Validation Report

Illinois, SPS-6
Task Order 27, CLIN 2
July 8 to 10, 2008

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1 Executive Summary

A visit was made to the Illinois 0600 on July 8 to 10, 2008 for the purposes of conducting a validation of the WIM system located on I-57, approximately 10 miles south of the I-57/I-72 interchange. The SPS-6 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 is the fourth validation visit to this location. The site was installed on July 26 to 27, 2005 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.

During the post-validation, without explanation, the equipment suddenly began reporting extra "ghost" axles on all heavy trucks, with the system generally reporting these vehicles as Class 15 (unclassified) vehicles. IRD was contacted by phone. They suggested the removal and replacement of the weighpad signal analysis board (SSM). This action was taken and corrected the problem for the remainder of the validation. The cause of the malfunction remains unexplained. Data collected prior to and after this visit containing a high number of Class 15 vehicles should be investigated further.

The site is instrumented with PAT bending plate and iSync electronics. It is installed in portland cement concrete, 400 feet long.

The validation used the following trucks:

1) 5-axle tractor semi-trailer with a tractor having an air suspension and a trailer with a standard rear tandem and a steel leaf suspension loaded to 70,070 lbs., the "Partial" truck.
2) 5-axle tractor semi-trailerwith a tractor having a an air suspension and a trailer with a standard rear tandemand an air suspension loaded to 76,870 lbs., the "Golden 2" truck.

The validation speeds ranged from 53 to 65 miles per hour. The pavement temperatures ranged from 89 to 121 degrees Fahrenheit. The desired speed range was achieved during this validation. The desired 30 degree Fahrenheit temperature range was also achieved.

Table 1-1 Post-Validation results – 170600 – 10-Jul-2008

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-2.0 ± 5.0%	Pass
Tandem axles	±15 percent	0.9 ± 4.4%	Pass
GVW	±10 percent	0.5 ± 3.2%	Pass
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.1 ft	Pass

Prepared: djw *Checked: bko*

The pavement condition appeared to be satisfactory for conducting a performance evaluation. There were no distresses observed that would influence truck motions significantly. A visual survey determined that there is no discernable bouncing or avoidance by trucks in the sensor area. Profile data collected by the Regional Support Contractor on April 14, 2008 was also available and is discussed in Section 4.1 of this report.

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

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

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

Prepared: djw *Checked: bko*

Upon our arrival at the site, we found the system parameters were not the same as we left them at the conclusion of our last validation on March 29, 2007. Since that time, IRD has installed new weighpad analysis firmware and performed a remote calibration of the system settings using downloaded data.

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

2 Corrective Actions Recommended

The cause of the sudden reporting of "ghost" axles on heavy trucks during the Post-Validation and data collected prior to and after this Validation visit containing a high number of Class 15 vehicles should be investigated further.

The significant transverse crack located approximately 25 feet after the leading transition to the concrete section reported after the last validation remains. Although it does not appear to influence truck movement as they cross the sensors, corrective actions should be evaluated as soon as feasible.

No other corrective actions are required at this site at this time.

3 Post Calibration Analysis

This final analysis is based on test runs conducted July 9 and 10, 2008 during the morning hours at test site 170600 on I-57. This SPS-6 site is at milepost 225.7 on the northbound, righthand of a four-lane divided facility. No auto-calibration was used during test runs. The two trucks used for the calibration and for the subsequent validation included:

1. 5-axle tractor semi-trailer with a tractor having an air suspension and a trailer with a standard rear tandem and a steel leaf suspension loaded to 70,070 lbs., the "Partial" truck.
2. 5-axle tractor semi-trailerwith a tractor having an air suspension and a trailer with a standard rear tandem and an air suspension loaded to 76,870 lbs., the "Golden 2" truck.

The calibration and final validation used a different "golden" truck than for the preliminary validation. Each truck made a total of 20 passes over the WIM scale at speeds ranging from approximately 53 to 65 miles per hour. The desired speed range was achieved during this validation. Pavement surface temperatures were recorded during the test runs ranging from about 89 to 121 degrees Fahrenheit. The desired 30 degree Fahrenheit temperature range was also achieved. The computed values of 95% confidence limits of each statistic for the total population are in Table 3-1.

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

Table 3-1 Post-Validation Results – 170600 – 10-Jul-2008

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-2.0 ± 5.0%	Pass
Tandem axles	±15 percent	0.9 ± 4.4%	Pass
GVW	±10 percent	0.5 ± 3.2%	Pass
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.1 ft	Pass

Prepared: djw *Checked: bko*

The test runs were conducted primarily during the morning to early evening hours, resulting in a wide range of pavement temperatures. The runs were also conducted at various speeds to determine the effects of these variables on the performance of the WIM scale. To investigate these effects, the data set was split into three speed groups and three temperature groups. The distribution of runs by speed and temperature is illustrated in Figure 3-1. The figure indicates that the desired distribution of speed and temperature combinations was achieved for this set of validation runs.

The three speed groups were divided as follows: Low speed – 53 to 57 mph, Medium speed – 58 to 63 mph and High speed – 64 + mph. The three temperature groups were created by splitting the runs between those at 89 to 99 degrees Fahrenheit for Low temperature, 100 to 110 degrees Fahrenheit for Medium temperature and 111 to 121 degrees Fahrenheit for High temperature.

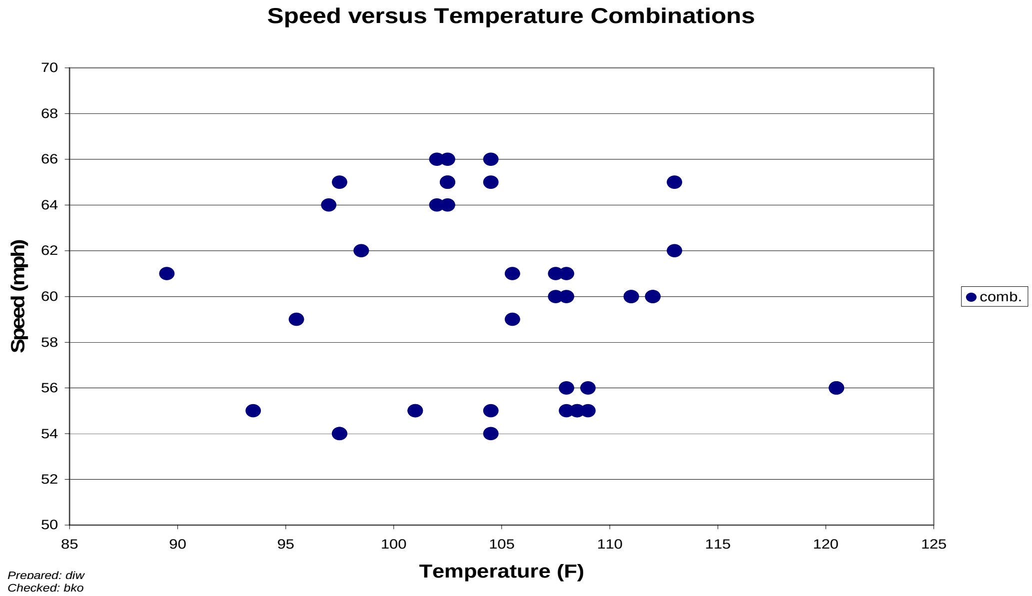

Figure 3-1 Post-Validation Speed-Temperature Distribution – 170600 – 10-Jul-2008

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

Figure 3-2 shows the GVW Percent Error vs. Speed graph for the population as a whole. It can be seen in Figure 3-2 that the equipment slightly underestimates GVW at the higher speeds. Variability appears to be reasonably consistent throughout the entire speed range.

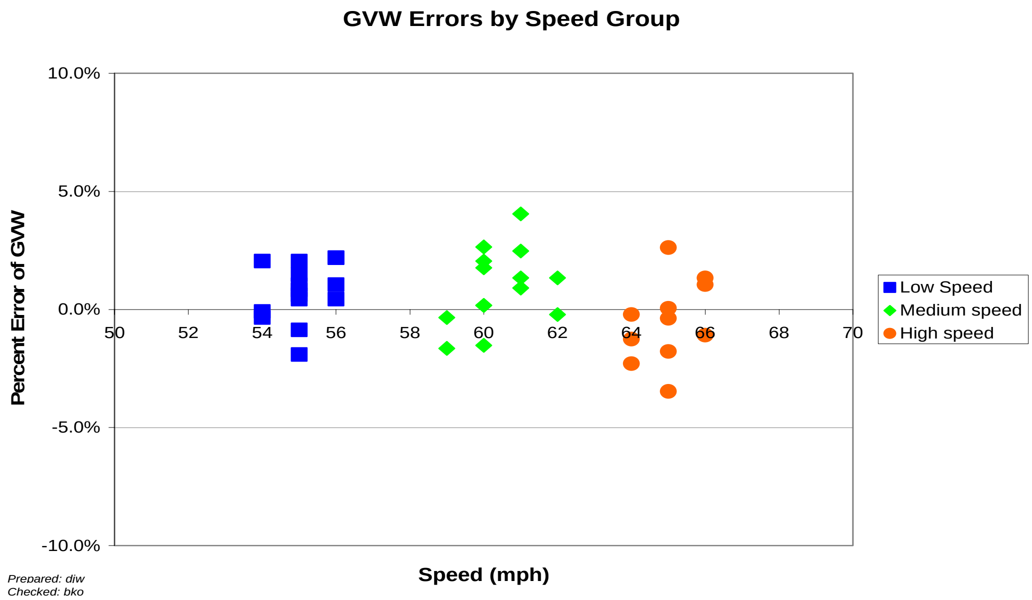

Figure 3-2 Post-validation GVW Percent Error vs. Speed – 170600 – 10-Jul-2008

Figure 3-3 shows the relationship between temperature and GVW percentage error. The system appears to estimate GVW with reasonable accuracy at all temperatures. There is a slight increase in variability at the medium temperatures that may be attributed to the increased number of samples at those temperatures.

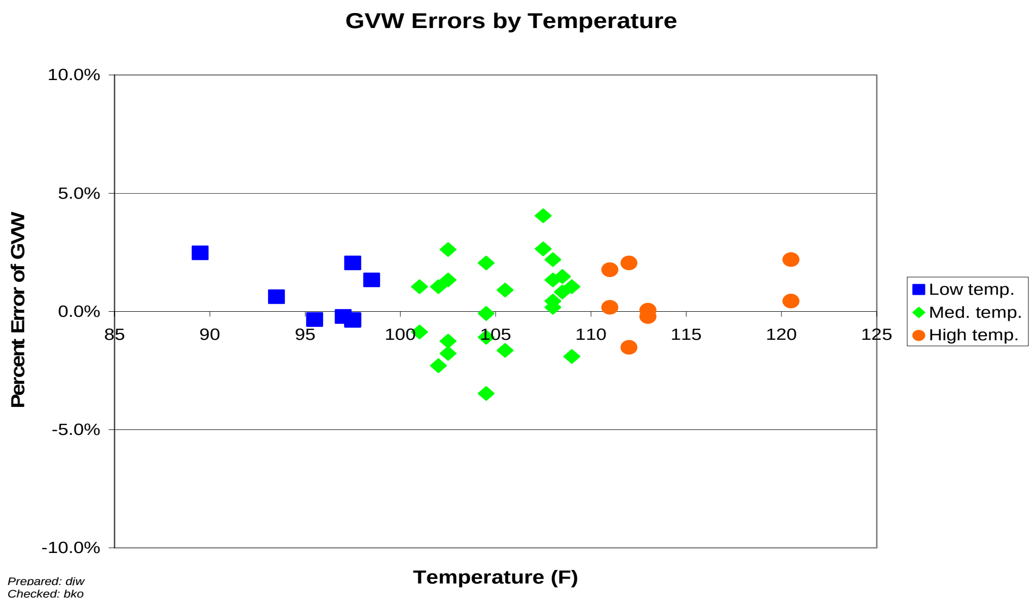

Figure 3-3 Post-Validation GVW Percent Error vs. Temperature – 170600 – 10-Jul-2008

Figure 3-4 shows the relationship between the drive tandem spacing errors in feet and speeds. This graph is used as a potential indicator of classification errors due to failure to correctly identify spacings on a vehicle. Since the most common reference value is the drive tandem on a Class 9 vehicle, this is the spacing evaluated and plotted for validations. There is no apparent influence of speed on spacing errors.

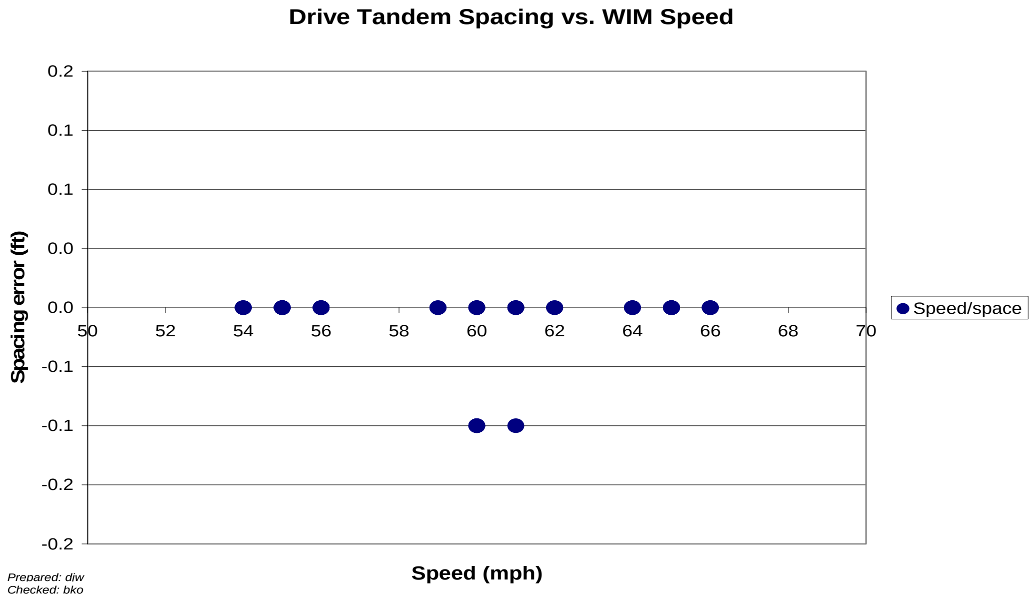

Figure 3-4 Post-Validation Spacing vs. Speed – 170600 – 10-Jul-2008

3.1 Temperature-based Analysis

The three temperature groups were created by splitting the runs between those at 89 to 99 degrees Fahrenheit for Low temperature, 100 to 110 degrees Fahrenheit for Medium temperature and 111 to 121 degrees Fahrenheit for High temperature.

Table 3-2 Post-Validation Results by Temperature Bin – 170600 – 10-Jul-2008

Element	95% Limit	Low Temperature 89 to 99 °F	Medium Temperature 100 to 110 °F	High Temperature 111 to 121 °F
Steering axles	+20 %	-1.8 ± 5.8%	-2.2 ± 5.0%	-1.5 ± 7.0%
Tandem axles	+15 %	1.0 ± 4.2%	0.8 ± 5.0%	1.0 ± 3.9%
GVW	+10 %	0.6 ± 2.8%	0.4 ± 3.8%	0.6 ± 3.0%
Axle spacing	+ 0.5 ft	0.0 ± 0.0 ft	0.0 ± 0.0 ft	0.0 ± 0.1 ft

Prepared: djw *Checked: bko*

Table 3-2 demonstrates the tendency of the equipment to underestimate steering axle weights at all temperatures. GVW and tandem axle weights appear to be estimated with reasonable accuracy at all temperatures. Variability for each weight estimate appears to be generally consistent at all temperatures.

Figure 3-5 is the distribution of GVW Errors versus Temperature by Truck graph. From the graph, it can be seen that the equipment tends to underestimate GVW for the Golden 2 truck (triangles) while overestimating GVW for the Partial truck (diamonds).

This tendency appears to cause an increase in the variability in error for the truck population as a whole at the medium temperatures.

