INTERNATIONAL ROAD DYNAMICS INC.

LTPP WIM DATA COLLECTION SYSTEMS

INSTALLATION AND CALIBRATION FOR LOUISIANA SPS-1 LTPP ID 220100

JANUARY 29, 2007

CLIN 2004C TASK ORDER # 16

CONTRACT NO. DTFH61-05-D-00001

U.S. Department of Transportation
Federal Highway Administration

LONG TERM Pavement PERFORMANCE

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1.0 EXECUTIVE SUMMARY

This report details the installation and calibration of the Louisiana SPS-1 Weigh-in-Motion (WIM) site located on US171 mile post 8.1. The WIM site is instrumented with IRD's iSINC (Intelligent Sensor Interface Network Controller) WIM Electronics, Kistler Quartz Sensors and inductive loops. The LTPP lane is in the north bound driving lane and is instrumented with two inductive loops and 8 Kistler Quartz sensors.

This Kistler sensor layout used at this site is referred to as a double threshold. There are two sensors arrays which span the entire width of the roadway. Each array weighs each side of the vehicle separately and twice (four measurements per axle).

The WIM system uses a landline modem for communication and power is provided by 120 Volt A.C. service. The WIM Controller cabinet is located on the shoulder behind the guard rail east of the north bound travel lanes.

The WIM equipment installation began on December 11, 2007 and was completed on December 13, 2007. The site was calibrated on January 23, 2008.

The calibration 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

Debbie Walker (COTR)
FHWA LTPP
ph: 202-493-3068
e: deborah.walker@fhwa.dot.gov

Mark Gardner (RSC)
Fugro
ph: 512-977-1800

Phillip Arena (Division Representative)
FHWA
ph: 225-757-7612

State of Louisiana DOT
Doc Zhang 225-767-9162
Ronny Dupont
Don Duberville 337-437-9200

Bruce Myers
International Road Dynamics (Phase 2 Contractor)
ph: 717-264-2077
c: 717-860-1817
e: bruce.myers@irdinc.com

3.0 SHEET 16 – SITE CALIBRATION SUMMARY

SITE CALIBRATION INFORMATION

1. DATE OF CALIBRATION (MONTH/DAY/YEAR): **January 23, 2008**

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 **26**

TRUCK#	TYPE	SUSPENSION
1	**9**	**1 & 2 & 3**
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 **.3 %** STANDARD DEVIATION **1.3%**
   SINGLE AXLE MEAN DIFFERENCE **- .5%** STANDARD DEVIATION **2.2%**
   DOUBLE AXLES MEAN DIFFERENCE **.4%** STANDARD DEVIATION **2.1%**

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

9. DEFINE THE SPEED RANGES USED (MPH): **48 - 52, 53 – 55, 55 – 60, 61 - 65**

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 2 100**%**
    FHWA CLASS 3 100**%**
    FHWA CLASS 4&5 100**%**
    FHWA CLASS 8 100**%**
    FHWA CLASS 9 100**%**
    FHWA CLASS 12 **%**
    "UNCLASSIFIED" VEHICLES: **%**

15. PICTURES: _____

16. NOTES:
    _____

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

3.1.1 iSINC SITE CALIBRATION FACTORS & SITE PARAMETERS AS OF 01-23-2008

Calibration Menu

Select Lane		1					
Select Axle Sensor		1					
Threshold		16					
WIM Calib Factors >		Select Speed Bin	1	2	3	4	5
		Max Speed (kph)	72	80	88	96	105
		Calib Factor	2985	3048	3016	3024	3024
Select Lane		1					
Select Axle Sensor		2					
Threshold		16					
WIM Calib Factors >		Select Speed Bin	1	2	3	4	5
		Max Speed (kph)	72	80	88	96	105
		Calib Factor	3094	3159	3127	3135	3125
Select Lane		1					
Select Axle Sensor		3					
Threshold		16					
WIM Calib Factors >		Select Speed Bin	1	2	3	4	5
		Max Speed (kph)	72	80	88	96	105
		Calib Factor	2985	3048	3016	3024	3024
Select Lane		1					
Select Axle Sensor		4					
Threshold		16					
WIM Calib Factors >		Select Speed Bin	1	2	3	4	5
		Max Speed (kph)	80	88	96	105	112
		Calib Factor	3094	3159	3127	3135	3125

Site Parameters Menu

Lane Name			1
Lane State			ENABLED
Upstream Loop >		Loop State	ENABLED
		Module UID	9
		Channel Num	0
		Polarity Active	LOW
		Width (cm)	250
Downstream Loop >		Loop State	ENABLED
		Module UID	9
		Channel Num	1
		Polarity Active	LOW
		Width (cm)	250
		Distance(cm)	670
Axle Sensors >		Select Axle	1
		Axle State	ENABLED
		Module UID	5
		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	5
		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	5
		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	5
		Channel Num	3
		Polarity Active	HIGH
		Type	KISTLER_DUAL
		Distance(cm)	579
		Temp State	ENABLED
		Temp Module UID	5
		Temp Channel Num	0
Processing >	MaxTimeout(ms)		3000
	Dynamic Comp(%)		102
	Sig Wt Diff(%)		40
	Min Axle Wt(kg)		1360
	Veh Rec Mode		Split
	Axl Sep(cm)		305

4.0 WIM SITE INVENTORY

1. ROUTE US171 MILEPOST:8.1 LTPP DIRECTION: **N** S E W

2. SITE DESCRIPTION
   GRADE: <1%
   ☐ Sag vertical
   Nearest SPS section upstream of the site: 220119
   Distance from sensor to nearest upstream SPS Section: 500 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: 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: 13 ft
    Distance from sensors: 13 ft
    Type: 336
    Access controlled by: ☐ LTPP / ☒ State / ☐ Joint
    Primary contact: Ronny Dupont
    Alternate contact: Doc Zhang

11. POWER:
    Power type: ☐ Overhead / ☒ Underground / ☐ Solar
    Distance from cabinet to drop: 75 ft
    Service provider: N/A.

