INTERNATIONAL ROAD DYNAMICS INC.

LTPP WIM DATA COLLECTION SYSTEMS

INSTALLATION AND CALIBRATION FOR TENNESSEE SPS-6 LTPP ID 470600

June 12, 2007

CLIN 2004C TASK ORDER # 14

CONTRACT NO. DTFH61-05-D-00001

U.S. Department of Transportation
Federal Highway Administration

LONG TERM Pavement PERFORMANCE

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

This report details the installation and calibration of the Tennessee SPS-6 Weigh-in-Motion (WIM) site located on I-40 WB at mile post 91.6. The WIM site is instrumented with IRD's iSINC (Intelligent Sensor Interface Network Controller) WIM Electronic and Kistler Quartz Sensor's. The LTPP lane is in the west bound driving lane it's instrumented for WIM data collection. It consists of two inductive loops and 8 Kistler Quartz sensors. All other lanes are instrumented for WIM data collection, consisting of two inductive loops and 4 Kistler Quartz sensors. The WIM system uses a landline modem for communication. Power is provided by 120 Volt A.C. service. The WIM Controller cabinet is located in the median.

The WIM equipment installation began on May 7, 2007 and was completed on May 10, 2007. The WIM system was commissioned and calibrated on May 30 and May 31, 2007 respectively.

The results demonstrate the WIM system meets the LTPP performance requirements for weight and axle spacing as detailed in the *Data Collection Guide for SPS WIM Sites*.

2.0 POINT OF CONTACTS

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FHWA LTPP
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James Maxwell ph: (615) 350-416
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Bruce Myers
International Road Dynamics (Phase 2 Contractor)
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3.0 SHEET 16 – SITE CALIBRATION SUMMARY

SITE CALIBRATION INFORMATION

1. DATE OF CALIBRATION (MONTH/DAY/YEAR): **May 31, 2007**

2. TYPE OF EQUIPMENT CALIBRATED:
   - ☒ WIM
   - ☐ CLASSIFIER
   - ☐ BOTH

3. REASON FOR CALIBRATION
   - ☐ REGULARLY SCHEDULED SITE VISIT
   - ☐ RESEARCH
   - ☐ EQUIPMENT REPLACEMENT
   - ☐ TRAINING
   - ☐ DATA TRIGGERED SYSTEM REVISION
   - ☒ NEW EQUIPMENT INSTALLATION
   - ☐ OTHER (SPECIFY) _____

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

5. EQUIPMENT MANUFACTURER: **International Road Dynamics Inc.**

WIM SYSTEM CALIBRATION SPECIFICS

6. CALIBRATION TECHNIQUE USED:
   - ☐ TRAFFIC STREAM:
     - NUMBER OF TRUCKS _____
     - ☐ STATIC SCALE
   - ☒ TEST TRUCKS:
     - NUMBER OF TEST TRUCKS **2**
     - PASSES PER TRUCK **21**

TRUCK#	TYPE	SUSPENSION
1	**9**	**1 & 2**
2	**9**	**1 & 2**
3	**X**	**X**
4	**X**	**X**
5	**X**	**X**

TYPE PER FHWA 13 BIN SYSTEM
SUSPENSION TYPES:
1 – AIR
2 – LEAF SPRING
3 – OTHER

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
   GVW MEAN DIFFERENCE **.8%** STANDARD DEVIATION **1.5%**
   SINGLE AXLE MEAN DIFFERENCE -**2.2%** STANDARD DEVIATION **3.2%**
   DOUBLE AXLES MEAN DIFFERENCE **1.4%** STANDARD DEVIATION **2.3%**

8. NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED: **3**

9. DEFINE THE SPEED RANGES USED (MPH): **50 - 60, 60 – 65, 65 - 75**

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) **See following sheets**

11. IS AUTO-CALIBRATION USED AT THIS SITE? ☐
    IF USED, LIST AND DEFINE AUTO-CALIBRATION VALUE _____

CLASSIFIER TEST SPECIFICS

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

13. METHOD TO DETERMINE LENGTH OF COUNT:
    TIME
    NUMBER OF VEHICLES
    NUMBER OF TRUCKS

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
    FHWA CLASS 2 **%**
    FHWA CLASS 3 **%**
    FHWA CLASS 4&5 **%**
    FHWA CLASS 8 **%**
    FHWA CLASS 9 **%**
    FHWA CLASS 12 **%**
    "UNCLASSIFIED" VEHICLES: **%**

15. PICTURES: _____

16. NOTES:
    _____

PERSON LEADING CALIBRATION EFFORT: **Bruce Myers**
CONTACT INFORMATION: **717-264-2077**

3.1.1 iSINC FINAL SITE CALIBRATION FACTORS

Calibration >							
Select Lane		4					
Select Axle Sensor		1					
Threshold		16					
WIM Calib Factors >		Select Speed Bin	1	2	3	4	5
		Max Speed (kph)	88	96	105	112	120
		Calib Factor	2764	2764	2764	2764	2764

Select Lane		4					
Select Axle Sensor		2					
Threshold		16					
WIM Calib Factors >		Select Speed Bin	1	2	3	4	5
		Max Speed (kph)	88	96	105	112	120
		Calib Factor	2934	2934	2934	2934	2934

Select Lane		4					
Select Axle Sensor		3					
Threshold		16					
WIM Calib Factors >		Select Speed Bin	1	2	3	4	5
		Max Speed (kph)	88	96	105	112	120
		Calib Factor	2764	2764	2764	2764	2764

Select Lane		4					
Select Axle Sensor		4					
Threshold		16					
WIM Calib Factors >		Select Speed Bin	1	2	3	4	5
		Max Speed (kph)	88	96	105	112	120
		Calib Factor	2934	2934	2934	2934	2934

3.1.2 iSINC SET-UP SITE PARAMETERS

Lane Name			4
Lane State			ENABLED
Upstream Loop >		Loop State	ENABLED
		Module UID	9
		Channel Num	2
		Polarity Active	LOW
		Width (cm)	285
Downstream Loop >		Loop State	ENABLED
		Module UID	9
		Channel Num	3
		Polarity Active	LOW
		Width (cm)	285
		Distance(cm)	670
Axle Sensors >		Select Axle	1
		Axle State	ENABLED
		Module UID	7
		Channel Num	0
		Polarity Active	HIGH
		Type	KISTLER_DUAL
		Distance(cm)	274
		Temp State	ENABLED
		Temp Module UID	5
		Temp Channel Num	0
Axle Sensors >		Select Axle	2
		Axle State	ENABLED
		Module UID	7
		Channel Num	1
		Polarity Active	HIGH
		Type	KISTLER_DUAL
		Distance(cm)	274
		Temp State	ENABLED
		Temp Module UID	5
		Temp Channel Num	0
Axle Sensors >		Select Axle	3
		Axle State	ENABLED
		Module UID	7
		Channel Num	2
		Polarity Active	HIGH
		Type	KISTLER_DUAL
		Distance(cm)	579
		Temp State	ENABLED
		Temp Module UID	5
		Temp Channel Num	0
Axle Sensors >		Select Axle	4
		Axle State	ENABLED
		Module UID	7
		Channel Num	3
		Polarity Active	HIGH
		Type	KISTLER_DUAL
		Distance(cm)	579
		Temp State	ENABLED
		Temp Module UID	5
		Temp Channel Num	0