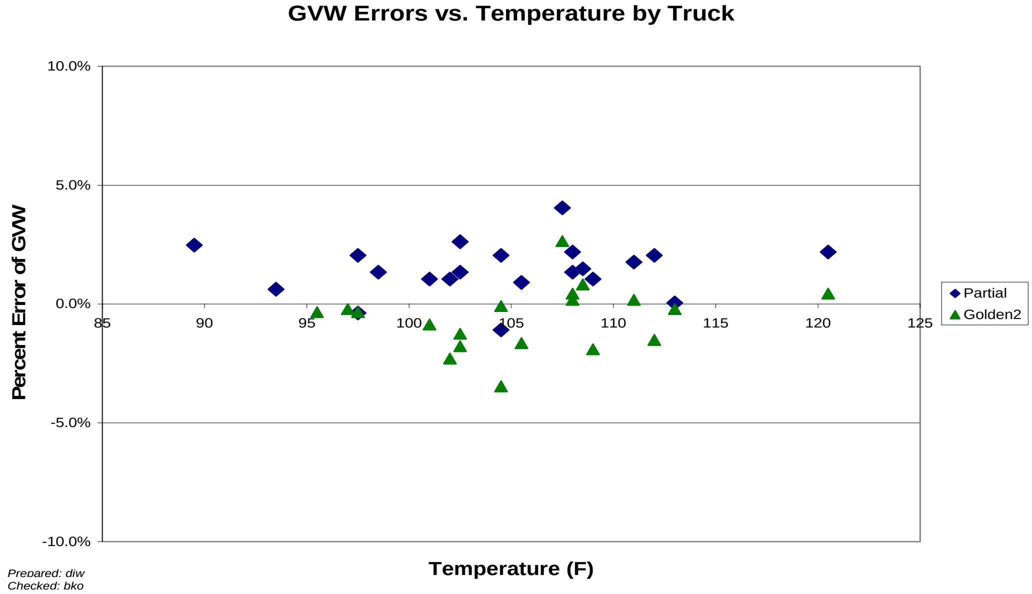

Figure 3-5 Post-Validation GVW Percent Error vs. Temperature by Truck – 170600 – 10-Jul-2008

Figure 3-6 shows the relationship between steering axle errors and temperature. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for calibration. This site does not use auto-calibration. The steering axles in this graph are associated only with Class 9 vehicles. The equipment tends to underestimate steering axle weights at all temperatures. There is apparently no temperature trend associated with steering axle estimates.

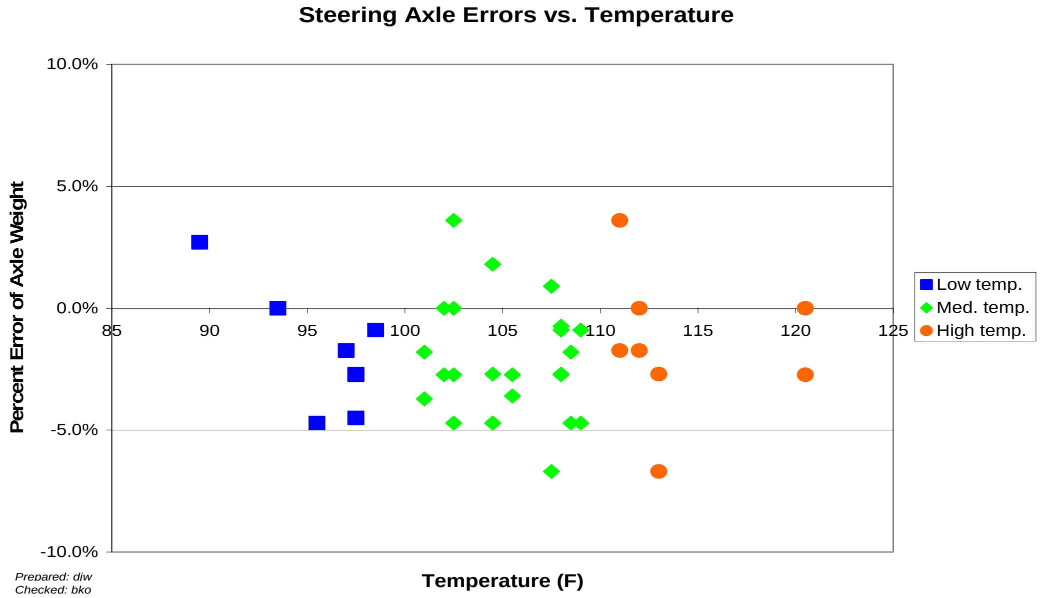

Figure 3-6 Post-Validation Steering Axle Error vs. Temperature by Group – 170600 – 10-Jul-2008

3.2 Speed-based Analysis

The three speed groups were divided using 53 to 57 mph for Low speed, 58 to 63 mph for Medium speed and 64+ mph for High speed.

Table 3-3 Post-Validation Results by Speed Bin – 170600 – 10-Jul-2008

Element	95% Limit	Low Speed 53 to 57 mph	Medium Speed 58 to 63 mph	High Speed 64+ mph
Steering axles	±20 %	-2.2 ± 4.1%	-1.8 ± 6.7%	-2.1 ± 5.6%
Tandem axles	±15 %	1.2 ± 3.4%	1.4 ± 4.9%	-0.2 ± 5.0%
GVW	±10 %	0.7 ± 2.6%	0.9 ± 3.5%	-0.5 ± 3.9%
Axle spacing	± 0.5 ft	0.0 ± 0.0 ft	0.0 ± 0.1 ft	0.0 ± 0.0 ft

Prepared: djw *Checked: bko*

From Table 3-3, it can be seen that for steering axle weights, the equipment underestimates at the all speeds. GVW and tandem axle weights are estimated with reasonable accuracy at all speeds. Generally, there is a slight increase in variability as speed increases.

From Figure 3-7, it appears that GVW for the Golden 2 truck (triangles) is generally underestimated at all speeds while the GVW estimates for the Partial truck (diamonds) appear to be generally overestimated at all speeds. Collectively, the equipment estimates GVW with reasonable accuracy and variability is consistent over the entire speed range.

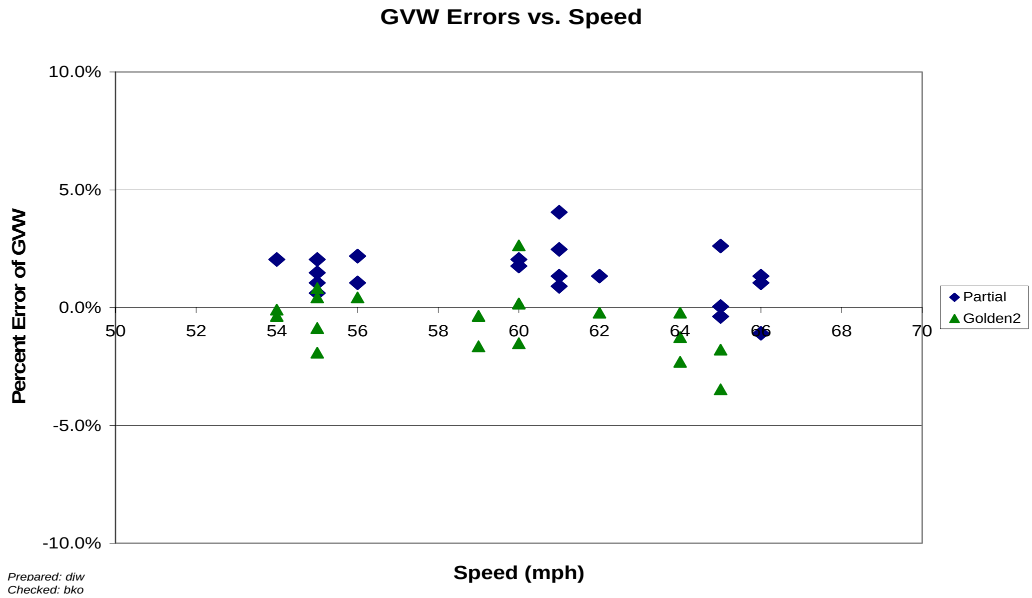

Figure 3-7 Post-Validation GVW Percent Error vs. Speed by Truck – 170600 – 10-Jul-2008

Figure 3-8 shows the relationship between steering axle errors and speed. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for auto-calibration. This site does not use auto-calibration. The steering axles in this graph are associated only with Class 9 vehicles. The figure shows an underestimation of steering axle weights at all speeds and an increased variability in error at the medium speeds.

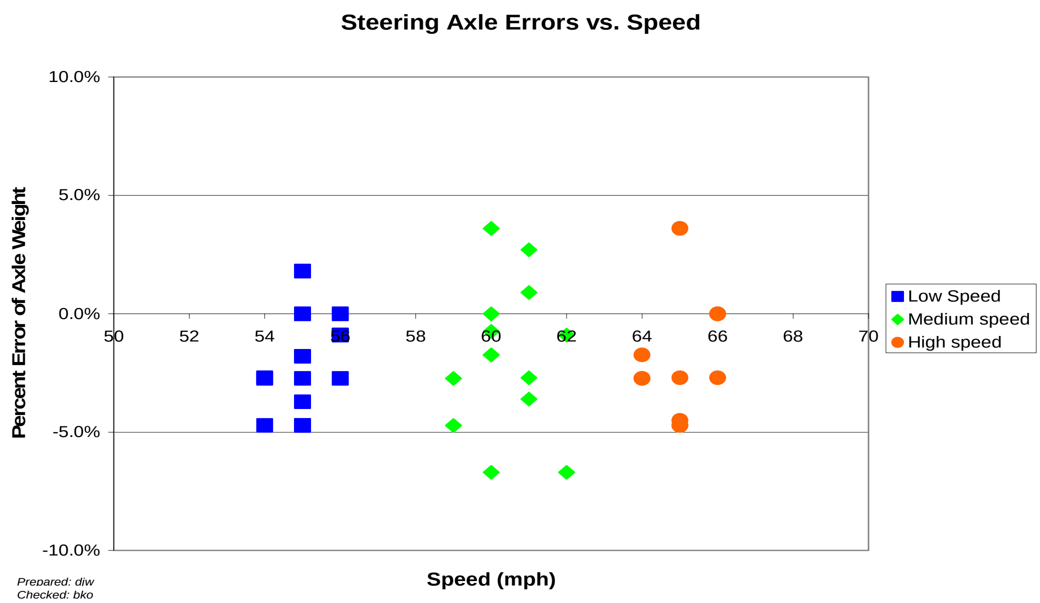

Figure 3-8 Post-Validation Steering Axle Percent Error vs. Speed by Group – 170600 – 10-Jul-2008

3.3 Classification Validation

This LTPP installed site uses the FHWA 13-bin classification scheme and the LTPP 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 two percent unclassified vehicles. The unclassified vehicles were a Class 5 vehicle with a trailer comprised of an irregular axle configuration and the other was a Class 9 that reported additional (“ghost”) axles.

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 8.0 percent.

Table 3-4 Truck Misclassification Percentages for 170600 – 10-Jul-2008

Class	Percent Error	Class	Percent Error	Class	Percent Error
4	100	5	13	6	0
7	N/A				
8	0	9	1	10	100
11	0	12	0	13	100

Prepared: djw Checked: bko

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

Table 3-5 Truck Classification Mean Differences for 170600 – 10-Jul-2008

Class	Mean Difference	Class	Mean Difference	Class	Mean Difference
4	UNK	5	- 13	6	0
7	N/A				
8	0	9	- 1	10	-100
11	0	12	0	13	UNK

Prepared: djw Checked: bko

These error rates are normalized to represent how many vehicles of the class are expected to be over or under-counted for every hundred of that class observed by the equipment. Thus a value of 0 means the class is identified correctly on average. A number between –1 and –100 indicates at least that number of vehicles either missed or not assigned to the class by the equipment. It is not possible to miss more than all of them or one hundred out of one hundred. Numbers 1 or larger indicate at least how many more vehicles are assigned to the class than the actual "hundred observed". Classes marked Unknown (UNK) are those identified by the equipment but no vehicles of the type were seen by the observer. There is no way to tell how many vehicles of that type might actually exist. N/A means no vehicles of the class were recorded by either the equipment or the observer.

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

3.4 Evaluation by ASTM E-1318 Criteria

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

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

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

Prepared: djw Checked: bko

4 Pavement Discussion

The pavement condition did not 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 Consultants on April 15, 2008 were processed through the LTPP SPS WIM Index software, version 1.1. This WIM scale is installed in a rigid 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 RSC 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 1.1 includes 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

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 above the upper index limits are presented in bold and values below the lower index limits are presented in italics.

Table 4-2 WIM Index Values - 170600 – 15–Apr-2008

Profiler Passes			**Pass 1**	**Pass 2**	**Pass 3**	**Pass 4**	**Pass 5**	**Ave.**
Center	LWP	LRI (m/km)	0.509	*0.493*	*0.423*	*0.471*	*0.424*	*0.464*
		SRI (m/km)	*0.283*	*0.302*	*0.366*	0.533	*0.291*	*0.355*
		Peak LRI (m/km)	0.578	0.566	*0.485*	0.555	0.525	0.542
		Peak SRI (m/km)	*0.530*	*0.538*	*0.552*	0.805	*0.460*	*0.577*
	RWP	LRI (m/km)	0.579	0.582	0.597	0.572	0.668	0.600
		SRI (m/km)	0.702	0.948	1.219	0.798	1.331	1.000
		Peak LRI (m/km)	0.627	0.665	0.674	0.610	0.668	0.649
		Peak SRI (m/km)	0.824	1.065	1.222	0.829	1.397	1.067
Left Shift	LWP	LRI (m/km)	0.619	0.591	0.630			0.613
		SRI (m/km)	*0.361*	*0.403*	*0.472*			*0.412*
		Peak LRI (m/km)	0.623	0.670	0.713			0.669
		Peak SRI (m/km)	*0.575*	*0.450*	*0.633*			*0.553*
	RWP	LRI (m/km)	0.730	0.650	0.607			0.662
		SRI (m/km)	0.815	1.191	0.856			0.954
		Peak LRI (m/km)	0.730	0.666	0.608			0.668
		Peak SRI (m/km)	0.859	1.194	0.915			0.989
Right Shift	LWP	LRI (m/km)	0.572	0.519	0.526			0.539
		SRI (m/km)	*0.406*	*0.425*	*0.407*			*0.413*
		Peak LRI (m/km)	0.582	0.612	0.633			0.609
		Peak SRI (m/km)	*0.492*	*0.480*	*0.498*			*0.490*
	RWP	LRI (m/km)	0.562	0.572	0.606			0.580
		SRI (m/km)	*0.496*	*0.383*	*0.443*			*0.441*
		Peak LRI (m/km)	0.622	0.625	0.630			0.626
		Peak SRI (m/km)	*0.526*	*0.452*	*0.515*			*0.498*

Prepared by: als checked by: jrn

Table 4-3 shows the computed index values for all 11 profiler passes for this WIM site for the prior profile data. 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 above the upper index limits are presented in bold and values below the lower index limits are presented in italics.

Table 4-3 WIM Index Values - 170600 –04-Jun-2006

Profiler Passes			Pass 1	Pass 2	Pass 3	Pass 4	Pass 5	Ave.
Center	LWP	LRI (m/km)	0.569	0.675	0.552	0.616	0.649	0.612
		SRI (m/km)	0.515	*0.401*	*0.447*	*0.452*	0.567	*0.476*
		Peak LRI (m/km)	0.676	0.700	0.648	0.662	0.658	0.669
		Peak SRI (m/km)	*0.534*	*0.524*	*0.479*	*0.606*	*0.584*	*0.545*
	RWP	LRI (m/km)	0.624	0.601	0.618	0.532	0.581	0.591
		SRI (m/km)	*0.498*	*0.320*	0.714	*0.344*	*0.487*	*0.473*
		Peak LRI (m/km)	0.658	0.706	0.672	0.657	0.673	0.673
		Peak SRI (m/km)	0.894	*0.569*	1.229	*0.615*	*0.680*	0.797
Left Shift	LWP	LRI (m/km)	*0.489*	0.578	*0.460*			0.509
		SRI (m/km)	*0.389*	*0.469*	*0.305*			*0.389*
		Peak LRI (m/km)	0.665	0.647	0.599			0.637
		Peak SRI (m/km)	*0.524*	*0.597*	*0.486*			*0.536*
	RWP	LRI (m/km)	0.603	0.664	0.870			0.712
		SRI (m/km)	1.070	0.975	1.734			1.260
		Peak LRI (m/km)	0.603	0.665	0.880			0.716
		Peak SRI (m/km)	1.392	1.313	2.310			1.672
Right Shift	LWP	LRI (m/km)	0.555	0.576	*0.447*			0.526
		SRI (m/km)	*0.479*	0.664	*0.318*			*0.487*
		Peak LRI (m/km)	0.642	0.641	0.608			0.630
		Peak SRI (m/km)	0.771	*0.709*	*0.429*			*0.636*
	RWP	LRI (m/km)	0.550	*0.469*	0.528			0.516
		SRI (m/km)	*0.475*	*0.379*	*0.365*			*0.406*
		Peak LRI (m/km)	0.642	0.603	0.627			0.624
		Peak SRI (m/km)	*0.652*	*0.549*	*0.557*			*0.586*

Prepared by: bko checked by: als

From Table 4-3 it can be seen that many of the SRI and peak SRI values fell below the lower threshold level. The LRI values predominantly fell between the two threshold levels. These values indicated that the pavement profile may or may not have influenced the WIM scale output. Since the scale could be validated as providing research quality data, no recommendation is made here for any remediation to the pavement at this site.