12. TELEPHONE:
    Telephone type: ☐ Overhead / ☒ Underground / ☒ Cell
    Distance from cabinet to drop: 75 ft
    Phone # : (337) 217-0849

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

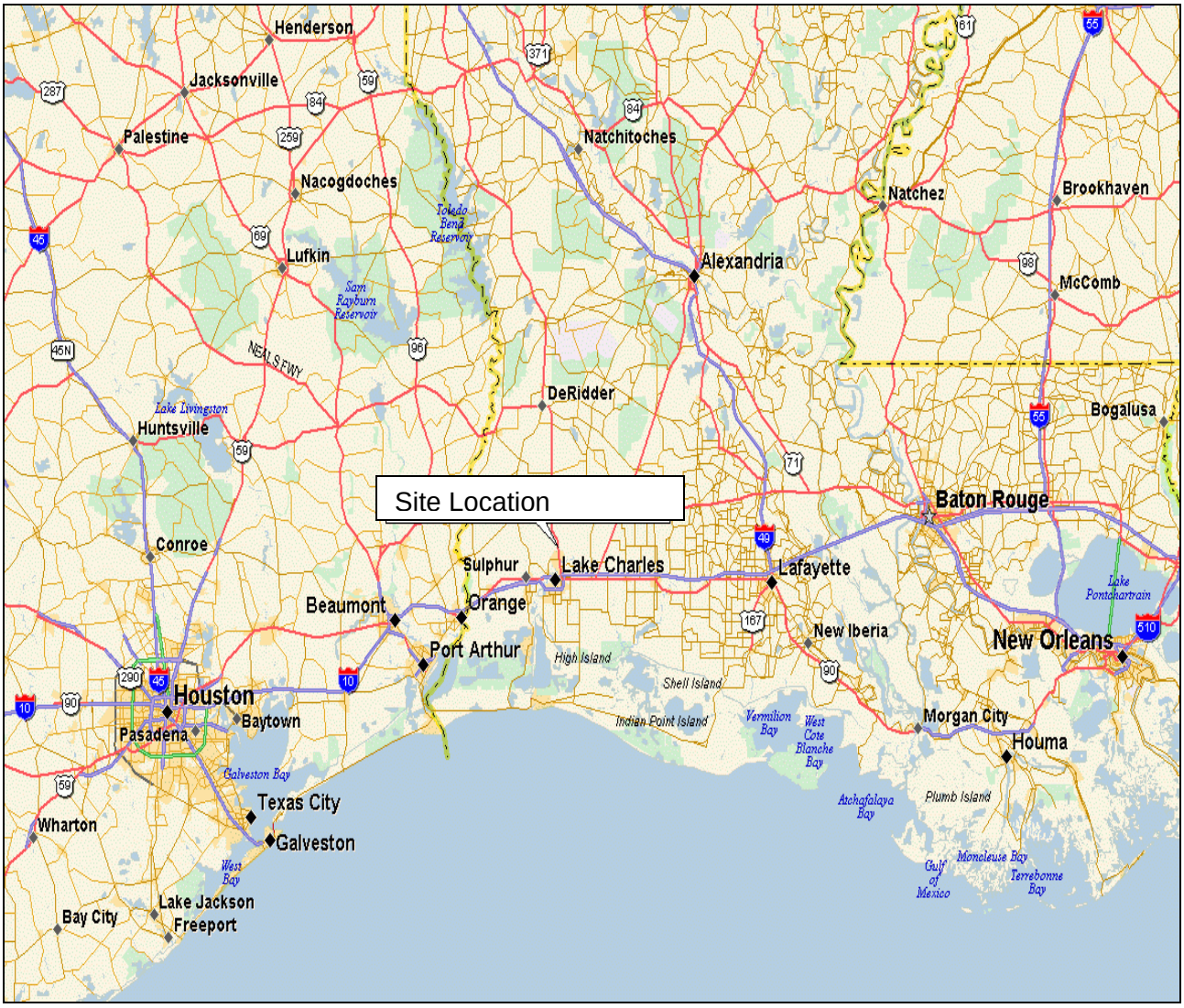
14. TEST TRUCK CYCLE:
    Turnaround time: 4 minutes
    Turnaround distance: 2 miles

