Validation Report

Ohio, SPS-2

Task Order 9, CLIN 2
May 10 through May 12, 2005

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1 Executive Summary

A visit was made to the Ohio SPS-2 beginning on May 10 and continuing through May 12, 2005 for the purposes of conducting a validation of the WIM system located on US Route 23 at milepost 19.7. The validation procedures were in accordance with LTPP's SPS WIM Data Collection Guide dated August 21, 2001.

This site meets all LTPP loading precision WIM requirements except speed which is not considered sufficient to disqualify the site as having research quality data.

The classification algorithm does not provide research quality classification information.

The site is instrumented with Mettler-Toledo load cell sensors and WIM controller.

The validation used the following trucks:

1) 3S2 with a tractor having air suspension and standard rear tandem trailer having air suspension, loaded to 77,020 lbs.
2) 3S2 with a tractor having air suspension and trailer having a standard two leaf spring suspension, loaded to 51,970 lbs.

The validation speeds ranged from 44 to 58 miles per hour. The pavement temperatures ranged from 58 to 102 degrees Fahrenheit.

Table 1-1 Post-Validation results – 390200 – 12-May-2005

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Single axles	±20 percent	-5.1%±7.3%	Pass
Tandem axles	±15 percent	1.5%±9.2%	Pass
Gross vehicle weights	±10 percent	0.3%±6.3%	Pass
Speed	±1 mph [2 km/hr]	**1.0±0.9 mph**	**Fail**
Axle spacing	± 0.5 ft [150 mm]	0.0±0.2 ft	Pass

The pavement condition was satisfactory for conducting a performance evaluation. There were no distresses observed that would influence truck motions significantly.

This site meets the overall classification requirement of less than two percent unclassified. However, it does not meet the less than two percent trucks misclassified criteria. This is not due solely to single unit truck classification problems.

The majority of vehicles that were misclassified were Class 3s, 4s and 5s that were being misidentified within the category of light single unit vehicles, i.e. 3s classified as 4s and 5s, 4s being classified as 5s, and 5s being classified as 3s and 4s.

MACTEC field personnel worked with the agency representative to compute factor adjustments. The agency representative made all equipment changes. This is consistent with our experience in other jurisdictions and our previous visits to this site.

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, and the field validation procedures do not include verification of that information.

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

2 Corrective Actions Recommended

The system's classification algorithms should be augmented with weight parameters to correct the problem of small Class 5 vehicles being classified as Class 3s and 4s and vice versa.

The backup of the water being drained from the sensors originally identified during the November, 2003 assessment was reevaluated. The condition described at that time remains. Although there appears to be adequate room for a significant amount of water, if the drainage pipe was to back up and become frozen, the scale pit will begin to fill eventually keeping the scale from operating properly.

3 Post Calibration Analysis

This final analysis is based on test runs conducted May 11, 2005 during the early evening hours and May 12, 2005 during the morning hours at test site 390200 on US Route 23. This SPS-2 site is at milepost 19.7 on the northbound, right hand lane of a divided four-lane facility. No auto-calibration was used during test runs. The two trucks used for calibration and for the subsequent validation included:

1. 3S2 with a tractor having air suspension and standard rear tandem trailer having air suspension, loaded to 77,020 lbs. (Golden Truck B)
2. 3S2 with a tractor having air suspension and trailer having a standard two leaf spring suspension, loaded to 51,970 lbs. (Class 9)

Each truck made a total of 21 passes over the WIM scale at speeds ranging from approximately 44 to 58 miles per hour. Pavement surface temperatures were recorded during the test runs ranging from about 58 to 102 degrees Fahrenheit. The computed values of 95% confidence limits of each statistic for the total population are in Table 3-1.

Table 3-1 Post-Validation Results - 390200 – 12-May-2005

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Single axles	±20 percent	-5.1%±7.3%	Pass
Tandem axles	±15 percent	1.5%±9.2%	Pass
Gross vehicle weights	±10 percent	0.3%±6.3%	Pass
Speed	±1 mph [2 km/hr]	**1.0±0.9 mph**	**Fail**
Axle spacing	± 0.5 ft [150 mm]	0.0±0.2 ft	Pass

The test runs were conducted primarily during the early evening hours on May 11 and mid-morning hours on May 12, resulting in two groups of pavement temperatures at the two extremes of the observed temperature range. The runs were also conducted at various speeds to determine the effects of that variable on the performance of the WIM scale. To investigate these effects, the dataset was split into three speed groups and two temperature groups. The distribution of runs by speed and temperature is illustrated in Figure 3-1. The figure indicates that the complete coverage of speed and temperature

combinations throughout the temperature range was not achieved for this set of validation runs.

The speed groups were divided as follows: Low speed - 42-47 mph, Medium speed - 48-52 mph and High speed 53+ mph. The two temperature groups were created by splitting the runs between those at 55 to 80 degrees Fahrenheit for Low temperature and 81 to 105 degrees Fahrenheit for High temperature.

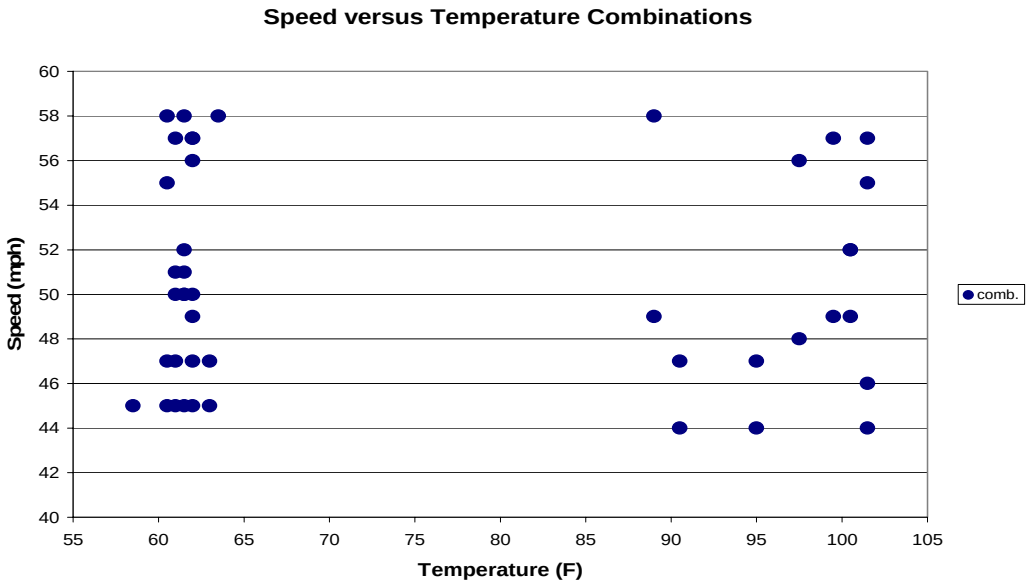


Figure 3-1 Post-Validation Speed-Temperature Distribution – 390200 – 12-May-2005

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. From the figure it can be seen that the GVW error estimate of the WIM equipment decreased as the speed of the test trucks increased. The scatter of the percent error also decreased as the speeds increased.

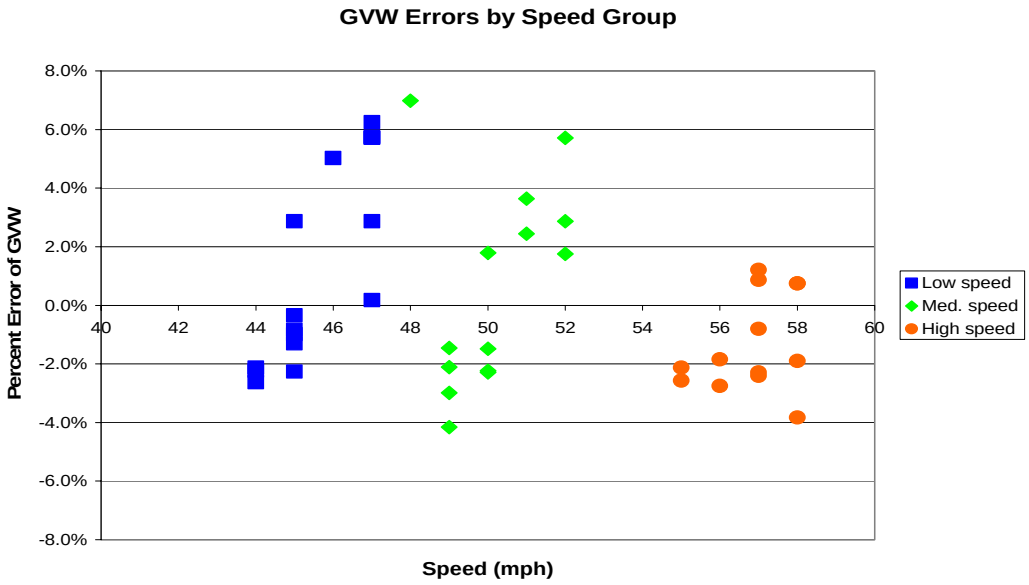


Figure 3-2 Post-validation GVW Percent Error vs. Speed– 390200 –12-May-2005

Figure 3-3 shows the relationship between temperature and GVW percentage error. The graph illustrates that there does not appear to be a relationship between GVW error and pavement temperature.

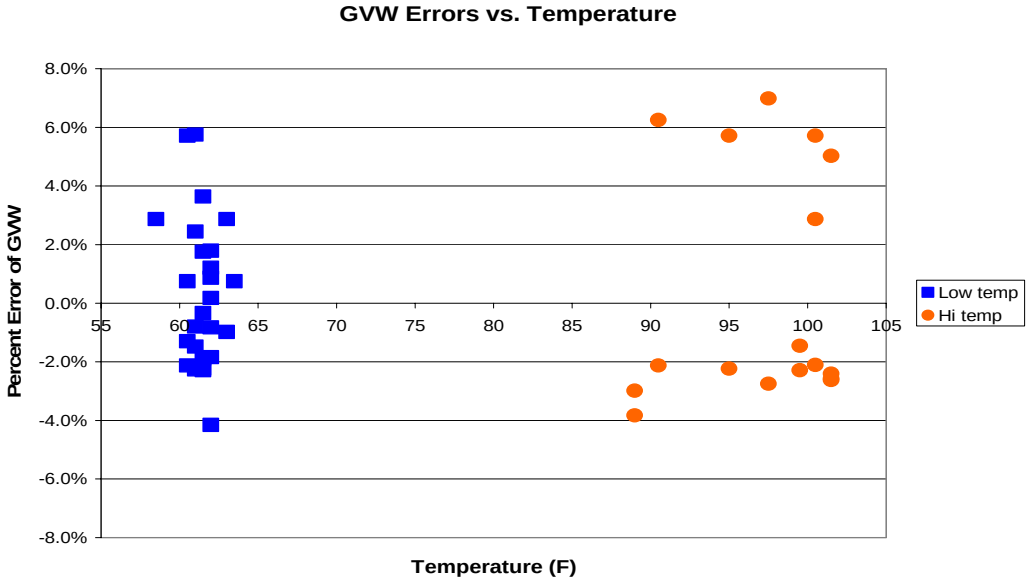


Figure 3-3 Post-Validation GVW Percent Error vs. Temperature– 390200 – 12-May-2005

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.

Axle spacing errors appear to be consistent throughout the test truck speed range and are limited to maximums of about 2.4 inches (0.2 feet). Vehicles speeds appear to have no effect on the error of measured axle spacing.

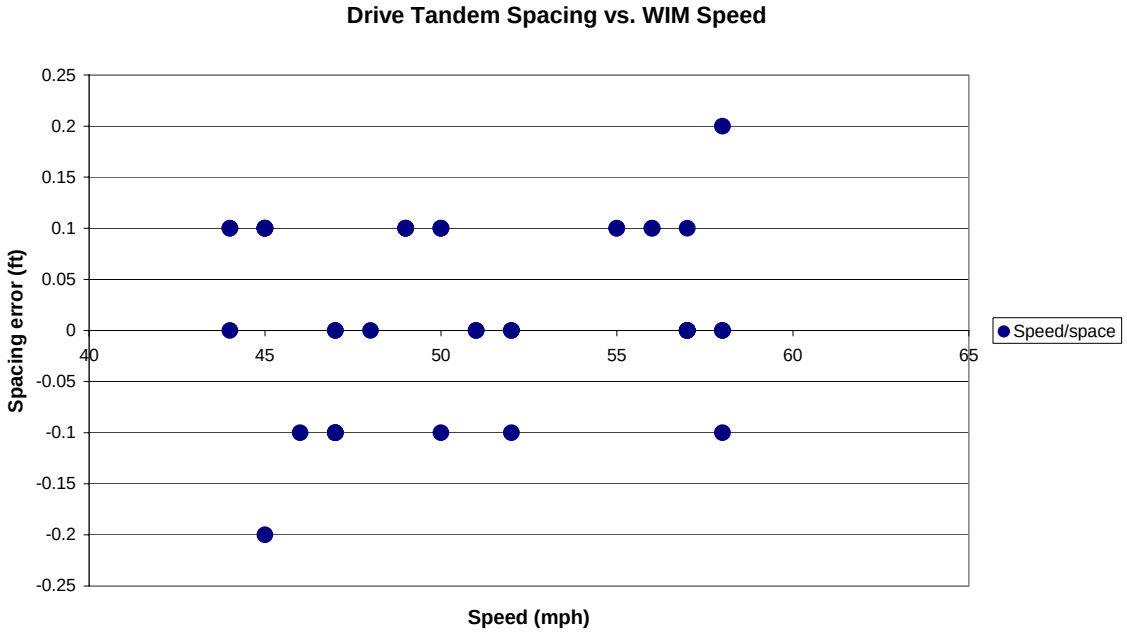


Figure 3-4 Post-Validation Spacing vs. Speed - 390200 – 12-May-2005

3.1 Temperature-based Analysis

The two temperature groups were created by splitting the runs between those at 55 to 80 degrees Fahrenheit for Low temperature and 81 to 105 degrees Fahrenheit for High temperature.

Table 3-2 Post-Validation Results by Temperature Bin – 390200 –12-May-2005

Element	95% Limit	Low Temperature 55-80 °F	High Temperature 81-105 °F
Single axles	±20 %	-5.0%±7.5%	-5.3%±7.8%
Tandem axles	±15 %	1.5%±8.4%	1.5%±10.8%
GVW	±10 %	0.3%±5.2%	0.3±8.5%
Speed	±1 mph	1.0±0.9 mph	1.0±0.9 mph
Axle spacing	± 0.5 ft	0.0±0.2 ft	0.0±0.2 ft

The unseasonably low temperatures during the morning hours of May 12 did not allow the pavement temperature to increase enough to bridge the gap between the low temperatures and the high temperatures. As a result, there is no “medium” temperature range group in Table 3-2. Although these “medium” temperatures were not achieved

during the test runs, results from the test truck runs over the wide range of pavement temperatures indicated very small changes in mean and variability errors.

Figure 3-5 shows the distribution of GVW errors versus temperature by truck. The GVW results for the Class 9 (diamonds) and the Golden Truck B (squares) indicate a lack of a relationship between the GVW mean error and the pavement temperature. The Class 9 GVW was generally overestimated while the Golden Truck B was underestimated consistently.

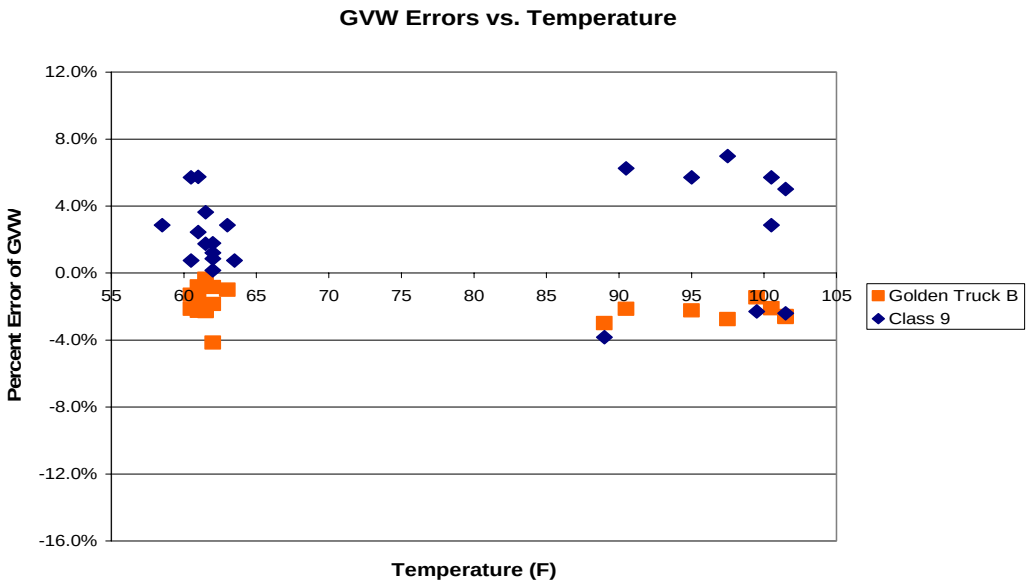


Figure 3-5 Post-Validation GVW Percent Error vs. Temperature by Truck – 390200 – 12-May-2005

Figure 3-6 shows the relation between steering axle errors and temperature. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for calibration. This site does not use auto-calibration. The figure illustrates a general underestimation of steering axle weights by this WIM equipment at all temperatures.