The average index values obtained from the April 2008 data are generally similar or higher than the average values obtained from the June 2006 profile data. This trend meets the expected trend for these data. Two values in particular are identified as being significantly lower from the April 2008 data as compared to the June 2006 data. These are the SRI and Peak SRI from the right wheelpath of the center pass data. The most likely explanation for the decrease is the presence of a small distortion in or around the right wheelpath of the lane that located close to the WIM sensor. This distortion is sufficiently small in width that it is possible for the profiler to capture data on either side without observing the distortion and the distortion presents a sufficiently large elevation change that its presence or lack thereof can be directly observed in the measurements.

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. A significant transverse crack located approximately 25 feet following the leading transition to the concrete section was discovered, but appears to be far enough in advance of the WIM scales so that it does not affect the movement of the trucks as they transverse the WIM scale area.

4.3 Vehicle-pavement Interaction Discussion

A visual observation of the trucks as they approach, transverse 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 PAT bending plate sensors and iSync electronics. The sensors are installed in a portland cement concrete pavement about 400 ft in length. The roadway outside this short section is asphalt.

All equipment and sensors were installed in July 2005 as part of the SPS WIM Phase II contract.

Since the last Validation visit on March 28, 2007, the weighpad analysis firmware was replaced. A remote calibration by the installer using downloaded data was subsequently performed. The quality of the data based on remote calibration since the replacement and prior to this validation cannot be determined.

During the Post-Validation, without explanation, the equipment suddenly began reporting extra “ghost” axles on all heavy trucks, with the system generally reporting these vehicles as Class 15 (unclassified) vehicles. IRD was contacted by phone and suggested the removal and replacement of the weighpad signal analysis board (SSM). This action appears to have corrected the problem. The cause of the malfunction remains unexplained. Data collected prior to and after this visit containing a high number of Class 15 vehicles should be investigated further.

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.

A complete visual inspection of all WIM system and support components was also performed. All components appeared to be in good physical condition.

5.2 Calibration Process

Upon our arrival at the site, we found the system parameters were not the same as we left them at the conclusion of our last validation on *March 29, 2007*. Since that time, IRD has installed new weighpad analysis firmware and subsequently performed a remote calibration of the system settings using downloaded data.

No calibration iterations were required, but since improving the statistics was desired, one-iteration of the calibration process was performed 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 - 170600 - 08-Jul-2008

Speed Bin	Left Sensor 1	Right Sensor 2
80 kph:	3275	3684
88 kph:	3474	3908
96 kph:	3367	3789
104 kph	3320	3734
112 kph:	3219	3619

Prepared: djw Checked: bko

5.2.1 Calibration Iteration 1

As a result of the Pre-Validation, where GVW transitioned from a slight overestimation of 0.5% at the lower test speeds, to an underestimation of 2.2% at the higher test speeds, the system compensation factors were adjusted as shown in Table 5-2.

Table 5-2 Calibration 1 - Change in Parameters - 170600 - 09-Jul-2008

Speed Bins	**Right Sensor 1**	**Change**	**Left Sensor 2**	**Change**
80 kph:	3275	0.0%	3684	0.0%
88 kph:	3462	-0.5%	3895	-0.5%
96 kph:	3420	1.4%	3848	1.4%
104 kph	3399	2.2%	3822	2.2%
112 kph:	3219	0.0%	3619	0.0%

Prepared: djw Checked: bko

The results of the twelve calibration iteration verification runs are shown in Table 5-3.

Table 5-3 Calibration Iteration 1 Results – 170600 – 09-Jul-2008 (12:36 PM)

SPS-1, -2, -5, -6 and -8	**95 %Confidence Limit of Error**	**Site Values**	**Pass/Fail**
Steering axles	±20 percent	-2.8 ± 3.8%	Pass
Tandem axles	±15 percent	0.4 ± 5.2%	Pass
GVW	±10 percent	-0.1 ± 4.0%	Pass
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	Pass

Prepared: djw Checked: bko

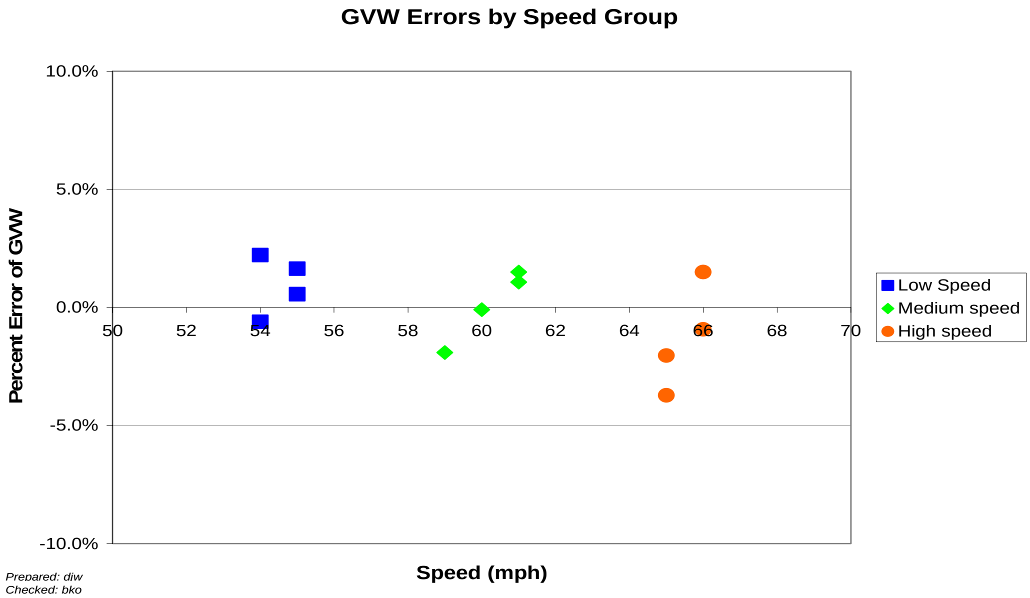

Figure 5-1 Calibration Iteration 1 GVW Percent Error vs. Speed Group – 170600 – 09-Jul-2008 (12:36 PM)

5.3 Summary of Traffic Sheet 16s

This site has validation information from previous visits as well as the current one in the tables below. Table 5-4 has the information for TRF_CALIBRATION_AVC for Sheet 16s submitted prior to this validation as well as the information for the current visit. The Sheet 16s available reflect only this contractor's validation visits.

Table 5-4 Classification Validation History – 170600 – 10-Jul-2008

Date	Method	Mean Difference				Percent
		Class 9	Class 8	Other 1	Other 2	Unclassified
07/09/2008	Manual	-1	0	-13 (Cl 5)		0
07/08/2008	Manual	0	50			
03/29/2007	Manual	0	0			0
03/28/2007	Manual	0	0			0
09/21/2006	Manual	0	0			0
09/19/2006	Manual	0	0			0
09/08/2005	Manual	0	0			0
09/07/2005	Manual	0	0			0

Prepared: djw *Checked: bko*

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

Table 5-5 Weight Validation History – 170600 – 10-Jul-2008

Date	Method	Mean Error and (SD)		
		GVW	Single Axles	Tandem Axles
07/10/2008	Test Trucks	0.5 (1.6)	-2.0 (2.5)	0.9 (2.2)
07/09/2008	Test Trucks	-0.8 (2.0)	-2.7 (1.8)	-0.5 (2.8)
03/29/2007	Test Trucks	0.2 (2.4)	-3.1 (5.6)	1.0 (3.6)
03/28/2007	Test Trucks	1.6 (2.8)	-6.6 (6.3)	-0.3 (3.9)
09/21/2006	Test Trucks	-0.7 (2.5)	-4.8 (5.1)	0.0 (3.5)
09/20/2006	Test Trucks	-0.4 (2.5)	-3.4 (4.4)	0.1 (3.7)
09/08/2005	Test Trucks	1.5 (2.9)	-3.0 (6.5)	2.4 (3.5)
09/07/2005	Test Trucks	1.6 (2.6)	-3.5 (5.2)	2.6 (3.6)

Prepared: djw Checked: bko

5.4 Projected Maintenance/Replacement Requirements

The cause and correction of the “ghost” axle malfunction should be investigated further.

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

6 Pre-Validation Analysis

Upon our arrival at the site, we found the system parameters were not the same as we left them at the conclusion of our last validation on *March 29, 2007*. In the interval, at an unknown date, IRD has installed new weighpad analysis firmware and subsequently performed a remote calibration of the system settings using downloaded data.

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

Table 6-1 Calibration Factor Change – 170600 – since 29-Mar-2007

	Left Sensors 1		Right Sensors 2	
	08-Jul-2008	*29-Mar-2007*	*08-Jul-2008*	*29-Mar-2007*
80 kph:	3275	3884	3684	3524
88 kph:	3474	4120	3908	3740
96 kph:	3367	3994	3789	3626
104 kph	3320	3928	3734	3574
112 kph:	3219	3817	3619	3464

Prepared: djw Checked: bko

The Pre-Validation analysis is based on test runs conducted July 8, 2008 during the morning and early afternoon hours and July 9, 2008 during the morning hours at test site 170600 on I-57. This SPS-6 site is at milepost 225.7 on the northbound, righthand of a four-lane divided facility. No auto-calibration was used during test runs.

The three 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 76,680 lbs., the "golden" truck.
2. 5-axle tractor semi-trailer with a tractor having an air suspension and a trailer with a standard rear tandem and a steel leaf suspension loaded to 70,150 lbs., the "Partial" truck.
3. 5-axle tractor semi-trailer with a tractor having a an air suspension and a trailer with a standard rear tandem and an air suspension loaded to 77,070 lbs., "Golden 2" truck.

For the initial validation, the Golden truck and the Golden 2 truck each made 10 passes over the WIM scale and the Partial truck made 20 passes over the WIM scale at speeds ranging from approximately 53 to 65 miles per hour. The desired speed range was achieved during this validation. Pavement surface temperatures were recorded during the test runs ranging from about 71 to 105degrees Fahrenheit. The desired 30 degree Fahrenheit temperature range was also achieved. The computed values of 95% confidence limits of each statistic for the total population are in Table 6-2.

Table 6-2 indicates that the conditions for research quality loading data were met.

Table 6-2 Pre-Validation Results – 170600 – 08-Jul-2008

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-2.7 ± 3.6%	Pass
Tandem axles	±15 percent	-0.5 ± 5.7%	Pass
GVW	±10 percent	-0.8 ± 4.0%	Pass
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.0 ft	Pass

Prepared: djw *Checked: bko*

The test runs were conducted primarily during the morning and early afternoon hours under partly cloudy weather conditions, resulting in a wide range of pavement temperatures. The runs were also conducted at various speeds to determine the effects of these variables on the performance of the WIM scale. To investigate these effects, the dataset was split into three speed groups and three temperature groups. The distribution of runs within these groupings is illustrated in Figure 6-1. The figure indicates that the desired distribution of speed and temperature combinations was achieved for this set of validation runs.

The three speed groups were divided into 53 to 57 mph for Low speed, 58 to 63 mph for Medium speed and 64+ mph for High speed. The three temperature groups were created by splitting the runs between those at 71 to 83 degrees Fahrenheit for Low temperature, 84 to 91 degrees Fahrenheit for Medium temperature and 92 to 105 degrees Fahrenheit for High temperature.

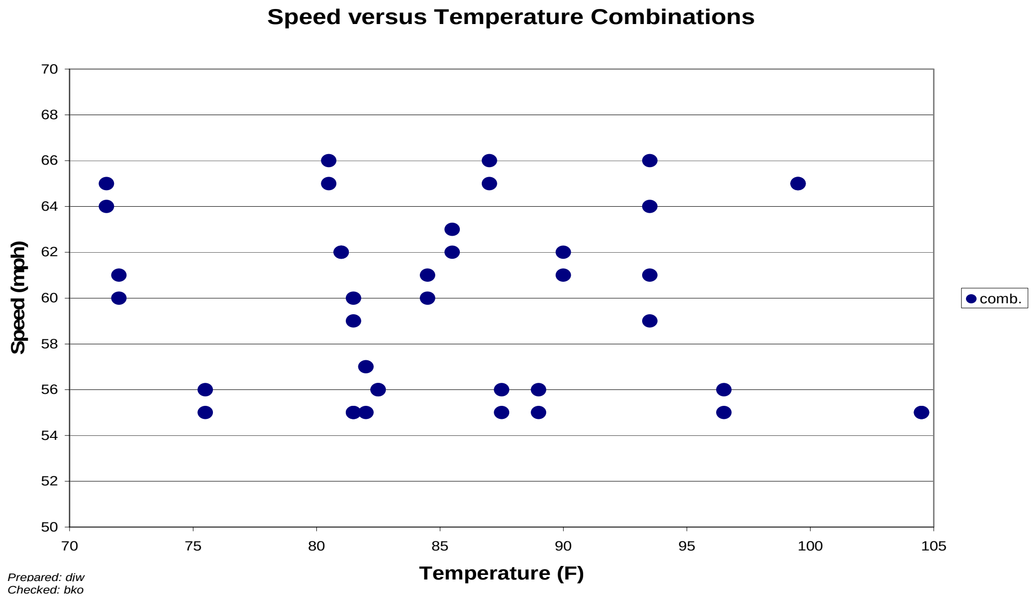

Figure 6-1 Pre-Validation Speed-Temperature Distribution – 170600 – 08-Jul-2008

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

Figure 6-2 shows the GVW Percent Error vs. Speed graph for the population as a whole. As can be seen in the figure; the equipment progresses from an essentially unbiased estimation of GVW at low speeds to an underestimation of GVW at high speeds. With the exception of one outlier, variability appears to remain reasonably consistent over the entire speed range.

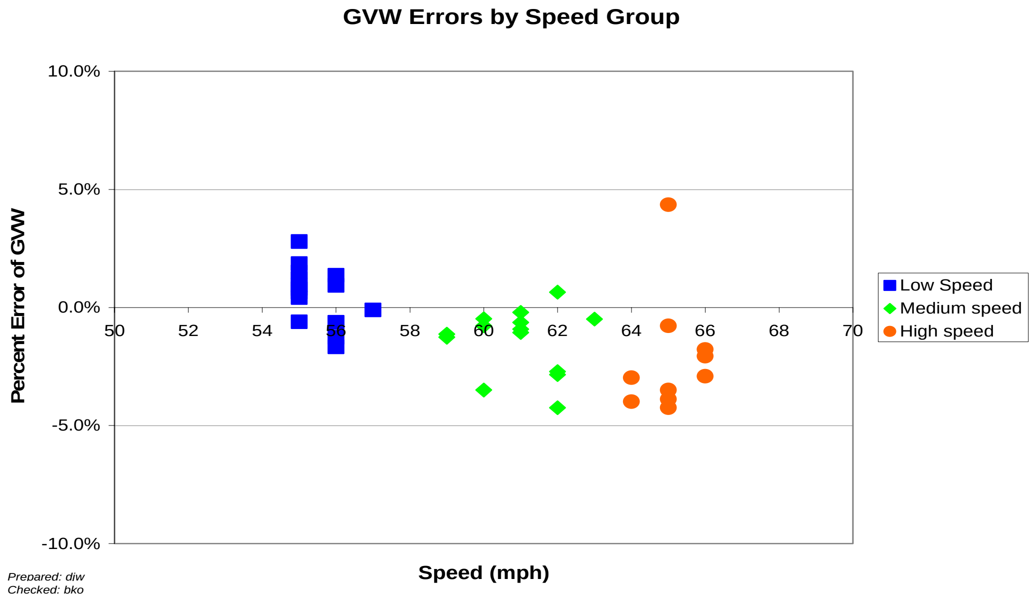

Figure 6-2 Pre-validation GVW Percent Error vs. Speed – 170600 – 08-Jul-2008

Figure 6-3 shows the relationship between temperature and GVW percentage error. GVW appears to be underestimated by the equipment at all temperatures. Variability appears to remain consistent throughout the entire temperature range.

