Validation Report

Maine, SPS-5
Task Order 15, CLIN 2
October 14 to 15, 2008

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1 Executive Summary

A visit was made to the Maine 0500 on October 14 to 15, 2008 for the purpose of conducting a validation of the WIM system located on I-95 approximately 17 miles north of I-395 near Bangor, Maine. The SPS-5 is located in the righthand, northbound lane of a four-lane divided facility. The posted speed limit at this location is 65 mph. The LTPP lane is the only lane that is instrumented at this site. The validation procedures were in accordance with LTPP's SPS WIM Data Collection Guide dated August 21, 2001.

This site has been monitored since at least the mid-1990s with a series of three different piezo systems in the vicinity of Argyle. This is our second validation visit to this location. The site was installed on May 22 to 23, 2007 by International Road Dynamics Inc..

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

The site is instrumented with quartz piezo WIM 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 76,370 lbs., the "golden" truck.
2) 5-axle tractor semi-trailer with a tractor having an air suspension and a trailer with a split rear tandem and an air suspension loaded to 64,420 lbs., the "partial" truck.

The validation speeds ranged from 53 to 65 miles per hour. The pavement temperatures ranged from 51 to 71 degrees Fahrenheit. The desired speed range was achieved during this validation. The desired 30 degree Fahrenheit temperature range was not achieved.

Table 1-1 - Post-Validation results – 230500 – 15-Oct-2008

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-1.0 ± 4.4%	Pass
Single axles	±20 percent	-1.7 ± 6.1%	Pass
Tandem axles	±15 percent	-1.1 ± 5.1%	Pass
GVW	±10 percent	-1.4 ± 2.9%	Pass
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.1 ft	Pass

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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

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This site still needs four years of data to meet the goal of five years of research quality data as 2008 is expected to have a year of research quality data.

2 Corrective Actions Recommended

No maintenance beyond the routine activities programmed for this site has been identified.

If the LTPP Classification Algorithm undergoes additional modification, reviewing the differentiation between Class 4 and Class 5 vehicles should be considered for this site.

3 Post Calibration Analysis

This final analysis is based on test runs conducted October 15, 2008 from mid-morning to late afternoon at test site 230500 on I-95. This SPS-5 site is at milepost 200.1 on the northbound, righthand of a four-lane divided facility. No auto-calibration was used during test runs. The two trucks used for calibration and for the subsequent validation included:

1. 5-axle tractor-trailer with a tractor having an air suspension and trailer with a standard rear tandem and air suspension loaded to 76,370 lbs., the "golden" truck.
2. 5-axle tractor semi-trailer with a tractor having an air suspension and a trailer with a split rear tandem and an air suspension loaded to 64,420 lbs., the "partial" truck.

Each truck made a total of 20 passes over the WIM scale at speeds ranging from approximately 53 to 65 miles per hour. The desired speed range was achieved during this validation. Pavement surface temperatures were recorded during the test runs ranged from about 51 to 71 degrees Fahrenheit. The desired 30 degree Fahrenheit temperature range was not achieved. The computed values of 95% confidence limits of each statistic for the total population are in Table 3-1.

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

Table 3-1 - Post-Validation Results – 230500 – 15-Oct-2008

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-1.0 ± 4.4%	Pass
Single axles	±20 percent	-1.7 ± 6.1%	Pass
Tandem axles	±15 percent	-1.1 ± 5.1%	Pass
GVW	±10 percent	-1.4 ± 2.9%	Pass
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.1 ft	Pass

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The test runs were conducted from mid-morning throughout the after resulting in modest range of pavement temperatures. 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 data set was split into three speed groups and two

temperature groups. The distribution of runs by speed and temperature is illustrated in Figure 3-1. The figure indicates that the desired distribution of speed and temperature combinations was not achieved for this set of validation runs. Only a twenty degree temperature range was obtained.

The three speed groups were divided as follows: Low speed – 53 to 57 mph, Medium speed – 58 to 62 mph and High speed – 63 + mph. The two temperature groups were created by splitting the runs between those at 51 to 60 degrees Fahrenheit for Low temperature, and 61 to 71 degrees Fahrenheit for High temperature.

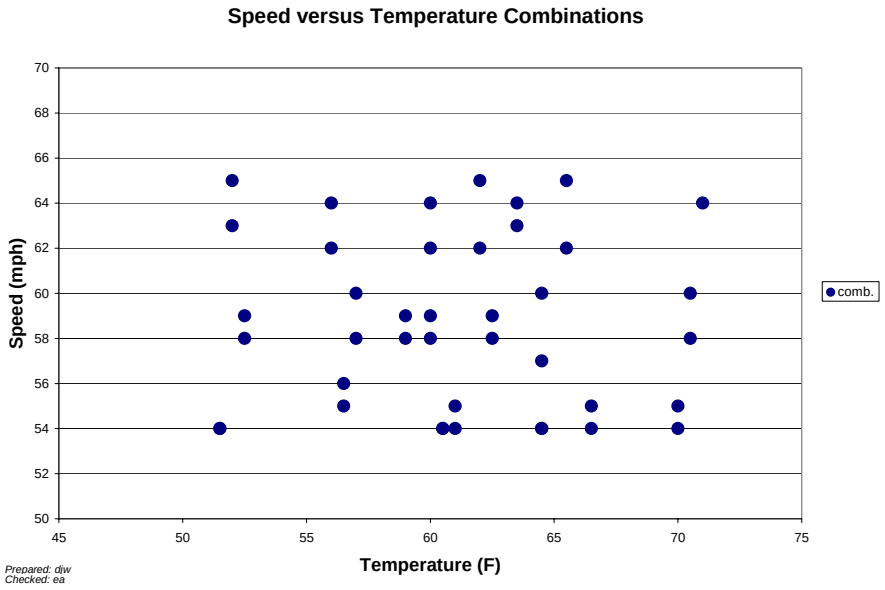

Figure 3-1 - Post-Validation Speed-Temperature Distribution – 230500 – 15-Oct-2008

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. Figure 3-2 shows that the variability in error is consistent throughout the entire speed range with a very slight upward trend as speed increases.

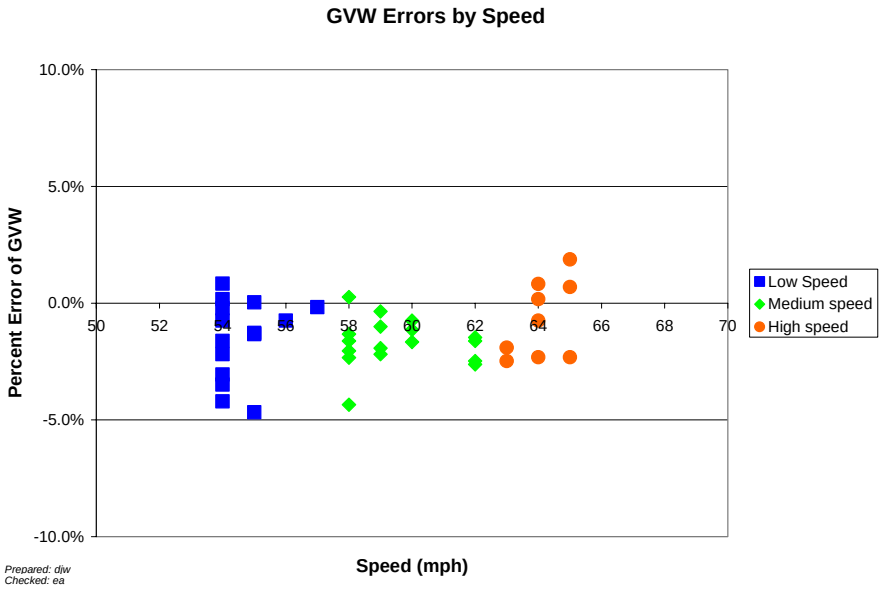

Figure 3-2 - Post-Validation GVW Percent Error vs. Speed – 230500 – 15-Oct-2008

Figure 3-3 shows the relationship between temperature and GVW percentage error. There appears to be a consistent downward trend from low to high temperature. Variability is consistent throughout the entire temperature range

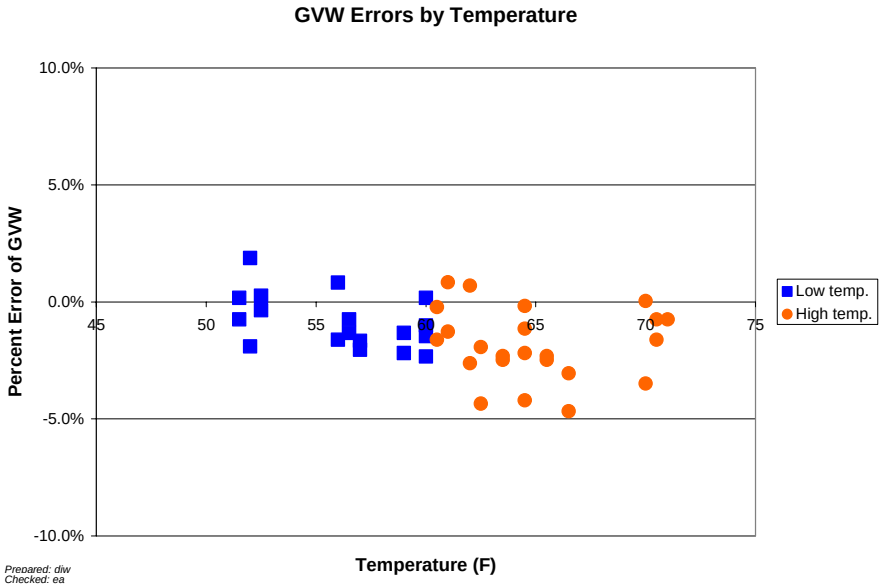

Figure 3-3 - Post-Validation GVW Percent Error vs. Temperature – 230500 – 15-Oct-2008

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. There is no apparent relationship between speed and axle spacing measurements.

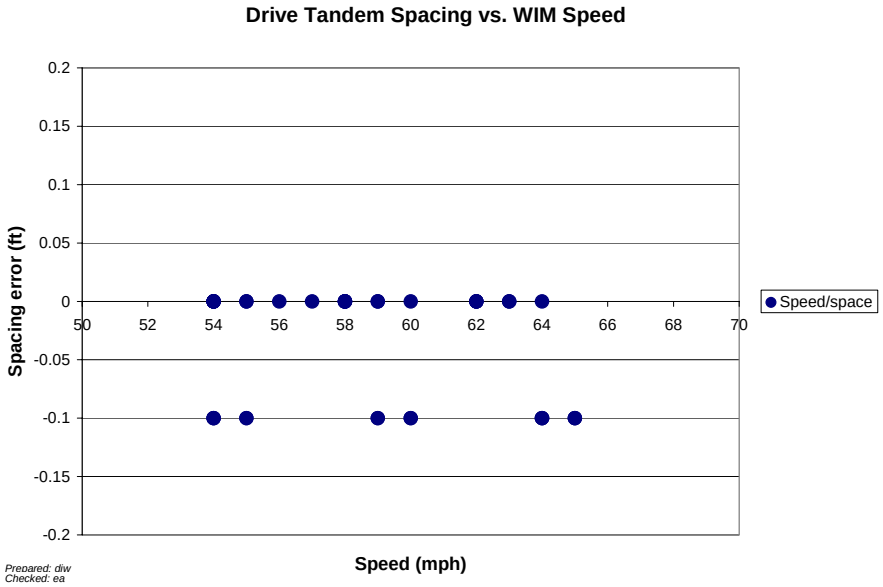

Figure 3-4 - Post-Validation Spacing vs. Speed – 230500 – 15-Oct-2008

3.1 Temperature-based Analysis

The two temperature groups were created by splitting the runs between those at 51 to 60 degrees Fahrenheit for Low temperature, and 61 to 71 degrees Fahrenheit for High temperature.

Table 3-2 - Post-Validation Results by Temperature Bin – 230500 – 15-Oct-2008

Element	95% Limit	Low Temperature 51 to 60 °F	High Temperature61 to 71 °F
Steering axles	±20 %	-0.8 ± 4.1%	-1.1 ± 5.0%
Single axles	±20 %	-1.5 ± 5.4%	-1.8 ± 6.8%
Tandem axles	±15 %	-0.3 ± 5.4%	-1.8 ± 4.7%
GVW	±10 %	-0.9 ± 2.4%	-1.8 ± 3.2%
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft

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From Table 3-2, it can be seen that the equipment underestimates temperatures for all loading statistics throughout the observed temperature range. The underestimation is somewhat larger at the upper end.

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

From Figure 3-5 it can be seen that the GVW for both the golden truck (squares) and the partial truck (diamonds) were underestimated. Variability in error for both trucks is also similar. There is a downward trend from low to high temperatures.

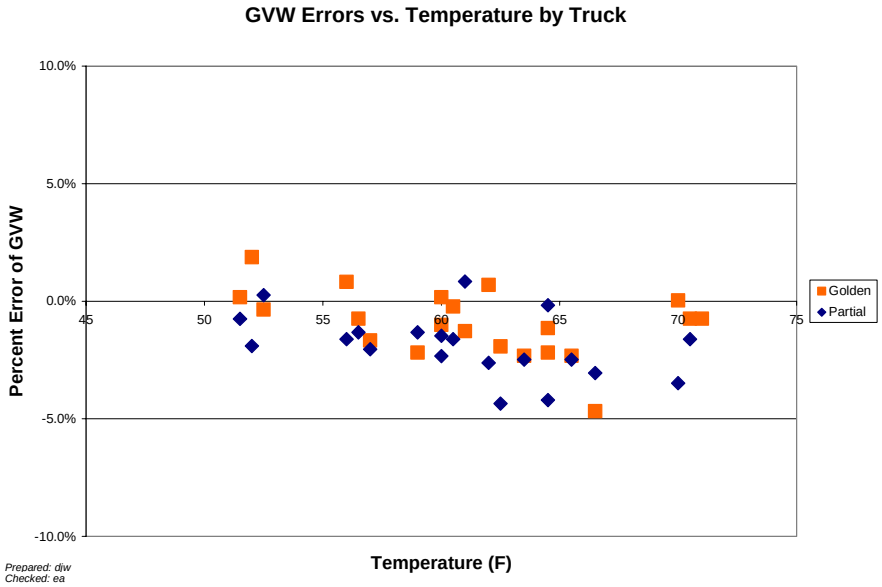

Figure 3-5 - Post-Validation GVW Percent Error vs. Temperature by Truck – 230500 – 15-Oct-2008

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 auto-calibration. This site does not use auto-calibration. The steering axles in this graph are associated only with Class 9 vehicles. The steering axles in Figure 3-6 are generally underestimated at all temperatures.

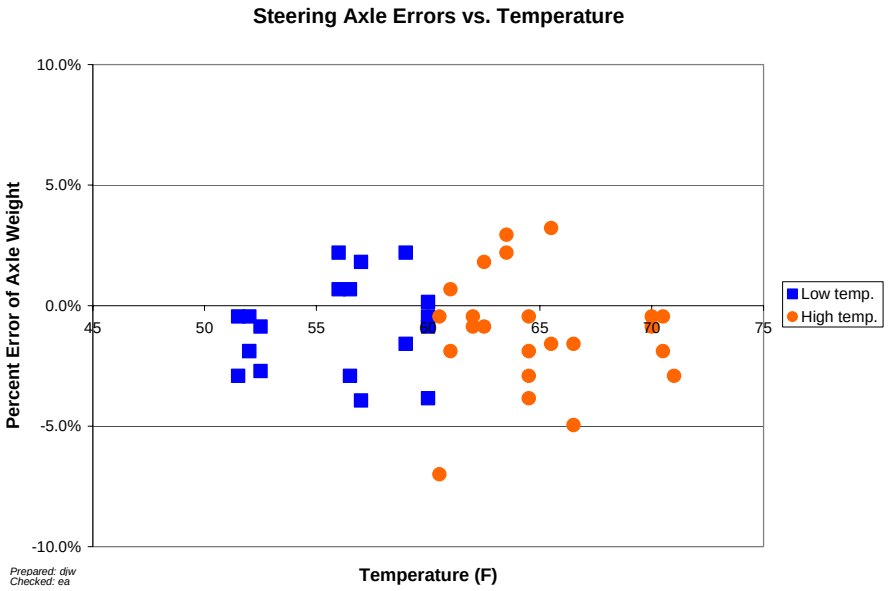

Figure 3-6 - Post-Validation Steering Axle Error vs. Temperature by Group – 230500 – 15-Oct-2008

Figure 3-7 shows that single axles are generally underestimated at all temperatures. The graph exhibits a downward trend from lower temperatures to higher temperatures.

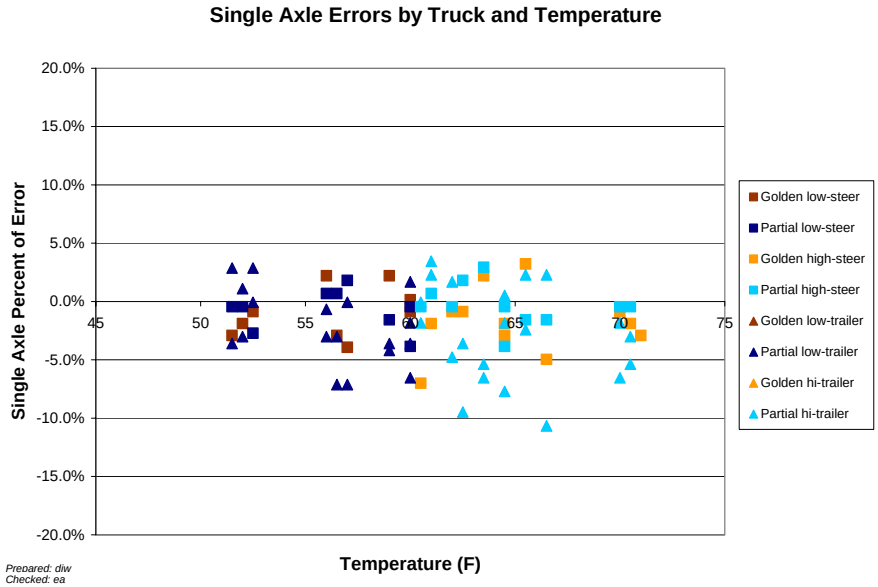

Figure 3-7 - Post-Validation Single Axle Errors by Truck and Temperature – 230500 – 15-Oct-2008

3.2 Speed-based Analysis

The three speed groups were created using 53 to 57 mph for Low speed, 58 to 62 mph for Medium speed and 63+ mph for High speed.