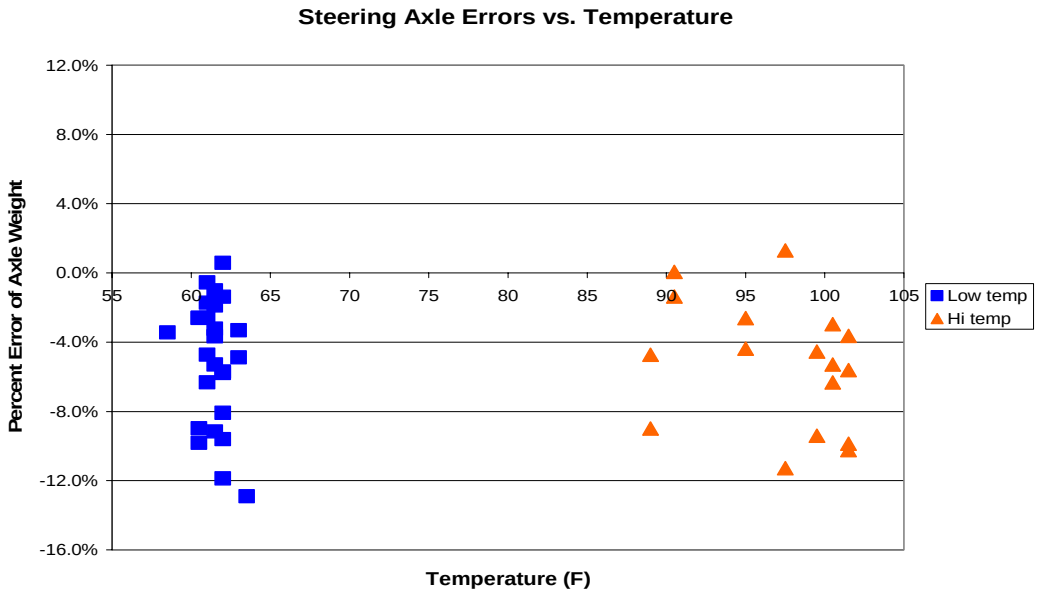


Figure 3-6 Post-Validation Steering Axle Error vs. Temperature by Group - 390200 –12-May-2005

3.2 Speed-based Analysis

The speed groups were divided as follows: Low speed - 42-47 mph, Medium speed - 48-52 mph and High speed 53+ mph.

Table 3-3 Post-Validation Results by Speed Bin – 390200 – 12-May-2005

Element	95% Limit	Low Speed 42-47 mph	Medium Speed 48-52 mph	High Speed 53+ mph
Single axles	±20 %	-2.4%±3.8%	-4.1%±4.5%	-9.6%±4.3%
Tandem axles	±15 %	2.2%±9.7%	1.6%±11.4%	0.4%±6.7%
GVW	±10 %	1.4%±7.3%	0.6%±7.5%	-1.3%±3.6%
Speed	±1 mph	1.0±0.9 mph	1.0±0.9 mph	1.0±0.9 mph
Axle spacing	± 0.5 ft	0.2±0.2 ft	0.0±0.2 ft	0.0±0.2 ft

From Table 3-3 it appears that this WIM equipment at this site increasingly underestimates single axle weights as the speed increases. For tandem and GVW weights the system overestimates by approximately 2.0% at low speeds, overestimates by approximately 1.0% at medium speeds. At high speeds the WIM equipment overestimates tandem weights by approximately 0.4% and underestimates GVW by approximately 1.3%. Distribution of error for single axles is fairly stable. The distribution of error for tandem and GVW weights peaks at the medium speeds.

Figure 3-7 illustrates the tendency of the WIM equipment to report a smaller mean error and less variation in error as the speed of the test trucks increased. This tendency is more prevalent with the Class 9 truck (diamonds) than Golden Truck B (squares).

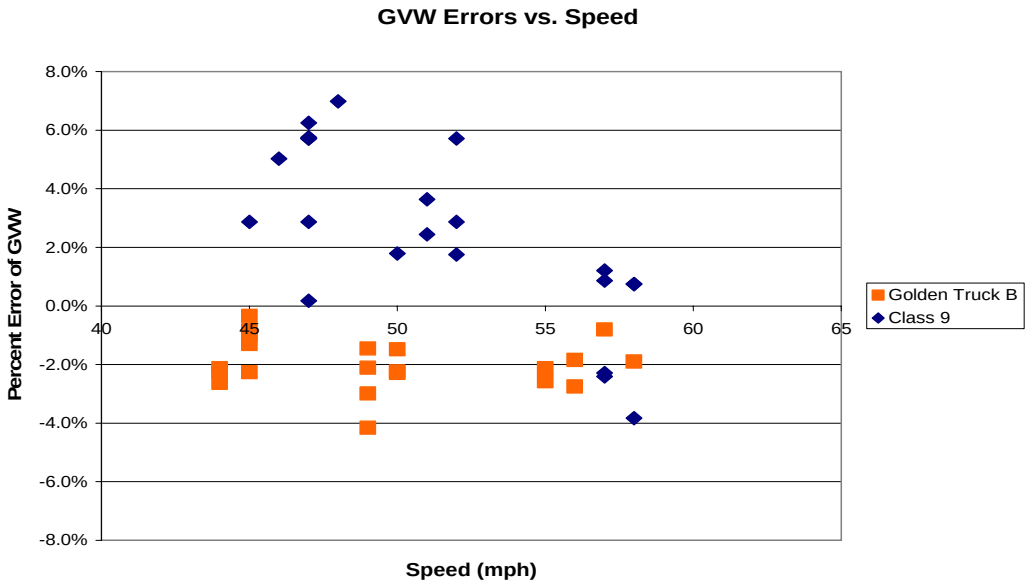


Figure 3-7 Post-Validation GVW Percent Error vs. Speed by Truck – 390200 –12-May-2005

Figure 3-8 shows the relation between steering axle errors and speed. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for calibration. This site does not use auto-calibration. Figure 3-8 shows how the WIM equipment underestimates the steering axle weights. The underestimate is slight at low speeds and increases as speed increases. Variability of the error is generally constant throughout the entire speed range.

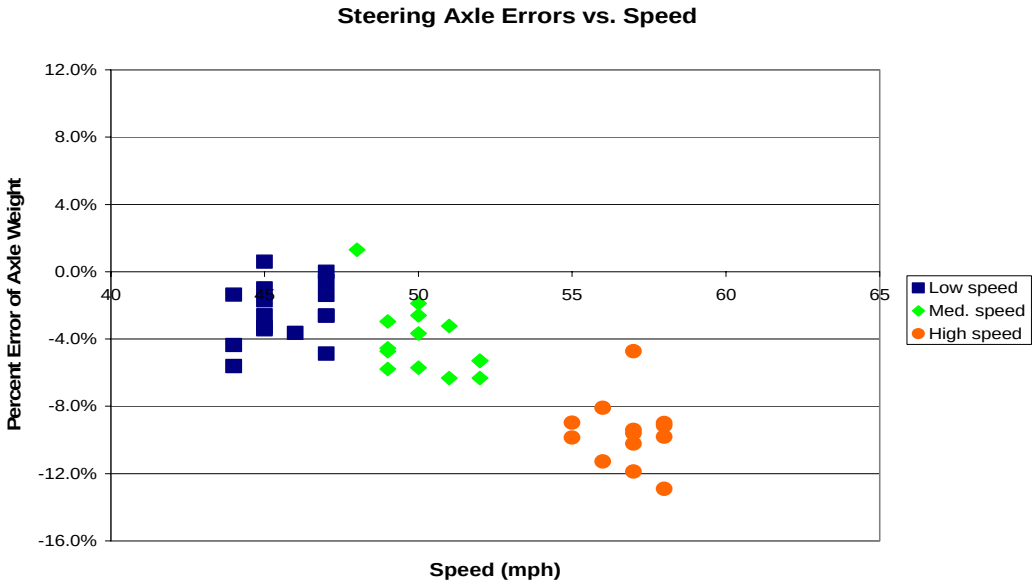


Figure 3-8 Post-Validation Steering Axle Percent Error vs. Speed by Group- 390200 –12-May-2005

3.3 Classification Validation

The agency uses the FHWA 13 bin classification scheme.

A sample of 100 vehicles 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 0 percent unknown vehicles and 0 percent unclassified vehicles.

The second check is the ability of the algorithm to correctly distinguish between truck classes with no more than 2% errors in such classifications. Table 3-4 has the classification error rates by class. The overall misclassification rate is 21.7% and is driven primarily but not entirely by single unit vehicle misclassifications. A single misclassification of a car as a Class 9 produced the Class 9 misclassification percentage.

Table 3-4 Truck Misclassification Percentages for 390200 - 12-May-2005

Class	Percent Error	Class	Percent Error	Class	Percent Error
4	75%	5	53.8%	6	100%
7	N/A				
8	0.0%	9	2.6%	10	0.0
11	0.0%	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 reported above 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 390200 - 12-May-2005

Class	Mean Difference	Class	Mean Difference	Class	Mean Difference
4	300.0	5	-27.3	6	-100.0
7	N/A				
8	0.0	9	2.7	10	0.0
11	0.0	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 be

present exist. N/A means no vehicles of the class recorded by either the equipment or the observer.

3.4 Evaluation by ASTM E-1318 Criteria

The ASTM E-1318 standard 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, and the field validation procedures do not include verification of that information.

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

For reference, a wheel load comparison of left and right wheel load weights is included in Figure 3-9. It is interesting to note that the left wheel loads are consistently heavier than the right wheel loads. Substantially all of the left wheel loads are above the short line that indicates the graphing of right wheel loads versus themselves.

Figure 3-9 Comparison of Left and Right Wheel Load Weights - 390200 – 12-May-2005

4 Pavement Discussion

Although this site was successfully calibrated and validated, the pavement smoothness may or may not have contributed to any difficulties encountered in achieving the result.

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, Inc. on May 4, 2005 were processed through the LTPP SPS WIM Index software, version 1.0. This WIM scale is installed on a portland cement concrete 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 1.0, was developed with four different indices: LRI, SRI, Peak LRI and Peak SRI. The LRI incorporates the pavement profile starting 25.8 m prior to the scale and ending 3.2 m after the scale in the direction of travel. The SRI incorporates a shorter section of pavement profile beginning 2.74 m prior to the WIM scale and ending 0.46 m after the scale. The LRI and SRI are the index values for the actual location of the WIM scale. Peak LRI is the highest value of LRI, within 30 m prior to the scale. Peak SRI indicates the highest value of SRI that is located between 2.45 m prior to the scale and 1.5 m after the scale. Also, a range for each of the indices was developed to provide the smoothness criteria. The ranges are shown in Table 4-1. When all of the values are below the lower thresholds, it is presumed unlikely that pavement smoothness will significantly influence sensor output. When one or more values exceed an upper threshold there is a reasonable expectation that the pavement smoothness will influence the outcome of the validation. When all values are below the upper threshold but not all below the lower threshold, the pavement smoothness may or may not influence the validation outcome.

Table 4-1 Thresholds for WIM Index Values

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

Index	Lower Threshold (m/km)	Upper Threshold (m/km)
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. These are shown in the right most column of the table. Values below the index lower limits are presented in *italics*. Values above the upper limits are in **bold**.

Table 4-2 WIM Index Values - 390200 –04-May-2005

Profiler Passes			Pass 1	Pass 2	Pass 3	Pass 4	Pass 5	Ave.
Center	LWP	LRI (m/km)	1.295	1.304	1.279	1.273	1.324	1.295
		SRI (m/km)	1.326	1.239	1.394	1.238	1.511	1.342
		Peak LRI (m/km)	1.302	1.329	1.294	1.273	1.324	1.304
		Peak SRI (m/km)	1.569	1.541	1.600	1.530	1.521	1.552
	RWP	LRI (m/km)	0.819	0.816	0.836	0.862	0.858	0.838
		SRI (m/km)	*0.287*	*0.314*	*0.494*	*0.439*	*0.391*	*0.385*
		Peak LRI (m/km)	0.971	1.032	1.030	0.966	0.971	0.994
		Peak SRI (m/km)	*0.619*	*0.637*	0.771	*0.722*	*0.667*	*0.683*
Left Shift	LWP	LRI (m/km)	1.027	0.974	1.169			1.057
		SRI (m/km)	1.108	1.186	1.418			1.237
		Peak LRI (m/km)	1.027	0.974	1.171			1.057
		Peak SRI (m/km)	1.421	1.468	1.686			1.525
	RWP	LRI (m/km)	0.999	1.070	0.939			1.003
		SRI (m/km)	0.630	0.517	0.662			0.603
		Peak LRI (m/km)	1.237	1.260	1.165			1.221
		Peak SRI (m/km)	0.767	*0.697*	*0.716*			*0.727*
Right Shift	LWP	LRI (m/km)	1.299	1.299	1.339			1.312
		SRI (m/km)	0.990	1.288	1.059			1.112
		Peak LRI (m/km)	1.453	1.391	1.480			1.441
		Peak SRI (m/km)	1.035	1.504	1.201			1.247
	RWP	LRI (m/km)	0.815	0.792	0.798			0.802
		SRI (m/km)	0.564	0.516	*0.444*			0.508
		Peak LRI (m/km)	0.839	0.797	0.823			0.820
		Peak SRI (m/km)	0.866	*0.672*	*0.741*			0.760

From Table 4-2 it can be seen that all of indices except some SRI and Peak SRI indices computed from the profiles are between the upper and the lower threshold values. Six out of twenty-two SRI values are below the lower threshold limits and five of them happen at the right wheel path of the center profiling. Eight out of twenty-two Peak SRI values are below the lower threshold limits and again half of them happen at the right wheel path of the center profiling. 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. Based on the profile data analysis, the Ohio SPS-2 WIM site does

not meet the requirements for WIM site locations. Since the site has met the performance specifications for loading, no pavement remediation is recommended at this time.

It should be noted that the existing pavement is tined portland cement concrete. The tining makes it unlikely that the resulting profile index values will be below the performance threshold (the lower index limit).

Table 4-3 shows the computed index values for the prior site validation. Although the computations were computed with an earlier version of the software, the difference in LRI and SRI values between the two versions has been found to be less than 3 percent. All of the values computed for the prior visit were between the upper and lower threshold values.

Table 4-3 WIM Index values (Alpha version) - 390200 – 04 February-2004

Profiler Passes			**Pass 1**	**Pass 2**	**Pass 3**	**Pass 4**	**Pass 5**	**Ave.**
Center	LWP	LRI (m/km)	1.206	1.190	1.215	1.276	1.274	1.232
		SRI (m/km)	1.490	1.293	1.672	1.448	1.781	1.537
	RWP	LRI (m/km)	0.863	0.858	0.822	0.838	0.770	0.830
		SRI (m/km)	0.657	0.581	0.700	0.587	0.664	0.638
Left Shift	LWP	LRI (m/km)	1.240	1.187	1.312			1.246
		SRI (m/km)	2.026	1.567	1.824			1.806
	RWP	LRI (m/km)	1.020	0.817	1.028			0.955
		SRI (m/km)	0.979	0.834	1.174			0.996
Right Shift	LWP	LRI (m/km)	1.580	1.561	1.510			1.550
		SRI (m/km)	1.754	1.894	1.685			1.778
	RWP	LRI (m/km)	0.959	0.985	0.960			0.968
		SRI (m/km)	1.525	1.466	1.553			1.515

Table 4-4 gives the comparison of the average index values between this validation and the prior site validation are presented.