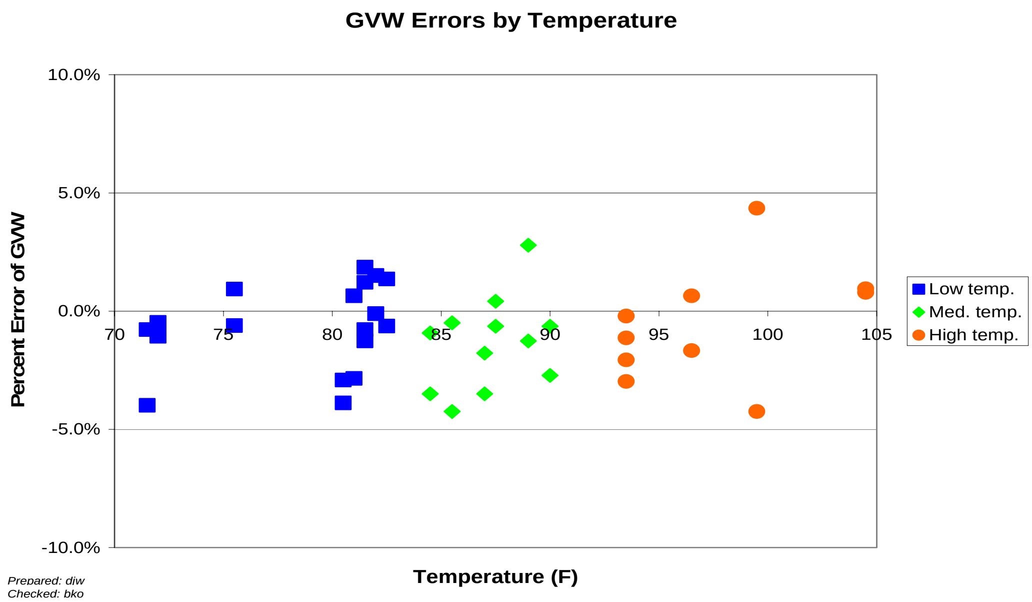

Figure 6-3 Pre-Validation GVW Percent Error vs. Temperature – 170600 – 08-Jul-2008

Figure 6-4 shows the relationship between the drive tandem spacing errors in feet and speeds. This graph is used as a potential indicator of classification errors due to failure to correctly identify spacings on a vehicle. Since the most common reference value is the drive tandem on a Class 9 vehicle, this is the spacing evaluated and plotted for validations. There is no apparent influence of speed on spacing error.

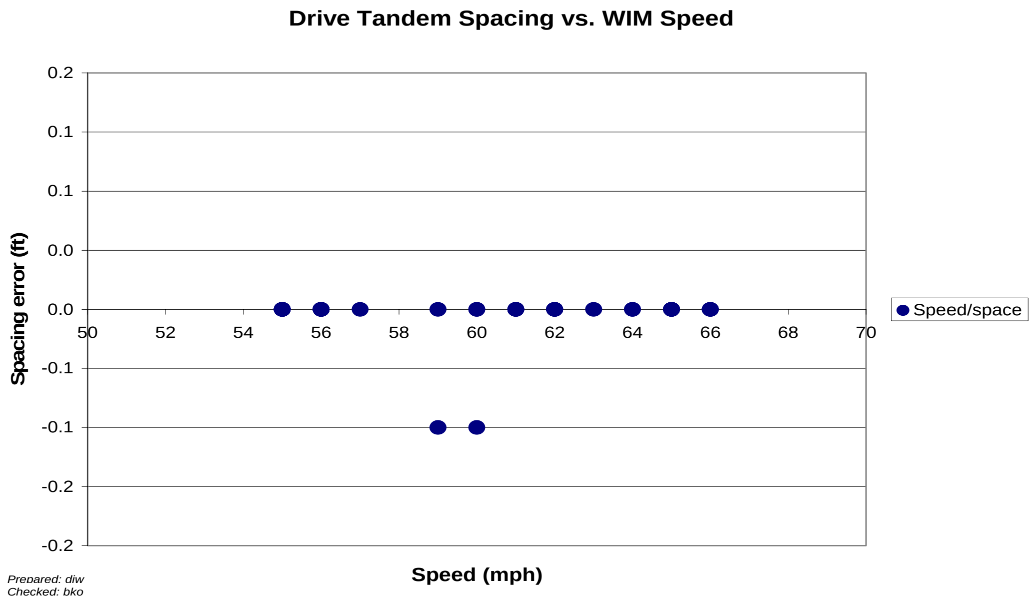

Figure 6-4 Pre-Validation Spacing vs. Speed - 170600 – 08-Jul-2008

6.1 Temperature-based Analysis

The three temperature groups were created by splitting the runs between those at 71 to 83 degrees Fahrenheit for Low temperature, 84 to 91 degrees Fahrenheit for Medium temperature and 92 to 105 degrees Fahrenheit for High temperature.

Table 6-3 Pre-Validation Results by Temperature Bin – 170600 – 08-Jul-2008

Element	95% Limit	Low Temperature 71to 83 °F	Medium Temperature 84 to 91 °F	High Temperature 92 to 105 °F
Steering axles	±20 %	-2.1 ± 4.3%	-3.1 ± 3.2%	-3.1 ± 3.3%
Tandem axles	±15 %	-0.4 ± 4.8%	-1.0 ± 6.1%	0.0 ± 7.2%
GVW	±10 %	-0.7 ± 3.8%	-1.4 ± 4.3%	-0.6 ± 5.5%
Axle spacing	± 0.5 ft	0.0 ± 0.0 ft	0.0 ± 0.1 ft	0.0 ± 0.0 ft

Prepared: djw *Checked: bko*

From Table 6-3, it can be seen that the equipment generally underestimates GVW at all temperatures. The equipment accurately estimates tandem and steering axle weights. Variability appears to generally increase as temperature increases.

Figure 6-5 shows the distribution of GVW Errors versus Temperature by Truck.
At all temperatures, the patterns for the three trucks are similar. Variability in error for the each truck independently as well as for the truck population as a whole appears to remain consistent over the entire temperature range.

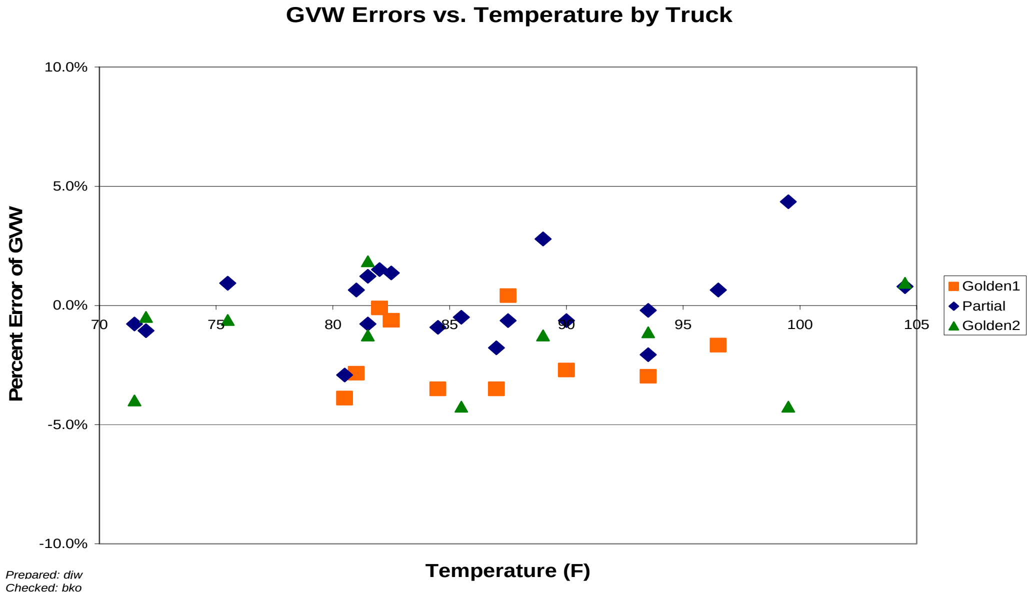

Figure 6-5 Pre-Validation GVW Percent Error vs. Temperature by Truck – 170600 – 08-Jul-2008

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. Steering axle weights are underestimated by the equipment at all temperatures. Variability is consistent throughout the temperature range.

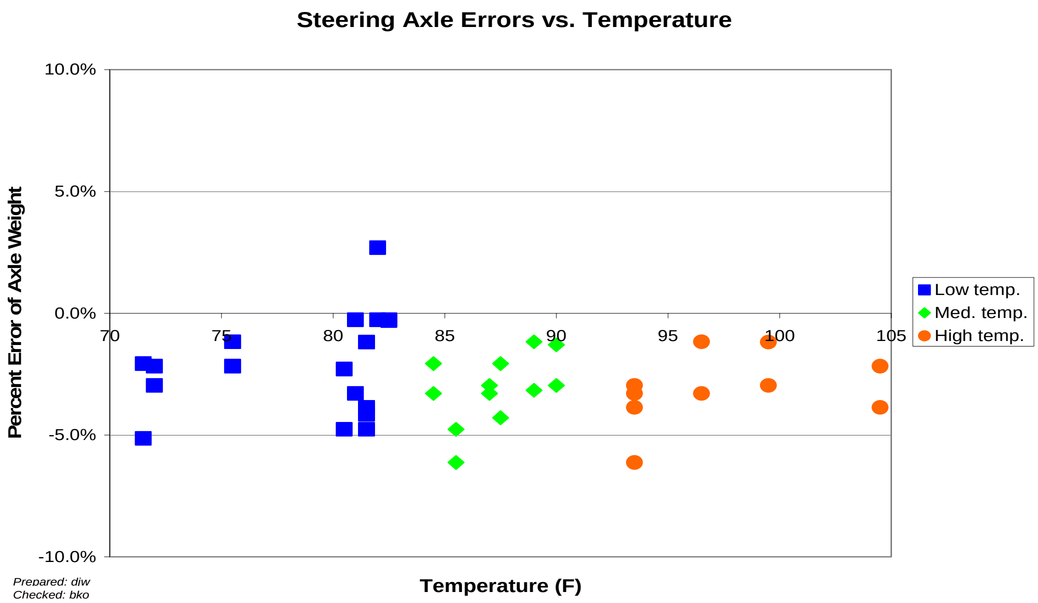

Figure 6-6 Pre-Validation Steering Axle Error vs. Temperature by Group – 170600 – 08-Jul-2008

6.2 Speed-based Analysis

The speed groups were divided as follows: Low speed – 53 to 57 mph, Medium speed – 58 to 63 mph and High speed – 64+ mph.

Table 6-4 Pre-Validation Results by Speed Bin – 170600 – 08-Jul-2008

Element	95% Limit	Low Speed 53 to 57 mph	Medium Speed 58 to 63 mph	High Speed 64+ mph
Steering axles	±20 %	-1.7 ± 3.8%	-3.4 ± 3.7%	-3.1 ± 2.7%
Tandem axles	±15 %	0.9 ± 3.7%	-1.1 ± 4.6%	-1.9 ± 8.1%
GVW	±10 %	0.5 ± 2.6%	-1.4 ± 3.0%	-2.2 ± 5.8%
Axle spacing	± 0.5 ft	0.0 ± 0.0 ft	0.0 ± 0.1 ft	0.0 ± 0.0 ft

Prepared: djw Checked: bko

Table 6-4 shows the tendency for the equipment to transition from estimating GVW and tandem axle weights accurately at low speeds to increasingly underestimating these weights as speed increases. Variability in GVW and tandem weight errors increases as speed increases. For steering axle weights, the equipment underestimates at all speeds and variability decreases as speed increases.

As shown in Figure 6-7, the patterns of the three trucks appear similar, transitioning from accurate estimation at the low speeds to underestimation at the high speeds. Variability in GVW estimation appears to increase as speed increases due to the increasing variance in underestimation by the equipment for each truck individually as speed increases.

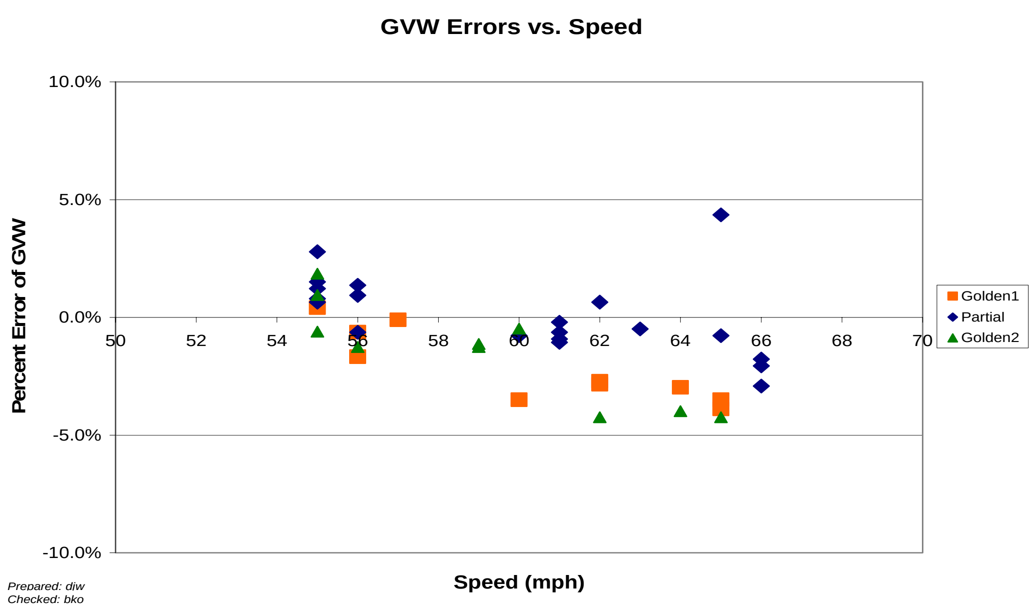

Figure 6-7 Pre-Validation GVW Percent Error vs. Speed Group - 170600 –08-Jul-2008

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

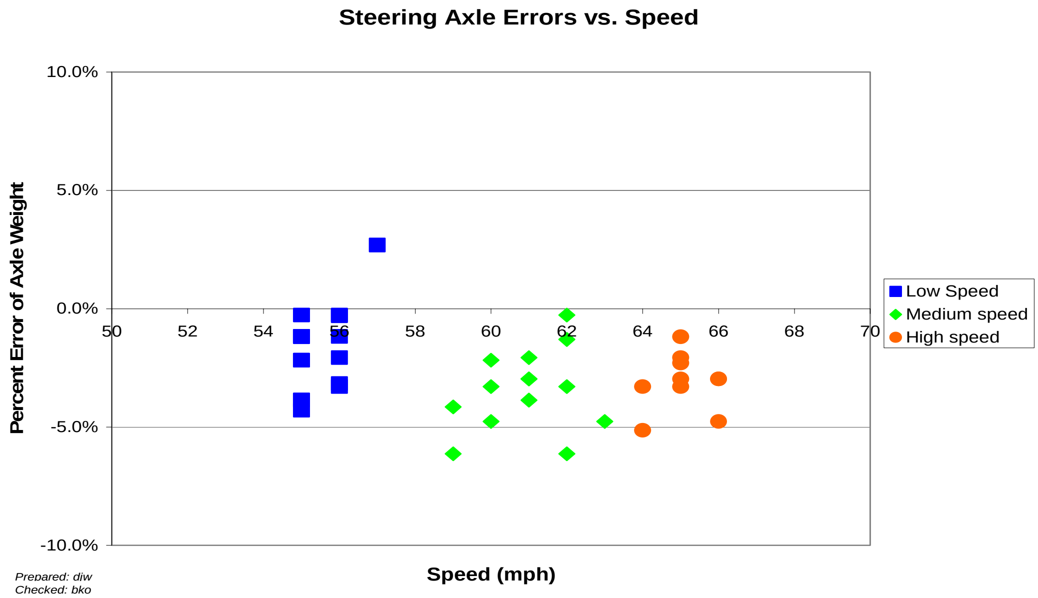

Figure 6-8 Pre-Validation Steering Axle Percent Error vs. Speed Group - 170600 – 08-Jul-2008

6.3 Classification Validation

This LTPP installed site uses the FHWA 13-bin classification scheme and the LTPP 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 6-5 has the classification error rates by class. The overall misclassification rate is 2.0 percent.

Table 6-5 Truck Misclassification Percentages for 170600 – 08-Jul-2008

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

Prepared: djw Checked: bko

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

Table 6-6 Truck Classification Mean Differences for 170600 – 08-Jul-2008

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

Prepared: djw Checked: bko

These error rates are normalized to represent how many vehicles of the class are expected to be over- or under-counted for every hundred of that class observed by the equipment. Thus a value of 0 means the class is identified correctly on average. A number between –1 and –100 indicates at least that number of vehicles either missed or not assigned to the class by the equipment. It is not possible to miss more than all of them or one hundred out of one hundred. Numbers 1 or larger indicate at least how many more vehicles are assigned to the class than the actual “hundred observed”. Classes marked Unknown are those identified by the equipment but no vehicles of the type were seen the observer. There is no way to tell how many vehicles of that type might actually exist. N/A means no vehicles of the class were recorded by either the equipment or the observer.

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 for heavy trucks, with the exception of one Class 5 vehicle with a trailer that was identified as a Class 8, the observed bias and variability are thought to be more strongly related to radar speed precision than errors in the WIM equipment.

