Validation Report

Wisconsin, SPS-1
Task Order 20, CLIN 2
November 27 to 28, 2007

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1 Executive Summary

A visit was made to the Wisconsin 0100 on November 27 to 28, 2007 for the purposes of conducting a validation of the WIM system located on SR 29 at approximately 1.25 miles east of Hilltop Road. The SPS-1 is located in the righthand, westbound lane of a four-lane divided facility. The posted speed limit at this location is 65 mph. The validation procedures were in accordance with LTPP's SPS WIM Data Collection Guide dated August 21, 2001.

This site was a relocation of an existing site located approximately 175 feet downstream from the present site. At the old site, all four lanes are instrumented with bending plate technology. The leading WIM sensor in the LTPP lane at the old site has been removed and the excavation has been filled with asphalt. At this new site, the LTPP lane is the only lane that was instrumented. This is the first validation visit to this location. The site was installed on June 19 and 20, 2007 by International Road Dynamics Inc.

This site meets all LTPP precision requirements except speed. This is not considered sufficient to disqualify the site as having research quality data. The classification algorithm is not currently providing research quality classification information.

The site is instrumented with bending plate and iSINC electronics. It is installed in portland cement concrete. This WIM location also serves to provide traffic data for the SPS-2 site, which is located immediately upstream of the SPS-1 site.

The validation used the following trucks:

1) 5-axle tractor-trailer with a tractor having an air suspension and a trailer with a standard rear tandem and an air suspension loaded to 77,530 lbs., the "golden" truck.
2) 5-axle tractor semi-trailer with a tractor having an air suspension and a trailer with a standard rear tandem and an air suspension loaded to 68,170 lbs., the "partial" truck.

The validation speeds ranged from 53 to 65 miles per hour. The pavement temperatures ranged from 12 to 30 degrees Fahrenheit. The desired speed range was achieved during this validation. The desired 30 degree Fahrenheit temperature range was not achieved.

Table 1-1 Post-Validation results – 550100 – 28-Nov-2007

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-2.0 ± 7.5%	Pass
Tandem axles	±15 percent	-0.2 ± 7.7%	Pass
GVW	±10 percent	-0.5 ± 5.6%	Pass
Speed	**±1 mph [2 km/hr]**	**0.0 ± 1.2 mph**	**Fail**
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.0 ft	Pass

Prepared: djw *Checked: bko*

The pavement condition appeared to be satisfactory for conducting a performance evaluation. There were no distresses observed that would influence truck motions significantly. A visual survey determined that there is no discernable bouncing or avoidance by trucks in the sensor area. No profile data is provided from which WIMIndex values can be calculated.

If this site had been evaluated using ASTM E-1318-02 it would have met the conditions for a Type I site exclusive of wheel loads. LTPP does not validate WIM performance with respect to wheel loads.

Table 1-2 Results Based on ASTM E-1318-02 Test Procedures

Characteristic	Limits for Allowable Error	Percent within Allowable Error	Pass/Fail
Single Axles	± 20%	100%	Pass
Axle Groups	± 15%	100%	Pass
GVW	± 10%	100%	Pass

Prepared: djw *Checked: bko*

This site needs five years of data to meet the goal of five years of research quality data.

2 Corrective Actions Recommended

This site requires no corrective actions at this time.

3 Post Calibration Analysis

This final analysis is based on test runs conducted November 28, 2007 during the morning and early afternoon hours at test site 550100 on SR 29. This SPS-1 site is at milepost 189.8 on the westbound, righthand of a four-lane divided facility. No auto-calibration was used during test runs. The two trucks used for the calibration and for the subsequent validation included:

1. 5-axle tractor-trailer with a tractor having an air suspension and trailer with a standard rear tandem and air suspension loaded to 77,530 lbs., the "golden" truck.
2. 5-axle tractor semi-trailer with a tractor having an air suspension and a trailer with a standard rear tandem and an air suspension loaded to 68,170 lbs., the "partial" truck.

Each truck made a total of 20 passes over the WIM scale at speeds ranging from approximately 53 to 65 miles per hour. The desired speed range was achieved during this validation. Pavement surface temperatures were recorded during the test runs ranging from about 12 to 30 degrees Fahrenheit. The desired 30 degree Fahrenheit temperature range was not achieved. The computed values of 95% confidence limits of each statistic for the total population are in Table 3-1.

As shown in Table 3-1, the site meets and passed all LTPP performance criteria for research quality data for weight and spacing. It did not meet the requirements for speed, which is not considered sufficient to disqualify the site as having research quality data.

Table 3-1 Post-Validation Results – 550100 – 28-Nov-2007

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-2.0 ± 7.5%	Pass
Tandem axles	±15 percent	-0.2 ± 7.7%	Pass
GVW	±10 percent	-0.5 ± 5.6%	Pass
Speed	**±1 mph [2 km/hr]**	**0.0 ± 1.2 mph**	**Fail**
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.0 ft	Pass

Prepared: djw *Checked: bko*

The test runs were conducted primarily during morning and early afternoon hours under mostly cloudy weather conditions, resulting in a limited range of pavement temperatures. The runs were also conducted at various speeds to determine the effects of these variables on the performance of the WIM scale. To investigate these effects, the data set was split into three speed groups and two temperature groups. The distribution of runs by speed and temperature is illustrated in Figure 3-1. The figure indicates that the desired

distribution of speed and temperature combinations was not achieved for this set of validation runs.

The three speed groups were divided as follows: Low speed – 53 to 55 mph, Medium speed – 56 to 61 mph and High speed – 62 + mph. The two temperature groups were created by splitting the runs between those at 12 to 22 degrees Fahrenheit for Low temperature and 23 to 30 degrees Fahrenheit for High temperature.

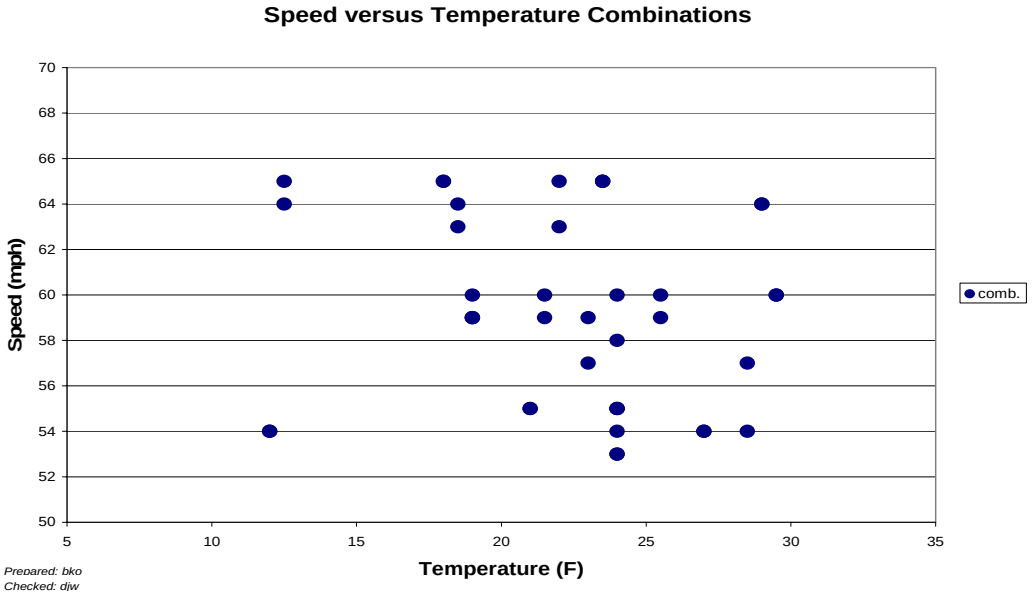

Figure 3-1 Post-Validation Speed-Temperature Distribution – 550100 – 28-Nov-2007

A series of graphs was developed to investigate visually any sign of a relationship between speed or temperature and the scale performance.

Figure 3-2 shows the GVW Percent Error vs. Speed graph for the population as a whole. From the figure, it can be seen that the equipment slightly underestimates GVW at the lower speeds and measures GVW with reasonable accuracy at the medium and high speeds. Variability is notably greater at the medium speeds when compared with low and high speed variability.

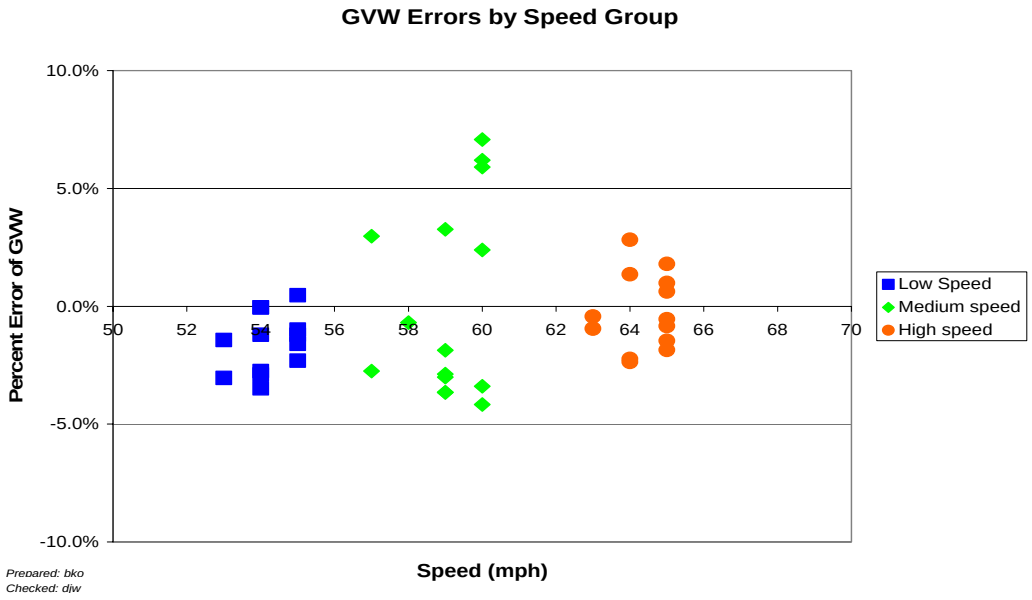

Figure 3-2 Post-validation GVW Percent Error vs. Speed – 550100 – 28-Nov-2007

Figure 3-3 shows the relationship between temperature and GVW percentage error. The graph illustrates that there does not appear to be a relationship between GVW error and pavement temperature.

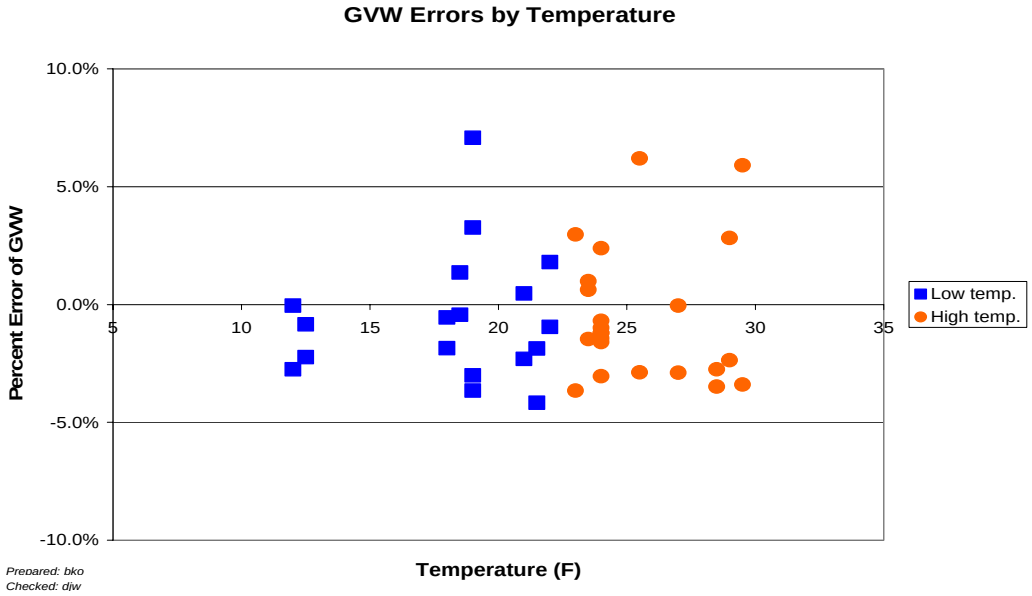

Figure 3-3 Post-Validation GVW Percent Error vs. Temperature – 550100 – 28-Nov-2007

Figure 3-4 shows the relationship between the drive tandem spacing errors in feet and speeds. This graph is used as a potential indicator of classification errors due to failure to correctly identify spacings on a vehicle. Since the most common reference value is the

drive tandem on a Class 9 vehicle, this is the spacing evaluated and plotted for validations. Axle spacing errors appear to be consistent throughout the test truck speed range and are limited to about 0.1 feet. Vehicles speeds appear to have no effect on the error of measured axle spacing.

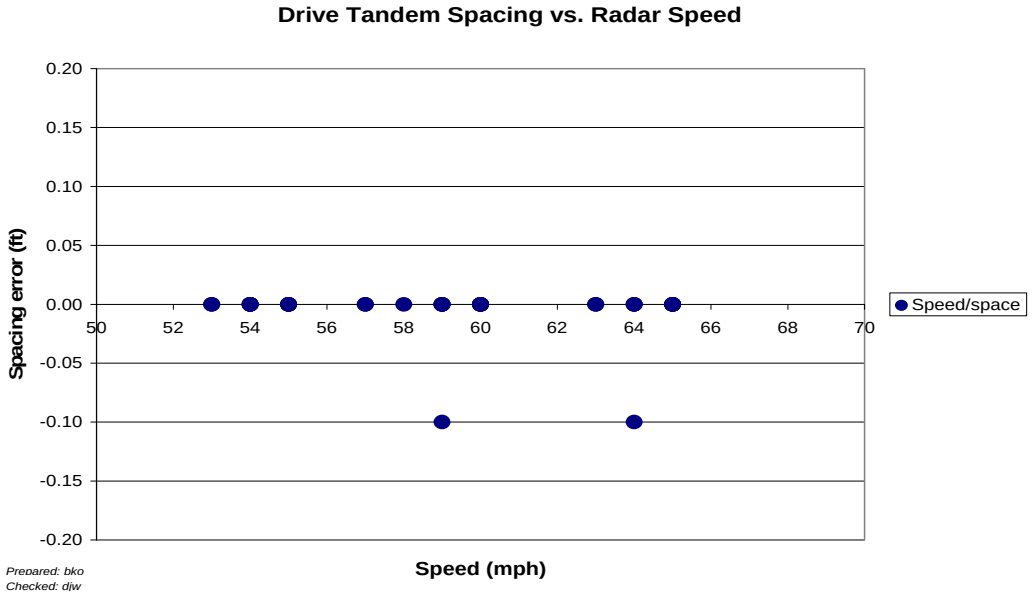

Figure 3-4 Post-Validation Spacing vs. Speed – 550100 – 28-Nov-2007

3.1 Temperature-based Analysis

The two temperature groups were created by splitting the runs between those at 12 to 22 degrees Fahrenheit for Low temperature and 23 to 30 degrees Fahrenheit for High temperature.

Table 3-2 Post-Validation Results by Temperature Bin – 550100 – 28-Nov-2007

Element	95% Limit	Low Temperature 12 to 22 °F	High Temperature 23 to 30 °F
Steering axles	±20 %	-1.7 ± 7.1%	-2.3 ± 8.3%
Tandem axles	±15 %	-0.3 ± 6.8%	-0.1 ± 8.6%
GVW	±10 %	-0.6 ± 5.8%	-0.5 ± 5.9%
Speed	±1 mph	-0.1 ± 1.3 mph	0.0 ± 1.3 mph
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.0 ft

Prepared: djw *Checked: bko*

From Table 3-2, it appears that the mean error for steering axles is greater than the mean error for tandem and GVW weights at all temperatures. The equipment appears to estimate GVW and tandem axle weights with reasonable accuracy. The scatter for all weight errors is greater at the higher temperatures.

Figure 3-5 is the distribution of GVW Errors versus Temperature by Truck graph.

The figure illustrates consistent GVW errors for both trucks over the observed temperature range.

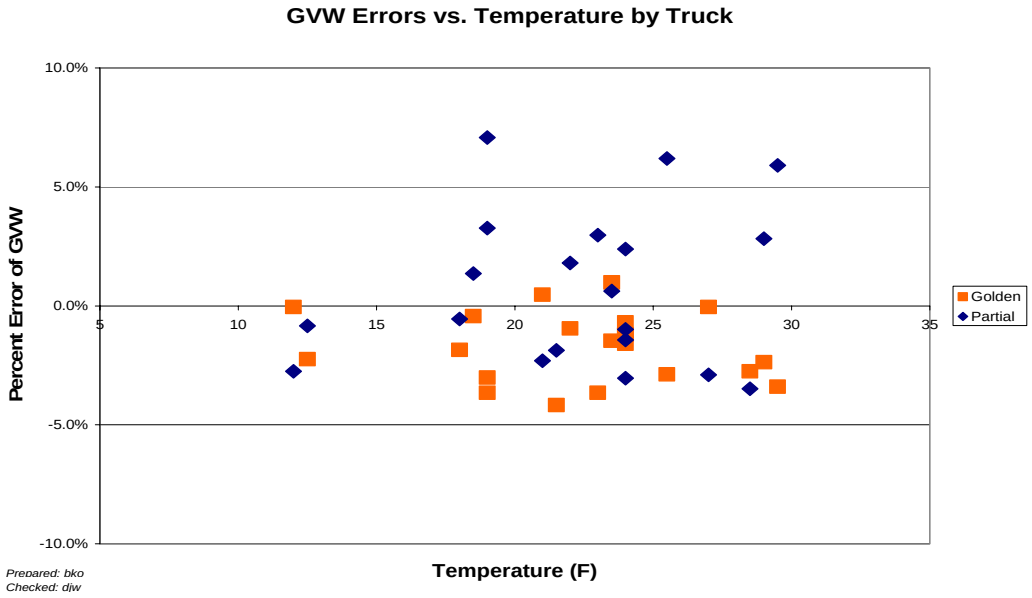

Figure 3-5 Post-Validation GVW Percent Error vs. Temperature by Truck – 550100 – 28-Nov-2007

Figure 3-6 shows the relationship between steering axle errors and temperature. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for calibration. This site does not use auto-calibration. The steering axles in this graph are associated only with Class 9 vehicles. Figure 3-6 shows how the WIM equipment underestimates the steering axle weights at all temperatures. Variability of the error is increasing as the temperature increases. This may be a function of the number of observations rather than an actual temperature effect.

