

# Speed on Roadway Segments

National Forum  
on  
*Speeding*

June 15-16, 2005

By Kay Fitzpatrick



# Sources of Material for Presentation

- NCHRP Project 15-18
- FHWA Rural Highway Studies
- TxDOT Research
- Literature



# Topic Areas

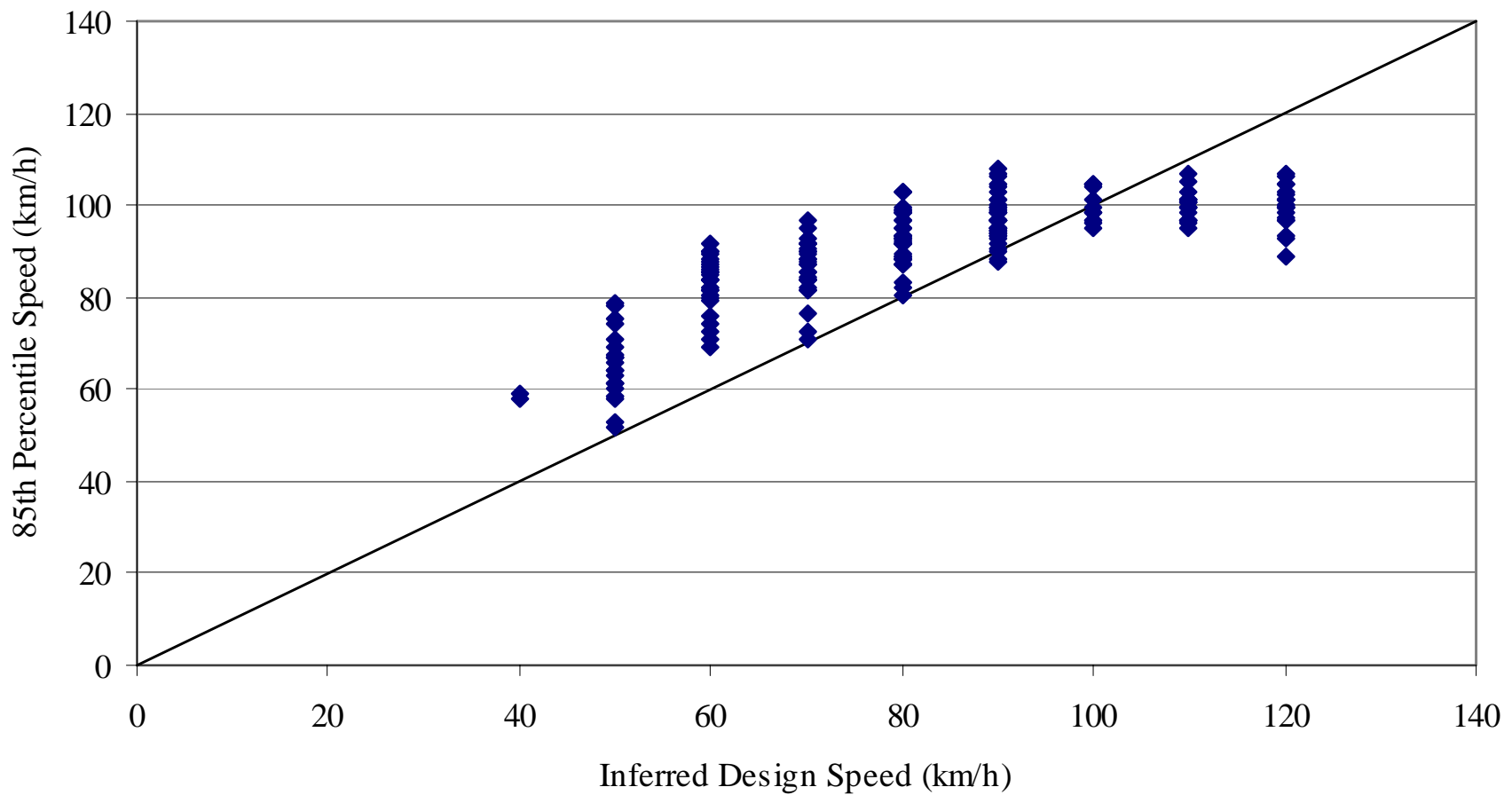
- Design Speed
- Posted Speed
- Operating Speed