Table 3-3 - Post-Validation Results by Speed Bin – 230500 – 15-Oct-2008

Element	95% Limit	Low Speed 53 to 57 mph	Medium Speed 58 to 62 mph	High Speed 63+ mph
Steering axles	±20 %	-1.9 ± 4.6%	-0.9 ± 4.0%	0.4 ± 5.2%
Single axles	±20 %	-2.0 ± 6.7%	-1.8 ± 5.8%	-0.8 ± 6.8%
Tandem axles	±15 %	-1.3 ± 4.3%	-1.4 ± 5.3%	-0.6 ± 6.7%
GVW	±10 %	-1.5 ± 3.6%	-1.7 ± 2.2%	-0.7 ± 3.8%
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft	-0.1 ± 0.1 ft

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Table 3-3 shows the underestimation of all weights at all speeds.

Figure 3-8 illustrates the tendency for the system to underestimate GVW at all speeds. Variability in error is consistent throughout the entire speed range.

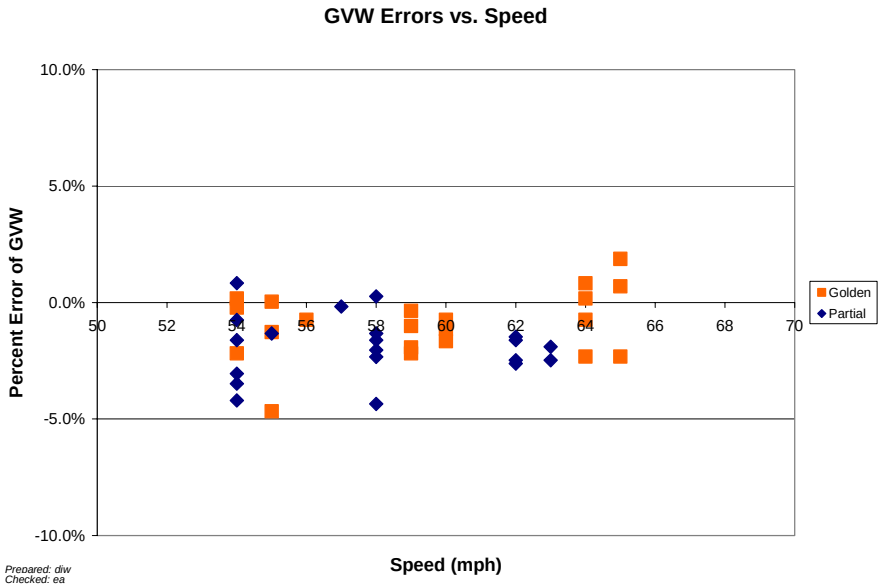

Figure 3-8 - Post-Validation GVW Percent Error vs. Speed by Truck – 230500 – 15-Oct-2008

Figure 3-9 shows the relationship between steering axle errors and speed. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for auto-calibration. This site does not use auto-calibration. The steering axles in this graph are associated only with Class 9 vehicles. From Figure 3-9, it can be seen that the equipment tends to underestimate steering axle loads at all speeds with an upward progression from low to high speeds.

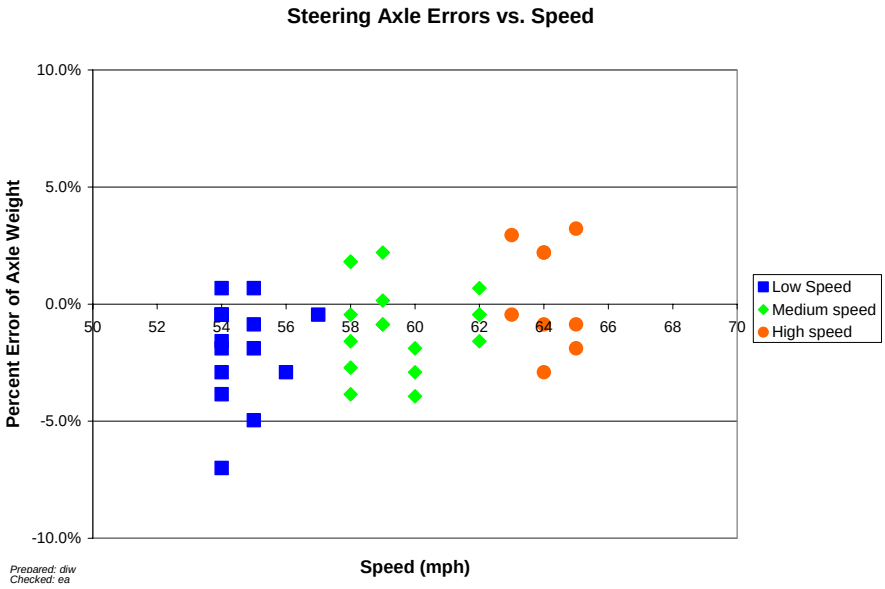

Figure 3-9 - Post-Validation Steering Axle Percent Error vs. Speed by Group – 230500 – 15-Oct-2008

Figure 3-10 is a single axle graph included because the partial truck had a split tandem on the trailer. It shows that single axles are generally underestimated at all temperatures. The graph exhibits an upward trend from lower speeds to higher speeds. Variability is greater at low and medium speed compared to high speed.

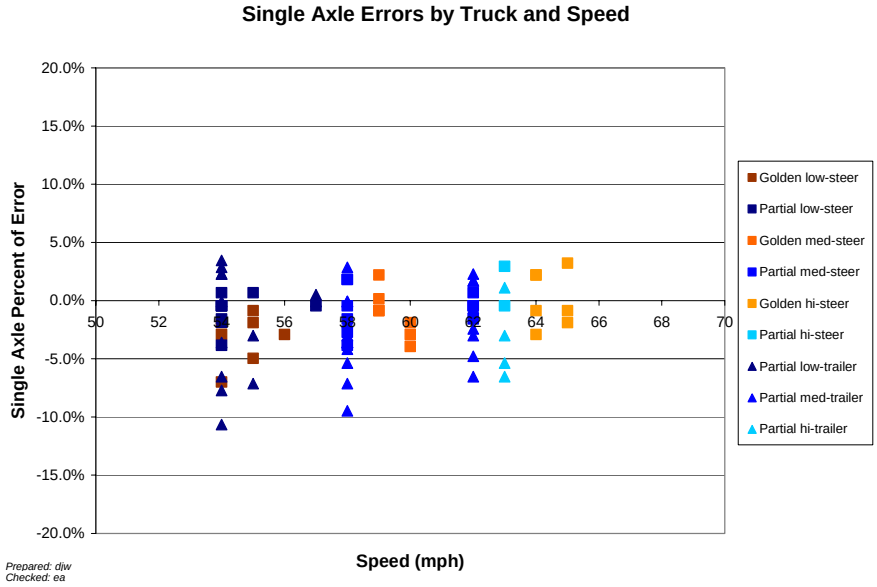

Figure 3-10 - Post-Validation Single Axle Errors by Truck and Speed – 230500 – 15-Oct-2008

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 100 trucks was collected at the site. Video was taken at the site to provide ground truth for the evaluation. Based on the sample it was determined that there are zero percent unknown vehicles and zero percent unclassified vehicles.

The second check is the ability of the algorithm to correctly distinguish between truck classes with no more than 2% errors in such classifications. Table 3-4 has the classification error rates by class. The overall misclassification rate is 7.8 percent. The errors are the result of confusing Class 4s and Class 5s vehicles.

Table 3-4 - Truck Misclassification Percentages for 230500 – 15-Oct-2008

Class	Percent Error	Class	Percent Error	Class	Percent Error
4	67	5	24	6	0
7	N/A				
8	0	9	0	10	0
11	N/A	12	N/A	13	N/A

Prepared: ea *Checked: bko*

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

Table 3-5 - Truck Classification Mean Differences for 230500 – 15-Oct-2008

Class	Mean Difference	Class	Mean Difference	Class	Mean Difference
4	- 50	5	21	6	0
7	N/A				
8	0	9	0	10	0
11	N/A	12	N/A	13	N/A

Prepared: ea *Checked: bko*

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

Unknown (UNK) are those identified by the equipment but no vehicles of the type were seen by the observer. There is no way to tell how many vehicles of that type might actually exist. N/A means no vehicles of the class were recorded by either the equipment or the observer. Four of six class 4s and one of five class 5s were mistakenly identified

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. The persistent failure to classify vehicles that are at the border of the length differentiation between Class 4 and Class 5 may be linked to errors in speed measurement of the WIM equipment or a function of the local vehicle population.

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: ea *Checked: bko*

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 Stantec on September 16, 2008 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

Prepared: als *Checked: jrn*

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 thresholds are presented in italics and values above the upper index thresholds are presented in bold.

Table 4-2 - WIM Index Values – 230500 –16-Sep-2008

Profiler Passes			Pass 1	Pass 2	Pass 3	Pass 4	Pass 5	Ave.
Center	LWP	LRI (m/km)	*0.380*	*0.396*	*0.400*	*0.407*	*0.359*	*0.388*
		SRI (m/km)	*0.375*	*0.424*	*0.424*	*0.402*	*0.344*	*0.394*
		Peak LRI (m/km)	0.651	0.568	0.594	0.572	0.529	0.583
		Peak SRI (m/km)	*0.572*	*0.738*	*0.708*	*0.689*	*0.594*	*0.660*
	RWP	LRI (m/km)	*0.388*	0.504	*0.462*	*0.485*	*0.436*	*0.455*
		SRI (m/km)	*0.347*	*0.440*	*0.371*	*0.457*	*0.413*	*0.406*
		Peak LRI (m/km)	0.545	0.536	*0.486*	0.506	*0.494*	0.513
		Peak SRI (m/km)	*0.444*	*0.536*	*0.522*	*0.584*	*0.517*	*0.521*
Left Shift	LWP	LRI (m/km)	0.624	0.575	0.620			0.606
		SRI (m/km)	0.841	0.696	0.732			0.756
		Peak LRI (m/km)	0.884	0.847	0.918			0.883
		Peak SRI (m/km)	0.938	0.787	0.851			0.859
	RWP	LRI (m/km)	0.651	0.721	0.620			0.664
		SRI (m/km)	*0.290*	*0.298*	*0.288*			*0.292*
		Peak LRI (m/km)	0.692	0.763	0.669			0.708
		Peak SRI (m/km)	*0.720*	*0.749*	*0.705*			*0.725*
Right Shift	LWP	LRI (m/km)	0.680	0.693	0.688			0.687
		SRI (m/km)	0.564	0.508	0.678			0.583
		Peak LRI (m/km)	0.700	0.754	0.698			0.717
		Peak SRI (m/km)	*0.639*	*0.724*	*0.715*			*0.693*
	RWP	LRI (m/km)	0.652	0.580	0.763			0.665
		SRI (m/km)	*0.448*	*0.442*	0.714			0.535
		Peak LRI (m/km)	0.654	0.624	0.774			0.684
		Peak SRI (m/km)	*0.665*	*0.655*	0.819			*0.713*

Prepared: als *Checked: jrn*

From Table 4-2 it can be seen that half of the indices computed from the profiles are below lower threshold values. The other half of the indices are between the lower and upper threshold values. These values indicate that the pavement roughness may or may not interfere with the validation of 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 WIM sensors and iSINC electronics. The sensors are installed in an asphalt concrete pavement.

5.1 Pre-Evaluation Diagnostics

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

5.2 Calibration Process

The equipment required two iterations of the calibration process between the initial 40 runs and the final 40 runs.

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 - 230500 - 14-Oct-2008

Speed Bin	Left Sensor 1	Right Sensor 2
80 kph	3053	3053
88 kph	2991	2991
96 kph	3084	3084
104 kph	3053	3053
112 kph	3053	3053

Prepared: ea *Checked: bko*

5.2.1 Calibration Iteration 1

As a result of the Pre-Validation, where there was consistent overestimation throughout the speed range, the compensation factors were adjusted as shown in Table 5-2.

Table 5-2 - Calibration 1 - Change in Parameters - 230500 - 15-Oct-2008

Speed Bins	Right Sensor 1	Change	Left Sensor 2	Change
50 kph	2862	4.3%	2862	4.3%
55 kph	2862	4.3%	2862	4.3%
60 kph	2884	6.5%	2884	6.5%
65 kph	2872	5.9%	2872	5.9%
70 kph	2872	5.9%	2872	5.9%

Prepared: ea *Checked: bko*

Table 5-3 shows the results of the first calibration iteration. Investigation of the error patterns indicated that although the trucks were the same as for the Pre-Validation, the responses did not track together. This led to the increase in variability that produced the failure. It was determined that the driver of the partial truck was different and it was

concluded that he may have misunderstood his instructions on speed approaching the sensor. It was decided to repeat the calibration iteration without any parameter changes.

Table 5-3 - Calibration Iteration 1 Results – 230500 – 15-Oct-2008 (08:52 AM)

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-3.5 ± 4.2%	Pass
Single axles	±20 percent	-5.4 ± 11.2%	Pass
Tandem axles	±15 percent	-1.3 ± 7.7%	Pass
GVW	**±10 percent**	**-2.9 ± 10.0%**	**Fail**
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	Pass

Prepared: ea *Checked: bko*

Figure 5-1 illustrates the source of the variability for the GVW error. The widely scattered diamonds are the errors associated with the partial truck.

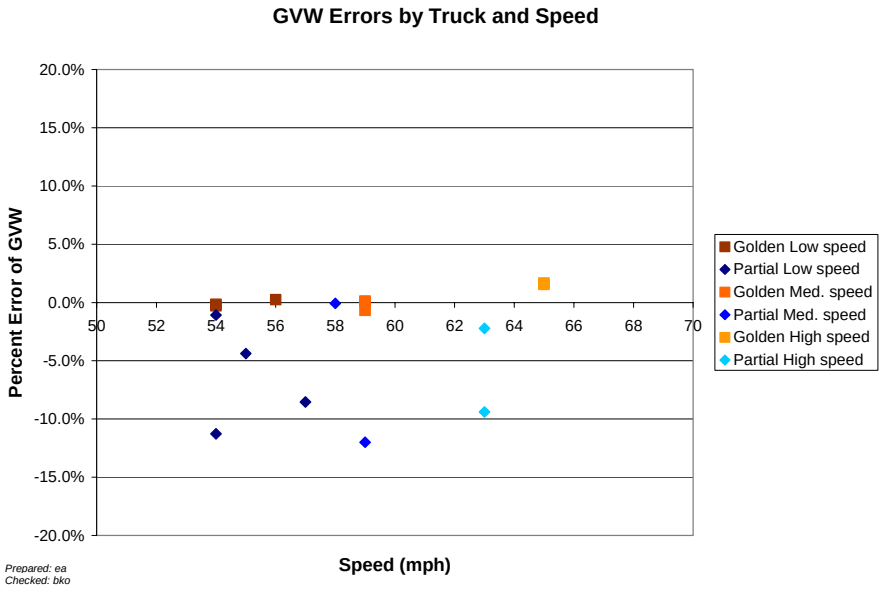

Figure 5-1 - Calibration Iteration 1 GVW Percent Error by Truck vs. Speed Group – 230500 – 15-Oct-2008 (08:52 AM)

5.2.2 Calibration Iteration 2

As a result of the first calibration, where it appeared that the driver of the partial truck changed speed approaching the sensors, the compensation factors were not adjusted but left as shown in Table 5-4.

Table 5-4 – Calibration 2 – Change in Parameters - 230500- 15-Oct-2008

Speed Bins	Right Sensor 1	Change	Left Sensor 2	Change
50 kph	2862	0.0	2862	0.0
55 kph	2862	0.0	2862	0.0
60 kph	2884	0.0	2884	0.0
65 kph	2872	0.0	2872	0.0
70 kph	2872	0.0	2872	0.0

Prepared: ea *Checked: bko*

Table 5-5 - Calibration Iteration 2 Results – 230500 – 15-Oct-2008 (10:14 AM)

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-2.8 ± 4.0%	Pass
Single axles	±20 percent	-2.2 ± 5.6%	Pass
Tandem axles	±15 percent	-0.3 ± 5.7%	Pass
GVW	±10 percent	-0.9 ± 2.7%	Pass
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.1 ft	Pass

Prepared: ea *Checked: bko*

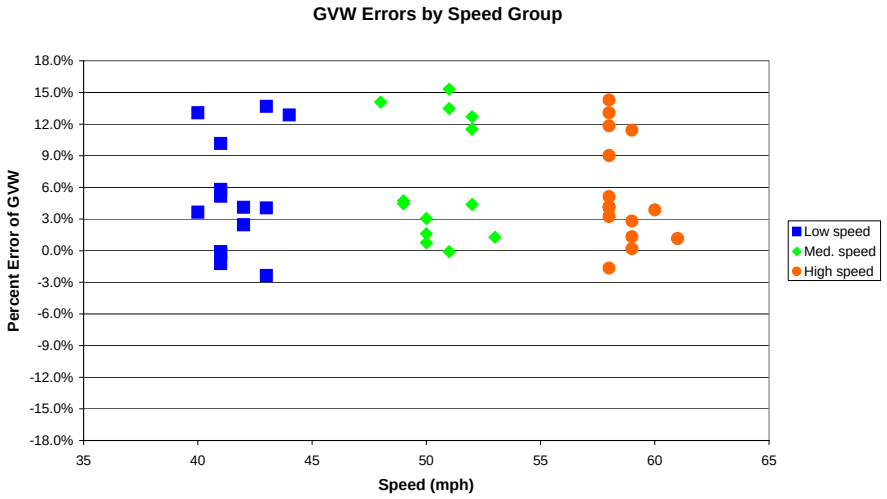

Figure 5-2 - Calibration Iteration 2 GVW Percent Error vs. Speed Group – 230500 – 15-Oct-2008 (10:14 AM)

5.3 Summary of Traffic Sheet 16s

This site has validation information from our previous visit as well as the current one in the tables below. Table 5-6 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 only reflect agency and this contractor's validation visits.