6.4 Evaluation by ASTM E-1318 Criteria

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

Table 6-7 Results of Validation Using ASTM E-1318-02 Criteria

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

Prepared: djw *Checked: bko*

6.5 Prior Validations

The last validation for this site was done March 29, 2007. It was the third validation of the site. The site was producing research loading quality data. Figure 6-9 shows the GVW Percent Error vs. Speed for the post validation runs. The site was validated with two trucks. The "Golden" truck was loaded to 73,690 lbs. The "partial" truck which had air suspension on the tractor tandem and steel leaf suspension on the trailer tandem was loaded to 52,010 lbs.

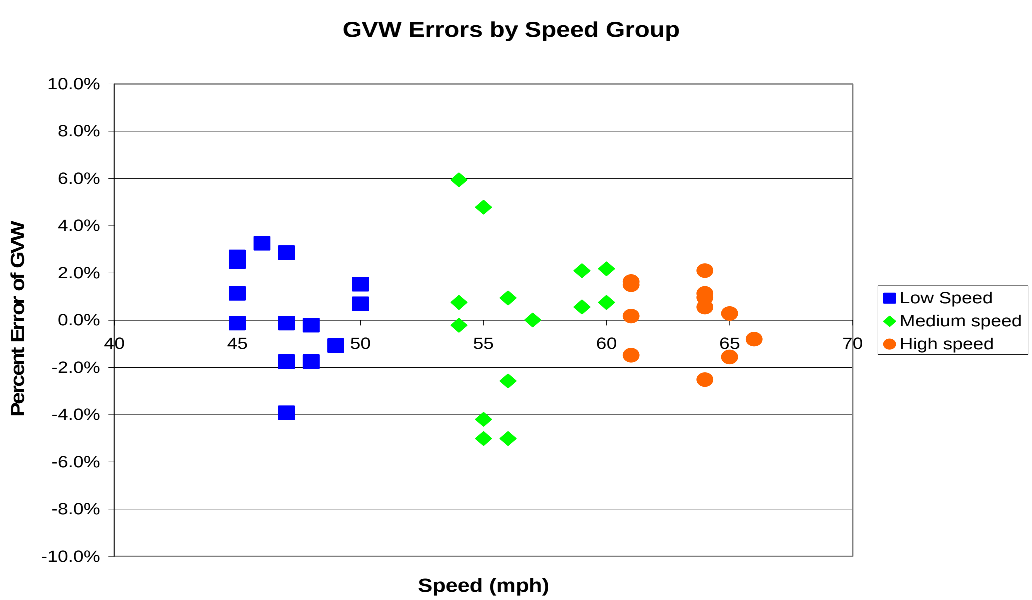

Figure 6-9 Last Validation GVW Percent Error vs. Speed – 170600 – 29-Mar-2007

Table 6-8 shows the overall results from the last validation. The site was left with essentially unbiased estimates for GVW and tandem axle weights. The variability on those weights was somewhat larger.

Table 6-8 Last Validation Final Results – 170600 – 29-Mar-2007

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-3.1 ± 11.3%	Pass
Tandem axles	±15 percent	1.0 ± 7.2%	Pass
Gross vehicle weights	±10 percent	0.2 ± 4.9%	Pass
Axle spacing	± 0.5 ft [150 mm]	0.0 ± 0.1 ft	Pass

Prepared: djw Checked: bko

Table 6-9 has the results at the end of the last validation by temperature. Mostly sunny weather conditions contributed to a wide temperature range. The temperatures observed were similar to those of the current validation. Through this validation the equipment has been observed at temperature from 48 to 130 degrees Fahrenheit.

Table 6-9 Last Validation Results by Temperature Bin – 170600 – 29-Mar-2007

Element	95% Limit	Low Temperature 56-69 °F	Medium Temperature 70-87 °F	High Temperature 88-103 °F
Steering axles	±20 %	-3.5 ± 12.3%	-2.5 ± 11.2%	-2.8 ± 13.7%
Tandem axles	±15 %	1.2 ± 7.3%	0.6 ± 8.6%	0.9 ± 6.6%
GVW	±10 %	0.4 ± 5.7%	0.0 ± 5.3%	0.2 ± 4.3%
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.0 ft	0.0 ± 0.0 ft

Prepared: djw Checked: bko

Table 6-10 has the results of the prior post validation by speed groups. At that time, the equipment appeared to estimate GVW and tandem axle weights with reasonable accuracy and underestimate steering axle weights at all speeds. A wider range of speeds was used in the prior validation to obtain the desired 20 mile per hour range. Subsequent decisions have resulted in limiting the validation range to 15th to 85th percentile (or speed limit if lower.

Table 6-10 Last Validation Results by Speed Bin – 170600 – 29-Mar-2007

Element	95% Limit	Low Speed 45 to 50 mph	Medium Speed 51 to 60 mph	High Speed 61+ mph
Steering axles	±20 %	-4.5 ± 14.2%	-3.3 ± 12.7%	-1.2 ± 7.5%
Tandem axles	±15 %	1.5 ± 5.3%	0.7 ± 9.0%	0.6 ± 7.8%
GVW	±10 %	0.4 ± 4.5%	0.1 ± 7.2%	0.2 ± 3.2%
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft	0.0 ± 0 ft

Prepared: djw Checked: bko

7 Data Availability and Quality

As of July 8, 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 1997,1998, 2006 and 2007 have a sufficient quantity to be considered complete years of data. In the absence of validation information prior to 2005, together with the calibration information gathered in 2006, it can be seen that at least 3 additional years of research quality data are needed to meet the goal of a minimum of 5 years of research weight data. In view of the sensor change since March 2007 the data for 2007 and 2008 (pending receipt by LTPP) should be scrutinized carefully to be confident that it is research quality.

Table 7-1 Amount of Traffic Data Available 170600 – 08-Jul-2008

Year	Classification Days	Months	Coverage	Weight Days	Months	Coverage
1991	0	0	None	17	2	Full Week
1992	0	0	None	110	7	Full Week
1993	44	2	Full Week	48	3	Full Week
1994	96	7	Full Week	126	7	Full Week
1995	60	5	Full Week	0	0	None
1996	23	6	Full Week	0	0	None
1997	224	11	Full Week	282	11	Full Week
1998	218	10	Full Week	225	11	Full Week
1999	52	3	Full Week	51	3	Full Week
2002	4	1	Weekday(s) and Weekend day(s)	0	0	None
2005	135	5	Full Week	137	5	Full Week
2006	319	12	Full Week	317	12	Full Week
2007	281	10	Full Week	286	10	Full Week

Prepared: djw *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.

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

Table 7-2 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.

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 – 170600 – 10-Jul-2008

Characteristic	Class 9
Percentage Overweights	0.2%
Percentage Underweights	0.2%
Unloaded Peak	32,000 lbs
Loaded Peak	76,000 lbs

Prepared: djw Checked: bko

The expected percentage of unclassified vehicles is 0.4%. 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 7-3. These are based on data collected immediately after the validation and may not be wholly representative of the population at the site. They should however provide a sense of the statistics expected when SPS comparison data is computed for the Post-Validation period.

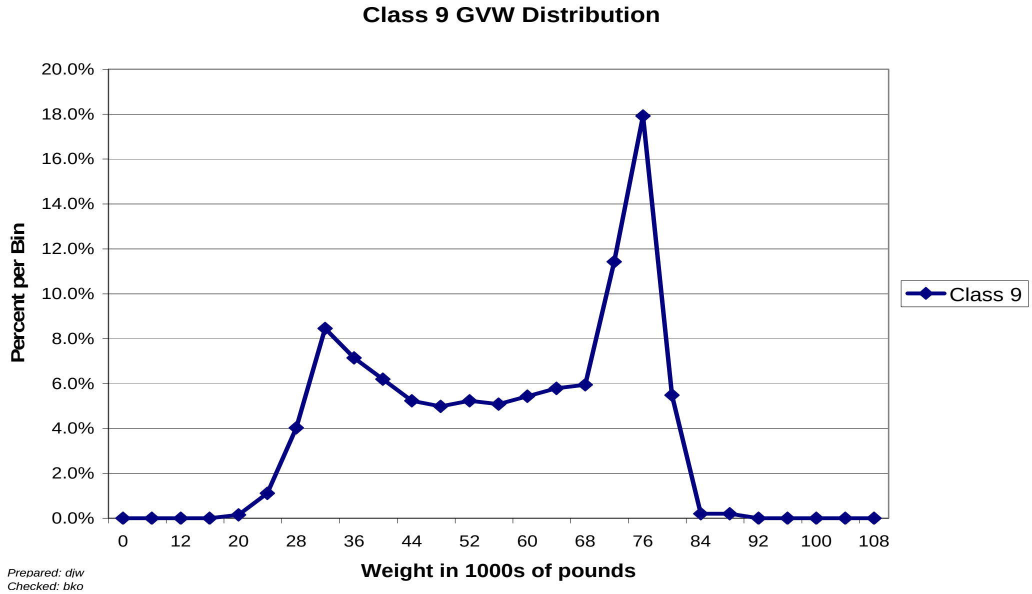

Figure 7-1 Expected GVW Distribution Class 9 – 170600 – 10-Jul-2008

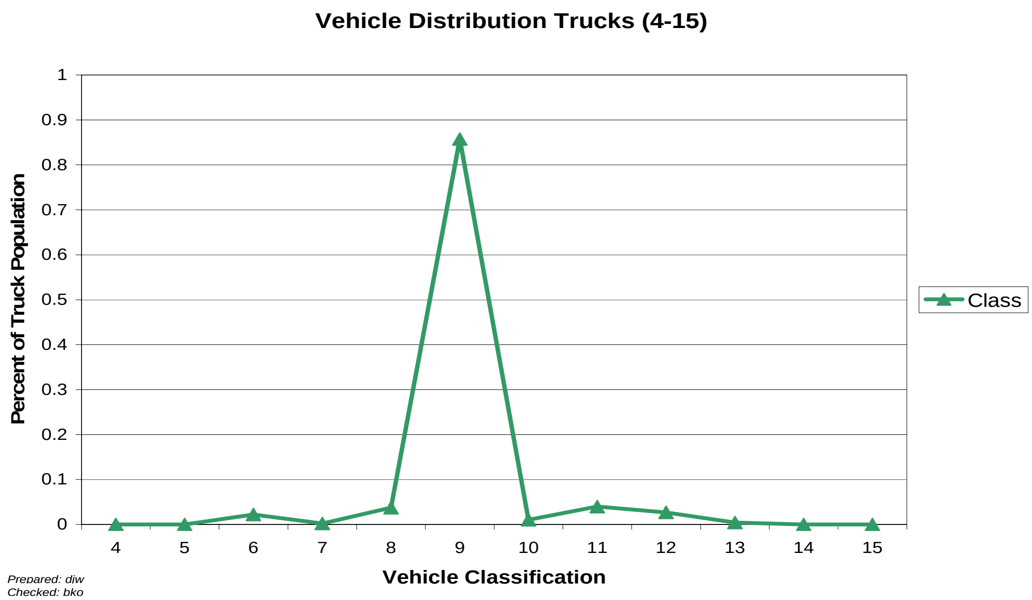

Figure 7-2 Expected Vehicle Distribution – 170600 – 10-Jul-2008

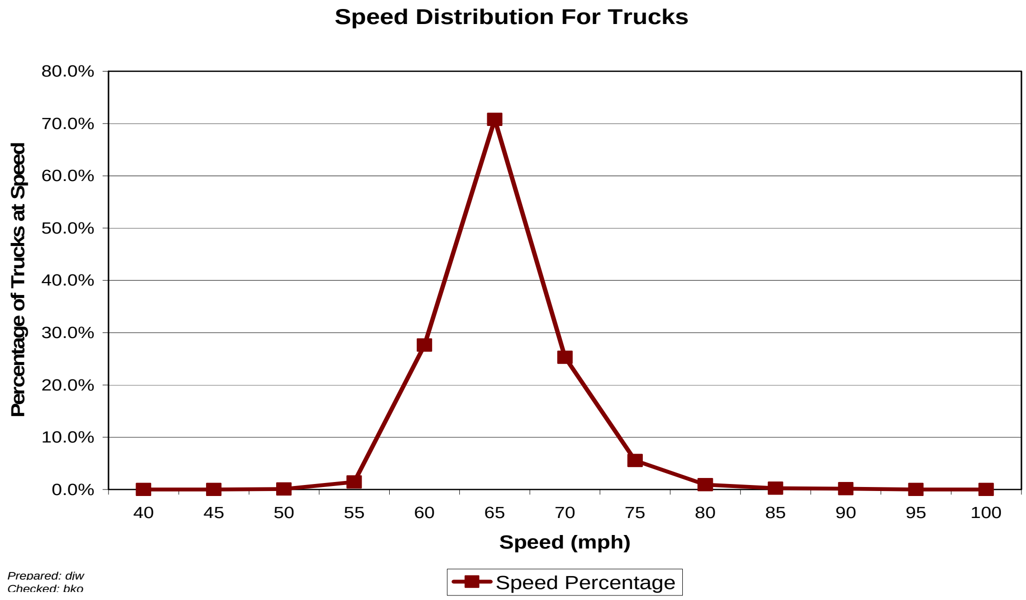

Figure 7-3 Expected Speed Distribution – 170600 – 10-Jul-2008

8 Data Sheets

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

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

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

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

Calibration Iteration 1 Worksheets (1 page)

Test Truck Photographs (9 pages)

LTPP Mod 3 Classification Scheme (1 page)

Final System Parameters (1 page)

9 Updated Handout Guide and Sheet 17

A copy of the handout has been included following page 33. It includes a current Sheet 17 with all applicable maps and photographs.

10 Updated Sheet 18

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

11 Traffic Sheet 16(s)

Sheet 16s for the pre-validation and post-validation conditions are attached following the current Sheet 18 information at the very end of the report.

POST-VISIT HANDOUT GUIDE FOR SPS WIM VALIDATION

STATE: Illinois

SHRP ID: 0600

Figures

Photos

1. General Information

SITE ID: *170600*

LOCATION: *I-57 North, milepost 225.6, approximately 10.0 miles south of the I-57/ I-72 interchange in Champaign.*

VISIT DATE: *Beginning Tuesday, July 8, 2008*

VISIT TYPE: *Validation*

2. Contact Information

POINTS OF CONTACT:

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

Highway Agency: *David Lippert, david.lippert@illinois.gov*

Rob Robinson, 217-785-2353, robinsonre@nt.dot.state.il.us

Mark Gawedzinski, 217-782-2799, mark.gawedzinski@illinois.gov

Amy Schutzbach, 217-785-4888, amy.schutzbach@illinois.gov

Susan Stitt, 217-782-8080, susan.stitt@illinois.gov

Ramon Taylor, 217-782-2065, ramon.taylor@illinois.gov

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

FHWA Division Office Liaison: *Douglas Blades*, 217-492-4629, *douglas.blades@fhwa.dot.gov*

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

3. Agenda

BRIEFING DATE: *None Requested*

ON SITE PERIOD: *Beginning Tuesday, July 8, 2008 at 8:00 am*

TRUCK ROUTE CHECK: *Completed.*

4. Site Location/ Directions

NEAREST AIRPORT: *University of Illinois' Willard Airport, Champaign, IL*

DIRECTIONS TO THE SITE: *Approximately 10 miles south of the I-57/I-72 interchange in Champaign.*

MEETING LOCATION: *On-site, Tuesday July 8, 2008at 8:00 am*

WIM SITE LOCATION: *Located in the northbound driving lane of Interstate 57, milepost 225.6, just north of the rest areas near the town of Pesotum.*

WIM SITE LOCATION MAP:

