

# Freeway Work Zone Lane Capacity

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Smart Work Zone  
Deployment Initiative

# Purpose

- Analyze field data: Urban, Long-Term WZ.
- Provide practical capacity figures.
- Provide input for simulation by UWM.
- Identify expected impacts upstream of WZ.

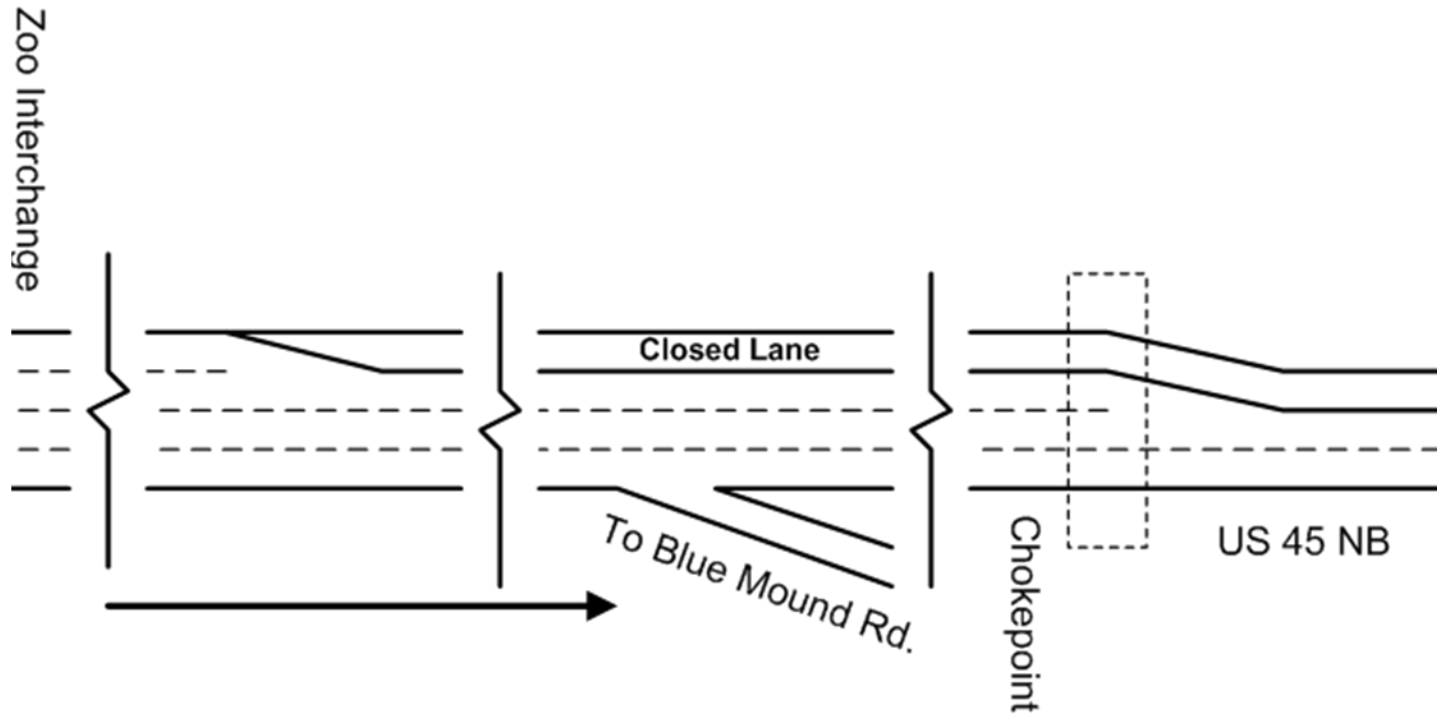
# Data

- Milwaukee Co., WI Urban Freeway.
- Two Long-Term Work Zones.
- 5-minute speed/volume/occupancy.
  - Source: Transportal web site (TOPS lab).
- 78 detectors-8 mainline/13 ramp locations.
- 50 days: Before-During-After WZ.
- 6.2-mile corridor.