Table 5-6 - Classification Validation History – 230500 – 15-Oct-2008

Date	Method	Mean Difference				Percent Unclassified
		Class 9	Class 8	Other 1	Other 2	
15-Oct-08	Manual	0	0	0 (CL 10)	21 (CL 5)	0
14-Oct-08	Manual	0	0	0 (CL 10)	0 (CL 5)	0
15-Aug-07	Manual	0	0	0 (CL 10)		0
14-Aug-07	Manual	0	0	0 (CL 10)		0
02-Oct-02	Manual					
18-Oct-01	Manual					
18-Oct-00	Manual					

Prepared: ea *Checked: bko*

Table 5-7 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 only reflect agency and this contractor's validation visits.

Table 5-7 - Weight Validation History – 230500 – 15-Oct-2008

Date	Method	Mean Error and (SD)		
		GVW	Single Axles	Tandem Axles
15-Oct-08	Test Trucks	-1.4 (1.4)	-1.7 (3.1)	-1.1 (2.6)
14-Oct-08	Test Trucks	5.8 (2.7)	5.4 (4.7)	6.3 (2.8)
15-Aug-07	Test Trucks	2.4 (2.0)	4.8 (4.1)	2.0 (2.7)
14-Aug-07	Test Trucks	1.6 (2.8)	3.2 (4.2)	1.3 (3.2)
02-Oct-02	Test Trucks			
18-Oct-01	Test Trucks			
18-Oct-00	Test Trucks			

Prepared: ea *Checked: bko*

5.4 Projected Maintenance/Replacement Requirements

This site is scheduled for semi-annual maintenance under the installation contract.

6 Pre-Validation Analysis

This pre-validation analysis is based on test runs conducted October 14, 2008 in the afternoon at test site 230500 on I-95. This SPS-5 site is at milepost 200.1 on the northbound, righthand of a four-lane divided facility. No auto-calibration was used during test runs. The two trucks used for initial validation included:

1. 5-axle tractor semi-trailer combination with a tractor having an air suspension and trailer with standard rear tandem and an air suspension loaded to 76,200 lbs., the "golden" truck.
2. 5-axle tractor semi-trailer with a tractor having an air suspension and a trailer with a split rear tandem and an air suspension loaded to 69,900 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 51 to 65 miles per hour. The desired speed range was achieved during this validation. Pavement surface temperatures were recorded during the test runs ranging from about 54 to 65 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 6-1.

Table 6-1 indicates that due to bias in combination with GVW error, the condition for research quality loading data were not met.

Table 6-1 - Pre-Validation Results – 230500 – 14-Oct-2008

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	7.4 ± 8.5%	Pass
Single axles	±20 percent	5.4 ± 9.3%	Pass
Tandem axles	±15 percent	6.3 ± 5.6%	Pass
GVW	**±10 percent**	**5.8 ± 5.5%**	**Fail**
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.1 ft	Pass

Prepared: ea *Checked: bko*

The test runs were conducted primarily during the evening and early morning hours, resulting in a very narrow range of pavement temperatures. 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 one temperature group. 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 due to the limited temperature range.

The three speed groups were divided into 51 to 57 mph for Low speed, 58 to 62 mph for Medium speed and 63+ mph for High speed. The one temperature group was created by splitting the runs between those at 54 to 66 degrees Fahrenheit.

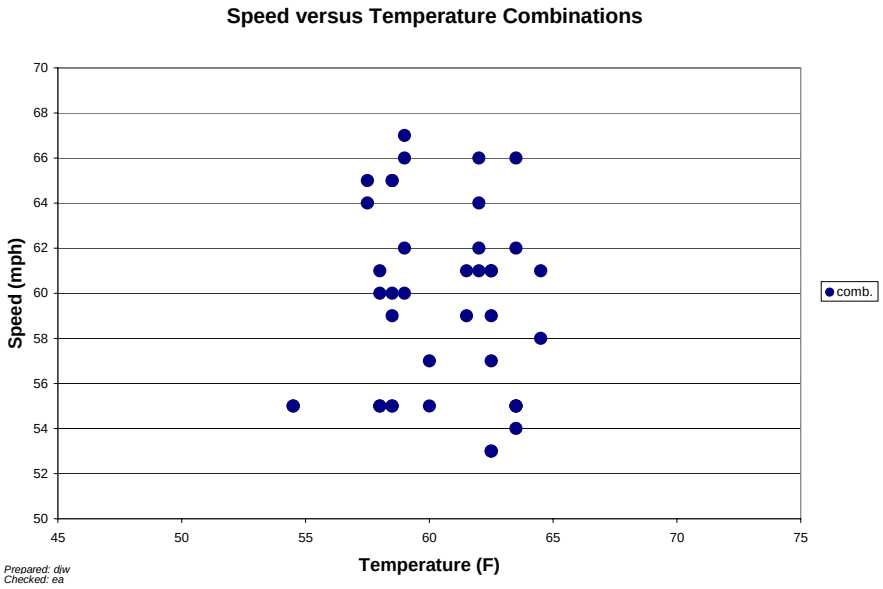

Figure 6-1 - Pre-Validation Speed-Temperature Distribution – 230500 – 14-Oct-2008

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

Figure 6-2 shows the GVW Percent Error vs. Speed graph for the population as a whole. As shown in Figure 6-2 the GVW is overestimated at all speeds. Variability is greater at low and medium speeds as compared to high speeds. The outlier was confirmed as an actual measurement.

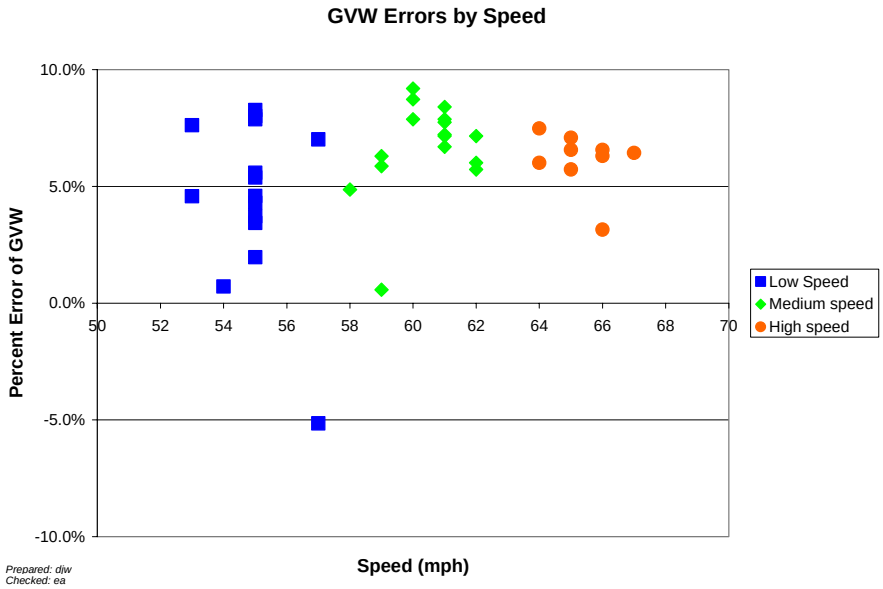

Figure 6-2 - Pre-Validation GVW Percent Error vs. Speed – 230500 – 14-Oct-2008

Figure 6-3 shows the relationship between temperature and GVW percentage error. The graph shows that GVW is overestimated. The sole underestimate is a valid equipment reading.

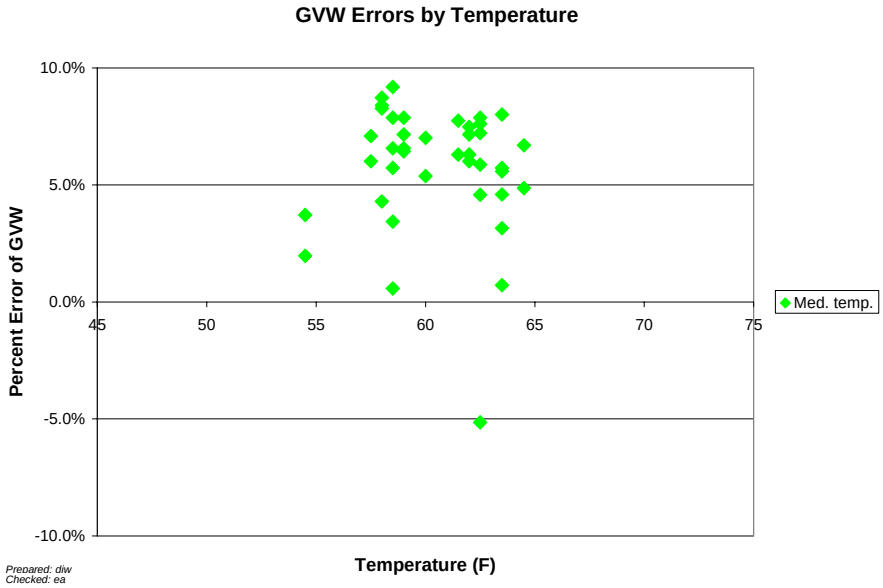

Figure 6-3 - Pre-Validation GVW Percent Error vs. Temperature – 230500 – 14-Oct-2008

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. Figure 6-4 indicates that the errors in tandem spacing were not affected by changes in speed.

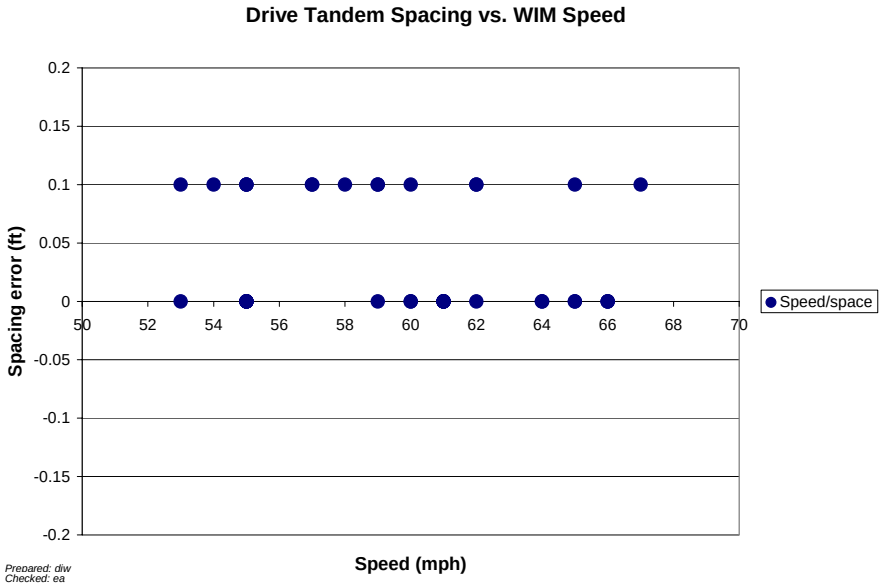

Figure 6-4 - Pre-Validation Spacing vs. Speed - 230500 – 14-Oct-2008

6.1 Temperature-based Analysis

The one temperature group was created by using the runs between those at 54 to 66 degrees Fahrenheit for Medium temperature.

Table 6-2 - Pre-Validation Results by Temperature Bin – 230500 – 14-Oct-2008

Element	95% Limit	Medium Temperature 54 to 66 °F
Steering axles	±20 %	7.4 ± 8.5%
Single axles	±20 %	5.4 ± 9.3%
Tandem axles	±15 %	6.3 ± 5.6%
GVW	±10 %	5.8 ± 5.5%
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft

Prepared: ea *Checked: bko*

From Table 6-2 it is shown that the equipment produces an overestimation of all weights at all temperatures.

Figure 6-5 shows the distribution of GVW Errors versus Temperature by Truck.
As shown by the graph, the equipment mostly overestimates the GVW for both trucks at all temperatures. Both the square and the diamond truck show similar variability.

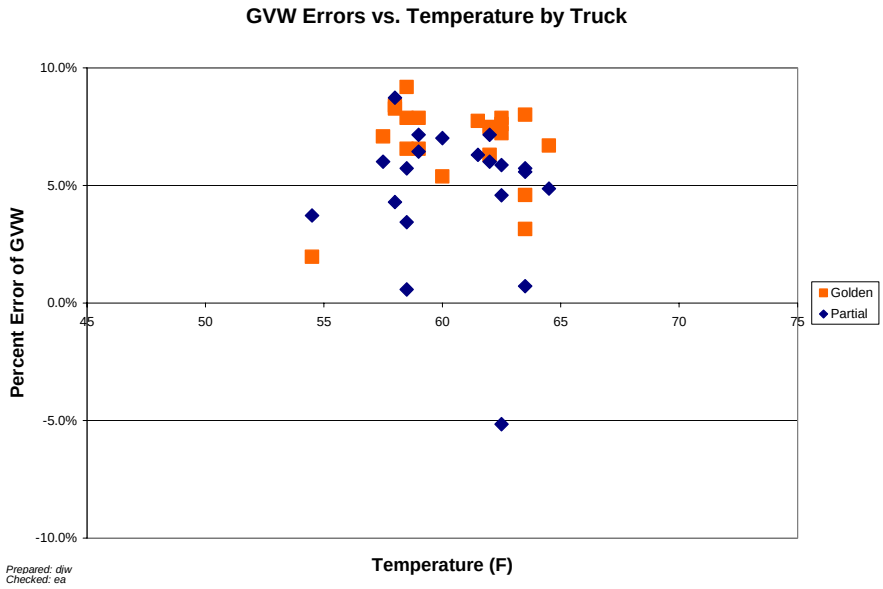

Figure 6-5 - Pre-Validation GVW Percent Error vs. Temperature by Truck – 230500 – 14-Oct-2008

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. At all temperatures, the steering axle weights are generally overestimated. The variability in steering axle error is consistent throughout the entire temperature. The axle weight seems to follow a downward trend from low to high temperatures.

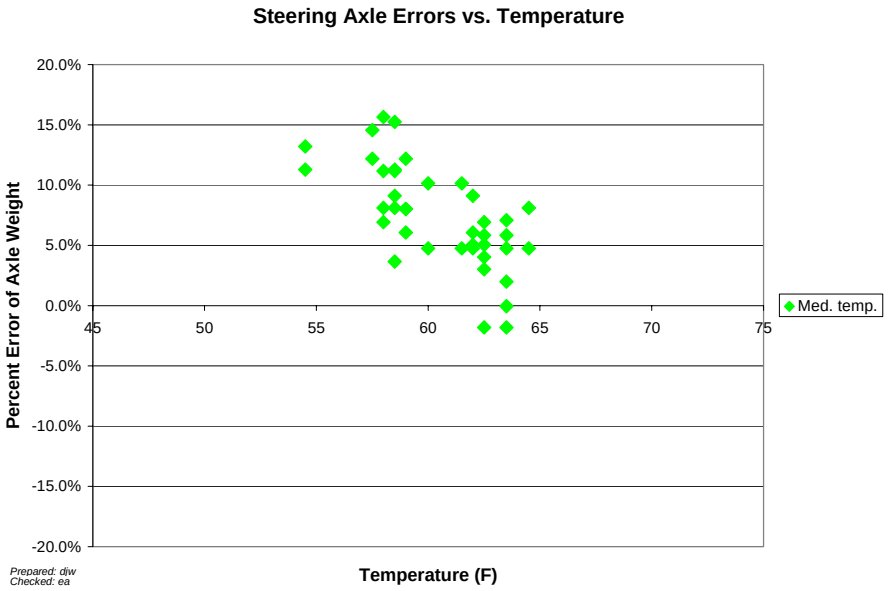

Figure 6-6 - Pre-Validation Steering Axle Error vs. Temperature by Group – 230500 – 14-Oct-2008

Figure 6-7 shows that single axles are generally overestimated at all temperatures. There is no apparent influence of single axle weight on error.

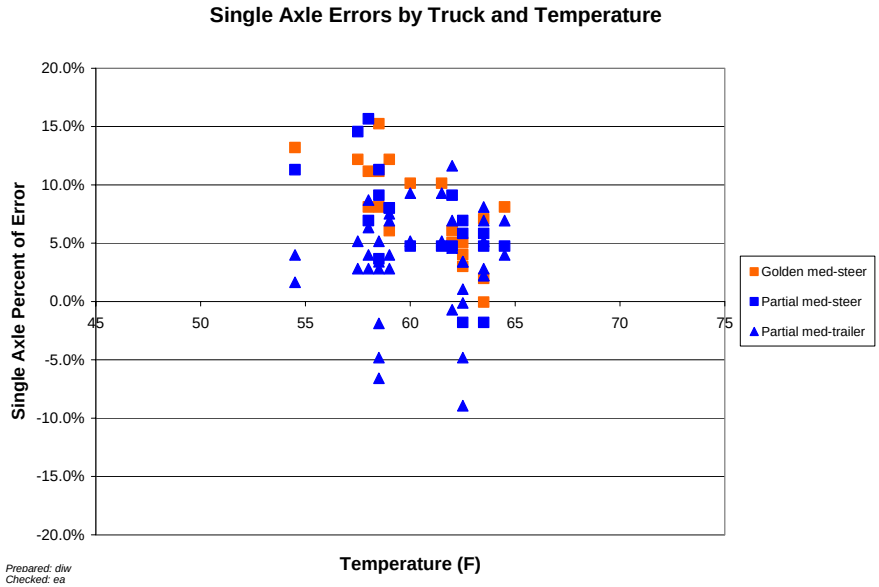

Figure 6-7 - Pre-Validation Single Axle Errors by Truck and Temperature – 230500 – 14-Oct-2008

6.2 Speed-based Analysis

The speed groups were divided as follows: Low speed – 51 to 57 mph, Medium speed – 58 to 62 mph and High speed – 63+ mph.

