLY TOTAL VOLUME	MONTHLY TOTAL VOLUME PERCENTAGE	MONTHLY TOTAL OVERWEIGHT VEHICLES	MONTHLY TOTAL OVERWEIGHT PERCENTAGE
C1	0	0	0.0%	0	0.0%
C2	6,750	209,245	45.5%	0	0.0%
C3	4,340	134,533	29.2%	0	0.0%
C4	84	2,596	0.6%	69	0.8%
C5	317	9,814	2.1%	106	1.2%
C6	153	4,742	1.0%	393	4.6%
C7	3	100	0.0%	5	0.1%
C8	89	2,758	0.6%	46	0.5%
C9	2,854	88,473	19.2%	7,600	88.6%
C10	51	1,570	0.3%	197	2.3%
C11	145	4,484	1.0%	4	0.0%
C12	47	1,455	0.3%	10	0.1%
C13	6	196	0.0%	145	1.7%
TOTAL =	14,838	459,966	100.0%	8,575	100.0%

TABLE 2 - TOP 10 GROSS VEHICLE WEIGHT, CLASS 9 AND CLASS 10
WIM #26 - OWATONNA
January 2011

DATE	DAY OF WEEK	TIME	VEHICLE CLASS	DIRECTION	LANE	GVW (lbs)
1/20/11	Thursday	10:34:09	10	Southbound	4	135,000
1/5/11	Wednesday	14:50:33	10	Southbound	4	131,000
1/30/11	Sunday	10:25:12	10	Southbound	4	129,000
1/25/11	Tuesday	15:06:38	10	Northbound	1	127,000
1/6/11	Thursday	9:44:58	10	Northbound	2	126,000
1/6/11	Thursday	11:38:36	10	Northbound	1	126,000
1/30/11	Sunday	14:14:13	10	Southbound	4	124,000
1/18/11	Tuesday	11:43:18	10	Southbound	4	123,000
1/18/11	Tuesday	15:12:51	10	Northbound	1	122,000
1/26/11	Wednesday	13:10:46	10	Northbound	1	122,000

TABLE 3 - TOP 20 SPEEDERS
WIM #26 - OWATONNA
January 2011

DATE	DAY OF WEEK	TIME	VEHICLE CLASS	DIRECTION	LANE	SPEED (mph)
1/15/11	Saturday	21:11:58	3	Southbound	4	122
1/27/11	Thursday	19:36:45	2	Southbound	3	120
1/5/11	Wednesday	5:12:32	3	Southbound	3	117
1/15/11	Saturday	13:42:06	3	Northbound	2	117
1/22/11	Saturday	11:37:37	2	Southbound	3	117
1/24/11	Monday	19:31:47	3	Southbound	3	116
1/24/11	Monday	19:35:26	3	Northbound	1	114
1/16/11	Sunday	13:32:11	3	Northbound	2	113
1/9/11	Sunday	15:55:55	3	Southbound	3	110
1/8/11	Saturday	12:09:14	3	Northbound	1	109
1/19/11	Wednesday	19:59:54	2	Southbound	3	107
1/8/11	Saturday	11:03:52	2	Southbound	3	106
1/23/11	Sunday	14:08:18	2	Northbound	2	106
1/24/11	Monday	0:14:28	2	Northbound	2	106
1/26/11	Wednesday	9:42:28	3	Northbound	2	106
1/26/11	Wednesday	19:19:28	2	Northbound	2	106
1/27/11	Thursday	15:17:31	3	Southbound	3	106
1/12/11	Wednesday	6:44:40	3	Southbound	3	104
1/13/11	Thursday	11:56:49	2	Southbound	4	104
1/15/11	Saturday	16:37:45	2	Southbound	3	104

TABLE 4 - GROSS VEHICLE WEIGHT BY CLASS AND LANE
WIM #26 - OWATONNA
January 2011

VEHICLE CLASS	NB DRIVING LANE (Kips)	NB PASSING LANE (Kips)	SB PASSING LANE (Kips)	SB DRIVING LANE (Kips)	TOTAL (Kips)	PERCENTAGE
C1	3	4	3	3	13	0.0%
C2	238,271	111,079	125,286	235,467	710,102	10.1%
C3	249,871	112,171	132,082	264,122	758,244	10.7%
C4	18,709	2,185	4,393	22,417	47,703	0.7%
C5	56,643	13,048	12,967	43,890	126,548	1.8%
C6	30,599	3,611	17,776	58,902	110,887	1.6%
C7	1,478	154	338	2,289	4,259	0.1%
C8	45,191	5,073	6,287	44,647	101,199	1.4%
C9	2,193,212	181,235	231,232	2,170,780	4,776,459	67.7%
C10	41,948	6,926	7,170	41,976	98,020	1.4%
C11	106,910	8,312	8,744	111,670	235,635	3.3%
C12	37,058	2,082	3,704	35,384	78,228	1.1%
C13	4,475	0	298	2,519	7,293	0.1%
TOTAL =	3,024,366	445,881	550,277	3,034,065	7,054,589	100.0%
GVW/LANE =	42.9%	6.3%	7.8%	43.0%		
GVW/DIRECTION =	49.2%		50.8%			
GVW/DIRECTION =	3,470,247		3,584,342			

TABLE 5 - ESALs BY CLASS AND LANE AND FLEXIBLE ESAL FACTOR
WIM #26 - OWATONNA
January 2011

VEHICLE CLASS	NB DRIVING LANE	NB PASSING LANE	SB PASSING LANE	SB DRIVING LANE	TOTAL	PERCENTAGE	FLEXIBLE ESAL FACTOR
C1	0	0	0	0	0	0.0%	0.0004
C2	39	19	18	32	108	0.1%	0.0006
C3	94	44	47	87	271	0.3%	0.0020
C4	389	70	110	491	1,060	1.1%	0.72
C5	565	214	191	657	1,628	1.6%	0.16
C6	540	63	343	1,047	1,992	2.0%	0.54
C7	23	4	9	59	94	0.1%	0.85
C8	559	53	79	649	1,338	1.3%	0.38
C9	41,091	3,690	4,736	37,134	86,651	86.1%	1.03
C10	676	118	119	609	1,522	1.5%	0.97
C11	2,163	180	221	2,313	4,878	4.8%	1.16
C12	420	27	57	396	900	0.9%	0.67
C13	133	0	14	75	222	0.2%	3.69
TOTAL =	46,692	4,481	5,943	43,548	100,664	100.0%	
ESALS/LANE =	46.4%	4.5%	5.9%	43.3%			
ESALS/DIRECTION =	50.8%		49.2%				
ESALS/DIRECTION =	51,173		49,491				

TABLE 6 - FREIGHT SUMMARY
WIM #26 - OWATONNA
January 2011

NORTHBOUND

VEHICLE CLASS	WEIGHT OF EMPTY VEHICLE (Kips)	TOTAL NUMBER OF VEHICLES	NUMBER OF EMPTY VEHICLES	PERCENTAGE OF EMPTY VEHICLES	TOTAL WEIGHT OF FREIGHT & VEHICLES (Kips)	WEIGHT OF EMPTY VEHICLES (Kips)	TOTAL WEIGHT OF FREIGHT (Tons)
C4	15.0	1,255	231	18.4%	33,448	2,925	7,582
C5	8.0	5,461	951	17.4%	68,546	6,902	12,782
C6	19.0	1,444	367	25.4%	41,760	6,175	7,561
C7	11.5	38	1	2.6%	1,372	11	468
C8	31.0	1,364	632	46.3%	43,472	14,631	3,075
C9	33.0	44,374	6,071	13.7%	2,515,734	176,148	537,794
C10	33.5	790	152	19.2%	46,858	3,880	10,803
C11	36.5	2,244	137	6.1%	123,376	4,395	21,038
C12	36.5	755	27	3.6%	43,006	824	7,805
C13	31.5	117	0	0.0%	13,010	0	4,662
TOTAL =		57,842	8,569	14.8%	2,930,582	--	613,568

SOUTHBOUND

VEHICLE CLASS	WEIGHT OF EMPTY VEHICLE (Kips)	TOTAL NUMBER OF VEHICLES	NUMBER OF EMPTY VEHICLES	PERCENTAGE OF EMPTY VEHICLES	TOTAL WEIGHT OF FREIGHT & VEHICLES (Kips)	WEIGHT OF EMPTY VEHICLES (Kips)	TOTAL WEIGHT OF FREIGHT (Tons)
C4	15.0	1,432	221	15.4%	39,200	2,814	9,111
C5	8.0	4,078	917	22.5%	57,709	6,500	12,961
C6	19.0	3,288	465	14.1%	102,373	7,874	20,431
C7	11.5	80	1	1.3%	3,041	10	1,061
C8	31.0	1,257	473	37.6%	43,252	10,685	4,132
C9	33.0	44,129	5,193	11.8%	2,453,325	152,281	508,078
C10	33.5	791	107	13.5%	47,217	2,816	10,744
C11	36.5	2,239	124	5.5%	125,167	3,884	22,043
C12	36.5	704	36	5.1%	40,967	1,192	7,697
C13	31.5	83	1	1.2%	8,824	29	3,106
TOTAL =		58,081	7,538	13.0%	2,921,075	--	599,362
GRAND TOTAL =		115,923	16,107	13.9%	5,851,657	--	1,212,929

TABLE 7 - GROSS VEHICLE WEIGHT BY CLASS AND LANE
WIM #26 - OWATONNA
January 2011

MONTH	VEHICLE CLASS	LANE 1 (Kips)	GVW ± 5%	LANE 2 (Kips)	GVW ± 5%	LANE 3 (Kips)	GVW ± 5%	LANE 4 (Kips)	GVW ± 5%
Aug 10	C2	3.94	--	3.81	--	3.84	--	3.57	--
Sep 10		3.82	-3.05%	3.81	0.00%	3.83	-0.26%	3.58	0.28%
Oct 10		3.77	-4.31%	3.74	-1.84%	3.79	-1.30%	3.56	-0.28%
Nov 10		3.81	-3.30%	3.87	1.57%	3.91	1.82%	3.60	0.84%
Dec 10		3.77	-4.31%	4.01	**5.25%**	3.92	2.08%	3.54	-0.84%
Jan 11		4.06	--	4.02	--	3.95	--	3.70	--
Aug 10	C3	6.18	--	5.83	--	5.73	--	5.76	--
Sep 10		5.98	-3.24%	5.84	0.17%	5.74	0.17%	5.80	0.69%
Oct 10		5.82	**-5.83%**	5.68	-2.57%	5.64	-1.57%	5.70	-1.04%
Nov 10		5.79	**-6.31%**	5.83	0.00%	5.73	0.00%	5.66	-1.74%
Dec 10		5.65	**-8.58%**	6.01	3.09%	5.72	-0.17%	5.38	**-6.60%**
Jan 11		6.23	--	6.14	--	5.91	--	5.70	--

TABLE 8 - FRONT AXLE WEIGHT BY CLASS AND LANE
WIM #26 - OWATONNA
January 2011

MONTH	VEHICLE CLASS	LANE 1 (Kips)	FRONT AXLE ± 9%	LANE 2 (Kips)	FRONT AXLE ± 9%	LANE 3 (Kips)	FRONT AXLE ± 9%	LANE 4 (Kips)	FRONT AXLE ± 9%
Aug 10	C2	2.34	--	2.20	--	2.19	--	2.03	--
Sep 10		2.28	-2.56%	2.21	0.45%	2.19	0.00%	2.05	0.99%
Oct 10		2.26	-3.42%	2.17	-1.36%	2.18	-0.46%	2.05	0.99%
Nov 10		2.27	-2.99%	2.24	1.82%	2.24	2.28%	2.07	1.97%
Dec 10		2.25	-3.85%	2.31	5.00%	2.23	1.83%	2.03	0.00%
Jan 11		2.44	--	2.33	--	2.27	--	2.14	--
Aug 10	C3	3.23	--	3.01	--	2.95	--	2.83	--
Sep 10		3.14	-2.79%	3.04	1.00%	2.96	0.34%	2.87	1.41%
Oct 10		3.10	-4.02%	2.98	-1.00%	2.93	-0.68%	2.85	0.71%
Nov 10		3.13	-3.10%	3.07	1.99%	3.00	1.69%	2.88	1.77%
Dec 10		3.11	-3.72%	3.16	4.98%	2.99	1.36%	2.77	-2.12%
Jan 11		3.43	--	3.22	--	3.08	--	2.92	--
Aug 10	C9	11.44	--	11.18	--	11.25	--	11.10	--
Sep 10		11.23	-1.84%	11.15	-0.27%	11.07	-1.60%	11.13	0.27%
Oct 10		11.12	-2.80%	10.98	-1.79%	11.00	-2.22%	11.07	-0.27%
Nov 10		11.19	-2.19%	11.10	-0.72%	11.22	-0.27%	11.14	0.36%
Dec 10		10.76	-5.94%	11.20	0.18%	11.03	-1.96%	10.53	-5.14%
Jan 11		12.06	--	11.42	--	11.50	--	11.31	--

