Validation Report

Wisconsin, SPS-1
Task Order 26, CLIN 2
May 20 and 21, 2008

List of Tables

List of Figures

1 Executive Summary

A visit was made to the Wisconsin 0100 on May 20 and 21, 2008 for the purposes of conducting a validation of the WIM system located on SR 29, 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 LTPP lane is the only lane that is instrumented at this site. 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. This is the second validation visit to this location. The site was installed on June 19 to 20, 2007 by International Road Dynamics Inc..

This site demonstrates the ability to produce research quality loading data under the observed conditions. The classification algorithm is not currently providing research quality classification information.

The site is instrumented with bending plate WIM sensors 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 77,520 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 68,440 lbs., the "partial" truck.

The validation speeds ranged from 52 to 65 miles per hour. The pavement temperatures ranged from 52 to 87 degrees Fahrenheit. The desired speed range was achieved during this validation. The desired 30 degree Fahrenheit temperature range was also achieved.

Table 1-1 Post-Validation results – 550100 – 21-May-2008

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	0.8 ± 3.0%	Pass
Tandem axles	±15 percent	0.2 ± 4.2%	Pass
GVW	±10 percent	0.2 ± 2.2%	Pass
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.1 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 has been 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*

Upon our arrival at the site, we found the system parameters were the same as we left them at the conclusion of our last validation on November 28, 2007. Before Pre-Validation began, IRD remotely downloaded new firmware for the weighpad signal processing board and recommended that we install new compensation parameters that were 5% lower than the existing parameters to account for changes in weight statistics as a result of the change. The new compensation factors were installed prior to beginning Pre-Validation runs.

This site needs four 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 May 21, 2008 during the mid-morning to 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 77,520 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 68,440 lbs., the "partial" truck.

Each truck made a total of 20 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 52 to 87 degrees Fahrenheit. The desired 30 degree Fahrenheit temperature range was achieved. The computed values of 95% confidence limits of each statistic for the total population are in Table 3-1.

The statistics in Table 3-1 indicate that the loading data meets the conditions for research quality data.

Table 3-1 Post-Validation Results – 550100 – 21-May-2008

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	0.8 ± 3.0%	Pass
Tandem axles	±15 percent	0.2 ± 4.2%	Pass
GVW	±10 percent	0.2 ± 2.2%	Pass
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.1 ft	Pass

Prepared: djw *Checked: bko*

The test runs were conducted primarily during the morning and afternoon hours under partly cloudy weather conditions, resulting in a 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 three 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 achieved for this set of validation runs.

The three speed groups were divided as follows: Low speed – 52 to 56 mph, Medium speed – 57 to 62 mph and High speed – 63 + mph. The three temperature groups were created by splitting the runs between those at 52 to 60 degrees Fahrenheit for Low temperature, 61 to 71 degrees Fahrenheit for Medium temperature and 72 to 87 degrees Fahrenheit for High temperature.

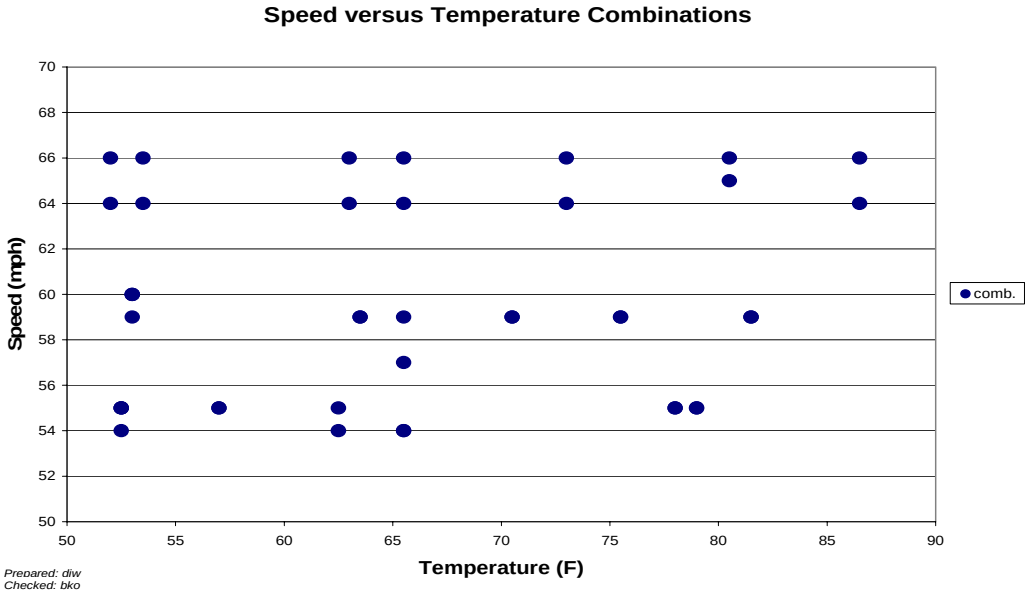

Figure 3-1 Post-Validation Speed-Temperature Distribution – 550100 – 21-May-2008

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. It can be seen from the figure that the equipment estimates GVW with reasonable accuracy at all speeds. Variability in error is consistent throughout the entire speed range.

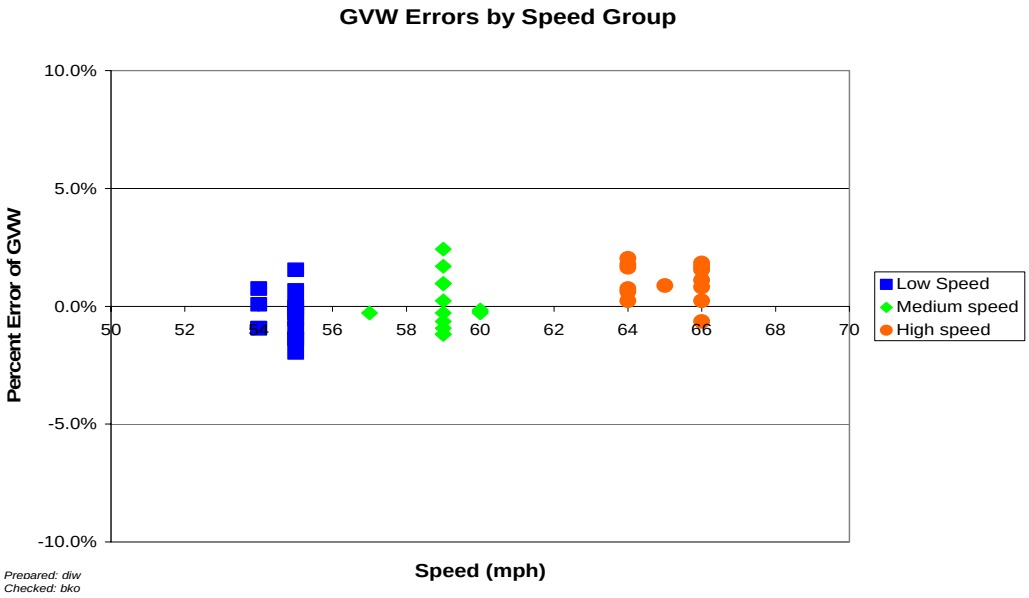

Figure 3-2 Post-validation GVW Percent Error vs. Speed – 550100 – 21-May-2008

Figure 3-3 shows the relationship between temperature and GVW percentage error. There is no apparent influence of temperature on the error estimates. Variability is consistent throughout the entire temperature range.

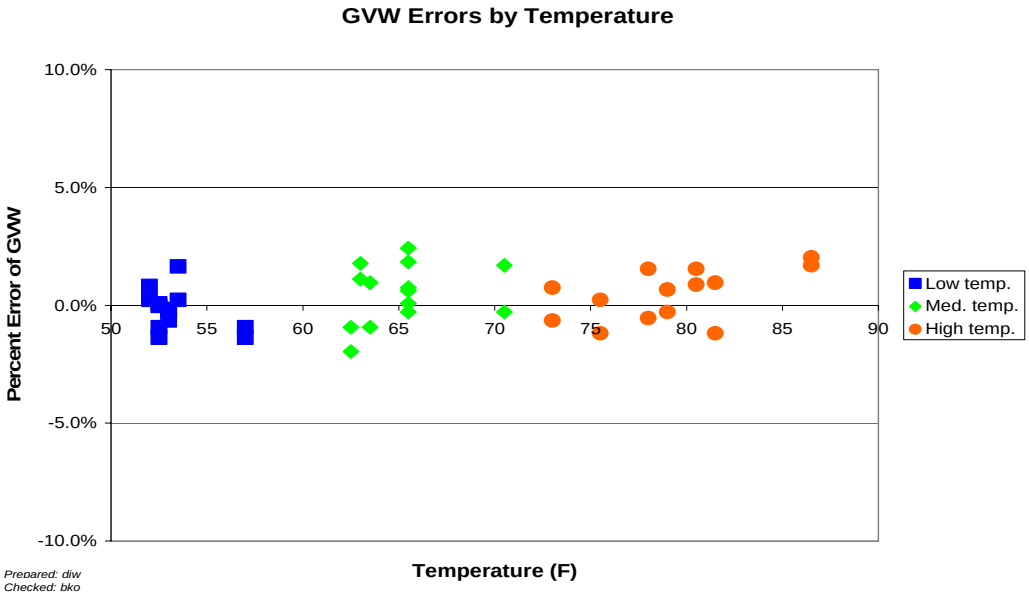

Figure 3-3 Post-Validation GVW Percent Error vs. Temperature – 550100 – 21-May-2008

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. There is no apparent influence of speed on spacing errors. Spacing error was limited to 0.1 feet (2 inches).

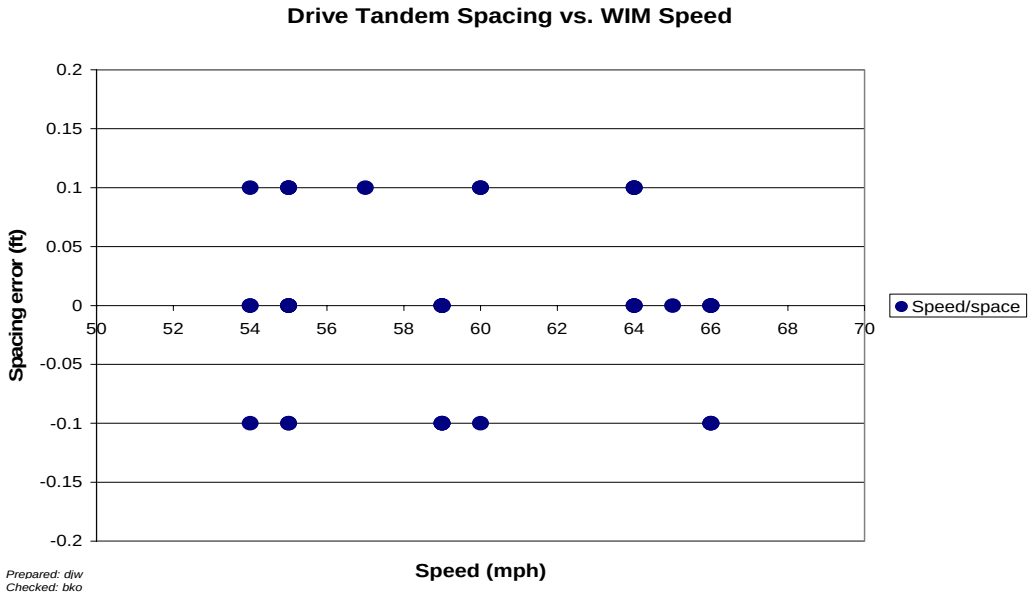

Figure 3-4 Post-Validation Spacing vs. Speed – 550100 – 21-May-2008

3.1 Temperature-based Analysis

The three temperature groups were created by splitting the runs between those at 52 to 60 degrees Fahrenheit for Low temperature, 61 to 71 degrees Fahrenheit for Medium temperature and 72 to 87 degrees Fahrenheit for High temperature.

Table 3-2 Post-Validation Results by Temperature Bin – 550100 – 21-May-2008

Element	95% Limit	Low Temperature 52 to 60 °F	Medium Temperature 61 to 71 °F	High Temperature 72 to 87 °F
Steering axles	±20 %	0.9 ± 2.8%	1.2 ± 3.0%	0.4 ± 3.6%
Tandem axles	±15 %	-0.4 ± 3.3%	0.4 ± 5.4%	0.5 ± 3.9%
GVW	±10 %	-0.2 ± 1.8%	0.5 ± 2.7%	0.5 ± 2.3%
Axle spacing	± 0.5 ft	0.0 ± 0.2 ft	0.0 ± 0.2 ft	0.0 ± 0.1 ft

Prepared: djw *Checked: bko*

From Table 3-2, it can be seen that the equipment estimates all weights at all temperatures with reasonable accuracy. Variability in error is generally consistent throughout the temperature range for all weights, with the exception of a slight increase for tandem axle weights at medium temperatures.

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

From the graph it can be seen that the equipment demonstrates the ability to estimate GVW for both trucks with reasonable accuracy at the observed temperatures. Variability in error for both trucks is also similar.

