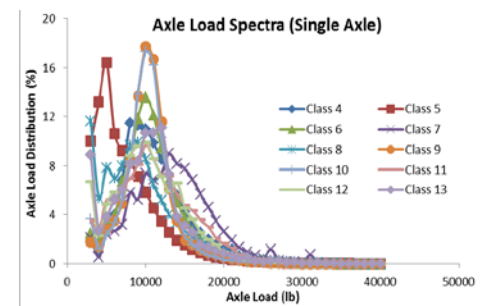
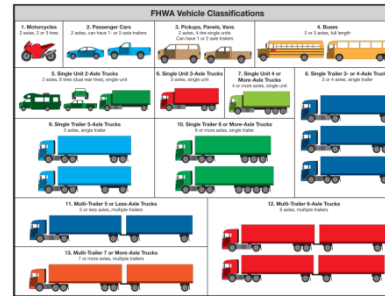




# Project 0-6940

## Develop System to Render Mechanistic-Empirical Traffic Data for Pavement Design

### Workshop PPT Slides



by

LUBINDA F. WALUBITA, SANG ICK LEE, & ALDO ALDO

# Outline

- ❑ Traffic Data Source
- ❑ Traffic Stations & Highway Sites
- ❑ Traffic Parameters & Example Results
- ❑ Traffic Data Accuracy & System Comparisons
- ❑ The MS Access M-E Traffic Data Storage System (The T-DSS)
- ❑ Data Analysis Macro
- ❑ Discussion

# Traffic Data Sources

- a) Permanent WIM
- b) Portable WIM
- c) Pneumatic tube counters

# Traffic Data Sources.

## Type of traffic data being collected & assembled

a) Permanent WIM stations (2013-2016)



b) Portable WIM stations



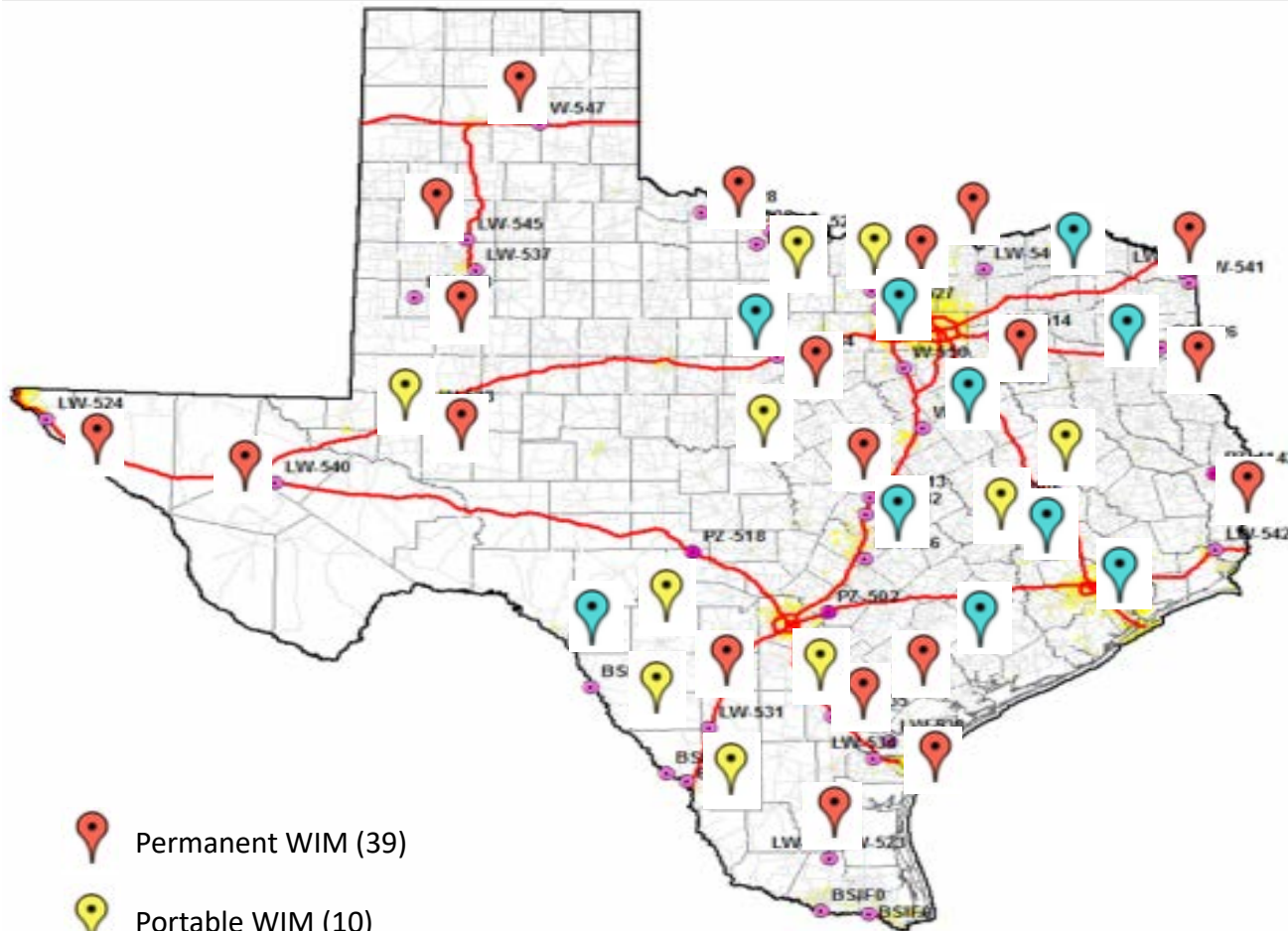
c) Pneumatic traffic tube (PTT) counters



Traffic Data Type	Traffic Parameter	Permanent WIM	Portable WIM	Pneumatic Traffic Tube (PTT) Counters
Traffic Volume	Average Annual Daily Traffic (AADT)	✓	✓	✓
	Average Annual Daily Truck Traffic (AADTT)	✓	✓	✓
	Truck percentage	✓	✓	✓
	Axles per truck	✓	✓	
Classification	Vehicle Classification Distribution (VCD)	✓	✓	✓
Vehicle Speed	Vehicle speeds (mph)	✓	✓	✓
Adjustment Factors	Monthly Adjustment Factors (MAF)	✓		
	Hourly Distribution Factors (HDF)	✓	✓	✓
Growth Rate	Yearly Volume Growth Rate (Gr)	✓		
Weight	Gross Vehicle Weight (GVW)	✓	✓	
	Axle Load Distribution Factors (ALDF) or Axle Load Spectra (ALS)	✓	✓	

# Traffic Data Sources..

## Map location of WIM & PTT Sites for traffic data collected to date



# Traffic Stations & Highway Sites

- a) Permanent WIM
- b) Portable WIM
- c) Pneumatic tube counters

# Traffic Stations & Hwy Sites.

## Example permanent WIM stations

#	Station ID#	District (County)	Climatic Region	Hwy	Lane Direction	Mile Marker	GPS Coordinates
1	W513	WAC(Bell)	Moderate	IH 35	All (NB & SB)	276-280	N 30° 51' 36" W 97° 35' 18"
2	W523	PHR(Hidalgo)	Moderate	US 281	All (NB & SB)	750-748	N 26° 41' 09" W 98° 06' 53"
3	W524	ELP(El Paso)	Dry-Warm	IH 10	All (EB &WB)	40-41	N 31° 37' 59" W 106° 13' 08"
4	W527	FTW(Wise)	Wet-Cold	SH 114	All (NB & SB)	582	N 33° 02' 11" W 97° 25' 56"
5	W531	LRD(La Salle)	Dry-Warm	IH 35	All (NB & SB)	50-55	N 28° 13' 05" W 99° 18' 10"
6	W534	CRP(Corpus Christi)	Moderate	IH 69	All (NB & SB)	145	N 27° 50' 23" W 97° 37' 59"
7	W541	ATL(Cass)	Wet-Cold	FM3129	NB (L1) & SB(L1)	232-230	N 33° 13' 32" W 94° 05' 56"
8	W542	BMT(Western Orange)	Wet-Warm	IH 10	All (EB &WB)	860-865	N 30° 07' 35" W 94° 01' 25"
9	W547	AMA (Potter)	Dry-Cold	IH 40	All (EB & WB)	110-120	N 35° 11' 39" W 101° 04' 26"

# Traffic Stations & Hwy Sites..

## Example portable WIM sites

#	Site ID#	District (County)	Climatic Region	Hwy	Lane Direction	Mile Marker	GPS Coordinates
1	TS001	LRD (Webb)	Dry-warm	US 83	NB (Outside)	678-680	N 28° 02' 37.4", W 099° 32' 59.8"
2	TS002	BRY (Robertson)	Wet-Warm	SH7	All (EB & WB)	618-616	N 31° 15' 27.1" W 96° 21' 09.5"
3	TS003	BRY(Leon)	Wet-Warm	SH7	WB-L1	658-660	N 31° 18', W 95° 35'
4	TS007	FTW (Wise)	Wet-Cold	SH 114	EB-L1	582-584	N 33°02'; W 97°25'
5	TS004	LRD (Dimmit)	Dry-Warm	FM 468	EB-L1	432-434	N 28°33'; W 99°30'
6	TS005	CRP (Live Oak)	Moderate	US 281	NB-L1 & SB-L1	620-622	N 28°27'59.0", W 98°10'50.7"
7	TS006	BWD (Comanche)	Dry-Warm	SH 6	NB-L1	386-384	N 32°13; W 98°57'W
8	TS008	ODA (Midland)	Dry-Warm	FM 1787	All (EB & WB)	280	N 31°41'; W 102°07'
9	TS009	LRD (Webb)	Dry-Warm	US 83	NB (Outside)	696-698	N 27° 46' 46.2", W 099° 27' 0.2"



# Traffic Stations & Hwy Sites...

## Example PTT sites

#	Site ID#	District (County)	Climatic Region	Hwy	Lane Direction	Mile Marker	GPS Coordinates
1	TTI00001	ATL (Panola)	Wet-Cold	US 59	SB (Outside)	308-310	N 32° 12' 05.3" W 94° 20' 35.5"
2	TTI00051	AUS (Bastrop)	Moderate	SH 304	SB	450-452	N 30° 06' 06.8" W 97° 21' 08.5"
3	TTI00024	YKM(Lavaca)	Wet-Warm	SH 95	SB	522-524	N 29° 22' 34.6" W 97° 09' 52.0"
4	TTI00002	FTW (Wise)	Wet-Cold	SH 114	EB (Outside)	582-584	N 33° 02' 12.1" W 97° 25' 34.5"
5	TTI00005	LRD (Maverick)	Dry-Warm	Loop 480	SB & NB (Outside)	570-567	N 28° 40' 58.9" W 100° 30' 10.5"
6	TTI00016	HOU(Harris)	Wet-Warm	FM 2100	NB & SB	456-454	N 29° 55' 32.6" W 95° 04' 18.2"
7	TTI00007	PAR(Lamar)	Wet-Cold	US 271	NB & SB	187-188	N 33° 51' 06.50" W 95° 30' 33.20"
8	TTI00019	SAT(Comal)	Dry-Warm	IH 35	SB (Outside)	190-189	N 29° 42' 34.8" W 98° 05' 23.8"
9	TTI00009	WAC(Bell)	Moderate	IH 35 (Frontage)	NB & SB	269-268	N 30° 58' 25.90" W 97° 30' 55.2"