TABLE 9 - SITE SUMMARY
WIM #26 - OWATONNA
December 2010

VOLUME & VEHICLE CLASS

MONTH	TOTAL VOLUME	MONTHLY ADT	MONTHLY HCADT	PASSENGER VEHICLES #	PASSENGER VEHICLES %	HEAVY COMMERCIAL VEHICLES #	HEAVY COMMERCIAL VEHICLES %	HEAVY COMMERCIAL VEHICLES IN DRIVING LANE %	HEAVY COMMERCIAL VEHICLES IN PASSING LANE %
Feb 10	--	--	--	--	--	--	--	--	--
Mar 10	--	--	--	--	--	--	--	--	--
Apr 10	--	--	--	--	--	--	--	--	--
May 10	--	--	--	--	--	--	--	--	--
Jun 10	--	--	--	--	--	--	--	--	--
Jul 10	--	--	--	--	--	--	--	--	--
Aug 10	691,254	22,557	4,508	551,564	79.8%	139,690	20.2%	90.1%	9.9%
Sep 10	610,358	20,407	4,380	475,677	77.9%	134,681	22.1%	89.9%	10.1%
Oct 10	629,178	20,396	4,636	489,929	77.9%	139,249	22.1%	90.4%	9.6%
Nov 10	569,872	19,267	4,083	445,444	78.2%	124,428	21.8%	90.1%	9.9%
Dec 10	531,769	17,123	3,892	412,054	77.5%	119,715	22.5%	82.9%	17.1%
Jan 11	459,966	14,838	3,748	343,778	74.7%	116,188	25.3%	89.7%	10.3%
TOTAL =	3,492,397	--	--	2,718,446	--	773,951	--	--	--
AVERAGE =	582,066	19,098	4,208	453,074	77.8%	128,992	22.2%	88.8%	11.2%

ESALS

MONTH	ESALS NB DRIVING LANE	ESALS NB PASSING LANE	ESALS SB PASSING LANE	ESALS SB DRIVING LANE	TOTAL ESALS	DRIVING LANE ESALS %	PASSING LANE ESALS %	PAVEMENT LIFE DECREASE MONTHS*
Feb 10	--	--	--	--	--	--	--	--
Mar 10	--	--	--	--	--	--	--	--
Apr 10	--	--	--	--	--	--	--	--
May 10	--	--	--	--	--	--	--	--
Jun 10	--	--	--	--	--	--	--	--
Jul 10	--	--	--	--	--	--	--	--
Aug 10	59,041	4,858	5,851	56,035	125,786	91.5%	8.5%	1.79
Sep 10	54,088	4,907	5,523	55,604	120,121	91.3%	8.7%	1.82
Oct 10	54,479	4,620	5,315	59,034	123,449	92.0%	8.0%	3.03
Nov 10	48,937	4,441	5,504	54,935	113,818	91.3%	8.7%	4.94
Dec 10	34,492	10,605	6,375	38,421	89,892	81.1%	18.9%	1.33
Jan 11	46,692	4,481	5,943	43,548	100,664	89.6%	10.4%	0.70
TOTAL =	297,729	33,913	34,511	307,578	673,730	--	--	--
AVERAGE =	49,621	5,652	5,752	51,263	112,288	89.5%	10.5%	2.3

* Based on WLI of 88,000 lbs in effect starting december 13, 2010.

TABLE 9 - SITE SUMMARY (contd.)
WIM #26 - OWATONNA
December 2010

GROSS VEHICLE WEIGHT

MONTH	GVW NB DRIVING LANE	GVW NB PASSING LANE	GVW SB PASSING LANE	GVW SB DRIVING LANE	TOTAL GVW KIPS
Feb 10	--	--	--	--	--
Mar 10	--	--	--	--	--
Apr 10	--	--	--	--	--
May 10	--	--	--	--	--
Jun 10	--	--	--	--	--
Jul 10	--	--	--	--	--
Aug 10	3,816,740	671,567	753,699	3,834,162	9,076,168
Sep 10	3,664,543	615,926	656,648	3,687,539	8,624,656
Oct 10	3,746,250	608,336	672,745	3,863,146	8,890,477
Nov 10	3,372,732	557,946	651,605	3,525,881	8,108,163
Dec 10	2,641,399	912,544	677,021	2,970,502	7,201,466
Jan 11	3,024,366	445,881	550,277	3,034,065	7,054,589
TOTAL =	20,266,030	3,812,201	3,961,994	20,915,295	48,955,520
AVERAGE =	3,377,672	635,367	660,332	3,485,883	8,159,253

OVERWEIGHT VEHICLES

MONTH	TOTAL NUMBER OF OVERWEIGHT VEHICLES *	OVERWEIGHT/ TOTAL VOLUME %	OVERWEIGHT/ HEAVY COMMERCIAL VOLUME %	NUMBER OVER 88,000 LBS	NUMBER OVER 98,000 LBS
Feb 10	--	--	--	--	--
Mar 10	--	--	--	--	--
Apr 10	--	--	--	--	--
May 10	--	--	--	--	--
Jun 10	--	--	--	--	--
Jul 10	--	--	--	--	--
Aug 10	15,156	2.2%	10.8%	230	105
Sep 10	12,752	2.1%	9.5%	361	173
Oct 10	10,902	1.7%	7.8%	540	250
Nov 10	12,718	2.2%	10.2%	481	185
Dec 10	5,468	1.0%	4.6%	423	227
Jan 11	8,575	1.9%	7.4%	553	163
TOTAL =	65,571	--	--	2,588	1,103
AVERAGE =	10,929	1.9%	8.5%	431	184

SPEED

MONTH	AVERAGE SPEED (mph)	MEDIAN SPEED (mph)	85th PERCENTILE SPEED (mph)	SYSTEM OPERATION Days	SYSTEM OPERATION %
Feb 10	--	--	--	--	--
Mar 10	--	--	--	--	--
Apr 10	--	--	--	--	--
May 10	--	--	--	--	--
Jun 10	--	--	--	--	--
Jul 10	--	--	--	--	--
Aug 10	75	76	80	31	100.0%
Sep 10	75	75	80	30	100.0%
Oct 10	75	76	80	31	100.0%
Nov 10	75	76	80	30	100.0%
Dec 10	71	73	79	31	100.0%
Jan 11	72	73	79	31	100.0%
TOTAL =	--	--	--	184.00	--
AVERAGE =	74	75	80	--	100.0%

FREIGHT

MONTH	NB FREIGHT TONS	SB FREIGHT TONS	TOTAL FREIGHT TONS	NB FREIGHT %	SB FREIGHT %
Feb 10	--	--	--	--	--
Mar 10	--	--	--	--	--
Apr 10	--	--	--	--	--
May 10	--	--	--	--	--
Jun 10	--	--	--	--	--
Jul 10	--	--	--	--	--
Aug 10	743,336	695,898	1,439,234	51.6%	48.4%
Sep 10	719,391	704,501	1,423,892	50.5%	49.5%
Oct 10	732,495	743,491	1,475,986	49.6%	50.4%
Nov 10	646,637	691,687	1,338,324	48.3%	51.7%
Dec 10	582,466	570,629	1,153,095	50.5%	49.5%
Jan 11	613,568	599,362	1,212,929	50.6%	49.4%
TOTAL =	4,037,892	4,005,568	8,043,460	--	--
AVERAGE =	672,982	667,595	1,340,577	50.2%	49.8%

CALIBRATION RESULTS

WIM # 26
SITE: Owatonna
DATE: 1/20/11

LANE : 1

	Static Weight					
	GVW	**Steer**	**2nd Axle**	**3rd Axle**	**4th Axle**	**5th Axle**
Test Vehicle	79.7	12.2	16.9	16.8	15.9	17.8

SENSOR 1

	Calibration Factors					
Speed Bins	**1**	**2**	**3**	**4**	**5**	**Average**
Original Setting	3383.00	3287.00	3242.00	3194.00	3194.00	3260.00
1st Try						
Final	3721.00	3615.00	3566.00	3513.00	3513.00	3585.60
Percentage Change	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%

SENSOR 2

	Calibration Factors					
Speed Bins	**1**	**2**	**3**	**4**	**5**	**Average**
Original Setting	3220.00	3192.00	3192.00	3066.00	3066.00	3147.20
1st Try						
Final	3542.00	3511.00	3511.00	3372.00	3372.00	3461.60
Percentage Change	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%

SENSOR 3

	Calibration Factors					
Speed Bins	**1**	**2**	**3**	**4**	**5**	**Average**
Original Setting	3771.00	3750.00	3683.00	3700.00	3700.00	3720.80
1st Try						
Final	4148.00	4125.00	4051.00	4070.00	4070.00	4092.80
Percentage Change	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%

SENSOR 4

	Calibration Factors					
Speed Bins	**1**	**2**	**3**	**4**	**5**	**Average**
Original Setting	3438.00	3398.00	3453.00	3223.00	3223.00	3347.00
1st Try						
Final	3781.00	3737.00	3798.00	3545.00	3545.00	3681.20
Percentage Change	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%

					WIM Weight							
Date	**Time**	**Lap Time**	**Vehicle Number**	**Speed**	**GVW**	**Steer**	**2nd Axle**	**3rd Axle**	**4th Axle**	**5th Axle**	1st Tandem	2nd Tandem
1/20/11				72	79.7	11.3	16.9	16.6	15.1	19.8	33.5	34.9
1/20/11				69	78.8	11.6	17.2	16.1	14.4	19.4	33.3	33.8
1/20/11				70	78.8	11.8	16.7	16.5	14.2	19.6	33.2	33.8
1/20/11				63	80.3	12.7	17.2	16.7	14.5	19.2	33.9	33.7
1/20/11				70	80.4	11.2	17.3	16.4	15.2	20.2	33.7	35.4

Date	**Time**	**Lap Time**	**GVW ± 5%**	**Steer ± 9%**	**2nd Axle ± 9%**	**3rd Axle ± 9%**	**4th Axle ± 9%**	**5th Axle ± 9%**	1st Tandem **± 9%**	2nd Tandem **± 9%**
1/20/11	0:00:00		0.0%	-7.4%	0.0%	-1.2%	-5.0%	11.2%	-0.6%	3.6%
1/20/11	0:00:00		-1.1%	-4.9%	1.8%	-4.2%	-9.4%	9.0%	-1.2%	0.3%
1/20/11	0:00:00		-1.1%	-3.3%	-1.2%	-1.8%	-10.7%	10.1%	-1.5%	0.3%
1/20/11	0:00:00		0.8%	4.1%	1.8%	-0.6%	-8.8%	7.9%	0.6%	0.0%
1/20/11	0:00:00		0.9%	-8.2%	2.4%	-2.4%	-4.4%	13.5%	0.0%	5.0%

COMMENT:

LANE : 2

	Static Weight					
	GVW	**Steer**	**2nd Axle**	**3rd Axle**	**4th Axle**	**5th Axle**
Test Vehicle	79.7	12.2	16.9	16.8	15.9	17.8

SENSOR 1

	Calibration Factors					
Speed Bins	**1**	**2**	**3**	**4**	**5**	**Average**
Original Setting	3979.00	4082.00	4141.00	4141.00	4141.00	4096.80
1st Try						
Final	4058.00	4163.00	4224.00	4224.00	4224.00	4178.60
Percentage Change	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%

SENSOR 2

	Calibration Factors					
Speed Bins	**1**	**2**	**3**	**4**	**5**	**Average**
Original Setting	3668.00	3771.00	3701.00	3701.00	3701.00	3708.40
1st Try						
Final	3741.00	3846.00	3775.00	3775.00	3775.00	3782.40
Percentage Change	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%

SENSOR3

	Calibration Factors					
Speed Bins	**1**	**2**	**3**	**4**	**5**	**Average**
Original Setting	4589.00	4398.00	4442.00	4442.00	4442.00	4462.60
1st Try						
Final	4681.00	4486.00	4531.00	4531.00	4531.00	4552.00
Percentage Change	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%