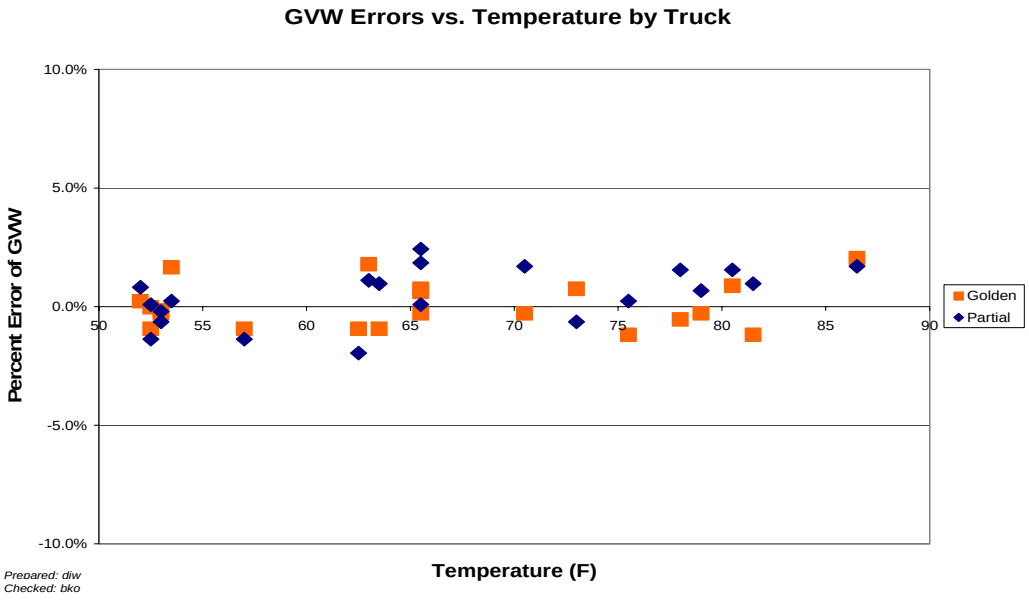

Figure 3-5 Post-Validation GVW Percent Error vs. Temperature by Truck – 550100 – 21-May-2008

Figure 3-6 shows the relation 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. Steering axle weights are generally overestimated at all temperatures. Variability appears to remain constant throughout the entire temperature range.

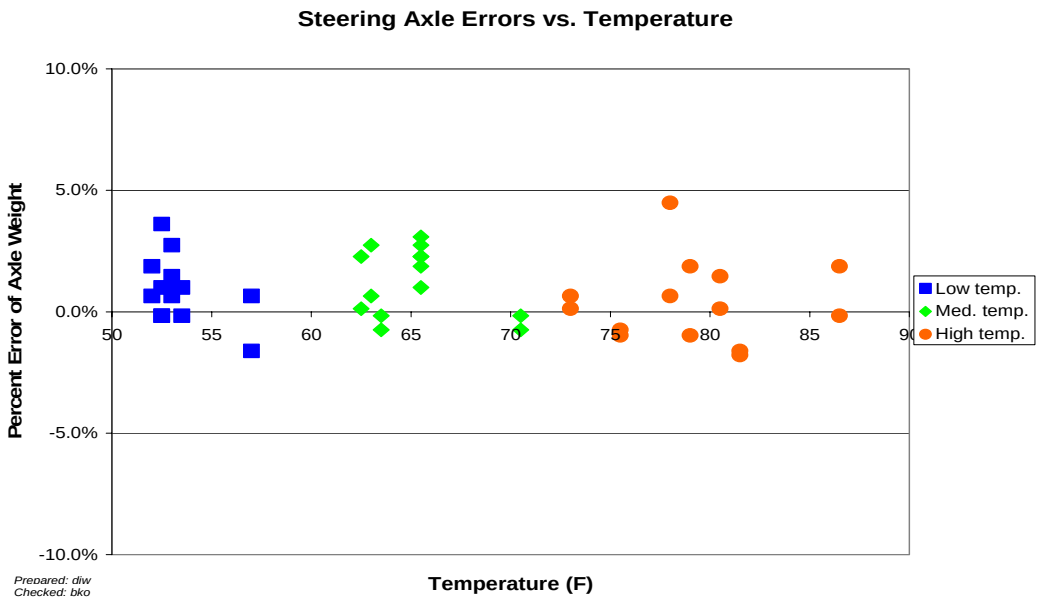

Figure 3-6 Post-Validation Steering Axle Error vs. Temperature by Group – 550100 – 21-May-2008

3.2 Speed-based Analysis

The three speed groups were divided using 52 to 56 mph for Low speed, 57 to 62 mph for Medium speed and 63+ mph for High speed.

Table 3-3 Post-Validation Results by Speed Bin – 550100 – 21-May-2008

Element	95% Limit	Low Speed 52 to 56 mph	Medium Speed 57 to 62 mph	High Speed 63+ mph
Steering axles	±20 %	1.2 ± 3.8%	0.2 ± 3.1%	1.1 ± 2.2%
Tandem axles	±15 %	-0.6 ± 3.2%	0.1 ± 4.6%	1.1 ± 4.5%
GVW	±10 %	-0.4 ± 2.1%	0.1 ± 2.3%	1.0 ± 1.7%
Axle spacing	± 0.5 ft	0.0 ± 0.2 ft	0.0 ± 0.2 ft	0.0 ± 0.1 ft

Prepared: djw *Checked: bko*

Table 3-3 demonstrates the ability of the equipment to accurately estimate all weights at all speeds. Variability is also reasonably consistent throughout the entire speed range.

From Figure 3-7, it can be seen that the equipment generally estimates GVW for both trucks accurately, with a slight overestimation at the higher speeds. Variability in error is consistent throughout the entire speed range.

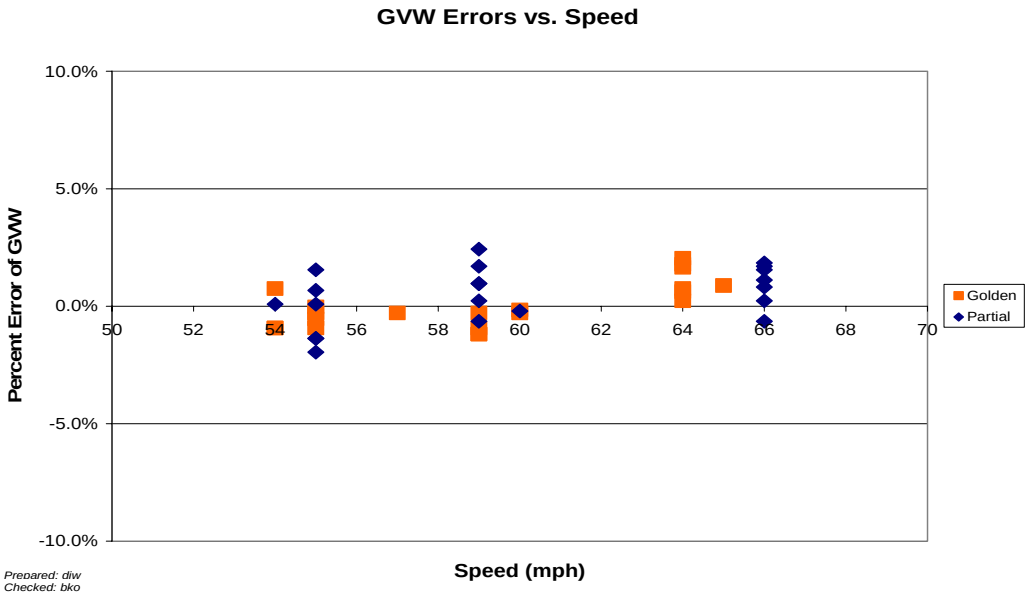

Figure 3-7 Post-Validation GVW Percent Error vs. Speed by Truck – 550100 – 21-May-2008

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. From the graph, it can be seen that the equipment generally overestimates steering axle weights at all speeds. Variability appears to be slightly greater at the lower speeds.

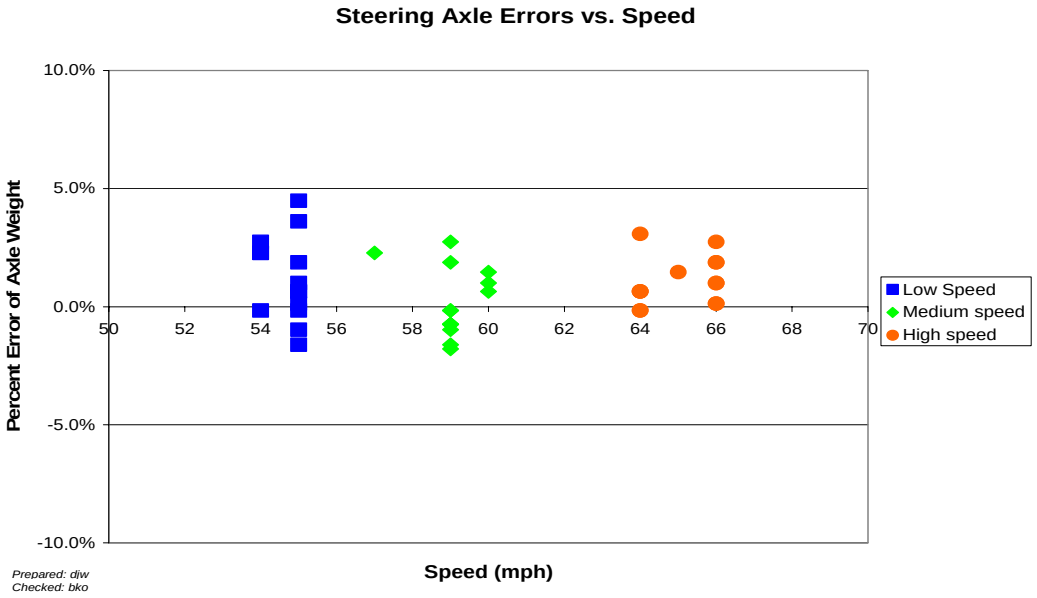

Figure 3-8 Post-Validation Steering Axle Percent Error vs. Speed by Group – 550100 – 21-May-2008

3.3 Classification Validation

The agency uses a variant of the FHWA 13-bin classification scheme. Classification 15 has been added to define unclassified vehicles. A Classification 14 also exists in the output data.

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 the 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 5 percent.

Table 3-4 Truck Misclassification Percentages for 550100 – 21-May-2008

Class	Percent Error	Class	Percent Error	Class	Percent Error
4	0	5	14	6	0
7	0				
8	33	9	0	10	33
11	N/A	12	N/A	13	0

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 – 21-May-2008

Class	Mean Difference	Class	Mean Difference	Class	Mean Difference
4	0	5	- 14	6	0
7	0				
8	50	9	0	10	- 33
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.

A limited investigation of the precision and bias of the speeds reported by the equipment was undertaken. The values were not within the expected tolerances. Since the classification data for heavy trucks met research quality standards, with the exception of a small sample of Class 8s (4) and Class 10s (3), the observed bias and variability are thought to be more strongly related to radar speed precision than errors in the WIM equipment.

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 condition did not influence truck movement across the sensors.

4.1 Profile Analysis

Profile data collected in the year prior to the site visit or since installation 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.

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 and any of the sensors for the equipment.

5 Equipment Discussion

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

There were no changes in basic equipment operating condition since the validation on November 28, 2007 until the change of firmware immediately prior to the validation.

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

The equipment required one-iteration of the calibration process between the initial 40 runs and the final 40 runs.

5.2.1 Calibration Iteration 1

The operating system weight compensation parameters that were in place prior to the Pre-Validation are in Table 5-1. These are not the factors as of the end of the last validation thus the initial validation runs served as calibration inputs rather than determination of the change in loading errors since the prior validation.

Table 5-1 Initial System Parameters - 550100 - 20-May-2008

Speed Bin	Left Sensor 1	Right Sensor 2
80 kph	3131	3302
88 kph	3211	3388
96 kph	3392	3579
104 kph	3114	3286
112 kph	3099	3269

Prepared: djw *Checked: bko*

As a result of the Pre-Validation, where the GVW error ranged from +6.7% to -1.0%, the compensation factors were adjusted as shown in Table 5-2.

Table 5-2 Calibration 1 - Change in Parameters - 550100 - 21-May-2008

Speed Bin	Change	New Left Sensor 1 Factor	Change	New Right Sensor 2 Factor
80 kph	N/A	3131	N/A	3302
88 kph	-1.5%	3162	-1.5%	3336
96 kph	-6.7%	3164	-6.7%	3338
104 kph	+3.0%	3210	+3.0%	3386
112 kph	N/A	3099	N/A	3269

Prepared: djw *Checked: bko*

Table 5-3 Calibration Iteration 1 Results – 550100 – 21-May-2008 (08:52 AM)

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	0.5 ± 2.4%	Pass
Tandem axles	±15 percent	-0.4 ± 3.6%	Pass
GVW	±10 percent	-0.2 ± 1.7%	Pass
Axle spacing	± 0.5 ft	0.0 ± 0.2 ft	Pass

Prepared: djw *Checked: bko*

As shown in Table 5-3 and Figure 5-1, the calibration produced the expected results. No additional calibration iterations of the equipment were required.

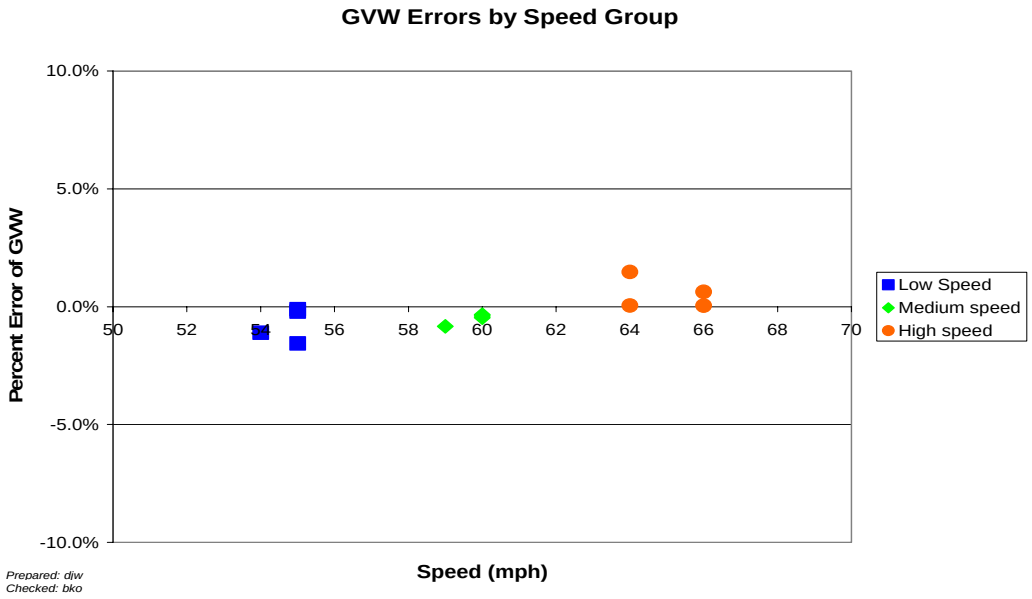

Figure 5-1 Calibration Iteration 1 GVW Percent Error vs. Speed Group – 550100 – 21-May-2008 (08:52 AM)

5.3 Summary of Traffic Sheet 16s

This site has validation information from the previous visit as well as the current one in the tables below. Sheet 16 data for previous equipment installations is not included.