# Traffic Parameters & Example Results

- a) Excel data sheets
- b) PPT slides
- c) The T-DSS

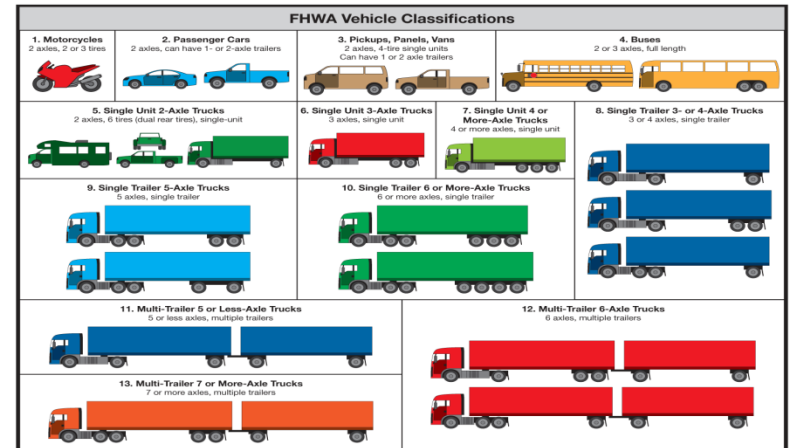
# Traffic Parameters Generated

## (a) General Traffic Data

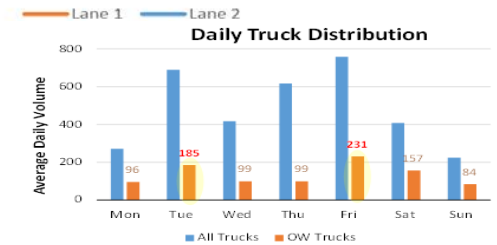
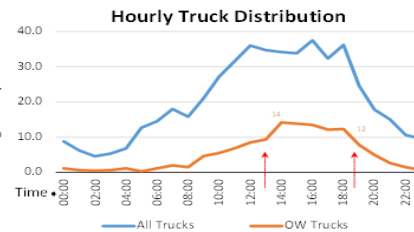
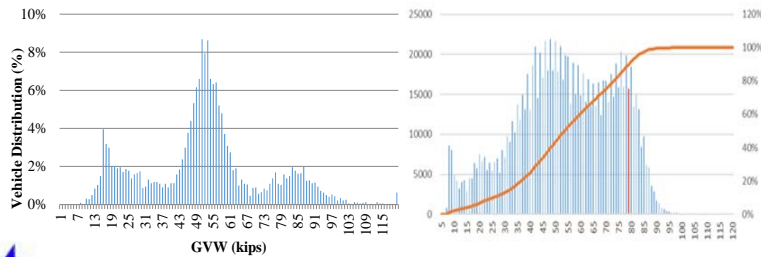
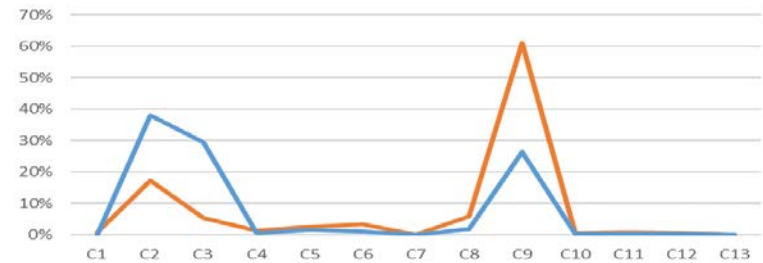
- 1) Volume counts (ADT, ADTT, %Trucks, etc)
- 2) Vehicle speed
- 3) Vehicle classification (VCD)
- 4) Hourly & daily distributions
- 5) Growth rates (Gr)
- 6) Vehicle weights (GVW)
- 7) Axle load distribution
- 8) Overweight's & overloading statistics
- 9) ATHWLDs
- 10) LEFs
- 11) Etc

## (b) Software/M-E Inputs

- 1) FPS
- 2) TxCRCP-ME (Concrete)
- 3) TxM-E
- 4) TxACOL
- 5) TxCrackPro
- 6) M-E PDG
- 7) AASHTOWare
- 8) PerRoad



Vehicle Class Distribution



# Example Traffic Results.

## Permanent WIM – Volume & FPS inputs (Example Station W531)

FPS Parameter	NB-L1 (Outside)	NB-L2 (Inside)	SB-L1 (Outside)	SB-L2 (Inside)	Comment
ADT-Beginning	6,113	2,699	6,213	2,656	ADT at the beginning of the design period
ADT-END 20 Year	23,001	10,155	23,377	9,994	ADT at the end of the design period (20 yrs)
18 kip ESALs 20 Years (millions)	39.08	5.49	40.11	5.76	@ 6.85% Gr
Avg. vehicle speed (mph)	~65	~65	~65	~65	Approach speed assumed to be equal to operational speed
% Trucks in ADT	47%	13%	51%	14%	
ATHWLD (kips)	14.3	11.8	12.3	12.7	
%Tandem axles	55.5%	51.1%	57.9%	54.9%	

# Example Traffic Results.

## Permanent WIM –FPS inputs (Example Station W531)

Input Design Data

Basic Design Criteria	
LENGTH OF ANALYSIS PERIOD, (Year)	20
MIN TIME TO FIRST OVERLAY, (Year)	10
MIN TIME BETWEEN OVERLAYS, (Year)	8
DESIGN CONFIDENCE LEVEL 95.0%	C
INITIAL SERVICEABILITY INDEX	4.8
FINAL SERVICEABILITY INDEX	3.5
SERVICEABILITY INDEX AFTER OVERLAY	4.8
DISTRICT TEMPERATURE CONSTANT (°F)	31
INTEREST RATE (%)	7.0

Traffic Data	
ADT, BEGINNING (VEH/DAY)	6113
ADT, END 20 YR (VEH/DAY)	23001
18 kip ESAL 20 YR (1 DIR) (millions)	39.08
AVG APP. SPEED TO OV. ZONE (mph)	65
AVG SPEED, OV. DIRECTION (mph)	45.
AVG SPEED, NON-OV. DIRECTION (mph)	50.
PERCENT ADT/HR CONSTRUCTION (%)	6.0
PERCENT TRUCKS IN ADT (%)	47

Program Controls	
MAX FUNDS /SQ. YD, INIT CONST	200.
MAX THICKNESS, INIT CONST	60.0
MAX THICKNESS, ALL OVERLAYS	6.0

To Main Menu

Navigation buttons: Previous, Next

# Example Traffic Results.

## Permanent WIM –TxCRCP-ME inputs (Example Station W531)

### CRCP DESIGN PROGRAM BASED ON MECHANISTIC-EMPIRICAL PRINCIPLES

Developed under TxDOT Research Project 0-5832

Version: TxCRCP-ME v07b

#### A. Project Identification

District	
County	
Highway	
CSJ	
Direction	
Station (Begin)	
Station (End)	

#### B. Design Parameters

Design Life (year)	30
Number of Punchouts per Mile	10

#### C. Design Traffic

Total Number of Lanes in One Direction	
Total Design Traffic in One Direction (million ESALs)	

#### D. Concrete Layer Information

Thickness of Concrete Layer (in.)	
28-Day Modulus of Rupture (psi)	570

#### E. Support Layers Information

Soil Classification System	USCS
Soil Classification of Subgrade	
Base Type	CTB
Base Thickness (in.)	6
Modulus of Base Layer (ksi)	
Composite K (psi/in.)	0

Input

Temperature

Soil Classification

K-Table

Composite K

S-Table

Stress

Analysis Result

Final Result

Time vs. Punchout

#### Concrete - Inputs (Based on Concrete Daily ESAL)

	NB-L1	NB-L2	SB-L1	SB-L2	Comment
Design Life	30	30	30	30	30 Years
Annual Growth Rate	6.72	6.72	6.72	6.72	6.72 %
Number of Lanes in one direction	2	2	2	2	
18 kip ESALs 30 Years (million)	221.53	26.20	168.20	14.99	



# Example Traffic Results..

## Permanent WIM – Truck overweight & overloading statistics

Station#	Most Overload Lane	ADTT	Daily OW Trucks (> 80 kips)	%OW
W523 (US 281)	SB outside	1 968	98	5.0%
W524 (IH 10)	EB outside	3 910	94	2.4%
W527 (SH 114)	EB outside	1 670	333	19.9%
W531 (IH 35)	NB outside	2 400	144	6.0%
W541 (FM 3129)	NB outside	192	70	36.5%
W547 (IH 40)	WB outside	2 676	159	5.9%

Station#	%age Overweight (Count of Daily Overweight Axles)			
	Single (20 kips)	Tandem (> 34 kips)	Tridem (> 42 kips)	Quad (> 50 kips)
W523 (US 281)	2.0% (14)	8.0% ( <b>200</b> )	21.3% (3)	40.0% (1)
W524 (IH 10)	0.7% (41)	3.0% ( <b>171</b> )	42.3% (11)	0.0%
W527 (SH 114)	1.0% (27)	33.0% ( <b>703</b> )	90.5% (17)	58.3% (1)
W531 (IH 35)	0.8% (26)	7.9% ( <b>317</b> )	20.0% (3)	34.8% (1)
W541 (FM 3129)	0.5% (1)	41.5% ( <b>149</b> )	4.9% (1)	0.0%
W547 (IH 40)	1.3% (45)	12.0% ( <b>508</b> )	91.8% (16)	0.0%

Mostly Overloaded Axle	%age Overweight Axle Count	Overweight Record (> 34 kips)
Tandem	8 – 53%	1.3 – 1.8 times (30-80%)

A truck maybe within legal GVW limit, but due to uneven loading, the axles may overloaded as shown above with higher %age overweight on the axles than the GVW, i.e., W523 = 5% (GVW) vs 8% (tandem)

# Example Traffic Results..

	Daily Truck	Daily OW Truck (GVW>80 kips)	OW %
NB Outside	2400	144	6.0%
NB Inside	369	19	5.1%
SB Outside	3145	31	1.0%
SB Inside	363	18	5.0%

North Bound							
	L1 = Outside Lane				L2 = Inside Lane		
Axle Type	Daily Count	OW Axle Count	% OW		Daily Count	OW Axle Count	% OW
Single	3209	25.6	0.8%		515	2.7	0.5%
Tandem	4019	317.4	7.9%		539	65.3	12.1%
Tridem	12	2.4	20.0%		1.4	0.3	21.4%
Quad	1.15	0.4	34.8%		0.15	0.05	33.3%