Table 6-3 - Pre-Validation Results by Speed Bin – 230500 – 14-Oct-2008

Element	95% Limit	Low Speed 51 to 57 mph	Medium Speed 58 to 62 mph	High Speed 63+ mph
Steering axles	±20 %	6.3 ± 9.7%	7.2 ± 6.8%	9.4 ± 11.6%
Single axles	±20 %	4.1 ± 10.5%	5.8 ± 8.0%	7.4 ± 10.1%
Tandem axles	±15 %	5.2 ± 7.5%	7.6 ± 4.2%	5.9 ± 3.2%
GVW	±10 %	4.5 ± 7.5%	6.7 ± 4.3%	6.1 ± 2.9%
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft

Prepared: ea *Checked: bko*

From Table 6-3 it is shown that the equipment overestimates weights at all speeds.

Figure 6-8 shows that the patterns of the two trucks appear similar at all speeds.

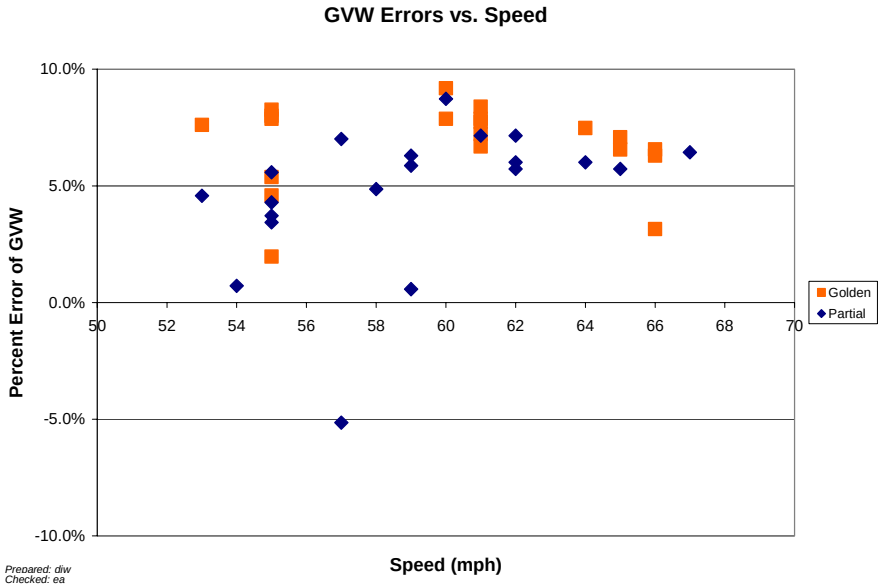

Figure 6-8 - Pre-Validation GVW Percent Error vs. Speed Group - 230500 –14-Oct-2008

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 the tendency to increasingly overestimate from lower to higher speeds.

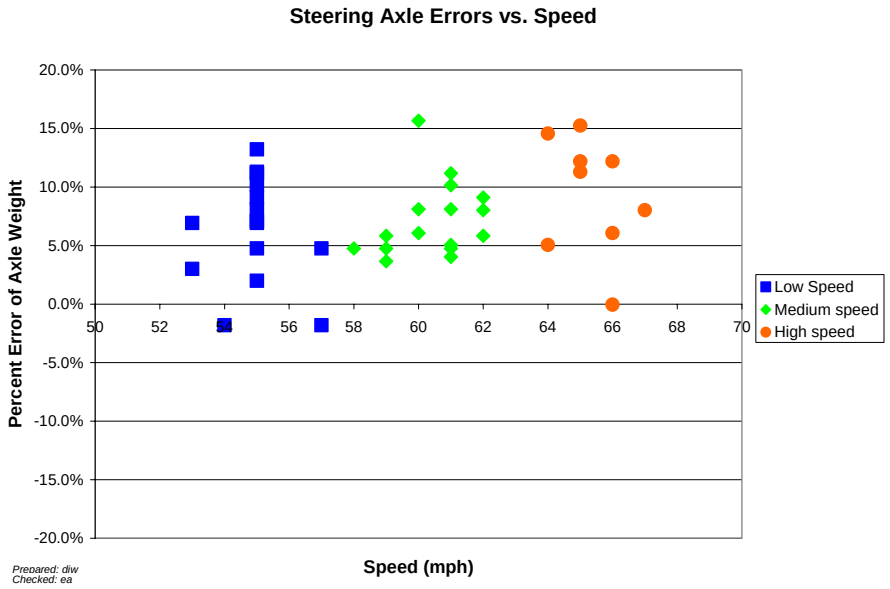

Figure 6-9 - Pre-Validation Steering Axle Percent Error vs. Speed Group - 230500 – 14-Oct-2008

Figure 6-10 shows that single axles are generally overestimated at all speeds. Variability is evenly distributed in the entire graph. There is also an upward trend from low to high speed. The singles on the split tandem (triangles) appear more likely to be underestimated than the steering axles (squares).

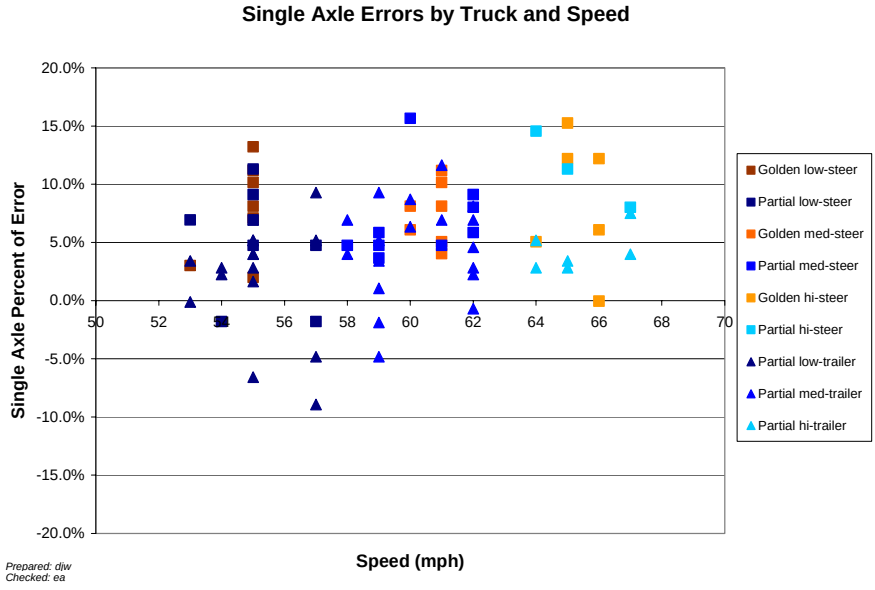

Figure 6-10 - Pre-Validation Single Axle Errors by Truck and Speed – 230500 – 14-Oct-2008

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

The second check is the ability of the algorithm to correctly distinguish between truck classes with no more than 2% errors in such classifications. Table 6-4 has the classification error rates by class. The overall misclassification rate is zero percent.

Table 6-4 - Truck Misclassification Percentages for 230500 – 14-Oct-2008

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

Prepared: ea *Checked: bko*

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

Table 6-5 - Truck Classification Mean Differences for 230500 – 14-Oct-2008

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

Prepared: ea *Checked: bko*

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

Unknown (UNK) are those identified by the equipment but no vehicles of the type were seen 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.

6.4 Evaluation by ASTM E-1318 Criteria

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

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

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

Prepared: ea *Checked: bko*

6.5 Prior Validations

The last validation for this site was done August 15, 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. The site was validated with two trucks. The “Golden” truck was loaded to 75,200 lbs. The “partial” truck which had a 15 tapered leaf suspension on the tractor and a standard tandem with air suspension on the tractor was loaded to 65,140 lbs.

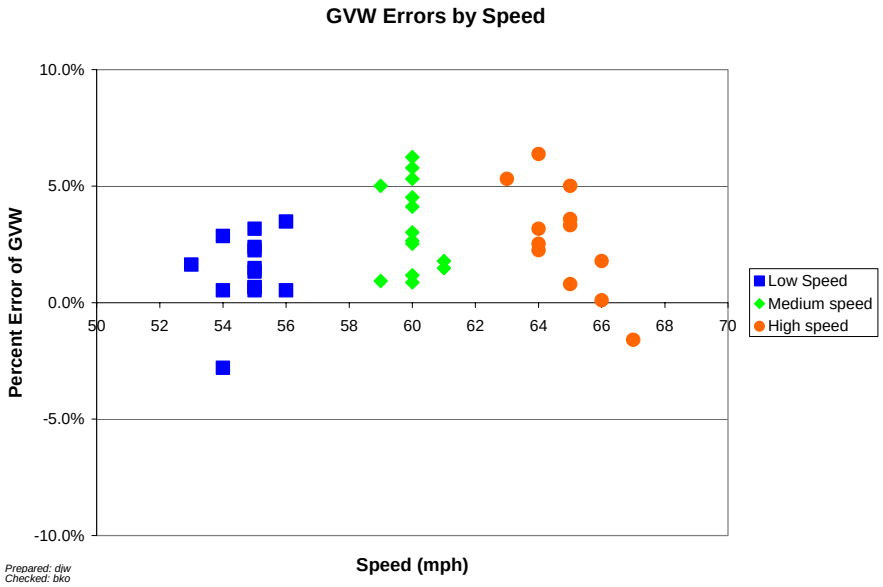

Figure 6-11 - Last Validation GVW Percent Error vs. Speed – 230500 – 15-Aug-2007

Table 6-7 shows the overall results from the last validation which demonstrated the ability to produce research quality data. Compared to the initial pre-validation results in Table 6-1, Table 6-7 shows lower degree of overestimation for weights.

Table 6-7 - Last Validation Final Results – 230500 – 15-Aug-2007

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	4.8 ± 8.2%	Pass
Tandem axles	±15 percent	2.0 ± 5.3%	Pass
GVW	±10 percent	2.4 ± 4.1%	Pass
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.0 ft	Pass

Prepared: ea *Checked: bko*

Table 6-8 has the results at the end of the last validation by temperature. The variability at both low and high temperature range is very similar. Through this validation the equipment has been observed at temperature from 42 to 99 degrees Fahrenheit.

Table 6-8 - Last Validation Results by Temperature Bin – 230500 – 15-Aug-2007

Element	95% Limit	Low Temperature 62 to 67 °F	High Temperature 68 to 73 °F
Steering axles	±20 %	6.0 ± 4.6%	4.0 ± 10.0%
Tandem axles	±15 %	1.6 ± 5.6%	2.4 ± 5.2%
GVW	±10 %	2.2 ± 4.7%	2.6 ± 4.0%
Axle spacing	± 0.5 ft	0.0 ± 0.0 ft	0.0 ± 0.0 ft

Prepared: ea *Checked: bko*

Table 6-9 has the results of the prior post validation by speed groups. The upward trend with increasing speed during the pre-validation runs was present at the end of the last validation.

Table 6-9 - Last Validation Results by Speed Bin – 230500 – 15-Aug-2007

Element	95% Limit	Low Speed 53 to 57 mph	Medium Speed 58 to 61 mph	High Speed 62+ mph
Steering axles	±20 %	5.2 ± 4.5%	6.0 ± 8.9%	3.0 ± 11.6%
Tandem axles	±15 %	0.7 ± 4.3%	2.8 ± 5.4%	2.7 ± 5.8%
GVW	±10 %	1.3 ± 3.4%	3.2 ± 4.1%	2.7 ± 5.0%
Axle spacing	± 0.5 ft	0.0 ± 0.0 ft	0.0 ± 0.0 ft	0.0 ± 0.0 ft

Prepared: ea *Checked: bko*

7 Data Availability and Quality

As of October 14, 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 2001 through 2003 have a sufficient quantity to be considered complete years of classification data and that 2002 and 2003 are complete years of

loading data. **In the absence of previously gathered validation 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 230500 – 14-Oct-2008

Year	Classification Days	Months	Coverage	Weight Days	Months	Coverage
2000	115	5	Full week	113	4	Full week
2001	288	12	Full week	79	4	Full week
2002	230	11	Full week	252	10	Full week
2003	227	11	Full week	255	11	Full week
2004	76	5	Full week	None		
2007	158	6	Full week	158	6	Full week
2008	195	7	Full week	195	7	Full week

Prepared: ea *Checked: bko*

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

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

Table 7-2 is generated with a column for every vehicle class 4 or higher that represents 10 percent or more of the truck (class 4-20) population. In creating Table 7-2 the following definitions are used:

- Class 9 overweights are defined as the percentage of vehicles greater than 88,000 pounds
- Class 9 underweights are defined as the percentage of vehicles less than 20,000 pounds.
- Class 9 unloaded peak is the bin less than 44,000 pounds with the greatest percentage of trucks.
- Class 9 loaded peak is the bin 60,000 pounds or larger with the greatest percentage of trucks.
- For all other trucks the typical axle configuration is used to determine the maximum allowable weight based on 18,000 pounds for single axles and 34,000 pounds for tandem axles. A ten percent cushion above that maximum is used to set the overweight threshold.

- For all other trucks in the absence of site specific information the computation of under weights assumes the power unit weighs 10,000 pounds and each axle on a trailer 5,000 pounds. Ninety percent of the total for the unloaded configuration is the value below which a truck is considered under weight.
- For all trucks other than class 9s that have a bi-modal distribution the unloaded peak is defined to be in a bin less than or equal to half of the allowable maximum weight.
- For all trucks other than class 9s that have a bi-modal distribution the loaded peak is defined to be in a bin greater than or equal to half of the allowable maximum weight.

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

Table 7-2 - GVW Characteristics of Major sub-groups of Trucks – 230500 – 15-Oct-2008

Characteristic	Class 9	Class 10	Class 5
Percentage Overweights	0%	0%	0%
Percentage Underweights	0%	0%	0%
Unloaded Peak	32,000 lbs	36,000 lbs	
Loaded Peak	72,000 lbs	72,000 lbs	
Peak			12,000 lbs