Table 4-4 Average index value comparison

Profiler Passes			**Ave. (2004)**	**Ave. (2005)**	**Change**
Center	LWP	LRI (m/km)	1.232	1.295	5%
		SRI (m/km)	1.537	1.342	-13%
	RWP	LRI (m/km)	0.830	0.838	1%
		SRI (m/km)	0.638	*0.385*	-40%
Left Shift	LWP	LRI (m/km)	1.246	1.057	-15%
		SRI (m/km)	1.806	1.237	-31%
	RWP	LRI (m/km)	0.955	1.003	5%
		SRI (m/km)	0.996	0.603	-39%
Right Shift	LWP	LRI (m/km)	1.550	1.312	-15%
		SRI (m/km)	1.778	1.112	-37%
	RWP	LRI (m/km)	0.968	0.802	-17%
		SRI (m/km)	1.515	0.508	-66%

As shown in the table, some significant reductions of index values, especially SRI index values, were observed since the previous profile data was collected. One might conclude there were some smoothness improvements on the site. However, a closer examination of the profiles collected prior to both validation visits indicates that a shift of about 7 feet occurred between the starting points for the profiles collected in 2004 and 2005. Figure 4-1 shows the comparison of a sample set of profiles from both validations.

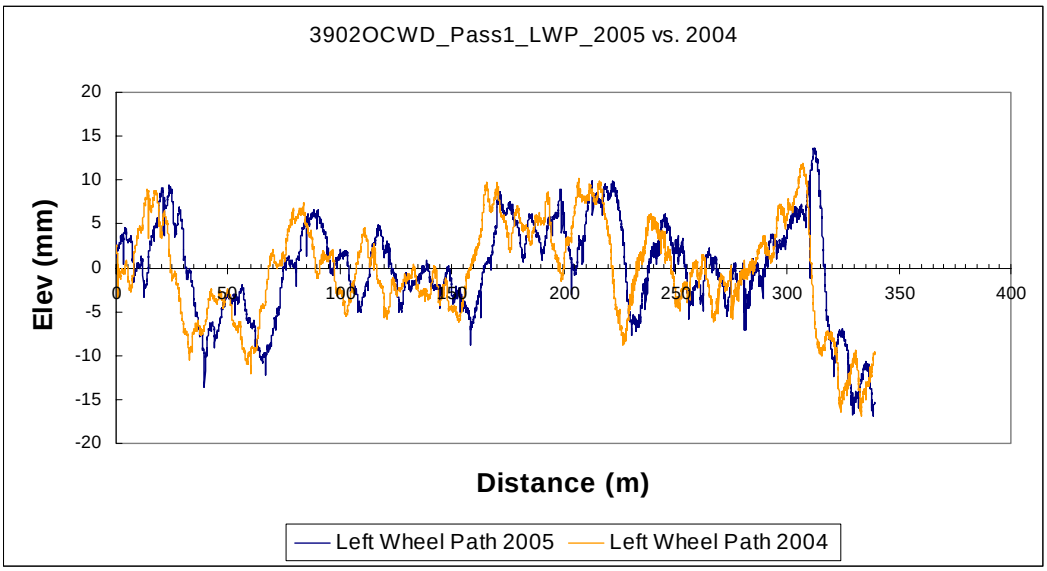


Figure 4-1 Sample Comparison of Profiles - 390200 - 4-May-2005

As seen from the figure, the starting point of the profile in 2005 was about 7 feet away from the starting point in 2004 in the opposite direction toward the WIM location. The SRI is particularly sensitive to this shift as this value incorporates such a short distance of profile data.

Therefore, it can be concluded that the reductions of the index values are not a result of any improvement in pavement smoothness, but a result of the discrepancy in the starting points of the profile data collection from the two time periods. In the LTPP Manual for Profile Measurement and Processing (Version 4.1, May 2004), it is recommended that the profile data comparison should be made between the visits if there is a previous visit. This guideline should be followed to ensure the quality of the data.

The Regional Support Contractor has been made aware of this problem.

4.2 Distress survey and any applicable photos

The pavement condition is satisfactory. There were no distresses observed that would influence truck motions significantly.

4.3 Vehicle-pavement interaction discussion

A visual survey of truck movement over the site determined that there is no discernable vertical or horizontal movement of the trucks prior to, passing over, or beyond the WIM

scale area. Most of the trucks were traveling along the wheel path. Daylight cannot be seen between the tires and any of the sensors of the equipment indicating that the truck tires appear to be fully touching the sensors.

5 Equipment Discussion

The traffic monitoring equipment at this location includes Mettler-Toledo load cell sensors and WIM controller. These sensors are installed in a staggered configuration in a 500-foot concrete pavement section. The roadway outside this short section is asphalt.

Since the validation in April 2004 and before this validation the vendor performed static load tests and made adjustments to the operating parameters. The vendor also installed a calibration routine within the software to assist in the calibration of the system. Compensation factors for weight are automatically calculated based on a comparison between the static weight of the test trucks and the mean weight reported by the WIM equipment. The compensation factor is identified as the "multiplier" for each test truck. Typically there is a multiplier for a light truck, a partially loaded truck and a heavy truck, but these may be changed by the agency at their discretion. These adjustments and improvements appear to have improved the linearity of the weights.

The ghost axles that were observed during the validation in April 2004 appear to have been eliminated.

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 appear to be in good physical condition.

The backup of the water being drained from the sensors identified during the assessment and later validations was reevaluated. The conditions described in those reports remain unchanged.

5.2 Calibration Process

The equipment required 1 iteration of the calibration process between the initial 42 runs and the final 43 runs.

5.2.1 Calibration Iteration 1

The results of the 42 pre-calibration runs performed by the three test trucks produced an average combined GVW error of approximately -1.6% ± 10.0%. The partially loaded truck produced an average error of +7.794% while the fully loaded trucks combined to produce a mean error of -2.476%. Based on these errors the medium weight and heavy weight truck multipliers, which are used to compensate for non-linear bias output, were adjusted. The medium weight multiplier was decreased by 7.794% from 0.999490528 to

.927573608 and the heavy multiplier was increased from 0.913853318 to 0.937089650. The precision of the values is reported as they were displayed by the equipment.

The first set of 11 iterations performed by two of the three trucks produced a mean error of -5.0% ± 8.8%. Based on the decrease of the deviation of the weight error to within the acceptable range, it was determined that no further adjustments were required and 32 more runs were performed by the test trucks to meet the 40 post-calibration run requirement.

Table 5-1 Calibration Iteration 1 Results - 390200 – 11-May-2005 (beginning 2:20 PM)

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Single axles	±20 percent	-5.0%±8.8%	Pass
Tandem axles	±15 percent	1.4%±11.1%	Pass
Gross vehicle weights	±10 percent	0.3%±9.2%	Pass
Vehicle speed	±1 mph [2 km/hr]	**1.0±0.9 mph**	**Fail**
Axle spacing length	± 0.5 ft [150 mm]	0.0±0.2 ft	Pass

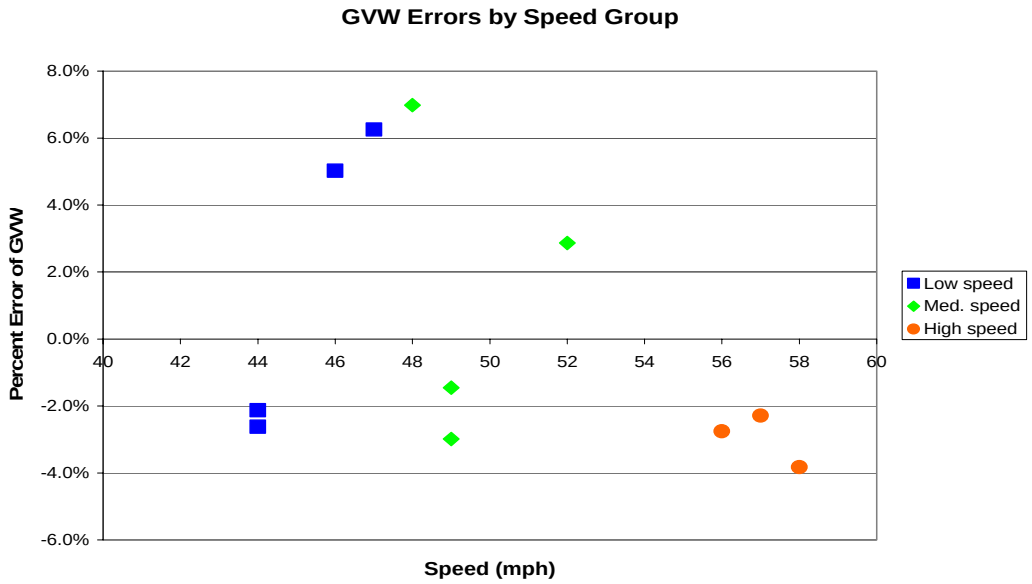


Figure 5-1 Calibration Iteration 1 GVW Percent Error vs. Speed Group - 390200 –11-May-2005 (beginning 2:20 PM)

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 5-2 has the information found in TRF_CALIBRATION_AVC for site visits and Sheet 16s submitted prior to this validation as well as the information for the current visit

Table 5-2 Classification Validation History - 390200

Date	Method	Mean Difference				Percent Unclassified
		Class 9	Class 8	Other 1	Other 2	
09/17/1999	No data available					
04/09/2001	No data available					
05/29/2002	No data available					
11/12/2003	No. Trucks	0	17	N/A	N/A	0
2/4/2004	No. Trucks	-3	0	-70 (Class 5)	N/A	0
4/14/2004	No. Trucks	-6	50	200 (Class 7)	-67 (Class 6)	0
4/15/2004	No. Trucks	-5	20	25 (Class 5)	-33 (Class 6)	0
5/10/2005	No. of Trucks	0	0	-50 (Class 5)		0
5/12/2005	No. of Trucks	2.7	0	-27.3 (Class 5)		0

Table 5-3 has the information found in TRF_CALIBRATION_WIM for site visits and Sheet 16s submitted prior to this validation as well as the information for the current visit.

Table 5-3 Weight Validation History - 390200

Date	Method	Mean Error and (SD)		
		GVW	Single Axles	Tandem Axles
09/17/1999	Test Trucks	No data available		
04/09/2001	Test Trucks	No data available		
05/29/2002	Test Trucks	-1.5 (3.2)	2.1 (3.4)	-2.0 (3.1)
2/3/2004	Test Trucks	6.4 (3.6)	-1.3 (3.5)	10.5 (8.9)
2/4/2004	Test Trucks	0.4 (5.1)	-7.2 (2.8)	4.0 (9.8)
4/14/2004	Test Trucks	-2.7 (3.6)	-6.6 (3.7)	0.0 (5.4)
4/15/2004	Test Trucks	-0.8 (3.6)	-4.6 (4.1)	-1.5 (5.0)
5/11/2005	Test Trucks	2.9 (6.2)	-1.6 (4.9)	3.8 (7.5)
5/12/2005	Test Trucks	0.3 (3.1)	-5.1 (3.6)	1.5 (4.6)

5.4 Projected Maintenance/Replacement Requirements

The system algorithm needs to be reviewed to correct the problem associated with classifying type 3, 4, and 5 vehicles.

6 Pre-Validation Analysis

This pre-validation analysis is based on test runs conducted May 10 during the mid afternoon to early evening hours and May 11 during the mid-morning hours at test site 390200 on US Route 23. This SPS-2 site is at milepost 19.7 on the northbound, right hand lane of a divided four-lane 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 air suspension loaded to 75,420 lbs. (Golden Truck A)
2. 5-axle tractor semi-trailer combination with a tractor having air suspension and trailer with standard rear tandem and leaf spring suspension loaded to 51,900 lbs. (Class 9)
3. 5-axle tractor semi-trailer combination with a tractor having an air suspension and trailer with standard rear tandem and air suspension loaded to 76,680 lbs. (Golden Truck B)

Golden Truck A and Class 9 were used during the initial day of testing on May 10, 2005. On day two, Golden Truck B was substituted for Golden Truck A because Golden Truck A could not longer be provided by the vendor. Golden Truck B was similar in weight and dimension to Golden Truck B and was deemed an acceptable substitute by the field leader and state representative.

For the initial validation Golden Truck A, Class 9 and Golden Truck B made a total of 12, 21 and 9 passes respectively over the WIM scale at speeds ranging from approximately 43 to 57 miles per hour. Pavement surface temperatures were recorded during the test runs ranging from about 77 to 103 degrees Fahrenheit. The computed values of 95% confidence limits of each statistic for the total population are within Table 6-1.

The site met only the spacing and single axle precision requirements based on the initial validation runs.

Table 6-1 Pre-Validation Results - 390200 – 11-May-2005

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Single axles	±20 percent	-1.6%±10.0%	Pass
Tandem axles	±15 percent	**3.8%±15.0%**	**Fail**
Gross vehicle weights	±10 percent	**2.9%±12.5%**	**Fail**
Vehicle speed	±1 mph [2 km/hr]	**0.6±0.9 mph**	**Fail**

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Axle spacing length	± 0.5 ft [150 mm]	0.0±0.2 ft	Pass

The test runs were conducted primarily during the afternoon hours on May 10 and the morning hours on May 11, resulting in a reasonably 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 two temperature groups. The distribution of runs within these groupings is illustrated in Figure 6-1. The figure indicates that the desired distribution of speed and temperature combinations was achieved for this set of validation runs.

The speed groups were divided as follows: Low speed - 42-47 mph, Medium speed - 48-52 mph and High speed 53+ mph. The three temperature groups were created by splitting the runs between those at 75 to 90 degrees Fahrenheit for Low temperature and 91 to 105 degrees Fahrenheit for High temperature.

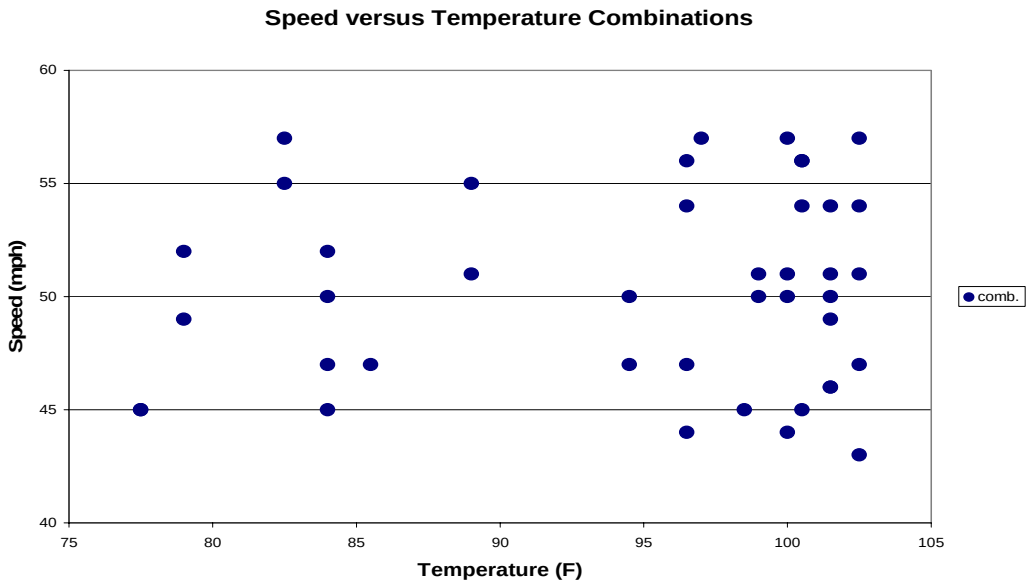


Figure 6-1 Pre-Validation Speed-Temperature Distribution – 390200 – 11-May-2005

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

Figure 6-2 shows the GVW Percent Error vs. Speed graph for the population as a whole. The estimation of GVW by the WIM equipment appears to decrease slightly from lower speeds to higher speeds. Variability in GVW error is somewhat less at high speeds when compared to low and medium speeds.

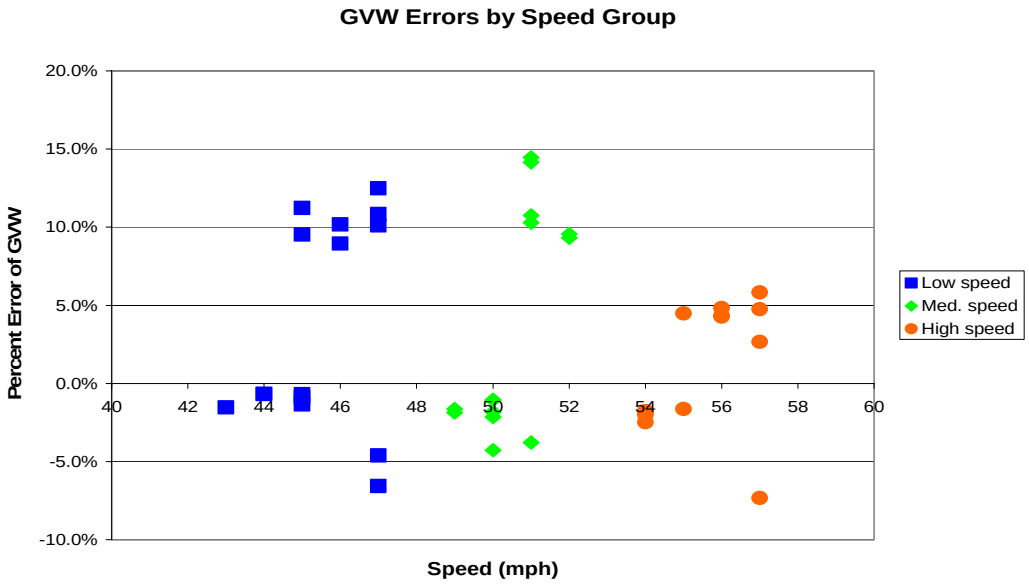


Figure 6-2 Pre-validation GVW Percent Error vs. Speed – 390200 –11-May-2005

Figure 6-3 shows the relationship between temperature and GVW percentage error. There does not appear to be a relationship between GVW error and temperature at this site.