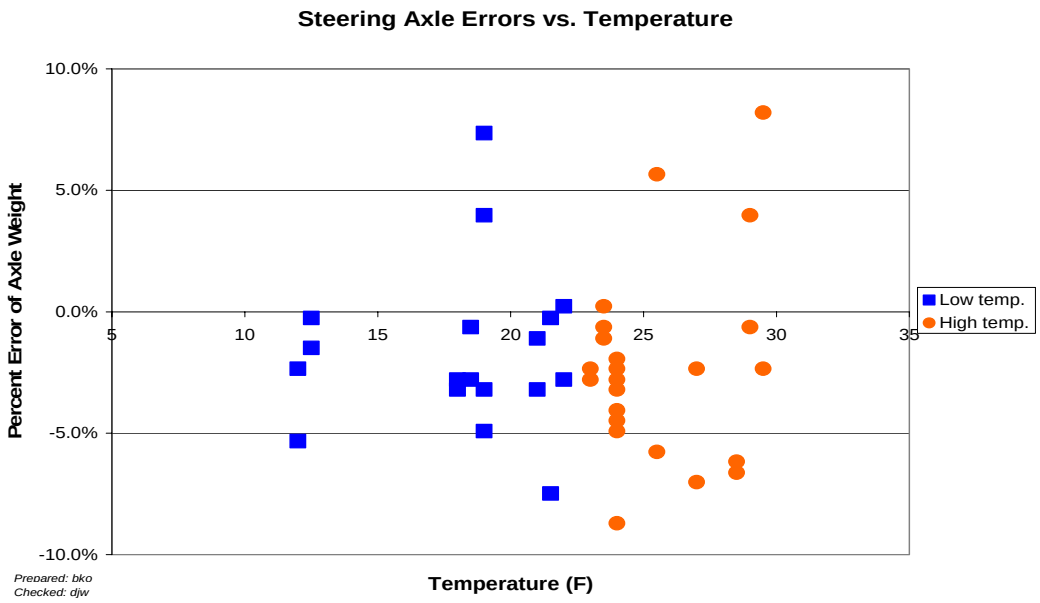

Figure 3-6 Post-Validation Steering Axle Error vs. Temperature by Group – 550100 – 28-Nov-2007

3.2 Speed-based Analysis

The three speed groups were divided using 53 to 55 mph for Low speed, 56 to 61 mph for Medium speed and 62+ mph for High speed.

Table 3-3 Post-Validation Results by Speed Bin – 550100 – 28-Nov-2007

Element	95% Limit	Low Speed 53 to 55 mph	Medium Speed 56 to 61 mph	High Speed 62+ mph
Steering axles	±20 %	-3.7 ± 3.9%	-1.5 ± 11.6%	-0.9 ± 4.1%
Tandem axles	±15 %	-1.3 ± 4.0%	0.7 ± 11.5%	-0.1 ± 4.9%
GVW	±10 %	-1.6 ± 2.7%	0.1 ± 8.7%	-0.2 ± 3.6%
Speed	±1 mph	-0.2 ± 1.3 mph	0.1 ± 1.3 mph	0.1 ± 1.4 mph
Axle spacing	± 0.5 ft	0.0 ± 0.0 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft

Prepared: djw *Checked: bko*

From Table 3-3 it appears that all weights are estimated with reasonable accuracy with the exception of the slight underestimation of weights at the lower speeds. Scatter of the error is much greater at the medium speeds for all weight estimation errors.

Figure 3-7 illustrates the tendency of the WIM equipment to estimate GVW differently for each test truck. For the Golden truck (squares), the equipment estimates GVW with reasonable accuracy at the low and high speeds and underestimates at the medium speeds. For the Partial truck (diamonds), the equipment underestimates GVW at the low speeds, slightly overestimates at the high speeds, and overestimates to a much greater degree at the medium speeds. At the medium speeds, the underestimation of GVW for the Golden

truck when combined with the overestimation of GVW for the Partial truck contributes to a much greater scatter in error for the truck population as a whole at those speeds.

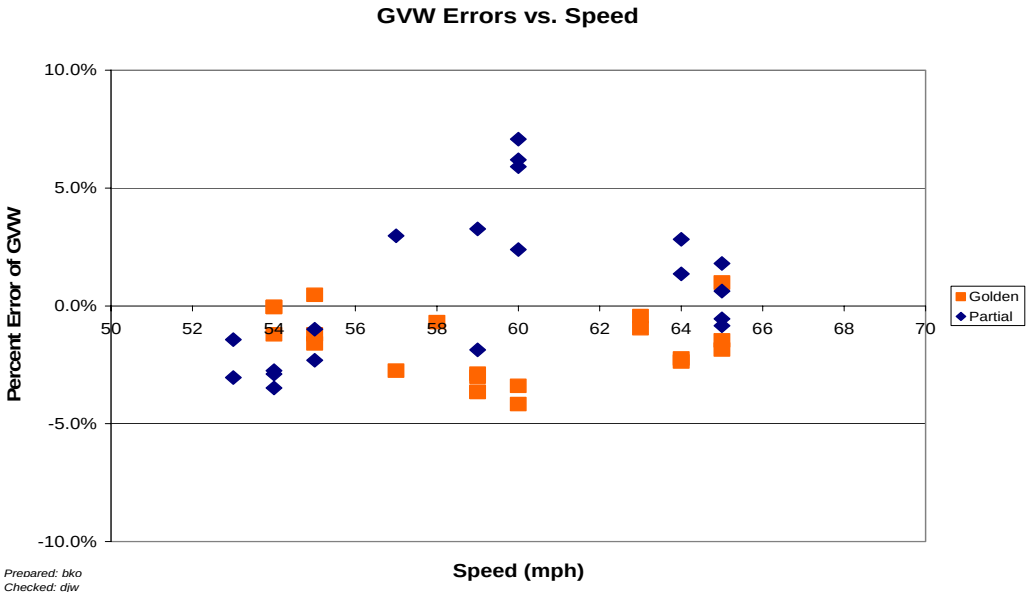

Figure 3-7 Post-Validation GVW Percent Error vs. Speed by Truck – 550100 – 28-Nov-2007

Figure 3-8 shows the relationship between steering axle errors and speed. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for auto-calibration. This site does not use auto-calibration. The steering axles in this graph are associated only with Class 9 vehicles. Figure 3-8 shows how the WIM equipment underestimates steering axle weights at the low and medium speeds and estimates with reasonable accuracy at high speeds. As with GVW, scatter of error is much greater at the medium speeds.

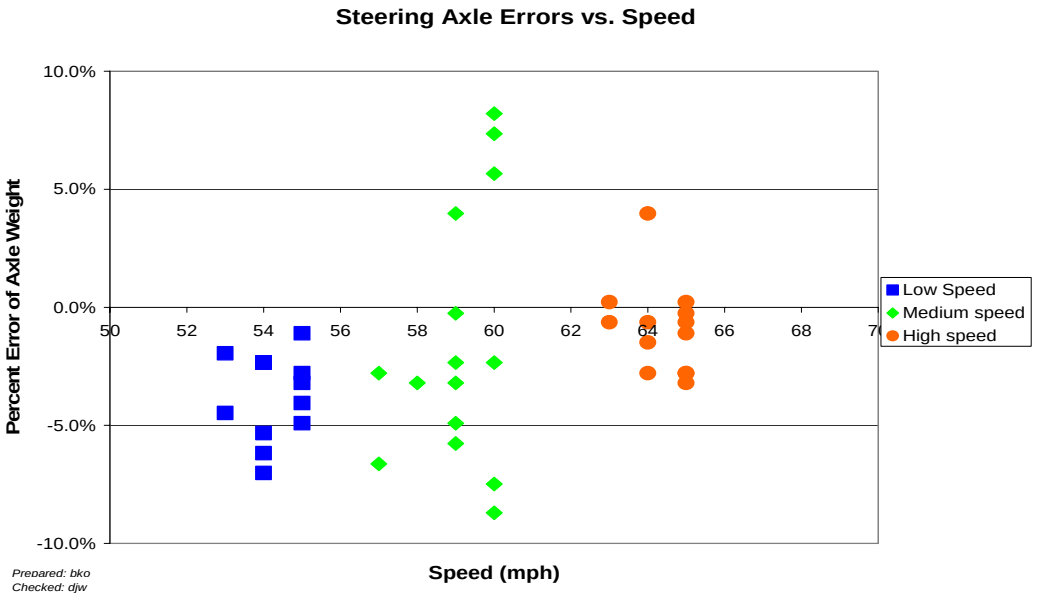

Figure 3-8 Post-Validation Steering Axle Percent Error vs. Speed by Group – 550100 – 28-Nov-2007

Figure 3-9 illustrates the tendency for the equipment to estimate steering axle weights much in the same manner as GVW is estimated. For both trucks, steering axle weights are underestimated at low speeds and estimated with reasonable accuracy at high speeds. At the medium speeds, the opposing estimating tendencies contribute to a much greater scatter in error at those speeds.

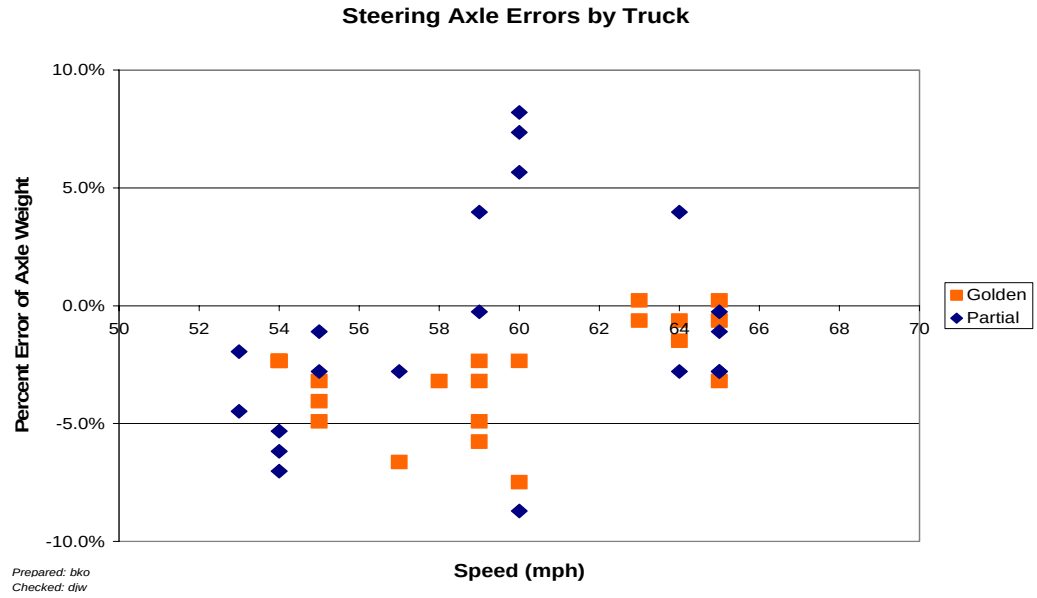

Figure 3-9 Post-Validation Steering Axle Errors by Truck and Speed – 550100 – 28-Nov-2007

3.3 Classification Validation

The agency uses the LTPP ETG Mod 3 algorithm to classify vehicles in the FHWA 13-bin classification scheme at this site. Classification 15 has been added to define unclassified vehicles.

The classification validation is intended to find gross errors in vehicle classification, not to validate the installed algorithm. A sample of 100 trucks was collected at the site. Video was taken at the site to provide ground truth for the evaluation. Based on a 100 percent sample it was determined that there are zero percent unknown vehicles and zero percent unclassified vehicles.

The second check is the ability of the algorithm to correctly distinguish between truck classes with no more than 2% errors in such classifications. Table 3-4 has the classification error rates by class. The overall misclassification rate is 11.3 percent. Most of the misclassification errors were related to Class 5 vehicles with short axle spacings. Those vehicles were consistently identified as belonging to Class 4.

Table 3-4 Truck Misclassification Percentages for 550100 – 28-Nov-2007

Class	Percent Error	Class	Percent Error	Class	Percent Error
4	100	5	46	6	13
7	0				
8	0	9	0	10	0
11	N/A	12	N/A	13	N/A

Prepared: djw *Checked: bko*

The misclassification percentage is computed as the probability that a pair containing the class of interest does NOT include a match. Thus if there are eight pairs of observations with at least one Class 9 and only six of them are matches, the error rate is 25 percent. The percent error and the mean differences reported below do not represent the same statistic. It is possible to have error rates greater than 0 with a mean difference of zero.

Table 3-5 Truck Classification Mean Differences for 550100 – 28-Nov-2007

Class	Mean Difference	Class	Mean Difference	Class	Mean Difference
4	UNK	5	- 46	6	- 13
7	0				
8	0	9	0	10	0
11	N/A	12	N/A	13	N/A

Prepared: djw *Checked: bko*

These error rates are normalized to represent how many vehicles of the class are expected to be over or under-counted for every hundred of that class observed by the equipment. Thus a value of 0 means the class is identified correctly on average. A number between –1 and –100 indicates at least that number of vehicles either missed or not assigned to the class by the equipment. It is not possible to miss more than all of them or one hundred out of one hundred. Numbers 1 or larger indicate at least how many more vehicles are assigned to the class than the actual "hundred observed". Classes marked

Unknown (UNK) are those identified by the equipment but no vehicles of the type were seen by the observer. There is no way to tell how many vehicles of that type might actually exist. N/A means no vehicles of the class were recorded by either the equipment or the observer.

3.4 Evaluation by ASTM E-1318 Criteria

The ASTM E-1318 criteria for a successful validation of Type I sites is 95% of the observed errors within the limits for allowable errors for each of the relevant statistics. If this site had been evaluated using ASTM E-1318-02 it would have met the conditions for a Type I site exclusive of wheel loads. LTPP does not validate WIM performance with respect to wheel loads.

Table 3-6 Results of Validation Using ASTM E-1318-02 Criteria

Characteristic	Limits for Allowable Error	Percent within Allowable Error	Pass/Fail
Single Axles	± 20%	100%	Pass
Axle Groups	± 15%	100%	Pass
GVW	± 10%	100%	Pass

Prepared: djw *Checked: bko*

4 Pavement Discussion

The pavement smoothness may have contributed to the higher degree of scatter for both GVW and Steering axle error at the medium speeds. In the absence of profile data elimination of smoothness as a possible cause is not possible.

The pavement condition did not appear to influence truck movement across the sensors.

4.1 Profile Analysis

Profile data collected since installation and prior to the site visit do not exist. A site visit to collect profile data has not been scheduled yet. An amended report will be submitted when the data is available.

4.2 Distress Survey and Any Applicable Photos

During a visual survey of the pavement, no distresses that would influence truck movement across the WIM scales were noted. The repaired area from the previous bending plate location is beyond the influence area of the sensors.

4.3 Vehicle-pavement Interaction Discussion

A visual observation of the trucks as they approach, traverse and leave the sensor area did not indicate any visible motion of the trucks that would affect the performance of the WIM scales. Trucks appear to track down the wheel path and daylight cannot be seen between the tires of any of the sensors for the equipment.

5 Equipment Discussion

The traffic monitoring equipment at this location includes bending plate and iSINC. These sensors are installed in a portland cement concrete pavement.

New WIM sensors, an electronic controller and support components were installed for the LTPP lane at a site approximately 175 feet upstream from the original site since an Assessment was performed on December 14, 2004.

5.1 Pre-Evaluation Diagnostics

A complete electronic and electrical check of all system components including in-road sensors, electrical power, and telephone service were performed immediately prior to the evaluation. All sensors and system components were found to be within operating parameters.

5.2 Calibration Process

Although no calibration iterations were required, one-calibration iteration was performed between the initial 40 runs and the final 40 runs to improve statistics in the medium speed range (56 to 61). This is above the 15th percentile speed.

For this equipment, there are six primary calibration factors. The dynamic compensation factor is increased to account for underestimation of front axle weights at all speeds and is decreased to compensate for overestimation of front axle weights at all speeds.

The five speed point factors are increased or decreased to compensate for underestimation, overestimation or an imbalance in left/right weights at five different speed ranges.

For this site, the starting factors were:

Dynamic Compensation Factor: 103
Speed point factors:

	Left	Right
Speed bin 1:	3296	3476
Speed bin 2:	3381	3566
Speed bin 3:	3414	3601
Speed bin 4:	3315	3497
Speed bin 5:	3262	3441

5.2.1 Calibration Iteration 1

The results of the pre-validation test runs indicated that the equipment was generally underestimating all weights by approximately 5.0% at medium speeds and overestimating weights by 1.0% at the high speeds. For front axle weights, the equipment underestimated by an additional 3.0% at all speeds.