Prepared: ea *Checked: bko*

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

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

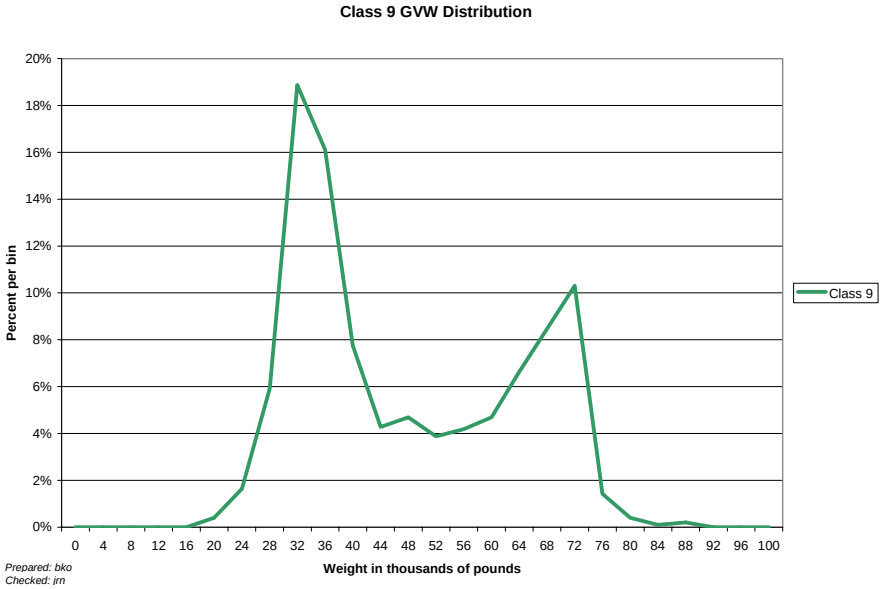

Figure 7-1 - Expected GVW Distribution Class 9 – 230500 – 15-Oct-2008

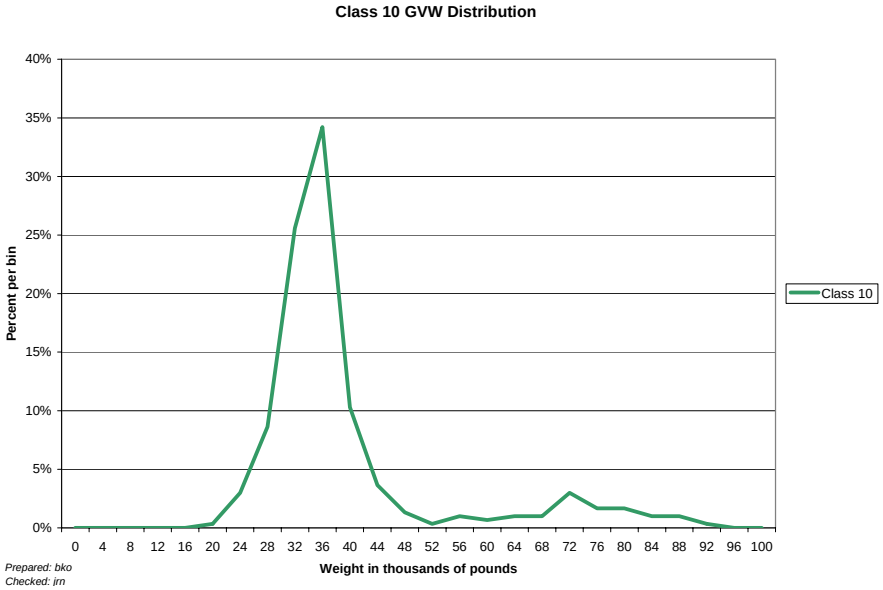

Figure 7-2 - Expected GVW Distribution Class 10 – 230500 – 15-Oct-2008

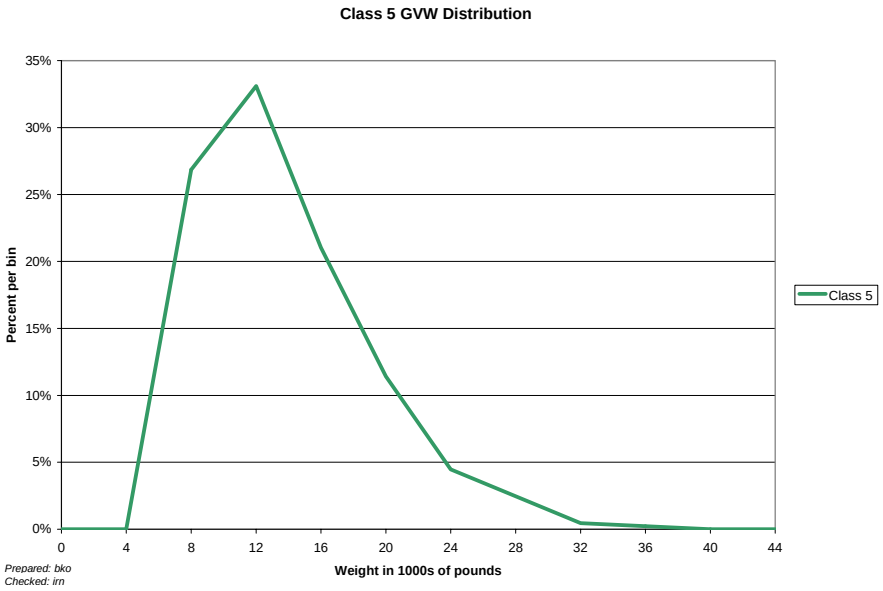

Figure 7-3 - Expected GVW Distribution Class 5 – 230500 – 15-Oct-2008

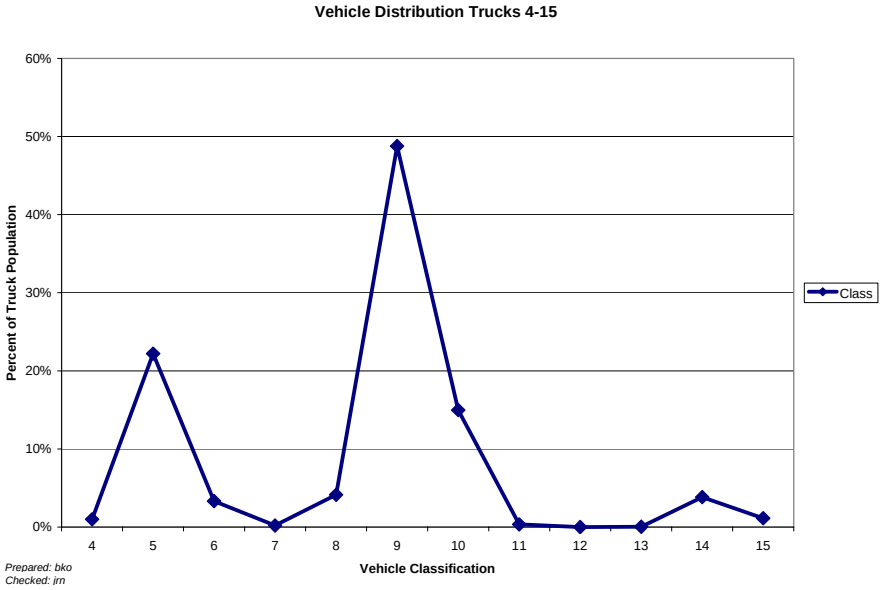

Figure 7-4 - Expected Vehicle Distribution – 230500 – 15-Oct-2008

8 Data Sheets

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

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

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

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

Calibration Iteration 1 Worksheets – (1 page)

Test Truck Photographs (7 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 this page. It includes a current Sheet 17 with all applicable maps and photographs. There are no significant changes in the information provided.

10 Updated Sheet 18

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

11 Traffic Sheet 16(s)

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

POST-VISIT HANDOUT GUIDE FOR SPS WIM FIELD VALIDATION

STATE: Maine

SHRP ID: 230500

Figures

Photos

1. General Information

SITE ID: *230500*

LOCATION: *I-95, milepost 200.1*

VISIT DATE: *October 14, 2008*

VISIT TYPE: *Validation*

2. Contact Information

POINTS OF CONTACT:

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

Highway Agency: *Ron Cote, 207-624-3620, ron.cote@maine.gov*

Dale Peabody, 207-624-3305, dale.peabody@maine.gov

Tim Soucie, 207-624-3264, timothy.soucie@maine.gov

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

FHWA Division Office Liaison:
Anna Price, 207-622-8350 ext.101, anna.price@dot.gov

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

3. Agenda

BRIEFING DATE: *No briefing requested for this visit.*

ON SITE PERIOD: *October 14 and 15, 2008.*

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

4. Site Location/ Directions

NEAREST AIRPORT: *Bangor International Airport, Bangor, Maine*

DIRECTIONS TO THE SITE: *Approximately 17 miles north of Bangor, Maine on I-95.*

MEETING LOCATION: *On site, beginning at 9:30 a.m.*

WIM SITE LOCATION: *I-95, milepost 200.1, approximately 17 miles north of I-395. Lat: 44.9989N; Long: -68.7005W*

WIM SITE LOCATION MAP: *See Figure 4.1*

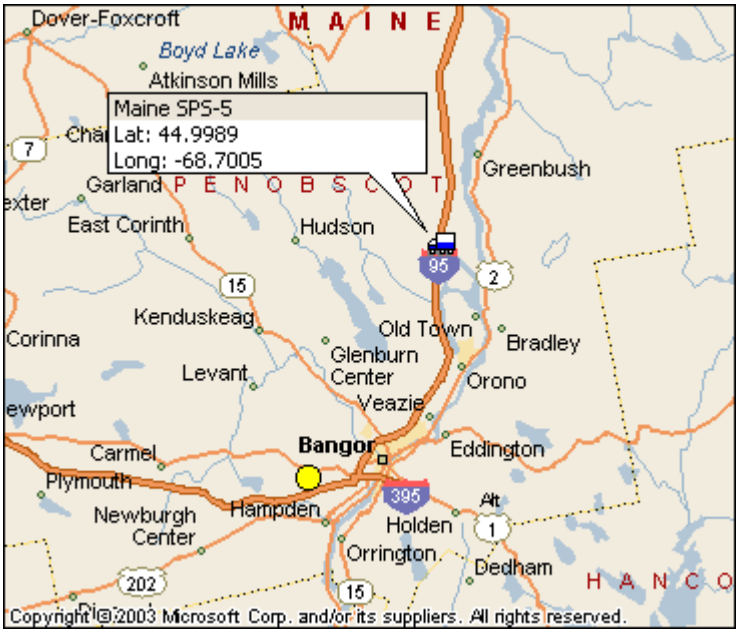

Figure 4-1 – Site 230500 in Maine

5. Truck Route Information

ROUTE RESTRICTIONS: *None*

SCALE LOCATION: *Dysart's Truck Stop, Coldbrook Road, Bangor, Maine off of I-95, exit 180.*

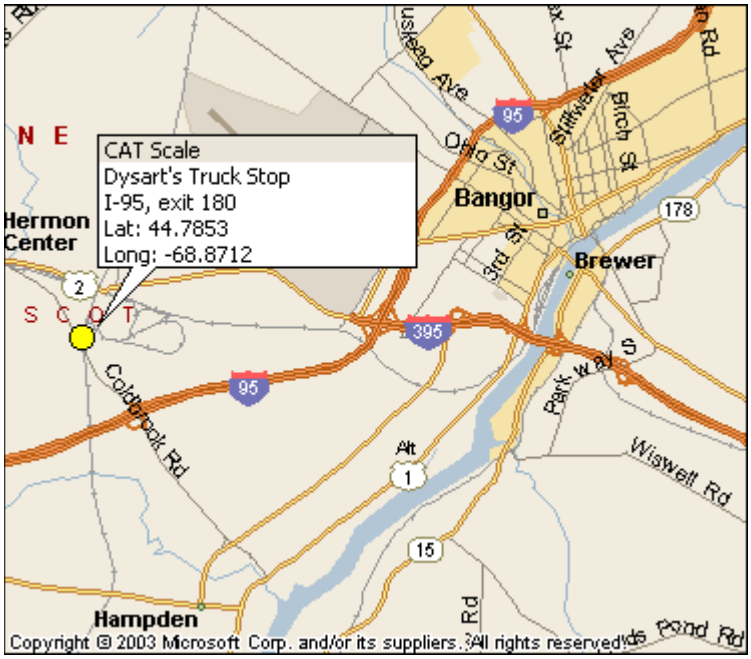

Figure 5-1 – Truck Scale Location for 230500 in Maine

TRUCK ROUTE: *See Figure 5.2*

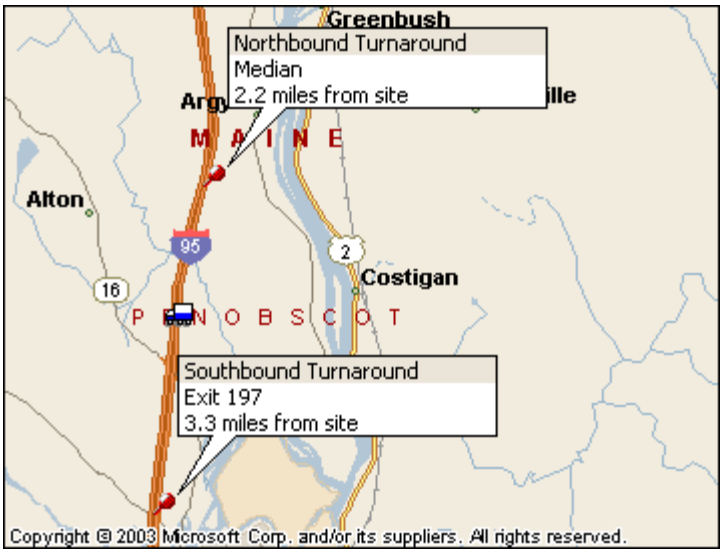

Figure 5-2 – Truck Route at 230500 in Maine

Permission to be granted by the Maine State Police to use median crossover for North turnaround.

NB on I-95 to median turnaround (2.2 miles)
SB on I-95 to exit 197 (3.3 miles)

Total distance = 11.0 miles (15 minutes)

6. Sheet 17 – Maine (230500)

1.* ROUTE ____I-95__ MILEPOST __200.1__ LTPP DIRECTION - N S E W

2.* WIM SITE DESCRIPTION - Grade __<1_____ % Sag vertical Y / N
Nearest SPS section upstream of the site ___230502_____
Distance from sensor to nearest upstream SPS Section __3.49 mi

3.* LANE CONFIGURATION
Lanes in LTPP direction __2_ Lane width _12___ ft

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

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

Shoulder width __10_____ ft

4.* PAVEMENT TYPE _____Asphalt_____

5.* PAVEMENT SURFACE CONDITION – Distress Survey
Date _10/14/2008_ Photo Filename:23_0500_Upstream_10_14_08.jpg
Date _10/14/2008_ Photo Filename:23_0500_Downstream_10_14_08.jpg
Date _____ Photo Filename: _____

6. * SENSOR SEQUENCE _____Loop – Quartz – Quartz -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 ___45_____ ft
Distance from system __51 __ ft
TYPE _____336_Short _____

CABINET ACCESS controlled by LTPP / STATE / JOINT ?
Contact - name and phone number ___Ron Cote 207-624-3620_____
Alternate - name and phone number __Roy Czinku__306-653-6627___

11. * POWER

Distance to cabinet from drop ___7____ ft Overhead / underground / solar / AC in cabinet?
Service provider _____ Phone number _____

12. * TELEPHONE

Distance to cabinet from drop ___0____ ft Overhead / under ground / cell?
Service provider _____ Phone Number _____

13.* SYSTEM (software & version no.)- ___IRD iSINC_____
Computer connection – RS232 / Parallel port / USB / Other _____

14. * TEST TRUCK TURNAROUND time __15___minutes Distance __11.0____ mi.

15. PHOTOS FILENAME

Power source __23_0500_Solar_Panels_10_14_08.jpg

Phone source 23_0500_Cell_Modem_10_14_08.jpg
Cabinet exterior 23_0500_Cabinet_Exterior_10_14_08.jpg
Cabinet interior 23_0500_Cabinet_Interior_front_10_14_08.jpg
23_0500_Cabinet_Interior_back_10_14_08.jpg
Weight sensors 23_0500_Leading_WIM_Sensor_10_14_08.jpg
23_0500_Trailing_WIM_Sensor_10_14_08.jpg
Classification sensors __None_____
Other sensors 23_0500_Leading_Loop_Sensor_10_14_08.jpg
23_0500_Trailing_Loop_Sensor_10_14_08.jpg
Description _Loops_____

Downstream direction at sensors on LTPP lane
23_0500_Downstream_10_14_08.jpg
Upstream direction at sensors on LTPP lane
__23_0500_Upstream_10_14_08.jpg

