CALIBRATION OF LRFR LIVE LOAD FACTORS USING WEIGH-IN-MOTION DATA

Interim Report

SPR 635

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by

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16. Abstract

The Load and Resistance Factor Rating (LRFR) code for load rating bridges is based on factors calibrated from structural load and resistance statistics to achieve a more uniform level of reliability for all bridges. The liveload factors in the LRFR code are based on load data thought to be representative of heavy truck traffic nationwide. However, the code allows for recalibrating liveload factors for a jurisdiction if weigh-in-motion data of sufficient quality and quantity are available. The Oregon Department of Transportation is implementing customized liveload factors based on the analysis described in this report. The relatively low liveload factors obtained in the Oregon calibration are a logical outcome of the regulatory and enforcement environment in Oregon.

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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	millimeters squared	mm^2
ft^2	square feet	0.093	meters squared	m^2
yd^2	square yards	0.836	meters squared	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	kilometers squared	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	ml
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	meters cubed	m^3
yd^3	cubic yards	0.765	meters cubed	m^3
NOTE: Volumes greater than 1000 L shall be shown in m^3.				
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams	Mg
		TEMPERATURE (exact)		
°F	Fahrenheit	(F-32)/1.8	Celsius	°C

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	millimeters squared	0.0016	square inches	in^2
m^2	meters squared	10.764	square feet	ft^2
m^2	meters squared	1.196	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	kilometers squared	0.386	square miles	mi^2
		VOLUME		
ml	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	meters cubed	35.315	cubic feet	ft^3
m^3	meters cubed	1.308	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.205	pounds	lb
Mg	megagrams	1.102	short tons (2000 lb)	T
		TEMPERATURE (exact)		
°C	Celsius	1.8C+32	Fahrenheit	°F

*SI is the symbol for the International System of Measurement

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REPORT OF:

CALIBRATION OF LRFR LIVE LOAD FACTORS FOR OREGON STATE-OWNED BRIDGES USING WEIGH-IN-MOTION DATA

to

OREGON DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

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Introduction

Live load factors for bridge rating have been calculated using Oregon weigh-in-motion (WIM) data. These factors have been calculated for four sites, including state and interstate routes around the state and at different "seasons." This report presents the analysis methods used to determine the site-specific live load factors and the resulting live load factors based on WIM data.

Live Load Factor Analysis & Methodology

Live load factors for legal load vehicles, continuous-trip permit (CTP) vehicles, and single-trip permit (STP) vehicles were calculated using the approach presented in "Calibration of LRFR Live Load Factors for Oregon Using I-5 Weigh-In-Motion Data" (2005) by Bala Sivakumar, which can be found in Appendix F of this report. Factors were calculated for three windows of time in each month: 1) All month, 2) 2 weeks – 1st – 14th, and 3) 2 weeks – 15th – 28th. This was done to track possible changes within each individual month, and to see how live load factors computed for two-week data windows compared with those using four-week data windows (all-month factors). Typically, in practice, two-weeks of data are used to compute site specific live load factors; however no standard of time or data volume has previously been established.

NCHRP Report 454 presents a generic method for calculating site-specific live load factors, which is the same as that found in the LRFR Manual. The main difference between Sivakumar's method and the NCHRP 454 method comes from the definition of the alongside truck. The NCHRP 454 method uses statistics corresponding to the 3S2 population only, while Sivakumar's method uses statistics matched by vehicles in all the following tables and classifications based on Oregon State University's recommendation that these more fully represent the alongside truck population in Oregon:

- Legal trucks (Weight Table 1),
- Extended Weight Table 2 (105,500 lbs maximum) and
- 98,000-lb CTP vehicles from Weight Table 3

This inclusion of CTP trucks as part of the along-side truck population is a conservative departure from past load factor calibration work.

A template for calculating the live load factors was set up using an Excel spreadsheet. The cleaned and filtered WIM data were imported, and sorted according to vehicle classification, based on Oregon Department of Transportation (ODOT) weight tables. Cleaning and filtering of the raw WIM data were performed to remove the following:

1. Record where the gross vehicle weight (GVW) value is equal to 0.0.
2. Record does not follow the general record pattern; this could be any inconsistency in the time stamp, words out of place from the status quo, incomplete records, etc.
3. Records with misplaced characters, such as a letter where a number should be or a number where a letter should be.
4. Record where an individual axle is greater than 50 kips.
5. Record where the speed is less than 10 mph.
6. Record where the speed is greater than 99 mph.
7. Record where the length is greater than 200 ft.

8. Record where the sum of the axle spacing lengths are greater than the length of the truck.
9. Record where the sum of the axle spacing lengths are less than 7 ft.
10. Record where the first axle spacing is less than 5 ft.
11. Record where the # of axles is greater than 13.
12. Record where the GVW is greater than 280 kips.
13. Record where any axle spacing is less than 3.4 ft.
14. Record which has a GVW +/- the sum of the axle weights by more than 7%.
15. Record which has a GVW less than 2.0 kips

Statistics were generated based on GVW for the rating truck and the alongside truck, as defined in Sivakumar's report. Only the top 20% of the truck weight data within each category were considered to be consistent with the projection of the upper tail of the weight histogram (NCHRP 454). Live load factors were determined for the different ODOT rating vehicles shown in Table 1.

Table 1: ODOT rating vehicle classifications.

Rating Vehicle	Live Load Factor Designation	GVW (k)
Legal Type 3	Oregon Legal Loads	50
Legal Type 3S2		80
Legal Type 3-3		80
OR-CTP-2A	CTP-2A,2B	105.5
OR-CTP-2B		105.5
OR-CTP-3	CTP-3	98
OR-STP-3	STP-3	120.5
OR-STP-4A	STP-4A	99
OR-STP-4B	STP-4B	185
OR-STP-5A	STP-5A	150.5
OR-STP-5B	STP-5B	162.5
OR-STP-5C	STP-5C	258
OR-STP-5BW	STP-5BW	204

Selection of Sites

There are currently four highways/interstates of interest in Oregon which are collecting WIM data: I-5, I-84, OR58, and US97. From these highways, individual sites were selected for analysis. One of the key influences in choosing a site was the volume of average daily truck traffic (ADTT), as described in further detail later. The WIM sites chosen are shown in Table 2.

Table 2: Selected WIM sites, locations, and ADTT.

Corridor	Site Location	Site Designation	ADTT	ADTT % of ADT
I-5	Woodburn NB	WBNB	5550	13%
US97	Bend NB	BNB	607	8%
OR58	Lowell WB	LWB	581	7%
I-84	Emigrant Hill WB	EHWB	1786	36%

Selection of Seasons

To assess possible variations in the data during different periods of the year, four "seasons" were selected for each WIM site. In theory, each WIM site collects a continuous record of data for vehicles crossing the WIM scales. However, due to local conditions such as roadway construction or problems such as hardware or electronics issues, data were not always continuous over an entire month. Therefore, the months selected for analysis were chosen based on complete months of data within each "season", as shown in Table 3.

Table 3: Seasonal classification by month.

Season	Time Frame
Winter	November - January
Spring	April
Summer	May - June
Fall	October

From this general breakdown, months were selected for each site. Some months strayed outside of traditional "seasonal" boundaries, but only when necessary due to noncontinuous data sets. Table 4 lists the specific months from which WIM data were available for each of the sites. These timeframes were used to determine the site specific live load factors.

Table 4: Month and year of WIM data used to compute site specific live load factors.

Site	Winter	Spring	Summer	Fall
I-5 Woodburn NB	Jan_05	Apr_05	June_05	Oct_05
US97 Bend NB	Dec_05	-	June_05	Oct_05
OR58 Lowell WB	Jan_05	Apr_05	June_05	Oct_05
I-84 Emigrant Hill WB	Nov_05	Apr_05	May_05	Oct_05

Data collection for Bend NB did not begin until June, 2005. Therefore, live load factors could not be calculated for "Spring". These will be computed as data becomes available for the current year, 2006.

Weight Table Sorting Methodology

Classifying and sorting the WIM data proved to be an important issue. Two separate WIM data sorting methods were investigated and compared to one another. These are the Conventional Sort method and the Modified Sort method.

1. Conventional Sort ("GVW + Axle Group Sort")
    - This method sorts vehicles based on their GVW, axle group weights, and length. It is the method currently used by the Oregon Department of Transportation to classify vehicles as Weight Table 1, Weight Table 2, Weight Table 3, Weight Table 4, Weight Table 5, or Table X (the overflow table classification). Permits are issued based on a vehicle's Weight Table classification.
    - It accounts for the axle spacing in assigning each vehicle to the appropriate Motor Carrier Transportation Division (MCTD) Weight Table.

- It assigns more vehicles to higher Weight Tables than the Modified Sort (described subsequently) based on the axle weights.
- Proportionately more heavy vehicles that could have been interpreted as "rogue" legal vehicles are assigned to Weight Table 3 and above and are now considered as legitimate permit vehicles.
- It yields lower coefficients of variation compared to the Modified Sort.
- It yields lower live load factors compared to the Modified Sort.
- It is less conservative, but is thought to better represent the permitted truck population in Oregon, than the Modified Sort.

2. Modified Sort ("GVW + Truck Length Sort")
    - This method sorts vehicles based only on their GVW and rear-to-steer axle length, and it does not account for axle groupings.
    - Assigns more vehicles to lower Weight Tables than the Conventional Sort.
    - Proportionately more heavy vehicles that could have been interpreted as legitimate permit vehicles are conservatively assigned to Weight Tables 1 & 2 and are thus considered "rogue" legal vehicles.
    - It yields higher coefficients of variation compared to the Conventional Sort.
    - It yields higher live load factors compared to the Conventional Sort.
    - It is more conservative, but may unfairly penalize Oregon's well established, easily and simply available, and inexpensive permitting process, than the Conventional Sort.

Table 5 compares the Weight Table breakdown for each sorting method. The live load factors herein are calculated based on the Conventional Sort method because it better represents the permitted truck population in Oregon. In contrast to some other states where truckers generally know the vehicle GVW but may not know their axle grouping weights, MCTD and ODOT report that Oregon truckers are generally aware of their axle and tandem weights, usually to within 2,000 lbs, which proves beneficial in obtaining a continuous trip permit (Groff, 2006).

Table 5: Comparison of sorting methods for table classification.

Site Info		Sort Method	Table 1	Table 2	Table 3	Table 4	Table 5	Table X	Total #
Winter	I-5 WBNB	Conventional Sort	124062	13175	1788	44	1	32	139102
		Modified Sort	125014	13690	366	29	2	1	139102
	US97 BNB	Conventional Sort	9776	411	398	9	0	1	10595
		Modified Sort	9954	535	105	1	0	0	10595
	OR58 LWB	Conventional Sort	15157	469	30	3	0	0	15659
		Modified Sort	15164	477	17	1	0	0	15659
	I-84 EHWB	Conventional Sort	43416	2224	72	2	0	0	45714
		Modified Sort	43447	2253	14	0	0	0	45714
Spring	I-5 WBNB	Conventional Sort	136364	13065	1835	57	1	25	151347
		Modified Sort	137374	13554	392	21	2	4	151347
	US97 BNB	Conventional Sort	-	-	-	-	-	-	0
		Modified Sort	-	-	-	-	-	-	0
	OR58 LWB	Conventional Sort	17455	433	17	3	0	0	17908
		Modified Sort	17460	442	6	0	0	0	17908
	I-84 EHWB	Conventional Sort	37249	3433	7177	73	2	77	48011
		Modified Sort	39846	5964	2191	9	1	0	48011
Summer	I-5 WBNB	Conventional Sort	143018	13684	4713	89	4	47	161555
		Modified Sort	145524	15001	1004	19	6	1	161555
	US97 BNB	Conventional Sort	15676	763	2304	9	1	20	18773
		Modified Sort	16640	1811	314	7	1	0	18773
	OR58 LWB	Conventional Sort	24765	954	95	12	1	3	25830
		Modified Sort	24813	982	32	3	0	0	25830
	I-84 EHWB	Conventional Sort	45109	4206	1057	13	0	8	50393
		Modified Sort	45450	4563	378	0	0	0	50393
Fall	I-5 WBNB	Conventional Sort	135964	12136	3912	93	14	46	152165
		Modified Sort	137776	13298	1025	47	19	0	152165
	US97 BNB	Conventional Sort	18028	708	304	12	4	11	19067
		Modified Sort	18167	831	60	7	2	0	19067
	OR58 LWB	Conventional Sort	25235	1278	202	9	1	13	26738
		Modified Sort	25388	1309	36	5	0	0	26738
	I-84 EHWB	Conventional Sort	48426	3084	49	0	0	1	51560
		Modified Sort	48447	3101	12	0	0	0	51560

Statistical Parameters

Several of the statistical parameters used in calculating the t_{ADTT} value deserve further elaboration. The t_{ADTT} statistic is defined in Sivakumar's report mentioned above. These include the Multiple-Presence Probability factor, the ADTT value, and the number of permits per day.

Multiple-Presence Probability Factor

- This value was taken as 1/15 for use in determining live load factors by the NCHRP 454 method. This is a conservative estimate which was used to calibrate the national model.
- Using Sivakumar's method, this value was taken as 1/30 based on more recent research performed by his firm.

ADTT Values

- ADTT values specific to each site were used in calculating the t_{ADTT} statistic. These values are listed in Table 2 (and Appendix E), as provided by David Fifer at ODOT, January 2006. The percent of ADT values are as reported by Tim Rogers at FHWA, January 2006.

Permits per Day

- The number of permits per day used in calculating the t_{ADTT} value is derived from the Conventional Sort method. Once the data is sorted according to the ODOT table classification, the number of Weight Table 3 CTP vehicles with 5 axles and GVW less than 99 kips are removed and placed into Weight Table 2, thereby including them as part of the routine traffic stream. The number of permits is then calculated by summing the remaining trucks in Weight Table 3 as well as those in Weight Tables 4, 5, and X, and then dividing by the number of days in the month. This represents the average number of STP vehicles passing the WIM site each day. Table 6 shows the adjusted number of vehicles by the Conventional Sort method, while Table 7 shows the observed number of STP permits for each WIM site.

Table 6: Adjusted number of vehicles by the Conventional Sort method.

Site Info		Table 1	Table 2*	Table 3*	Table 4	Table 5	Table X	Total #
Winter	I-5 WBNB	124062	13652	1311	44	1	32	139102
	US97 BNB	9776	596	213	9	0	1	10595
	OR58 LWB	15157	473	26	3	0	0	15659
	I-84 EHWB	43416	2238	58	2	0	0	45714
Spring	I-5 WBNB	136364	13674	1226	57	1	25	151347
	US97 BNB	-	-	-	-	-	-	0
	OR58 LWB	17455	436	14	3	0	0	17908
	I-84 EHWB	37249	7121	3489	73	2	77	48011
Summer	I-5 WBNB	143018	15622	2775	89	4	47	161555
	US97 BNB	15676	2379	688	9	1	20	18773
	OR58 LWB	24765	999	50	12	1	3	25830
	I-84 EHWB	45109	4802	461	13	0	8	50393
Fall	I-5 WBNB	135964	13572	2476	93	14	46	152165
	US97 BNB	18028	825	187	12	4	11	19067
	OR58 LWB	25235	1419	61	9	1	13	26738
	I-84 EHWB	48426	3094	39	0	0	1	51560

* CTP vehicles less than 99k from Table 3 are added into Table 2's total and subtracted from Table 3's total

Table 7: Observed number of Single Trip Permits for WIM sites.

Site Info		Observed Single Trip Permits/Month (Sum of T3*, T4, T5, TX Vehicles)	Observed Single Trip Permits/Day (Sum/30)
Winter	I-5 WBNB	1388	45
	US97 BNB	223	7
	OR58 LWB	29	1
	I-84 EHWB	60	2
Spring	I-5 WBNB	1309	44
	US97 BNB	-	-
	OR58 LWB	17	1
	I-84 EHWB	3641	121
Summer	I-5 WBNB	2915	97
	US97 BNB	718	24
	OR58 LWB	66	2
	I-84 EHWB	482	16
Fall	I-5 WBNB	2629	85
	US97 BNB	214	7
	OR58 LWB	84	3
	I-84 EHWB	40	1

* T3 vehicles do not include CTP's < 99.0 k

Live Load Factor Results

The computed live load factors for all sites, for all seasons, and for all ODOT rating vehicles are shown in Fig. 1. Tables 8a, 8b, and 8c contain the live load factors represented by Fig. 1.

It is ODOT's intent to replace the LRFR manuals' Table 6-5 and Table 6-6 (upper portion) with Oregon-specific values based on the population of trucks on the state highways. Live load factors for ADTT greater than 5000 correspond to the Woodburn NB (I-5) site. Live load factors for ADTT equal to 1500 correspond to the Emigrant Hill WB (I-84) site. Live load factors for ADTT less than 500 correspond to the Lowell WB (OR58) and Bend NB (US97) sites. For each level of ADTT, the highest live load factor from all seasons and time-frames was chosen. These selected live load factors are lower than the values found in the LRFR manual, and are shown in Table 9 and Table 10. Because ODOT's MCTD issues Single Trip Permits in large numbers on a routine basis without specific structural review, they are treated the same as "Routine or Annual" in Table 10 (upper portion of LRFR Table 6-6). Table 12 shows where each of the controlling live load factors came from.

Table 9: Comparison of LRFR Table 6-5 with Oregon-specific live load factors (Legal Loads).

Traffic Volume (one direction)	Load Factor	
	LRFR	Oregon-Specific
Unknown	1.80	1.40
ADTT ≥ 5000	1.80	1.40
ADTT = 1500	1.67	1.34
ADTT ≤ 500	1.51	1.30

Table 10: Comparison of the upper portion of LRFR Table 6-6 with Oregon-specific live load factors (Permit Loads).

Permit Type	Frequency Condition	Loading Condition	DF	Permit Vehicle	Live load Factor γ_L by ADTT (one direction)					
					> 5000		= 1500		< 500	
					LRFR	Oregon-Specific	LRFR	Oregon-Specific	LRFR	Oregon-Specific
Continuous Trip (Annual)	Unlimited Crossings	Mix w/traffic (other vehicles may be on the bridge)	2 or more lanes	CTP-2A	1.75	1.36	1.58	1.33	1.45	1.24
				CTP-2B	1.75	1.36	1.58	1.33	1.45	1.24
				CTP-3	1.80	1.43	1.63	1.39	1.49	1.29
Single Trip	Route-Specific Limited Crossings	Mix w/traffic (other vehicles may be on the bridge)	2 or more lanes	STP-3	1.60	1.23	1.46	1.18	1.35	1.11
				STP-4A	1.80	1.38	1.63	1.32	1.49	1.24
				STP-4B	1.30	0.99	1.21	0.96	1.14	0.91
				STP-5A	1.30	1.09	1.21	1.06	1.14	1.00
				STP-5B	1.30	1.05	1.21	1.02	1.14	0.97
				STP-5C	1.30	0.86	1.21	0.84	1.14	0.81
				STP-5BW	1.30	0.95	1.21	0.92	1.14	0.88

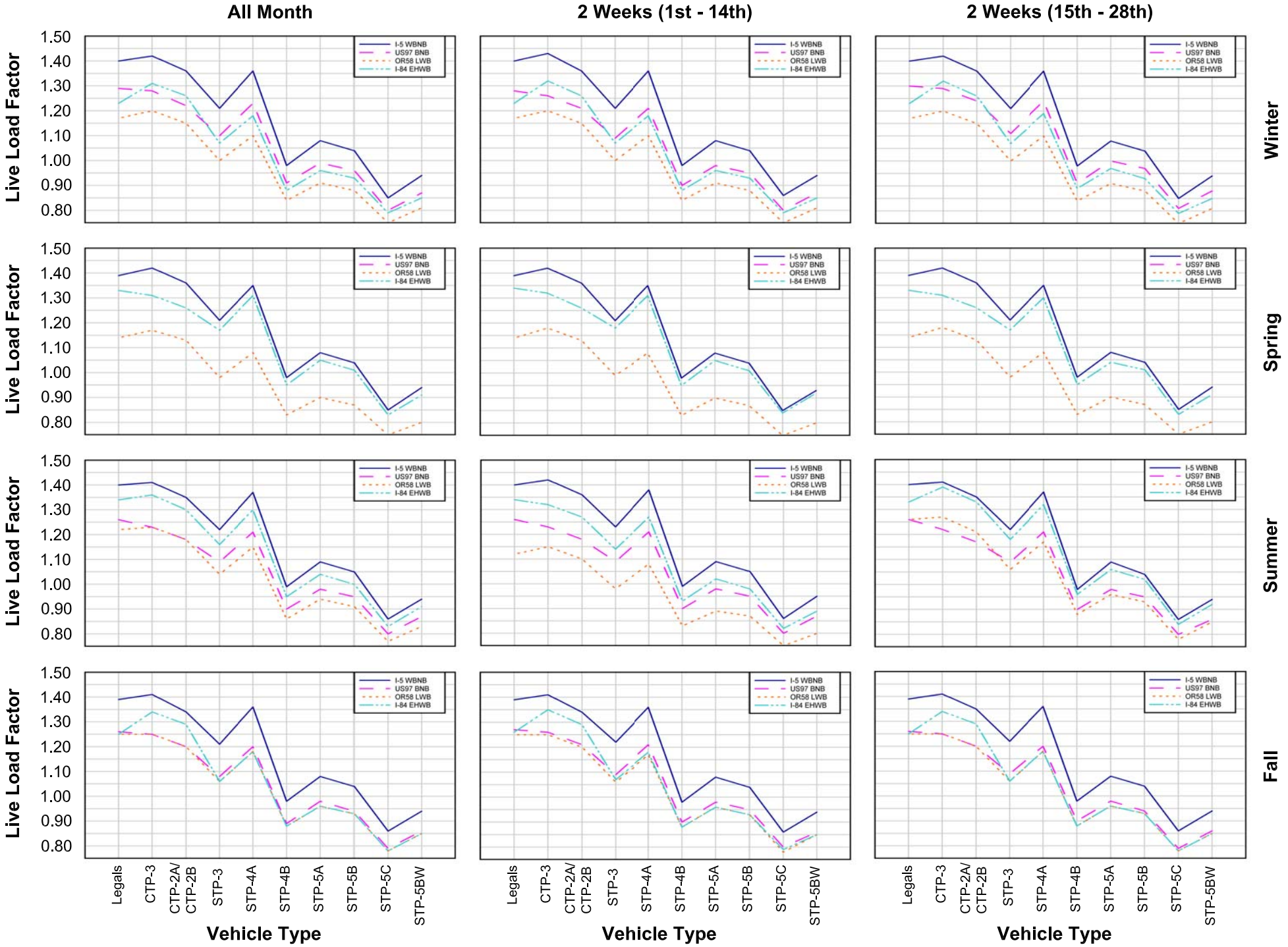


Figure 1 - Computed live load factors for all sites & seasons, and for all ODOT rating vehicles.

Table 8a: Summary of live load factors for all sites & seasons - All Month

		I-5 Woodburn NB	Hwy 97 Bend NB	OR 58 Lowell WB	I-84 Emigrant Hill WB
	Type	γL	γL	γL	γL
Winter	Oregon Legal Loads	1.40	1.29	1.17	1.23
	CTP-3	1.42	1.28	1.20	1.31
	CTP-2A, CTP-2B	1.36	1.22	1.15	1.26
	STP-3	1.21	1.10	1.00	1.07
	STP-4A	1.36	1.23	1.10	1.18
	STP-4B	0.98	0.91	0.84	0.88
	STP-5A	1.08	0.99	0.91	0.96
	STP-5B	1.04	0.96	0.88	0.93
	STP-5C	0.85	0.80	0.75	0.79
	STP-5BW	0.94	0.87	0.81	0.85
Spring	Oregon Legal Loads	1.39		1.14	1.33
	CTP-3	1.42		1.17	1.31
	CTP-2A, CTP-2B	1.36		1.13	1.26
	STP-3	1.21		0.98	1.17
	STP-4A	1.35		1.08	1.31
	STP-4B	0.98		0.83	0.95
	STP-5A	1.08		0.90	1.05
	STP-5B	1.04		0.87	1.01
	STP-5C	0.85		0.75	0.83
	STP-5BW	0.94		0.80	0.91
Summer	Oregon Legal Loads	1.40	1.26	1.22	1.34
	CTP-3	1.41	1.23	1.23	1.36
	CTP-2A, CTP-2B	1.35	1.18	1.18	1.30
	STP-3	1.22	1.09	1.04	1.16
	STP-4A	1.37	1.21	1.15	1.30
	STP-4B	0.99	0.90	0.86	0.95
	STP-5A	1.09	0.98	0.94	1.04
	STP-5B	1.05	0.95	0.91	1.00
	STP-5C	0.86	0.80	0.77	0.83
	STP-5BW	0.94	0.87	0.83	0.91
Fall	Oregon Legal Loads	1.39	1.26	1.25	1.25
	CTP-3	1.41	1.25	1.25	1.34
	CTP-2A, CTP-2B	1.34	1.20	1.20	1.29
	STP-3	1.21	1.08	1.06	1.06
	STP-4A	1.36	1.20	1.18	1.18
	STP-4B	0.98	0.89	0.88	0.88
	STP-5A	1.08	0.98	0.96	0.96
	STP-5B	1.04	0.94	0.93	0.93
	STP-5C	0.86	0.79	0.78	0.78
	STP-5BW	0.94	0.86	0.85	0.85

Table 8b: Summary of live load factors for all sites & seasons - 2 weeks (1st - 14th)

		I-5 Woodburn NB	Hwy 97 Bend NB	OR 58 Lowell WB	I-84 Emigrant Hill WB
	Type	γL	γL	γL	γL
Winter	Oregon Legal Loads	1.40	1.28	1.17	1.23
	CTP-3	1.43	1.26	1.20	1.32
	CTP-2A, CTP-2B	1.36	1.21	1.15	1.26
	STP-3	1.21	1.09	1.00	1.07
	STP-4A	1.36	1.21	1.10	1.18
	STP-4B	0.98	0.90	0.84	0.88
	STP-5A	1.08	0.98	0.91	0.96
	STP-5B	1.04	0.95	0.88	0.93
	STP-5C	0.86	0.80	0.75	0.79
	STP-5BW	0.94	0.87	0.81	0.85
Spring	Oregon Legal Loads	1.39		1.14	1.34
	CTP-3	1.42		1.18	1.32
	CTP-2A, CTP-2B	1.36		1.13	1.26
	STP-3	1.21		0.99	1.18
	STP-4A	1.35		1.08	1.31
	STP-4B	0.98		0.83	0.95
	STP-5A	1.08		0.90	1.05
	STP-5B	1.04		0.87	1.01
	STP-5C	0.85		0.75	0.84
	STP-5BW	0.93		0.80	0.92
Summer	Oregon Legal Loads	1.40	1.26	1.12	1.34
	CTP-3	1.42	1.23	1.15	1.32
	CTP-2A, CTP-2B	1.36	1.18	1.10	1.27
	STP-3	1.23	1.09	0.98	1.14
	STP-4A	1.38	1.21	1.08	1.27
	STP-4B	0.99	0.90	0.83	0.93
	STP-5A	1.09	0.98	0.89	1.02
	STP-5B	1.05	0.95	0.87	0.98
	STP-5C	0.86	0.80	0.75	0.82
	STP-5BW	0.95	0.87	0.80	0.89
Fall	Oregon Legal Loads	1.39	1.27	1.25	1.26
	CTP-3	1.41	1.26	1.25	1.35
	CTP-2A, CTP-2B	1.34	1.21	1.20	1.29
	STP-3	1.22	1.09	1.06	1.07
	STP-4A	1.36	1.21	1.17	1.18
	STP-4B	0.98	0.90	0.88	0.88
	STP-5A	1.08	0.98	0.96	0.96
	STP-5B	1.04	0.95	0.93	0.93
	STP-5C	0.86	0.80	0.78	0.79
	STP-5BW	0.94	0.86	0.85	0.85

Table 8c: Summary of live load factors for all sites & seasons - 2 weeks (15th - 28th)

		I-5 Woodburn NB	Hwy 97 Bend NB	OR 58 Lowell WB	I-84 Emigrant Hill WB
	Type	γL	γL	γL	γL
Winter	Oregon Legal Loads	1.40	1.30	1.17	1.23
	CTP-3	1.42	1.29	1.20	1.32
	CTP-2A, CTP-2B	1.36	1.24	1.15	1.26
	STP-3	1.21	1.11	1.00	1.07
	STP-4A	1.36	1.24	1.10	1.19
	STP-4B	0.98	0.91	0.84	0.89
	STP-5A	1.08	1.00	0.91	0.97
	STP-5B	1.04	0.97	0.88	0.93
	STP-5C	0.85	0.81	0.75	0.79
	STP-5BW	0.94	0.88	0.81	0.85
Spring	Oregon Legal Loads	1.39		1.14	1.33
	CTP-3	1.42		1.18	1.31
	CTP-2A, CTP-2B	1.36		1.13	1.26
	STP-3	1.21		0.98	1.17
	STP-4A	1.35		1.08	1.30
	STP-4B	0.98		0.83	0.95
	STP-5A	1.08		0.90	1.04
	STP-5B	1.04		0.87	1.01
	STP-5C	0.85		0.75	0.83
	STP-5BW	0.94		0.80	0.91
Summer	Oregon Legal Loads	1.40	1.26	1.26	1.33
	CTP-3	1.41	1.22	1.27	1.39
	CTP-2A, CTP-2B	1.35	1.17	1.21	1.33
	STP-3	1.22	1.09	1.06	1.18
	STP-4A	1.37	1.21	1.17	1.32
	STP-4B	0.98	0.90	0.88	0.96
	STP-5A	1.09	0.98	0.96	1.06
	STP-5B	1.04	0.95	0.93	1.02
	STP-5C	0.86	0.80	0.78	0.84
	STP-5BW	0.94	0.86	0.85	0.92
Fall	Oregon Legal Loads	1.39	1.26	1.25	1.25
	CTP-3	1.41	1.25	1.25	1.34
	CTP-2A, CTP-2B	1.35	1.20	1.20	1.29
	STP-3	1.22	1.09	1.06	1.06
	STP-4A	1.36	1.20	1.18	1.18
	STP-4B	0.98	0.90	0.88	0.88
	STP-5A	1.08	0.98	0.96	0.96
	STP-5B	1.04	0.94	0.93	0.93
	STP-5C	0.86	0.79	0.78	0.78
	STP-5BW	0.94	0.86	0.85	0.85

Example Calculation

The following section provides a detailed example for calculating live load factors. Data from the I-5 Woodburn NB site for June 2005 (2 weeks, 1st – 14th) is used to illustrate the procedure. Live load factors are calculated for Oregon Legal Loads, CTP-2A, CTP-2B, CTP-3, and STP-3. A more in-depth analysis is provided in Sivakumar's draft report, which can be found in Appendix F. Table 11 lists the statistics used in deriving the live load factors. Statistics for all sites, seasons, and time-frames can be found in Appendix A.

Table 11: Statistics for I-5 Woodburn NB, June 2005 (2 weeks, 1st - 14th)

Vehicle	Using the Top 20% of the WIM Record		
	Max GVW	Mean W^*	σ^*
3S2 - Legal	80^{K}	75.1^{K}	2.0^{K}
Alongside Truck	105.5^{K}	83.9^{K}	9.7^{K}

Using Equation 39, NCHRP Report 454, LRFR load factor for rating is given as:

$$\gamma_L = 1.8\frac{W_T}{240} \times \frac{72}{W} \qquad \text{(Eq. 39)}$$

W = Weight of vehicle (legal truck or permit truck)
W_T = Expected maximum total weight of rating and alongside vehicles
$W_T = R_T + A_T$

R_T = Rating Truck
$R_T = W^* + t_{ADTT}\sigma^*$ (for legal loads)
W^* = Mean of top 20% legal trucks
σ^* = Standard deviation of top 20% legal trucks
$R_T = P + t_{ADTT}\sigma^*$ (for permit loads)
P = Weight of permit truck
σ^* = Standard deviation of top 20% alongside trucks

A_T = Alongside Truck
$A_T = W^* + t_{ADTT}\sigma^*$
W^* = Mean of top 20% alongside trucks
σ^* = Standard deviation of top 20% alongside trucks

t_{ADTT} = Fractile value corresponding to number of side-by-side events N
N = Number of side-by-side crossings
N (legals) = (ADTT) x (365 days/yr) x (Evaluation period) x ($P_{s/s}$) x (% of record)
N (permits) = (N_P) x (365 days/yr) x (Evaluation period) x ($P_{s/s}$)
$P_{s/s}$ = Probability of side-by-side = 1/30 (Sivakumar, 2005)
N_P = Number of observed Single Trip Permits (from Table 7)

1) Load Factor for Oregon Legal Loads.

Using a 1/30 probability of side-by-side events for two legal trucks, a 5 year evaluation period, an ADTT=5550, and taking the top 20% of the record; the number of side-by-side events N:

$N = (5550)(365)(5)(1/30)(1/5) = 67{,}525$
$1/N = 1.4809 \times 10^{-5}$

From NCHRP 454, Appendix A: $t_{ADTT} = 4.18$

$R_T = 75.1 + 4.18 \times 2.0$
$= 83.3^K$

$A_T = 83.9 + 4.18 \times 9.7$
$= 124.5^K$

$W_T = 83.3^K + 124.5^K$
$= 207.8^K$

$$\gamma_L = 1.8 \times \frac{207.8}{240} \times \frac{72}{80}$$

= **1.40** → This is the controlling value for ADTT ≥ 5000, as shown in Table 12

2) Load Factors for Continuous Trip Permits (CTP).

ODOT has estimated that CTPs are about 30% of legal truck traffic on I-5 for determining the number of side-by-side events, N (CTP adjacent to a legal truck).

$N = 67525 \times 0.30 = 20258$
$1/N = 4.9364 \times 10^{-5}$

From NCHRP 454, Appendix A: $t_{ADTT} = 3.89$

$A_T = 83.9 + 3.89 \times 9.7$
$= 121.8^K$

a) For 105.5^k CTP (CTP-2A/2B)

$R_T = 105.5 + 3.89 \times 9.7$
$= 143.4^K$

$W_T = 143.4^K + 121.8^K$
$= 265.2^K$

$$\gamma_L = 1.8 \times \frac{265.2}{240} \times \frac{72}{105.5}$$

= **1.36** → This is the controlling value for ADTT ≥ 5000, as shown in Table 12

b) For 98^k CTP (CTP-3A)

$R_T = 98 + 3.89X9.7$
$= 135.9^K$

$W_T = 135.9^K + 121.8^K$
$= 257.7^K$

$$\gamma_L = 1.8 \times \frac{257.7}{240} \times \frac{72}{98}$$

= **1.42**

3) Load Factor for 120.5^K STP-3 (same method for all STP vehicles)

From Table 7, $N_P = 97$:

$N = (97)(365)(5)(1/30) = 5901$
$1/N = 1.6947 \times 10^{-4}$

From NCHRP 454, Appendix A: $t_{ADTT} = 3.58$

$A_T = 83.9^K + 3.58x9.7^K$
$= 118.8^K$

$R_T = 120.5 + 34.7$
$= 155.4^K$

$W_T = 155.4^K + 118.8^K$
$= 274.1^K$

$$\gamma_L = 1.8 \times \frac{274.1}{240} \times \frac{72}{120.5}$$

= **1.23** → This is the controlling value for ADTT ≥ 5000, as shown in Table 12

Upper Bound Live Load Factors

Table 12 shows the upper bound (controlling) live load factors for all sites, seasons, and timeframes. The site, season, and time-frame for each upper bound are listed. Several of

the upper bound live load factors are shared by more than one season and/or time-frame. Explanation of each abbreviation in the row entitled "Source" is described at the bottom of Table 12.

Table 12: Upper bound live load factors for all sites, seasons, and time-frames

Vehicle		ADTT		
		≥ 5000	1500	≤ 500
Legals (Type 3, 3S2, 3-3)	γ_L	1.40	1.34	1.30
	Source	I-5 Woodburn NB ({AM, 1-14, 15-28}, Wi & Su)	I-84 Emigrant Hill WB (AM, Su) (1-14, Sp & Su)	US97 Bend NB (15-28, Wi)
CTP-3	γ_L	1.43	1.39	1.29
	Source	I-5 Woodburn NB (1-14, Wi)	I-84 Emigrant Hill WB (15-28, Su)	US97 Bend NB (15-28, Wi)
CTP-2A CTP-2B	γ_L	1.36	1.33	1.24
	Source	I-5 Woodburn NB ({AM, 1-14, 15-28}, Wi & Sp)	I-84 Emigrant Hill WB (15-28, Su)	US97 Bend NB (15-28, Wi)
STP-3	γ_L	1.23	1.18	1.11
	Source	I-5 Woodburn NB (1-14, Su)	I-84 Emigrant Hill WB (1-14, Sp) (15-28, Su)	US97 Bend NB (15-28, Wi)
STP-4A	γ_L	1.38	1.32	1.24
	Source	I-5 Woodburn NB (1-14, Su)	I-84 Emigrant Hill WB (15-28, Su)	US97 Bend NB (15-28, Wi)
STP-4B	γ_L	0.99	0.96	0.91
	Source	I-5 Woodburn NB (AM & 1-14, Su)	I-84 Emigrant Hill WB (15-28, Su)	US97 Bend NB (AM & 15-28, Wi)
STP-5A	γ_L	1.09	1.06	1.00
	Source	I-5 Woodburn NB (AM & 1-14 & 15-28, Su)	I-84 Emigrant Hill WB (15-28, Su)	US97 Bend NB (15-28, Wi)
STP-5B	γ_L	1.05	1.02	0.97
	Source	I-5 Woodburn NB (AM & 1-14, Su)	I-84 Emigrant Hill WB (15-28, Su)	US97 Bend NB (15-28, Wi)
STP-5C	γ_L	0.86	0.84	0.81
	Source	I-5 Woodburn NB ({AM, 1-14, 15-28}, Su, Fa) & (1-14, Wi)	I-84 Emigrant Hill WB (1-14, Sp) (15-28, Su)	US97 Bend NB (15-28, Wi)
STP-5BW	γ_L	0.95	0.92	0.88
	Source	I-5 Woodburn NB (1-14, Su)	I-84 Emigrant Hill WB (1-14, Sp) (15-28, Su)	US97 Bend NB (15-28, Wi)

*Time window abbreviation key:

All Month	=	AM
2 Weeks (1st - 14th)	=	1-14
2 Weeks (15th - 28th)	=	15-28

*Season abbreviation key:

Winter	=	Wi
Spring	=	Sp
Summer	=	Su
Fall	=	Fa

Significant Findings

Significant findings based on the results of this study are presented below. This includes information on seasonal, directional, and traffic-volume variations between sites, overweight vehicle avoidance, axle loads in excess of 50 kips, interstate versus non-interstate traffic, and 2-week versus 4-week time windows.

Seasonal Variation

The variation of live load factors for the different seasons at all four sites can be seen in Fig. 2. Tables 13a, 13b, 13c, and 13d contain the live load factors represented by Figure 2. I-5 Woodburn NB and US97 Bend NB show very little change from season to season, while OR58 Lowell WB and I-84 Emigrant Hill WB show a slight variation between select seasons. The greatest variation for OR58 is for the Oregon Legal Load (2 Weeks, 1^{st} – 14^{th}) from a Summer live load factor of 1.12 to a Fall live load factor of 1.25 (12% change). The greatest variation for I-84 is for the STP-4A (2 Weeks, 15^{th} – 28th) from a Fall live load factor of 1.18 to a Summer live load factor of 1.32 (13% change). Some of these seasonal variations may be attributed to movement of construction equipment and agricultural products in the summer and fall.

Directional Variation

The live load factors are insensitive to the direction of travel. To confirm this point, another site – Woodburn SB for January 2005 – was investigated and compared to its counterpart, Woodburn NB. Table 14 compares Woodburn NB and SB live load factors for each time-frame during January, 2005. The results show that direction of travel is insignificant.

Table 14: Comparison of live load factors between the Woodburn NB & SB sites for January, 2005.

Location	Time-Frame	Legals	CTP-3	CTP-2A/2B	STP-3	STP-4A	STP-4B	STP-5A	STP-5B	STP-5C	STP-5BW
I-5 WBNB	All Month	1.40	1.42	1.36	1.21	1.36	0.98	1.08	1.04	0.85	0.94
I-5 WBSB	All Month	1.39	1.42	1.36	1.22	1.37	0.98	1.09	1.05	0.86	0.94
I-5 WBNB	1st - 14th	1.40	1.43	1.36	1.21	1.36	0.98	1.08	1.04	0.86	0.94
I-5 WBSB	1st - 14th	1.38	1.42	1.36	1.22	1.37	0.98	1.08	1.04	0.86	0.94
I-5 WBNB	15th - 28th	1.40	1.42	1.36	1.21	1.36	0.98	1.08	1.04	0.85	0.94
I-5 WBSB	15th - 28th	1.39	1.43	1.36	1.23	1.38	0.99	1.09	1.05	0.86	0.95

Traffic Volume Variations

The calculated live load factors presented herein agree with the LRFR trend of lower load factors for lower ADTT volume.