As a result, the primary factors were adjusted to compensate for these errors and the following factors were installed:

Dynamic compensation factor: 106
Speed point factors:

	Left	Right
Speed bin 1:	3296	3476
Speed bin 2:	3381	3566
Speed bin 3:	3571	3767
Speed bin 4:	3278	3459
Speed bin 5:	3262	3441

Speed bin 1, 2 and 5 factors were not adjusted. There was no data to support changes in factors 1 and 5 as those are associated with 50 and 70 mph respectively. The Phase I On-Site Leader made the calculations, determined the new factors and input them into the controller.

The results of the 12 calibration verification runs are shown in Table 5-1. Because of the calibration verification run equipment accuracies, no further calibrations were deemed necessary. A final 28 test runs were conducted to complete the post-validation series of 40 runs.

Table 5-1 Calibration Iteration 1 Results – 550100 – 28-Nov-2007 (08:53 AM)

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-3.9 ± 5.9%	Pass
Tandem axles	±15 percent	-0.8 ± 6.9%	Pass
GVW	±10 percent	-1.4 ± 3.8%	Pass
Speed	**±1 mph**	**-0.3 ± 1.4 mph**	**Fail**
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	Pass

Prepared: djw Checked: bko

Figure 5-1 illustrates the change in GVW error estimation at medium speed.

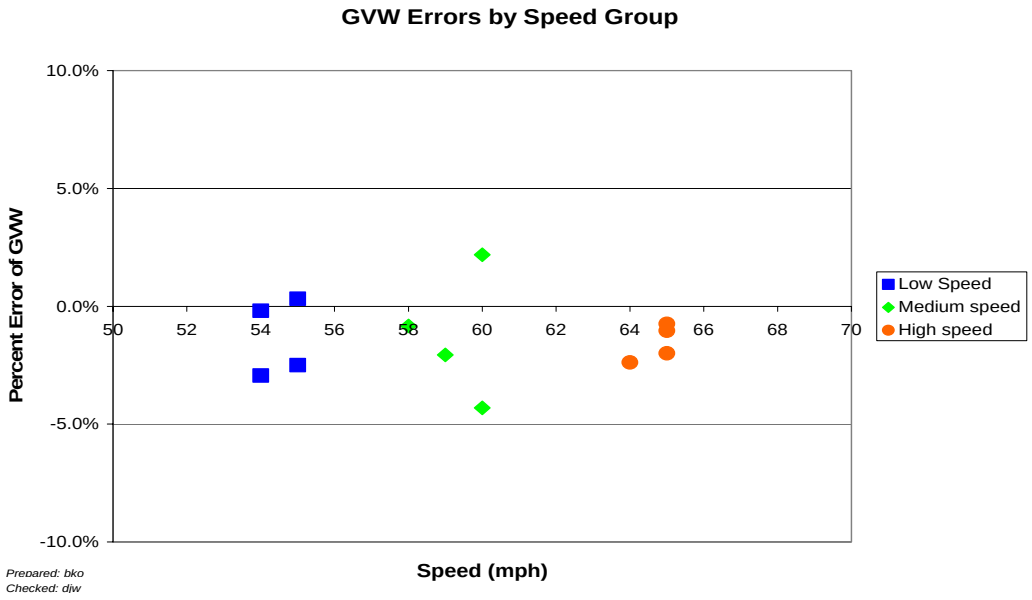

Figure 5-1 Calibration Iteration 1 GVW Percent Error vs. Speed Group – 550100 – 28-Nov-2007 (08:53 AM)

5.3 Summary of Traffic Sheet 16s

This site has validation information only for the current visit in the tables below. Table 5-2 has information for TRF_CALIBRATION_AVC for Sheet 16s for this validation. The data from the Assessment in 2004 is for the previous installation. There no 2004 monitored data available.

Table 5-2 Classification Validation History – 550100 – 28-Nov-2007

Date	Method	Mean Difference				Percent Unclassified
		Class 9	Class 8	Other 1	Other 2	
28-Nov-07	Manual	0	0			0
27-Nov-07	Manual	0	0			0

Prepared: djw Checked: bko

Table 5-3 has the information for TRF_CALIBRATION_WIM for Sheet 16s submitted for this validation.

Table 5-3 Weight Validation History – 550100 – 28-Nov-2007

Date	Method	Mean Error and (SD)		
		GVW	Single Axles	Tandem Axles
28-Nov-07	Test Trucks	-0.5 (2.8)	-2.0 (3.7)	-0.2 (3.9)
27-Nov-07	Test Trucks	-1.8 (3.2)	-5.4 (3.7)	-1.0 (4.1)

Prepared: djw *Checked: bko*

5.4 Projected Maintenance/Replacement Requirements

This site is scheduled for semi-annual maintenance under the installation contract. No other maintenance is required at this time.

6 Pre-Validation Analysis

This pre-validation analysis is based on test runs conducted November 27, 2007 during the morning and early afternoon hours at test site 550100 on SR 29. This SPS-1 site is at milepost 189.8 on the westbound, righthand of a four-lane divided facility. No auto-calibration was used during test runs. The two trucks used for initial validation included:

1. 5-axle tractor semi-trailer combination with a tractor having an air suspension and trailer with standard rear tandem and an air suspension loaded to 77,870 lbs.
2. 5-axle tractor semi-trailer with a tractor having an air suspension and a trailer with a standard rear tandem and an air suspension loaded to 67,820 lbs., the partial truck.

For the initial validation, each truck made a total of 21 passes over the WIM scale at speeds ranging from approximately 52 to 65 miles per hour. The desired speed range was achieved during this validation. Pavement surface temperatures were recorded during the test runs ranging from about 10 to 30degrees Fahrenheit. The desired 30 degree Fahrenheit temperature range was not achieved. The computed values of 95% confidence limits of each statistic for the total population are in Table 6-1.

As shown in Table 6-1, the site meets and passed all LTPP performance criteria for research quality data for weight and spacing. It did not meet the requirements for speed, which is not considered sufficient to disqualify the site as having research quality data.

Table 6-1 Pre-Validation Results – 550100 – 27-Nov-2007

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-5.4 ± 7.5%	Pass
Tandem axles	±15 percent	-1.0 ± 8.2%	Pass
GVW	±10 percent	-1.8 ± 6.4%	Pass
Speed	**±1 mph [2 km/hr]**	**-0.3 ± 1.7 mph**	**Fail**
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.0 ft	Pass

Prepared: djw *Checked: bko*

The test runs were conducted primarily during the morning and early afternoon hours under windy and cloudy weather conditions, resulting in a limited range of pavement temperatures. The runs were also conducted at various speeds to determine the effects of these variables on the performance of the WIM scale. To investigate these effects, the dataset was split into three speed groups and two temperature groups. The distribution of runs within these groupings is illustrated in Figure 6-1. The figure indicates that the desired distribution of speed and temperature combinations was not achieved for this set of validation runs.

The three speed groups were divided into 52 to 55 mph for Low speed, 56 to 61 mph for Medium speed and 62+ mph for High speed. The two temperature groups were created by splitting the runs between those at 10 to 21 degrees Fahrenheit for Low temperature 22 to 30 degrees Fahrenheit for High temperature.

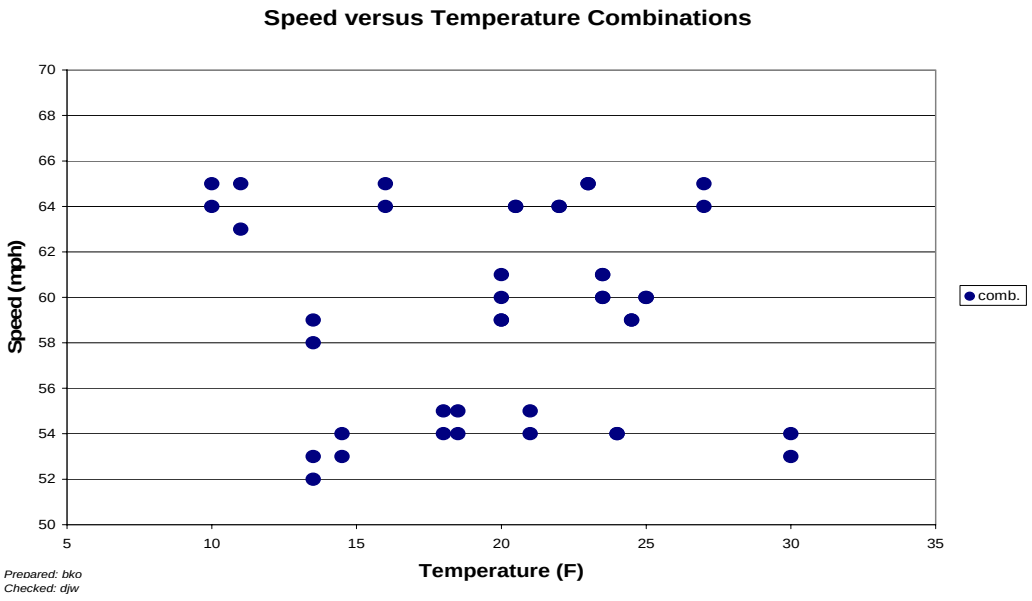

Figure 6-1 Pre-Validation Speed-Temperature Distribution – 550100 – 27-Nov-2007

A series of graphs was developed to investigate visually for any sign of any relationship between speed or temperature and the scale performance.

Figure 6-2 shows the GVW Percent Error vs. Speed graph for the population as a whole. From the figure, it can be seen that the equipment underestimates GVW at low and medium speeds. The scatter of the percent error is much greater at the medium speeds.

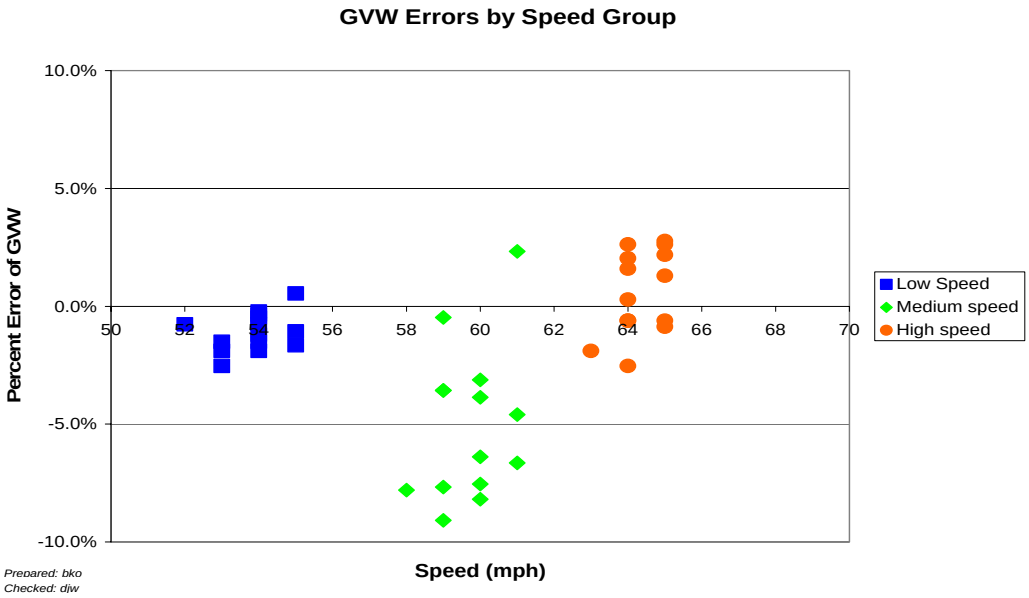

Figure 6-2 Pre-validation GVW Percent Error vs. Speed – 550100 – 27-Nov-2007

Figure 6-3 shows the relationship between temperature and GVW percentage error. The graph illustrates that there does not appear to be a relationship between GVW error and pavement temperature in the observed range.

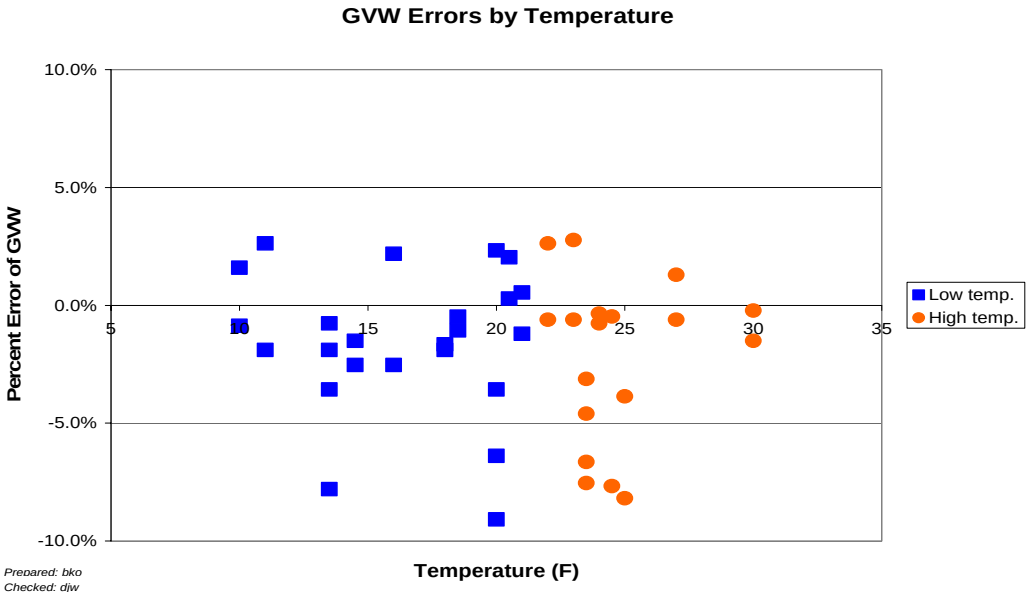

Figure 6-3 Pre-Validation GVW Percent Error vs. Temperature – 550100 – 27-Nov-2007

Figure 6-4 shows the relationship between the drive tandem spacing errors in feet and speeds. This graph is used as a potential indicator of classification errors due to failure to

correctly identify spacings on a vehicle. Since the most common reference value is the drive tandem on a Class 9 vehicle, this is the spacing evaluated and plotted for validations. Axle spacing errors appear to be consistent throughout the test truck speed range and are limited to about 0.1 feet.

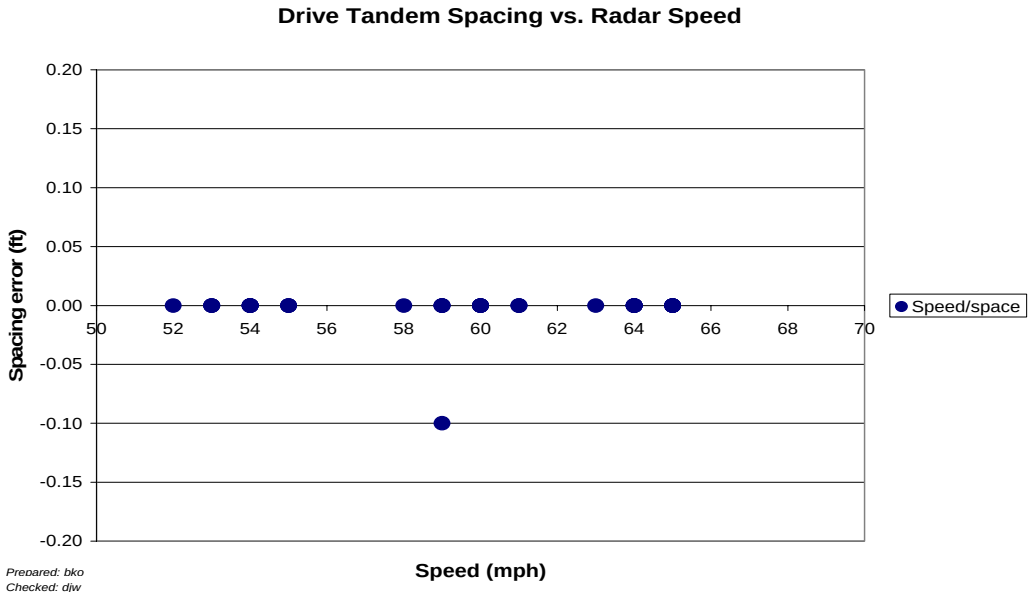

Figure 6-4 Pre-Validation Spacing vs. Speed - 550100 – 27-Nov-2007

6.1 Temperature-based Analysis

The two temperature groups were created by splitting the runs between those at 10 to 21 degrees Fahrenheit for Low temperature and 22 to 30 degrees Fahrenheit for High temperature.

Table 6-2 Pre-Validation Results by Temperature Bin – 550100 – 27-Nov-2007

Element	95% Limit	Low Temperature 10 to 21 °F	High Temperature 22 to 30 °F
Steering axles	±20 %	-4.7 ± 7.4%	-6.2 ± 8.2%
Tandem axles	±15 %	-0.8 ± 7.3%	-1.2 ± 9.6%
GVW	±10 %	-1.5 ± 6.2%	-2.2 ± 7.3%
Speed	±1 mph	-0.1 ± 1.9 mph	-0.5 ± 1.3 mph
Axle spacing	± 0.5 ft	0.0 ± 0.0 ft	0.0 ± 0.0 ft

Prepared: djw *Checked: bko*

From Table 6-2 it appears that the equipment underestimates all weights at all temperatures. Scatter in error appears to be slightly greater at the higher temperatures.

Figure 6-5 shows the distribution of GVW Errors versus Temperature by Truck. The figure illustrates the tendency of the WIM equipment to report reasonably accurate estimates of GVW weights for the Partial truck (diamonds) while underestimating GVW for the Golden truck (squares) over the entire temperature range. Scatter of error appears

to be greater for the Golden truck when compared with the scatter of error for the Partial truck.