SENSOR 4

	Calibration Factors					
Speed Bins	**1**	**2**	**3**	**4**	**5**	**Average**
Original Setting	3979.00	3910.00	3760.00	3760.00	3760.00	3833.80
1st Try						
Final	4058.00	3988.00	3835.00	3835.00	3835.00	3910.20
Percentage Change	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%

					WIM Weight							
Date	**Time**	**Lap Time**	**Vehicle Number**	**Speed**	**GVW**	**Steer**	**2nd Axle**	**3rd Axle**	**4th Axle**	**5th Axle**	1st Tandem	2nd Tandem
1/20/11				71	80.1	11.0	17.2	16.5	15.1	20.3	33.7	35.4
1/20/11				70	80.8	11.6	17.5	16.5	14.8	20.3	34.0	35.1
1/20/11				70	80.9	11.6	17.2	16.9	15.2	19.9	34.1	35.1
1/20/11				70	80.1	11.4	16.9	16.4	15.2	20.2	33.3	35.4
1/20/11				68	80.4	11.4	17.0	17.1	15.0	20.0	34.1	35.0

Date	**Time**	**Lap Time**	**GVW ± 5%**	**Steer ± 9%**	**2nd Axle ± 9%**	**3rd Axle ± 9%**	**4th Axle ± 9%**	**5th Axle ± 9%**	1st Tandem **± 9%**	2nd Tandem **± 9%**
1/20/11	0:00:00	--	0.5%		1.8%	-1.8%	-5.0%	14.0%	0.0%	5.0%
1/20/11	0:00:00	0:00:00	1.4%	-4.9%	3.6%	-1.8%	-6.9%	14.0%	0.9%	4.2%
1/20/11	0:00:00	0:00:00	1.5%	-4.9%	1.8%	0.6%	-4.4%	11.8%	1.2%	4.2%
1/20/11	0:00:00	0:00:00	0.5%	-6.6%	0.0%	-2.4%	-4.4%	13.5%	-1.2%	5.0%
1/20/11	0:00:00	0:00:00	0.9%	-6.6%	0.6%	1.8%	-5.7%	12.4%	1.2%	3.9%

COMMENT:

LANE : 3

	Static Weight					
	GVW	Steer	2nd Axle	3rd Axle	4th Axle	5th Axle
Test Vehicle	79.7	12.2	16.9	16.8	15.9	17.8

SENSOR 1

	Calibration Factors					
Speed Bins	1	2	3	4	5	Average
Original Setting	3200.00	3204.00	3221.00	3221.00	3221.00	3213.40
1st Try						
Final	3328.00	3332.00	3349.00	3349.00	3349.00	3341.40
Percentage Change	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%

SENSOR 2

	Calibration Factors					
Speed Bins	1	2	3	4	5	Average
Original Setting	3323.00	3270.00	3252.00	3252.00	3252.00	3269.80
1st Try						
Final	3456.00	3400.00	3382.00	3382.00	3382.00	3400.40
Percentage Change	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%

SENSOR 3

	Calibration Factors					
Speed Bins	1	2	3	4	5	Average
Original Setting	3462.00	3474.00	3424.00	3424.00	3424.00	3441.60
1st Try						
Final	3600.00	3613.00	3561.00	3561.00	3561.00	3579.20
Percentage Change	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%

SENSOR 4

	Calibration Factors					
Speed Bins	1	2	3	4	5	Average
Original Setting	2979.00	2992.00	2986.00	2986.00	2986.00	2985.80
1st Try						
Final	3098.00	3111.00	3105.00	3105.00	3105.00	3104.80
Percentage Change	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%

		Lap	Vehicle		WIM Weight							
Date	**Time**	**Time**	**Number**	**Speed**	**GVW**	**Steer**	**2nd Axle**	**3rd Axle**	**4th Axle**	**5th Axle**	1st Tandem	2nd Tandem
1/20/11				69	80.4	12.1	17.1	16.9	14.3	20.0	34.0	34.3
1/20/11				69	78.9	11.6	16.6	16.9	14.3	19.6	33.5	33.9
1/20/11				69	81.9	11.9	17.3	17.2	15.6	19.8	34.5	35.4
1/20/11				71	79.9	11.8	16.8	16.7	14.7	19.9	33.5	34.6
1/20/11				68	81.9	12.1	17.2	17.7	14.6	20.3	34.9	34.9

Date	**Time**	**Lap Time**	**GVW ± 5%**	**Steer ± 9%**	**2nd Axle ± 9%**	**3rd Axle ± 9%**	**4th Axle ± 9%**	**5th Axle ± 9%**	1st Tandem **± 9%**	2nd Tandem **± 9%**
1/20/11	0:00:00	--	0.9%	-0.8%	1.2%	0.6%	-10.1%	12.4%	0.9%	1.8%
1/20/11	0:00:00	0:00:00	-1.0%	-4.9%	-1.8%	0.6%	-10.1%	10.1%	-0.6%	0.6%
1/20/11	0:00:00	--	2.8%	-2.5%	2.4%	2.4%	-1.9%	11.2%	2.4%	5.0%
1/20/11	0:00:00	0:00:00	0.3%	-3.3%	-0.6%	-0.6%	-7.5%	11.8%	-0.6%	2.7%
1/20/11	0:00:00	--	2.8%	-0.8%	1.8%	5.4%	-8.2%	14.0%	3.6%	3.6%

COMMENT:

LANE : 4

	Static Weight					
	GVW	Steer	2nd Axle	3rd Axle	4th Axle	5th Axle
Test Vehicle	79.7	12.2	16.9	16.8	15.9	17.8

SENSOR 1

	Calibration Factors					
Speed Bins	1	2	3	4	5	Average
Original Setting	2958.00	2925.00	2826.00	3054.00	3054.00	2963.40
1st Try						
Final	3206.00	3170.00	3063.00	3298.00	3298.00	3207.00
Percentage Change	8.4%	8.4%	8.4%	8.0%	8.0%	8.2%

SENSOR 2

	Calibration Factors					
Speed Bins	1	2	3	4	5	Average
Original Setting	2827.00	2723.00	2703.00	2734.00	2734.00	2744.20
1st Try						
Final	3053.00	2940.00	2919.00	2952.00	2952.00	2963.20
Percentage Change	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%

SENSOR 3

	Calibration Factors					
Speed Bins	1	2	3	4	5	Average
Original Setting	3126.00	3073.00	2937.00	3007.00	3007.00	3030.00
1st Try						
Final	3376.00	3318.00	3171.00	3247.00	3247.00	3271.80
Percentage Change	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%

SENSOR 4

	Calibration Factors					
Speed Bins	1	2	3	4	5	Average
Original Setting	2984.00	2920.00	2891.00	2832.00	2832.00	2891.80
1st Try						
Final	3222.00	3153.00	3122.00	3058.00	3058.00	3122.60
Percentage Change	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%

		Lap	Vehicle		WIM Weight							
Date	**Time**	**Time**	**Number**	**Speed**	**GVW**	**Steer**	**2nd Axle**	**3rd Axle**	**4th Axle**	**5th Axle**	1st Tandem	2nd Tandem
1/20/11				71	78.9	11.5	16.6	16.0	15.1	19.8	32.6	34.9
1/20/11				70	79.8	11.8	16.4	16.5	15.3	19.8	32.9	35.1
1/20/11				70	79.7	11.7	16.4	16.8	15.2	19.8	33.2	35.0
1/20/11				67	82.2	12.4	16.7	17.3	15.7	20.0	34.0	35.7
1/20/11				70	79.0	11.6	16.3	16.2	14.9	19.9	32.5	34.8

Date	**Time**	**Lap Time**	**GVW ± 5%**	**Steer ± 9%**	**2nd Axle ± 9%**	**3rd Axle ± 9%**	**4th Axle ± 9%**	**5th Axle ± 9%**	1st Tandem **± 9%**	2nd Tandem **± 9%**
1/20/11			-1.0%	-5.7%	-1.8%	-4.8%	-5.0%	11.2%	-3.3%	3.6%
1/20/11			0.1%	-3.3%	-3.0%	-1.8%	-3.8%	11.2%	-2.4%	4.2%
1/20/11			0.0%	-4.1%	-3.0%	0.0%	-4.4%	11.2%	-1.5%	3.9%
1/20/11			3.1%	1.6%	-1.2%	3.0%	-1.3%	12.4%	0.9%	5.9%
1/20/11			-0.9%	-4.9%	-3.6%	-3.6%	-6.3%	11.8%	-3.6%	3.3%

COMMENT:

