Validation Report

Tennessee, SPS-6
Task Order 15, CLIN 2
September 30 to October 1, 2008

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1 Executive Summary

A visit was made to the Tennessee 0600 on September 30 to October 1, 2008 for the purposes of conducting a validation of the WIM system located on I-40 approximately 8 miles east of Jackson, Tennessee. The SPS-6 is located in the righthand, westbound lane of a four-lane divided facility. The posted speed limit at this location is 70 mph. The LTPP lane is one of 4 lanes instrumented with WIM at this site and is identified in the system controller as Lane 4. The validation procedures were in accordance with LTPP's SPS WIM Data Collection Guide dated August 21, 2001.

This site is a relocation of a site originally installed 148 feet upstream of the current location. The old sensors were removed and the pavement was resurfaced prior to this installation. This is the second validation visit to this location. The site was installed on May 7 to 10, 2007 by International Road Dynamics Inc..

This site demonstrates the ability to produce research quality loading data under the observed conditions. The classification data is also of research quality for Traffic Monitoring Guide classes.

The site is instrumented with quartz piezo sensors and iSINC electronics. It is installed in asphalt concrete.

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 77,290 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 a 4 tapered leaf suspension loaded to 67,210 lbs., the "partial" truck.

The validation speeds ranged from 57 to 70 miles per hour. The pavement temperatures ranged from 65 to 101 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 – 470600 – 01-Oct-2008

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	3.1 ± 5.6%	Pass
Tandem axles	±15 percent	0.6 ± 5.4%	Pass
GVW	±10 percent	1.0 ± 2.8%	Pass
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.1 ft	Pass

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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.

Profile data collected by Fugro South, Inc. on September 22, 2008 and processed through the LTPP SPS WIM Index software, version 1.1 indicated that the upper WIM index threshold was not exceeded at any location.

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: sfm *Checked: jrn*

Upon our arrival at the site, we found the system parameters were not the same as we left them at the conclusion of our last validation on June 13, 2007. We have no information on the rationale or reason for the parameter adjustments.

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

2 Corrective Actions Recommended

This site is scheduled for semi-annual maintenance under the installation contract. No maintenance was identified for this site besides the regularly scheduled activities.

3 Post Calibration Analysis

This final analysis is based on test runs conducted October 1, 2008 from mid morning to mid afternoon at test site 470600 on I-40. This SPS-6 site is at milepost 91.6 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 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 77,290 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 a 4 tapered leaf suspension loaded to 67,210 lbs., the "partial" truck.

A different golden truck from the Pre-Validation was used for the Post-Validation. The truck utilized for the Pre-Validation runs had a fixed split tandem air suspension on the trailer.

Each truck made a total of 20 passes over the WIM scale at speeds ranging from approximately 57 to 70 miles per hour. The desired speed range was achieved during this validation. Pavement surface temperatures were recorded during the test runs ranging from about 65 to 101 degrees 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 3-1.

Table 3-1 shows that the site is producing research quality data.

Table 3-1 - Post-Validation Results – 470600 – 01-Oct-2008

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	3.1 ± 5.6%	Pass
Tandem axles	±15 percent	0.6 ± 5.4%	Pass
GVW	±10 percent	1.0 ± 2.8%	Pass
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.1 ft	Pass

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The test runs were conducted primarily during the morning hours under cloudy weather conditions and early afternoon hours under 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 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 – 57 to 62 mph, Medium speed – 63 to 67 mph and High speed – 68 + mph. The three temperature groups were created by splitting the runs between those at 65 to 75 degrees Fahrenheit for Low temperature, 76 to 85 degrees Fahrenheit for Medium temperature and 86 to 101 degrees Fahrenheit for High temperature.

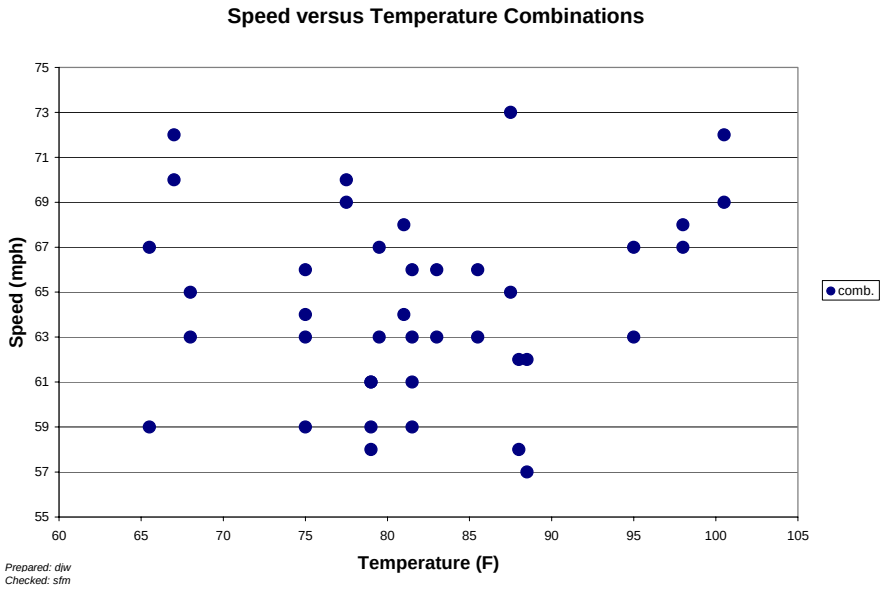

Figure 3-1 - Post-Validation Speed-Temperature Distribution – 470600 – 01-Oct-2008

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. GVW is observed to be overestimated slightly but errors are scattered in a similar pattern at all speeds.

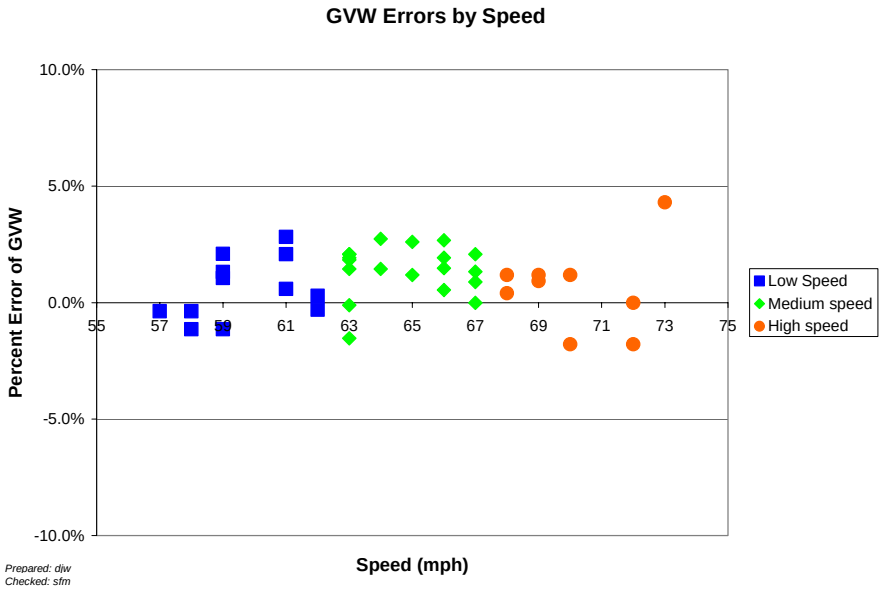

Figure 3-2 - Post-Validation GVW Percent Error vs. Speed – 470600 – 01-Oct-2008

Figure 3-3 shows the relationship between temperature and GVW percentage error. The scatter of GVW percent error is consistent at all temperatures. The values appear to decrease slightly at high temperatures.

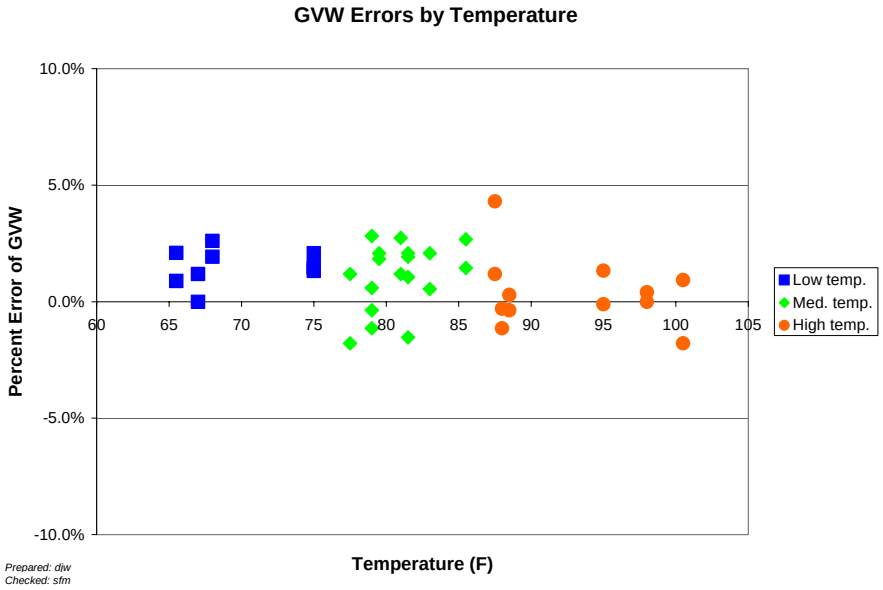

Figure 3-3 - Post-Validation GVW Percent Error vs. Temperature – 470600 – 01-Oct-2008

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. Figure 3-4 shows the error in spacing is not influenced by speed. It appears underestimation of spacing can occur at any speed.

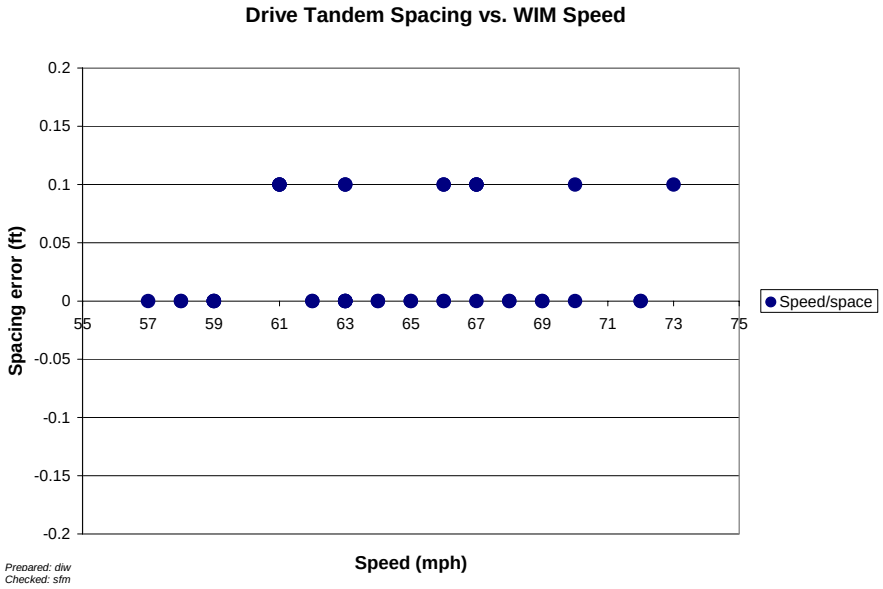

Figure 3-4 - Post-Validation Spacing vs. Speed – 470600 – 01-Oct-2008

3.1 Temperature-based Analysis

The three temperature groups were created by splitting the runs between those at 65 to 75 degrees Fahrenheit for Low temperature, 76 to 85 degrees Fahrenheit for Medium temperature and 86 to 101 degrees Fahrenheit for High temperature.

Table 3-2 - Post-Validation Results by Temperature Bin – 470600 – 01-Oct-2008

Element	95% Limit	Low Temperature 65 to 75 °F	Medium Temperature 76 to 85 °F	High Temperature 86 to 101 °F
Steering axles	±20 %	4.5 ± 5.9%	3.6 ± 5.7%	1.1 ± 4.5%
Tandem axles	±15 %	1.0 ± 4.1%	0.6 ± 5.2%	0.2 ± 7.1%
GVW	±10 %	1.5 ± 1.7%	1.1 ± 3.0%	0.4 ± 3.4%
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft

Prepared: sfm *Checked: jrn*

Table 3-2 shows errors have tendency to decrease at the high temperature range. The variability of errors in high temperature range is greater than the others.

Figure 3-5 is the distribution of GVW Errors versus Temperature by Truck graph. Both trucks have similar patterns with temperature.

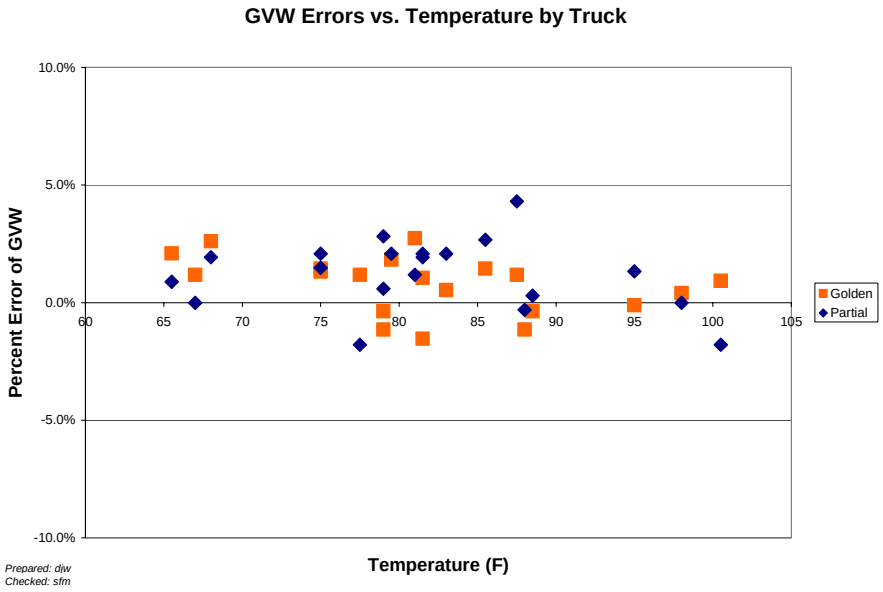

Figure 3-5 - Post-Validation GVW Percent Error vs. Temperature by Truck – 470600 – 01-Oct-2008

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 error scatter has a similar pattern at all temperatures but tends to decrease with increasing temperature.

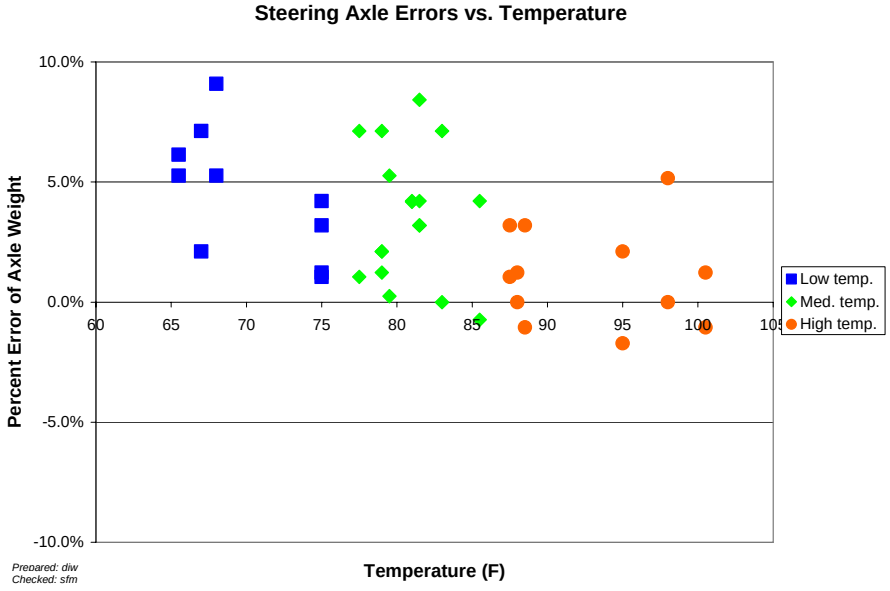

Figure 3-6 - Post-Validation Steering Axle Error vs. Temperature by Group – 470600 – 01-Oct-2008

3.2 Speed-based Analysis

The three speed groups were created using 57 to 62 mph for Low speed, 63 to 67 mph for Medium speed and 68+ mph for High speed.

Table 3-3 - Post-Validation Results by Speed Bin – 470600 – 01-Oct-2008

Element	95% Limit	Low Speed 57 to 62 mph	Medium Speed 63 to 67 mph	High Speed 68+ mph
Steering axles	±20 %	2.5 ± 5.0%	3.6 ± 6.4%	2.8 ± 6.7%
Tandem axles	±15 %	0.2 ± 4.6%	1.0 ± 4.3%	0.1 ± 8.7%
GVW	±10 %	0.6 ± 2.9%	1.4 ± 2.3%	0.6 ± 4.2%
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft

Prepared: sfm *Checked: jrn*

Table 3-3 shows the average error in the low and high speed range is approximately the same. However variability of errors is larger in the high temperature range.