Table 5-4 has the information for TRF_CALIBRATION_AVC for Sheet 16s submitted prior to this validation as well as the information for the current visit. The Sheet 16s available reflect only this contractor's validation visits.

Table 5-4 Classification Validation History – 550100 – 21-May-2008

Date	Method	Mean Difference				Percent Unclassified
		Class 9	Class 8	Class 5	Other 2	
21-May-08	Manual	0		-14		1.0
20-May-08	Manual	-1		-15		2.0
28-Nov-07	Manual	0	0			0.0
27-Nov-07	Manual	0	0			0.0

Prepared: djw *Checked: bko*

Table 5-5 has the information for TRF_CALIBRATION_WIM for Sheet 16s submitted prior to this validation as well as the information for the current visit. The Sheet 16s available reflect only this contractor's validation visits.

Table 5-5 Weight Validation History – 550100 – 21-May-2008

Date	Method	Mean Error and (SD)		
		GVW	Single Axles	Tandem Axles
21-May-08	Test Trucks	0.2 (1.1)	0.8 (1.5)	0.2 (2.1)
20-May-08	Test Trucks	3.2 (3.6)	4.7 (3.7)	2.9 (3.9)
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.

6 Pre-Validation Analysis

Upon our arrival at the site, we found the system parameters were the same as we left them at the conclusion of our last validation on November 28, 2007. Before Pre-Validation began, IRD remotely downloaded new firmware for the weighpad signal processing board. They recommended that we install new compensation parameters that were 5% lower than the existing parameters to account for changes in weight statistics as a result of the change. The parameter changes were made in accordance with their recommendations. Those factors and the changes installed following IRD's firmware upgrade prior to the Pre-validation are shown Table 6-1:

Table 6-1 Weight Compensation Factor Changes Made Following Firmware Change - 550100 - 20-May-2008

	Left / Sensors 1		Right / Sensors 2	
	20-May-2008	28-Nov-2007	20-May-2008	28-Nov-2007
80 kph	3131	3296	3302	3476
88 kph	3211	3381	3388	3566
96 kph	3392	3571	3579	3767
104 kph	3114	3278	3286	3459
112 kph	3099	3262	3269	3441

Prepared: djw *Checked: bko*

The Pre-Validation analysis is based on test runs conducted May 20, 2008 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 76,870 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 68,150 lbs., the "partial" truck.

For the initial validation each truck made a total of 20 passes over the WIM scale at speeds ranging from approximately 50 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 67 to 97degrees Fahrenheit. The desired 30 degree Fahrenheit temperature range was also achieved. The computed values of 95% confidence limits of each statistic for the total population are in Table 6-2.

Table 6-2 indicates that due to variability in GVW error, the conditions for research quality loading data were not met following the changes applied after the firmware installation.

Table 6-2 Pre-Validation Results – 550100 – 20-May-2008

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	4.7 ± 7.4%	Pass
Tandem axles	±15 percent	2.9 ± 7.8%	Pass
GVW	**±10 percent**	**3.2 ± 7.3%**	**Fail**
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.2 ft	Pass

Prepared: djw *Checked: bko*

The test runs were conducted primarily during the morning and early afternoon hours under mostly sunny weather conditions, resulting in a 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 achieved for this set of validation runs.

The three speed groups were divided into 50 to 56 mph for Low speed, 57 to 62 mph for Medium speed and 63+ mph for High speed. The two temperature groups were created by splitting the runs between those at 67 to 80 degrees Fahrenheit for Low temperature and 81 to 97 degrees Fahrenheit for High temperature.

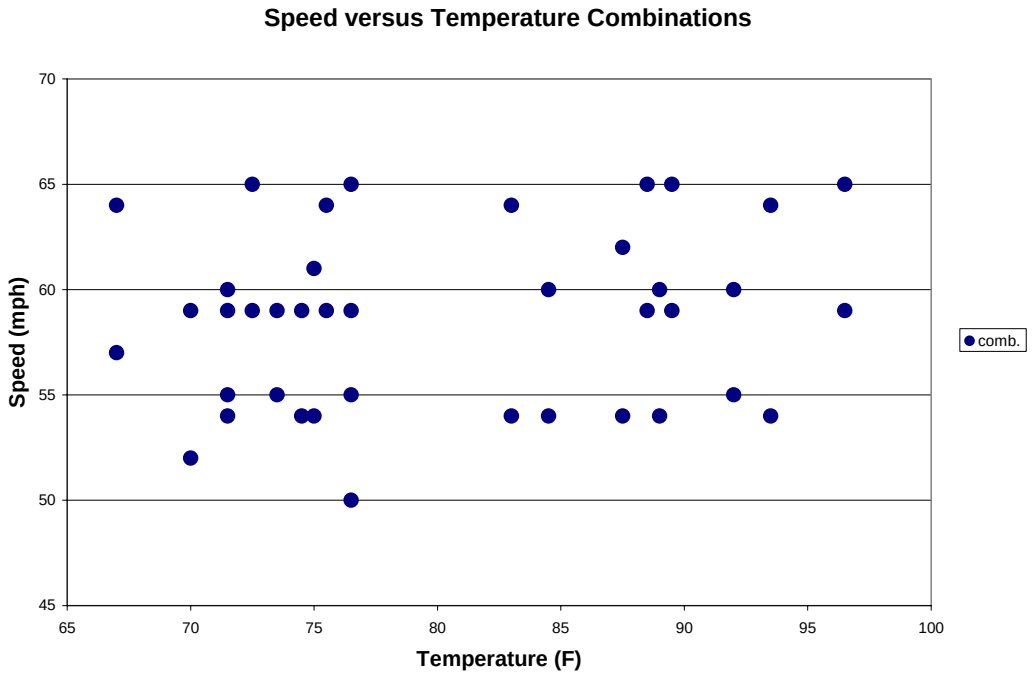

Figure 6-1 Pre-Validation Speed-Temperature Distribution – 550100 – 20-May-2008

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. As can be seen in the figure, the system increasingly overestimates GVW from the lower speeds to the medium speeds and then moves toward an underestimation at the higher speeds. Error is greater at the medium speeds when compared with low and high speeds. Variability appears to be greatest at the medium speeds.

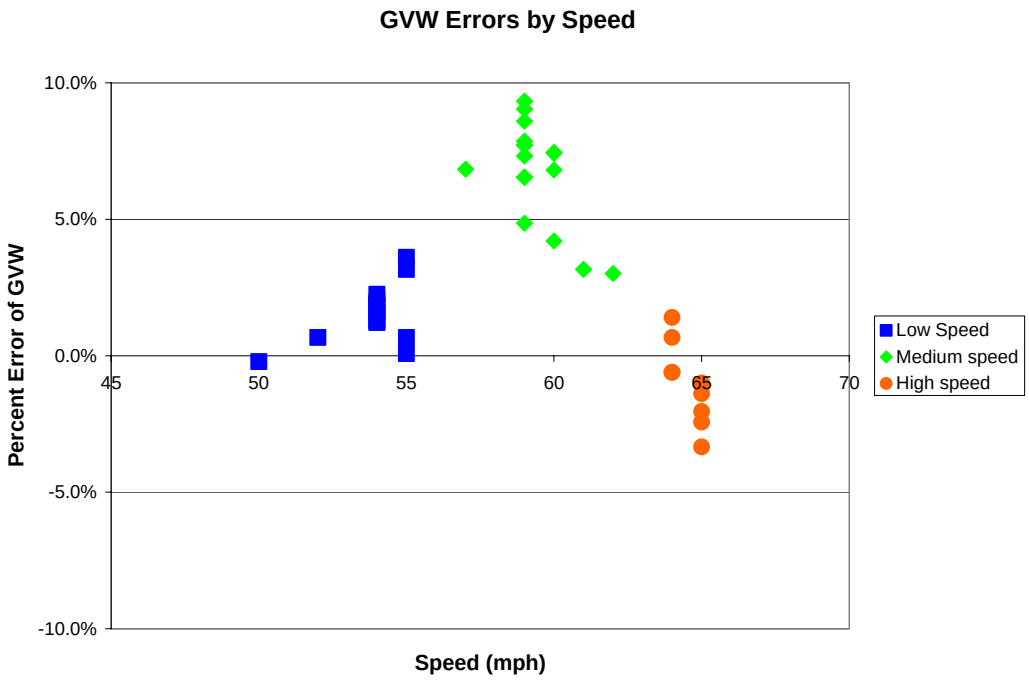

Figure 6-2 Pre-validation GVW Percent Error vs. Speed – 550100 – 20-May-2008

Figure 6-3 shows the relationship between temperature and GVW percentage error. The graph shows that GVW is overestimated at all temperatures. Variability appears to remain consistent over the entire temperature range.

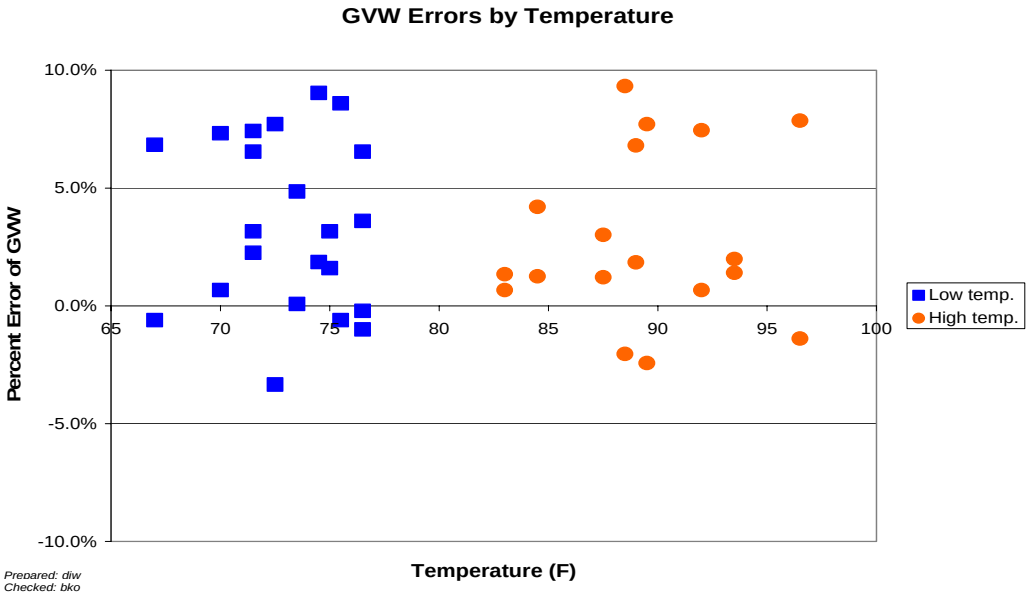

Figure 6-3 Pre-Validation GVW Percent Error vs. Temperature – 550100 – 20-May-2008

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. There is no apparent influence of speed on spacing error, which are limited to 0.1 feet (2 inches).

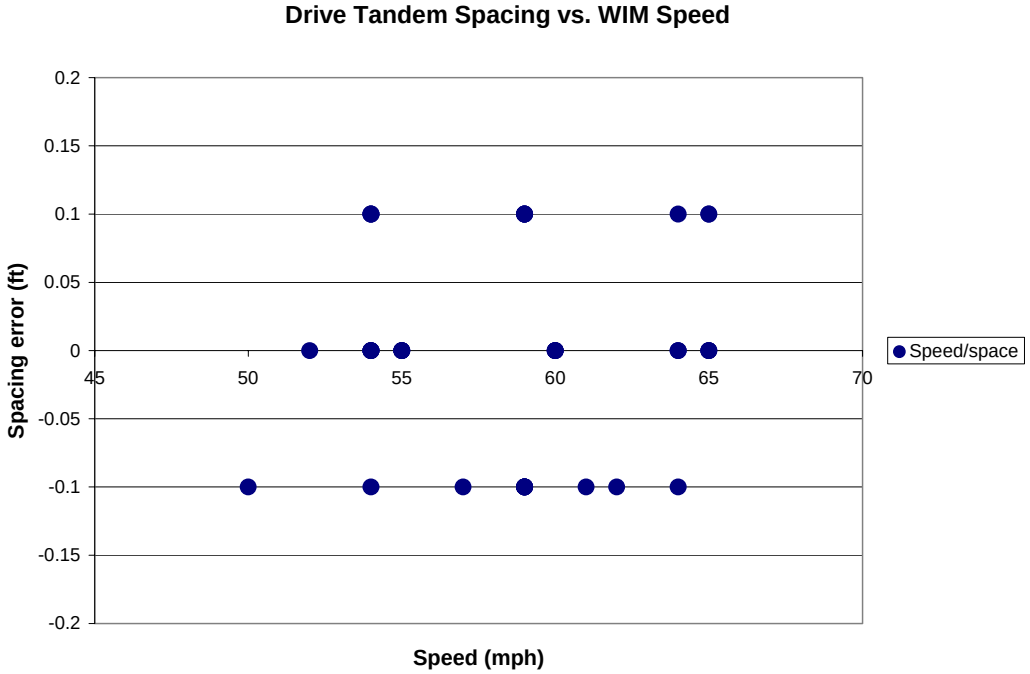

Figure 6-4 Pre-Validation Spacing vs. Speed - 550100 – 20-May-2008

6.1 Temperature-based Analysis

The two temperature groups were created by splitting the runs between those at 67 to 80 degrees Fahrenheit for Low temperature and 81 to 97 degrees Fahrenheit for High temperature.