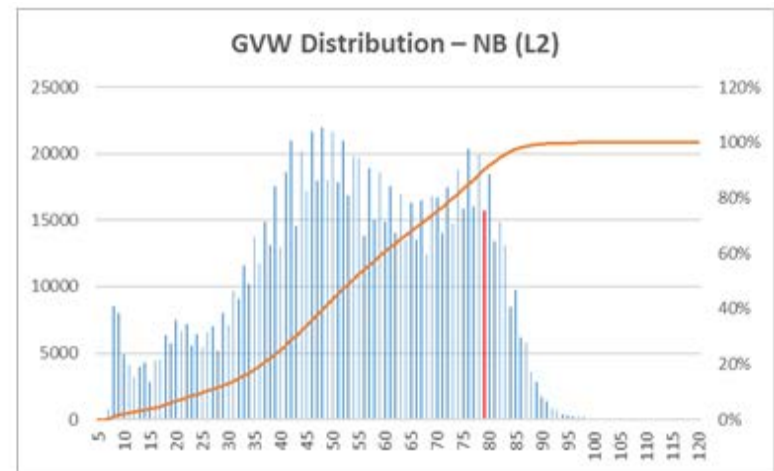
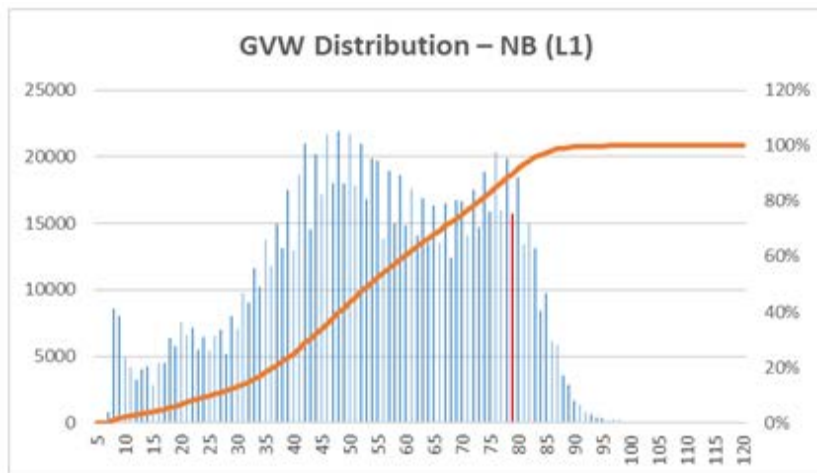
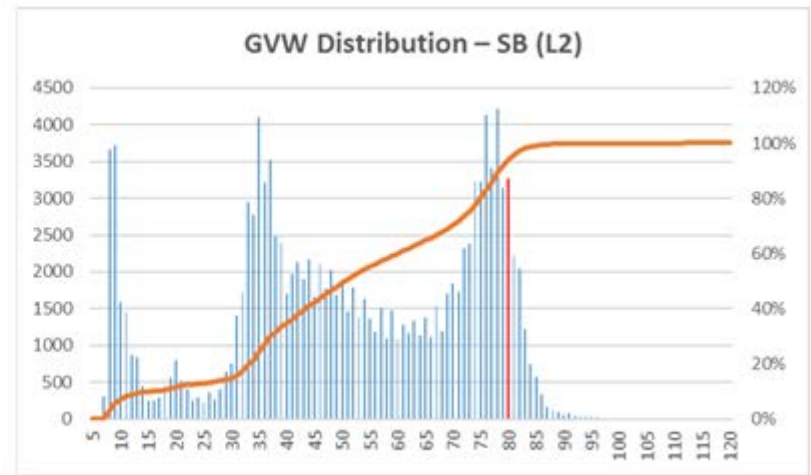
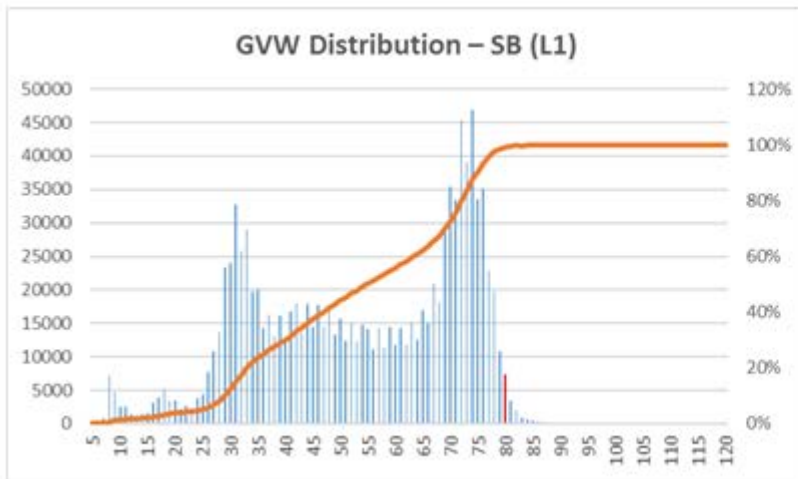
South Bound							
	L1 = Outside Lane				L2 = Inside Lane		
Axle Type	Daily Count	OW Axle Count	% OW		Daily Count	OW Axle Count	% OW
Single	3944	19.00	0.5%		478	2.5	0.5%
Tandem	5446	232.00	4.3%		583	63.8	10.9%
Tridem	13	4.9	37.7%		1.4	0.4	28.6%
Quad	1.4	0.6	42.9%		0.16	0.08	50.0%

OW Criteria: Single >20 kips, Tandem > 34 kips, Tridem > 42 kips, Quad>50 kips



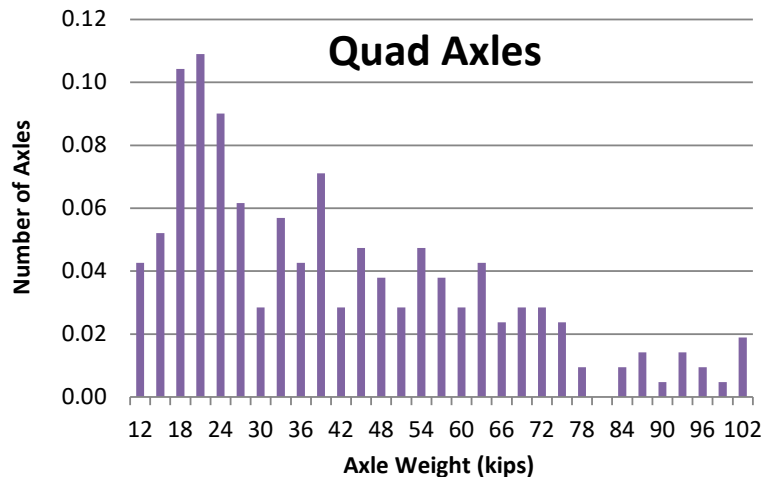
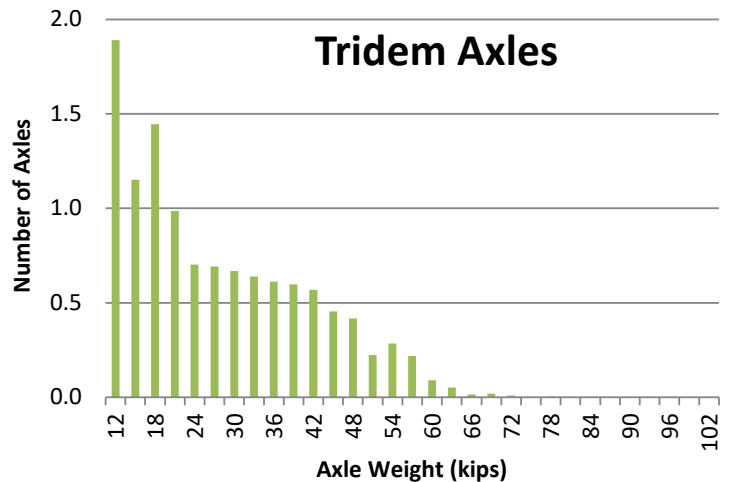
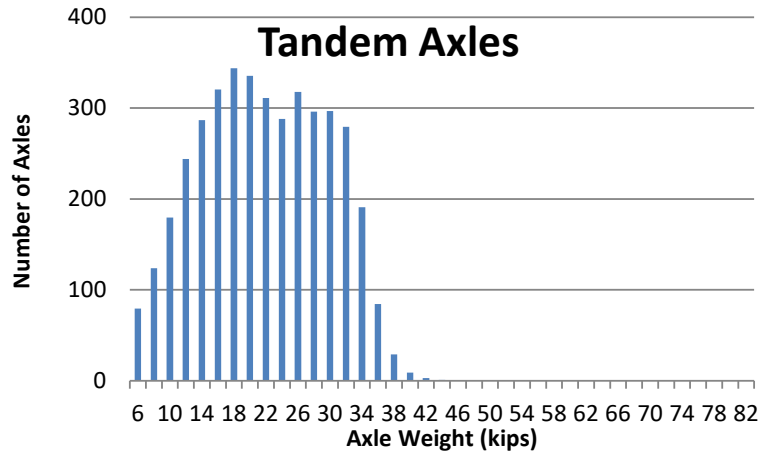
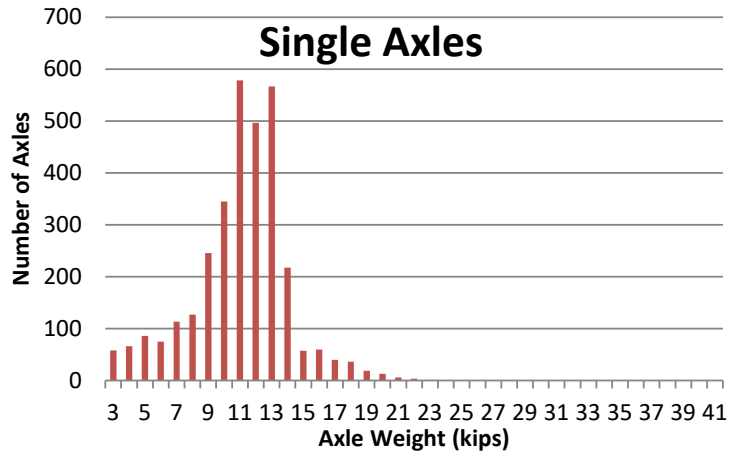
# Example Traffic Results...