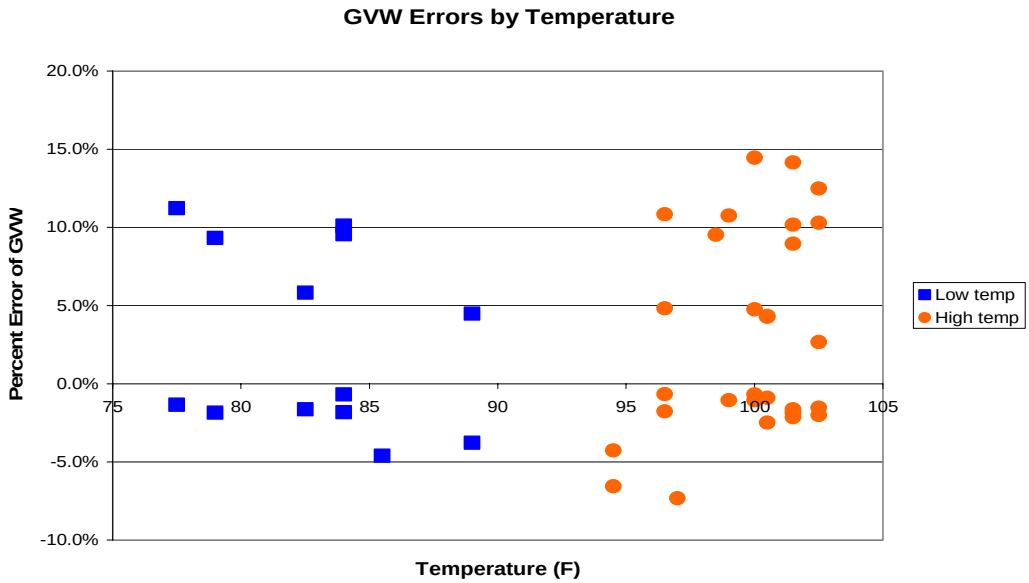


Figure 6-3 Pre-Validation GVW Percent Error vs. Temperature - 390200 –11-May-2005

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. This figure indicates that there is no effect from speed on the ability of the WIM equipment to measure axle spacing.

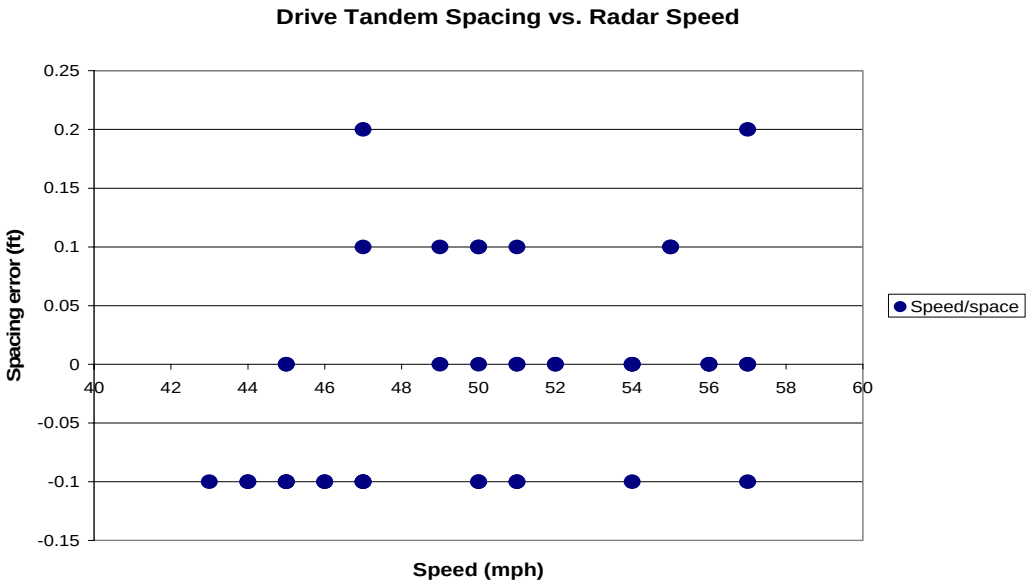


Figure 6-4 Pre-Validation Spacing vs. Speed - 390200 – 11-May-2005

6.1 Temperature-based Analysis

The two temperature groups were created by splitting the runs between those at 75 to 90 degrees Fahrenheit for Low temperature and 91 to 105 degrees Fahrenheit for High temperature.

Table 6-2 Pre-Validation Results by Temperature Bin - 390200 –11-May-2005

Element	95% Limit	Low Temperature 75-90°F	High Temperature 91-105 °F
Single axles	±20 %	-1.8%±9.2%	-1.6%±10.9%
Tandem axles	±15 %	3.6%±14.6%	3.9%±15.6%
GVW	±10 %	2.7%±12.8%	3.0%±13.2%
Speed	±1 mph	0.6±0.9 mph	0.6±0.9 mph
Axle spacing	± 0.5 ft	0.0±0.2 ft	0.0±0.2 ft

As shown in Table 6-2, mean error and variability in error are fairly consistent over the course of the entire speed range.

Figure 6-3 shows the distribution of GVW errors versus temperature by truck. Estimation of GVW by the equipment appears to fairly accurate for Golden Truck A (squares) and Golden Truck B (triangles) with a slight underestimation for GVW at the higher speeds. GVW for the Class 9 (diamonds) is generally overestimated. The scatter of the errors for

the Golden Truck A and Golden Truck B also appears generally small when compared to the Class 9 test truck.

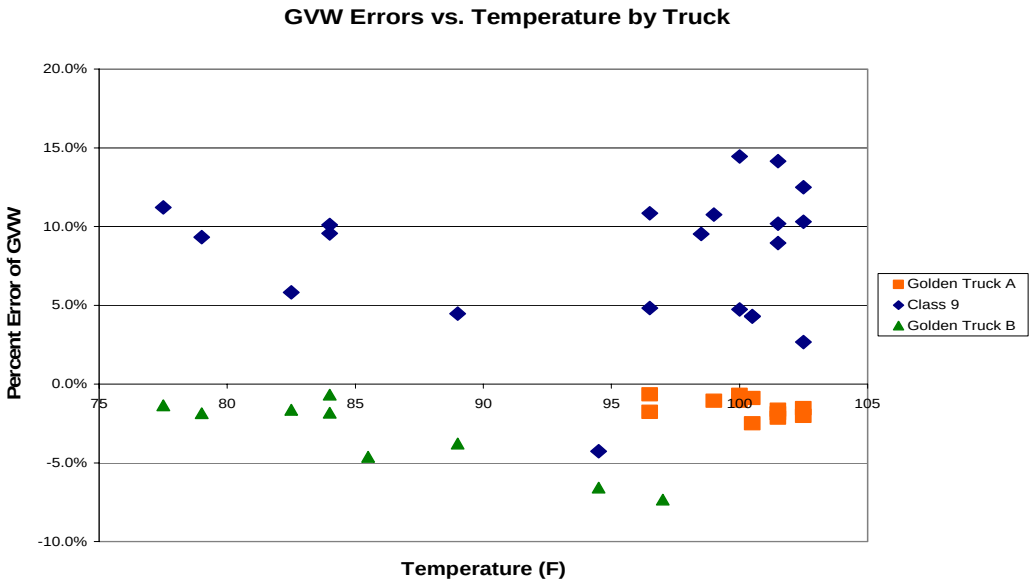


Figure 6-5 Pre-Validation GVW Percent Error vs. Temperature by Truck – 390200 –11-May-2005

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 calibration. This site does not use auto-calibration. From the figure it can be seen that the equipment generally estimates steering axle weights accurately, however variability in the steering axle error is somewhat larger at high temperatures when compared to low temperatures.

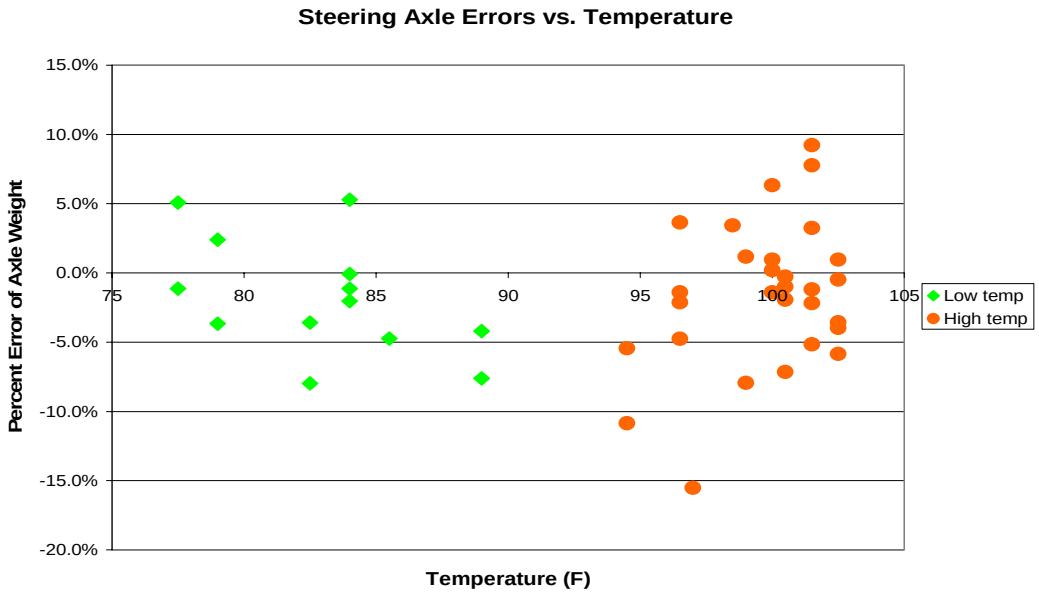


Figure 6-6 Pre-Validation Steering Axle Error vs. Temperature by Group - 390200 –11-May-2005

6.2 Speed-based Analysis

The speed groups were divided as follows: Low speed - 42-47 mph, Medium speed - 48-54 mph and High speed 53+ mph.

Table 6-3 Pre-Validation Results by Speed Bin - 390200 –11-May-2005

Element	95% Limit	Low Speed 42-47 mph	Medium Speed 48-52 mph	High Speed 53+ mph
Single axles	±20 %	0.6%±11.2%	-1.2%±8.7%	-4.7%±9.0%
Tandem axles	±15 %	4.4%±15.6%	4.7%±18.9%	2.3%±10.6%
GVW	±10 %	3.8%±14.5%	3.6%±15.5%	1.1%±8.9%
Speed	±1 mph	0.6±0.9 mph	0.6±0.9 mph	0.6±0.9 mph
Axle spacing	± 0.5 ft	0.2±0.2 ft	0.0±0.2 ft	0.0±0.2 ft

It appears from the table that for the truck population as a whole there is a decrease in mean error for all weights at the high speeds. The variability peaks at the medium speeds for tandem and GVW weights while dipping at medium speeds for single axles.
Figure 6-7 shows the consistent performance of the WIM equipment with regard to the heavier trucks, Golden Truck A (squares) and Golden Truck B (triangles), while the equipment overestimates the Class 9 truck weights (diamonds) by around 10.0% at the low and medium speeds and around 5.0% at the high speeds. The variability for the Class 9 truck is slightly larger at all speeds when compared to the other trucks.

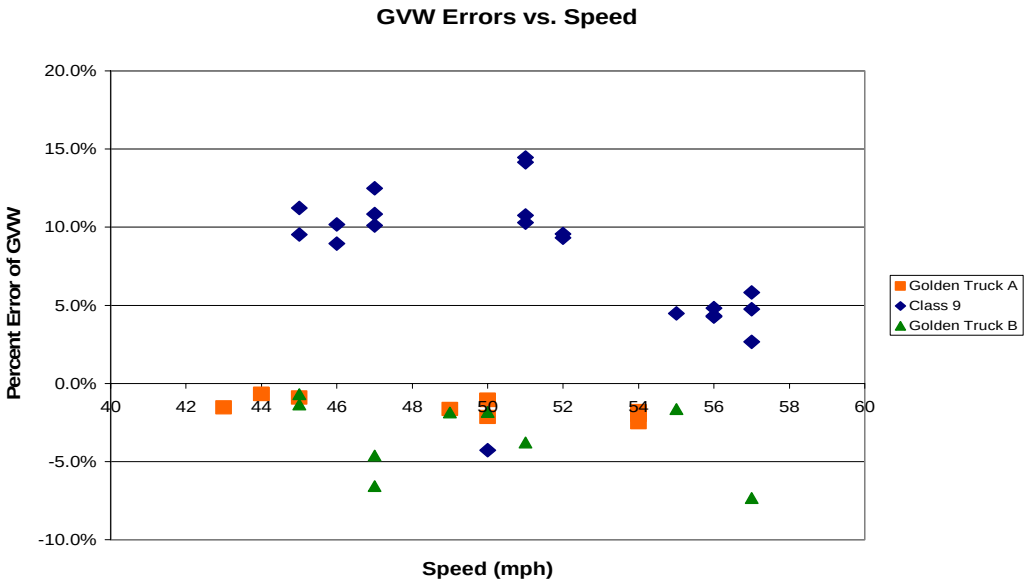


Figure 6-7 Pre-Validation GVW Percent Error vs. Speed Group - 390200 –11-May-2005

Figure 6-8 shows the relation between steering axle errors and speed. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for calibration. This site does not use auto-calibration. From the figure it can be seen that the mean error for steering axles decreases as speeds increase. Distribution of error is generally similar at all speeds.

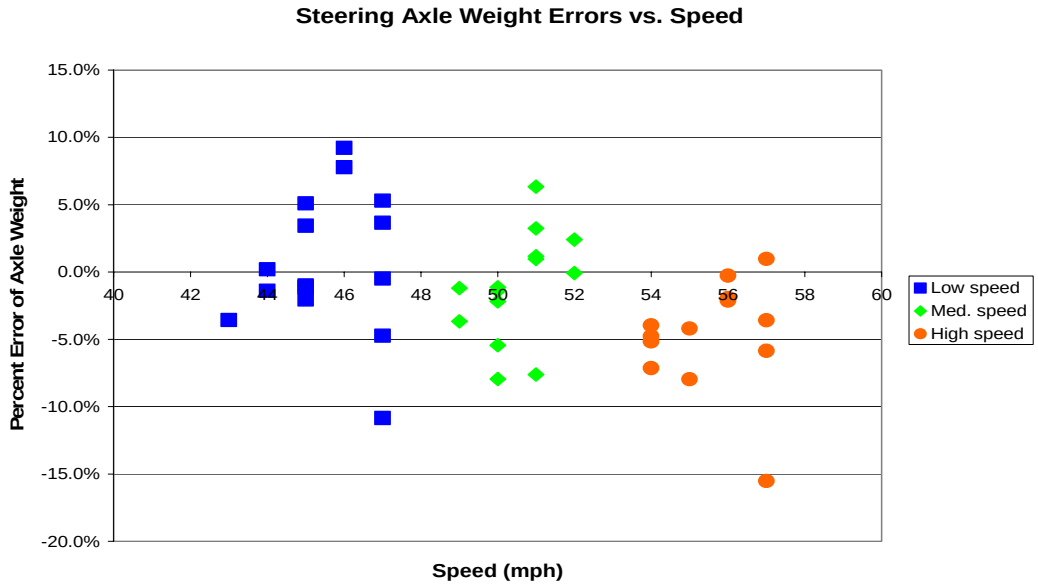


Figure 6-8 Pre-Validation Steering Axle Percent Error vs. Speed Group - 390200 –11-May-2005

6.3 Classification Validation

The agency uses the FHWA 13-bin classification scheme.