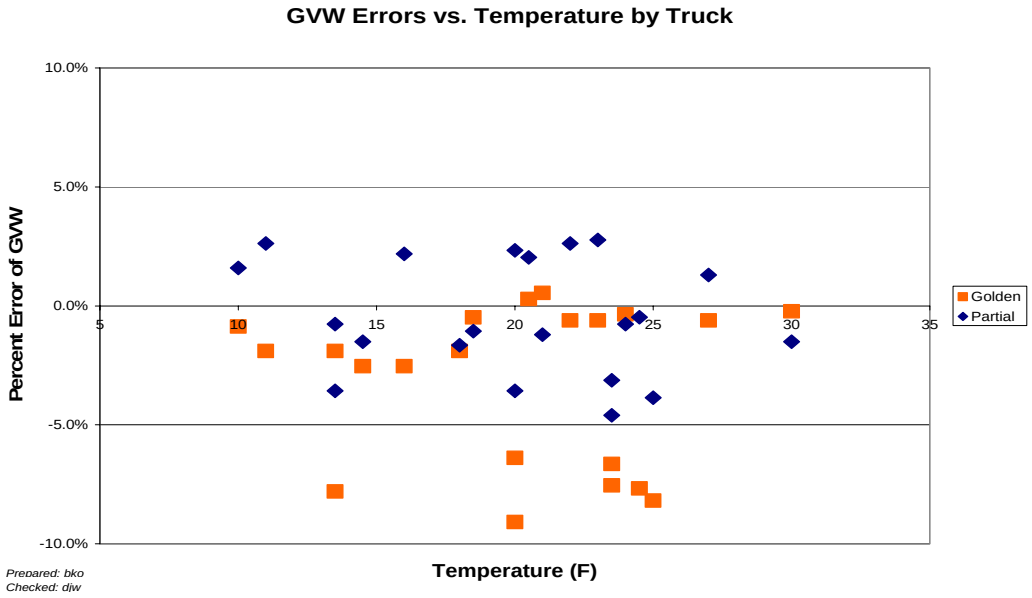

Figure 6-5 Pre-Validation GVW Percent Error vs. Temperature by Truck – 550100 – 27-Nov-2007

Figure 6-6 shows the relationship between steering axle errors and temperature. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for auto-calibration. This site does not use auto-calibration. The steering axles in this graph are associated only with Class 9 vehicles. The figure shows how the WIM equipment underestimates the steering axle weights. Variability of the error appears to be consistent, given fewer samples at the upper and lower ends of the temperature range.

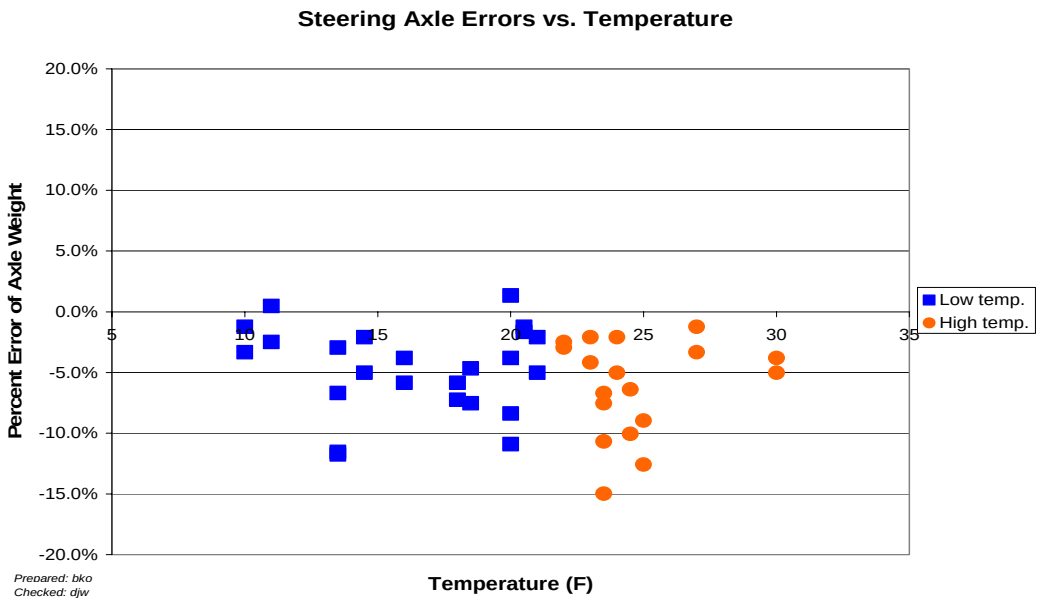

Figure 6-6 Pre-Validation Steering Axle Error vs. Temperature by Group – 550100 – 27-Nov-2007

6.2 Speed-based Analysis

The speed groups were divided as follows: Low speed – 52 to 55 mph, Medium speed – 56 to 61 mph and High speed – 62+ mph.

Table 6-3 Pre-Validation Results by Speed Bin – 550100 – 27-Nov-2007

Element	95% Limit	Low Speed 52 to 55 mph	Medium Speed 56 to 61 mph	High Speed 62+ mph
Steering axles	±20 %	-4.6 ± 4.0%	-8.8 ± 8.8%	-2.6 ± 3.5%
Tandem axles	±15 %	-0.4 ± 3.3%	-3.9 ± 11.3%	1.2 ± 4.8%
GVW	±10 %	-1.1 ± 1.8%	-5.0 ± 7.0%	0.6 ± 3.9%
Speed	±1 mph	0.1 ± 2 mph	-0.6 ± 1.6 mph	-0.3 ± 1.6 mph
Axle spacing	± 0.5 ft	0.0 ± 0.0 ft	0.0 ± 0.1 ft	0.0 ± 0.0 ft

Prepared: djw *Checked: bko*

From Table 6-3, it appears that the mean error and variability in error for all weights is much greater at the medium speeds. Steering axle mean error is greater than GVW and tandem axle error at all speeds.

Figure 6-7 illustrates the tendency of the WIM equipment to estimate GVW differently for each test truck at the medium and high speeds. At the medium speeds, the underestimation of GVW for the Golden truck (squares) is much greater than the underestimation of GVW for the Partial truck (diamonds). At the high speeds, GVW for the Golden truck is estimated with reasonable accuracy while GVW for the Partial truck is overestimated. Scatter for each truck separately is reasonably consistent. The

estimating tendencies of the equipment contribute to a much greater scatter in error for the truck population as a whole at the medium speeds.

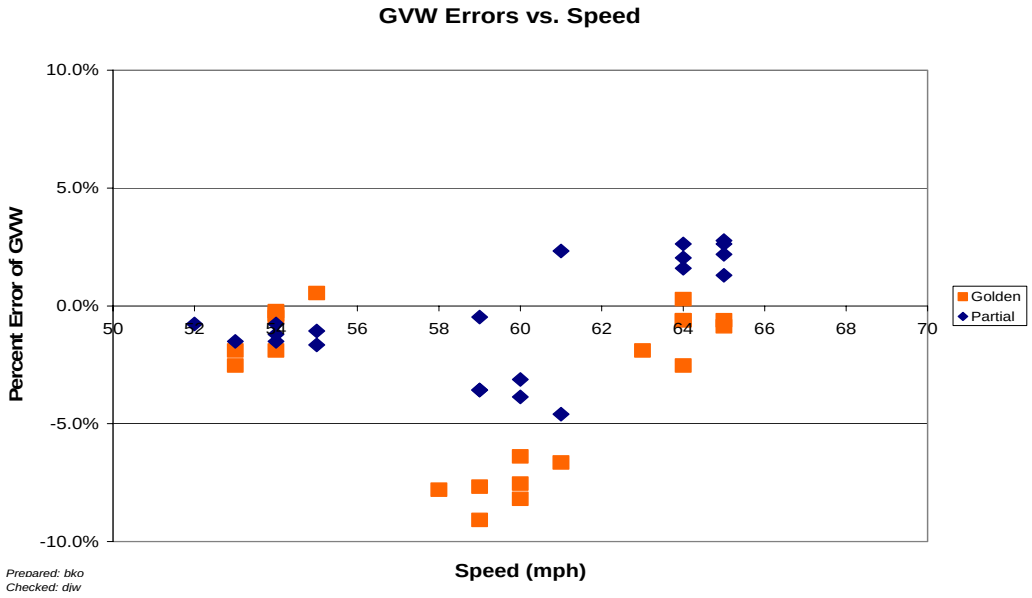

Figure 6-7 Pre-Validation GVW Percent Error vs. Speed Group - 550100 –27-Nov-2007

Figure 6-8 shows the relationship between steering axle errors and speed. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for calibration. This site does not use auto-calibration. The steering axles in this graph are associated only with Class 9 vehicles. The figure shows how the WIM equipment generally underestimates the steering axle weights and to a greater degree at the medium speeds. Variability of the error appears to be greater at the medium speeds.

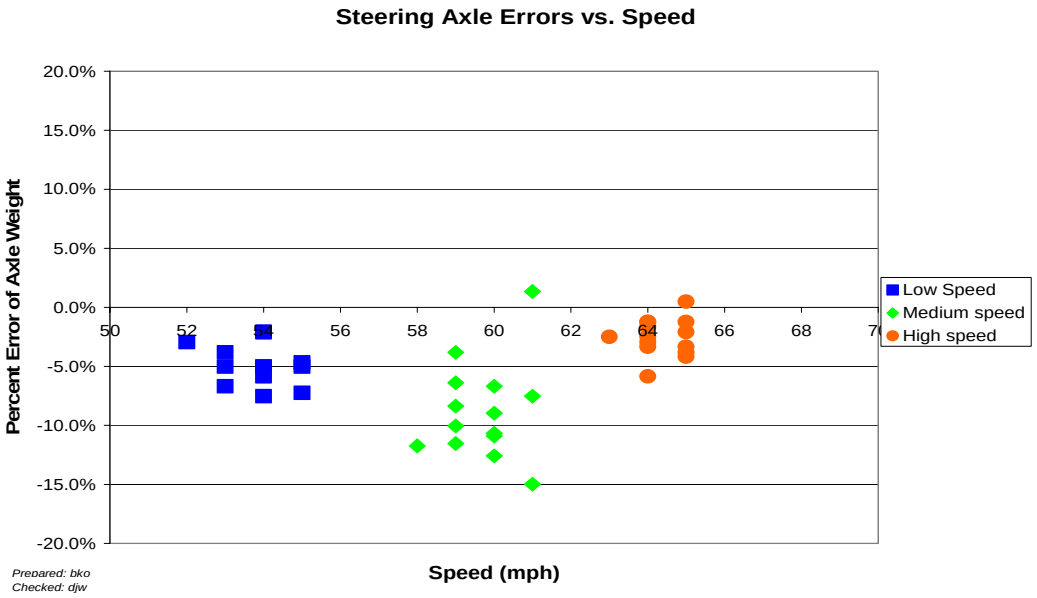

Figure 6-8 Pre-Validation Steering Axle Percent Error vs. Speed Group - 550100 – 27-Nov-2007

Figure 6-9 illustrates the tendency for the equipment to underestimate steering axle weights for both trucks at all speeds. The separation of GVW estimations at the medium speeds shown in Figure 6-7 does not occur with the Steering axle estimations, although the variability in error is still greater at those speeds.

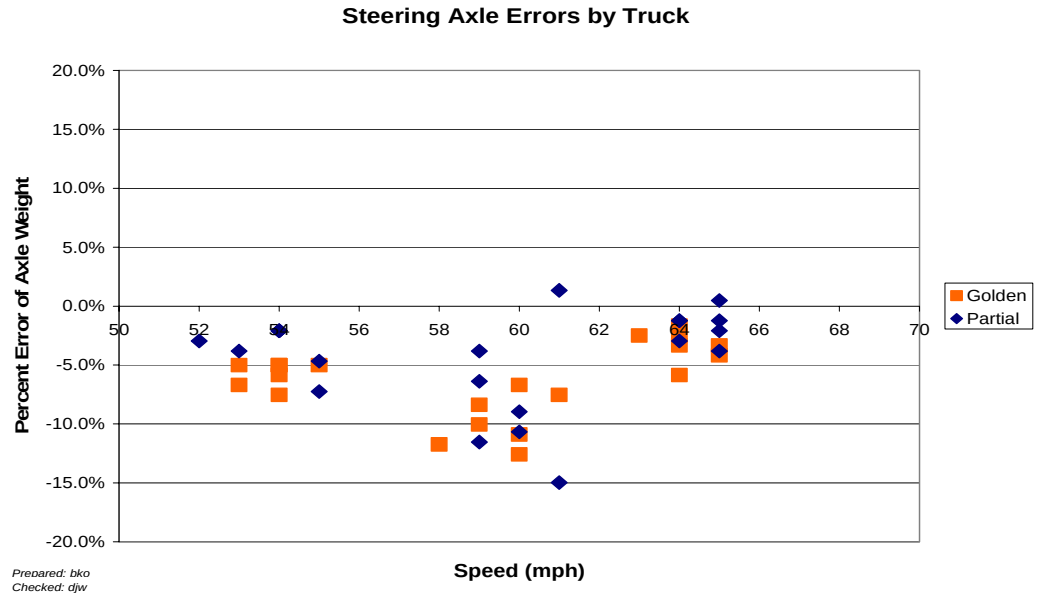

Figure 6-9 Pre-Validation Steering Axle Errors by Truck and Speed – 550100 – 27-Nov-2007

6.3 Classification Validation

The agency uses the LTPP ETG Mod 3 algorithm to classify vehicles in the FHWA 13-bin classification scheme at this site. Classification 15 has been added to define unclassified vehicles.

The classification validation is intended to find gross errors in vehicle classification, not to validate the installed algorithm. A sample of 100 trucks was collected at the site. The classification identification is to identify gross errors in classification, not validate the classification algorithm. Video was taken at the site to provide ground truth for the evaluation. Based on a 100 percent sample it was determined that there are zero percent unknown vehicles and zero percent unclassified vehicles.

The second check is the ability of the algorithm to correctly distinguish between truck classes with no more than 2% errors in such classifications. Table 6-4 has the classification error rates by class. The overall misclassification rate is 11.3 percent. The errors in classification are associated with short wheelbase Class5s that the equipment bins as Class 4s.

Table 6-4 Truck Misclassification Percentages for 550100 – 27-Nov-2007

Class	Percent Error	Class	Percent Error	Class	Percent Error
4	67	5	33	6	25
7	0				
8	0	9	0	10	0
11	N/A	12	N/A	13	N/A

Prepared: djw *Checked: bko*

The misclassification percentage is computed as the probability that a pair containing the class of interest does NOT include a match. Thus if there are eight pairs of observations with at least one Class 9 and only six of them a re matches, the error rate is 25 percent. The percent error and the mean differences reported below do not represent the same statistic. It is possible to have error rates greater than 0 with a mean difference of zero.

Table 6-5 Truck Classification Mean Differences for 550100 – 27-Nov-2007

Class	Mean Difference	Class	Mean Difference	Class	Mean Difference
4	200	5	- 33	6	- 25
7	0				
8	0	9	0	10	0
11	N/A	12	N/A	13	N/A

Prepared: djw *Checked: bko*

These error rates are normalized to represent how many vehicles of the class are expected to be over- or under-counted for every hundred of that class observed by the equipment. Thus a value of 0 means the class is identified correctly on average. A number between –1 and –100 indicates at least that number of vehicles either missed or not assigned to the class by the equipment. It is not possible to miss more than all of them or one hundred out of one hundred. Numbers 1 or larger indicate at least how many more

vehicles are assigned to the class than the actual "hundred observed". Classes marked Unknown are those identified by the equipment but no vehicles of the type were seen the observer. There is no way to tell how many vehicles of that type might actually exist. N/A means no vehicles of the class were recorded by either the equipment or the observer.

6.4 Evaluation by ASTM E-1318 Criteria

The ASTM E-1318 criteria for a successful validation of Type I sites is 95% of the observed errors within the limits for allowable errors for each of the relevant statistics. If this site had been evaluated using ASTM E-1318-02 it would have met the conditions for a Type I site exclusive of wheel loads. LTPP does not validate WIM performance with respect to wheel loads.

Table 6-6 Results of Validation Using ASTM E-1318-02 Criteria

Characteristic	Limits for Allowable Error	Percent within Allowable Error	Pass/Fail
Single Axles	± 20%	100%	Pass
Axle Groups	± 15%	100%	Pass
GVW	± 10%	100%	Pass

Prepared: djw *Checked: bko*

7 Data Availability and Quality

As of November 27, 2007 this site does not have at least 5 years of research quality data. Research quality data is defined to be at least 210 days in a year of data of known calibration meeting LTPP's precision requirements.

Data that has validation information available has been reviewed in light of the patterns present in the two weeks immediately following a validation/calibration activity. A determination of research quality data is based on the consistency with the validation pattern. Data that follows consistent and rational patterns in the absence of calibration information may be considered nominally of research quality pending validation information with which to compare it. Data that is inconsistent with expected patterns and has no supporting validation information is not considered research quality.

The amount and coverage for the site for years prior to installation is not included in this report. There is insufficient data in any year (1998, 1999, 2000 and 2001) to qualify for research quality data. In the absence data from the previous installation, it can be seen that at least five additional years of research quality data are needed to meet the goal of a minimum of 5 years of research weight data.

GVW graphs and characteristics associated with them are used as data screening tools. As a result classes constituting more that ten percent of the truck population are considered major sub-groups whose evaluation characteristics should be identified for use in screening. The typical values to be used for reviewing incoming data after a validation are determined starting with data from the day after the completion of a validation.

Class 9s and Class 5s constitute more than 10 percent of the truck population. Based on the data collected from the end of the last calibration iteration the following are the expected values for these populations. The precise values to be used in data review will need to be determined by the Regional Support Contractor on receipt of the first 14 days of data after the successful validation. For sites that do not meet LTPP precision requirements, this period may still be used as a starting point from which to track scale changes.