## Permanent WIM – GVW distribution (Example Station W531)



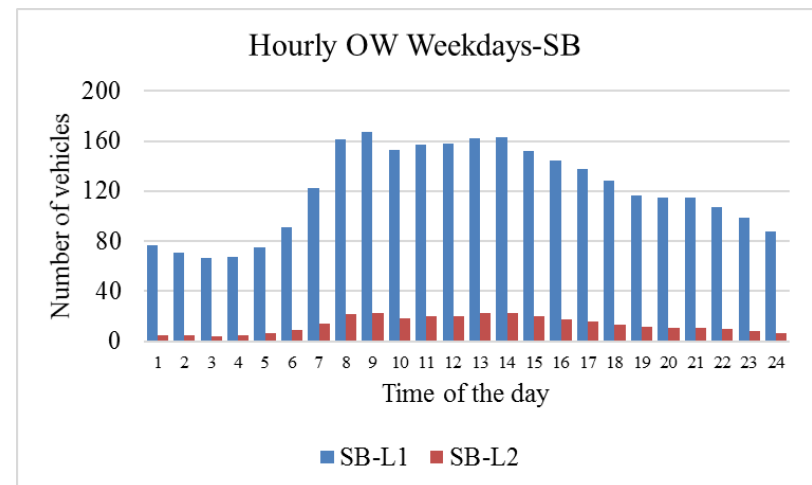
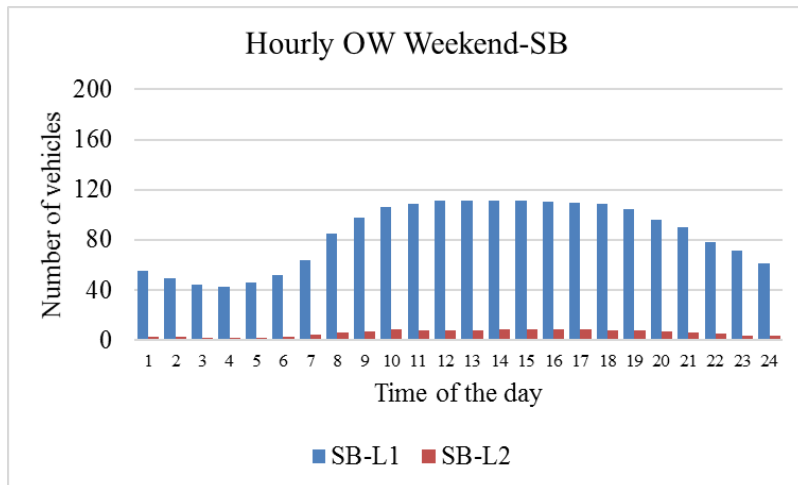
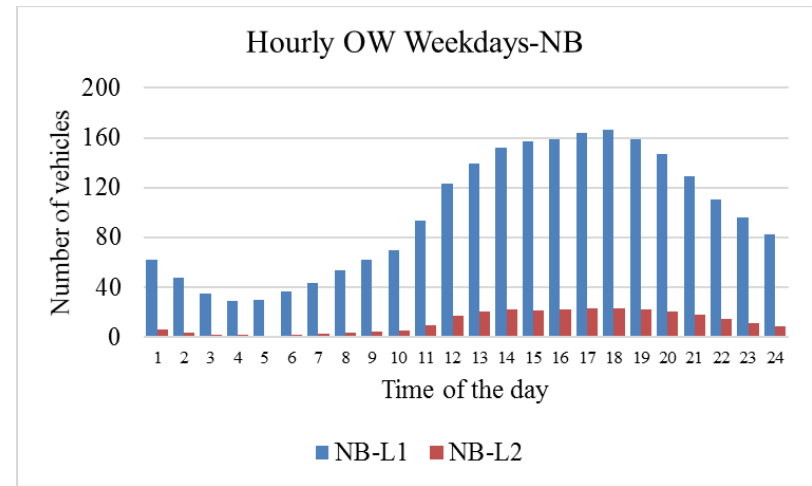
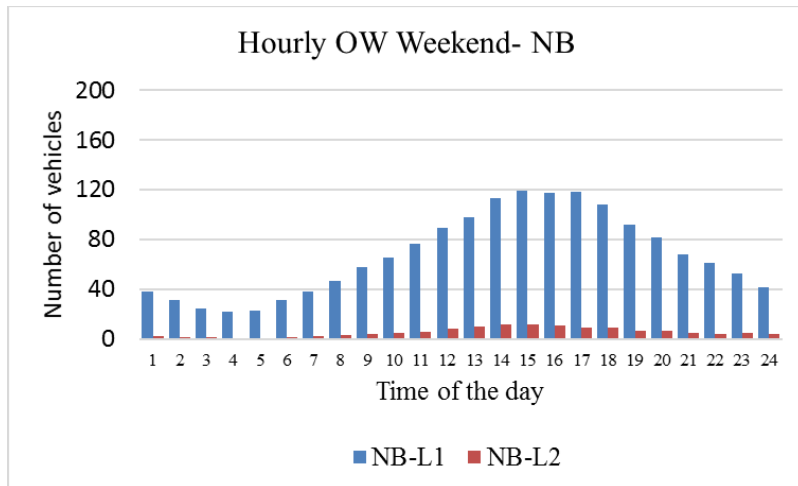
# Example Traffic Results.....

## Permanent WIM – Axle weight distribution (Example Station W531 , NB outside)



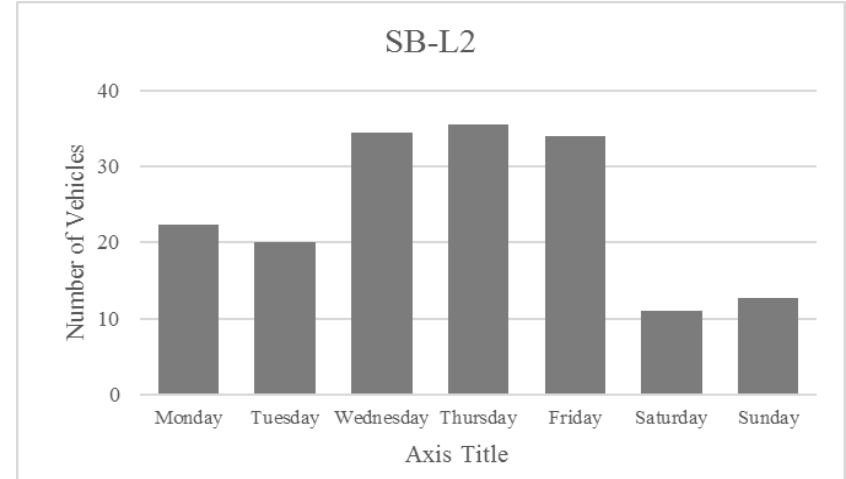
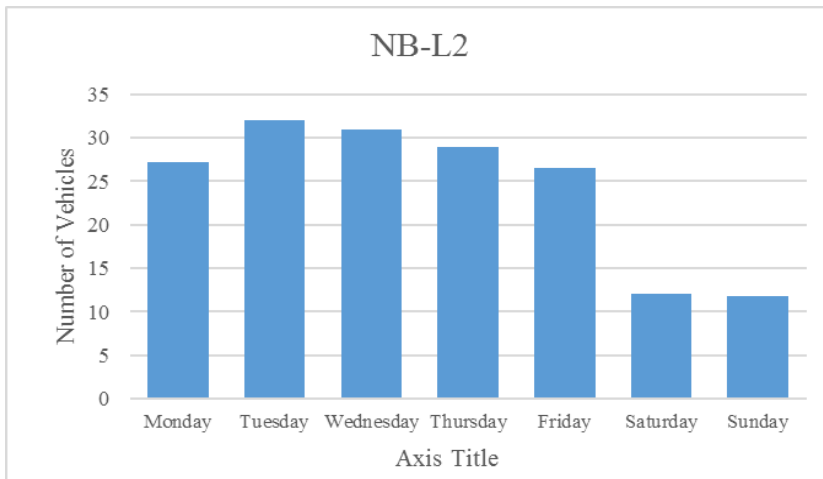
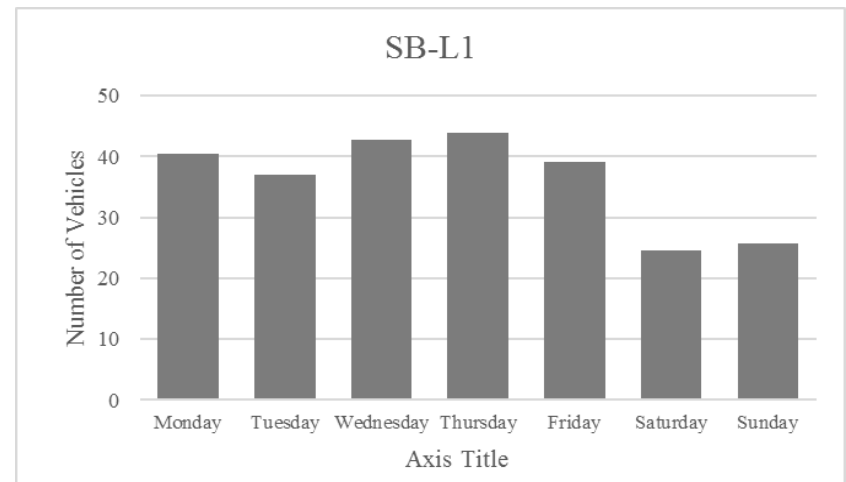
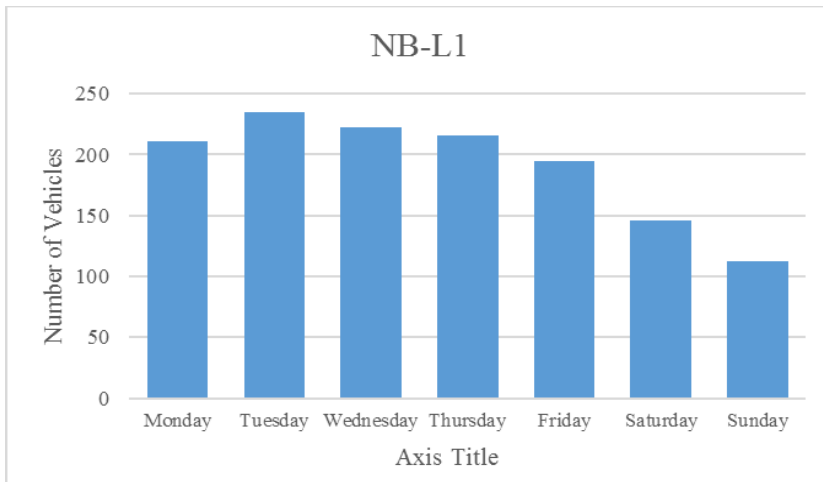
# Example Traffic Results.....