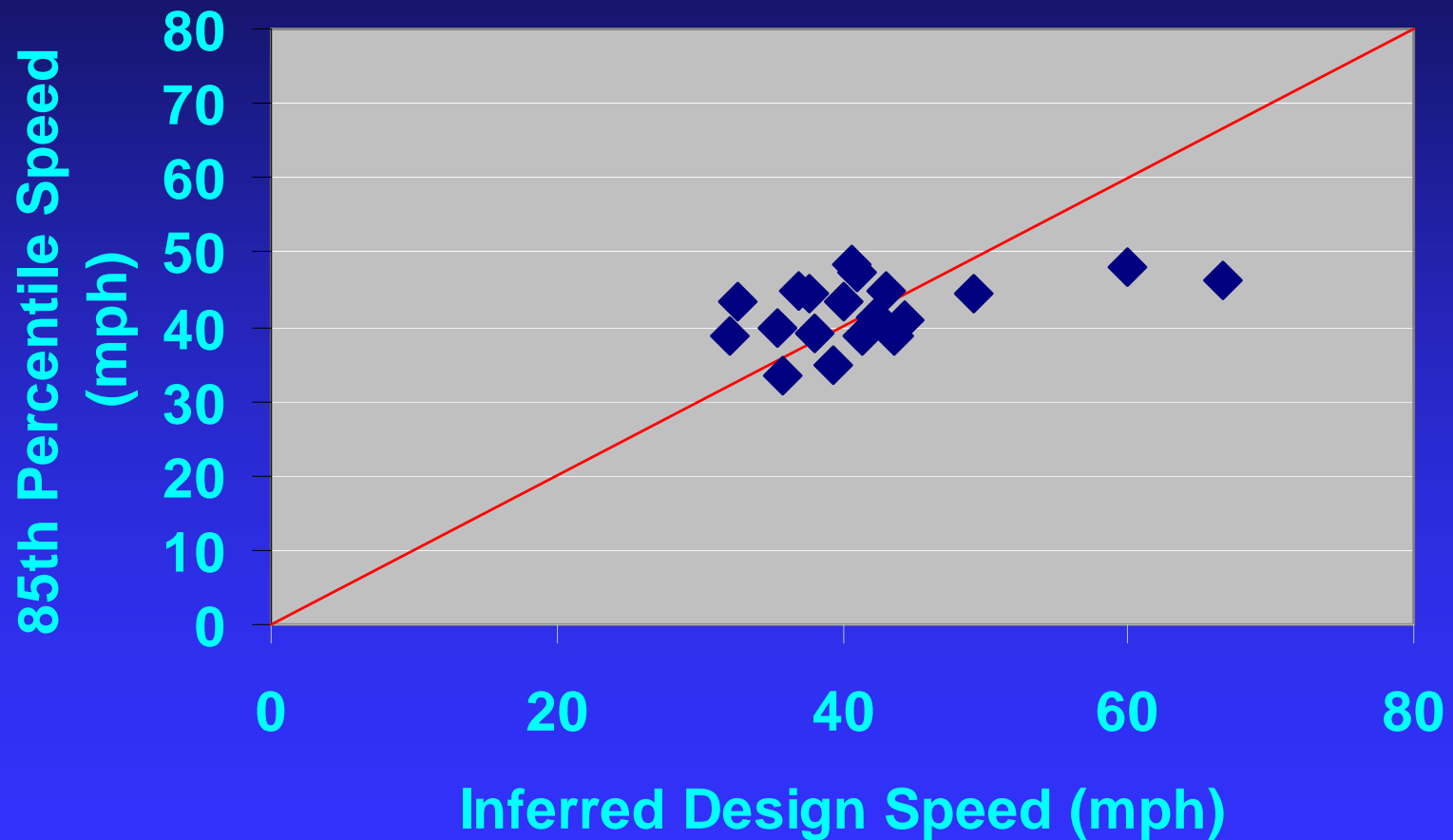
# Design Speed



# Rural Highway, Horizontal Curves (128 sites, 6 states)

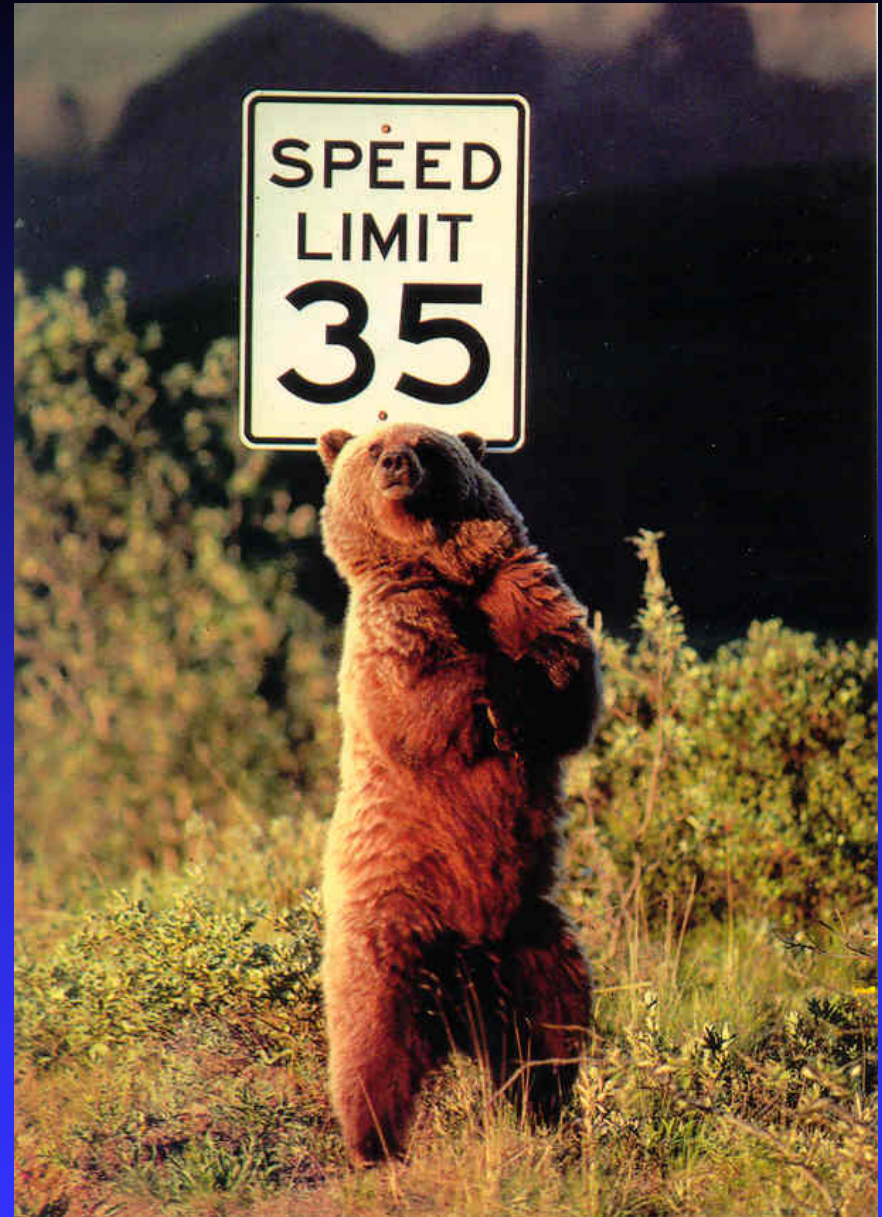


# Suburban Arterial, Horizontal Curves (19 sites, Texas)





# Posted Speed



# Procedures Used to Set Speed Limits (ITE Survey)

- 85<sup>th</sup> percentile speed – predominant factor
- Roadway geometry
- Roadside development
- Crash experiences
- Political pressure