Overweight Vehicle Avoidance

Possible overweight vehicle avoidance of WIM sites was considered in a previous study by Portland State University. Based on data reported in the study, there was no significant evidence of scale avoidance, as shown in the "Weight Enforcement and Evasion: Oregon Case Study" report by Strathman and Theisen (2002).

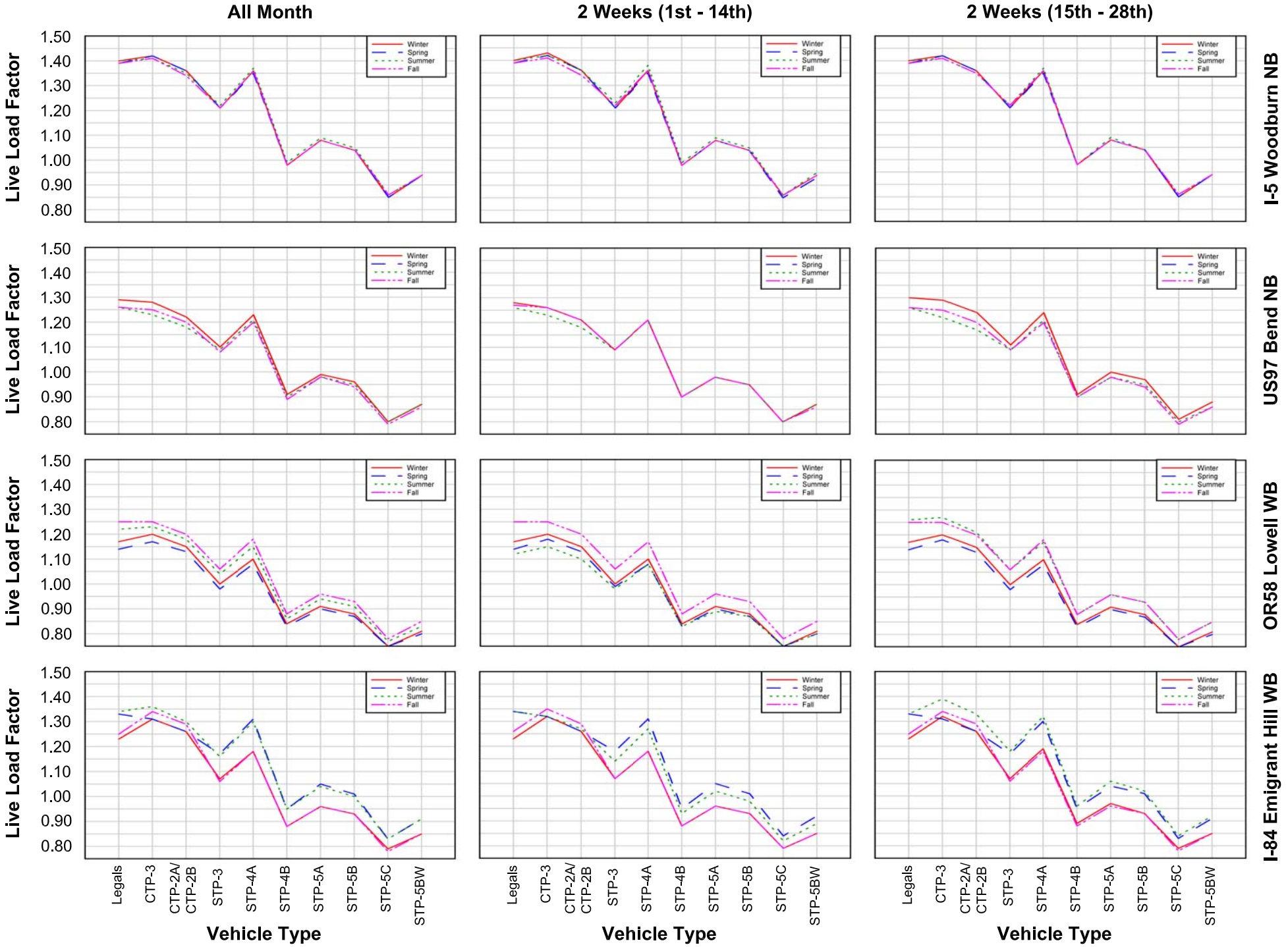


Figure 2 - Variation of live load factors for the different seasons at all four sites.

Table 13a: Statistical summary for seasonal variation of live load factors for I-5 Woodburn NB

	I-5 Woodburn NB								
Type	Time Window	Winter	Spring	Summer	Fall	Mean	Hi	Low	% of Mean
Oregon Legal Loads	All Month	1.40	1.39	1.40	1.39	1.40	1.40	1.39	0.87%
	2 Weeks (1-14)	1.40	1.39	1.40	1.39	1.40	1.40	1.39	0.95%
	2 Weeks (15-28)	1.40	1.39	1.40	1.39	1.40	1.40	1.39	0.67%
CTP-3	All Month	1.42	1.42	1.41	1.41	1.42	1.42	1.41	1.31%
	2 Weeks (1-14)	1.43	1.42	1.42	1.41	1.42	1.43	1.41	1.34%
	2 Weeks (15-28)	1.42	1.42	1.41	1.41	1.42	1.42	1.41	1.15%
CTP-2A, CTP-2B	All Month	1.36	1.36	1.35	1.34	1.35	1.36	1.34	1.28%
	2 Weeks (1-14)	1.36	1.36	1.36	1.34	1.36	1.36	1.34	1.30%
	2 Weeks (15-28)	1.36	1.36	1.35	1.35	1.35	1.36	1.35	1.11%
STP-3	All Month	1.21	1.21	1.22	1.21	1.22	1.22	1.21	1.25%
	2 Weeks (1-14)	1.21	1.21	1.23	1.22	1.22	1.23	1.21	1.63%
	2 Weeks (15-28)	1.21	1.21	1.22	1.22	1.22	1.22	1.21	0.95%
STP-4A	All Month	1.36	1.35	1.37	1.36	1.36	1.37	1.35	1.35%
	2 Weeks (1-14)	1.36	1.35	1.38	1.36	1.36	1.38	1.35	1.77%
	2 Weeks (15-28)	1.36	1.35	1.37	1.36	1.36	1.37	1.35	1.03%
STP-4B	All Month	0.98	0.98	0.99	0.98	0.98	0.99	0.98	1.01%
	2 Weeks (1-14)	0.98	0.98	0.99	0.98	0.98	0.99	0.98	1.32%
	2 Weeks (15-28)	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.77%
STP-5A	All Month	1.08	1.08	1.09	1.08	1.08	1.09	1.08	1.12%
	2 Weeks (1-14)	1.08	1.08	1.09	1.08	1.08	1.09	1.08	1.47%
	2 Weeks (15-28)	1.08	1.08	1.09	1.08	1.08	1.09	1.08	0.86%
STP-5B	All Month	1.04	1.04	1.05	1.04	1.04	1.05	1.04	1.08%
	2 Weeks (1-14)	1.04	1.04	1.05	1.04	1.04	1.05	1.04	1.41%
	2 Weeks (15-28)	1.04	1.04	1.04	1.04	1.04	1.04	1.04	0.82%
STP-5C	All Month	0.85	0.85	0.86	0.86	0.86	0.86	0.85	0.83%
	2 Weeks (1-14)	0.86	0.85	0.86	0.86	0.86	0.86	0.85	1.08%
	2 Weeks (15-28)	0.85	0.85	0.86	0.86	0.86	0.86	0.85	0.63%
STP-5BW	All Month	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.95%
	2 Weeks (1-14)	0.94	0.93	0.95	0.94	0.94	0.95	0.93	1.25%
	2 Weeks (15-28)	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.73%

Table 13b: Statistical summary for seasonal variation of live load factors for US97 Bend NB.

	US97 Bend NB								
Type	Time Window	Winter	Spring	Summer	Fall	Mean	Hi	Low	% of Mean
Oregon Legal Loads	All Month	1.29		1.26	1.26	1.27	1.29	1.26	1.99%
	2 Weeks (1-14)	1.28		1.26	1.27	1.27	1.28	1.26	1.09%
	2 Weeks (15-28)	1.30		1.26	1.26	1.27	1.30	1.26	3.30%
CTP-3	All Month	1.28		1.23	1.25	1.25	1.28	1.23	3.90%
	2 Weeks (1-14)	1.26		1.23	1.26	1.25	1.26	1.23	2.76%
	2 Weeks (15-28)	1.29		1.22	1.25	1.25	1.29	1.22	5.71%
CTP-2A, CTP-2B	All Month	1.22		1.18	1.20	1.20	1.22	1.18	3.78%
	2 Weeks (1-14)	1.21		1.18	1.21	1.20	1.21	1.18	2.67%
	2 Weeks (15-28)	1.24		1.17	1.20	1.20	1.24	1.17	5.52%
STP-3	All Month	1.10		1.09	1.08	1.09	1.10	1.08	1.63%
	2 Weeks (1-14)	1.09		1.09	1.09	1.09	1.09	1.09	0.40%
	2 Weeks (15-28)	1.11		1.09	1.09	1.10	1.11	1.09	2.64%
STP-4A	All Month	1.23		1.21	1.20	1.21	1.23	1.20	1.79%
	2 Weeks (1-14)	1.21		1.21	1.21	1.21	1.21	1.21	0.44%
	2 Weeks (15-28)	1.24		1.21	1.20	1.22	1.24	1.20	2.90%
STP-4B	All Month	0.91		0.90	0.89	0.90	0.91	0.89	1.29%
	2 Weeks (1-14)	0.90		0.90	0.90	0.90	0.90	0.90	0.32%
	2 Weeks (15-28)	0.91		0.90	0.90	0.90	0.91	0.90	2.09%
STP-5A	All Month	0.99		0.98	0.98	0.98	0.99	0.98	1.45%
	2 Weeks (1-14)	0.98		0.98	0.98	0.98	0.98	0.98	0.36%
	2 Weeks (15-28)	1.00		0.98	0.98	0.98	1.00	0.98	2.36%
STP-5B	All Month	0.96		0.95	0.94	0.95	0.96	0.94	1.39%
	2 Weeks (1-14)	0.95		0.95	0.95	0.95	0.95	0.95	0.34%
	2 Weeks (15-28)	0.97		0.95	0.94	0.95	0.97	0.94	2.26%
STP-5C	All Month	0.80		0.80	0.79	0.80	0.80	0.79	1.04%
	2 Weeks (1-14)	0.80		0.80	0.80	0.80	0.80	0.80	0.26%
	2 Weeks (15-28)	0.81		0.80	0.79	0.80	0.81	0.79	1.69%
STP-5BW	All Month	0.87		0.87	0.86	0.87	0.87	0.86	1.22%
	2 Weeks (1-14)	0.87		0.87	0.86	0.87	0.87	0.86	0.30%
	2 Weeks (15-28)	0.88		0.86	0.86	0.87	0.88	0.86	1.97%

Table 13c: Statistical summary for seasonal variation of live load factors for OR58 Lowell WB.

	OR58 Lowell WB								
Type	Time Window	Winter	Spring	Summer	Fall	Mean	Hi	Low	% of Mean
Oregon Legal Loads	All Month	1.17	1.14	1.22	1.25	1.20	1.25	1.14	9.22%
	2 Weeks (1-14)	1.17	1.14	1.12	1.25	1.17	1.25	1.12	11.51%
	2 Weeks (15-28)	1.17	1.14	1.26	1.25	1.21	1.26	1.14	9.57%
CTP-3	All Month	1.20	1.17	1.23	1.25	1.21	1.25	1.17	6.16%
	2 Weeks (1-14)	1.20	1.18	1.15	1.25	1.19	1.25	1.15	8.45%
	2 Weeks (15-28)	1.20	1.18	1.27	1.25	1.22	1.27	1.18	7.38%
CTP-2A, CTP-2B	All Month	1.15	1.13	1.18	1.20	1.17	1.20	1.13	5.96%
	2 Weeks (1-14)	1.15	1.13	1.10	1.20	1.15	1.20	1.10	8.16%
	2 Weeks (15-28)	1.15	1.13	1.21	1.20	1.18	1.21	1.13	7.14%
STP-3	All Month	1.00	0.98	1.04	1.06	1.02	1.06	0.98	7.71%
	2 Weeks (1-14)	1.00	0.99	0.98	1.06	1.01	1.06	0.98	7.83%
	2 Weeks (15-28)	1.00	0.98	1.06	1.06	1.03	1.06	0.98	7.82%
STP-4A	All Month	1.10	1.08	1.15	1.18	1.12	1.18	1.08	8.51%
	2 Weeks (1-14)	1.10	1.08	1.08	1.17	1.11	1.17	1.08	8.66%
	2 Weeks (15-28)	1.10	1.08	1.17	1.18	1.13	1.18	1.08	8.63%
STP-4B	All Month	0.84	0.83	0.86	0.88	0.85	0.88	0.83	6.01%
	2 Weeks (1-14)	0.84	0.83	0.83	0.88	0.84	0.88	0.83	6.09%
	2 Weeks (15-28)	0.84	0.83	0.88	0.88	0.86	0.88	0.83	6.10%
STP-5A	All Month	0.91	0.90	0.94	0.96	0.92	0.96	0.90	6.81%
	2 Weeks (1-14)	0.91	0.90	0.89	0.96	0.91	0.96	0.89	6.91%
	2 Weeks (15-28)	0.91	0.90	0.96	0.96	0.93	0.96	0.90	6.92%
STP-5B	All Month	0.88	0.87	0.91	0.93	0.90	0.93	0.87	6.51%
	2 Weeks (1-14)	0.88	0.87	0.87	0.93	0.89	0.93	0.87	6.60%
	2 Weeks (15-28)	0.88	0.87	0.93	0.93	0.90	0.93	0.87	6.61%
STP-5C	All Month	0.75	0.75	0.77	0.78	0.76	0.78	0.75	4.80%
	2 Weeks (1-14)	0.75	0.75	0.75	0.78	0.76	0.78	0.75	4.86%
	2 Weeks (15-28)	0.75	0.75	0.78	0.78	0.77	0.78	0.75	4.89%
STP-5BW	All Month	0.81	0.80	0.83	0.85	0.82	0.85	0.80	5.64%
	2 Weeks (1-14)	0.81	0.80	0.80	0.85	0.82	0.85	0.80	5.71%
	2 Weeks (15-28)	0.81	0.80	0.85	0.85	0.83	0.85	0.80	5.73%

Table 13d: Statistical summary for seasonal variation of live load factors for I-84 Emigrant Hill WB.

	I-84 Emigrant Hill WB								
Type	Time Window	Winter	Spring	Summer	Fall	Mean	Hi	Low	% of Mean
Oregon Legal Loads	All Month	1.23	1.33	1.34	1.25	1.29	1.34	1.23	8.84%
	2 Weeks (1-14)	1.23	1.34	1.34	1.26	1.29	1.34	1.23	8.95%
	2 Weeks (15-28)	1.23	1.33	1.33	1.25	1.29	1.33	1.23	7.79%
CTP-3	All Month	1.31	1.31	1.36	1.34	1.33	1.36	1.31	3.55%
	2 Weeks (1-14)	1.32	1.32	1.32	1.35	1.33	1.35	1.32	2.57%
	2 Weeks (15-28)	1.32	1.31	1.39	1.34	1.34	1.39	1.31	6.16%
CTP-2A, CTP-2B	All Month	1.26	1.26	1.30	1.29	1.28	1.30	1.26	3.44%
	2 Weeks (1-14)	1.26	1.26	1.27	1.29	1.27	1.29	1.26	2.49%
	2 Weeks (15-28)	1.26	1.26	1.33	1.29	1.28	1.33	1.26	5.97%
STP-3	All Month	1.07	1.17	1.16	1.06	1.12	1.17	1.06	9.64%
	2 Weeks (1-14)	1.07	1.18	1.14	1.07	1.11	1.18	1.07	9.71%
	2 Weeks (15-28)	1.07	1.17	1.18	1.06	1.12	1.18	1.06	10.84%
STP-4A	All Month	1.18	1.31	1.30	1.18	1.24	1.31	1.18	10.55%
	2 Weeks (1-14)	1.18	1.31	1.27	1.18	1.24	1.31	1.18	10.63%
	2 Weeks (15-28)	1.19	1.30	1.32	1.18	1.25	1.32	1.18	11.86%
STP-4B	All Month	0.88	0.95	0.95	0.88	0.92	0.95	0.88	7.66%
	2 Weeks (1-14)	0.88	0.95	0.93	0.88	0.91	0.95	0.88	7.70%
	2 Weeks (15-28)	0.89	0.95	0.96	0.88	0.92	0.96	0.88	8.62%
STP-5A	All Month	0.96	1.05	1.04	0.96	1.00	1.05	0.96	8.60%
	2 Weeks (1-14)	0.96	1.05	1.02	0.96	1.00	1.05	0.96	8.66%
	2 Weeks (15-28)	0.97	1.04	1.06	0.96	1.01	1.06	0.96	9.68%
STP-5B	All Month	0.93	1.01	1.00	0.93	0.97	1.01	0.93	8.25%
	2 Weeks (1-14)	0.93	1.01	0.98	0.93	0.96	1.01	0.93	8.30%
	2 Weeks (15-28)	0.93	1.01	1.02	0.93	0.97	1.02	0.93	9.28%
STP-5C	All Month	0.79	0.83	0.83	0.78	0.81	0.83	0.78	6.21%
	2 Weeks (1-14)	0.79	0.84	0.82	0.79	0.81	0.84	0.79	6.25%
	2 Weeks (15-28)	0.79	0.83	0.84	0.78	0.81	0.84	0.78	7.00%
STP-5BW	All Month	0.85	0.91	0.91	0.85	0.88	0.91	0.85	7.22%
	2 Weeks (1-14)	0.85	0.92	0.89	0.85	0.88	0.92	0.85	7.26%
	2 Weeks (15-28)	0.85	0.91	0.92	0.85	0.88	0.92	0.85	8.13%

Axle Loads > 50 kips

Before the WIM data can be processed for live load factors, it must be filtered, cleaned, and organized. One of the filtering commands removes any vehicle record that has an individual axle weight greater than 50 kips, as mentioned previously. The upper bound of 50 kips was selected based on modern tire properties. It is not possible for modern tires to sustain the amount of pressure produce by a 50-kip axle load, even divided amongst four individual tires.

Interstate versus Non-Interstate Traffic

Interstate traffic produces higher ADTT values, which in turn produce higher live load factors. This follows the national trend of higher live load factors for higher ADTT values. Table 15 shows the total number records for each site and at each season, along with their corresponding ADTT values, while Fig. 3 shows this in graphical form. The calibrations developed here are valid statewide for interstate versus non-interstate routes on state-owned bridges.

Table 15: Total number of WIM records.

Site	Winter	Spring	Summer	Fall	ADTT	% of ADT
I-5 Woodburn NB	139102	151347	161555	152165	5550	13%
US97 Bend NB	10595		18773	19067	607	8%
OR58 Lowell WB	15659	17908	25830	26738	581	7%
I-84 Emigrant Hill WB	45714	48011	50393	51560	1786	36%

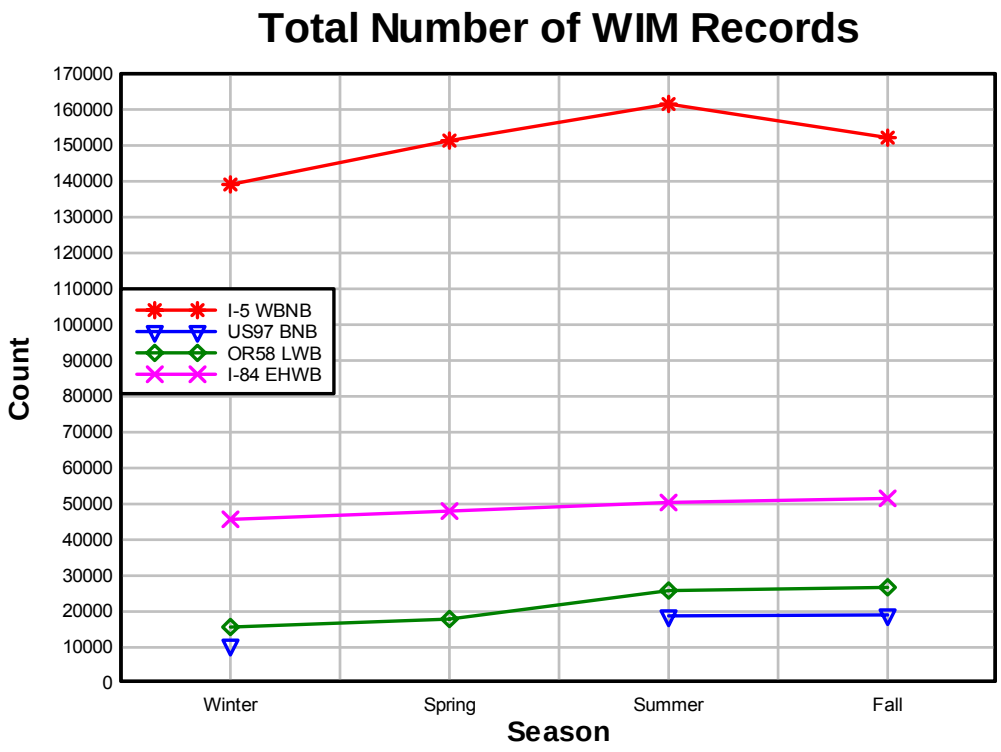


Figure 3 – Total number of WIM records for each site and season.

2-week versus 4-week Time Windows

Live load factors were calculated for three different windows of time in each month: 1) All month, 2) 2 weeks – 1st – 14th, and 3) 2 weeks – 15th – 28th. This was done to track possible changes within each individual month, and to see how live load factors computed for two-week data windows compared with those using four-week data windows (all-month factors). As shown in Fig. 1, there was little change between the different time windows. This would suggest that reasonable characterization of the WIM sites could be made from any two continuous weeks of data within the month of interest.

Sensitivity Analysis

A sensitivity analysis was performed to see how easily the live load factors were affected by shifts in the mean and standard deviation. All four sites were investigated for the Summer season using the first two weeks of data (1st – 14th). The statistics were originally derived from the alongside vehicle (all T1, T2, & CTP's < 99.0k from Weight Table 3). The analysis determined the degree to which the mean and standard deviation would need to be adjusted to change the live load factor by 0.05. The two parameters were analyzed independent of one another (first, change only the mean for a live load factor change of 0.05, and then change only the standard deviation for a live load factor change of 0.05). The results are shown in Table 16. The mean would have to change by about 10% for all sites, and the standard deviation by ~ 15% on the interstates, and ~ 25% on the state highways.

An increase in the mean GVW weight indicates growth in truck weights. An increase in the standard deviation means higher dispersion. Changes in these parameters, which should be monitored, may result in changes in compliance or enforcement, and would indicate a possible need to recalibrate the load factors.

Table 16: Sensitivity analysis for alongside vehicle variability for select rating vehicles during summer season (2 Weeks - 1st - 14th).

Site Info		Original Statistics*		Increase W to Increase γ_L by .05		Increase σ to Increase γ_L by .05	
		W (kips)	σ (kips)	W (kips)	% Change	σ (kips)	% Change
I-5 WBNB	Legals γ_L = 1.40 to 1.45	83.9	9.7	91.3	**9%**	11.5	**18%**
	CTP-3 γ_L = 1.42 to 1.47	83.9	9.7	93.0	**11%**	10.9	**12%**
	STP-4A γ_L = 1.38 to 1.43	83.9	9.7	93.1	**11%**	11.0	**13%**
US97 BNB	Legals γ_L = 1.26 to 1.31	81.7	6.5	89.1	**9%**	8.5	**31%**
	CTP-3 γ_L = 1.23 to 1.28	81.7	6.5	90.8	**11%**	7.9	**21%**
	STP-4A γ_L = 1.21 to 1.26	81.7	6.5	90.7	**11%**	7.9	**22%**
OR58 LWB	Legals γ_L = 1.12 to 1.17	68.2	6.3	75.6	**11%**	8.3	**32%**
	CTP-3 γ_L = 1.15 to 1.20	68.2	6.3	77.3	**13%**	7.7	**22%**
	STP-4A γ_L = 1.08 to 1.13	68.2	6.3	77.4	**13%**	8.2	**30%**
I-84 EHWB	Legals γ_L = 1.34 to 1.39	80.8	8.5	88.2	**9%**	10.4	**22%**
	CTP-3 γ_L = 1.32 to 1.37	80.8	8.5	89.9	**11%**	9.8	**15%**
	STP-4A γ_L = 1.27 to 1.32	80.8	8.5	90.0	**11%**	10.0	**17%**

*Statistics derived from T1, T2, & CTP's < 99.0k from T3 (alongside vehicle)

The sensitivity analysis was also performed on the statistics for the legal vehicles (3S2 population) with the results shown in Table 17, whereas Table 16 was created based on the statistics for the alongside vehicle. The live load factors for legal vehicles were the only factors affected by this change. Table 11 clarifies the difference between the two sets of statistics.

Table 17: Sensitivity analysis for legal vehicle variability for legal rating vehicles during summer season (2 Weeks - 1st - 14th).

Site Info		Original Statistics*		Increase W to Increase γ_L by .05		Increase σ to Increase γ_L by .05	
		W (kips)	σ (kips)	W (kips)	% Change	σ (kips)	% Change
I-5 WBNB	Legals γ_L = 1.40 to 1.45	75.1	2.0	82.5	**10%**	3.8	**89%**
US97 BNB	Legals γ_L = 1.26 to 1.31	78.5	0.9	85.9	**9%**	2.9	**226%**
OR58 LWB	Legals γ_L = 1.12 to 1.17	64.1	2.7	71.5	**12%**	4.8	**74%**
I-84 EHWB	Legals γ_L = 1.34 to 1.39	71.3	3.4	78.7	**10%**	5.3	**56%**

*Statistics derived from 3S2 population

Notes for Woodburn NB, June 05 (1st - 14th)

- Increasing the 3S2 mean by 5% (78.9 k) and the Alongside mean by 4.5% (87.7 k) will change the Legal LL Factor by .05.

- Increasing the 3S2 sd by 44.5%% (2.9 k) and the Alongside sd by 9% (10.6 k) will change the Legal LL Factor by .05.

- Increasing the 3S2 mean by 2.5% (77.0 k), the 3S2 sd by 22.3% (2.5 k), the Alongside mean by 2.25% (85.8 k), and the Alongside sd by 4.5% (10.1 k) will change the Legal LL Factor by .05.

Discussion

The Oregon-specific live load factors calibrated using large WIM data sets are lower than those found in the LRFR manual, which were calibrated based on the Ontario vehicle weight data of 1975. For example, the LRFR live load factor for legal loads is 1.80 for ADTT $\geq$ 5000, while the Oregon-specific value is 1.40. Similar reductions in live load factors are seen for lower ADTT ranges, as well as for permit vehicles (Oregon's CTP and STP vehicles). This difference can be attributed to the fact that there were

significantly more overloads in the Ontario random vehicle data than are present in the Oregon legal loads or in the vehicle population grouped as the "alongside truck" (Sivakumar, 2005). The maximum loading event for the LRFR calibration was controlled by overloaded random vehicles. The reduced number of overloads in the Oregon data explains the reduced site-specific live load factors. Factors for Oregon's lower degree of overloads include the minimal cost of overweight permits, the large number of such permits authorized, the ease of access in obtaining them (such as through the Internet), the weight-mile tax that results in lower tax for loads placed on more axles, development and fostering of the "Trusted Carrier" program which enhances cooperation and load compliance by trucking companies, and the significant enforcement and cost of penalties imposed on vehicles which are non-compliant. The compliance to weight limits for trucks in Oregon was verified in a study by Strathman and Theisen (2002) that demonstrated there was no statistically significant evidence of overweight truck scale avoidance. The ability to minimize uncertainties in the truck population through the effective means described above was critical in reducing the live load factors and should be continued to permit smaller factors than that prescribed in LRFR.

Quality Control Checks for Processing WIM Data and Load Factor Calculations

The method used to develop the site specific load factors includes the following tasks:

- Obtain raw WIM data from ODOT ftp site.
- Identify format errors in raw WIM data and reformat for subsequent processing (program Wingnut#.exe where # is the current version number).
- Identify WIM record errors (program Liger#.exe where # is the current version number).
- Review error files to ensure reported errors are captured and no records are lost.
- Sort data into weight-table classifications (program Tablesorter#.exe where # is the current version number).
- Filter records containing 3S2 configurations and compiles the T2PCTP and T3MCTP records (program 3S2_Nubs2b).
- Spot check records to ensure proper sort.
- Plot GVW results to look for visual distinctions such as repeated records, spurious outliers, and other inconsistencies. It was observed that the cleaned and sorted records could contain replicate identical records, of which only one was true. This visual scanning of results is still necessary and it is not recommended to use a purely computerized process.
- Import weight-table records into Excel, sort top 20%, compute statistics, and compute live load factors.

As part of the data evaluation process, a series of quality control checks were performed to verify the accuracy of the data classification and calculations performed by OSU. The QC process included the following:

- Verification of WIM data record error identification.
- Verification of raw WIM record transcription to OSU usable format.
- Verification of sorting algorithm for weight-table classification.
- Verification of statistical parameter calculation in spreadsheets.
- Verification of live load factor calculation in spreadsheet.

All software programs written by OSU that were used for cleaning and sorting the raw WIM data, as well as the spreadsheets developed by OSU for calculation of statistical results and load factors were independently checked. The software programs were verified by creating sample input files for each step of the cleaning and sorting process. These sample input files contained each of the specific error identification types that were to be captured, as well as specific valid WIM records that were of known classification.

1. Raw WIM data are used for input into Wingnut#.exe for initial sorting. Eleven (11) errors are identified and removed by this program. Primarily errors at this stage are format issues. Data with formatting errors are removed and placed in error files. To check the program, a sample input file was made with over 50 entries. Some entries were valid WIM records and others included the specific errors to be found and omitted from the data set at this point. The order of the valid data and known errors were random. The output results from Wingnut# were checked against the errors that were intended. All errors were correctly identified with the exception of Error 325 which only pertains to the old style WIM files with axle pictograms and as such not included in the sample file.

   Error 144 – If line1(N:N+4).EQ.'W 0.0' (TYPE)
   Error 184 – If line1(N:N+3).NE.'LANE' (TYPE)
   Error 203 – If line1(N:N+4).EQ.'W 0.0' (CLASS)
   Error 244 – If line1(N:N+3).NE.'LANE' (CLASS)
   Error 253 – If line1(N:N+1).EQ.'TY'.OR.line1(N:N).EQ.'C' is not true
   Error 275 – If line2(N:N).EQ.'U'
   Error 300 – If line2(N:N).NE.'k' (18-K)
   Error 327 – If line2(N:N).NE.'k' (ESAL)
   Error 361 – If line3(N:N+3).EQ.'AXLE'.OR.'18-K'.OR.'ESAL'
   Error 377 – If line4(N:N+3).EQ.'(ft)'
   Error 325 – If line8(N:N+1).EQ.'Un'

2. The next step in the sorting process is program Liger#.exe. There are 14 errors identified and removed by this program. These are errors that identify outlier data that typically would be an erroneous record. Using the sample input file with specified errors and valid data, all the error types were properly captured and stored in the error files. The only issue that was detected was for speeds greater than 99 mph. The program read only 2 integers and so did not catch those trucks that might be traveling over 100 mph. This was corrected and subsequently verified. There was no impact on the prior load factor results based on this format specification, particularly as the WIM system already identifies vehicles that are traveling too fast and does not record the data for such cases.

   Error 142 – Invalid Date ((15:15) does not equal ':' and (25:27) does not equal '200')
   Error 165 – Non-Numerical Value (char. 28 - 222 contains a non-numerical value)
   Error 177 – Decimal Value in Wrong Place
   Error 202 – Individual Axle Weight > 50 kips

Error 216 – Speed < 10 mph
Error 229 – Speed > 99 mph
Error 242 – Length > 200 ft
Error 256 – Bumper-to-Bumper Length + 10 ft < The Sum of the Axle Spacings
Error 269 – Length < 7 ft AND Sum of Axles < 7 ft
Error 282 – 1st Axle Spacing < 5 ft (steer axle)
Error 296 – Axle # does not Equal 1 - 13
Error 309 – GVW > 280 kips (check outcome)
Error 325 – Any Axle Spacing < 3.4 ft
Error 344 – GVW > +/- 7% of the Sum of the Axle Weights

3. The weight-table sort is performed with two FORTRAN programs that use the Liger cleaned WIM data. The data are sorted into the correct ODOT permit weight-table classifications. To verify this program, an input file was made that included 3 trucks from each of the weight tables (Tables 1 through 5). The three record examples for each table classification were taken from the lower, the middle, and the upper range of each table. The data were properly sorted by overall GVW into the correct weight tables.

4. The second program that sorts the cleaned truck data is 3S2_Nubs.exe. This program sorts the Liger data into 3S2's and T2PCTP (Table 2 with continuous trip permit trucks) and T3MCTP (Table 3 without the continuous permit trucks) folders for input into load factor statistics. A day in a month was run in this program to verify that all trucks sorted into 3S2 were 5 axles and met the axle spacing requirements for the 3S2. The spacing used was the default (>5.5'). The program correctly identified the 5 axle vehicles and these were further correctly sorted out into the 3S2 configurations.

   Next, the T2PCTP and T3MCTP were verified against the output tables from table sorter. The Table 3 file was sorted by axles and then axle spacing to identify the 3S2 trucks and to verify the final number of these trucks matched those subtracted from the new T3MCTP file and the same number was added to T2PCTP (except for those vehicles with GVW > 80 kips).

5. Finally, the truck GVW statistics and live load factors in the final spreadsheet were verified. The table data are imported and the top 20% of the records are used to determine the mean and standard deviation truck population. The spreadsheet results were verified using a month of WIM data. The sorted data was imported into the Excel worksheets of the template file and results were compared with the output from the previous calculations. The mean and standard deviations of the GVW were checked to ensure that the top 20% is being captured. The LL factor formulae and results in the spreadsheet, as well as the t-score lookup were verified using hand calculations.

The WIM data processing described above relies on specific data formatting. If the format is changed in the future, the programs will need to be updated. Additionally, the permit weight table sort used by OSU are based on the current ODOT permit weight

tables: STK#300557 (Permit Weight Table 1), STK#300558 (Permit Weight Table 2), STK#300559 (Permit Weight Table 3), STK#300560 (Permit Weight Table 4), STK#300561 (Permit Weight Table 5). If these permit tables change, then the program Tablesorter will need to be revised accordingly

To ensure changes can be properly implemented, ODOT should inform OSU of future changes when or if they occur.

References

AASHTO (2003). *Manual for Condition Evaluation and Load and Resistance Factor Rating (LRFR) of Highway Bridges*, Washington, D.C.

Fifer, D. (2006). Oregon Department of Transportation, E-mail correspondence with J. Pelphrey at Oregon State University.

Groff, R. (2006). Oregon Department of Transportation, E-mail correspondence with J. Pelphrey at Oregon State University.

Moses, F. (2001). "Calibration of Load Factors for LRFR Bridge Evaluation." *NCHRP Report 454*, Transportation Research Board, National Research Council, Washington, D.C.

Rogers, T. (2005). Federal Highway Administration, E-mail correspondence with C. Higgins at Oregon State University, Excel Spreadsheet for Percent of ADT.

Sivakumar, B. (2005). "Calibration of LRFR Live Load Factors for Oregon Using I-5 Weigh-In-Motion Data." Lichtenstein Consulting Engineers, Inc., Paramus, New Jersey

Strathman, J.G. and Theisen, G. (2002). "Weight Enforcement and Evasion: Oregon Case Study." Center for Urban Studies, College of Urban and Public Affairs, Portland State University

Appendices

Description of Appendices

Appendix A – Live Load Factor Calculation Sheets

Appendix A contains the "live" calculation tables from Excel for each site. These tables calculate the live load factors addressed in the body of this report. Each seasonal site is represented by three sheets, which produce live load factors for each window of time.

Sheet 1	→	All Month
Sheet 2	→	2 Weeks (1^{st} – 14^{th})
Sheet 3	→	2 Weeks (15^{th} – 28^{th})

Each site has four "seasons" of data, for a total of 12 sheets of live load factors. Bend NB does not have data for the spring season, and thus only has 9 sheets. The total number of sheets in this appendix is 45. Each sheet includes a table at the bottom which shows the parameters for calculating the t_{ADTT} statistic.

Appendix B – GVW Statistical Data

Appendix B contains tables of GVW statistical data for each site during each season. Three tables are listed on each page: The first include data for the entire month, the second is for the first window of 2-week data (1^{st} – 14^{th}), and the third is for the second window of 2-week data (15^{th} – 28^{th}). There are a total of 15 pages in this appendix.

Appendix C – Graphical Output

Appendix C contains graphical output of the live load factors. It also includes 3S2 histograms for each site during each season.

Appendix D – Calendar Year 2004 Permit Counts for ODOT

Appendix D contains all permits issued by the State of Oregon for 2004 and most of 2005.

Appendix E – Site Information

Appendix E lists information pertinent for each WIM site, such as its location on a map of Oregon, its ADT and ADTT values, and other information specific to the WIM equipment. The information in this appendix was provided by David Fifer at ODOT, January 2006.

Appendix F – Bala Sivakumar's Initial Report

Appendix F contains a draft report entitled "Calibration of LRFR Live Load Factors for Oregon Using I-5 Weigh-In-Motion Data", prepared by Bala Sivakumar of Lichtenstein Consulting Engineers, Inc. The methodology in Sivakumar's report for calculating live load factors was employed here in this report.

Appendix G – ODOT Load Rating Vehicles & Weight Tables

Appendix G contains pictograms of ODOT's load rating vehicles, as well as all five weight tables.

Appendix H – Computer Output (DVD)

Appendix H contains all computer files associated in calculating the live load factors. This includes all raw WIM data, as well as all Excel files.

