Validation Report

Florida, SPS-5

Task Order 8, CLIN 2
March 2 and 3, 2005

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1 Executive Summary

A visit was made to the Florida SPS-5 on March 2nd and 3rd, 2005 for the purposes of conducting a Validation of the WIM system located on US Route 1, 4.5 miles north of SR 706. The validation procedures were in accordance with LTPP's SPS WIM Data Collection Guide (SPS WIM DCG) dated August 21, 2001. The LTPP lane is identified as Lane 4 in the WIM controller.

This is the second validation visit we have made to this site, the first being December 18, 2003. At that time, this site met the precision requirements for research quality data.

This site was successfully validated on March 3, 2003 and is currently providing research quality WIM data and is considered to be providing research quality classification information as defined in the SPS WIM Data Collection Guide.

The site is instrumented with Kistler quartz piezo sensors installed in asphalt concrete pavement and IRD/PAT Traffic electronics.

The validation used the following trucks:

1) 3S2 FHWA Class 9 with a tractor having an air suspension drive tandem and trailer with standard rear tandem and air suspension loaded to 78,300 lbs.
2) 2D FHWA Class 5 with tapered spring leaf suspension loaded to 23,640 lbs.

The validation speeds ranged from 34 to 56 miles per hour. The pavement temperatures ranged from 73 to 77 degrees Fahrenheit for the final validation.

Table 1-1 Post-Validation Results – 120500 – 03 Mar 2005

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Loaded single axles	±20 percent	1.7%±10.0%	Pass
Loaded tandem axles	±15 percent	-3.0%±5.9%	Pass
Gross vehicle weights	±10 percent	-1.6%±6.5%	Pass
Vehicle speed	±1 mph [2 km/hr]	N/A	Pass
Axle spacing length	± 0.5 ft [150 mm]	0.0±0.0 ft	Pass

This site meets the overall classification requirement of less than two percent unclassified. It does not meet the less than two percent trucks misclassified criteria. The errors are attributed to heavy or long Class 3 vehicles being identified by the classification algorithm as Class 5 vehicles. The State's algorithm is length and weight-based, characteristics that cannot be determined with visual examination. The observer, using FHWA definitions distinguishes these types by the number of

tires on the rear axle, a characteristic the equipments sensor array is not designed to capture.

MACTEC field staff worked with the agency representative to compute factor adjustments. The agency representative made all equipment changes. This was expected given the information on the Traffic Sheet 18 completed as part of the assessment and previous validation visits held in December 2003.

The pavement condition was satisfactory for conducting a validation. 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.

The WIM index was not exceeded at any location at this site. **This site meets the LTPP pavement smoothness requirements for WIM locations.**

2 Corrective Actions Recommended

The left side section of the leading WIM sensor indicates a low insulation resistance. Although the value recorded is below the manufacturer's recommended tolerance, the sensor appears to be working properly. **This sensor should be checked periodically and the data from the site should be reviewed on at least a monthly basis. Data that reflects variability and imbalance when comparing left and right axles may indicate that this sensor has failed.**

3 Post Validation Analysis

This final analysis is based on test runs conducted March 3, 2005 from mid-day to early afternoon at test site 120500 on US Route 1, 4.5 miles north of SR 706. This SPS-5 site is located on the southbound, right hand lane of a divided four-lane facility. No auto-calibration was used during test runs and auto-calibration is not used during normal site operations.

The two trucks used for testing were:

1. 3S2 (FHWA Class 9) with a tractor having an air suspension drive tandem and a trailer with standard rear tandem and air suspension loaded to 78,300 lbs.
2. 2D (FHWA Class 5) with tapered spring leaf suspension and loaded to 23,640 lbs.

Each truck made a total of 20 passes over the WIM scale at speeds ranging from approximately 34 to 56 miles per hour. Pavement surface temperatures recorded during the test runs ranged from about 73 to 77 degrees Fahrenheit. The computed values of 95% confidence limits of each statistic for the total population are within Table 3-1.

As shown in Table 3-1, the site passed all of the performance criteria for weight and spacing. No post-calibration speed checks were considered necessary given the validation of speed measurement pre-calibration and the consistent spacing validation.

Table 3-1 Post-Validation Results - 120500 – 03 Mar 2005

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Loaded single axles	±20 percent	1.7%±10.0%	Pass
Loaded tandem axles	±15 percent	-3.0%±5.9%	Pass
Gross vehicle weights	±10 percent	-1.6%±6.5%	Pass
Vehicle speed	±1 mph [2 km/hr]	N/A	--
Axle spacing length	± 0.5 ft [150 mm]	0.0±0.0 ft	Pass

The test runs were conducted primarily during the mid-day to early afternoon, resulting in a very narrow range of pavement temperatures. Given that the site passed pre-validation analysis over a 25 degree Fahrenheit temperature range and the post-validation was a result of calibration to improve data quality rather than bring the site into conformance, temperature differentiation in the runs was not critical to the post-validation analysis. The runs were conducted at various speeds to determine the effects of these variables on the performance of the WIM scale.

To investigate speed effects, the dataset was split into three speed groups. The speed groups were divided as follows: Low speed = 34-40 mph, Medium speed = 41-48 mph and High speed = 49+ mph.

A series of graphs was developed to check visually for any sign of a relationship between speed and the scale performance.

Figure 3-1 shows the by truck GVW percent error vs. speed graph for the population as a whole. Diamonds are used to identify the Class 5 truck. The equipment underestimates the GVW for this truck at low and high speeds and overestimates the GVW at medium speeds. The Class 9 truck is represented by squares and tends to have GVW underestimated at all speeds. There is less scatter for GVW errors at the medium range speeds.

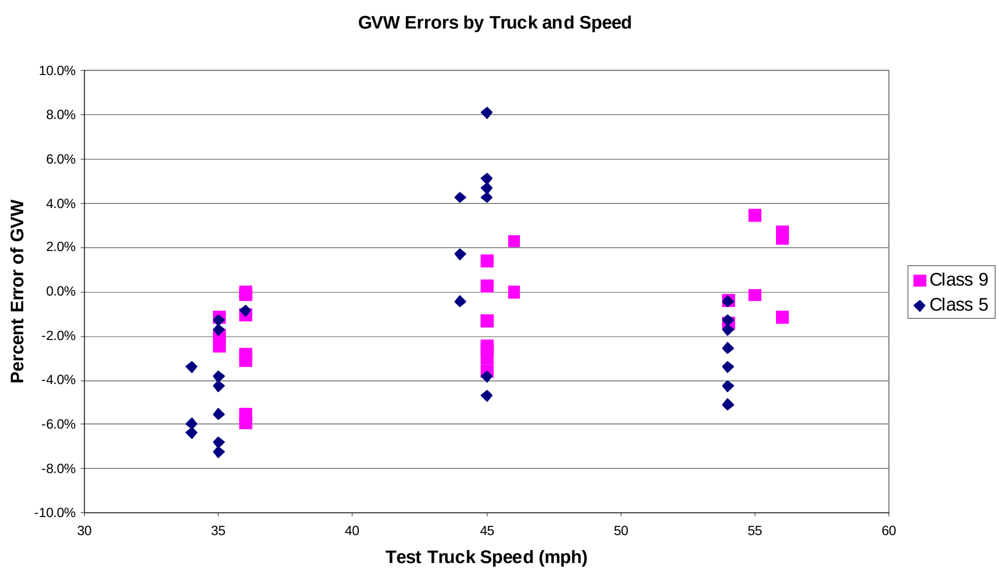


Figure 3-1 Post-Validation GVW Percent Error vs. Speed by Truck – 120500 – 03 Mar 2005

Figure 3-2 shows the lack of relationship between the spacing errors in feet and speeds. The graph indicates that the errors in tandem spacings for the test trucks were not affected by changes in speed. The speed limit at this site is 55 mph and the prevailing speed is higher than the posted Speed Limit. The information in Figure 3-2 infers that spacing errors should probably not exist at the higher speeds more typical of vehicles at this site.

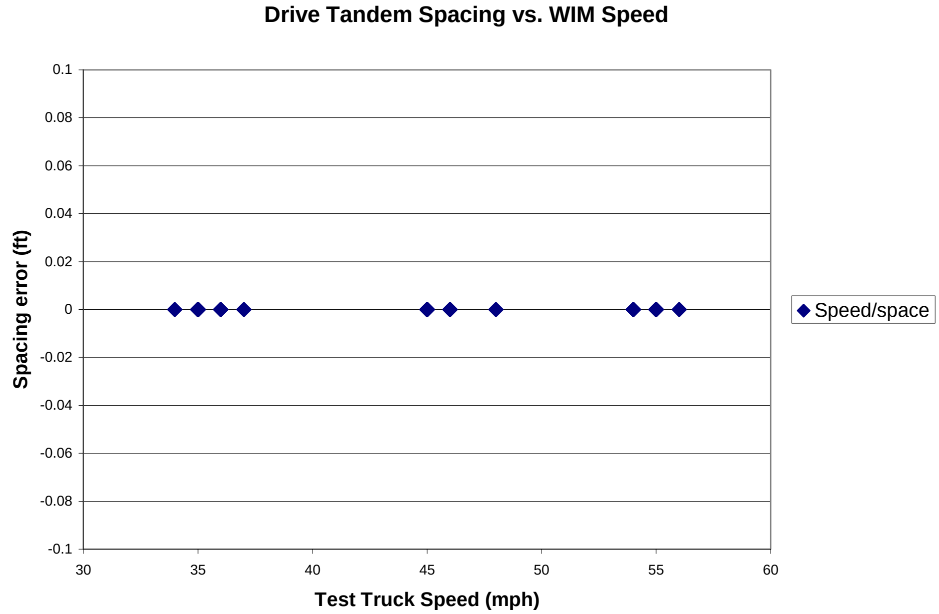


Figure 3-2 Post-Validation Speed vs. Spacing - 120500 – 03 Mar 2005

3.1 Temperature-based Analysis

A temperature based analysis was not performed for the validation runs due to the very narrow temperature range achieved during the post calibration runs. The performance of the system during the pre-validation temperature-based analysis which showed no significant relationship for weight and spacing errors versus a range of temperatures, made collection for such analysis non-critical.

3.2 Speed-based Analysis

The speed groups were divided as follows: Low speed = 34 to 40 mph, Medium speed = 41 to 48 mph and High speed = 49+ mph.

Table 3-2 Post-Validation Results by Speed Bin – 120500 – 03 Mar 2005

Element	95% Limit	Low Speed 34-40 mph	Med. Speed 41-48 mph	High Speed 49+ mph
Single axles	±20 %	-1.3%±6.9%	2.6%±12.3%	4.2%±9.3%
Tandem axles	±15 %	-2.9%±6.9%	-4.0%±4.4%	-1.9%±7.2%
GVW	±10 %	-2.7%±4.9%	0.1%±8.5%	-2.2%±6.0%
Speed	±1 mph	N/A	N/A	--
Axle spacing	± 0.5 ft	0.0±0.0 ft	0.0±0.0 ft	0.0±0.0 ft

From Table 3-2 and Figure 3-3, it appears that the GVW variability is higher at the medium and high range speeds. It appears that the gross weights are generally underestimated at the low and high range speeds and estimated fairly accurately at medium range speeds.

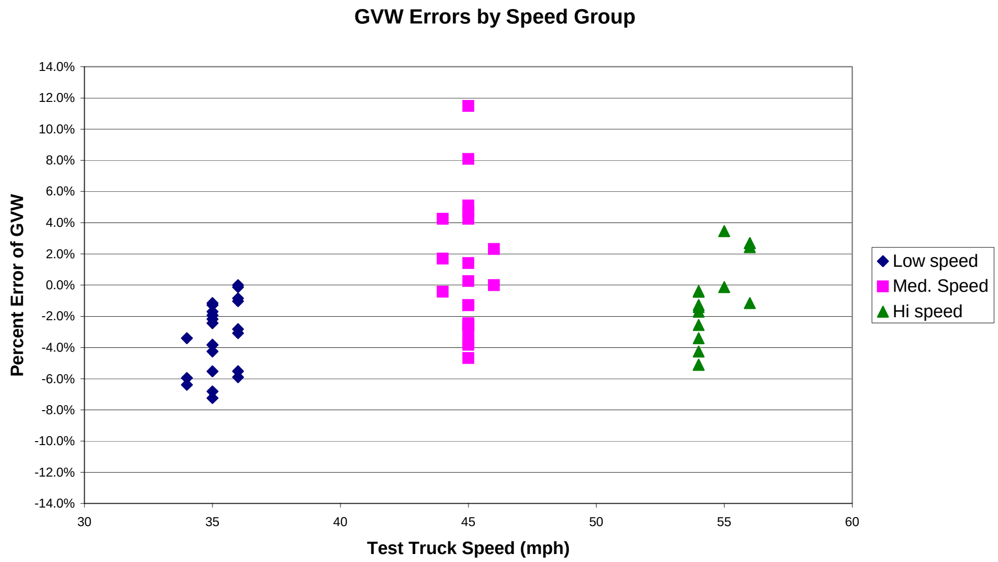


Figure 3-3 Post-Validation GVW Percent Error vs. Speed Group - 120500 – 03 Mar 2005

As shown in Figure 3-4 the WIM equipment underestimated the Class 9 GVW at all speeds. The GVW for the Class 5 truck was underestimated at the low and high range speeds and overestimated at the medium range speeds. The scatter appears larger at the medium range speeds than at the low and high range speeds. The scatter of GVW error for each truck remained fairly consistent throughout the entire speed range.

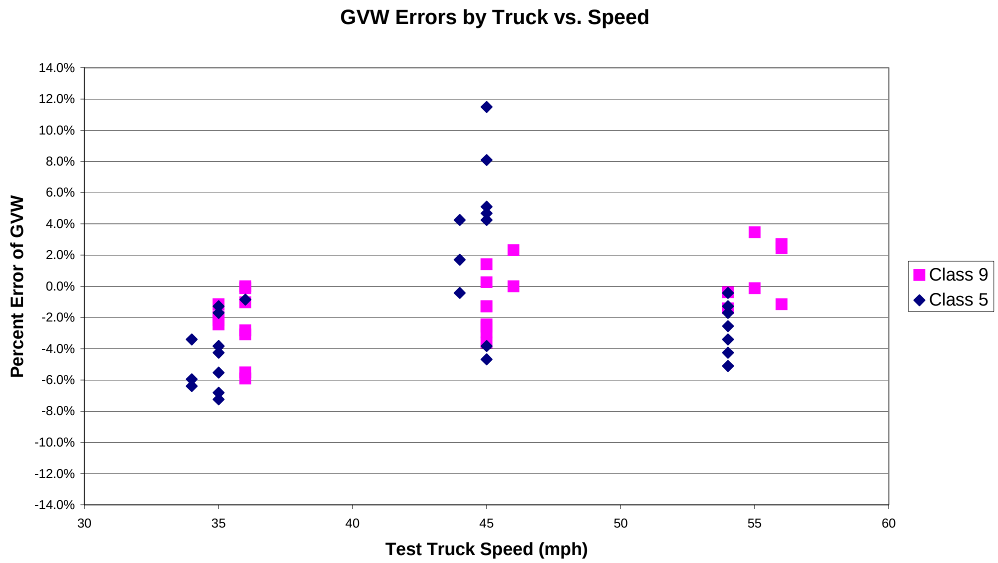


Figure 3-4 Post-Validation GVW Percent Error vs. Speed by Truck – 120500 – 03 Mar 2005

From Figure 3-5 it appears that the WIM equipment over estimates the steering axle weights at the low speeds, and then produces a progressively higher overestimation as the speed of the test trucks increase. Scatter appears larger at the medium range speeds than at the low and high range speeds.