Figure 1 - Average Volume and Average Overweight Volume vs. Day of the Week

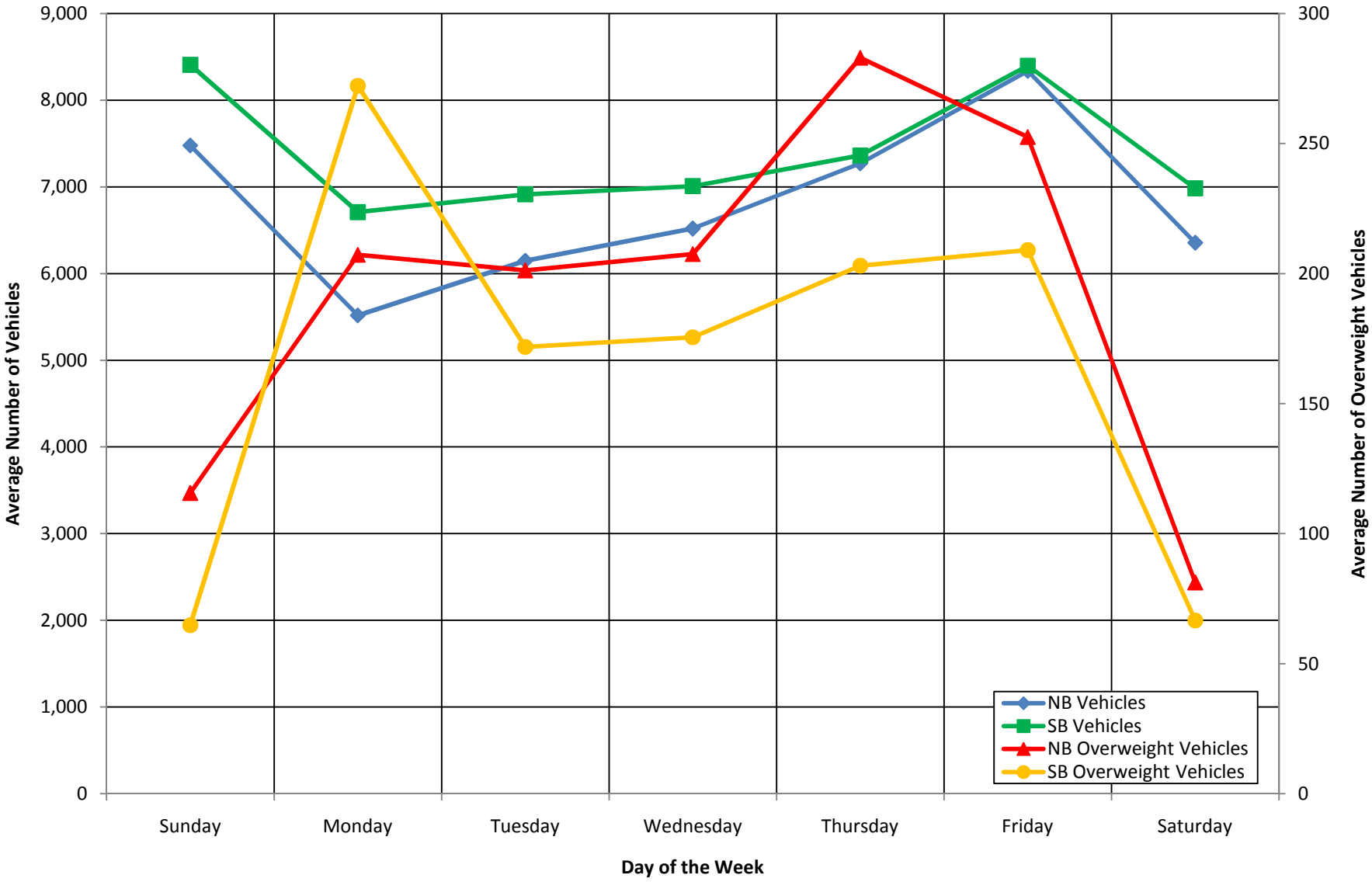

Figure 2 - Passenger and Heavy Commercial Vehicles vs. Hour of the Day

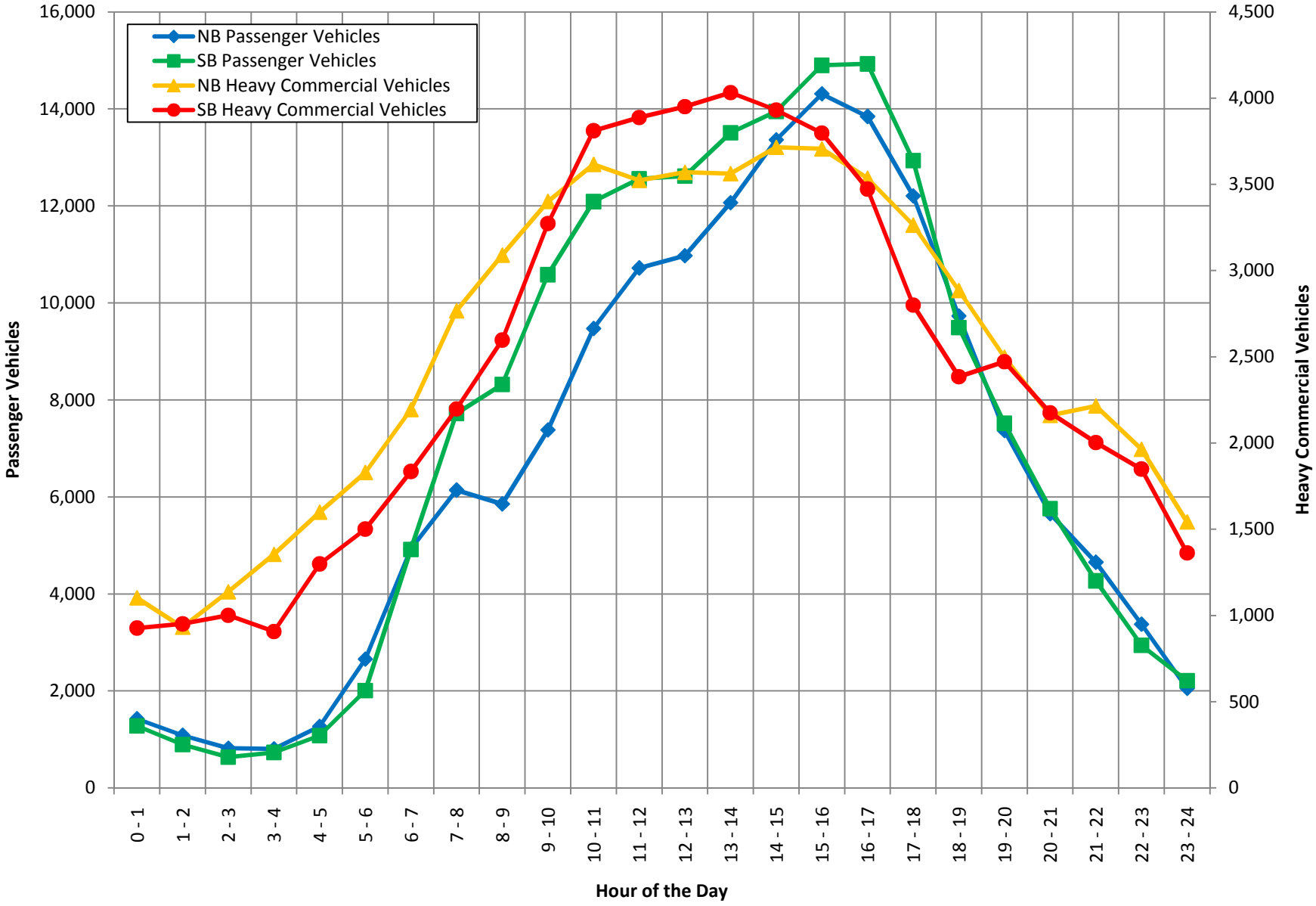

Figure 3 - Overweight Vehicles by Class vs. Hour of the Day

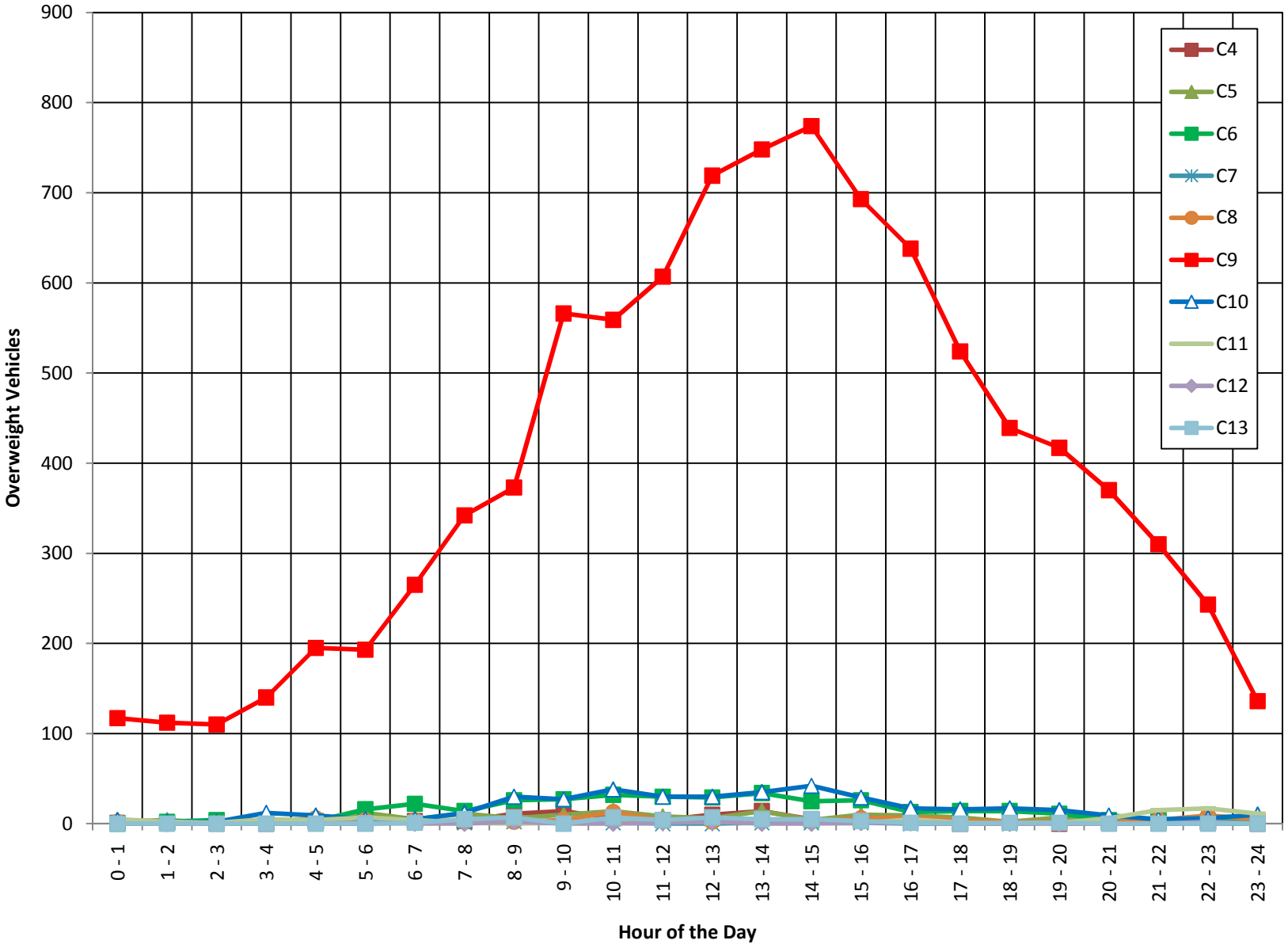

Figure 4 - Overweight Vehicles by Direction vs. Hour of the Day