COMMENTS _____

Amenities approximately 7 miles south of site in Orono, Maine, exit 193

COMPLETED BY ____Dean J. Wolf_____

PHONE _301-210-5105_____ DATE COMPLETED __10__/_14__/_2008___

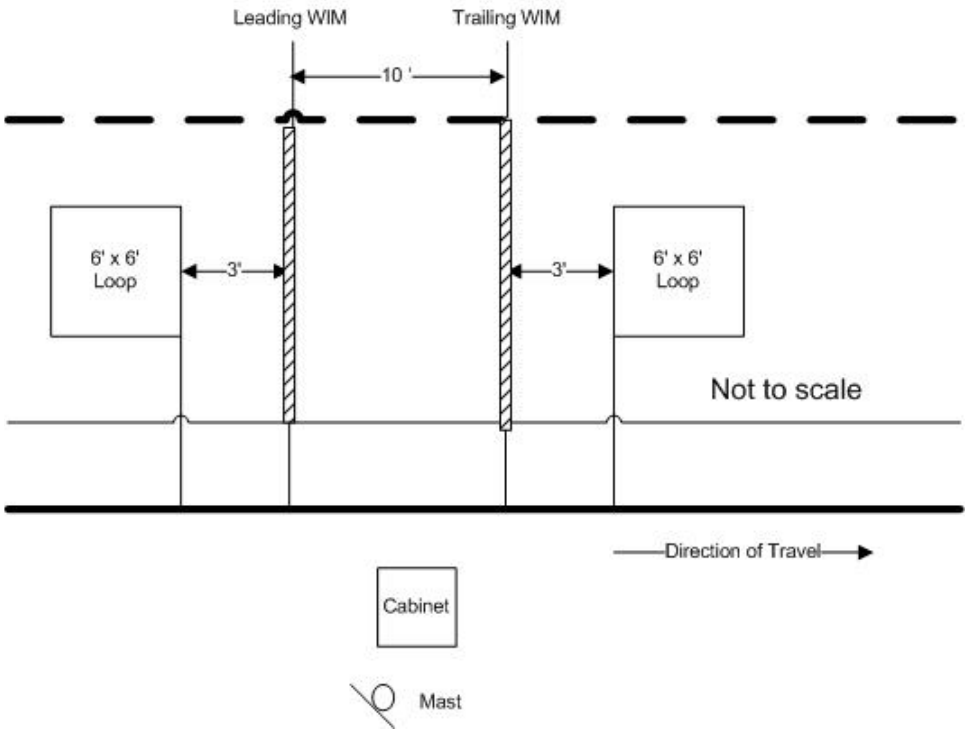

Figure 6-1 – Sketch of Equipment Layout -230500

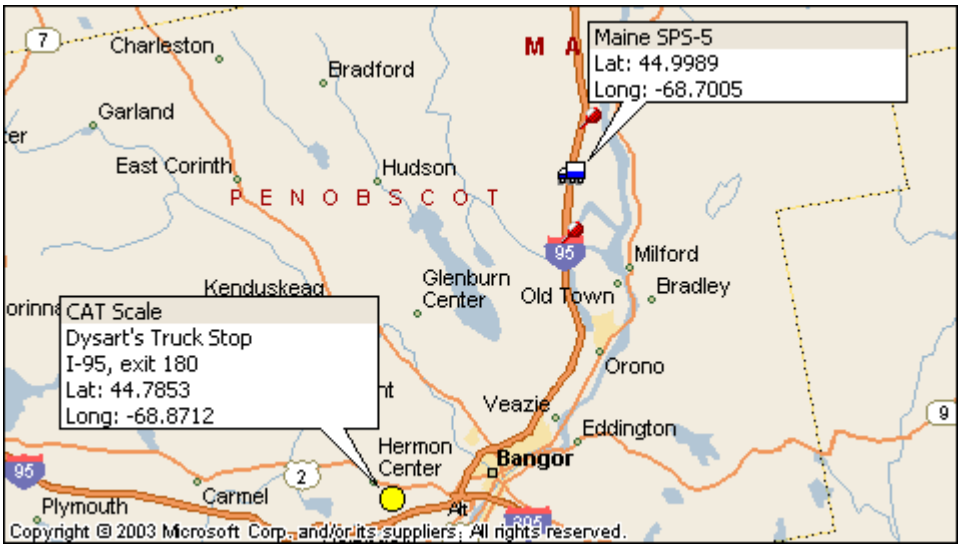

Figure 6-2 – Site Map of 230500 in Maine

Photo 6-1 - 23_0500_Upstream_10_14_08.jpg

Photo 6-2 - 23_0500_Downstream_10_14_08.jpg

Photo 6-3 – 23_0500_Solar_Panels_10_14_08.jpg

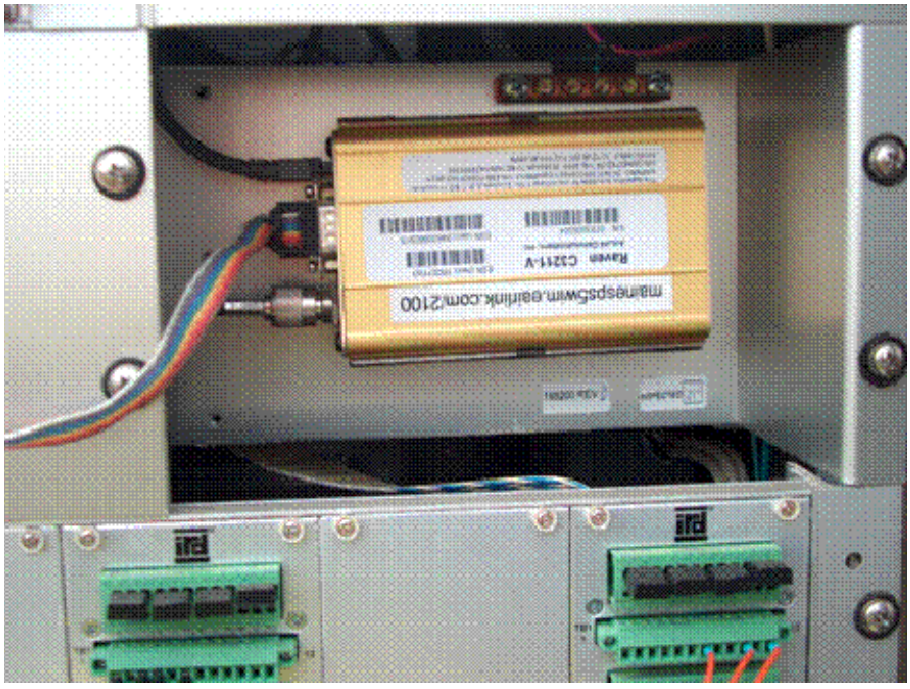

Photo 6-4 - 23_0500_Cell_Modem_10_14_08.jpg

Photo 6-5 - 23_0500_Cabinet_Exterior_10_14_08.jpg

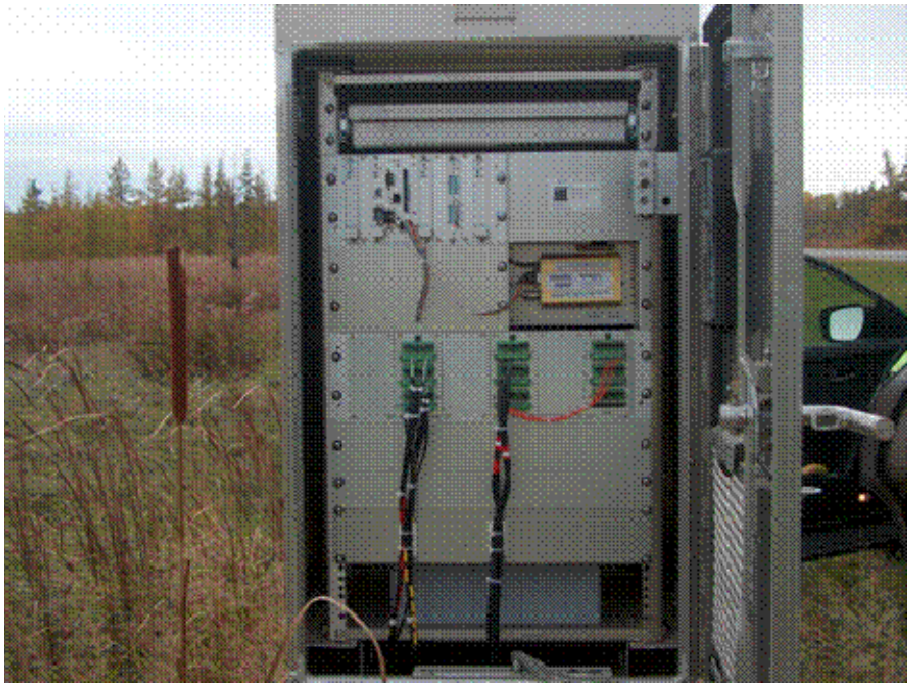

Photo 6-6 - 23_0500_Cabinet_Interior_Front_10_14_08.jpg

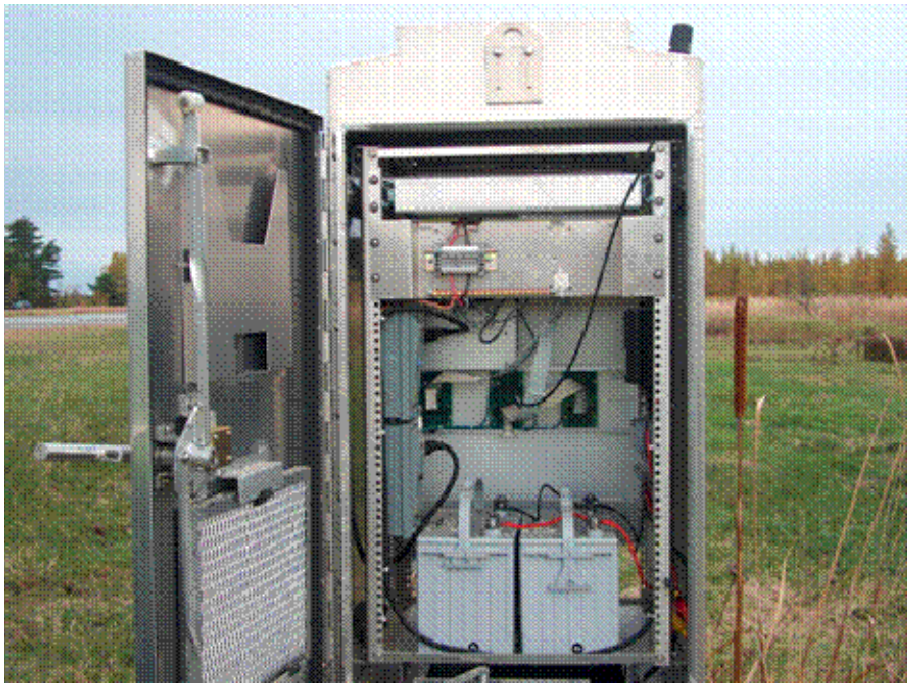

Photo 6-7 - 23_0500_Cabinet_Interior_Back_10_14_08.jpg

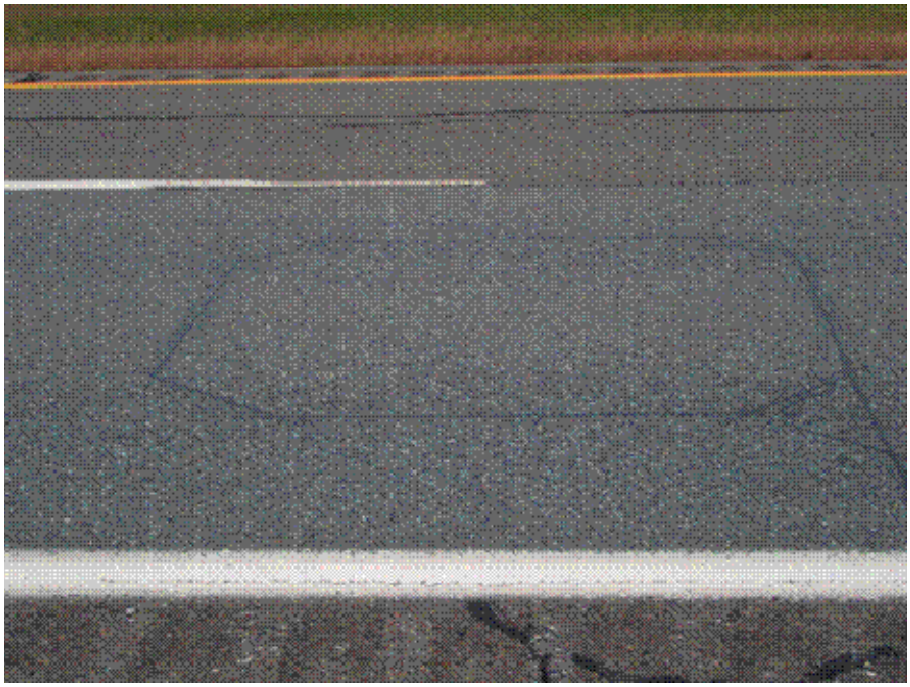

Photo 6-8 - 23_0500_Leading_Loop_Sensor_10_14_08.jpg

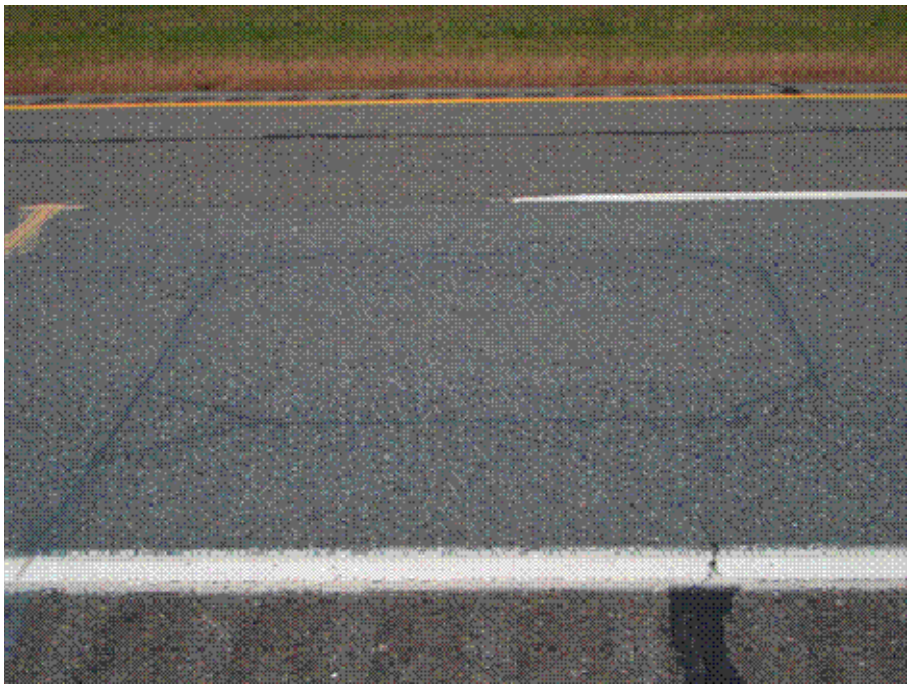

Photo 6-9 - 23_0500_Trailing_Loop_Sensor_10_14_08.jpg

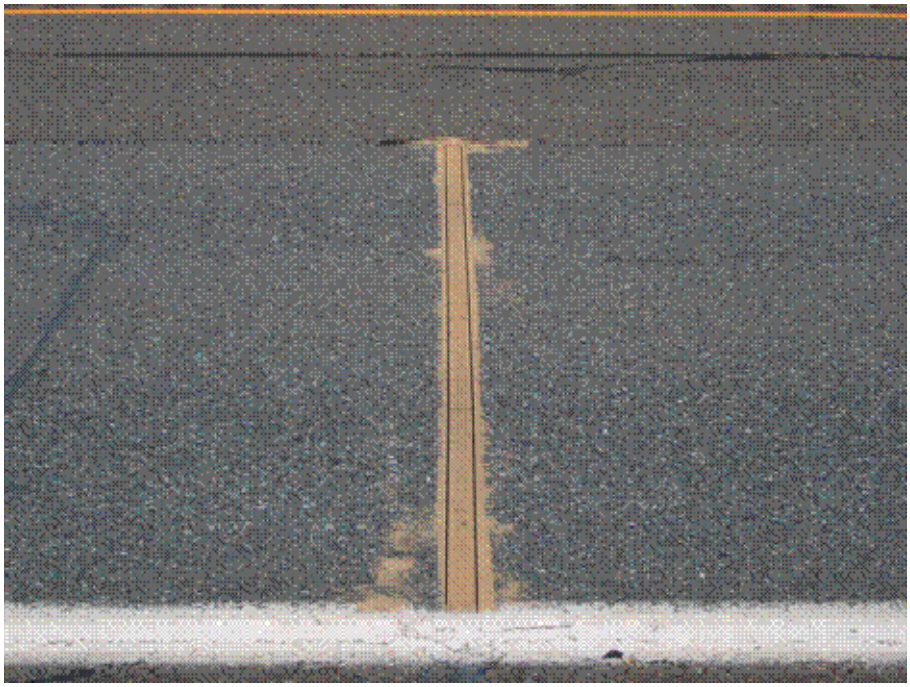

Photo 6-10 - 23_0500_Leading_WIM_Sensor_10_14_08.jpg

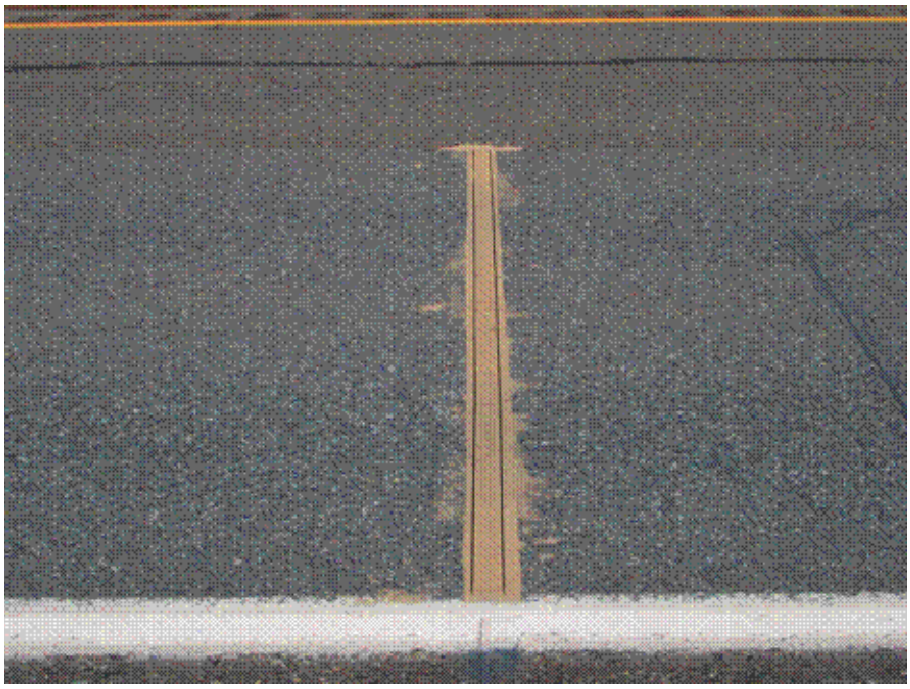

Photo 6-11 - 23_0500_Trailing_WIM_Sensor_10_14_08.jpg

SHEET 18	STATE CODE [23]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [0500]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) 10/14/2008

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 __
      - ☒ 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 - _____ ☐ 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: _____ Phone:_____

Agency: _____

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

Name: Chris DelMonaco Phone:(207) 214-9613

Agency: Thomas DiCenzo Inc.

f. Traffic Control –

Name: _____ Phone:_____

Agency: _____

g. Enforcement Coordination –

Name: _____ Phone:_____

Agency: _____

h. Nearest Static Scale

Name: Dysart's Location:I-95, exit 180

Phone: (207) 942-4878

SHEET 16 **LTPP MONITORED TRAFFIC DATA** **SITE CALIBRATION SUMMARY**	*STATE ASSIGNED ID [__ __ __ __] *STATE CODE [23] *SHRP SECTION ID [0500]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [10/14/2008]

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

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

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

5. EQUIPMENT MANUFACTURER ___IRD/Kistler_____

WIM SYSTEM CALIBRATION SPECIFICS**

6.**CALIBRATION TECHNIQUE USED:
   ___ TRAFFIC STREAM -- ___STATIC SCALE (Y/N) _X_ TEST TRUCKS

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

   __ 20__ PASSES PER TRUCK

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

TRUCK	TYPE	SUSPENSION
1	9	1
2	9	1
3		

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
   MEAN DIFFERENCE BETWEEN ---
   DYNAMIC AND STATIC GVW ___5.8 STANDARD DEVIATION ___2.7
   DYNAMIC AND STATIC SINGLE AXLES ___5.4 STANDARD DEVIATION ___4.7
   DYNAMIC AND STATIC DOUBLE AXLES ___6.3 STANDARD DEVIATION ___2.8

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

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

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) ___3053___

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

CLASSIFIER TEST SPECIFICS***

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

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

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
   *** FHWA CLASS 9 ____ 0 FHWA CLASS _5_ ____ ____ 0
   *** FHWA CLASS 8 ____ 0 FHWA CLASS _10_ ____ ____ 0
   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 [23] *SHRP SECTION ID [0500]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [10/15/2008]

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

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

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

5. EQUIPMENT MANUFACTURER ___IRD/Kistler_____

WIM SYSTEM CALIBRATION SPECIFICS**

6.**CALIBRATION TECHNIQUE USED:
   ___ TRAFFIC STREAM -- ___STATIC SCALE (Y/N) _X_ TEST TRUCKS

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

   __ 20__ PASSES PER TRUCK

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

TRUCK	TYPE	SUSPENSION
1	9	1
2	9	1
3		

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
   MEAN DIFFERENCE BETWEEN ---
   DYNAMIC AND STATIC GVW -1.4 STANDARD DEVIATION 1.4
   DYNAMIC AND STATIC SINGLE AXLES -1.7 STANDARD DEVIATION 3.1
   DYNAMIC AND STATIC DOUBLE AXLES -1.1 STANDARD DEVIATION 2.6

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

9. DEFINE THE SPEED RANGES USED (MPH) _____ 55 60 65 _____ __ __ _____ _____
   _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) ___2872___

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

CLASSIFIER TEST SPECIFICS***

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

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

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
   *** FHWA CLASS 9 ____ 0 FHWA CLASS _5_ ____ ____ 21
   *** FHWA CLASS 8 ____ 0 FHWA CLASS _10_ ____ ____ 0
   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	23
LTPP Traffic Data	* SPS PROJECT ID	0 5 0 0
*CALIBRATION TEST TRUCK # 1	* DATE 10/14/09	

Rev. 08/31/01

TRUCK #356
TRAILER #3289

PART I.