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

16. NOTES:

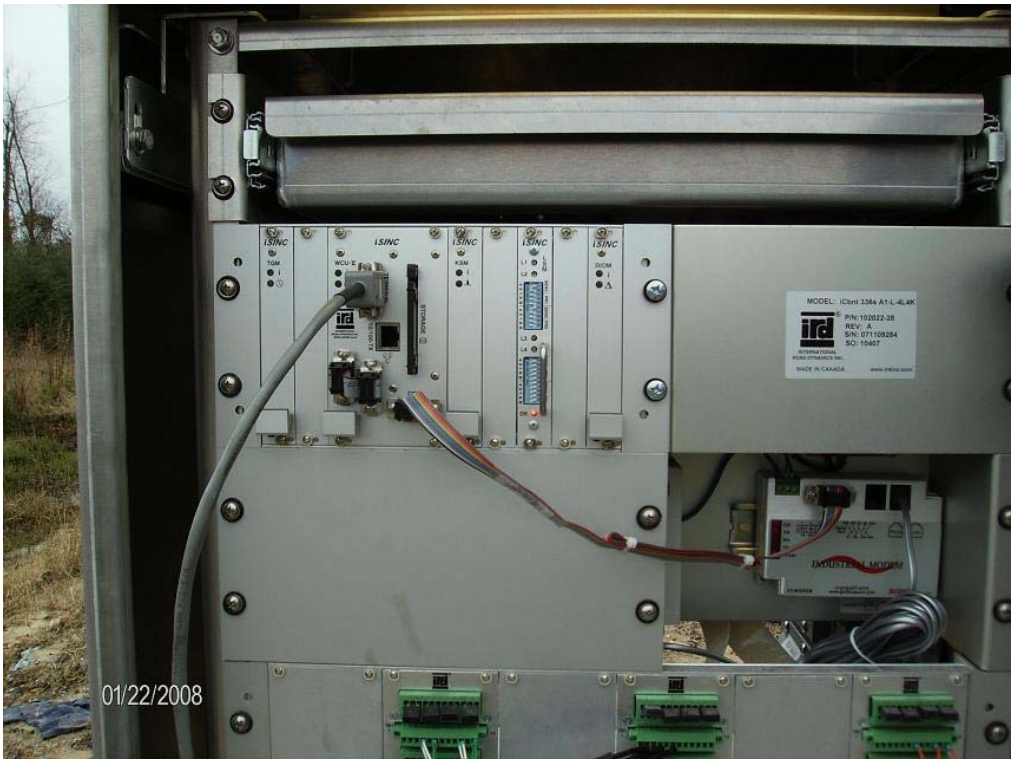
COMPLETED BY: **Bruce Myers**
CONTACT INFORMATION: **717-264-2077**