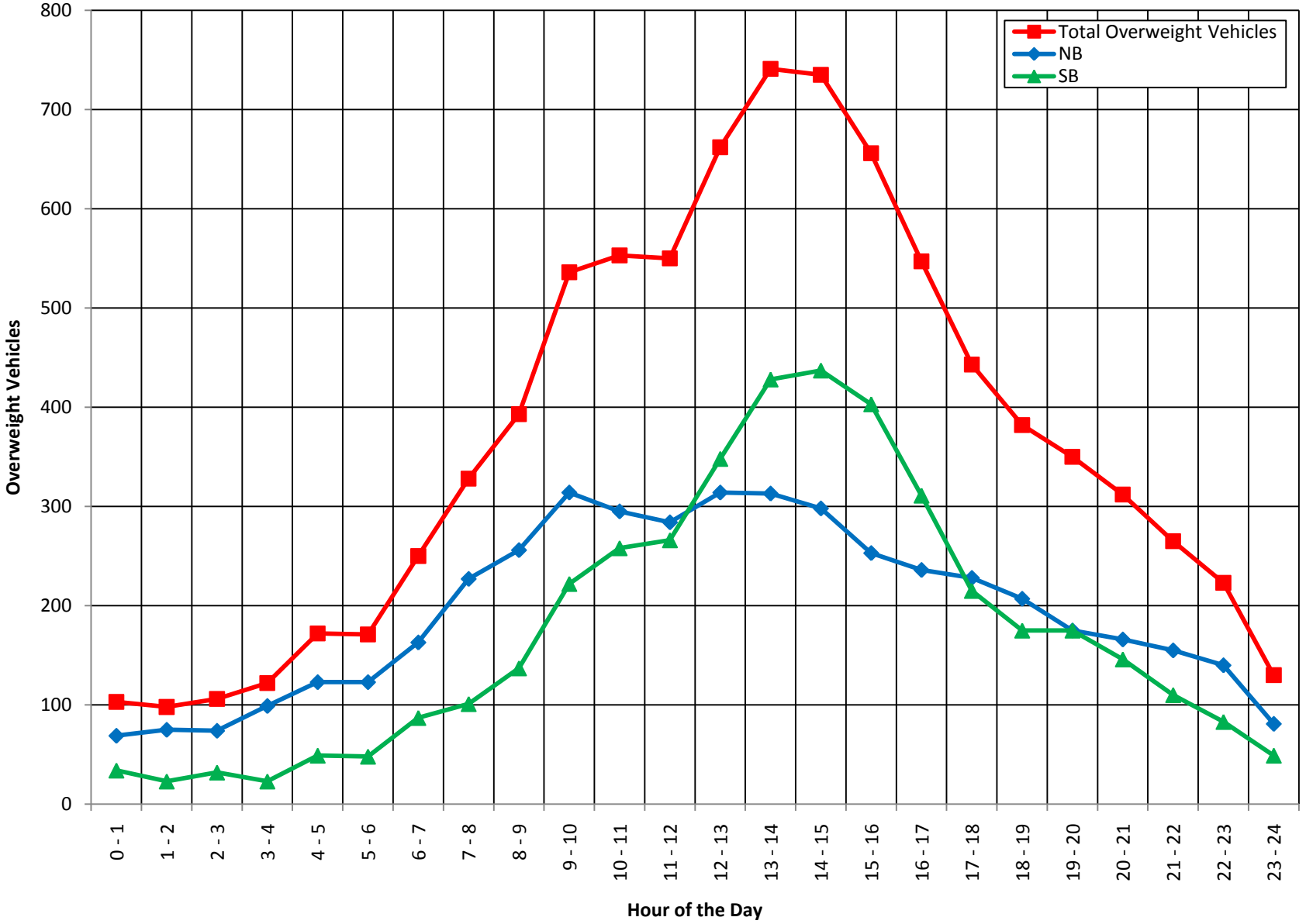

Figure 5 - Class 9's and 10's by Direction vs. Gross Vehicle Weight

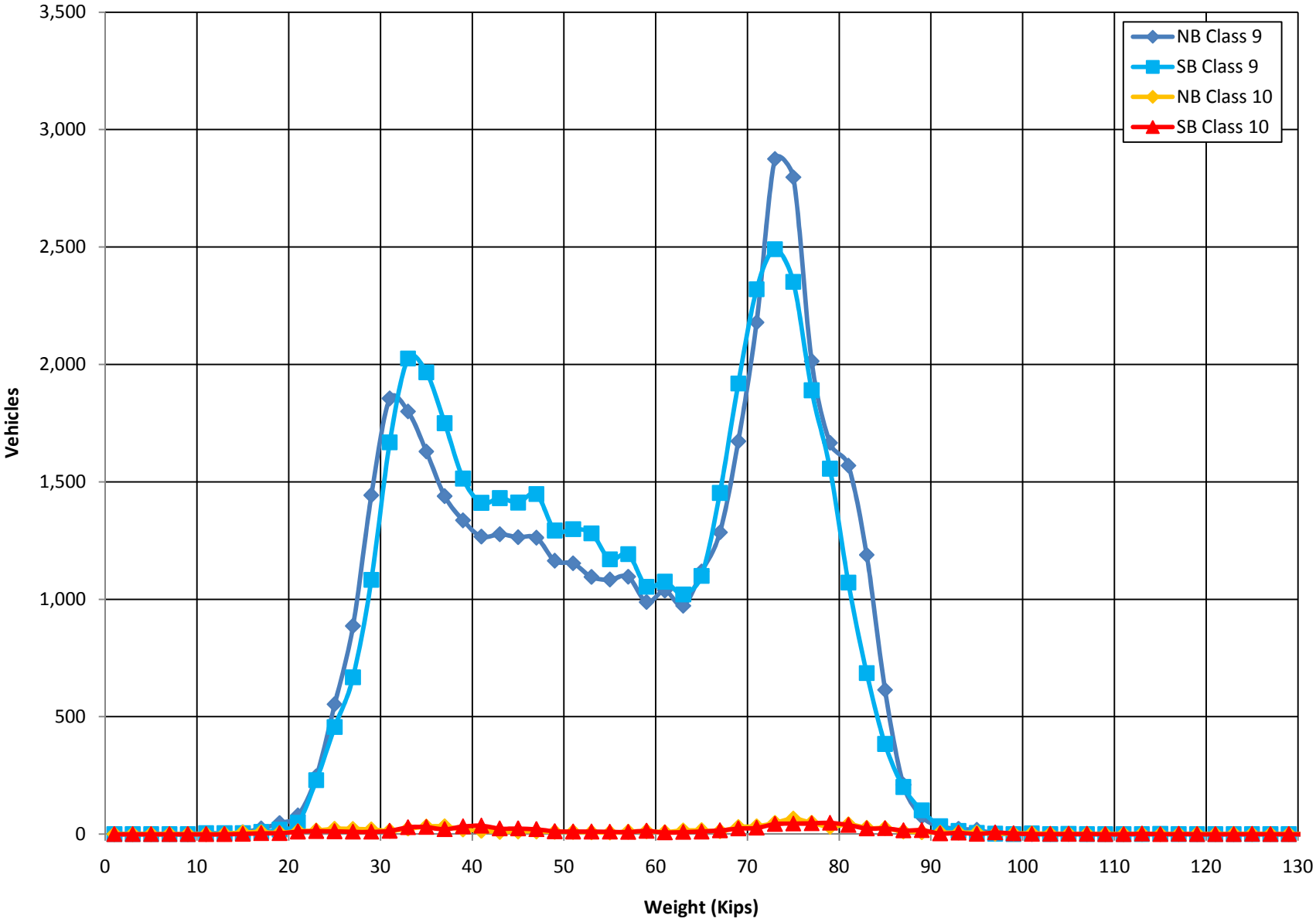

Figure 6 - Average Speed by Lane and Vehicle Type vs. Hour of the Day

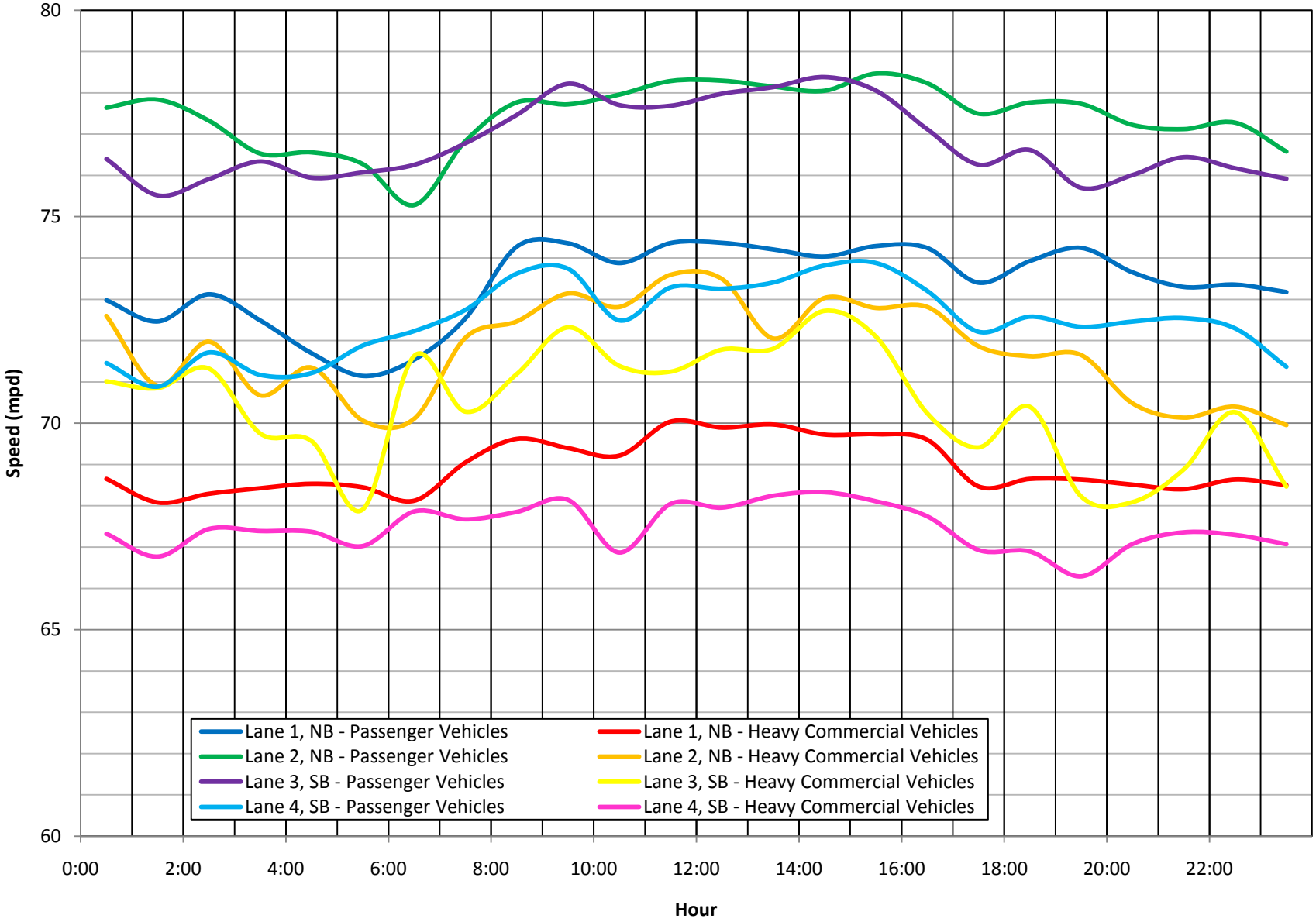

Figure 7 - Average Speed vs. Day of the Week

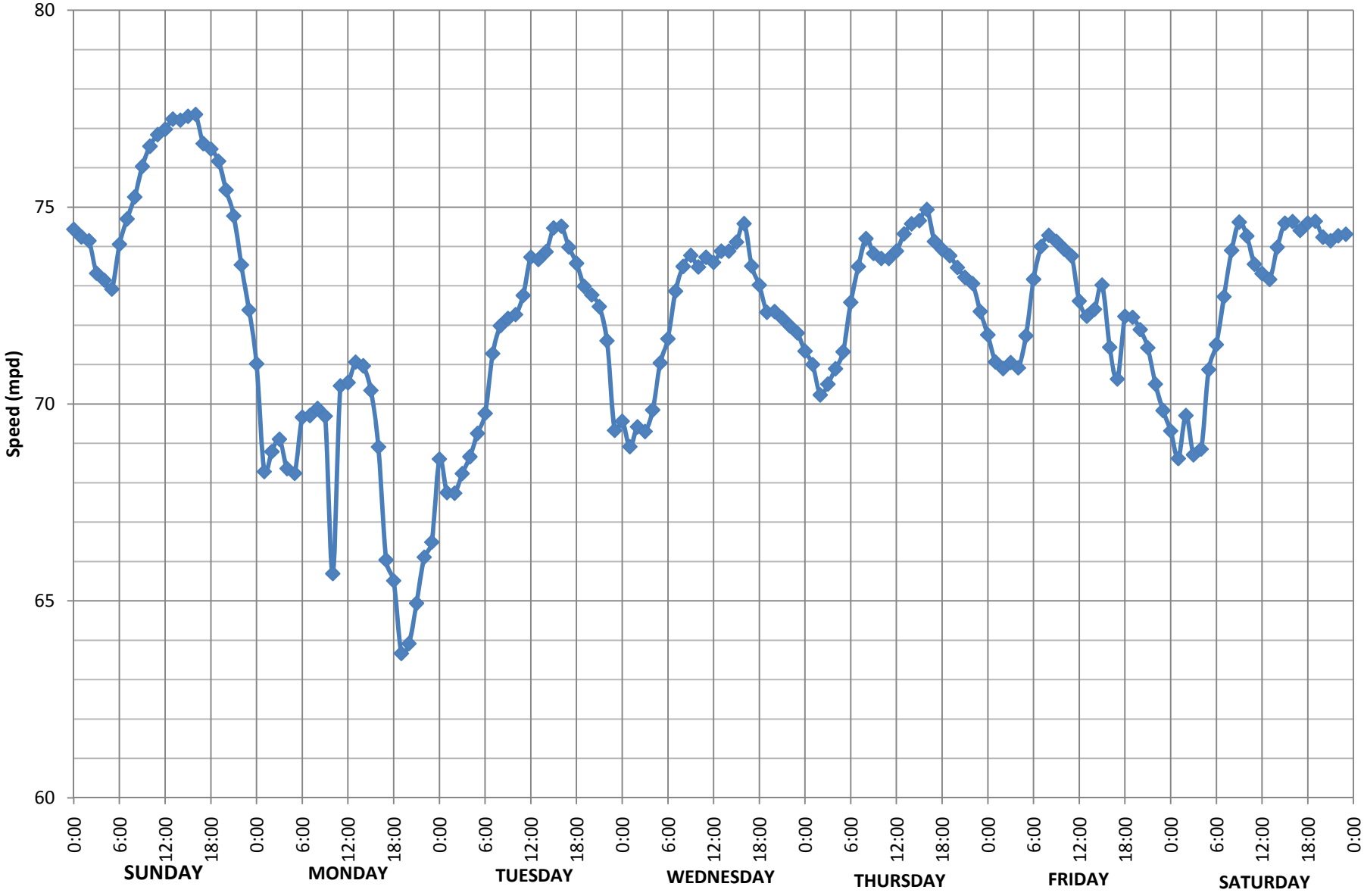