Table 7-1 is generated with a column for every vehicle class 4 or higher that represents 10 percent or more of the truck (class 4-20) population. In creating Table 7-1 the following definitions are used:

- Class 9 overweights are defined as the percentage of vehicles greater than 88,000 pounds
- Class 9 underweights are defined as the percentage of vehicles less than 20,000 pounds.
- Class 9 unloaded peak is the bin less than 44,000 pounds with the greatest percentage of trucks.
- Class 9 loaded peak is the bin 60,000 pounds or larger with the greatest percentage of trucks.
- For all other trucks the typical axle configuration is used to determine the maximum allowable weight based on 18,000 pounds for single axles and 34,000 pounds for tandem axles. A ten percent cushion above that maximum is used to set the overweight threshold.
- For all other trucks in the absence of site specific information the computation of under weights assumes the power unit weighs 10,000 pounds and each axle on a trailer 5,000 pounds. Ninety percent of the total for the unloaded configuration is the value below which a truck is considered under weight.
- For all trucks other than class 9s that have a bi-modal distribution the unloaded peak is defined to be in a bin less than or equal to half of the allowable maximum weight.
- For all trucks other than class 9s that have a bi-modal distribution the loaded peak is defined to be in a bin greater than or equal to half of the allowable maximum weight.

There may be more than one bin identified for the unloaded or loaded peak due to the small sample size collected after validation. Where only one peak exists, the peak rather than a loaded or unloaded peak is identified. This may happen with single unit trucks. It is not expected to occur with combination vehicles.

Table 7-1 GVW Characteristics of Major sub-groups of Trucks – 550100 – 28-Nov-2007

Characteristic	Class 9	Class 5
Percentage Overweights	1.9%	0.0%
Percentage Underweights	0.2%	2.3%
Unloaded Peak	34,000 lbs	
Loaded Peak	74,000 lbs	
Peak		12,000 lbs

Prepared: djw *Checked: bko*

The expected percentage of unclassified vehicles is 0.3%. This is based on the percentage of unclassified vehicles in the post-validation data download.

The graphical screening comparison figures are found in Figure 7-1 through Figure 7-4. These are based on data collected immediately after the validation and may not be wholly representative of the population at the site. They should however provide a sense of the statistics expected when SPS comparison data is computed for the post-validation Sheet 16.

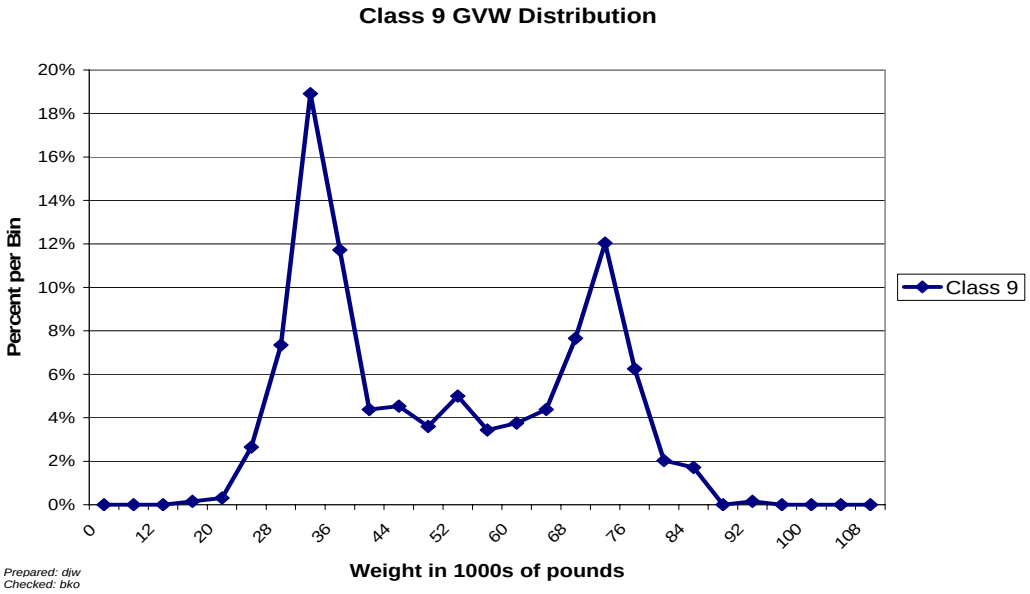

Figure 7-1 Expected GVW Distribution Class 9 – 550100 – 28-Nov-2007

Figure 7-2 Expected GVW Distribution Class 5 – 550100 – 28-Nov-2007

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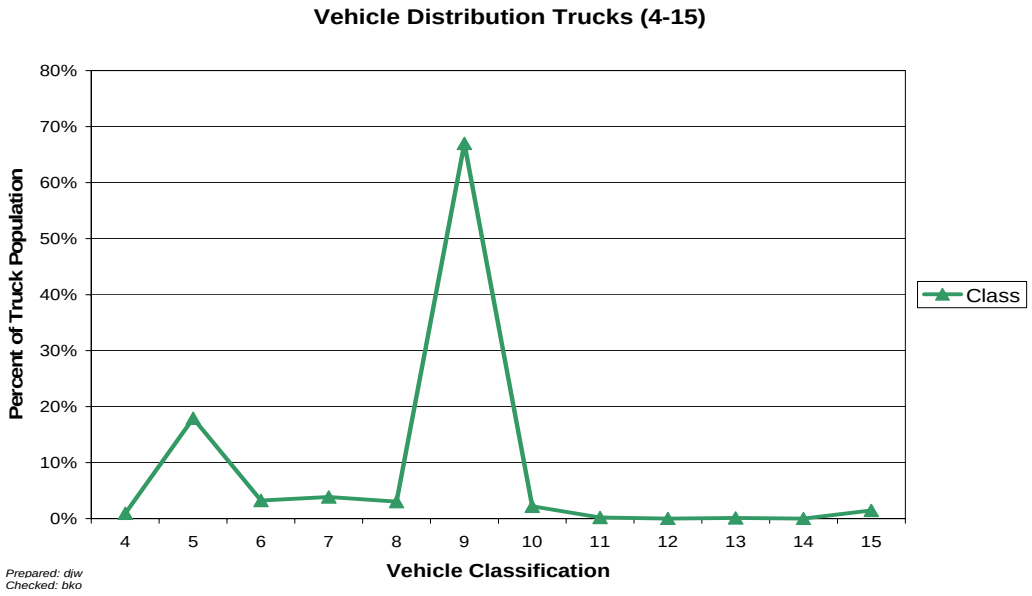

Figure 7-3 Expected Vehicle Distribution – 550100 – 28-Nov-2007

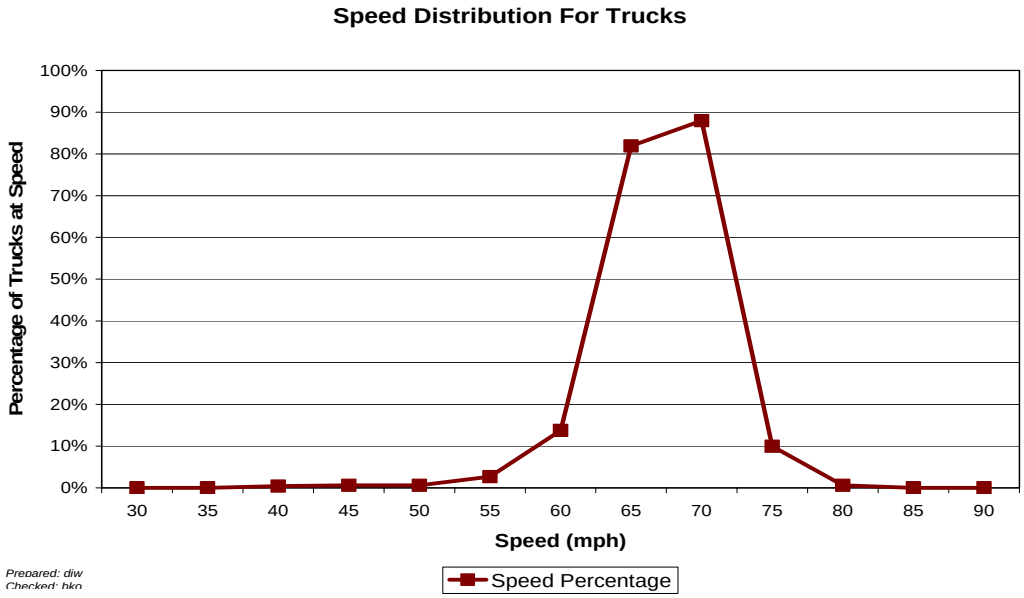

Figure 7-4 Expected Speed Distribution – 550100 – 28-Nov-2007

8 Data Sheets

The following is a listing of data sheets incorporated in Appendix A.

Sheet 19 – Truck 1 – 3S2 loaded air suspension (3 pages)
Sheet 19 – Truck 2 – 3S2 partially loaded air suspension (3 pages)

Sheet 20 – Speed and Classification verification – Pre-Validation (2 pages)

Sheet 20 – Speed and Classification verification – Post-Validation (2 pages)

Sheet 21 – Pre-Validation (3 pages)
Sheet 21 – Calibration Iteration 1 – (1 page)
Sheet 21 – Post-Validation (2 pages)

Calibration Iteration 1 Worksheets – (2 pages)

Test Truck Photographs (6 pages)

LTPP Mod 3 Classification Scheme (1 page)

Final System Parameters (1 page)

9 Updated Handout Guide and Sheet 17

A copy of the handout has been included following the next page. It includes a current Sheet 17 with all applicable maps and photographs.

10 Updated Sheet 18

A current Sheet 18 indicating the contacts, conditions for assessments and evaluations has been attached following the updated handout guide.

11 Traffic Sheet 16(s)

Sheet 16s for the Pre-Validation and Post-Validation conditions are attached following the current Sheet 18 information at the very end of the report.

POST-VISIT HANDOUT GUIDE FOR SPS WIM FIELD VALIDATION

STATE: Wisconsin

SHRP ID: 550100

Figures

Photos

1. General Information

SITE ID: *550100*

LOCATION: *State Highway 29, milepost 189.8.*

VISIT DATE: *November 27, 2007*

VISIT TYPE: *Validation*

2. Contact Information

POINTS OF CONTACT:

Assessment Team: *Dean J. Wolf, 301-210-5105, djwolf@mactec.com*

Highway Agency: *Laura Fenley, 608-246-5455, laura.fenley@dot.state.wi.us*

Bill Duckert, 608-246-5440, william.duckert@dot.state.wi.us

Steven Krebs, 608-246-5399, steven.krebs@dot.state.wi.us

John Williamson, 608-267-2939, john.williamson@dot.state.wi.us

FHWA COTR: *Debbie Walker, 202-493-3068, deborah.walker@fhwa.dot.gov*

FHWA Division Office Liaison: *Wesley Shemwell, 608-829-7521, Wesley.shemwell@fhwa.dot.gov*

LTPP SPS WIM WEB PAGE: *http://www.tfhrc.gov/pavement/ltpp/spstraffic/index.htm*

3. Agenda

BRIEFING DATE: *Briefing not requested for this visit*

ON SITE PERIOD: *Beginning November 27, 2007*

TRUCK ROUTE CHECK: *Completed by Phase II Contractor at installation*

4. Site Location/ Directions

NEAREST AIRPORT: *Central Wisconsin Airport, Wausau/Stevens Point, Wisconsin.*

DIRECTIONS TO THE SITE: *State Highway 29, 1.25miles east of Hilltop Road.*

MEETING LOCATION: *On site beginning at 9:00 a.m.*

WIM SITE LOCATION: *US Route 29, milepost 189.8 (Latitude: 44.8508 ^{0} and Longitude: -89.2671^{0})*

WIM SITE LOCATION MAP:

Figure 4-1 Site 550100 in Wisconsin

5. Truck Route Information

ROUTE RESTRICTIONS: *None.*

SCALE LOCATION: *Rib Mountain Travel Center (BP station), US 51/SR-29 Exit 188 Wausau, WI; Phone: 715-355-5600, Fax: 715-359-8728, Proprietor: Sharon Klatt; Latitude: 44.91512, Long: -89.64942; Open 24/7; $8.50 per weigh.*

TRUCK ROUTE:

- *Eastbound: 1.94 miles to Willow Drive*
- *Westbound: 1.25 miles to Hilltop Road*

6. Sheet 17 – Wisconsin (550100)

1.* ROUTE ___US 29_____MILEPOST _189.9_____LTPP DIRECTION - N S E W

2.* WIM SITE DESCRIPTION - Grade __<1_____ % Sag vertical Y / N
Nearest SPS section upstream of the site ___0219_____
Distance from sensor to nearest upstream SPS Section _____95_____ ft

3.* LANE CONFIGURATION
Lanes in LTPP direction __2___ Lane width __12____ ft

Median - 1 – painted
2 – physical barrier
3 – grass
4 – none

Shoulder - 1 – curb and gutter
2 – paved AC
3 – paved PCC
4 – unpaved
5 – none

Shoulder width ___8_____ ft

4.* PAVEMENT TYPE ____portland cement concrete_____

5.* PAVEMENT SURFACE CONDITION – Distress Survey
Date _11/27/2007__ Photo 55_0100_Upstream_11_27_07.jpg_____
Date _11/27/2007__ Photo 55_0100_Downstream_11_27_07.jpg_____
Date _____ Photo _____

6. * SENSOR SEQUENCE ____loop – bending plate – bending plate loop _____

7. * REPLACEMENT AND/OR GRINDING __ __ __ / __ __ / __ __ __ __
REPLACEMENT AND/OR GRINDING __ __ __ / __ __ / __ __ __ __
REPLACEMENT AND/OR GRINDING __ __ __ / __ __ / __ __ __ __

8. RAMPS OR INTERSECTIONS
Intersection/driveway within 300 m upstream of sensor location Y / N
distance __575'_____
Intersection/driveway within 300 m downstream of sensor location Y / N
distance _125' (single house driveway)_____
Is shoulder routinely used for turns or passing? Y / N

9. DRAINAGE (*Bending plate and load cell systems only)*
1 – Open to ground
2 – Pipe to culvert
3 – None

Clearance under plate ____6_____ in
Clearance/access to flush fines from under system Y / N

10. * CABINET LOCATION

Same side of road as LTPP lane Y / N Median Y/ N Behind barrier Y / N

Distance from edge of traveled lane __30____ ft

Distance from system ___36_____ ft

TYPE _____3M_____

CABINET ACCESS controlled by LTPP / STATE / JOINT?

Contact - name and phone number ___John Williamson (608) 267-2939__

Alternate - name and phone number ___Jane Oldenburg (608) 245-2679__

11. * POWER

Distance to cabinet from drop ___7____ ft Overhead / underground / solar / AC

in cabinet?

Service provider _____ Phone number _____

12. * TELEPHONE

Distance to cabinet from drop _____7_____ ft Overhead / underground / cell?

Service provider _____ Phone Number _____

13.* SYSTEM (software & version no.)- _____

Computer connection – RS232 / Parallel port / USB / Other _____

14. * TEST TRUCK TURNAROUND time ___7____ minutes DISTANCE _6.5___ mi

15. PHOTOS FILENAME

Power source __Power_Service_Box_55_0100_11_27_07.jpg ___

Phone source __Telephone_Box_55_0100_11_27_07.jpg _____

Cabinet exterior __Cabinet_Exterior_55_0100_11_27_07.jpg _____

Cabinet interior __Cabinet_Interior_Front_55_0100_11_27_07.jpg _

__Cabinet_Interior_Back_55_0100_11_27_07.jpg _

Weight sensors __ Leading_WIM_Sensor_55_0100_11_27_07.jpg _

__ Trailing_WIM_Sensor_55_0100_11_27_07.jpg _

Classification sensors _____

Other sensors __ Leading_Loop_Sensor_55_0100_11_27_07.jpg _

__ Trailing_Loop_Sensor_55_0100_11_27_07.jpg _

Description __Loop Sensors_____

Downstream direction at sensors on LTPP lane

55_0100_Upstream_11_27_07.jpg_____

Upstream direction at sensors on LTPP lane

55_0100_Downstream_11_27_07.jpg_____

COMMENTS __ GPS Coordinates: Latitude: 44° 51.029' and Longitude: -089^{0} 15.997'

Amenities:

Hatley – 3 miles west of site: BP gas, Subway restaurant

Wausau – 20 miles west of site: Various gas stations, hotels, restaurants, Home Depot