DIOM Debounce Times	Loop On (ticks)	40	
	Loop Off (ticks)	40	
	OvrHgt On (ticks)	40	
	OvrHght Off (ticks)	0	
	Axle On (ticks)	40	
	Axle Off (ticks)	40	
Axle Snsor Debounce >	Type	KISTLER_DUAL	PIEZO
	On (ticks)	8	8
	Off (ticks)	40	40

3.1.3 iSINC SET-UP PROCESSING

Processing >	MaxTimeout(ms)		3000
	Dynamic Comp(%)		103
	Sig Wt Diff(%)		40
	Min Axle Wt(kg)		1360
	Veh Rec Mode		Split
	Axl Sep(cm)		306

4.0 WIM SITE INVENTORY

1. ROUTE I-40 MILEPOST:91.6 LTPP DIRECTION: N S E **W**

2. SITE DESCRIPTION
   GRADE: 1%
   ☐ Sag vertical
   Nearest SPS section upstream of the site: 470608
   Distance from sensor to nearest upstream SPS Section: 237 ft.

3. LANE CONFIGURATION
   Number of lanes in LTPP direction: 2 lanes
   Lane width: 12 ft.
   ☐ Median painted
   ☐ Median physical barrier
   ☒ Median grass
   ☐ Median none
   ☐ Shoulder curb and gutter
   ☐ Shoulder paved AC
   ☒ Shoulder paved PCC
   ☐ Shoulder unpaved
   Shoulder width: 10 ft.
4. PAVEMENT TYPE: 9 ¼" AC over 9" PCC

5. CONDITION: (Surface distresses by type / severity within WIM section)
   Good

6. SENSOR SEQUENCE: Loop - Kistler - Kistler - Loop

7. PAVEMENT REPLACEMENT AND/OR GRINDING:
   Straightedge check: Performed _____ Result: ☒ Pass / ☐ Marginal / ☐ Unsatisfactory
   Short wave check: Performed _____ Result: ☒ Pass / ☐ Marginal / ☐ Unsatisfactory
   Long wave check: Performed _____ Result: ☒ Pass / ☐ Marginal / ☐ Unsatisfactory

8. ANY EFFECTS FROM RAMPS OR LANE TRANSITIONS:
   ☐ Intersection/driveway within 300m upstream, distance: _____
   ☐ Intersection/driveway within 300m downstream, distance: _____
   ☐ LTPP lane used for passing by vehicles traveling in south bound lane

9. DRAINAGE:
   ☐ Open to ground
   ☐ Pipe to culvert or ditch
   ☒ None
   ☐ French drain

10. CABINET LOCATION:
    - ☒ Same side of road as LTPP lane
    - ☐ Median
    - ☐ Behind guard rail

    Distance from edge of travel lane to cabinet: 40 ft
    Distance from sensors: 50 ft
    Type: 336
    Access controlled by: ☐ LTPP / ☒ State / ☐ Joint
    Primary contact: James Maxwell (615) 350-4167
    Alternate contact:

11. POWER:
    Power type: ☐ Overhead / ☐ Underground / ☐ Solar
    Distance from cabinet to drop: 5 ft
    Service provider: N/A.

12. TELEPHONE:
    Telephone type: ☐ Overhead / ☒ Underground / ☒ Cell
    Distance from cabinet to drop: 20 ft
    Phone # : (731) 424-2545

13. SYSTEM:
    Software: iSINC
    Version:
    Connection: ☒ RS232 / ☐ Parallel port / ☐ USB / ☐ Other

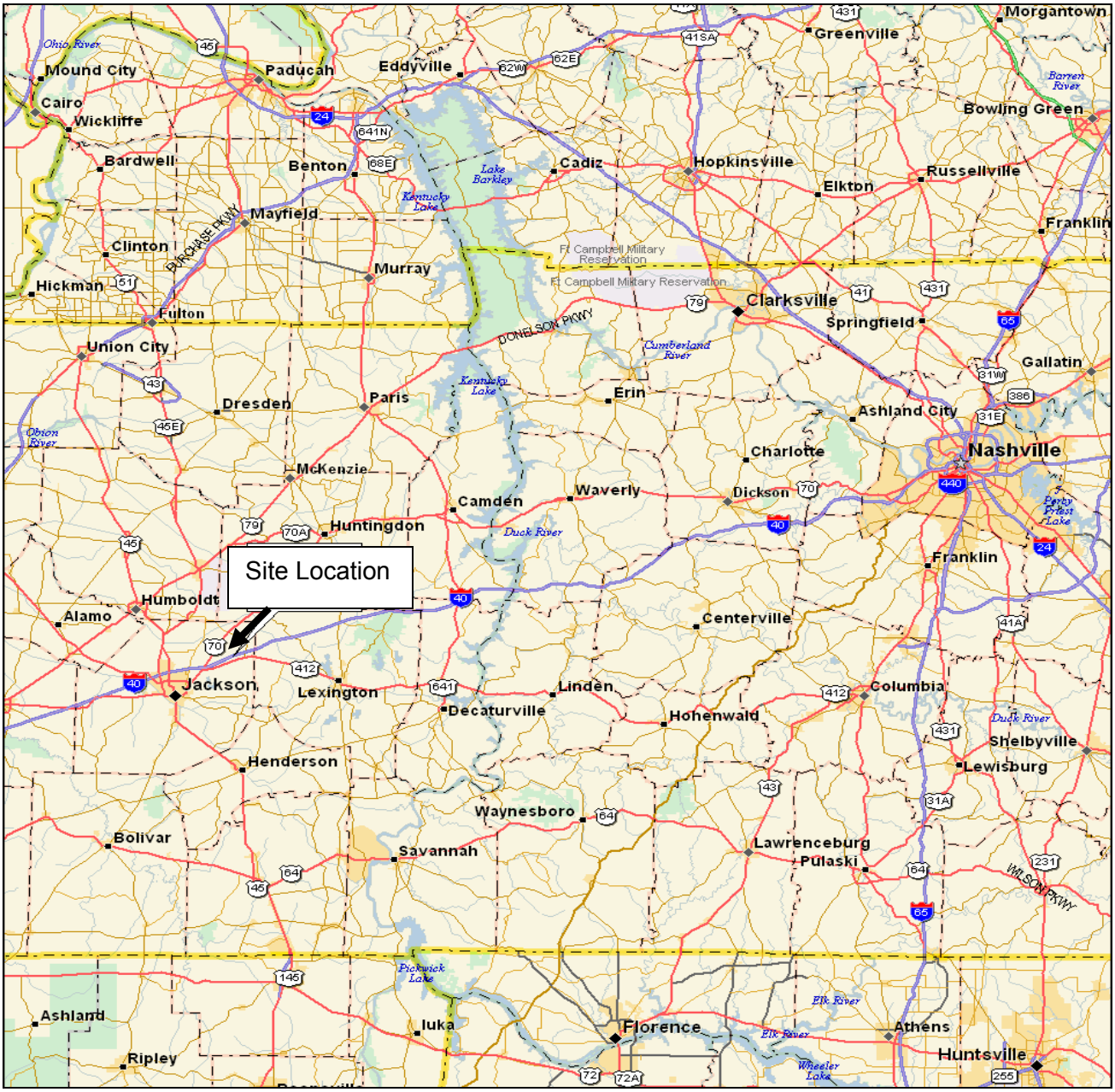
14. TEST TRUCK CYCLE:
    Turnaround time: 14 minutes
    Turnaround distance: 14 miles