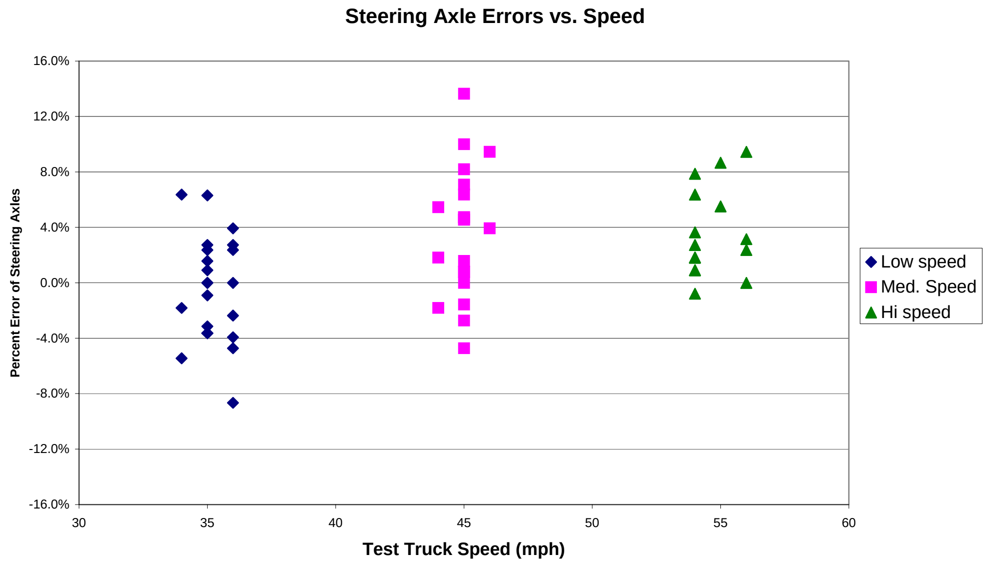


Figure 3-5 Post-Validation Steering Axle Percent Error vs. Speed Group - 120500 – 03 Mar 2005

From Figure 3-6 it appears that when the steering axle weight errors are grouped by truck, the steering axle weights are estimated accurately at the low speed range and then are progressively overestimated as the speeds of the test trucks increases. The scatter of the steering axle errors appears to be larger at the medium range speeds than at the low and high range speeds for both trucks.

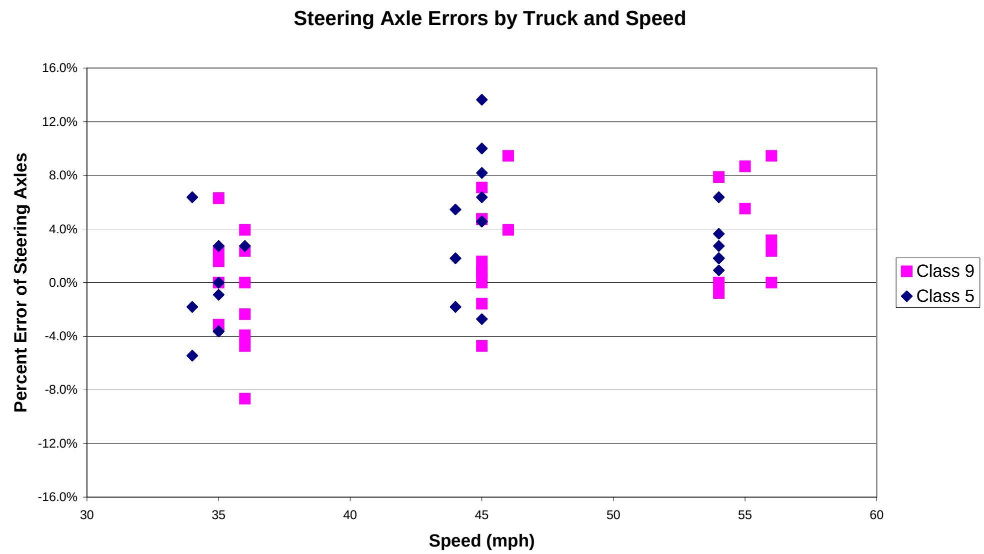


Figure 3-6 Post-Validation Steering Axle Percent Error vs. Speed by Truck - 120500 – 03 Mar 2005

3.3 Classification Validation

The agency uses a modified FHWA 13 bin classification scheme. The modification utilizes a Class 15 for unknown vehicles.

Post-validation classification validation was not performed as the pre-validation classification only had errors for Class 5 vehicles. The errors are attributed to heavy or long Class 3 vehicles being identified by the classification algorithm as Class 5 vehicles. The State's algorithm is length and weight-based, characteristics that cannot be determined with visual examination. The observer, using FHWA definitions distinguishes these types by the number of tires on the rear axle, a characteristic the equipments sensor array is not designed to capture.

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

4 Pavement Discussion

The pavement is in good condition and does not significantly influence truck movement across the sensors. There does not appear to be any significant changes in the pavement condition since the last validation visit on December 18, 2003.

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. The Long Range Index (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 Short Range Index (SRI) incorporates a shorter section of pavement profile beginning 2.7 m prior to the WIM scale and ending 0.5 m after the scale.

Profile data was collected at the SPS WIM location by Fugro/BRE, Inc. on April 7, 2004 and were processed through the LTPP SPS WIM Index software (Alpha version). This WIM scale is installed on a flexible pavement. The results are shown in Table 4-1.

A total of 8 profiler passes were conducted over the WIM site. Since the issuance of the LTPP directive on collection of longitudinal profile data for SPS WIM section, 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 done 4 passes at the center of the lane, 2 passes shifted to the left side of the lane, and 2 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).

Table 4-1 shows the computed index values for all 8 profiler passes for this WIM site. The average values over the four passes only at the center of the lane at each path were calculated, as shown in the right most column of the table. The average values over the two passes at the right side and left side of the lane are not calculated because of the lower reliability associated with the average of only two passes. Values above the index limits are presented in italics.

Table 4-1 Long Range Index (LRI) and Short Range Index (SRI) - 120500 –07-Apr-2004

Profiler Passes			**Pass 1**	**Pass 2**	**Pass 3**	**Pass 4**	**Ave.**
Center	LWP	LRI (m/km)	0.580	0.573	0.621	0.575	0.587
		SRI (m/km)	0.404	0.308	0.474	0.489	0.419
	RWP	LRI (m/km)	0.715	0.594	0.589	0.626	0.631
		SRI (m/km)	0.559	0.403	0.354	0.415	0.433
Left Shift	LWP	LRI (m/km)	0.591	0.555			
		SRI (m/km)	0.702	0.394			
	RWP	LRI (m/km)	0.589	0.579			
		SRI (m/km)	0.496	0.489			
Right Shift	LWP	LRI (m/km)	0.535	0.509			
		SRI (m/km)	0.447	0.450			
	RWP	LRI (m/km)	0.725	0.720			
		SRI (m/km)	0.407	0.628			

All of the passes in both the LWP and RWP were below the WIM Index value of 0.789 m/km as can be seen in the table. When all values are less than 0.789 it is presumed unlikely that pavement conditions will significantly influence sensor output. **Based on the profile data analysis, the Florida SPS-5 WIM site meets the requirements for WIM site locations.** No pavement remediation is required at present for this site.

4.2 Distress survey and any applicable photos

The pavement is in a good condition. The trucks' movement over the site did not appear to be affected by any pavement distresses.

4.3 Vehicle-pavement interaction discussion

The trucks do not appear to be displaying any significant vertical movement while approaching, traversing or exiting the WIM scale area. Trucks track down the wheel path. Daylight is not apparent between the tires and any of the sensors for the equipment.

5 Equipment Discussion

The traffic monitoring equipment at this location includes Kistler quartz piezo sensors and an IRD/PAT Traffic DAW-190 controller. The sensors are installed in a staggered array, sixteen feet apart in asphalt concrete pavement.

Since the last Validation visit on December 18, 2003 the agency instituted a new classification scheme that is a modified FHWA 13-bin scheme. The modification includes Class 15 for unclassified vehicles. The algorithm previously used has been modified to address the axle spacings for Class 3 and Class 5 vehicles. This adjustment was made in an attempt to prevent cross-classification of these vehicle types.

5.1 Pre-Validation 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. The left side section of the leading WIM sensor indicates a low insulation resistance. Although the value recorded is below the manufacturer's recommended tolerance, the sensor appears to be working properly. **This sensor should be checked periodically and the data from the site should be reviewed on at least a monthly basis. Data that reflects variability and imbalance when comparing left and right axles may indicate that this sensor has failed.**

All other 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 appear to be in good physical condition.

5.2 Calibration Process

The equipment underwent one-iteration of the calibration process between the initial 60 runs and the final 40 runs. The calibration adjustments were done at the Agency's request in order to further improve data quality at the site. All calibration adjustments were made by the agency representative.

5.2.1 Calibration Iteration 1

The results of the 60 pre-calibration runs performed by the two test trucks produced a range of -9.0% to +6.1% for the average GVW error, with the largest underestimation at the lower range speeds. The factor to be adjusted was the low speed compensation factor, which is modified so that if weights are underestimated at the lower speed range they are increased. If weights are overestimated they are decreased. The adjustment increment used was the absolute value of the mean percent error at the low speed range. The value of the low speed compensation factor was increased by 2.0% from 995 to 1015 to reduce the size of the underestimate for GVW at the lower speed range.

The first 20 calibration runs were performed by the two test trucks and produced an average error of -1.1% for GVW. Based on this result and the values for the single and tandem axles it was determined that no further adjustments were needed.

Table 5-1 and Figure 5-1 show the results of Calibration 1 adjustment based on 20 post-calibration runs. These runs were conducted at the predetermined test speeds. The tendency to underestimate GVW decreases with increasing speed. The Agency elected to make no further adjustments to the equipment.

Table 5-1 Calibration Iteration 1 Results - 120500 – 03 Mar 2005 (beginning 4:49 PM)

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Loaded single axles	±20 percent	1.9%±11.1%	Pass
Loaded tandem axles	±15 percent	-2.8%±6.1%	Pass
Gross vehicle weights	±10 percent	-1.1%±6.9%	Pass
Vehicle speed	±1 mph [2 km/hr]	N/A	--
Axle spacing length	± 0.5 ft [150 mm]	0.0±0.0 ft	Pass

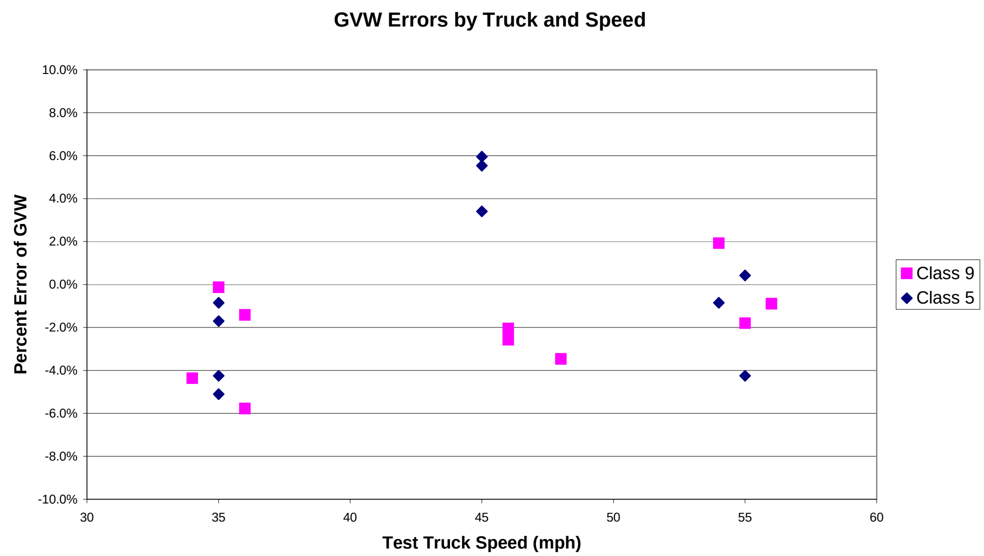


Figure 5-1 Calibration Iteration 1 GVW Percent Error vs. Speed Group - 120500 – 03 Mar 2005(beginning 4:49 PM)

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. Shaded blocks indicate the dates when a research data quality determination was made.

Table 5-2 Classification Validation History - 120500

Date	Method	Mean Difference				Percent Unclassified
		Class 9	Class 8	Other 1	Other 2	
3/2/05	No. of Trucks	0	0			0
12/4/03	No. of Trucks	0	0	36		

Table 5-3 Weight Validation History - 120500

Date	Method	Mean Error and SD		
		GVW	Single Axles	Tandem Axles
3/3/05	Test Trucks	-2.1 (3.2)	0.1 (5.0)	-3.2 (3.0)
3/2/05	Test Trucks	1.7 (3.6)	0.4 (4.4)	-2.0 (3.1)
12/18/03	Test Trucks	-5.9 (2.0)	-6.6 (3.8)	5.4 (2.4)

Since the initial installation of the equipment in 1997 the WIM system has utilized an IRD/PAT Traffic controller. The in-road sensors in the LTPP lane were changed from BL piezo sensor to Kistler quartz sensors in 2003. At that time the WIM controller was also upgraded.

Calibrations of the equipment at this site have been performed by the vendor or a state contractor since the installation of the equipment.

5.4 Projected Maintenance/Replacement Requirements

The left side section of the leading WIM sensor indicates a low insulation resistance. Although the value recorded is below the manufacturer's recommended tolerance, the sensor currently appears to be working properly. **As funds become available this sensor should be replaced.**

6 Pre-Validation Analysis

This initial analysis is based on test runs conducted late morning to mid evening on March 2, 2005 and mid-morning to mid-day on March 3, 2005 at test site 120500 on US Route 1, 4.5 miles north of SR 706. The split between days was made to obtain a wider temperature range.

For the initial validation each truck made a total of 30 passes over the WIM scale at speeds ranging from approximately 34 to 56 miles per hour. Pavement surface temperatures were recorded during the test runs ranging from about 69 to 95 degrees Fahrenheit. The computed values of 95% confidence limits of each statistic for the total population are within Table 6-1.

As seen in Table 6-1 the site passed all of the performance criteria for research quality data. Given the trend in underestimation of GVW with speed, additional work was agreed on to provide an opportunity to improve the site's data quality.