Appendix A

Live Load Factor Calculation Sheets

Woodburn NB, All Month, January 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	44167	8833	80	73.8	2.1
T1 & T2 w/98k CTP	Varies	137714	27543	105.5	83.8	9.8

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	4.18	82.7	124.9	207.6	**1.40**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.89	136.3	122.2	258.5	**1.42**
CTP-2A, CTP-2B	105.5	3.89	143.8	122.2	266.0	**1.36**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	3.38	153.7	117.1	270.8	**1.21**
STP-4A	99	3.38	132.2	117.1	249.3	**1.36**
STP-4B	185	3.38	218.2	117.1	335.3	**0.98**
STP-5A	150.5	3.38	183.7	117.1	300.8	**1.08**
STP-5B	162.5	3.38	195.7	117.1	312.8	**1.04**
STP-5C	258	3.38	291.2	117.1	408.3	**0.85**
STP-5BW	204	3.38	237.2	117.1	354.3	**0.94**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	5550	67525	1.48E-05	4.18	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					20258	4.94E-05	3.89	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	45	2738	3.65E-04	3.38	STP's

Woodburn NB, 2 Weeks (1st - 14th), January 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	19881	3976	80	73.7	2.1
T1 & T2 w/98k CTP	Varies	63029	12606	105.5	84.0	9.8

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	4.18	82.6	125.1	207.7	**1.40**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.89	136.3	122.4	258.7	**1.43**
CTP-2A, CTP-2B	105.5	3.89	143.8	122.4	266.2	**1.36**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	3.38	153.8	117.3	271.0	**1.21**
STP-4A	99	3.38	132.3	117.3	249.5	**1.36**
STP-4B	185	3.38	218.3	117.3	335.5	**0.98**
STP-5A	150.5	3.38	183.8	117.3	301.0	**1.08**
STP-5B	162.5	3.38	195.8	117.3	313.0	**1.04**
STP-5C	258	3.38	291.3	117.3	408.5	**0.86**
STP-5BW	204	3.38	237.3	117.3	354.5	**0.94**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	5550	67525	1.48E-05	4.18	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					20258	4.94E-05	3.89	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	45	2738	3.65E-04	3.38	STP's

Woodburn NB, 2 Weeks (15th - 28th), January 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	20954	4191	80	74.0	2.1
T1 & T2 w/98k CTP	Varies	64461	12892	105.5	83.9	9.8

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	4.18	82.7	125.0	207.7	**1.40**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.89	136.3	122.2	258.5	**1.42**
CTP-2A, CTP-2B	105.5	3.89	143.8	122.2	266.0	**1.36**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	3.38	153.7	117.1	270.9	**1.21**
STP-4A	99	3.38	132.2	117.1	249.4	**1.36**
STP-4B	185	3.38	218.2	117.1	335.4	**0.98**
STP-5A	150.5	3.38	183.7	117.1	300.9	**1.08**
STP-5B	162.5	3.38	195.7	117.1	312.9	**1.04**
STP-5C	258	3.38	291.2	117.1	408.4	**0.85**
STP-5BW	204	3.38	237.2	117.1	354.4	**0.94**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	5550	67525	1.48E-05	4.18	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					20258	4.94E-05	3.89	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	45	2738	3.65E-04	3.38	STP's

Woodburn NB, All Month, April 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	49232	9846	80	74.0	2.1
T1 & T2 w/98k CTP	Varies	150038	30008	105.5	83.1	9.8

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	4.18	82.6	124.0	206.7	**1.39**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.89	136.2	121.3	257.5	**1.42**
CTP-2A, CTP-2B	105.5	3.89	143.7	121.3	265.0	**1.36**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	3.37	153.6	116.1	269.7	**1.21**
STP-4A	99	3.37	132.1	116.1	248.2	**1.35**
STP-4B	185	3.37	218.1	116.1	334.2	**0.98**
STP-5A	150.5	3.37	183.6	116.1	299.7	**1.08**
STP-5B	162.5	3.37	195.6	116.1	311.7	**1.04**
STP-5C	258	3.37	291.1	116.1	407.2	**0.85**
STP-5BW	204	3.37	237.1	116.1	353.2	**0.94**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	5550	67525	1.48E-05	4.18	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					20258	4.94E-05	3.89	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	44	2677	3.74E-04	3.37	STP's

Woodburn NB, 2 Weeks (1st - 14th), April 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	23332	4666	80	74.0	2.1
T1 & T2 w/98k CTP	Varies	71195	14239	105.5	83.0	9.8

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	4.18	82.6	124.0	206.6	**1.39**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.89	136.2	121.2	257.4	**1.42**
CTP-2A, CTP-2B	105.5	3.89	143.7	121.2	264.9	**1.36**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	3.37	153.6	116.1	269.7	**1.21**
STP-4A	99	3.37	132.1	116.1	248.2	**1.35**
STP-4B	185	3.37	218.1	116.1	334.2	**0.98**
STP-5A	150.5	3.37	183.6	116.1	299.7	**1.08**
STP-5B	162.5	3.37	195.6	116.1	311.7	**1.04**
STP-5C	258	3.37	291.1	116.1	407.2	**0.85**
STP-5BW	204	3.37	237.1	116.1	353.2	**0.93**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	5550	67525	1.48E-05	4.18	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					20258	4.94E-05	3.89	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	44	2677	3.74E-04	3.37	STP's

Woodburn NB, 2 Weeks (15th - 28th), April 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	23520	4704	80	74.0	2.0
T1 & T2 w/98k CTP	Varies	71393	14279	105.5	83.1	9.8

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	4.18	82.5	124.1	206.7	**1.39**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.89	136.2	121.4	257.6	**1.42**
CTP-2A, CTP-2B	105.5	3.89	143.7	121.4	265.1	**1.36**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	3.37	153.6	116.2	269.8	**1.21**
STP-4A	99	3.37	132.1	116.2	248.3	**1.35**
STP-4B	185	3.37	218.1	116.2	334.3	**0.98**
STP-5A	150.5	3.37	183.6	116.2	299.8	**1.08**
STP-5B	162.5	3.37	195.6	116.2	311.8	**1.04**
STP-5C	258	3.37	291.1	116.2	407.3	**0.85**
STP-5BW	204	3.37	237.1	116.2	353.3	**0.94**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	5550	67525	1.48E-05	4.18	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					20258	4.94E-05	3.89	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	44	2677	3.74E-04	3.37	STP's

Woodburn NB, All Month, June 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	58455	11691	80	75.5	1.9
T1 & T2 w/98k CTP	Varies	158640	31728	105.5	83.7	9.6

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	4.18	83.4	123.9	207.3	**1.40**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.89	135.4	121.2	256.6	**1.41**
CTP-2A, CTP-2B	105.5	3.89	142.9	121.2	264.1	**1.35**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	3.58	154.9	118.2	273.1	**1.22**
STP-4A	99	3.58	133.4	118.2	251.6	**1.37**
STP-4B	185	3.58	219.4	118.2	337.6	**0.99**
STP-5A	150.5	3.58	184.9	118.2	303.1	**1.09**
STP-5B	162.5	3.58	196.9	118.2	315.1	**1.05**
STP-5C	258	3.58	292.4	118.2	410.6	**0.86**
STP-5BW	204	3.58	238.4	118.2	356.6	**0.94**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	5550	67525	1.48E-05	4.18	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					20258	4.94E-05	3.89	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	97	5901	1.69E-04	3.58	STP's

Woodburn NB, 2 Weeks (1st - 14th), June 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	23360	4672	80	75.1	2.0
T1 & T2 w/98k CTP	Varies	73096	14619	105.5	83.9	9.7

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	4.18	83.3	124.5	207.8	**1.40**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.89	135.9	121.8	257.7	**1.42**
CTP-2A, CTP-2B	105.5	3.89	143.4	121.8	265.2	**1.36**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	3.58	155.4	118.8	274.1	**1.23**
STP-4A	99	3.58	133.9	118.8	252.6	**1.38**
STP-4B	185	3.58	219.9	118.8	338.6	**0.99**
STP-5A	150.5	3.58	185.4	118.8	304.1	**1.09**
STP-5B	162.5	3.58	197.4	118.8	316.1	**1.05**
STP-5C	258	3.58	292.9	118.8	411.6	**0.86**
STP-5BW	204	3.58	238.9	118.8	357.6	**0.95**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	5550	67525	1.48E-05	4.18	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					20258	4.94E-05	3.89	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	97	5901	1.69E-04	3.58	STP's

Woodburn NB, 2 Weeks (15th - 28th), June 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	28523	5705	80	75.6	1.9
T1 & T2 w/98k CTP	Varies	72376	14475	105.5	83.5	9.6

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	4.18	83.4	123.4	206.8	**1.40**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.89	135.2	120.7	255.9	**1.41**
CTP-2A, CTP-2B	105.5	3.89	142.7	120.7	263.4	**1.35**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	3.58	154.7	117.7	272.4	**1.22**
STP-4A	99	3.58	133.2	117.7	250.9	**1.37**
STP-4B	185	3.58	219.2	117.7	336.9	**0.98**
STP-5A	150.5	3.58	184.7	117.7	302.4	**1.09**
STP-5B	162.5	3.58	196.7	117.7	314.4	**1.04**
STP-5C	258	3.58	292.2	117.7	409.9	**0.86**
STP-5BW	204	3.58	238.2	117.7	355.9	**0.94**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	5550	67525	1.48E-05	4.18	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					20258	4.94E-05	3.89	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	97	5901	1.69E-04	3.58	STP's

Woodburn NB, All Month, October 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	64133	12827	80	74.9	2.0
T1 & T2 w/98k CTP	Varies	149536	29907	105.5	82.9	9.5

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	4.18	83.1	122.7	205.8	**1.39**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.89	135.1	120.0	255.1	**1.41**
CTP-2A, CTP-2B	105.5	3.89	142.6	120.0	262.6	**1.34**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	3.55	154.3	116.7	271.0	**1.21**
STP-4A	99	3.55	132.8	116.7	249.5	**1.36**
STP-4B	185	3.55	218.8	116.7	335.5	**0.98**
STP-5A	150.5	3.55	184.3	116.7	301.0	**1.08**
STP-5B	162.5	3.55	196.3	116.7	313.0	**1.04**
STP-5C	258	3.55	291.8	116.7	408.5	**0.86**
STP-5BW	204	3.55	237.8	116.7	354.5	**0.94**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	5550	67525	1.48E-05	4.18	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					20258	4.94E-05	3.89	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	85	5171	1.93E-04	3.55	STP's

Woodburn NB, 2 Weeks (1st - 14th), October 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	31204	6241	80	75.0	1.9
T1 & T2 w/98k CTP	Varies	69207	13841	105.5	83.0	9.5

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	4.18	83.0	122.8	205.9	**1.39**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.89	135.1	120.1	255.2	**1.41**
CTP-2A, CTP-2B	105.5	3.89	142.6	120.1	262.7	**1.34**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	3.55	154.3	116.9	271.2	**1.22**
STP-4A	99	3.55	132.8	116.9	249.7	**1.36**
STP-4B	185	3.55	218.8	116.9	335.7	**0.98**
STP-5A	150.5	3.55	184.3	116.9	301.2	**1.08**
STP-5B	162.5	3.55	196.3	116.9	313.2	**1.04**
STP-5C	258	3.55	291.8	116.9	408.7	**0.86**
STP-5BW	204	3.55	237.8	116.9	354.7	**0.94**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	5550	67525	1.48E-05	4.18	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					20258	4.94E-05	3.89	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	85	5171	1.93E-04	3.55	STP's

Woodburn NB, 2 Weeks (15th - 28th), October 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	28102	5620	80	74.9	2.0
T1 & T2 w/98k CTP	Varies	67333	13467	105.5	83.1	9.6

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	4.18	83.3	123.0	206.4	**1.39**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.89	135.3	120.3	255.6	**1.41**
CTP-2A, CTP-2B	105.5	3.89	142.8	120.3	263.1	**1.35**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	3.55	154.5	117.0	271.5	**1.22**
STP-4A	99	3.55	133.0	117.0	250.0	**1.36**
STP-4B	185	3.55	219.0	117.0	336.0	**0.98**
STP-5A	150.5	3.55	184.5	117.0	301.5	**1.08**
STP-5B	162.5	3.55	196.5	117.0	313.5	**1.04**
STP-5C	258	3.55	292.0	117.0	409.0	**0.86**
STP-5BW	204	3.55	238.0	117.0	355.0	**0.94**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	5550	67525	1.48E-05	4.18	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					20258	4.94E-05	3.89	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	85	5171	1.93E-04	3.55	STP's

Bend NB, All Month, December 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	5305	1061	80	76.5	1.3
T1 & T2 w/98k CTP	Varies	10372	2074	105.5	80.2	8.0

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.64	81.3	109.4	190.7	**1.29**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.32	124.6	106.8	231.5	**1.28**
CTP-2A, CTP-2B	105.5	3.32	132.1	106.8	239.0	**1.22**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.83	143.2	102.9	246.1	**1.10**
STP-4A	99	2.83	121.7	102.9	224.6	**1.23**
STP-4B	185	2.83	207.7	102.9	310.6	**0.91**
STP-5A	150.5	2.83	173.2	102.9	276.1	**0.99**
STP-5B	162.5	2.83	185.2	102.9	288.1	**0.96**
STP-5C	258	2.83	280.7	102.9	383.6	**0.80**
STP-5BW	204	2.83	226.7	102.9	329.6	**0.87**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	607	7385	1.35E-04	3.64	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					2216	4.51E-04	3.32	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	7	426	2.35E-03	2.83	STP's

Bend NB, 2 Weeks (1st - 14th), December 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	2499	500	80	76.3	1.3
T1 & T2 w/98k CTP	Varies	4927	985	105.5	79.7	7.8

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.64	81.2	108.0	189.1	**1.28**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.32	123.7	105.5	229.2	**1.26**
CTP-2A, CTP-2B	105.5	3.32	131.2	105.5	236.7	**1.21**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.83	142.4	101.6	244.1	**1.09**
STP-4A	99	2.83	120.9	101.6	222.6	**1.21**
STP-4B	185	2.83	206.9	101.6	308.6	**0.90**
STP-5A	150.5	2.83	172.4	101.6	274.1	**0.98**
STP-5B	162.5	2.83	184.4	101.6	286.1	**0.95**
STP-5C	258	2.83	279.9	101.6	381.6	**0.80**
STP-5BW	204	2.83	225.9	101.6	327.6	**0.87**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	607	7385	1.35E-04	3.64	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					2216	4.51E-04	3.32	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	7	426	2.35E-03	2.83	STP's

Bend NB, 2 Weeks (15th - 28th), December 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	2294	459	80	76.7	1.3
T1 & T2 w/98k CTP	Varies	4490	898	105.5	80.8	8.4

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.64	81.2	111.3	192.5	**1.30**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.32	125.8	108.6	234.4	**1.29**
CTP-2A, CTP-2B	105.5	3.32	133.3	108.6	241.9	**1.24**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.83	144.2	104.5	248.7	**1.11**
STP-4A	99	2.83	122.7	104.5	227.2	**1.24**
STP-4B	185	2.83	208.7	104.5	313.2	**0.91**
STP-5A	150.5	2.83	174.2	104.5	278.7	**1.00**
STP-5B	162.5	2.83	186.2	104.5	290.7	**0.97**
STP-5C	258	2.83	281.7	104.5	386.2	**0.81**
STP-5BW	204	2.83	227.7	104.5	332.2	**0.88**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	607	7385	1.35E-04	3.64	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					2216	4.51E-04	3.32	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	7	426	2.35E-03	2.83	STP's

Bend NB, All Month, June 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	7605	1521	80	78.5	0.9
T1 & T2 w/98k CTP	Varies	18055	3611	105.5	81.8	6.5

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.64	81.7	105.3	187.0	**1.26**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.32	119.4	103.2	222.6	**1.23**
CTP-2A, CTP-2B	105.5	3.32	126.9	103.2	230.1	**1.18**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	3.20	141.2	102.4	243.6	**1.09**
STP-4A	99	3.20	119.7	102.4	222.1	**1.21**
STP-4B	185	3.20	205.7	102.4	308.1	**0.90**
STP-5A	150.5	3.20	171.2	102.4	273.6	**0.98**
STP-5B	162.5	3.20	183.2	102.4	285.6	**0.95**
STP-5C	258	3.20	278.7	102.4	381.1	**0.80**
STP-5BW	204	3.20	224.7	102.4	327.1	**0.87**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	607	7385	1.35E-04	3.64	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					2216	4.51E-04	3.32	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	24	1460	6.85E-04	3.20	STP's

Bend NB, 2 Weeks (1st - 14th), June 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	3345	669	80	78.5	0.9
T1 & T2 w/98k CTP	Varies	7880	1576	105.5	81.7	6.5

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.64	81.7	105.4	187.1	**1.26**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.32	119.6	103.3	222.9	**1.23**
CTP-2A, CTP-2B	105.5	3.32	127.1	103.3	230.4	**1.18**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	3.20	141.3	102.5	243.9	**1.09**
STP-4A	99	3.20	119.8	102.5	222.4	**1.21**
STP-4B	185	3.20	205.8	102.5	308.4	**0.90**
STP-5A	150.5	3.20	171.3	102.5	273.9	**0.98**
STP-5B	162.5	3.20	183.3	102.5	285.9	**0.95**
STP-5C	258	3.20	278.8	102.5	381.4	**0.80**
STP-5BW	204	3.20	224.8	102.5	327.4	**0.87**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	607	7385	1.35E-04	3.64	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					2216	4.51E-04	3.32	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	24	1460	6.85E-04	3.20	STP's

Bend NB, 2 Weeks (15th - 28th), June 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	3571	714	80	78.6	0.9
T1 & T2 w/98k CTP	Varies	8556	1711	105.5	81.7	6.3

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.64	81.7	104.6	186.3	**1.26**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.32	118.9	102.5	221.4	**1.22**
CTP-2A, CTP-2B	105.5	3.32	126.4	102.5	228.9	**1.17**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	3.20	140.6	101.8	242.4	**1.09**
STP-4A	99	3.20	119.1	101.8	220.9	**1.21**
STP-4B	185	3.20	205.1	101.8	306.9	**0.90**
STP-5A	150.5	3.20	170.6	101.8	272.4	**0.98**
STP-5B	162.5	3.20	182.6	101.8	284.4	**0.95**
STP-5C	258	3.20	278.1	101.8	379.9	**0.80**
STP-5BW	204	3.20	224.1	101.8	325.9	**0.86**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	607	7385	1.35E-04	3.64	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					2216	4.51E-04	3.32	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	24	1460	6.85E-04	3.20	STP's

Bend NB, All Month, October 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	9129	1826	80	75.7	1.3
T1 & T2 w/98k CTP	Varies	18853	3771	105.5	78.8	7.6

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.64	80.6	106.4	187.0	**1.26**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.32	123.1	103.9	227.1	**1.25**
CTP-2A, CTP-2B	105.5	3.32	130.6	103.9	234.6	**1.20**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.83	141.9	100.2	242.1	**1.08**
STP-4A	99	2.83	120.4	100.2	220.6	**1.20**
STP-4B	185	2.83	206.4	100.2	306.6	**0.89**
STP-5A	150.5	2.83	171.9	100.2	272.1	**0.98**
STP-5B	162.5	2.83	183.9	100.2	284.1	**0.94**
STP-5C	258	2.83	279.4	100.2	379.6	**0.79**
STP-5BW	204	2.83	225.4	100.2	325.6	**0.86**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	607	7385	1.35E-04	3.64	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					2216	4.51E-04	3.32	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	7	426	2.35E-03	2.83	STP's

Bend NB, 2 Weeks (1st - 14th), October 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	3949	790	80	75.9	1.3
T1 & T2 w/98k CTP	Varies	8506	1701	105.5	79.1	7.7

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.64	80.6	107.1	187.8	**1.27**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.32	123.5	104.6	228.1	**1.26**
CTP-2A, CTP-2B	105.5	3.32	131.0	104.6	235.6	**1.21**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.83	142.2	100.8	243.1	**1.09**
STP-4A	99	2.83	120.7	100.8	221.6	**1.21**
STP-4B	185	2.83	206.7	100.8	307.6	**0.90**
STP-5A	150.5	2.83	172.2	100.8	273.1	**0.98**
STP-5B	162.5	2.83	184.2	100.8	285.1	**0.95**
STP-5C	258	2.83	279.7	100.8	380.6	**0.80**
STP-5BW	204	2.83	225.7	100.8	326.6	**0.86**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	607	7385	1.35E-04	3.64	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					2216	4.51E-04	3.32	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	7	426	2.35E-03	2.83	STP's

Bend NB, 2 Weeks (15th - 28th), October 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	4256	851	80	75.6	1.4
T1 & T2 w/98k CTP	Varies	8654	1731	105.5	78.8	7.6

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.64	80.6	106.4	187.0	**1.26**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.32	123.2	104.0	227.2	**1.25**
CTP-2A, CTP-2B	105.5	3.32	130.7	104.0	234.7	**1.20**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.83	141.9	100.3	242.2	**1.09**
STP-4A	99	2.83	120.4	100.3	220.7	**1.20**
STP-4B	185	2.83	206.4	100.3	306.7	**0.90**
STP-5A	150.5	2.83	171.9	100.3	272.2	**0.98**
STP-5B	162.5	2.83	183.9	100.3	284.2	**0.94**
STP-5C	258	2.83	279.4	100.3	379.7	**0.79**
STP-5BW	204	2.83	225.4	100.3	325.7	**0.86**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	607	7385	1.35E-04	3.64	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					2216	4.51E-04	3.32	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	7	426	2.35E-03	2.83	STP's

Lowell WB, All Month, January 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	7373	1475	80	62.8	3.6
T1 & T2 w/98k CTP	Varies	15630	3126	105.5	70.0	7.5

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.63	75.9	97.1	173.0	**1.17**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.31	122.6	94.7	217.3	**1.20**
CTP-2A, CTP-2B	105.5	3.31	130.1	94.7	224.8	**1.15**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.13	136.4	85.9	222.3	**1.00**
STP-4A	99	2.13	114.9	85.9	200.8	**1.10**
STP-4B	185	2.13	200.9	85.9	286.8	**0.84**
STP-5A	150.5	2.13	166.4	85.9	252.3	**0.91**
STP-5B	162.5	2.13	178.4	85.9	264.3	**0.88**
STP-5C	258	2.13	273.9	85.9	359.8	**0.75**
STP-5BW	204	2.13	219.9	85.9	305.8	**0.81**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	581	7069	1.41E-04	3.63	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					2121	4.72E-04	3.31	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	1	61	1.64E-02	2.13	STP's

Lowell WB, 2 Weeks (1st - 14th), January 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	2848	570	80	62.3	3.6
T1 & T2 w/98k CTP	Varies	6368	1274	105.5	69.8	7.5

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.63	75.5	97.2	172.7	**1.17**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.31	122.9	94.8	217.7	**1.20**
CTP-2A, CTP-2B	105.5	3.31	130.4	94.8	225.2	**1.15**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.13	136.6	85.9	222.5	**1.00**
STP-4A	99	2.13	115.1	85.9	201.0	**1.10**
STP-4B	185	2.13	201.1	85.9	287.0	**0.84**
STP-5A	150.5	2.13	166.6	85.9	252.5	**0.91**
STP-5B	162.5	2.13	178.6	85.9	264.5	**0.88**
STP-5C	258	2.13	274.1	85.9	360.0	**0.75**
STP-5BW	204	2.13	220.1	85.9	306.0	**0.81**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	581	7069	1.41E-04	3.63	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					2121	4.72E-04	3.31	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	1	61	1.64E-02	2.13	STP's

Lowell WB, 2 Weeks (15th - 28th), January 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	3830	766	80	63.1	3.6
T1 & T2 w/98k CTP	Varies	7910	1582	105.5	70.4	7.5

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.63	76.1	97.7	173.8	**1.17**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.31	122.8	95.3	218.1	**1.20**
CTP-2A, CTP-2B	105.5	3.31	130.3	95.3	225.6	**1.15**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.13	136.5	86.4	223.0	**1.00**
STP-4A	99	2.13	115.0	86.4	201.5	**1.10**
STP-4B	185	2.13	201.0	86.4	287.5	**0.84**
STP-5A	150.5	2.13	166.5	86.4	253.0	**0.91**
STP-5B	162.5	2.13	178.5	86.4	265.0	**0.88**
STP-5C	258	2.13	274.0	86.4	360.5	**0.75**
STP-5BW	204	2.13	220.0	86.4	306.5	**0.81**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	581	7069	1.41E-04	3.63	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					2121	4.72E-04	3.31	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	1	61	1.64E-02	2.13	STP's

Lowell WB, All Month, April 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	9103	1821	80	63.7	3.0
T1 & T2 w/98k CTP	Varies	17891	3578	105.5	69.6	6.9

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.63	74.5	94.6	169.1	**1.14**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.31	120.8	92.4	213.1	**1.17**
CTP-2A, CTP-2B	105.5	3.31	128.3	92.4	220.6	**1.13**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.13	135.2	84.3	219.5	**0.98**
STP-4A	99	2.13	113.7	84.3	198.0	**1.08**
STP-4B	185	2.13	199.7	84.3	284.0	**0.83**
STP-5A	150.5	2.13	165.2	84.3	249.5	**0.90**
STP-5B	162.5	2.13	177.2	84.3	261.5	**0.87**
STP-5C	258	2.13	272.7	84.3	357.0	**0.75**
STP-5BW	204	2.13	218.7	84.3	303.0	**0.80**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	581	7069	1.41E-04	3.63	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					2121	4.72E-04	3.31	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	1	61	1.64E-02	2.13	STP's

Lowell WB, 2 Weeks (1st - 14th), April 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	3727	745	80	63.1	3.1
T1 & T2 w/98k CTP	Varies	7211	1442	105.5	69.8	7.0

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.63	74.4	95.1	169.6	**1.14**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.31	121.1	92.9	214.0	**1.18**
CTP-2A, CTP-2B	105.5	3.31	128.6	92.9	221.5	**1.13**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.13	135.4	84.7	220.1	**0.99**
STP-4A	99	2.13	113.9	84.7	198.6	**1.08**
STP-4B	185	2.13	199.9	84.7	284.6	**0.83**
STP-5A	150.5	2.13	165.4	84.7	250.1	**0.90**
STP-5B	162.5	2.13	177.4	84.7	262.1	**0.87**
STP-5C	258	2.13	272.9	84.7	357.6	**0.75**
STP-5BW	204	2.13	218.9	84.7	303.6	**0.80**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	581	7069	1.41E-04	3.63	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					2121	4.72E-04	3.31	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	1	61	1.64E-02	2.13	STP's

Lowell WB, 2 Weeks (15th - 28th), April 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	4841	968	80	63.9	2.9
T1 & T2 w/98k CTP	Varies	9598	1920	105.5	69.5	6.9

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.63	74.5	94.7	169.2	**1.14**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.31	120.9	92.4	213.3	**1.18**
CTP-2A, CTP-2B	105.5	3.31	128.4	92.4	220.8	**1.13**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.13	135.3	84.3	219.6	**0.98**
STP-4A	99	2.13	113.8	84.3	198.1	**1.08**
STP-4B	185	2.13	199.8	84.3	284.1	**0.83**
STP-5A	150.5	2.13	165.3	84.3	249.6	**0.90**
STP-5B	162.5	2.13	177.3	84.3	261.6	**0.87**
STP-5C	258	2.13	272.8	84.3	357.1	**0.75**
STP-5BW	204	2.13	218.8	84.3	303.1	**0.80**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	581	7069	1.41E-04	3.63	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					2121	4.72E-04	3.31	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	1	61	1.64E-02	2.13	STP's

Lowell WB, All Month, June 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	12842	2568	80	67.4	3.1
T1 & T2 w/98k CTP	Varies	25764	5153	105.5	72.9	8.0

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.63	78.8	101.9	180.7	**1.22**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.31	124.4	99.3	223.8	**1.23**
CTP-2A, CTP-2B	105.5	3.31	131.9	99.3	231.3	**1.18**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.40	139.7	92.1	231.8	**1.04**
STP-4A	99	2.40	118.2	92.1	210.3	**1.15**
STP-4B	185	2.40	204.2	92.1	296.3	**0.86**
STP-5A	150.5	2.40	169.7	92.1	261.8	**0.94**
STP-5B	162.5	2.40	181.7	92.1	273.8	**0.91**
STP-5C	258	2.40	277.2	92.1	369.3	**0.77**
STP-5BW	204	2.40	223.2	92.1	315.3	**0.83**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	581	7069	1.41E-04	3.63	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					2121	4.72E-04	3.31	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	2	122	8.22E-03	2.40	STP's

Lowell WB, 2 Weeks (1st - 14th), June 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	5599	1120	80	64.1	2.7
T1 & T2 w/98k CTP	Varies	11208	2242	105.5	68.2	6.3

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.63	74.0	91.2	165.2	**1.12**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.31	118.9	89.2	208.1	**1.15**
CTP-2A, CTP-2B	105.5	3.31	126.4	89.2	215.6	**1.10**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.40	135.7	83.4	219.1	**0.98**
STP-4A	99	2.40	114.2	83.4	197.6	**1.08**
STP-4B	185	2.40	200.2	83.4	283.6	**0.83**
STP-5A	150.5	2.40	165.7	83.4	249.1	**0.89**
STP-5B	162.5	2.40	177.7	83.4	261.1	**0.87**
STP-5C	258	2.40	273.2	83.4	356.6	**0.75**
STP-5BW	204	2.40	219.2	83.4	302.6	**0.80**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	581	7069	1.41E-04	3.63	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					2121	4.72E-04	3.31	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	2	122	8.22E-03	2.40	STP's

Lowell WB, 2 Weeks (15th - 28th), June 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	6181	1236	80	69.2	2.9
T1 & T2 w/98k CTP	Varies	12374	2475	105.5	75.8	8.5

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.63	79.8	106.5	186.3	**1.26**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.31	126.0	103.8	229.7	**1.27**
CTP-2A, CTP-2B	105.5	3.31	133.5	103.8	237.2	**1.21**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.40	140.8	96.1	236.9	**1.06**
STP-4A	99	2.40	119.3	96.1	215.4	**1.17**
STP-4B	185	2.40	205.3	96.1	301.4	**0.88**
STP-5A	150.5	2.40	170.8	96.1	266.9	**0.96**
STP-5B	162.5	2.40	182.8	96.1	278.9	**0.93**
STP-5C	258	2.40	278.3	96.1	374.4	**0.78**
STP-5BW	204	2.40	224.3	96.1	320.4	**0.85**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	581	7069	1.41E-04	3.63	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					2121	4.72E-04	3.31	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	2	122	8.22E-03	2.40	STP's

Lowell WB, All Month, October 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	13138	2628	80	70.6	2.7
T1 & T2 w/98k CTP	Varies	26654	5331	105.5	75.8	8.0

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.63	80.6	104.9	185.4	**1.25**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.31	124.4	102.3	226.7	**1.25**
CTP-2A, CTP-2B	105.5	3.31	131.9	102.3	234.2	**1.20**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.54	140.8	96.2	237.0	**1.06**
STP-4A	99	2.54	119.3	96.2	215.5	**1.18**
STP-4B	185	2.54	205.3	96.2	301.5	**0.88**
STP-5A	150.5	2.54	170.8	96.2	267.0	**0.96**
STP-5B	162.5	2.54	182.8	96.2	279.0	**0.93**
STP-5C	258	2.54	278.3	96.2	374.5	**0.78**
STP-5BW	204	2.54	224.3	96.2	320.5	**0.85**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	581	7069	1.41E-04	3.63	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					2121	4.72E-04	3.31	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	3	183	5.48E-03	2.54	STP's

Lowell WB, 2 Weeks (1st - 14th), October 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	5857	1171	80	70.6	2.7
T1 & T2 w/98k CTP	Varies	12307	2461	105.5	75.6	8.0

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.63	80.6	104.6	185.1	**1.25**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.31	124.4	102.0	226.4	**1.25**
CTP-2A, CTP-2B	105.5	3.31	131.9	102.0	233.9	**1.20**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.54	140.8	95.9	236.7	**1.06**
STP-4A	99	2.54	119.3	95.9	215.2	**1.17**
STP-4B	185	2.54	205.3	95.9	301.2	**0.88**
STP-5A	150.5	2.54	170.8	95.9	266.7	**0.96**
STP-5B	162.5	2.54	182.8	95.9	278.7	**0.93**
STP-5C	258	2.54	278.3	95.9	374.2	**0.78**
STP-5BW	204	2.54	224.3	95.9	320.2	**0.85**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	581	7069	1.41E-04	3.63	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					2121	4.72E-04	3.31	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	3	183	5.48E-03	2.54	STP's

Lowell WB, 2 Weeks (15th - 28th), October 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	5939	1188	80	70.7	2.7
T1 & T2 w/98k CTP	Varies	11913	2383	105.5	76.1	8.0

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.63	80.6	105.3	185.9	**1.25**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.31	124.6	102.7	227.3	**1.25**
CTP-2A, CTP-2B	105.5	3.31	132.1	102.7	234.8	**1.20**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.54	140.9	96.6	237.5	**1.06**
STP-4A	99	2.54	119.4	96.6	216.0	**1.18**
STP-4B	185	2.54	205.4	96.6	302.0	**0.88**
STP-5A	150.5	2.54	170.9	96.6	267.5	**0.96**
STP-5B	162.5	2.54	182.9	96.6	279.5	**0.93**
STP-5C	258	2.54	278.4	96.6	375.0	**0.78**
STP-5BW	204	2.54	224.4	96.6	321.0	**0.85**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	581	7069	1.41E-04	3.63	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					2121	4.72E-04	3.31	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	3	183	5.48E-03	2.54	STP's

Emigrant Hill WB, All Month, November 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	26657	5331	80	63.3	2.3
T1 & T2 w/98k CTP	Varies	45654	9131	105.5	73.2	9.3

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.91	72.4	109.7	182.1	**1.23**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.61	131.7	106.8	238.5	**1.31**
CTP-2A, CTP-2B	105.5	3.61	139.2	106.8	246.0	**1.26**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.40	142.9	95.6	238.4	**1.07**
STP-4A	99	2.40	121.4	95.6	216.9	**1.18**
STP-4B	185	2.40	207.4	95.6	302.9	**0.88**
STP-5A	150.5	2.40	172.9	95.6	268.4	**0.96**
STP-5B	162.5	2.40	184.9	95.6	280.4	**0.93**
STP-5C	258	2.40	280.4	95.6	375.9	**0.79**
STP-5BW	204	2.40	226.4	95.6	321.9	**0.85**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	1786	21730	4.60E-05	3.91	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					6519	1.53E-04	3.61	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	2	122	8.22E-03	2.40	STP's

Emigrant Hill WB, 2 Weeks (1st - 14th), November 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	12261	2452	80	63.2	2.3
T1 & T2 w/98k CTP	Varies	21165	4233	105.5	72.8	9.4

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.91	72.0	109.7	181.7	**1.23**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.61	132.0	106.8	238.8	**1.32**
CTP-2A, CTP-2B	105.5	3.61	139.5	106.8	246.3	**1.26**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.40	143.1	95.4	238.5	**1.07**
STP-4A	99	2.40	121.6	95.4	217.0	**1.18**
STP-4B	185	2.40	207.6	95.4	303.0	**0.88**
STP-5A	150.5	2.40	173.1	95.4	268.5	**0.96**
STP-5B	162.5	2.40	185.1	95.4	280.5	**0.93**
STP-5C	258	2.40	280.6	95.4	376.0	**0.79**
STP-5BW	204	2.40	226.6	95.4	322.0	**0.85**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	1786	21730	4.60E-05	3.91	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					6519	1.53E-04	3.61	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	2	122	8.22E-03	2.40	STP's

Emigrant Hill WB, 2 Weeks (15th - 28th), November 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	12741	2548	80	63.5	2.4
T1 & T2 w/98k CTP	Varies	21498	4300	105.5	73.5	9.4

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.91	72.7	110.1	182.8	**1.23**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.61	131.9	107.3	239.2	**1.32**
CTP-2A, CTP-2B	105.5	3.61	139.4	107.3	246.7	**1.26**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.40	143.0	96.0	239.0	**1.07**
STP-4A	99	2.40	121.5	96.0	217.5	**1.19**
STP-4B	185	2.40	207.5	96.0	303.5	**0.89**
STP-5A	150.5	2.40	173.0	96.0	269.0	**0.97**
STP-5B	162.5	2.40	185.0	96.0	281.0	**0.93**
STP-5C	258	2.40	280.5	96.0	376.5	**0.79**
STP-5BW	204	2.40	226.5	96.0	322.5	**0.85**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	1786	21730	4.60E-05	3.91	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					6519	1.53E-04	3.61	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	2	122	8.22E-03	2.40	STP's

Emigrant Hill WB, All Month, April 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	28021	5604	80	76.6	1.7
T1 & T2 w/98k CTP	Varies	44370	8874	105.5	83.9	7.8

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.91	83.1	114.4	197.6	**1.33**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.61	126.2	112.1	238.3	**1.31**
CTP-2A, CTP-2B	105.5	3.61	133.7	112.1	245.8	**1.26**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	3.64	149.0	112.3	261.3	**1.17**
STP-4A	99	3.64	127.5	112.3	239.8	**1.31**
STP-4B	185	3.64	213.5	112.3	325.8	**0.95**
STP-5A	150.5	3.64	179.0	112.3	291.3	**1.05**
STP-5B	162.5	3.64	191.0	112.3	303.3	**1.01**
STP-5C	258	3.64	286.5	112.3	398.8	**0.83**
STP-5BW	204	3.64	232.5	112.3	344.8	**0.91**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	1786	21730	4.60E-05	3.91	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					6519	1.53E-04	3.61	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	121	7361	1.36E-04	3.64	STP's

Emigrant Hill WB, 2 Weeks (1st - 14th), April 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	13387	2677	80	76.5	1.7
T1 & T2 w/98k CTP	Varies	21375	4275	105.5	84.1	7.9

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.91	83.2	115.1	198.3	**1.34**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.61	126.6	112.7	239.3	**1.32**
CTP-2A, CTP-2B	105.5	3.61	134.1	112.7	246.8	**1.26**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	3.64	149.3	112.9	262.3	**1.18**
STP-4A	99	3.64	127.8	112.9	240.8	**1.31**
STP-4B	185	3.64	213.8	112.9	326.8	**0.95**
STP-5A	150.5	3.64	179.3	112.9	292.3	**1.05**
STP-5B	162.5	3.64	191.3	112.9	304.3	**1.01**
STP-5C	258	3.64	286.8	112.9	399.8	**0.84**
STP-5BW	204	3.64	232.8	112.9	345.8	**0.92**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	1786	21730	4.60E-05	3.91	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					6519	1.53E-04	3.61	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	121	7361	1.36E-04	3.64	STP's

Emigrant Hill WB, 2 Weeks (15th - 28th), April 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	13296	2659	80	76.8	1.6
T1 & T2 w/98k CTP	Varies	20818	4164	105.5	83.7	7.8

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.91	83.1	114.0	197.1	**1.33**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.61	126.0	111.7	237.7	**1.31**
CTP-2A, CTP-2B	105.5	3.61	133.5	111.7	245.2	**1.26**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	3.64	148.7	111.9	260.7	**1.17**
STP-4A	99	3.64	127.2	111.9	239.2	**1.30**
STP-4B	185	3.64	213.2	111.9	325.2	**0.95**
STP-5A	150.5	3.64	178.7	111.9	290.7	**1.04**
STP-5B	162.5	3.64	190.7	111.9	302.7	**1.01**
STP-5C	258	3.64	286.2	111.9	398.2	**0.83**
STP-5BW	204	3.64	232.2	111.9	344.2	**0.91**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	1786	21730	4.60E-05	3.91	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					6519	1.53E-04	3.61	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	121	7361	1.36E-04	3.64	STP's

Emigrant Hill WB, All Month, May 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	30429	6086	80	70.3	2.8
T1 & T2 w/98k CTP	Varies	49911	9982	105.5	80.5	9.5

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.91	81.4	117.5	199.0	**1.34**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.61	132.2	114.7	246.9	**1.36**
CTP-2A, CTP-2B	105.5	3.61	139.7	114.7	254.4	**1.30**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	3.08	149.7	109.7	259.4	**1.16**
STP-4A	99	3.08	128.2	109.7	237.9	**1.30**
STP-4B	185	3.08	214.2	109.7	323.9	**0.95**
STP-5A	150.5	3.08	179.7	109.7	289.4	**1.04**
STP-5B	162.5	3.08	191.7	109.7	301.4	**1.00**
STP-5C	258	3.08	287.2	109.7	396.9	**0.83**
STP-5BW	204	3.08	233.2	109.7	342.9	**0.91**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	1786	21730	4.60E-05	3.91	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					6519	1.53E-04	3.61	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	16	973	1.03E-03	3.08	STP's

Emigrant Hill WB, 2 Weeks (1st - 14th), May 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	13460	2692	80	71.3	3.4
T1 & T2 w/98k CTP	Varies	22262	4452	105.5	80.8	8.5

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.91	84.6	114.2	198.8	**1.34**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.61	128.8	111.6	240.4	**1.32**
CTP-2A, CTP-2B	105.5	3.61	136.3	111.6	247.9	**1.27**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	3.08	146.8	107.1	253.9	**1.14**
STP-4A	99	3.08	125.3	107.1	232.4	**1.27**
STP-4B	185	3.08	211.3	107.1	318.4	**0.93**
STP-5A	150.5	3.08	176.8	107.1	283.9	**1.02**
STP-5B	162.5	3.08	188.8	107.1	295.9	**0.98**
STP-5C	258	3.08	284.3	107.1	391.4	**0.82**
STP-5BW	204	3.08	230.3	107.1	337.4	**0.89**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	1786	21730	4.60E-05	3.91	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					6519	1.53E-04	3.61	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	16	973	1.03E-03	3.08	STP's

Emigrant Hill WB, 2 Weeks (15th - 28th), May 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	13905	2781	80	69.3	1.9
T1 & T2 w/98k CTP	Varies	22959	4592	105.5	80.8	10.2

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.91	76.9	120.8	197.7	**1.33**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.61	134.9	117.8	252.7	**1.39**
CTP-2A, CTP-2B	105.5	3.61	142.4	117.8	260.2	**1.33**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	3.08	152.0	112.4	264.4	**1.18**
STP-4A	99	3.08	130.5	112.4	242.9	**1.32**
STP-4B	185	3.08	216.5	112.4	328.9	**0.96**
STP-5A	150.5	3.08	182.0	112.4	294.4	**1.06**
STP-5B	162.5	3.08	194.0	112.4	306.4	**1.02**
STP-5C	258	3.08	289.5	112.4	401.9	**0.84**
STP-5BW	204	3.08	235.5	112.4	347.9	**0.92**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	1786	21730	4.60E-05	3.91	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					6519	1.53E-04	3.61	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	16	973	1.03E-03	3.08	STP's

Emigrant Hill WB, All Month, October 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	29423	5885	80	63.3	2.3
T1 & T2 w/98k CTP	Varies	51520	10304	105.5	74.5	9.9