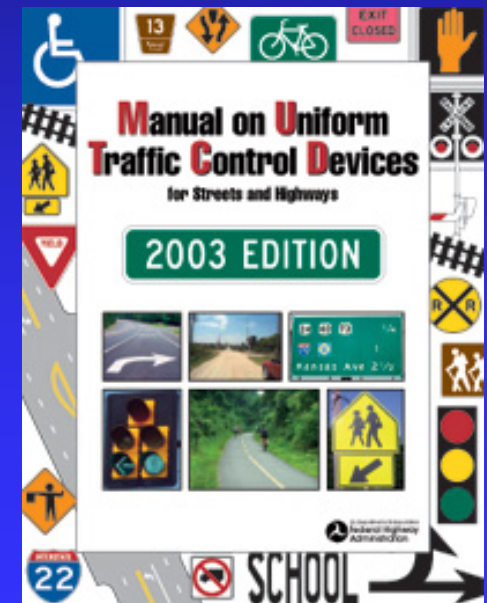
# Deviations From the 85<sup>th</sup> Percentile Speed (ITE Survey)

- Politics (33%)
- Crashes (13%)
- Roadway areas (11%)
- Roadway geometry (9%)

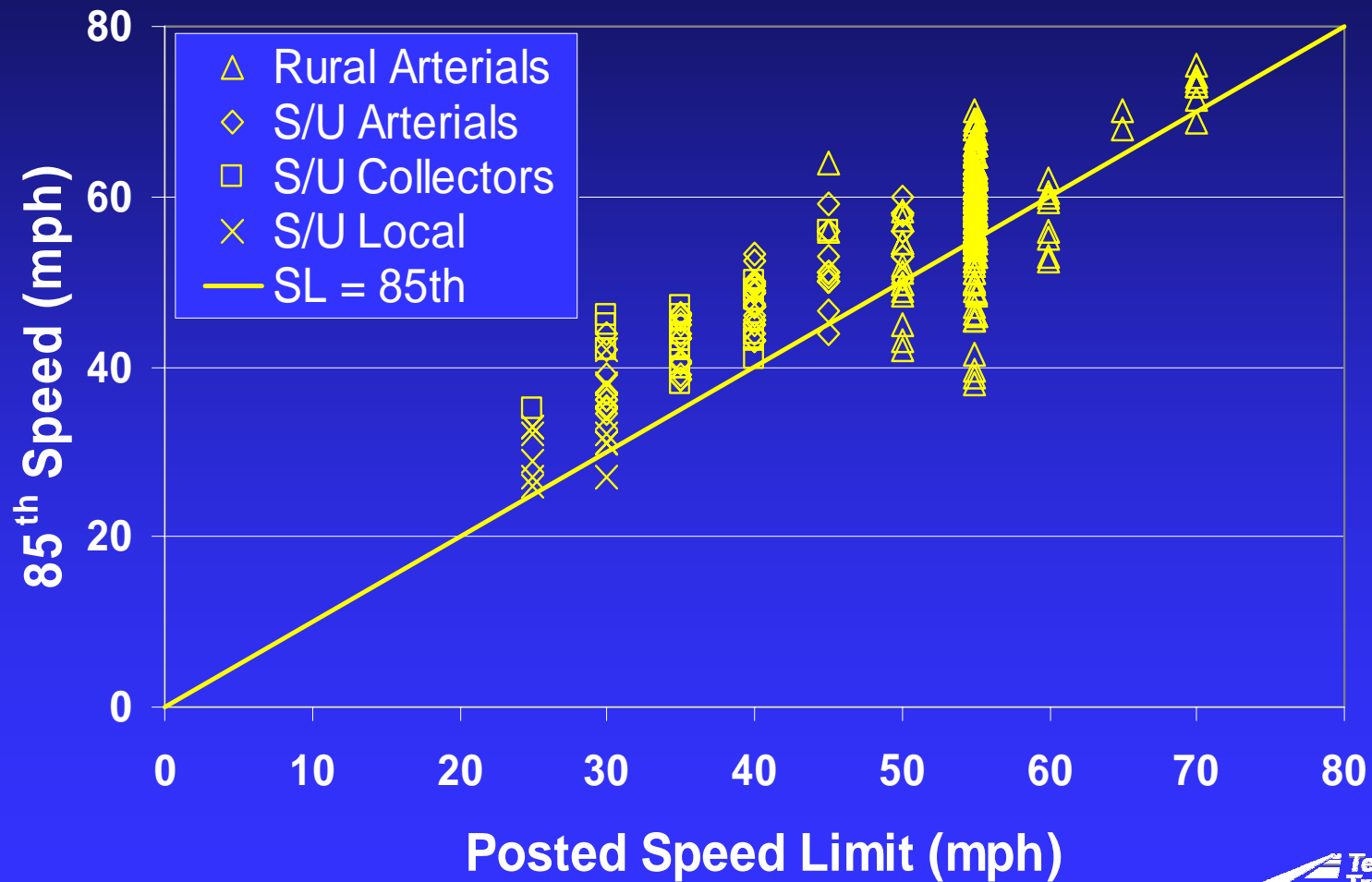


# MUTCD Guidelines

- 85<sup>th</sup> percentile speed of free-flowing traffic rounded up to nearest 5 mph
- Road characteristics
- Speed pace
- Roadside development
- Parking practices
- Reported crash experiences