COMPLETED BY Dean J. Wolf

PHONE (301) 210-5105 DATE COMPLETED 11 / 27 / 2007

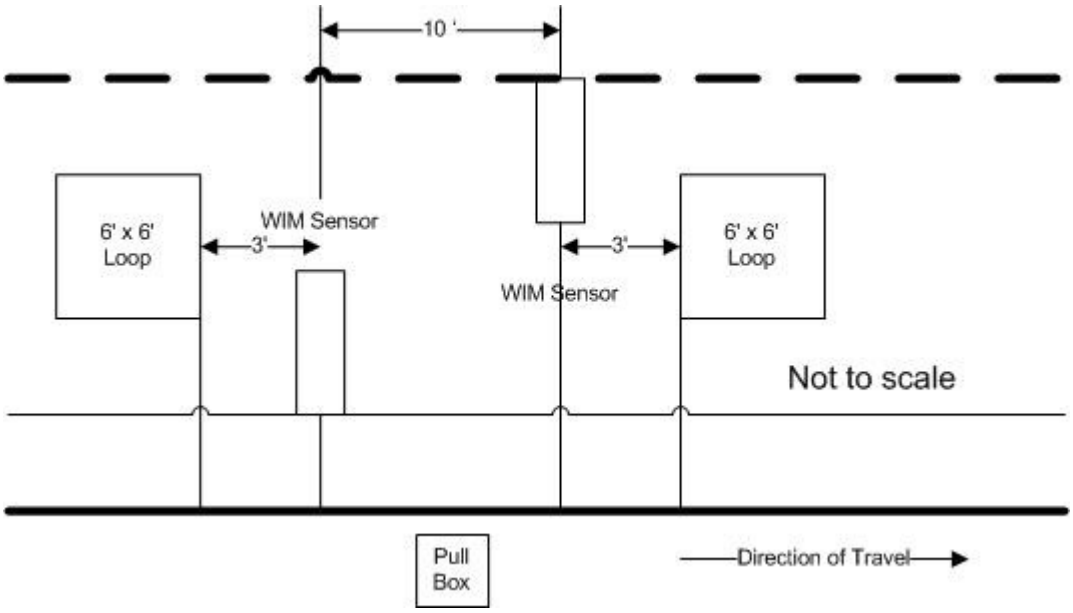

Figure 6-1 Equipment Layout WI 0100

Figure 6-2 Site Map of 550100 in Wisconsin

Photo 6-1 Upstream_55_0100_11_27_07.jpg

Photo 6-2 Downstream_55_0100_11_27_07.jpg

Photo 6-3 Power_Service_Box_55_0100_11_27_07.jpg

Photo 6-4 Telephone_Box_55_0100_11_27_07.jpg

Photo 6-5 Cabinet_Exterior_55_0100_11_27_07.jpg

Photo 6-6 Cabinet_Interior_Front_55_0100_11_27_07.jpg

Photo 6-7 Cabinet_Interior_Rear_55_0100_11_27_07.jpg

Photo 6-8 Leading_WIM_Sensor_55_0100_11_27_07.jpg

Photo 6-9 Trailing_WIM_Sensor_55_0100_11_27_07.jpg

Photo 6-10 Leading_Loop_Sensor_55_0100_11_27_07.jpg

Photo 6-11 Trailing_Loop_Sensor_55_0100_11_27_07.jpg

SHEET 18	STATE CODE [55]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [0100]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) 11/27/2007

Rev. 05/15/07

1. DATA PROCESSING –
   a. Down load –
      - ☐ State only
      - ☐ LTPP read only
      - ☒ LTPP download
      - ☐ LTPP download and copy to state

   b. Data Review –
      - ☐ State per LTPP guidelines
      - ☐ State – ☐ Weekly ☐ Twice a Month ☐ Monthly ☐ Quarterly
      - ☒ LTPP

   c. Data submission –
      - ☐ State – ☐ Weekly ☐ Twice a month ☐ Monthly ☐ Quarterly
      - ☒ LTPP

2. EQUIPMENT –
   a. Purchase –
      - ☐ State
      - ☒ LTPP

   b. Installation –
      - ☐ Included with purchase
      - ☐ Separate contract by State
      - ☐ State personnel
      - ☒ LTPP contract

   c. Maintenance –
      - ☒ Contract with purchase – Expiration Date _5 years from installation_
      - ☐ Separate contract LTPP – Expiration Date _____
      - ☐ Separate contract State – Expiration Date _____
      - ☐ State personnel

   d. Calibration –
      - ☒ Vendor
      - ☐ State
      - ☐ LTPP

   e. Manuals and software control –
      - ☐ State
      - ☒ LTPP

   f. Power –
      i. Type –
         - ☐ Overhead
         - ☒ Underground
         - ☐ Solar

      ii. Payment –
         - ☒ State
         - ☐ LTPP
         - ☐ N/A

g. Communication –

i. Type –
- ☒ Landline
- ☐ Cellular
- ☐ Other

ii. Payment –
- ☒ State
- ☐ LTPP
- ☐ N/A

3. PAVEMENT –

a. Type –
- ☒ Portland Concrete Cement
- ☐ Asphalt Concrete

b. Allowable rehabilitation activities –
- ☐ Always new
- ☐ Replacement as needed
- ☐ Grinding and maintenance as needed
- ☐ Maintenance only
- ☐ No remediation

c. Profiling Site Markings –
- ☐ Permanent
- ☐ Temporary

4. ON SITE ACTIVITIES –

a. WIM Validation Check - advance notice required _____ ☐ days ☐ weeks

b. Notice for straightedge and grinding check - _____ ☐ days ☐ weeks

i. On site lead –
- ☐ State
- ☐ LTPP

ii. Accept grinding –
- ☐ State
- ☐ LTPP

c. Authorization to calibrate site –
- ☐ State only
- ☐ LTPP

d. Calibration Routine –
- ☒ LTPP – ☐ Semi-annually ☒ Annually
- ☐ State per LTPP protocol – ☐ Semi-annually ☐ Annually
- ☐ State other – _____

e. Test Vehicles
   i. Trucks –
      1st – Air suspension 3S2 ☐ State ☒ LTPP
      2nd – _3S2 different weight/suspension__ ☐ State ☒ LTPP
      3rd – _____ ☐ State ☐ LTPP
      4th – _____ ☐ State ☐ LTPP
   ii. Loads – ☐ State ☒ LTPP
   iii. Drivers – ☐ State ☒ LTPP

f. Contractor(s) with prior successful experience in WIM calibration in state:

IRD

g. Access to cabinet
   i. Personnel Access –
      ☐ State only
      ☒ Joint
      ☐ LTPP
   ii. Physical Access –
      ☒ Key
      ☐ Combination

h. State personnel required on site – ☐Yes ☒No

i. Traffic Control Required – ☐Yes ☒No

j. Enforcement Coordination Required – ☐Yes ☒No

5. SITE SPECIFIC CONDITIONS –
   a. Funds and accountability – _____
   b. Reports – _____
   c. Other – _____
   d. Special Conditions – _____

6. CONTACTS –
   a. Equipment (operational status, access, etc.) –

      Name: Roy Czinku Phone:(306) 653-6627

      Agency: IRD

b. Maintenance (equipment) –

Name: Roy Czinku Phone:(306) 653-6627

Agency: IRD

c. Data Processing and Pre-Visit Data –

Name: Roy Czinku Phone:(306) 653-6627

Agency: IRD

d. Construction schedule and verification –

Name: _____ Phone:_____

Agency: _____

e. Test Vehicles (trucks, loads, drivers) –

Name: Greg Guite Phone:715-849-4000

Agency: Elite Carriers, LLC

f. Traffic Control –

Name: _____ Phone:_____

Agency: _____

g. Enforcement Coordination –

Name: _____ Phone:_____

Agency: _____

h. Nearest Static Scale

Name: Rib Mountain Travel Center Location:US 51/SR 29 (Exit 188)

Phone: 713-359-8728

SHEET 16 **LTPP MONITORED TRAFFIC DATA** **SITE CALIBRATION SUMMARY**	*STATE ASSIGNED ID [__ __ __ __] *STATE CODE [55] *SHRP SECTION ID [0100]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [ ]

2. * TYPE OF EQUIPMENT CALIBRATED ____ WIM ____ CLASSIFIER _X_ BOTH

3. * REASON FOR CALIBRATION
   - ____ REGULARLY SCHEDULED SITE VISIT
   - ____ RESEARCH
   - ____ EQUIPMENT REPLACEMENT
   - ____ TRAINING
   - ____ DATA TRIGGERED SYSTEM REVISION
   - ____ NEW EQUIPMENT INSTALLATION
   - _X_ OTHER (SPECIFY) ___LTPP Validation_____

4. * SENSORS INSTALLED IN LTPP LANE AT THIS SITE (CHECK ALL THAT APPLY):
   - ____ BARE ROUND PIEZO CERAMIC
   - ____ BARE FLAT PIEZO
   - _X__ BENDING PLATES
   - ____ CHANNELIZED ROUND PIEZO
   - ____ LOAD CELLS
   - ____ QUARTZ PIEZO
   - ____ CHANNELIZED FLAT PIEZO
   - _X__ INDUCTANCE LOOPS
   - ____ CAPACITANCE PADS
   - ____ OTHER (SPECIFY) _____

5. EQUIPMENT MANUFACTURER ___IRD/ PAT Traffic_____

WIM SYSTEM CALIBRATION SPECIFICS**

6.**CALIBRATION TECHNIQUE USED:

____ TRAFFIC STREAM -- ____STATIC SCALE (Y/N) _X__ TEST TRUCKS

___ NUMBER OF TRUCKS COMPARED __ 2 __ NUMBER OF TEST TRUCKS USED

__ 21__ PASSES PER TRUCK

TYPE PER FHWA 13 BIN SYSTEM
SUSPENSION: 1 - AIR; 2 - LEAF SPRING
3 - OTHER (DESCRIBE)

TRUCK	TYPE	SUSPENSION
1	___9_____	___1_____
2	___9_____	___1_____
3	_____	_____

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)

MEAN DIFFERENCE BETWEEN ---

DYNAMIC AND STATIC GVW	___-1.8	STANDARD DEVIATION	___3.2
DYNAMIC AND STATIC SINGLE AXLES	____-5.3	STANDARD DEVIATION	___3.8
DYNAMIC AND STATIC DOUBLE AXLES	___-1.0	STANDARD DEVIATION	___4.1

8. 3 ____ NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED

9. DEFINE THE SPEED RANGES USED (MPH) _____ _55_ __60__ __65_ __ __ __ __ _____ _____
_____ _____ _____ _____ _____ _____ _____ _____ _____ _____

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) ___3315 / 3497___

11.** IS AUTO-CALIBRATION USED AT THIS SITE? (Y/N) _N_
IF YES, LIST AND DEFINE AUTO-CALIBRATION VALUE: _____
_____
_____

CLASSIFIER TEST SPECIFICS***

12.*** METHOD FOR COLLECTING INDEPENDENT VOLUME MEASUREMENT BY VEHICLE CLASS:
____ VIDEO _X_ MANUAL ____ PARALLEL CLASSIFIERS

13. METHOD TO DETERMINE LENGTH OF COUNT ____ TIME _X_ NUMBER OF TRUCKS

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:

*** FHWA CLASS 9	____ 0.0	FHWA CLASS ____	____ ____ _____
*** FHWA CLASS 8	____ 0.0	FHWA CLASS ____	____ ____ _____
		FHWA CLASS ____	____ ____ _____
		FHWA CLASS ____	____ ____ _____

*** PERCENT "UNCLASSIFIED" VEHICLES: ____ 0.0

PERSON LEADING CALIBRATION EFFORT: __Dean J. Wolf, MACTEC_____
CONTACT INFORMATION: _____301-210-5105_____ rev. November 9, 1999

SHEET 16 **LTPP MONITORED TRAFFIC DATA** **SITE CALIBRATION SUMMARY**	*STATE ASSIGNED ID [__ __ __ __] *STATE CODE [55] *SHRP SECTION ID [0100]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [11/28/2007]

2. * TYPE OF EQUIPMENT CALIBRATED ____ WIM ____ CLASSIFIER _X_ BOTH

3. * REASON FOR CALIBRATION
   - ____ REGULARLY SCHEDULED SITE VISIT
   - ____ RESEARCH
   - ____ EQUIPMENT REPLACEMENT
   - ____ TRAINING
   - ____ DATA TRIGGERED SYSTEM REVISION
   - ____ NEW EQUIPMENT INSTALLATION
   - _X_ OTHER (SPECIFY) ___LTPP Validation_____

4. * SENSORS INSTALLED IN LTPP LANE AT THIS SITE (CHECK ALL THAT APPLY):
   - ____ BARE ROUND PIEZO CERAMIC
   - ____ BARE FLAT PIEZO
   - _X__ BENDING PLATES
   - ____ CHANNELIZED ROUND PIEZO
   - ____ LOAD CELLS
   - ____ QUARTZ PIEZO
   - ____ CHANNELIZED FLAT PIEZO
   - _X__ INDUCTANCE LOOPS
   - ____ CAPACITANCE PADS
   - ____ OTHER (SPECIFY) _____

5. EQUIPMENT MANUFACTURER ___IRD/ PAT Traffic_____

WIM SYSTEM CALIBRATION SPECIFICS**

6.**CALIBRATION TECHNIQUE USED:

____ TRAFFIC STREAM -- ____STATIC SCALE (Y/N) _X__ TEST TRUCKS

___ NUMBER OF TRUCKS COMPARED __ 2 __ NUMBER OF TEST TRUCKS USED

__ 20__ PASSES PER TRUCK

TYPE PER FHWA 13 BIN SYSTEM
SUSPENSION: 1 - AIR; 2 - LEAF SPRING
3 - OTHER (DESCRIBE)

TRUCK	TYPE	SUSPENSION
1	___9_____	___1_____
2	___9_____	___1_____
3	_____	_____

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
   MEAN DIFFERENCE BETWEEN ---
   - DYNAMIC AND STATIC GVW ___-0.5 STANDARD DEVIATION ___2.8
   - DYNAMIC AND STATIC SINGLE AXLES ___-2.0 STANDARD DEVIATION ___3.7
   - DYNAMIC AND STATIC DOUBLE AXLES ___-0.2 STANDARD DEVIATION ___3.9

8. 3 ____ NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED

9. DEFINE THE SPEED RANGES USED (MPH) _____ _55_ __60__ __65_ _____ __ __ _____ _____
   _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) ___3315 / 3497___

11.** IS AUTO-CALIBRATION USED AT THIS SITE? (Y/N) _N_
   IF YES, LIST AND DEFINE AUTO-CALIBRATION VALUE: _____
   _____
   _____

CLASSIFIER TEST SPECIFICS***

12.*** METHOD FOR COLLECTING INDEPENDENT VOLUME MEASUREMENT BY VEHICLE CLASS:
   ____ VIDEO _X_ MANUAL ____ PARALLEL CLASSIFIERS

13. METHOD TO DETERMINE LENGTH OF COUNT ____ TIME _X_ NUMBER OF TRUCKS

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
   - *** FHWA CLASS 9 ____ 0.0
   - *** FHWA CLASS 8 ____ 0.0
   - FHWA CLASS ____ ____ ____ _____
   - FHWA CLASS ____ ____ ____ _____
   - FHWA CLASS ____ ____ ____ _____
   - FHWA CLASS ____ ____ ____ _____
   - *** PERCENT "UNCLASSIFIED" VEHICLES: ____ 0.0

PERSON LEADING CALIBRATION EFFORT: __Dean J. Wolf, MACTEC_____
CONTACT INFORMATION: _____301-210-5105_____ rev. November 9, 1999

APPENDIX A

Sheet 19	* STATE_CODE 55
LTPP Traffic Data	* SPS PROJECT ID 0100 0200
*CALIBRATION TEST TRUCK # 1	* DATE 11/27/07

Rev. 08/31/01

Tractor 243
trailer 375

PART I.

1.* FHWA Class 9 2.* Number of Axles 5 Number of weight days 2

AXLES - units (lbs) / 100s lbs / kg

GEOMETRY

8 a) * Tractor Cab Style - Cab Over Engine / ~~Conventional~~ b) * Sleeper Cab? (Y) / N

9. a) * Make: kenworth b) * Model: _____

10.* Trailer Load Distribution Description:
box trailer

11. a) Tractor Tare Weight (units): _____

b). Trailer Tare Weight (units): _____

12.* Axle Spacing – units m / feet and inches / (feet and tenths)

A to B 17.0 B to C 4.3 C to D 32.8

D to E 4.1 E to F _____

Wheelbase (measured A to last) _____ Computed 58.2

13. *Kingpin Offset From Axle B (units) _____(_____)
(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	295 R 22.5	2 leaf
B	295 R 22.5	air
C	295 R 22.5	air
D	295 R 22.5	air
E	295 R 22.5	air
F	_____	_____

Sheet 19	* STATE_CODE 55
LTPP Traffic Data	* SPS PROJECT ID 0100 0200
*CALIBRATION TEST TRUCK #_1_	* DATE 11/17/07

Rev. 08/31/01

PART II

Day 1

*b) Average Pre-Test Loaded weight 78050 47
*c) Post Test Loaded Weight 77700
*d) Difference Post Test – Pre-test -350
347

Table 5. Raw data – Axle scales – pre-test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	12020	15430	15430	17590	17590		78060
2	11980	15440	15440	17590	17590		78040
3	11980	15440	15440	17590	17590		78040
Average	11996 93	15440 37	15440 37	17590	17590		78050 47

Table 6. Raw data – Axle scales –

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11800	15360	15360	17590	17590		77700
2							
3							
Average	11800	15360	15360	17590	17590		77700

78050
77700
350

Table 7. Raw data – Axle scales – post-test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1							
2							
3							
Average							

Measured By DJW Verified By DJW Weight date 11/27/07

Sheet 19	* STATE_CODE 55
LTPP Traffic Data	* SPS PROJECT ID ~~0100~~ 0200
*CALIBRATION TEST TRUCK #_1_	* DATE 11/28/07

Rev. 08/31/01

Day 2

7.2 *b) Average Pre-Test Loaded weight 77647

*c) Post Test Loaded Weight 77420

*d) Difference Post Test – Pre-test 227

Table 5.2. Raw data – Axle scales – pre-test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11760	15340	15340	17600	17600		77640
2	11740	15360	15360	17590	17590		77640
3	11740	15360	15360	17600	17600		77660
Average	11741	15~~3~~353	15353	17597	17597		77647

Table 6.2. Raw data – Axle scales –

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11600	15290	15290	17620	17620		77420
2							
3							
Average	11600	15290	15290	17620	17620		77420

Table 7.2 Raw data – Axle scales – post-test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1							
2							
3							
Average							

Measured By DJW Verified By [illegible] Weight date 11/29/2007

Sheet 19	* STATE_CODE 55
LTPP Traffic Data	* SPS PROJECT ID 0100 0200
*CALIBRATION TEST TRUCK # 2	* DATE 11/27/07

Rev. 08/31/01

truck 498 tractor 249

PART I.