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.91	72.3	113.2	185.6	**1.25**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.61	133.8	110.3	244.1	**1.34**
CTP-2A, CTP-2B	105.5	3.61	141.3	110.3	251.6	**1.29**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.13	141.7	95.6	237.3	**1.06**
STP-4A	99	2.13	120.2	95.6	215.8	**1.18**
STP-4B	185	2.13	206.2	95.6	301.8	**0.88**
STP-5A	150.5	2.13	171.7	95.6	267.3	**0.96**
STP-5B	162.5	2.13	183.7	95.6	279.3	**0.93**
STP-5C	258	2.13	279.2	95.6	374.8	**0.78**
STP-5BW	204	2.13	225.2	95.6	320.8	**0.85**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	1786	21730	4.60E-05	3.91	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					6519	1.53E-04	3.61	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	1	61	1.64E-02	2.13	STP's

Emigrant Hill WB, 2 Weeks (1st - 14th), October 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	12712	2542	80	63.3	2.4
T1 & T2 w/98k CTP	Varies	22645	4529	105.5	75.3	9.9

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.91	72.7	114.1	186.8	**1.26**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.61	133.8	111.1	245.0	**1.35**
CTP-2A, CTP-2B	105.5	3.61	141.3	111.1	252.5	**1.29**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.13	141.7	96.5	238.2	**1.07**
STP-4A	99	2.13	120.2	96.5	216.7	**1.18**
STP-4B	185	2.13	206.2	96.5	302.7	**0.88**
STP-5A	150.5	2.13	171.7	96.5	268.2	**0.96**
STP-5B	162.5	2.13	183.7	96.5	280.2	**0.93**
STP-5C	258	2.13	279.2	96.5	375.7	**0.79**
STP-5BW	204	2.13	225.2	96.5	321.7	**0.85**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	1786	21730	4.60E-05	3.91	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					6519	1.53E-04	3.61	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	1	61	1.64E-02	2.13	STP's

Emigrant Hill WB, 2 Weeks (15th - 28th), October 2005

Bala's Method

Vehicle	Axles	Total Number Vehicles	Top 20% Number Vehicles	Statistics		
				GVW	W	σ
				kips	kips	kips
3S2 - 80k	5	13041	2608	80	63.2	2.2
T1 & T2 w/98k CTP	Varies	22803	4561	105.5	74.7	9.9

Legals

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
Oregon Legal Loads	80	3.91	72.0	113.3	185.2	**1.25**

CTP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
CTP-3	98	3.61	133.6	110.3	243.9	**1.34**
CTP-2A, CTP-2B	105.5	3.61	141.1	110.3	251.4	**1.29**

STP's

Type	GVW	t_{ADTT}	R_T	A_T	W_T	γ_L
STP-3	120.5	2.13	141.5	95.7	237.3	**1.06**
STP-4A	99	2.13	120.0	95.7	215.8	**1.18**
STP-4B	185	2.13	206.0	95.7	301.8	**0.88**
STP-5A	150.5	2.13	171.5	95.7	267.3	**0.96**
STP-5B	162.5	2.13	183.5	95.7	279.3	**0.93**
STP-5C	258	2.13	279.0	95.7	374.8	**0.78**
STP-5BW	204	2.13	225.0	95.7	320.8	**0.85**

t_{ADTT} Calculation for Legal Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
5	365	0.033	0.2	1786	21730	4.60E-05	3.91	Legals

t_{ADTT} Calculation for CTP Vehicles

Exposure Period	Days	M.P.P.	Top %	ADTT	N	1/N	t_{ADTT}	
CTP's are 30% of legal truck traffic on I-5 for det. N					6519	1.53E-04	3.61	CTP's

t_{ADTT} Calculation for STP Vehicles

Exposure Period	Days	M.P.P.	Top %	# Permits	N	1/N	t_{ADTT}	
5	365	0.033	1	1	61	1.64E-02	2.13	STP's

Appendix B

GVW Statistical Data

GVW Statistical Data for Woodburn NB WIM Record - January 2005

January All Month, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	124062	24812	73.66	2.55	3%
Table 1 (3S2 to 80k)	44167	8833	73.85	2.11	3%
Table 2 with CTP (all)	13652	2730	101.49	1.72	2%
Table 1 and 2 with CTP	137714	27543	83.85	9.84	12%
Table 3 No CTP	1311		89.29	17.75	20%
Table 4	44		118.09	21.46	18%
Table 5	1		152.30		
Table 3# and 4	1355		90.22	18.59	21%
Table 3#, 4, and 5	1356		90.27	18.66	21%

January 1-14, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	56596	11319	73.50	2.60	4%
Table 1 (3S2 to 80k)	19881	3976	73.66	2.13	3%
Table 2 with CTP (all)	6433	1287	101.40	1.71	2%
Table 1 and 2 with CTP	63029	12606	84.01	9.85	12%
Table 3 No CTP	604		89.69	17.45	19%
Table 4	15		111.67	17.09	15%
Table 5	1		152.30		
Table 3# and 4	619		90.22	17.76	20%
Table 3#, 4, and 5	620		90.32	17.92	20%

January 15-28, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	58115	11623	73.79	2.53	3%
Table 1 (3S2 to 80k)	20954	4191	73.97	2.10	3%
Table 2 with CTP (all)	6346	1269	101.54	1.71	2%
Table 1 and 2 with CTP	64461	12892	83.90	9.84	12%
Table 3 No CTP	628		88.98	17.86	20%
Table 4	27		119.12	20.19	17%
Table 5	0				
Table 3# and 4	655		90.22	18.92	21%
Table 3#, 4, and 5	655		90.22	18.92	21%

No CTP's included in Table 3 data
Mean & Standard Deviation for Tables 3, 4, and 5 use all truck records

GVW Statistical Data for Woodburn NB WIM Record - April 2005

April All Month, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	136363	27273	73.60	2.58	4%
Table 1 (3S2 to 80k)	49232	9846	74.04	2.05	3%
Table 2 with CTP (all)	13675	2735	101.43	1.72	2%
Table 1 and 2 with CTP	150038	30008	83.05	9.81	12%
Table 3 No CTP	1226		90.40	19.01	21%
Table 4	57		127.66	30.47	24%
Table 5	1		134.10		
Table 3# and 4	1283		92.05	21.09	23%
Table 3#, 4, and 5	1284		92.09	21.12	23%

April 1-14, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	64706	12941	73.53	2.61	4%
Table 1 (3S2 to 80k)	23332	4666	73.98	2.06	3%
Table 2 with CTP (all)	6489	1298	101.38	1.71	2%
Table 1 and 2 with CTP	71195	14239	83.02	9.81	12%
Table 3 No CTP	500		90.31	18.13	20%
Table 4	27		119.22	27.04	23%
Table 5	0				
Table 3# and 4	527		91.79	19.72	21%
Table 3#, 4, and 5	527		91.79	19.72	21%

April 15-28, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	64846	12969	73.64	2.55	3%
Table 1 (3S2 to 80k)	23520	4704	74.03	2.04	3%
Table 2 with CTP (all)	6547	1309	101.42	1.72	2%
Table 1 and 2 with CTP	71393	14279	83.13	9.82	12%
Table 3 No CTP	643		90.42	19.88	22%
Table 4	26		138.47	32.85	24%
Table 5	0				
Table 3# and 4	669		92.29	22.50	24%
Table 3#, 4, and 5	669		92.29	22.50	24%

No CTP's included in Table 3 data

Mean & Standard Deviation for Tables 3, 4, and 5 use all truck records

GVW Statistical Data for Woodburn NB WIM Record - June 2005

June All Month, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	143018	28604	74.41	2.54	3%
Table 1 (3S2 to 80k)	58455	11691	75.48	1.90	3%
Table 2 with CTP (all)	15622	3124	102.18	1.67	2%
Table 1 and 2 with CTP	158640	31728	83.72	9.61	11%
Table 3 No CTP	2775		92.00	16.53	18%
Table 4	89		115.03	20.98	18%
Table 5	4		127.38	36.94	29%
Table 3# and 4	2864		92.72	17.16	19%
Table 3#, 4, and 5	2868		92.77	17.24	19%

June 1-14, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	66000	13200	74.30	2.54	3%
Table 1 (3S2 to 80k)	23360	4672	75.06	1.98	3%
Table 2 with CTP (all)	7096	1419	102.22	1.64	2%
Table 1 and 2 with CTP	73096	14619	83.90	9.73	12%
Table 3 No CTP	1185		90.16	16.40	18%
Table 4	29		123.34	20.09	16%
Table 5	0				
Table 3# and 4	1214		90.96	17.25	19%
Table 3#, 4, and 5	1214		90.96	17.25	19%

June 15-28, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	65335	13067	74.44	2.55	3%
Table 1 (3S2 to 80k)	28523	5705	75.62	1.86	2%
Table 2 with CTP (all)	7041	1408	102.18	1.67	2%
Table 1 and 2 with CTP	72376	14475	83.47	9.55	11%
Table 3 No CTP	1279		92.57	16.66	18%
Table 4	49		111.99	21.01	19%
Table 5	1		107.50		
Table 3# and 4	1328		93.28	17.22	18%
Table 3#, 4, and 5	1329		93.29	17.22	18%

No CTP's included in Table 3 data
Mean & Standard Deviation for Tables 3, 4, and 5 use all truck records

GVW Statistical Data for Woodburn NB WIM Record - October 2005

October All Month, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	135964	27193	74.03	2.64	4%
Table 1 (3S2 to 80k)	64133	12827	74.93	1.97	3%
Table 2 with CTP (all)	13572	2714	101.87	1.74	2%
Table 1 and 2 with CTP	149536	29907	82.87	9.53	12%
Table 3 No CTP	2476		92.46	16.30	18%
Table 4	93		112.59	24.51	22%
Table 5	14		126.38	29.46	23%
Table 3# and 4	2569		93.19	17.08	18%
Table 3#, 4, and 5	2583		93.37	17.33	19%

October 1-14, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	62782	12556	74.03	2.64	4%
Table 1 (3S2 to 80k)	31204	6241	74.95	1.94	3%
Table 2 with CTP (all)	6425	1285	101.76	1.81	2%
Table 1 and 2 with CTP	69207	13841	83.04	9.53	11%
Table 3 No CTP	1116		93.14	16.18	17%
Table 4	52		111.90	23.66	21%
Table 5	8		125.46	29.17	23%
Table 3# and 4	1168		93.98	17.01	18%
Table 3#, 4, and 5	1176		94.19	17.30	18%

October 15-28, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	61073	12215	73.99	2.69	4%
Table 1 (3S2 to 80k)	28102	5620	74.92	2.01	3%
Table 2 with CTP (all)	6260	1252	101.91	1.68	2%
Table 1 and 2 with CTP	67333	13467	83.06	9.57	12%
Table 3 No CTP	1184		92.63	15.92	17%
Table 4	40		113.40	26.15	23%
Table 5	6		127.60	32.59	26%
Table 3# and 4	1224		93.31	16.75	18%
Table 3#, 4, and 5	1230		93.48	17.01	18%

No CTP's included in Table 3 data
Mean & Standard Deviation for Tables 3, 4, and 5 use all truck records

GVW Statistical Data for Bend NB WIM Record - December 2005

December All Month, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	9776	1955	75.59	1.78	2%
Table 1 (3S2 to 80k)	5305	1061	76.52	1.30	2%
Table 2 with CTP (all)	596	119	101.12	1.40	1%
Table 1 and 2 with CTP	10372	2074	80.21	8.02	10%
Table 3 No CTP	213		85.26	18.47	22%
Table 4	9		110.48	11.19	10%
Table 5	0				
Table 3# and 4	222		86.28	18.88	22%
Table 3#, 4, and 5	222		86.28	18.88	22%

December 1-14, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	4661	932	75.38	1.79	2%
Table 1 (3S2 to 80k)	2499	500	76.28	1.34	2%
Table 2 with CTP (all)	266	53	100.34	1.56	2%
Table 1 and 2 with CTP	4927	985	79.73	7.75	10%
Table 3 No CTP	78		85.84	17.32	20%
Table 4	4		108.65	6.58	6%
Table 5	0				
Table 3# and 4	82		86.95	17.64	20%
Table 3#, 4, and 5	82		86.95	17.64	20%

December 15-28, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	4216	843	75.81	1.72	2%
Table 1 (3S2 to 80k)	2294	459	76.66	1.25	2%
Table 2 with CTP (all)	274	55	101.60	1.27	1%
Table 1 and 2 with CTP	4490	898	80.78	8.38	10%
Table 3 No CTP	111		85.96	18.56	22%
Table 4	3		119.63	8.76	7%
Table 5	0				
Table 3# and 4	114		86.85	19.13	22%
Table 3#, 4, and 5	114		86.85	19.13	22%

No CTP's included in Table 3 data
Mean & Standard Deviation for Tables 3, 4, and 5 use all truck records

GVW Statistical Data for Bend NB WIM Record - June 2005

June All Month, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	15676	3135	76.17	2.32	3%
Table 1 (3S2 to 80k)	7605	1521	78.54	0.87	1%
Table 2 with CTP (all)	2379	476	97.20	4.84	5%
Table 1 and 2 with CTP	18055	3611	81.76	6.46	8%
Table 3 No CTP	688		88.40	16.38	19%
Table 4	9		125.68	26.15	21%
Table 5	1		176.00		
Table 3# and 4	697		88.88	17.04	19%
Table 3#, 4, and 5	698		89.01	17.35	19%

June 1-14, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	6857	1371	76.06	2.32	3%
Table 1 (3S2 to 80k)	3345	669	78.52	0.87	1%
Table 2 with CTP (all)	1023	205	97.43	4.58	5%
Table 1 and 2 with CTP	7880	1576	81.70	6.51	8%
Table 3 No CTP	245		88.70	17.17	19%
Table 4	5		139.78	22.41	16%
Table 5	1		176.00		
Table 3# and 4	250		89.72	18.66	21%
Table 3#, 4, and 5	251		90.07	19.41	22%

June 15-28, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	7425	1485	76.32	2.25	3%
Table 1 (3S2 to 80k)	3571	714	78.55	0.87	1%
Table 2 with CTP (all)	1131	226	96.42	5.60	6%
Table 1 and 2 with CTP	8556	1711	81.66	6.29	8%
Table 3 No CTP	360		88.06	15.38	17%
Table 4	3		117.30	10.01	9%
Table 5	0				
Table 3# and 4	363		88.30	15.56	18%
Table 3#, 4, and 5	363		88.30	15.56	18%

No CTP's included in Table 3 data

Mean & Standard Deviation for Tables 3, 4, and 5 use all truck records

GVW Statistical Data for Bend NB WIM Record - October 2005

October All Month, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	18028	3606	74.74	1.93	3%
Table 1 (3S2 to 80k)	9129	1826	75.68	1.35	2%
Table 2 with CTP (all)	825	165	100.03	1.54	2%
Table 1 and 2 with CTP	18853	3771	78.79	7.57	10%
Table 3 No CTP	187		83.83	18.93	23%
Table 4	12		132.63	29.23	22%
Table 5	4		133.35	8.73	7%
Table 3# and 4	199		86.77	22.79	26%
Table 3#, 4, and 5	203		87.69	23.51	27%

October 1-14, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	8114	1623	74.90	1.92	3%
Table 1 (3S2 to 80k)	3949	790	75.90	1.30	2%
Table 2 with CTP (all)	392	78	100.23	1.55	2%
Table 1 and 2 with CTP	8506	1701	79.11	7.69	10%
Table 3 No CTP	99		83.31	19.26	23%
Table 4	9		126.48	23.24	18%
Table 5	4		133.35	8.73	7%
Table 3# and 4	108		86.90	22.89	26%
Table 3#, 4, and 5	112		88.56	24.13	27%

October 15-28, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	8267	1653	74.66	1.93	3%
Table 1 (3S2 to 80k)	4256	851	75.57	1.37	2%
Table 2 with CTP (all)	387	77	99.70	1.64	2%
Table 1 and 2 with CTP	8654	1731	78.81	7.58	10%
Table 3 No CTP	76		84.68	18.51	22%
Table 4	2		137.75	51.41	37%
Table 5	0				
Table 3# and 4	78		86.04	20.96	24%
Table 3#, 4, and 5	78		86.04	20.96	24%

No CTP's included in Table 3 data
Mean & Standard Deviation for Tables 3, 4, and 5 use all truck records

GVW Statistical Data for Lowell WB WIM Record - January 2005

January All Month, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	15157	3031	66.56	5.06	8%
Table 1 (3S2 to 80k)	7373	1475	62.79	3.61	6%
Table 2 with CTP (all)	473	95	89.00	2.96	3%
Table 1 and 2 with CTP	15630	3126	70.02	7.45	11%
Table 3 No CTP	26		96.00	19.41	20%
Table 4	3		129.03	37.82	29%
Table 5	0				
Table 3# and 4	29		99.42	23.31	23%
Table 3#, 4, and 5	29		99.42	23.31	23%

January 1-14, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	6180	1236	66.41	5.35	8%
Table 1 (3S2 to 80k)	2848	570	62.32	3.63	6%
Table 2 with CTP (all)	188	38	88.93	3.65	4%
Table 1 and 2 with CTP	6368	1274	69.84	7.54	11%
Table 3 No CTP	15		100.12	8.61	9%
Table 4	3		129.03	37.82	29%
Table 5	0				
Table 3# and 4	18		104.94	18.77	18%
Table 3#, 4, and 5	18		104.94	18.77	18%

January 15-28, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	7651	1530	66.73	4.87	7%
Table 1 (3S2 to 80k)	3830	766	63.08	3.58	6%
Table 2 with CTP (all)	259	52	89.19	2.50	3%
Table 1 and 2 with CTP	7910	1582	70.43	7.51	11%
Table 3 No CTP	11		90.38	27.90	31%
Table 4	0				
Table 5	0				
Table 3# and 4	11		90.38	27.90	31%
Table 3#, 4, and 5	11		90.38	27.90	31%

No CTP's included in Table 3 data

Mean & Standard Deviation for Tables 3, 4, and 5 use all truck records

GVW Statistical Data for Lowell WB WIM Record - April 2005

April All Month, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	17455	3491	66.94	4.71	7%
Table 1 (3S2 to 80k)	9103	1821	63.69	2.99	5%
Table 2 with CTP (all)	436	87	88.46	2.01	2%
Table 1 and 2 with CTP	17891	3578	69.57	6.89	10%
Table 3 No CTP	14		85.77	17.02	20%
Table 4	3		108.60	4.20	4%
Table 5	0				
Table 3# and 4	17		89.80	17.83	20%
Table 3#, 4, and 5	17		89.80	17.83	20%

April 1-14, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	7029	1406	67.06	4.85	7%
Table 1 (3S2 to 80k)	3727	745	63.06	3.13	5%
Table 2 with CTP (all)	182	36	88.73	2.47	3%
Table 1 and 2 with CTP	7211	1442	69.81	6.98	10%
Table 3 No CTP	6		94.37	11.22	12%
Table 4	1		106.80		
Table 5	0				
Table 3# and 4	7		96.14	11.27	12%
Table 3#, 4, and 5	7		96.14	11.27	12%

April 15-28, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	9359	1872	66.87	4.68	7%
Table 1 (3S2 to 80k)	4841	968	63.93	2.91	5%
Table 2 with CTP (all)	239	48	86.85	1.98	2%
Table 1 and 2 with CTP	9598	1920	69.54	6.92	10%
Table 3 No CTP	7		78.54	19.68	25%
Table 4	2		109.50	5.52	5%
Table 5	0				
Table 3# and 4	9		85.42	21.93	26%
Table 3#, 4, and 5	9		85.42	21.93	26%

No CTP's included in Table 3 data

Mean & Standard Deviation for Tables 3, 4, and 5 use all truck records

GVW Statistical Data for Lowell WB WIM Record - June 2005

June All Month, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	24765	4953	68.71	3.95	6%
Table 1 (3S2 to 80k)	12842	2568	67.41	3.14	5%
Table 2 with CTP (all)	999	200	94.86	2.29	2%
Table 1 and 2 with CTP	25764	5153	72.91	7.99	11%
Table 3 No CTP	50		102.67	22.87	22%
Table 4	12		127.71	26.31	21%
Table 5	1		138.10		
Table 3# and 4	62		107.51	25.39	24%
Table 3#, 4, and 5	63		97.88	14.66	15%

June 1-14, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	11033	2207	66.54	4.56	7%
Table 1 (3S2 to 80k)	5599	1120	64.08	2.73	4%
Table 2 with CTP (all)	175	35	88.98	1.68	2%
Table 1 and 2 with CTP	11208	2242	68.23	6.33	9%
Table 3 No CTP	13		106.11	29.85	28%
Table 4	0				
Table 5	0				
Table 3# and 4	13		106.11	29.85	28%
Table 3#, 4, and 5	13		106.11	29.85	28%

June 15-28, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	11668	2334	69.94	3.48	5%
Table 1 (3S2 to 80k)	6181	1236	69.17	2.93	4%
Table 2 with CTP (all)	706	141	95.43	2.19	2%
Table 1 and 2 with CTP	12374	2475	75.79	8.46	11%
Table 3 No CTP	29		100.10	18.18	18%
Table 4	11		129.91	26.41	20%
Table 5	1		138.10		
Table 3# and 4	40		108.30	24.45	23%
Table 3#, 4, and 5	41		109.03	24.59	23%

No CTP's included in Table 3 data
Mean & Standard Deviation for Tables 3, 4, and 5 use all truck records

GVW Statistical Data for Lowell WB WIM Record - October 2005

October All Month, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	25235	5047	70.62	3.33	5%
Table 1 (3S2 to 80k)	13138	2628	70.64	2.74	4%
Table 2 with CTP (all)	1419	284	95.99	2.40	3%
Table 1 and 2 with CTP	26654	5331	75.84	7.99	11%
Table 3 No CTP	61		97.70	22.41	23%
Table 4	9		138.38	22.28	16%
Table 5	1		108.30		
Table 3# and 4	70		102.93	26.12	25%
Table 3#, 4, and 5	71		103.01	25.94	25%

October 1-14, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	11653	2331	70.33	3.36	5%
Table 1 (3S2 to 80k)	5857	1171	70.63	2.74	4%
Table 2 with CTP (all)	654	131	95.59	2.29	2%
Table 1 and 2 with CTP	12307	2461	75.57	7.98	11%
Table 3 No CTP	31		95.37	20.06	21%
Table 4	2		121.80	7.35	6%
Table 5	1		108.30		
Table 3# and 4	33		96.97	20.49	21%
Table 3#, 4, and 5	34		97.31	20.27	21%

October 15-28, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	11261	2252	70.75	3.37	5%
Table 1 (3S2 to 80k)	5939	1188	70.69	2.73	4%
Table 2 with CTP (all)	652	130	96.24	2.49	3%
Table 1 and 2 with CTP	11913	2383	76.11	8.04	11%
Table 3 No CTP	28		100.54	25.50	25%
Table 4	7		143.11	23.14	16%
Table 5	0				
Table 3# and 4	35		109.06	30.16	28%
Table 3#, 4, and 5	35		109.06	30.16	28%

No CTP's included in Table 3 data
Mean & Standard Deviation for Tables 3, 4, and 5 use all truck records

GVW Statistical Data for Emigrant Hill WB WIM Record - November 2005

November All Month, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	43416	8683	67.37	5.32	8%
Table 1 (3S2 to 80k)	26657	5331	63.32	2.33	4%
Table 2 with CTP (all)	2238	448	94.24	2.16	2%
Table 1 and 2 with CTP	45654	9131	73.18	9.33	13%
Table 3 No CTP	58		86.30	19.41	22%
Table 4	2		87.15	7.99	9%
Table 5	0				
Table 3# and 4	60		86.33	19.11	22%
Table 3#, 4, and 5	60		86.33	19.11	22%

November 1-14, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	20128	4026	67.00	5.38	8%
Table 1 (3S2 to 80k)	12261	2452	63.16	2.27	4%
Table 2 with CTP (all)	1037	207	93.72	2.23	2%
Table 1 and 2 with CTP	21165	4233	72.83	9.42	13%
Table 3 No CTP	32		84.69	20.11	24%
Table 4	1		92.80		
Table 5	0				
Table 3# and 4	33		84.94	19.84	23%
Table 3#, 4, and 5	33		84.94	19.84	23%

November 15-28, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	20443	4089	67.59	5.24	8%
Table 1 (3S2 to 80k)	12741	2548	63.48	2.36	4%
Table 2 with CTP (all)	1055	211	94.88	2.07	2%
Table 1 and 2 with CTP	21498	4300	73.45	9.38	13%
Table 3 No CTP	24		88.00	19.37	22%
Table 4	1		81.50		
Table 5	0				
Table 3# and 4	25		87.74	19.01	22%
Table 3#, 4, and 5	25		87.74	19.01	22%

No CTP's included in Table 3 data

Mean & Standard Deviation for Tables 3, 4, and 5 use all truck records

GVW Statistical Data for Emigrant Hill WB WIM Record - April 2005

April All Month, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	37249	7450	75.32	2.03	3%
Table 1 (3S2 to 80k)	28021	5604	76.64	1.66	2%
Table 2 with CTP (all)	7121	1424	98.92	3.54	4%
Table 1 and 2 with CTP	44370	8874	83.87	7.82	9%
Table 3 No CTP	3489		98.49	13.81	14%
Table 4	73		115.65	23.35	20%
Table 5	2		161.10	38.89	24%
Table 3# and 4	3562		98.85	14.27	14%
Table 3#, 4, and 5	3564		98.88	14.36	15%

April 1-14, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	17893	3579	75.26	2.06	3%
Table 1 (3S2 to 80k)	13387	2677	76.53	1.70	2%
Table 2 with CTP (all)	3482	696	99.10	3.35	3%
Table 1 and 2 with CTP	21375	4275	84.12	7.92	9%
Table 3 No CTP	1696		98.31	13.36	14%
Table 4	35		114.49	21.33	19%
Table 5	1		133.60		
Table 3# and 4	1731		98.64	13.75	14%
Table 3#, 4, and 5	1732		98.66	13.77	14%

April 15-28, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	17509	3502	75.42	1.98	3%
Table 1 (3S2 to 80k)	13296	2659	76.77	1.61	2%
Table 2 with CTP (all)	3309	662	98.80	3.67	4%
Table 1 and 2 with CTP	20818	4164	83.69	7.76	9%
Table 3 No CTP	1644		98.58	14.07	14%
Table 4	32		116.31	25.76	22%
Table 5	1		188.60		
Table 3# and 4	1676		98.92	14.57	15%
Table 3#, 4, and 5	1677		98.97	14.73	15%

No CTP's included in Table 3 data

Mean & Standard Deviation for Tables 3, 4, and 5 use all truck records

GVW Statistical Data for Emigrant Hill WB WIM Record - May 2005

May All Month, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	45109	9022	70.87	3.24	5%
Table 1 (3S2 to 80k)	30429	6086	70.30	2.85	4%
Table 2 with CTP (all)	4802	960	98.86	2.47	2%
Table 1 and 2 with CTP	49911	9982	80.48	9.48	12%
Table 3 No CTP	461		100.28	17.34	17%
Table 4	13		106.53	10.32	10%
Table 5	0				
Table 3# and 4	474		100.45	17.21	17%
Table 3#, 4, and 5	474		100.45	17.21	17%

May 1-14, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	19942	3988	71.43	3.46	5%
Table 1 (3S2 to 80k)	13460	2692	71.32	3.40	5%
Table 2 with CTP (all)	2320	464	97.86	2.99	3%
Table 1 and 2 with CTP	22262	4452	80.83	8.53	11%
Table 3 No CTP	377		99.50	16.97	17%
Table 4	9		104.58	10.54	10%
Table 5	0				
Table 3# and 4	386		99.62	16.86	17%
Table 3#, 4, and 5	386		99.62	16.86	17%

May 15-28, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	20756	4151	70.40	3.03	4%
Table 1 (3S2 to 80k)	13905	2781	69.34	1.93	3%
Table 2 with CTP (all)	2203	441	99.48	2.06	2%
Table 1 and 2 with CTP	22959	4592	80.82	10.23	13%
Table 3 No CTP	77		104.29	18.12	17%
Table 4	4		110.93	9.62	9%
Table 5	0				
Table 3# and 4	81		104.62	17.82	17%
Table 3#, 4, and 5	81		104.62	17.82	17%

No CTP's included in Table 3 data
Mean & Standard Deviation for Tables 3, 4, and 5 use all truck records

GVW Statistical Data for Emigrant Hill WB WIM Record - October 2005

October All Month, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	48426	9685	67.16	5.48	8%
Table 1 (3S2 to 80k)	29423	5885	63.25	2.33	4%
Table 2 with CTP (all)	3094	619	94.99	2.35	2%
Table 1 and 2 with CTP	51520	10304	74.46	9.92	13%
Table 3 No CTP	39		90.52	22.51	25%
Table 4	0				
Table 5	0				
Table 3# and 4	39		90.52	22.51	25%
Table 3#, 4, and 5	39		90.52	22.51	25%

October 1-14, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	21156	4231	67.32	5.47	8%
Table 1 (3S2 to 80k)	12712	2542	63.29	2.40	4%
Table 2 with CTP (all)	1489	298	94.97	2.39	3%
Table 1 and 2 with CTP	22645	4529	75.29	9.93	13%
Table 3 No CTP	15		87.39	22.05	25%
Table 4	0				
Table 5	0				
Table 3# and 4	15		87.39	22.05	25%
Table 3#, 4, and 5	15		87.39	22.05	25%

October 15-28, 2005

Data Classification	Tot. No. of Records	No. of Top 20%	Mean (kips)	Std Dev (kips)	COV (%)
Table 1 (all)	21401	4280	67.32	5.53	8%
Table 1 (3S2 to 80k)	13041	2608	63.23	2.24	4%
Table 2 with CTP (all)	1402	280	95.01	2.38	3%
Table 1 and 2 with CTP	22803	4561	74.72	9.85	13%
Table 3 No CTP	21		88.44	20.61	23%
Table 4	0				
Table 5	0				
Table 3# and 4	21		88.44	20.61	23%
Table 3#, 4, and 5	21		88.44	20.61	23%

No CTP's included in Table 3 data
Mean & Standard Deviation for Tables 3, 4, and 5 use all truck records

Appendix C

Graphical Output

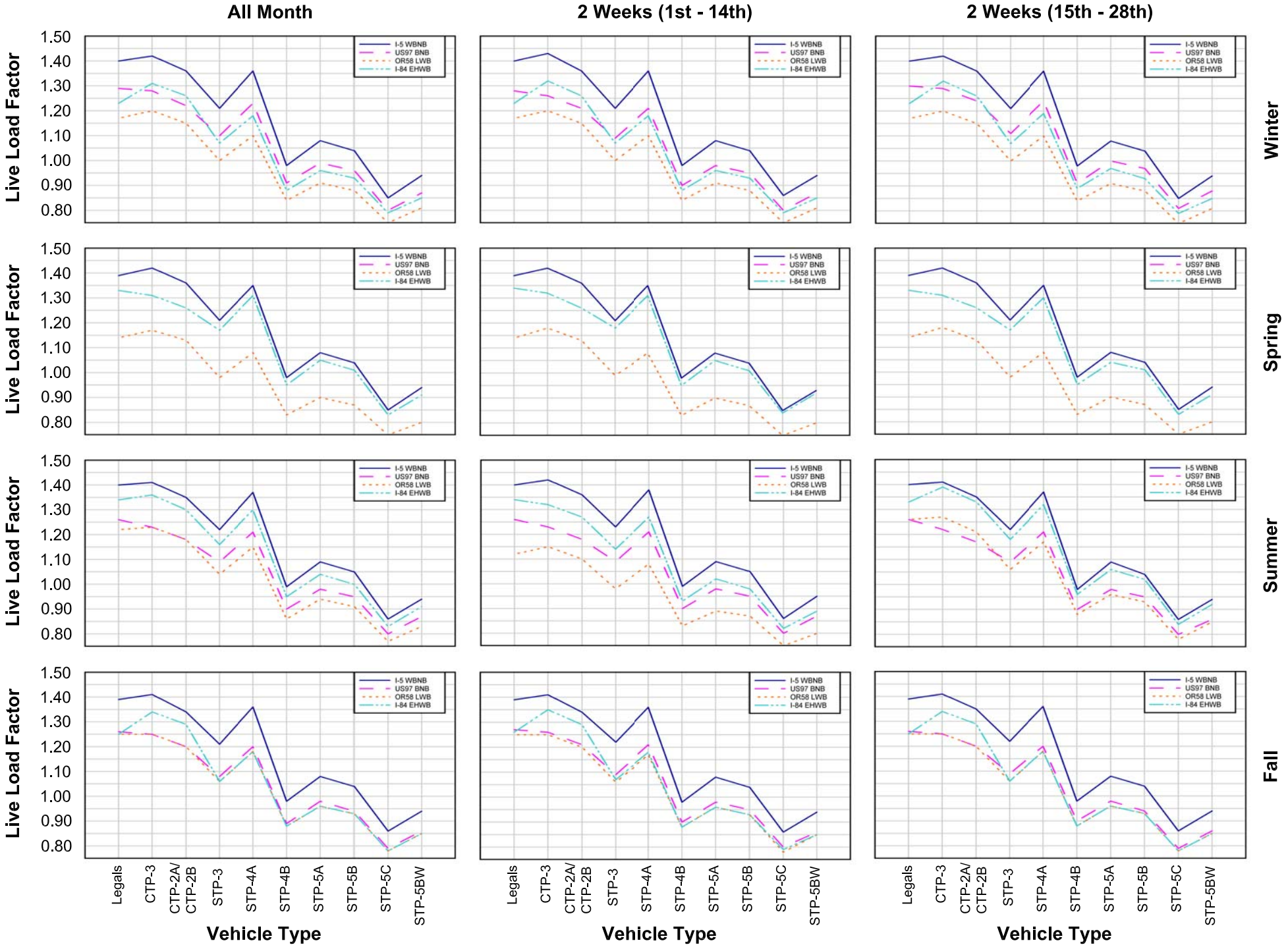


Figure 1 - Computed live load factors for all sites & seasons, and for all ODOT rating vehicles.

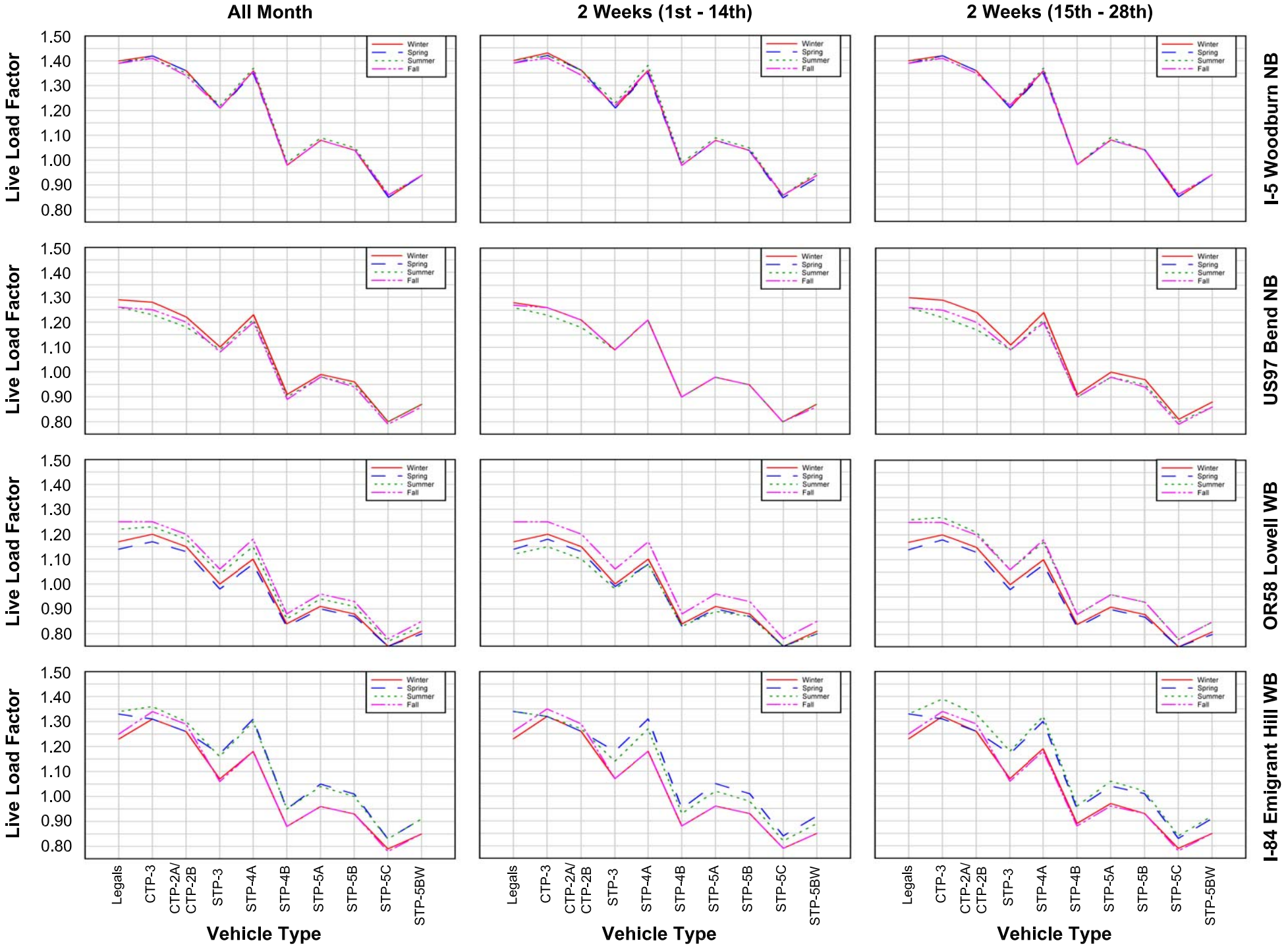


Figure 2 - Variation of live load factors for the different seasons at all four sites.