Table 6-1 Pre-Validation Results - 120500 – 02 Mar 2005

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Loaded single axles	±20 percent	2.0%±8.8%	Pass
Loaded tandem axles	±15 percent	-1.8%±6.1%	Pass
Gross vehicle weights	±10 percent	-1.2%±7.3%	Pass
Vehicle speed	±1 mph [2 km/hr]	0.2±0.5 mph	Pass
Axle spacing length	± 0.5 ft [150 mm]	0.0±0.0 ft	Pass

The test runs were conducted primarily during the mid-evening hours to the late morning over the course of two days, resulting in a fairly 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 desired equitable distribution across speed and temperature combinations was achieved. The speed groups were divided as follows: Low speed = 34 to 40 mph, Medium speed = 41 to 48 mph and High speed = 49+ mph. The three temperature groups were created by splitting the runs between those at 69 to 76 for Low temperature, 77 to 85 for Medium temperature and 86 to 95 for High temperature.

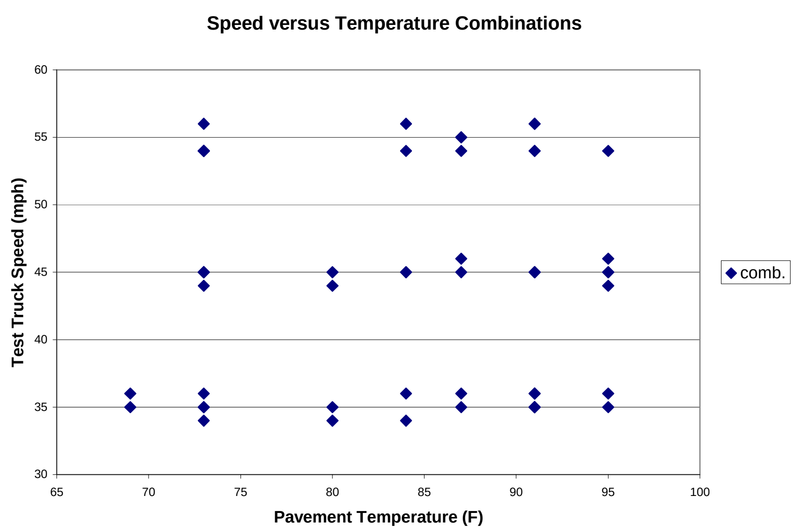


Figure 6-1 Pre-Validation Speed-Temperature Distribution – 120500 – 02 Mar 2005

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

Figure 6-2 shows the by truck GVW percent error vs. speed graph for the population as a whole. From the figure it appears that the GVW for both trucks was similarly underestimated at the low speed range. The GVW for the Class 5 truck was overestimated at the medium speed range and was underestimated at the high range speeds. The scatter of the GVW errors for the Class 5 truck is larger at the medium speed range than at the low and high speed ranges. The Class 9 GVW shows decreasing underestimation with increasing speeds.

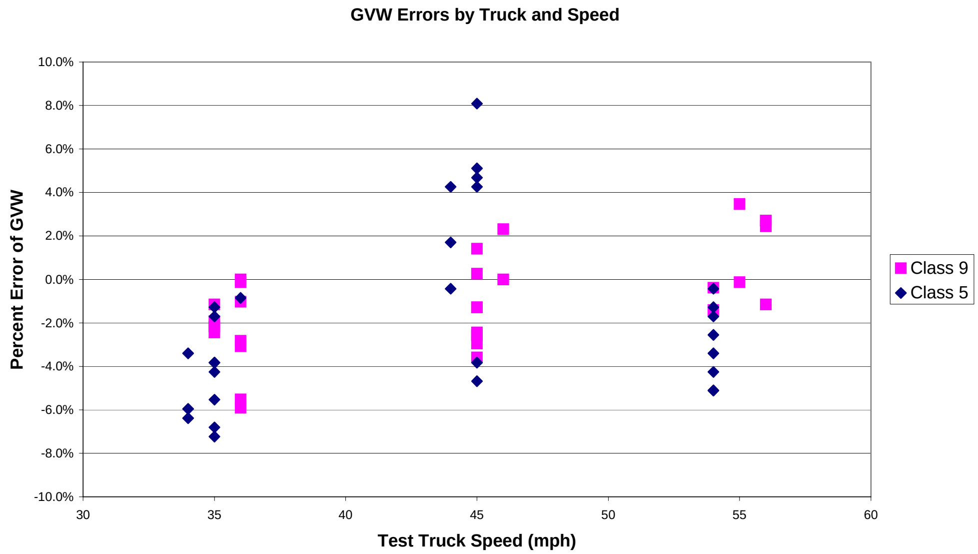


Figure 6-2 Pre-validation GVW Percent Error vs. Speed by Truck – 120500 – 02 Mar 2005

Figure 6-3 shows the relationship between temperature and GVW percentage error. From the figure, it appears that when the GVW errors for both test trucks are combined they are underestimated more at the low temperature range than at the medium and high temperatures. The scatter for combined GVW errors appears larger at the medium and high temperatures than at the low temperature.

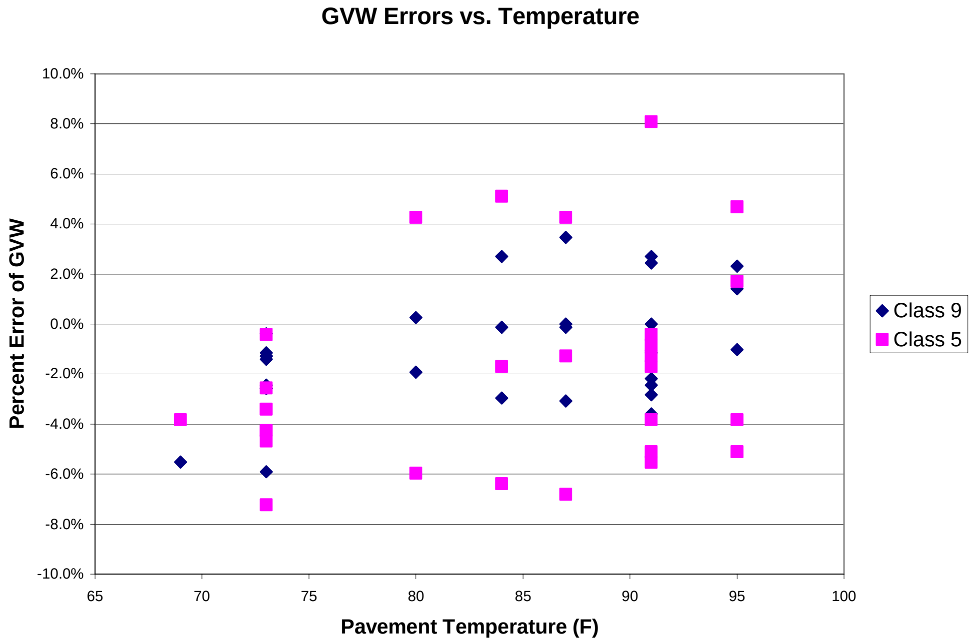


Figure 6-3 Pre-Validation GVW Percent Error vs. Temperature by Truck – 120500 – 02 Mar 2005

Figure 6-4 shows the relationship between the spacing errors in feet and speeds. From the figure it appears that errors in tandem spacings for the test trucks were generally not affected by changes in speed.

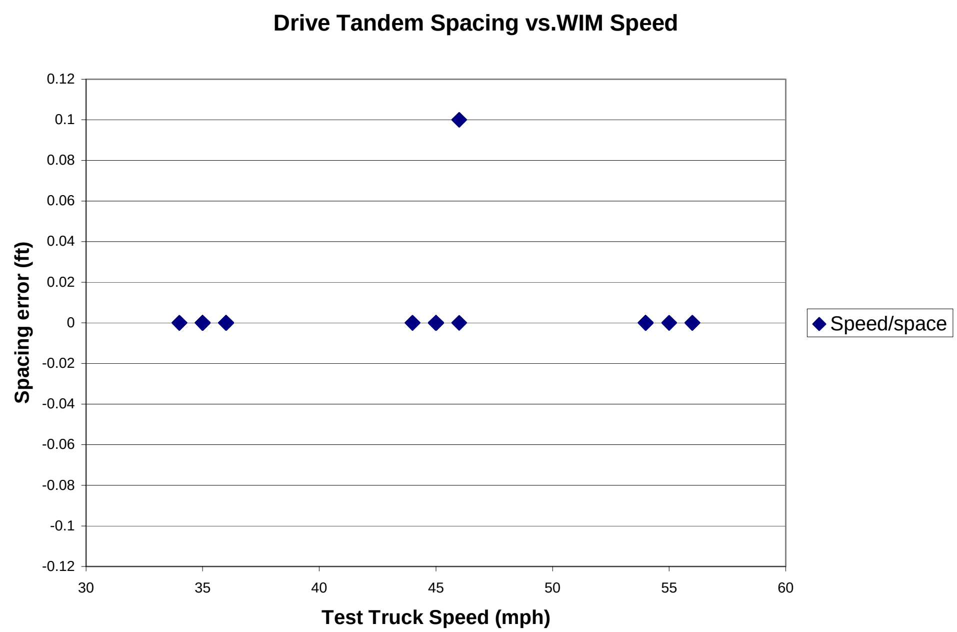


Figure 6-4 Pre-Validation Speed vs. Spacing – 120500 – 02 Mar 2005

6.1 Temperature-based Analysis

The three temperature groups were created by splitting the runs between those at 69 to 76 degrees Fahrenheit for Low temperature, 77 to 85 degrees Fahrenheit for Medium temperature and 86 to 95 degrees Fahrenheit for High temperature.

From Table 6-2 it appears that the GVW and tandem weights are underestimated at all temperatures, and the steering axle weights are underestimated at low temperatures and overestimated at the medium and high temperatures.

Table 6-2 Pre-Validation Results by Temperature Bin - 120500 – 02 Mar 2005

Element	95% Limit	Low Temp. 69-76F	Medium Temp. 77-85F	High Temp. 86-95F
Single axles	±20 %	-0.4%±9.9%	3.7%±7.7%	2.5%±8.7%
Tandem axles	±15 %	-3.2%±5.9%	-1.1%±6.1%	-1.0%±6.3%
GVW	±10 %	-2.4%±7.9%	-0.7%±8.9%	-0.7%±7.0%
Speed	±1 mph	N/A	N/A	N/A
Axle spacing	±0.5 ft	0.0±0.0 ft	0.0±0.0 ft	0.0±0.1 ft

Figure 6-5 it can be seen that the equipment underestimates the test truck GVW at all temperatures with higher underestimation at the lower range temperatures. The scatter of GVW errors appears larger at the lower temperatures range than at the medium and high temperature range.

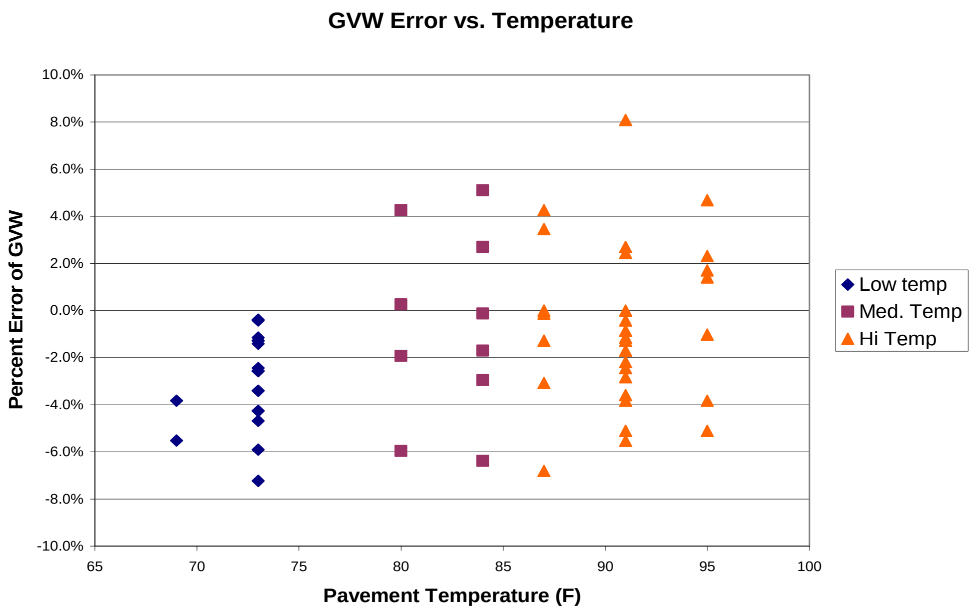


Figure 6-5 Pre-Validation GVW Percent Error vs. Temperature by Group – 120500 – 02 Mar 2005

Figure 6-6 shows that the equipment estimates steering axle weights comparatively accurately at all temperatures. It appears that the scatter of the steering axle errors is smaller at the medium temperatures than at the low and high temperatures.

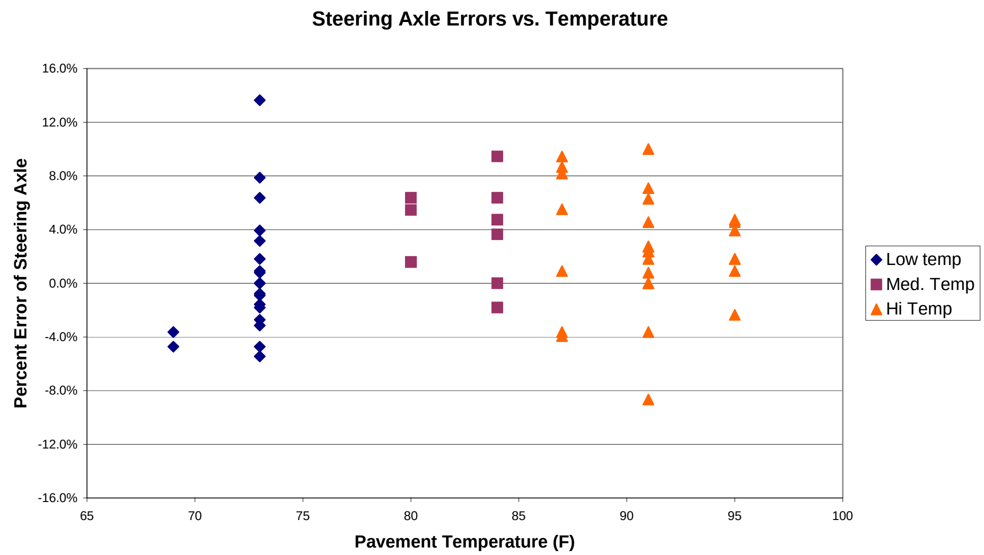


Figure 6-6 Pre-Validation Steering Axle Error vs. Temperature by Group – 120500 – 02 Mar 2005

6.2 Speed-based Analysis

The speed groups were divided as follows: Low speed = 34 to 40 mph, Medium speed = 41 to 48 mph and High speed = 49+ mph.