# 85<sup>th</sup> Speed vs Speed Limit (NCHRP / TxDOT / FHWA Data)



# Percentile Speed Equals Posted Speed (Rural Roads)

Source	Functional Class	Vehicle Percentile (%) When Speed =			Sites
		Posted	+ 5 mph	+ 10 mph	
NCHRP	Rural, Arterial	37 / 48*	70	91	9
FHWA	Rural, Minor Arterial	59	87	99	9
FHWA	Rural, Principal Arterial	72	90	98	36
FHWA	Rural	64	86	97	126

# Percentile Speed Equals Posted Speed (Suburban/Urban Roads)

Source	Functional Class	Vehicle Percentile (%) When Speed =			Sites
		Posted	+ 5 mph	+ 10 mph	
TxDOT	Suburban/Urban Arterial	32	69	91	35
NCHRP	Suburban/Urban Arterial	32	69	92	35
NCHRP	Suburban/Urban Collector	23	57	86	22
NCHRP	Suburban/Urban Local	52	83	96	13

# Operating and Posted Speed Field Studies

- Previous findings:
  - ◆ 85th %-ile speed exceeds posted
  - ◆ 50th %-ile speed near posted
- NCHRP/other studies:
  - ◆ Rural: 37 to 72% at posted speed
  - ◆ Suburban/urban: 32 to 52% at posted

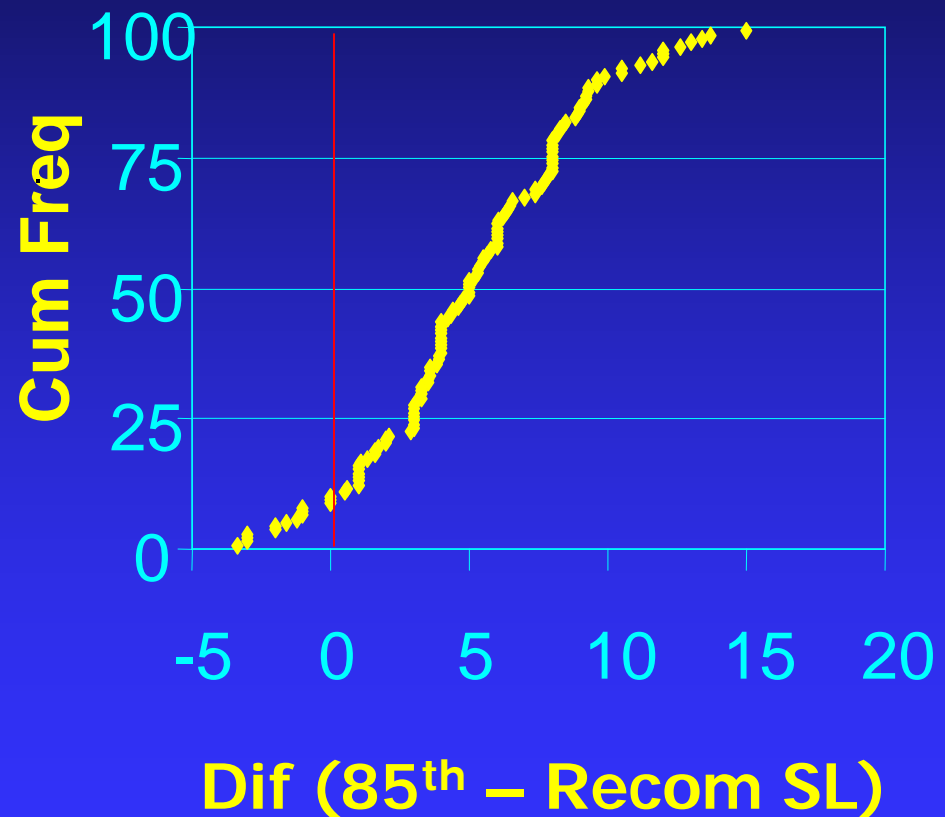


# Speed Zoning Reports

- ITE TENC Committee 97-12
- Request “speed zoning investigations your agency has recently conducted”
- 256 report received
- 128 contained both 85<sup>th</sup> percentile speed value and speed limit recommendation

# Operating and Posted Speed Speed Zone Studies

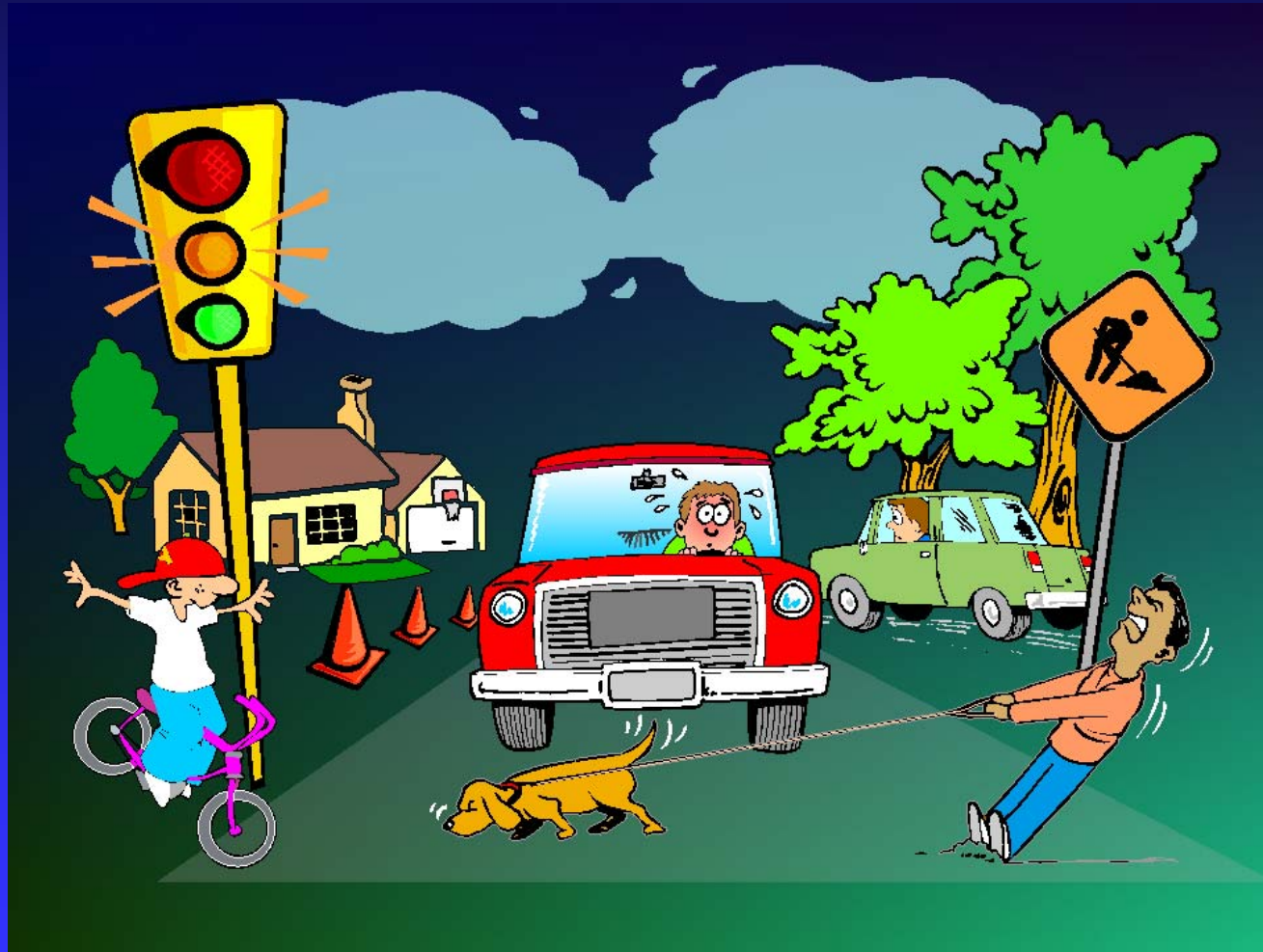
- 128 speed zone studies  
→ 10% rounded *up* and 31% rounded to *nearest* 5 mph



# Operating and Posted Speed Comments

- 85<sup>th</sup> percentile speed is a “starting point”
- Encourage changes in how speed limits are set?