1.* FHWA Class 9 2.* Number of Axles 5 Number of weight days 2

AXLES - units - (lbs) / 100s lbs / kg

GEOMETRY

8 a) * Tractor Cab Style - Cab Over Engine / (Conventional) b) * Sleeper Cab? (Y) / N

9. a) * Make: Kenworth b) * Model: _____

10.* Trailer Load Distribution Description:
box trailer

11. a) Tractor Tare Weight (units): _____

b). Trailer Tare Weight (units): _____

12.* Axle Spacing – units m / feet and inches / feet and tenths

A to B 16.9 B to C ~~4.4~~ 4.3 mkd C to D 32.0

D to E 4.1 E to F _____

Wheelbase (measured A to last) _____ Computed 57.3

13. *Kingpin Offset From Axle B (units) _____(_____)__
(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	75R22.5	2 leaf steel
B	75R22.5	air
C	75R22.5	air
D	75R22.5	air
E	75R22.5	air
F	_____	_____

Sheet 19	* STATE_CODE 55
LTPP Traffic Data	* SPS PROJECT ID ~~0100~~ 0200
*CALIBRATION TEST TRUCK #_2_	* DATE 11/~~27~~ 07

Rev. 08/31/01

PART II

Day 1

*b) Average Pre-Test Loaded weight 67980
*c) Post Test Loaded Weight 67660
*d) Difference Post Test – Pre-test -320

Table 5. Raw data – Axle scales – pre-test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11700	15710	15710	12450	12450		68020
2	11640	15730	15730	12430	12430		67960
3	11720	15690	15690	12430	12430		67960
Average	11690	15710	15710	12440	12440		67980

97 31 31

Table 6. Raw data – Axle scales – ~~post test~~

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11600	15610	15610	12420	12420		67660
2							
3							
Average	11600	15610	15610	12420	12420		67660

67980
67660
320

Table 7. Raw data – Axle scales – post-test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1							
2							
3							
Average							

Measured By NJW Verified By MMO Weight date 11/27/07

Sheet 19	* STATE_CODE 55
LTPP Traffic Data	* SPS PROJECT ID ~~0100~~ 0200
*CALIBRATION TEST TRUCK # 2	* DATE 11/28 07

Rev. 08/31/01

Day 2

7.2 *b) Average Pre-Test Loaded weight 68307
*c) Post Test Loaded Weight 68040
*d) Difference Post Test – Pre-test 267

Table 5.2. Raw data – Axle scales – pre-test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11880	15810	15910	12810	12610		68320
2	11940	15770	15770	12410	12410		68300
3	11880	15810	15810	12400	12400		68300
Average	11900	15791	15797	12407	12407		68307

Table 6.2. Raw data – Axle scales – post test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11760	15730	15730	12410	12410		68040
2							
3							
Average	11760	15730	15730	12410	12410		68040

Table 7.2 Raw data – Axle scales – ~~post-test~~

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1							
2							
3							
Average							

Measured By [signature] Verified By DJW Weight date 11/28/07

Sheet 20	* STATE_CODE	55
LTPP Traffic Data	*SPS PROJECT_ID	~~0100~~ 0200
Speed and Classification Checks * 1 of* 2	* DATE	11 /27 /2007

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
67	9	24199	67	9	62	9	25292	62	9
59	4	24200	59	5	67	4	25312	64	5
63	4	24203	62	4	68	5	25313	69	5
60	4	24204	60	4	70	7	25314	70	7
65	9	24212	64	9	65	9	25318	67	9
65	9	24218	65	9	41	5	25321	39	5
64	9	24219	64	9	59	9	25324	59	9
67	9	24221	67	9	57	6	25327	62	6
64	9	24222	64	9	68	9	25328	68	9
64	9	24240	63	9	65	9	25329	66	9
63	9	24247	62	9	64	5	25331	65	5
54	9	24250	53	9	50	9	25334	51	9
54	9	24251	52	9	67	8	25339	67	8
62	9	25252	62	9	65	9	25342	66	9
68	7	25254	69	7	68	5	25343	68	5
65	7	25255	65	7	64	9	25346	62	9
65	7	25256	67	7	68	9	25349	69	9
69	9	25262	70	9	64	9	25353	65	9
64	9	25263	65	9	70	5	25354	70	5
60	9	25274	61	9	68	6	25355	69	6
66	9	25281	66	9	66	9	25357	66	9
65	5	25285	65	5	63	9	25358	63	9
65	9	25287	65	9	70	8	25360	71	8
65	9	25289	65	9	68	9	25365	70	9
64	9	25290	65	9	70	4	25366	69	4

22.3 spacing

22.4' spacing

Recorded by DJW Direction W Lane 1 Time from 9:20 to 2:05

9:35 2:36

Sheet 20	* STATE_CODE	55
LTPP Traffic Data	*SPS PROJECT_ID	~~0100~~ 0200
Speed and Classification Checks * 2 of* 2	* DATE	11 / 27 / 2007

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
69	9	25368	66	9	65	~~2~~ 9	25457	66	9
57	9	25381	60	9	60	9	25458	60	9
65	9	25382	68	9	63	9	25463	65	9
65	9	25385	66	9	67	8	25464	67	8
65	9	25386	65	9	67	8	25465	66	8
66	9	25388	67	9	68	9	25466	69	9
62	9	25395	61	9	65	9	25472	67	9
59	5	25397	60	5	69	9	25474	69	9
68	9	25399	68	9	69	9	25475	68	9
63	9	25408	64	9	66	9	25476	67	9
62	9	25416	65	9	67	9	25477	67	9
60	9	25418	61	9	64	9	25486	63	9
70	9	25419	70	9	67	~~4~~	25488	67	5
65	9	25421	70	9	66	9	25489	68	9
68	~~4~~	25423	69	6	69	9	25498	69	9
65	6	25426	65	6	67	9	25499	69	9
61	9	25427	64	9	68	9	25502	69	9
61	4	25430	61	5	59	8	25512	57	8
64	9	25431	63	9	67	9	25525	67	9
65	9	25436	64	9	69	4	25527	69	~~5~~
63	~~5~~ 9	25443	~~65~~	~~5~~ 9	39	5	25532	37	~~9~~ 5
62	5	25451	63	5	67	5	25541	~~68~~	~~5~~
65	9	25452	64	9	65	9	25543	63	9
65	9	25453	66	9	63	9	25557	63	9
61	9	25456	62	9	63	10	25558	62	10

Recorded by DSW Direction W Lane 1 Time from 2:37 to 3:25

6420060018_SPSWIM_TO_20_55_2.90_~~0100~~ 0200 post-Validation_Sheet_20.doc

p/v's w/ 85 the 85

Sheet 20	* STATE_CODE	55
LTPP Traffic Data	*SPS PROJECT_ID	~~0100~~ 0200
Speed and Classification Checks * 1 of* 2	* DATE	11 /27/2007

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
66	9	28531	67	9	66	9	28617	65	9
60	9	28535	61	9	67	9	28619	65	9
65	9	28539	65	9	63	9	28620	63	9
62	9	28543	62	9	65	6	28621	64	6
66	9	28548	66	9	67	9	28627	66	9
70	9	28557	70	9	64	9	28647	64	9
68	9	28558	68	9	66	9	28650	66	9
64	9	28560	63	9	68	9	28653	68	9
64	9	28564	64	9	64	9	28654	64	9
45	6	28565	45	6	64	9	28661	62	9
65	9	28566	65	9	64	8	28662	64	8
65	9	28569	66	9	67	9	28666	65	9
68	8	28570	68	8	67	9	28668	46	9
66	9	28571	65	9	68	4	28672	69	6
65	8	28580	65	8	64	9	28673	64	9
68	6	28584	68	6	65	9	28681	67	9
67	69	28595	68	9	65	9	28682	66	9
66	9	28598	66	9	68	9	28683	68	9
64	9	28599	65	9	69	10	28684	69	10
65	9	28600	66	9	70	5	28686	69	5
65	9	28607	64	9	68	8	28688	69	8
64	4	28609	65	5	62	9	28691	63	9
70	5	28611	70	5	64	9	28692	63	9
68	4	28612	69	5	69	9	28696	69	9
66	9	28616	66	9	60	9	28710	61	9

22.9'

21.8'

22.8

Recorded by DW Direction W Lane 1 Time from 1:10 to 2:15

Sheet 20	* STATE_CODE	55
LTPP Traffic Data	*SPS PROJECT_ID	~~0100~~ 0200
Speed and Classification Checks * 2 of* 2	* DATE	11 / 27 / 2007

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
60	9	28711	61	9	67	6	28768	68	6
67	4	28713	68	5	70	9	28769	70	9
65	9	28716	66	9	70	9	28773	70	9
65	9	28717	65	9	67	9	28779	68	9
69	4	28718	69	5	65	9	28786	66	9
66	9	28730	67	9	65	9	28787	65	9
67	9	28731	67	9	65	9	28788	66	9
65	6	28732	64	6	63	9	28798	63	9
70	9	28739	70	9	67	9	28799	67	9
68	5	28740	71	5	63	5	28802	64	5
65	6	28741	64	6	67	9	28804	66	9
64	9	28742	63	9	65	9	28809	64	9
65	9	28744	65	9	67	9	28810	65	9
67	4	28745	67	5	62	5	28811	63	5
66	9	28749	68	9	66	8	28814	66	8
68	10	28752	67	10	64	9	28817	64	9
62	10	28753	62	10	68	9	28819	68	9
62	9	28754	63	9	68	5	28821	67	5
64	9	28755	64	9	68	9	28828	69	9
68	7	28758	69	7	64	9	28830	66	9
70	8	28759	69	8	59	6	28831	59	6
70	9	28763	71	9	67	9	28833	67	9
60	9	28764	60	9	65	9	28836	65	9
68	9	28766	68	9	65	9	28841	65	9
65	9	28767	66	9	61	9	28842	61	9

23.6 22.6 22.4

Recorded by DJW Direction W Lane 1 Time from 2:16 to 2:52

Sheet 21	* STATE_CODE	55
LTPP Traffic Data	*SPS PROJECT_ID	~~0100~~ 0200
WIM System Test Truck Records 1 of 3	* DATE	11 / 27 /2007

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
30	54	1	1	8:53	24075	54	5.7/5.6	7.7/7.6	7.5/7.8	8.4/9.4	8.8/9.0		77.7	17.0	4.3	32.8	4.0	
30	53	2	1	8:53	24076	53	5.2/6.0	8.0/7.3	8.0/7.7	6.6/6.0	5.9/6.2		66.8	17.0	4.3	32.0	4.1	
25	60	1	2	9:08	24141	59	5.3/5.1	6.8/7.3	7.3/7.5	7.7/8.1	8.7/7.8		71.5	17.1	4.3	32.9	4.0	
25	60	2	2	9:08	24142	60	5.4/5.2	7.5/7.5	8.0/7.0	7.1/6.0	6.1/5.4		65.2	17.0	4.3	32.1	4.0	
10	65	1	3	9:22	24218	65	5.8/5.7	7.8/7.9	7.4/7.7	8.7/9.0	9.0/8.2		77.2	17.1	4.3	32.8	4.0	
10	64	2	3	9:22	24222	64	5.5/6.0	8.2/7.8	8.2/7.8	7.0/6.3	6.7/5.4		68.9	16.9	4.3	32.0	4.1	
13.5	53	1	4	9:30	24250	54	5.8/5.3	7.6/7.5	7.7/8.1	8.3/8.7	8.9/8.6		76.4	17.0	4.3	32.8	4.0	
13.5	52	2	4	9:30	24251	54	5.6/5.7	8.5/7.2	8.4/7.4	6.6/5.7	6.3/5.8		67.3	16.9	4.3	31.9	4.0	
13.5	58	1	5	9:37	24280	59	5.3/5.2	6.9/7.1	7.3/7.5	7.7/8.3	8.2/8.3		71.8	17.1	4.3	32.9	4.0	
13.5	59	2	5	9:37	24281	59	5.1/5.2	7.5/7.5	7.7/6.6	7.1/6.2	6.4/6.2		65.4	17.0	4.3	32.0	4.0	
11.0	63	1	6	9:44	24311	64	6.0/5.6	7.8/7.4	7.6/7.6	8.6/8.1	9.1/8.5		76.4	17.0	4.3	32.6	4.0	
11.0	65	2	6	9:45	24313	63	5.7/6.0	8.3/7.8	8.3/7.8	7.1/5.3	7.0/6.3		69.6	17.0	4.3	32.0	4.0	
18.0	54	1	7	9:52	24332	55	5.8/5.4	7.8/7.7	7.6/7.9	8.0/8.9	8.9/8.5		76.4	17.0	4.3	32.9	4.0	
18.0	55	2	7	9:52	24333	54	5.6/5.2	8.2/7.1	8.5/6.9	7.0/5.2	7.3/5.6		66.7	16.9	4.3	31.9	4.0	
20.0	59	1	8	10:00	24357	59	5.4/5.5	7.2/7.7	7.4/6.7	8.3/7.1	8.6/6.9		70.8	17.0	4.3	32.7	4.0	
20.0	59	2	8	10:00	24358	58	5.3/5.9	7.5/7.5	7.5/6.7	6.8/5.7	6.2/6.4		65.4	16.9	4.2	31.9	4.0	

Recorded by JW

Checked by MO

Sheet 21	* STATE_CODE	55
LTPP Traffic Data	*SPS PROJECT_ID	~~0100~~ 0200
WIM System Test Truck Records 2 of 3	* DATE	11 / 27 /2007

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
20.5	64	1	9	10:08	24387	64	5.9/5.8	7.7/7.6	7.5/7.8	9.0/9.1	9.3/8.4		78.1	17.1	4.3	32.8	4.0	
20.5	64	2	9	10:08	24388	64	5.7/5.8	8.5/7.6	8.1/7.6	7.0/5.5	7.1/6.2		69.2	16.9	4.3	31.9	4.0	
21.0	55	1	10	10:15	24[illegible]9	54	5.7/5.6	7.6/7.8	7.7/8.0	8.2/9.7	8.7/9.3		78.3	17.0	4.3	32.8	4.0	
21.0	54	2	10	10:15	24[illegible]0	53	5.6/5.8	8.2/7.8	8.2/7.5	6.4/5.5	6.1/6.0		62.0	16.9	4.3	31.9	4.0	
23.5	~~64~~61	1	11	10:23	24436	60	5.1/5.9	7.9/7.8	7.1/7.0	7.6/7.8	8.3/8.3		72.7	17.0	4.3	32.7	4.0	
23.5	61	2	11	10:23	24437	59	4.7/5.2	7.4/7.5	7.3/6.5	7.2/6.2	7.0/5.6		64.7	17.0	4.3	31.9	4.0	
27.0	64	1	12	10:30	24465	64	5.8/5.7	7.8/7.7	7.5/7.7	8.9/9.0	9.1/8.2		77.4	17.0	4.3	32.7	4.0	
27.0	65	2	12	10:30	24466	64	5.6/5.9	8.5/7.4	8.3/7.4	7.1/5.6	7.1/5.8		68.7	16.9	4.3	31.9	4.0	
14.5	53	1	13	10:37	24498	54	6.0/5.3	7.9/7.4	7.8/7.8	8.4/8.3	8.9/8.1		75.9	17.0	4.3	32.8	4.0	
14.5	54	2	13	10:37	24499	54	5.7/5.7	8.3/7.8	8.3/7.1	6.8/5.2	6.8/6.0		66.8	17.0	4.3	31.9	4.0	
23.5	60	1	14	10:45	24531	59	5.2/5.9	7.9/7.3	7.3/7.2	7.5/7.8	8.0/7.9		72.0	17.0	4.3	32.7	4.0	
23.5	60	2	14	10:45	24532	59	5.0/5.4	7.5/7.5	7.7/6.9	7.1/6.2	6.2/6.2		65.7	17.0	4.3	32.0	4.1	
22.0	64	1	15	10:52	24553	64	5.9/5.7	7.8/7.4	7.6/7.7	8.9/8.5	9.8/8.2		77.4	17.0	4.3	32.8	4.0	
22.0	64	2	15	10:52	24554	64	5.5/5.8	8.4/7.6	8.3/7.5	6.9/6.1	7.4/6.1		69.6	17.0	4.3	32.0	4.0	
24.0	54	1	16	11:00	24581	54	5.8/5.5	7.8/7.5	7.9/7.8	8.7/8.8	9.2/8.5		77.6	17.0	4.3	32.7	4.1	
24.0	54	2	16	11:00	24582	54	5.7/5.7	7.9/7.3	8.3/7.2	6.9/5.8	6.5/6.1		67.3	17.0	4.3	32.0	4.0	

Recorded by DW

Checked by

Sheet 21	* STATE_CODE	55
LTPP Traffic Data	*SPS PROJECT_ID	~~0100~~ 0200
WIM System Test Truck Records 3 of 3	* DATE	11 / 27 /2007