15. PICTURES: See following pages, Site Map, WIM Site, Site layout drawings

16. NOTES:

COMPLETED BY: **Bruce Myers**
CONTACT INFORMATION: **717-264-2077**

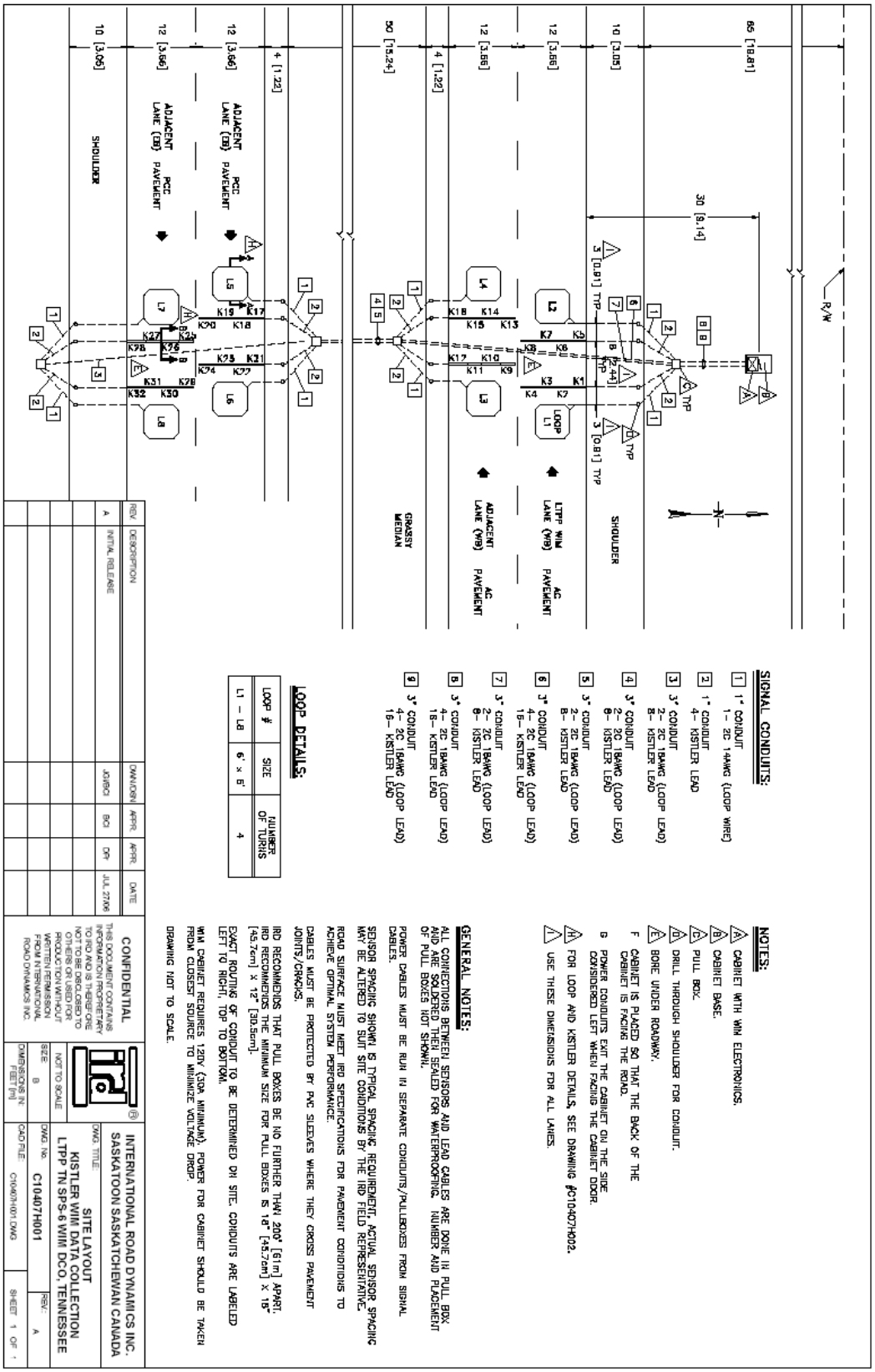
4.1.1 SITE MAP


Site Location
Mound City
Paducah
Cairo
Wickliffe
Bardwell
Benton
Eddyville
Cadiz
Hopkinsville
Greenville
Morgantown
Bowling Green
Russellville
Elkton
Franklin
Mayfield
Clinton
Hickman
Fulton
Murray
Ft Campbell Military Reservation
Clarksville
Springfield
Gallatin
Union City
Dresden
Paris
Erin
Ashland City
Nashville
Charlotte
McKenzie
Camden
Waverly
Dickson
Huntingdon
Humboldt
Alamo
Jackson
Lexington
Decaturville
Linden
Centerville
Columbia
Hohenwald
Shelbyville
Lewisburg
Henderson
Waynesboro
Bolivar
Savannah
Lawrenceburg
Pulaski
Ashland
Ripley
Iuka
Florence
Athens
Huntsville
Franklin
Kentucky Lake
Lake Barkley
Cumberland River
Duck River
Elk River
Wheeler Lake
Pickwick Lake
Obion River
Ohio River
Barren River
Perry Priest Lake
DONELSON PKWY
PURCHASE PKWY
WILSON PKWY