# Operating Speed

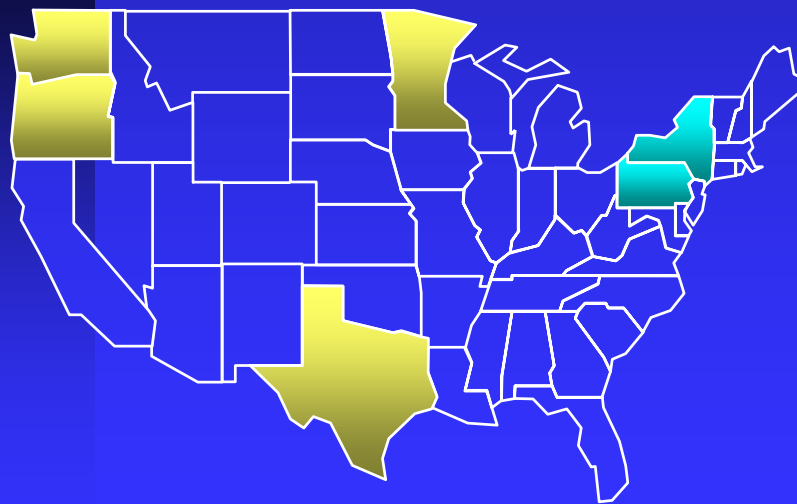


# FHWA Study Rural Highways



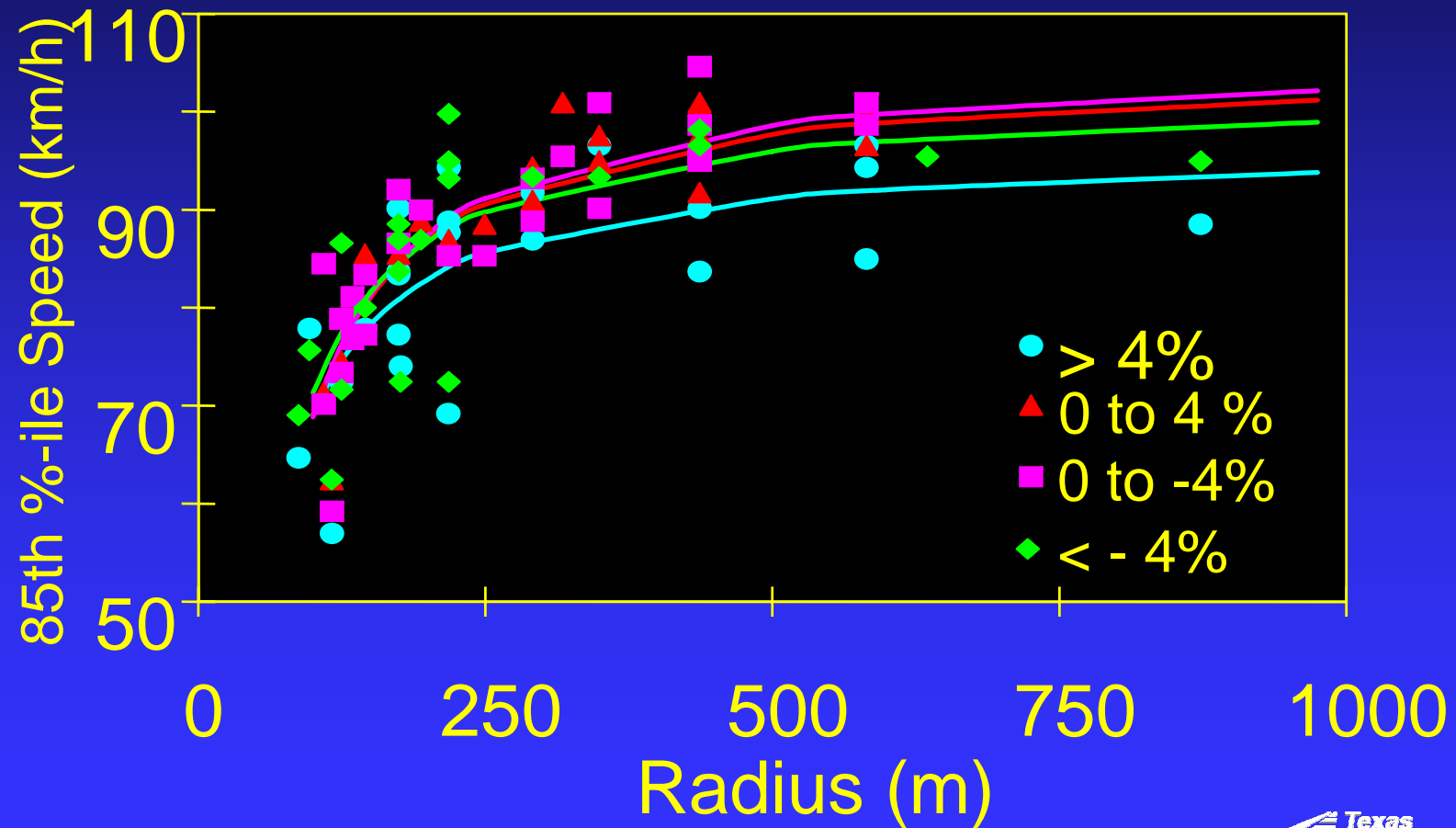
Piezoelectric  
Sensor

Direction  
of Travel →



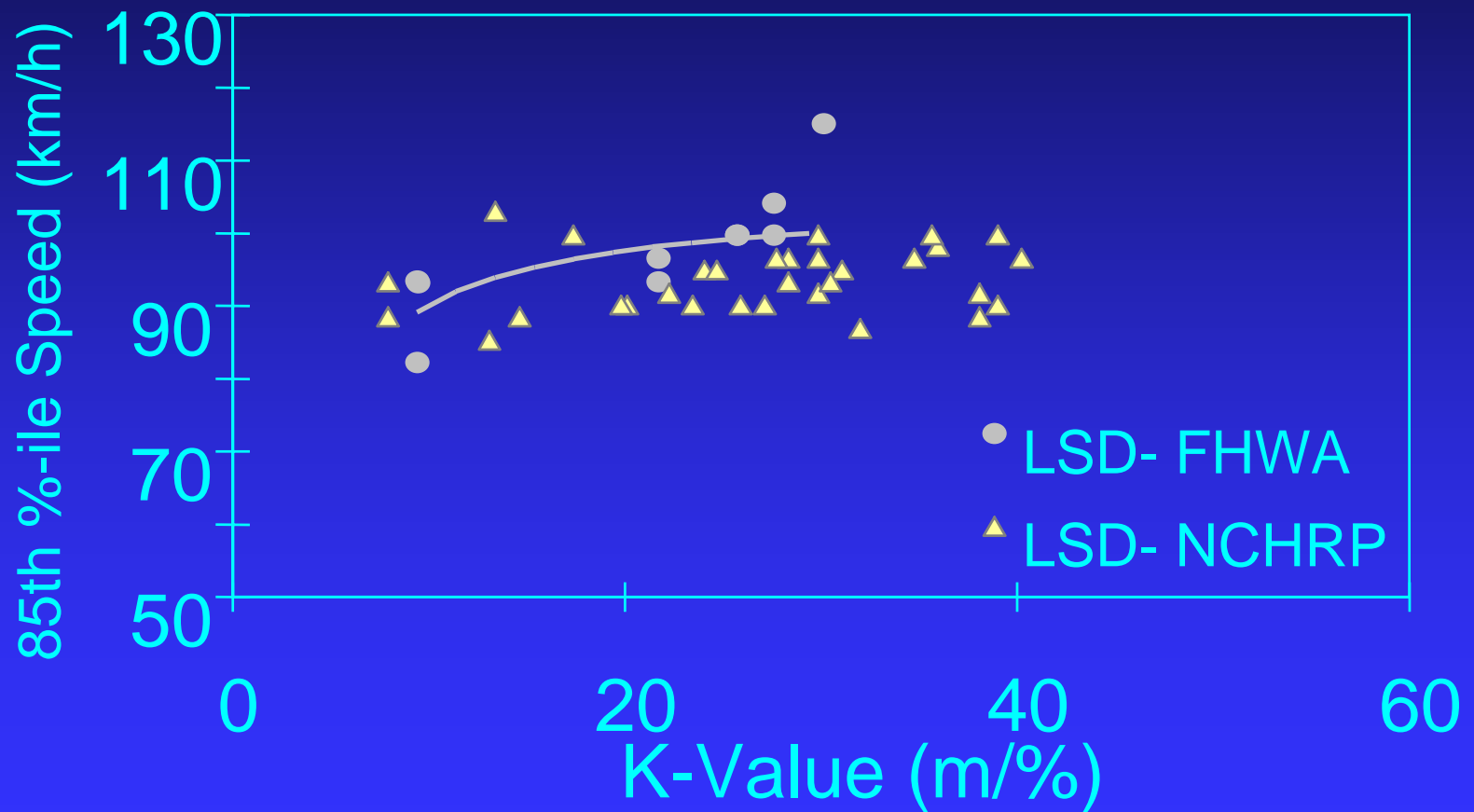
Traffic Counter/Classifier

# FHWA Study - Rural Highways Speeds on Horizontal Curves





# FHWA Study - Rural Highways Limited Sight Distance Curves



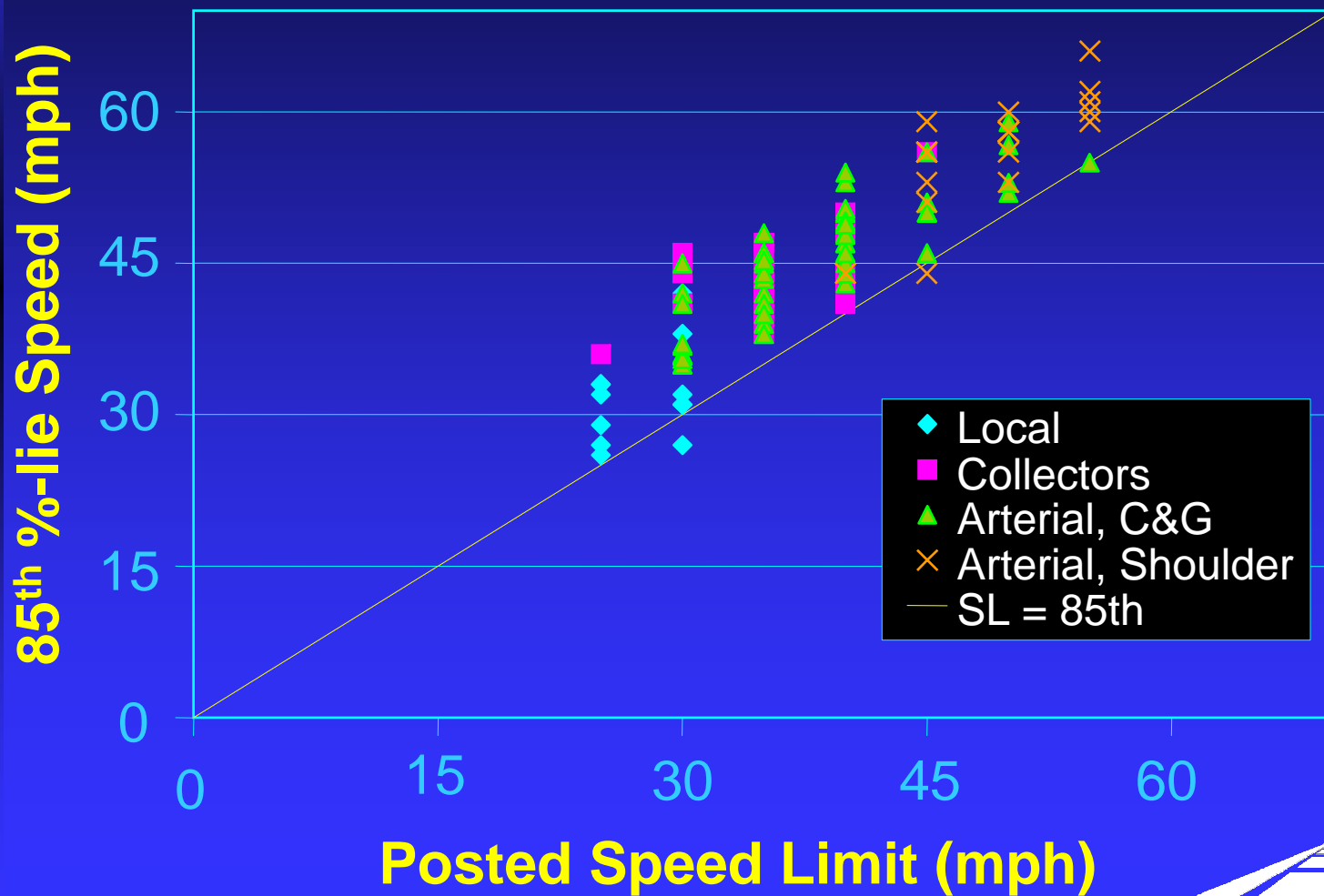
# FHWA Study - Rural Highways Findings

- Horizontal Alignment