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
24.5	59	1	17	11:08	24604	59	5.0/5.7	7.6/7.8	6.9/7.1	7.6/7.9	8.1/8.3	-	71.9	17.0	4.3	32.8	4.0	
24.5	59	2	17	11:08	24605	59	4.9/6.0	7.3/7.8	7.4/6.7	7.1/6.2	7.3/6.7		67.5	16.9	4.3	31.9	4.0	
23.0	65	1	18	11:15	24637	64	5.7/5.7	7.6/7.8	7.4/7.7	8.8/8.9	9.5/8.3		77.4	17.0	4.3	32.8	4.0	
23.0	65	2	18	11:16	24641	64	5.5/5.9	8.6/7.6	8.4/7.8	7.1/5.7	7.4/5.7		69.7	16.9	4.3	31.9	4.0	
18.5	54	1	19	11:23	24671	54	5.6/5.4	7.7/7.7	7.7/8.2	8.5/8.8	9.0/8.8		77.5	17.0	4.3	32.8	4.0	
18.5	55	2	19	11:23	24672	54	5.3/5.8	8.1/7.6	7.8/7.7	6.5/6.0	6.3/6.0		67.1	17.0	4.3	32.0	4.0	
20	60	1	20	11:31	24697	59	5.5/5.1	7.3/7.3	7.3/7.2	8.0/8.4	8.7/8.2		72.9	17.0	4.3	32.9	4.1	
20	61	2	20	11:31	24698	60	5.7/6.1	7.8/7.8	7.6/8.0	7.3/6.2	7.2/5.8		69.4	16.9	4.3	32.0	4.1	
16	64	1	21	11:39	24723	64	5.8/5.4	7.9/7.9	7.5/7.6	8.7/8.0	8.7/8.3		75.9	17.0	4.3	32.7	4.0	
16	65	2	21	11:39	24724	65	5.3/5.9	8.3/7.6	8.3/7.7	7.4/6.1	9.2/5.4		69.3	17.0	4.3	31.9	4.0	

Recorded by DW

Checked by MD

Sheet 21	* STATE_CODE	55
LTPP Traffic Data	*SPS PROJECT_ID	~~0100~~ 0200
WIM System Test Truck Records 1 of 1	* DATE	11 /27 / 2007

77 6
68.3

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
12	54	1	1	8:53	27605	54	5.8/5.6	7.8/7.7	7.7/7.7	8.5/8.7	9.3/8.7		77.5	17.0	4.3	32.7	4.0	
12	54	2	1	8:53	27606	53	5.4/5.8	8.4/7.1	8.3/7.5	6.3/5.7	6.2/5.8		66.3	16.9	4.3	32.0	4.0	
24	58	1	2	9:01	27638	59	5.6/5.7	8.2/8.1	7.6/7.5	8.2/8.6	8.7/8.7		77.0	17.0	4.3	32.8	4.0	
24	60	2	2	9:01	27640	59	5.4/5.4	8.0/8.0	8.1/7.3	7.4/6.4	6.8/7.0		69.8	16.9	4.3	32.0	4.0	
12.5	64	1	3	9:08	27658	64	5.7/5.8	7.5/7.8	7.3/7.6	8.7/8.1	8.9/8.2		75.8	17.0	4.3	32.8	4.0	
12.5	65	2	3	9:08	27659	65	5.7/6.1	8.2/7.3	7.8/7.5	6.7/6.4	6.7/5.2		67.6	17.0	4.3	32.0	4.1	
21	~~55~~	1	4	9:15	27690	55	5.8/5.5	7.8/7.4	7.8/8.0	8.4/9.3	9.0/8.8		77.9	17.0	4.3	32.8	4.0	
21	55	2	4	9:15	27691	54	5.7/6.0	8.4/7.3	8.2/7.6	6.8/5.2	6.5/5.3		66.6	16.9	4.3	31.9	4.0	
21.5	60	1	5	9:23	27711	59	5.5/5.3	7.6/7.2	7.5/7.3	8.1/8.6	9.0/8.2		74.3	17.0	4.3	32.7	4.0	
21.5	59	2	5	9:23	27712	59	5.3/6.5	8.0/7.9	8.1/6.8	7.0/5.6	6.2/5.5		66.9	16.9	4.2	31.9	4.0	
18	65	1	6	9:30	27741	64	5.7/5.6	7.5/8.0	7.2/7.8	8.0/9.2	8.8/8.3		76.1	17.0	4.3	32.8	4.0	
18	65	2	6	9:30	27742	65	5.6/5.9	8.1/7.4	7.8/7.5	7.0/5.3	6.8/6.3		67.8	16.9	4.3	31.9	4.0	

Recorded by DJW

Checked by

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Sheet 21	* STATE_CODE	55
LTPP Traffic Data	*SPS PROJECT_ID	~~0100~~ 0200
WIM System Test Truck Records 2 of 2	* DATE	11/~~27~~28/2007

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
24	55	1	15	10:46	28025	55	5.7/5.5	7.7/7.5	7.6/8.1	8.1/8.8	9.2/8.4		76.6	17.1	4.3	32.9	4.0	
24	53	2	14	10:46	28026	53	5.5/5.8	8.4/7.0	8.2/7.5	6.7/5.1	6.4/5.4		66.1	16.9	4.3	31.9	4.0	
19	59	1	16	10:54	28051	59	5.6/5.5	7.5/7.8	7.5/7.6	8.1/8.4	8.9/8.3		75.2	17.0	4.3	32.7	4.0	
19	59	2	15	10:54	28052	59	5.8/6.5	8.9/7.6	7.9/7.7	7.4/5.9	6.6/6.1		70.4	16.9	4.3	31.9	4.0	
23.5	65	1	17	11:01	28075	65	5.7/5.9	7.4/7.6	7.2/7.8	8.2/9.0	8.9/8.7		76.4	17.1	4.3	32.8	4.0	
23.5	65	2	16	11:01	28076	65	5.7/6.0	8.3/7.1	8.4/7.1	7.1/5.0	6.5/6.0		68.6	17.0	4.3	31.9	4.0	
27	54	1	18	11:09	28105	55	5.8/5.6	7.8/7.5	7.7/8.0	8.3/9.3	9.0/8.6		77.5	17.0	4.3	32.8	4.0	
27	54	2	17	11:09	28106	54	5.3/5.7	8.4/7.5	8.2/7.4	6.5/5.4	6.7/5.3		66.2	16.9	4.3	31.9	4.0	
29.5	60	1	19	11:16	28132	60	5.5/5.9	8.1/7.6	7.3/7.2	8.3/8.0	8.9/7.9		74.9	17.0	4.3	32.8	4.0	
29.5	60	2	18	11:16	28133	60	6.3/6.5	8.8/8.0	7.9/6.9	7.5/5.7	7.4/7.0		72.2	16.9	4.3	32.0	4.0	
29	64	1	20	11:23	28150	64	6.0/5.6	8.8/7.2	7.5/7.5	9.0/7.8	9.1/7.9		75.7	17.0	4.3	32.7	4.0	
29	64	2	19	11:24	28151	64	6.1/6.2	8.5/7.9	8.1/7.4	7.2/5.0	7.3/6.4		70.1	16.9	4.3	32.0	4.0	
28.5	57	1	21	11:31	28173	57	5.8/5.1	7.7/7.1	7.7/7.4	8.6/8.4	9.1/8.5		75.4	17.0	4.3	32.7	4.0	
28.5	54	2	20	11:31	28175	53	5.4/5.7	8.4/7.2	8.3/7.1	6.4/5.4	6.2/5.7		65.8	16.9	4.3	31.8	4.0	

Recorded by DJW

Checked by

Sheet 21	* STATE_CODE	55
LTPP Traffic Data	*SPS PROJECT_ID	~~0100~~ 0200
WIM System Test Truck Records 1 of 2	* DATE	11/~~28~~29/2007

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
24	54	1	7	9:38	27778	54	5.8/5.6	7.5/7.2	7.5/7.8	8.9/8.9	8.8/8.9		76.6	17.0	4.3	32.7	4.0	
24	55	2	7	9:39	27779	55	5.9/5.6	8.3/7.1	8.4/7.3	6.5/6.0	6.7/5.7		67.5	16.9	4.3	31.9	4.0	
25.5	59	1	8	9:46	27801	59	5.5/5.5	8.0/8.1	7.5/7.5	8.1/8.0	8.8/8.3		75.3	17.1	4.3	32.8	4.0	
25.5	60	2	8	9:46	27802	60	6.1/6.4	8.9/7.8	7.8/7.9	7.6/6.4	6.8/6.7		72.4	16.9	4.3	31.9	4.0	
23.5	65	1	9	9:53	27826	64	5.8/5.9	7.7/8.0	7.1/7.5	8.7/9.4	9.1/9.1		78.3	17.0	4.3	32.8	4.0	
* 23.5	64	~~2~~	~~9~~	9:59	27827	67	5.9/5.6	8.3/7.1	8.2/7.1	6.5/5.1	6.4/5.1		65.4	20.0	~~3.5~~	~~31.8~~	~~4.0~~	need one scale
24	55	1	10	10:01	27866	55	5.7/5.4	7.8/7.3	7.7/7.7	8.4/8.2	9.0/8.8		76.3	17.0	4.3	32.7	4.0	
24	53	2	9	10:01	27867	52	5.6/6.0	8.0/7.5	8.4/7.5	6.5/5.7	6.1/5.9		67.2	17.0	4.3	32.0	4.0	
19	59	1	11	10:09	27895	59	5.6/5.7	7.4/7.4	7.2/7.8	7.6/8.7	8.8/8.5		74.7	17.1	4.3	32.9	4.0	
19	60	2	10	10:09	27896	60	6.3/6.4	8.1/8.1	8.0/7.9	7.3/6.5	7.3/6.7		73.0	16.9	4.3	31.9	4.0	
22	63	1	12	10:16	27918	64	5.8/5.9	7.7/7.5	7.5/7.6	9.2/8.8	8.7/8.1		76.8	17.0	4.3	32.7	4.0	
22	65	2	11	10:16	27919	65	5.5/6.0	8.1/7.6	8.0/7.8	7.0/5.8	7.1/6.3		69.4	16.9	4.3	31.9	4.0	
23	59	1	13	10:31	27960	60	5.4/6.0	8.2/7.9	7.4/7.5	8.7/7.3	9.0/7.6		74.7	17.1	4.3	32.8	4.0	
23	58	2	12	10:31	27961	58	5.1/6.4	8.0/8.3	8.1/7.0	7.3/6.1	7.4/6.6		70.2	16.9	4.3	31.9	4.0	
18.5	63	1	14	10:39	27995	64	5.8/5.8	7.7/7.6	7.3/7.9	9.0/9.0	9.0/8.1		77.2	17.0	4.3	32.8	4.0	
18.5	64	2	13	10:39	27996	65	5.5/6.0	8.6/7.3	8.3/7.8	6.8/5.9	6.7/6.1		69.1	17.0	4.2	32.1	4.1	

Recorded by DJW

Checked by MKO

1st 12 WIMs are cal 1 12 WIMs

Calibration Worksheet

Site: 550200

Calibration Iteration 1 Date 11/28/07

Beginning factors:

Speed Point (mph)	Name	Value
Overall		① / ②
Front Axle	dynamic comp	103
1 – (80)	speed bin 1	3296/3476
2 – ( )	2	3381/3566
3 – ( )	3	3414/3601
4 – ( )	4	3315/3497
5 – ( )	5	3262/3441

Errors:

	Speed Point 1	Speed Point 2	Speed Point 3	Speed Point 4	Speed Point 5
F/A		-4.6	-8.8	-2.5	
Tandem		-0.4	-3.9	1.2	
GVW		-1.1	-5.0	0.6	

Adjustments:

	Raise	Lower	Percentage
Overall	☐	☐	
Front Axle	☑	☐	3.0
Speed Point 1	☐	☐	
Speed Point 2	☐	☐	
Speed Point 3	☑	☐	4.6
Speed Point 4	☐	☑	1.1
Speed Point 5	☐	☐	

End factors:

Speed Point (mph)	Name	Value
Overall		① / ②
Front Axle	dynamic comp	106
1 – ( )	speed bin 1	3296/3476
2 – ( )	2	3381/3566
3 – ( )	3	3571/3767
4 – ( )	4	3278/3459
5 – ( )	5	3262/3441

060018 70_20_55_290 07091

6/20 06008 STSCWIM TO 20 55 280 0700

Computations worksheet by djw

Veh 1 f/a = 11900

gvw = 77850

Veh 2 f/a = 11650

gvw = 67800

55

60

65

w/o front axle

l	r
3381	3418
3414	3594
3315	3295
3566	3605
3601	3791
3497	3476

77850
67800
145650
72825
2 | 145650
14
05
4
16
16
05
4
10

72800 gross

11780 f/a 16 %

	f/a	gvw		
55	-4.6 (11238)	-1.1 (72000)	72393	(-.005)
60	-8.8 (10743)	-5.0 (69160)	69536	(-4.5)
65	-2.5 (11486)	0.6 (73286)	~~72765~~	
	(11155)	(71174)	73638	(+1.1)

raise f/a by 5 % | -5.3 | | -1.8 |

w/ f/a change 3.5 %

raise f/a by 3.5 % 103 - 107

34NW 3601 raise speed bin 3 by 4.6 %
l = 3571 r = 3767

3315 3497 lower speed bin 4 by 1.1 %
l = 3278 r = 3459

11631
11119
11888
11546

TEST VEHICLE PHOTOGRAPHS FOR SPS WIM VALIDATION

November 27, 2007

STATE: Wisconsin

SHRP ID: 550100

Photo 1 - Truck_1_Tractor_55_0100_11_27_07.JPG

Photo 2 - Truck_1_Trailer_Load_1_55_0100_11_27_07.JPG

Photo 3 - Truck_1_Suspension_1_55_0100_11_27_07.JPG

Photo 4 - Truck_1_Suspension_2_55_0100_11_27_07.JPG

Photo 5 - Truck_1_Suspension_3_55_0100_11_27_07.JPG

Photo 6 - Truck_2_Tractor_55_0100_11_27_07.JPG

Photo 7 - Truck_2_Trailer_55_0100_11_27_07.JPG

Photo 8 - Truck_2_Suspension_1_55_0100_11_27_07.JPG

Photo 9 - Truck_2_Suspension_2_55_0100_11_27_07.JPG

Photo 10 - Truck_2_Suspension_3_55_0100_11_27_07.JPG

ETG LTPP CLASS SCHEME, MOD 3

Class	Vehicle Type	No. Axles	Spacing 1	Spacing 2	Spacing 3	Spacing 4	Spacing 5	Spacing 6	Spacing 7	Spacing 8	Gross Weight Min-Max	Axle 1 Weight Min *
1	Motorcycle	2	1.00-5.99								0.10-3.00	
2	Passenger Car	2	6.00-10.10								1.00-7.99	
3	Other (Pickup/Van)	2	10.11-23.09								1.00-7.99	
4	Bus	2	23.10-40.00								12.00 >	
5	2D Single Unit	2	6.00-23.09								8.00 >	2.5
2	Car w/ 1 Axle Trailer	3	6.00-10.10	6.00-25.00							1.00-11.99	
3	Other w/ 1 Axle Trailer	3	10.11-23.09	6.00-25.00							1.00-11.99	
4	Bus	3	23.10-40.00	3.00-7.00							20.00 >	
5	2D w/ 1 Axle Trailer	3	6.00-23.09	6.30-30.00							12.00-19.99	2.5
6	3 Axle Single Unit	3	6.00-23.09	2.50-6.29							12.00 >	3.5
8	Semi, 2S1	3	6.00-23.09	11.00-45.00							20.00 >	3.5
2	Car w/ 2 Axle Trailer	4	6.00-10.10	6.00-30.00	1.00-11.99						1.00-11.99	
3	Other w/ 2 Axle Trailer	4	10.11-23.09	6.00-30.00	1.00-11.99						1.00-11.99	
5	2D w/ 2 Axle Trailer	4	6.00-26.00	6.30-40.00	1.00-20.00						12.00-19.99	2.5
7	4 Axle Single Unit	4	6.00-23.09	2.50-6.29	2.50-12.99						12.00 >	3.5
8	Semi, 3S1	4	6.00-26.00	2.50-6.29	13.00-50.00						20.00 >	5.0
8	Semi, 2S2	4	6.00-26.00	8.00-45.00	2.50-20.00						20.00 >	3.5
3	Other w/ 3 Axle Trailer	5	10.11-23.09	6.00-25.00	1.00-11.99	1.00-11.99					1.00-11.99	
5	2D w/ 3 Axle Trailer	5	6.00-23.09	6.30-35.00	1.00-25.00	1.00-11.99					12.00-19.99	2.5
7	5 Axle Single Unit	5	6.00-23.09	2.50-6.29	2.50-6.29	2.50-6.30					12.00 >	3.5
9	Semi, 3S2	5	6.00-30.00	2.50-6.29	6.30-65.00	2.50-11.99					20.00 >	5.0
9	Truck+FullTrailer (3-2)	5	6.00-30.00	2.50-6.29	6.30-50.00	12.00-27.00					20.00>	3.5
9	Semi, 2S3	5	6.00-30.00	16.00-45.00	2.50-6.30	2.50-6.30					20.00 >	3.5
11	Semi+FullTrailer, 2S12	5	6.00-30.00	11.00-26.00	6.00-20.00	11.00-26.00					20.00 >	3.5
10	Semi, 3S3	6	6.00-26.00	2.50-6.30	6.10-50.00	2.50-11.99	2.50-10.99				20.00 >	5.0
12	Semi+Full Trailer, 3S12	6	6.00-26.00	2.50-6.30	11.00-26.00	6.00-24.00	11.00-26.00				20.00 >	5.0
13	7 Axle Multi's	7	6.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00			20.00 >	5.0
13	8 Axle Multi's	8	6.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00		20.00 >	5.0
13	9 Axle Multi's	9	6.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	20.00 >	5.0

Spacings in feet
Weights in kips (Lbs/1000)
* Suggested Axle 1 minimum weight threshold if allowed by WIM system's class algorithm programming

System Operating Parameters

Wisconsin SPS-1 (Lane 1)

	November 27, 2007	Installation Calibration
Speed Bin	**Sensor 1 (Left)**	**Sensor 1 (Left)**
1	3296	3296
2	3381	3381
3	3521	3414
4	3278	3315
5	3262	3262
	Sensor 2 (Right)	**Sensor 2 (Right)**
1	3476	3476
2	3566	3566
3	3767	3601
4	3459	3497
5	3441	3441
Dynamic comp	106	103