Table 6-3 shows the error statistics by speed group. The table indicates that the equipment underestimates all weights at the low speeds. At the medium speeds the steering axle and GVW weights are overestimated by 3.7 percent and 0.9 percent respectively and the tandem weights are underestimated by 2 percent on average. At the high speeds, the single and tandem weights are overestimated by 3.5 percent and 0.3 percent respectively, and the GVW is underestimated by 1.0 percent. The variability for tandem axle weights is fairly consistent through the entire speed range while the variability of single and GVW weights is slightly higher at the medium speeds.

Table 6-3 Pre-Validation Results by Speed Bin - 120500 – 02 Mar 2005

Element	95% Limit	Low Speed	Med. Speed	High Speed
Single axles	±20 %	-0.6%±7.9%	3.7%±9.6%	3.5%±6.7%
Tandem axles	±15 %	-3.0%±5.8%	-2.0%±5.7%	0.3%±6.3%
GVW	±10 %	-3.4%±4.6%	0.9%±8.8%	-1.0%±5.9%
Speed	±1 mph	N/A	N/A	N/A
Axle spacing	± 0.5 ft	0.0±0.0 ft	0.0±0.1 ft	0.0±0.0 ft

From Figure 6-7, it appears the mean GVW errors are underestimated at the low and high range speeds and slightly overestimated at the medium range speeds. The scatter for GVW error is larger at the medium range speeds than at the low and high range speeds. The high speed range has an upper limit by the speed limit. This value is slightly lower than the median speed for the traffic stream.

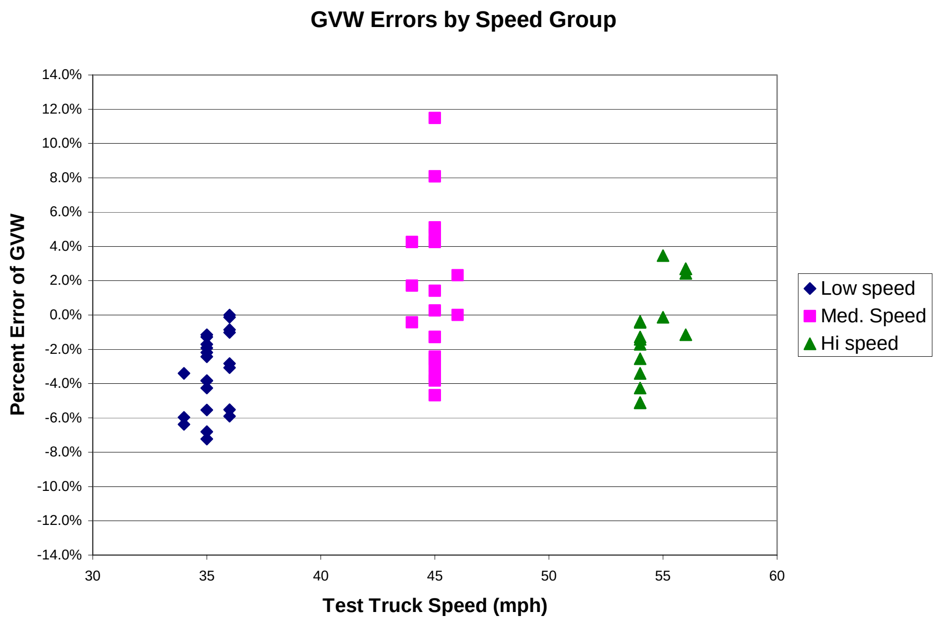


Figure 6-7 Pre-Validation GVW Percent Error vs. Speed Group – 120500 – 02 Mar 2005

From Figure 6-8 it appears that the GVW error and variability trends illustrated in Figure 6-7 are dissimilar to those of individual trucks. The Class 5 exhibits larger scatter and overestimation rather than underestimation of GVW for the medium speed than it does for high and low speeds. For the ends of the test range, the Class 5s GVW tendency and scatter are very similar. By contrast, the scatter for Class 9 GVW remains similar over the speed range while the level of underestimation decreases. The dissimilarity in the vehicle response is reflected in the larger variability at medium speeds in Table 6-3.

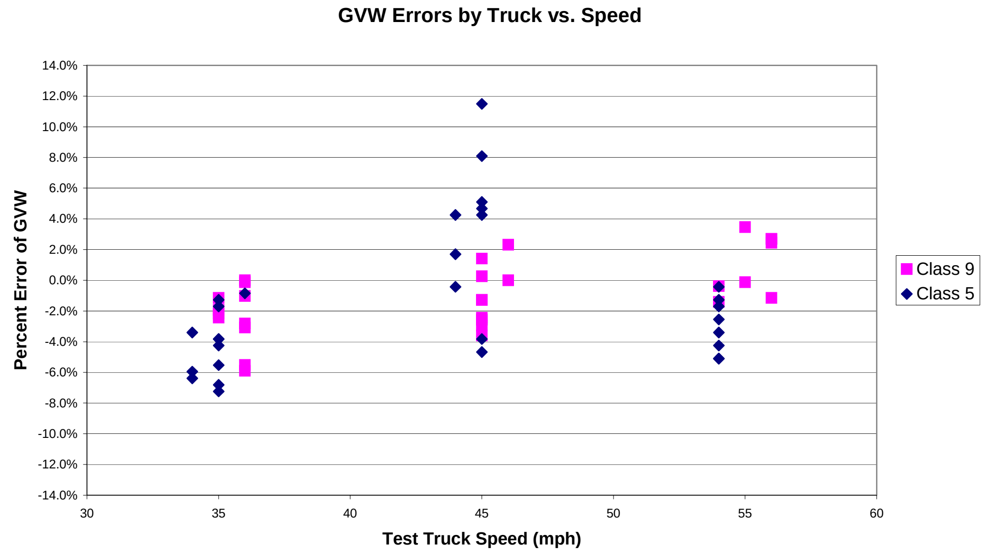


Figure 6-8 Pre-Validation GVW Percent Error vs. Speed by Truck – 120500 – 02 Mar 2005

From Figure 6-9, it appears that the steering axle weights are estimated accurately at the low range speeds, and then are increasingly overestimated as the speeds of the test trucks increase. The scatter of the steering axle weight errors is larger at the medium speed range than at the low and high range speeds.

Figure 6-9 Pre-Validation Steering Axle Percent Error vs. Speed Group - 120500 – 02 Mar 2005

From Figure 6-10, it appears that the steering axle weight errors and scatter trends illustrated in Figure 6-9 remain consistent when the steering axle errors of the test trucks are evaluated separately.

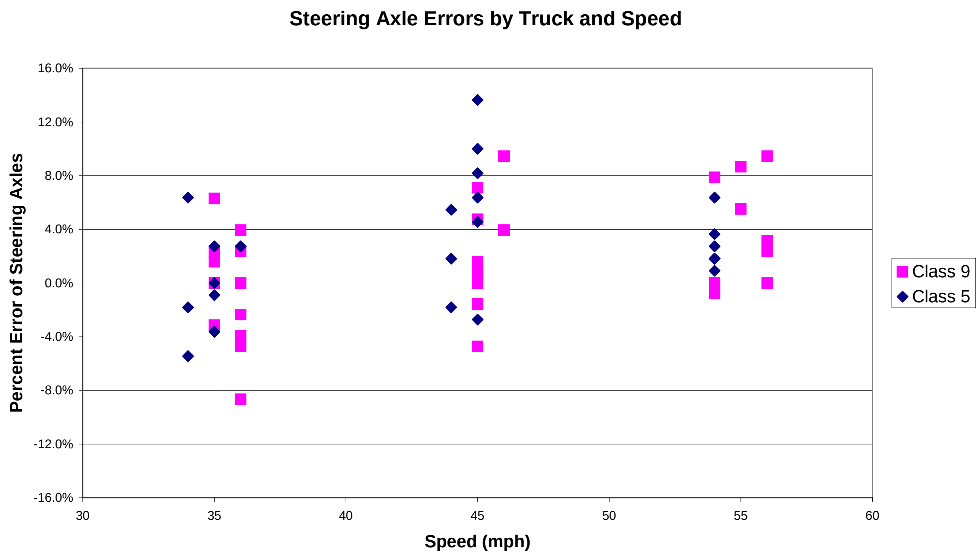


Figure 6-10 Pre-Validation Steering Axle Percent Error vs. Speed by Truck - 120500 – 02 Mar 2005

6.3 Classification Validation

The agency uses a modified FHWA 13 bin classification scheme. The modification utilizes a Class 15 for unknown vehicles.

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

The second check is the ability of the algorithm to correctly distinguish between truck classes with no more than 2% errors in such classifications. The Class 5 misclassification errors are a result of a difference between the classification identification process utilized by the observer which is strictly by number of axles and whether or not the rear axle contains dual wheels. The system classification algorithm utilizes not only the number of axles, but also the axle spacing and the weight of the vehicle. Therefore, Class 5 vehicles that may be classified properly when compared with the system algorithm may be identified properly; the classification test observer does not have the capability to make the same differentiation between Class 3 and Class 5 vehicles. In this case, the discrepancy of Class 5 misclassification does not appear to be a significant problem and does not constitute a failure of the system in providing research quality classification data. The following are the classification error rates by class:

Table 6-4 Truck Misclassification Percentages for 120500 – 02 Mar 2005

Class	Percent Error	Class	Percent Error	Class	Percent Error
4	0	5	4.8	6	N/A
7	0				
8	0	9	0	10	N/A
11	N/A	12	N/A	13	N/A

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

Table 6-5 Truck Classification Mean Differences for 120500 – 02 Mar 2005

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

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 more than those that might actually present exist. N/A means no vehicles of the class recorded by either the equipment or the observer.

7 Data Availability and Quality

As of March 3, 2005 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 1994 and 1997 to 2003 have a sufficient quantity of classification data to be considered complete years of data. The years 1998, 1999, 2002 and 2003 have sufficient quantity of weight data to be considered complete years of data. Together with the previously gathered calibration information it can be seen that at least 5 additional years of research quality data are needed to meet the goal of a minimum of 5 years of research weight data. As of this time, no data has been submitted from this site for 2004.

Upon submission and review of the 2004 data, we may only need 4 additional years to meet the goal of 5 years of research quality data, as this site was successfully validated in December of 2003.

Table 7-1 Amount of Traffic Data Available for 120500

Year	Classification Days	Months	Coverage	Weight Days	Months	Coverage
1991	32	3	Full Week	14	2	Full Week
1992	183	8	Full Week	21	3	Full Week
1993				7	2	Full Week
1994	243	8	Full Week	16	3	Full Week
1995	57	2	Full Week			
1996	104	5	Full Week	84	7	Full Week
1997	280	10	Full Week	21	3	Full Week
1998	359	12	Full Week	345	12	Full Week
1999	257	9	Full Week	270	9	Full Week
2000	356	12	Full Week	31	1	Full Week
2001	355	12	Full Week			Full Week
2002	243	9	Full Week	336	12	Full Week
2003	261	10	Full Week	267	11	Full Week

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

Class 9s, Class 6s and Class 5s constitute more than 10 percent of the truck population. Based on the data collected from the end of the last calibration iteration the following are the expected values for these populations. The precise values to be used in data review will need to be determined by the Regional Support Contractor upon 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 GVW Characteristics of Major Sub-groups of Trucks - 120500 – 03 Mar 2005

	Class 9	Class 6	Class 5
Percentage Overweights	0	0	0
Percentage Underweights	0	0	0
Unloaded Peak (lbs.)	32,000	20,000	8,000
Loaded Peak (lbs.)	76,000 or 80,000	36,000	24,000

The expected percentage of unclassified vehicles is 0.

The graphical screening comparison figures are found in Figure 7-1 through Figure 7-5.

The graph in Figure 7-1 for Class 9s is based on 33 vehicles.

Figure 7-1 Expected GVW Distribution Class 9 – 120500 – 03 Mar 2005

The graphic in Figure 7-2 for Class 6s is based on 9 vehicles.

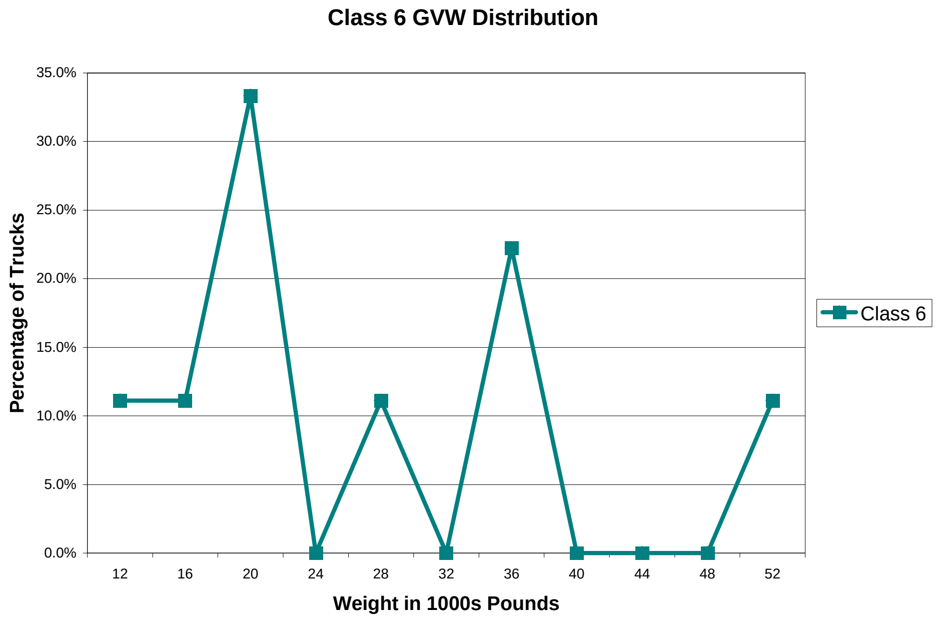


Figure 7-2 Expected GVW Distribution Class 6 - 120500 - 03 Mar 2005

The graph in Figure 7-3 for Class 5s is based on 99 vehicles.