Figure 3-7 shows the results for GVW errors by truck with respect to speed. The points for both trucks are scattered in a similar pattern.

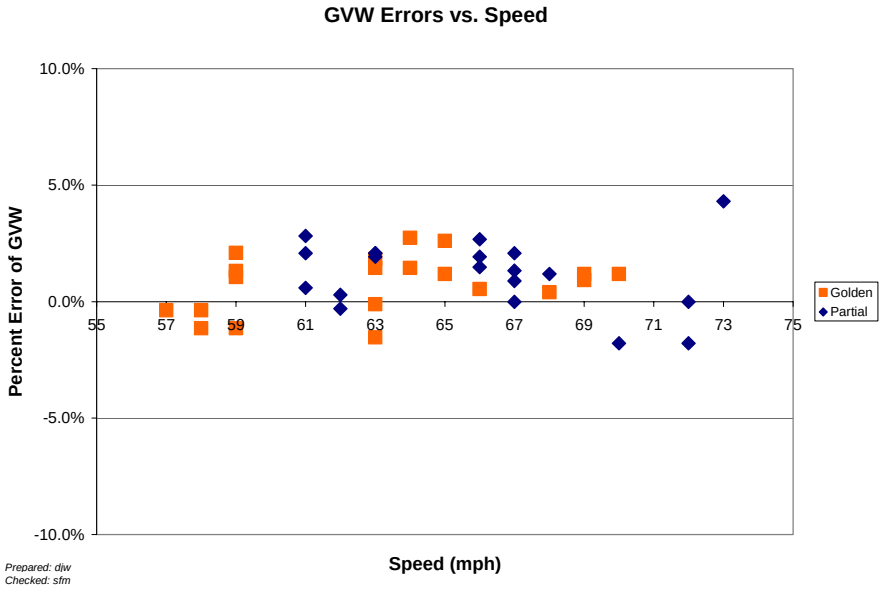

Figure 3-7 - Post-Validation GVW Percent Error vs. Speed by Truck – 470600 – 01-Oct-2008

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. Steering axle error is overestimated at all speeds with a similar scatter.

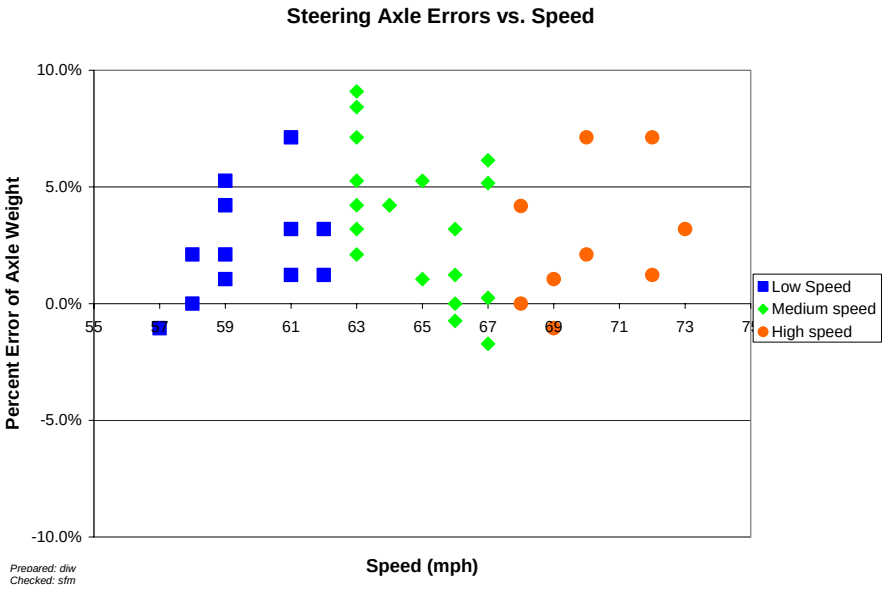

Figure 3-8 - Post-Validation Steering Axle Percent Error vs. Speed by Group – 470600 – 01-Oct-2008

3.3 Classification Validation

This LTPP installed site uses the FHWA 13-bin classification scheme and the LTPP ETG mod 3 classification algorithm. 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 one hour (139 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 zero percent.

Table 3-4 - Truck Misclassification Percentages for 470600 – 01-Oct-2008

Class	Percent Error	Class	Percent Error	Class	Percent Error
4	0	5	0	6	0
7	0				
8	0	9	0	10	0
11	0	12	0	13	0

Prepared: sfm *Checked: jrn*

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 470600 – 01-Oct-2008

Class	Mean Difference	Class	Mean Difference	Class	Mean Difference
4	0	5	0	6	0
7	0				
8	0	9	0	10	0
11	0	12	0	13	0

Prepared: sfm *Checked: jrn*

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 met research quality standards, 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: sfm *Checked: jrn*

4 Pavement Discussion

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

4.1 Profile Analysis

The WIM site is a section of pavement that is 305 meters long with the WIM scale located at 274.5 meters from the beginning of the test section. An ICC profiler was used to collect longitudinal profiles of the test section with a sampling interval of 25 millimeters.

Profile data collected at the SPS WIM location by Fugro South, Inc. on September 22, 2008 and were processed through the LTPP SPS WIM Index software, version 1.1. This WIM scale is installed on a flexible pavement.

A total of 11 profiler passes were conducted over the WIM site. Since the issuance of the LTPP directive on collection of longitudinal profile data for SPS WIM sections, the requirements have been a minimum of 3 passes in the center of the lane and one shifted to each side. For this site the Regional Support Contractor has completed 5 passes at the center of the lane, 3 passes shifted to the left side of the lane, and 3 passes shifted to the right side of the lane. Shifts to the sides of the lanes were made such that data were collected as close to the lane edges as was safely possible. For each profiler pass, profiles were recorded under the left wheel path (LWP) and the right wheel path (RWP).

The SPS WIM Index software, version 1.0 was developed with four different indices: LRI, SRI, Peak LRI and Peak SRI. The LRI incorporates the pavement profile starting 25.8 m prior to the scale and ending 3.2 m after the scale in the direction of travel. The SRI incorporates a shorter section of pavement profile beginning 2.74 m prior to the WIM scale and ending 0.46 m after the scale. The LRI and SRI are the index values for the actual location of the WIM scale. Peak LRI is the highest value of LRI, within 30 m prior to the scale. Peak SRI indicates the highest value of SRI that is located between 2.45 m prior to the scale and 1.5 m after the scale. Also, a range for each of the indices was developed to provide the smoothness criteria. The ranges are shown in Table 4-1. When all of the values are below the lower thresholds, it is presumed unlikely that pavement smoothness will significantly influence sensor output. When one or more values exceed an upper threshold there is a reasonable expectation that the pavement smoothness will influence the outcome of the validation. When all values are below the upper threshold but not all below the lower threshold, the pavement smoothness may or may not influence the validation outcome.

Table 4-1 - Thresholds for WIM Index Values

Index	Lower Threshold (m/km)	Upper Threshold (m/km)
LRI	0.50	2.1
SRI	0.50	2.1
Peak LRI	0.50	2.1
Peak SRI	0.75	2.9

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Table 4-2 shows the computed index values for all 11 profiler passes for this WIM site. The average values over the passes in each path were also calculated when three or more passes were completed. These are shown in the right most column of the table. Values below the lower index limits are presented in italics and values above the upper index limits are presented in bold.

Table 4-2 - WIM Index Values – 470600 –22-Sep-2008

Profiler Passes			**Pass 1**	**Pass 2**	**Pass 3**	**Pass 4**	**Pass 5**	**Ave.**
Center	LWP	LRI (m/km)	0.647	0.529	0.964	0.536	0.813	0.698
		SRI (m/km)	0.608	0.545	1.042	0.674	*0.484*	0.671
		Peak LRI (m/km)	0.913	0.588	0.977	0.566	0.813	0.771
		Peak SRI (m/km)	0.781	0.848	1.236	1.021	*0.593*	0.896
	RWP	LRI (m/km)	0.612	*0.446*	0.846	*0.450*	0.717	0.614
		SRI (m/km)	0.588	0.538	1.079	0.620	1.098	0.785
		Peak LRI (m/km)	0.861	*0.458*	0.847	*0.450*	0.890	0.701
		Peak SRI (m/km)	*0.592*	*0.568*	1.206	*0.656*	1.157	0.836
Left Shift	LWP	LRI (m/km)	0.631	0.525	0.757			0.638
		SRI (m/km)	*0.274*	*0.407*	*0.490*			*0.390*
		Peak LRI (m/km)	0.789	0.537	0.797			0.708
		Peak SRI (m/km)	*0.298*	*0.507*	*0.708*			*0.504*
	RWP	LRI (m/km)	0.597	0.535	0.881			0.671
		SRI (m/km)	*0.236*	*0.472*	0.678			*0.462*
		Peak LRI (m/km)	0.796	0.539	1.074			0.803
		Peak SRI (m/km)	*0.426*	*0.583*	*0.683*			*0.564*
Right Shift	LWP	LRI (m/km)	0.797	0.561	0.524			0.627
		SRI (m/km)	*0.334*	*0.271*	*0.322*			*0.309*
		Peak LRI (m/km)	0.914	0.731	0.609			0.751
		Peak SRI (m/km)	*0.423*	*0.316*	*0.384*			*0.374*
	RWP	LRI (m/km)	0.808	0.763	*0.494*			0.688
		SRI (m/km)	0.554	*0.352*	*0.173*			*0.360*
		Peak LRI (m/km)	0.809	0.818	*0.494*			0.707
		Peak SRI (m/km)	*0.628*	*0.595*	*0.318*			*0.514*

Prepared: als *Checked: jrn*

From Table 4-2 it can be seen that 33 of the indices computed from the profiles are below the lower threshold values. Four of the values falling below the lower threshold are either SRI or Peak SRI. These values indicate that the roughness close to the scale is unlikely to affect the calibration and operation of the WIM scale while the pavement roughness further from the scale may or may not interfere with the calibration and operation of the WIM scale. However, since the WIM scale was successfully validated, it appears that the pavement ride quality is not interfering with current operations at the scale.

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 quartz piezo sensors and iSINC electronics. The sensors are installed in asphalt concrete pavement.

There were no changes in basic equipment operating condition since the last validation on June 13, 2007.

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

Upon our arrival at the site, we found the system parameters were not the same as we left them at the conclusion of our last validation on June 13, 2007. Apparently the site has had equipment maintenance work or factor adjustments made remotely between our last Validation visit and this one.

The equipment underwent one-iteration of the calibration process between the initial 40 runs and the final 40 runs to reduce the underestimation of the loading statistics.

The operating system weight compensation parameters that were in place prior to the Pre-Validation are in Table 5-1.

Table 5-1 - Initial System Parameters - 470600 - 30-Sep-2008

Speed Bin	Left Sensor 1	Right Sensor 2
88 kph	2819	2992
96 kph	2819	2992
104 kph	2819	2992
112 kph	2819	2992
120 kph	2819	2992

Prepared: sfm *Checked: jrn*

5.2.1 Calibration Iteration 1

As a result of the Pre-Validation, where GVW was underestimated by approximately three percent at all speeds, the compensation factors were adjusted as shown in Table 5-2.

Table 5-2 - Calibration 1 - Change in Parameters - 470600 - 01-Oct-2008

Speed Bins	Right Sensor 1	Change	Left Sensor 2	Change
88 kph	3077	2.9%	2899	2.9%
96 kph	3077	2.9%	2899	2.9%
104 kph	3102	3.7%	2923	3.7%
112 kph	3089	3.2%	2910	3.2%
120 kph	3089	3.2%	2910	3.2%

Prepared: sfm *Checked: jrn*

Factors for speeds outside the tested range were adjusted to match the nearest end of the range. The changes made were not minimal. Experience with this equipment set-up indicated that failure to make at least the same change for the bins immediately adjacent to the modified ranges would lead to larger truck errors than necessary if trucks were forced to run outside of the expected test speed range.

Table 5-3 - Calibration Iteration 1 Results – 470600 – 01-Oct-2008 (09:21 AM)

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	2.9 ± 5.1%	Pass
Tandem axles	±15 percent	1.3 ± 6.1%	Pass
GVW	±10 percent	1.5 ± 2.4%	Pass
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	Pass

Prepared: sfm *Checked: jrn*

The acceptable results of the calibration runs as shown in Table 5-3 and Figure 5-1 terminated the calibration iterations.

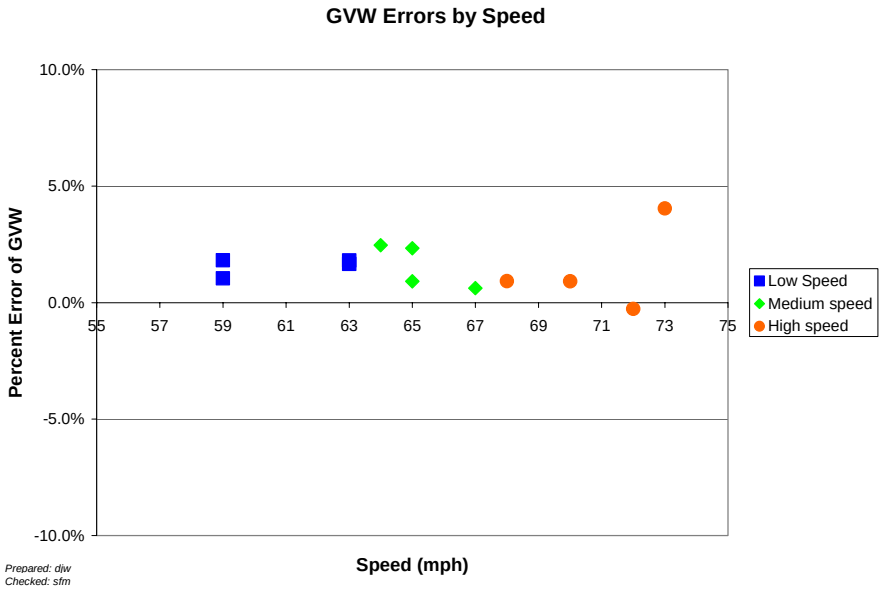


Figure 5-1 - Calibration Iteration 1 GVW Percent Error vs. Speed Group – 470600 – 01-Oct-2008 (09:21 AM)

5.3 Summary of Traffic Sheet 16s

This site has validation information from previous visits as well as the current one in the tables below. 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 agency and this contractor's validation visits.

Table 5-4 - Classification Validation History – 470600 – 01-Oct-2008

Date	Method	Mean Difference				Percent Unclassified
		Class 9	Class 8	Other 1	Other 2	
10/01/08	Manual	0	0			0.0
09/30/08	Manual	0	0			0.0
06/13/07	Manual	0	0			0.0
06/12/07	Manual	0	0			0.0
09/22/02	Manual					
05/14/02	Manual					

Prepared: sfm *Checked: jrn*

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 agency and this contractor's validation visits.

Table 5-5 - Weight Validation History – 470600 – 01-Oct-2008

Date	Method	Mean Error and (SD)		
		GVW	Single Axles	Tandem Axles
10/01/08	Test Trucks	1.0 (1.4)	3.1 (2.8)	0.6 (2.7)
09/30/08	Test Trucks	-2.9 (1.5)	-2.0 (4.0)	-3.3 (2.4)
06/13/07	Test Trucks	1.1 (2.1)	0.5 (4.4)	1.4 (3.7)
06/12/07	Test Trucks	1.3 (1.4)	2.2 (3.0)	1.0 (2.9)
09/22/02	Test Trucks			
05/14/02	Test Trucks			

Prepared: sfm *Checked: jrn*

5.4 Projected Maintenance/Replacement Requirements

This site is scheduled for semi-annual maintenance under the installation contract. No other maintenance was identified as a result of this visit.

6 Pre-Validation Analysis

Upon our arrival at the site, we found the system parameters were not the same as we left them at the conclusion of our last validation on June 13, 2007. Apparently the site has had equipment maintenance work or factor adjustments made remotely between our last Validation visit and this one.

The factors in place at the end of our last Validation visit and those found prior to validation are shown below.

Table 6-1 - Calibration Factor Change – 470600 – since 13-Jun-2007

	Left Sensors 1/3		Right Sensors 2/4	
	30-Sep-2008	13-Jun-2007	30-Sep-2008	13-Jun-2007
88 kph	2819	2764	2992	2934
96 kph	2819	2764	2992	2934
104 kph	2819	2764	2992	2934
112 kph	2819	2764	2992	2934
120 kph	2819	2764	2992	2934

Prepared: sfm *Checked: jrn*

This pre-validation analysis is based on test runs conducted September 30, 2008 from mid morning to mid afternoon at test site 470600 on I-40. This SPS-6 site is at milepost 91.6 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 split rear tandem and an air suspension loaded to 78,980 lbs., the “golden” truck. This was the truck provided for Day 1. It was replaced prior to the calibration and final validation.

2. 5-axle tractor semi-trailer with a tractor having an air suspension and a trailer with a standard rear tandem and a 4 tapered leaf suspension loaded to 67,630 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 60 to 70 miles per hour. The desired speed range was achieved during this validation. Pavement surface temperatures were recorded during the test runs ranging from about 75 to 103 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 6-2.