4.1.1 SITE MAP



US171 North Bound Mile Post 8.1

4.1.2 PICTURES, WIM SITE

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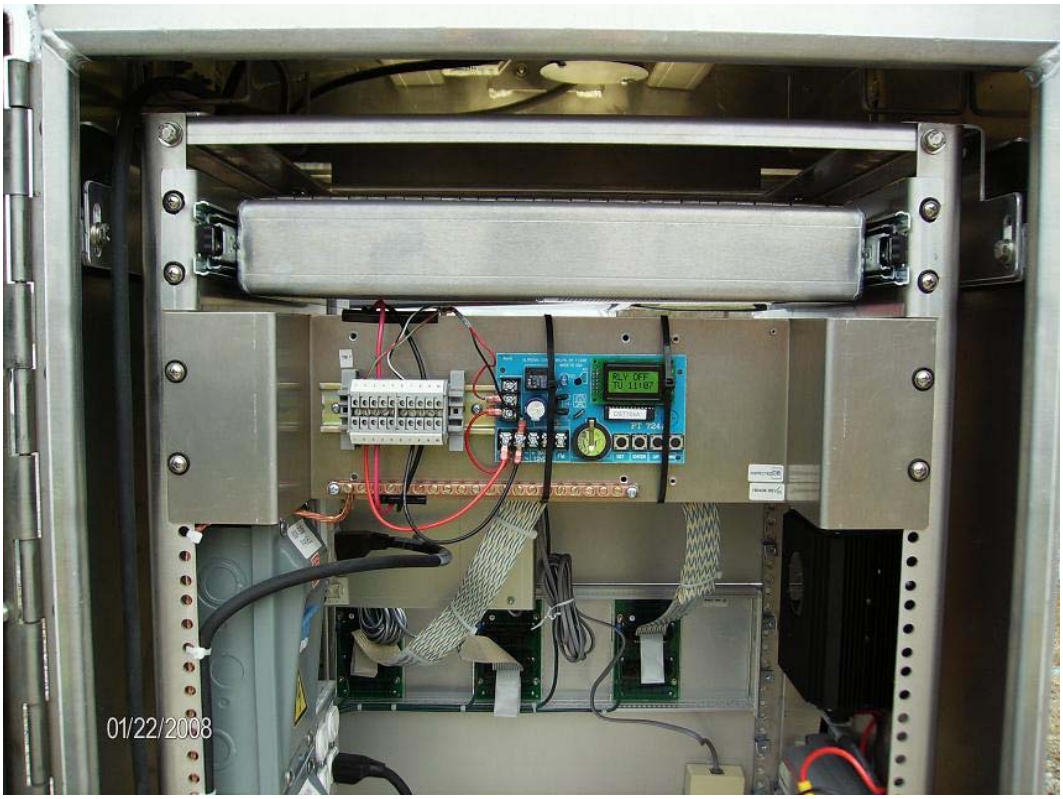
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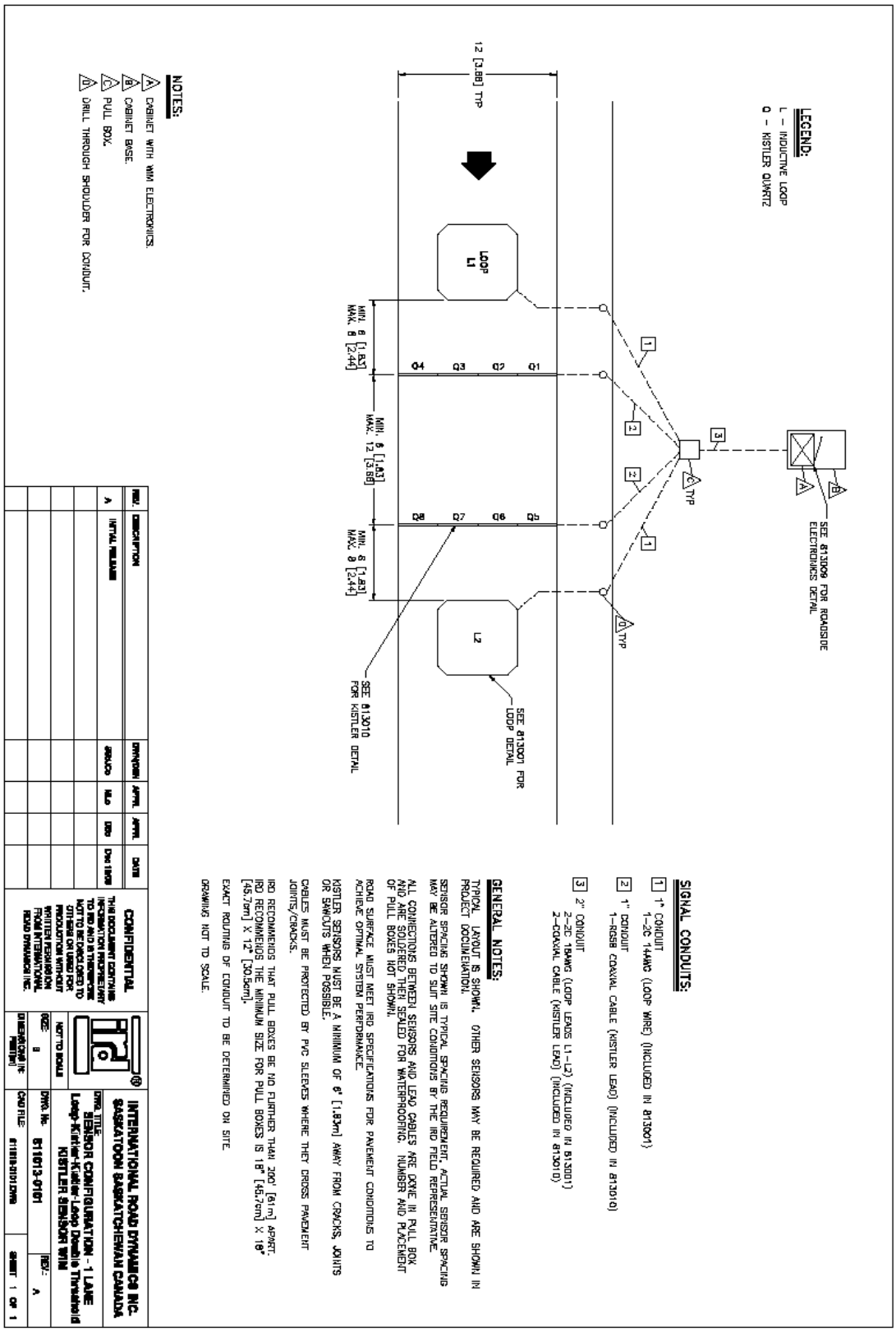
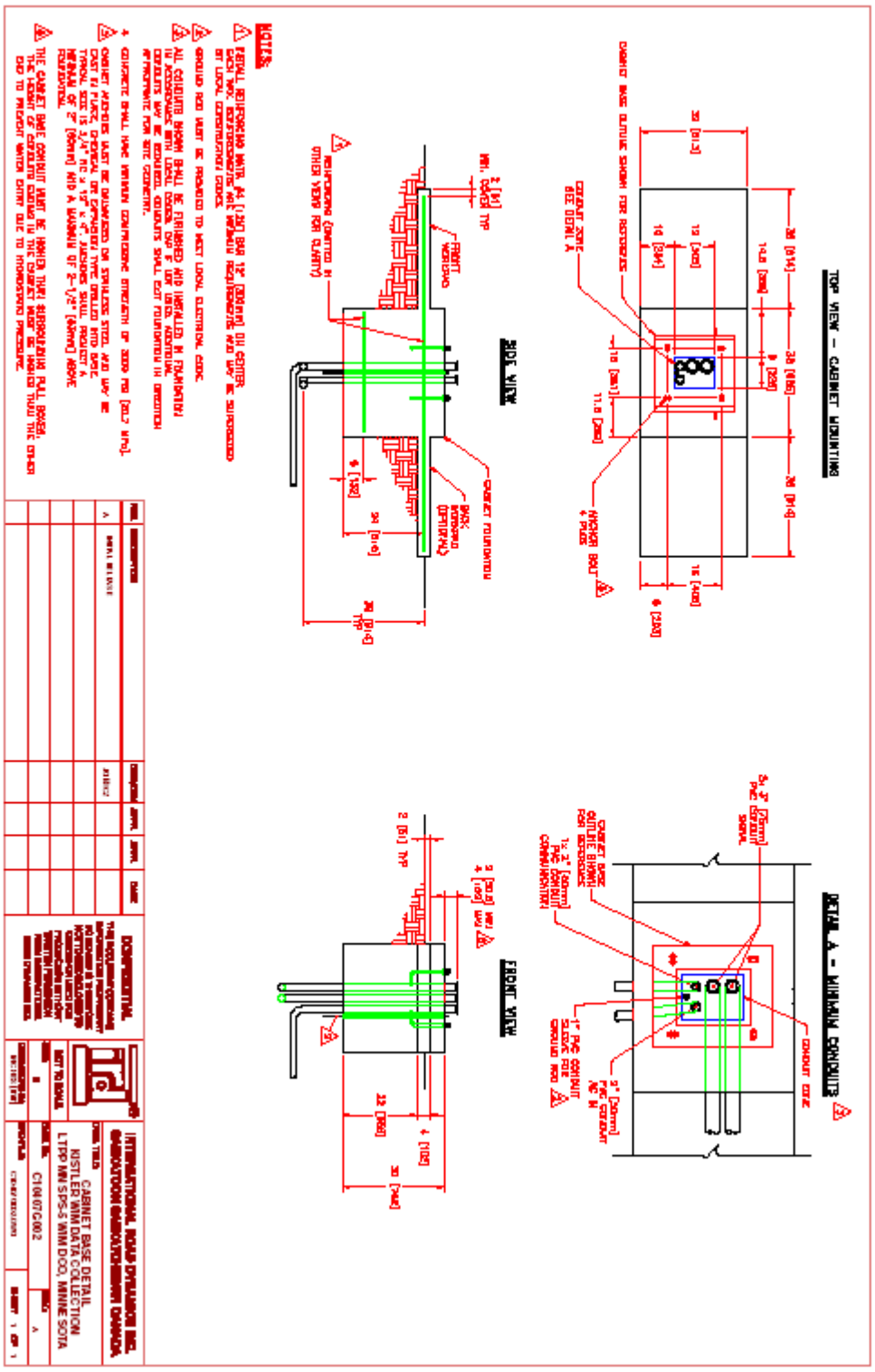
4.1.3 SITE DRAWING & LAYOUT