Table 6-3 Pre-Validation Results by Temperature Bin – 550100 – 20-May-2008

Element	95% Limit	Low Temperature 67 to 80 °F	High Temperature 81 to 97 °F
Steering axles	±20 %	5.3 ± 7.7%	4.0 ± 7.6%
Tandem axles	±15 %	3.1 ± 8.1%	2.6 ± 7.8%
GVW	±10 %	3.4 ± 7.6%	2.8 ± 7.6%
Axle spacing	± 0.5 ft	0.0 ± 0.2 ft	0.0 ± 0.1 ft

Prepared: djw *Checked: bko*

From Table 6-3, it can be seen that the equipment produces an overestimation of all weights at all temperatures. For all weights, variability appears to be consistent throughout the entire temperature range.

Figure 6-5 shows the distribution of GVW Errors versus Temperature by Truck. As can be seen in the graph, the equipment generally overestimates the GVW for both trucks at all temperatures. The error and variability for both trucks is similar.

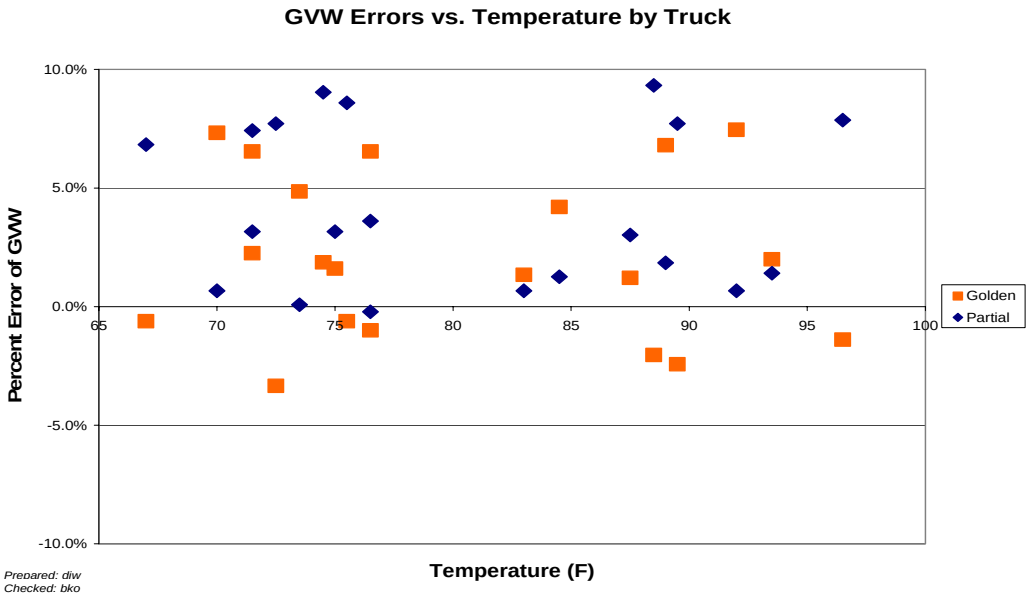

Figure 6-5 Pre-Validation GVW Percent Error vs. Temperature by Truck – 550100 – 20-May-2008

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. At all temperatures, the steering axle weights are generally overestimated. Variability in error is consistent throughout the entire temperature range.

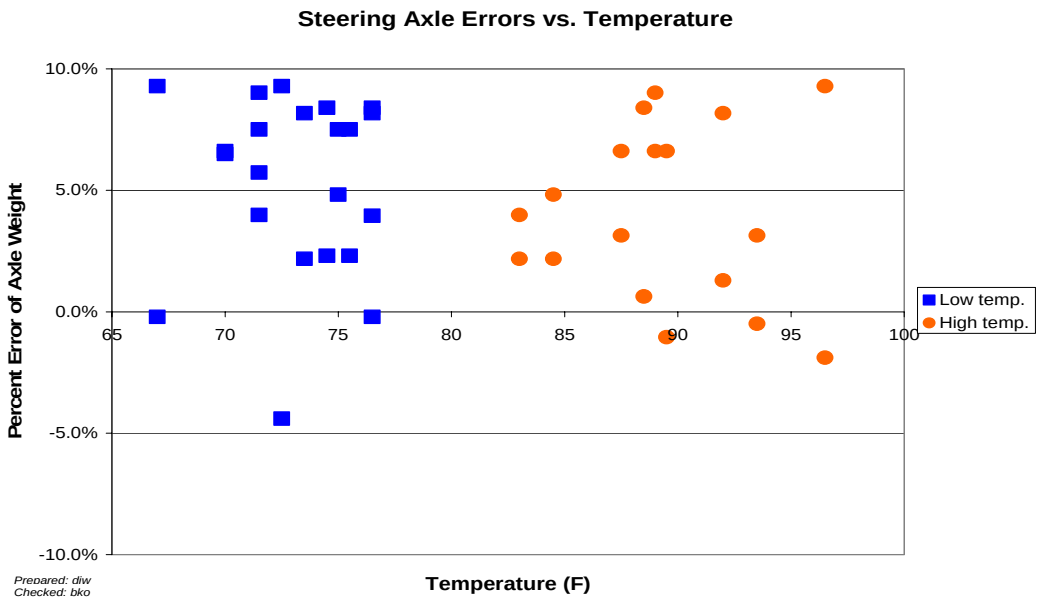

Figure 6-6 Pre-Validation Steering Axle Error vs. Temperature by Group – 550100 – 20-May-2008

6.2 Speed-based Analysis

The speed groups were divided as follows: Low speed – 50 to 56 mph, Medium speed – 57 to 62 mph and High speed – 63+ mph.

Table 6-4 Pre-Validation Results by Speed Bin – 550100 – 20-May-2008

Element	95% Limit	Low Speed 50 to 56 mph	Medium Speed 57 to 62 mph	High Speed 63+ mph
Steering axles	±20 %	4.2 ± 4.4%	7.9 ± 2.6%	-0.3 ± 4.7%
Tandem axles	±15 %	1.1 ± 3.1%	6.5 ± 5.7%	-1.2 ± 3.8%
GVW	±10 %	1.5 ± 2.3%	6.7 ± 4.0%	-1.0 ± 3.4%
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.2 ft	0.0 ± 0.2 ft

Prepared: djw *Checked: bko*

Table 6-4 shows the tendency for the equipment to overestimate all weights at the low and medium speeds, and underestimate all weights at the higher speeds. Variability in error for steering axle appears to decrease at the medium speeds when compared with low and high speeds, while tandem axle and GVW error appears to display an opposing trend.

As can be seen in Figure 6-7, the weight estimation and error variability patterns of the two trucks appear similar at all speeds.

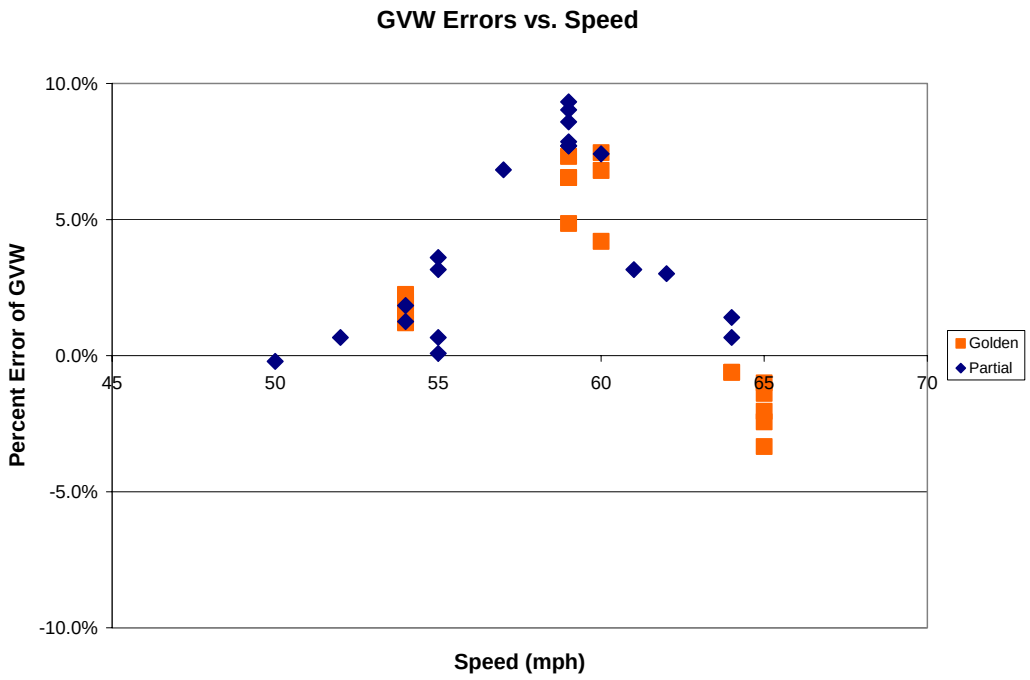

Figure 6-7 Pre-Validation GVW Percent Error vs. Speed Group - 550100 –20-May-2008

Figure 6-8 shows the relation 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 illustrates the tendency for the equipment to increasingly overestimate steering axle weights from low to medium speeds and then transition to an underestimation at the higher speeds. Variability in error appears to be greater at the lower speeds when compared with medium and high speeds.

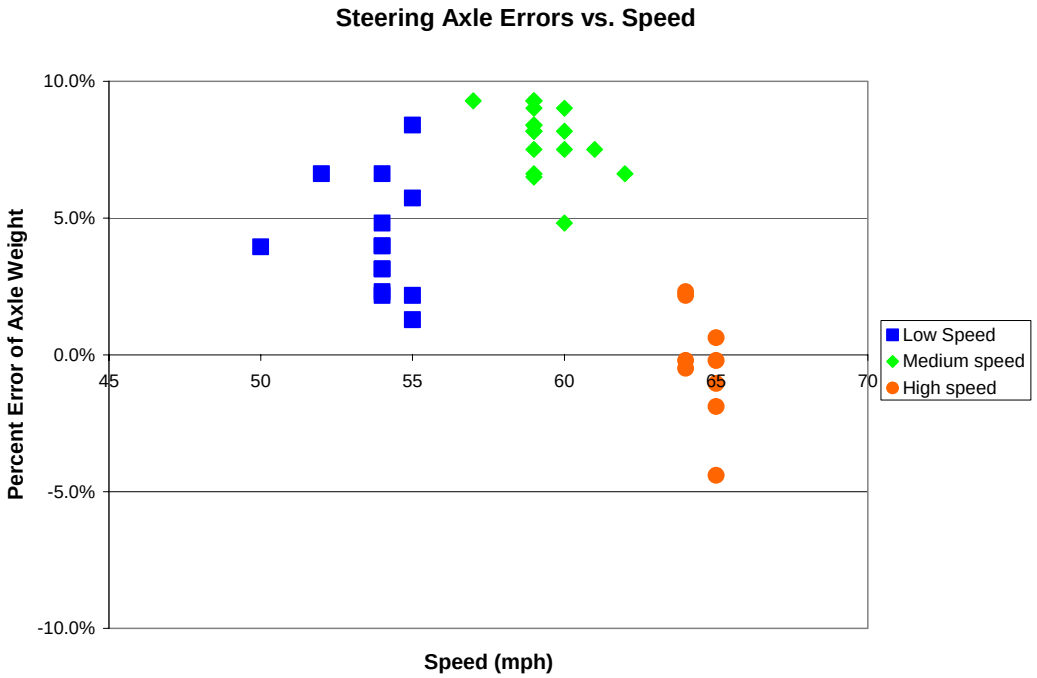

Figure 6-8 Pre-Validation Steering Axle Percent Error vs. Speed Group - 550100 – 20-May-2008

6.3 Classification Validation

The agency uses a variant of the FHWA 13-bin classification scheme. Classification 15 has been added to define unclassified vehicles. A Classification 14 also appears in the output data files.

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 the 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 6-5 has the classification error rates by class. The overall misclassification rate is 8 percent.

Table 6-5 Truck Misclassification Percentages for 550100 – 20-May-2008

Class	Percent Error	Class	Percent Error	Class	Percent Error
4	67	5	23	6	0
7	0				
8	13	9	1	10	33
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 6-6 Truck Classification Mean Differences for 550100 – 20-May-2008

Class	Mean Difference	Class	Mean Difference	Class	Mean Difference
4	50	5	- 15	6	0
7	0				
8	14	9	- 1	10	- 33
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.

A limited investigation of the precision and bias of the speeds reported by the equipment was undertaken. The values were not within the expected tolerances. Since the classification data for heavy trucks met research quality standards, with the exception of a small sample of Class 8s (7) and Class 10s (3), the observed bias and variability are thought to be more strongly related to radar speed precision than errors in the WIM equipment.

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 6-7 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*

6.5 Prior Validations

The last validation for this site was done November 27 and 28, 2007. It was the first validation of the site. The site was producing research quality data. Figure 6-9 shows the GVW Percent Error vs. Speed for the post validation runs. The site was validated with two trucks. The "Golden" truck was loaded to 77,530 lbs. The "partial" truck which had air suspension on both tandems was loaded to 68,170 lbs. The greater variability observed in the Pre-Validation runs for medium speeds existed then as well.