Table 6-2 shows that the site was producing research quality data at the beginning of the validation. However, all loading statistics indicated that weights were being underestimated. In the case of GVW the underestimation is approximately three percent. On the basis of the observed bias a calibration run was considered necessary.

Table 6-2 - Pre-Validation Results – 470600 – 30-Sep-2008

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-0.1 ± 5.1%	Pass
Single axles	±20 percent	-2.0 ± 8.0%	Pass
Tandem axles	±15 percent	-3.3 ± 4.7%	Pass
GVW	±10 percent	-2.9 ± 3.1%	Pass
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.2 ft	Pass

Prepared: sfm *Checked: jrn*

The runs were 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 three 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. A twenty-eight degree difference was observed which permitted creation of three temperature groups. It did not meet the required 30 degree minimum temperature spread to achieve the minimum desired range of speed and temperature conditions.

The three speed groups were divided into 60 to 63 mph for Low speed, 64 to 67 mph for Medium speed and 68+ mph for High speed. The three temperature groups were created by splitting the runs between those at 75 to 83 degrees Fahrenheit for Low temperature, 84 to 92 degrees Fahrenheit for Medium temperature and 93 to 103 degrees Fahrenheit for High temperature.

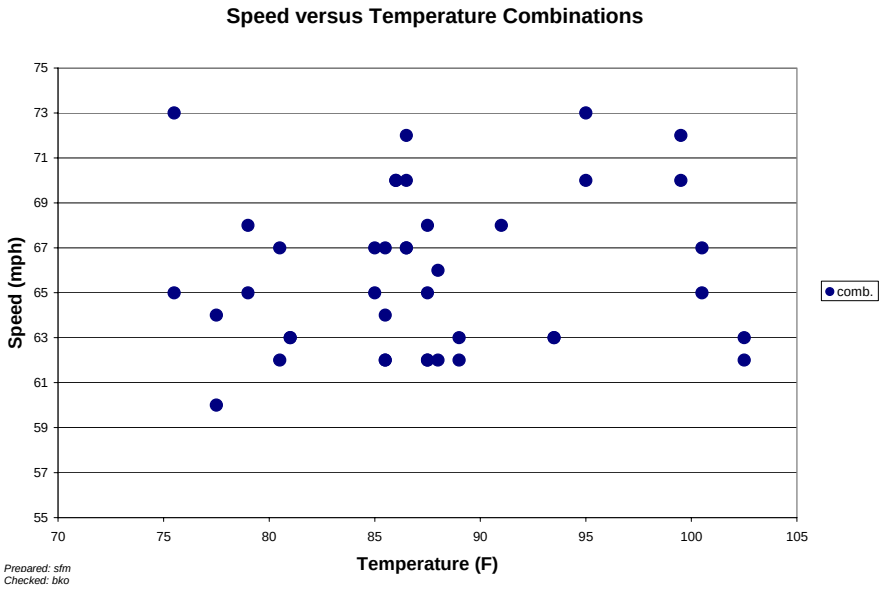


Figure 6-1 - Pre-Validation Speed-Temperature Distribution – 470600 – 30-Sep-2008

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. The underestimation of GVW was observed at all speeds with essentially the same degree of scatter. The outlier at medium speed was verified as the actual data collected by the system.

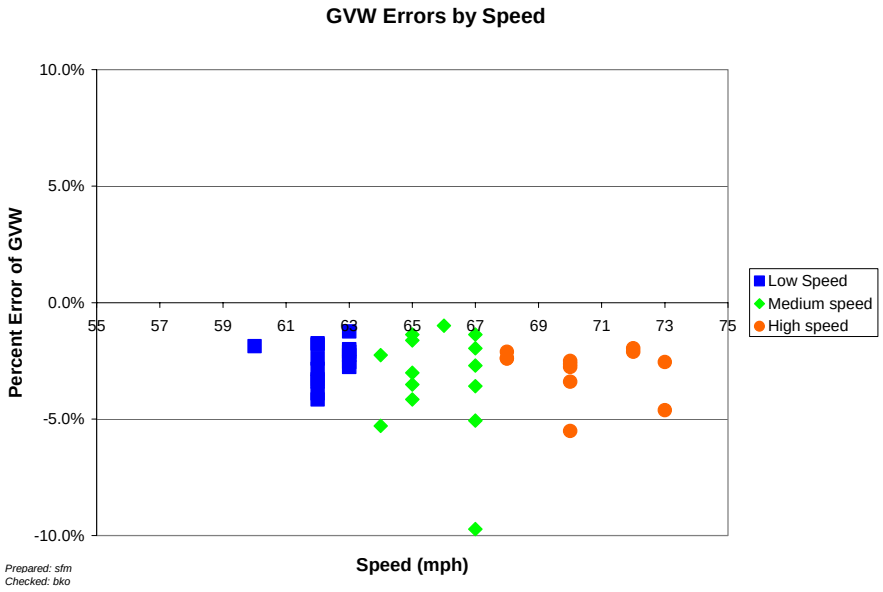


Figure 6-2 - Pre-validation GVW Percent Error vs. Speed – 470600 – 30-Sep-2008

Figure 6-3 shows the relationship between temperature and GVW percentage error. It shows the underestimation of GVW which is consistent for all temperatures. The outlier at medium temperature was verified as the actual data collected by the system.

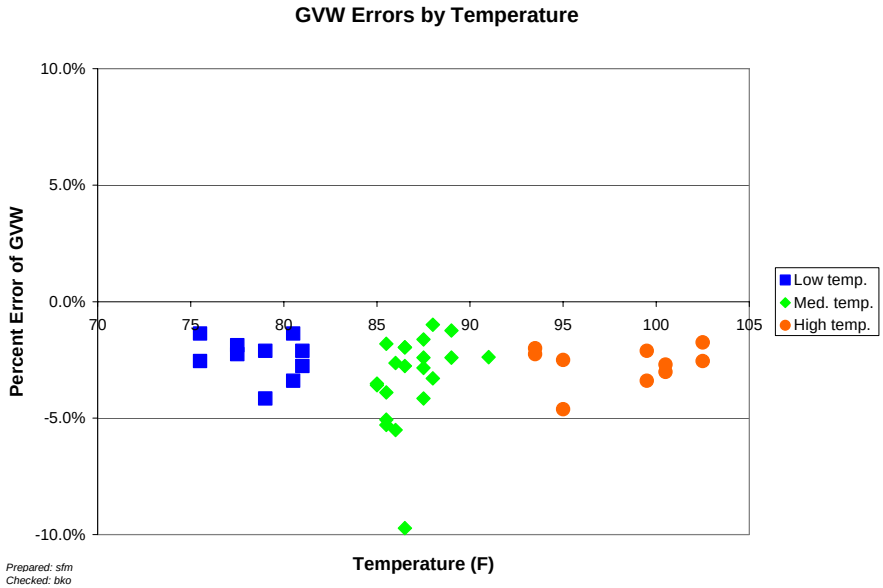


Figure 6-3 - Pre-Validation GVW Percent Error vs. Temperature – 470600 – 30-Sep-2008

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. Speed has no apparent influence on spacing error.

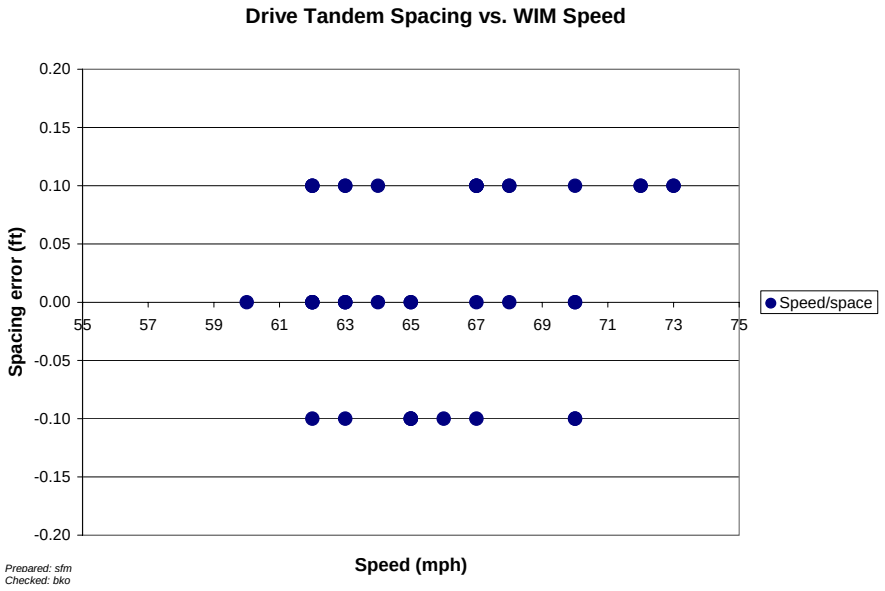


Figure 6-4 - Pre-Validation Spacing vs. Speed - 470600 – 30-Sep-2008

6.1 Temperature-based Analysis

The three temperature groups were created by splitting the runs between those at 75 to 83 degrees Fahrenheit for Low temperature, 84 to 92 degrees Fahrenheit for Medium temperature and 93 to 103 degrees Fahrenheit for High temperature.

Table 6-3 - Pre-Validation Results by Temperature Bin – 470600 – 30-Sep-2008

Element	95% Limit	Low Temperature 75 to 83 °F	Medium Temperature 84 to 92 °F	High Temperature 93 to 103 °F
Steering axles	±20 %	1.5 ± 6.0%	-0.3 ± 5.3%	-1.2 ± 3.6%
Single axles	±20 %	-0.6 ± 7.8%	-2.5 ± 9.2%	-2.1 ± 5.6%
Tandem axles	±15 %	-3.1 ± 2.5%	-3.5 ± 5.7%	-3.0 ± 5.2%
GVW	±10 %	-2.4 ± 2.0%	-3.3 ± 4.1%	-2.7 ± 1.9%
Axle spacing	± 0.5 ft	0.0 ± 0.2 ft	0.0 ± 0.2 ft	0.0 ± 0.2 ft

Prepared: sfm *Checked: jrn*

Table 6-3 shows no particular trends other than the underestimation of most loading statistics at all temperatures.

Figure 6-5 shows the distribution of GVW Errors versus Temperature by Truck. It shows no apparent temperature trend.

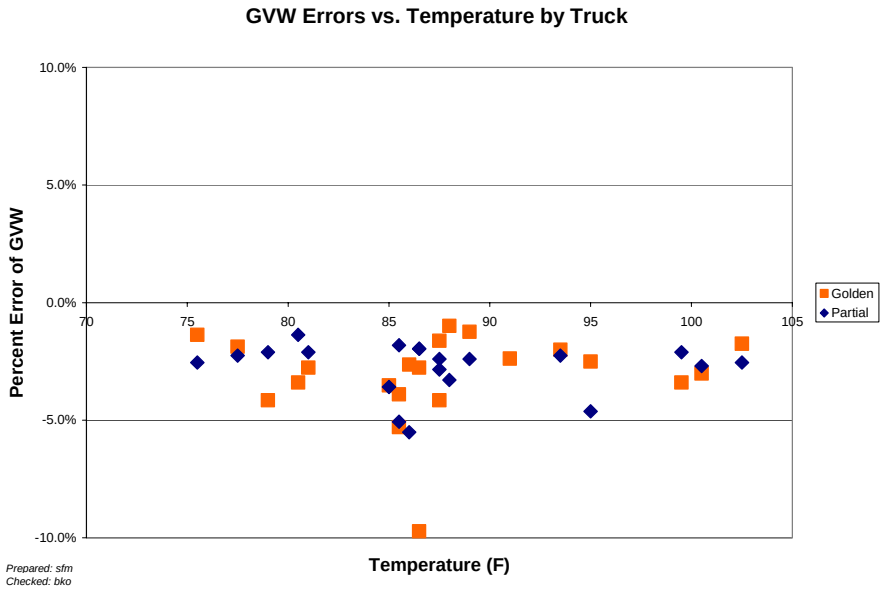


Figure 6-5 - Pre-Validation GVW Percent Error vs. Temperature by Truck – 470600 – 30-Sep-2008

Figure 6-6 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 auto-calibration. This site does not use auto-calibration. The steering axles in this graph are associated only with Class 9 vehicles.

In Figure 6-6 the pattern of the low and medium temperature ranges match for degree of scatter. The medium and high temperature ranges show similar levels of error. There is no obvious trend in error with temperature.

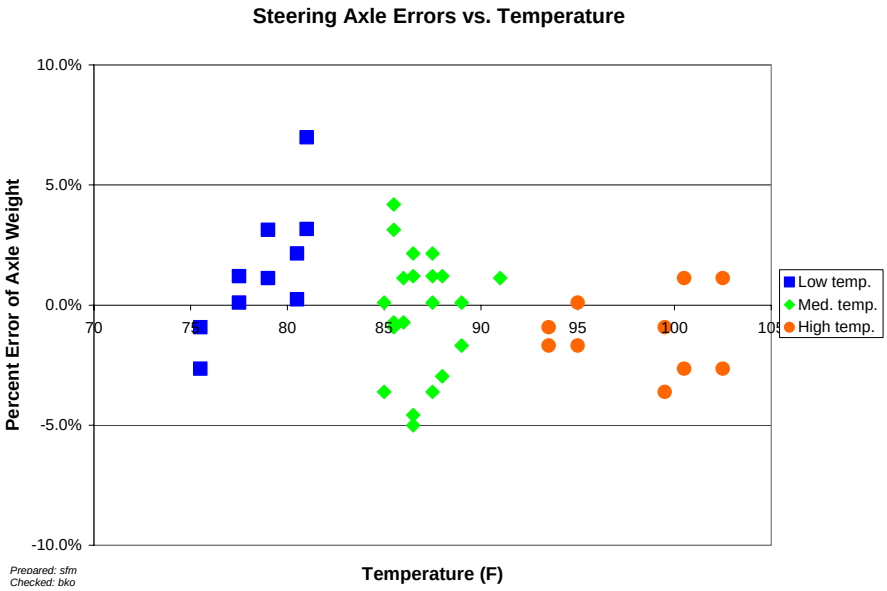


Figure 6-6 - Pre-Validation Steering Axle Error vs. Temperature by Group – 470600 – 30-Sep-2008

Figure 6-7 is included because the test trucks have single axles on both tractors and the trailer of the golden truck. The diamonds are the trailer axles which show similar patterns to the steering axles at medium speed. The trailer axle errors tend to be underestimated at the low and high temperatures.

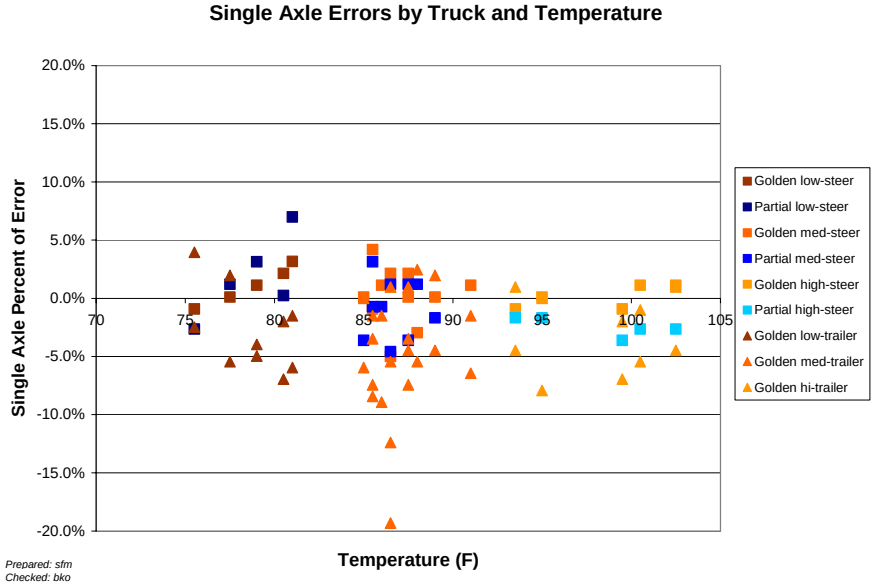


Figure 6-7 - Pre-Validation Single Axle Errors by Truck and Temperature – 470600 – 30-Sep-2008

6.2 Speed-based Analysis

The speed groups were divided as follows: Low speed – 60 to 63 mph, Medium speed – 64 to 67 mph and High speed – 68+ mph.

Table 6-4 - Pre-Validation Results by Speed Bin – 470600 – 30-Sep-2008

Element	95% Limit	Low Speed 60 to 63 mph	Medium Speed 64 to 67 mph	High Speed 68+ mph
Steering axles	±20 %	0.8 ± 5.4%	0.1 ± 4.4%	-1.4 ± 5.6%
Single axles	±20 %	-1.2 ± 7.2%	-2.2 ± 10.0%	-2.6 ± 6.7%
Tandem axles	±15 %	-3.3 ± 3.5%	-3.6 ± 5.8%	-2.9 ± 5.6%
GVW	±10 %	-2.6 ± 1.8%	-3.3 ± 4.9%	-2.9 ± 2.4%
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.2 ft	0.0 ± 0.2 ft

Prepared: sfm *Checked: jrn*

Table 6-4 shows GWV and tandem axles are underestimated by approximately three percent at all speeds, however the variability for these elements is different. Single axles are also underestimated but not as much.