Kistler Sensor Array
6 X 6 Inductive Loop
Saw Cut
Pull Box
1" PVC
2" PVC
US 171 NB Mile Post 7.9, Calcasieu Parish
WIM Controller Pedestal / Cabinet
2" PVC Sch 40
4 – 1" PVC Sch 40
Pull Box
7 ft.
10 ft.
Shoulder
12 ft.
NB Driving
12 ft.
NB Passing
3 ft.
10 ft.
3 ft.
Site Plan 10407R

4.1.4 WIM CABINET CONCRETE PEDESTAL



4.1.5 ELECTRICAL READINGS

IRD

Site Service Sheet

Clear

System Type: iSINC/Kistler Quartz

Date: 1/22/2008 **State:** LA **Location:** US171 Mile Post 8.1
Job #: 10407R **Site #:** **Directions:** Approx. 8 Miles North Lake Charles

		Lead	Trail						
Loops	**Lane**	**1 NB**	**1 NB**						
Resistance		.8 ohm	.8 ohm						
Leakage		inf	inf						
Inductance uH		145 uh	148 uh						
Frequency									

Kistler	**Lane - 1**	**CH 0**	**CH 1**	**CH 2**	**CH 3**				
Amplitude		OK	OK	OK	OK				
Capacitance		9.6 nF	10.3 nF	10.2 nF	10.1 nF				
Resistance		inf	inf	inf	inf				

Kistler	**Lane - 2**								
Amplitude									
Capacitance									
Resistance									
Serial #									
Piezo	**Lane - 3**								
Amplitude									
Capacitance									
Resistance									
Serial #									
Kistler	**Lane - 4**								
Amplitude									
Capacitance									
Resistance									
Serial #									

System

A/C Service	O.K.
Power Supply	13.4 Vdc
DC Supply	13.4 Vdc
Back-Up	13.4 Vdc
System Input	
Modem Power	
Phone off	10 Vdc
Phone on	52 Vdc

Software

System: iSINC/M2

Site Full Operating Capacity **Pass**

Technician: Bruce Myers **Date:** 1/22/2008

5.0 WIM CALIBRATION

5.1.1 TEST TRUCK #1 INFORMATION

DATE OF CALIBRATION: **January 23, 2008**

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		12120		D
B		33880		D (B&C combined)
C				
D		33460		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)
	79460		79460

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

9. TRACTOR MANUFACTURER:
   Make: Kenworth
   Model:

10. TRAILER LOAD DESCRIPTION: Crane Test Weights

11. TRAILER TARE WEIGHT (lb): _____

12. AXLE SPACINGS

Axle	Spacing (feet & inches)
A-B	14.4'
B-C	4.7'
C-D	27.9’
D-E	4.1’

KINGPIN OFFSET FROM AXLE B (ft, + towards rear): +2 ft

SUSPENSSION:

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

5.1.2 PICTURES, TEST TRUCK 1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01/23/2008


01/23/2008


01/23/2008


01/23/2008


01/23/2008

5.1.3 TEST TRUCK #2 INFORMATION

DATE OF CALIBRATION: **January 23, 2008**

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		11440		D
B		19540		D (B&C combined)
C				
D		30660		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)
	61640		61640

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

9. TRACTOR MANUFACTURER:
   Make: Kenworth
   Model:

10. TRAILER LOAD DESCRIPTION: Crane Test Weights

11. TRAILER TARE WEIGHT (lb): _____

12. AXLE SPACINGS

Axle	Spacing (feet & inches)
A-B	17.9’
B-C	4.5’
C-D	31.3’
D-E	10.1’

KINGPIN OFFSET FROM AXLE B (ft, + towards rear): +1.7 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	11R22.5	air
E	11R22.5	air

5.1.4 PICTURES, TEST TRUCK 2


N# 7J169478
01/23/2008


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01/23/2008


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01/23/2008

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				79.5	12.1	33.9	33.5	14.4	4.7	27.9	4.1
2				61.6	11.4	19.5	30.7	17.9	4.5	31.3	10.1