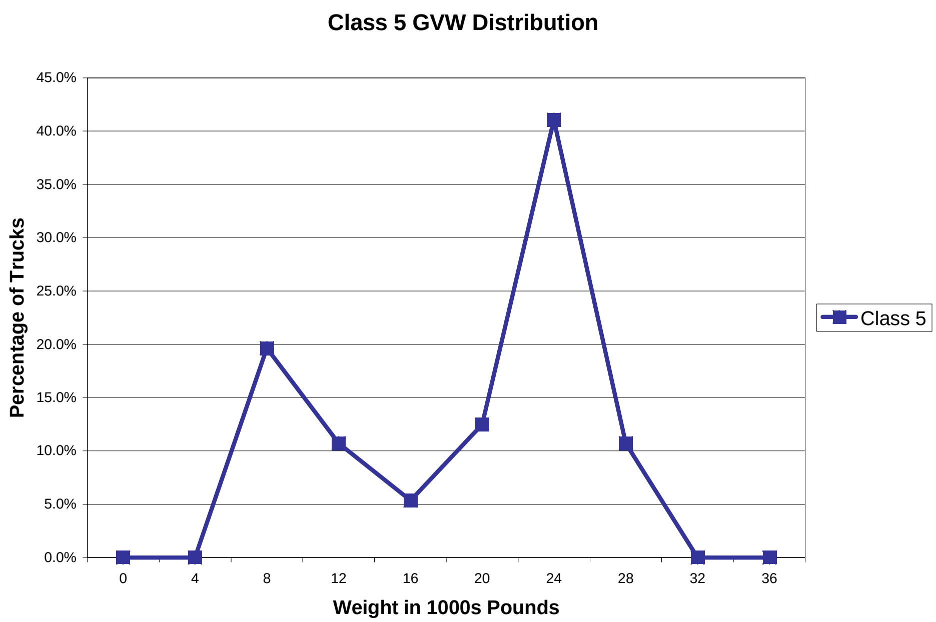


Figure 7-3 Expected GVW Distribution Class 5 - 120500 - 03 Mar 2005

As illustrated in Figure 7-4, Classes 9 and 6 are just over the 10 percent cut-off for potential comparison classes. Due to the limited numbers in the sample, more than these vehicles may not be present in sufficient numbers in the comparison period to generate comparison data sets.

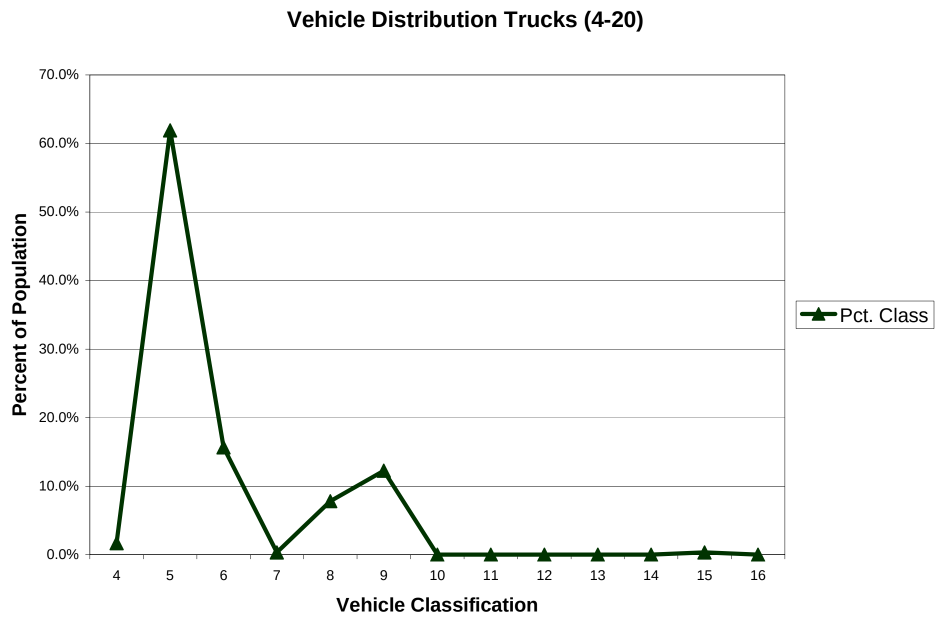


Figure 7-4 Expected Vehicle Distribution – 120500 – 03 Mar 2005

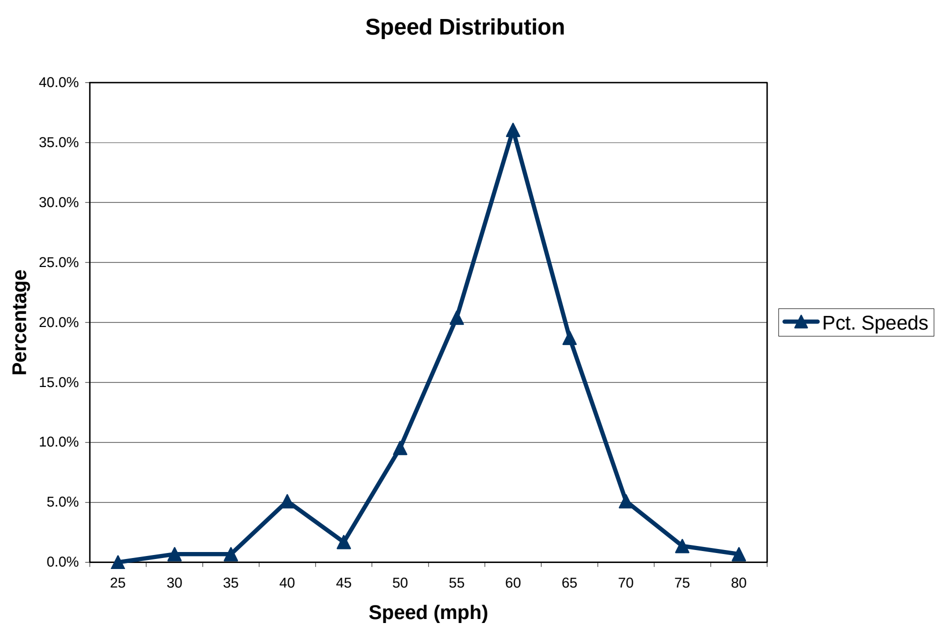


Figure 7-5 Expected Speed Distribution - 120500 – 03 Mar 2005

8 Data Sheets

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

Sheet 19 – Truck 1 – 3S2 fully-loaded with air suspension (4 pages)
Sheet 19 – Truck 2 – 2D fully-loaded with spring suspension (4 pages)

Sheet 20 – Speed and Classification verification pre-validation (2 pages)

Sheet 21 – Pre-validation (8 pages)
Sheet 21 – Calibration Iteration 1 – (3 pages)
Sheet 21 – Post-validation (5 pages)

Calibration Iteration 1 Worksheet – (1 page)

9 Updated Handout Guide and Sheet 17

A copy of the handout has been included following page 26. It includes a current Sheet 17 with all applicable maps and photographs. There are no significant changes in the information provided.

10 Updated Sheet 18

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

11 Traffic Sheet 16(s)

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

POST-VISIT HANDOUT GUIDE FOR SPS WIM VALIDATION

STATE: Florida

SHRP ID: 0500

Figures

1. General Information

SITE ID: *120500*

LOCATION: *US 1 South, 4.5 miles North of SR 706*

VISIT DATE: *March 2 and 3, 2005*

VISIT TYPE: *Validation*

2. Contact Information

POINTS OF CONTACT:

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

Highway Agency: *Walton Jones, 850-414-4726, walton.jones@dot.state.fl.us*
Mike Leggett, 850-414-4727, Michael.Leggett@dot.state.fl.us

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

FHWA Division Office Liaison: *Norbert Munoz, 850-942-9650, ext. 3036, norbert.munoz@fhwa.dot.gov*

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

3. Agenda

BRIEFING DATE: *None requested.*

ONSITE PERIOD: *March 2 and 3, 2005*

TRUCK ROUTE CHECK: N/A

4. Site Location/ Directions

NEAREST AIRPORT: *Palm Beach International Airport, West Palm Beach, Florida or Fort Lauderdale/Hollywood International Airport, Fort Lauderdale, Florida.*

DIRECTIONS TO THE SITE: *4.5 miles north of SR 706, near Tequesta.*

MEETING LOCATION: *On Site – 8:00 a.m., March 3rd, 2005*

WIM SITE LOCATION: *US 1 (Latitude: 26.99734; Longitude: -80.09726)*

WIM SITE LOCATION MAP: *See Figure 4.1*

Figure 4-1: Site 120500 in Florida

5. Truck Route Information

ROUTE RESTRICTIONS: *None*

SCALE LOCATION: *Brown Mayflower Moving and Storage, 1900 Old Okeechobee Rd., West Palm Beach, FL. $10.00 per run, open M-F, 8:00am to 4:45pm. Contact – Henry Wilkinson, 561-686-1400. Located off of Okeechobee Blvd.*

TRUCK ROUTE:

- *Northbound Turnaround: 1.779 miles from the site (27^0 00.783' North and 80^0 06.246' West).*
- *Southbound Turnaround: 0.52 miles from site (26^0 59.399' North and 80^0 05.659' West).*

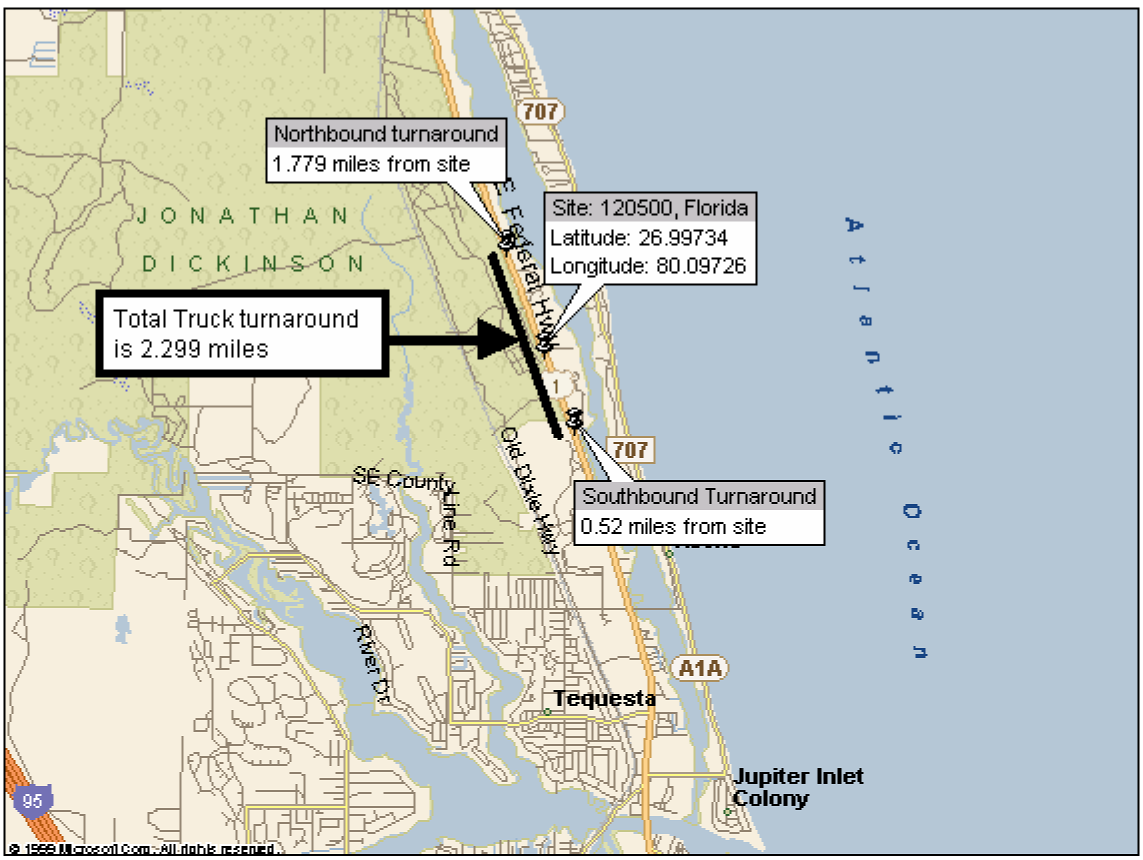


Figure 5-1: Truck Route map of 120500

6. Sheet 17 – Florida (120500)

1.* ROUTE ___US 1____ MILEPOST __N/A____LTPP DIRECTION - N S E W

2.* WIM SITE DESCRIPTION - Grade ___< 1_____ % Sag vertical Y / N
Nearest SPS section upstream of the site _0__ _5__ _5__ _4__
Distance from sensor to nearest upstream SPS Section ___ _1__ _8__ _2__ 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 ___ _4__ ft

4.* PAVEMENT TYPE ______Asphalt Concrete_____ ______________

5.* PAVEMENT SURFACE CONDITION – Distress Survey
Date _12-04-03_ Photo Filename Downstream_TO_2_12_13A_0500_12_04_03.JPG___
Date _12-04-03_ Photo Filename _Upstream_TO_2_12_13A_0500_12_04_03.JPG ____
Date ____

6. * SENSOR SEQUENCE _____Quartz Sensor – Loop – Quartz Sensor___

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

8. RAMPS OR INTERSECTIONS
Intersection/driveway within 300 m upstream of sensor location Y / N
distance __________
Intersection/driveway within 300 m downstream of sensor location Y / N
distance __________
Is shoulder routinely used for turns or passing? Y / N

9. DRAINAGE (*Bending plate and load cell systems only)*

1 – Open to ground
2 – Pipe to culvert
3 – None

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

10. * CABINET LOCATION
Same side of road as LTPP lane Y / N Median Y/ N Behind barrier Y / N
Distance from edge of traveled lane _3_ _2_ ft
Distance from system __**1_2_9** __ ft
TYPE _______334 B____________________

CABINET ACCESS controlled by LTPP / STATE / JOINT
Contact - name and phone number _____Kip Jones (850) 414-4726__
Alternate - name and phone number __Michael Leggett (850) 414-4726__

11. * POWER
Distance to cabinet from drop ___ ___ _5__ ft Overhead / underground / solar / AC in cabinet?
Service provider ______________ Phone number ____________________

12. * TELEPHONE
Distance to cabinet from drop ___ _2__ _0__ ft Overhead / under ground / cell?
Service provider _________________ Phone Number ________________

13.* SYSTEM (software & version no.)- _________PAT DAW 190 Ver. 3.18 4/2/03__
Computer connection – RS232 / Parallel port / USB / Other _______________

14. * TEST TRUCK TURNAROUND time ___6____ minutes DISTANCE _3.4__ mi.