  - ◆ Radius: key variable
  - ◆ Other variables: length of curve, deflection angle, superelevation, desired speed (previous tangent speed)
- Vertical Alignment
  - ◆ K, SSD
- Combination Alignments
  - ◆ Theories

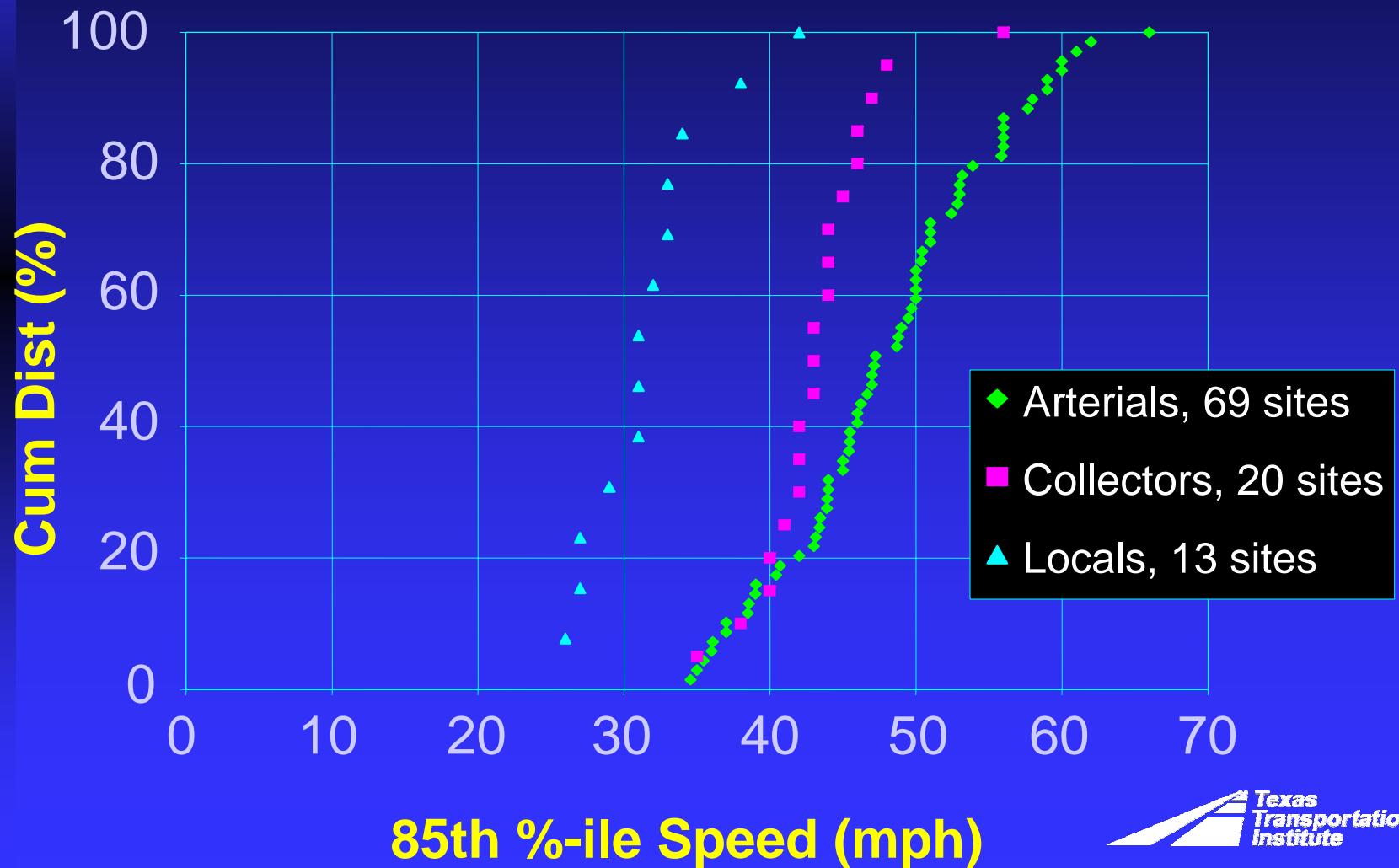
# NCHRP Field Studies

- 79 **tangent** sites, most suburban/urban
- Sites not near signals or horizontal curves (elements known to influence operating speed)
- Free-flow speed measured with laser and counters
- Roadway and roadside characteristics