Dynamic Test Vehicle Measurements

ID	V#	Speed	Temp	GVW	F/A	T1	T2	1>2	2>3	3>4	4>5
1	3728	49	55	79.8	11.8	33.9	34.0	14.5	4.5	27.8	4.1
2	3729	49	55	60.4	11.0	19.8	29.5	18.0	4.3	31.0	10.0
1	3740	54	55	80.1	12.0	33.7	34.4	14.5	4.5	27.8	4.1
2	3741	54	55	62.4	11.2	19.4	31.8	18.0	4.3	31.3	10.1
1	3749	59	55	80.4	11.8	34.1	34.4	14.7	4.5	27.7	4.0
2	3750	60	55	62.2	11.2	19.9	31.2	18.0	4.3	31.3	10.0
1	3764	64	55	77.9	11.7	33.6	31.6	14.4	4.5	27.7	4.1
2	3765	64	55	60.6	11.5	19.2	29.9	17.8	4.2	31.2	10.0
1	3777	49	54	79.0	12.0	33.9	33.1	14.5	4.5	27.8	4.0
2	3778	49	54	60.9	11.5	19.1	30.2	17.9	4.3	31.3	10.0
1	3792	54	54	80.3	12.2	34.0	34.1	14.4	4.5	27.8	4.0
2	3793	54	54	62.9	11.5	20.1	31.4	18.1	4.3	31.3	10.0
1	3811	59	54	78.6	11.9	33.4	33.3	14.4	4.5	27.7	4.0
2	3812	59	54	62.1	11.7	19.1	31.3	18.0	4.3	31.3	10.1
1	3827	64	53	81.4	11.7	35.2	34.5	14.4	4.5	27.8	4.0
2	3829	62	53	62.1	11.5	19.4	31.2	18.0	4.3	31.3	10.0
1	3860	50	53	79.4	12.1	33.4	33.9	14.5	4.5	27.9	4.0
2	3861	49	53	61.2	11.3	19.3	30.6	17.9	4.3	31.2	10.0
1	3881	54	53	79.2	12.1	33.3	33.7	14.4	4.5	27.8	4.0
2	3882	53	53	62.1	11.8	19.4	31.0	18.0	4.3	31.4	10.1
1	3894	59	53	78.9	11.9	33.8	33.3	14.4	4.5	27.8	4.1
2	3895	59	53	62.6	11.7	19.4	31.4	18.0	4.3	31.3	10.1
1	3914	64	53	80.9	11.6	34.4	34.8	14.3	4.5	27.6	4.0
2	3915	63	53	61.9	11.7	19.8	30.3	18.0	4.3	31.2	10.0
1	3931	49	53	80.1	11.9	33.6	34.7	14.5	4.5	27.9	4.1
2	3933	49	53	62.2	11.3	20.1	30.9	18.1	4.3	31.3	10.0
1	3946	54	53	80.1	12.2	33.7	34.3	14.4	4.5	27.7	4.0
2	3947	54	53	61.6	11.5	19.7	30.4	17.9	4.3	31.1	10.0
1	3958	59	53	78.2	11.5	33.9	32.9	14.4	4.5	27.7	4.0
2	3959	60	53	62.8	11.5	20.0	31.3	18.0	4.3	31.2	10.1
1	3968	64	53	81.4	11.6	35.8	34.0	14.3	4.5	27.6	4.0
2	3969	63	53	63.4	11.6	19.7	32.0	18.0	4.3	31.3	10.1
1	3981	49	53	79.0	12.1	33.1	33.7	14.4	4.5	27.7	4.0
2	3982	49	53	61.5	11.3	19.5	30.7	18.0	4.3	31.2	10.0
1	3988	59	53	78.2	11.9	33.9	32.3	14.3	4.5	27.7	4.0
2	3989	58	53	61.4	11.7	19.7	29.9	17.9	4.2	31.1	10.0
1	3995	64	53	78.4	11.6	33.3	33.5	14.3	4.5	27.5	4.1
2	3996	64	53	62.8	11.7	19.7	31.4	18.0	4.3	31.3	10.1
1	4013	49	53	79.2	12.2	33.9	33.3	14.5	4.5	27.8	4.0
2	4014	50	53	62.0	11.3	20.3	30.4	18.0	4.3	31.3	10.0