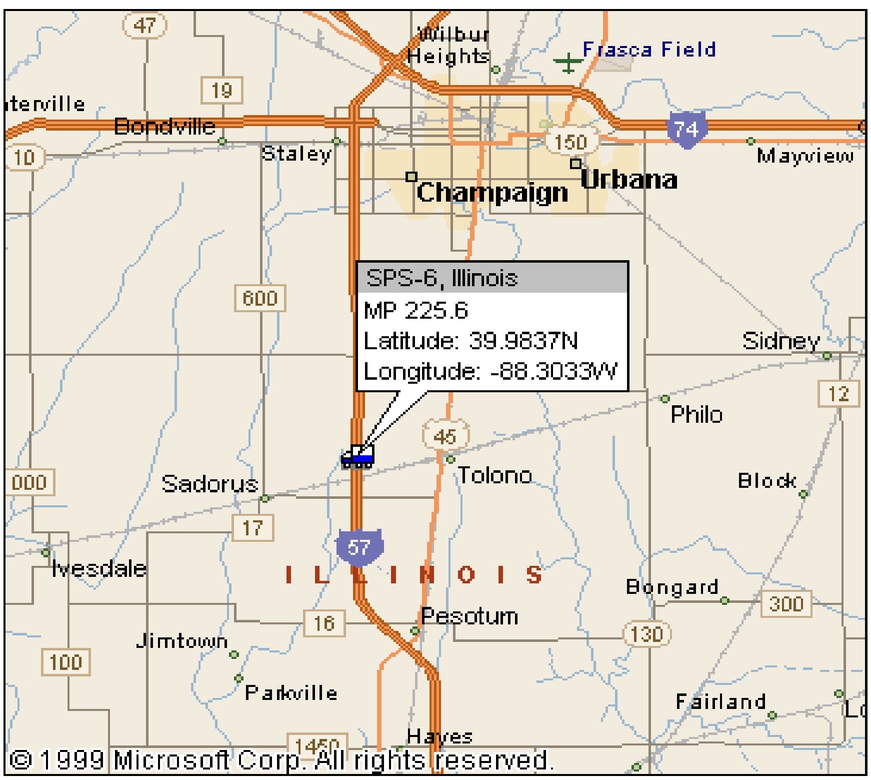

Figure 4-1 - WIM Site Location - 170600 - Illinois

5. Truck Route Information

ROUTE RESTRICTIONS: *None*

SCALE LOCATION: *Road Ranger, I-57 & HWY 36, EXIT 212, Tuscola, IL; Operator – Carol Logan, Phone 217-253-5474; Latitude: 39.79258 Longitude: -88.26667; Open 24 hours; $8.50 per weigh; located 13.3 miles from WIM site.*

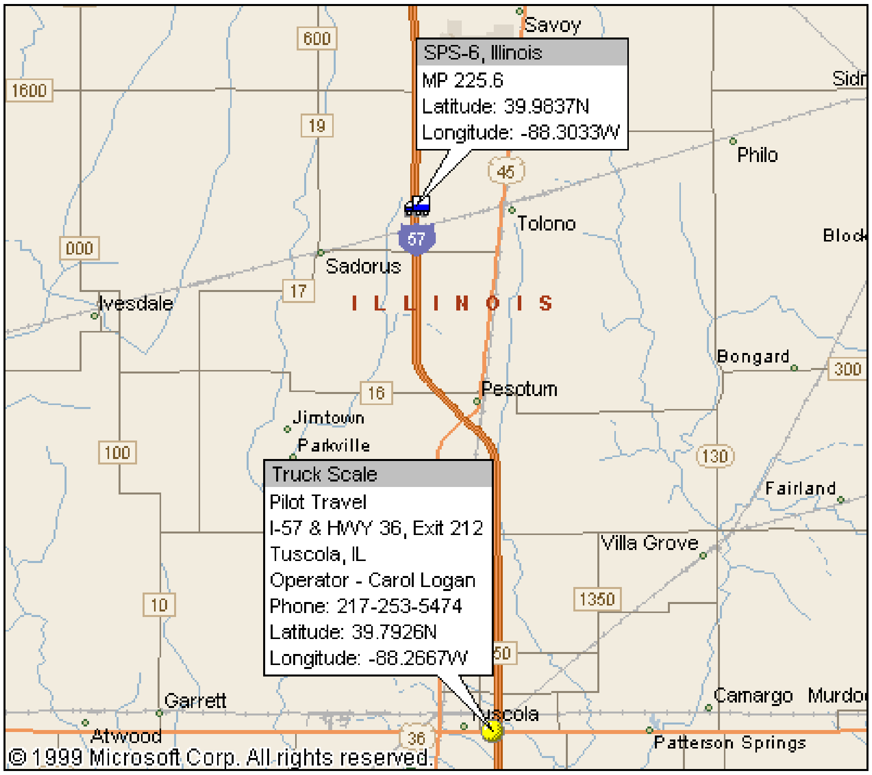

Figure 5-1 – Truck Scale Location – 170600 - Illinois

TRUCK ROUTE:

Northbound – Exit 229 / CR18 Monticello Savoy *Distance from WIM - 3.3 Miles*

Southbound – Exit 220 / US45 Pesotum *Distance from WIM - 5.7 Miles*

Circuit travel distance – 18.0 Miles *Estimated lap time - 20 Minutes*

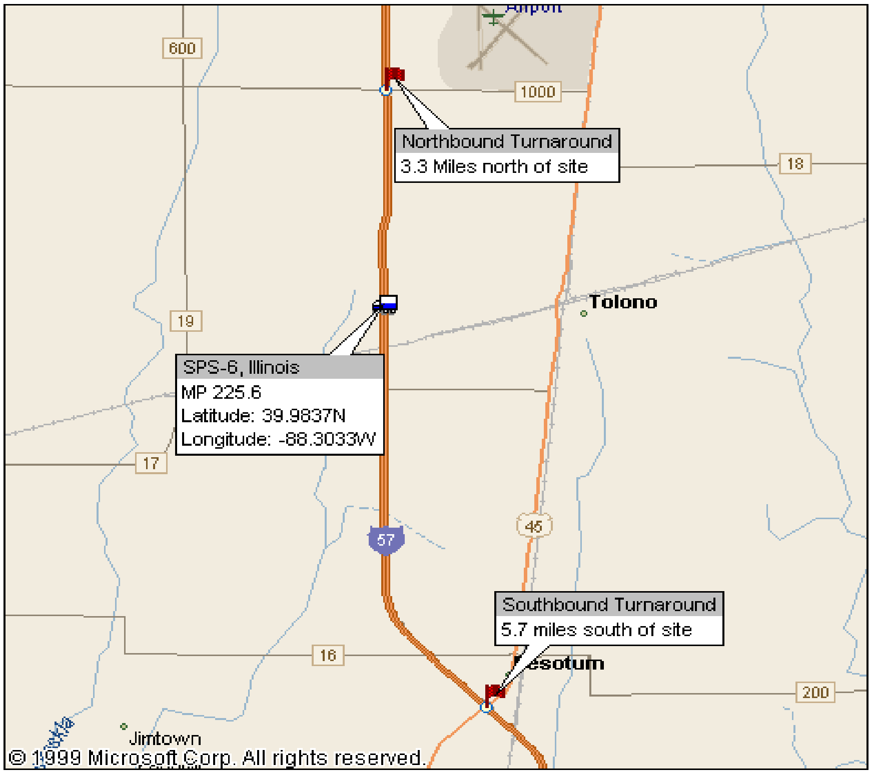

Figure 5-2 - Truck Route - 170600 - Illinois

6. Sheet 17 – Illinois (170600)

1.* ROUTE ___I-57______ MILEPOST __225.7___LTPP DIRECTION - N S E W

2.* WIM SITE DESCRIPTION - Grade ___<1%_____ % Sag vertical Y / N
Nearest SPS section upstream of the site _0__ _6__ _6__ _4__
Distance from sensor to nearest upstream SPS Section _8__0__ 2__0__ ft.

3.* LANE CONFIGURATION
Lanes in LTPP direction __2__ Lane width _1__2_ ft

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

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

Shoulder width __1__0_ ft

4.* PAVEMENT TYPE ___________Portland Concrete Cement_________ _____

5.* PAVEMENT SURFACE CONDITION – Distress Survey
Date: 07_08_08 Filename: _17_0600_Upstream_07_08_08___________________
Date: 07_08_08 Filename:_ 17_0600_Downstream_07_08_08______________
Date: ________ Filename: ____

6. * SENSOR SEQUENCE
___________________Loop – Bending Plate-Bending Plate-Loop___________________

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

8. RAMPS OR INTERSECTIONS
Intersection/driveway within 300 m upstream of sensor location Y / N distance ________
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 ___ __6_. _0_ 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 __6_2__ ft
Distance from system __6__8__ ft
TYPE _____336S______________________________

CABINET ACCESS controlled by LTPP / STATE / JOINT?
Contact - name and phone number __Basel Abukhater, Stantec, Inc._____
Alternate - name and phone number __Ray Taylor, IL DOT___________

11. * POWER
Distance to cabinet from drop __7_7_7_ ___ ft Overhead / underground / solar / AC in cabinet?
Service provider ______________________ Phone number ________________

12. * TELEPHONE
Distance to cabinet from drop ___1_2__ ___ ft Overhead / underground / cell?
Service provider _________________________Phone Number ________________

13. * SYSTEM (software & version no.)- ____IRD/PAT Traffic iSinc________________
Computer connection – RS232 / Parallel port / USB / Other _________________

14. * TEST TRUCK TURNAROUND time _20____ minutes DISTANCE _18.0_ mi.

15. PHOTOS FILENAME
Power source 17_0600_Power_Meter_07_08_08.jpg
17_0600_Service_Mast_07_08_08.jpg
Phone source 17_0600_Telephone_Box_07_08_08.jpg
Cabinet exterior 17_0600_Cabinet_Exterior_07_08_08.jpg
Cabinet interior 17_0600_Cabinet_Interior_Front_07_08_08.jpg
17_0600_Cabinet_Interior_Back_07_08_08.jpg
Weight sensors 17_0600_Leading _WIM_Sensor_07_08_08.jpg
17_0600_Trailing _WIM_Sensor_07_08_08.jpg
Other sensors 17_0600_Leading _Loop_Sensor_07_08_08.jpg
17_0600_Trailing _Loop_Sensor_07_08_08.jpg
Description ____
Downstream direction at sensors on LTPP lane
_______17_600_Downstream_07_08_08________________________________
Upstream direction at sensors on LTPP lane
_______17_600_Upstream_07_08_08___________________________________

COMMENTS

Power trench has sunk up to 6" in some areas and over 95% of the 777' length of the trench

GPS – 39 degrees, 59.027 min north; -88 deg, 18.201 min West

Power Trench repaired as of site visit on 09/18/06

COMPLETED BY Dean J. Wolf

PHONE 301-210-5105 DATE COMPLETED 07 / 08 / 2 0 0 8

Sketch of equipment layout

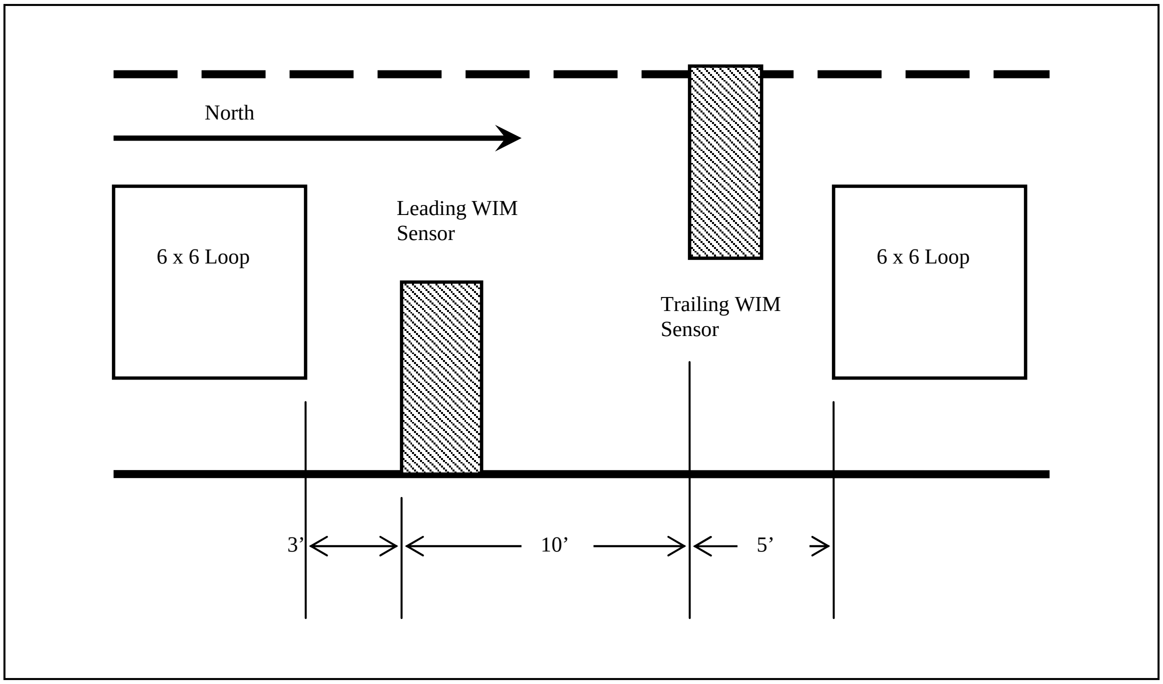

Photo 1 - 17_0600_Upstream_07_08_08.jpg

Photo 2 - 17_0600_Downstream_07_08_08.jpg

Photo 3 - 17_0600_Power_Meter_07_08_08.jpg

Photo 4 - 17_0600_Service_Mast_07_08_08.jpg

Photo 5 - 17_0600_Telephone_Box_07_08_08.jpg

Photo 6 - 17_0600_Cabinet_Exterior_07_08_08.jpg

Photo 7 - 17_0600_Cabinet_Interior_Front_07_08_08.jpg

Photo 8 - 17_0600_Cabinet_Interior_Back_07_08_08.jpg

Photo 9 - 17_0600_Leading_WIM_Sensor_07_08_08.jpg

Photo 10 - 17_0600_Trailing_WIM_Sensor_07_08_08.jpg

Photo 11 - 17_0600_Leading_Loop_07_08_08.jpg

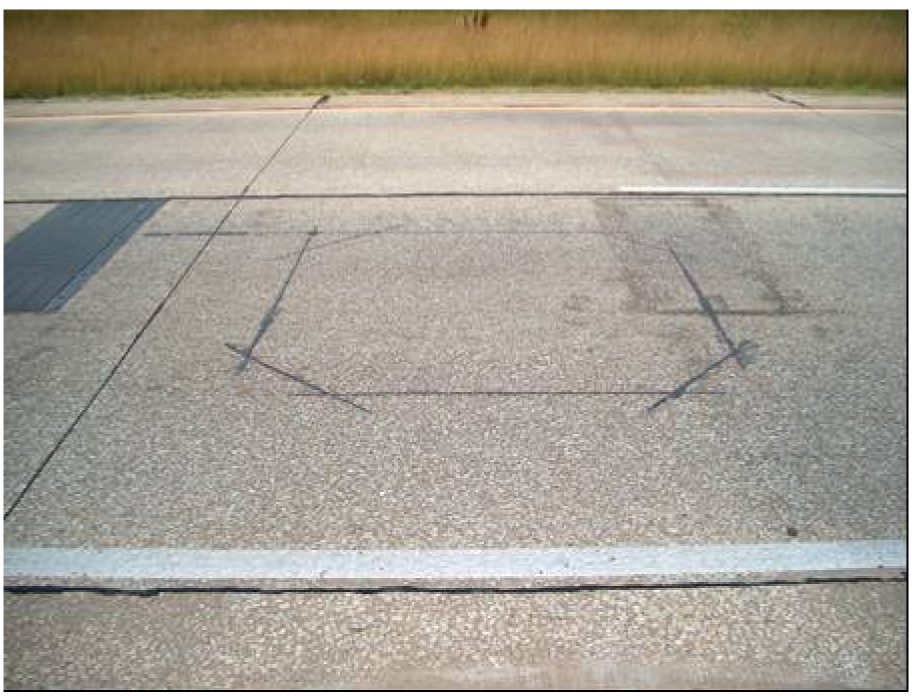

Photo 12 - 17_0600_Trailing_Loop_07_08_08.jpg

SHEET 18	STATE CODE [17]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [0600]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) 07/08/2008

Rev. 05/15/07

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

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

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

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

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

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

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

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

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

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

g. Communication –

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

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

3. PAVEMENT –

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

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

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

4. ON SITE ACTIVITIES –

a. WIM Validation Check - advance notice required _2__ ☐ days ☒ weeks

b. Notice for straightedge and grinding check - __2_ ☐ days ☒ weeks

i. On site lead –
- ☐ State
- ☒ LTPP

ii. Accept grinding –
- ☐ State
- ☒ LTPP

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

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

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

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

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

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

i. Traffic Control Required – ☐Yes ☒No

j. Enforcement Coordination Required – ☐Yes ☒No

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

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

      Name: Ray Taylor Phone:(217) 782-2065

      Agency: IL DOT

b. Maintenance (equipment) –

Name: Ray Taylor Phone:(217) 782-2065

Agency: IL DOT

c. Data Processing and Pre-Visit Data –

Name: Basel Abukhater Phone:(716)632-0804

Agency: Stantec, Inc

d. Construction schedule and verification –

Name: _____ Phone:_____

Agency: IL DOT District 5, Region 3

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

Name: Bryan Patterson Phone:(317) 271-8545

Agency: Lavre Leasing

f. Traffic Control –

Name: _____ Phone:_____

Agency: _____

g. Enforcement Coordination –

Name: _____ Phone:_____

Agency: _____

h. Nearest Static Scale

Name: Road Ranger Location:I-57, Exit 121

Phone: _____

SHEET 16 **LTPP MONITORED TRAFFIC DATA** **SITE CALIBRATION SUMMARY**	*STATE ASSIGNED ID [__ __ __ __] *STATE CODE [17] *SHRP SECTION ID [0600]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [07/08/08]