15. PHOTOS FILENAME
Power source _ Solar_Panels_TO_2_12_13A_0500_12_04_03.JPG __
Phone source _ Telephone_Drop_TO_2_12_13A_0500_12_04_03.JPG _
Cabinet exterior ____
Cabinet interior _ Cabinet_Interior_1_TO_2_12_13A_0500_12_04_03.JPG _
Weight sensors __Leading_Quartz_Sensor_TO_2_12_13A_0500_12_04_03.JPG
Classification sensors __ Loop_Sensor_TO_2_12_13A_0500_12_04_03.JPG __
Other sensors _______________________
Description ______________________________
Downstream direction at sensors on LTPP lane _
Downstream_TO_2_12_13A_0500_12_04_03.JPG ___________________
Upstream direction at sensors on LTPP lane _
Upstream_TO_2_12_13A_0500_12_04_03.JPG ___________________

COMMENTS ____________GPS Coordinates: Latitude: 26.99734; Longitude: -80.09726

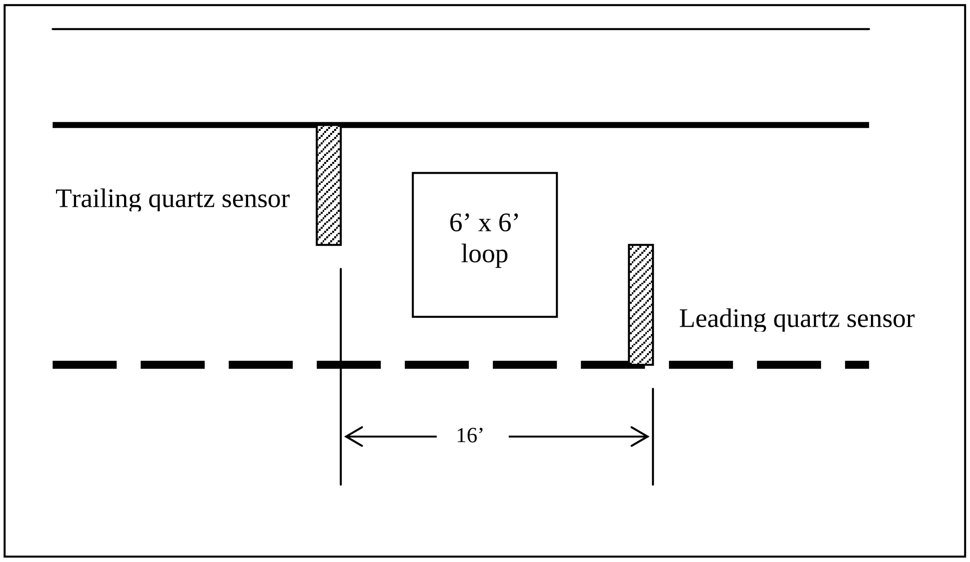
______________Amenities:
______________ Various Hotels, Restaurants, Gas Stations located 5 miles South of site in Jupiter.

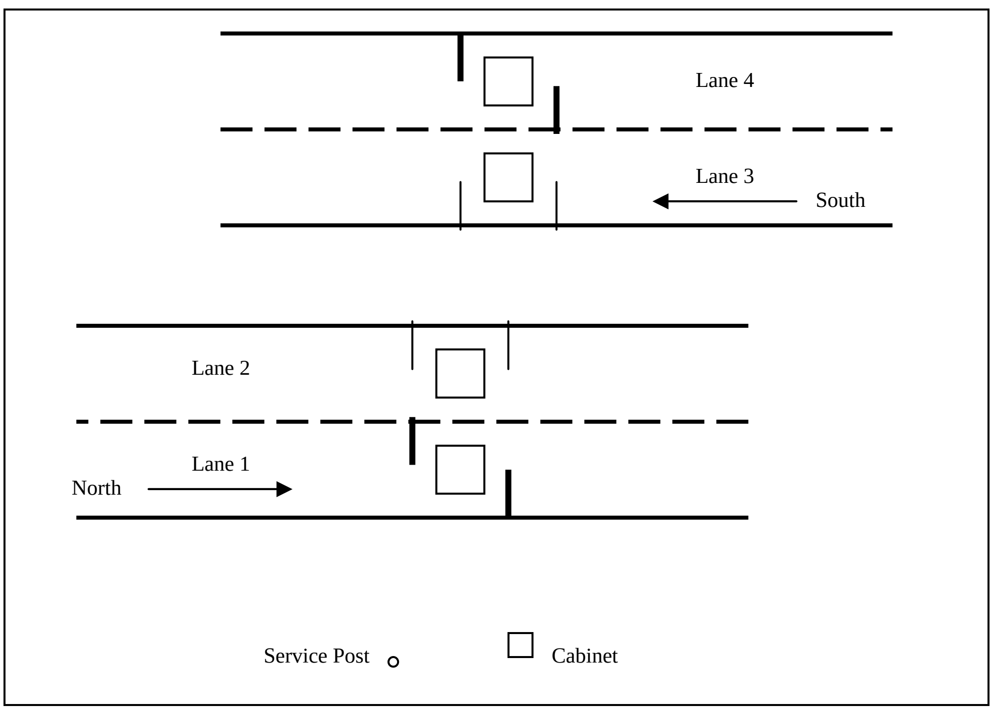
___________Types of Trucks: One Class 9 and One Class 5
___________Expected Weight Ranges: For Class 9 – 72,000 to 80,000 lbs.; For Class 5: 10,000-12,000 lbs
___________Speeds to be run: 45 to 55 mph

COMPLETED BY _____Dean J. Wolf____________________________

PHONE __301-210-5105___ DATE COMPLETED **_0_ _3_ /_0_ _2_ / _2_ _0_ _0_ _5_**

Sketch of equipment layout





Site Map

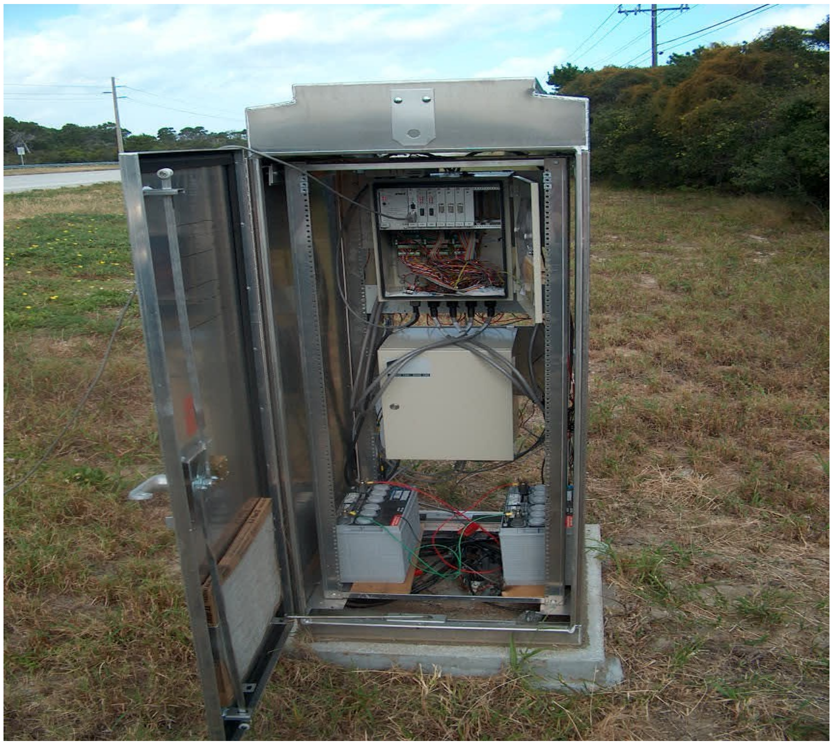
Figure 6-1: Site Map of 120500

Downstream_TO_2_12_13A_0500_12_04_03.JPG (Distress Photo 1)

Upstream_TO_2_12_13A_0500_12_04_03.JPG (Distress Photo 2)

Solar_Panels_TO_2_12_13A_0500_12_04_03.JPG

Telephone_Drop_TO_2_12_13A_0500_12_04_03.JPG



Cabinet_Interior_1_TO_2_12_13A_0500_12_04_03.JPG

Leading_Quartz_Sensor_TO_2_12_13A_0500_12_04_03.JPG

Loop_Sensor_TO_2_12_13A_0500_12_04_03.JPG

SHEET 18	STATE CODE [_12]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [_ 0500_]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) _12__ / _30__ / __2003__ __

Rev. 05/25/04

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

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

   c. Data submission –
      - □ State – □ Weekly □ Twice a month ■ Monthly □ Quarterly
      - ■ LTPP

2. EQUIPMENT –
   a. Purchase –
      - ■ State
      - □ LTPP

   b. Installation –
      - ■ Included with purchase
      - □ Separate contract by State
      - □ State personnel
      - □ LTPP contract

   c. Maintenance –
      - □ Contract with purchase – Expiration Date _______
      - □ Separate contract LTPP – Expiration Date _______
      - ■ Separate contract State – Expiration Date _______
      - □ State personnel

   d. Calibration –
      - ■ Vendor
      - □ State
      - □ LTPP

   e. Manuals and software control –
      - ■ State
      - □ LTPP

   f. Power –
      i. Type –
      - □ Overhead
      - □ Underground
      - ■ Solar

      ii. Payment –
      - □ State
      - □ LTPP
      - ■ N/A

g. Communication –

i. Type –
- ■ Landline
- □ Cellular
- □ Other

ii. Payment –
- ■ State
- □ LTPP
- □ N/A

3. PAVEMENT –

a. Type –
- □ Portland Concrete Cement
- ■ Asphalt Concrete

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

c. Profiling Site Markings –
- □ Permanent
- ■ Temporary

4. ON SITE ACTIVITIES –

a. WIM Validation Check - advance notice required __14___ ■ days □ weeks

b. Notice for straightedge and grinding check - ___4___ □ 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 – Class 5	☐ 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:

____________FTE, DTS, MACTEC Inc.________________________

g. Access to cabinet

i. Personnel Access –

■ State only
☐ Joint
☐ LTPP

ii. Physical Access –

■ Key
☐ Combination

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

i. Traffic Control Required – ☐Yes ■No

j. Enforcement Coordination Required – ☐Yes ■No

5. SITE SPECIFIC CONDITIONS –

a. Funds and accountability – ____________________

b. Reports – ____________________

c. Other – ____________________

d. Special Conditions – ____________________

6. CONTACTS –

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

Name: ____Michael Leggett ____ Phone: (850) 414-4727

Agency: ____________________

b. Maintenance (equipment) –

Name: ______Kip Jones ________ Phone: (850) 414-4726

Agency: ____

c. Data Processing and Pre-Visit Data –

Name: _____Richard Reel _______ Phone: (850) 414 4709

Agency: ____

d. Construction schedule and verification –

Name: _______Kip Jones _________ Phone: (850) 414-4726 _

Agency: ____

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

Name: ~~Palm Beach Equipment Rental~~ Phone: ~~(561) 738-7707~~ 352 748 6066

Agency: Gibham Trucking Lines Coleman, FL 33521

f. Traffic Control –

Name: ________________________ Phone: _________________

Agency: ____

g. Enforcement Coordination –

Name: ________________________ Phone: _________________

Agency: ____

h. Nearest Static Scale

Name: Brown Mayflower Moving and Storage Location: 1900 Old Okeechobee Rd., West Palm Beach, FL. open M-F, 8:00am to 4:45pm Phone: Contact – Henry Wilkinson, 561-686-1400. Located off of Okeechobee Blvd.

SHEET 16 LTPP MONITORED TRAFFIC DATA SITE CALIBRATION SUMMARY	*STATE ASSIGNED ID [_9_9_2_1 __] *STATE CODE [_1_2_] *SHRP SECTION ID [_0_5_0_0 __]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [_0_3_ / _0_2_ / _2_0_0_5_ __]

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

3. * REASON FOR CALIBRATION
____ REGULARLY SCHEDULED SITE VISIT ____ RESEARCH
____ EQUIPMENT REPLACEMENT ____ TRAINING
____ DATA TRIGGERED SYSTEM REVISION ____ NEW EQUIPMENT INSTALLATION
__X_ OTHER (SPECIFY) __SPSWIM Validation________________________________

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

5. EQUIPMENT MANUFACTURER _____Controller – IRD/PAT Traffic ; Sensors - Kistler_______________

WIM SYSTEM CALIBRATION SPECIFICS**

6.**CALIBRATION TECHNIQUE USED:
____ TRAFFIC STREAM -- ____STATIC SCALE (Y/N) __X_ TEST TRUCKS

__ __ __ NUMBER OF TRUCKS COMPARED __ _2 __ NUMBER OF TEST TRUCKS USED

__ 3_0__ PASSES PER TRUCK

	TRUCK	TYPE	SUSPENSION
TYPE PER FHWA 13 BIN SYSTEM	1	___9____	___1_______________
SUSPENSION: 1 - AIR; 2 - LEAF SPRING	2	___5____	___2_______________
3 - OTHER (DESCRIBE)	3	________	____________________

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
MEAN DIFFERENCE BETWEEN ---
DYNAMIC AND STATIC GVW ___ ___- 1_ . _2_ STANDARD DEVIATION __3__ . _6_
DYNAMIC AND STATIC SINGLE AXLES ___ ___ _2_ . _0_ STANDARD DEVIATION __4__ . _4_
DYNAMIC AND STATIC DOUBLE AXLES ___ ___ -_1 . _8_ STANDARD DEVIATION __ 3_ . _1_

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

9. DEFINE THE SPEED RANGES USED (MPH) ___30 – 40 mph, 41-48 mph, 49-56 mph ______ ______ ______
______ ______ ______ ______ ______ ______ ______ ______ ______ ______

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) ___9_9_5___ . ___ ___

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

CLASSIFIER TEST SPECIFICS***

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

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

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
*** FHWA CLASS 9 ____ _0__ ____ FHWA CLASS __5_ ____ _-_4_._8_ ____
*** FHWA CLASS 8 ____ _0__ ____ FHWA CLASS ____ ____ ____ ____ ____
FHWA CLASS ____ ____ ____ ____ ____
FHWA CLASS ____ ____ ____ ____ ____
*** PERCENT "UNCLASSIFIED" VEHICLES: ____ ____ . ____

PERSON LEADING CALIBRATION EFFORT: _____Dean J. Wolf____
CONTACT INFORMATION: ___(301) 210-5105_______________________________________ rev. November 9, 1999

SHEET 16 LTPP MONITORED TRAFFIC DATA SITE CALIBRATION SUMMARY	*STATE ASSIGNED ID [_9_9_2_1 __] *STATE CODE [_1_2_] *SHRP SECTION ID [_0_5_0_0 __]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [_0_3_ / _0_3_ / _2_0_0_5_ __]

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

3. * REASON FOR CALIBRATION
____ REGULARLY SCHEDULED SITE VISIT ____ RESEARCH
____ EQUIPMENT REPLACEMENT ____ TRAINING
____ DATA TRIGGERED SYSTEM REVISION ____ NEW EQUIPMENT INSTALLATION
__X_ OTHER (SPECIFY) __SPSWIM Validation________________________________

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

5. EQUIPMENT MANUFACTURER _____Controller – IRD/PAT Traffic ; Sensors - Kistler_______________

WIM SYSTEM CALIBRATION SPECIFICS**

6.**CALIBRATION TECHNIQUE USED:
____ TRAFFIC STREAM -- ____STATIC SCALE (Y/N) __X_ TEST TRUCKS

__ __ __ NUMBER OF TRUCKS COMPARED __ _2 __ NUMBER OF TEST TRUCKS USED

__ 3_0__ 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	___5____	___2_______________
3	________	___________________

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
MEAN DIFFERENCE BETWEEN ---
DYNAMIC AND STATIC GVW ___ ___- 1_ . _6_ STANDARD DEVIATION __3__ . _2_
DYNAMIC AND STATIC SINGLE AXLES ___ ___ _1_ . _7_ STANDARD DEVIATION __4__ . _9_
DYNAMIC AND STATIC DOUBLE AXLES ___ ___ -_3 . _0_ STANDARD DEVIATION __ 2_ . _9_

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

9. DEFINE THE SPEED RANGES USED (MPH) ___30 – 40 mph, 41-48 mph, 49-56 mph ______ ______ ______
______ ______ ______ ______ ______ ______ ______ ______ ______ ______

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) ___1_0_1_5_ . ___ ___

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 ___ MANUAL ___ PARALLEL CLASSIFIERS

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

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

PERSON LEADING CALIBRATION EFFORT: _____Dean J. Wolf________________________________
CONTACT INFORMATION: ___(301) 210-5105________________________________ rev. November 9, 1999

APPENDIX A

Sheet 19	* STATE_CODE	12
LTPP Traffic Data	* SPS PROJECT ID	0500
*CALIBRATION TEST TRUCK # 1	* DATE	03/02/2005

Rev. 08/31/01

PART I.