Date:	2008/01/23
Technician:	Bruce Myers
Location:	LTPP Louisiana

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	3728	49	55	0.4%	-2.5%	0.0%	1.5%	0.1	-0.2	-0.1	0.0
2	3729	49	55	-1.9%	-3.5%	1.5%	-3.9%	0.1	-0.2	-0.3	-0.1
1	3740	54	55	0.8%	-0.8%	-0.6%	2.7%	0.1	-0.2	-0.1	0.0
2	3741	54	55	1.3%	-1.8%	-0.5%	3.6%	0.1	-0.2	0.0	0.0
1	3749	59	55	1.1%	-2.5%	0.6%	2.7%	0.3	-0.2	-0.2	-0.1
2	3750	60	55	1.0%	-1.8%	2.1%	1.6%	0.1	-0.2	0.0	-0.1
1	3764	64	55	-2.0%	-3.3%	-0.9%	-5.7%	0.0	-0.2	-0.2	0.0
2	3765	64	55	-1.6%	0.9%	-1.5%	-2.6%	-0.1	-0.3	-0.1	-0.1
1	3777	49	54	-0.6%	-0.8%	0.0%	-1.2%	0.1	-0.2	-0.1	-0.1
2	3778	49	54	-1.1%	0.9%	-2.1%	-1.6%	0.0	-0.2	0.0	-0.1
1	3792	54	54	1.0%	0.8%	0.3%	1.8%	0.0	-0.2	-0.1	-0.1
2	3793	54	54	2.1%	0.9%	3.1%	2.3%	0.2	-0.2	0.0	-0.1
1	3811	59	54	-1.1%	-1.7%	-1.5%	-0.6%	0.0	-0.2	-0.2	-0.1
2	3812	59	54	0.8%	2.6%	-2.1%	2.0%	0.1	-0.2	0.0	0.0
1	3827	64	53	2.4%	-3.3%	3.8%	3.0%	0.0	-0.2	-0.1	-0.1
2	3829	62	53	0.8%	0.9%	-0.5%	1.6%	0.1	-0.2	0.0	-0.1
1	3860	50	53	-0.1%	0.0%	-1.5%	1.2%	0.1	-0.2	0.0	-0.1
2	3861	49	53	-0.6%	-0.9%	-1.0%	-0.3%	0.0	-0.2	-0.1	-0.1
1	3881	54	53	-0.4%	0.0%	-1.8%	0.6%	0.0	-0.2	-0.1	-0.1
2	3882	53	53	0.8%	3.5%	-0.5%	1.0%	0.1	-0.2	0.1	0.0
1	3894	59	53	-0.8%	-1.7%	-0.3%	-0.6%	0.0	-0.2	-0.1	0.0
2	3895	59	53	1.6%	2.6%	-0.5%	2.3%	0.1	-0.2	0.0	0.0
1	3914	64	53	1.8%	-4.1%	1.5%	3.9%	-0.1	-0.2	-0.3	-0.1
2	3915	63	53	0.5%	2.6%	1.5%	-1.3%	0.1	-0.2	-0.1	-0.1
1	3931	49	53	0.8%	-1.7%	-0.9%	3.6%	0.1	-0.2	0.0	0.0
2	3933	49	53	1.0%	-0.9%	3.1%	0.7%	0.2	-0.2	0.0	-0.1
1	3946	54	53	0.8%	0.8%	-0.6%	2.4%	0.0	-0.2	-0.2	-0.1
2	3947	54	53	0.0%	0.9%	1.0%	-1.0%	0.0	-0.2	-0.2	-0.1
1	3958	59	53	-1.6%	-5.0%	0.0%	-1.8%	0.0	-0.2	-0.2	-0.1
2	3959	60	53	1.9%	0.9%	2.6%	2.0%	0.1	-0.2	-0.1	0.0
1	3968	64	53	2.4%	-4.1%	5.6%	1.5%	-0.1	-0.2	-0.3	-0.1
2	3969	63	53	2.9%	1.8%	1.0%	4.2%	0.1	-0.2	0.0	0.0
1	3981	49	53	-0.6%	0.0%	-2.4%	0.6%	0.0	-0.2	-0.2	-0.1
2	3982	49	53	-0.2%	-0.9%	0.0%	0.0%	0.1	-0.2	-0.1	-0.1
1	3988	59	53	-1.6%	-1.7%	0.0%	-3.6%	-0.1	-0.2	-0.2	-0.1
2	3989	58	53	-0.3%	2.6%	1.0%	-2.6%	0.0	-0.3	-0.2	-0.1
1	3995	64	53	-1.4%	-4.1%	-1.8%	0.0%	-0.1	-0.2	-0.4	0.0
2	3996	64	53	1.9%	2.6%	1.0%	2.3%	0.1	-0.2	0.0	0.0
1	4013	49	53	-0.4%	0.8%	0.0%	-0.6%	0.1	-0.2	-0.1	-0.1
2	4014	50	53	0.6%	-0.9%	4.1%	-1.0%	0.1	-0.2	0.0	-0.1

6.1.3 OVERALL PERFORMANCE

International Road Dynamics Inc.

FHWA VERIFICATION

Specifications						
Confidence	95%	Speed range low	45	to	52
	(1.96)	Speed range medium	52	to	59
Gross vehicle weight	10%	Speed range high	59	to	70
Tandem group weight	15%	Temperature range low	52	to	53
Single axle weight	20%	Temperature range medium	53	to	54
Axle spacings	0.5	Temperature range high	54	to	55

Overall					
Characteristic	Error	StdDev	Specification	Calculated	Pass/Fail
Gross vehicle weight	0.3%	1.3%	10%	2.9%	pass
Tandem group weight	0.4%	2.1%	15%	4.5%	pass
Single axle weight	-0.5%	2.2%	20%	4.9%	pass
Axle spacings	-0.1	0.1	0.5	0.3	pass

Speed range 45 to 52 (12 runs)				
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	-0.2%	0.8%	10%	2.0%
Tandem group weight	0.0%	1.9%	15%	3.7%
Single axle weight	-0.9%	1.3%	20%	3.8%
Axle spacings	-0.1	0.1	0.5	0.3

Speed range 52 to 59 (16 runs)				
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	0.3%	1.1%	10%	2.6%
Tandem group weight	0.3%	1.8%	15%	3.8%
Single axle weight	0.0%	2.3%	20%	4.6%
Axle spacings	-0.1	0.1	0.5	0.3

Speed range 59 to 70 (12 runs)				
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	0.9%	1.7%	10%	4.3%
Tandem group weight	1.0%	2.5%	15%	6.0%
Single axle weight	-0.9%	2.8%	20%	6.5%
Axle spacings	-0.1	0.1	0.5	0.3

Temperature range 52 to 53 (26 runs)				
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	0.5%	1.3%	10%	3.0%
Tandem group weight	0.6%	2.0%	15%	4.5%
Single axle weight	-0.3%	2.4%	20%	5.2%