A sample of 100 vehicles 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 0 percent unknown vehicles and 0 percent unclassified vehicles.

The second check is the ability of the algorithm to correctly distinguish between truck classes with no more than 2% errors in such classifications. Table 6-4 has the classification error rates by class. The overall misclassification rate is 15.2% and is based on light, single unit vehicles.

Table 6-4 Truck Misclassification Percentages for 390200 - 11-May-2005

Class	Percent Error	Class	Percent Error	Class	Percent Error
4	100%	5	50%	6	0.0%
7	0.0%				
8	0.0%	9	0.0%	10	0.0%
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 reported above 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 390200 - 11-May-2005

Class	Mean Difference	Class	Mean Difference	Class	Mean Difference
4	UNK	5	-50.0	6	0.0
7	N/A				
8	0.0	9	0.0	10	0.0
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 be present exist. N/A means no vehicles of the class recorded by either the equipment or the

observer. As can be seen in Table 6-5 the misclassification appears to be limited to vehicles that might be described as Class 5s.

6.4 Evaluation by ASTM E-1318 Criteria

The ASTM E-1318 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 **not** have met the conditions for a Type I site. As, LTPP does not validate WIM performance with respect to wheel loads the field validation procedures did not include verification of that information. Table 6-6 shows the results using ASTM processes, exclusive of the wheel loads.

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

Characteristic	Limits for Allowable Error	Percent within Allowable Error	Pass/Fail
Single Axles	± 20%	100%	Pass
Axle Groups	± 15%	**91.7%**	**Fail**
GVW	± 10%	**78.6%**	**Fail**

7 Data Availability and Quality

As of May 12, 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 all years represented except for 2002 have a sufficient quantity to be considered complete years of data. For 2002 the weight data is sufficient to be a complete year of data. In the absence of previously gathered validation 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.

Table 7-1 Amount of Traffic Data Available 390200 –12-May-2005

Year	Classification Days	Months	Coverage	Weight Days	Months	Coverage
1998	255	11	Complete Week	272	11	Complete Week

Year	Classification Days	Months	Coverage	Weight Days	Months	Coverage
2000	274	11	Complete Week	323	12	Complete Week
2001	273	12	Complete Week	290	11	Complete Week
2002	170	10	Complete Week	249	11	Complete Week
2003	282	12	Complete Week	298	12	Complete Week

Data was not available after the download to create graphs of expected shapes of Class 9 GVW, vehicle distribution and speed curves. The RSC will need to create such comparison information on receipt of the first post-validation data submission from the agency.

8 Data Sheets

The following is a listing of data sheets and photographs incorporated in Appendix A. Appendix A follows after the Sheet 16 information at the very end of the report.

Sheet 19 – Truck 1 – 3S2 loaded air suspension (4 pages)
Sheet 19 – Truck 2 – 3S2 partially loaded leaf spring suspension (8 pages)
Sheet 19 – Truck 3 – 3S2 loaded air suspension (4 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 (7 pages)
Sheet 21 – Calibration Iteration 1 – (2 pages)
Sheet 21 – Post-validation (5 pages)

Calibration Iteration 1 Worksheets – (1 page)

Test Truck Photographs (7 pages)

9 Updated Handout guide and Sheet 17

A copy of the post-visit handout has been included following page 32. It includes a current Sheet 17 with all applicable maps and photographs. There are no significant changes in the information provided.

10 Updated Sheet 18

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

11 Traffic Sheet 16(s)

Sheet 16s for the pre-validation and post-validation conditions are attached following the current Sheet 18 information.

POST-VISIT HANDOUT GUIDE FOR SPS WIM FIELD VALIDATION

STATE: Ohio

SHRP ID: 0200

Figures

1. General Information

SITE ID: *390200*

LOCATION: *US 23 North (Mile Post: 19.7) at Delaware*

VISIT DATE: *Beginning May 10th, 2005*

VISIT TYPE: *Validation*

2. Contact Information

POINTS OF CONTACT:

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

Highway Agency: *Steven Jessberger, 614-752-4057, steven.jessberger@dot.state.oh.us*

Roger Green, 614-995-5993, roger.green@dot.state.oh.us

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

FHWA Division Office Liaison: *Bob McQuiston, 614-280-6848, bob.mcqiston@fhwa.dot.gov*

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

3. Agenda

BRIEFING DATE: *No Briefing Requested*

ONSITE PERIOD: *May 10th through May 12th, 2005*

TRUCK ROUTE CHECK: *Completed (See Truck Route)*

4. Site Location/ Directions

NEAREST AIRPORT: *Port Columbus International Airport, Columbus, OH*

DIRECTIONS TO THE SITE: *7.6 miles North of SR 37*

MEETING LOCATION: *On site*

WIM SITE LOCATION: *US 23North, Milepost 19.7*

WIM SITE LOCATION MAP:*See Figure 4.1*

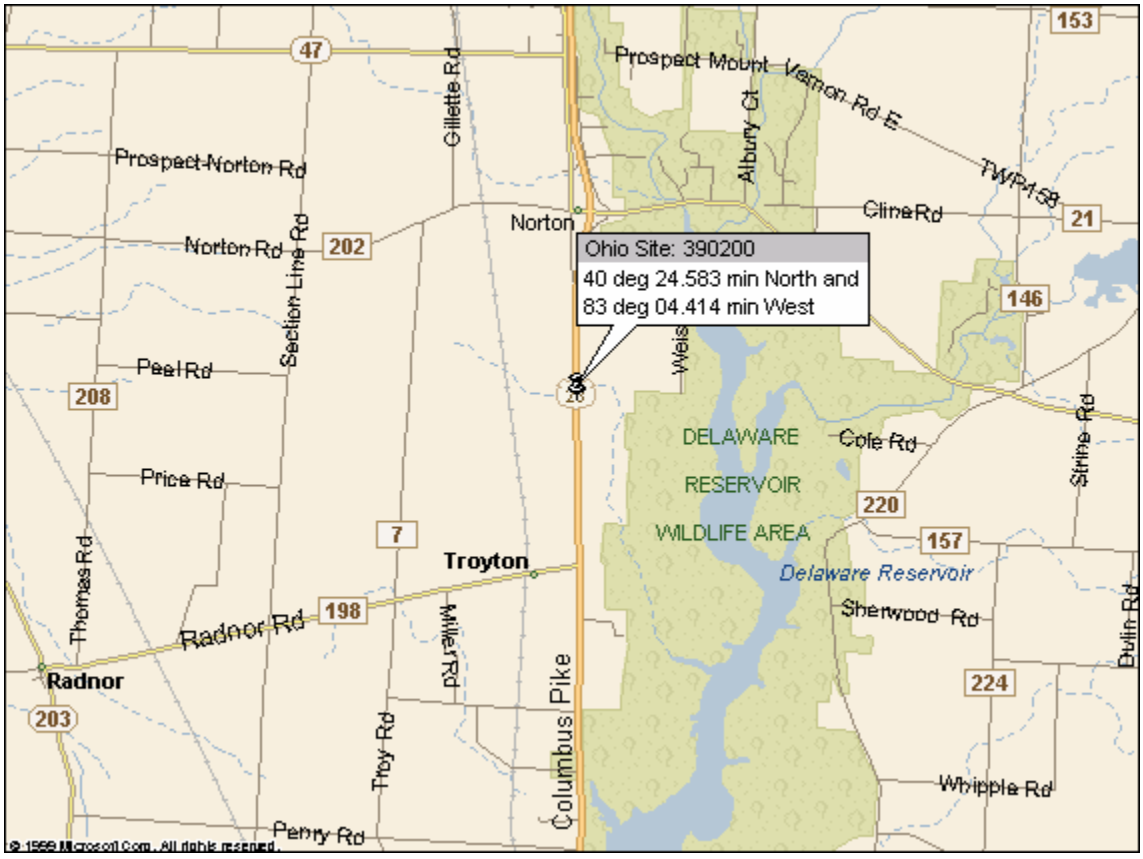


Figure 4-1 - Section 390200 near Delaware, Ohio

5. Truck Route Information

ROUTE RESTRICTIONS: *None*

SCALE LOCATION: *I-71 Milepost 129, Hours: 7:00 a.m.-3:00 p.m. and 8:00 p.m.-4:00 a.m. Contact: Don Brane (740) 965-3105. CAT Scales at Pilot Travel, I-71 at Exit 131, Sunbury, OH.*

TRUCK ROUTE:

- *Northbound Turnaround –1.678 miles from site at SR 229 (40^0 26.035' North and 83^0 04. 363' West)*
- *Southbound Turnaround –1.424 miles from site at Irwin Road (40^0 23. 356' North and 83^0 04.459' West)*

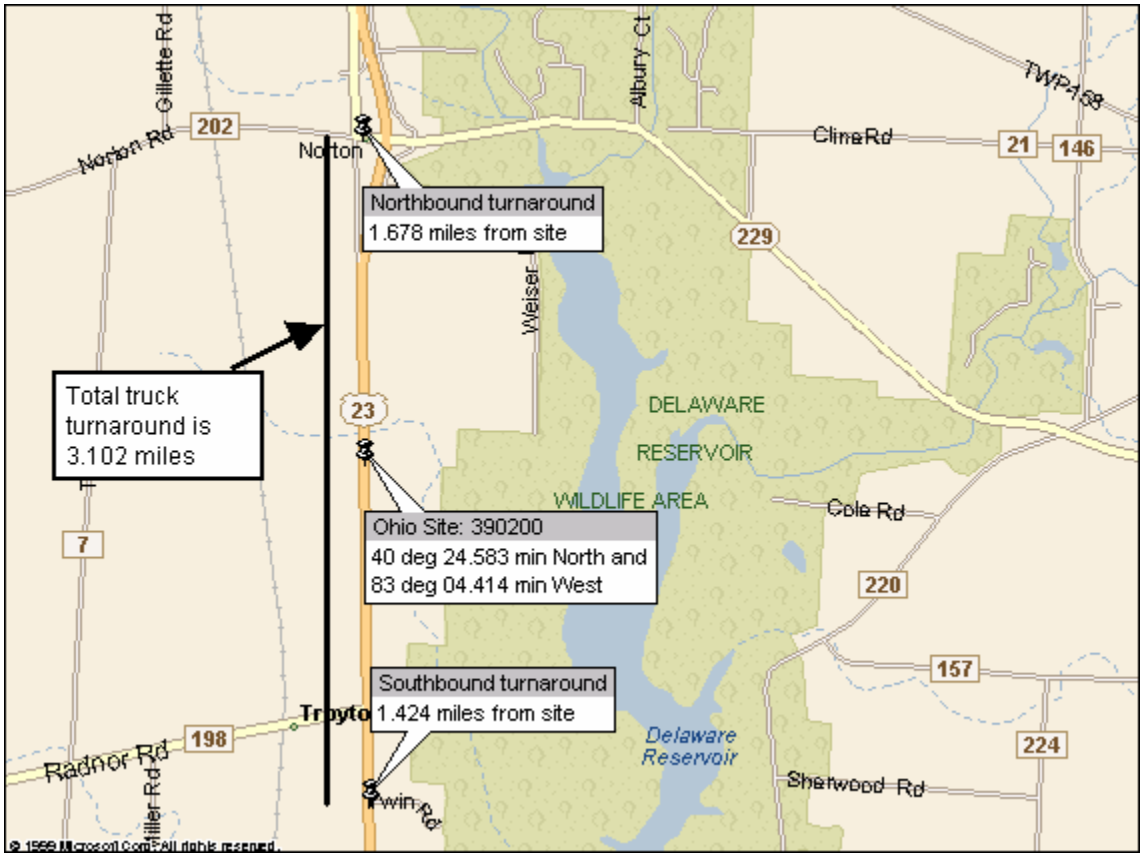


Figure 5-1 - Truck Turnaround Map at 390200

6. Sheet 17 – Ohio (390200)

1.* ROUTE ___US 23____ MILEPOST ___19.745__LTPP DIRECTION - N S E W

2.* WIM SITE DESCRIPTION - Grade __<_1_____ % Sag vertical Y / N
Nearest SPS section upstream of the site _0__ _2__ __6_ _1__
Distance from sensor to nearest upstream SPS Section ___ _4__ _0__ _5__ 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 _____ Cement Concrete_____

5.* PAVEMENT SURFACE CONDITION – Distress Survey
Date _11-12-03_ Photo Filename_ TO_1_39_7A_0200_Downstream_11_12_03.jpg _
Date _11-12-03_Photo Filename_ TO_1_39_7A_0200_Upstream_11_12_03.jpg _
Date _11-12-03_ Photo Filename_____

6. * SENSOR SEQUENCE _____Loop – Load Cell – Load Cell_

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 _5_ _4_ ft

Distance from system __8__5__ ft

TYPE ___ M_____

CABINET ACCESS controlled by LTPP / STATE / JOINT?

Contact - name and phone number ___Steven Jessberger 614-752-4057__

Alternate - name and phone number ___Dave Gardner 614-752-5740____

11. * POWER

Distance to cabinet from drop ___ _1__ _0__ ft Overhead / underground / solar / AC in cabinet?

Service provider __Amer. Elec. Power___Phone number _____

12. * TELEPHONE

Distance to cabinet from drop _9__ _9__ _1__ ft Overhead / under ground / cell?

Service provider ____Verizon__ Phone Number _____

13.* SYSTEM (software & version no.)- _____Mettler - Toledo_____

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

14. * TEST TRUCK TURNAROUND time __10_____ minutes DISTANCE _6.2__ mi.

15. PHOTOS FILENAME

Power source _ TO_9_39_2.50_0200_AC_Meter_Box_05_10_05.jpg ____

Phone source _ TO_1_39_7A_0200_Phone_Pedestal_11_12_03.jpg _____

Cabinet exterior _ TO_9_39_2.50_0200_Cabinet_Exterior_05_10_05.jpg ___

Cabinet interior _ TO_9_39_2.50_0200_Cabinet_Interior_05_10_05.jpg ____

Weight sensors _ TO_9_39_2.50_0200_Leading_WIM_Sensor_05_10_05.jpg __

Classification sensors _ TO_9_39_2.50_0200_Trailing_WIM_Sensor_05_10_05.jpg ___

Other sensors _ TO_9_39_2.50_0200_Loop_Sensor_05_10_05.jpg _

Description _____

Downstream direction at sensors on LTPP lane

___TO_1_39_7A_0200_Downstream_11_12_03.jpg _____

Upstream direction at sensors on LTPP lane

___TO_1_39_7A_0200_Upstream_11_12_03.jpg _____

COMMENTS

GPS Coordinates for site: 40^0 24.583' North and 83^0 04.414' West

Amenities_-_5.5_miles_ south_of_site
Food_-Wendy's & Mc Donald's
Gas_-_Citgo, Sunoco, mini-mart
Miscelleaneous_-_84 Lumber
Hotel_-_Travel Lodge

10.0_miles south of site

Food_-_Damon's, Wendy's, Taco Bell, Kroger's
Hotel_-_Super 8, Ameri Host
Miscellaneous_- Banks, Wal-Mart, Sears Hardware

Contact for Lane Switch -__Dave Zurbe – 740-363-1251_(ext 266) - Striping
Roger Green – LTPP Division Liaison (Ohio)
Delaware County Garage – Bob Lloyd 740-369-1569

Types of Trucks: Two Class 9s

Expected Weight Ranges: Truck 1 –72,000 to 80,000 legal limit on gross and axles, air suspension;
Truck 2 – partially loaded to approximately 50,000 lbs no suspension requirements;

Speeds to be run: 45 to 55 mph_(Posted Speed Limit is 55 mph)
Corrective actions recommended: Controller classification firmware should be updated to facilitate the use of weights in the classification process.