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

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

GEOMETRY

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

9. a) * Make: MACK b) * Model: CH

10.* Trailer Load Distribution Description:

ROLLS OF PAPER OVER EACH 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 11.4 B to C 4.4 C to D 33.6

D to E 4.2 E to F _____

Wheelbase (measured A to last) _____ Computed 53.6

13. *Kingpin Offset From Axle B (units) _____ (+1.9)

(+ is to the rear)

SUSPENSION

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

Sheet 19	* STATE_CODE	_23_
LTPP Traffic Data	* SPS PROJECT ID	_0_5_0_0_
*CALIBRATION TEST TRUCK #_1_	* DATE	10/14/08

Rev. 08/31/01

PART II

Day 1

*b) Average Pre-Test Loaded weight 76390
*c) Post Test Loaded Weight 76010
*d) Difference Post Test – Pre-test .380

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9840	16400	16400	16780	16780		76200
2	10000	16530	16530	16760	16760		76580
3							
Average	9920	16465	16465	16770	16770		76390

Table 6. Raw data – Axle scales –

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

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9660	16400	16400	16780	16780		76200
2	9920	16140	16380	16770	16770		76020
3							
Average	9790	16390	16390	16770	16770		76010

Measured By JW Verified By SA Weight date 10/14/08

Sheet 19	* STATE_CODE	_23_
LTPP Traffic Data	* SPS PROJECT ID	_0_5_0_0_
*CALIBRATION TEST TRUCK #_1_	* DATE	10 |15 |08

Rev. 08/31/01

Day 2

7.2 *b) Average Pre-Test Loaded weight 76620

*c) Post Test Loaded Weight 76120

*d) Difference Post Test – Pre-test ~ 500

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9980	16540	16540	16780	16780		76620
2	9860	16610	16610	16770	16770		76620
3							
Average	9920	16575	16575	16775	16775		76620

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	9620	16460	16460	16790	16790		76120
2	9680	16430	16430	16790	16790		76120
3							
Average	9650	16445	16445	16790	16790		76120

Measured By djw Verified By ZA Weight date 10/15/08

Sheet 19	* STATE_CODE	_23_
LTPP Traffic Data	* SPS PROJECT ID	_0_5_0_0_
*CALIBRATION TEST TRUCK #_2_	* DATE 12/14/08	

Rev. 08/31/01

TRUCK # 358
TRAILER # 1

PART I.

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

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

GEOMETRY

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

9. a) * Make: MACK b) * Model: CH

10.* Trailer Load Distribution Description:
CRANE COUNTERWEIGHTS LOADED OVER FRONT & REAR OF TRAILER

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

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

A to B 11.4 B to C 4.3 C to D 30

D to E 10 E to F _____

Wheelbase (measured A to last) _____ Computed 55.7 SA.

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	11R 24.5	3 FULL LEAF
B	295R 24.5	AIR
C	295R 24.5	AIR
D	11R 24.5	AIR
E	11R 24.5	AIR
F		

Sheet 19	* STATE_CODE	_23_
LTPP Traffic Data	* SPS PROJECT ID	_0_5_0_0_
*CALIBRATION TEST TRUCK #_2_	* DATE	10/14/08

Rev. 08/31/01

PART II

Day 1

*b) Average Pre-Test Loaded weight 70190

*c) Post Test Loaded Weight 69610

*d) Difference Post Test – Pre-test -580

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9360	13410	13410	17030	17030		70240
2	9320	13390	13390	17020	17020		70140
3							
Average	9340	13400	13400	17025	17025		70190

Table 6. Raw data – Axle scales –

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

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	8960	13320	13320	17010	17010		69620
2	9020	13270	13270	17020	17020		69600
3							
Average	8990	13295	13295	17015	17015		69610

Measured By djw Verified By SM Weight date 10/14/08

Sheet 19	* STATE_CODE	23
LTPP Traffic Data	* SPS PROJECT ID	0500
*CALIBRATION TEST TRUCK # 2	* DATE	

Rev. 08/31/01

Day 2

7.2 *b) Average Pre-Test Loaded weight 69650

*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	9120	13260	13260	17010	17010		69660
2	9000	13330	13330	16990	16990		69640
3							
Average	9060	13295	13295	17000	17000		69650

Table 6.2. Raw data – Axle scales –

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

Table 7.2 Raw data – Axle scales – post-test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	8540	13310	13310	17020	17020		69200
2	8700	13210	13210	17030	17030		69180
3							
Average	8620	13260	13260	17025	17025		69190

Measured By AW Verified By SA Weight date

Sheet 20	* STATE_CODE	2_3
LTPP Traffic Data	*SPS PROJECT_ID	0_5_0_0
Speed and Classification Checks * 1 of* 2	* DATE	10/13/2008

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
68	9	22051	68	9	67	9	22230	67	9
67	9	22052	67	9	65	5	22237	62	5
65	9	22057	65	9	64	5	22257	63	5
69	10	22059	69	10	64	9	22261	64	9
68	9	22066	68	9	65	10	22290	65	10
67	10	22082	67	10	70	10	22293	70	10
64	9	22084	64	9	73	10	22295	73	10
62	8	22088	63	8	70	5	22297	69	5
67	9	22092	66	9	67	9	22300	68	9
68	9	22097	67	9	66	10	22301	65	10
69	9	22098	69	9	74	10	22307	74	10
73	9	22099	73	9	68	9	22309	68	9
60	5	22105	61	5	64	9	22323	64	9
65	9	22114	66	9	68	5	22329	67	5
67	9	22115	67	9	70	10	22331	69	10
67	9	22116	67	9	68	10	22332	68	10
68	9	22119	68	9	70	9	22340	70	9
67	5	22138	67	5	68	10	22348	68	10
68	5	22140	69	5	65	5	22359	66	5
73	10	22142	72	10	74	10	22361	72	10
67	10	22165	68	10	64	9	22376	64	9
67	9	22180	66	9	65	9	22377	65	9
62	5	22202	65	5	69	9	22384	69	9
74	10	22204	74	10	62	5	22386	62	5
73	10	22206	72	10	75	10	22401	75	10

Recorded by MARK E Direction N Lane 1 Time from 0830 AM to 1:15 PM

Sheet 20	* STATE_CODE 23
LTPP Traffic Data	*SPS PROJECT_ID 0500
Speed and Classification Checks * 2 of* 2	* DATE 10/13/2008

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
71	9	22403	72	9	64	9	22566	63	9
65	9	22408	65	9	70	9	22580	69	9
69	9	22416	69	9	64	9	22581	63	9
72	10	22421	70	10	69	9	22602	69	9
68	9	22427	68	9	67	10	22606	67	10
64	9	22450	64	9	64	9	22609	63	9
67	9	22452	67	9	72	10	22634	75	10
67	9	22464	67	9	69	9	22639	68	9
70	10	22465	70	10	66	9	22642	67	9
67	9	22468	66	9	62	9	22647	62	9
67	9	22471	67	9	67	9	22658	67	9
66	9	22472	67	9	65	9	22667	64	9
72	10	22475	72	10	60	5	22688	60	5
50	5	22485	50	5	67	9	22693	67	9
70	9	22490	70	9	65	5	22705	65	5
76	9	22518	76	9	65	9	22706	64	9
71	5	22519	71	5	69	10	22711	69	10
72	10	22522	71	10	68	5	22718	68	5
69	10	22528	68	10	59	5	22720	59	5
63	9	22531	64	9	70	10	22738	68	10
68	9	22532	68	9	72	10	22747	74	10
61	5	22537	60	5	65	6	22750	65	6
67	5	22545	66	5	65	5	22760	65	5
65	8	22547	65	8	66	9	22768	67	9
65	10	22549	65	10	62	9	22793	62	9

Recorded by MARK Z Direction N Lane 1 Time from 11:15 AM to 1:02 PM

Sheet 20	* STATE_CODE	23
LTPP Traffic Data	*SPS PROJECT_ID	0500
Speed and Classification Checks * 1 of* 2	* DATE	10/15/2008

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
61	5	26425	63	5	64	10	26539	66	10
81	6	26430	81	6	67	9	26546	68	9
69	9	26436	67	9	64	9	26552	64	9
62	9	26437	63	9	72	9	26684	70	9
59	5	26466	59	5	65	10	26689	66	10
57	5	26467	57	5	64	9	26691	64	9
66	9	26469	68	9	59	5	26692	60	5
72	10	26471	73	10	62	9	26696	63	9
59	6	26473	61	6	62	5	26698	62	5
58	9	26474	59	9	66	9	26707	66	9
59	5	26475	58	5	68	10	26714	69	10
62	5	26479	64	5	66	9	26724	67	9
65	10	26480	67	10	65	9	26725	65	9
54	9	26490	53	9	60	9	26740	62	9
61	9	26493	63	9	73	10	26742	73	10
65	9	26494	66	9	67	10	26743	68	10
78	10	26498	78	10	65	10	26762	66	10
75	9	26499	76	9	69	9	26764	68	9
67	10	26501	68	10	64	9	26774	65	9
69	9	26504	67	9	69	10	26781	70	10
65	9	26505	64	9	62	9	26783	62	9
63	9	26507	64	9	64	9	26788	63	9
67	10	26531	67	10	64	9	26803	64	9
64	5	26532	64	5	65	10	26805	66	10
70	10	26537	70	10	67	9	26809	67	9

Recorded by MARK Z Direction N Lane 1 Time from 12:05 PM to 1:40 PM

Sheet 20	* STATE_CODE 23
LTPP Traffic Data	*SPS PROJECT_ID 0500
Speed and Classification Checks * 2 of* 2	* DATE 10/15/2008

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	
61	9	26826	62	9	65	9	27057	65	9	
67	8	26828	67	8	58	4	27063	55	4	
* 59	5	26833	58	4	61	9	27064	62	9	
68	9	26838	63	9	59	9	27069	60	9	
70	9	26861	69	9	63	9	27080	63	9	
72	10	26868	73	10	68	9	27082	68	9	
62	9	26871	63	9	68	10	27086	69	10	
70	9	26880	70	9	72	9	27088	69	9	
72	6	26881	71	6	64	10	27091	65	10	
64	5	26882	63	5	65	10	27104	66	10	
65	9	26886	66	9	62	5	27110	63	4	*
66	9	26891	66	9	54	5	27119	54	5	
68	10	26897	68	10	59	9	27132	60	9	
67	9	26898	67	9	59	5	27134	63	4	*
68	10	26908	68	10	67	10	27141	66	10	
73	10	26920	74	10	70	9	27142	70	9	
67	9	26940	67	9	62	10	27145	62	10	
* 64	4	26949	65	5	68	4	27154	69	4	
60	9	26952	61	9	64	9	27157	64	9	
* 50	5	27010	51	4	69	9	27161	70	9	
74	9	27016	75	9	68	9	27163	69	9	
65	10	27030	65	10	62	5	27165	63	5	
55	5	27043	55	5	71	9	27170	71	9	
66	9	27044	64	9	78	5	27171	79	5	
55	10	27045	54	10	70	9	27174	70	9	

Recorded by MARK Z Direction N Lane 1 Time from 1:46 PM to 2:54 PM

Sheet 21	* STATE_CODE	2_3_
LTPP Traffic Data	*SPS PROJECT_ID	0_5_0_0_
WIM System Test Truck Records 1 of 3	* DATE	10/13/2008

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
54.5	57	1	1	9:21	22027	55	60/51	82/87	83/86	84/84	76/84		77.7	11.6	4.4	34.0	4.1	
54.5	57	2	1	9:21	22028	55	48/54	70/70	63/70	86/91	83/90		72.5	11.6	4.4	30.4	10.1	
58	60	1	2	10:00	22153	61	53/56	92/86	88/89	82/10.0	80/99		82.6	11.5	4.4	34.0	4.1	
58	61	2	2	10:00	22154	60	52/54	73/78	67/71	90/91	84/10.1		76.0	11.6	4.4	30.4	10.1	
58.5	64	1	3	10:16	22210	65	59/54	83/92	81/96	79/96	79/92		81.2	11.6	4.4	34.1	4.1	
58.5	64	2	3	10:16	22211	65	52/50	69/77	65/74	91/85	83/92		73.9	11.6	4.4	30.4	10.1	
58.5	55	1	4	10:32	22265	55	53/56	88/91	86/88	84/98	82/96		82.2	11.6	4.4	34.0	4.1	
58.5	55	2	4	10:32	22266 ~~22266~~	55	49/51	71/75	76/63	89/90	84/75		72.3	11.6	4.4	30.5	10.1	
58.5	58	1	5	10:48	22313	60	52/54	87/90	87/91	85/10.5	80/100		83.2	11.6	4.4	34.1	4.1	
58.5	58	2	5	10:48	22314	59	51/44	73/70	72/65	88/79	79/83		70.3	11.6	4.4	30.3	10.1	
57.5	68	1	6	11:04	22364	65	53/57	87/87	85/88	83/99	79/97		81.6	11.6	4.4	34.1	4.1	
57.5	65	2	6	11:04	22365	64	56/49	67/78	63/75	91/84	83/96		74.1	11.6	4.3	30.3	10.1	
58	54	1	7	11:21	22430	55	50/56	87/90	84/90	83/96	87/10.1		82.5	11.6	4.4	34.1	4.1	
58	52	2	7	11:21	22431	55	49/49	71/75	69/67	90/87	86/89		72.9	11.6	4.4	30.3	10.1	
59	60	1	8	11:39	22495	60	46/58	93/92	87/94	79/99	77/98		82.2	11.6	4.4	34.1	4.1	
59	61	2	8	11:39	22496	62	46/53	72/73	89/67	92/90	83/92		74.9	11.6	4.3	30.2	10.1	

Recorded by MARK Z Checked by

Sheet 21	* STATE_CODE	_2_3_
LTPP Traffic Data	*SPS PROJECT_ID	_0_5_0_0_
WIM System Test Truck Records 2 of 3	* DATE	10/13/2008

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space (14)	C-D space	D-E space	E-F space	
59	66	1	9	11:54	22553	66	52/58	86/90	84/89	87/94	75/10.0		81.2	11.6	4.4	34.0	4.1		
59	65	2	9	11:54	22554	67	47/52	79/76	65/74	91/92	83/94		74.4	11.6	4.4	30.5	10.1		
60	54	1	10	12:10	22612	55	55/53	87/92	81/89	81/92	84/90		80.3	11.5	4.4	34.0	4.1		
60	54	2	10	12:10	22613	57	46/50	73/74	69/71	92/94	86/93		74.8	11.6	4.4	30.4	10.1		
61.5	61	1	11	12:25	22672	61	52/56	86/90	87/92	81/98	83/96		82.1	11.6	4.4	34.1	4.1		
61.5	58	2	11	12:25	22673	59	48/48	73/74	68/68	91/95	85/94		74.3	11.6	4.4	30.4	10.1		
62	66	1	12	12:41	22734	66	50/54	83/91	82/90	80/99	82/98		81.0	11.6	4.4	34.1	4.1		
62	62	2	12	12:41	22735	62	51/49	71/73	76/74	90/88	86/83		74.1	11.6	4.4	30.4	10.1		
63.5	55	1	13	12:57	22787	55	51/54	85/86	85/86	80/95	79/96		79.7	11.6	4.4	34.0	4.1		
63.5	55	2	13	12:57	22788	55	46/50	69/73	60/77	90/92	85/94		73.8	11.6	4.3	30.4	10.1		
64.5	61	1	14	13:50	23029	61	51/55	87/90	84/91	81/98	78/97		81.3	11.6	4.4	34.1	4.1		
64.5	59	2	14	13:50	23030	58	46/50	73/72	71/62	90/92	86/91		73.3	11.6	4.4	30.3	10.0		
63.5	64	1	15	14:05	23103	66	44/54	84/89	82/89	76/95	77/96		78.6	11.6	4.4	34.0	4.1		
63.5	62	2	15	14:05	23104	62	46/51	72/73	72/67	89/95	84/90		73.9	11.6	4.4	30.4	10.1		
62.5	56	1	16	14:21	23175	56	48/53	88/93	85/91	79/100	83/100		82.0	11.6	4.4	34.1	4.1		56 mph
62.5	55	2	16	14:21	23176	55	48/50	70/77	66/75	90/86	83/87		73.1	11.6	4.4	30.4	10.1		55 mph

Recorded by MARK Z

Checked by

Sheet 21	* STATE_CODE	23
LTPP Traffic Data	*SPS PROJECT_ID	0500
WIM System Test Truck Records 3 of 3	* DATE	10/14/31/2008

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
62.5	60	1	17	14:37	23240	61	51/52	87/98	87/90	81/94	86/96	8	82.2	11.6	4.4	34.2	4.1	
62.5	57	2	17	14:37	23241	57	48/42	71/65	62/59	88/74	78/77		66.3	11.5	4.4	30.3	10.0	
62	62	1	18	14:53	23310	64	50/53	88/88	90/88	82/10.0	79/10.0		81.9	11.6	4.4	34.1	4.1	
62	61	2	18	14:53	23311	61	46/50	73/71	69/67	89/10.1	86/96		74.9	11.6	4.3	30.4	10.1	
63.5	53	1	19	15:09	23407	55	47/53	87/91	83/91	85/10.2	85/99		82.3	11.6	4.4	34.1	4.1	
63.5	53	2	19	15:09	23408	54	44/46	65/72	65/64	86/89	84/90		70.4	11.6	4.4	30.4	10.1	
62.5	60	1	20	15:25	23486	61	50/52	91/84	83/92	86/95	84/99		81.7	11.6	4.4	34.1	4.1	
62.5	58	2	20	15:25	23487	59	52/45	71/75	77/72	89/83	88/88		74.0	11.5	4.3	30.4	10.1	

Recorded by MARK Z

Checked by JW

Sheet 21	* STATE_CODE	23
LTPP Traffic Data	*SPS PROJECT_ID	0500
WIM System Test Truck Records 1 of ~~1~~ 1	* DATE	10/15/2008