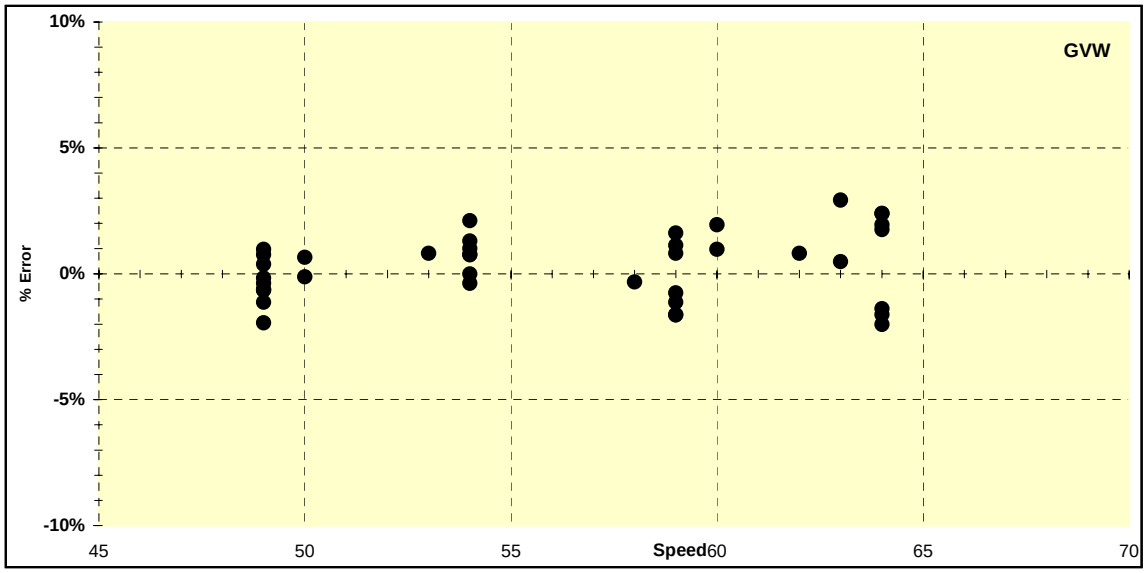
Temperature range 53 to 54 (6 runs)				
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	0.2%	1.3%	10%	2.9%
Tandem group weight	0.0%	1.8%	15%	3.7%
Single axle weight	0.5%	1.5%	20%	3.5%

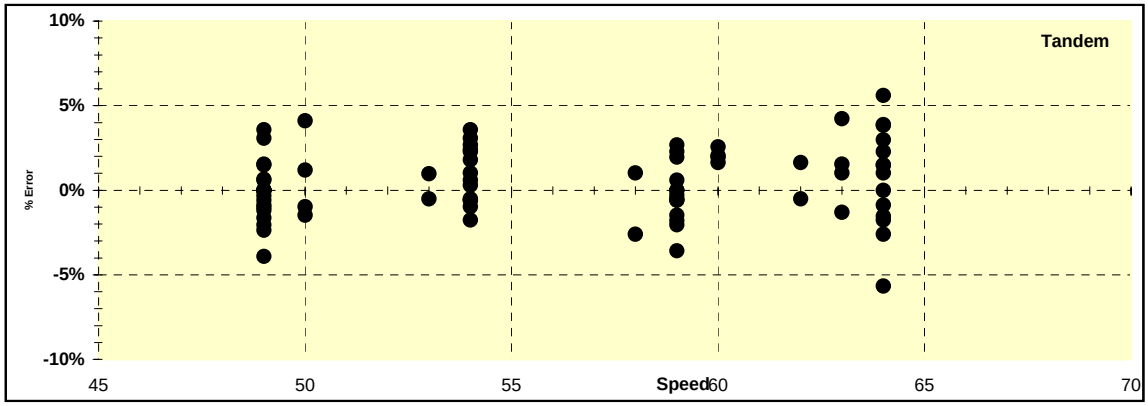
Temperature range 54 to 55 (8 runs)				
Characteristic	Error	StdDev	Specification	Calculated
Gross vehicle weight	-0.1%	1.5%	10%	3.1%
Tandem group weight	0.0%	2.5%	15%	5.2%
Single axle weight	-1.9%	1.4%	20%	4.8%

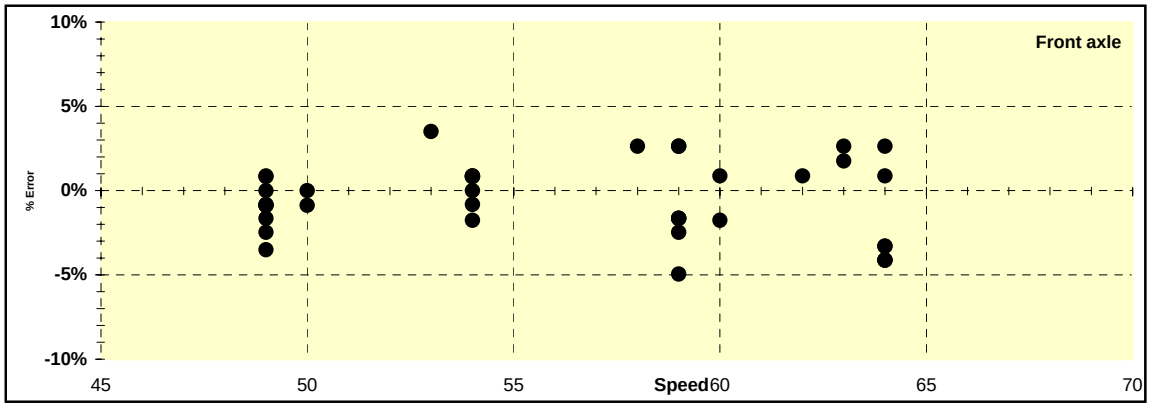
6.1.4 WEIGHT GRAPHS

International Road Dynamics Inc.

FHWA VERIFICATION







6.1.5 TEMPERATURE INFLUENCE GRAPHS

International Road Dynamics Inc.