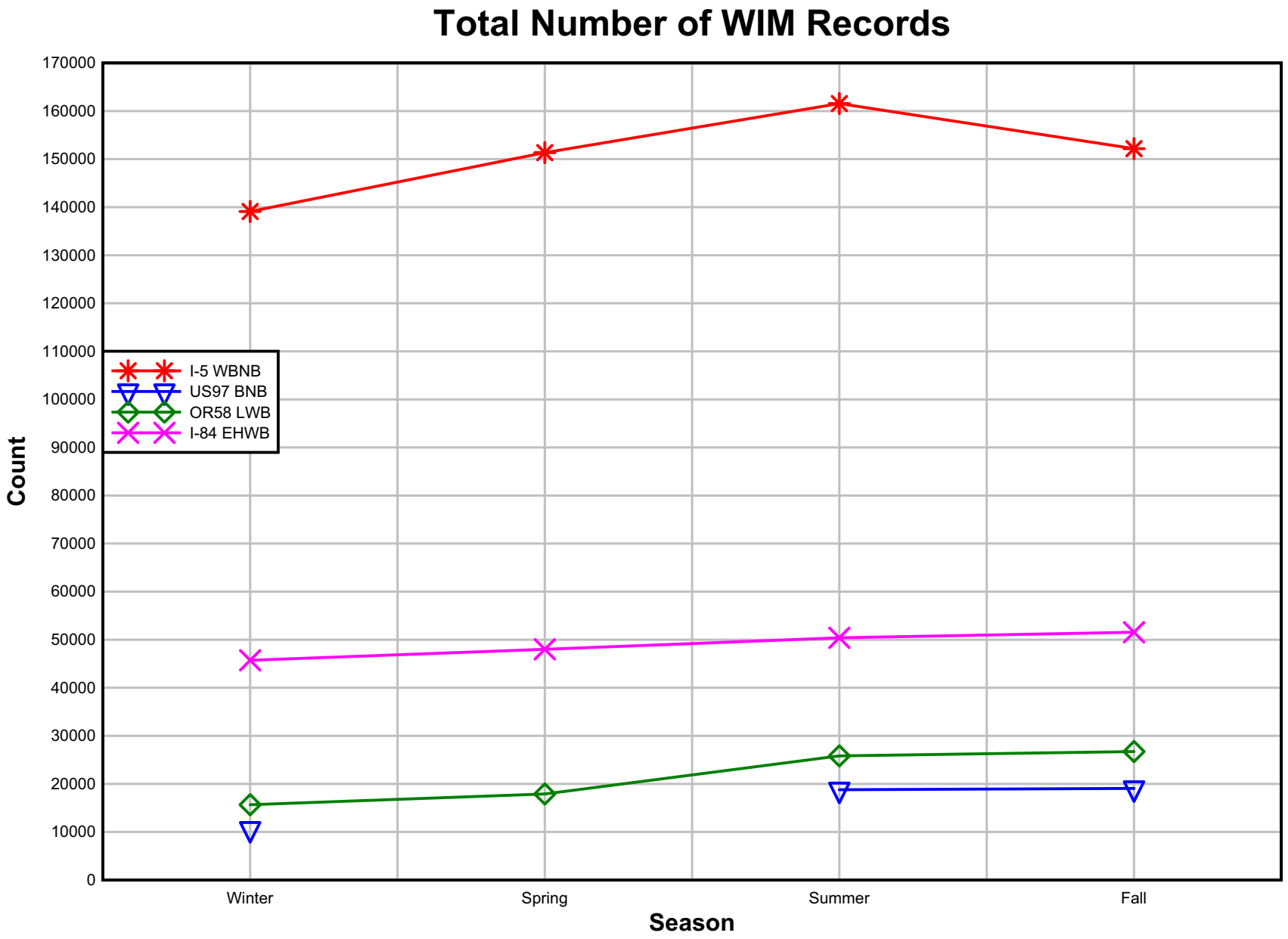
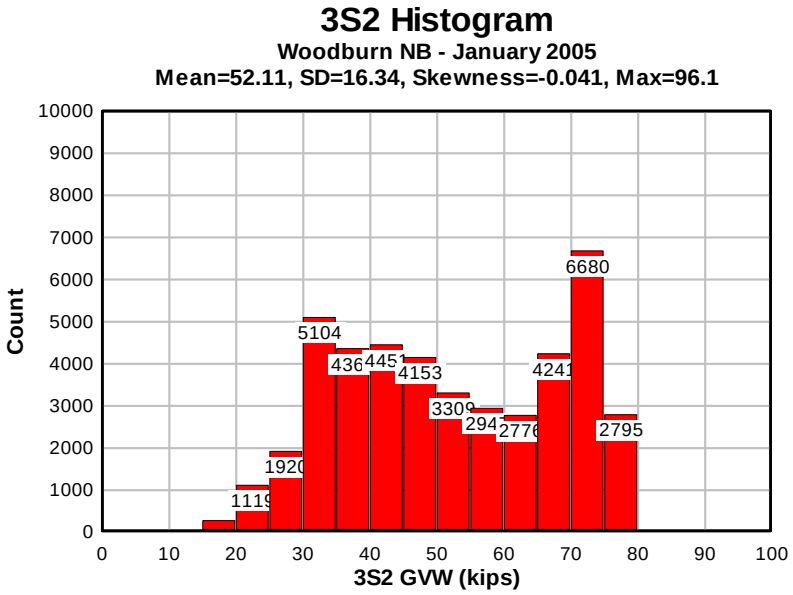
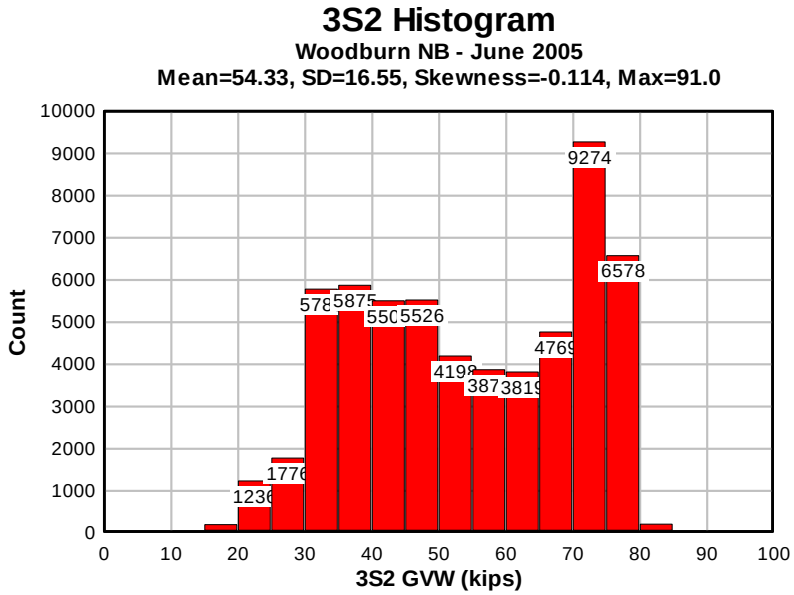
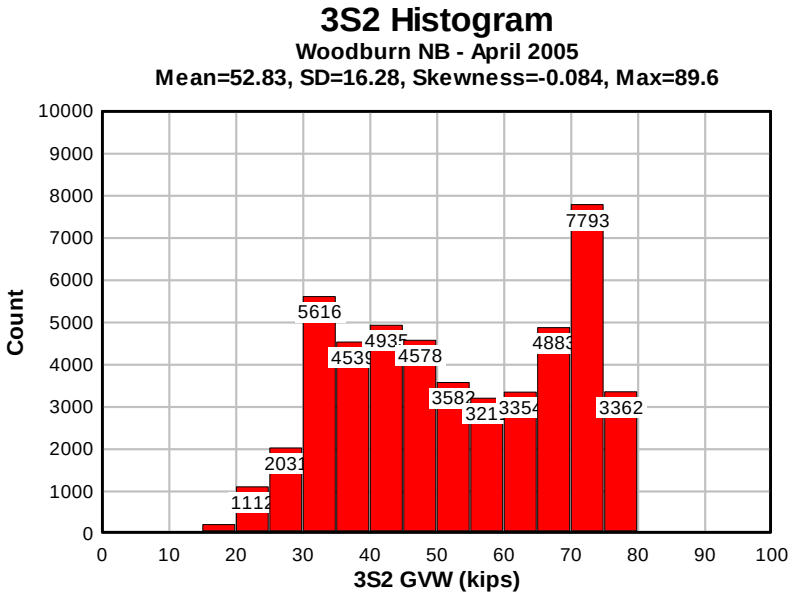
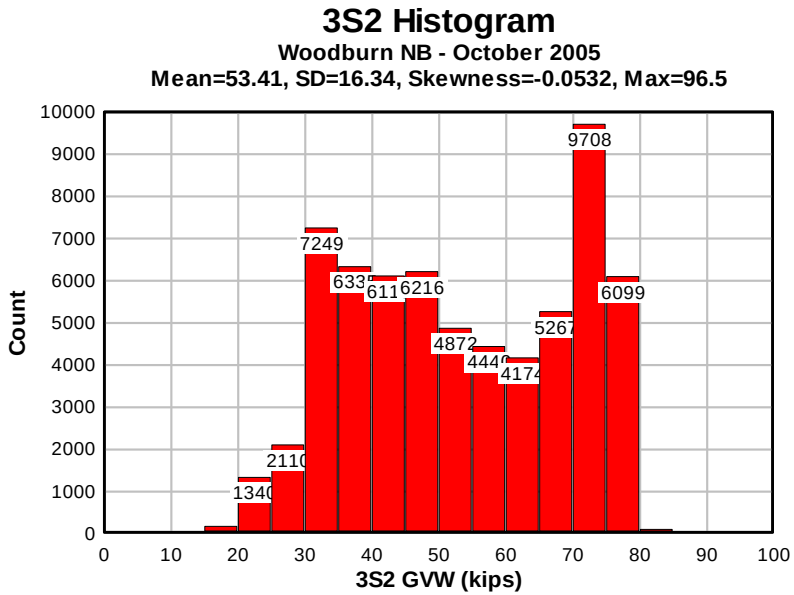


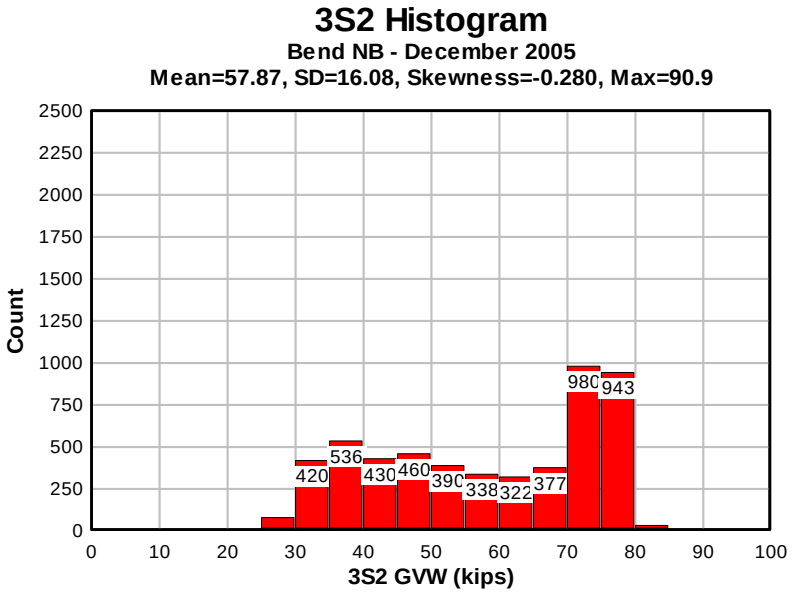
Figure 3 - Total number of WIM records for each site and season

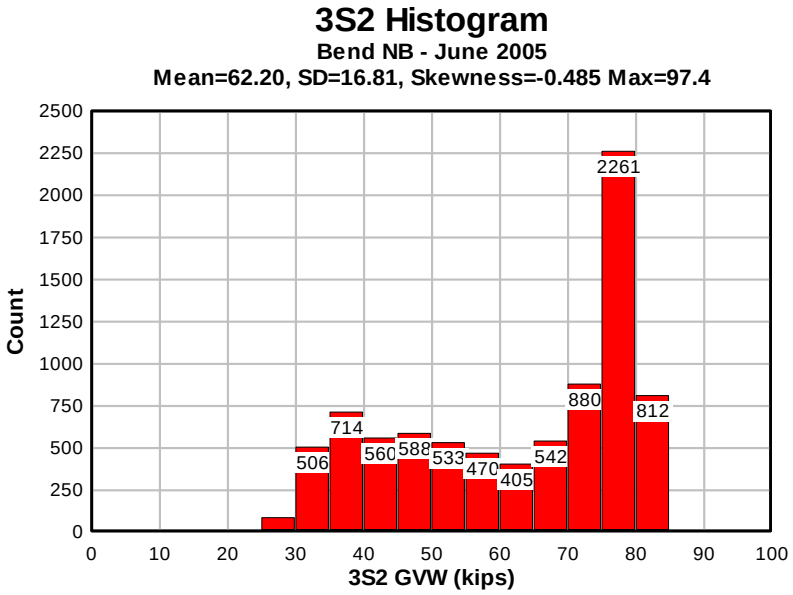

3S2 Histogram
Woodburn NB - January 2005
Mean=52.11, SD=16.34, Skewness=-0.041, Max=96.1
Count
3S2 GVW (kips)
5104
6680
2795

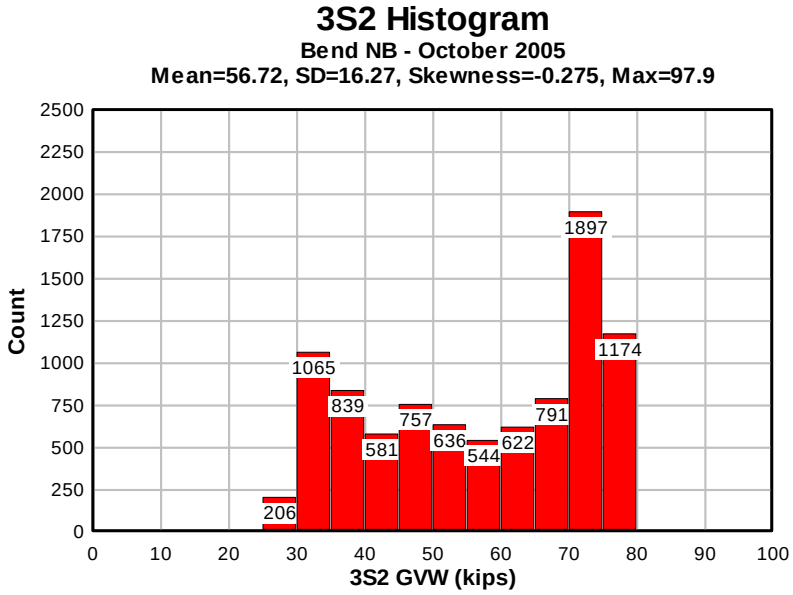

3S2 Histogram
Woodburn NB - June 2005
Mean=54.33, SD=16.55, Skewness=-0.114, Max=91.0
Count
3S2 GVW (kips)
9274
6578

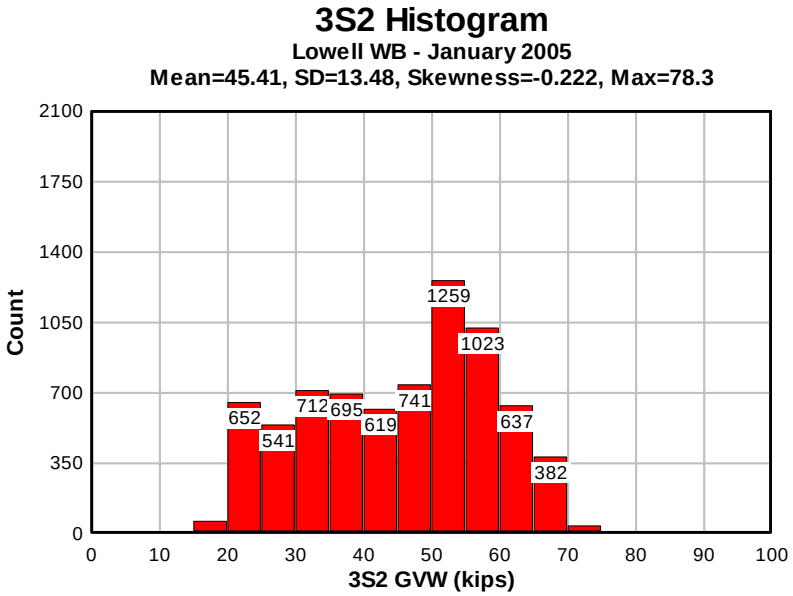

3S2 Histogram
Woodburn NB - April 2005
Mean=52.83, SD=16.28, Skewness=-0.084, Max=89.6
Count
3S2 GVW (kips)
5616
7793
3362

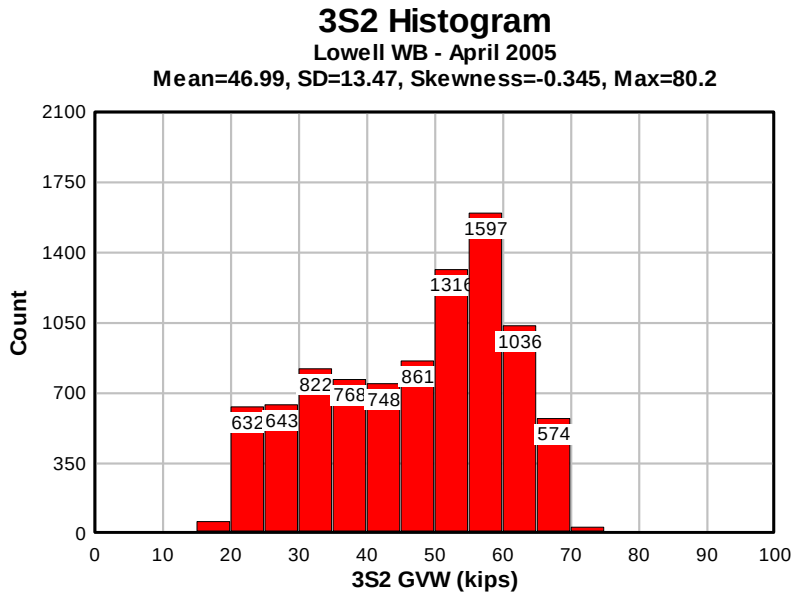

3S2 Histogram
Woodburn NB - October 2005
Mean=53.41, SD=16.34, Skewness=-0.0532, Max=96.5
Count
3S2 GVW (kips)
9708
7249
6099

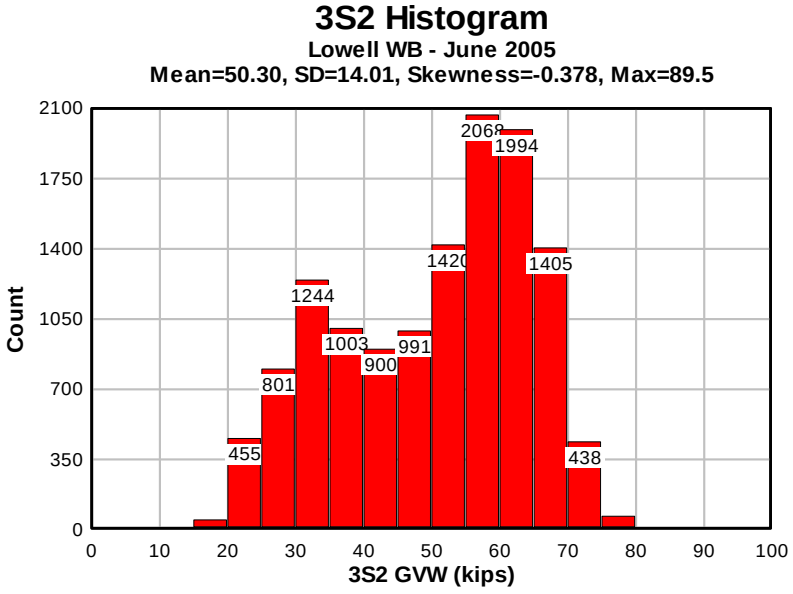

3S2 Histogram
Bend NB - December 2005
Mean=57.87, SD=16.08, Skewness=-0.280, Max=90.9
Count
3S2 GVW (kips)
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
0
10
20
30
40
50
60
70
80
90
100
420
536
430
460
390
338
322
377
980
943

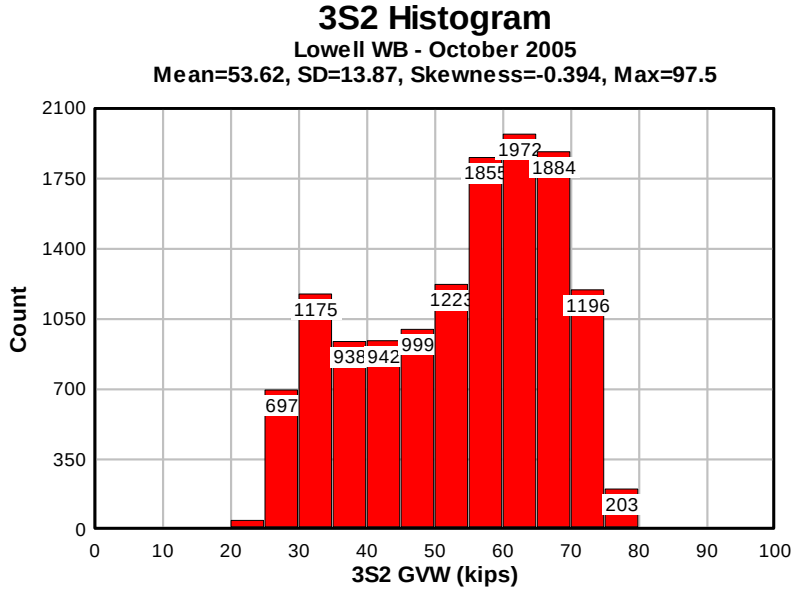

3S2 Histogram
Bend NB - June 2005
Mean=62.20, SD=16.81, Skewness=-0.485 Max=97.4
Count
3S2 GVW (kips)
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
0
10
20
30
40
50
60
70
80
90
100
506
714
560
588
533
470
405
542
880
2261
812

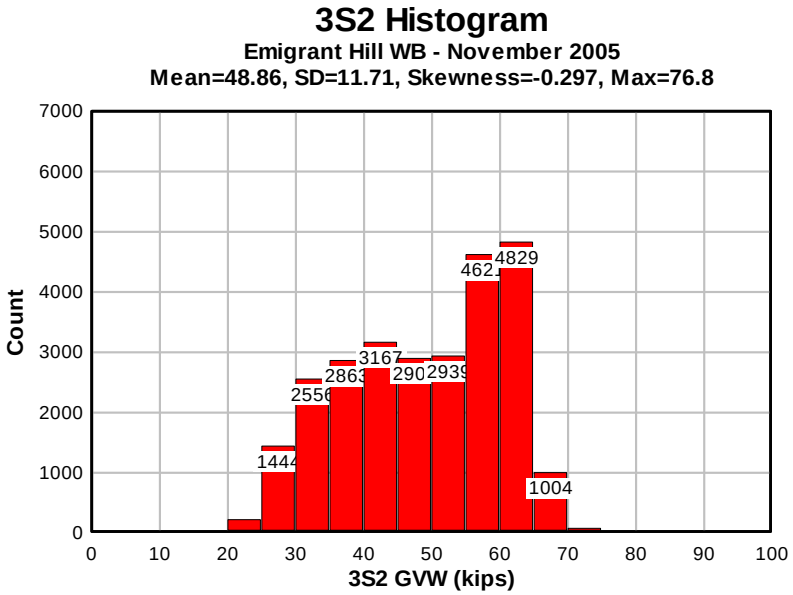

3S2 Histogram
Bend NB - October 2005
Mean=56.72, SD=16.27, Skewness=-0.275, Max=97.9
Count
3S2 GVW (kips)
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
0
10
20
30
40
50
60
70
80
90
100
206
1065
839
581
757
636
544
622
791
1897
1174

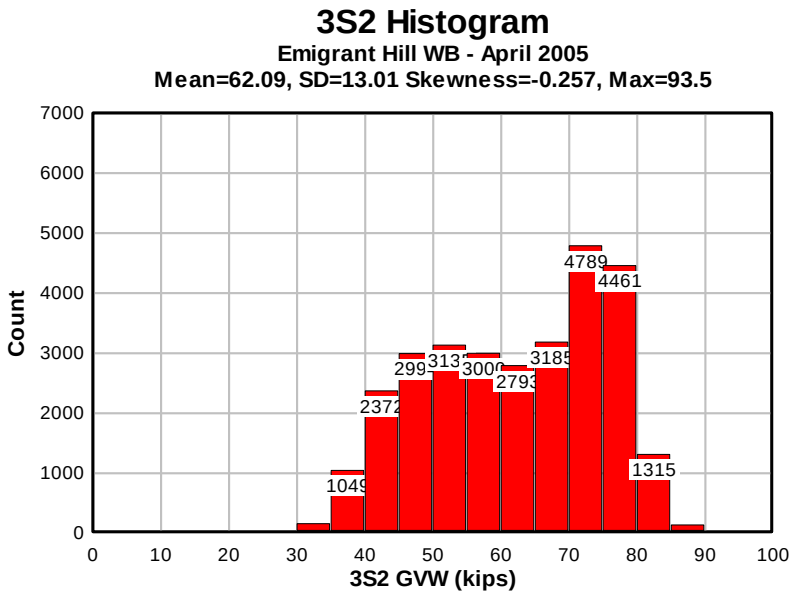

3S2 Histogram
Lowell WB - January 2005
Mean=45.41, SD=13.48, Skewness=-0.222, Max=78.3
Count
3S2 GVW (kips)
652
541
712
695
619
741
1259
1023
637
382

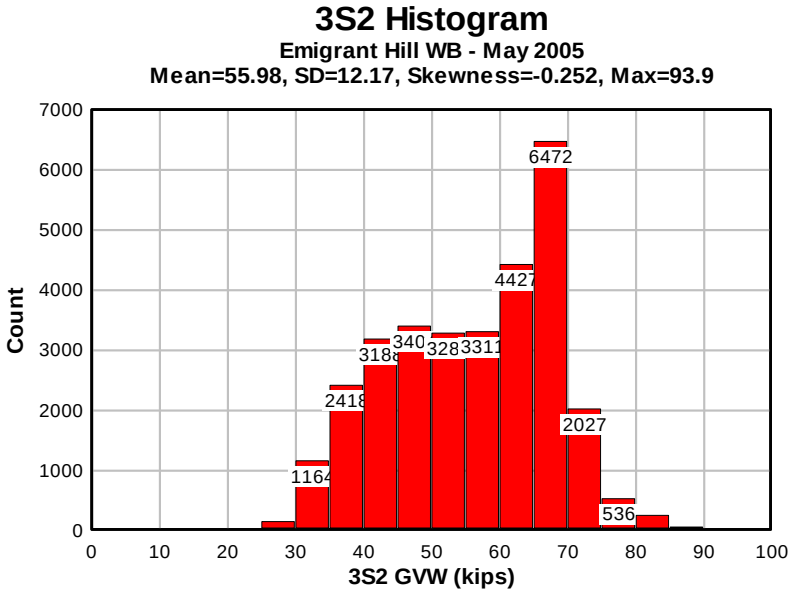

3S2 Histogram
Lowell WB - April 2005
Mean=46.99, SD=13.47, Skewness=-0.345, Max=80.2
Count
3S2 GVW (kips)
632
643
822
768
748
861
1316
1597
1036
574

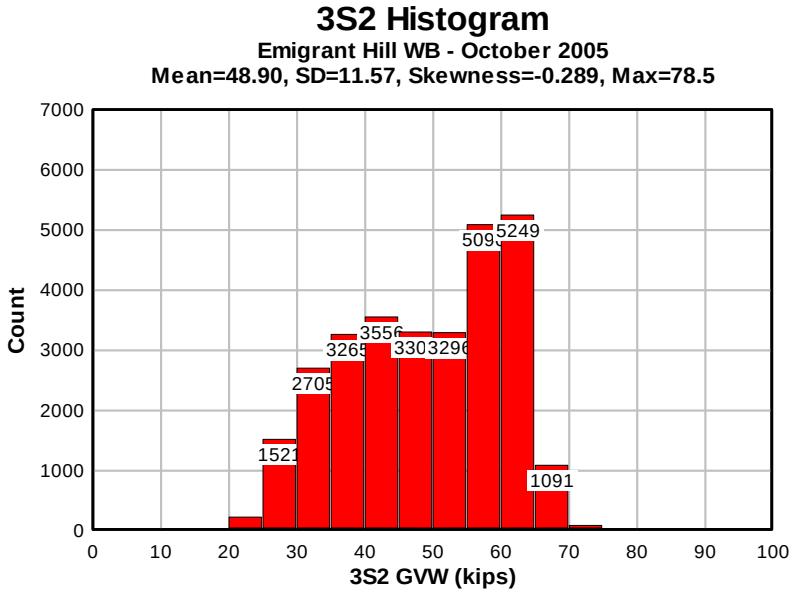

3S2 Histogram
Lowell WB - June 2005
Mean=50.30, SD=14.01, Skewness=-0.378, Max=89.5
Count
3S2 GVW (kips)
455
801
1244
1003
900
991
1420
2068
1994
1405
438


3S2 Histogram
Lowell WB - October 2005
Mean=53.62, SD=13.87, Skewness=-0.394, Max=97.5
Count
3S2 GVW (kips)
697
1175
938
942
999
1223
1855
1972
1884
1196
203


3S2 Histogram
Emigrant Hill WB - November 2005
Mean=48.86, SD=11.71, Skewness=-0.297, Max=76.8
Count
3S2 GVW (kips)
1444
2556
2863
3167
2902
2939
4621
4829
1004


3S2 Histogram
Emigrant Hill WB - April 2005
Mean=62.09, SD=13.01 Skewness=-0.257, Max=93.5
Count
3S2 GVW (kips)
1049
2372
2993
3131
3000
2793
3185
4789
4461
1315


3S2 Histogram
Emigrant Hill WB - May 2005
Mean=55.98, SD=12.17, Skewness=-0.252, Max=93.9
Count
3S2 GVW (kips)
1164
2418
3188
3402
3283
3311
4427
6472
2027
536


3S2 Histogram
Emigrant Hill WB - October 2005
Mean=48.90, SD=11.57, Skewness=-0.289, Max=78.5
Count
3S2 GVW (kips)
1521
2705
3265
3556
3303
3296
5093
5249
1091

Appendix D

Calendar Year 2004 Permit Counts for ODOT

Calendar Year 2004 Permit Counts for ODOT

2004	CTP's						COVP's						STP's	Running Totals for:		
	AWSS	ClacCnty	LaneCnty	MariCnty	ODOT	OTA	AWSS	ClacCnty	LaneCnty	MariCnty	ODOT	OTA	ODOT	CTP's	COVP's	ALL
January	139	7	0	31	172	78	5,035	60	536	1,374	2,036	3,471	6,835	427	12,512	19,774
February	96	8	0	28	169	150	2,754	201	288	1,228	2,102	2,536	7,259	451	9,109	16,819
March	640	7	0	24	203	69	4,693	239	357	1,334	1,854	3,094	9,240	943	11,571	21,754
April	250	13	0	50	223	155	3,932	138	260	1,221	2,125	2,684	9,764	691	10,360	20,815
May	294	7	0	29	288	108	2,341	213	303	1,647	2,624	2,250	9,140	726	9,378	19,244
June	159	6	0	25	307	213	3,401	88	253	1,535	2,351	2,279	10,509	710	9,907	21,126
July	171	4	0	30	331	56	2,932	113	410	1,333	1,867	2,423	10,715	592	9,078	20,385
August	137	2	0	25	325	64	3,376	20	453	1,892	1,827	2,596	11,741	553	10,164	22,458
September	130	0	0	19	218	212	2,503	48	315	1,724	1,636	2,275	11,070	579	8,501	20,150
October	218	16	0	282	234	188	4,541	157	285	1,561	1,323	6,882	10,513	938	14,749	26,200
November	238	3	0	106	446	1,030	4,516	282	729	2,518	1,513	6,462	9,294	1,823	16,020	27,137
***December	84	3	0	95	337	101	6,078	185	677	3,075	1,844	5,908	8,101	620	17,767	26,488
Cumulative Totals	2,556	76	0	744	3,253	2,424	46,102	1,744	4,866	20,442	23,102	42,860	114,181	9,053	139,116	262,350

2005	CTP's						COVP's						STP's	Running Totals for:		
	AWSS	ClacCnty	LaneCnty	MariCnty	ODOT	OTA	AWSS	ClacCnty	LaneCnty	MariCnty	ODOT	OTA	ODOT	CTP's	COVP's	ALL
January	109	6	0	48	320	477	5,907	140	584	1,651	2,375	3,802	7,677	960	14,459	23,096
February	100	4	0	8	276	40	2,912	148	252	978	2,276	3,156	8,314	428	9,722	18,464
March	270	28	0	70	320	257	4,675	421	474	2,086	2,066	3,224	10,053	945	12,946	23,944
April	88	12	0	22	407	109	3,446	142	406	1,413	2,011	2,762	9,684	638	10,180	20,502
May	199	9	0	57	391	38	3,337	147	389	2,024	2,035	2,576	11,394	694	10,508	22,596
June	175	1	0	40	548	129	4,691	159	282	1,450	1,978	2,697	11,587	893	11,257	23,737
July	119	6	0	23	407	73	2,916	123	302	1,629	1,838	3,062	10,922	628	9,870	21,420
August	173	4	0	24	599	77	3,943	77	455	1,323	1,801	2,537	13,364	877	10,136	24,377
September	120	10	0	315	496	177	3,232	109	401	1,511	1,975	3,451	12,693	1,118	10,679	24,490
October	95	5	0	42	545	352	4,926	93	197	2,144	1,739	5,619	11,054	1,039	14,718	26,811
November														0	0	0
***December														0	0	0
Cumulative Totals	1,448	85	0	649	4,309	1,729	39,985	1,559	3,742	16,209	20,094	32,886	106,742	8,220	114,475	229,437

Appendix E

Site Information

Interstate 5

Woodburn NB

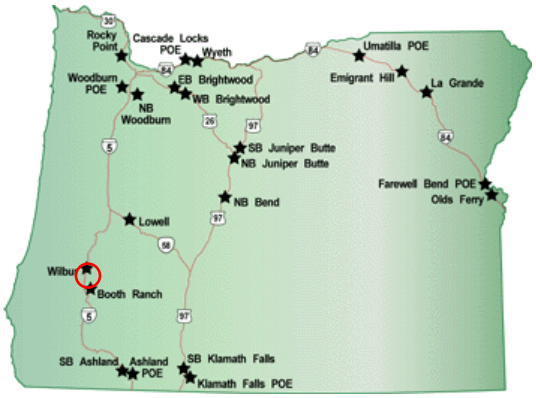
Location (MP)	I-5 (274.15)
ADT	41,893
ADTT	5,550
# Lanes	3
# Lanes Instrumented	2
WIM Equipment	Single Load Cell
Date of Last Calibration	June 05
Calibration Interval	6 mths. (or as needed)

Woodburn POE SB

Location (MP)	I-5 (274.18)
ADT	44,748
ADTT	5,689
# Lanes	3
# Lanes Instrumented	2
WIM Equipment	Single Load Cell
Date of Last Calibration	June 05
Calibration Interval	6 mths. (or as needed)

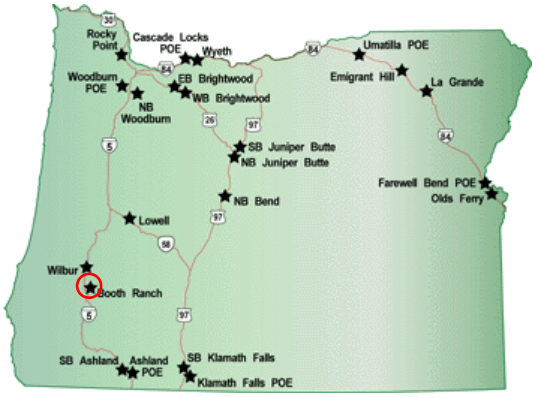
Wilbur SB

Location (MP)	130.03
ADT	19,244
ADTT	2,602
# Lanes	2
# Lanes Instrumented	2
WIM Equipment	Single Load Cell
Date of Last Calibration	Sept. 05
Calibration Interval	6 mths. (or as needed)



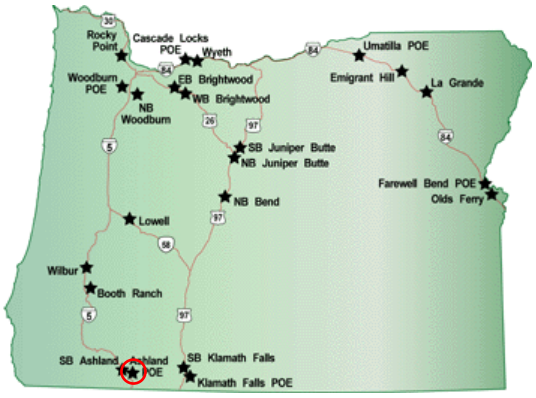
Booth Ranch NB

Location (MP)	111.07
ADT	12,619
ADTT	3,442
# Lanes	2
# Lanes Instrumented	1
WIM Equipment	Single Load Cell
Date of Last Calibration	Aug 05
Calibration Interval	6 mths. (or as needed)



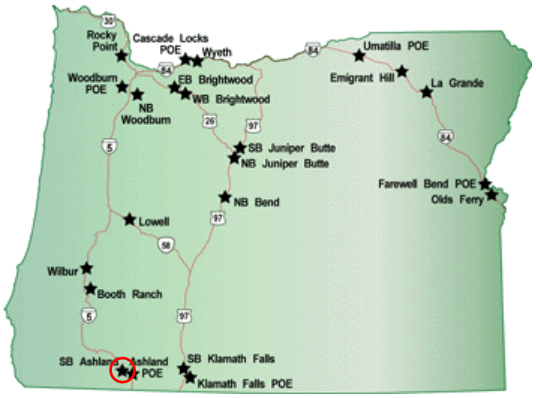
Ashland POE NB

Location (MP)	18.08
ADT	11,710
ADTT	2,979
# Lanes	2
# Lanes Instrumented	1
WIM Equipment	Single Load Cell
Date of Last Calibration	Dec 05
Calibration Interval	6 mths. (or as needed)



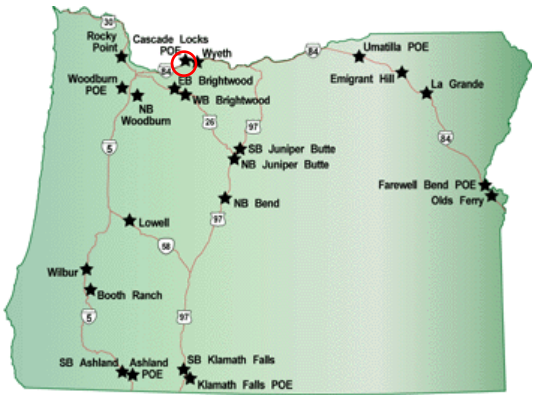
Ashland SB

Location (MP)	18.24
ADT	11,776
ADTT	2,838
# Lanes	2
# Lanes Instrumented	1
WIM Equipment	Single Load Cell
Date of Last Calibration	Dec 05
Calibration Interval	6 mths. (or as needed)

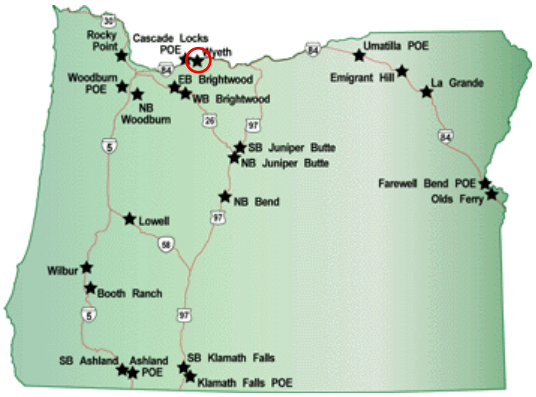


Interstate 84

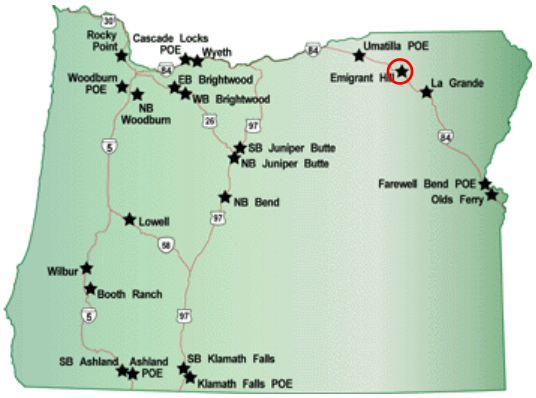
Cascade Locks POE EB	
Location (MP)	44.93
ADT	9,880
ADTT	4,602
# Lanes	2
# Lanes Instrumented	1
WIM Equipment	Single Load Cell
Date of Last Calibration	Sept 05
Calibration Interval	6 mths. (or as needed)



Wyeth WB	
Location (MP)	54.30
ADT	7011
ADTT	2,158
# Lanes	2
# Lanes Instrumented	2
WIM Equipment	Single Load Cell
Date of Last Calibration	Oct 05
Calibration Interval	6 mths. (or as needed)

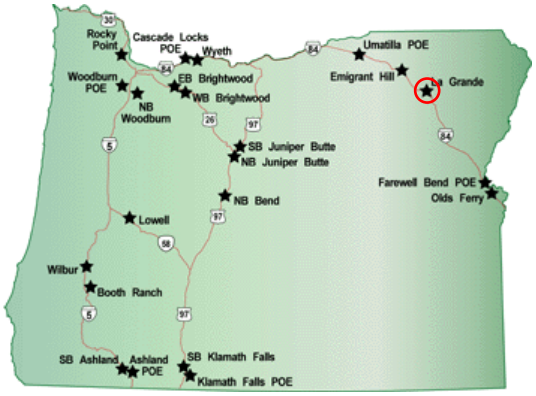


Emigrant Hill WB	
Location (MP)	226.95
ADT	3,252
ADTT	1,786
# Lanes	2
# Lanes Instrumented	1
WIM Equipment	Single Load Cell
Date of Last Calibration	Oct 05
Calibration Interval	6 mths. (or as needed)



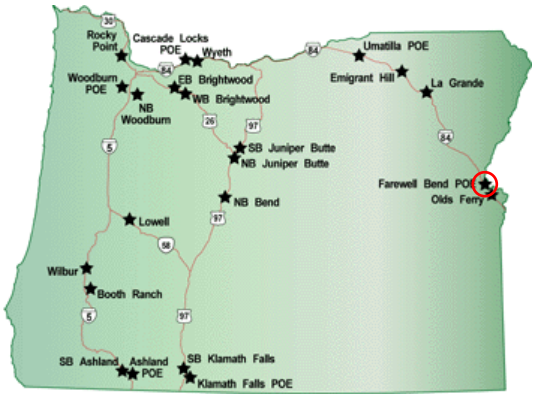
La Grande EB

Location (MP)	258.52
ADT	3,972
ADTT	2,327
# Lanes	2
# Lanes Instrumented	1
WIM Equipment	Single Load Cell
Date of Last Calibration	Sept 05
Calibration Interval	6 mths. (or as needed)



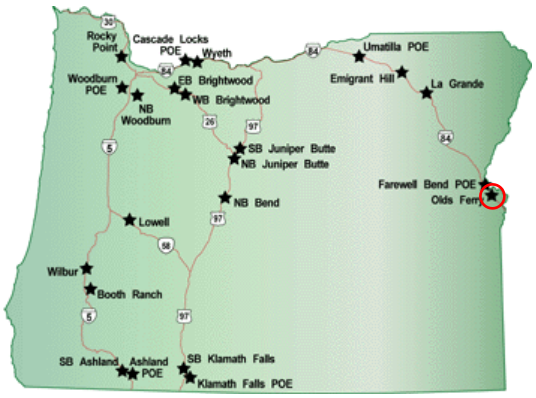
Farewell Bend POE WB

Location (MP)	353.31
ADT	2,866
ADTT	1,848
# Lanes	2
# Lanes Instrumented	1
WIM Equipment	Single Load Cell
Date of Last Calibration	Sept 05
Calibration Interval	6 mths. (or as needed)