Figure 6-8 shows GVW is underestimated for both trucks and has a similar pattern.

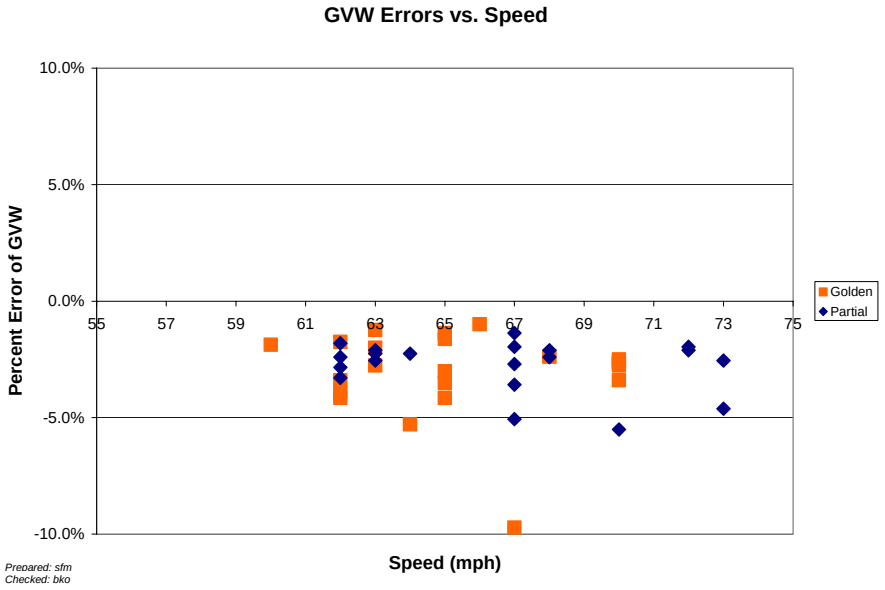


Figure 6-8 - Pre-Validation GVW Percent Error vs. Speed Group - 470600 –30-Sep-2008

Figure 6-9 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.

Figure 6-9 shows steering axle error at low speed has somewhat larger scatter than at medium and high speeds.

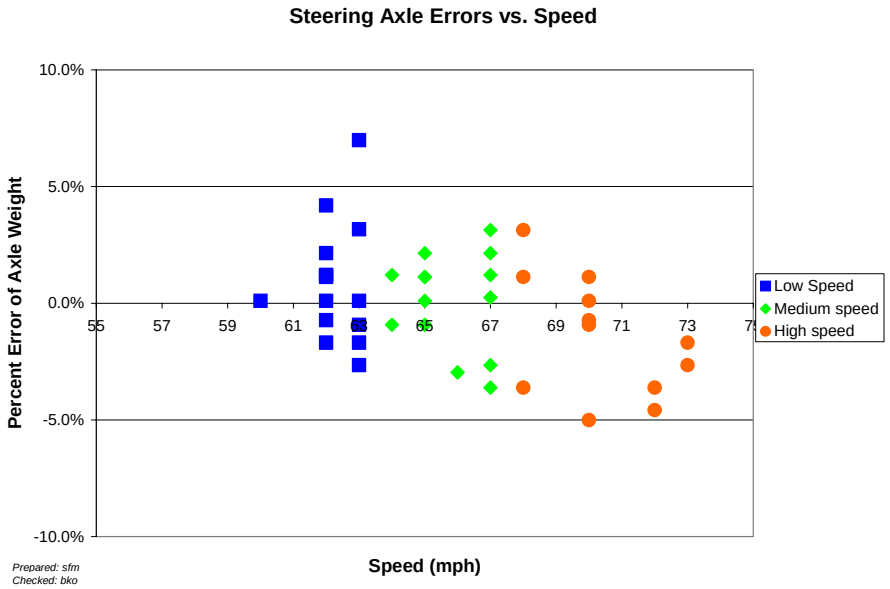


Figure 6-9 - Pre-Validation Steering Axle Percent Error vs. Speed Group - 470600 – 30-Sep-2008

Figure 6-10 is included because the test trucks have single axles on both tractors and the trailer of the golden truck. The diamonds are the trailer axles which show similar patterns to the steering axles at low and medium speeds. The trailer axle errors tend to be underestimated at the high temperature.

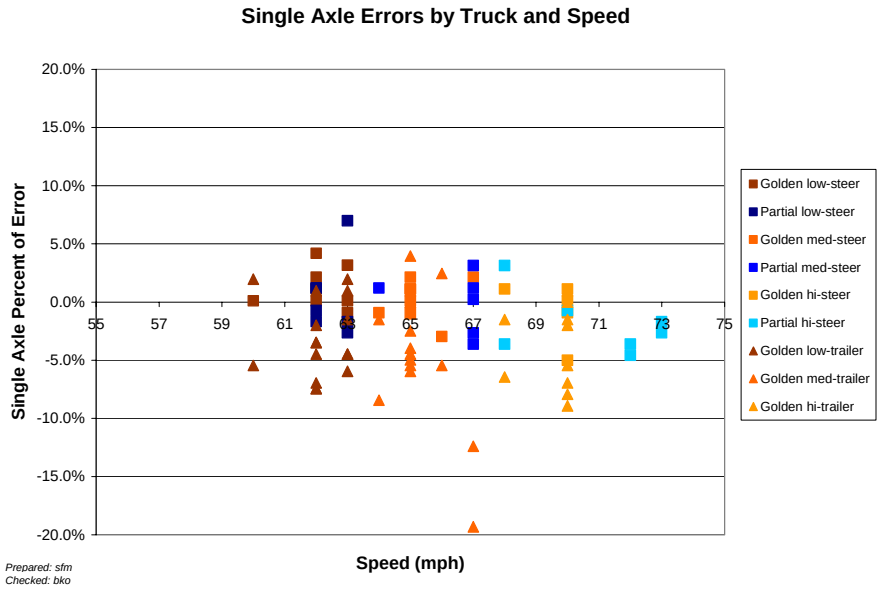


Figure 6-10 - Pre-Validation Single Axle Errors by Truck and Speed – 470600 – 30-Sep-2008

6.3 Classification Validation

This LTPP installed site uses the FHWA 13-bin classification scheme and the LTPP ETG mod 3 classification algorithm. 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 one hour (110 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 1.8 percent. In this case the large value associated with Class 6 and the 100 percent error for Class 4 represents one of four Class 6s observed which the equipment classified as a Class 4.

Table 6-5 - Truck Misclassification Percentages for 470600 – 30-Sep-2008

Class	Percent Error	Class	Percent Error	Class	Percent Error
4	100	5	0	6	25
7	0				
8	0	9	0	10	0
11	0	12	0	13	N/A

Prepared: sfm *Checked: jrn*

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 6-6 - Truck Classification Mean Differences for 470600 – 30-Sep-2008

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

Prepared: sfm *Checked: jrn*

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 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. In this case the large value associated with Class 6 and the UNK for Class 4 represent one of four Class 6s observed which the equipment classified as a Class 4.

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 met research quality standards, 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: sfm *Checked: jrn*

6.5 Prior Validations

The last validation for this site was done June 13, 2007. It was the first validation of the site. The site was producing research quality data.

Figure 6-11 shows the GVW Percent Error vs. Speed for the Post Validation runs from the previous validation. The site was validated with two trucks. The "Golden" truck was loaded to 74,870 lbs. The "partial" truck which had air suspension on both tandems with a split rear tandem on the trailer was loaded to 67,280 lbs.

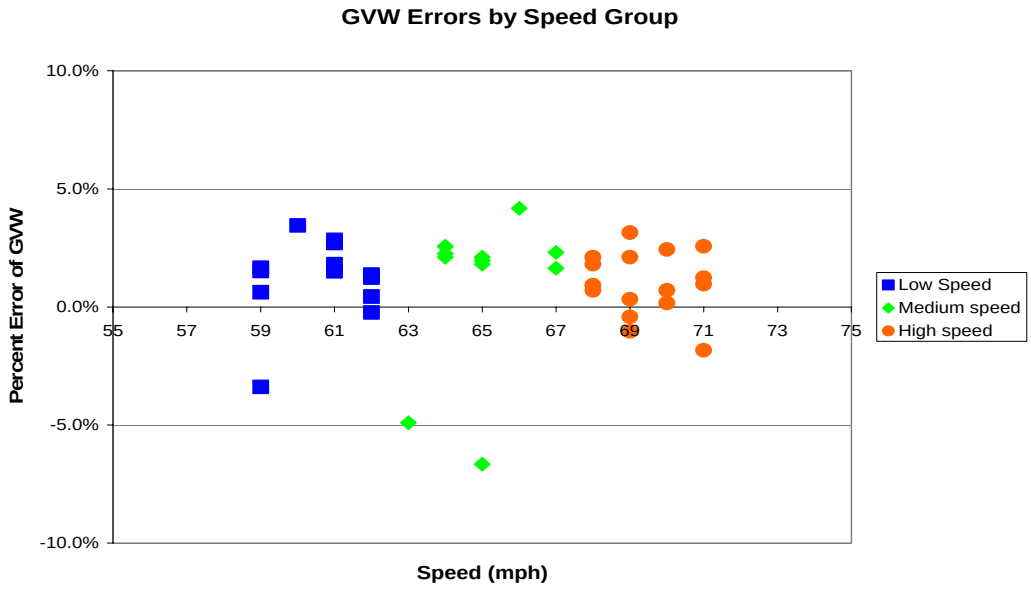


Figure 6-11 - Last Validation GVW Percent Error vs. Speed – 470600 – 13-Jun-2007

Table 6-8 shows the overall results from the last validation. Steering axle errors have the same level of variability. They are nearly unbiased according to the pre-validation results. Single axle variability is approximately the same as before but, an overestimate has become and underestimate. GVW and tandem axles were overestimated and are about four percent lower at the start of the validation than at the end. These changes may be a function of the difference in trucks or actual changes in the equipment.

Table 6-8 - Last Validation Final Results – 470600 – 13-Jun-2007

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-1.5 ± 5.6%	Pass
Single axles	±20 percent	0.5 ± 8.8%	Pass
Tandem axles	±15 percent	1.4 ± 7.4%	Pass
GVW	±10 percent	1.1 ± 4.3%	Pass
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.1 ft	Pass

Prepared: sfm *Checked: jrn*

Table 6-9 has the results at the end of the last validation by temperature. The temperature conditions for the current and previous visits were essentially the same. Through this validation the equipment has been observed at temperature from 65 to 120 degrees Fahrenheit.

Table 6-9 - Last Validation Results by Temperature Bin – 470600 – 13-Jun-2007

Element	95% Limit	Low Temperature 72 to 90 °F	Medium Temperature 91 to 105 °F	High Temperature 106 to 115 °F
Steering axles	±20 %	0.2 ± 4.7%	0.0 ± 6.1%	-3.1 ± 4.4%
Single axles	±20 %	2.0 ± 6.3%	-0.7 ± 11.6%	0.4 ± 8.4%
Tandem axles	±15 %	0.9 ± 8.6%	1.2 ± 7.0%	1.9 ± 7.8%
GVW	±10 %	1.3 ± 5.5%	0.3 ± 6.8%	1.4 ± 2.4%
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft

Prepared: sfm *Checked: jrn*

Table 6-10 has the results of the prior post validation by speed groups. The site was left with a slight overestimation for most loading statistics in all speed groups. The site tended to underestimate loading statistics according to the Pre-Validation results for the current visit.

Table 6-10 - Last Validation Results by Speed Bin – 470600 – 13-Jun-2007

Element	95% Limit	Low Speed 59 to 62 mph	Medium Speed 63 to 67 mph	High Speed 68+ mph
Steering Axles	±20 %	-1.2 ± 7.9%	0.2 ± 3.9%	-2.9 ± 3.8%
Single axles	±20 %	0.5 ± 10.2%	1.2 ± 9.8%	-0.1 ± 7.2%
Tandem axles	±15 %	1.8 ± 8.4%	1.0 ± 8.8%	1.5 ± 6.6%
GVW	±10 %	1.2 ± 3.7%	1.0 ± 7.2%	1.0 ± 2.9%
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft

Prepared: sfm *Checked: jrn*

7 Data Availability and Quality

As of September 30, 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 is shown in Table 7-1. The value for months is a measure of the seasonal variation in the data. The indicator of coverage indicates whether day of week variation has been accounted for on an annual basis. As can be seen from the table only 2007 has a sufficient quantity to be considered a complete year of data. **Together with the previously gathered calibration information 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.

Table 7-1 - Amount of Traffic Data Available 470600 – 30-Sep-2008

Year	Classification Days	Months	Coverage	Weight Days	Months	Coverage
2001	90	4	Full Week	90	4	Full Week
2002	104	6	Full Week			
2007	214	7	Full Week	214	7	Full Week
2008	197	7	Full Week	198	7	Full Week

Prepared: sfm *Checked: jrn*

GVW graphs and characteristics associated with them are used as data screening tools. Data to generate representative screening graphs was not available as of the due date of this report.

8 Data Sheets

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

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

Sheet 20 – Classification verification – Pre-Validation (3 pages)
Sheet 20 – Classification verification – Post-Validation (3 pages)

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

Calibration Iteration 1 Worksheet – (1 page)

Test Truck Photographs (9 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 page 30. 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 VALIDATION

STATE: Tennessee

SHRP ID: 0600

Figures

Photos

1. General Information

SITE ID: *470600*

LOCATION: *I-40 West (Mile Post 91.67)*

VISIT DATE: *September 30, 2008*

VISIT TYPE: *Validation*

2. Contact Information

POINTS OF CONTACT:

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

Highway Agency: *Jim Maxwell, 615-350-4167, james.maxwell@state.tn.us*

Gary Wright, 512-977-1856, gwright@fugro.com

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

FHWA Division Office Liaison: *John H. Steele, 615-781-5777, john.steele@fhwa.dot.gov*

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

3. Agenda

BRIEFING DATE: *No briefing requested*

ONSITE PERIOD: *September 30 and October 1, 2008*

TRUCK ROUTE CHECK: *Completed, see Truck Route.*

4. Site Location/ Directions

NEAREST AIRPORT: *Memphis International Airport, Memphis, TN*

DIRECTIONS TO THE SITE: *1.8 miles west of exit 93, US 152/Low Road.*

MEETING LOCATION: *On Site at 9:00AM*

WIM SITE LOCATION: *Westbound lane of IH-40, near Milepost 91.67, approximately 3 miles East of Jackson, TN (35.7092^0 N and 88.6633^0 W)*

WIM SITE LOCATION MAP: *See Figure 4.1*

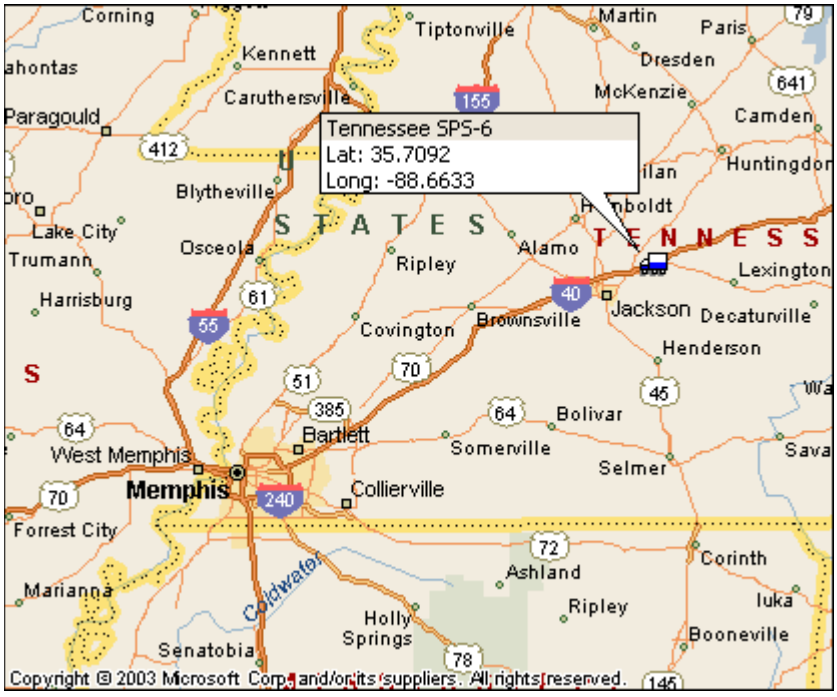


Figure 4-1 - Section 470600 near Jackson, Tennessee

5. Truck Route Information

ROUTE RESTRICTIONS: *None*

SCALE LOCATION: *Love's Country Store, I-40 at Exit 87, Jackson, TN. Contact - Carol Delane, Ph: 731-422-0901 (35.6790^0 N and -88. 7444^0 W)*