## Permanent WIM – Overweight hourly distribution (Example Station W531)



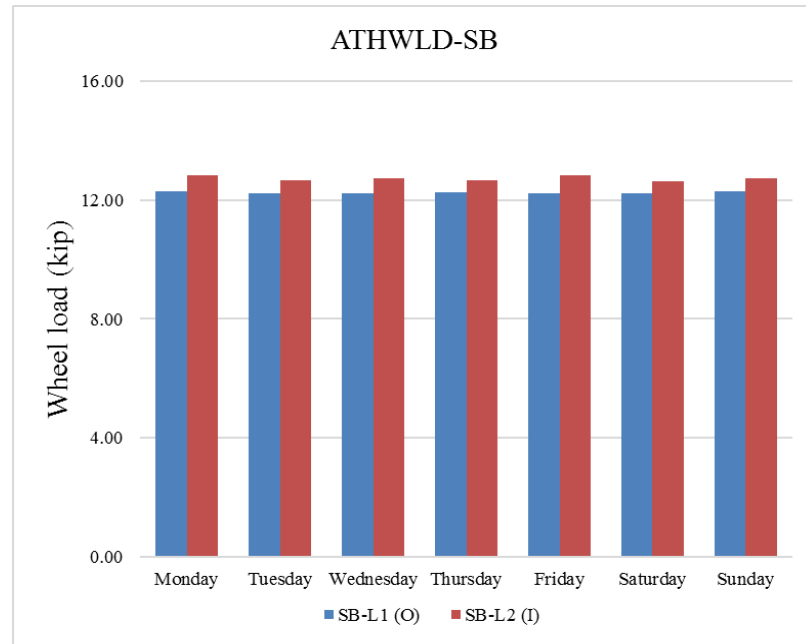
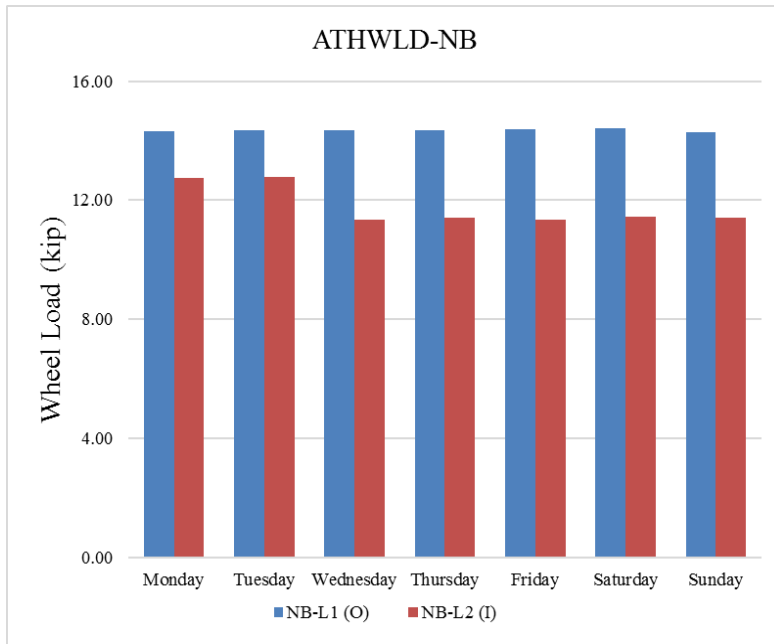
# Example Traffic Results.....

## Permanent WIM – Overweight daily distribution (Example Station W531)



# Example Traffic Results.....

## Permanent WIM – Daily ATHWLD Distribution (Example Station W531)

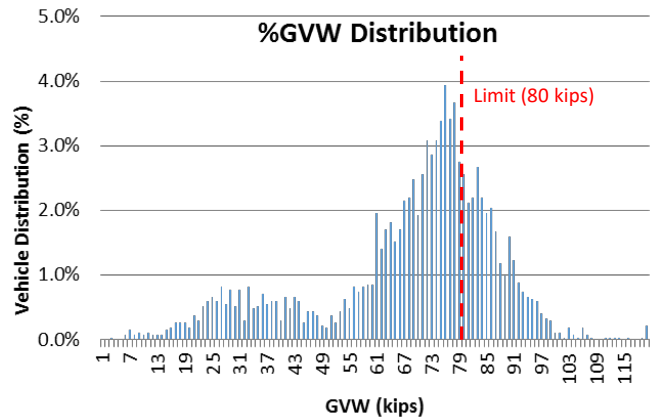
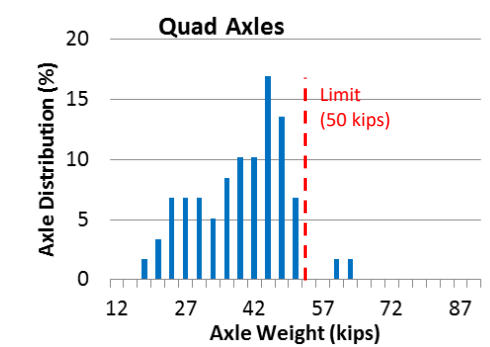
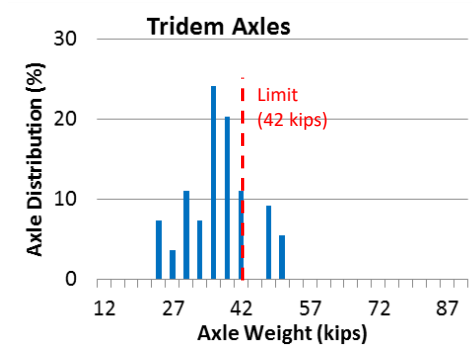
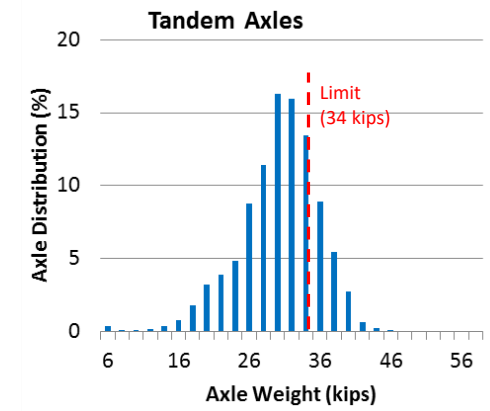
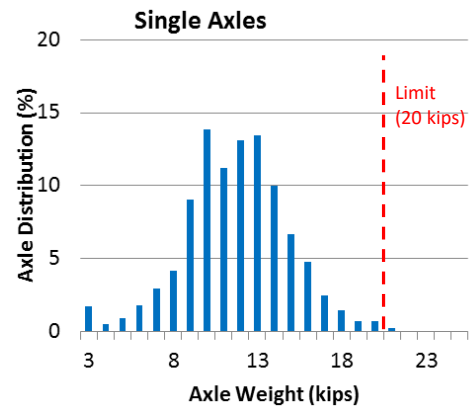


	ATHWLD	% Tandem Axles
NB-L1 (O)	14.34 kips	55.5%
NB-L2 (I)	11.78 kips	51.1%
SB-L1 (O)	12.25 kips	57.9%
SB-L2 (I)	12.74 kips	54.9%

# Example Traffic Results...

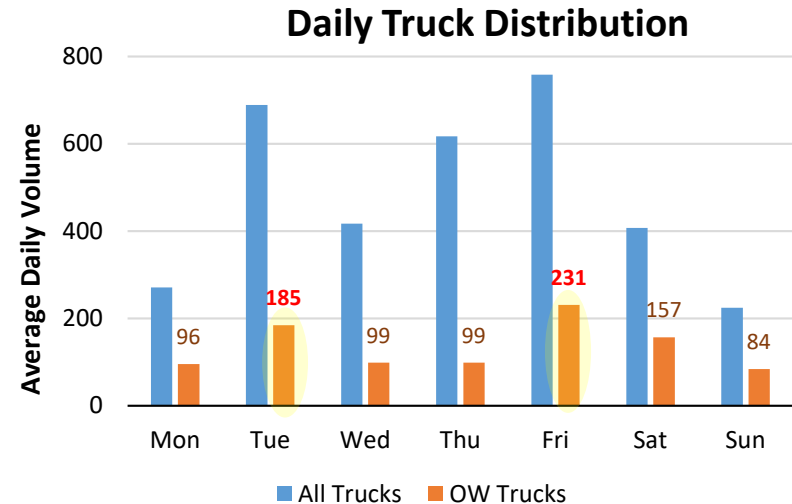
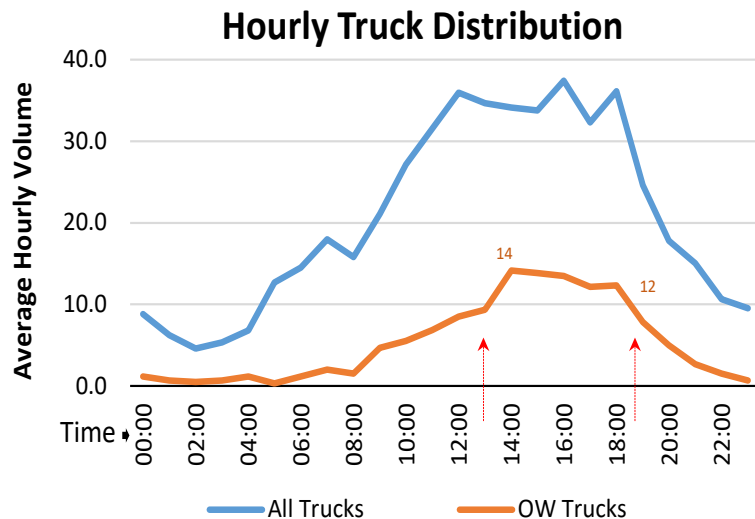
- ME traffic data collected using **portable WIM** on US 83 NB (LRD)  $\Rightarrow$  RM 698-696

Volume	Parameter	FPS Input
ADT	1714	ADT-Beginning 3429
ADTT	495	ADT-END 20 Year 6,193
Truck %	28.8%	18 kip ESALs 8.44
20-Yr 18-kip ESALs	8.44 million	20 Years (million) 59.7
		Avg. vehicle speed (mph) 28.8%
		%Trucks in ADT



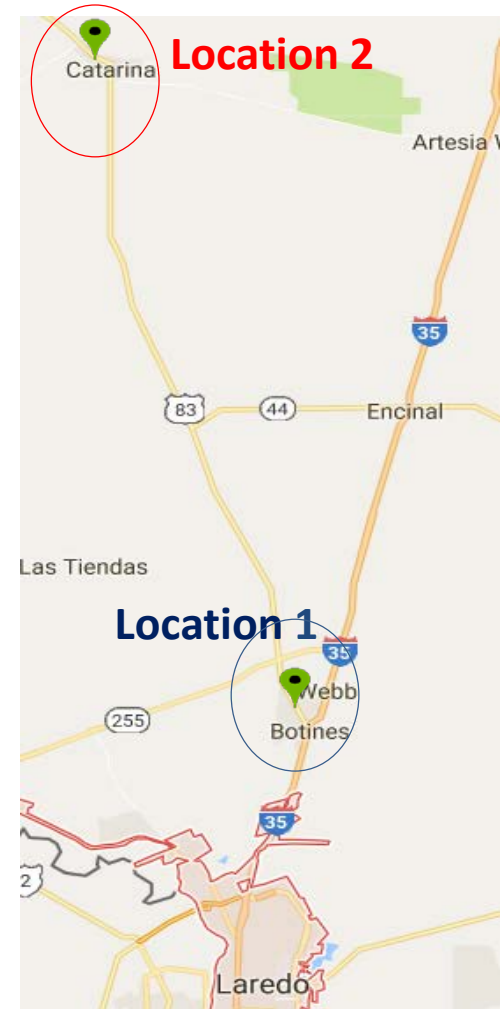
# Example Traffic Data Results..