Olds Ferry EB

Location (MP)	354.38
ADT	3,458
ADTT	2,045
# Lanes	2
# Lanes Instrumented	1
WIM Equipment	Single Load Cell
Date of Last Calibration	Sept 05
Calibration Interval	6 mths. (or as needed)



US Highway 97

Juniper Butte SB

Location (MP)	108.20
ADT	4,967
ADTT	935
# Lanes	2
# Lanes Instrumented	1
WIM Equipment	Single Load Cell
Date of Last Calibration	Nov 05
Calibration Interval	6 mths. (or as needed)

Juniper Butte NB

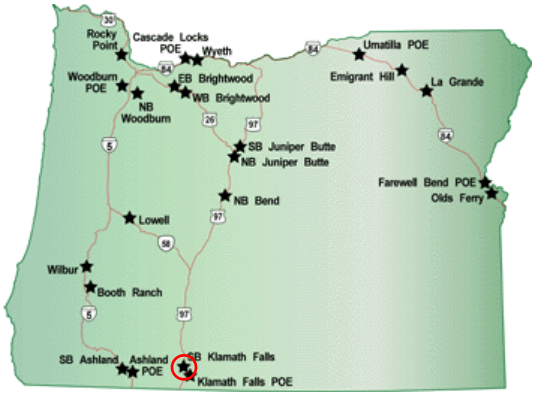
Location (MP)	106.90
ADT	4,792
ADTT	882
# Lanes	2
# Lanes Instrumented	1
WIM Equipment	Single Load Cell
Date of Last Calibration	Nov 05
Calibration Interval	6 mths. (or as needed)

Bend NB

Location (MP)	145.50
ADT	6,943
ADTT	607
# Lanes	2
# Lanes Instrumented	1
WIM Equipment	Single Load Cell
Date of Last Calibration	Oct 05
Calibration Interval	6 mths. (or as needed)

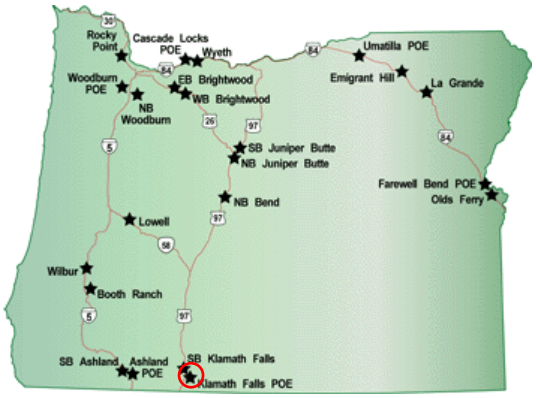
Klamath Falls SB

Location (MP)	271.41
ADT	3,129
ADTT	907
# Lanes	2
# Lanes Instrumented	1
WIM Equipment	Single Load Cell
Date of Last Calibration	Oct 05
Calibration Interval	6 mths. (or as needed)



Klamath Falls POE NB

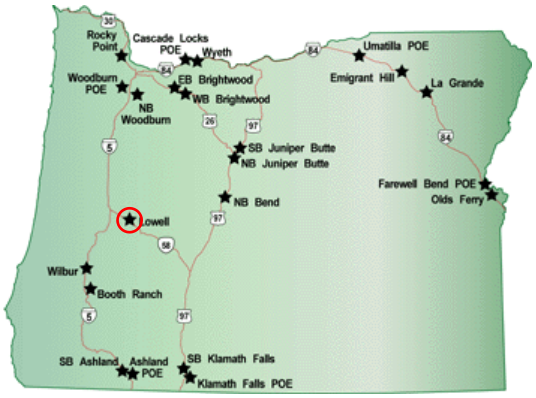
Location (MP)	271.73
ADT	3,857
ADTT	769
# Lanes	2
# Lanes Instrumented	1
WIM Equipment	Single Load Cell
Date of Last Calibration	Oct 05
Calibration Interval	6 mths. (or as needed)



OR Highway 58

Lowell WB

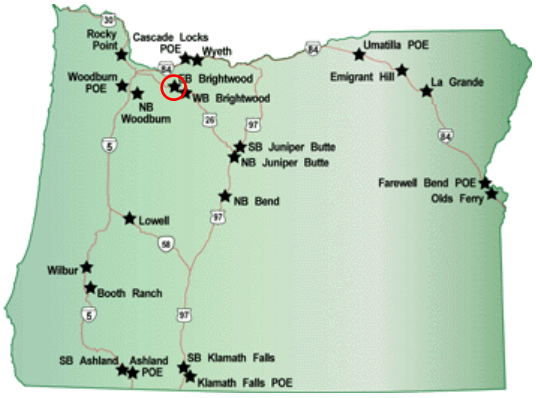
Location (MP)	17.17
ADT	3,205
ADTT	581
# Lanes	2
# Lanes Instrumented	1
WIM Equipment	Single Load Cell
Date of Last Calibration	Nov 05
Calibration Interval	6 mths. (or as needed)



US Highway 26

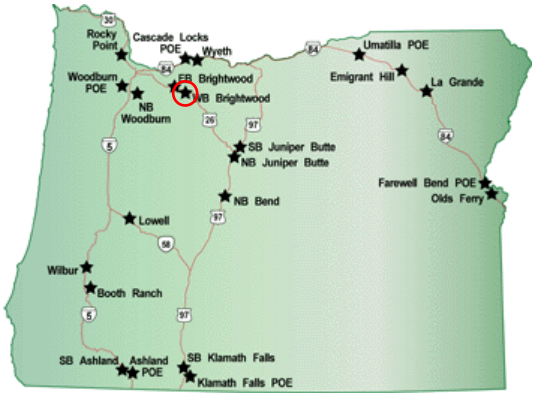
Brightwood EB

Location (MP)	36.51
ADT	4,761
ADTT	357
# Lanes	2
# Lanes Instrumented	1
WIM Equipment	Single Load Cell
Date of Last Calibration	Sept 05
Calibration Interval	6 mths. (or as needed)



Brightwood WB

Location (MP)	36.31
ADT	4,360
ADTT	787
# Lanes	2
# Lanes Instrumented	1
WIM Equipment	Single Load Cell
Date of Last Calibration	Sept 05
Calibration Interval	6 mths. (or as needed)



Appendix F

"Calibration of LRFR Live Load Factors for Oregon Using I-5 Weigh-In-Motion Data" (2005) by Bala Sivakumar

OREGON DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

DRAFT REPORT OF:

CALIBRATION OF ROUTE-SPECIFIC LRFR LIVE LOAD FACTORS USING I-5 WEIGH-IN-MOTION DATA

PREPARED BY:

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NOVEMBER 9, 2005

Revision 1: 11/9/05
Revision 2: 11/14/05

I. PURPOSE

Oregon-specific load factors have been developed for LRFR bridge load ratings using weigh-in-motion (WIM) data from the Woodburn Northbound site on I-5. These load factors for Oregon legal loads and permit loads, given in Table 5 of this report, represent the same reference safety margin as LRFR load factors.

II. LRFR Live Load Factors

Generalized load factors given in the LRFR manual apply when only the ADTT at a site is known or can be estimated. Generalized load factors are representative of bridges nationwide with similar traffic volumes.

Table 1. Generalized LRFR Live Load Factors for Legal Loads

Traffic Volume	Limit State	Load Factor
Unknown	STRENGTH	1.8
ADTT > 5000	STRENGTH	1.8
ADTT = 1000	STRENGTH	1.65
ADTT < 100	STRENGTH	1.4

Table 2. LRFR Generalized Permit Load Factors -- Routine Permits

Permit Type	Frequency	ADTT (one direction)	Load Factor by Permit Weight	
			Up to 100 KIPS	>150 KIPS
Routine or Annual	Unlimited Crossings	>5000	1.80	1.30
		=1000	1.60	1.20
		<100	1.40	1.10

ODOT *LRFR Interim Scoping Load Rating Guidelines* has subdivided Permit Load Rating into Continuous Trip Permit (CTP) Load Rating and Single Trip Permit (STP) Load Rating. Because MCTD issues Single Trip Permits in large numbers on a routine basis without a specific structural review, they are also

treated as “Routine or Annual” in the above table. This means Live load Factors will vary according to ADTT, weight, and effective bridge length

III. Route-Specific LRFR Live Load Factors for I-5

The LRFR Manual provides a procedure for calculating site-specific load factors using truck weight data (from WIM sites) that follow the same format used in the derivation of live load factors contained in the LRFD Specifications and the Manual. These more refined site-specific load factors are characteristic of a particular bridge site, route, or jurisdiction and reflect the actual truck traffic and likely maximum loadings over the exposure period.

LRFR permit live load factors are derived to account for the possibility of simultaneous presence of non-permit heavy trucks on the bridge when the permit vehicle crosses the span. The load factor applied to the permit vehicle depends on the random alongside truck. Thus the load factors are higher for spans with higher ADTT and smaller for heavier permits. The live load factors for permit loads are reduced compared with legal load rating values to account for the small probability of simultaneous crossing events and also the lesser likelihood that a permit truck will be significantly overloaded.

Statistics shown herein are for top 20% GVW obtained from WIM data for the period July 1st – 14th, 2005. The data was collected at the Woodburn permanent WIM site on I-5 Northbound. The WIM sensors were in the right and center lanes. The data was filtered by Dr. Chris Higgins to remove the following:

1. Record where the GVW value is equal to 0.0.
2. Record does not follow the general record pattern; this could be any inconsistency in the time stamp, words out of place from the status quo, incomplete records, etc.
3. Records with misplaced characters, such as a letter where a number should be or a number where a letter should be.
4. Record where an individual axle is greater than 50 kips.
5. Record where the speed is less than 10 mph.
6. Record where the speed is greater than 99 mph.
7. Record where the length is greater than 200 ft.
8. Record where the sum of the axle spacings are greater than the length of the truck.
9. Record where the sum of the axle spacings are less than 7 ft.
10. Record where the first axle spacing is less than 5 ft.
11. Record where the # of axles is greater than 13.
12. Record where the GVW is greater than 280 kips.
13. Record where any axle spacing is less than 3.4 ft.
14. Record which has a GVW +/- the sum of the axle weights by more than 7%.

The filtered WIM data obtained as text files from Dr. Higgins were read into an excel spreadsheet for analysis.

IV. Calibration of Load Factors Using Oregon WIM Data

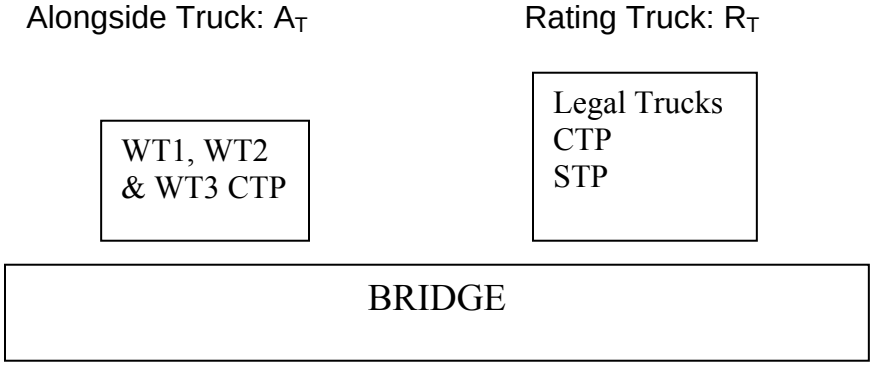


Fig. 1 Maximum Loading Event With Side-by-Side Trucks

Rating truck R_T could be a legal load or a permit truck. The permit truck is a known load conforming to ODOT CTP and STP configurations for Load Rating Tier 2. The legal loads are truck configurations conforming to Weight Table 1. Statistics for top 20% GVW legal trucks from Oregon WIM data are given in Table 3.

WIM data for defining the Alongside Truck for load rating includes all truck configurations for:

- Legal trucks (Weight Table 1),
- Extended Weight Table 2 (105,000 lbs max) and
- 98,000 lb CTP from Weight Table 3

Due to the numerous permits granted, the above combination of loads is considered the likely traffic scenario for Oregon. Statistics for top 20% GVW alongside trucks (trucks meeting the three categories above) from Oregon WIM data are given in Table 3.

Maximum expected live loading is given by:

$$W_T = R_T + A_T$$

W_T = Expected maximum total weight of rating and alongside vehicles.

$$A_T = W^* + t_{ADTT}\sigma^*$$

- For Legal Loads:

$$R_T = W^* + t_{ADTT}\sigma^*$$

t_{ADTT} = Fractile value corresponding to number of side-by-side events N.
W^* = Mean of top 20% legal trucks
σ^* = Standard Deviation of top 20% legal trucks

- For Permit Loads:

$$R_T = P + t_{ADTT}\sigma*$$

P = Weight of permit truck
$\sigma*$ = Standard Deviation of permit trucks

The Standard Deviation for permit trucks has not been established for Oregon traffic. As an approximation, the $\sigma*$ for the top 20% of alongside trucks is used herein for permit load factor calibration. When more precise data is available the analysis can be updated as necessary.

Table 3: Statistics – Top 20% Using Oregon WIM Data

VEHICLE	GVW – TOP 20%		
	MAX GVW	Mean W *	σ^*
3S2 - Legal	80 K	76.2 K	1.8 K
Alongside Truck	105.5 K	84.1 K	9.6 K

Multiple –Presence Probabilities

LRFD and LRFR calibrations assumed a 1/15 (6.7%) probability of side-by-side events for truck passages. This assumption was based on visual observations and is conservative for most sites. Recent WIM studies completed under NCHRP 12-63 by the Lichtenstein Research Team indicates much lower multiple-presence probabilities even for very high ADTT sites. Very accurate time stamps were collected and analyzed for WIM sites on I-84 in Idaho and I-75 in Ohio to estimate the number side-by-side events over several days in 2004 and 2005 (See Appendix to this Report, Tables 1.6 and 1.7). The results are as given below in Table 4:

Table 4: Multiple-Presence Probabilities from WIM Data

SITE	ADTT	LANES	MAXIMUM SIDE-BY-SIDE PROBABILITY
I-84 Idaho	>2500	2	1.37%
I-75 Ohio	>5000	3	3.35%

It should be noted that these probabilities consider all trucks within a headway separation of 60 feet to constitute a side-by-side event. This larger and more conservative definition of headway separation may produce a higher multiple presence but may have a lower total moment on most spans. The I-5 site is comparable to the Ohio I-75 site in terms of the number of lanes and truck traffic volume. For calibration purposes, a 1/30 (3.4%) probability of side-by-side events is adopted as being a more representative value for the I-5 site.

LRFR Calibration Approach

Using Equation 39, NCHRP Report 454, LRFR load factor for rating is given as:

$$\gamma_L = 1.8\frac{W_T}{240}\times\frac{72}{W} \qquad \text{(Eq. 39)}$$

W = Weight of vehicle (legal truck or permit truck)
W_T = Expected maximum total weight of rating and alongside vehicles.

1) Load Factor for Oregon Legal Loads.

t_{ADTT} = Fractile value corresponding to number of side-by-side events N.

Using a 1/30 probability of side-by-side events for two legal trucks, a 5 year evaluation period, and ADTT=5000; the number of side-by-side events N:

N = (365)(5000)(5)(1/30)(1/5) = 60,833
$1/N$ = $1.6438X10^{-5}$

From NCHRP 454, Appendix A: t_{ADTT} = 4.15

R_T = 76.2 + 4.15x1.8

= 83.7^K

A_T = 84.1 + 4.15 X 9.6

= 123.9^K

$W_T = R_T + A_T$
$= 83.7^K + 123.9^K$
$= 207.6^K$

$$\gamma_L = 1.8 \times \frac{207.6}{240} \times \frac{72}{80}$$

$= 1.40$

(Note that the COV of 2.3% is unusually low for random legal loads. This should be further investigated with additional WIM data. It is also important to ensure that the overloaded legal trucks are being classified properly, and not taken as permit loads)

2) Load Factors for Continuous Trip Permits CTP.

ODOT has estimated that CTPs are about 30% of legal truck traffic on I-5 for determining the number of side-by-side events, N (CTP adjacent to a legal truck).

N = 60833 x 0.30 = 18250.

$1/N = 5.479 \times 10^{-5}$

$t_{(ADTT)} = 3.87$

$A_T = 84.1^K + 3.87 \times 9.6^K$
$= 121.3^K$

$W_T = R_T + A_T$

a) For 105.5^k CTP

$R_T = 105.5^K + 3.87 \times 9.6^K$
$= 142.7$

$W_T = 142.7^K + 121.3^K$
$= 264^K$

Using Eq. 39 (NCHRP Rpt 454):

$$\gamma_L = 1.8 \times \frac{264}{240} \times \frac{72}{105.5}$$

$= 1.35$

b) For 98^k CTP

$R_T = 98^K + 3.87X9.6^K$

$= 135.2$

$W_T = 135.2^K + 121.3^K$

$= 256.5^K$

$$\gamma_L = 1.8 \times \frac{256.5^K}{240} \times \frac{72}{98}$$

= 1.41 say 1.40

3) Load Factors for Single Trip Permits STP

Number of permits per day is conservatively taken as 100, based on actual permits observed in WIM data (592 in 14 days).

N = (365)(100)(5)(1/30) = 6083

$1/N = 1.644 \text{ X } 10^{-4}$

$t_{(ADTT)} = 3.59$

$A_T = 84.1^K + 3.59 \text{ X } 9.6^K$

$= 118.6^K$

$$R_T = P + t_{ADTT}\sigma *$$

$= P + 3.59x9.6^K$

$= P + 34.5$

Table 5: STP Load Factors

STP	P	R_T= P + 34.5	A_T	$W_T=R_T+A_T$	$\gamma_L = 1.8 \times \frac{W_T}{240} \times \frac{72}{P}$
STP-3	120.5^K	155.0	120.3^K	275.3^K	1.23
STP-4A	99^K	133.5	120.3^K	253.8^K	1.38
STP-4B	185^K	219.5	120.3^K	339.8^K	0.99
STP-5A	150.5^K	185	120.3^K	305.3^K	1.10
STP-5B	162.5^K	197	120.3^K	317.3^K	1.05
STP-5C	258^K	292.5	120.3^K	412.8^K	0.86
STP-5BW	204^K	238.5	120.3^K	358.8^K	0.95

Table 6. Summary of LRFR Live Load Factors Using I-5 WIM Data

Load Type	Vehicle	ADTT (minimum)	LRFR Generalized Live Load Factor	Route-Specific Load Factors (rounded up to nearest 0.05 or to 1.0)
Oregon Legal Loads	Type 3, Type 3S2, Type 3-3	5000	1.8	1.40
Continuous Trip Permit	CTP-2A, 105.5^K	5000	1.75	1.35
Continuous Trip Permit	CTP-2B 105.5^K	5000	1.75	1.35
Continuous Trip Permit	CTP-3, 98^K	5000	1.80	1.40
Single Trip Permit	STP-3, 120.5^K	5000	1.60	1.25
Single Trip Permit	STP-4A, 99^K	5000	1.80	1.40
Single Trip Permit	STP-4B, 185^K	5000	1.30	1.00
Single Trip Permit	STP-5A, 150.5^K	5000	1.30	1.10
Single Trip Permit	STP-5B, 162.5^K	5000	1.30	1.05
Single Trip Permit	STP-5C, 258^K	5000	1.30	1.00
Single Trip Permit	STP-5BW, 204^K	5000	1.30	1.00

V. Discussion

The Ontario truck weight data used in the calibration of the LRFR specifications were reasonably matched by a 3S2 truck with a normal distribution and a mean of 68 kips and standard deviation of 18 kips. The weight parameters fit the heaviest one-fifth of the truck weight population and it is assumed that the remaining trucks have no influence on the maximum loading events. The corresponding parameters for the Oregon I-5 truck weight data are: 76.2 kips and 1.8 kips for legal loads, and 84.1 kips and 9.6 kips for the alongside truck. The parameters indicate that there were significantly more overloads in the Ontario random truck data than are present in the Oregon legal loads or in the truck population grouped as the “alongside truck”. The maximum loading event for the LRFR calibration of load factors was controlled by the overloaded random trucks. It was shown that even when a permit truck of known weight up to 125 kips crosses the bridge, the expected maximum loading is lower compared with the maximum random legal loading event due to the many overloads in the random traffic. That is, most routine permits did not affect the critical loading, which was governed by the non-permit overloads. The reduced overloads in the Oregon data explains the reduced site-specific load factors. It has been noted that the low costs of overweight permits, the number of such permits authorized, their easy access through the Internet, and significant penalties for non-compliance may have reduced the potential for overloads in Oregon compared with other jurisdictions. Note that the COV of 2.3% is unusually low for random legal loads on I-5. This should be further investigated with additional WIM data. It is also important to ensure that the overloaded legal trucks are being classified properly, and not taken as permit loads. WIM data for the Southbound direction as well as data from other times of the year should be analyzed to check for directional or seasonal variations in truck loads on I-5. Caution should be exercised when extending these site-specific load factors to other routes in Oregon, especially non-Interstate routes, where the degree of overloading may be higher. WIM data from non-interstate routes will provide a good estimate in this regard.

The maximum loading event for calibration assumes a legal truck or a permit truck in one lane and a random truck (referred to as the alongside vehicle) in the adjoining lane. This approach is used for CTP as well as STP permits due to the large number of such trucks in the traffic stream. In the LRFD calibration, Nowak showed that the maximum expected lifetime loading in each lane for two-lane loading is 0.85 times the single lane expected maximum lifetime loading. Therefore, in a two-lane loading situation, the extreme occasional overloads that may be present within the various truck categories are not influential in the calibration of live load factors. This also suggests that data for long periods of time to identify such loads would not be very beneficial for calibration purposes. Quality, and not quantity, of data is key to reliable calibration statistics. The route-specific load factors represent a target beta level corresponding to the Operating level of 2.5.

APPENDIX

MULTIPLE PRESENCE PROBABILITIES

Multiple Presence Probabilities from WIM Data
Ref: NCHRP Project 12-63

1) **Idaho I-84 (2 Lanes)**

WIM data was collected in Idaho on Interstate 84 using a WIM and classifier setup for high resolution time stamps for a period of 6 days in Oct and Nov 2004. The site has two lanes in each direction, a nominal ADT of 18000 in all four lanes, with 26% truck traffic. Data collection and calibration of time stamping clocks was done by Dr. Fu for the Lichtentein Team with assistance from IDOT personnel. The site had free flowing traffic with no unusual grade or ramps present and was not near a weigh station.

To calculate multiple presence probabilities for side-by-side trucks (Idaho WIM), the following procedure was adopted:

1. For each of the six days, the total number of trucks, the trucks in the right lanes (Lane 0 or 1) and left lanes (Lane 2 or 3) were determined. (Note that for this four lane highway, Lanes 0 and 2 are in one direction and Lanes 1 and 3 are in the opposite direction). ADTT ranged from 1169 to 3119 for the various days.
2. The number of trucks in the left and right lanes in each direction for each day of measurement is given in Table 1.4. It was evident that about 90% of the trucks were in the right lane. Data collection durations varied from 11.1 hours to 23.3 hours and the number of trucks measured during this period varied from 479 to 2797.
3. For each truck crossing in the right lane, the likelihood of a second truck side-by-side in the left lane was examined using the truck arrival times and vehicle travel speeds. For the purposes of this analysis, headway separations from 5 ft to 60 ft were considered as side-by-side presence.
4. The number of side-by-side cases were determined for each 5 ft increment from 5 ft to 60 ft. The number of multiple presence cases increased with increasing headway separations. The total side-by-side cases for all days are given in the table below, which illustrates the likelihood of such events.

Table 1.4 Total Side-by-Side Events

Headway Separation	Total Side-by-Side Events
< 5’	7
< 10’	20
< 15’	32
< 20’	40
< 25’	58
< 30’	70
< 35’	79
< 40’	95
< 50’	121
< 60’	138

5. The multiple presence probabilities were calculated for each day for each increment of headway separation by dividing the number of side-by-side cases by the total number of trucks crossings in that particular period (Table 1.6). The maximum values are given below:

Table 1.5 Multiple Presence Probabilities

Headway Separation	Multiple Presence Probabilities
< 5’	0.18
< 10’	0.37
< 15’	0.55
< 20’	0.55
< 25’	0.92
< 30’	0.92
< 35’	0.92
< 40’	1.11
< 50’	1.33
< 60’	1.37

The multiple presence probabilities for this site are quite low (<1.37%) compared to past assumptions. LRFD used an assumed multiple presence probability of 1/15 (=6.7%). The site has moderate to heavy truck traffic typical of many Interstate highways.

Multiple presence should be viewed in conjunction with bridge span. A larger definition of headway separation may produce a higher multiple presence but may have a lower total moment. Headway separation of 60 ft, gives a total moment of (1+0.65) on a 200 ft span and much lower values on shorter spans. For short spans a headway separation greater than 30 ft may not be significant for moments. So the 1/15 assumption is very conservative even for high ADTT.

Side-by-side occurrences				Black Canyon I-84, IDAHO																			
Date/Lanes	# of trucks		ADTT	Data Duration	Side-by-side occurrence as a function of headway distance																			
	Lane				<5ft		<10ft		<15ft		<20ft		<25ft		<30ft		<35ft		<40ft		<50ft		<60ft	
	0 or 1	2 or 3		(hrs)	# of cases	%	# of cases	%	# of cases	%	# of cases	%	# of cases	%	# of cases	%	# of cases	%	# of cases	%	# of cases	%	# of cases	%
10/26-27/4 Lanes 0&2	2208	222	2958	19.7	0	0	0	0	0	0	2	0.08	2	0.08	2	0.08	2	0.08	2	0.08	4	0.16	4	0.16
10/26-27/4 Lanes 1&3	2444	187	2764	22.8	0	0	1	0.04	2	0.08	3	0.11	4	0.15	4	0.15	4	0.15	4	0.15	4	0.15	6	0.23
10/27-28/4 Lanes 0&2	2409	213	2698	23.3	1	0.04	7	0.27	9	0.34	10	0.38	17	0.65	21	0.8	25	0.95	29	1.11	35	1.33	36	1.37
10/27-28/4 Lanes 1&3	2797	182	3119	22.9	2	0.07	3	0.1	4	0.13	6	0.2	10	0.34	11	0.37	11	0.37	16	0.54	19	0.64	22	0.74
10/28-29/4 Lanes 0&2	2127	248	2509	22.7	3	0.13	4	0.17	6	0.25	8	0.34	10	0.42	13	0.55	14	0.59	17	0.72	21	0.88	26	1.09
10/28-29/4 Lanes 1&3	2510	213	2875	22.7	0	0	2	0.07	6	0.22	6	0.22	7	0.26	7	0.26	8	0.29	10	0.37	19	0.7	25	0.92
10/31/04 Lanes 0&2	1096	96	1773	16.1	0	0	1	0.08	1	0.08	1	0.08	1	0.08	3	0.25	4	0.34	5	0.42	6	0.5	6	0.5
10/31/4 Lanes 1&3	1804	80	2792	16.2	0	0	0	0	1	0.05	1	0.05	2	0.11	2	0.11	2	0.11	2	0.11	2	0.11	2	0.11
11/1/4 Lanes 0&2	479	67	1169	11.2	1	0.18	2	0.37	3	0.55	3	0.55	5	0.92	5	0.92	5	0.92	5	0.92	5	0.92	5	0.92
11/1/04 Lanes 1&3	896	47	2037	11.1	0	0	0	0	0	0	0	0	0	0	2	0.21	4	0.42	5	0.53	6	0.64	6	0.64

Notes: 1. No data are available for Oct.29 to Oct.31.
2. ADTT is calculated using the recorded vehicles.
3. Lanes 0,1 are right lanes; lanes 2,3 are left lanes

Table 1.6 Idaho Multiple Presence Probabilities

2) Ohio I-75 (3 Lanes)

Side-by-side occurrences, 8/29/05 G.Fu **I-75 NB Wood County, OH (3-lane freeway with only 2 lanes instrumeted)**

Date/Lanes	# of trucks Lane 1	Lane 2	ADTT	data duration (hrs)	Side-by-side occupation as function of definition (headway distance) <5ft # of cases	%	<10ft # of cases	%	<15ft # of cases	%	<20ft # of cases	%	<25ft # of cases	%	<30ft # of cases	%	<35ft # of cases	%	<40ft # of cases	%	<50ft # of cases	%	<60ft # of cases	%
8/20/2005 0:00-14:00 (Saturday) Lanes 1 & 2	1626	1364	5126	14.0	6	0.2	13	0.43	19	0.64	23	0.77	29	0.97	36	1.2	42	1.4	49	1.64	57	1.91	88	2.94
8/20/05 15:00-24:00 (Saturday) Lanes 1&2	707	588	3453	9.0	0	0	1	0.08	2	0.15	3	0.23	4	0.31	7	0.54	7	0.54	7	0.54	13	1	16	1.24
8/22/05 0:00-10:00 (Monday) Lanes 1&2	1646	1500	7550	10.0	7	0.22	10	0.32	17	0.54	24	0.76	29	0.92	32	1.02	39	1.24	50	1.59	62	1.97	86	2.73
8/22/05 10:00-24:00 (Monday) Lanes 1&2	2885	3270	10551	14.0	16	0.26	31	0.5	44	0.71	52	0.84	69	1.12	79	1.28	104	1.69	122	1.98	159	2.58	206	3.35

Notes: 1. ADTT is calculated using the recorded vehicles.
2. Any two of these time periods may be combined to find an averaged adtt and percentage of side-side cases.

Table 1.7 - Ohio I-75 Multiple Presence Probabilities

Appendix G

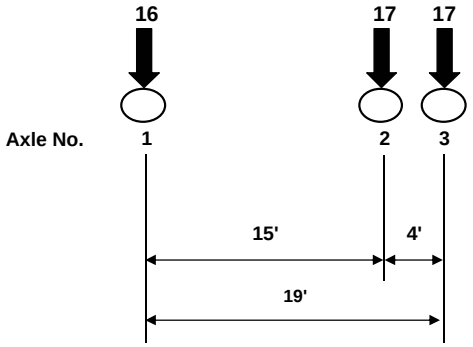
ODOT's Load Rating Vehicles & Weight Tables

OREGON LEGAL LOADS - Load Rating Tier-2

Indicated concentrated loads are axle loads in kips

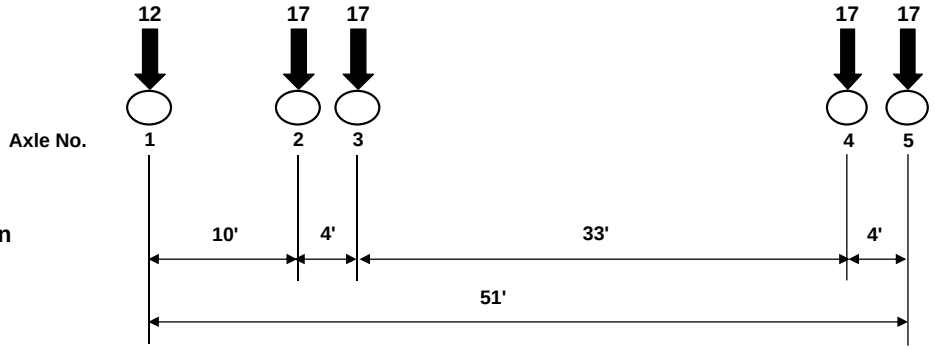
TYPE 3 Legal Truck

3 Axle Vehicle
Gross Weight = 50 k



TYPE 3S2 Legal truck

5 Axle Vehicle
Gross Weight = 80 k

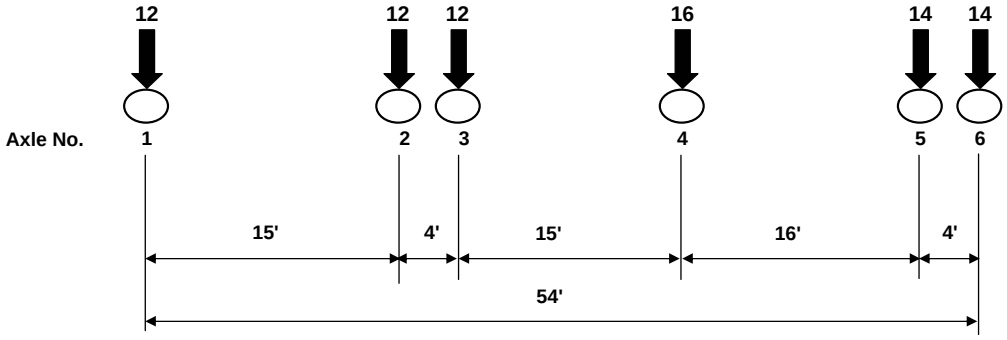


Note:
This truck is greater than the standard AASHTO Type 3S2, which has Gross Weight = 72 k

---

TYPE 3-3 Legal Truck

6 Axle Vehicle
Gross Weight = 80 k

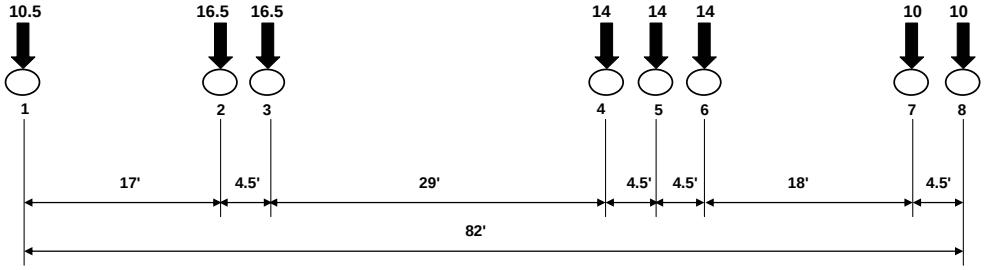


OREGON CONTINUOUS TRIP PERMIT (CTP) LOADS - Load Rating Tier-2

Indicated concentrated loads are axle loads in kips

Type OR-CTP-2A

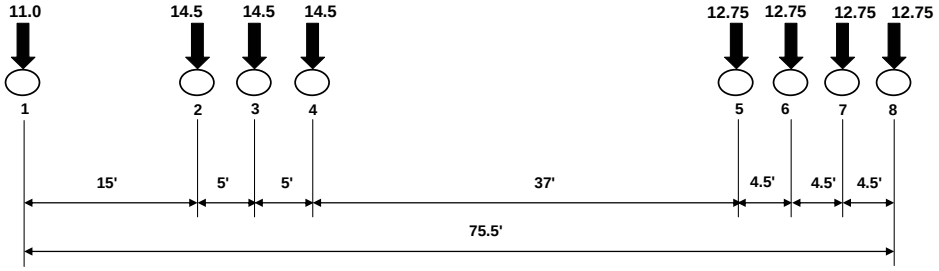
8 Axle Vehicle
Gross Weight = 105.5 k



Representative Sample of
Annual Extended Weight Permit
Weight Table 2
MCTD refers to this as a
"Canadian Mule Train"
(This load was not used in Tier-1)

Type OR-CTP-2B

8 Axle Vehicle
Gross Weight = 105.5 k

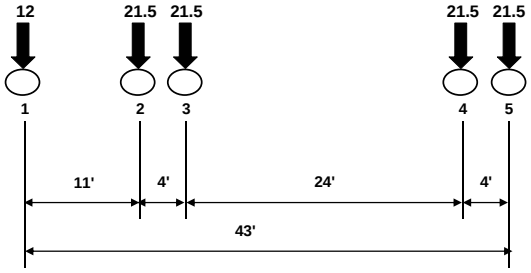


Representative Sample of
Annual Extended Weight Permit
Weight Table 2
Maximum 4-axle group

(This load was not used in Tier-1)

Type OR-CTP-3

5 Axle Vehicle
Gross Weight = 98 k



Representative Sample of
Annual Heavy Haul Permit
Weight Table 3

(Similar to "Permit-1" in Tier-1)

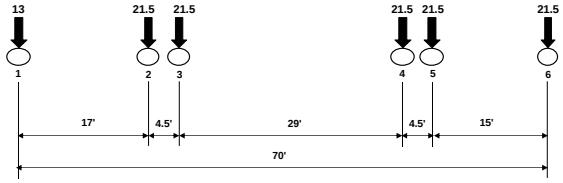
Note:
"Extended Weight" is a term that refers to trucks with axles or tandems the same as Legal Loads (20 k single-axle, 34 k tandem) but have a maximum GVW of 105.5 k. These are found in Weight Table 2. Examples of these include log trucks and milk tank trucks.

OREGON SINGLE-TRIP PERMIT (STP) LOADS - Load Rating Tier-2

Indicated concentrated loads are axle loads in kips

Type OR-STP-3

6 Axle Vehicle
Gross Weight = 120.5 k

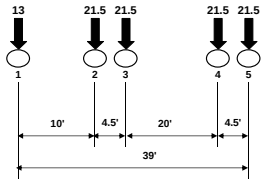


Representative Sample of
Single Trip Permit
in Weight Table 3

(Same as "Permit-5" in Tier-1)

Type OR-STP-4A

5 Axle Vehicle
Gross Weight = 99 k

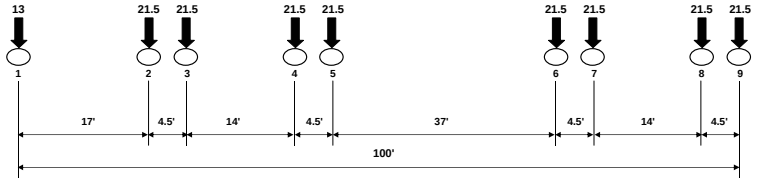


Representative Sample of
Short Single Trip Permit
in Weight Table 4

(Similar to "Permit-2" in Tier-1)

Type OR-STP-4B

9 Axle Vehicle
Gross Weight = 185 k

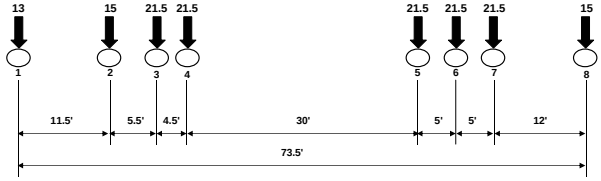


Representative Sample of
Long Single Trip Permit
in Weight Table 4

(Similar to "Permit-7" in Tier-1)

Type OR-STP-5A

8 Axle Vehicle
Gross Weight = 150.5 k

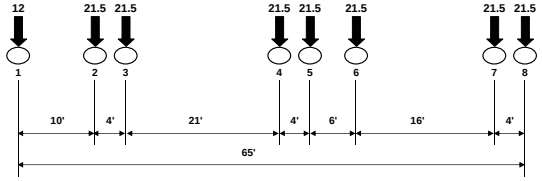


Representative Sample of
Single Trip Permit
in Weight Table 5

(Same as "Permit-6" in Tier-1)

Type OR-STP-5B

8 Axle Vehicle
Gross Weight = 162.5 k

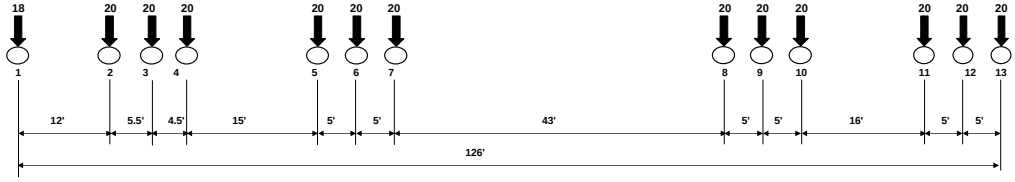


Representative Sample of
Single Trip Permit
in Weight Table 5

(Similar to "Permit-3" in Tier-1)

Type OR-STP-5C

13 Axle Vehicle
Gross Weight = 258 k

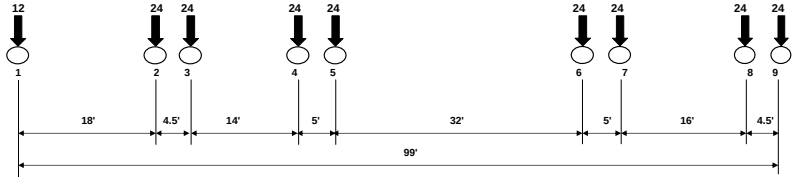


Representative Sample of
Single Trip Permit
in Weight Table 5

(This load was not used in Tier-1)

Type OR-STP-5BW

9 Axle Vehicle
Gross Weight = 204 k



Representative Sample
Single-Trip Permit
with Bonus Weights
in Weight Table 5
(Replaces "Permit-4" in Tier-1)

OREGON LOAD RATING TRUCKS - Load Rating Tier-2

LOAD GROUP	TIER-2 LOAD DESIGNATION	TYPE OF LOAD	G.V.W.	MCTD WEIGHT TABLE	NOTES	Corresponding Tier-1 Truck Designation	Corresponding OSU Study Designation
Design Loads	---	Design Load	72 k	---	Required for NBI reporting in the past, not used in Tier-2.	HS-20	Vehicle 1
	HL-93 Truck	Design Load	72 k	---	The most critical of the three HL-93 combination loads (below) will now be used for NBI reporting. Not used in Tier-1.	---	---
	HL-93 Tandem	Design Load	50 k	---		---	---
	HL-93 Truck + Lane	Design Load Combination (required by LRFR)	---	---	HL-93 Truck applied with 0.640 k/ft lane	---	---
	HL-93 Tandem + Lane	Design Load Combination (required by LRFR)	---	---	HL-93 Tandem applied with 0.640 k/ft lane	---	---
	HL-93 Truck Train + Lane	Design Load Combination (required by LRFR)	---	---	Train of 2 HL-93 Trucks @ 90% applied with 0.640 k/ft lane @ 90%	---	---
Legal Loads	Type 3	Legal Load	50 k	Weight Table 1	Same as AASHTO Legal Type 3	Type 3	Vehicle 2
	Type 3S2	Legal Load	80 k	Weight Table 1	Different than standard AASHTO 3S2, which is 72 k.	Type 3S2	Vehicle 3
	Type 3-3	Legal Load	80 k	Weight Table 1	Same as AASHTO Legal Type 3-3	Type 3-3	Vehicle 4
	Type 3-3 Train + Legal Lane	Legal Load Combination (required by LRFR)	---	---	Train of 2 Legal Type 3-3's @ 75% applied with 0.2 k/ft lane load. Not used in Tier-1.	---	---
	Type 3-3 + Legal Lane	Legal Load Combination (required by LRFR)	---	---	Legal Type 3-3 @ 75% applied with 0.2 k/ft lane load. Used only for Spans > 200 ft. Not used in Tier-1.	---	---
Continuous Trip Permit Loads	Type CTP-2A	Annual Extended Weight Permit	105.5 k	Weight Table 2	MCTD refers to this as a "Canadian Mule Train"	(Permit 8)	---
	Type CTP-2B	Annual Extended Weight Permit	105.5 k	Weight Table 2	Contains maximum allowable 4-axle cluster	(Permit 9)	---
	Type CTP-3	Annual Heavy Haul Permit	98 k	Weight Table 3	Heavy Haul that maximizes Weight Table 3	Permit 1	Vehicle 5
Single Trip Permit Loads	Type STP-3	Single Trip Permit	120.5 k	Weight Table 3	In Tier-1, was used for Local Agency bridges only	Permit 5	Vehicle 9
	Type STP-4A	Single Trip Permit	99 k	Weight Table 4	In Tier-1, was considered representative of CTP's	Permit 2	Vehicle 6
	Type STP-4B	Single Trip Permit	185 k	Weight Table 4	In Tier-1, was used for Local Agency bridges only	Permit 7	Vehicle 11
	Type STP-5A	Single Trip Permit	150.5 k	Weight Table 5	In Tier-1, was used for Local Agency bridges only	Permit 6	Vehicle 10
	Type STP-5B	Single Trip Permit	162.5 k	Weight Table 5	In Tier-1, was considered representative of Weight Table 4	Permit 3	Vehicle 7
	Type STP-5C	Single Trip Permit	258 k	Weight Table 5	Represents upper range of WT-5, heavy 6-axle group in 36 ft	---	---
	Type STP-5BW	Single Trip Permit	204 k	Weight Table 5 with Bonus Weights	In Tier-1, was considered representative of Weight Table 5	Permit 4	Vehicle 8

Shading indicates the loadings to be investigated and reported for ODOT Tier-2 load ratings. The "Type 3-3 + Legal Lane" loading applies only to spans > 200 ft.