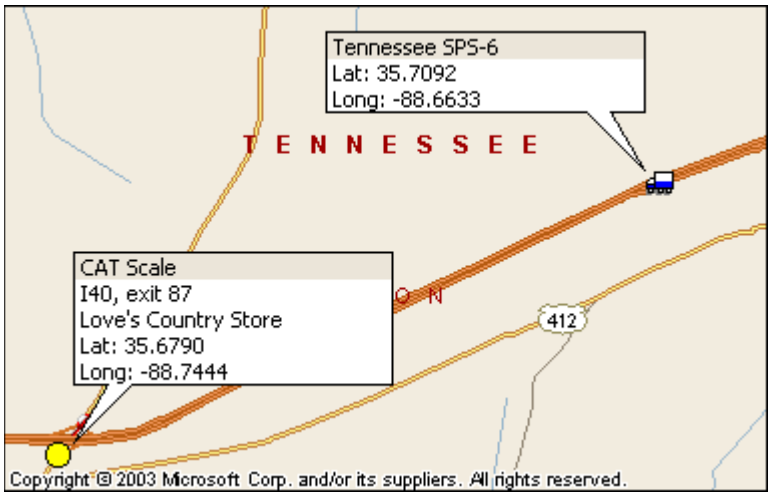


Figure 5-1 - CAT Scale Location for Tennessee SPS-6

TRUCK ROUTE:

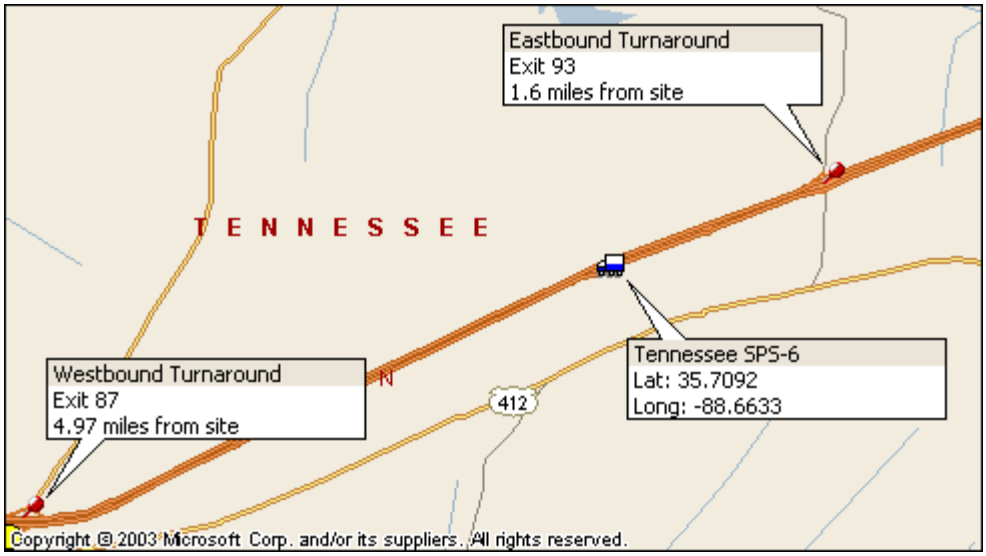


Figure 5-2 - Truck Route for Tennessee SPS-6

- *Westbound Turnaround – Route 70 (Exit 87) 4.96 miles from the site*
- *Eastbound Turnaround – Route 152/Law Road (Exit 93) 1.60 miles from the site*

Total distance = 13.1 miles (15 minutes)

6. Sheet 17 – Tennessee (470600)

1.* ROUTE ___I-40____ MILEPOST __91.67___LTPP DIRECTION - N S E W

2.* WIM SITE DESCRIPTION - Grade ___<_1____ % Sag vertical Y / N
Nearest SPS section upstream of the site _project out of study__
Distance from sensor to nearest upstream SPS Section ___ N/A__ ft

3.* LANE CONFIGURATION
Lanes in LTPP direction __2__ Lane width _1_ _2_ 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 _1__ _1__ ft

4.* PAVEMENT TYPE _____Asphalt Concrete ___ ____

5.* PAVEMENT SURFACE CONDITION – Distress Survey
Date: 09/30/08 Photo: 470600_Upstream_09_30_08.jpg
Date: 09/30/08 Photo: 470600_Downstream_09_30_08.jpg

6. * SENSOR SEQUENCE ___loop – quartz piezo – quartz piezo – 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 _____
Intersection/driveway within 300 m downstream of sensor location Y / N
distance _____
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 ___ ___ . ___ 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 _4_ 4_ ft

Distance from system __ _5_ 0__ ft

TYPE _____3R_____

CABINET ACCESS controlled by LTPP / STATE / JOINT ?

Contact - name and phone number: _____

Alternate - name and phone number _____

11. * POWER

Distance to cabinet from drop ___ _32 ___ ___ ftOverhead / underground / solar / AC in cabinet?

Service provider _____ Phone number _____

12. * TELEPHONE

Distance to cabinet from drop __ _32_ __ ft Overhead / under ground / cell?

Service provider _____ Phone Number

_____

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

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

14. * TEST TRUCK TURNAROUND time __1_5___minutes DISTANCE _1_3_ mi.

15. PHOTOS FILENAME

Power source 470600_Power_Meter_09_30_08.jpg

Phone source 470600_Phone_Modem_09_30_08.jpg

Cabinet exterior 470600_Cabinet_Exterior_09_30_08.jpg

Cabinet interior 470600_Cabinet_Interior_Front_09_30_08.jpg

470600_Cabinet_Interior_Back_09_30_08.jpg

Weight sensors 470600_Leading_WIM_Sensor_09_30_08.jpg

470600_Trailing_WIM_Sensor_09_30_08.jpg

Classification sensors _____

Other sensors 470600_Leading_Loop_09_30_08.jpg

470600_Trailing_Loop_09_30_08.jpg

Description ___loops_____

_____

_____

Downstream direction at sensors on LTPP lane

470600_Downstream_09_30_08.jpg

Upstream direction at sensors on LTPP lane

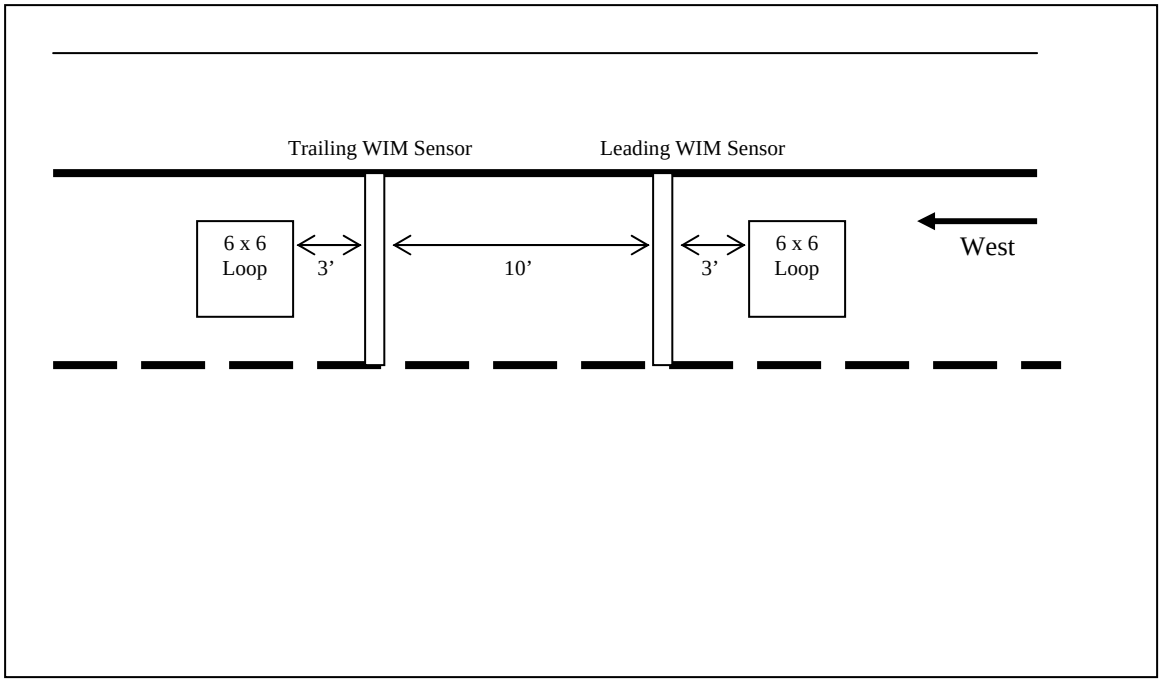
470600_Upstream_09_30_08.jpg

COMMENTS GPS Coordinates for Site: 35.7092^0 N and 88.6633^{0}W_____
_____new site is 164 feet west of old site._____
_____
_____Amenities: _____Various Hotels, Restaurants, Gas Stations etc. can be found 6 to 11 miles west of the site in Jackson, TN. Exits 80 A & B, 82 A & B and 85.
_____
_Posted Speed limit – 70 mph _____