COMPLETED BY ____Dean J. Wolf

PHONE _301-210-5105_____DATE COMPLETED _0_ 5_ /_1_ 0_ / _2_ 0_ 0_ 5_

Sketch of equipment layout

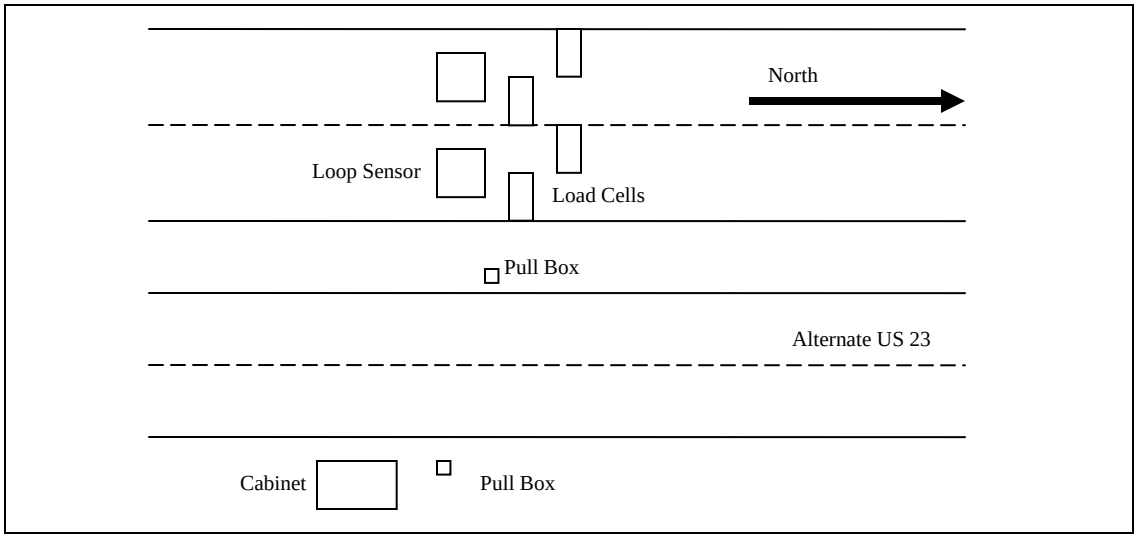


Figure 6-1 – Sketch of Equipment layout at 390200

Site Map

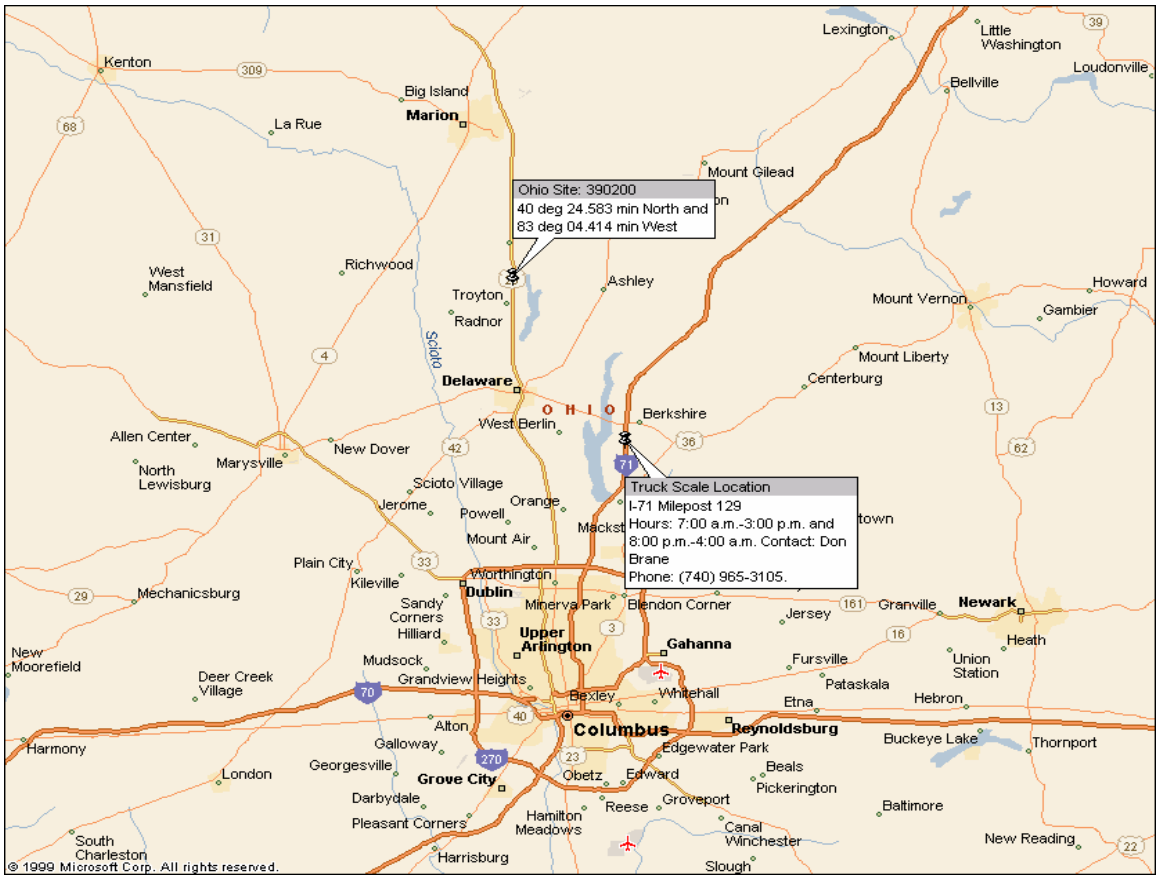


Figure 6-2 - Site map at 390200

TO_1_39_7A_0200_Downstream_11_12_03.jpg

TO_1_39_7A_0200_Upstream_11_12_03.jpg

TO_9_39_2.50_0200_AC_Meter_Box_05_10_05.jpg

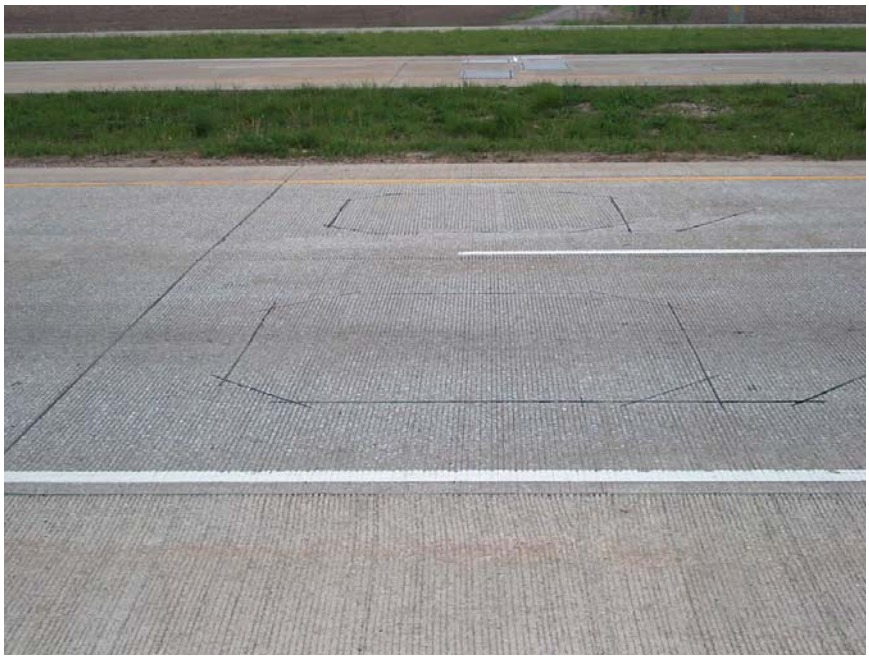
TO_1_39_7A_0200_Phone_Pedestal_11_12_03.jpg

TO_9_39_2.50_0200_Cabinet_Exterior_05_10_05.jpg

TO_9_39_2.50_0200_Cabinet_Interior_05_10_05.jpg

TO_9_39_2.50_0200_Leading_WIM_Sensor_05_10_05.jpg

TO_9_39_2.50_0200_Trailing_WIM_Sensor_05_10_05.jpg



TO_9_39_2.50_0200_Loop_Sensor_05_10_05.jpg

SHEET 18	STATE CODE [_39]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [_0200 _]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) __05_ / __10_ / __ 2005_ __

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 - __14__ ■ 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_____	□ State	■ LTPP
3rd – _____	□ State	□ LTPP
4th – _____	□ State	□ LTPP

ii. Loads – □ State ■ LTPP

iii. Drivers – □ State ■ LTPP

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

_____

g. Access to cabinet

i. Personnel Access –

■ State only
□ Joint
□ LTPP

ii. Physical Access –

■ Key
□ Combination

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

i. Traffic Control Required – □Yes ■No

j. Enforcement Coordination Required – □Yes ■No

5. SITE SPECIFIC CONDITIONS –

a. Funds and accountability – _____

b. Reports – _____

c. Other – _____

d. Special Conditions – _____

6. CONTACTS –

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

Name: _ Steven Jessberger_ Phone: __614-752-4057_____

Agency: ____Ohio DOT_____

b. Maintenance (equipment) –

Name: _____Steven Jessberger_ Phone: __614-752-4057___

Agency: _____Ohio DOT_____

c. Data Processing and Pre-Visit Data –

Name: _____Steven Jessberger_ Phone: __614-752-4057___

Agency: _____Ohio DOT_____

d. Construction schedule and verification –

Name: _____ Phone: _____

Agency: _____

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

Name: _____ Phone: _____

Agency: _____

f. Traffic Control –

Name: _____ Phone: _____

Agency: _____

g. Enforcement Coordination –

Name: _____ Phone: _____

Agency: _____

h. Nearest Static Scale

Name: __CAT Scale_____ Location:_I-71 exit 133____

Phone: _____

SHEET 16 **LTPP MONITORED TRAFFIC DATA** **SITE CALIBRATION SUMMARY**	*STATE ASSIGNED ID [__0_7_2_1_] *STATE CODE [_3_9_] *SHRP SECTION ID [_0_2_0_0__]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [_0_5_ / _1_1_ / _2_0_0_5 __]

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

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

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

5. EQUIPMENT MANUFACTURER _____Mettler-Toledo_____

WIM SYSTEM CALIBRATION SPECIFICS**

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

   __ __ __ NUMBER OF TRUCKS COMPARED __3__ __ NUMBER OF TEST TRUCKS USED

   __1_4 __ PASSES PER TRUCK

	TRUCK	TYPE	SUSPENSION
TYPE PER FHWA 13 BIN SYSTEM	1	___9____	____1_____
SUSPENSION: 1 - AIR; 2 - LEAF SPRING	2	___9____	____2_____
3 - OTHER (DESCRIBE)	3	___9____	____2_____

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
   MEAN DIFFERENCE BETWEEN ---
   DYNAMIC AND STATIC GVW ___ ___ _2_ . 9_ STANDARD DEVIATION __ _6 . 2_
   DYNAMIC AND STATIC SINGLE AXLES ___ ___ - 1 . 6_ STANDARD DEVIATION __ _4 . 9_
   DYNAMIC AND STATIC DOUBLE AXLES ___ ___ _3_ . 8_ STANDARD DEVIATION __ _7 . 5_

8. ___3____ NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED

9. DEFINE THE SPEED RANGES USED (MPH) _____40-47, 48-52, 53+ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) _light truck = .998015992;
    medium truck = .927573608; heavy truck = .937089650___

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 ____ __0_._0__ FHWA CLASS ____ ____ ____ ____ ____
    FHWA CLASS ____ ____ ____ ____ ____
    FHWA CLASS ____ ____ ____ ____ ____
    *** PERCENT "UNCLASSIFIED" VEHICLES: ____ __0_ . _0__

PERSON LEADING CALIBRATION EFFORT: ___Dean J. Wolf_____
CONTACT INFORMATION: __MACTEC Engineering and Consulting 301-210-5105_____ rev. November 9, 1999

SHEET 16 **LTPP MONITORED TRAFFIC DATA** **SITE CALIBRATION SUMMARY**	*STATE ASSIGNED ID [__0_7_2_1_] *STATE CODE [_3_9_] *SHRP SECTION ID [_0_2_0_0__]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [_0_5_ / _1_2_ / _2_0_0_5 __]

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

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

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

5. EQUIPMENT MANUFACTURER _____Mettler-Toledo_____

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

   __2_1 __ PASSES PER TRUCK

	TRUCK	TYPE	SUSPENSION
TYPE PER FHWA 13 BIN SYSTEM	1	___9____	____1_____
SUSPENSION: 1 - AIR; 2 - LEAF SPRING	2	___9____	____2_____
3 - OTHER (DESCRIBE)	3	_____	_____

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
   MEAN DIFFERENCE BETWEEN ---
   DYNAMIC AND STATIC GVW ___ ___ _0_ . 3_ STANDARD DEVIATION __ _3 . 1_
   DYNAMIC AND STATIC SINGLE AXLES ___ ___ - 5 . 1_ STANDARD DEVIATION __ _3 . 6_
   DYNAMIC AND STATIC DOUBLE AXLES ___ ___ _1_ . 5_ STANDARD DEVIATION __ _4 . 6_

8. ___3____ NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED

9. DEFINE THE SPEED RANGES USED (MPH) _____40-47, 48-52, 53+ _____ _____ _____ _____ _____
   _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) _light truck = .998015992;
    medium truck = .927573608; heavy truck = .937089650___

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 ____ __2_._7__ FHWA CLASS ____ ____ ____ ____ ____
    *** FHWA CLASS 8 ____ __0_._0__ FHWA CLASS ____ ____ ____ ____ ____
    FHWA CLASS ____ ____ ____ ____ ____
    FHWA CLASS ____ ____ ____ ____ ____
    *** PERCENT "UNCLASSIFIED" VEHICLES: ____ __0_ . _0__

PERSON LEADING CALIBRATION EFFORT: ___Dean J. Wolf_____
CONTACT INFORMATION: __MACTEC Engineering and Consulting 301-210-5105_____ rev. November 9, 1999

APPENDIX A

Sheet 19	* STATE_CODE	39
LTPP Traffic Data	* SPS PROJECT ID	0100 / 0200
*CALIBRATION TEST TRUCK # 1	* DATE	05/10/05

Rev. 08/31/01

PART I.

truck # 158

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

day 1 only

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		10180	9980	(D) / C
B		16620	16590	D / (C)
C		16620	16590	D / (C)
D		16060	16070	D / (C)
E		16060	16070	D / (C)
F				D / C

GVW (same units as axles)

7. a) Empty GVW unk

*b) Average Pre-Test Loaded weight 75540
*c) Post Test Loaded Weight 75300
*d) Difference Post Test – Pre-test -240

GEOMETRY

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

9. a) * Make: Great Freightliner b) * Model: Century

10.* Trailer Load Distribution Description:
Pallets loaded evenly along trailer

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

b). Trailer Tare Weight (units): unk

Sheet 19	* STATE_CODE	39
LTPP Traffic Data	* SPS PROJECT ID	0100/ 0200
*CALIBRATION TEST TRUCK # 1	* DATE	05/10/05

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

A to B 17' 1" B to C 4' 3" C to D 37' 3"

D to E 4' 1" E to F _____

Wheelbased (measured A to last) _____ Computed 62.8

13. *Kingpin Offset From Axle B (units) +1.75 (_____)

(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	295/75R225	Full Spring leaf 2 leaves
B	"	AIR
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	39
LTPP Traffic Data	* SPS PROJECT ID	0100/0200
*CALIBRATION TEST TRUCK #1	* DATE	05/10/05

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		II -I		III -II		IV -III		V -IV		V	
V -VI		VI- VII		VII- VIII		VIII- IX		IX`		X	
										XI	
Avg.											

Table 2. Raw Axle and GVW measurements

Axles	Meas.	Pre-test Weight			Post-test Weight
A	I				
A + B	II				
A + B + C	III				
A + B + C + D	IV				
A + B + C + D + E (1)	V				
B + C + D + E	VI				
C + D + E	VII				
D + E	VIII				
E	IX				
A + B + C + D + E (2)	X				
A + B + C + D + E (3)	XI				

Table 3. Axle and GVW computations - post -test

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.											

Sheet 19	* STATE_CODE	39
LTPP Traffic Data	* SPS PROJECT ID	0100 / 0200
*CALIBRATION TEST TRUCK # 1	* DATE	05/10/05

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	10,180	16620	16620	16060	16060		75540
2	10,200	16610	16610	16060	16060		75540
3	10,160	16630	16630	16060	16060		75540
Average	10,180	16620	16620	16060	16060		75540

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	9980	16590	16590	16070	16070		75300
2							75300
3							75300
Average	9980	16590	16590	16070	16070		75300

Measured By SW Verified By DJW

Sheet 19	* STATE_CODE	39
LTPP Traffic Data	* SPS PROJECT ID	0200
*CALIBRATION TEST TRUCK # 2	* DATE	05/10/05

Rev. 08/31/01

days 1+2

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		9760	9620	(D) / C
B		10620	10526	D / (C)
C		10620	10570	D / (C)
D		10510	10510	D / (C)
E		10510	10510	D / (C)
F				D / C

GVW (same units as axles)

7. a) Empty GVW unk

*b) Average Pre-Test Loaded weight 52010
*c) Post Test Loaded Weight 51780
*d) Difference Post Test – Pre-test -30

GEOMETRY

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

9. a) * Make: Freightliner b) * Model: FLD 120

10.* Trailer Load Distribution Description:
Pallet loaded with sand bags along trailer

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

b). Trailer Tare Weight (units): unk

Sheet 19	* STATE_CODE	39
LTPP Traffic Data	* SPS PROJECT ID	0100/ 0200
*CALIBRATION TEST TRUCK # 2	* DATE	05/10/05

Rev. 08/31/01

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

A to B 12' 8" B to C 4' 2" C to D 34' 1"

D to E 4' 1" E to F _____

Wheelbased (measured A to last) _____ Computed 55.2

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	295/75R22.5	Spring leaf, 2 Full leaves
B	"	AIR
C	"	"
D	"	leaf spring, 3 tapper leaves
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	39
LTPP Traffic Data	* SPS PROJECT ID	0100 / 0200
*CALIBRATION TEST TRUCK #2	* DATE	05/10/05

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		II -I		III -II		IV -III		V -IV		V	
V -VI		VI- VII		VII- VIII		VIII- IX		IX`		X	
										XI	
Avg.											