- ME traffic data collected using portable WIM on US 83 NB (LRD)  $\Rightarrow$  RM 698-696



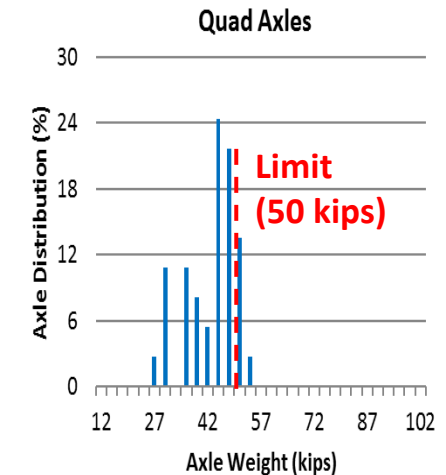
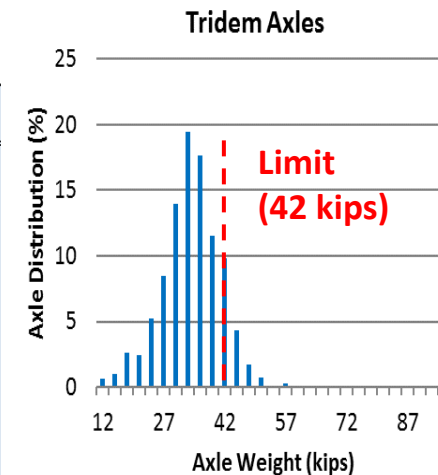
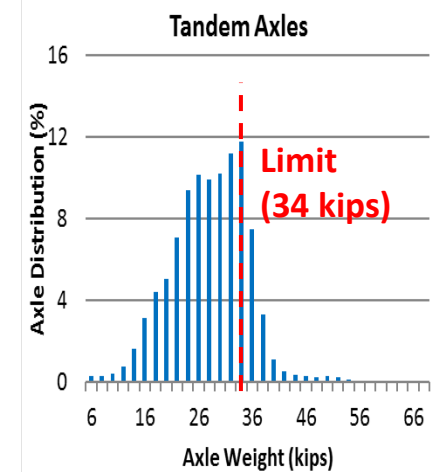
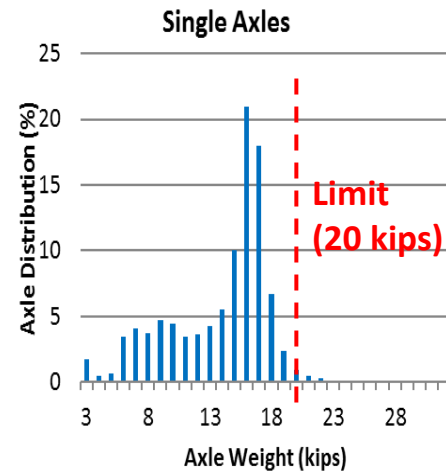
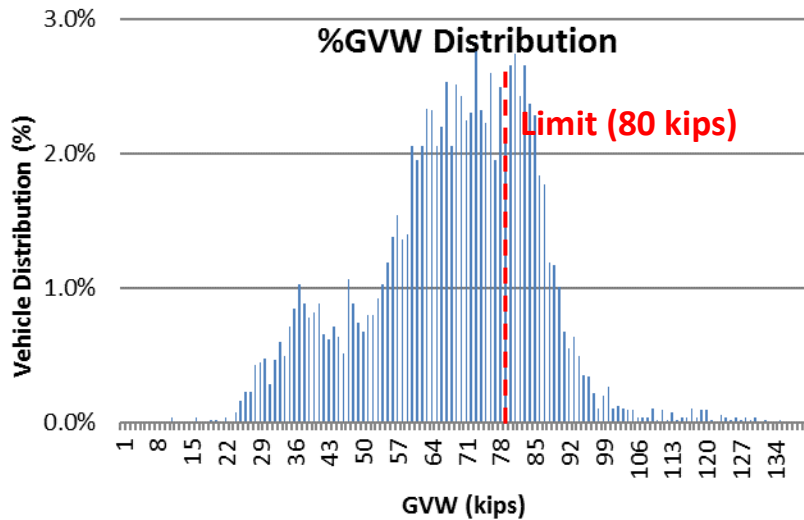
# Example Traffic Data Results...

US 83	Location 1	Location 2
County	Webb	Dimmit
Nearest RM	698 (0.8 miles to North)	654 (0.6 miles to North)
ADT	1 877	2 344
ADTT	610	911
Avg. Truck Speed	59.4 mph	58.7 mph
20-year ESAL	<b>9.33 million</b>	<b>21.21 million</b>
ATHWLDs	11.39	15.9 kips
Class9 Front Axle Wt. COV	7.5 %	13.4%
Daily GVW overweight	127 (24.8%)	366 (40.2%)
Daily Tandem Axle Overweight	230 (28.4%)	802 (52.5%)





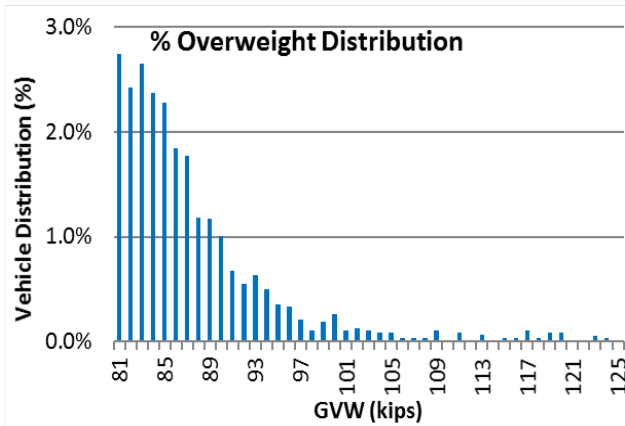
# Example Traffic Results.....



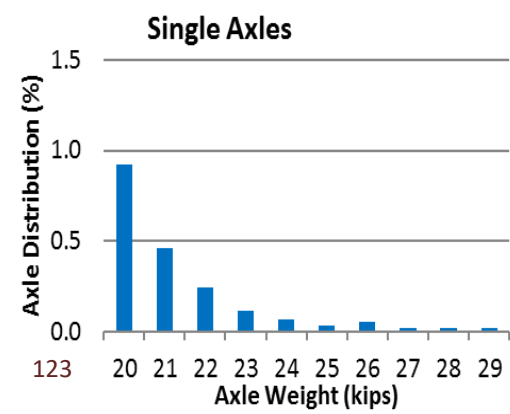
Axle Type	Daily Count
Steering Axles	438
Non-steering Single Axles	250
Single Axles	688
Tandem Axles	609
Tridem Axles	63
Quad Axles	3

US 83 NB, RM 678-680 (Webb County, LRD): <https://goo.gl/udr6tl>

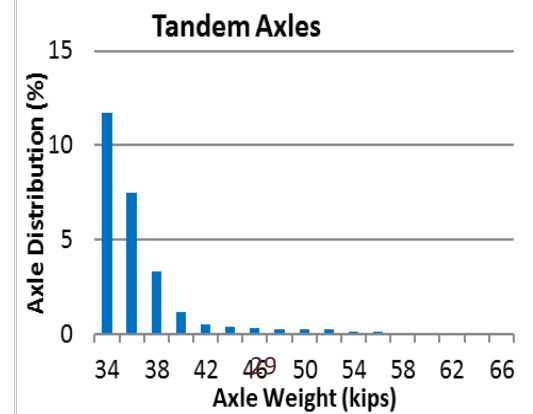
# Example Traffic Results.....



**27.6% Overloaded Trucks Daily**  
(GVW  $\geq$  80 kips)



**1.6% Overloaded Trucks Daily**  
(Single Axle Weight  $\geq$  20 kips)

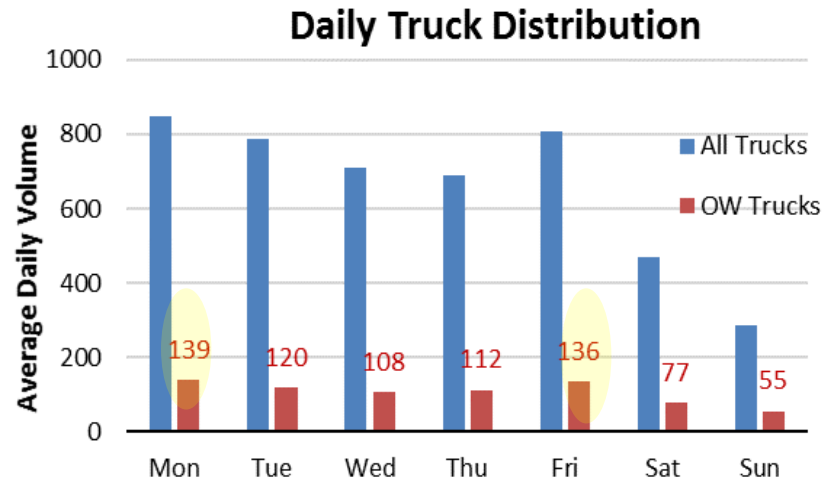
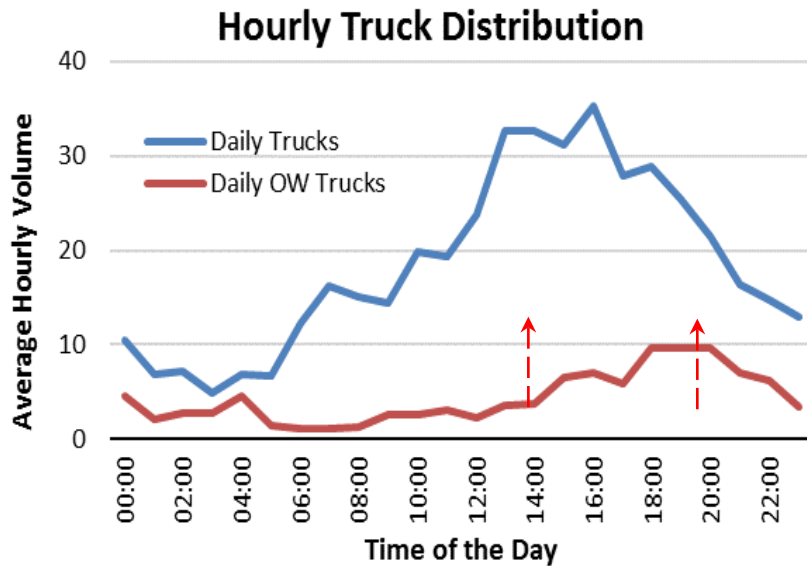


**28.4% Overloaded Trucks Daily**  
(Tandem Axle Weight  $\geq$  34 kips)

Over-Weight summary	Daily Overweight Count (% of Total)	Maximum Overweight Recorded
GVW Overweight ( $\geq$ 80 kips)	121 (27.6%)	123 kips (54% Overweight)
Single Axles ( $\geq$ 20 kips)	14 (2.0%)	29 kips (45% Overweight)
Tandem Axles ( $\geq$ 34 kips)	159 (26.1%)	66 kips (94% Overweight)
Tridem Axles ( $\geq$ 42 kips)	11 (17.0%)	57 kips (36% Overweight)
Quad Axles ( $\geq$ 50 kips)	0.5 (16.2%)	54 kips (8% Overweight)