COMPLETED BY _____Dean J. Wolf_____

PHONE _301-210-5105____ DATE COMPLETED _ 1_0 _ /_0 _1 _ / _2_0_0_8_

Sketch of equipment layout



Site Map

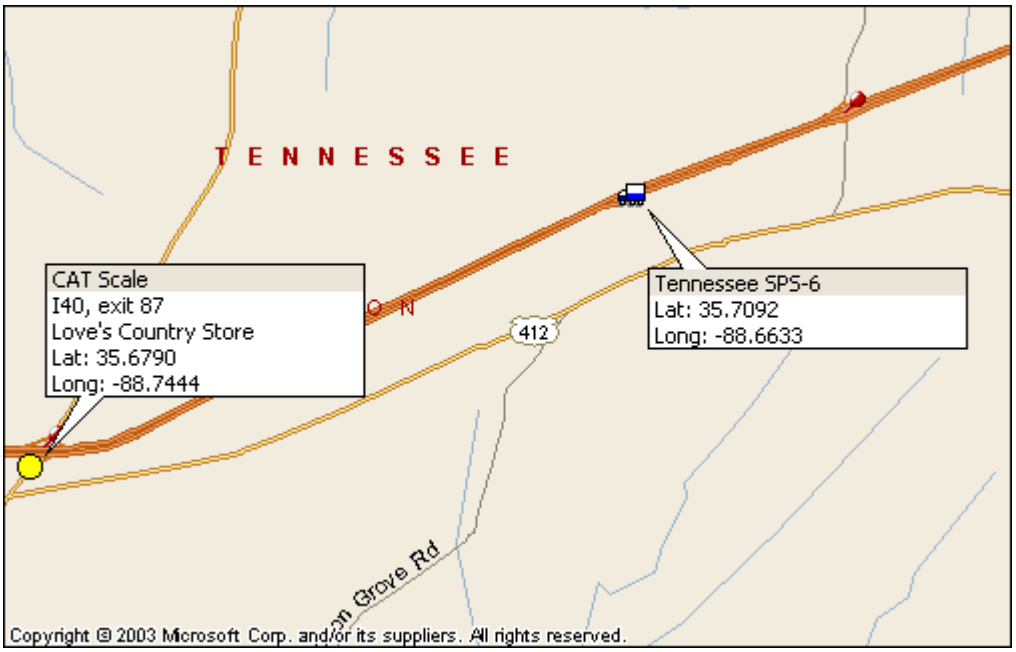


Figure 6-1 - Site Map for Tennessee SPS-6

Photo 1 - 470600_Upstream_09_30_08.jpg

Photo 2 - 470600_Downstream_09_30_08.jpg

Photo 3 - 470600_Power_Meter_09_30_08.jpg

Photo 4 - 470600_Phone_Modem_09_30_08.jpg

Photo 5 - 470600_Cabinet_Exterior_09_30_08.jpg

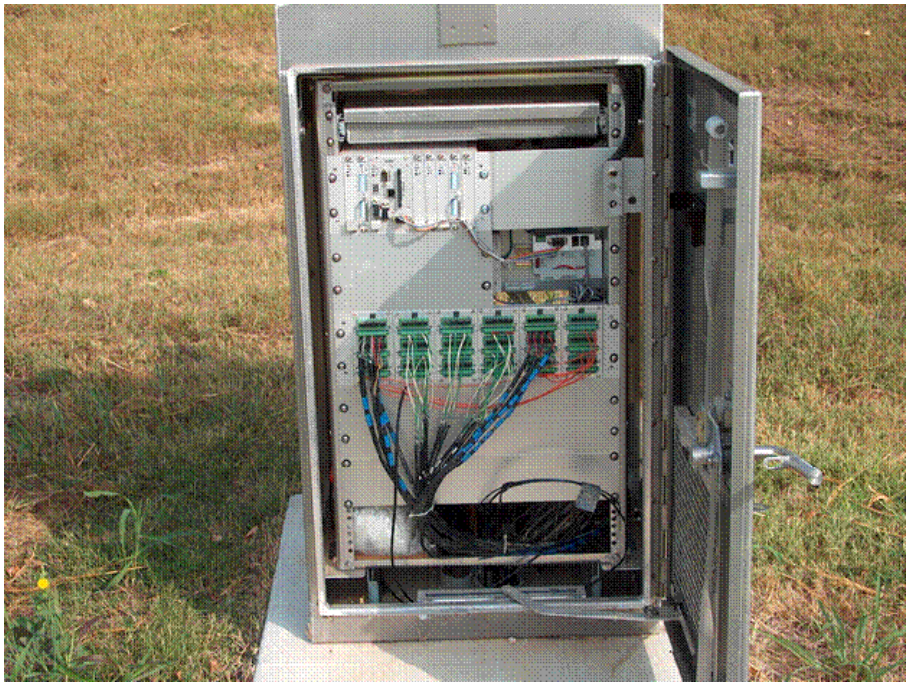


Photo 6 - 470600_Cabinet_Interior_Front_09_30_08.jpg

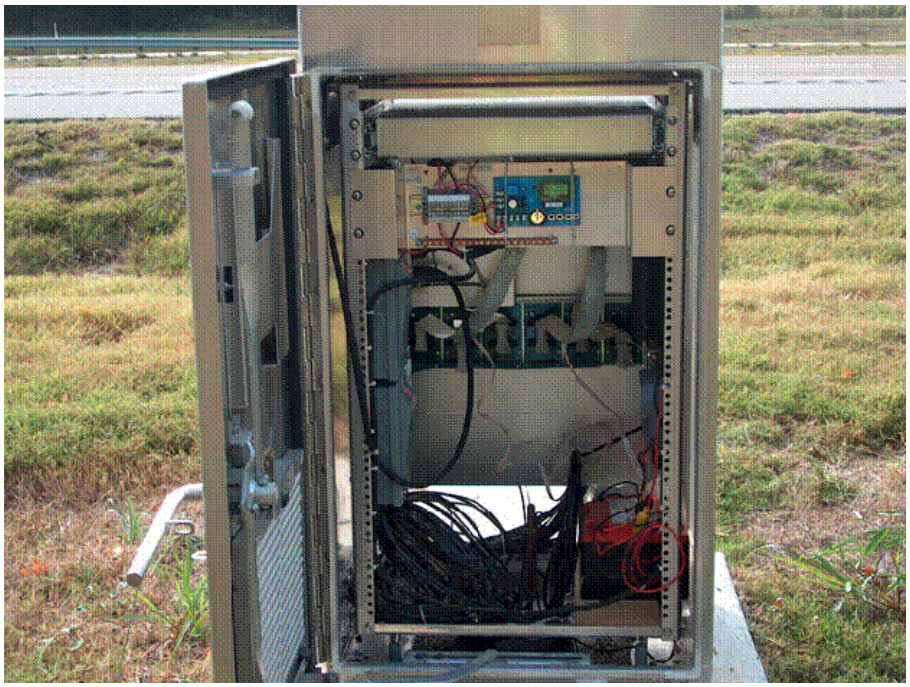


Photo 7 - 470600_Cabinet_Interior_Back_09_30_08.jpg

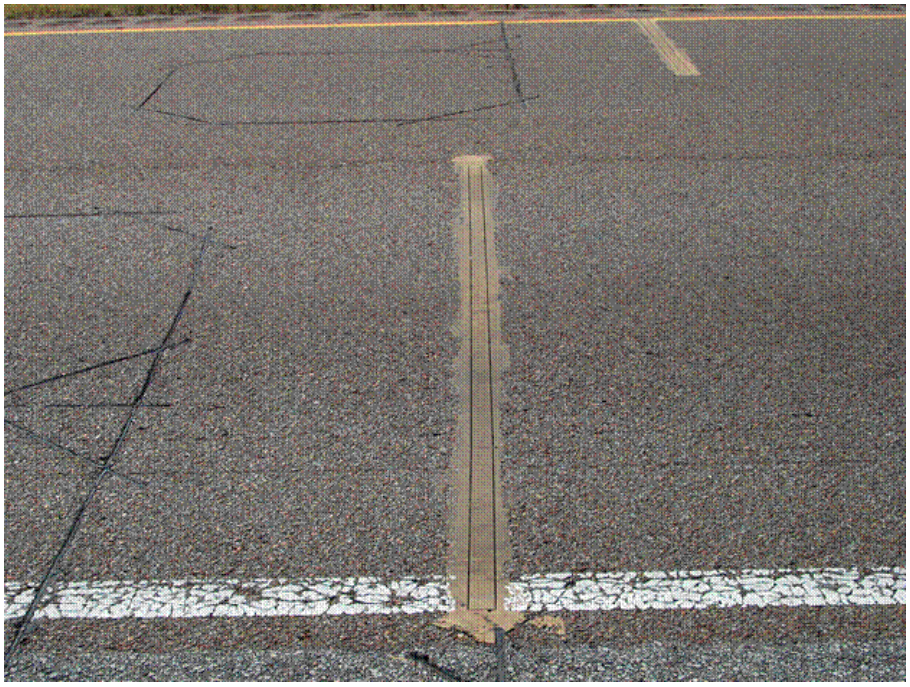


Photo 8 - 470600_Leading_WIM_Sensor_09_30_08.jpg

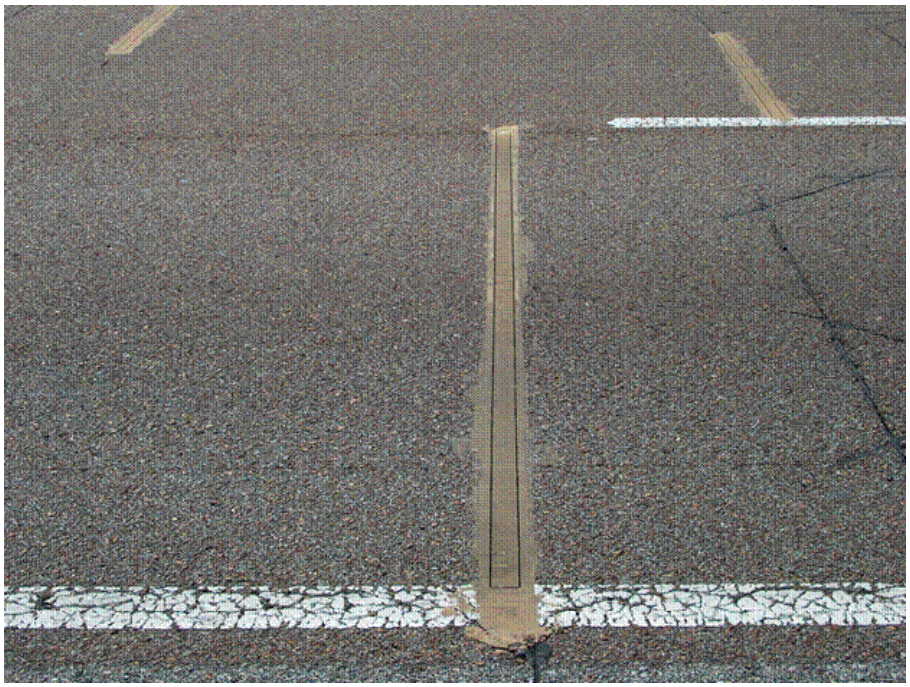


Photo 9 - 470600_Trailing_WIM_Sensor_09_30_08.jpg

Photo 10 - 470600_Leading_Loop_09_30_08.jpg

Photo 11 - 470600_Trailing_Loop_09_30_08.jpg

SHEET 18	STATE CODE [47]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [0600]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) 9/30/2008

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:

_____

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: Jim Maxwell Phone:(615) 350-4167

Agency: _____

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

Name: _____ Phone:_____

Agency: _____

f. Traffic Control –

Name: _____ Phone:_____

Agency: _____

g. Enforcement Coordination –

Name: _____ Phone:_____

Agency: _____

h. Nearest Static Scale

Name: Lowe's Country Location:I-40 at Exit 87, Jackson, TN

Phone: (731) 422-0901

SHEET 16 **LTPP MONITORED TRAFFIC DATA** **SITE CALIBRATION SUMMARY**	*STATE ASSIGNED ID [__ __ __ __] *STATE CODE [47] *SHRP SECTION ID [0600]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [09/30/2008]

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

3. * REASON FOR CALIBRATION
   - ____ REGULARLY SCHEDULED SITE VISIT
   - ____ EQUIPMENT REPLACEMENT
   - ____ DATA TRIGGERED SYSTEM REVISION
   - ____ RESEARCH
   - ____ TRAINING
   - ____ 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
   - ____ BENDING PLATES
   - ____ CHANNELIZED ROUND PIEZO
   - ____ LOAD CELLS
   - _X__ 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_____	___2_____
3	_____	_____

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)

MEAN DIFFERENCE BETWEEN ---

DYNAMIC AND STATIC GVW	___-2.9	STANDARD DEVIATION	___1.5
DYNAMIC AND STATIC SINGLE AXLES	____-2.0	STANDARD DEVIATION	___4.0
DYNAMIC AND STATIC DOUBLE AXLES	___-3.3	STANDARD DEVIATION	___2.4

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

9. DEFINE THE SPEED RANGES USED (MPH) _____ _60_ __65__ __70_ __ __ __ _____ _____
_____ _____ _____ _____ _____ _____ _____ _____ _____ _____

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) ___2992/2819___

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 _X__ TIME ___ NUMBER OF TRUCKS

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
*** FHWA CLASS 9 ____ 0
*** FHWA CLASS 8 ____ 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

SHEET 16 **LTPP MONITORED TRAFFIC DATA** **SITE CALIBRATION SUMMARY**	*STATE ASSIGNED ID [__ __ __ __] *STATE CODE [47] *SHRP SECTION ID [0600]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [10/1/2008]

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

3. * REASON FOR CALIBRATION
   - ____ REGULARLY SCHEDULED SITE VISIT
   - ____ EQUIPMENT REPLACEMENT
   - ____ DATA TRIGGERED SYSTEM REVISION
   - ____ RESEARCH
   - ____ TRAINING
   - ____ 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
   - ____ BENDING PLATES
   - ____ CHANNELIZED ROUND PIEZO
   - ____ LOAD CELLS
   - _X__ 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_____	___2_____
3	_____	_____

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
   MEAN DIFFERENCE BETWEEN ---
   - DYNAMIC AND STATIC GVW ___1.0 STANDARD DEVIATION ___1.4
   - DYNAMIC AND STATIC SINGLE AXLES ___3.1 STANDARD DEVIATION ___2.8
   - DYNAMIC AND STATIC DOUBLE AXLES ___0.6 STANDARD DEVIATION ___2.7

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

9. DEFINE THE SPEED RANGES USED (MPH) _____ _60_ __65__ __70_ __ __ __ _____ _____
   _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) ___3089 / 2910___

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 _X__ TIME ___ NUMBER OF TRUCKS

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
   - *** FHWA CLASS 9 ____ 0
   - *** FHWA CLASS 8 ____ 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	_4_7_
LTPP Traffic Data	* SPS PROJECT ID	_0_6_0_0_
*CALIBRATION TEST TRUCK # 2 1	* DATE 9/30/08	

Rev. 08/31/01

Truck #02

PART I.

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

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:

3 FORK LIFTS & STEEL EQUIPMENT OVER REAR TANDEM

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 15.9 B to C 4.4 C to D 27.9

D to E 10.1 E to F _____

Wheelbase (measured A to last) _____ Computed 57.8

13. *Kingpin Offset From Axle B (units) 2.3 (_____)

(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	75 R 24.5	2 FULL LEAF
B	11 R 22.5	AIR
C	11 R 22.5	AIR
D	75 R 24.5	AIR
E	11 R 24.5	AIR
F		

Sheet 19	* STATE_CODE	_4_7_
LTPP Traffic Data	* SPS PROJECT ID	_0_6_0_0_
*CALIBRATION TEST TRUCK #_1_	* DATE	9/30/08

Rev. 08/31/01

PART II

Day 1

*b) Average Pre-Test Loaded weight 79020

*c) Post Test Loaded Weight 78940

*d) Difference Post Test – Pre-test ~~-180~~ -80

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9800	14420	14420	20190	20190		79020
2	9800	14420	14420	20190	20190		79020
3							
Average	9800	14420	14420	20190	20190		79020

Table 6. Raw data – Axle scales –

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9820	14330	14330	20230	20230		78940
2	9740	14400	14400	20200	20200		78940
3							
Average	9780	14365	14365	20215	20215		78940

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 sfm Weight date 9/30/08

Sheet 19	* STATE_CODE
LTPP Traffic Data	* SPS PROJECT ID
*CALIBRATION TEST TRUCK # 3	* DATE 10/1/03

Rev. 08/31/01

trk 1 day 2

PART I.

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

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

GEOMETRY

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

9. a) * Make: PETERBUILT b) * Model: ____

10.* Trailer Load Distribution Description:

COUNTERWEIGHTS LOADED EVENLY ALONG 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 12.8 B to C 4.3 C to D 33.4

D to E 4.1 E to F ____

Wheelbase (measured A to last) ____ Computed 59.6

13. *Kingpin Offset From Axle B (units) 2 FT (____)

(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	11R 22.5	4 FULL LEAF
B	11R 24.5	AIR
C	11R 24.5	AIR
D	11R 24.5	AIR
E	11R 24.5	AIR
F	____	____

4015 47 2118 0600

Sheet 19	* STATE_CODE	_4_7_
LTPP Traffic Data	* SPS PROJECT ID	_0_6_0_0_
*CALIBRATION TEST TRUCK #_1_	* DATE	10/1/08

Rev. 08/31/01

Day 2

7.2 *b) Average Pre-Test Loaded weight 77490

*c) Post Test Loaded Weight

*d) Difference Post Test – Pre-test

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9620	17080	17080	16850	16850		77480
2	9600	17100	17100	16850	16850		77500
3							
Average	9610	17090	17090	16850	16850		77490

Table 6.2. Raw data – Axle scales –

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
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	9460	16960	16960	16850	16850		77080
2	9320	17050	17050	16830	16830		77080
3							
Average	9390	17005	17005	16840	16840		77080

Measured By J.W Verified By SFM Weight date 10/1/08

Sheet 19	* STATE_CODE	_4_7_
LTPP Traffic Data	* SPS PROJECT ID	_0_6_0_0_
*CALIBRATION TEST TRUCK # 2	* DATE	9/30/08

Rev. 08/31/01

TRUCK # CD2
TRAILER # 1011

PART I.

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

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

GEOMETRY

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

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

10.* Trailer Load Distribution Description:

STONE LOADED EVENLY ON TRAILER MOSTLY OVER REAR TANDEM

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 15.4 B to C 4.3 C to D 18.8

D to E 4.1 E to F _____

Wheelbase (measured A to last) _____ Computed 42.6

13. *Kingpin Offset From Axle B (units) 2.4 FT (_____)

(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	11R 22.5	3 FULL LEAF
B	295R 22.5	AIR
C	80R 22.5	AIR
D	11R 24.5	4 TAPERED LEAF
E	11R 24.5	4 TAPERED LEAF
F		

Sheet 19	* STATE_CODE	_4_7_
LTPP Traffic Data	* SPS PROJECT ID	_0_6_0_0_
*CALIBRATION TEST TRUCK #_2_	* DATE	09/30/2008

Rev. 08/31/01

PART II

Day 1

*b) Average Pre-Test Loaded weight 67830
*c) Post Test Loaded Weight 67420
*d) Difference Post Test – Pre-test -410

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10480	9650	9650	19020	19020		67820
2	10500	9640	9640	19030	19030		67840
3							
Average	10490	9645	9645	19025	19025		67830

Table 6. Raw data – Axle scales –

ass	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	10240	9630	9630	18950	18950		67400
2	10280	9610	9610	18970	18970		67440
3							
Average	10260	9620	9620	18960	18960		67420

Measured By _____ Verified By SFM Weight date 9/30/08

Sheet 19	* STATE_CODE	4_7_
LTPP Traffic Data	* SPS PROJECT ID	0_6_0_0_
*CALIBRATION TEST TRUCK # 2_	* DATE	10/1/08

Rev. 08/31/01

Day 2

7.2 *b) Average Pre-Test Loaded weight 67380

*c) Post Test Loaded Weight 67030

*d) Difference Post Test – Pre-test -350

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10320	11500	11500	17030	17030		67380
2	10340	11480	11480	17040	17040		67380
3							
Average	10330	11490	11490	17035	17035		67380

Table 6.2. Raw data – Axle scales –

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
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	10020	11520	11520	16990	16990		67040
2	10020	11510	1510	16990	16990		67020
3							
Average	10020	11515	11515	16990	16990		67030

Measured By dw Verified By sfm Weight date 10/1/08

Sheet 20	* STATE_CODE _4_7_
LTPP Traffic Data	*SPS PROJECT_ID _0_6_0_0_
Speed and Classification Checks * 1 of* 3	* DATE _0_9_ / _3_0_ / _2_0_0_8_

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	6426	64	9	62	9	6861	61	9
65	9	6439	64	9	67	11	6866	66	11
70	9	6447	66	9	68	9	6870	66	9
65	11	6463	65	11	67	9	6886	66	9
65	9	6475	64	9	70	9	6893	69	9
68	9	6483	66	9	70	9	6895	69	9
64	9	6502	63	9	68	6	6906	67	6
68	9	6510	67	9	57	9	6925	57	9
64	9	6518	68	9	64	9	6935	62	9
68	9	6522	64	9	63	9	6947	63	9
67	9	6527	65	9	67	9	6951	65	9
72	9	6544	70	9	67	9	6952	65	9
74	9	6558	73	9	71	9	6961	70	9
64	9	6591	63	9	71	9	6980	70	9
65	9	6603	65	9	68	9	6984	66	9
73	9	6608	73	9	62	9	6990	61	9
68	9	6613	68	9	62	5	6993	62	5
70	9	6622	71	9	65	9	7001	64	9
65	9	6796	64	9	68	5	7006	68	5
69	9	6806	68	9	67	9	7018	65	9
67	9	6808	67	9	64	9	7025	66	9
68	9	6815	68	9	65	8	7030	65	8
72	9	6817	70	9	62	9	7038	62	9
72	9	6823	70	9	66	9	7056	65	9
64	9	6838	64	9	67	9	7065	65	9

Recorded by MARK Z Direction W Lane 4 Time from 10:20 AM to 10:40 AM

Sheet 20	* STATE_CODE	_4_7_
LTPP Traffic Data	*SPS PROJECT_ID.	_0_6_0_0_
Speed and Classification Checks * 2 of* 3	* DATE	_0_9_ / _3_0_ / _2_0_0_8_

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	11	7084	63	11	65	9	7643	65	9
68	9	7301	68	9	67	5	7656	66	5
71	6	7410	70	6	69	9	7659	68	9
59	9	7425	58	9	58	9	7668	58	9
70	9	7428	69	9	65	9	7672	64	9
65	10	7431	65	10	62	8	7893	64	8
68	9	7447	68	9	65	11	7897	64	11
70	5	7448	69	5	68	9	7904	67	9
70	9	7457	69	9	65	9	7907	64	9
65	9	7460	65	9	64	9	7910	64	9
64	9	7474	63	9	65	9	7912	64	9
65	5	7475	64	5	70	9	7920	68	9
66	9	7484	67	9	67	9	7945	66	9
68	9	7533	67	9	64	9	7959	63	9
64	5	7542	64	5	67	9	7969	66	9
63	9	7556	63	9	64	9	7984	63	9
69	9	7561	68	9	67	9	7996	66	9
63	4	7580	62	6	68	9	8005	66	9
63	6	7587	62	6	64	9	8017	65	9
62	9	7597	62	9	64	10	8029	64	10
71	7	7604	69	7	62	9	8039	63	9
65	9	7610	64	9	64	9	8046	63	9
66	9	7618	65	9	66	9	8059	66	9
62	9	7626	61	9	64	9	8069	63	9
66	9	7637	66	9	65	9	8076	64	9

Recorded by MARK Z Direction W Lane 4 Time from 1040 AM to 1112 AM

Sheet 20	* STATE_CODE
LTPP Traffic Data	*SPS PROJECT_ID
Speed and Classification Checks * 3 of* 3	* DATE 9 / 30 / 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	8151	65	9					
64	9	8159	65	9					
65	9	8176	66	9					
62	9	8197	61	9					
63	8	8209	62	8					
64	9	8232	66	9					
67	9	8249	67	9					
70	9	8260	69	9					
65	10	8270	65	10					
71	12	8354	70	12					

Direction W Lane 4 Time from 11:AM to 11:20 AM

Recorded by: MARK Z

64200 SPSWIM_TRF_sheet_20.doc

Sheet 20	* STATE_CODE 4_7_
LTPP Traffic Data	*SPS PROJECT_ID 0_6_0_0_
Speed and Classification Checks * 1 of* 3	* DATE 1_0_/_0_1_/2_0_0_8_