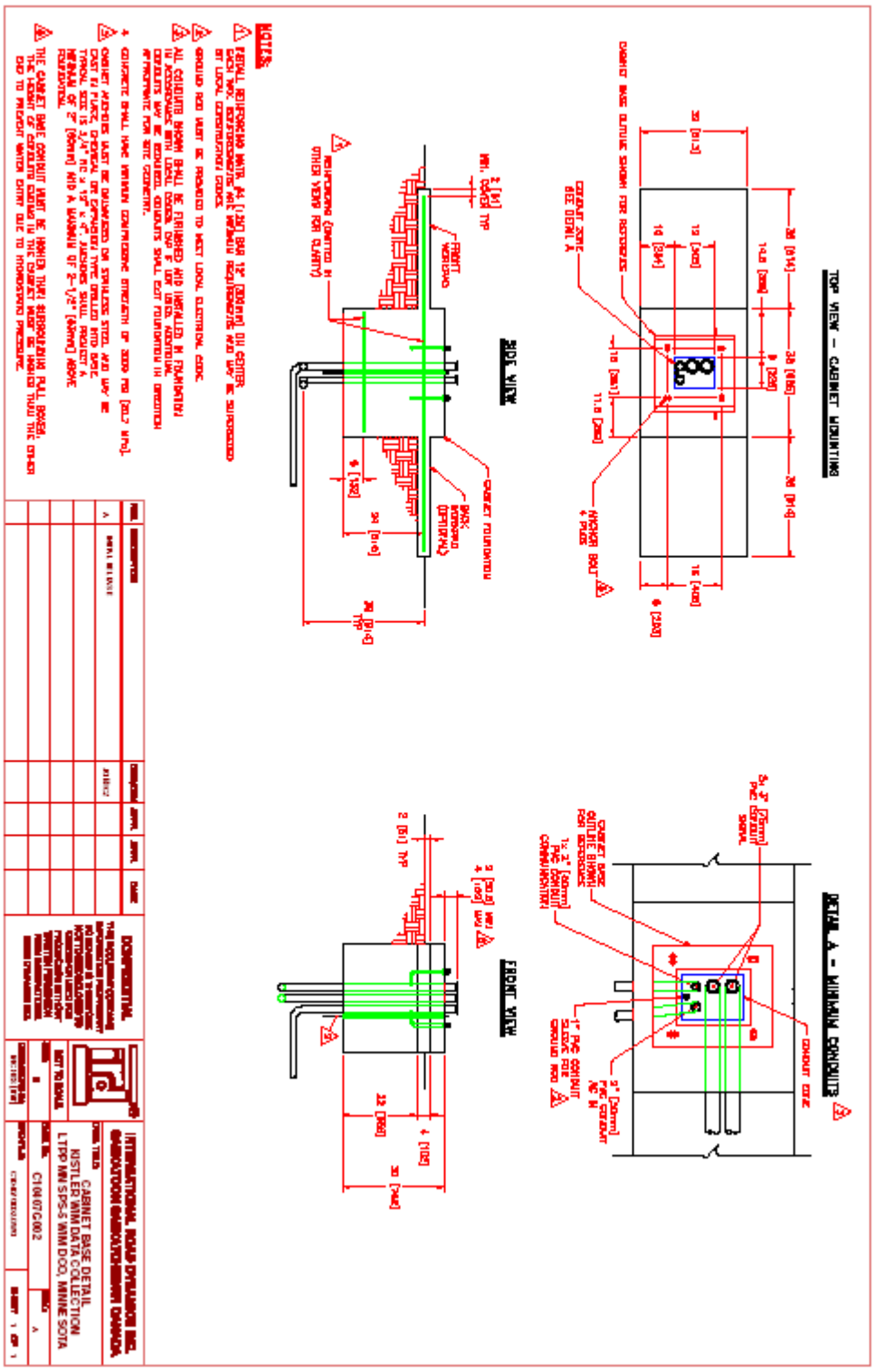
4.1.2 PICTURES, WIM SITE

4.1.3 PICTURES, INSTALLATION

4.1.4 STE LAYOUT



4.1.5 WIM CABINET CONCRETE PEDESTAL



4.1.6 ELECTRICAL READINGS

IRD

Site Service Sheet

Clear

System Type: iSINC / Kistler Quartz

Date: 5/31/2007 **State:** TN **Location:** LTPP Tennessee
Job #: 10407H **Site #:** **Directions:** I-40 WB Mile Post 91.6

	Position	Lead	Trail	Lead	Trail	Lead	Trail	Lead	Trail
Loops	**Lane**	**1**	**1**	**2**	**2**	**3**	**3**	**4**	**4**
Resistance		1.2 Ω	1.2Ω	1.1Ω	1.1Ω	1 Ω	1Ω	.8 Ω	.8 Ω
Leakage		inf	inf	inf	inf	inf	inf	inf	inf
Inductance uH		136 uH	133 uH	135 uH	134 uH	138 uH	137 uH	137 uH	138 uH
Frequency		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Kistler	**Lane - 1**	**Lead**	**Lead**	**Trail**	**Trail**	**5**	**6**	**7**	**8**
Amplitude		OK	OK	OK	OK				
Capacitance		12 nF	12 nF	12 nF	12 nF				
Resistance		inf.	inf.	inf.	inf.				
Serial #		1565722	1553914	1566186	1566066				
Kistler	**Lane - 2**	**Lead**	**Lead**	**Trail**	**Trail**	**5**	**6**	**7**	**8**
Amplitude		OK	OK	OK	OK				
Capacitance		7.3 nF	8 nF	6.8 nF	7.6 nF				
Resistance		inf.	inf.	inf.	inf.				
Serial #		1565728	1553902	1565708	1564619				
Piezo	**Lane - 3**	**Lead**	**Lead**	**Trail**	**Trail**				
Amplitude		OK	OK	OK	OK				
Capacitance		8 nF	7.2 nF	7.9 nF	6.9 nF				
Resistance		inf.	inf.	inf.	inf.				
Serial #		1566204	1566064	1565711	1544611				
Kistler	**Lane - 4**	**Lead**	**Lead**	**Lead**	**Lead**	**Trail**	**Trail**	**Trail**	**Trail**
Amplitude		OK	OK	OK	OK	OK	OK	OK	OK
Capacitance		8.1 nF	6.9 nF	7.6 nF	7.1 nF	7.9 nF	7.3 nF	7.6 nF	7.2 nF
Resistance		inf	inf	inf	inf	inf	inf	inf	inf
Serial #		1369845	1385430	1369851	1440538	1397606	1416277	1309332	1389967