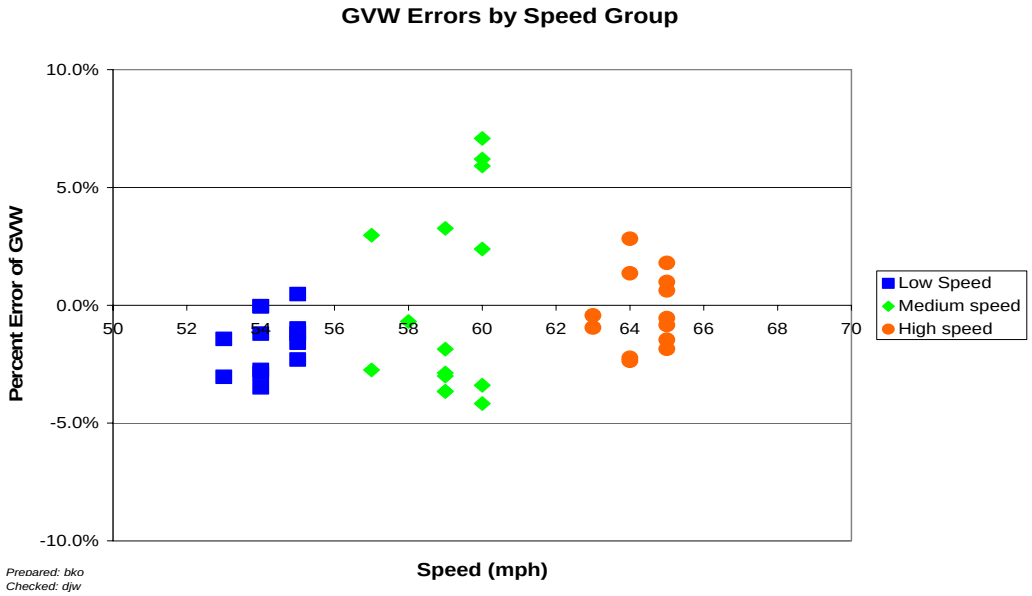

Figure 6-9 Last Validation GVW Percent Error vs. Speed – 550100 – 28-Nov-2007

Table 6-8 shows the overall results from the last validation. The site was left with a tendency to slightly underestimate tandem axle and gross vehicle weights.

Table 6-8 Last Validation Final 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
Gross vehicle weights	±10 percent	-0.5 ± 5.6%	Pass
Axle spacing	± 0.5 ft [150 mm]	0.0 ± 0.0 ft	Pass

Prepared: djw *Checked: bko*

Table 6-9 has the results at the end of the last validation by temperature. The variability at both the very cold and very warm ends of the observed temperature range is very similar. Through this validation the equipment has been observed at temperature from 12 to 97 degrees Fahrenheit.

Table 6-9 Last 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%
Axle spacing	± 0.5 ft	-0.1 ± 0.1 ft	0.0 ± 0.0 ft

Table 6-10 has the results of the prior post validation by speed groups. The downward trend for steering axle estimates with increasing speed and the slight rise in the estimates at the medium speeds for tandem axles and GVW was present then as well.

Table 6-10 Last 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%
Axle spacing	± 0.5 ft	0.0 ± 0.0 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft

Prepared: djw *Checked: bko*

7 Data Availability and Quality

As of May 20, 2008 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 of data from the previous

installation, it can be seen that at least four 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.

Only Class 9s constitute more than 10 percent of the truck population. Based on the data collected following this validation 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.

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 – 21-May-2008

Characteristic	**Class 9**
Percentage Overweights	0.0%
Percentage Underweights	0.6%
Unloaded Peak	36,000 lbs
Loaded Peak	80,000 lbs

Prepared: djw *Checked: bko*

The expected percentage of unclassified vehicles is 0.2%. This is based on the percentage of unclassified vehicles (Class 15) in the Post-Validation data download.

The graphical screening comparison figures are found in Figure 7-1 through Figure 7-3. 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 period.

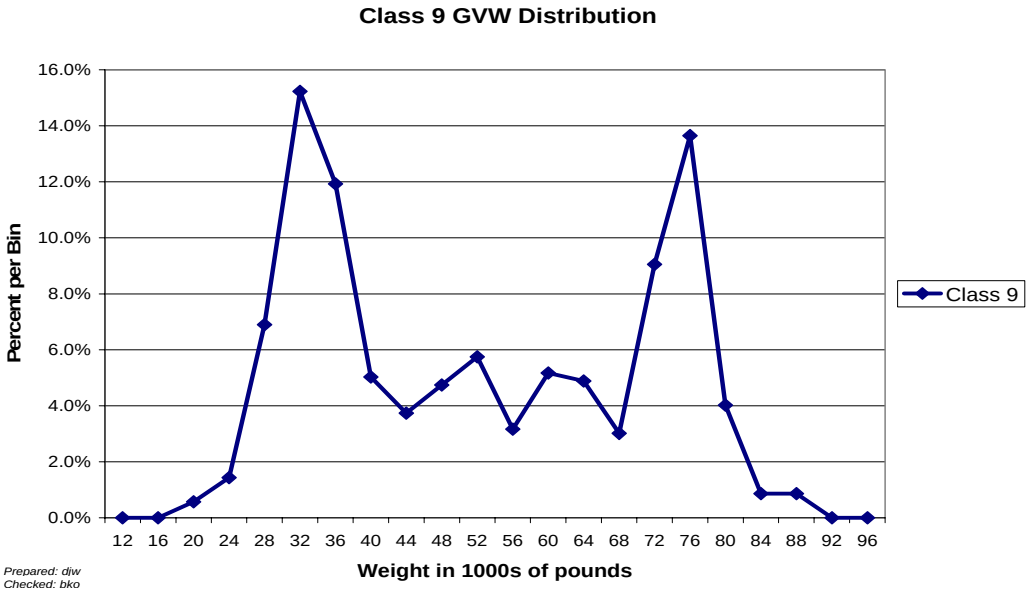

Figure 7-1 Expected GVW Distribution Class 9 – 550100 – 21-May-2008

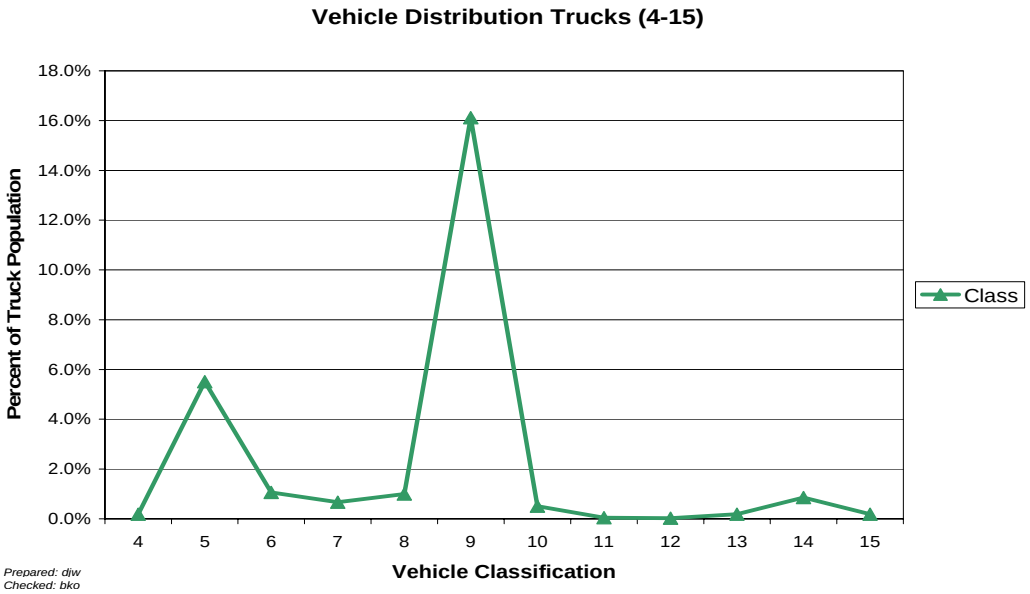

Figure 7-2 Expected Vehicle Distribution – 550100 – 21-May-2008

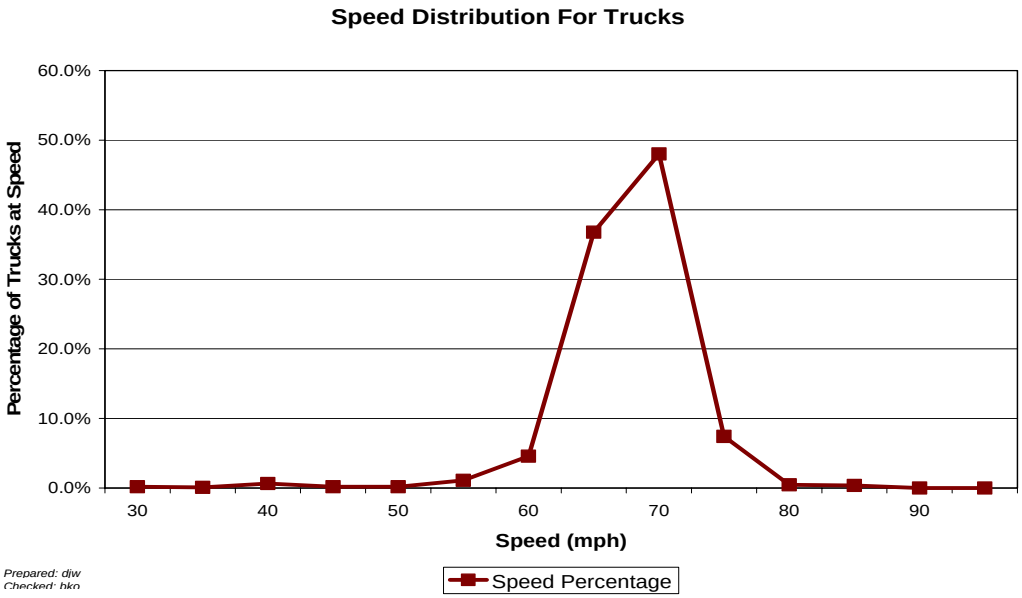

Figure 7-3 Expected Speed Distribution – 550100 – 21-May-2008

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 – (1 page)

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 end of this report. It includes a current Sheet 17 with all applicable maps and photographs. There are no significant changes in the information provided.

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: *May 20, 2008*

VISIT TYPE: *Validation*

2. Contact Information

POINTS OF CONTACT:

Validation Team Leader: *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 May 20, 2008*

TRUCK ROUTE CHECK: *Verified last visit*

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.*

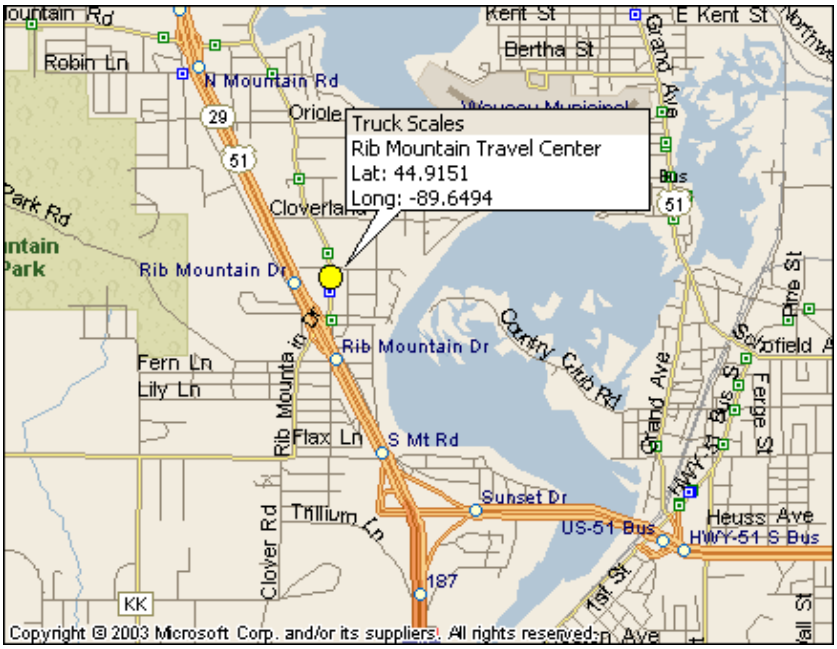

Figure 5-1 - Truck Scale Location - 550100

TRUCK ROUTE:

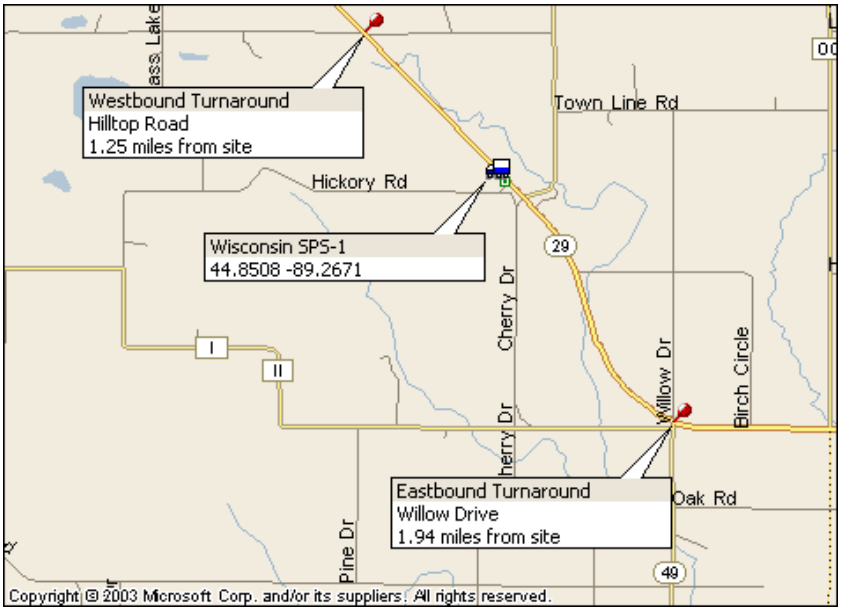

Figure 5-2 - Truck Route - 550100

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

6. Sheet 17 – Wisconsin (550100)

1.* ROUTE ___SR 29_____MILEPOST _189.8_____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 05/20/08 Photo __55_0100_Upstream_05_20_08_____
Date 05/20/08 Photo __55_0100_Downstream_05_20_08_____
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_____ ftOverhead / 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 __55_0100_Power_Source_05_20_08.jpg_____