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	5	44132	68	5	62	12	44317	62	12
58	5	44142	60	5	64	9	44331	64	9
68	9	44148	67	9	72	9	44337	72	9
68	9	44156	67	9	72	9	44338	72	9
62	9	44158	62	9	65	9	44349	64	9
65	9	44170	65	9	64	11	44354	63	11
65	9	44176	65	9	68	9	44370	67	9
70	9	44182	70	9	65	9	44373	64	9
64	9	44186	62	9	65	11	44378	64	11
68	9	44197	67	9	68	4	44382	67	4
63	11	44203	64	11	70	9	44393	69	9
65	9	44211	64	9	62	9	44399	62	9
63	9	44215	63	9	68	9	44402	68	9
65	9	44219	63	9	66	9	44411	64	9
64	9	44222	63	9	64	9	44424	66	9
70	9	44228	69	9	70	9	44427	69	9
64	9	44239	62	9	63	9	44434	62	9
70	9	44243	69	9	72	9	44467	71	9
67	9	44249	67	9	66	9	44473	65	9
73	9	44255	72	9	70	9	44484	68	9
72	9	44257	70	9	70	9	44636	70	9
65	9	44265	64	9	67	9	44660	66	9
65	9	44280	65	9	70	9	44687	69	9
67	9	44285	67	9	63	9	44701	62	9
62	7	44304	66	7	68	9	44717	67	9

Recorded by MARK Z Direction W Lane 4 Time from 12:08 PM to 12:27 PM

Sheet 20	* STATE_CODE 47
LTPP Traffic Data	*SPS PROJECT_ID 0600
Speed and Classification Checks * 2 of* 3	* DATE 10/01/2008

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
72	9	44727	71	9	71	9	44985	70	9
61	9	44733	60	9	68	9	44991	68	9
59	9	44739	60	9	55	8	45000	55	8
64	9	44747	63	9	66	5	45008	65	5
72	9	44759	72	9	67	12	45016	66	12
62	11	44766	62	11	60	8	45021	59	8
61	12	44769	61	12	64	9	45024	63	9
68	9	44781	67	9	63	9	45039	62	9
69	9	44794	69	9	68	9	45047	67	9
61	9	44800	60	9	65	9	45057	68	9
60	9	44807	59	9	64	9	45310	63	9
62	9	44820	66	9	65	9	45319	65	9
69	9	44836	68	9	65	9	45326	64	9
70	9	44843	69	9	67	9	45342	66	9
65	9	44849	65	9	64	10	45349	64	10
64	9	44864	65	9	63	9	45361	63	9
70	9	44897	69	9	65	9	45370	64	9
70	9	44903	69	9	69	5	45374	68	5
60	9	44913	62	9	66	9	45379	64	9
66	9	44917	64	9	62	9	45390	62	9
59	9	44928	60	9	57	9	45395	58	9
65	11	44936	63	11	66	9	45411	67	9
66	9	44948	67	9	63	9	45414	61	9
65	9	44964	64	9	66	9	45422	65	9
74	9	44977	73	9	68	9	45431	67	9

Recorded by MARK E Direction W Lane 4 Time from 12:27 PM to 12:48 PM

Sheet 20	* STATE_CODE
LTPP Traffic Data	*SPS PROJECT_ID
Speed and Classification Checks * 2 of* 3	* DATE 10/1/2008

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	45455	64	9	70	9	45937	68	9
70	9	45467	70	9	60	9	45956	59	9
63	9	45496	64	9	64	9	45971	63	9
63	9	45499	61	9	67	9	45979	69	9
69	9	45504	68	9	62	13	45993	60	13
68	9	45513	67	9	62	9	46013	62	9
65	9	45547	65	9	67	6	46019	64	6
69	9	45552	68	9	67	9	46029	67	9
56	9	45557	55	9	64	9	46046	63	9
62	9	45574	64	9	67	9	46054	67	9
66	9	45584	65	9	69	9	46072	68	9
64	9	45805	64	9	70	9	46097	68	9
65	9	45814	64	9	68	8	46105	67	8
69	9	45818	68	9	62	9	46116	61	9
68	9	45829	68	9					
70	9	45844	68	9					
59	6	45851	59	6					
60	9	45853	62	9					
66	9	45862	65	9					
71	9	45866	68	9					
63	8	45872	62	8					
67	9	45897	67	9					
65	9	45912	65	9					
67	9	45922	66	9					
65	9	45931	63	9					

Direction W Lane 4 Time from 1250PM to 1:08PM

Recorded by: MARK Z

64200702 SPSWIM_TRF_sheet_20.doc

TO-27-47-2118-0600 [illegible] VAL

Sheet 21	* STATE_CODE	_4_7_
LTPP Traffic Data	*SPS PROJECT_ID	_0_6_0_0_
WIM System Test Truck Records 1 of 3	* DATE	_0_9_/_3_0_/_2_0_0_8_

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
77.5	64	2	1	10:47	7257	64	52/53	46/47	48/42	10.4/81	99/89		66.1	15.6	4.9	18.8	4.1	
77.5	60	1	1	10:47	7270	60	48/50	68/75	69/69	99/92	99/107		72.5	16.1	4.4	27.4	10.1	
79	67	2	2	11:02	7748	68	51/56	42/49	47/48	95/87	93/95		66.2	15.6	4.4	18.8	4.1	
79	65	1	2	11:02	7759	65	52/47	66/74	64/67	97/95	95/99		75.7	16.2	4.3	27.4	10.2	
75.5	73	2	3	11:17	8254	73	51/50	45/51	42/49	96/88	91/95		65.9	15.6	4.4	18.8	4.1	
75.5	64	1	3	11:18	8264	65	~~48/49~~	66/76	64/69	97/100	10.0/11.0		77.9	16.1	4.4	27.3	10.1	
81	62	2	4	11:34	8764	63	48/49 53/58	45/49	46/46	95/86	91/95		66.2	15.7	4.3	18.9	4.2	
81	62	1	4	11:34	8772	63	53/48	69/75	69/66	10.3/95	97/10.2		76.8	16.1	4.4	27.4	10.2	
80.5	66	2	5	11:50	9243	67	50/54	45/51	47/47	98/83	10.0/93		66.7	15.5	4.4	18.8	4.1	
80.5	65	1	5	11:50	9254	62	51/49	68/73	68/69	10.1/87	99/99		76.3	16.1	4.4	27.5	10.2	
1550 91	~	2	6	~	~	~	~	~	~	~	~	~	~	~	~	~	~	
91	68	1	6	12:06	9767	68	51/48	66/80	69/67	98/91	97/10.2		77.1	16.1	4.4	27.5	10.2	
87.5	61	2	06	12:22	10300	62	54/51	43/48	48/45	96/83	97/96		65.7	15.5	4.4	18.9	4.1	
87.5	61	1	7	12:23	10303	62	51/47	68/72	68/69	98/89	95/100		75.7	16.2	4.4	27.4	10.2	
88	66	2	07	12:38	10863	62	51/54	46/50	43/49	96/79	95/92		65.4	15.5	4.4	18.8	4.1	
88	66	1	8	12:38	10879	66	47/48	68/75	69/77	97/94	98/10.9		78.2	16.1	4.3	27.3	10.1	

Recorded by MARK Z

Checked by

Sheet 21	* STATE_CODE	_4_7_
LTPP Traffic Data	*SPS PROJECT_ID	_0_6_0_0_
WIM System Test Truck Records 2 of 3	* DATE	_0_9_/_3_0_/_2_0_0_8_

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	
85.5	65	2	8	12:54	11404	67	54/53	44/43	49/48	96/99	85/91		64.2	15.6	4.4	18.9	4.1		
85.5	64	1	9	12:54	11409	64	47/50	66/69	60/71	93/92	90/10.9		74.8	16.1	4.4	22.4	10.2		
95	73	2	9	14:10	14015	73	52/50	44/49	44/41	99/82	94/89		64.5	15.6	4.4	18.7	4.1		
95	70	1	10	14:10	14022	70	49/49	68/81	69/68	97/89	98/10.4		77.0	16.1	4.3	22.4	10.1		
102.5	63	2	10	14:26	14599	62	49/52	41/49	44/47	99/84	98/96		65.9	15.6	4.4	18.8	4.1		63 mph
102.5	63	1	11	14:26	14609	62	46/53	62/79	65/72	99/94	99/10.6		77.6	16.8	4.4	23.5	10.1		
100.5	66	2	11	14:42	15156	67	51/50	49/50	44/46	10.1/83	93/92		65.8	15.5	4.4	18.8	4.1		
100.5	65	1	12	14:42	15160	65	49/50	64/77	64/72	94/97	95/10.5		76.6	16.1	4.3	22.3	10.1		
99.5	72	2	12	14:58	15733	70	50/50	51/50	48/49	98/81	91/93		66.2	15.5	4.4	18.8	4.1		72 mph
99.5	70	1	13	14:58	15740	70	49/48	62/77	67/73	93/95	91/10.7		76.3	16.0	4.3	22.3	10.1		
93.5	63	2	13	15:13	16311	63	50/52	45/50	45/45	98/83	99/93		66.1	15.5	4.4	18.8	4.1		
93.5	63	1	14	15:13	16319	63	46/51	64/77	67/71	96/97	93/11.1		72.4	16.1	4.3	22.4	10.2		
86.5	67	2	14	15:29	16907	67	49/56	51/50	46/50	97/86	88/91		66.3	15.5	4.4	18.8	4.2		
86.5	66	1	15	15:29	16926	67	50/50	60/76	69/78	82/81	85/92		71.3	16.1	4.3	22.6	10.2		
86	70	2	15	15:45	17485	70	51/52	42/42	44/46	10.2/80	90/89		63.9	15.6	4.4	18.9	4.1		
86	69	1	16	15:45	17492	70	46/53	65/81	67/75	92/92	91/10.8		76.9	16.1	4.4	22.4	10.1		

Recorded by MARK E

Checked by

Sheet 21	* STATE_CODE	4 7
LTPP Traffic Data	*SPS PROJECT_ID	0 6 0 0
WIM System Test Truck Records 3 of 3	* DATE	0 9 / 3 0 / 2 0 0 8

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
89	62	2	16	16:01	18140	62	52/50	42/47	47/45	96/82	102/96		66.6	15.6	4.3	18.8	4.1	
89	62	1	17	16:02	18148	63	48/50	67/79	70/68	104/89	98/108		78.0	16.1	4.4	27.3	10.2	
87.5	66	2	17	16:17	18720	68	51/49	47/52	46/45	100/85	90/95		66.0	15.6	4.4	18.8	4.2	
87.5	65	1	18	16:20	18810	65	48/52	65/74	68/73	101/92	98/106		77.7	16.0	4.3	27.4	10.1	
86.5	72	2	18	16:34	19384	72	50/49	51/53	42/42	98/86	100/91		66.3	15.5	4.4	18.8	4.1	
86.5	70	1	19	16:35	19397	70	47/46	68/76	61/75	98/93	96/108		76.8	16.1	4.4	27.4	10.1	
85.5	61	2	19	16:52	20017	62	51/52	46/48	47/45	95/81	106/99		66.4	15.5	4.4	18.9	4.1	
85.5	61	1	20	16:52	20020	62	49/53	65/76	61/74	93/94	93/102		75.9	16.1	4.3	27.3	10.1	
85	67	2	20	17:09	20685	67	50/50	40/45	46/45	99/78	102/93		65.2	15.6	4.3	18.8	4.1	
85	65	1	21	17:10	20700	65	[illegible]	[illegible]	63/69	101/89	97/105		76.2	16.1	4.4	27.3	10.1	
							51/47	65/76										

66.0 M3

Recorded by MARK Z

Checked by [signature]

Sheet 21	* STATE_CODE 47
LTPP Traffic Data	*SPS PROJECT_ID 0600
WIM System Test Truck Records 1 of 1	* DATE 10/01/2008

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
68	63	2	1	9:21	38548	63	54/57	54/58	54/62	85/83	85/92		68.5	15.6	4.3	18.8	4.1	
68	65	1	1	9:21	38556	65	46/54	81/94	80/90	83/90	81/96		79.3	17.9	4.3	33.8	4.1	
65.5	65	2	2	9:38	39070	67	55/53	55/58	55/60	85/83	81/93		67.8	15.6	4.4	18.8	4.2	
65.5	59	1	2	9:39	39086	59	50/50	85/86	86/88	86/84	79/95		78.9	18.0	4.3	33.8	4.1	
67	71	2	3	9:55	39587	72	55/54	46/53	58/60	87/85	85/89		67.2	15.6	4.3	18.9	4.2	
67	70	1	3	9:55	39602	70	47/50	80/92	83/84	85/84	78/91		78.2	17.9	4.3	33.7	4.1	
75	64	2	4	10:12	40127	63	54/51	54/61	55/61	88/82	88/92		68.6	15.6	4.4	18.9	4.2	
75	59	1	4	10:14	40205	59	49/47	87/89	85/82	89/85	81/90		78.3	18.0	4.3	33.8	4.1	
81	67	2	5	10:30	40776	68	52/54	54/57	59/59	85/82	84/94		68.0	15.6	4.3	18.8	4.2	
81	62	1	5	10:30	40796	64	50/49	90/92	81/89	82/83	82/94		79.4	17.9	4.3	33.6	4.1	
87.5	72	2	6	10:46	41301	73	55/50	70/70	58/60	90/76	86/85		70.1	15.5	4.4	18.9	4.2	
87.5	63	1	6	10:47	41321	65	48/48	87/89	89/81	81/87	80/92		78.2	17.9	4.3	33.7	4.1	

Recorded by MARK Z

Checked by

Sheet 21	* STATE_CODE 47
LTPP Traffic Data	*SPS PROJECT_ID 0600
WIM System Test Truck Records 1 of 2	* DATE 10/01/2008

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	
79	60	2	1	11:04	41892	61	55/54	55/58	57/59	88/86	91/88		69.1	15.6	4.4	18.9	4.2		
	~~52~~	~~1~~	~~1~~	~~11:04~~	~~41899~~	~~58~~	~~58/55~~	~~67/66~~	~~70/55~~	~~82/75~~	~~80/70~~		~~68.8~~						WRONG TRUCK
79	57	1	1	11:04	41899	58	46/51	83/90	81/85	82/83	71/97		77.0	17.9	4.3	33.6	4.1		
	~~62~~	~~2~~	~~2~~	~~11:20~~	~~42448~~	~~67~~	~~58/55~~	~~68/73~~	~~69/74~~	~~59/78~~	~~63/75~~		~~67.3~~	~~15.4~~	~~4.3~~				WRONG TRUCK
75	~~66~~	2	2	11:20	~~42436~~ ~~42459~~	68	53/50	56/61	58/62	87/78	89/88		68.2	15.5	4.4	18.9	4.2		
75	64	1	2	11:20	42459	64	50/49	87/91	88/88	77/90	79/93		78.4	17.9	4.3	33.6	4.1		
83	62	2	3	11:36	42959	63	54/55	56/54	59/57	87/86	87/90		68.6	15.6	4.4	18.9	4.1		
83	66	1	3	11:36	42970	66	47/48	83/87	90/82	90/82	79/88		77.7	17.9	4.3	33.7	4.1		
81.5	61	2	4	11:53	43563	61	49/56	53/63	56/62	85/86	82/95		68.6	15.5	4.4	18.9	4.2		
81.5	57	1	4	11:54	43585	59	47/52	79/90	81/83	93/83	80/93		78.1	17.9	4.3	33.7	4.1		
79.5	66	2	5	12:21	44496	67	53/49	62/60	55/58	87/80	92/91		68.6	15.5	4.4	18.9	4.1		
79.5	62	1	5	12:22	44505	63	50/50	84/91	81/89	79/88	79/96		78.7	17.9	4.3	33.6	4.1		
77.5	70	2	6	12:37	45062	70	52/57	52/57	53/54	82/81	83/88		66.0	15.6	4.4	18.8	4.2		
77.5	68	1	6	12:38	45082	69	49/47	87/91	89/88	84/79	77/91		78.2	17.9	4.3	33.7	4.1		
79	60	2	7	12:54	45588	61	52/51	58/60	53/58	86/84	81/93		67.6	15.5	4.4	18.9	4.2		
79	58	1	7	12:54	45616	59	46/51	82/89	84/86	76/82	71/97		76.4	17.9	4.3	33.7	4.1		

Recorded by MARK B Checked by

Sheet 21	* STATE_CODE 47
LTPP Traffic Data	*SPS PROJECT_ID 0600
WIM System Test Truck Records 2 of 2	* DATE 10/01/2008