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

AXLES - units - lbs / 100s lbs / kg

	3. Empty Truck Axle Weight	4.* Pre-Test Average Loaded Axle Weight	5.* Post-Test Average Loaded Axle Weight	6.* Measured D)irectly or C)alculated?
A		12970	12360	D / (C)
B		15350	15100	D / (C)
C		15120	15100	D / (C)
D		17570	17460	D / (C)
E		17330	17460	D / (C)
F				D / C

GVW (same units as axles)

7. a) Empty GVW ______

*b) Average Pre-Test Loaded weight 78300
*c) Post Test Loaded Weight 77480
*d) Difference Post Test – Pre-test 820

GEOMETRY

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

9. a) * Make: MACK   b) * Model: CL733

10.* Trailer Load Distribution Description:

Concrete blocks distributed evenly over length of trailer

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

b). Trailer Tare Weight (units): ______

Sheet 19	* STATE_CODE 12
LTPP Traffic Data	* SPS PROJECT ID 0510
*CALIBRATION TEST TRUCK # 1	* DATE 03/02/2015

Rev. 08/31/01

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

A to B 17.3' B to C 4.3' C to D 32.1'

D to E 4.1' E to F ____

Wheelbased (measured A to last) ____ Computed 57.8

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	11R24.5	~~Air~~ Leaf Spring
B	11R24.5	Air
C	11R24.5	Air
D	11R24.5	Air
E	11R24.5	Air
F		

16. Cold Tire Pressures (psi) – from right to left

Steering Axle	Axle B	Axle C	Axle D	Axle E

Sheet 19	* STATE_CODE	12
LTPP Traffic Data	* SPS PROJECT ID	0500
*CALIBRATION TEST TRUCK # 1	* DATE	03/02/2005

Rev. 08/31/01

PART II

Table 1. Axle and GVW computations - pre-test

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I	12920	II -I	15400	III -II	15040	IV -III	17620	V -IV	17360	V	78340
V -VI	13020	VI-VII	15300	VII-VIII	15200	VIII-IX	17520	IX`	17300	X	78400
										XI	78160
Avg.	12970	15350		15120		17570		17330		78300	

Table 2. Raw Axle and GVW measurements

Axles	Meas.	Pre-test Weight			Post-test Weight
A	I	12920			12360
A + B	II	28320			27460
A + B + C	III	43360			42560
A + B + C + D	IV	60980			60820
A + B + C + D + E (1)	V	78340			77480
B + C + D + E	VI	65320			65120
C + D + E	VII	50020			50020
D + E	VIII	34820			34920
E	IX	17300			17460
A + B + C + D + E (2)	X	78400			77480
A + B + C + D + E (3)	XI	78160			

Table 3. Axle and GVW computations - post -test

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I	12360	II -I	15100	III -II	15160	IV -III	17460	V -IV	17460	V	77480
V -VI	12360	VI-VII	15100	VII-VIII	15100	VIII-IX	17460	IX`	17460	X	77480
										XI	
Avg.	12360	15100		15100		17460		17460		77480	

Sheet 19	* STATE_CODE 12
LTPP Traffic Data	* SPS PROJECT ID 0500
*CALIBRATION TEST TRUCK #__	* DATE 03/02/2005

Rev. 08/31/01

Table 4 . Axle and GVW computations -

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I		II -I		III -II		IV -III		V -IV		V	
V -VI		VI-VII		VII-VIII		VIII-IX		IX`		X	
										XI	
Avg.											

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

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

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	12360	15100	15100	17460	17460	–	77480
2							—
3							—
Average	12360	15100	15100	17460	17460		77480

Measured By DJW

Verified By ____________________

Sheet 19	* STATE_CODE 12
LTPP Traffic Data	* SPS PROJECT ID 0500
*CALIBRATION TEST TRUCK # 2	* DATE 3/2/2005

Rev. 08/31/01

PART I.

1.* FHWA Class 5 2.* Number of Axles 2

AXLES - units - lbs / 100s lbs / kg

	3. Empty Truck Axle Weight	4.* Pre-Test Average Loaded Axle Weight	5.* Post-Test Average Loaded Axle Weight	6.* Measured D)irectly or C)alculated?
A		11140	10900	(D) / C
B		12660	12540	(D) / C
C				D / C
D				D / C
E				D / C
F				D / C

GVW (same units as axles)

7. a) Empty GVW ______________

*b) Average Pre-Test Loaded weight 23640
*c) Post Test Loaded Weight 23440
*d) Difference Post Test – Pre-test 200

GEOMETRY

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

9. a) * Make: International b) * Model: 4700

10.* Trailer Load Distribution Description:

3 forklift counterweights placed evenly along truck bed

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

b). Trailer Tare Weight (units): ______________

Sheet 19	* STATE_CODE 12
LTPP Traffic Data	* SPS PROJECT ID 0500
*CALIBRATION TEST TRUCK # 2	* DATE 3/2/2005

Rev. 08/31/01

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

A to B 19.8 B to C ________ C to D ________

D to E ________ E to F ________

Wheelbased (measured A to last) ________ Computed 19.8

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

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	295/75R 22.5	spring, tapered leaf, 10 leafs
B	295/75R 22.5	spring, tapered leaf, 7 leafs
C		
D		
E		
F		

16. Cold Tire Pressures (psi) – from right to left

Steering Axle	Axle B	Axle C	Axle D	Axle E

Sheet 19	* STATE_CODE 12
LTPP Traffic Data	* SPS PROJECT ID 0500
*CALIBRATION TEST TRUCK # 2	* DATE 3/2/2005

Rev. 08/31/01

PART II

Table 1. Axle and GVW computations - pre-test

Axle A		Axle B		Axle C		Axle D		Axle ~~E~~ B		GVW	
I	11140	II -I		III -II		IV -III		V -IV	12660	V	23800
V -VI	11140	VI- VII		VII- VIII		VIII- IX		IX`	12660	X	23560
										XI	23560
Avg.	11140								12660		23640

Table 2. Raw Axle and GVW measurements

Axles	Meas.	Pre-test Weight			Post-test Weight
A	I	11140			10900
~~A + B~~	II				
~~A + B~~ + C	III				
~~A + B + C + D~~ A	IV	11140			10900
A + B + ~~C + D + E (1)~~ A+B	V	23800			23440
~~B + C + D~~ + ~~E~~ B	VI	12660			12540
~~C + D + E~~	VII				
~~D + E~~	VIII				
~~E~~ B	IX	12540			12540
~~A + B + C + D + E (2)~~ A+B	X	23560			23440
~~A + B~~ + C + D + E (3) A+B	XI	23560			

Table 3. Axle and GVW computations - post -test

Axle A		Axle B		Axle C		Axle D		Axle ~~E~~ B		GVW	
I	10900	II -I		III -II		IV -III		V -IV	12540	V	23440
V -VI	10900	VI- VII		VII- VIII		VIII- IX		IX`	12540	X	23440
										XI	
Avg.	10900								12540		23440

Sheet 19	* STATE_CODE 12
LTPP Traffic Data	* SPS PROJECT ID 0500
*CALIBRATION TEST TRUCK # 2	* DATE 03/02/2005

Rev. 08/31/01

Table 4 . Axle and GVW computations -

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I		II -I		III -II		IV -III		V -IV		V	
V -VI		VI- VII		VII- VIII		VIII- IX		IX`		X	
										XI	
Avg.											

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

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

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							
2							
3							
Average							

Measured By DJW Verified By ____________

Sheet 20	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0500
Speed and Classification Checks * 1 of* 2	* DATE 03/02/2005

Rev. 08/31/2001….   CLASS 1 | SPEED 1

	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	
	61	5		61	5	64	3		64	3	
	59	2		59	2	58	5		58	5	
	55	5		55	5	61	3		61	3	
	59	2		59	2	52	2		52	2	
	62	5		62	5	62	2		61	2	
	60	3		60	3	51	2		50	2	
x	56	9		55	9	70	2		69	2	
x	54	5		54	5	54	3		53	3	
	58	2		57	2	55	5		55	5	
	56	2		57	2	59	2		59	2	
x	52	3		52	5	56	3		56	3	
	52	5		52	5	56	3		55	3	
	53	3		53	3	60	2		60	2	
x	36	9		36	9	61	3		61	3	
x	34	5		34	5	60	2		60	2	
	44	2		44	2	55	9		55	9	x
	53	2		53	2	54	5		54	5	x
	66	2		67	2	59	5		58	5	
	47	3		47	3	54	2		53	2	
	70	8		69	8	57	2		56	2	
	61	5		60	5	64	3		64	3	
	52	2		52	2	36	9		35	9	x
	68	3		68	3	35	5		34	5	x
x	45	9		45	9	69	2		69	2	
x	45	5		45	5	63	2		63	2	

Recorded by DJW   Direction S   Lane 4   Time from 11:15 to 12:28

1358   1356   1425   1415

checked bkw 3/14/2005 for correct entry

Sheet 20	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0500
Speed and Classification Checks * 2 of* 2	* DATE 03/02/2005

Rev. 08/31/2001….

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
60	3		60	3	61	2		61	2
49	3		49	3	65	2		65	2
58	7		58	7	61	3		60	3
54	5		53	5	62	5		61	5
55	3		56	3	63	3		62	3
57	3		56	3	64	3		63	3
61	2		61	2	54	3		54	3
56	2		55	2	56	2		56	2
* 46	9		45	9	55	9		55	9 *
* 45	5		45	5	61	2		61	2
59	2		59	2	54	5		54	5
67	2		66	2	61	3		61	3
52	3		52	3	58	3		57	3
60	3		60	3	57	3		57	3
42	2		41	2	62	2		62	2
58	3		58	3	57	3		57	3
56	3		56	3	50	3		50	3
56	3		56	3	51	5		51	5
53	3		53	3	53	5		53	5
63	5		63	5	56	2		55	2
54	2		54	2	54	3		55	3
62	3		62	3	54	2		54	2
55	2		54	2	51	9		52	9
63	9		63	9	65	2		64	2
54	3		54	3	66	2		66	2

Recorded by DAW Direction S Lane 4 Time from 12:29 to 1:01

1395 obs. = 56.06 diff +.33 1389 1451 class errors - 2 1446

wim = 56.29 [illegible]

5 called 3 - 1 ([illegible])

[illegible] called 3 - 1 ([illegible])

Sheet 21	* STATE_CODE
LTPP Traffic Data	*SPS PROJECT_ID
WIM System Test Truck Records 1 of 5	* DATE 03/02/05 / /

Rev. 08/31/2001

First 40 Runs

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
80		1	1	11:04:43	7383	35	6.7/6.2	7.2/7.7	8.0/6.7	8.8/9.0	9.1/8.5		76.4	17.4	4.3	31.9	4.1	
80		2	1	11:05:30	7402	34	6.4/5.3	6.0/4.4					22.1	19.8				
80		1	2	11:21:03	7744	45	7.1/5.8	7.3/8.0	8.0/6.9	9.7/9.5	9.3/9.6		78.1	17.5	4.3	32	4.1	
80		2	2	11:24:21	7759	44	6.2/5.4	7.3/5.6					24.5	19.8				
84		1	3	11:36:59	8077	56	6.7/7.2	7.5/8.0	8.3/7.0	8.4/9.1	7.9/10.1		80.0	17.5	4.3	32.1	4.0	
84		2	3	11:37:06	8101	54	6.0/5.4	6.6/5.1					23.1	19.8				
84		1	4	11:53:49	8446	56	7.1/5.6	7.0/7.5	7.8/7.0	8.9/10.0	8.1/8.8		77.8	17.4	4.3	32.1	4.1	
84		2	4	11:51:27	8453	34	5.8/5.0	6.0/5.1					22	19.8				

Recorded by ______________________ Checked by ______________________

Sheet 21	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0500
WIM System Test Truck Records 2 of 5	* DATE 3/02/05 03/02/2005

Rev. 08/31/2001

First

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
84		1	5	12:03:41	8789	45	6.5/6.6	7.4/7.7	8.0/6.4	8.2/8.2	7.9/8.5		75.6	17.4	4.3	32.1	4.1	
84		2	5	12:04:29	8808	45	6.3/5.4	7.4/5.7					24.7	14.8				
87		1	6	12:17:51	9111	55	6.9/6.9	7.6/7.6	8.5/7.2	8.4/9.9	8.0/9.5		80.6	17.4	4.3	32.0	4.1	
87		2	6	12:19:40	9150	54	5.9/5.2	6.6/5.4					23.2	14.8				
87		1	7	12:33:35	9497	36	6.4/5.8	7.2/7.4	7.7/6.6	9.3/8.2	8.0/8.9		75.5	17.5	4.3	32	4.1	
87		2	7	12:33:97	9505	35	5.8/4.8	6.6/4.7					21.9	19.8				
87		1	8	12:[illegible]	9763	66	7.0/6.9	[illegible]	7.9/6.9	8.8/8.0	8.0/9.2		77.9	17.5	4.3	32.1	4.1	
		2	8	12:45:57	9783	45	6.4/5.5	7.1/5.6					24.5	19.8				

Recorded by SAM Checked by

Sheet 21	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0500
WIM System Test Truck Records 3 of 8	* DATE 03/02/05 03/02/2005

Rev. 08/31/2001

First

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
87		1	9	12:59:59	10094	55	6.9 / 6.5	7.4 / 7.8	8.7 / 7.3	9.6 / 6.3	7.3 / 9.9		77.8	17.5	4.3	32.2	4.1	
91		1	10	13:13:42	10389	36	6.1 / 5.5	7.2 / 7.7	7.7 / 7.0	9.6 / 8.2	7.5 / 9.1		75.7	17.6	4.3	32	4.1	
91		2	9	13:14:03	10401	35	5.6 / 5.0	6.8 / 4.7					22.2	19.8				
91		1	11	13:27:20	10715	45	6.9 / 6.7	7.3 / 7.2	7.8 / 6.9	9.2 / 5.8	8.2 / 9.2		75.1	17.4	4.3	32	4.0	
91		2	10	13:27:57	10726	45	6.5 / 5.6	7.5 / 5.9					25.4	19.8				
91		1	12	14:08:10	11696	35	6.9 / 6.6	7.2 / 7.1	7.6 / 6.8	9.5 / 7.2	7.7 / 9.0		76.2	17.5	4.3	32	4.1	
91		2	11	14:08:20	11699	35	6.0 / 5.7	6.8 / 4.4					23.1	19.8				
95		1	13	14:26:15	12153	45	6.6 / 6.5	7.4 / 7.9	7.8 / 7.0	9.2 / 8.8	7.7 / 9.8		79	17.5	4.3	32.1	4.1	