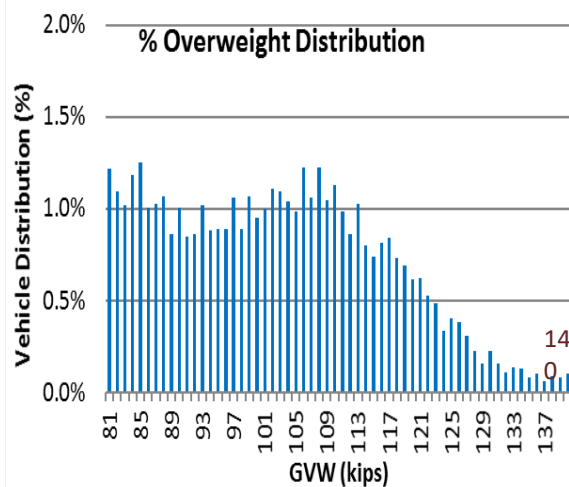


# Example Traffic Results.....

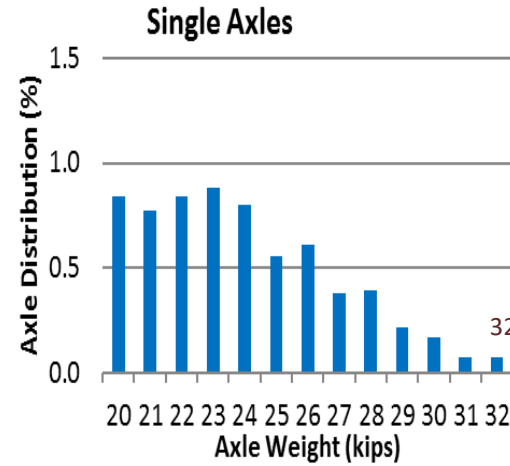


- ⇒ 3:00 PM to 9:00 PM (15:00 – 21:00 hrs) is most critical in terms of overloaded truck operation (GVW ≥ 80 kips), i.e., most overloaded trucks occurred between 3:00 PM & 9:00 PM .
- ⇒ Monday & Friday has more recorded overweight trucks than the other days of the week – that is most overloaded trucks occurred on Monday & Friday

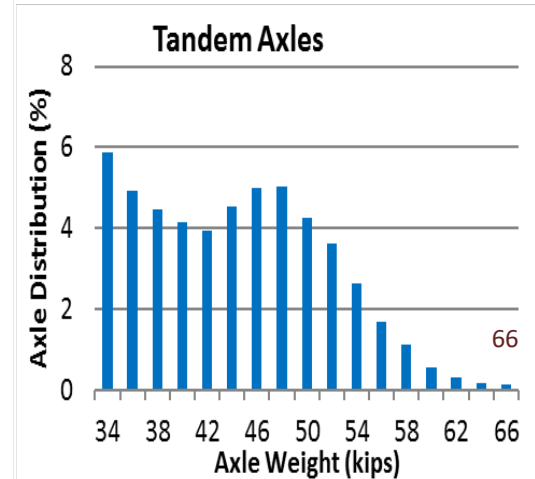
# Example Results.....



**40.2% Overloaded Trucks Daily**  
(GVW  $\geq$  80 kips)



**6.7% Overloaded Trucks Daily**  
(Single Axle Weight  $\geq$  20 kips)



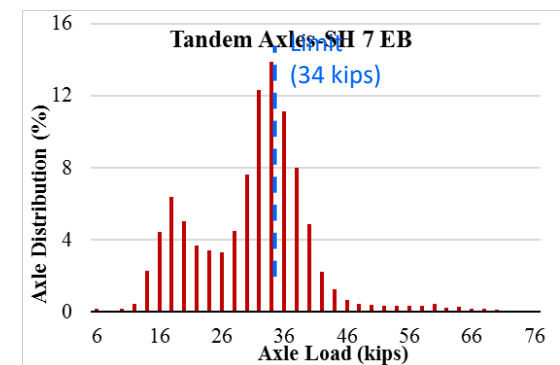
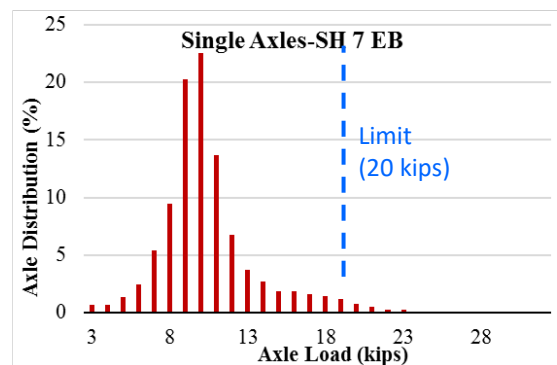
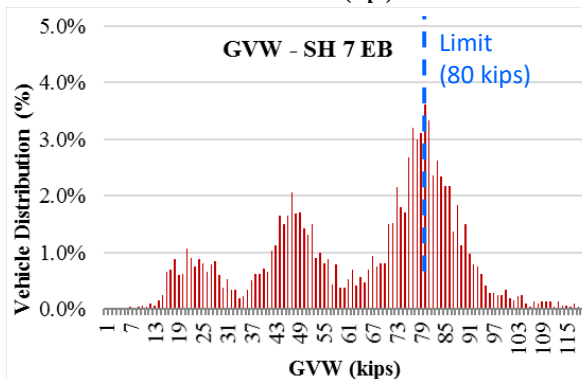
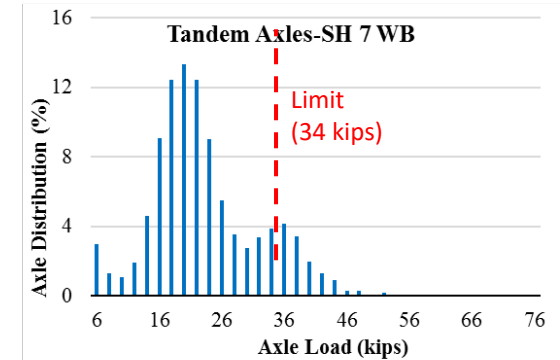
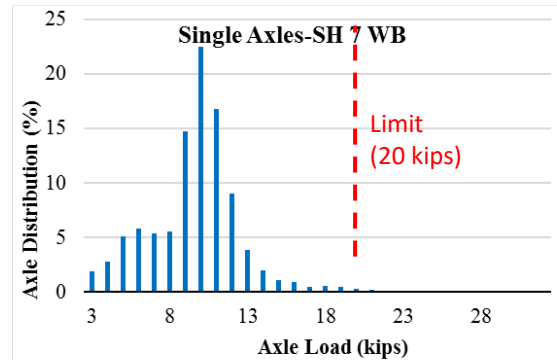
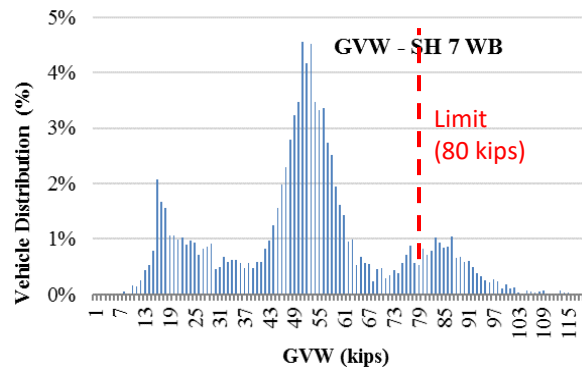
**52.5% Overloaded Trucks Daily**  
(Tandem Axle Weight  $\geq$  34 kips)

Over-Weight summary	Daily Overweight Count (% of Total)	Maximum Overweight Recorded
GVW Overweight ( $\geq$ 80 kips)	366 (40.2%)	140 kips (75% Overweight)
Single Axles ( $\geq$ 20 kips)	74 (6.7%)	32 kips (78% Overweight)
Tandem Axles ( $\geq$ 34 kips)	802 (52.5%)	66 kips (94% Overweight)
Tridem Axles ( $\geq$ 42 kips)	14 (60.7%)	93 kips (120% Overweight)
Quad Axles ( $\geq$ 50 kips)	4 (65.8%)	102 kips (104% Overweight)

US 83 NB, RM 654-652 (Dimmit County, LRD)

# Example Traffic Results.....

## GVW & axle load distribution – SH 7, Bryan



# Traffic Data Accuracy & System Comparisons

# System & Traffic Data Comparison.

## Permanent WIM – ADT Comparison with TPP

Station#	District	TTI	TPP
W523 (US 281)	PHR	14,527	14,403
W524 (IH 10)	ELP	24,445	25,027
W527 (SH 114)	FTW	15,260	15,869
W531 (IH 35)	LRD	17,681	17,685
W541 (FM 3129)	ATL	1,121	1,150
W547 (IH 40)	AMA	11,976	12,187

# System & Traffic Data Comparison..

## Portable WIM – ADT comparison with permanent WIM, TPP website, & PTT

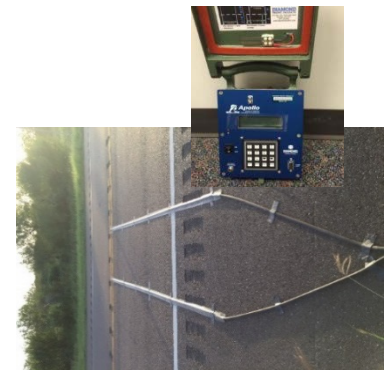
Site#	Hwy	District	Portable WIM (TTI)	Permanent WIM (TTI)	Nearest Site (s) on TPP Website	PTT (TTI)
TS001	US 83	LRD	4 687	-	5 130	4 619
TS002	SH 7	BRY	2 692	-	2 518	2 525
TS003	SH 7	BRY	2 050	-	1 913	2 118
TS007 (Jul2016)	SH 114 (EB-L1)	FTW	4 511	4 802	4 873	4 230
TS005	US 281	CRP	10 310	-	10 239	
TS006	SH 6	BWD	2 118	-	2 085	
TS004	FM 468	LRD	1 976	-	1 757	
TS008	FM 1787	ODA	2 521	-	2 552	
TS009	US 83	LRD	3 520	-	3 769	3 506

Station/sites for TTI portable & TP&P website are not exactly the same



# System & Traffic Data Comparison...

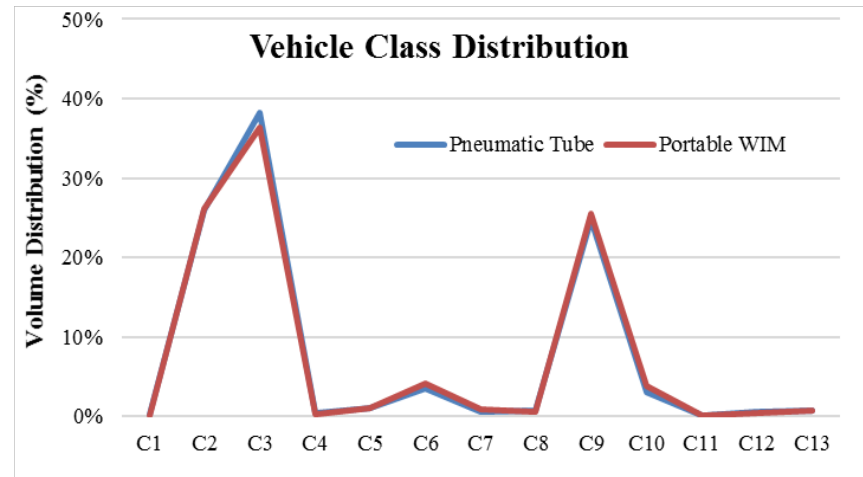
## Portable WIM – Validation with permanent WIM (SH 114, EB outside lane, Jul2016)