Figure 8 - Average Speed by Lane and Direction vs. Hour of the Day

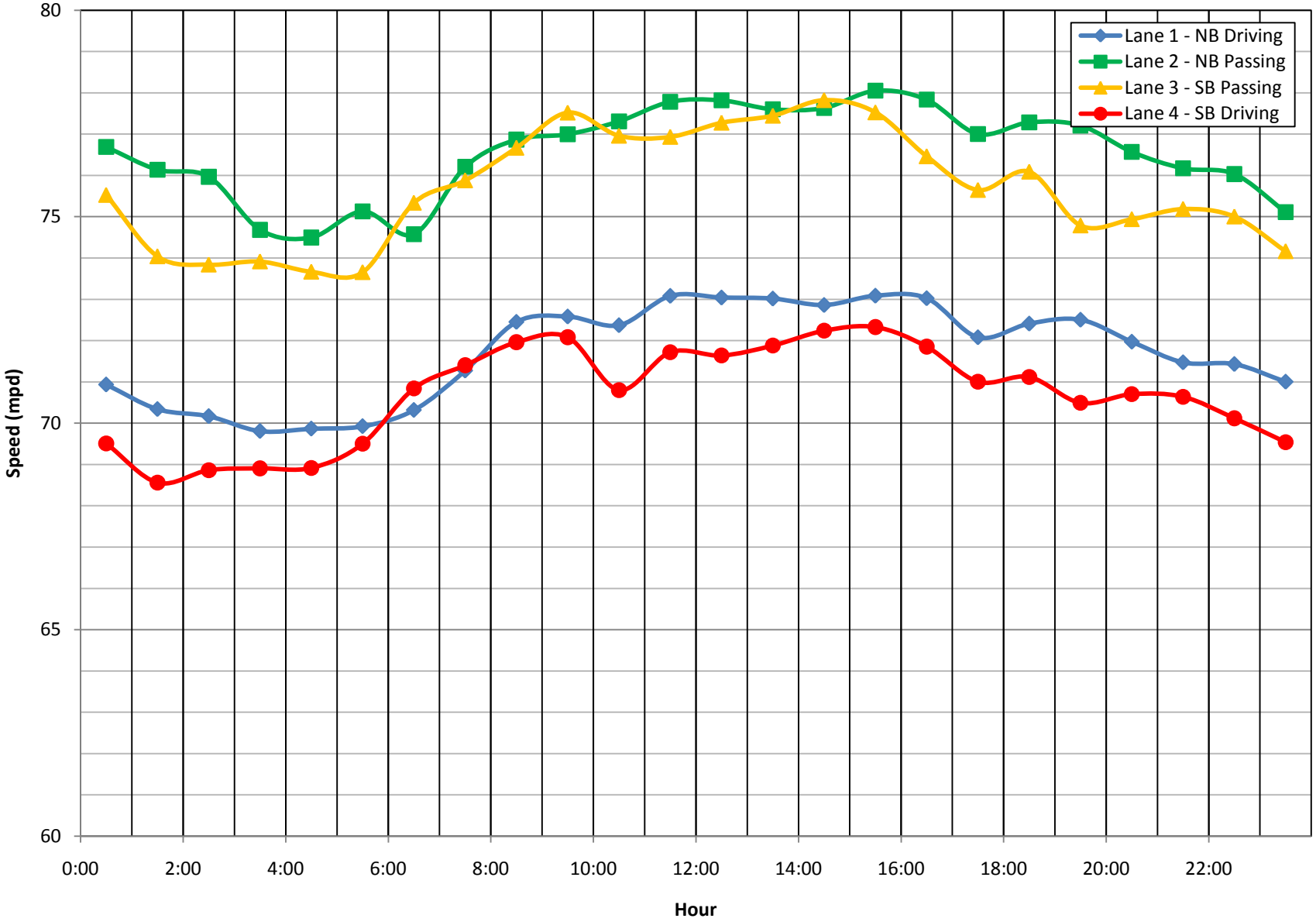

Figure 9 - Total Gross Vehicle Weight by Class and Lane

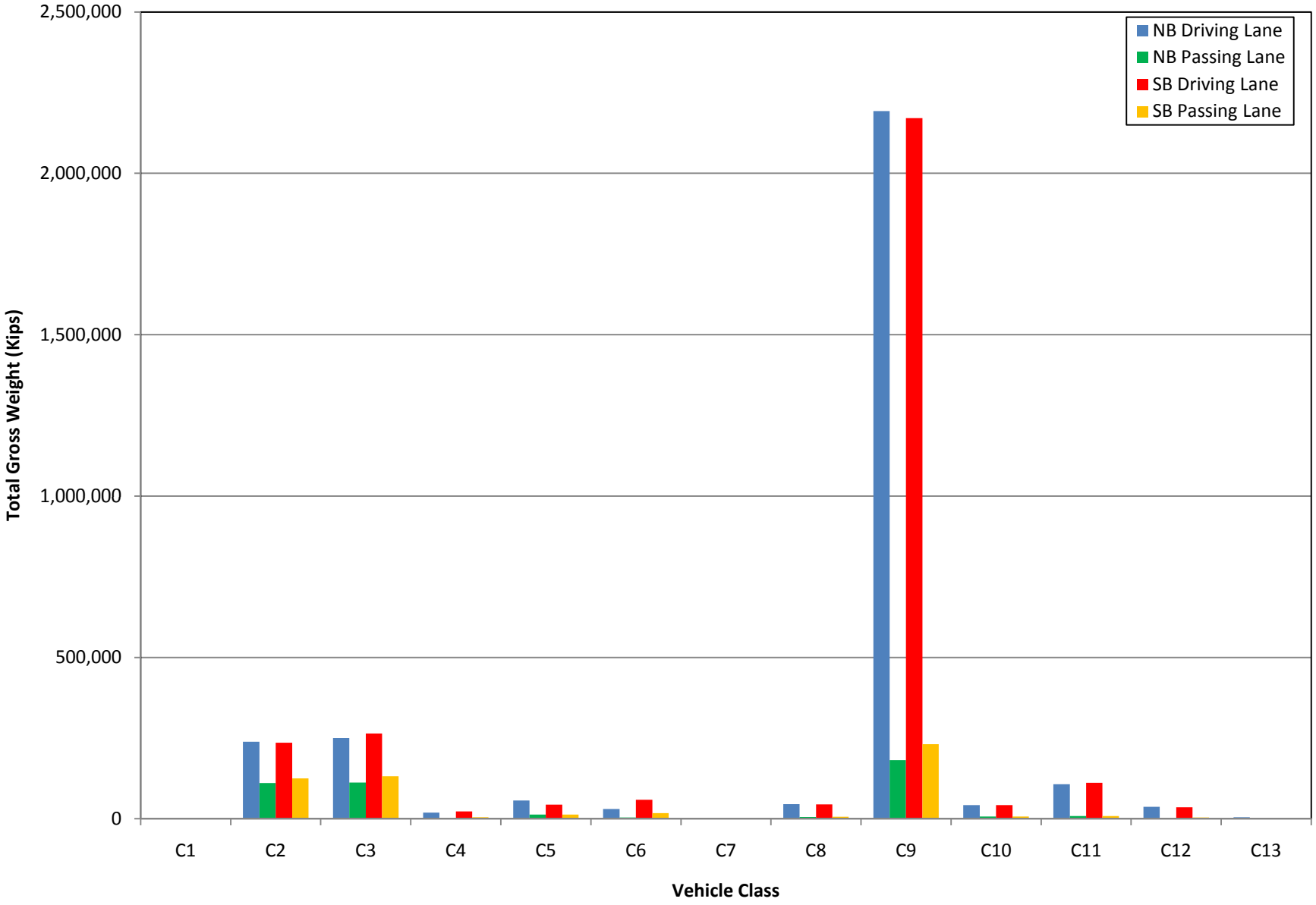

Figure 10 - Total Gross Vehicle Weight by Class

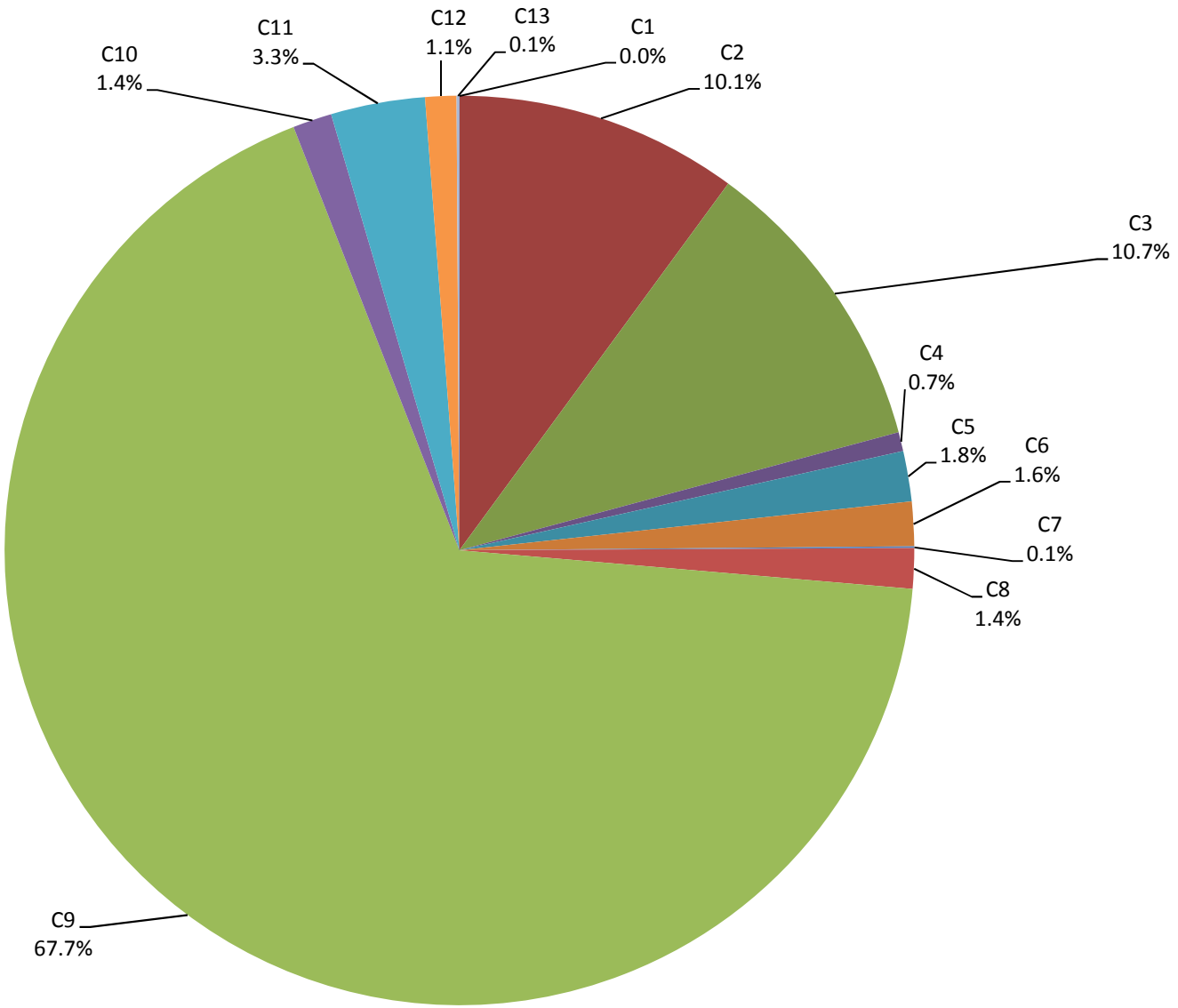

Figure 11 - Total ESALs by Class and Lane