LIVELOAD LEVELS OF SERVICE - Load Rating Tier-2

TYPE OF LOAD	Max. G.V.W.	WEIGHT TABLE	REPRESENTATIVE RATING TRUCKS
Oregon Legal Loads	80 k	Table 1	Types 3, 3S2, 3-3
Annual (Continuous Trip) Extended Weight Permit	105.5 k	Table 2	Types CTP-2A, CTP-2B
Annual (Continuous Trip) Heavy Haul Permit	98 k	Table 3	Type CTP-3
Single Trip Permits	228 k	Table 3	Type STP-3
	266 k	Table 4	Types STP-4A and STP-4B
	304 k	Table 5	Types STP-5A, STP-5B, STP-5C, STP-5BW
Super-Loads (require specific evaluation)		Beyond Table 5	---

OREGON DEPARTMENT OF TRANSPORTATION
MOTOR CARRIER TRANSPORTATION DIVISION
TRANSPORTATION PERMIT UNIT
550 CAPITOL ST NE
SALEM OREGON 97301-2530

Permit Weight Table 1

The following exceptions apply to the table of weights shown below:

Exception 1: Two consecutive tandem axles may weigh up to 34,000 pounds each if:

Minimum Axle Spacing Required	Interstate Highways	Non-Interstate Highways
30 feet or more	Permit Required	No Permit Required
36 feet or more	No Permit Required	No Permit Required

Exception 2: A group of four axles consisting of a set of tandem axles and two axles spaced nine feet or more apart may have a loaded weight of more than 65,500 pounds and up to 70,000 pounds if:

Minimum Axle Spacing Required	Interstate Highways	Non-Interstate Highways
35 feet or more	Permit Required	No Permit Required

- Minimum axle spacing is the distance between the first and last axle of any group shown above.

Wheelbase In Feet * ▼	Number of Axles						Wheelbase In Feet * ▼	Number of Axles					
	2	3	4	5	6	7 Or More		2	3	4	5	6	7 Or More
4	34,000	34,000	34,000	34,000	34,000	34,000	**31**	40,000	59,000	62,500	67,500	72,500	78,000
5	34,000	34,000	34,000	34,000	34,000	34,000	**32**	40,000	60,000	63,500	68,000	73,000	78,500
6	34,000	34,000	34,000	34,000	34,000	34,000	**33**	40,000	60,000	64,000	68,500	74,000	79,000
7	34,000	34,000	34,000	34,000	34,000	34,000	**34**	40,000	60,000	64,500	69,000	74,500	80,000
8 & less	34,000	34,000	34,000	34,000	34,000	34,000	**35**	40,000	60,000	65,500	70,000	75,000	80,000
Over 8	38,000	42,000	42,000	42,000	42,000	42,000	**36**	40,000	60,000	66,000	70,500	75,500	80,000
9	39,000	42,500	42,500	42,500	42,500	42,500	**37**	40,000	60,000	66,500	71,000	76,000	80,000
10	40,000	43,500	43,500	43,500	43,500	43,500	**38**	40,000	60,000	67,500	71,500	77,000	80,000
11	40,000	44,000	44,000	44,000	44,000	44,000	**39**	40,000	60,000	68,000	72,500	77,500	80,000
12	40,000	45,000	50,000	50,000	50,000	50,000	**40**	40,000	60,000	68,500	73,000	78,000	80,000
13	40,000	45,500	50,500	50,500	50,500	50,500	**41**	40,000	60,000	69,500	73,500	78,500	80,000
14	40,000	46,500	51,500	51,500	51,500	51,500	**42**	40,000	60,000	70,000	74,000	79,000	80,000
15	40,000	47,000	52,000	52,000	52,000	52,000	**43**	40,000	60,000	70,500	75,000	80,000	80,000
16	40,000	48,000	52,500	58,000	58,000	58,000	**44**	40,000	60,000	71,500	75,500	80,000	80,000
17	40,000	48,500	53,500	58,500	58,500	58,500	**45**	40,000	60,000	72,000	76,000	80,000	80,000
18	40,000	49,500	54,000	59,000	59,000	59,000	**46**	40,000	60,000	72,500	76,500	80,000	80,000
19	40,000	50,000	54,500	60,000	60,000	60,000	**47**	40,000	60,000	73,500	77,500	80,000	80,000
20	40,000	51,000	55,500	60,500	66,000	66,000	**48**	40,000	60,000	74,000	78,000	80,000	80,000
21	40,000	51,500	56,000	61,000	66,500	66,500	**49**	40,000	60,000	74,500	78,500	80,000	80,000
22	40,000	52,500	56,500	61,500	67,000	67,000	**50**	40,000	60,000	75,500	79,000	80,000	80,000
23	40,000	53,000	57,500	62,500	68,000	68,000	**51**	40,000	60,000	76,000	80,000	80,000	80,000
24	40,000	54,000	58,000	63,000	68,500	74,000	**52**	40,000	60,000	76,500	80,000	80,000	80,000
25	40,000	54,500	58,500	63,500	69,000	74,500	**53**	40,000	60,000	77,500	80,000	80,000	80,000
26	40,000	55,500	59,500	64,000	69,500	75,000	**54**	40,000	60,000	78,000	80,000	80,000	80,000
27	40,000	56,000	60,000	65,000	70,000	75,500	**55**	40,000	60,000	78,500	80,000	80,000	80,000
28	40,000	57,000	60,500	65,500	71,000	76,500	**56**	40,000	60,000	79,500	80,000	80,000	80,000
29	40,000	57,500	61,500	66,000	71,500	77,000	**57 or**	40,000	60,000	80,000	80,000	80,000	80,000
30	40,000	58,500	62,000	66,500	72,000	77,500	**more**						

The loaded weight of any group of axles, vehicle, or combination of vehicles shall not exceed that specified in the table of weights shown above or any of the following:

- The manufacturer's side wall tire rating but not to exceed 600 pounds per inch of tire width.
- 600 pounds per inch of tire width.
- 20,000 pounds on any one axle, including any one axle of a group of axles.
- 34,000 pounds on any tandem axle.
- The sum of the permittable axle, tandem axle, or group of axle weights shown above, whichever is less.

Note exceptions 1 and 2 above.

Distance measured to the nearest foot; when exactly 1/2 foot or more, round up to the next larger number.

OREGON DEPARTMENT OF TRANSPORTATION
MOTOR CARRIER TRANSPORTATION DIVISION
550 CAPITOL ST NE
SALEM OR 97301-2530

PERMIT WEIGHT TABLE
2

WHEELBASE	5 Axles	6 Axles	7 Axles	8 or More Axles
47	77500	81000	81000	81000
48	78000	82000	82000	82000
49	78500	83000	83000	83000
50	79000	84000	84000	84000
51	80000	84500	85000	85000
52	80500	85000	86000	86000
53	81000	86000	87000	87000
54	81500	86500	88000	91000
55	82500	87000	89000	92000
56	83000	87500	90000	93000
57	83500	88000	91000	94000
58	84000	89000	92000	95000
59	85000	89500	93000	96000
60	85500	90000	94000	97000
61	86000	90500	95000	98000
62	87000	91000	96000	99000
63	87500	92000	97000	100000
64	88000	92500	97500	101000
65	88500	93000	98000	102000
66	89000	93500	98500	103000
67	90000	94000	99000	104000
68	90000	95000	99500	105000
69	90000	95500	100000	105500
70	90000	96000	101000	105500
71	90000	96500	101500	105500
72	90000	96500	102000	105500
73	90000	96500	102500	105500
74	90000	96500	103000	105500
75	90000	96500	104000	105500
76	90000	96500	104500	105500
77	90000	96500	105000	105500
78	90000	96500	105500	105500

See Weight Table 1, if using less than five axles or 47 feet wheelbase.

OREGON DEPARTMENT OF TRANSPORTATION
MOTOR CARRIER TRANSPORTATION DIVISION
550 CAPITOL ST NE
SALEM OR 97301-2530

PERMIT WEIGHT TABLE 3

WHEELBASE

	2 Axles	3 Axles	4 Axles	5 Axles	6 Axles	7 Axles	8 Axles	9 Axles	10 Axles	11 Axles	12 Axles	13 Axles	14 Axles	15 Axles	16 Axles	17 Axles	18 Axles	19 Axles	20 Axles
4	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000
5	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000
6	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000
7	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000
8	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000
OVER 8 (BUT LESS THAN 8'6")																			
	43,000	48,000	48,000	48,000	48,000	48,000	48,000	48,000	48,000	48,000	48,000	48,000	48,000	48,000	48,000	48,000	48,000	48,000	48,000
9	43,000	49,000	49,000	49,000	49,000	49,000	49,000	49,000	49,000	49,000	49,000	49,000	49,000	49,000	49,000	49,000	49,000	49,000	49,000
10	43,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
11	43,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000
12	43,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000
13	43,000	53,000	53,000	53,000	53,000	53,000	53,000	53,000	53,000	53,000	53,000	53,000	53,000	53,000	53,000	53,000	53,000	53,000	53,000
14	43,000	54,000	54,000	54,000	54,000	54,000	54,000	54,000	54,000	54,000	54,000	54,000	54,000	54,000	54,000	54,000	54,000	54,000	54,000
15	43,000	55,000	55,000	55,000	55,000	55,000	55,000	55,000	55,000	55,000	55,000	55,000	55,000	55,000	55,000	55,000	55,000	55,000	55,000
16	43,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000
17	43,000	57,000	57,000	57,000	57,000	57,000	57,000	57,000	57,000	57,000	57,000	57,000	57,000	57,000	57,000	57,000	57,000	57,000	57,000
18	43,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000
19	43,000	64,500	70,800	70,800	70,800	70,800	70,800	70,800	70,800	70,800	70,800	70,800	70,800	70,800	70,800	70,800	70,800	70,800	70,800
20	43,000	64,500	72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000
21	43,000	64,500	73,200	73,200	73,200	73,200	73,200	73,200	73,200	73,200	73,200	73,200	73,200	73,200	73,200	73,200	73,200	73,200	73,200
22	43,000	64,500	74,400	74,400	74,400	74,400	74,400	74,400	74,400	74,400	74,400	74,400	74,400	74,400	74,400	74,400	74,400	74,400	74,400
23	43,000	64,500	75,600	75,600	75,600	75,600	75,600	75,600	75,600	75,600	75,600	75,600	75,600	75,600	75,600	75,600	75,600	75,600	75,600
24	43,000	64,500	76,800	76,800	76,800	76,800	76,800	76,800	76,800	76,800	76,800	76,800	76,800	76,800	76,800	76,800	76,800	76,800	76,800
25	43,000	64,500	78,000	78,000	78,000	78,000	78,000	78,000	78,000	78,000	78,000	78,000	78,000	78,000	78,000	78,000	78,000	78,000	78,000
26	43,000	64,500	79,200	79,200	79,200	79,200	79,200	79,200	79,200	79,200	79,200	79,200	79,200	79,200	79,200	79,200	79,200	79,200	79,200
27	43,000	64,500	80,400	80,400	80,400	80,400	80,400	80,400	80,400	80,400	80,400	80,400	80,400	80,400	80,400	80,400	80,400	80,400	80,400
28	43,000	64,500	81,600	81,600	81,600	81,600	81,600	81,600	81,600	81,600	81,600	81,600	81,600	81,600	81,600	81,600	81,600	81,600	81,600
29	43,000	64,500	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800	82,800
30	43,000	64,500	84,000	84,000	84,000	84,000	84,000	84,000	84,000	84,000	84,000	84,000	84,000	84,000	84,000	84,000	84,000	84,000	84,000
31	43,000	64,500	85,200	85,200	85,200	85,200	85,200	85,200	85,200	85,200	85,200	85,200	85,200	85,200	85,200	85,200	85,200	85,200	85,200
32	43,000	64,500	86,000	86,400	86,400	86,400	86,400	86,400	86,400	86,400	86,400	86,400	86,400	86,400	86,400	86,400	86,400	86,400	86,400
33	43,000	64,500	86,000	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600	87,600
34	43,000	64,500	86,000	88,800	88,800	88,800	88,800	88,800	88,800	88,800	88,800	88,800	88,800	88,800	88,800	88,800	88,800	88,800	88,800
35	43,000	64,500	86,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000
36	43,000	64,500	86,000	91,200	91,200	91,200	91,200	91,200	91,200	91,200	91,200	91,200	91,200	91,200	91,200	91,200	91,200	91,200	91,200
37	43,000	64,500	86,000	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400
38	43,000	64,500	86,000	93,600	93,600	93,600	93,600	93,600	93,600	93,600	93,600	93,600	93,600	93,600	93,600	93,600	93,600	93,600	93,600
39	43,000	64,500	86,000	94,800	94,800	94,800	94,800	94,800	94,800	94,800	94,800	94,800	94,800	94,800	94,800	94,800	94,800	94,800	94,800
40	43,000	64,500	86,000	96,000	96,000	96,000	96,000	96,000	96,000	96,000	96,000	96,000	96,000	96,000	96,000	96,000	96,000	96,000	96,000
41	43,000	64,500	86,000	97,200	97,200	97,200	97,200	97,200	97,200	97,200	97,200	97,200	97,200	97,200	97,200	97,200	97,200	97,200	97,200
42	43,000	64,500	86,000	98,400	98,400	98,400	98,400	98,400	98,400	98,400	98,400	98,400	98,400	98,400	98,400	98,400	98,400	98,400	98,400
43	43,000	64,500	86,000	99,600	99,600	99,600	99,600	99,600	99,600	99,600	99,600	99,600	99,600	99,600	99,600	99,600	99,600	99,600	99,600
44	43,000	64,500	86,000	100,800	100,800	100,800	100,800	100,800	100,800	100,800	100,800	100,800	100,800	100,800	100,800	100,800	100,800	100,800	100,800
45	43,000	64,500	86,000	102,000	102,000	102,000	102,000	102,000	102,000	102,000	102,000	102,000	102,000	102,000	102,000	102,000	102,000	102,000	102,000
46	43,000	64,500	86,000	103,200	103,200	103,200	103,200	103,200	103,200	103,200	103,200	103,200	103,200	103,200	103,200	103,200	103,200	103,200	103,200
47	43,000	64,500	86,000	104,400	104,400	104,400	104,400	104,400	104,400	104,400	104,400	104,400	104,400	104,400	104,400	104,400	104,400	104,400	104,400
48	43,000	64,500	86,000	105,600	105,600	105,600	105,600	105,600	105,600	105,600	105,600	105,600	105,600	105,600	105,600	105,600	105,600	105,600	105,600
49	43,000	64,500	86,000	106,800	106,800	106,800	106,800	106,800	106,800	106,800	106,800	106,800	106,800	106,800	106,800	106,800	106,800	106,800	106,800
50	43,000	64,500	86,000	107,500	108,000	108,000	108,000	108,000	108,000	108,000	108,000	108,000	108,000	108,000	108,000	108,000	108,000	108,000	108,000
51	43,000	64,500	86,000	107,500	109,200	109,200	109,200	109,200	109,200	109,200	109,200	109,200	109,200	109,200	109,200	109,200	109,200	109,200	109,200
52	43,000	64,500	86,000	107,500	110,400	110,400	110,400	110,400	110,400	110,400	110,400	110,400	110,400	110,400	110,400	110,400	110,400	110,400	110,400
53	43,000	64,500	86,000	107,500	111,600	111,600	111,600	111,600	111,600	111,600	111,600	111,600	111,600	111,600	111,600	111,600	111,600	111,600	111,600
54	43,000	64,500	86,000	107,500	112,800	112,800	112,800	112,800	112,800	112,800	112,800	112,800	112,800	112,800	112,800	112,800	112,800	112,800	112,800
55	43,000	64,500	86,000	107,500	114,000	114,000	114,000	114,000	114,000	114,000	114,000	114,000	114,000	114,000	114,000	114,000	114,000	114,000	114,000
56	43,000	64,500	86,000	107,500	115,200	115,200	115,200	115,200	115,200	115,200	115,200	115,200	115,200	115,200	115,200	115,200	115,200	115,200	115,200
57	43,000	64,500	86,000	107,500	116,400	116,400	116,400	116,400	116,400	116,400	116,400	116,400	116,400	116,400	116,400	116,400	116,400	116,400	116,400
58	43,000	64,500	86,000	107,500	117,600	117,600	117,600	117,600	117,600	117,600	117,600	117,600	117,600	117,600	117,600	117,600	117,600	117,600	117,600
59	43,000	64,500	86,000	107,500	118,800	118,800	118,800	118,800	118,800	118,800	118,800	118,800	118,800	118,800	118,800	118,800	118,800	118,800	118,800
60	43,000	64,500	86,000	107,500	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000
61	43,000	64,500	86,000	107,500	121,200	121,200	121,200	121,200	121,200	121,200	121,200	121,200	121,200	121,200	121,200	121,200	121,200	121,200	121,200
62	43,000	64,500	86,000	107,500	122,400	122,400	122,400	122,400	122,400	122,400	122,400	122,400	122,400	122,400	122,400	122,400	122,400	122,400	122,400
63	43,000	64,500	86,000	107,500	123,600	123,600	123,600	123,600	123,600	123,600	123,600	123,600	123,600	123,600	123,600	123,600	123,600	123,600	123,600
64	43,000	64,500	86,000	107,500	124,800	124,800	124,800	124,800	124,800	124,800	124,800	124,800	124,800	124,800	124,800	124,800	124,800	124,800	124,800
65	43,000	64,500	86,000	107,500	126,000	126,000	126,000	126,000	126,000	126,000	126,000	126,000	126,000	126,000	126,000	126,000	126,000	126,000	126,000
66	43,000	64,500	86,000	107,500	127,200	127,200	127,200	127,200	127,200	127,200	127,200	127,200	127,200	127,200	127,200	127,200	127,200	127,200	127,200
67	43,000	64,500	86,000	107,500	128,400	128,400	128,400	128,400	128,400	128,400	128,400	128,400	128,400	128,400	128,400	128,400	128,400	128,400	128,400
68	43,000	64,500	86,000	107,500	129,000	129,600	129,600	129,600	129,600	129,600	129,600	129,600	129,600	129,600	129,600	129,600	129,600	129,600	129,600
69	43,000	64,500	86,000	107,500	129,000	130,800	130,800	130,800	130,800	130,800	130,800	130,800	130,800	130,800	130,800	130,800	130,800	130,800	130,800
70	43,000	64,500	86,000	107,500	129,000	132,000	132,000	132,000	132,000	132,000	132,000	132,000	132,000	132,000	132,000	132,000	132,000	132,000	132,000

● DISTANCE MEASURED TO THE NEAREST FOOT. WHEN EXACTLY 1/2 FOOT OR MORE, ROUND UP TO THE NEXT LARGER NUMBER ●

WHEELBASE	2 Axles	3 Axles	4 Axles	5 Axles	6 Axles	7 Axles	8 Axles	9 Axles	10 Axles	11 Axles	12 Axles	13 Axles	14 Axles	15 Axles	16 Axles	17 Axles	18 Axles	19 Axles	20 Axles
71	43,000	64,500	86,000	107,500	129,000	133,200	133,200	133,200	133,200	133,200	133,200	133,200	133,200	133,200	133,200	133,200	133,200	133,200	133,200
72	43,000	64,500	86,000	107,500	129,000	134,400	134,400	134,400	134,400	134,400	134,400	134,400	134,400	134,400	134,400	134,400	134,400	134,400	134,400
73	43,000	64,500	86,000	107,500	129,000	135,600	135,600	135,600	135,600	135,600	135,600	135,600	135,600	135,600	135,600	135,600	135,600	135,600	135,600
74	43,000	64,500	86,000	107,500	129,000	136,800	136,800	136,800	136,800	136,800	136,800	136,800	136,800	136,800	136,800	136,800	136,800	136,800	136,800
75	43,000	64,500	86,000	107,500	129,000	138,000	138,000	138,000	138,000	138,000	138,000	138,000	138,000	138,000	138,000	138,000	138,000	138,000	138,000
76	43,000	64,500	86,000	107,500	129,000	139,200	139,200	139,200	139,200	139,200	139,200	139,200	139,200	139,200	139,200	139,200	139,200	139,200	139,200
77	43,000	64,500	86,000	107,500	129,000	140,400	140,400	140,400	140,400	140,400	140,400	140,400	140,400	140,400	140,400	140,400	140,400	140,400	140,400
78	43,000	64,500	86,000	107,500	129,000	141,600	141,600	141,600	141,600	141,600	141,600	141,600	141,600	141,600	141,600	141,600	141,600	141,600	141,600
79	43,000	64,500	86,000	107,500	129,000	142,800	142,800	142,800	142,800	142,800	142,800	142,800	142,800	142,800	142,800	142,800	142,800	142,800	142,800
80	43,000	64,500	86,000	107,500	129,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000
81	43,000	64,500	86,000	107,500	129,000	145,200	145,200	145,200	145,200	145,200	145,200	145,200	145,200	145,200	145,200	145,200	145,200	145,200	145,200
82	43,000	64,500	86,000	107,500	129,000	146,400	146,400	146,400	146,400	146,400	146,400	146,400	146,400	146,400	146,400	146,400	146,400	146,400	146,400
83	43,000	64,500	86,000	107,500	129,000	147,600	147,600	147,600	147,600	147,600	147,600	147,600	147,600	147,600	147,600	147,600	147,600	147,600	147,600
84	43,000	64,500	86,000	107,500	129,000	148,800	148,800	148,800	148,800	148,800	148,800	148,800	148,800	148,800	148,800	148,800	148,800	148,800	148,800
85	43,000	64,500	86,000	107,500	129,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
86	43,000	64,500	86,000	107,500	129,000	150,500	151,200	151,200	151,200	151,200	151,200	151,200	151,200	151,200	151,200	151,200	151,200	151,200	151,200
87	43,000	64,500	86,000	107,500	129,000	150,500	152,400	152,400	152,400	152,400	152,400	152,400	152,400	152,400	152,400	152,400	152,400	152,400	152,400
88	43,000	64,500	86,000	107,500	129,000	150,500	153,600	153,600	153,600	153,600	153,600	153,600	153,600	153,600	153,600	153,600	153,600	153,600	153,600
89	43,000	64,500	86,000	107,500	129,000	150,500	154,800	154,800	154,800	154,800	154,800	154,800	154,800	154,800	154,800	154,800	154,800	154,800	154,800
90	43,000	64,500	86,000	107,500	129,000	150,500	156,000	156,000	156,000	156,000	156,000	156,000	156,000	156,000	156,000	156,000	156,000	156,000	156,000
91	43,000	64,500	86,000	107,500	129,000	150,500	157,200	157,200	157,200	157,200	157,200	157,200	157,200	157,200	157,200	157,200	157,200	157,200	157,200
92	43,000	64,500	86,000	107,500	129,000	150,500	158,400	158,400	158,400	158,400	158,400	158,400	158,400	158,400	158,400	158,400	158,400	158,400	158,400
93	43,000	64,500	86,000	107,500	129,000	150,500	159,600	159,600	159,600	159,600	159,600	159,600	159,600	159,600	159,600	159,600	159,600	159,600	159,600
94	43,000	64,500	86,000	107,500	129,000	150,500	160,800	160,800	160,800	160,800	160,800	160,800	160,800	160,800	160,800	160,800	160,800	160,800	160,800
95	43,000	64,500	86,000	107,500	129,000	150,500	162,000	162,000	162,000	162,000	162,000	162,000	162,000	162,000	162,000	162,000	162,000	162,000	162,000
96	43,000	64,500	86,000	107,500	129,000	150,500	163,200	163,200	163,200	163,200	163,200	163,200	163,200	163,200	163,200	163,200	163,200	163,200	163,200
97	43,000	64,500	86,000	107,500	129,000	150,500	164,400	164,400	164,400	164,400	164,400	164,400	164,400	164,400	164,400	164,400	164,400	164,400	164,400
98	43,000	64,500	86,000	107,500	129,000	150,500	165,600	165,600	165,600	165,600	165,600	165,600	165,600	165,600	165,600	165,600	165,600	165,600	165,600
99	43,000	64,500	86,000	107,500	129,000	150,500	166,800	166,800	166,800	166,800	166,800	166,800	166,800	166,800	166,800	166,800	166,800	166,800	166,800
100	43,000	64,500	86,000	107,500	129,000	150,500	168,000	168,000	168,000	168,000	168,000	168,000	168,000	168,000	168,000	168,000	168,000	168,000	168,000
101	43,000	64,500	86,000	107,500	129,000	150,500	169,200	169,200	169,200	169,200	169,200	169,200	169,200	169,200	169,200	169,200	169,200	169,200	169,200
102	43,000	64,500	86,000	107,500	129,000	150,500	170,400	170,400	170,400	170,400	170,400	170,400	170,400	170,400	170,400	170,400	170,400	170,400	170,400
103	43,000	64,500	86,000	107,500	129,000	150,500	171,600	171,600	171,600	171,600	171,600	171,600	171,600	171,600	171,600	171,600	171,600	171,600	171,600
104	43,000	64,500	86,000	107,500	129,000	150,500	172,000	172,800	172,800	172,800	172,800	172,800	172,800	172,800	172,800	172,800	172,800	172,800	172,800
105	43,000	64,500	86,000	107,500	129,000	150,500	172,000	174,000	174,000	174,000	174,000	174,000	174,000	174,000	174,000	174,000	174,000	174,000	174,000
106	43,000	64,500	86,000	107,500	129,000	150,500	172,000	175,200	175,200	175,200	175,200	175,200	175,200	175,200	175,200	175,200	175,200	175,200	175,200
107	43,000	64,500	86,000	107,500	129,000	150,500	172,000	176,400	176,400	176,400	176,400	176,400	176,400	176,400	176,400	176,400	176,400	176,400	176,400
108	43,000	64,500	86,000	107,500	129,000	150,500	172,000	177,600	177,600	177,600	177,600	177,600	177,600	177,600	177,600	177,600	177,600	177,600	177,600
109	43,000	64,500	86,000	107,500	129,000	150,500	172,000	178,800	178,800	178,800	178,800	178,800	178,800	178,800	178,800	178,800	178,800	178,800	178,800
110	43,000	64,500	86,000	107,500	129,000	150,500	172,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000
111	43,000	64,500	86,000	107,500	129,000	150,500	172,000	181,200	181,200	181,200	181,200	181,200	181,200	181,200	181,200	181,200	181,200	181,200	181,200
112	43,000	64,500	86,000	107,500	129,000	150,500	172,000	182,400	182,400	182,400	182,400	182,400	182,400	182,400	182,400	182,400	182,400	182,400	182,400
113	43,000	64,500	86,000	107,500	129,000	150,500	172,000	183,600	183,600	183,600	183,600	183,600	183,600	183,600	183,600	183,600	183,600	183,600	183,600
114	43,000	64,500	86,000	107,500	129,000	150,500	172,000	184,800	184,800	184,800	184,800	184,800	184,800	184,800	184,800	184,800	184,800	184,800	184,800
115	43,000	64,500	86,000	107,500	129,000	150,500	172,000	186,000	186,000	186,000	186,000	186,000	186,000	186,000	186,000	186,000	186,000	186,000	186,000
116	43,000	64,500	86,000	107,500	129,000	150,500	172,000	187,200	187,200	187,200	187,200	187,200	187,200	187,200	187,200	187,200	187,200	187,200	187,200
117	43,000	64,500	86,000	107,500	129,000	150,500	172,000	188,400	188,400	188,400	188,400	188,400	188,400	188,400	188,400	188,400	188,400	188,400	188,400
118	43,000	64,500	86,000	107,500	129,000	150,500	172,000	189,600	189,600	189,600	189,600	189,600	189,600	189,600	189,600	189,600	189,600	189,600	189,600
119	43,000	64,500	86,000	107,500	129,000	150,500	172,000	190,800	190,800	190,800	190,800	190,800	190,800	190,800	190,800	190,800	190,800	190,800	190,800
120	43,000	64,500	86,000	107,500	129,000	150,500	172,000	192,000	192,000	192,000	192,000	192,000	192,000	192,000	192,000	192,000	192,000	192,000	192,000
121	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,200	193,200	193,200	193,200	193,200	193,200	193,200	193,200	193,200	193,200	193,200	193,200
122	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	194,400	194,400	194,400	194,400	194,400	194,400	194,400	194,400	194,400	194,400	194,400
123	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	195,600	195,600	195,600	195,600	195,600	195,600	195,600	195,600	195,600	195,600	195,600
124	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	196,800	196,800	196,800	196,800	196,800	196,800	196,800	196,800	196,800	196,800	196,800
125	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	198,000	198,000	198,000	198,000	198,000	198,000	198,000	198,000	198,000	198,000	198,000
126	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	199,200	199,200	199,200	199,200	199,200	199,200	199,200	199,200	199,200	199,200	199,200
127	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	200,400	200,400	200,400	200,400	200,400	200,400	200,400	200,400	200,400	200,400	200,400
128	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	201,600	201,600	201,600	201,600	201,600	201,600	201,600	201,600	201,600	201,600	201,600
129	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	202,800	202,800	202,800	202,800	202,800	202,800	202,800	202,800	202,800	202,800	202,800
130	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	204,000	204,000	204,000	204,000	204,000	204,000	204,000	204,000	204,000	204,000	204,000
131	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	205,200	205,200	205,200	205,200	205,200	205,200	205,200	205,200	205,200	205,200	205,200
132	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	206,400	206,400	206,400	206,400	206,400	206,400	206,400	206,400	206,400	206,400	206,400
133	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	207,600	207,600	207,600	207,600	207,600	207,600	207,600	207,600	207,600	207,600	207,600
134	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	208,800	208,800	208,800	208,800	208,800	208,800	208,800	208,800	208,800	208,800	208,800
135	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	210,000	210,000	210,000	210,000	210,000	210,000	210,000	210,000	210,000	210,000	210,000
136	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	211,200	211,200	211,200	211,200	211,200	211,200	211,200	211,200	211,200	211,200	211,200
137	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	212,400	212,400	212,400	212,400	212,400	212,400	212,400	212,400	212,400	212,400	212,400
138	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	213,600	213,600	213,600	213,600	213,600	213,600	213,600	213,600	213,600	213,600	213,600
139	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	214,800	214,800	214,800	214,800	214,800	214,800	214,800	214,800	214,800	214,800	214,800
140	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	216,000	216,000	216,000	216,000	216,000	216,000	216,000	216,000	216,000	216,000
141	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	217,200	217,200	217,200	217,200	217,200	217,200	217,200	217,200	217,200	217,200
142	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	218,400	218,400	218,400	218,400	218,400	218,400	218,400	218,400	218,400	218,400
143	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	219,600	219,600	219,600	219,600	219,600	219,600	219,600	219,600	219,600	219,600
144	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	220,800	220,800	220,800	220,800	220,800	220,800	220,800	220,800	220,800	220,800
145	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	222,000	222,000	222,000	222,000	222,000	222,000	222,000	222,000	222,000	222,000
146	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	223,200	223,200	223,200	223,200	223,200	223,200	223,200	223,200	223,200	223,200
147	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	224,400	224,400	224,400	224,400	224,400	224,400	224,400	224,400	224,400	224,400
148	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	225,600	225,600	225,600	225,600	225,600	225,600	225,600	225,600	225,600	225,600
149	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	226,800	226,800	226,800	226,800	226,800	226,800	226,800	226,800	226,800	226,800
150	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	228,000	228,000	228,000	228,000	228,000	228,000	228,000	228,000	228,000	228,000