System

A/C Service	118.0
Power Supply	13.4 Vdc
Solar Panel	
Back-Up	13.4 Vdc
System Input	
Modem Power	
Phone off	
Phone on	

Temp Sensor

White+	
Red +	

Software

System	iSINC

Site Full Operating Capacity **Pass** √
Fail

Technician: Steven Schroader **Date:** 5/30/2007

5.0 WIM CALIBRATION

5.1.1 TEST TRUCK #1 INFORMATION

DATE OF CALIBRATION: **May 31, 2007**

1. TEST TRUCK NUMBER: 1 2. FHWA CLASS: 9 3. Number of axles: 5

Axle	Empty Truck Axle Weights (lb)	4. Pre-Test Loaded Axle Weights (lb)	5. Post-Test Loaded Axle Weights (lb)	6. Measured Directly or Calculated
A		9620		D
B		35160		D (B&C combined)
C				
D		33280		D (D&E combined)
E				

7. CALCULATIONS:

Empty Truck Gross Weight (lb)	Pre-Test Loaded Gross Weight (lb)	Post-Test Loaded Gross Weight (lb)	Pre to Post Difference (lb)
	78060		78060

8. TRACTOR CAB STYLE: ☐ Cab over engine / ☒ Conventional ☐ With sleeper

9. TRACTOR MANUFACTURER:
   Make: Peterbuilt
   Model:

10. TRAILER LOAD DESCRIPTION: Fork Lift & Steel

11. TRAILER TARE WEIGHT (lb): _____

12. AXLE SPACINGS

Axle	Spacing (feet & inches)
A-B	15.1'
B-C	4.3'
C-D	32.6’
D-E	4’

KINGPIN OFFSET FROM AXLE B (ft, + towards rear): +1.5 ft

SUSPENSSION:

Axle	17. Tire Size	18. Suspension description (leaf, air, # of leaves, taper or flat leaf, etc.)
A	11R24.5	Leaf spring – two leaves
B	11R24.5	air
C	11R24.5	air
D	75R22.5	air
E	75R22.5	air

5.1.2 PICTURES, TEST TRUCK 1


06.01.2007


06.01.2007

5.1.3 TEST TRUCK #2 INFORMATION

DATE OF CALIBRATION: **May 31, 2006**

1. TEST TRUCK NUMBER: 2 2. FHWA CLASS: 9 3. Number of axles: 5

Axle	Empty Truck Axle Weights (lb)	4. Pre-Test Loaded Axle Weights (lb)	5. Post-Test Loaded Axle Weights (lb)	6. Measured Directly or Calculated
A		9500		D
B		28080		D (B&C combined)
C				
D		24400		D (D&E combined)
E				

7. CALCULATIONS:

Empty Truck Gross Weight (lb)	Pre-Test Loaded Gross Weight (lb)	Post-Test Loaded Gross Weight (lb)	Pre to Post Difference (lb)
	61980		61980

8. TRACTOR CAB STYLE: ☐ Cab over engine / ☒ Conventional ☒ With sleeper

9. TRACTOR MANUFACTURER:
   Make: Peterbuilt
   Model:

10. TRAILER LOAD DESCRIPTION: Steel

11. TRAILER TARE WEIGHT (lb): _____

12. AXLE SPACINGS

Axle	Spacing (feet & inches)
A-B	14.9’
B-C	4.4’
C-D	27.1’
D-E	10.1’

KINGPIN OFFSET FROM AXLE B (ft, + towards rear): +1.5 ft

SUSPENSSION:

Axle	17. Tire Size	18. Suspension description (leaf, air, # of leaves, taper or flat leaf, etc.)
A	11R24.5	Leaf spring – two leaves
B	11R24.5	air
C	11R24.5	air
D	11R24.5	air
E	11R24.5	air

5.1.4 PICTURES, TEST TRUCK 2


GENERAL
06.01.2007


LUFKIN
T330388
06.01.2007

6.0 TEST TRUCK CALIBRATION RECORDS

6.1.1 VALIDATION RUNS

International Road Dynamics Inc.

FHWA VERIFICATION

Static Test Vehicle Measurements

ID				GVW	F/A	T1	T2	1>2	2>3	3>4	4>5
1				78.1	9.6	35.2	33.3	15.1	4.3	32.6	4.0
2				62.0	9.5	28.1	24.4	14.9	4.4	27.1	10.1

b

Dynamic Test Vehicle Measurements

ID	V#	Speed	Temp	GVW	F/A	T1	T2	1>2	2>3	3>4	4>5
1	38801	56	72	75.4	8.7	33.9	32.7	14.9	4.1	*32.0*	3.9
2	38807	58	72	61.1	9.1	27.5	24.5	14.5	4.3	26.6	10.0
1	39370	63	78	77.6	8.9	34.7	34.9	15.2	4.2	32.7	4.0
2	39374	64	78	63.7	9.3	28.1	26.3	14.8	4.4	27.1	10.1
1	39927	69	78	77.7	9.1	34.6	34.0	15.3	4.2	32.7	4.0
2	39929	70	78	62.0	9.4	28.3	24.4	14.8	4.4	27.2	10.2
1	40523	59	83	77.3	8.8	35.1	33.4	15.2	4.2	32.8	4.0
2	40525	59	83	62.3	9.6	27.5	25.2	14.9	4.4	27.2	10.2
1	411171	63	88	78.3	9.1	35.2	34.0	15.2	4.2	32.6	4.0
2	41172	65	88	62.6	9.4	28.1	25.1	14.8	4.4	27.2	10.2
1	41764	68	85	79.2	9.6	35.5	34.2	15.2	4.2	32.6	4.0
2	41765	69	85	63.4	9.9	27.7	25.7	14.8	4.4	27.2	10.2
1	42506	57	85	78.2	9.1	35.0	34.0	15.2	4.2	32.6	4.0
2	42509	59	85	61.9	9.5	27.8	24.6	14.9	4.4	27.1	10.1
1	43197	64	83	78.6	9.1	35.1	34.3	15.2	4.2	32.7	4.1
2	43198	65	83	64.4	9.7	28.8	25.9	14.8	4.4	27.3	10.2
1	43886	68	83	78.3	9.1	35.4	33.8	15.1	4.2	32.6	4.0
2	43891	69	83	61.9	9.9	28.1	23.9	14.9	4.4	27.3	10.2
1	44539	59	87	79.9	9.5	35.8	34.6	15.3	4.2	32.7	4.0
2	44544	60	87	63.5	9.5	28.6	25.4	14.8	4.4	27.1	10.2
1	46303	62	88	78.9	9.6	35.6	33.8	15.2	4.2	32.7	4.0
2	46304	65	88	64.3	9.6	29.4	25.2	14.8	4.4	27.1	10.1
1	46881	70	87	78.7	9.0	35.2	34.5	15.2	4.2	32.6	4.0
2	46682	71	87	62.9	9.5	28.6	24.8	14.8	4.4	27.2	10.1
1	47503	59	87	78.2	9.5	35.2	33.5	15.2	4.2	32.6	4.0
2	47506	60	87	63.1	9.5	27.9	25.5	14.9	4.4	27.2	10.2
1	48187	63	93	79.5	9.4	35.8	34.4	15.2	4.2	32.6	4.0
2	48190	64	93	62.0	9.6	27.4	25.1	14.9	4.4	27.2	10.1
1	48900	70	94	78.0	9.0	34.7	34.2	15.2	4.2	32.5	4.0
2	48903	70	94	62.8	9.2	28.6	25.0	14.8	4.4	27.2	10.1
1	49608	59	94	79.2	9.3	35.5	34.3	15.3	4.3	32.7	4.0
2	49611	59	94	62.3	9.3	28.1	25.0	14.9	4.4	27.1	10.1
1	50313	64	99	78.2	9.1	35.0	34.0	15.2	4.2	32.6	4.0
2	50315	64	99	62.5	9.5	28.2	24.8	14.8	4.4	27.2	10.2
1	51092	68	100	78.5	9.2	35.4	33.9	15.2	4.2	32.6	4.0
2	51093	70	100	64.2	9.3	28.4	26.5	14.8	4.4	27.2	10.1
1	51792	60	102	78.4	9.4	35.0	34.0	15.3	4.2	32.7	4.0
2	51794	60	102	63.6	9.5	28.5	25.5	14.8	4.4	27.2	10.2