Recorded by SAM Checked by

Sheet 21	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0500
WIM System Test Truck Records 4 of	* DATE 03/02/2005

Rev. 08/31/2001

First

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
95		2	12	14:26:22	12158	45	6.0 / 5.5	7.3 / 5.8					20.6	19.9				
95		2	13	14:50:21	12767	54	6.2 / 5.0	6.2 / 4.9					[illegible]	19.8				
95		1	14	15:09:59	13333	36	6.4 / 6.0	7.4 / 7.6	8.1 / 6.8	9.0 / 8.7	7.9 / 9.2		77.1	17.5	4.3	32.1	4.1	
95		2	14	15:10:09	13536	35	6.0 / 5.1	6.5 / 5.0					22.6	19.9				
95		1	15	15:26:48	3842	46	6.5 / 6.7	7.6 / 7.9	7.6 / 7.0	9.8 / 10.0	7.8 / 9.7		79.7	17.5	4.4	32.1	4.1	
95		2	15	15:26:52	13846	44	6.0 / 5.2	7.1 / 5.6					23.9	19.8				
91		1	16	15:44:18	14340	56	6.3 / 6.4	7.4 / 8.1	8.7 / 7.3	8.9 / 9.4	7.8 / 9.8		80	17.5	4.3	32.1	4.1	
91		2	16	15:44:42	14355	54	6.1 / 5.1	6.4 / 4.7					22.3	19.8				

Recorded by SAM Checked by ______

Sheet 21	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0500
WIM System Test Truck Records 5 of 8	* DATE 03/02/2005

Rev. 08/31/2001

First

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
91		1	17	16:06:11	15050	76	6.8 / 6.[illegible]	7.8 / 7.6	4.0 / 6.9	9.7 / 9.5	0.2 / 9.9		77.9	17.5	4.3	32	4.1	
91		2	17	16:06:29	15055	76	5.9 / 5.4	6.3 / 5.7					23.3	19.4				
91		1	18	16:23:39	15577	45	6.3 / 6.5	7.2 / 8.1	8.0 / 7.1	8.5 / 7.5	7.5 / 9.4		76.0	17.5	4.3	32	4.1	
91		2	18	16:23:40	15582	45	6.0 / 5.5	6.4 / 4.0					22.6	19.8				
91		1	19	16:38:36	16094	56	6.5 / 6.5	7.2 / 7.8	9.7 / 7.0	9.9 / 8.5	8.3 / 10.4		79.8	17.5	4.3	32.1	4.0	
91		2	19	16:38:52	16116	54	6.3 / 5.0	6.6 / 5.5					23.4	19.7				
91		1	20	16:51:40	16572	35	6.7 / 6.5	7.1 / 7.5	8.0 / 6.6	9.2 / 8.6	8.1 / 9.0		77.0	17.5	4.3	32	4.1	
91		2	20	16:52:21	16606	35	5.5 / 5.5	7.0 / 5.2					23.2	19.8				

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Sheet 21	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0500
WIM System Test Truck Records 6 of 8	* DATE 03/03/2005

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Second Forty Run (NO CHANGES)

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
64		1	1		6214	36	6.3 / 5.8	6.7 / 7.2	7.5 / 6.6	9.2 / 8.6	7.7 / 7.7		73.6	17.4	4.3	32.1	4.2	
64		2	1		6221	35	5.7 / 4.9	6.9 / 5.2					22.6	19.8				
73		1	2		6347	45	6.8 / 5.3	7.0 / 7.7	6.0 / 6.1	9.1 / 9.1	7.5 / 9.9		76.9	17.4	4.3	32.1	4.1	
73		2	2		6350	45	5.4 / 5.3	6.6 / 5.1					22.4	19.7				
[illegible]		1	3	10:31:19	6660	[illegible]	[illegible]	7.[illegible] / 7.8	8.0 / 6.[illegible]	[illegible]	[illegible] / 6.9		76.8	[illegible]	[illegible]	[illegible]	[illegible]	
73		2	3	10:31:31	[illegible]	54	6.1 / 5.0	[illegible]					[illegible]	19.8				
73		2	4	10:35:48	[illegible]	35	6.0 / 5.0	6.2 / 4.5					21.8	19.8				
73		1	4	[illegible]	6648	45	6.7 / 6.0	7.2 / 7.8	8.0 / 6.[illegible]	[illegible]	7.6 / 8.[illegible]		[illegible]	17.5	4.2	32.1	4.1	

Recorded by SAm

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Sheet 21	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0500
WIM System Test Truck Records 7 of 8	* DATE 03/03/2005

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Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
73		2	5	10:40:38	6858	45	6.5 / 6.0	7.8 / 5.9					26.2	19.8				
73		2	6	10:44:28	6909	54	6.5 / 5.2	6.8 / 4.6					22.7	19.8				
73		1	6	10:48:46	[illegible]	56	6.4 / 6.7	7.6 / 7.5	7.5 / 7.0	[illegible]	7.8 / 9.0		77.0	17.4	4.3	32.0	4.0	
73		2	7	10:49:43	[illegible]	34	5.4 / 5.0	6.5 / 5.8					22.7	19.8				
73		1	7	10:54:19	6982	[illegible]	6.7 / 6.5	6.6 / 6.7	7.7 / 6.1	9.1 / 7.0	7.2 / 9.0		[illegible]	17.0	4.3	32.1	4.1	
73		2	8	[illegible]	6926	44	5.8 / 5.0	7.0 / 5.6					23.4	19.8				
73		1	8	[illegible]	7083	54	6.7 / 7.0	7.3 / 7.4	7.9 / 6.6	7.7 / 7.5	8.0 / 10.1		77.6	17.5	4.3	32.1	4.1	
73		2	9	[illegible]	7106	54	[illegible]	[illegible]					22.9	19.8				

Recorded by SAM

Checked by

Sheet 21	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0500
WIM System Test Truck Records 8 of 8	* DATE ~~03/03/05~~ 03/03/2005

Rev. 08/31/2001

second Run

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
73		1	9	[illegible]	7206	[illegible]	[illegible]	[illegible]	[illegible] / 6.8	[illegible] / 8	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]		2	10	[illegible]	7207	[illegible]	[illegible] / 6.1	[illegible] / 9.8					[illegible]	[illegible]				
73		1	10	11:09:06	7332	45	6.3 / 6.2	6.9 / 7.5	7.7 / 6.8	8.2 / 9.1	7.4 / 9.8		75.9	17.5	4.3	32	4.1	
[illegible]		2	11	[illegible]	7339	46	6.5 / 6.5	[illegible] / 6.5					[illegible]	19.8				
73		1	5	10:44:03	6736	45	6.5 / 6.3	7.0 / 7.2	7.9 / 7.1	8.2 / 9.5	7.1 / 9.5		76.9	17.0	4.3	32.1	4.1	

Recorded by SAM Checked by ____________

Sheet 21	* STATE_CODE 1 2
LTPP Traffic Data	*SPS PROJECT_ID 0500
WIM System Test Truck Records 1 of 5	* DATE 3/07/05 03/03/2005

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CALIBRATION 1 / FINAL RUNS

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
73		1	1	11:55:43	8348	54	6.4 / 6.0	6.9 / 7.4	7.6 / 6.8	7.4 / 7.6	7.7 / 9.1		74.5	17.4	4.3	31.9	4.1	
77		2	1	[illegible]	[illegible]	[illegible]	7.4 / 6.9	7.4 / 6.7					[illegible]	19.9				
77		[illegible]	2	12:00:49	8475	46	6.0 / 6.0	7.2 / 7.4	7.9 / 6.9	9.5 / 8.1	7.7 / 9.7		76.3	17.5	4.3	32.1	4.1	
77		2	2	12:01:12	8485	45	6.4 / 5.9	6.9 / 5.7					24.9	19.9				
77		1	3	[illegible]	8568	55	5.9 / 7.5	[illegible]	[illegible]	[illegible] / 8.1	7.8 / [illegible]		76.5	17.5	4.3	32.1	4.1	
77		2	3	12:05:26	8576	55	6.1 / 5.5	6.1 / [illegible]					22.5	19.8				
77		1	4	12:04:02	8648	[illegible]	6.2 / 6.5	7.5 / 7.5	7.9 / 6.7	9.7 / 9.6	7.9 / 4.9		74.4	17.5	4.3	32	4.2	
77		2	4	12:0[illegible]	86[illegible]	[illegible]	[illegible]	[illegible] / 5.2					[illegible]	19.9				

Recorded by SAM

Checked by ____________

Sheet 21	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0500
WIM System Test Truck Records 2 of 5	* DATE 3/3/05 03/03/2005

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Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
77		1	5	12:12:12	8727	46	6.5 / 5.9	7.5 / 7.6	8.2 / 7.1	8.4 / 7.9	7.4 / 9.3		75.9	17.4	4.3	32.1	4.1	
77		2	5	12:12:20	8736	45	6.0 / 5.0	7.5 / 5.3					24.3	19.8				
77		1	6	12:16:10	8812	54	6.5 / 6.[illegible]	7.[illegible] / 7.8	8.[illegible] / 6.[illegible]	8.6 / 10.[illegible]	[illegible] / 10.[illegible]		79.[illegible]	17.5	4.3	32.1	4.1	
77		2	6	12:16:20	8815	55	6.[illegible] / 5.5	6.7 / 5.2					23.6	19.8				
77		1	7	12:19:55	8894	[illegible]	6.7 / 6.1	7.6 / 7.7	7.9 / 7.[illegible]	9.5 / 9.4	7.8 / 9.[illegible]		77.8	17.4	4.3	32.[illegible]	4.1	
77		2	7	12:20:17	[illegible]	[illegible]	7.[illegible] / 5.9	7.9 / 5.4					23.3	19.8				
77		1	8	12:2[illegible]:31	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
77		2	8	12:26:09	[illegible]	45	6.2 / 5.9	7.[illegible] / [illegible]					24.8	19.9				

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Sheet 21	* STATE_CODE	1 2
LTPP Traffic Data	*SPS PROJECT_ID	0500
WIM System Test Truck Records 3 of 5	* DATE 3/3/05	03/03/2005

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Third

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
77		1	9	12:32:06	9183	56	6.6 / 6.6	7.4 / 7.8	8.0 / 6.7	8.4 / 8.4	7.7 / 9.6		77.2	17.5	4.3	32.1	4.1	
77		2	9	12:32:16	9186	54	6.3 / 5.5	6.4 / 5.0					23.3	19.8				
77		1	10	12:36:31	9288	36	6.8 / 6.3	6.9 / 7.6	7.7 / 6.8	9.1 / 9.3	7.6 / 8.7		76.8	17.5	4.3	32	4.1	
77		2	10	12:36:37	9293	35	6.2 / 5.3	6.2 / 5.5					23.1	19.8				
77		1	11	12:40:12	9366	45	6.7 / 5.8	7.3 / 7.7	8.0 / 6.0	8.8 / 8.6	7.9 / 8.5		75.3	17.4	4.3	32	4.1	
77		1	12	12:47:35	9544	54	6.5 / 7.3	7.3 / 7.4	8.2 / 6.4	8.9 / 8.9	8.0 / 9.1		78.0	17.4	4.3	32	4.0	
77		2	11	12:47:42	9547	55	6.2 / 5.8	6.3 / 4.7					22.9	19.8				
77		1	13	12:59:47	9816	35	6.6 / 6.2	7.2 / 7.9	8.0 / 6.8	9.0 / 6.8	7.6 / 9.8		75.9	17.4	4.3	32	4.1	

Recorded by BAm Checked by ______

1st cal verification

Sheet 21	* STATE_CODE	12
LTPP Traffic Data	*SPS PROJECT_ID	0500
WIM System Test Truck Records 4 of 5	* DATE 3/3/05	03/03/2005

Rev. 08/31/2001

Third

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
77		2	12	13:01:17	9852	35	5.8 / 5.4	6.8 / 4.6					22.6	19.8				
77		1	14	13:04:05	9908	45	6.3 / 6.0	7.0 / 8.1	7.6 / 6.8	8.2 / 9.0	7.4 / 9.3		75.8	17.5	4.3	32.1	4.1	
77		2	13	13:05:14	9928	45	5.5 / 5.3	7.0 / 5.6					23.5	19.8				
77		1	15	13:12:39	10125	55	6.4 / 6.1	7.2 / 8.0	8.0 / 6.7	8.6 / 9.3	8.0 / 9.4		77.7	17.5	4.5	32.1	4.1	
77		2	14	13:12:43	10132	54	5.6 / 5.0	5.8 / 5.1					21.5	19.8				
77		1	16	13:16:21	10214	36	6.4 / 6.0	6.8 / 7.8	7.6 / 6.6	9.8 / 8.6	7.7 / 8.9		76.3	17.5	4.3	32.0	4.1	
77		2	15	13:16:29	10218	35	5.9 / 4.9	7.1 / 5.8					23.6	19.7				
77		1	17	13:21:23	10329	45	6.5 / 6.5	7.0 / 7.4	7.9 / 6.9	8.6 / 7.0	7.5 / 9.1		74.2	17.5	4.3	32.1	4.1	

Recorded by SAM

Checked by

Sheet 21

LTPP Traffic Data

WIM System Test Truck Records 5 of 5

* STATE_CODE	12
*SPS PROJECT_ID	0500
* DATE	~~03/03/05~~ 03 /03 /2005

Rev. 08/31/2001

Third

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
77		2	16	13:21:39	10334	45	6.3 / 5.7	7.2 / 5.4					24.6	19.9				
77		1	18	13:25:53	10420	55	6.8 / 7.0	7.4 / 7.9	8.0 / 6.4	7.9 / 7.1	7.5 / 9.4		75.3	17.5	4.3	32.1	4.1	
77		2	17	13:26:08	10426	54	6.3 / 5.3	6.2 / 4.9					22.7	19.9				
77		1	19	13:29:24	10512	37	6.8 / 5.8	6.7 / 7.8	7.9 / 6.8	9.4 / 9.1	8.2 / 9.6		78.0	17.4	4.3	32.1	4.2	
77		2	18	13:29:41	10516	35	5.8 / 4.9	6.7 / 4.7					22.0	19.7				
77		1	20	13:43:46	10602	45	6.9 / 6.7	7.2 / 7.8	7.8 / 6.4	8.2 / 6.8	7.9 / 9.9		75.6	17.5	4.3	32.1	4.0	
77		2	19	13:34:00	10609	45	5.5 / 5.3	7.4 / 6.1					24.3	19.8				
77		2	20	13:38:14	10717	54	6.0 / 4.9	6.5 / 4.9					22.3	19.8				

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120500 3/3/05

Calibration 1

Start - Speed point 1 (low speed) = 995

Errors (low speed) - -2 %

increase low speed point 995 × 1.02 = 1015

New Factor

Speed point 1 = 1015