Phone source __55_0100_Telephone_Source_05_20_08.jpg _____

Cabinet exterior __55_0100_Cabinet_Exterior_05_20_08.jpg _____

Cabinet interior __55_0100_Cabinet_Interior_Front_05_20_08.jpg ____

__55_0100_Cabinet_Interior_Back_05_20_08.jpg ____

Weight sensors __55_0100_Leading_WIM_Sensor_05_20_08.jpg ____

__55_0100_Trailing_WIM_Sensor_05_20_08.jpg ____

Classification sensors _____

Other sensors _55_0100_Leading_Loop_05_20_08.jpg_____

_55_0100_Trailing_Loop_05_20_08.jpg_____

Description __Loop Sensors_____

Downstream direction at sensors on LTPP lane

_____55_0100_Downstream_05_20_08_____

Upstream direction at sensors on LTPP lane

_____55_0100_Upstream_05_20_08_____

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 5/20/08

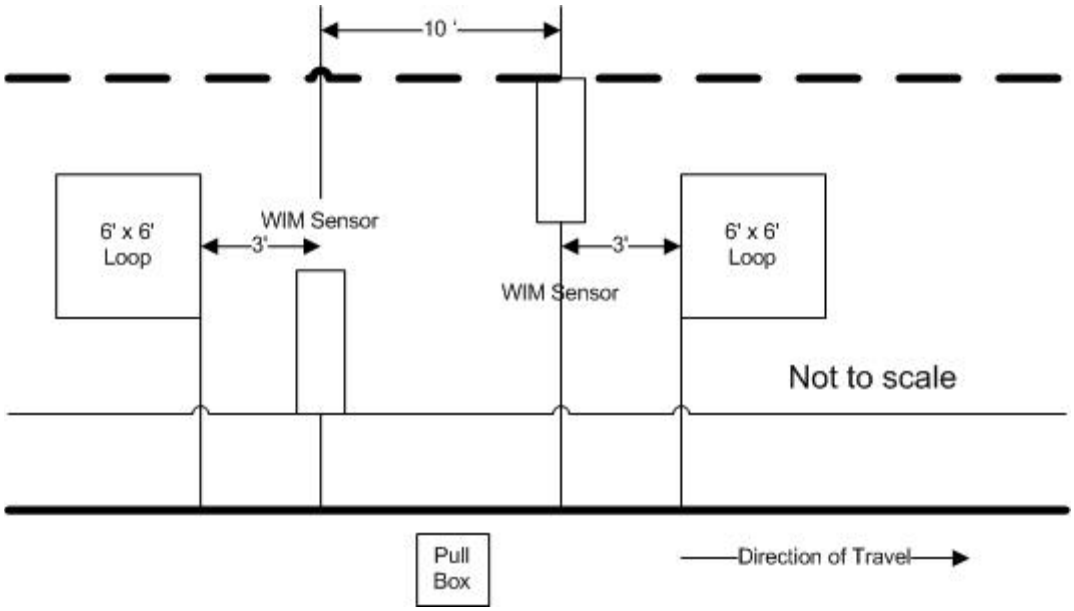

Figure 6-1 Equipment Layout - 550100

Figure 6-2 Site Map - 550100

Photo 1 - 55_0100_Upstream_05_20_08.jpg

Photo 2 - 55_0100_Downstream_05_20_08.jpg

Photo 3 - 55_0100_Power_Meter_05_20_08.jpg

Photo 4 - 55_0100_Telephone_Source_05_20_08.jpg

Photo 5 - 55_0100_Cabinet_Exterior_05_20_08.jpg

Photo 6 - 55_0100_Cabinet_Interior_Front_05_20_08.jpg

Photo 7 - 55_0100_Cabinet_Interior_Back_05_20_08.jpg

Photo 8 - 55_0100_Leading_WIM_Sensor_05_20_08.jpg

Photo 9 - 55_0100_Trailing_WIM_Sensor_05_20_08.jpg

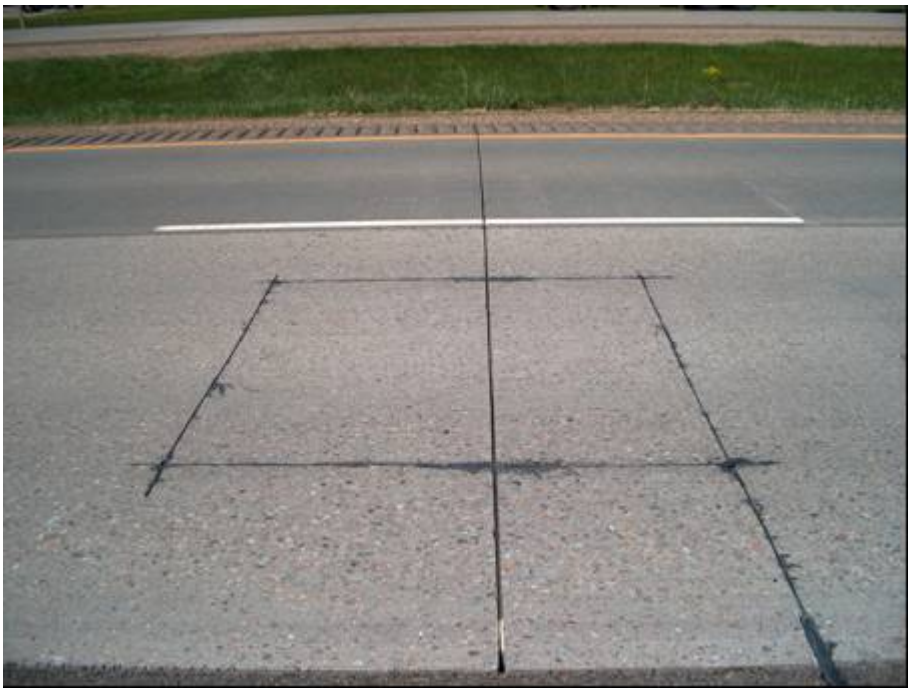

Photo 10 - 55_0100_Leading_loop_05_20_08.jpg

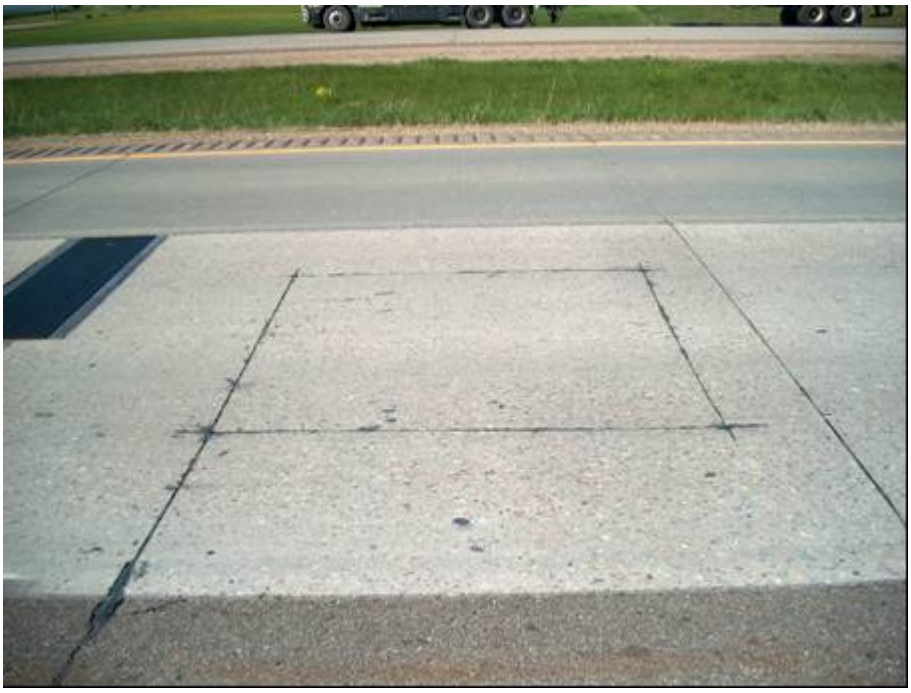

Photo 11 - 55_0100_Trailing_Loop_05_20_08.jpg

SHEET 18	STATE CODE [55]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [0100]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) 05/20/2008

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 _2__ ☐ days ☒ weeks

b. Notice for straightedge and grinding check - __2_ ☐ 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) [05/20/08]

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

	TRUCK	TYPE	SUSPENSION
TYPE PER FHWA 13 BIN SYSTEM	1	9	1
SUSPENSION: 1 - AIR; 2 - LEAF SPRING	2	9	1
3 - OTHER (DESCRIBE)	3		

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
   MEAN DIFFERENCE BETWEEN ---
   DYNAMIC AND STATIC GVW 3.2 STANDARD DEVIATION 3.6
   DYNAMIC AND STATIC SINGLE AXLES 4.7 STANDARD DEVIATION 3.7
   DYNAMIC AND STATIC DOUBLE AXLES 2.9 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) 3286, 3114

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 ___ -1 FHWA CLASS 5 ___ ___ -15
   *** FHWA CLASS 8 ___ 1 FHWA CLASS ___ ___ ___ _____
   FHWA CLASS ___ ___ ___ _____
   FHWA CLASS ___ ___ ___ _____
   *** PERCENT "UNCLASSIFIED" VEHICLES: ___ 1.7

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) [5/21/2008]

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

	TRUCK	TYPE	SUSPENSION
TYPE PER FHWA 13 BIN SYSTEM	1	9	1
SUSPENSION: 1 - AIR; 2 - LEAF SPRING	2	9	1
3 - OTHER (DESCRIBE)	3		

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
   MEAN DIFFERENCE BETWEEN ---
   DYNAMIC AND STATIC GVW ___0.2 STANDARD DEVIATION ___1.1
   DYNAMIC AND STATIC SINGLE AXLES ___0.8 STANDARD DEVIATION ___1.5
   DYNAMIC AND STATIC DOUBLE AXLES ___0.2 STANDARD DEVIATION ___2.1

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) ___3386, 3210___

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 FHWA CLASS _5_ ____ ____ -14
   *** FHWA CLASS 8 ____ 50 FHWA CLASS ____ ____ ____ _____
   FHWA CLASS ____ ____ ____ _____
   FHWA CLASS ____ ____ ____ _____
   *** PERCENT "UNCLASSIFIED" VEHICLES: ____ 0.8

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

APPENDIX A

Sheet 19	* STATE_CODE	5 5
LTPP Traffic Data	* SPS PROJECT ID	0 1 0 0
*CALIBRATION TEST TRUCK # 1	* DATE	05/20/08

Rev. 08/31/01

truck 711

PART I. GOAT trailer 53 474A

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:

rolls of paper

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 36.4

D to E 4.1 E to F _____

Wheelbase (measured A to last) _____ Computed 61.8

13. *Kingpin Offset From Axle B (units) + 1.3 (_____)
(+ 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 FULL LEAF
B	75R22.5	AIR
C	75R22.5	AIR
D	75R22.5	AIR
E	75R22.5	AIR
F		

Sheet 19	* STATE_CODE	5 5
LTPP Traffic Data	* SPS PROJECT ID	0 1 0 0
*CALIBRATION TEST TRUCK # 1	* DATE	05/20/08

Rev. 08/31/01

PART II

Day 1

*b) Average Pre-Test Loaded weight 77060
*c) Post Test Loaded Weight 76680
*d) Difference Post Test – Pre-test -380

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	12020	17160	17160	15360	15360		77060
2	12020	17160	17160	15360	15360		77060
3							
Average	12020	17160	17160	15360	15360		77060

Table 6. Raw data – Axle scales –

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

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11840	17090	17090	15330	15330		76680
2	11820	17090	17090	15340	15340		76680
3							
Average	11830	17090	17090	15335	15335		76680

Measured By DJW Verified By MJZ Weight date 5/20/08

Sheet 19	* STATE_CODE	5 5
LTPP Traffic Data	* SPS PROJECT ID	0 1 0 0
*CALIBRATION TEST TRUCK # 1	* DATE	5/21/2008

Rev. 08/31/01

Day 2

7.2 *b) Average Pre-Test Loaded weight 77660

*c) Post Test Loaded Weight 77380

*d) Difference Post Test – Pre-test -280

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	12400	17300	17300	15330	15330		77660
2	12380	17310	17310	15330	15330		77660
3							
Average	12390	17305	17305	15330	15330		77660

Table 6.2. Raw data – Axle scales –

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

Table 7.2 Raw data – Axle scales – post-test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	12240	17250	17250	15320	15320		77380
2	12260	17230	17230	15330	15330		77380
3							
Average	12250	17240	17240	15325	15325		77380

Measured By DSW Verified By MJZ Weight date 5-24-08

Sheet 19	* STATE_CODE	5 5
LTPP Traffic Data	* SPS PROJECT ID	0 1 0 0
*CALIBRATION TEST TRUCK # 2	* DATE	

Rev. 08/31/01

Dutch hwy 750
Yelm SR 510 A

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:

Steel coils

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 17.1 B to C 4.3 C to D 32.8

D to E 4.1 E to F _____

Wheelbase (measured A to last) _____ Computed 58.3

13. *Kingpin Offset From Axle B (units) +1.0 (_____)
(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	11R22.5	2 FW LEAF
B	11R22.5	AIR
C	11R22.5	AIR
D	11R22.5	AIR
E	11R22.5	AIR
F		

Sheet 19	* STATE_CODE	5 5
LTPP Traffic Data	* SPS PROJECT ID	0 1 0 0
*CALIBRATION TEST TRUCK # 2	* DATE	05/20/08

Rev. 08/31/01

Day 2

7.2 *b) Average Pre-Test Loaded weight 68300

*c) Post Test Loaded Weight 67990

*d) Difference Post Test – Pre-test -310

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11360	15170	15170	13310	13310		68320
2	11360	15160	15160	13300	13300		68280
3							
Average	11360	15165	15165	13305	13305		68300

Table 6.2. Raw data – Axle scales –

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

Table 7.2 Raw data – Axle scales – post-test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11160	15110	15110	13310	13310		68000
2	11140	15110	15110	13310	13310		67980
3							
Average	11150	15110	15110	13310	13310		67990