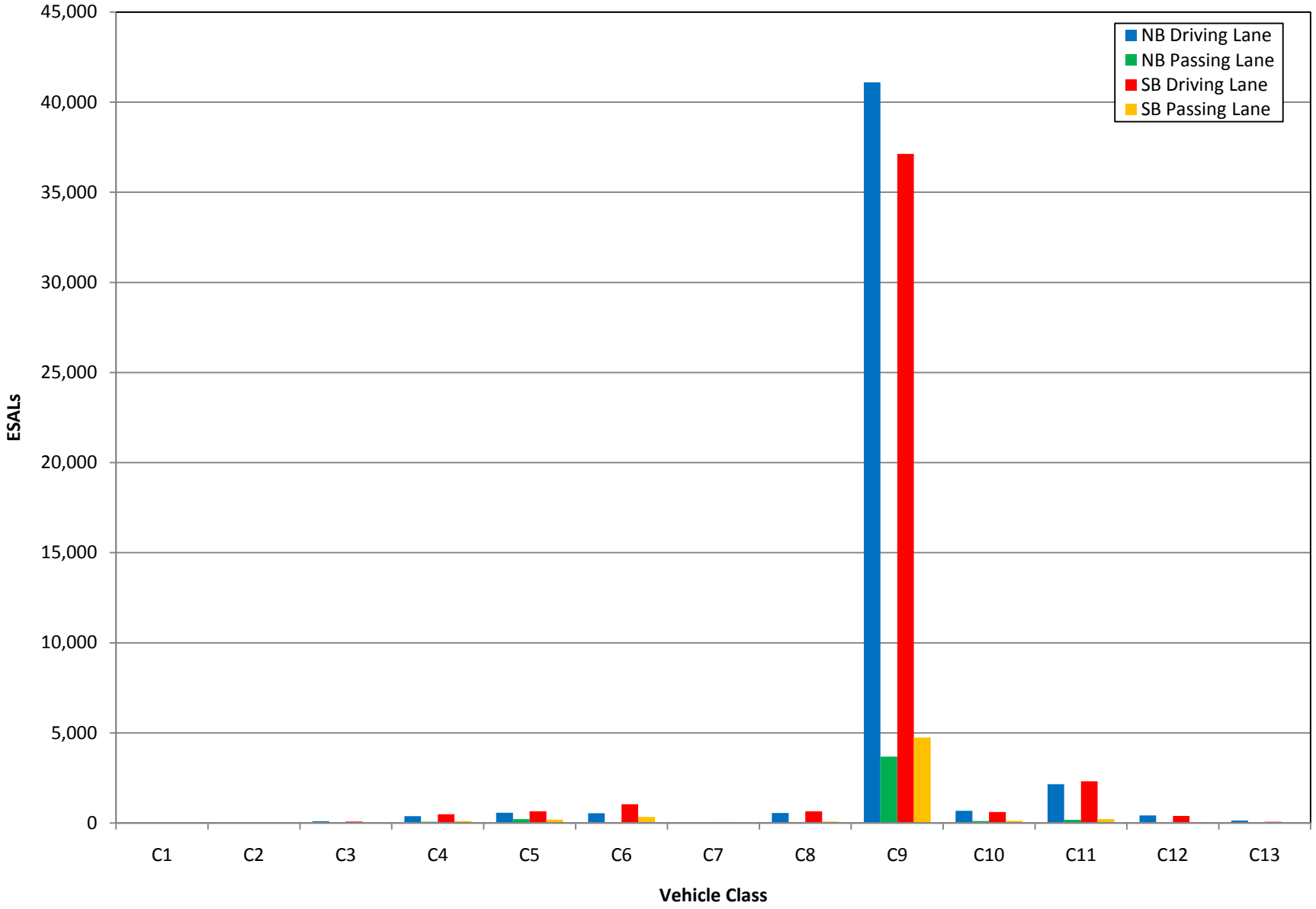

Figure 12 - ESALs by Class

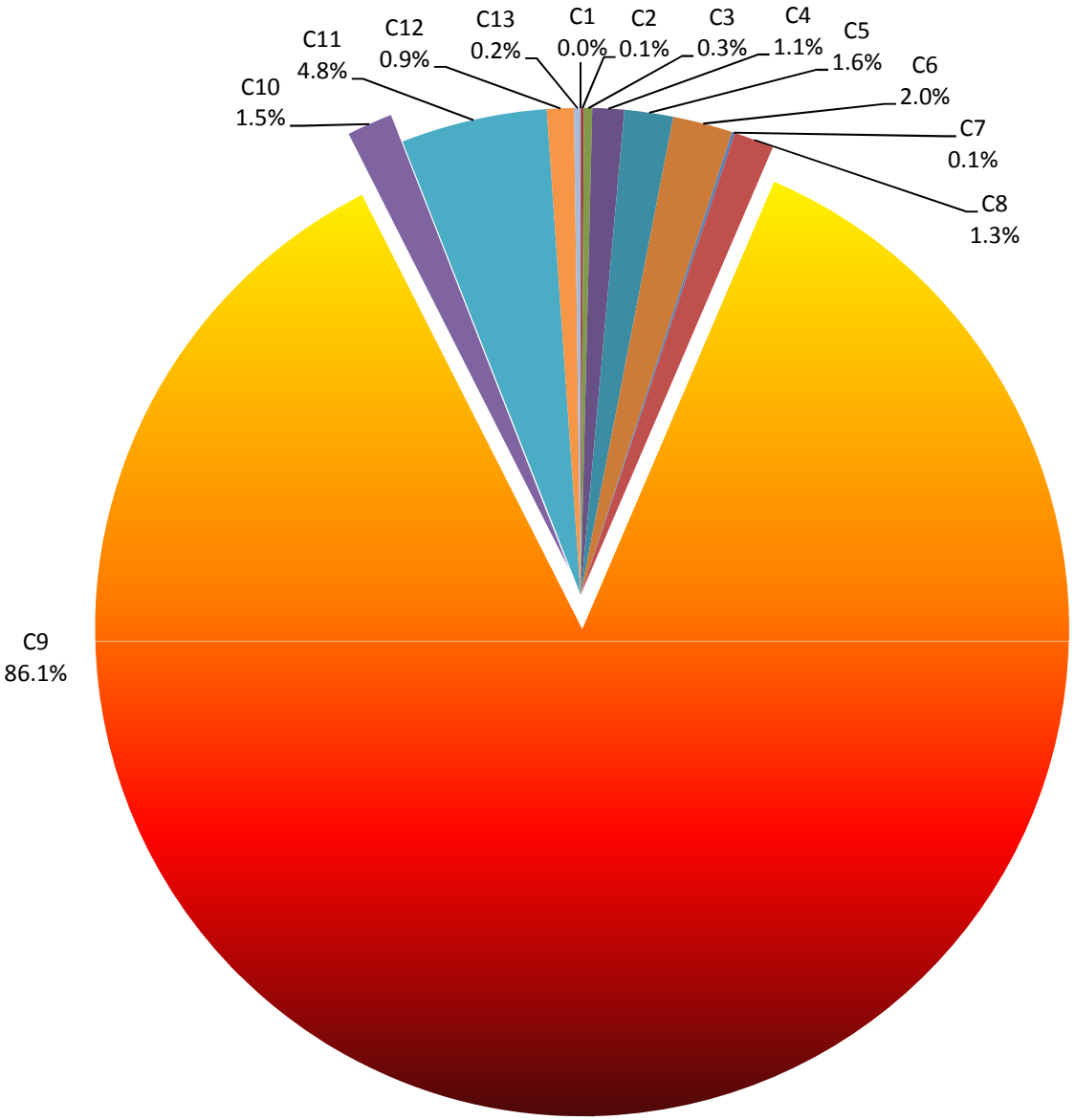

Figure 13 - Freight Tonnage and Percentage by Direction and Class

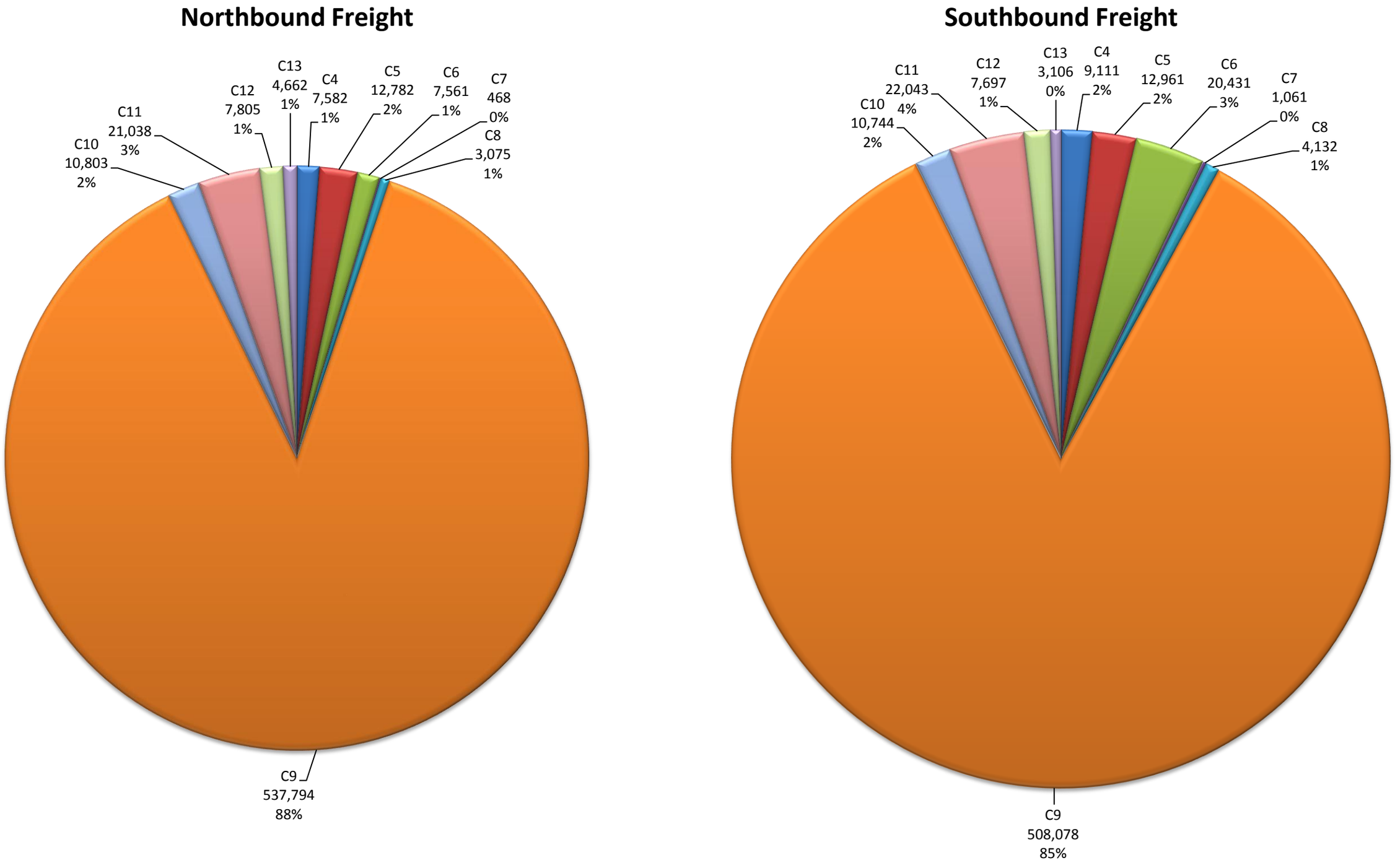

Figure 14 - Monthly Class 9 GVW Histogram - Lane 1 (NB Driving)

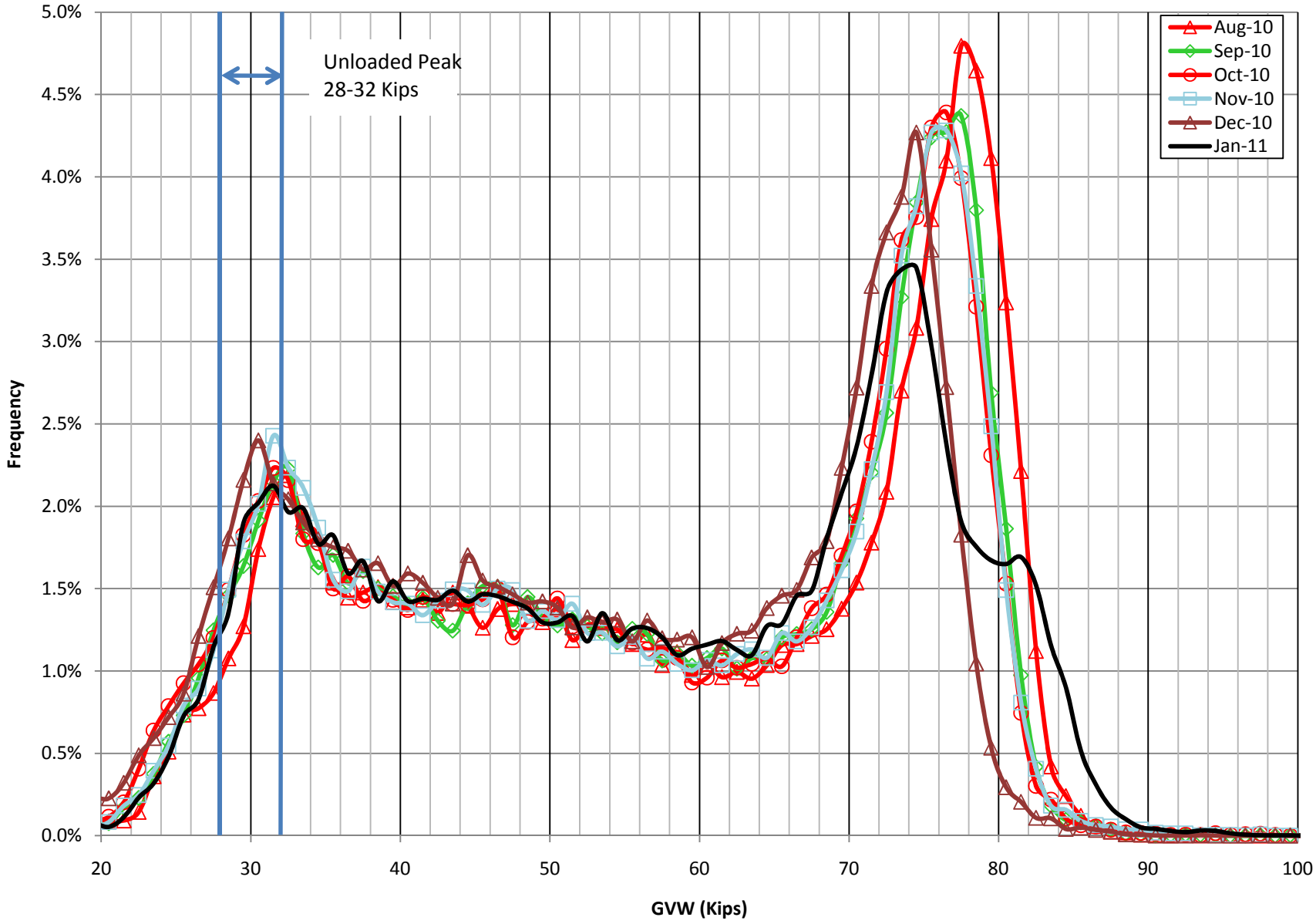

Figure 15 - Monthly Class 9 GVW Histogram - Lane 2 (NB Passing)