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
42.5	58	1	1	8:52	25760	56	44/51	79/84	81/88	77/97	77/92		76.8	11.4	4.3	33.7	4.0	
42.5	54	2	1	8:52	25761	54	44/41	62/63	60/59	79/73	71/67		61.8	11.5	4.3	30	9.9	
43.5	61	1	2	9:08	25807	59	48/51	80/86	82/88	74/92	72/94		76.7	11.5	4.3	33.7	4.0	
43.5	59	2	2	9:08	25808	59	44/39	64/64	61/53	74/72	71/70		61.3	11.4	4.3	29.9	9.9	
47.5	64	1	3	9:24	25855	65	48/49	82/86	78/88	76/97	79/96		77.9	11.5	4.3	33.6	4.0	
47.5	64	2	3	9:24	25856	63	46/41	65/64	56/58	83/76	75/68		63.1	11.4	4.3	30.0	10.0	
49.5	53	1	4	9:39	25901	54	45/52	78/86	78/84	77/91	79/95		76.4	11.5	4.3	33.6	4.0	
49.5	53	2	4	9:39	25902	55	47/41	64/66	65/62	80/79	76/85		66.6	11.5	4.3	30.1	10.0	
52	59	1	5	9:57	25962	59	48/50	81/87	81/86	73/92	73/95		76.7	11.5	4.3	33.7	4.0	
52	58	2	5	9:57	25963	57	46/41	64/63	65/56	79/73	79/75		63.7	11.4	4.3	29.9	10.0	
52	66	1	~~1~~ 1	10:14	26018	65	45/51	82/85	78/87	78/95	82/94		77.8	11.4	4.3	33.7	4.0	
52	64	2	~~1~~ 1	10:14	26019	63	44/44	65/60	56/67	82/90	77/88		68.1	11.5	4.3	30.0	9.9	
51.5	54	1	~~2~~ 2	10:30	26067	54	47/48	79/92	78/86	78/88	81/89		76.5	11.5	4.3	33.7	4.0	
51.5	53	2	~~2~~ 2	10:30	26068	54	42/46	64/69	62/66	84/91	78/86		68.9	11.5	4.3	30.0	10.0	
52.5	59	1	~~3~~ 3	10:46	26119	59	49/48	85/90	80/87	74/88	78/88		76.1	11.5	4.4	33.7	4.0	
52.5	59	2	~~3~~ 3	10:46	26120	58	40/46	63/66	68/68	84/89	81/89		69.6	11.5	4.3	29.9	10.0	

CAL 2 ↓

Recorded by MARK 2 Checked by

Sheet 21	* STATE_CODE	23
LTPP Traffic Data	*SPS PROJECT_ID	0500
WIM System Test Truck Records 1 of 1	* DATE	10/15/2008

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
56	64	1	4	11:01	26182	64	50/50	79/78	76/84	80/101	82/89		77.0	11.5	4.4	33.7	4.0	
56	62	2	4	11:02	26183	62	41/48	60/69	63/63	80/89	76/89		68.3	11.5	4.3	30.0	10.0	
56.5	55	1	5	11:18	26259	56	48/47	81/91	75/89	70/89	74/95		75.8	11.5	4.4	33.7	4.0	
56.5	53	2	5	11:18	26260	55	45/44	64/60	67/73	81/84	76/82		68.5	11.5	4.3	30.0	9.9	
57	60	1	6	1134	26321	60	47/47	83/86	84/86	74/88	72/88		75.1	11.4	4.3	33.8	4.0	
57	58	2	6	11:34	26322	58	43/47	67/69	55/72	83/87	75/83		68.0	11.5	4.3	30.1	9.9	
70.5	69	1	12	13:31	26786	60	47/49	82/88	81/88	76/88	70/89		75.8	11.5	4.4	33.7	4.0	
70.5	59	2	12	13:31	26787	58	42/46	64/66	66/70	81/84	75/86		68.3	11.5	4.3	30.0	9.9	

GOES ON OTHER SHEET

Recorded by MARK E

Checked by

Sheet 21	* STATE_CODE	_2_3_
LTPP Traffic Data	*SPS PROJECT_ID	_0_5_0_0_
WIM System Test Truck Records 4 of 4 1 of 2 RW	* DATE	10/15/2008

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
59	60	1	15	14:20	27003	59	52/48	82/88	77/86	72/84	75/84		74.7	11.4	4.3	33.6	4.0	
59	58	2	15	14:20	27004	58	42/45	65/67	71/68	81/82	76/88		68.5	11.5	4.3	30.0	9.9	
71	64	1	16	15:28	27396	64	46/49	80/83	76/83	76/92	82/90		75.8	11.5	4.3	33.7	4.0	
66.5	54	1	17	15:44	27482	55	45/48	72/85	72/86	77/88	73/87		72.8	11.5	4.3	33.7	4.0	
66.5	54	2	16	15:44	27483	54	42/45	64/65	63/68	83/91	76/76		67.3	11.5	4.3	30.0	10.0	
62.5	60	1	18	16:01	27567	59	46/51	82/84	80/83	71/93	72/88		74.9	11.5	4.4	33.6	4.1	
62.5	58	2	17	16:01	27568	58	48/42	66/70	62/58	81/83	78/76		66.4	11.5	4.3	29.9	10.0	
63.5	64	1	19	16:17	27651	64	53/47	78/83	74/85	75/89	76/86		74.6	11.5	4.3	33.7	4.0	
63.5	62	2	18	16:17	27652	63	46/45	63/67	63/72	80/79	77/84		67.7	11.4	4.3	30.1	10.0	
64.5	54	1	20	16:33	27744	54	51/45	80/84	75/86	76/86	77/89		74.7	11.4	4.3	33.5	4.0	
64.5	54	2	19	16:33	27745	54	42/43	64/65	59/65	81/86	74/83		66.5	11.5	4.3	30.1	9.9	
60	58	1	21	16:49	27855	59	51/47	79/88	78/85	75/91	77/85		75.6	11.4	4.3	33.7	4.0	
60	58	2	20	16:49	27856	58	42/43	66/68	62/68	80/87	77/87		67.8	11.5	4.3	30.1	9.9	

Recorded by MARK Z

Checked by

Sheet 21	* STATE_CODE 23
LTPP Traffic Data	*SPS PROJECT_ID 0500
WIM System Test Truck Records 3 of 4 2+2 1800	* DATE 10/15/2008

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
60	64	1	7	11:49	26377	64	49/48	75/86	77/87	80/92	81/90		76.5	11.5	4.3	33.7	4.0	
60	62	2	7	11:49	26378	62	43/45	65/67	62/70	84/89	77/82		68.4	11.5	4.3	30.1	9.9	
61	54	1	8	12:07	26438	55	46/50	79/86	77/82	75/80	8/90		75.4	11.5	4.3	33.6	4.1	
61	54	2	8	12:07	26439	54	42/47	62/68	62/68	86/90	81/93		70.0	11.5	4.3	30.1	10.0	
64.5	60	1	9	12:23	26552	60	47/48	81/85	79/88	74/90	72/91		75.5	11.5	4.3	33.8	4.0	
64.5	58	2	9	12:23	26553	57	41/47	65/67	67/63	83/87	78/93		69.3	11.5	4.3	30.1	10.0	
62	64	1	10	12:39	26557	65	47/50	83/81	77/79	82/94	81/95		76.9	11.5	4.3	33.7	4.0	
62	62	2	10	12:39	26558	62	41/47	67/66	61/58	85/88	76/86		67.6	11.5	4.3	29.9	9.9	
70	55	1	11	13:16	26710	55	48/48	84/89	77/84	75/91	78/93		76.4	11.5	4.4	33.6	4.0	
70	54	2	11	13:16	26711	54	43/45	64/67	57/69	81/86	76/83		67.0	11.5	4.3	30.0	9.9	
70.5	60	1	12	13:31	26786	60	47/49	82/88	81/88	76/88	79/89		75.8	11.5	4.4	33.7	4.0	
70.5	59	2	12	13:31	26787	58	42/46	64/66	66/70	81/84	75/86		68.3	11.5	4.3	30.0	9.9	
65.5	64	1	13	13:47	26858	65	56/45	78/83	83/83	79/83	79/82		74.6	11.5	4.3	33.6	4.0	
65.5	62	2	13	13:47	26859	62	41/46	68/64	58/60	81/83	76/90		67.7	11.5	4.3	30.0	10.0	
60.5	54	1	14	14:03	26929	54	45/46	84/87	80/81	78/92	76/92		76.2	11.5	4.3	33.6	4.0	
60.5	54	2	14	14:03	26930	54	42/46	66/68	60/65	82/85	79/91		68.3	11.5	4.3	30.0	9.9	

Recorded by MARK Z

Checked by

Calibration Worksheet

Site: __230500___

Calibration Iteration ____1____ Date__10/14/08__

Beginning factors:

Speed Point (mph)	Name	Left Sensor 1 / 3	Right Sensor 2 / 4
Overall			
Front Axle	dynamic comp	105	
Distance	axl sens dis	305	
1 – (50)	80 kph	3053	3053
2 – (55)	88 kph	2991	2991
3 – (60)	96 kph	3084	3084
4 – (65)	104 kph	3053	3053
5 – (70)	112 kph	3053	3053

Errors:

	Speed Point 1 (50)	Speed Point 2 (55)	Speed Point 3 (60)	Speed Point 4 (65)	Speed Point 5 (70)
F/A		+ 6.3	+ 7.2	+ 9.4	
Tandem		+ 5.2	+ 7.6	+ 5.9	
GVW		+ 4.5	+ 6.7	+ 6.1	

Adjustments:

	Raise	Lower	Percentage
Overall	☐	☐	
Front Axle	☐	☑	1.7 %
Speed Point 1	☐	☑	4.3
Speed Point 2	☐	☑	~~6.5~~ 4.3
Speed Point 3	☐	☑	~~5.9~~ 6.5
Speed Point 4	☐	☑	5.9
Speed Point 5	☐	☑	5.9

End factors:

Speed Point (mph)	Name	Left Sensor 1 / 3	Right Sensor 2 / 4
Overall			
Front Axle	dynamic comp	103	
Distance	axl sens dis	301	
1 – (50)	80 kph	2862	2862
2 – (55)	88 kph	2862	2862
3 – (60)	96 kph	2884	2884
4 – (65)	104 kph	2872	2872
5 – (70)	112 kph	2872	2872

TEST VEHICLE PHOTOGRAPHS FOR SPS WIM VALIDATION

October 14, 2008

STATE: MAINE

SHRP ID: 230500

Photo 1 - 23_0500_Truck_1_Tractor_10_14_08.jpg

Photo 2 - 23_0500_Truck_1_Trailer_10_14_08.jpg

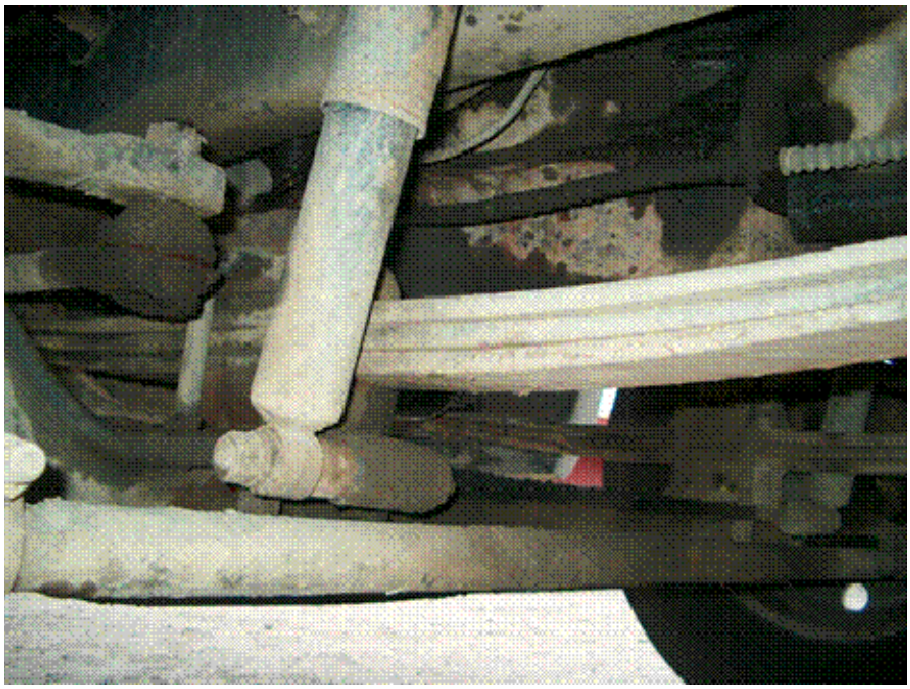

Photo 3 - 23_0500_Truck_1_Suspension_1_10_14_08.jpg

Photo 4 - 23_0500_Truck_1_Suspension_2_10_14_08.jpg

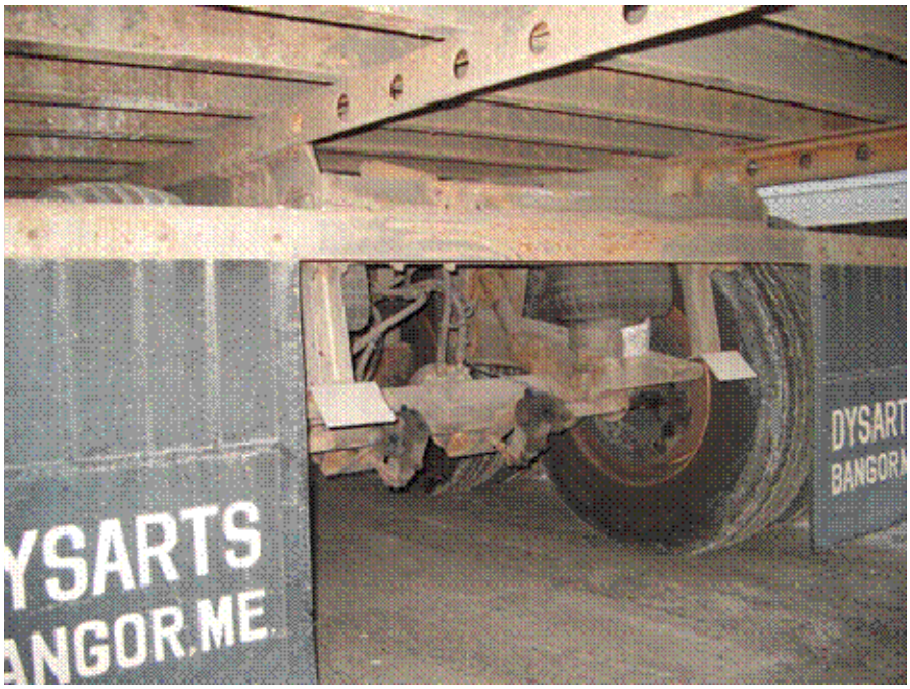

Photo 5 - 23_0500_Truck_1_Suspension_3_10_14_08.jpg

Photo 6 - 23_0500_Truck_2_Tractor_10_14_08.jpg

Photo 7 - 23_0500_Truck_2_Trailer_10_14_08.jpg

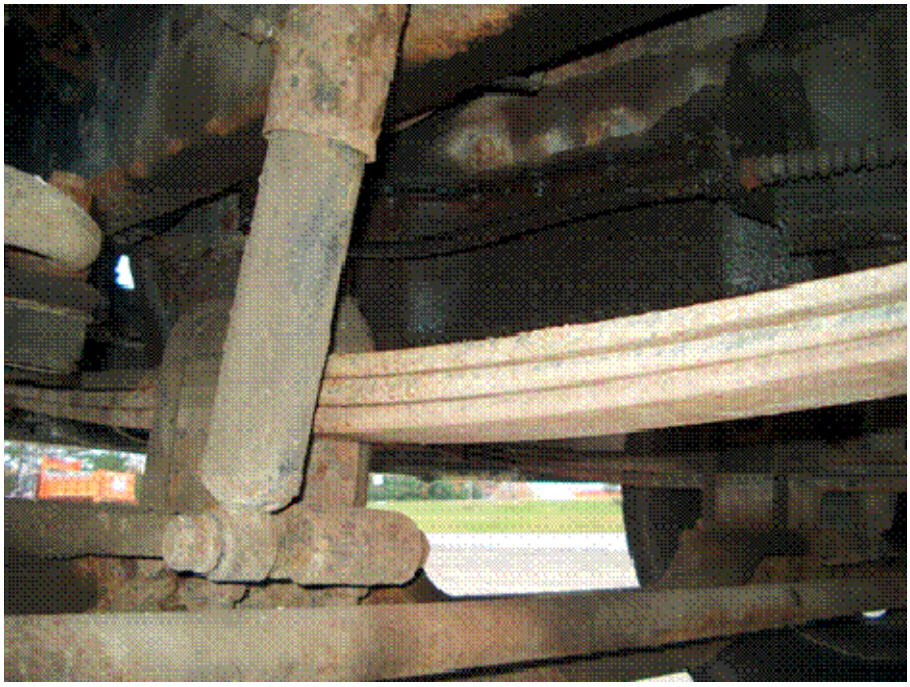

Photo 8 - 23_0500_Truck_2_Suspension_1_10_14_08.jpg

Photo 9 - 23_0500_Truck_2_Suspension_2_10_14_08.jpg

Photo 10 - 23_0500_Truck_2_Suspension_3_10_14_08.jpg

Photo 11 - 23_0500_truck_2_suspension_4_10_14_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

Maine SPS-5 (Lane 1)

Validation Visit – 15 October 2008

Calibration factor for sensor #1:

	15 October 2008	14 August 2007
Dynamic compensation	103	105
Axle sensor distance	301	305
80 kph	2862	3053
88 kph	2862	2991
96 kph	2884	3084
105 kph	2872	3053
112 kph	2872	3053

Calibration factor for sensor #2:

	15 October 2008	14 August 2007
Dynamic compensation		
Axle sensor distance		
80 kph	2862	3053
88 kph	2862	2991
96 kph	2884	3084
105 kph	2872	3053
112 kph	2872	3053