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

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

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

5. EQUIPMENT MANUFACTURER ___IRD/ PAT Traffic___

WIM SYSTEM CALIBRATION SPECIFICS**

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

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

__ 20__ PASSES PER TRUCK

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

TRUCK	TYPE	SUSPENSION
1	9	1
2	9	2
3	9	1

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
MEAN DIFFERENCE BETWEEN ---
DYNAMIC AND STATIC GVW ____-0.8 STANDARD DEVIATION ____2.0
DYNAMIC AND STATIC SINGLE AXLES ____-2.7 STANDARD DEVIATION ____1.8
DYNAMIC AND STATIC DOUBLE AXLES ____-0.5 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) ___3734, 3320__

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

CLASSIFIER TEST SPECIFICS***

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

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

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
*** FHWA CLASS 9 ____ 0.0 FHWA CLASS __ ____ ____ _
*** FHWA CLASS 8 ____ 50.0 FHWA CLASS __ ____ ____ _
FHWA CLASS __ ____ ____ _
FHWA CLASS __ ____ ____ _
*** PERCENT "UNCLASSIFIED" VEHICLES: ____ 0.0

PERSON LEADING CALIBRATION EFFORT: __Dean J. Wolf, MACTEC____
CONTACT INFORMATION: ______301-210-5105______ rev. November 9, 1999

SHEET 16 LTPP MONITORED TRAFFIC DATA SITE CALIBRATION SUMMARY	*STATE ASSIGNED ID [__ __ __ __] *STATE CODE [17] *SHRP SECTION ID [0600]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [07/09/08]

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

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

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

5. EQUIPMENT MANUFACTURER ___IRD/ PAT Traffic

WIM SYSTEM CALIBRATION SPECIFICS**

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

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

__ 20__ PASSES PER TRUCK

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

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
MEAN DIFFERENCE BETWEEN ---

DYNAMIC AND STATIC GVW	-0.5	STANDARD DEVIATION	1.6
DYNAMIC AND STATIC SINGLE AXLES	-2.0	STANDARD DEVIATION	2.5
DYNAMIC AND STATIC DOUBLE AXLES	0.9	STANDARD DEVIATION	2.2

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) ___3822, 3399__

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

CLASSIFIER TEST SPECIFICS***

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

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

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
*** FHWA CLASS 9 ____ -1.0 FHWA CLASS _5_ ____ ____ -13
*** FHWA CLASS 8 ____ 0.0 FHWA CLASS __ ____ ____ _
FHWA CLASS __ ____ ____ _
FHWA CLASS __ ____ ____ _
*** PERCENT "UNCLASSIFIED" VEHICLES: ____ 2.0

PERSON LEADING CALIBRATION EFFORT: __Dean J. Wolf, MACTEC
CONTACT INFORMATION: ______301-210-5105 rev. November 9, 1999

APPENDIX A

Sheet 19	* STATE_CODE _1_7_
LTPP Traffic Data	* SPS PROJECT ID _0_6_0_0_
*CALIBRATION TEST TRUCK #_1_	* DATE 7/8/08

Rev. 08/31/01

PART I.

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

AXLES - units - lbs / 100s lbs / kg

TRUCK 52
TRAILER 64

GEOMETRY

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

9. a) * Make: PETERBUILT   b) * Model: 359

10.* Trailer Load Distribution Description:

CONCRETE BLOCKS LOADED ALONG TRAILER

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

b). Trailer Tare Weight (units): ______

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

A to B 20.0   B to C 4.4   C to D 27.9

D to E 5.0   E to F ______

Wheelbase (measured A to last) ______   Computed ______

13. *Kingpin Offset From Axle B (units) ______ (+2.2)__

(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	75R 24.5	4 FULL STEEL LEAF
B	75R 24.5	AIR
C	75R 24.5	AIR
D	75R 24.5	AIR
E	75R 24.5	AIR
F		

Sheet 19	* STATE_CODE _1_7_
LTPP Traffic Data	* SPS PROJECT ID _0_6_0_0_
*CALIBRATION TEST TRUCK #_1_	* DATE

Rev. 08/31/01

PART II

Day 1

20 runs performed on day 1

10 - truck 1

10 - truck 2

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

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10040	15630	15630	17710	17710		76720
2	10020	15590	15590	17720	17720		76640
3							
Average	10030	15610	15610	17715	17715		76680

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		truck broke down.		no post weights for day 1			
2							
3							
Average							

Measured By DJW Verified By ______ Weight date 7/8/08

Sheet 19	* STATE_CODE	_1_7_
LTPP Traffic Data	* SPS PROJECT ID	_0_6_0_0_
*CALIBRATION TEST TRUCK #2	* DATE 7/8/08	

Rev. 08/31/01

PART I.

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

AXLES - units lbs / 100s lbs / kg

TRUCK #10-2
TRAILER 4668

GEOMETRY

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

9. a) * Make: PETERBUILT b) * Model: 379X

10.* Trailer Load Distribution Description:
BARRIER WALLS CONCRETE LOADED ALONG TRAILER

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

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

A to B 19.5 B to C 4.4 C to D 30.3

D to E 4.1 E to F ______

Wheelbase (measured A to last) ______ Computed 58.3

13. *Kingpin Offset From Axle B (units) ______ (1 FT)__
(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	75R 24.5	2 FULL STEEL LEAF
B	75R 24.5	AIR
C	75R 24.5	AIR
D	75R 22.5	1 FULL STEEL LEAF
E	75R 22.5	1 FULL STEEL LEAF
F		

6420070022_SPSWIM_TO_27_17_2.109_0600_Sheet_19_axle_scales_truck2.doc

Sheet 19	* STATE_CODE	_1_7_
LTPP Traffic Data	* SPS PROJECT ID	_0_6_0_0_
*CALIBRATION TEST TRUCK #_2_	* DATE	7/7/08

Rev. 08/31/01

PART II

Day 1

20 runs performed on day 1
10 - truck 1
10 - truck 2

*b) Average Pre-Test Loaded weight 70340
*c) Post Test Loaded Weight ______
*d) Difference Post Test – Pre-test ______

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11180	14500	14500	15080	15080		70340
2	11240	14450	14450	15100	15100		70340
3							
Average	11210	14475	14475	15090	15090		70340

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		truck went back to Indianapolis w/ broken down truck					
2		no post weights for day 1					
3		day 2 pre weights used as substitute see w/t page					
Average							

Measured By DJW Verified By [signature] Weight date 7/8/08

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Sheet 19	* STATE_CODE _1_7_
LTPP Traffic Data	* SPS PROJECT ID _0_6_0_0_
*CALIBRATION TEST TRUCK #_2_	* DATE

Rev. 08/31/01

Day 2

20 pre-val runs performed on day 2
truck 2 - 10
truck 3 - 10
38 post-val runs performed on day 2. truck 2 - 20 truck 3 - 18

7.2 *b) Average Pre-Test Loaded weight 70340
*c) Post Test Loaded Weight 69950
*d) Difference Post Test – Pre-test -390

Table 5.2. Raw data – Axle scales – pre-test (day 1 carry over)

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11180	14500	14500	15080	15080		70340
2	11240	14450	14450	15100	15100		70340
3							
Average	11210	14475	14475	14475	14475		70340

Table 6.2. Raw data – Axle scales – post day 2

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11140	14430	14430	15090	15090		70180
2	11160	14410	14410	15100	15100		70180
3							
Average	11150	14420	14420	15095	15095		70180

Table 7.2 Raw data – Axle scales – ~~post-test~~ pre-day 2

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10980	14380	14380	15110	15110		69960
2	11120	14270	14270	15140	15140		69940
3							
Average	11050	14325	~~15110~~ 14325	15125	15125		69950

Measured By djw Verified By [illegible] Weight date 7/9/08

Sheet 19	* STATE_CODE 17
LTPP Traffic Data	* SPS PROJECT ID 0600
*CALIBRATION TEST TRUCK # 2	* DATE 7/5/02

Rev. 08/31/01

TRUCK #67
TRAILER #64

PART I.

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

AXLES - units - lbs / 100s lbs / kg

GEOMETRY

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

9. a) * Make: PETERBILT b) * Model: 379X

10.* Trailer Load Distribution Description:

CONCRETE BLOCKS LOADED EVENLY ALONG TRAILER

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

b). Trailer Tare Weight (units): ____

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

A to B 12.4 B to C 4.4 C to D 28.0

D to E 5.1 E to F ____

Wheelbase (measured A to last) ____ Computed ____

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

(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	75R24.5	2 FULL LEAF
B	75R24.5	AIR
C	~~2~~75R24.5	AIR
D	75R24.5	AIR
E	75R24.5	AIR
F		

Sheet 19	* STATE_CODE 17
LTPP Traffic Data	* SPS PROJECT ID 0600
*CALIBRATION TEST TRUCK # __	* DATE 07/09/08

Rev. 08/31/01

PART II

Day 2

*b) Average Pre-Test Loaded weight 77070
*c) Post Test Loaded Weight 76660
*d) Difference Post Test – Pre-test - 410

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10120	15680	15680	17800	17800		77080
2	10120	15650	15650	17820	17820		77060
3							
Average	10120	15665	15665	17810	17810		77070

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 (actually performed morning of day 3 before 2 runs)

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10060	15600	15600	17710	17710		76680
2	10000	15640	15640	17680	17680		76640
3							
Average	10030	15620	15620	17695	17695		76660

Measured By djw Verified By ____________ Weight date 7/9/08

Sheet 20	* STATE_CODE 1 7
LTPP Traffic Data	*SPS PROJECT_ID 0 6 0 0
Speed and Classification Checks * 1 of* 2	* DATE 7/08/08

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
62	9	40725	60	9	57	9	40808	57	9
62	5	40726	62	5	59	9	40816	59	9
60	8	40727	61	8	62	9	40820	62	9
63	9	40734	63	9	64	9	40821	64	9
59	9	40738	59	9	60	9	40848	60	9
64	9	40740	64	9	59	9	40853	59	9
63	9	40741	63	9	63	9	40860	63	9
62	9	40745	61	9	62	9	40866	62	9
67	9	40749	68	9	58	10	40879	58	10
60	9	40752	59	9	59	10	40882	59	10
60	9	40762	59	9	60	9	40885	60	9
62	9	40765	61	9	62	5	40886	62	5
62	9	40767	59	9	58	9	40891	58	9
64	9	40768	61	9	54	9	40896	52	9
60	9	40774	59	9	60	9	40904	60	9
60	9	40777	60	9	65	9	40949	65	9
60	9	40779	60	9	60	9	40951	60	9
59	9	40781	59	9	60	9	40954	59	9
59	8	40783	59	5	62	9	40957	60	9
60	9	40785	60	9	59	9	40959	59	9
64	9	40791	64	9	60	9	40961	60	9
65	9	40793	65	9	59	9	40970	59	9
60	9	40799	59	9	59	9	40972	58	9
65	9	40800	65	9	52	9	40977	52	9
64	9	40803	64	9	57	9	40980	57	9

Recorded by MARK Z Direction N Lane 1 Time from 10:27AM to 11:15AM

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Sheet 20	* STATE_CODE _1_7_
LTPP Traffic Data	*SPS PROJECT_ID _0_6_0_0_
Speed and Classification Checks * 2 of* 2	* DATE 7 / 8 / 08

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
62	9	40984	62	9	62	5	41156	62	5
58	9	40995	58	9	67	9	41161	67	9
59	9	41016	59	9	63	5	41166	64	5
62	9	41022	62	9	62	9	41167	62	9
61	9	41023	61	9	64	9	41177	64	9
65	9	41027	64	9	64	5	41179	64	5
65	9	41028	65	9	64	9	41185	64	9
64	9	41029	64	9	64	9	41194	64	9
59	9	41032	60	9	58	9	41195	59	9
64	9	41078	63	9	58	10	41197	58	10
67	9	41083	67	9	60	9	41201	59	9
59	9	41090	59	9	58	9	41203	58	9
59	9	41091	58	9	64	9	41204	64	9
60	8	41098	60	8	59	9	41207	59	9
63	9	41100	63	9	61	12	41234	61	12
60	9	41101	61	9	54	9	41240	55	9
61	9	41108	61	9	62	9	41248	64	9
65	9	41113	65	9	60	9	41252	60	9
66	9	41123	65	9	60	9	41253	60	9
55	9	41125	55	9	65	9	41257	65	9
67	9	41133	67	9	67	9	41258	67	9
63	9	41134	66	9	62	9	41259	62	9
60	9	41141	60	9	70	9	41260	68	9
64	9	41142	63	9	56	5	41270	56	5
60	9	41155	60	9	64	5	41271	64	5

Recorded by MARK Z Direction N Lane 1 Time from 11:16AM to 11:55AM

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Sheet 20	* STATE_CODE 1 7
LTPP Traffic Data	*SPS PROJECT_ID 0 6 0 0
Speed and Classification Checks * 1 of* 2	* DATE 7/ 09 / 08

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
64	9	48949	63	9	59	9	49018	58	9
63	9	48951	61	9	56	9	49024	54	9
62	9	48952	61	9	63	6	49025	62	6
60	9	48957	60	9	62	9	49026	63	9
68	11	48965	67	11	62	6	49031	64	6
47	5	48966	46	5	59	15	49033	58	9
47	9	48967	48	9	63	9	49069	63	9
62	9	48975	62	9	70	5	49082	69	5
62	9	48976	62	9	62	9	49087	59	9
60	5	48982	59	5	63	9	49088	62	9
62	9	48984	63	9	62	11	49091	60	11
62	9	48985	62	9	65	9	49093	64	9
60	9	48992	59	9	60	5	49099	59	5
62	9	48995	61	9	55	9	49102	54	9
62	9	48999	61	9	56	9	49103	55	9
60	9	49000	62	9	65	9	49104	65	9
64	9	49001	60	9	56	8	49105	55	8
64	9	49007	66	9	57	9	49106	54	9
60	9	49008	64	9	59	9	49112	60	9
60	9	49010	60	9	64	9	49117	62	9
55	5	49011	54	5	57	9	49121	55	9
61	9	49012	59	9	63	9	49123	63	9
65	5	49015	65	5	68	5	49124	66	5
63	9	49016	63	9	59	5	49127	61	5
59	9	49017	57	9	59	9	49128	59	9

Recorded by MARK Z   Direction N   Lane 1   Time from ~~302~~ 315 PM to 431 PM

6420070022_SPSWIM_TO_27_17_2.109_0600_Post-Validation_Sheet_20.doc

Sheet 20	* STATE_CODE _1_7__
LTPP Traffic Data	*SPS PROJECT_ID _0_6_0_0_
Speed and Classification Checks * 2 of* 2	* DATE 2 / 09 / 08

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
61	4	49135	61	5	60	9	49235	60	9
60	9	49144	60	9	62	9	49236	59	9
SHORT TRAILER AXLE SPACING → 62	15	49146	61	5	62	9	49238	61	9
64	9	49149	63	9	62	9	49239	62	9
56	9	49155	55	9	60	9	49241	59	9
56	9	49157	56	9	60	9	49242	61	9
63	11	49161	63	11	60	9	49245	60	9
58	9	49162	58	9	60	9	49246	60	9
54	9	49163	55	9	63	9	49247	62	9
60	9	49169	59	9	62	9	49253	59	9
56	5	49174	54	5	64	5	49257	64	5
63	9	49184	62	9	59	5	49258	59	5
58	9	49185	55	9	58	9	49265	58	9
57	9	49186	57	9	64	9	49266	64	9
58	9	49188	56	9	52	9	49268	51	9
62	9	49192	61	9	57	5	49275	58	5
63	9	49195	61	9	59	9	49278	59	9
62	13	49197	63	10	60	9	49296	60	9
64	11	49199	63	11	57	9	49302	53	9
64	12	49203	65	12	53	9	49303	52	9
63	12	49212	60	12	62	9	49307	62	9
59	5	49214	57	5	65	9	49313	65	9
57	9	49215	57	9	64	6	49314	63	6
59	6	49226	61	6	61	9	49323	61	9
64	9	49227	63	9	61	9	49325	61	9

Recorded by MARK Z Direction N Lane 1 Time from 4:31 PM to 532 PM

6420070022_SPSWIM_TO_27_17_2.109_0600_Post-Validation_Sheet_20.doc

Sheet 21	* STATE_CODE 1
LTPP Traffic Data	*SPS PROJECT_ID 0600
WIM System Test Truck Records 1 of 3	* DATE 2/8/08