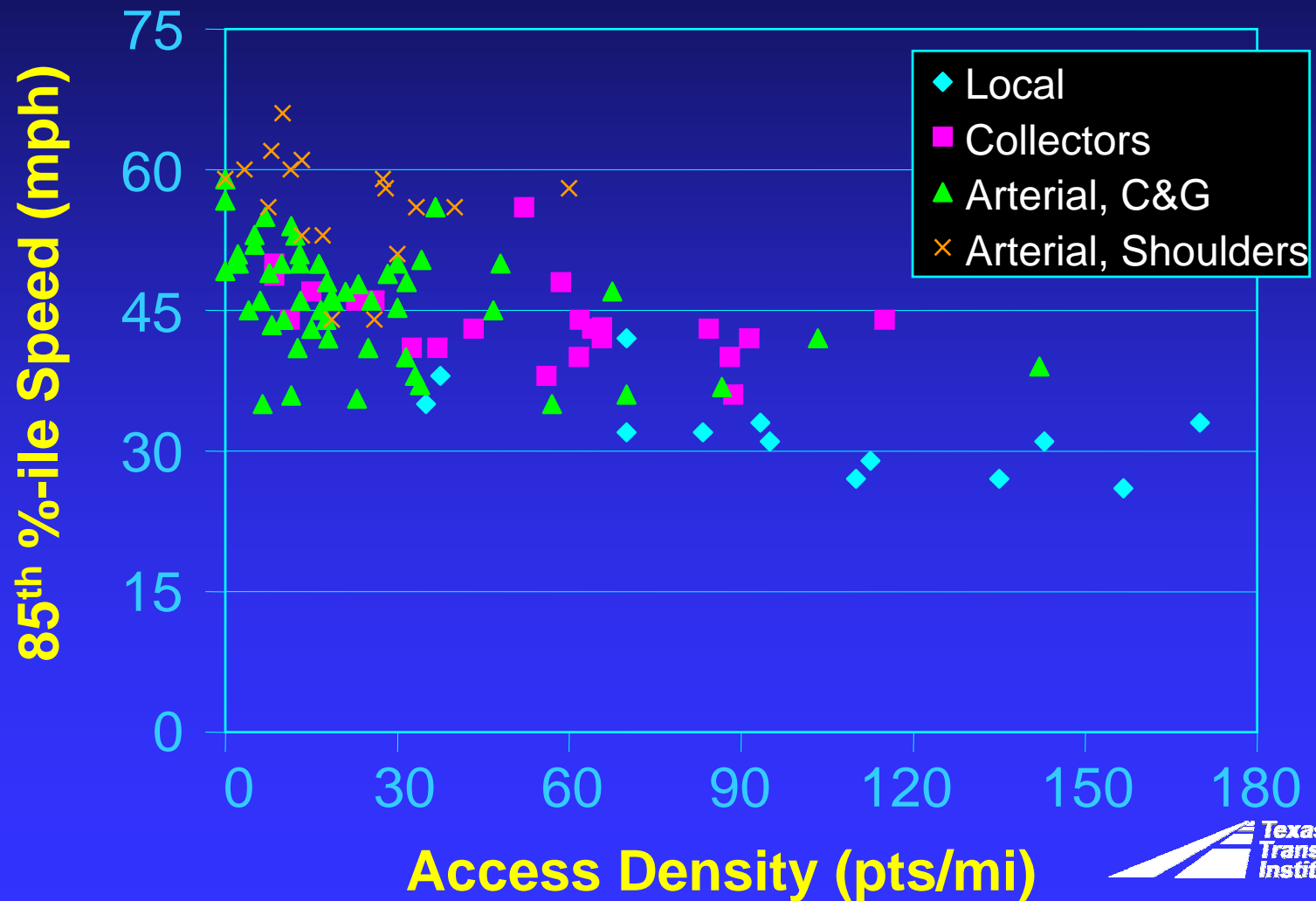
# NCHRP Study Posted Speed Limit



# NCHRP Study Roadway Type

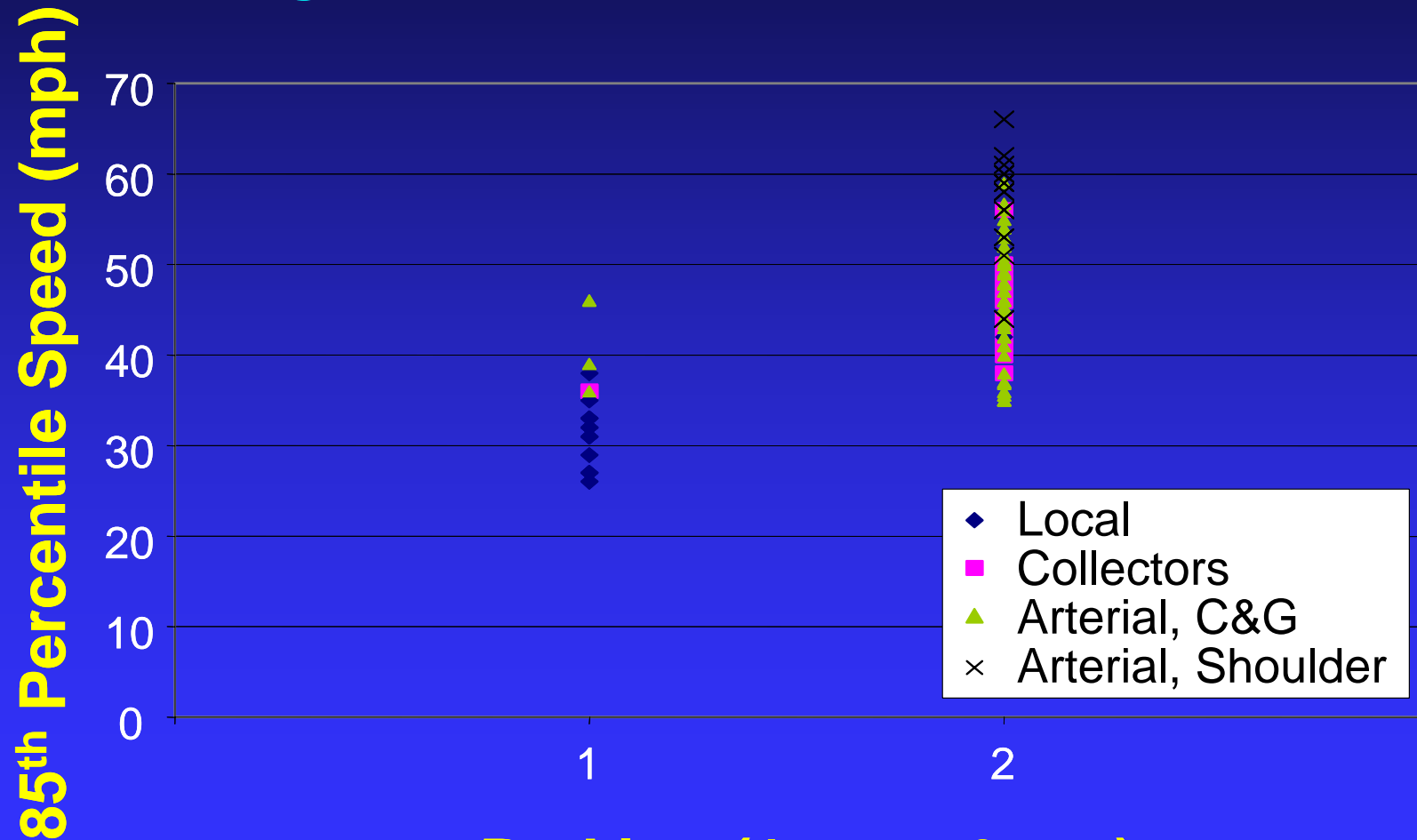


# NCHRP Study Access Density





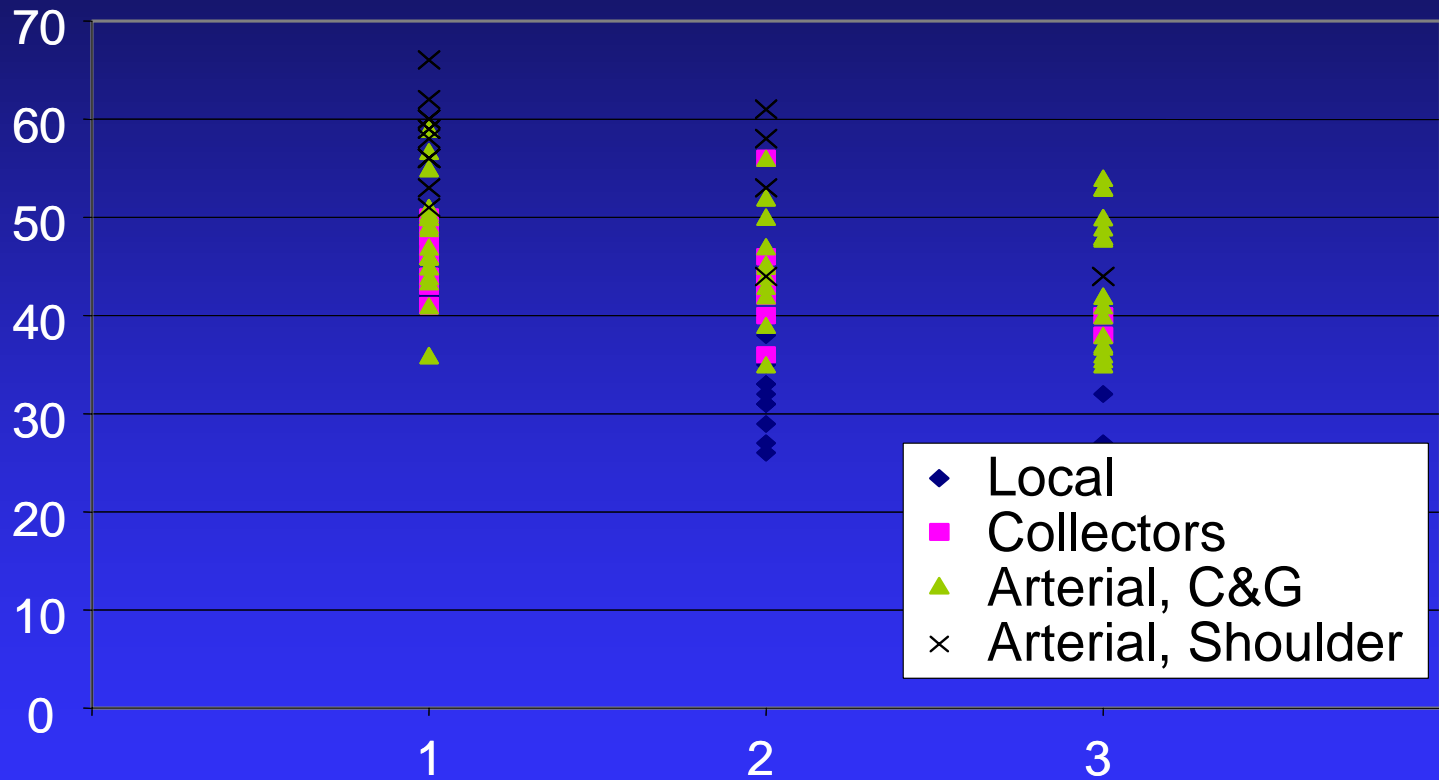
# NCHRP Study Parking



Parking (1=yes, 2=no)

# NCHRP Study Pedestrian Activity

85<sup>th</sup> Percentile Speed (mph)