Table 2. Raw Axle and GVW measurements

Axles	Meas.	Pre-test Weight			Post-test Weight
A	I				
A + B	II				
A + B + C	III				
A + B + C + D	IV				
A + B + C + D + E (1)	V				
B + C + D + E	VI				
C + D + E	VII				
D + E	VIII				
E	IX				
A + B + C + D + E (2)	X				
A + B + C + D + E (3)	XI				

Table 3. Axle and GVW computations - post -test

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.											

Sheet 19	* STATE_CODE	34
LTPP Traffic Data	* SPS PROJECT ID	0100/0200
*CALIBRATION TEST TRUCK # 2	* DATE	5/10/05

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	9760	10620	10620	10500	10500		52000
2	9760	10600	10600	10520	10520		52000
3	9740	10640	10640	10510	10510		52040
Average	9760	10620	10620	10510	10510		52010
1st day post	9660	10550	10550	10530	10530		51820

Table 6. Raw data – Axle scales – 2nd day pretest

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9760	10620	10620	10520	10520		52040
2	9740	10630	10630	10510	10510		52020
3	9720	10640	10640	10500	10500		52000
Average	9740	10630	10630	10510	10510		52020
2nd day post	9620	10570	10570	10510	10510		51780

Table 7. Raw ~~data – Axle scales – post test~~ 3rd day pretest

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9860	10620	10620	10540	10540		52180
2	9860	10620	10620	10520	10520		52140
3	9820	10620	10620	10540	10540		52140
Average		10620	10620	10540	10540		52150

Measured By _____ Verified By _____

Sheet 19	* STATE_CODE	39
LTPP Traffic Data	* SPS PROJECT ID	0100/0200
*CALIBRATION TEST TRUCK # 2	* DATE	5/11/05

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days 203

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		9740	9690	(D) / C
B		10430	10610	D / (C)
C		10630	10610	D / (C)
D		10510	10510	D / (C)
E		10510	10510	D / (C)
F				D / C

GVW (same units as axles)

7. a) Empty GVW _____

*b) Average Pre-Test Loaded weight ~~51780~~ 52020

*c) Post Test Loaded Weight 51920

*d) Difference Post Test – Pre-test -100

GEOMETRY

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

9. a) * Make: FREIGHTLINER b) * Model: FL0120

10.* Trailer Load Distribution Description:

PALLETS LOADED WITH SAND BAGS EVENLY ALONG TRAILER

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

b). Trailer Tare Weight (units): UNK

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

A to B 12.9' B to C 4.2' C to D 24.1'

D to E 4.1' E to F _____

Wheelbased (measured A to last) _____ Computed 55.2'

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	295/75R22.5	leaf spring, 2 full leaves
B	"	AIR
C	"	"
D	"	leaf spring, 3 tapered leaves
E	"	"
F	✓	

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

Steering Axle	Axle B	Axle C	Axle D	Axle E
_____	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
_____	_____	_____	_____	_____

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PART II

Table 1. Axle and GVW computations - pre-test

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 2. Raw Axle and GVW measurements

Axles	Meas.	Pre-test Weight			Post-test Weight
A	I				
A + B	II				
A + B + C	III				
A + B + C + D	IV				
A + B + C + D + E (1)	V				
B + C + D + E	VI				
C + D + E	VII				
D + E	VIII				
E	IX				
A + B + C + D + E (2)	X				
A + B + C + D + E (3)	XI				

Table 3. Axle and GVW computations - post -test

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.											

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*CALIBRATION TEST TRUCK # 1	* DATE	5/12/05

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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	9760	10620	10620	10520	10520		52040
2	9740	10630	10630	10510	10510		52020
3	9720	10640	10640	10500	10500		52000
Average	9740	10630	10630	10510	10510		52020
day 2 post	9620	10570	10570	10510	10510		51780

Table 6. Raw data – Axle scales – pre day 3

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9860	10620	10620	10540	10540		52180
2	9860	10620	10620	10520	10520		52140
3	9820	10620	10620	10540	10540		52140
Average	9850	10620	10620	1053	10530		52150

Table 7. Raw data – Axle scales – post-test - 3rd day

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9480	10600	10600	10520	10520		51920
2	9640	10640	10640	10500	10500		51920
3	9740	10590	10590	10500	10500		51920
Average	9690	10610	10610	10510	10510		51920

Measured By DAW Verified By _____

TRUCK 3

Sheet 19	* STATE_CODE 39
LTPP Traffic Data	* SPS PROJECT ID 0100/0200
*CALIBRATION TEST TRUCK # 3	* DATE 5/11/05

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PART I. days 2+3

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		11150		D / C
B		16750		D / C
C		16750		D / C
D		16080		D / C
E		16080		D / C
F				D / C

GVW (same units as axles)

7. a) Empty GVW unk

*b) Average Pre-Test Loaded weight 76800
*c) Post Test Loaded Weight
*d) Difference Post Test – Pre-test

GEOMETRY

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

9. a) * Make: FREIGHTLINER b) * Model: Classics XL

10.* Trailer Load Distribution Description:
Pallet loaded along trailer

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

b). Trailer Tare Weight (units): unk

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*CALIBRATION TEST TRUCK #3	* DATE	5/11/05

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

A to B 4'.1" 20.1' B to C 36'.10" 4.3' C to D 4'.3" 36.8'

D to E 20' 4'.1" E to F _____

Wheelbased (measured A to last) _____ Computed 65.3

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	275/80R24.5	Full spring leaf 2 leaves
B	285/75R 24.5	AIR
C	275/80R 24.5	"
D	295/75R22.5	"
E	"	"
F		

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

Steering Axle	Axle B	Axle C	Axle D	Axle E
_____	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
_____	_____	_____	_____	_____

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LTPP Traffic Data	* SPS PROJECT ID 0100/0200
*CALIBRATION TEST TRUCK #3	* DATE 5/11/05

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PART II

Table 1. Axle and GVW computations - pre-test

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 2. Raw Axle and GVW measurements

Axles	Meas.	Pre-test Weight			Post-test Weight
A	I				
A + B	II				
A + B + C	III				
A + B + C + D	IV				
A + B + C + D + E (1)	V				
B + C + D + E	VI				
C + D + E	VII				
D + E	VIII				
E	IX				
A + B + C + D + E (2)	X				
A + B + C + D + E (3)	XI				

Table 3. Axle and GVW computations - post -test

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.											

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LTPP Traffic Data	* SPS PROJECT ID	010 0/0200
*CALIBRATION TEST TRUCK # 3	* DATE	5/11/05

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3 | 16800

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	11160	16750	16750	16080	16080		76820
2	11160	16740	16740	16080	16080		76800
3	11140	16750	16750	16070	16070		76780
Average	11150	16750	16750	16080	16080		76800
day 2 post	11100	16650	16650	16080	16080		76560

Table 6. Raw data – Axle scales – day 3 pretest

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11660	16910	16910	16070	16070		77620
2	11580	16900	16900	16070	16070		77520
3	11560	16890	16890	16060	16060		77460
Average		16900	16900	16070	16070		77530

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 SW Verified By DJW

Sheet 20	* STATE_CODE	3 9
LTPP Traffic Data	*SPS PROJECT_ID	0 2 0 0
Speed and Classification Checks * 1 of* 2	* DATE	05/10/05

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pre - calibration

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
60	9	7322	58	9	69	3	7688	69	2 cor
59	5	7340	57	5	54	8	7706	55	8
61	9	7364	61	9	49	9	7717	50	9
58	9	7410	57	9	58	5	7731	58	5
58	4	1431	57	5 del trk	57	9	7737	56	9
63	9	7453	62	9	61	2	7752	61	2
56	9	7455	56	9	60	9	7758	60	9
54	9	7462	57	9	58	9	7762	57	9
54	9	7470	54	9	55	9	7767	55	9
59	9	7475	57	9	55	9	7787	55	9
83	3	7486	79	3	68	3	7795	68	3
64	9	7503	64	5 del trk	63	9	7804	62	9
55	9	7523	55	9	56	9	7813	56	9
59	2	7534	59	2	58	9	7817	58	9
56	9	7543	56	9	53	3	7841	53	2 8.7
57	3	7554	57	32 9.5	58	9	7857	58	9
61	9	7563	61	9	58	3	7861	2 58	2 9.4
58	9	7571	58	9	58	9	7895	58	7 ? 5 new axles
61	9	7584	60	9	59	3	7920	59	3
61	9	7591	60	9	63	3	7934	62	3
59	3	7595	59	2 cor	56	3	7937	55	2 9.0
59	9	7604	58	9	61	3	7948	60	2 8.4
54	6	7623	54	6	56	9	7961	55	9
55	9	7662	55	9	53	9	7966	53	9
62	9	7682	61	9	60	9	7980	59	9

Recorded by DJW Direction N Lane 1 Time from 11:00am to 11:35am

Sheet 20	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0206
Speed and Classification Checks * 2 of* 2	* DATE 05/10/2005

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WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
63	9	8008	60	9	60	9	8284	60	9
60	9	8022	59	9	61	3	8331	61	3
61	9	8042	60	9	56	9	8351	56	9
58	7	8052	58	7	58	5	8362	58	5
59	9	8070	59	9	55	4	8377	57	5 21.2
66	3	8075	65	3	57	3	8381	57	3
61	9	8081	59	9	60	9	8400	58	9
63	9	8110	61	9	61	3	8419	61	2 9.8
59	3	8115	59	3 10.1	56	3	8425	55	2 9.5
61	9	8125	60	9	62	3	8432	62	3
66	9	8145	64	9	61	6	8440	60	6
62	9	8153	61	9	57	9	8446	57	9
58	4	8162	56	5 del 23.3 tnk	53	3	8450	52	2 9.3
59	9	8178	58	9	61	3	8468	60	3
61	9	8182	60	9	52	9	8482	52	9
61	4	8184	59	5 22.0 plastic	60	6	8485	60	6
60	3	8199	59	3	55	4	8502	57	5 19.8
61	5	8209	59	5	59	9	8508	58	9
59	5	8230	59	5	57	5	8528	57	5
61	9	8236	60	9	61	9	8536	61	9
58	9	8241	58	9	61 ?	2	8577 ?	61	2 11.1
58	8	8253	58	8	65	9	8559	63	9
55	9	8256	55	9	61	9	8590	60	9
54	2	8262	54	2	73	2	8599	71	2
58	3	8267	58	3	63	10	8643	61	10

Recorded by DJW Direction N Lane 1 Time from 11:36 to 12:07

61 3 8661 61 2 cor

Sheet 20	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0200
Speed and Classification Checks * 1 of* 2	* DATE 05/12/2005

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post-calibration

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
58	3	11137	58	2	56	9	11405	56	9
60	5	11148	58	5	66	3	11419	64	2
56	9	11151	56	9	60	3	11427	59	3
62	3	11158	61	2	59	9	11439	58	9
49	3	11164	49	3	55	5	11449	54	5
60	2	11170	60	2	66	3	11458	65	3
56	4	11188	55	4	59	3	11463	59	3
58	8	11207	57	8	56	9	11472	55	9
55	4	4208	55	5	54	9	11476	54	9
61	5	11218	59	5	66	4	11486	64	4
54	9	11223	53	9	59	10	11501	58	10
54	4	11239	54	5	56	9	11503	56	9
58	10	11257	57	10	66	3	11509	65	2
63	10	11263	62	10	60	9	11527	58	9
63	3	11276	63	2	64	3	11532	63	3
67	3	11287	64	3	52	3	11537	51	3
57	3	11299	55	3	60	3	11545	59	3
59	9	11306	57	9	56	9	11557	54	9
60	9	11308	59	9	61	3	11569	60	3
54	3	11320	53	2	63	9	11573	62	9
67	3	11330	64	3	56	9	11581	55	9
60	9	11350	58	9	56	4	11582	54	5
64	5	11352	63	5	58	9	11583	56	9
55	9	11355	54	9	55	3	11605	54	3
58	3	11392	57	3	56	3	11610	54	3

Recorded by JDV Direction N Lane 1 Time from 1:15 to 1:35

Sheet 20	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0200
Speed and Classification Checks * 2 of* 2	* DATE 05/12/2005

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WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	
59	9	11636	58	9	55	3	11981	55	2	
61	3	11641	59	2	53	9	11991	52	9	
55	3	11656	55	2	61	9	11996	60	9	
63	3	11666	62	3	58	5	12003	57	5	
53	5	11670	51	5	54	10	12021	53	10	
60	5	11678	60	3	56	9	12036	55	9	
49	9	11708	49	9	45	4	12054	45	5	
56	9	11720	56	9	58	3	12060	58	2	
56	3	11725	56	3	58	3	12063	58	3	
74	3	11734	69	3	52	8	12069	52	8	1 axle trailer
59	9	11752	58	9	54	8	12094	52	8	
60	8	11761	58	8	60	9	12100	57	9	
58	9	11772	57	9	70	9	12101	68	9	
55	9	11835	54	9	63	9	12122	61	9	
61	9	11851	60	9	58	9	12124	58	9	
66	3	11859	65	3	58	3	12139	58	3	
61	9	11868	59	9	63	9	12147	62	9	
65	3	11881	65	3	62	9	12158	61	9	
59	2	11887	57	2	61	9	12167	59	9	
55	9	11901	53	9	57	3	12177	56	2	
61	11	11919	59	11	59	3	12178	59	3	
61	3	11930	61	3	56	9	12182	54	9	
60	4	11937	57	5	54	5	12203	56	3	
59	3	11947	59	3	55	9	12224	55	9	
55	4	11952	55	6	57	9	12238	56	9	

Recorded by DAW Direction N Lane 1 Time from 1:36 to _____

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0200
WIM System Test Truck Records 1 of 7	* DATE 05/10/2005

Rev. 08/31/2001

1st 40 runs (42) day 1

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
98.5		1	1		12187													
98.5		2	1	2:43	12193	45	4820 / 5200	5060 / 6500	5440 / 6460	4800 / 6760	5640 / 6160		56840	13.2	4.2	34.2	4.0	
101.5		1	1	2:50	12391	49	4620 / 5340	7200 / 9400	7460 / 8740	7090 / 8680	7320 / 8340		74180	17.2	4.3	37.7	4.1	
101.5		2	2	2:52	12426	46	4900 / 5540	4900 / 6540	5200 / 6580	4740 / 6500	5520 / 6120		56540	13.2	4.2	34.0	4.0	
101.5		1	2	2:58	12562	54.	4480 / 5080	7480 / 9380	7700 / 8900	6940 / 8520	7300 / 8240		74020	17.2	4.2	37.9	4.1	
101.5		2	3	3:00	12604	46	4940 / 5240	4920 / 6440	5360 / 6420	4840 / 6620	5860 / 6140		57180	13.2	4.2	34.3	4.1	
101.5		1	3	3:05	12767	50	4540 / 5320	7360 / 9340	7520 / 8940	6960 / 8500	6480 / 8440		73800	17.3	4.3	38.3	4.1	
101.5		2	4	3:07	12833	51	4600 / 5400	4880 / 6500	4900 / 6340	5840 / 7120	6300 / 7360		59240	13.2	4.2	34.0	4.0	

Recorded by NJW

Checked by _____

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0200
WIM System Test Truck Records 2 of 3	* DATE 05/10/2005