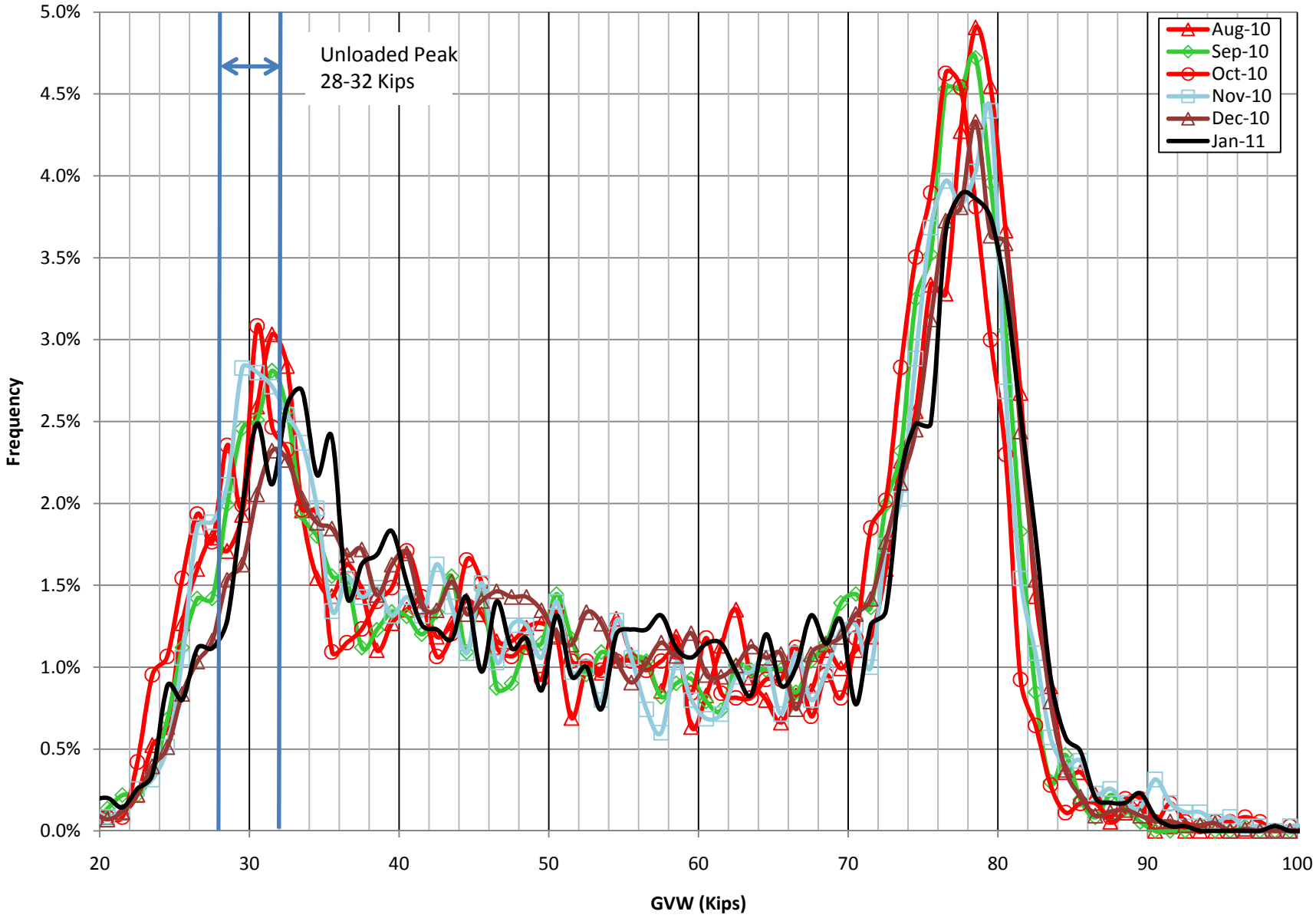

Figure 16 - Monthly Class 9 GVW Histogram - Lane 3 (SB Passing)

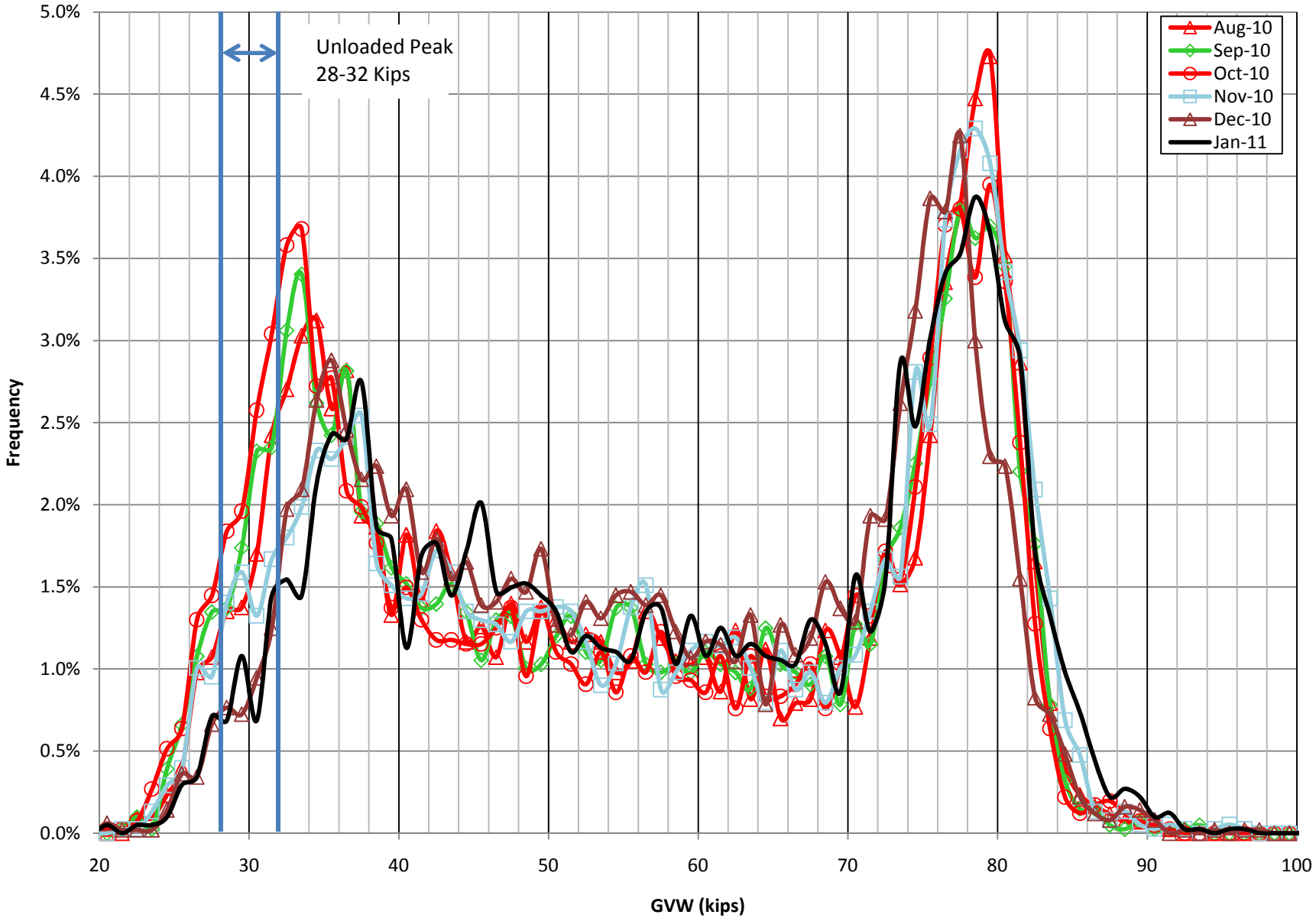

Figure 17 - Monthly Class 9 GVW Histogram - Lane 4 (SB Driving)

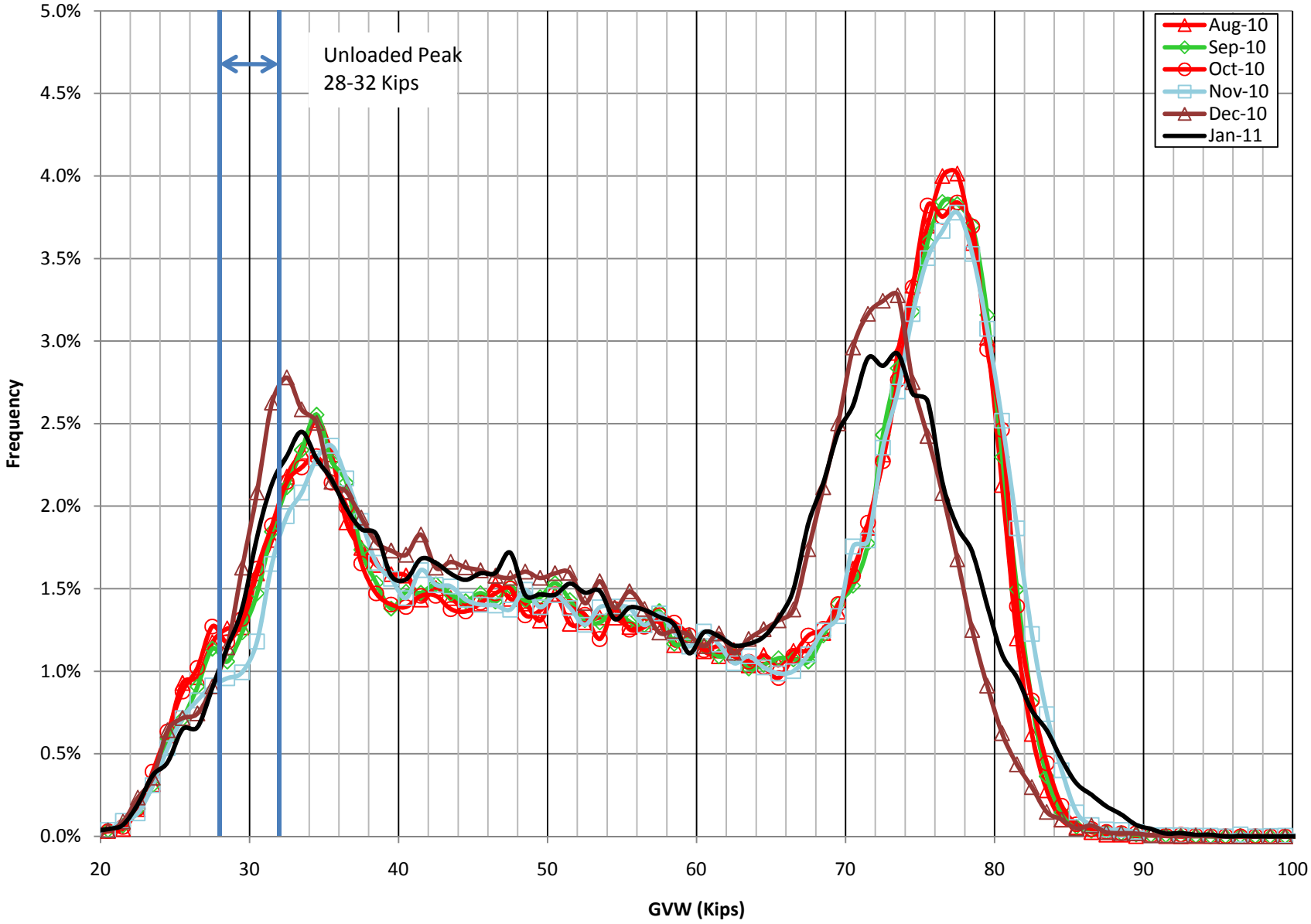

Figure 18 - Unloaded and Loaded Peaks by Lane vs. Date