Date:	2007/05/31
Technician:	Bruce Myers
Location:	Tennessee LTPP Lane 4

6.1.2 TEST TRUCKS ERROR CALCULATIONS

Truck	V#	Speed	Temp	GVW	F/A	T1	T2	1>2	2>3	3>4	4>5
1	38801	56	72	-3.5%	-9.4%	3.7%	-1.8%	-0.2	-0.2	-0.6	-0.1
2	38807	58	72	-1.5%	-4.2%	2.1%	0.4%	-0.4	-0.1	-0.5	-0.1
1	39370	63	78	-0.6%	-7.3%	1.4%	4.8%	0.1	-0.1	0.1	0.0
2	39374	64	78	2.7%	-2.1%	0.0%	7.8%	-0.1	0.0	0.0	0.0
1	39927	69	78	-0.5%	-5.2%	1.7%	2.1%	0.2	-0.1	0.1	0.0
2	39929	70	78	0.0%	-1.1%	0.7%	0.0%	-0.1	0.0	0.1	0.1
1	40523	59	83	-1.0%	-8.3%	0.3%	0.3%	0.1	-0.1	0.2	0.0
2	40525	59	83	0.5%	1.1%	2.1%	3.3%	0.0	0.0	0.1	0.1
1	411171	63	88	0.3%	-5.2%	0.0%	2.1%	0.1	-0.1	0.0	0.0
2	41172	65	88	1.0%	-1.1%	0.0%	2.9%	-0.1	0.0	0.1	0.1
1	41764	68	85	1.4%	0.0%	0.9%	2.7%	0.1	-0.1	0.0	0.0
2	41765	69	85	2.3%	4.2%	1.4%	5.3%	-0.1	0.0	0.1	0.1
1	42506	57	85	0.1%	-5.2%	0.6%	2.1%	0.1	-0.1	0.0	0.0
2	42509	59	85	-0.2%	0.0%	1.1%	0.8%	0.0	0.0	0.0	0.0
1	43197	64	83	0.6%	-5.2%	0.3%	3.0%	0.1	-0.1	0.1	0.1
2	43198	65	83	3.9%	2.1%	2.5%	6.1%	-0.1	0.0	0.2	0.1
1	43886	68	83	0.3%	-5.2%	0.6%	1.5%	0.0	-0.1	0.0	0.0
2	43891	69	83	-0.2%	4.2%	0.0%	-2.0%	0.0	0.0	0.2	0.1
1	44539	59	87	2.3%	-1.0%	1.7%	3.9%	0.2	-0.1	0.1	0.0
2	44544	60	87	2.4%	0.0%	1.8%	4.1%	-0.1	0.0	0.0	0.1
1	46303	62	88	1.0%	0.0%	1.1%	1.5%	0.1	-0.1	0.1	0.0
2	46304	65	88	3.7%	1.1%	4.6%	3.3%	-0.1	0.0	0.0	0.0
1	46881	70	87	0.8%	-6.3%	0.0%	3.6%	0.1	-0.1	0.0	0.0
2	46682	71	87	1.5%	0.0%	1.8%	1.6%	-0.1	0.0	0.1	0.0
1	47503	59	87	0.1%	-1.0%	0.0%	0.6%	0.1	-0.1	0.0	0.0
2	47506	60	87	1.8%	0.0%	0.7%	4.5%	0.0	0.0	0.1	0.1
1	48187	63	93	1.8%	-2.1%	1.7%	3.3%	0.1	-0.1	0.0	0.0
2	48190	64	93	0.0%	1.1%	2.5%	2.9%	0.0	0.0	0.1	0.0
1	48900	70	94	-0.1%	-6.3%	1.4%	2.7%	0.1	-0.1	-0.1	0.0
2	48903	70	94	1.3%	-3.2%	1.8%	2.5%	-0.1	0.0	0.1	0.0
1	49608	59	94	1.4%	-3.1%	0.9%	3.0%	0.2	0.0	0.1	0.0
2	49611	59	94	0.5%	-2.1%	0.0%	2.5%	0.0	0.0	0.0	0.0
1	50313	64	99	0.1%	-5.2%	0.6%	2.1%	0.1	-0.1	0.0	0.0
2	50315	64	99	0.8%	0.0%	0.4%	1.6%	-0.1	0.0	0.1	0.1
1	51092	68	100	0.5%	-4.2%	0.6%	1.8%	0.1	-0.1	0.0	0.0
2	51093	70	100	3.5%	-2.1%	1.1%	8.6%	-0.1	0.0	0.1	0.0
1	51792	60	102	0.4%	-2.1%	0.6%	2.1%	0.2	-0.1	0.1	0.0
2	51794	60	102	2.6%	0.0%	1.4%	4.5%	-0.1	0.0	0.1	0.1

6.1.3 OVERALL PERFORMANCE

International Road Dynamics Inc.