Measured By DJW Verified By MJZ Weight date 5/20/08

Sheet 19	* STATE_CODE	5 5
LTPP Traffic Data	* SPS PROJECT ID	0 1 0 0
*CALIBRATION TEST TRUCK # 2	* DATE	

Rev. 08/31/01

Day 2

7..3 *b) Average Pre-Test Loaded weight 68570

*c) Post Test Loaded Weight 68310

*d) Difference Post Test – Pre-test -260

Table 5.3. Raw data – Axle scales – pre-test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11580	15200	15200	13290	13290		68560
2	11560	15210	15210	13300	13300		68580
3							
Average	11570	15205	15205	13295	13295		68570

Table 6.3. Raw data – Axle scales –

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

Table 7.3. Raw data – Axle scales – post-test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11400	15160	15160	13300	13300		68320
2	11400	15160	15160	13290	13290		68300
3							
Average	11400	15160	15160	13295	13295		68310

Measured By DW Verified By MJZ Weight date 5-21-08

Sheet 20	* STATE_CODE	55
LTPP Traffic Data	*SPS PROJECT_ID	0100
Speed and Classification Checks * 1 of* 2	* DATE	05/20/2008

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
65	9	738	64	9	70	9	848	70	9
70	9	740	68	9	63	9	851	63	9
40	9	748	40	9	66	9	852	66	9
67	5	751	66	5	64	9	853	63	9
64	5	752	63	4	58	8	858	57	8
64	7	756	64	7	68	9	859	68	9
62	9	758	62	9	63	9	865	63	9
64	9	767	63	9	60	9	870	60	9
70	9	771	71	9	67	9	871	67	9
61	9	778	61	9	65	9	872	65	9
40	5	780	40	5	67	6	879	67	6
68	4	781	66	5	63	6	883	63	6
62	9	782	61	9	62	9	884	63	9
58	9	784	58	9	65	10	894	65	10
38	5	786	36	5	62	8	899	62	8
71	9	787	69	9	64	9	901	64	9
61	5	794	61	5	63	8	921	63	8
68	9	795	68	9	68	6	922	68	6
69	8	799	69	8	64	7	936	64	7
64	9	806	64	9	60	8	939	60	8
68	9	810	67	9	65	9	941	65	9
62	9	820	61	9	67	9	943	65	9
69	9	821	69	9	64	9	949	63	9
65	9	842	64	9	70	9	951	70	9
62	9	846	62	9	70	9	955	69	9

Recorded by ~~Bud~~ MARK B Direction W Lane 1 Time from 1:50PM to 2:43PM

Sheet 20	* STATE_CODE	55
LTPP Traffic Data	*SPS PROJECT_ID	0100
Speed and Classification Checks * 2 of* 2	* DATE	5/20/08

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
64	9	959	65	9	65	9	1081	65	9
61	5	960	54	5	67	9	1094	67	9
65	4	961	65	5	68	9	1104	68	9
67	9	966	66	9	64	5	1105	64	5
68	5	968	69	5	60	8	1112	60	8
67	9	975	67	9	52	6	1130	51	6
67	9	979	67	9	64	9	1133	64	9
63	9	987	64	9	72	9	1147	71	9
68	9	996	68	9	66	8	1160	66	5
68	9	1004	67	9	62	9	1161	62	9
60	9	1005	61	9	59	9	1162	60	9
65	9	1011	67	9	64	9	1163	64	9
64	9	1012	66	9	68	15	1165	68	9
64	9	1015	65	9	67	10	1166	67	10
65	9	1018	65	9	65	9	1174	66	9
64	9	1021	64	9	67	5	1175	67	5
65	9	1022	62	9	68	9	1182	69	9
65	9	1030	65	9	70	9	1184	69	9
62	9	1031	62	9	54	9	1191	54	9
67	9	1037	66	9	68	9	1193	67	9
67	9	1040	67	9	65	9	1201	64	9
67	5	1052	67	5	54	9	1203	52	9
67	9	1053	67	9	66	6	1209	66	6
65	8	1059	65	8	64	9	1213	65	9
64	9	1071	62	9	64	5	1218	64	5

Recorded by MARK B Direction W Lane 1 Time from 2:43 PM to 3:46 PM

Sheet 20	* STATE_CODE	5 5
LTPP Traffic Data	*SPS PROJECT_ID	0 1 0 0
Speed and Classification Checks * 1 of* 2	* DATE	5 / 21 / 08

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
68	9	3739	68	9	64	9	3845	64	9
68	9	3740	68	9	65	9	3848	65	9
64	9	3744	64	9	67	9	3851	66	9
66	9	3749	66	9	65	9	3856	65	9
65	9	3751	65	9	60	6	3860	59	6
70	9	3753	70	9	68	9	3862	69	9
67	9	3768	67	9	66	9	3863	66	9
68	9	3774	68	9	65	5	3869	65	5
67	6	3780	67	6	67	9	3870	67	9
68	5	3786	69	5	64	9	3887	64	9
65	9	3787	63	9	65	9	3890	63	9
59	9	3801	60	9	65	9	3891	65	9
63	9	3804	62	9	60	5	3895	61	5
65	9	3807	64	9	65	9	3898	65	9
55	5	3808	56	5	65	5	3901	66	5
68	9	3812	68	9	70	9	3902	69	9
63	9	3813	63	9	65	7	3907	66	7
65	9	3814	66	9	64	9	3911	65	9
64	9	3818	64	9	63	9	3918	64	9
62	8	3824	62	8	64	9	3927	64	9
70	9	3827	69	9	64	9	3928	64	9
68	9	3828	68	9	70	9	3930	70	9
62	5	3835	61	5	68	9	3933	69	9
63	8	3836	63	8	63	8	3935	63	8
63	9	3844	63	9	65	9	3936	65	9

Recorded by MARK Z Direction W Lane 1 Time from 1005 AM to 11:03AM

Sheet 20	* STATE_CODE	5 5
LTPP Traffic Data	*SPS PROJECT_ID	0 1 0 0
Speed and Classification Checks * 2 of* 2	* DATE	5 / 21 / 08

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
65	9	3945	65	9	65	9	4037	65	9
65	9	3946	65	9	64	8	4048	65	8
74	9	3950	74	9	65	5	4049	65	5
62	9	3954	64	9	62	9	4050	61	9
68	13	3956	68	13	70	9	4057	71	9
67	5	3964	66	5	60	7	4059	61	7
65	5	3965	64	5	70	5	4061	70	5
65	5	3966	64	5	64	6	4062	64	6
70	9	3970	69	9	65	9	4067	66	9
67	9	3974	68	9	70	6	4085	70	6
66	9	3979	66	9	69	9	4086	70	9
65	9	3980	65	9	65	10	4093	65	10
56	9	3987	55	9	65	10	4094	65	10
57	9	3988	60	9	66	9	4099	66	9
52	8	3995	52	5	59	9	4104	61	9
65	9	3999	65	9	72	9	4109	72	9
69	9	4000	69	9	62	9	4113	62	9
67	9	4004	67	9	68	9	4116	69	9
65	5	4005	65	5	65	9	4119	64	9
69	9	4013	68	9	55	8	4120	55	5
64	9	4022	64	9	65	9	4127	65	9
66	9	4024	66	9	69	9	4128	69	9
64	9	4029	65	9	66	9	4135	66	9
68	9	4030	68	9	64	7	4137	63	7
65	9	4035	65	9	65	9	4141	65	9

Recorded by MARK B Direction W Lane 1 Time from 11:06 AM to 11:57 AM

Sheet 21	* STATE_CODE 5 5
LTPP Traffic Data	*SPS PROJECT_ID 0 1 0 0
WIM System Test Truck Records 1 of 3	* DATE 0 5 / 2 0 / 2 0 0 8

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
76.5	50	2	1	11:15	165	50	6.0/5.7	6.9/8.0	7.2/7.4	6.5/7.0	6.0/7.3		68.0	17.1	4.2	32.7	4.0	
76.5	60	1	1	11:20	185	59	6.5/6.4	10.0/9.0	9.7/8.4	8.7/7.4	8.2/7.7		81.9	17.1	4.4	36.5	4.1	
76.5	55	2	2	11:23	196	55	6.4/5.8	7.4/8.0	7.5/7.4	6.6/7.3	6.6/7.3		70.6	17.1	4.3	32.8	4.1	
76.5	66	1	2	11:28	214	65	6.0/5.9	8.9/8.0	8.9/8.1	8.3/6.9	7.8/7.5		76.1	17.1	4.4	36.6	4.1	
71.5	60	2	3	11:31	226	60	6.1/6.0	7.6/8.4	8.1/7.7	6.7/7.7	7.3/7.6		73.2	17.1	4.3	32.8	4.1	
71.5	54	1	3	11:36	238	54	6.5/5.9	9.5/8.5	9.2/8.1	8.4/7.1	8.1/7.4		78.6	17.1	4.4	36.5	4.1	
70	53	2	4	11:40	251	52	5.8/6.2	6.8/8.5	7.0/7.4	6.2/7.2	6.3/7.2		68.6	17.1	4.3	32.7	4.1	
70	59	1	4	11:43	260	59	6.7/6.0	10.1/8.8	9.8/8.2	8.9/7.3	8.7/8.0		82.5	17.1	4.4	36.6	4.1	
67	58	2	5	11:48	271	57	6.3/6.0	7.9/8.3	8.4/7.9	7.2/6.5	6.8/7.3		72.8	17.1	4.2	32.8	4.1	
67	65	1	5	11:51	281	64	6.1/5.8	9.5/8.2	9.2/7.6	8.2/6.8	7.9/7.0		76.4	17.1	4.4	36.5	4.1	
78	62	2	6	11:55	301	61	6.0/6.1	7.4/8.1	8.0/7.7	6.3/6.7	7.0/7.1		70.3	17.2	4.2	32.8	4.1	
75	54	1	6	11:59	314	54	6.4/6.1	9.0/8.6	8.9/8.0	8.4/7.2	8.0/7.5		78.1	17.0	4.3	36.4	4.0	
71.5	55	2	7	12:05	339	55	6.1/5.8	7.3/8.4	7.7/7.6	7.2/6.6	6.5/7.2		70.3	17.1	4.3	32.8	4.1	
76.5	59	1	7	12:08	353	59	6.4/6.6	9.7/8.9	9.4/8.5	8.9/7.5	8.3/8.3		81.9	17.1	4.4	36.5	4.1	
72.5	60	2	8	12:12	370	59	6.2/6.1	7.6/8.2	8.3/7.8	7.5/7.0	7.0/7.6		73.4	17.1	4.2	32.9	4.1	
72.5	65	1	8	12:16	379	65	5.9/5.5	9.0/7.7	8.7/7.5	7.6/7.3	7.6/7.4		74.3	17.2	4.4	36.5	4.1	

Recorded by DAW

Checked by MJZ

Sheet 21	* STATE_CODE 55
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 2 of 3	* DATE 05/20/2008

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
74.5	59	2	9	12:20	398	59	5.8/6.4	7.7/8.6	8.2/8.1	7.8/7.1	7.0/7.6		74.3	17.0	4.2	32.7	4.1	
74.5	53	1	9	12:23	414	54	6.3/5.9	9.2/8.5	8.9/8.1	8.4/7.2	8.1/7.7		78.3	17.0	4.4	36.4	4.0	
73.5	54	2	10	12:27	431	55	5.8/5.7	7.3/8.0	7.7/7.2	5.8/7.4	5.9/7.5		68.2	17.1	4.3	32.8	4.1	
73.5	59	1	10	12:32	454	59	6.6/6.3	9.5/8.6	9.5/8.4	8.5/7.4	8.3/7.5		80.6	17.1	4.4	36.5	4.1	
75.5	58	2	11	13:52	760	59	6.0/6.1	7.3/8.4	7.9/8.1	7.3/7.9	7.2/7.7		74.0	17.1	4.2	32.7	4.1	
75.5	64	1	11	13:53	765	64	5.8/6.4	8.7/8.2	8.8/8.1	8.0/7.5	7.4/7.4		76.4	17.0	4.3	36.3	4.1	
83	64	2	12	14:00	791	64	5.6/5.9	6.8/8.3	7.4/7.6	6.9/6.6	6.4/7.0		68.6	17.0	4.2	32.7	4.1	
83	52	1	12	14:02	796	54	6.3/6.1	9.0/8.6	8.9/8.0	8.1/7.4	8.0/7.6		77.9	17.1	4.4	36.5	4.1	
89	55	2	13	14:08	819	54	6.0/6.0	7.3/8.1	7.4/7.4	6.2/7.3	6.3/7.4		69.4	17.1	4.3	32.7	4.0	
89	60	1	13	14:09	824	60	6.7/6.3	9.7/8.5	9.8/8.5	8.9/7.6	8.5/7.4		82.1	17.1	4.3	36.5	4.1	
88.5	59	2	14	14:16	856	59	5.9/6.3	7.5/8.7	8.2/8.1	7.7/7.3	6.9/7.9		74.5	17.1	4.2	32.7	4.1	
88.5	65	1	14	14:17	861	65	6.0/6.0	8.5/8.0	8.7/8.1	7.9/7.3	7.7/7.1		75.3	17.1	4.3	36.4	4.1	
87.5	62	2	15	14:23	880	62	5.9/6.1	7.1/8.4	7.4/7.8	6.2/7.6	6.4/7.4		70.2	17.0	4.2	32.6	4.0	
87.5	52	1	15	14:24	885	54	6.3/6.0	8.8/8.5	8.8/8.2	8.2/7.9	7.9/7.7		77.8	17.0	4.3	36.3	4.0	
92	55	2	16	14:30	915	55	5.5/5.9	6.9/8.1	7.5/7.3	6.0/7.4	6.4/7.4		68.6	17.1	4.3	32.7	4.1	
92	59	1	16	14:32	920	60	6.4/6.5	9.6/9.0	9.5/8.9	8.7/7.6	8.8/7.6		82.6	17.0	4.3	36.3	4.1	