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
82.5	56	2	1	9:14	40262	56	54/57	71/79	72/72	73/84	74/76		71.1	19.7	4.4	30.7	4.1	
82.5	56	1	1	9:14	40263	56	53/47	78/79	81/72	95/86	78/93		76.2	20.4	4.4	28.0	5.2	
81	60	2	2	9:25	40401	62	55/56	70/77	70/68	80/79	78/71		70.6	19.7	4.4	30.8	4.1	
81	60	1	2	9:35	40402	62	51/46	74/79	79/72	87/85	81/90		74.5	20.3	4.4	28.0	~~5.0~~ 5.1	
80.5	64	2	3	9:55	40527	66	52/54	61/76	68/68	79/77	71/75		68.1	19.7	4.4	30.9	4.1	
80.5	63	1	3	9:55	40528	65	49/49	79/79	80/75	84/84	81/85		73.7	20.3	4.4	28.0	5.2	
82	54	2	4	10:17	40684	55	56/55	69/76	71/73	80/85	73/74		71.2	19.6	4.4	30.7	4.1	
82	53	1	4	10:17	40685	57	52/51	79/77	82/72	91/87	83/92		76.6	20.4	4.4	28.1	5.2	
84.5	61	2	5	10:39	40824	61	55/54	65/75	73/66	78/78	81/70		69.5	19.7	4.4	30.8	4.1	
84.5	60	1	5	10:39	40825	60	48/49	79/78	77/74	84/87	79/95		74.0	20.3	4.3	28.0	5.1	
87	64	2	6	10:59	40912	66	53/55	64/76	65/74	78/81	70/73		68.9	19.6	4.4	30.7	4.0	
87	64	1	6	10:59	40913	65	48/49	76/81	80/76	84/84	85/85		74.0	20.3	4.4	28.1	5.2	
87.5	54	2	7	11:19	41039	56	56/53	67/77	71/72	73/84	73/72		69.7	19.7	4.4	30.7	4.1	
87.5	54	1	7	11:19	41040	55	49/47	74/85	83/75	91/90	80/95		77.0	20.3	4.4	28.0	5.2	
90	60	2	8	11:41	41211	61	55/53	67/70	69/71	79/82	74/72		69.7	19.6	4.4	30.8	4.1	
90	59	1	8	11:41	41212	62	50/49	74/79	78/76	85/86	81/87		74.6	20.2	4.4	28.0	5.2	

Recorded by MARK Z

Checked by [signature]

Sheet 21	* STATE_CODE 1
LTPP Traffic Data	*SPS PROJECT_ID 0600
WIM System Test Truck Records 2 of 3	* DATE 7/08/08

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
93.5	66	2	9	12:02	41356	66	54/54	61/75	73/66	81/77	73/73		68.7	19.7	4.4	30.8	4.1	
93.5	64	1	9	12:02	41357	64	49/48	76/80	78/75	85/85	81/89		74.4	20.3	4.4	28.0	5.2	
96.5	54	2	10	12:22	41515	55	53/57	68/77	73/70	74/86	73/77	[illegible]	70.6	19.6	4.4	30.8	4.1	
7/9/08 96.5	54	1	10	12:22	41516	56	49/48	75/79	78/74	90/87	77/95		75.4	20.4	4.4	28.0	5.2	
75.5	55	2	11	8:24	47503	56	55/55	71/75	73/70	73/84	78/74		70.8	19.7	4.4	30.8	4.1	
75.5	55	3	11	8:24	47504	55	51/48	78/78	81/74	91/92	76/97		76.6	19.8	4.4	28.3	5.2	
72	59	2	12	8:42	47552	61	54/54	68/75	71/66	74/83	76/72		69.4	19.7	4.4	30.9	4.1	
72	60	3	12	8:42	47553	60	50/49	78/80	~~82/86~~	~~83/85~~	~~85/95~~		76.7	19.7	4.4	28.2	5.1	
71.5	65	2	13	9:00	47600	65	54/55	67/74	82/76 67/72	93/85 80/81	85/90 74/72		69.6	19.7	4.4	30.8	4.1	
71.5	63	3	3	9:00	47601	64	49/47	75/79	79/73	[illegible]/81	79/82		74.0	19.7	4.4	28.4	5.2	
81.5	55	2	14	9:18	47654	55	55/52	66/78	76/70	72/85	79/78		71.0	19.7	4.4	30.8	4.1	
81.5	54	3	4	9:18	47656	55	52/48	80/81	82/75	95/91	85/95		78.5	19.7	4.4	28.3	5.2	
81.5	60	2	15	9:35	47701	60	55/51	68/76	71/67	80/80	74/74		69.6	19.7	4.4	30.8	4.1	
81.5	59	3	5	9:35	47702	59	48/49	80/76	84/76	87/85	84/91		76.1	19.7	4.3	28.2	5.1	
85.5	62	2	16	9:52	47751	63	[illegible]	55/51	67/73	73/70	82/78	76/71	69.8	19.7	4.4	30.9	4.1	
85.5	61	3	6	9:53	47752	62	48/47	74/80	76/76	88/78	77/92		73.8	19.7	4.4	28.3	5.1	

Recorded by MARK Z   Checked by [signature]

6420070022_SPSWIM_TO_27_17_2.109_0600_Pre-Validation_Sheet_21.doc

Sheet 21	* STATE_CODE _1_
LTPP Traffic Data	*SPS PROJECT_ID _0_6_0_0_
WIM System Test Truck Records 2 of 3	* DATE 7/09/08

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
89	55	2	17	10:10	47808	55	57/53	69/78	78/73	79/87	77/76		72.1	19.7	4.4	30.8	4.1	
89	55	3	7	10:10	47809	56	50/48	79/82	82/77	91/85	77/92		76.1	19.6	4.4	28.2	5.1	
93.5	61	2	18	10:28	47856	61	54/53	63/78	73/70	78/82	74/74		70.0	19.7	4.4	30.8	4.1	
93.5	60	3	8	10:28	47857	59	48/47	78/82	81/76	90/86	82/93		76.2	19.7	4.4	28.2	5.1	
99.5	66	2	19	11:04	47960	65	54/54	64/84	71/78	82/89	78/78		73.2	19.5	4.4	30.5	4.0	
99.5	65	3	9	11:04	47961	65	50/50	77/76	79/79	86/86	77/77		73.8	19.7	4.4	28.2	5.2	
104.5	55	2	20	11:22	48007	55	54/53	67/80	73/68	79/86	74/74		70.7	19.6	4.4	30.7	4.1	
104.5	55	3	10	11:22	48008	55	50/49	77/81	80/79	93/88	85/98		77.8	19.7	4.4	28.2	5.2	

Recorded by MARK B Checked by [signature]

6420070022_SPSWIM_TO_27_17_2.109_0600_Pre-Validation_Sheet_21.doc

Sheet 21	* STATE_CODE _1_,_
LTPP Traffic Data	*SPS PROJECT_ID _0_6_0_0_
WIM System Test Truck Records _1_ of _1_	* DATE _21/09/08_

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
97.5	56	2	1	12:36	48465	54	56/52	64/78	73/72	79/86	76/78		71.5	19.6	4.4	30.8	4.1	
97.5	53	3	1	12:36	48469	54	49/49	77/80	82/75	93/85	82/94		76.6	19.6	4.4	28.1	5.1	
105.5	61	2	2	12:53	48514	61	55/52	68/75	75/71	82/81	73/73		70.7	19.7	4.3	30.9	4.1	
105.5	58	3	2	12:55	48518	59	50/48	76/81	80/75	86/89	75/95		75.6	19.7	4.4	28.2	5.1	
102.5	65	2	3	13:11	48559	66	55/56	66/80	73/69	83/80	76/72		71.0	19.7	4.4	30.9	4.1	
102.5	64	3	3	13:12	48562	65	48/48	75/82	73/79	87/89	78/94		75.5	19.8	4.4	28.2	5.1	
108.5	55	2	4	13:29	48611	55	55/54	68/79	71/70	79/84	77/76		71.1	19.7	4.4	30.9	4.1	
108.5	54	3	4	13:30	48613	55	50/46	77/82	81/78	94/88	83/97		77.5	19.7	4.4	28.2	5.2	
108	61	2	5	13:47	48674	61	54/54	66/81	74/72	75/81	80/74		71.0	19.6	4.4	30.8	4.1	
108	59	3	5	13:47	48676	60	48/52	78/83	81/74	88/90	79/94		77.0	19.6	4.4	28.2	5.2	
104.5	66	2	6	14:05	48714	66	55/53	60/80	70/75	77/79	76/69		69.3	19.6	4.4	30.7	4.0	
104.5	65	3	6	14:05	48715	65	49/47	75/81	77/80	82/85	72/93		74.2	19.7	4.4	28.2	5.1	

Recorded by MARK Z

Checked by [signature]

Sheet 21	* STATE_CODE 1
LTPP Traffic Data	*SPS PROJECT_ID 0600
WIM System Test Truck Records 1 of 2	* DATE 2/9/08

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
120.5	55	2	7	14:43	48822	56	56/55	71/78	76/72	74/83	76/75		71.6	19.6	4.4	30.7	4.1	
120.5	55	3	7	14:43	48823	56	52/46	78/82	81/76	93/89	83/92		77.2	19.7	4.4	28.3	5.1	
112	60	2	8	15:01	48879	60	56/55	66/80	73/75	77/84	75/76		71.5	19.6	4.3	30.8	4.1	
112	59	3	8	15:02	48886	60	50/49	77/81	80/76	89/85	72/97		75.7	19.7	4.4	28.2	5.2	
113	66	2	9	15:19	48931	65	54/54	64/79	73/69	82/80	73/73		70.1	19.7	4.4	30.9	4.1	
113	63	3	9	15:21	48936	62	49/45	76/84	80/79	90/88	82/83		76.7	19.6	4.4	28.2	5.1	
104.5	53	2	10	15:37	48998	55	58/55	67/78	78/71	72/82	78/74		71.5	19.7	4.4	30.8	4.1	
104.5	53	3	10	15:39	49003	54	49/47	78/79	81/76	92/87	83/95		76.8	19.7	4.4	28.2	5.1	
107.5	61	2	11	15:55	49054	61	56/56	81/81	71/71	79/79	78/78		72.9	19.6	4.4	30.7	4.1	
107.5	59	3	11	15:57	49057	60	47/47	85/82	89/80	94/82	91/91		78.9	19.7	4.4	28.4	5.1	
102.5	65	2	12	16:13	49095	65	57/58	68/81	72/72	83/82	74/71		71.9	19.7	4.4	30.8	4.1	
102.5	63	3	12	16:15	49100	64	49/49	76/83	79/77	90/85	82/90		75.9	19.7	4.4	28.2	5.1	
109	55	2	13	16:31	49155	56	57/53	68/79	75/70	77/81	76/73		70.8	19.7	4.4	30.8	4.1	
109	53	3	13	16:34	49159	55	48/48	75/79	77/77	92/86	76/96		75.4	19.7	4.4	28.2	5.2	
108	58	2	14	16:49	49205	56	55/55	68/80	77/68	75/83	78/78		71.6	19.6	4.4	30.8	4.1	
108	53	3	14	16:52	49214	55	48/50	77/82	82/75	94/87	87/91		77.2	19.7	4.4	28.2	5.2	

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Sheet 21	* STATE_CODE 17
LTPP Traffic Data	*SPS PROJECT_ID 0600
WIM System Test Truck Records 2 of 2	* DATE 7/09/08

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
111	62	2	15	17:07	49262	60	58/57	64/78	73/72	81/84	74/72		71.3	19.6	4.3	30.7	4.1	
111	59	3	15	17:11	49272	60	50/49	76/81	82/80	93/86	81/92		77.0	19.7	4.3	28.2	5.1	
102	65	2	16	17:24	49310	66	56/55	63/81	69/74	85/79	78/69		70.8	19.7	4.4	30.9	4.1	
102	64	3	16	17:29	49331	64	49/49	80/78	81/77	86/80	79/92		75.1	19.7	4.4	28.3	5.2	
WRONG TRUCK ~~104~~	~~61~~	~~2~~	~~17~~	~~17:42~~	~~49381~~	~~61~~	~~53/52~~	~~70/72~~	~~75/73~~	~~86/89~~	~~80/82~~		~~72.7~~	~~19.8~~	~~4.4~~	~~30.1~~	~~10.2~~	
101	55	2	17	17:42	49380	55	57/52	69/76	76/69	75/83	78/72		70.8	19.7	4.4	30.8	4.1	
101	55	3	17	17:48	49405	55	51/46	77/78	78/72	69/110	93/88		76.2	19.7	4.4	28.2	5.2	
98.5	63	2	18	18:04	49484	62	55/55	66/77	73/72	80/83	75/74		71.0	19.7	4.4	30.9	4.1	
97.5	65	2	19	18:22	49528	65	54/52	63/80	71/70	77/79	78/75		69.8	19.7	4.4	30.8	4.1	
93.5	54	2	20	18:40	49563	55	56/55	69/78	74/68	79/81	73/71		70.5	19.7	4.4	31.0	4.1	
89.5	61	3	18	19:33	49661	61	57/57	70/80	76/66	83/80	79/71		71.8	19.7	4.4	30.9	4.1	
95.5	59	3	19	10:35	93	59	50/46	79/82	82/77	90/88	80/92		76.6	19.7	4.4	28.2	5.1	
97	63	3	20	10:55	173	64	51/48	77/84	78/80	88/90	80/91		76.7	19.7	4.4	28.2	5.1	

Recorded by MARK Z

Checked by [signature]

6420070022_SPSWIM_TO_27_17_2.109_0600_Post-Validation_Sheet_21.doc

Calibration Worksheet

Site: __170600___

Calibration Iteration ___1___ Date 7-9-08

Beginning factors:

Speed Point (mph)	Name	Left Sensor 1 / ~~3~~	Right Sensor 2 / ~~4~~
Overall			
Front Axle			
Distance			
1 – (50)	80 kph	3275	3684
2 – (55)	88 kph	3474	3908
3 – (60)	96 kph	3367	3789
4 – (65)	104 kph	3320	3734
5 – (70)	112 kph	3219	3619

Errors:

	Speed Point 1 ( )	Speed Point 2 (55)	Speed Point 3 (60)	Speed Point 4 (65)	Speed Point 5 ( )
F/A					
Tandem					
GVW					

Adjustments:

	Raise	Lower	Percentage
Overall	☐	☐	
Front Axle	☐	☐	
Speed Point 1	☐	☐	
Speed Point 2	☐	☑	0.3
Speed Point 3	☑	☐	1.6
Speed Point 4	☑	☐	2.4
Speed Point 5	☐	☐	

End factors:

Speed Point (mph)	Name	Left Sensor 1 / 3	Right Sensor 2 / 4
Overall			
Front Axle			
Distance			
1 – (50)	80 kph	3275	3684
2 – (55)	88 kph	3462	3895
3 – (60)	96 kph	3420	3848
4 – (65)	104 kph	3399	3822
5 – (70)	112 kph	3219	3619

TEST VEHICLE PHOTOGRAPHS FOR SPS WIM VALIDATION

July 08, 2008

STATE: Illinois

SHRP ID: 170600

Photo 1 17_0600_Truck_1_Tractor_07_08_08.jpg

Photo 2 17_0600_Truck_1_Trailer_07_08_08.jpg

Photo 3 17_0600_Truck_1_Suspension_1_07_08_08.jpg

Photo 4 17_0600_Truck_1_Suspension_2_07_08_08.jpg

Photo 5 17_0600_Truck_1_Suspension_3_07_08_08.jpg

Photo 6 17_0600_Truck_2_Tractor_07_08_08.jpg

Photo 7 17_0600_Truck_2_Trailer_07_08_08.jpg

Photo 8 17_0600_Truck_2_Suspension_1_07_08_08.jpg

Photo 9 17_0600_Truck_2_Suspension_2_07_08_08.jpg

Photo 10 17_0600_Truck_2_Suspension_3_07_08_08.jpg

Photo 11 17_0600_Truck_3_Tractor_07_08_08.jpg

Photo 12 17_0600_Truck_3_Trailer_07_08_08.jpg

Photo 13 17_0600_Truck_3_Suspenion_1_07_08_08.jpg

Photo 14 17_0600_Truck_3_Suspension_2_07_08_08.jpg

Photo 15 17_0600_Truck_3_Suspension_3_07_08_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

Illinois SPS-6 (Lane)

Calibration Factors for Sensor #1

Validation Visit Factor	July 9, 2008	July 8, 2008	March 28, 2007
80 kph	3275	3275	3884
88 kph	3462	3474	4120
96 kph	3420	3367	3994
104 kph	3399	3320	3928
112 kph	3219	3219	3817

Calibration Factors for Sensor #2

Validation Visit Factor	July 9, 2008	July 8, 2008	March 28, 2007
80 kph	3684	3684	3524
88 kph	3895	3908	3740
96 kph	3848	3789	3626
104 kph	3822	3734	3574
112 kph	3619	3619	3464
Distance	310 cm	310 cm	