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
81.5	65	2	8	13:10	46223	66	53/52	54/60	57/58	88/85	85/94		68.5	15.6	4.3	18.9	4.2	
81.5	63	1	8	13:11	46225	63	50/53	87/88	86/85	70/85	67/92		76.1	17.9	4.3	33.6	4.1	
81.5	70	2	9	13:28	46796	72	51/52	53/54	55/55	86/80	85/89		66.0	15.6	4.3	18.8	4.2	
81.5	68	1	9	13:28	46810	69	47/47	86/87	87/83	91/78	81/92		78.0	17.9	4.3	33.8	4.1	
88	62	2	10	13:44	47345	62	51/52	53/54	55/57	91/80	86/92		67.0	15.6	4.3	18.8	4.2	
88	58	1	10	13:44	47358	58	47/48	83/86	82/82	87/79	82/88		76.4	17.9	4.3	33.6	4.1	
85.5	65	2	11	14:01	47960	66	50/51	58/63	55/60	84/82	89/96		69.0	15.5	4.4	18.8	4.1	
85.5	64	1	11	14:02	47994	63	49/50	85/88	84/86	90/80	79/94		78.4	18.0	4.3	33.8	4.1	
98	66	2	12	14:17	48556	67	50/57	58/62	55/56	84/80	81/86		67.2	15.5	4.3	18.8	4.1	
98	67	1	12	14:18	48596	68	46/49	85/89	86/87	87/80	79/89		77.6	18.0	4.3	33.7	4.1	
88.5	62	2	13	14:35	49215	62	51/54	51/58	54/63	86/82	80/95		67.4	15.5	4.3	18.9	4.1	
88.5	57	1	13	14:35	49248	57	47/47	81/85	84/83	91/81	82/88		77.0	17.9	4.3	33.7	4.1	
95	65	2	14	14:52	49889	67	51/49	55/59	53/58	85/84	92/95		68.1	15.5	4.4	18.9	4.1	
95	63	1	14	14:53	49907	63	50/47	82/89	80/83	91/80	78/92		77.2	18.0	4.3	33.8	4.1	

Recorded by MARK Z

Checked by

Calibration Worksheet

Site: 470600

Calibration Iteration 2 Date 10/1/09

Beginning factors:

Speed Point (mph)	Name	Value	left 1/3	right 2/4
~~Overall~~ Distance	axl sen sep	302	302	
Front Axle	dynamic comp	107	107	
1 – (55)	88 kph	2819	2992	
2 – (60)	96 kph	2819	2992	
3 – (65)	104 kph	2819	2992	
4 – (70)	112 kph	2819	2992	
5 – (75)	120 kph	2819	2992	

Errors:

	Speed Point 1 (60)	Speed Point 2 (65)	Speed Point 3 (70)	Speed Point 4	Speed Point 5
F/A		-1.2	-2.2	-2.6	
Tandem		-3.3	-3.6	-2.9	
GVW		-2.6	-3.3	-2.9	

Adjustments:

	Raise	Lower	Percentage
~~Overall~~ Distance	☐	☐	n/c
Front Axle	☐	☑	~~1.0~~ 3.0
Speed Point 1	☐	☐	
Speed Point 2	☑	☐	2.9
Speed Point 3	☑	☐	3.7
Speed Point 4	☑	☐	3.2
Speed Point 5	☑	☐	3.2

End factors:

Speed Point (mph)	Name	Value	left 1/3	right 2/4
~~Overall~~ Distance	axl sen sep	302	302	
Front Axle	dynamic comp	104	104	
1 – (55)	80 kph	2899	3097	
2 – (60)	96 kph	2899	3077	
3 – (65)	104 kph	2923	3102	
4 – (70)	112 kph	2910	3089	
5 – (75)	120 kph	2910	3089	

TEST VEHICLE PHOTOGRAPHS FOR SPS WIM VALIDATION

September 30 and October 1, 2008

STATE: Tennessee

SHRP ID: 0600

Photo 1 - 470600_Truck_1_Tractor_Day_1_09_30_08.jpg

Photo 2 - 470600_Truck_1_Trailer_Day_1_09_30_08.jpg

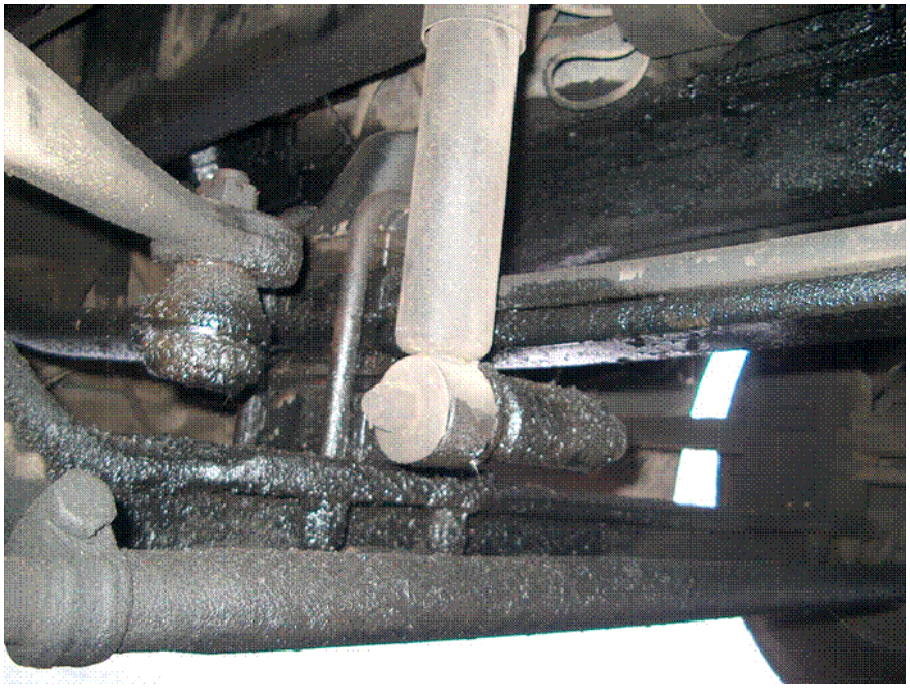


Photo 3 - 470600_Truck_1_Suspension_1_Day_1_09_30_08.jpg

Photo 4 - 470600_Truck_1_Suspension_2_Day_1_09_30_08.jpg

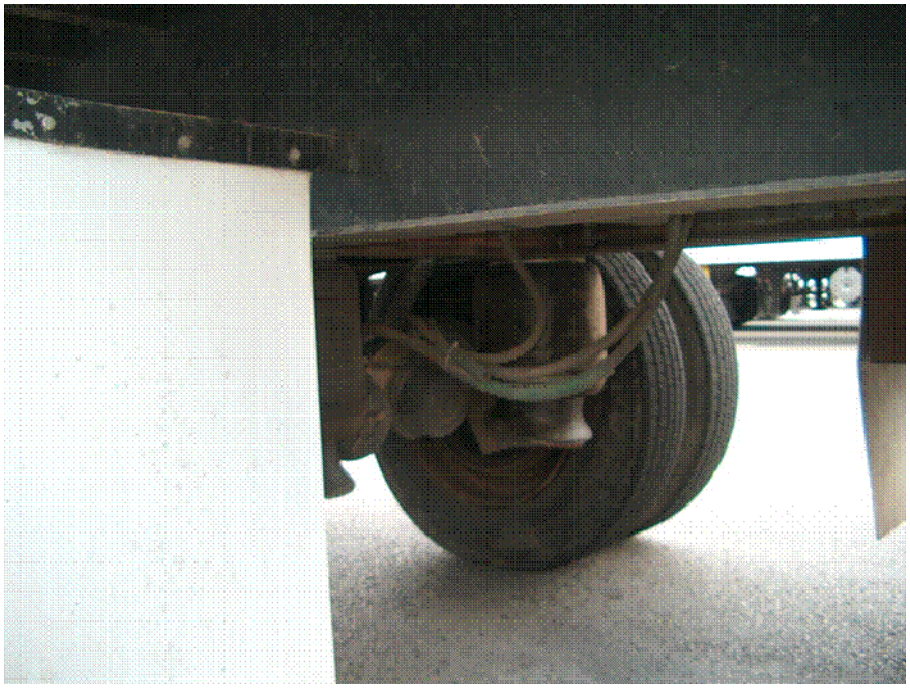


Photo 5 - 470600_Truck_1_Suspension_3_Day_1_09_30_08.jpg

Photo 6 - 470600_Truck_1_Tractor_Day_2_10_01_08.jpg

Photo 7 - 470600_Truck_1_Trailer_Day_2_09_30_08jpg

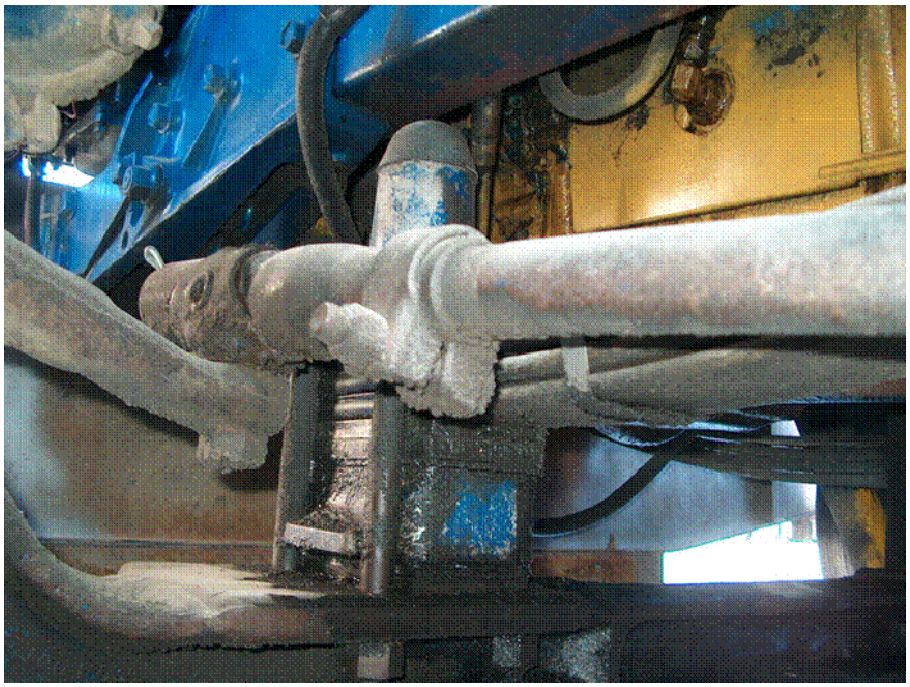


Photo 8 - 470600_Truck_1_Suspension_1_Day_2_10_01_08.jpg

Photo 9 - 470600_Truck_1_Suspension_2_Day_2_10_01_08.jpg

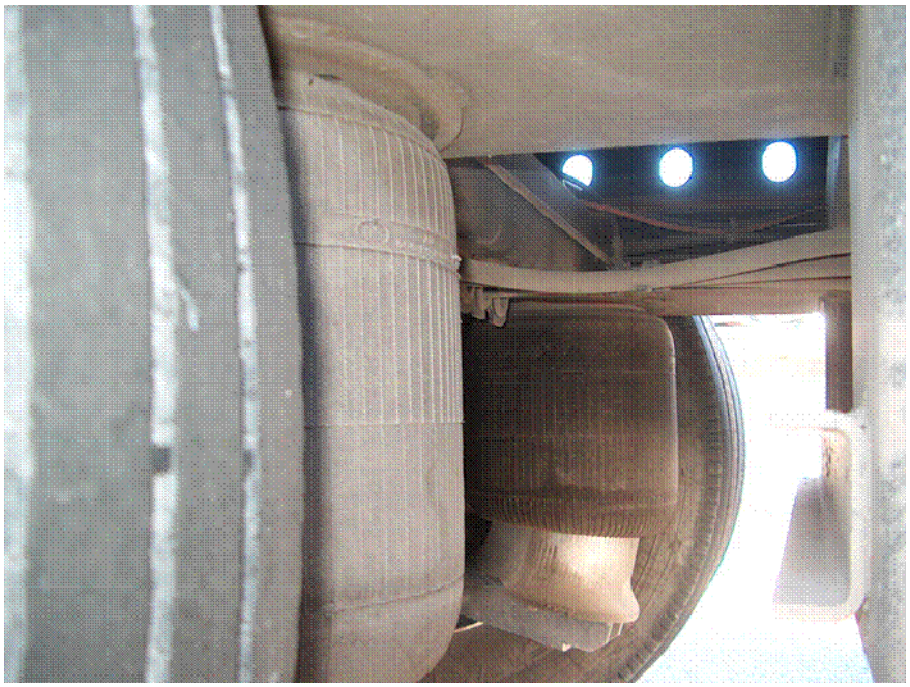


Photo 10 - 470600_Truck_1_Suspension_3_Day_2_10_01_08.jpg

Photo 11 - 470600_Truck_2_Tractor_09_30_08.jpg

Photo 12 - 470600_Truck_2_Trailer_09_30_08.jpg

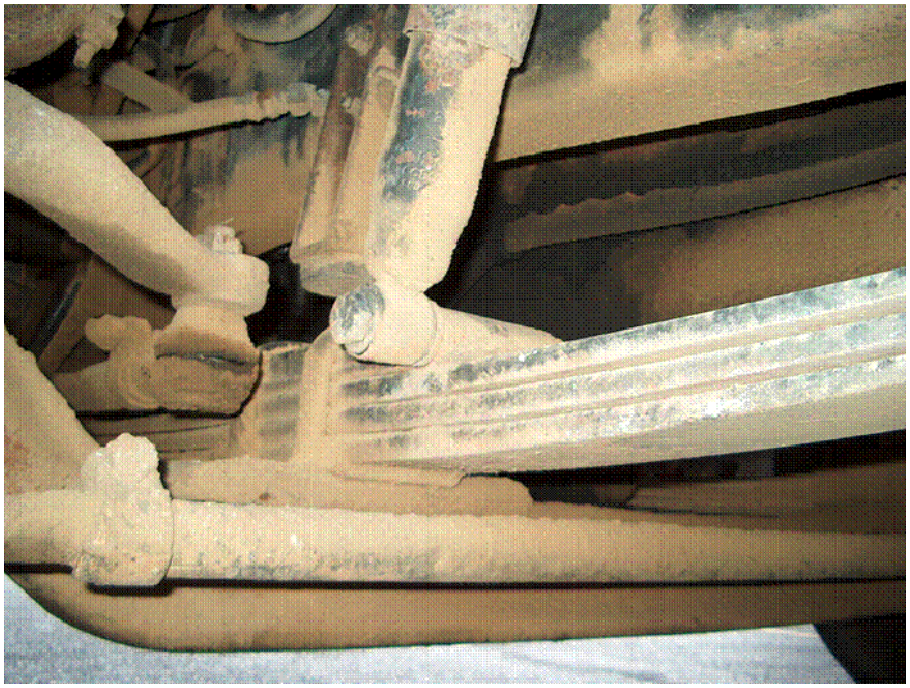


Photo 13 - 470600_Truck_2_Suspension_1_09_30_08.jpg

Photo 14 - 470600_Truck_2_Suspension_2_09_30_08.jpg

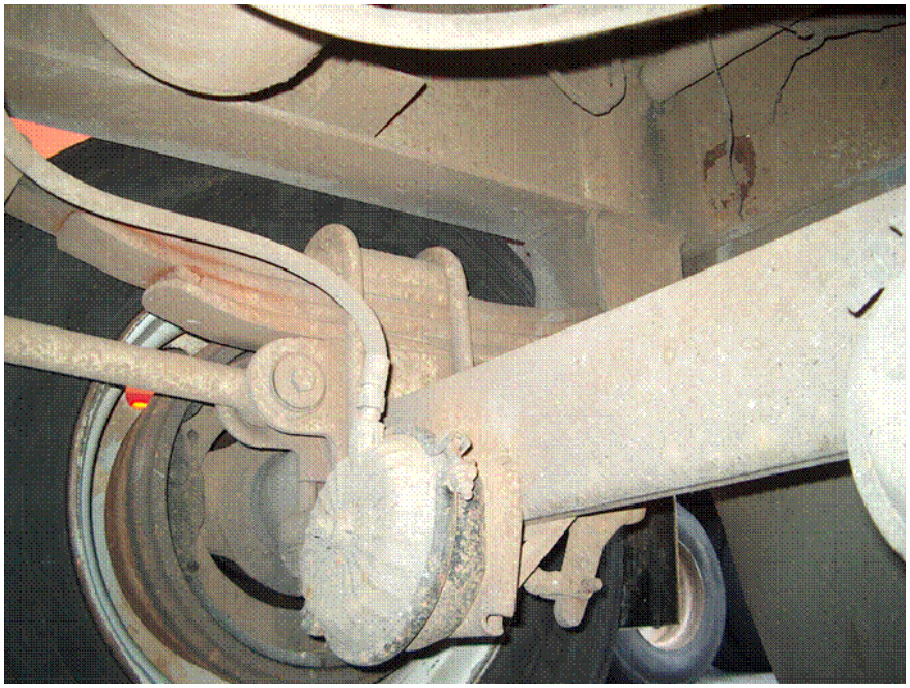


Photo 15 - 470600_Truck_2_Suspension_3_09_30_08.jpg

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

Tennessee SPS-6 (Lane 4)

Calibration Factors for Sensor #1 (Left)

Validation Visit	1 October 2008	30 September 2008	13 June 2007
Axle sensor separation	302	302	
Dynamic Compensation	104	107	
88 kph	2899	2819	2764
96 kph	2899	2819	2764
104 kph	2923	2819	2764
112 kph	2910	2819	2764
120 kph	2910	2819	2764

Calibration Factors for Sensor #2 (Right)

Validation Visit	1 October 2008	30 September 2008	13 June 2007
Axle sensor separation	302	302	
Dynamic Compensation	104	107	
88 kph	3077	2992	2934
96 kph	3077	2992	2934
104 kph	3102	2992	2934
112 kph	3089	2992	2934
120 kph	3089	2992	2934