Recorded by DW Checked by MJZ

Sheet 21	* STATE_CODE 55
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 3 of 3	* DATE 05/20/2008

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
96.5	61	2	17	14:38	953	59	5.9/6.4	7.7/8.7	8.0/7.7	7.7/6.9	6.9/7.6		73.5	17.1	4.2	32.8	4.1	
96.5	66	1	17	14:39	958	65	6.0/5.7	8.4/8.2	8.9/8.0	8.2/7.1	8.0/7.0		75.8	17.0	4.3	36.4	4.1	
93.5	65	2	18	14:45	985	64	5.4/5.8	7.2/8.1	7.7/7.5	6.5/7.3	6.3/7.4		69.1	17.1	4.3	32.8	4.1	
93.5	52	1	18	14:47	996	54	6.3/6.0	9.1/8.6	9.0/8.2	8.1/7.4	7.8/7.8		78.4	17.0	4.3	36.4	4.0	
84.5	53	2	19	14:52	1017	54	5.5/6.0	6.7/8.5	7.3/8.1	6.0/7.1	6.4/7.5		69.0	17.1	4.2	32.7	4.0	
84.5	60	1	19	14:55	1025	60	6.1/6.4	8.9/8.6	9.1/8.6	8.7/7.8	8.0/8.0		80.1	17.0	4.3	36.3	4.0	
89.5	59	2	20	15:00	1044	59	5.9/6.1	7.6/8.3	8.1/8.1	6.8/7.9	6.9/7.7		73.4	17.1	4.2	32.7	4.1	
89.5	65	1	20	15:	1058	65	6.1/5.7	8.8/7.9	8.9/8.0	7.9/7.2	7.5/7.0		75.0	17.1	4.3	36.4	4.1	

Recorded by DLW Checked by MJZ

Sheet 21	* STATE_CODE	5 5
LTPP Traffic Data	*SPS PROJECT_ID	0 1 0 0
WIM System Test Truck Records 1 of 1	* DATE	0 5 / 2 1 / 2 0 0 5

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
52.5	55	2	1	8:52	3439	55	5.9/5.7	7.1/7.9	7.3/7.2	6.5/6.3	6.4/7.2		67.5	17.1	4.3	32.8	4.1	
52.5	53	1	1	8:52	3440	54	6.4/5.9	8.8/8.6	8.6/8.0	7.4/7.3	7.7/7.6		76.8	17.1	4.4	36.4	4.1	
53	60	2	2	9:01	3479	60	5.5/6.1	6.8/8.1	7.4/7.4	6.1/6.5	6.7/7.6		68.3	17.1	4.2	32.7	4.0	
53	59	1	2	9:01	3480	60	6.2/6.2	8.3/8.5	8.9/8.1	7.9/7.2	7.9/7.6		77.3	17.1	4.4	36.4	4.1	
52	65	2	3	9:09	3514	66	5.7/6.0	7.1/8.0	7.4/7.4	7.3/7.1	6.2/6.8		69.0	17.1	4.3	32.7	4.1	
52	64	1	3	9:09	3515	64	6.3/6.1	9.0/8.3	8.9/7.9	8.1/7.3	8.2/7.6		77.7	17.1	4.4	36.5	4.1	
52.5	55	2	4	9:17	3546	55	6.1/5.8	7.0/8.0	7.7/7.2	6.1/7.1	6.3/7.1		68.5	17.1	4.3	32.8	4.1	
52.5	54	1	4	9:17	3547	55	6.3/6.0	9.0/8.5	8.9/8.1	8.0/7.1	8.0/7.5		77.5	17.0	4.3	36.4	4.0	
53	59	2	5	9:25	3593	59	5.8/6.0	6.8/8.0	7.3/7.6	5.9/6.6	6.8/7.1		68.0	17.0	4.2	32.7	4.0	
53	60	1	5	9:25	3595	60	6.9/8.0	9.1/8.5	8.9/8.2	8.2/6.8	7.8/7.4		77.4	17.1	4.4	36.5	4.1	
53.5	66	2	6	9:34	3635	66	5.4/6.0	6.9/8.1	7.5/7.3	6.5/7.3	6.1/7.3		68.6	17.1	4.3	32.7	4.1	
53.5	64	1	6	9:34	3636	64	6.2/6.1	9.1/8.4	8.9/8.1	8.5/7.7	8.1/7.5		78.8	17.1	4.4	36.4	4.1	

Recorded by DJW Checked by MJZ

Sheet 21	* STATE_CODE	5 5
LTPP Traffic Data	*SPS PROJECT_ID	0 1 0 0
WIM System Test Truck Records 1 of 2	* DATE	05/21/2008

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
57	55	2	7	9:42	3663	55	5.9/5.9	6.7/8.3	7.2/7.5	5.8/7.3	6.8/7.2		67.5	17.0	4.2	32.6	4.0	
57	54	1	7	9:42	3664	55	6.3/6.1	8.7/8.4	9.0/8.0	8.0/7.3	7.5/7.5		76.8	17.1	4.4	36.5	4.1	
70.5	60	2	8	10:10	3764	59	5.5/5.9	6.8/8.2	7.4/7.7	6.8/7.2	6.6/7.3		69.6	17.0	4.2	32.7	4.0	
70.5	62	1	8	10:10	3765	59	6.3/6.0	9.1/8.4	9.1/8.1	8.1/6.9	7.8/7.6		77.3	17.1	4.3	36.5	4.1	
65.5	66	2	9	10:18	3793	66	5.5/6.1	6.9/8.3	7.4/7.5	7.2/7.1	6.2/7.4		69.7	17.1	4.2	32.7	4.1	
65.5	64	1	9	10:18	3794	64	6.1/6.6	9.1/8.4	9.2/8.1	7.6/7.6	7.9/7.5		78.0	17.1	4.3	36.4	4.1	
62.5	54	2	10	10:26	3822	55	5.6/5.9	6.9/8.3	7.4/7.5	6.6/6.1	5.7/7.0		67.1	17.1	4.3	32.8	4.1	
62.5	53	1	10	10:27	3823	54	6.2/6.4	8.6/8.5	8.6/8.1	7.7/7.3	7.3/8.2		76.8	17.1	4.3	36.4	4.0	
63.5	60	2	11	10:35	3857	59	5.4/6.0	6.8/8.3	7.2/7.4	7.1/7.3	6.5/7.2		69.1	17.0	4.2	32.7	4.1	
63.5	59	1	11	10:36	3858	59	6.2/6.1	8.9/8.3	9.2/8.0	7.9/7.1	7.9/7.2		76.8	17.0	4.3	36.3	4.1	
63	66	2	12	10:44	3888	66	5.5/6.3	6.7/8.0	7.1/7.8	6.8/7.0	6.3/7.7		69.2	17.1	4.2	32.7	4.1	
63	64	1	12	10:45	3889	64	6.3/6.1	9.3/8.6	9.1/8.3	8.2/7.7	7.8/7.5		78.9	17.1	4.4	36.4	4.1	
65.5	54	2	13	10:53	3923	54	5.9/5.9	7.0/7.9	7.5/7.4	6.3/7.1	6.3/7.2		68.5	17.1	4.2	32.8	4.0	
65.5	52	1	13	10:53	3924	54	6.3/6.3	9.0/8.9	8.8/8.2	8.1/7.2	7.7/7.6		78.1	17.0	4.3	36.3	4.0	
65.5	59	2	14	11:03	3948	59	5.8/5.9	7.3/8.1	7.4/7.6	6.7/7.3	6.7/7.2		70.1	17.1	4.2	32.7	4.1	
65.5	57	1	14	11:03	3949	57	6.5/6.1	9.2/8.5	9.1/8.0	8.1/6.9	7.7/7.2		77.3	17.1	4.4	36.5	4.1	

Recorded by DW

Checked by MJZ

Sheet 21	* STATE_CODE 55
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 2 of 2	* DATE 05/21/2008

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
86.5	64	8 1	15	11:26	4045	64	6.4/5.9	9.5/8.3	9.1/8.2	8.4/7.3	8.2/7.8		79.1	17.0	4.3	36.4	4.1	
86.5	65	12	15	11:27	4046	66	5.7/6.0	7.2/8.0	7.4/7.5	6.5/7.3	6.7/7.2		69.6	17.1	4.3	32.8	4.1	
79	55	1	16	11:35	4078	55	6.5/5.7	9.1/8.4	9.2/7.9	8.2/6.9	8.0/7.3		77.3	17.1	4.4	36.5	4.1	
79	54	2	16	11:35	4079	55	6.0/5.7	7.1/7.9	7.6/7.2	7.1/6.8	6.3/7.2		68.9	17.1	4.3	32.8	4.1	
75.5	~~60~~ 58	1	17	11:42	4101	6~~2~~ 59	6.3/5.9	9.1/8.2	9.0/8.0	7.7/7.0	7.9/7.6		76.6	17.0	4.3	36.4	4.0	
75.5	59	2	17	11:42	4104	59	5.5/5.9	7.2/8.1	7.6/7.4	5.9/7.1	6.6/7.1		68.6	17.1	4.3	32.8	4.1	
73	63	1	18	11:49	4133	64	6.3/6.1	9.2/8.3	9.1/8.1	8.4/7.5	7.9/7.2		78.1	17.0	4.3	36.4	4.1	
73	65	2	18	11:50	4135	66	5.7/5.8	7.0/7.7	7.6/7.4	6.7/6.9	6.4/6.7		68.0	17.1	4.2	32.8	4.1	
78	54	1	19	11:57	4164	55	5.9/6.5	8.8/8.4	8.8/8.0	7.4/7.8	7.3/8.3		77.1	17.1	4.4	36.4	4.0	
78	55	2	19	11:57	4165	55	5.9/6.1	6.9/6.4	7.5/7.5	6.3/7.3	6.6/7.1		69.5	17.1	4.2	32.7	4.0	
81.5	60	1	20	12:06	4198	59	6.1/6.0	8.7/8.4	8.9/8.2	7.5/7.2	7.6/8.0		76.6	17.1	4.3	36.4	4.1	
81.5	59	2	20	12:06	4199	59	5.9/5.4	7.3/7.8	7.8/7.3*	7.3/7.1	6.4/6.9		69.1	17.1	4.3	32.9	4.1	
80.5	65	1	21	12:14	4225	65	6.4/6.1	9.2/8.4	9.4/8.3	7.9/7.2	8.1/7.3		78.2	17.1	4.3	36.6	4.1	
80.5	65	2	21	12:14	4227	66	5.6/5.9	7.2/8.2	7.6/7.3	7.0/7.0	6.4/7.3		69.5	17.1	4.3	32.8	4.1	

Recorded by DJW Checked by MJZ

Calibration Worksheet

Site: 550100

Calibration Iteration 1 Date 5-21-08

Beginning factors:

Speed Point (mph)	Name	Left Sensor 1 / ~~3~~	Right Sensor 2 / ~~4~~
Overall			
Front Axle			
Distance		372	
1 – (50)	80 kph	3131	3302
2 – (55)	88 kph	3211	3388
3 – (60)	96 kph	3392	3579
4 – (65)	104 kph	3114	3286
5 – (70)	112 kph	3099	3269

Errors:

	Speed Point 1 ( )	Speed Point 2 (55)	Speed Point 3 (60)	Speed Point 4 (65)	Speed Point 5 ( )
F/A		+ 4.2	+ 7.9	- 0.3	
Tandem		+ 1.1	+ 6.5	- 1.2	
GVW		+ 1.5	+ 6.7	- 1.0	

Adjustments:

	Raise	Lower	Percentage
Overall	☐	☐	
Front Axle	☐	☐	
Speed Point 1	☐	☐	
Speed Point 2	☐	☒	- 1.5
Speed Point 3	☐	☒	- 6.7
Speed Point 4	☒	☐	+ 3.0 *
Speed Point 5	☐	☐	

* + 3.0% manual calculation based on slant from 60 to 65 mph.

End factors:

Speed Point (mph)	Name	Left Sensor 1 / ~~3~~	Right Sensor 2 / ~~4~~
Overall			
Front Axle			
Distance		372	
1 – (50)	80 kph	3131	3302
2 – (55)	88 kph	3162	3336
3 – (60)	96 kph	~~3210~~ 3164	3338
4 – (65)	104 kph	~~3099~~ 3210	3386
5 – (70)	112 kph	3099	3269

TEST VEHICLE PHOTOGRAPHS FOR SPS WIM VALIDATION

May 20, 2008

STATE: Wisconsin

SHRP ID: 550100

Photo 1 55_0100_Truck_1_Tractor_05_20_08.jpg

Photo 2 55_0100_Truck_1_Trailer_05_20_08.jpg

Photo 3 55_0100_Truck_1_Suspension_1_05_20_08.jpg

Photo 4 55_0100_Truck_1_Suspension_2_05_20_08.jpg

Photo 5 55_0100_Truck_1_Suspension_3_05_20_08.jpg

Photo 6 55_0100_Truck_2_Tractor_05_20_08.jpg

Photo 7 55_0100_Truck_2_Trailer_05_20_08.jpg

Photo 8 55_0100_Truck_2_Suspension_1_05_20_08.jpg

Photo 9 55_0100_Truck_2_Suspension_2_05_20_08.jpg

Photo 10 55_0100_Truck_2_Suspension_3_05_20_08.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)

Calibration Factors for Sensor #1

Validation Visit	May 21, 2008	May 20, 2008*	November 27, 2007
Distance	372	372	372
Speed Bin			
80 kph	3131	3131	3296
88 kph	3162	3211	3381
96 kph	3164	3392	3571
104 kph	3210	3114	3278
112 kph	3099	3099	3262

Calibration Factors for Sensor #2

Validation Visit	May 21, 2008	May 20, 2008*	November 27, 2007
Distance			
Speed Bin			
80 kph	3302	3302	3476
88 kph	3336	3388	3566
96 kph	3338	3579	3767
104 kph	3386	3286	3459
112 kph	3269	3269	3441

*Factor change specified for post-firmware start point.