● DISTANCE MEASURED TO THE NEAREST FOOT. WHEN EXACTLY 1/2 FOOT OR MORE, ROUND UP TO THE NEXT LARGER NUMBER ●

OREGON DEPARTMENT OF TRANSPORTATION
MOTOR CARRIER TRANSPORTATION DIVISION
550 CAPITOL ST NE
SALEM OR 97301-2530

PERMIT WEIGHT TABLE
4

WHEELBASE

	2 Axles	3 Axles	4 Axles	5 Axles	6 Axles	7 Axles	8 Axles	9 Axles	10 Axles	11 Axles	12 Axles	13 Axles	14 Axles	15 Axles	16 Axles	17 Axles	18 Axles	19 Axles	20 Axles
4	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000
5	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000
6	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000
7	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000
8	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000
OVER 8' (BUT LESS THAN 8'6")																			
	43,000	57,600	57,600	57,600	57,600	57,600	57,600	57,600	57,600	57,600	57,600	57,600	57,600	57,600	57,600	57,600	57,600	57,600	57,600
9	43,000	58,800	58,800	58,800	58,800	58,800	58,800	58,800	58,800	58,800	58,800	58,800	58,800	58,800	58,800	58,800	58,800	58,800	58,800
10	43,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
11	43,000	61,200	61,200	61,200	61,200	61,200	61,200	61,200	61,200	61,200	61,200	61,200	61,200	61,200	61,200	61,200	61,200	61,200	61,200
12	43,000	62,400	62,400	62,400	62,400	62,400	62,400	62,400	62,400	62,400	62,400	62,400	62,400	62,400	62,400	62,400	62,400	62,400	62,400
13	43,000	63,600	63,600	63,600	63,600	63,600	63,600	63,600	63,600	63,600	63,600	63,600	63,600	63,600	63,600	63,600	63,600	63,600	63,600
14	43,000	64,500	64,800	64,800	64,800	64,800	64,800	64,800	64,800	64,800	64,800	64,800	64,800	64,800	64,800	64,800	64,800	64,800	64,800
15	43,000	64,500	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000	66,000
16	43,000	64,500	67,200	67,200	67,200	67,200	67,200	67,200	67,200	67,200	67,200	67,200	67,200	67,200	67,200	67,200	67,200	67,200	67,200
17	43,000	64,500	68,400	68,400	68,400	68,400	68,400	68,400	68,400	68,400	68,400	68,400	68,400	68,400	68,400	68,400	68,400	68,400	68,400
18	43,000	64,500	69,600	69,600	69,600	69,600	69,600	69,600	69,600	69,600	69,600	69,600	69,600	69,600	69,600	69,600	69,600	69,600	69,600
19	43,000	64,500	82,600	82,600	82,600	82,600	82,600	82,600	82,600	82,600	82,600	82,600	82,600	82,600	82,600	82,600	82,600	82,600	82,600
20	43,000	64,500	84,000	84,000	84,000	84,000	84,000	84,000	84,000	84,000	84,000	84,000	84,000	84,000	84,000	84,000	84,000	84,000	84,000
21	43,000	64,500	85,400	85,400	85,400	85,400	85,400	85,400	85,400	85,400	85,400	85,400	85,400	85,400	85,400	85,400	85,400	85,400	85,400
22	43,000	64,500	86,000	86,800	86,800	86,800	86,800	86,800	86,800	86,800	86,800	86,800	86,800	86,800	86,800	86,800	86,800	86,800	86,800
23	43,000	64,500	86,000	88,200	88,200	88,200	88,200	88,200	88,200	88,200	88,200	88,200	88,200	88,200	88,200	88,200	88,200	88,200	88,200
24	43,000	64,500	86,000	89,600	89,600	89,600	89,600	89,600	89,600	89,600	89,600	89,600	89,600	89,600	89,600	89,600	89,600	89,600	89,600
25	43,000	64,500	86,000	91,000	91,000	91,000	91,000	91,000	91,000	91,000	91,000	91,000	91,000	91,000	91,000	91,000	91,000	91,000	91,000
26	43,000	64,500	86,000	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400
27	43,000	64,500	86,000	93,800	93,800	93,800	93,800	93,800	93,800	93,800	93,800	93,800	93,800	93,800	93,800	93,800	93,800	93,800	93,800
28	43,000	64,500	86,000	95,200	95,200	95,200	95,200	95,200	95,200	95,200	95,200	95,200	95,200	95,200	95,200	95,200	95,200	95,200	95,200
29	43,000	64,500	86,000	96,600	96,600	96,600	96,600	96,600	96,600	96,600	96,600	96,600	96,600	96,600	96,600	96,600	96,600	96,600	96,600
30	43,000	64,500	86,000	98,000	98,000	98,000	98,000	98,000	98,000	98,000	98,000	98,000	98,000	98,000	98,000	98,000	98,000	98,000	98,000
31	43,000	64,500	86,000	99,400	99,400	99,400	99,400	99,400	99,400	99,400	99,400	99,400	99,400	99,400	99,400	99,400	99,400	99,400	99,400
32	43,000	64,500	86,000	100,800	100,800	100,800	100,800	100,800	100,800	100,800	100,800	100,800	100,800	100,800	100,800	100,800	100,800	100,800	100,800
33	43,000	64,500	86,000	102,200	102,200	102,200	102,200	102,200	102,200	102,200	102,200	102,200	102,200	102,200	102,200	102,200	102,200	102,200	102,200
34	43,000	64,500	86,000	103,600	103,600	103,600	103,600	103,600	103,600	103,600	103,600	103,600	103,600	103,600	103,600	103,600	103,600	103,600	103,600
35	43,000	64,500	86,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000
36	43,000	64,500	86,000	106,400	106,400	106,400	106,400	106,400	106,400	106,400	106,400	106,400	106,400	106,400	106,400	106,400	106,400	106,400	106,400
37	43,000	64,500	86,000	107,500	107,800	107,800	107,800	107,800	107,800	107,800	107,800	107,800	107,800	107,800	107,800	107,800	107,800	107,800	107,800
38	43,000	64,500	86,000	107,500	109,200	109,200	109,200	109,200	109,200	109,200	109,200	109,200	109,200	109,200	109,200	109,200	109,200	109,200	109,200
39	43,000	64,500	86,000	107,500	110,600	110,600	110,600	110,600	110,600	110,600	110,600	110,600	110,600	110,600	110,600	110,600	110,600	110,600	110,600
40	43,000	64,500	86,000	107,500	112,000	112,000	112,000	112,000	112,000	112,000	112,000	112,000	112,000	112,000	112,000	112,000	112,000	112,000	112,000
41	43,000	64,500	86,000	107,500	113,400	113,400	113,400	113,400	113,400	113,400	113,400	113,400	113,400	113,400	113,400	113,400	113,400	113,400	113,400
42	43,000	64,500	86,000	107,500	114,800	114,800	114,800	114,800	114,800	114,800	114,800	114,800	114,800	114,800	114,800	114,800	114,800	114,800	114,800
43	43,000	64,500	86,000	107,500	116,200	116,200	116,200	116,200	116,200	116,200	116,200	116,200	116,200	116,200	116,200	116,200	116,200	116,200	116,200
44	43,000	64,500	86,000	107,500	117,600	117,600	117,600	117,600	117,600	117,600	117,600	117,600	117,600	117,600	117,600	117,600	117,600	117,600	117,600
45	43,000	64,500	86,000	107,500	119,000	119,000	119,000	119,000	119,000	119,000	119,000	119,000	119,000	119,000	119,000	119,000	119,000	119,000	119,000
46	43,000	64,500	86,000	107,500	120,400	120,400	120,400	120,400	120,400	120,400	120,400	120,400	120,400	120,400	120,400	120,400	120,400	120,400	120,400
47	43,000	64,500	86,000	107,500	121,800	121,800	121,800	121,800	121,800	121,800	121,800	121,800	121,800	121,800	121,800	121,800	121,800	121,800	121,800
48	43,000	64,500	86,000	107,500	123,200	123,200	123,200	123,200	123,200	123,200	123,200	123,200	123,200	123,200	123,200	123,200	123,200	123,200	123,200
49	43,000	64,500	86,000	107,500	124,600	124,600	124,600	124,600	124,600	124,600	124,600	124,600	124,600	124,600	124,600	124,600	124,600	124,600	124,600
50	43,000	64,500	86,000	107,500	126,000	126,000	126,000	126,000	126,000	126,000	126,000	126,000	126,000	126,000	126,000	126,000	126,000	126,000	126,000
51	43,000	64,500	86,000	107,500	127,400	127,400	127,400	127,400	127,400	127,400	127,400	127,400	127,400	127,400	127,400	127,400	127,400	127,400	127,400
52	43,000	64,500	86,000	107,500	128,800	128,800	128,800	128,800	128,800	128,800	128,800	128,800	128,800	128,800	128,800	128,800	128,800	128,800	128,800
53	43,000	64,500	86,000	107,500	129,000	130,200	130,200	130,200	130,200	130,200	130,200	130,200	130,200	130,200	130,200	130,200	130,200	130,200	130,200
54	43,000	64,500	86,000	107,500	129,000	131,600	131,600	131,600	131,600	131,600	131,600	131,600	131,600	131,600	131,600	131,600	131,600	131,600	131,600
55	43,000	64,500	86,000	107,500	129,000	133,000	133,000	133,000	133,000	133,000	133,000	133,000	133,000	133,000	133,000	133,000	133,000	133,000	133,000
56	43,000	64,500	86,000	107,500	129,000	134,400	134,400	134,400	134,400	134,400	134,400	134,400	134,400	134,400	134,400	134,400	134,400	134,400	134,400
57	43,000	64,500	86,000	107,500	129,000	135,800	135,800	135,800	135,800	135,800	135,800	135,800	135,800	135,800	135,800	135,800	135,800	135,800	135,800
58	43,000	64,500	86,000	107,500	129,000	137,200	137,200	137,200	137,200	137,200	137,200	137,200	137,200	137,200	137,200	137,200	137,200	137,200	137,200
59	43,000	64,500	86,000	107,500	129,000	138,600	138,600	138,600	138,600	138,600	138,600	138,600	138,600	138,600	138,600	138,600	138,600	138,600	138,600
60	43,000	64,500	86,000	107,500	129,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000
61	43,000	64,500	86,000	107,500	129,000	141,400	141,400	141,400	141,400	141,400	141,400	141,400	141,400	141,400	141,400	141,400	141,400	141,400	141,400
62	43,000	64,500	86,000	107,500	129,000	142,800	142,800	142,800	142,800	142,800	142,800	142,800	142,800	142,800	142,800	142,800	142,800	142,800	142,800
63	43,000	64,500	86,000	107,500	129,000	144,200	144,200	144,200	144,200	144,200	144,200	144,200	144,200	144,200	144,200	144,200	144,200	144,200	144,200
64	43,000	64,500	86,000	107,500	129,000	145,600	145,600	145,600	145,600	145,600	145,600	145,600	145,600	145,600	145,600	145,600	145,600	145,600	145,600
65	43,000	64,500	86,000	107,500	129,000	147,000	147,000	147,000	147,000	147,000	147,000	147,000	147,000	147,000	147,000	147,000	147,000	147,000	147,000
66	43,000	64,500	86,000	107,500	129,000	148,400	148,400	148,400	148,400	148,400	148,400	148,400	148,400	148,400	148,400	148,400	148,400	148,400	148,400
67	43,000	64,500	86,000	107,500	129,000	149,800	149,800	149,800	149,800	149,800	149,800	149,800	149,800	149,800	149,800	149,800	149,800	149,800	149,800
68	43,000	64,500	86,000	107,500	129,000	150,500	151,200	151,200	151,200	151,200	151,200	151,200	151,200	151,200	151,200	151,200	151,200	151,200	151,200
69	43,000	64,500	86,000	107,500	129,000	150,500	152,600	152,600	152,600	152,600	152,600	152,600	152,600	152,600	152,600	152,600	152,600	152,600	152,600
70	43,000	64,500	86,000	107,500	129,000	150,500	154,000	154,000	154,000	154,000	154,000	154,000	154,000	154,000	154,000	154,000	154,000	154,000	154,000

● DISTANCE MEASURED TO THE NEAREST FOOT. WHEN EXACTLY 1/2 FOOT OR MORE, ROUND UP TO THE NEXT LARGER NUMBER ●

WHEELBASE	2 Axles	3 Axles	4 Axles	5 Axles	6 Axles	7 Axles	8 Axles	9 Axles	10 Axles	11 Axles	12 Axles	13 Axles	14 Axles	15 Axles	16 Axles	17 Axles	18 Axles	19 Axles	20 Axles
71	43,000	64,500	86,000	107,500	129,000	150,500	155,400	155,400	155,400	155,400	155,400	155,400	155,400	155,400	155,400	155,400	155,400	155,400	155,400
72	43,000	64,500	86,000	107,500	129,000	150,500	156,800	156,800	156,800	156,800	156,800	156,800	156,800	156,800	156,800	156,800	156,800	156,800	156,800
73	43,000	64,500	86,000	107,500	129,000	150,500	158,200	158,200	158,200	158,200	158,200	158,200	158,200	158,200	158,200	158,200	158,200	158,200	158,200
74	43,000	64,500	86,000	107,500	129,000	150,500	159,600	159,600	159,600	159,600	159,600	159,600	159,600	159,600	159,600	159,600	159,600	159,600	159,600
75	43,000	64,500	86,000	107,500	129,000	150,500	161,000	161,000	161,000	161,000	161,000	161,000	161,000	161,000	161,000	161,000	161,000	161,000	161,000
76	43,000	64,500	86,000	107,500	129,000	150,500	162,400	162,400	162,400	162,400	162,400	162,400	162,400	162,400	162,400	162,400	162,400	162,400	162,400
77	43,000	64,500	86,000	107,500	129,000	150,500	163,800	163,800	163,800	163,800	163,800	163,800	163,800	163,800	163,800	163,800	163,800	163,800	163,800
78	43,000	64,500	86,000	107,500	129,000	150,500	165,200	165,200	165,200	165,200	165,200	165,200	165,200	165,200	165,200	165,200	165,200	165,200	165,200
79	43,000	64,500	86,000	107,500	129,000	150,500	166,600	166,600	166,600	166,600	166,600	166,600	166,600	166,600	166,600	166,600	166,600	166,600	166,600
80	43,000	64,500	86,000	107,500	129,000	150,500	168,000	168,000	168,000	168,000	168,000	168,000	168,000	168,000	168,000	168,000	168,000	168,000	168,000
81	43,000	64,500	86,000	107,500	129,000	150,500	169,400	169,400	169,400	169,400	169,400	169,400	169,400	169,400	169,400	169,400	169,400	169,400	169,400
82	43,000	64,500	86,000	107,500	129,000	150,500	170,800	170,800	170,800	170,800	170,800	170,800	170,800	170,800	170,800	170,800	170,800	170,800	170,800
83	43,000	64,500	86,000	107,500	129,000	150,500	172,000	172,200	172,200	172,200	172,200	172,200	172,200	172,200	172,200	172,200	172,200	172,200	172,200
84	43,000	64,500	86,000	107,500	129,000	150,500	172,000	173,600	173,600	173,600	173,600	173,600	173,600	173,600	173,600	173,600	173,600	173,600	173,600
85	43,000	64,500	86,000	107,500	129,000	150,500	172,000	175,000	175,000	175,000	175,000	175,000	175,000	175,000	175,000	175,000	175,000	175,000	175,000
86	43,000	64,500	86,000	107,500	129,000	150,500	172,000	176,400	176,400	176,400	176,400	176,400	176,400	176,400	176,400	176,400	176,400	176,400	176,400
87	43,000	64,500	86,000	107,500	129,000	150,500	172,000	177,800	177,800	177,800	177,800	177,800	177,800	177,800	177,800	177,800	177,800	177,800	177,800
88	43,000	64,500	86,000	107,500	129,000	150,500	172,000	179,200	179,200	179,200	179,200	179,200	179,200	179,200	179,200	179,200	179,200	179,200	179,200
89	43,000	64,500	86,000	107,500	129,000	150,500	172,000	180,600	180,600	180,600	180,600	180,600	180,600	180,600	180,600	180,600	180,600	180,600	180,600
90	43,000	64,500	86,000	107,500	129,000	150,500	172,000	182,000	182,000	182,000	182,000	182,000	182,000	182,000	182,000	182,000	182,000	182,000	182,000
91	43,000	64,500	86,000	107,500	129,000	150,500	172,000	183,400	183,400	183,400	183,400	183,400	183,400	183,400	183,400	183,400	183,400	183,400	183,400
92	43,000	64,500	86,000	107,500	129,000	150,500	172,000	184,800	184,800	184,800	184,800	184,800	184,800	184,800	184,800	184,800	184,800	184,800	184,800
93	43,000	64,500	86,000	107,500	129,000	150,500	172,000	186,200	186,200	186,200	186,200	186,200	186,200	186,200	186,200	186,200	186,200	186,200	186,200
94	43,000	64,500	86,000	107,500	129,000	150,500	172,000	187,600	187,600	187,600	187,600	187,600	187,600	187,600	187,600	187,600	187,600	187,600	187,600
95	43,000	64,500	86,000	107,500	129,000	150,500	172,000	189,000	189,000	189,000	189,000	189,000	189,000	189,000	189,000	189,000	189,000	189,000	189,000
96	43,000	64,500	86,000	107,500	129,000	150,500	172,000	190,400	190,400	190,400	190,400	190,400	190,400	190,400	190,400	190,400	190,400	190,400	190,400
97	43,000	64,500	86,000	107,500	129,000	150,500	172,000	191,800	191,800	191,800	191,800	191,800	191,800	191,800	191,800	191,800	191,800	191,800	191,800
98	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,200	193,200	193,200	193,200	193,200	193,200	193,200	193,200	193,200	193,200	193,200	193,200
99	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	194,600	194,600	194,600	194,600	194,600	194,600	194,600	194,600	194,600	194,600	194,600
100	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	196,000	196,000	196,000	196,000	196,000	196,000	196,000	196,000	196,000	196,000	196,000
101	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	197,400	197,400	197,400	197,400	197,400	197,400	197,400	197,400	197,400	197,400	197,400
102	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	198,800	198,800	198,800	198,800	198,800	198,800	198,800	198,800	198,800	198,800	198,800
103	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	200,200	200,200	200,200	200,200	200,200	200,200	200,200	200,200	200,200	200,200	200,200
104	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	201,600	201,600	201,600	201,600	201,600	201,600	201,600	201,600	201,600	201,600	201,600
105	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	203,000	203,000	203,000	203,000	203,000	203,000	203,000	203,000	203,000	203,000	203,000
106	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	204,400	204,400	204,400	204,400	204,400	204,400	204,400	204,400	204,400	204,400	204,400
107	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	205,800	205,800	205,800	205,800	205,800	205,800	205,800	205,800	205,800	205,800	205,800
108	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	207,200	207,200	207,200	207,200	207,200	207,200	207,200	207,200	207,200	207,200	207,200
109	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	208,600	208,600	208,600	208,600	208,600	208,600	208,600	208,600	208,600	208,600	208,600
110	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	210,000	210,000	210,000	210,000	210,000	210,000	210,000	210,000	210,000	210,000	210,000
111	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	211,400	211,400	211,400	211,400	211,400	211,400	211,400	211,400	211,400	211,400	211,400
112	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	212,800	212,800	212,800	212,800	212,800	212,800	212,800	212,800	212,800	212,800	212,800
113	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	214,200	214,200	214,200	214,200	214,200	214,200	214,200	214,200	214,200	214,200	214,200
114	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	215,600	215,600	215,600	215,600	215,600	215,600	215,600	215,600	215,600	215,600
115	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	217,000	217,000	217,000	217,000	217,000	217,000	217,000	217,000	217,000	217,000
116	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	218,400	218,400	218,400	218,400	218,400	218,400	218,400	218,400	218,400	218,400
117	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	219,800	219,800	219,800	219,800	219,800	219,800	219,800	219,800	219,800	219,800
118	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	221,200	221,200	221,200	221,200	221,200	221,200	221,200	221,200	221,200	221,200
119	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	222,600	222,600	222,600	222,600	222,600	222,600	222,600	222,600	222,600	222,600
120	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	224,000	224,000	224,000	224,000	224,000	224,000	224,000	224,000	224,000	224,000
121	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	225,400	225,400	225,400	225,400	225,400	225,400	225,400	225,400	225,400	225,400
122	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	226,800	226,800	226,800	226,800	226,800	226,800	226,800	226,800	226,800	226,800
123	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	228,200	228,200	228,200	228,200	228,200	228,200	228,200	228,200	228,200	228,200
124	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	229,600	229,600	229,600	229,600	229,600	229,600	229,600	229,600	229,600	229,600
125	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	231,000	231,000	231,000	231,000	231,000	231,000	231,000	231,000	231,000	231,000
126	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	232,400	232,400	232,400	232,400	232,400	232,400	232,400	232,400	232,400	232,400
127	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	233,800	233,800	233,800	233,800	233,800	233,800	233,800	233,800	233,800	233,800
128	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	235,200	235,200	235,200	235,200	235,200	235,200	235,200	235,200	235,200	235,200
129	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	236,500	236,600	236,600	236,600	236,600	236,600	236,600	236,600	236,600	236,600
130	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	236,500	238,000	238,000	238,000	238,000	238,000	238,000	238,000	238,000	238,000
131	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	236,500	239,400	239,400	239,400	239,400	239,400	239,400	239,400	239,400	239,400
132	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	236,500	240,800	240,800	240,800	240,800	240,800	240,800	240,800	240,800	240,800
133	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	236,500	242,200	242,200	242,200	242,200	242,200	242,200	242,200	242,200	242,200
134	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	236,500	243,600	243,600	243,600	243,600	243,600	243,600	243,600	243,600	243,600
135	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	236,500	245,000	245,000	245,000	245,000	245,000	245,000	245,000	245,000	245,000
136	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	236,500	246,400	246,400	246,400	246,400	246,400	246,400	246,400	246,400	246,400
137	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	236,500	247,800	247,800	247,800	247,800	247,800	247,800	247,800	247,800	247,800
138	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	236,500	249,200	249,200	249,200	249,200	249,200	249,200	249,200	249,200	249,200
139	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	236,500	250,600	250,600	250,600	250,600	250,600	250,600	250,600	250,600	250,600
140	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	236,500	252,000	252,000	252,000	252,000	252,000	252,000	252,000	252,000	252,000
141	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	236,500	253,400	253,400	253,400	253,400	253,400	253,400	253,400	253,400	253,400
142	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	236,500	254,800	254,800	254,800	254,800	254,800	254,800	254,800	254,800	254,800
143	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	236,500	256,200	256,200	256,200	256,200	256,200	256,200	256,200	256,200	256,200
144	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	236,500	257,600	257,600	257,600	257,600	257,600	257,600	257,600	257,600	257,600
145	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	236,500	258,000	259,000	259,000	259,000	259,000	259,000	259,000	259,000	259,000
146	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	236,500	258,000	260,400	260,400	260,400	260,400	260,400	260,400	260,400	260,400
147	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	236,500	258,000	261,800	261,800	261,800	261,800	261,800	261,800	261,800	261,800
148	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	236,500	258,000	263,200	263,200	263,200	263,200	263,200	263,200	263,200	263,200
149	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	236,500	258,000	264,600	264,600	264,600	264,600	264,600	264,600	264,600	264,600
150	43,000	64,500	86,000	107,500	129,000	150,500	172,000	193,500	215,000	236,500	258,000	266,000	266,000	266,000	266,000	266,000	266,000	266,000	266,000

● DISTANCE MEASURED TO THE NEAREST FOOT. WHEN EXACTLY 1/2 FOOT OR MORE, ROUND UP TO THE NEXT LARGER NUMBER ●

OREGON DEPARTMENT OF TRANSPORTATION
MOTOR CARRIER TRANSPORTATION DIVISION
550 CAPITOL ST NE
SALEM OR 97301-2530

PERMIT WEIGHT TABLE
5

WHEELBASE

	2 Axles	3 Axles	4 Axles	5 Axles	6 Axles	7 Axles	8 Axles	9 Axles	10 Axles	11 Axles	12 Axles	13 Axles	14 Axles	15 Axles	16 Axles	17 Axles	18 Axles	19 Axles	20 Axles
4	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000
5	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000
6	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000
7	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000
8	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000
OVER 8' (BUT LESS THEN 8'6")	43,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000
9	43,000	58,500	58,500	58,500	58,500	58,500	58,500	58,500	58,500	58,500	58,500	58,500	58,500	58,500	58,500	58,500	58,500	58,500	58,500
10	43,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000
11	43,000	68,200	68,200	68,200	68,200	68,200	68,200	68,200	68,200	68,200	68,200	68,200	68,200	68,200	68,200	68,200	68,200	68,200	68,200
12	43,000	70,400	70,400	70,400	70,400	70,400	70,400	70,400	70,400	70,400	70,400	70,400	70,400	70,400	70,400	70,400	70,400	70,400	70,400
13	43,000	72,000	72,600	72,600	72,600	72,600	72,600	72,600	72,600	72,600	72,600	72,600	72,600	72,600	72,600	72,600	72,600	72,600	72,600
14	43,000	72,000	74,800	74,800	74,800	74,800	74,800	74,800	74,800	74,800	74,800	74,800	74,800	74,800	74,800	74,800	74,800	74,800	74,800
15	43,000	72,000	77,000	77,000	77,000	77,000	77,000	77,000	77,000	77,000	77,000	77,000	77,000	77,000	77,000	77,000	77,000	77,000	77,000
16	43,000	72,000	79,200	79,200	79,200	79,200	79,200	79,200	79,200	79,200	79,200	79,200	79,200	79,200	79,200	79,200	79,200	79,200	79,200
17	43,000	72,000	81,400	81,400	81,400	81,400	81,400	81,400	81,400	81,400	81,400	81,400	81,400	81,400	81,400	81,400	81,400	81,400	81,400
18	43,000	72,000	83,600	83,600	83,600	83,600	83,600	83,600	83,600	83,600	83,600	83,600	83,600	83,600	83,600	83,600	83,600	83,600	83,600
19	43,000	72,000	85,800	85,800	85,800	85,800	85,800	85,800	85,800	85,800	85,800	85,800	85,800	85,800	85,800	85,800	85,800	85,800	85,800
20	43,000	72,000	88,000	88,000	88,000	88,000	88,000	88,000	88,000	88,000	88,000	88,000	88,000	88,000	88,000	88,000	88,000	88,000	88,000
21	43,000	72,000	90,200	90,200	90,200	90,200	90,200	90,200	90,200	90,200	90,200	90,200	90,200	90,200	90,200	90,200	90,200	90,200	90,200
22	43,000	72,000	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400	92,400
23	43,000	72,000	94,600	94,600	94,600	94,600	94,600	94,600	94,600	94,600	94,600	94,600	94,600	94,600	94,600	94,600	94,600	94,600	94,600
24	43,000	72,000	96,000	96,800	96,800	96,800	96,800	96,800	96,800	96,800	96,800	96,800	96,800	96,800	96,800	96,800	96,800	96,800	96,800
25	43,000	72,000	96,000	99,000	99,000	99,000	99,000	99,000	99,000	99,000	99,000	99,000	99,000	99,000	99,000	99,000	99,000	99,000	99,000
26	43,000	72,000	96,000	101,200	101,200	101,200	101,200	101,200	101,200	101,200	101,200	101,200	101,200	101,200	101,200	101,200	101,200	101,200	101,200
27	43,000	72,000	96,000	103,400	103,400	103,400	103,400	103,400	103,400	103,400	103,400	103,400	103,400	103,400	103,400	103,400	103,400	103,400	103,400
28	43,000	72,000	96,000	105,600	105,600	105,600	105,600	105,600	105,600	105,600	105,600	105,600	105,600	105,600	105,600	105,600	105,600	105,600	105,600
29	43,000	72,000	96,000	107,800	107,800	107,800	107,800	107,800	107,800	107,800	107,800	107,800	107,800	107,800	107,800	107,800	107,800	107,800	107,800
30	43,000	72,000	96,000	110,000	110,000	110,000	110,000	110,000	110,000	110,000	110,000	110,000	110,000	110,000	110,000	110,000	110,000	110,000	110,000
31	43,000	72,000	96,000	113,600	113,600	113,600	113,600	113,600	113,600	113,600	113,600	113,600	113,600	113,600	113,600	113,600	113,600	113,600	113,600
32	43,000	72,000	96,000	115,200	115,200	115,200	115,200	115,200	115,200	115,200	115,200	115,200	115,200	115,200	115,200	115,200	115,200	115,200	115,200
33	43,000	72,000	96,000	116,800	116,800	116,800	116,800	116,800	116,800	116,800	116,800	116,800	116,800	116,800	116,800	116,800	116,800	116,800	116,800
34	43,000	72,000	96,000	118,400	118,400	118,400	118,400	118,400	118,400	118,400	118,400	118,400	118,400	118,400	118,400	118,400	118,400	118,400	118,400
35	43,000	72,000	96,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000
36	43,000	72,000	96,000	120,000	121,600	121,600	121,600	121,600	121,600	121,600	121,600	121,600	121,600	121,600	121,600	121,600	121,600	121,600	121,600
37	43,000	72,000	96,000	120,000	123,200	123,200	123,200	123,200	123,200	123,200	123,200	123,200	123,200	123,200	123,200	123,200	123,200	123,200	123,200
38	43,000	72,000	96,000	120,000	124,800	124,800	124,800	124,800	124,800	124,800	124,800	124,800	124,800	124,800	124,800	124,800	124,800	124,800	124,800
39	43,000	72,000	96,000	120,000	126,400	126,400	126,400	126,400	126,400	126,400	126,400	126,400	126,400	126,400	126,400	126,400	126,400	126,400	126,400
40	43,000	72,000	96,000	120,000	128,000	128,000	128,000	128,000	128,000	128,000	128,000	128,000	128,000	128,000	128,000	128,000	128,000	128,000	128,000
41	43,000	72,000	96,000	120,000	129,600	129,600	129,600	129,600	129,600	129,600	129,600	129,600	129,600	129,600	129,600	129,600	129,600	129,600	129,600
42	43,000	72,000	96,000	120,000	131,200	131,200	131,200	131,200	131,200	131,200	131,200	131,200	131,200	131,200	131,200	131,200	131,200	131,200	131,200
43	43,000	72,000	96,000	120,000	132,800	132,800	132,800	132,800	132,800	132,800	132,800	132,800	132,800	132,800	132,800	132,800	132,800	132,800	132,800
44	43,000	72,000	96,000	120,000	134,400	134,400	134,400	134,400	134,400	134,400	134,400	134,400	134,400	134,400	134,400	134,400	134,400	134,400	134,400
45	43,000	72,000	96,000	120,000	136,000	136,000	136,000	136,000	136,000	136,000	136,000	136,000	136,000	136,000	136,000	136,000	136,000	136,000	136,000
46	43,000	72,000	96,000	120,000	137,600	137,600	137,600	137,600	137,600	137,600	137,600	137,600	137,600	137,600	137,600	137,600	137,600	137,600	137,600
47	43,000	72,000	96,000	120,000	139,200	139,200	139,200	139,200	139,200	139,200	139,200	139,200	139,200	139,200	139,200	139,200	139,200	139,200	139,200
48	43,000	72,000	96,000	120,000	140,800	140,800	140,800	140,800	140,800	140,800	140,800	140,800	140,800	140,800	140,800	140,800	140,800	140,800	140,800
49	43,000	72,000	96,000	120,000	142,400	142,400	142,400	142,400	142,400	142,400	142,400	142,400	142,400	142,400	142,400	142,400	142,400	142,400	142,400
50	43,000	72,000	96,000	120,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000
51	43,000	72,000	96,000	120,000	144,000	145,600	145,600	145,600	145,600	145,600	145,600	145,600	145,600	145,600	145,600	145,600	145,600	145,600	145,600
52	43,000	72,000	96,000	120,000	144,000	147,200	147,200	147,200	147,200	147,200	147,200	147,200	147,200	147,200	147,200	147,200	147,200	147,200	147,200
53	43,000	72,000	96,000	120,000	144,000	148,800	148,800	148,800	148,800	148,800	148,800	148,800	148,800	148,800	148,800	148,800	148,800	148,800	148,800
54	43,000	72,000	96,000	120,000	144,000	150,400	150,400	150,400	150,400	150,400	150,400	150,400	150,400	150,400	150,400	150,400	150,400	150,400	150,400
55	43,000	72,000	96,000	120,000	144,000	152,000	152,000	152,000	152,000	152,000	152,000	152,000	152,000	152,000	152,000	152,000	152,000	152,000	152,000
56	43,000	72,000	96,000	120,000	144,000	153,600	153,600	153,600	153,600	153,600	153,600	153,600	153,600	153,600	153,600	153,600	153,600	153,600	153,600
57	43,000	72,000	96,000	120,000	144,000	155,200	155,200	155,200	155,200	155,200	155,200	155,200	155,200	155,200	155,200	155,200	155,200	155,200	155,200
58	43,000	72,000	96,000	120,000	144,000	156,800	156,800	156,800	156,800	156,800	156,800	156,800	156,800	156,800	156,800	156,800	156,800	156,800	156,800
59	43,000	72,000	96,000	120,000	144,000	158,400	158,400	158,400	158,400	158,400	158,400	158,400	158,400	158,400	158,400	158,400	158,400	158,400	158,400
60	43,000	72,000	96,000	120,000	144,000	160,000	160,000	160,000	160,000	160,000	160,000	160,000	160,000	160,000	160,000	160,000	160,000	160,000	160,000
61	43,000	72,000	96,000	120,000	144,000	161,600	161,600	161,600	161,600	161,600	161,600	161,600	161,600	161,600	161,600	161,600	161,600	161,600	161,600
62	43,000	72,000	96,000	120,000	144,000	163,200	163,200	163,200	163,200	163,200	163,200	163,200	163,200	163,200	163,200	163,200	163,200	163,200	163,200
63	43,000	72,000	96,000	120,000	144,000	164,800	164,800	164,800	164,800	164,800	164,800	164,800	164,800	164,800	164,800	164,800	164,800	164,800	164,800
64	43,000	72,000	96,000	120,000	144,000	166,400	166,400	166,400	166,400	166,400	166,400	166,400	166,400	166,400	166,400	166,400	166,400	166,400	166,400
65	43,000	72,000	96,000	120,000	144,000	168,000	168,000	168,000	168,000	168,000	168,000	168,000	168,000	168,000	168,000	168,000	168,000	168,000	168,000
66	43,000	72,000	96,000	120,000	144,000	168,000	169,600	169,600	169,600	169,600	169,600	169,600	169,600	169,600	169,600	169,600	169,600	169,600	169,600
67	43,000	72,000	96,000	120,000	144,000	168,000	171,200	171,200	171,200	171,200	171,200	171,200	171,200	171,200	171,200	171,200	171,200	171,200	171,200
68	43,000	72,000	96,000	120,000	144,000	168,000	172,800	172,800	172,800	172,800	172,800	172,800	172,800	172,800	172,800	172,800	172,800	172,800	172,800
69	43,000	72,000	96,000	120,000	144,000	168,000	174,400	174,400	174,400	174,400	174,400	174,400	174,400	174,400	174,400	174,400	174,400	174,400	174,400
70	43,000	72,000	96,000	120,000	144,000	168,000	176,000	176,000	176,000	176,000	176,000	176,000	176,000	176,000	176,000	176,000	176,000	176,000	176,000

● DISTANCE MEASURED TO THE NEAREST FOOT. WHEN EXACTLY 1/2 FOOT OR MORE, ROUND UP TO THE NEXT LARGER NUMBER ●

WHEELBASE	2 Axles	3 Axles	4 Axles	5 Axles	6 Axles	7 Axles	8 Axles	9 Axles	10 Axles	11 Axles	12 Axles	13 Axles	14 Axles	15 Axles	16 Axles	17 Axles	18 Axles	19 Axles	20 Axles
71	43,000	72,000	96,000	120,000	144,000	168,000	177,600	177,600	177,600	177,600	177,600	177,600	177,600	177,600	177,600	177,600	177,600	177,600	177,600
72	43,000	72,000	96,000	120,000	144,000	168,000	179,200	179,200	179,200	179,200	179,200	179,200	179,200	179,200	179,200	179,200	179,200	179,200	179,200
73	43,000	72,000	96,000	120,000	144,000	168,000	180,800	180,800	180,800	180,800	180,800	180,800	180,800	180,800	180,800	180,800	180,800	180,800	180,800
74	43,000	72,000	96,000	120,000	144,000	168,000	182,400	182,400	182,400	182,400	182,400	182,400	182,400	182,400	182,400	182,400	182,400	182,400	182,400
75	43,000	72,000	96,000	120,000	144,000	168,000	184,000	184,000	184,000	184,000	184,000	184,000	184,000	184,000	184,000	184,000	184,000	184,000	184,000
76	43,000	72,000	96,000	120,000	144,000	168,000	185,600	185,600	185,600	185,600	185,600	185,600	185,600	185,600	185,600	185,600	185,600	185,600	185,600
77	43,000	72,000	96,000	120,000	144,000	168,000	187,200	187,200	187,200	187,200	187,200	187,200	187,200	187,200	187,200	187,200	187,200	187,200	187,200
78	43,000	72,000	96,000	120,000	144,000	168,000	188,800	188,800	188,800	188,800	188,800	188,800	188,800	188,800	188,800	188,800	188,800	188,800	188,800
79	43,000	72,000	96,000	120,000	144,000	168,000	190,400	190,400	190,400	190,400	190,400	190,400	190,400	190,400	190,400	190,400	190,400	190,400	190,400
80	43,000	72,000	96,000	120,000	144,000	168,000	192,000	192,000	192,000	192,000	192,000	192,000	192,000	192,000	192,000	192,000	192,000	192,000	192,000
81	43,000	72,000	96,000	120,000	144,000	168,000	192,000	193,600	193,600	193,600	193,600	193,600	193,600	193,600	193,600	193,600	193,600	193,600	193,600
82	43,000	72,000	96,000	120,000	144,000	168,000	192,000	195,200	195,200	195,200	195,200	195,200	195,200	195,200	195,200	195,200	195,200	195,200	195,200
83	43,000	72,000	96,000	120,000	144,000	168,000	192,000	196,800	196,800	196,800	196,800	196,800	196,800	196,800	196,800	196,800	196,800	196,800	196,800
84	43,000	72,000	96,000	120,000	144,000	168,000	192,000	198,400	198,400	198,400	198,400	198,400	198,400	198,400	198,400	198,400	198,400	198,400	198,400
85	43,000	72,000	96,000	120,000	144,000	168,000	192,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
86	43,000	72,000	96,000	120,000	144,000	168,000	192,000	201,600	201,600	201,600	201,600	201,600	201,600	201,600	201,600	201,600	201,600	201,600	201,600
87	43,000	72,000	96,000	120,000	144,000	168,000	192,000	203,200	203,200	203,200	203,200	203,200	203,200	203,200	203,200	203,200	203,200	203,200	203,200
88	43,000	72,000	96,000	120,000	144,000	168,000	192,000	204,800	204,800	204,800	204,800	204,800	204,800	204,800	204,800	204,800	204,800	204,800	204,800
89	43,000	72,000	96,000	120,000	144,000	168,000	192,000	206,400	206,400	206,400	206,400	206,400	206,400	206,400	206,400	206,400	206,400	206,400	206,400
90	43,000	72,000	96,000	120,000	144,000	168,000	192,000	208,000	208,000	208,000	208,000	208,000	208,000	208,000	208,000	208,000	208,000	208,000	208,000
91	43,000	72,000	96,000	120,000	144,000	168,000	192,000	209,600	209,600	209,600	209,600	209,600	209,600	209,600	209,600	209,600	209,600	209,600	209,600
92	43,000	72,000	96,000	120,000	144,000	168,000	192,000	211,200	211,200	211,200	211,200	211,200	211,200	211,200	211,200	211,200	211,200	211,200	211,200
93	43,000	72,000	96,000	120,000	144,000	168,000	192,000	212,800	212,800	212,800	212,800	212,800	212,800	212,800	212,800	212,800	212,800	212,800	212,800
94	43,000	72,000	96,000	120,000	144,000	168,000	192,000	214,400	214,400	214,400	214,400	214,400	214,400	214,400	214,400	214,400	214,400	214,400	214,400
95	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	216,000	216,000	216,000	216,000	216,000	216,000	216,000	216,000	216,000	216,000	216,000
96	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	217,600	217,600	217,600	217,600	217,600	217,600	217,600	217,600	217,600	217,600	217,600
97	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	219,200	219,200	219,200	219,200	219,200	219,200	219,200	219,200	219,200	219,200	219,200
98	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	220,800	220,800	220,800	220,800	220,800	220,800	220,800	220,800	220,800	220,800	220,800
99	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	222,400	222,400	222,400	222,400	222,400	222,400	222,400	222,400	222,400	222,400	222,400
100	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	224,000	224,000	224,000	224,000	224,000	224,000	224,000	224,000	224,000	224,000	224,000
101	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	225,600	225,600	225,600	225,600	225,600	225,600	225,600	225,600	225,600	225,600	225,600
102	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	227,200	227,200	227,200	227,200	227,200	227,200	227,200	227,200	227,200	227,200	227,200
103	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	228,800	228,800	228,800	228,800	228,800	228,800	228,800	228,800	228,800	228,800	228,800
104	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	230,400	230,400	230,400	230,400	230,400	230,400	230,400	230,400	230,400	230,400	230,400
105	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	232,000	232,000	232,000	232,000	232,000	232,000	232,000	232,000	232,000	232,000	232,000
106	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	233,600	233,600	233,600	233,600	233,600	233,600	233,600	233,600	233,600	233,600	233,600
107	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	235,200	235,200	235,200	235,200	235,200	235,200	235,200	235,200	235,200	235,200	235,200
108	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	236,800	236,800	236,800	236,800	236,800	236,800	236,800	236,800	236,800	236,800	236,800
109	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	238,400	238,400	238,400	238,400	238,400	238,400	238,400	238,400	238,400	238,400	238,400
110	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	240,000	240,000	240,000	240,000	240,000	240,000	240,000	240,000	240,000	240,000
111	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	241,600	241,600	241,600	241,600	241,600	241,600	241,600	241,600	241,600	241,600
112	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	243,200	243,200	243,200	243,200	243,200	243,200	243,200	243,200	243,200	243,200
113	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	244,800	244,800	244,800	244,800	244,800	244,800	244,800	244,800	244,800	244,800
114	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	246,400	246,400	246,400	246,400	246,400	246,400	246,400	246,400	246,400	246,400
115	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	248,000	248,000	248,000	248,000	248,000	248,000	248,000	248,000	248,000	248,000
116	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	249,600	249,600	249,600	249,600	249,600	249,600	249,600	249,600	249,600	249,600
117	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	251,200	251,200	251,200	251,200	251,200	251,200	251,200	251,200	251,200	251,200
118	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	252,800	252,800	252,800	252,800	252,800	252,800	252,800	252,800	252,800	252,800
119	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	254,400	254,400	254,400	254,400	254,400	254,400	254,400	254,400	254,400	254,400
120	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	256,000	256,000	256,000	256,000	256,000	256,000	256,000	256,000	256,000	256,000
121	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	257,600	257,600	257,600	257,600	257,600	257,600	257,600	257,600	257,600	257,600
122	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	259,200	259,200	259,200	259,200	259,200	259,200	259,200	259,200	259,200	259,200
123	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	260,800	260,800	260,800	260,800	260,800	260,800	260,800	260,800	260,800	260,800
124	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	262,400	262,400	262,400	262,400	262,400	262,400	262,400	262,400	262,400	262,400
125	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	264,000	264,000	264,000	264,000	264,000	264,000	264,000	264,000	264,000
126	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	265,600	265,600	265,600	265,600	265,600	265,600	265,600	265,600	265,600
127	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	267,200	267,200	267,200	267,200	267,200	267,200	267,200	267,200	267,200
128	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	268,800	268,800	268,800	268,800	268,800	268,800	268,800	268,800	268,800
129	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	270,400	270,400	270,400	270,400	270,400	270,400	270,400	270,400	270,400
130	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000	272,000
131	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	273,600	273,600	273,600	273,600	273,600	273,600	273,600	273,600	273,600
132	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	275,200	275,200	275,200	275,200	275,200	275,200	275,200	275,200	275,200
133	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	276,800	276,800	276,800	276,800	276,800	276,800	276,800	276,800	276,800
134	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	278,400	278,400	278,400	278,400	278,400	278,400	278,400	278,400	278,400
135	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	280,000	280,000	280,000	280,000	280,000	280,000	280,000	280,000	280,000
136	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	281,600	281,600	281,600	281,600	281,600	281,600	281,600	281,600	281,600
137	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	283,200	283,200	283,200	283,200	283,200	283,200	283,200	283,200	283,200
138	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	284,800	284,800	284,800	284,800	284,800	284,800	284,800	284,800	284,800
139	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	286,400	286,400	286,400	286,400	286,400	286,400	286,400	286,400	286,400
140	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	288,000	288,000	288,000	288,000	288,000	288,000	288,000	288,000	288,000
141	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	288,000	289,600	289,600	289,600	289,600	289,600	289,600	289,600	289,600
142	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	288,000	291,200	291,200	291,200	291,200	291,200	291,200	291,200	291,200
143	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	288,000	292,800	292,800	292,800	292,800	292,800	292,800	292,800	292,800
144	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	288,000	294,400	294,400	294,400	294,400	294,400	294,400	294,400	294,400
145	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	288,000	296,000	296,000	296,000	296,000	296,000	296,000	296,000	296,000
146	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	288,000	297,600	297,600	297,600	297,600	297,600	297,600	297,600	297,600
147	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	288,000	299,200	299,200	299,200	299,200	299,200	299,200	299,200	299,200
148	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	288,000	300,800	300,800	300,800	300,800	300,800	300,800	300,800	300,800
149	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	288,000	302,400	302,400	302,400	302,400	302,400	302,400	302,400	302,400
150	43,000	72,000	96,000	120,000	144,000	168,000	192,000	216,000	240,000	264,000	288,000	304,000	304,000	304,000	304,000	304,000	304,000	304,000	304,000

● DISTANCE MEASURED TO THE NEAREST FOOT. WHEN EXACTLY 1/2 FOOT OR MORE, ROUND UP TO THE NEXT LARGER NUMBER ●

Appendix H

Computer Output (CD)