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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
102.5		1	4	3:13	12980	54	4500 5180	7280 9520	7320 8920	6880 8820	7060 8420		73900	17.1	4.3	37.6	4.0	
102.5		2	5	3:14	13028	57	4200 4920	4920 6160	5020 5700	4920 6080	4900 6460		53280	13.3	4.3	34.3	4.1	
100.5		1	5	3:22	13256	54	4440 4920	7420 9440	7520 8920	6780 8700	7060 8340		73540	17.2	4.3	38.0	4.1	
100.5		2	6	3:23	13278	56	4520 5140	5020 6000	5260 5620	5220 5900	4940 6520		54140	13.2	4.3	34.1	4.0	
102.5		1	6	3:31	13498	43	4620 5100	7280 9440	7400 8960	7360 8100	7800 8200		74260 ~~74820~~	16.9	4.2	37.3	4.0	
102.5		2	7	3:32	13522	47	4780 4860	5100 6440	5820 5660	6100 6900	6180 6540		58380	13.1	4.2	34.0	4.0	
99.0		1	8	3:39	13745	50	4980 4300	7240 9360	7620 9020	~~7500~~ 8760	7200 8640		74620	17.2	4.2	37.9	4.1	
99.0		2	8	3:39	13764	51	4660 5140	5120 6380	5260 6200	5500 6620	5000 7600		57480	13.3	4.3	34.6	4.1	

Recorded by DW

Checked by _____

Sheet 21	* STATE_CODE	39
LTPP Traffic Data	*SPS PROJECT_ID	0200
WIM System Test Truck Records 3 of 7	* DATE	05/10/2005

Rev. 08/31/2001

52040
75540

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
100.0		1	8	3:48	14069	50	4560 5380	7320 9440	7400 9140	6920 8740	7060 8660		74620	17.2	4.2	37.8	4.0	
100.0		2	9	3:51	14147	57	4480 5300	4840 6000	5100 6040	4880 6140	4760 6820		54360	13.4	4.3	34.5	4.1	
102.5		2	10	3:59	14432	51	4620 5160	4820 6460	5080 6520	5420 6580	4880 7780		57240	13.2	4.2	34.4	4.1	
100.0		1	9	4:05	14614	44	4820 5280	7200 9200	7420 8480	7120 8660	7640 8580		74900	17.0	4.2	37.5	4.0	
100.0		2	11	4:07	14691	51	4880 5420	4880 6520	5240 6160	5680 7280	6200 7140		59400	13.4	4.3	34.3	4.0	
100.5		1	10	4:13	14861	45	4780 5200	7340 9240	7520 8800	7220 8500	7740 8400		74740	17.1	4.2	37.6	4.1	
100.5		2	12	4:14	14918	56	4380 5120	4760 6320	4840 6000	5120 5920	5140 6520		54120	13.2	4.3	34.3	4.1	
96.5		1	17	4:22	15198	54	4500 5100	7520 9440	7380 8920	6740 8820	6980 8680		74080	17.1	4.3	37.6	4.1	

Recorded by DW

Checked by _____

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0200
WIM System Test Truck Records 4 of 7	* DATE 05/10/2005

Rev. 08/31/2001

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
96.5		2	13	4:23	15240	56	4400 5080	4880 6340	5060 5860	5080 6120	5280 6600		54400	13.2	4.3	34.3	4.0	
96.5		1	12	4:31	15529	44	4660 5260	7300 9180	7480 8980	7500 8460	7700 8380		74920	17.1	4.2	37.5	4.0	
96.5		2	14	4:33	15584	47	4680 5360	4840 6320	5320 6340	5040 7140	5980 6500		57520	13.2	4.2	34.1	4.1	

Recorded by NW

Checked by _____

North

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0200
WIM System Test Truck Records ~~5 of 7~~ 1 of 3	* DATE 05/11/05

Rev. 08/31/2001

DAY 2

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
77.5		2	15	9:25	6847	45	~~4~~920 5260	5180 6680	5500 6400	4900 6600	5440 6300		57120	13.2	4.2	34.1	4.1	
77.5		3	1	9:28	6943	45	5280 5720	7160 8700	7540 9080	7000 8700	~~7~~420 8700		75620	20.4	4.2	36.9	4.0	
79		2	16	9:42	7254	52	4680 5240	4820 6300	5060 6080	5020 6320	4660 7100		56740	13.3	4.3	34.6	4.1	
79		3	2	9:45	7316	49	5100 5620	7960 8900	7500 9080	6560 9080	6960 8700		75260	20.2	4.3	36.8	4.0	
82.5		2	17	9:57	7625	57	4320 5020	5200 6080	5020 5940	5160 6400	5060 6700		54920	13.2	4.2	34.3	4.1	
82.5		3	3	9:59	7676	55	4880 5360	8240 9040	7460 9160	6760 8920	6560 9060		75420	20.6	4.3	37.0	4.0	
84		2	18	10:12	7993	47	4940 5260	5120 6320	5540 5980	4980 6880	6000 6120		57140	13.3	4.2	34.2	4.1	
84		3	4	10:15	8063	45	5360 5520	8080 8640	7440 9100	6940 8760	7460 8840		76160	20.4	4.2	36.8	4	

Recorded by _____ Checked by _____

North

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0200
WIM System Test Truck Records ~~6~~ of ~~7~~ 2 OF 3	* DATE 05 / 11 / 05

Rev. 08/31/2001

day 2

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		2	19	10:26	8312	52	4640 5040	~~4960~~ 6200	5380 5860	~~5640~~ 6700	4760 7680		56860	13.2	4.3	34.5	4.1	
84		3	5	10:30	8396	50	5340 5660	7760 8700	7480 8960	6560 8860	7040 8620		75280	20.5	4.3	37.0	4.1	
88		3	6	10:59	9027	47	5380 5220	7920 8100	7460 8460	7160 7960	7680 7800		73140	20.9	4.3	37.3	4.1	
89		2	20	11:10	9306	55	4800 4480	5120 5580	5200 5500	5600 5800	5200 6900		54220	13.8	4.4	35.2	4.2	
89		3	7	11:13	9378	51	5060 5220	7920 8320	7300 8680	7040 8600	7800 8360		73780	20.8	4.3	37.2	4.1	
		~~2~~	~~7~~	~~11:26~~	~~9457~~	61	~~4400~~ ~~3880~~	~~11800~~ 5140	~~4960~~ 4940	~~5740~~ 5220	~~6630~~ ~~5710~~	VOID	~~49430~~	~~14.1~~	~~4.4~~	~~25.5~~	~~4.2~~	
97		3	8	11:28	9706	57	4860 4540	8020 8140	7420 8380	6600 8220	6760 8120		71060	21.2	4.4	37.5	4.1	
94.5		2	21	11:41	10002	50	4900 4260	5100 5080	5720 4940	4920 5120	4180 5460		49680	14.0	4.4	35.4	4.2	

Recorded by _____ Checked by _____

mouth

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0200
WIM System Test Truck Records ~~1 of 1~~ 3 of 3	* DATE 05 / 11 / 05

Rev. 08/31/2001

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
44.5		3	9	11:42	00034	47	3460 4460	8000 7560	7600 7940	7460 7580	7760 7560		37640	21.3	4.4	27.6	4.1	
		truck 1 - 12 truck 2 - 21																
		truck 3 - 9/42																

Recorded by _____ Checked by _____

First Calibration Runs Westbound

Sheet 21	* STATE_CODE	31
LTPP Traffic Data	*SPS PROJECT_ID	0200
WIM System Test Truck Records ~~5 of 5~~ 1 of 2	* DATE	05 / 11 / 05

Rev. 08/31/2001

(11 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
90.5		1	1	2:26	12896	44	5260 5880	7740 8860	7260 9240	6640 8740	7160 8600		75380	20.3	4.2	36.5	4.0	
90.5		2	1	2:29	12987	47	4460 5260	4800 6220	5020 5920	5020 6600	5760 6160		55220	13.8	4.3	34.3	4.1	
89		1	2	2:41	13296	49	5140 5620	7780 8850	7280 9040	6720 8920	6940 8600		74720	20.4	4.3	36.8	4.0	
89		2	2	2:44	13357	48	4240 4640	4600 5800	4401 5640	4380 5580	4560 5820		49980	13.2	4.2	34.1	4.1	
97.5		1	3	2:56	13678	56	4640 5380	6060 8900	7380 9320	6440 9160	6500 9180		74900	20.6	4.3	36.9	4.0	
97.5		2	3	2:59	13752	48	4501 5340	4800 6020	5260 5760	5020 6600	5960 6320		55600	13.3	4.3	34.1	4.1	
100.5		1	4	3:														
100.5		2	4	3:13	14161	52	4240 4760	4660 5980	4420 5720	5560 5760	4460 7300		53460	13.2	4.2	34.6	4.1	

Recorded by _____ Checked by _____

First Calibration Runs — North 4

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0220
WIM System Test Truck Records ___ of 2 of 2	* DATE 05 / 11 / 05

Rev. 08/31/2001

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
99.5		1	4	3:24	14513	49	5220 5560	7600 8820	8260 9080	6960 6740	7200 8460		75900	20.3	4.3	36.7	4.0	
99.5		2	5	3:27	14592	57	4100 4700	4540 6000	4980 5460	4500 5720	4540 6240		50780	13.2	4.3	34.1	4.1	
101.5		1	5	3:38	14935	44	5260 5400	7900 8520	7560 8980	6820 8680	7500 8280		75000	20.5	4.3	37.1	4.0	
101.5		2	6	3:41	15029	46	4540 4820	4760 6120	5160 5980	4640 6660	5800 6100		54580	13.2	4.2	33.9	4.1	
		truck 1 - 5 truck 2 - 6																
				11														

Recorded by _____ Checked by _____

Final calibration Run

Sheet 21	* STATE_CODE 39 39
LTPP Traffic Data	*SPS PROJECT_ID 0200
WIM System Test Truck Records 1 of 8	* DATE 05/11/2005

Rev. 08/31/2001

ADDITIONAL RUNS (32) day 2

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
100.5		1	6	3:55	15598	49	4260 5700	7980 8640	7360 8940	5760 9040	7160 8560		75400	20.4	4.3	36.8	4.0	
100.5		2	7	3:58	15679	52	4380 4820	5040 5780	5240 5620	5700 6420	5040 7200		54940	13.4	4.3	34.6	4.1	
101.3		1	7	4:10	16098	55	5060 5720	8260 8740	7580 8960	6780 8880	7140 8520		75040	20.5	4.3	37.0	4.1	
100.5		2	8	4:12	16159	57	4620 4900	4720 5780	5280 5200	4920 5360	4940 5800		50720	13.3	4.3	34.7	4.1	
95		1	8	4:25	16569	44	5320 5480	8120 8320	7700 8880	7380 8260	7500 8340		75300	20.4	4.3	37.2	4.1	
95		2	9	4:28	16653	47	4540 4920	5000 5980	5460 5740	5100 6520	5820 5860		54940	13.2	4.2	34.1	4.1	

Recorded by _____ Checked by _____

Northbound

Sheet 21	* STATE_CODE 39 39
LTPP Traffic Data	*SPS PROJECT_ID 0200200
WIM System Test Truck Records 2 of 5	* DATE 05/12/2005

Rev. 08/31/2001

final runs (day 3

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
		~~1~~	~~9~~	~~9:46~~	~~6301~~													
58.5		2	10	9:09	6387	45	4240 5140	4680 5900	5160 5720	4700 6420	5660 5840	5	53460	13.1	4.1	33.9	4.1	
61		1	9	9:22	6699	49	5080 5560	7980 8460	7500 8760	7000 8320	6920 5240		73820	20.2	4.3	36.8	4.0	
61		2	11	9:24	6751	50	4120 5040	4660 5960	5240 5420	5220 5760	4650 6800		52900	12.9	4.2	34.0	4.0	
63.5		2	12	9:39	7148	58	4060 4400	5000 5880	5500 5200	5520 5400	4760 6640		52360	13.3	4.3	35.0	4.2	
62		1	10	9:56	7491	45	5660 5700	8100 8450	7640 8580	7180 8640	7520 8580		76380	20.6	4.3	36.9	4.0	
62		2	13	9:58	7533	47	4660 4920	5040 5700	5500 5720	4720 5740	4240 5820		52060	13.3	4.3	34.7	4.1	
62		1	11	10:31	7890	57	5320 5440	8420 8700	7740 9160	7000 6800	7280 8540		76400	21	4.3	37.4	4.1	

Recorded by _____ Checked by _____

Nicole

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0200
WIM System Test Truck Records 3 of 5	* DATE 5/12/2005

Rev. 08/31/2001

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
62		2	14	10:33	7941	57	4180 4600	4980 5600	5400 5120	5300 5540	5200 6380		52600	13.3	4.3	35.1	4.2	
61.5		1	12	10:45	8198	45	5540 5640	8260 8480	7800 8920	7220 6720	7420 8760		76760	20.7	4.3	37.3	4.1	
~~61.5~~ 61.5		~~2~~ 1	13	11:01	7950	50	5520 5360	8300 8620	7620 6860	6920 6500	7380 8180		75260	20.6	4.3	36.9	4.1	
61.5		2	15	11:05	8061	52	4340 4860	4820 5720	5080 5180	5320 5800	4960 6800		52880	13.1	4.3	34.8	4.1	
62		1	14	11:17	8341	56	5020 5360	8440 8720	7820 9080	6940 8720	6900 8600	~~75~~	75600	20.6	4.3	37.3	4.1	
62		2	16	11:19	8408	57	4000 4560	5020 5800	5300 5180	5240 5760	4860 6700		52420	13.4	4.3	34.6	4.1	
63		1	15	11:34	8731	45	5500 5420	8220 8700	7720 9020	7220 8580	7400 8480		76260	20.5	4.3	37.3	4.1	
63		2	17	11:38	8818	47	~~4520~~ 4720	5040 5760	5740 5500	5100 6200	5540 5340		53460	13.3	4.2	33.6	4.2	

Recorded by _____ Checked by _____

North

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0200
WIM System Test Truck Records 4 of 5	* DATE 05/12/2005

Rev. 08/31/2001

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
61.5		1	16	11:50	9097	50	5440 5640	8080 8620	7520 8900	6980 8460	7260 8400		75300	20.5	4.3	37.1	4.1	
61.5		2	18	11:52	9156	51	4460 4940	4820 5720	4980 5640	5220 6200	4800 7080		53860	13.3	4.3	34.4	4.0	
61.5		1	17	12:04	9441	58	5000 5260	8520 5760	7760 9000	6840 9000	6800 8620		75560	20.8	4.4	37.3	4.1	
61		2 1	18	12:14	9674	45	5600 5500	8040 8400	7720 8820	7260 8300	7380 8260		75280	20.5	4.3	37.1	4.1	
61		2	19	12:19	9785	47	4680 4980	5120 5820	5540 5780	5940 6500	5760 5740		54960	13.4	4.3	34.8	4.2	
61		1	19	12:24	9931	50	5440 5560	8320 8760	7520 9020	7080 8600	7000 8580		75880	20.4	4.3	36.8	4.0	
61		2	20	12:29	10044	51	4400 4700	4960 5640	5560 5480	5460 5880	4280 6780		53240	13.2	4.3	34.7	4.1	
60.5		1	20	12:35	10174	55	5200 5080	8400 8780	7800 8960	6840 8820	7200 8300		75380	20.5	4.3	37.0	4.0	

Recorded by _____ Checked by _____

North

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0200
WIM System Test Truck Records 5 of 5	* DATE 05/12/2005

Rev. 08/31/2001

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
60.5		2	21	12:40	10284	58	4120 4640	5180 5540	5220 5400	5360 5560	4740 6600		52360	13.4	4.3	34.7	4.2	
60.5		1	~~22~~ 21	12:45	10412	45	5440 5560	8140 8720	7700 9100	7080 8480	7380 8420		76020	20.6	4.3	36.8	4.0	
60.5		2	22	12:50	10543	47	4600 4860	5000 5920	5500 ~~5~~620	5120 ~~6~~420	5860 6040		54940	13.2	4.2	34.6	4.1	

Recorded by _____ Checked by _____

TEST TRUCK PHOTOGRAPHS

STATE: Ohio

SHRP ID: 0200

TO_9_39_2.49_0100_Truck_1_Tractor.JPG

TO_9_39_2.49_0100_Truck_1_Tractor_Suspension.JPG

TO_9_39_2.49_0100_Truck_1_Trailer.JPG

TO_9_39_2.49_0100_Truck_1_Trailer_Suspension.JPG

TO_9_39_2.49_0100_Truck_2_Tractor.JPG

TO_9_39_2.49_0100_Truck_2_Tractor_Suspension.JPG

TO_9_39_2.49_0100_Truck_2_Trailer.JPG

TO_9_39_2.49_0100_Truck_2_Trailer_Suspension.JPG

TO_9_39_2.49_0100_Truck_3_Tractor.JPG

TO_9_39_2.49_0100_Truck_3_Tractor_Suspension.JPG

TO_9_39_2.49_0100_Truck_3_Trailer.JPG

TO_9_39_2.49_0100_Truck_3_Trailer_Suspension.JPG