FHWA VERIFICATION

Specifications					
Confidence	95%	Speed range low	50	to	60
	(1.96)	Speed range medium	60	to	65
Gross vehicle weight	10%	Speed range high	65	to	75
Tandem group weight	15%	Temperature range low	70	to	83
Single axle weight	20%	Temperature range medium	83	to	90
Axle spacings	0.5	Temperature range high	90	to	102

Overall

Characteristic	Error	StdDev	Specification	Calculated	Pass/Fail
Gross vehicle weight	0.8%	1.5%	10%	3.7%	pass
Tandem group weight	1.4%	2.3%	15%	5.9%	pass
Single axle weight	-2.2%	3.2%	20%	8.6%	pass
Axle spacings	0.0	0.1	0.5	0.2	pass

Speed range 50 to 60 (14 runs)

Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	0.4%	1.7%	10%	3.8%
Tandem group weight	0.9%	2.1%	15%	5.2%
Single axle weight	-2.5%	3.2%	20%	5.2%
Axle spacings	0.0	0.1	0.5	0.3

Speed range 60 to 65 (12 runs)

Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	1.3%	1.5%	10%	4.2%
Tandem group weight	2.0%	2.4%	15%	6.7%
Single axle weight	-2.0%	3.1%	20%	8.2%
Axle spacings	0.0	0.1	0.5	0.2

Speed range 65 to 75 (12 runs)

Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	0.9%	1.2%	10%	3.3%
Tandem group weight	1.4%	2.3%	15%	6.0%
Single axle weight	-2.1%	3.7%	20%	9.5%
Axle spacings	0.0	0.1	0.5	0.2

Temperature range 70 to 83 (12 runs)

Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	0.1%	1.9%	10%	3.9%
Tandem group weight	0.7%	2.8%	15%	6.3%
Single axle weight	-3.4%	4.3%	20%	12.0%

Temperature range 83 to 90 (14 runs)

Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	1.3%	1.1%	10%	3.5%
Tandem group weight	1.7%	1.8%	15%	5.4%
Single axle weight	-1.0%	2.8%	20%	6.7%

Temperature range 90 to 102 (12 runs)

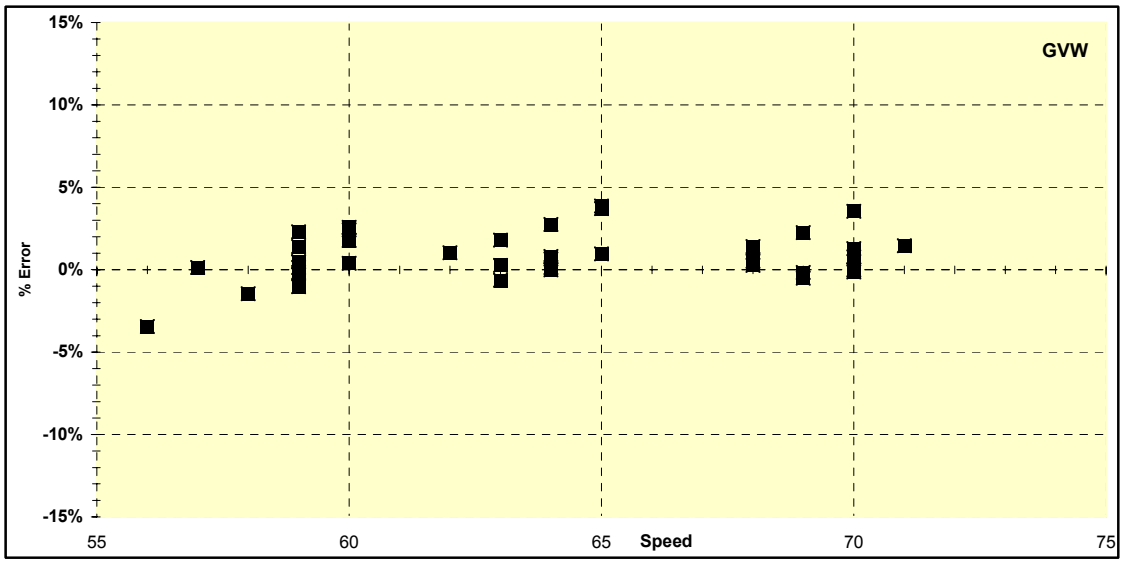
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	1.1%	1.1%	10%	3.3%
Tandem group weight	1.7%	2.2%	15%	6.1%
Single axle weight	-2.4%	2.1%	20%	6.8%

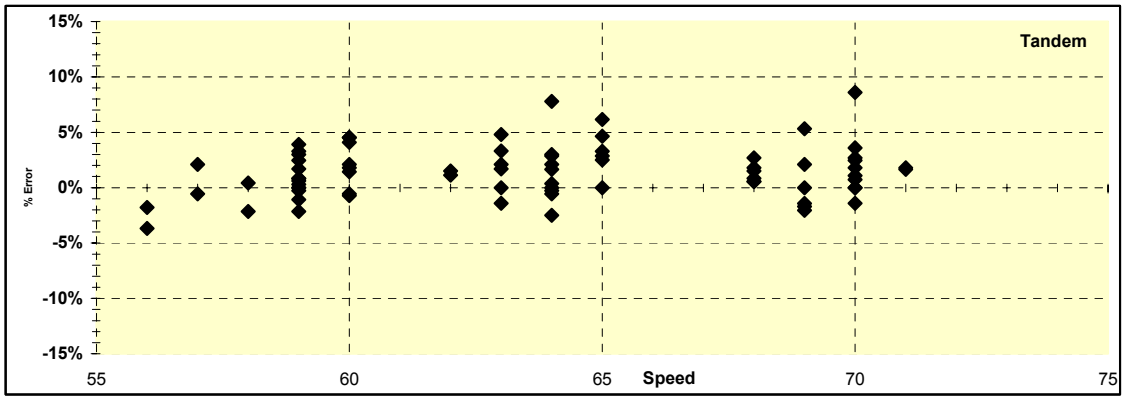
Tennessee LTPP Lane 4 Bruce Myers 2007/05/31