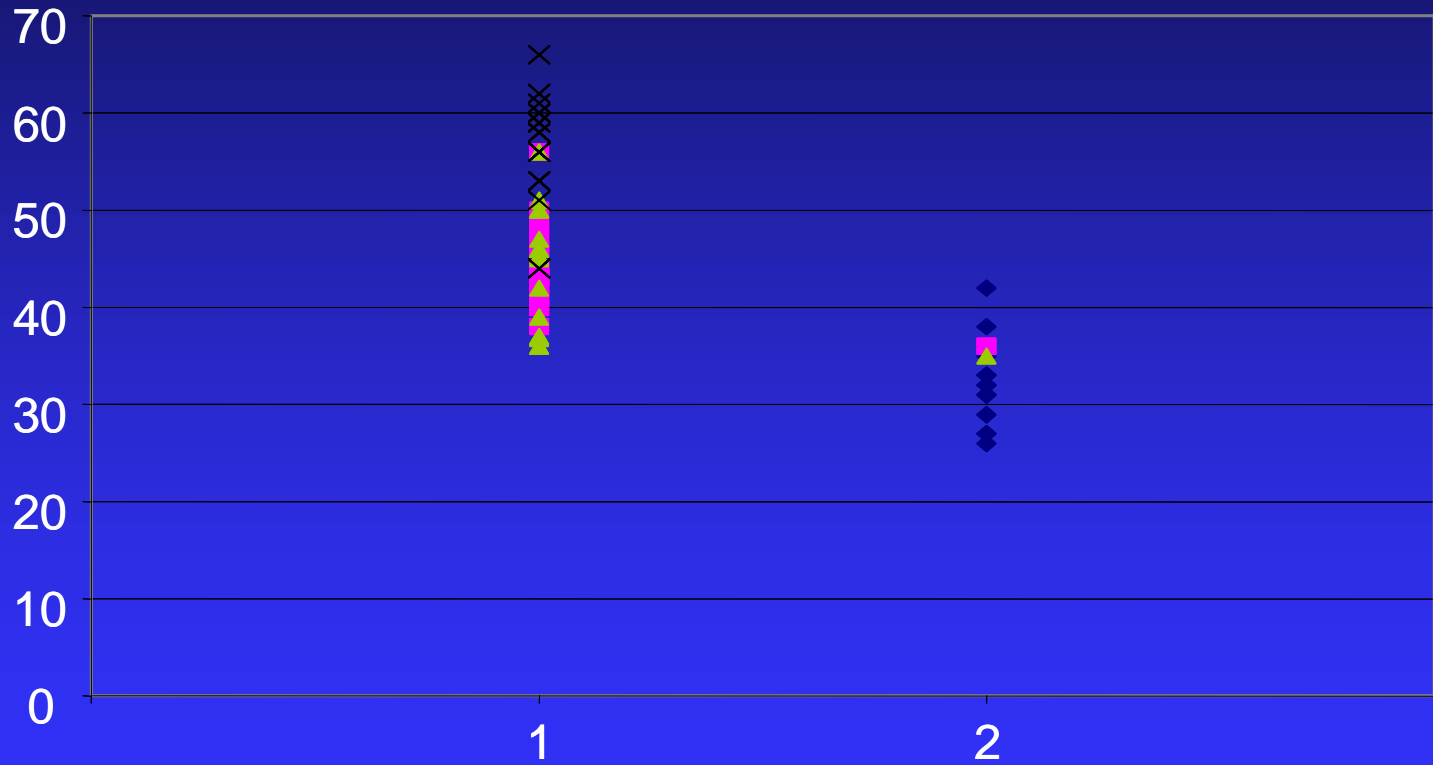


**Pedestrian Activity**  
(1=low, 2=med, 3=high)

# NCHRP Study Centerline Markings

- ◆ Local
- Collectors
- ▲ Arterial, C&G
- × Arterial, Shoulder

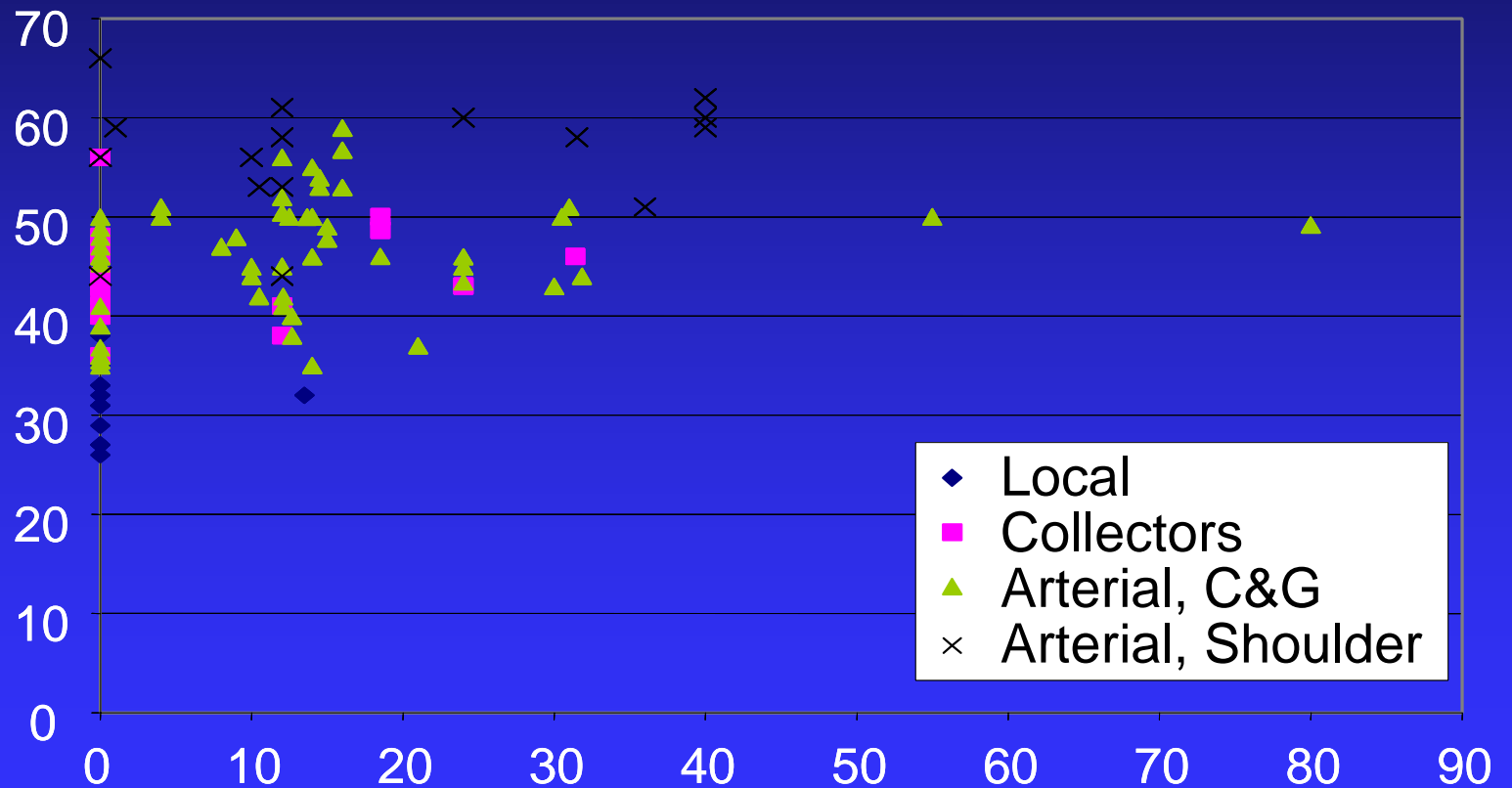
85<sup>th</sup> Percentile Speed (mph)



Centerline Markings (1=yes, 2=no)

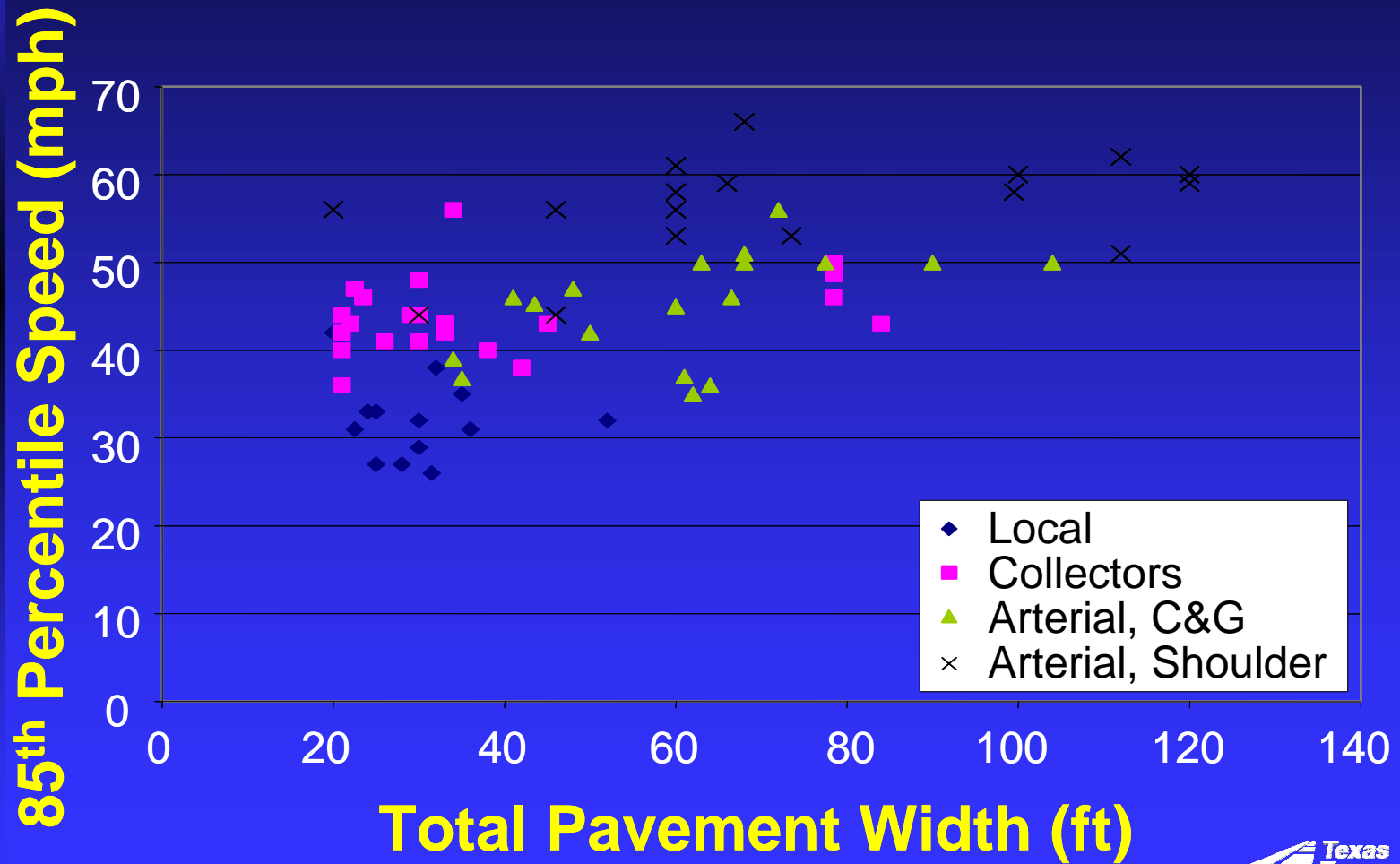
# NCHRP Study Median Width

85th Percentile Speed (mph)



Median Width (ft)

# NCHRP Study Total Pavement Width



# NCHRP Study

## Influence on Operating Speed

- Several variables show influences:
  - ◆ Access density
  - ◆ Pedestrian activity
  - ◆ Absence of centerline or edge line markings
  - ◆ On-street parking
  - ◆ Median presence
- Additional data needed



# Summary



# Influence on Horizontal Curve Speed

	Pre 1990s Rural	Krammes 1993 Rural	Fitz 1999 Rural	Schurr 2002 Rural	Poe 1996 Low	Fitz 2000 Urban
DC / Radius	Y	Y	Y		Y	
Deflect		Y		Y		Y
Len Curve		Y		Y		
Inferred Sp					Y	
Lane Width					Y	
Access					Y	Y
Speed Limit					Y	Y
Grade			Y	Y	Y	

# Influence on Tangent Speed

	Parma Rural 1999	Dixon Rural 1999	Polus Rural 2000	Fitz TX Urban 2000	Fitz TX Urban 2000	Fitz Urban 2003
Lane Width					Y	
Nearby HC			Y			O
Access	SL	O	SL			Y
Speed Limit				Y	Not	Y
Grade	Y	O		SL	SL	
Pedestrian						O
Median						O
Parking						O

SL=study limited, O = may, Y = yes

Questions?