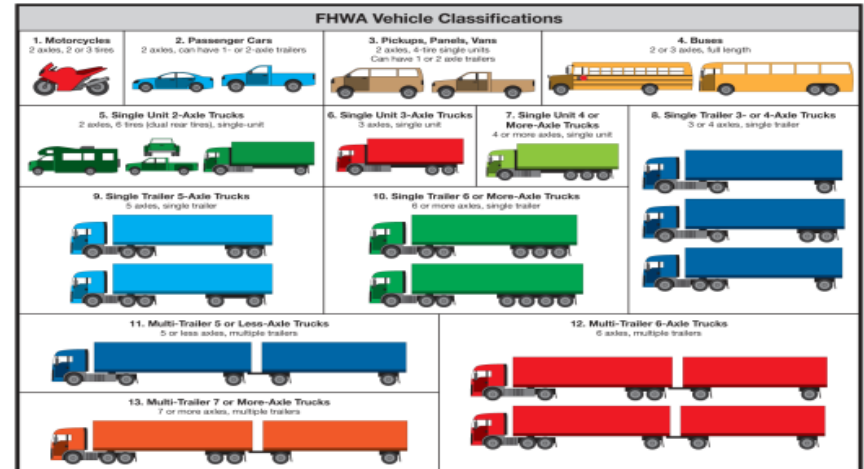
WIM Type	Permanent WIM	Portable WIM	PTT
Site ID#	W527	TS0007	TTI00002
Unit#	LW-527	TRS-3	PTT-1
ADT (EB outside lane)	4 802	4 511	4 230
%Trucks (EB outside lane)	32.9%	39.8%	29.2%
ADTT (EB outside lane)	1 572	1 561	1 235
18-kip ESALs	39.4 million	38.7 million	35.3 million
Comment			ESALs estimated using Haug Book
Data analyzed by	VP (TTI)	KK (TTI)	Lubinda (TTI)

# System & Traffic Data Comparison....

Volume	Pneumatic Tube	Portable WIM
ADT	1 753	1 760
ADTT	624	657
Truck %	35.6%	37.4%
20-Yr 18-kip ESALs	8.89 million	8.31 million



Speed	Pneumatic Tube	Portable WIM
Max (All)	108.5	114.0
Max (Truck)	98.5	97.0
Avg (All)	61.7	60.2
Avg (Truck)	58.7	59.1
Speed limit	60	60



# System & Traffic Data Comparison.....

FPS Inputs	Pneumatic Tube	Portable WIM	Comment
ADT-Beginning	3 506	3 520	ADT (both direction) at the beginning of the design period
ADT-END 20 Year	6 332	6 357	ADT (both direction) at the end of the design period (20 yrs)
18 kip ESALs 20 Years (million)	6.89	8.31	Assuming 3% growth rate
Avg. vehicle speed (mph)	61.7	60.2	Approach speed assumed to be equal to operational speed
% Trucks in ADT	35.6%	37.4%	



# System & Traffic Data Comparison.....

FPS Parameter	Pneumatic Tube	Portable WIM	Comment
ADT-Beginning	4 619	4 687	ADT (both direction) at the beginning of the design period
ADT-END 20 Year	8 343	8 466	ADT (both direction) at the end of the design period (20 yrs)
18 kip ESALs 20 Years (million)	17.85	21.21	Assuming 3% growth rate
Avg. vehicle speed (mph)	61.7	60.2	Approach speed assumed to be equal to operational speed
% Trucks in ADT	38.3%	38.9%	

US 83 NB | LRD, Webb County | (Between FM 133 and FM 2688)

RM 654 & 652 | GPS: N 28° 21' 37.5" W 099° 37' 55.9"

:<https://www.google.com/maps/place/28%C2%B021'37.5%22N+99%C2%B037'55.9%22W/@28.3603951,-99.63379,16.5z/data=!4m5!3m4!1s0x0:0x0!8m2!3d28.360428!4d-99.632204>

# **The MS Access M-E Traffic Data Storage System(The T-DSS)**

# The MS Access M-E Traffic Database

## The Prototype T-DSS (MS Access)

The screenshot shows the Microsoft Access interface for the '11. The Prototype T-DSS\_Project 0-6940\_Version011' database. The 'Screen(Switchboard)' form is active, displaying the following information:

- Project Title:** TxDOT Project 0-6940
- System Name:** The Texas M-E Traffic Data Storage System Project# 0-6940: The T-DSS
- Buttons:** HELP (blue), EXIT (red)
- Logos:** Texas Department of Transportation (left), Texas Transportation Institute (right)
- Project Managers:** Sonya Badgley, Hua Chen, and Enad Mahmoud
- PI/Research Supervisor:** Lubinda F. Walubita
- Data Tables:**
  - Traffic Volume & Classification:** Table01\_Traffic Volume, ESALs, & Vehicle Speed Data; Table02\_ADT, ADTT, & Vehicle Classification Data; Table03\_Traffic Volume Distribution (Daily & Hourly)
  - FPS & TxM-E Traffic Input Data:** Table04\_FPS Input Data; Table05a\_TxME Input Data (Level1 - General); Table05b\_TxME Input Data(Level1-ClassDistribution ...); Table05c\_TxME Input Data (Level2-Basic Data); Table06\_TxACOL & TxCrackPro Input Data; Table07a\_M-E PDG Input Data (Level1); Table07b\_AASHTOWare PVMNT Input Data (Level 1)
  - Traffic Weights & Overloading Data:** Table08\_Traffic Weight Data; Table09a\_Overloading Overweight Data Statistics...; Table09b\_Overloading Overweight Data Statistics...; Table09c\_Overweight Distribution (GVW and Axles)...; Table09d\_Overweight Distribution (GVW and Axles)...; Table09e\_Overweight Distribution (Daily and Hourl...; Table09f\_Overweight Distribution (Daily and Hourl...; Table10\_Load Equivalent Factors (LEFs)
  - Sensitivity & Error Analysis:** Table11\_WIM Sensitivity & Error-Accuracy Analysis D...
  - Supplementary Data:** Table12\_FHWA Vehicle Classification System; Table13\_FHWA Weight Classification; Table14\_Location of Texas Permanent WIM Stations

At the bottom of the form, there is a status bar showing 'Record: 1 of 1', 'No Filter', and a 'Search' field. The window title bar includes the name 'Prakoso, Adrianus'.

# **Data Analysis Macros, Clustering Algorithms, & Demonstration Examples**

# Macros, Clustering, & Demo Examples

Permanent WIM Macro

Example Results (Excel)

Demonstration Run

Portable WIM Macro

Example Results (Excel)

Demonstration Run

Clustering Algorithm

Example Results (Excel)

Demonstration Run

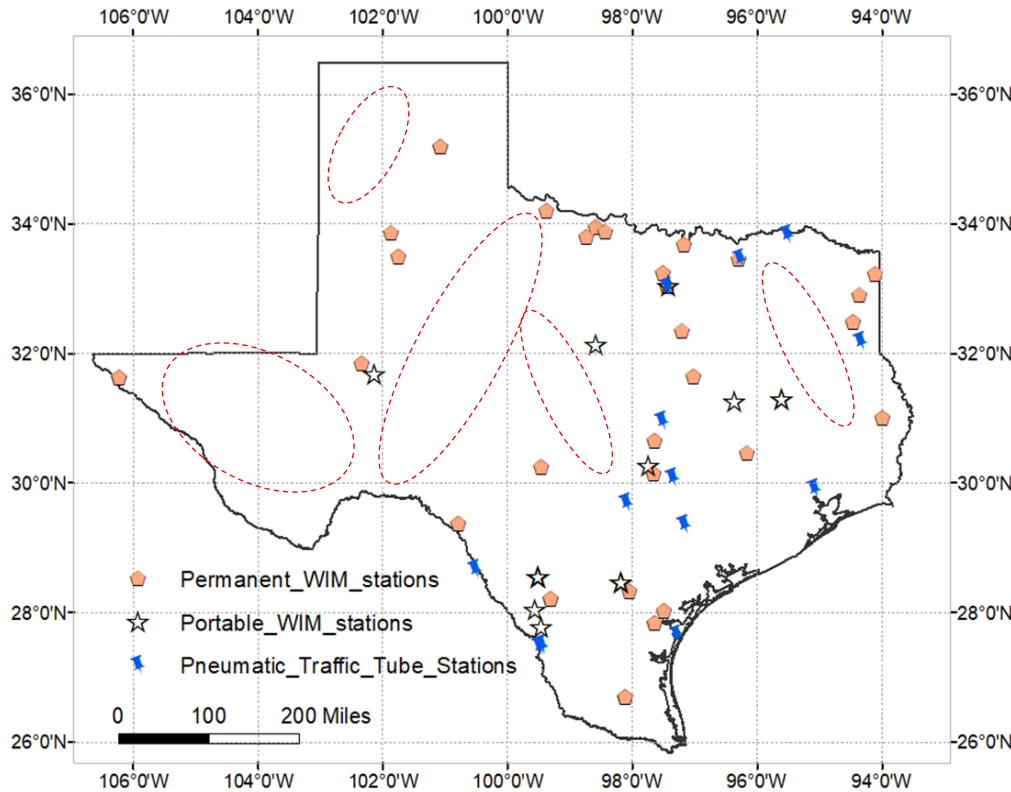


# **Summary, Recommendations, & Way Forward**

# Summary & Key Findings

- 1) Portable WIM = cost-effective & practical supplement for site-specific traffic data collection (volume counts, speed, VCD, & vehicle weight measurements)
- 2) Pneumatic tube counters = cheap & quick supplement for traffic volume counts, vehicle speed, & VCD data only; **ideal in situations where vehicle weight data is not critical.**
- 3) Macros & algorithms = able to compute & generate M-E traffic inputs for both flexible & concrete PVMNTs
- 4) Clustering algorithms = ideal & rapid methodology for estimating M-E traffic data inputs
- 5) T-DSS = convenient & readily accessible MS Access storage platform for M-E traffic data access

# Recommendations & Way Forward



Project continuation or implementation:

- a) More traffic data collection & continued population of the T-DSS for improved Clustering prediction accuracy
- b) Continued improvements & enhancements of the Clustering algorithms

Prediction Analysis				
Rank	WIM Station	Tandem Cluster	Highway	Percentage Match
1	W995		6 US-99	96.2%
2	W528		4 US-181	88.0%
3	W522		2 US-281	87.2%
4	W551		2 US-90	86.0%
5	W4142		5 US-96	81.1%
Predicted Cluster:		6		

Now Generate the Traffic Data from the Buttons Below		
FPS Input	TxCRCP	TxME
FPS Input	TxCRCP	TxME
FPS Input	TxCRCP	TxME
FPS Input	TxCRCP	TxME
FPS Input	TxCRCP	TxME

Proposed Future Addition:  
M-E PDG  
AASHTOWare

# Comments & Discussions