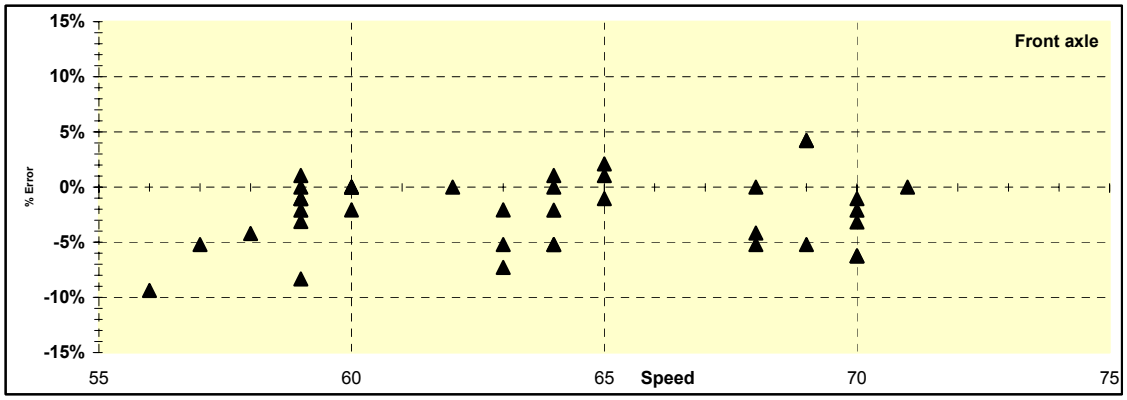
6.1.4 WEIGHT GRAPHS

International Road Dynamics Inc.

FHWA VERIFICATION

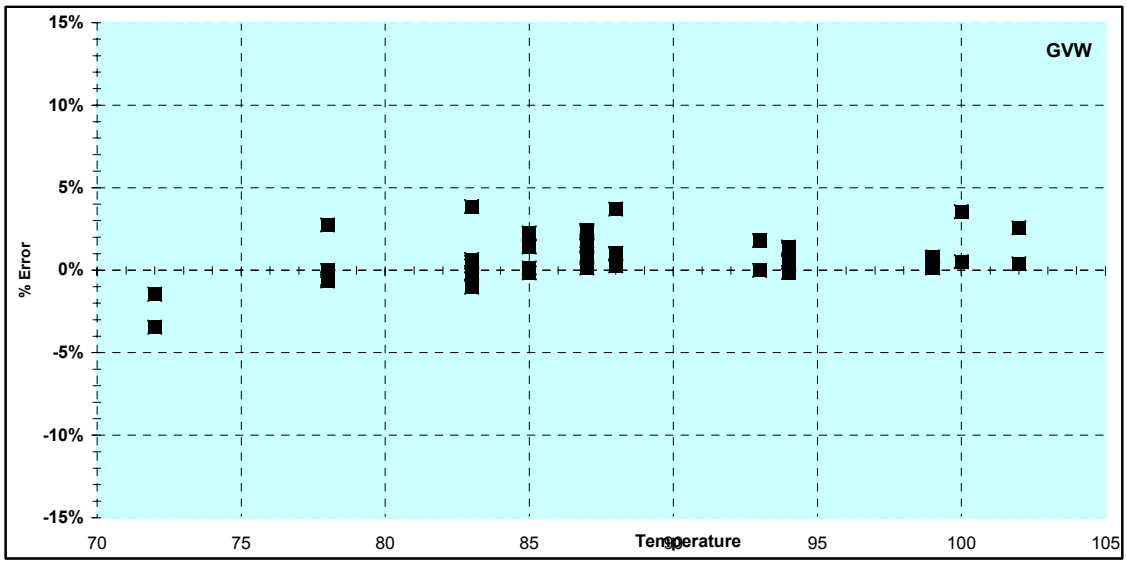


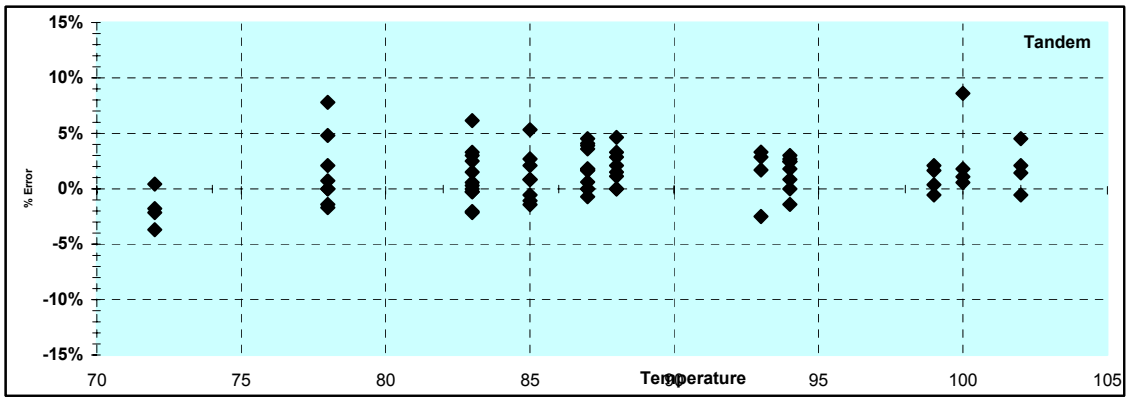


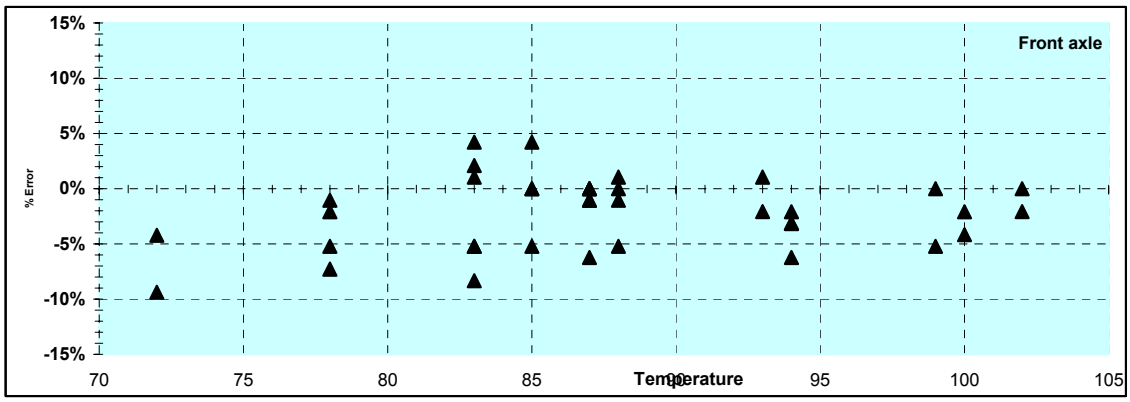


6.1.5 TEMPERATURE INFLUENCE GRAPHS

International Road Dynamics Inc.







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