# Practical emphasis

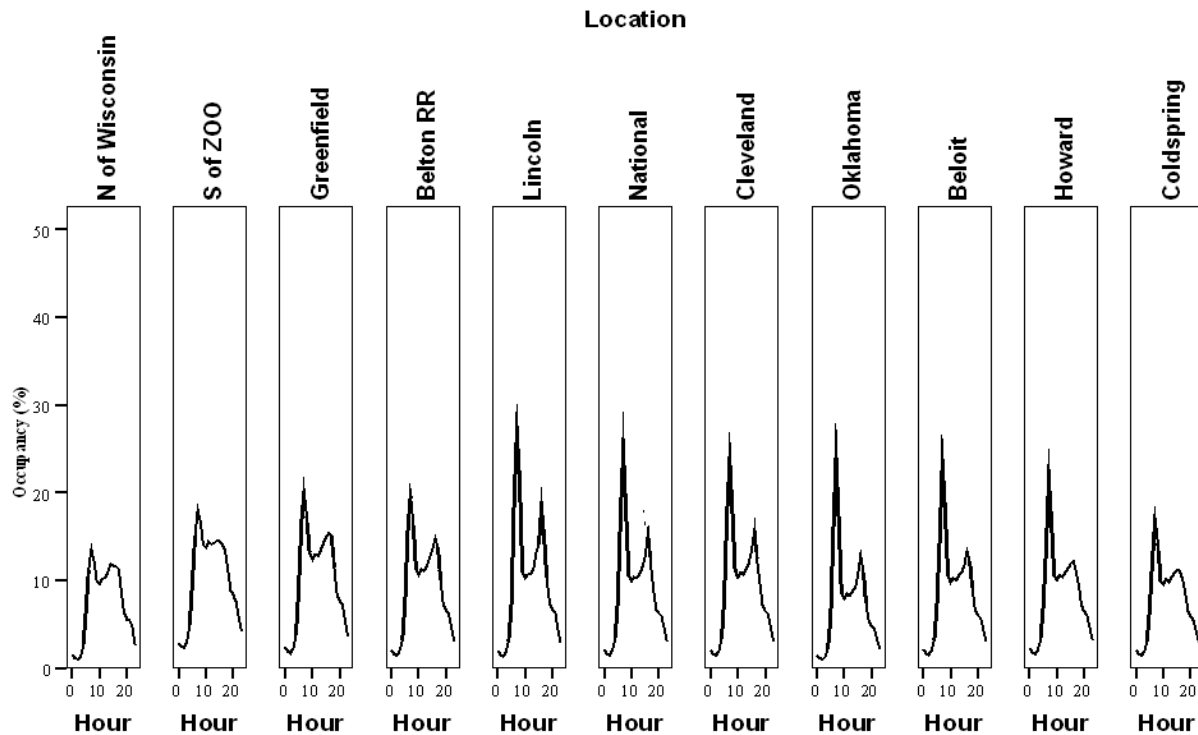
- Sustained volumes, not peak flows.
- Throughput: actual one-hour counts.
- AM/PM peak periods:  $\geq 90\%$  peak volume.
- Mid-day period: between AM, PM peak periods.

# Work Zone 1 (4-to-2 lanes)



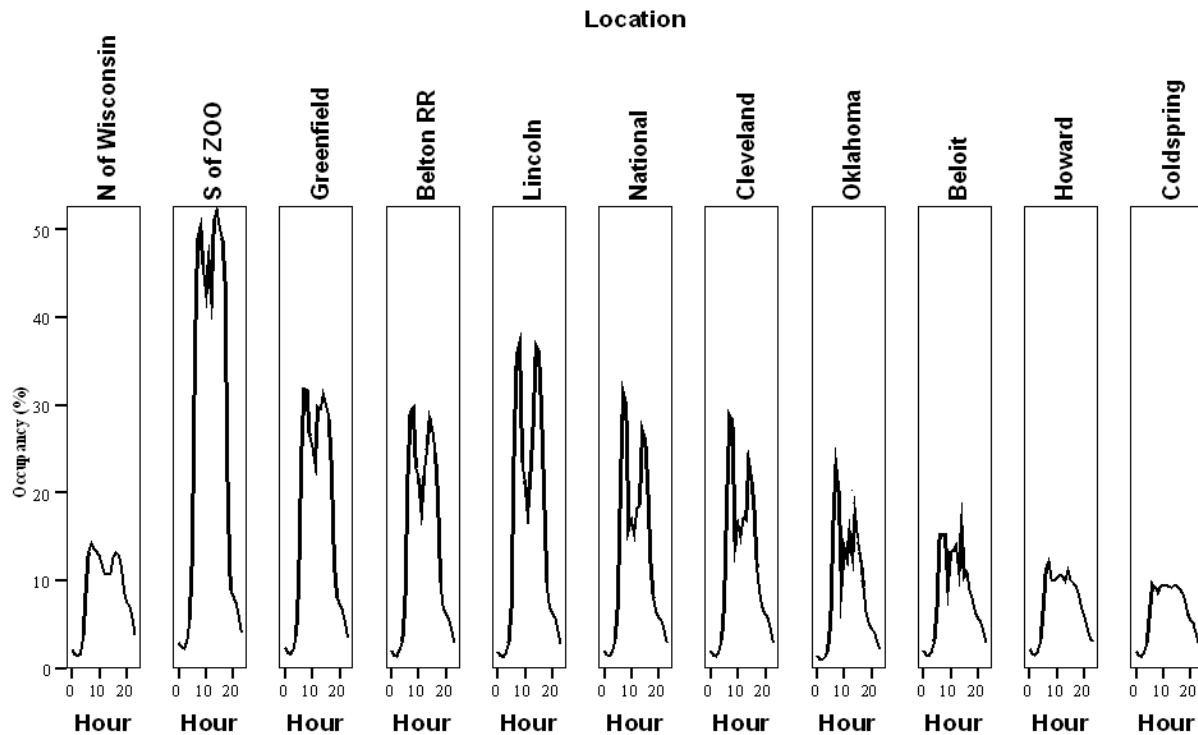
# Findings

Corridor 24-Hour Normal traffic 4/4, 4/5, 5/16, 5/17, 5/18, 5/19



# Findings

Corridor 24-Hour WZ1 4/11 ,4/14, 4/17, 4/18, 4/19, 4/20



# Findings

Morning peak hour Volume; Speed; Occupancy	Started 30 min earlier 2,100 vphpl; 9.1 mph; 47.5%
Morning peak period Volume; Speed; Occupancy	Started 35 min earlier; lasted 55 min longer 2,060 vphpl; 16.1 mph; 45.1%



# Findings

Afternoon peak hour Volume; Speed; Occupancy	Started 1h 25min later 2,050 vphpl; 11.4 mph; 46.5%
Afternoon peak period Volume; Speed; Occupancy	Started 15min later; Lasted 55 min longer 1,970 vphpl; 15.8 mph; 44.2%

# Findings

Mid-day  
Volume; Speed; Occupancy

1,803 vphpl; 12.1 mph; 47.9%

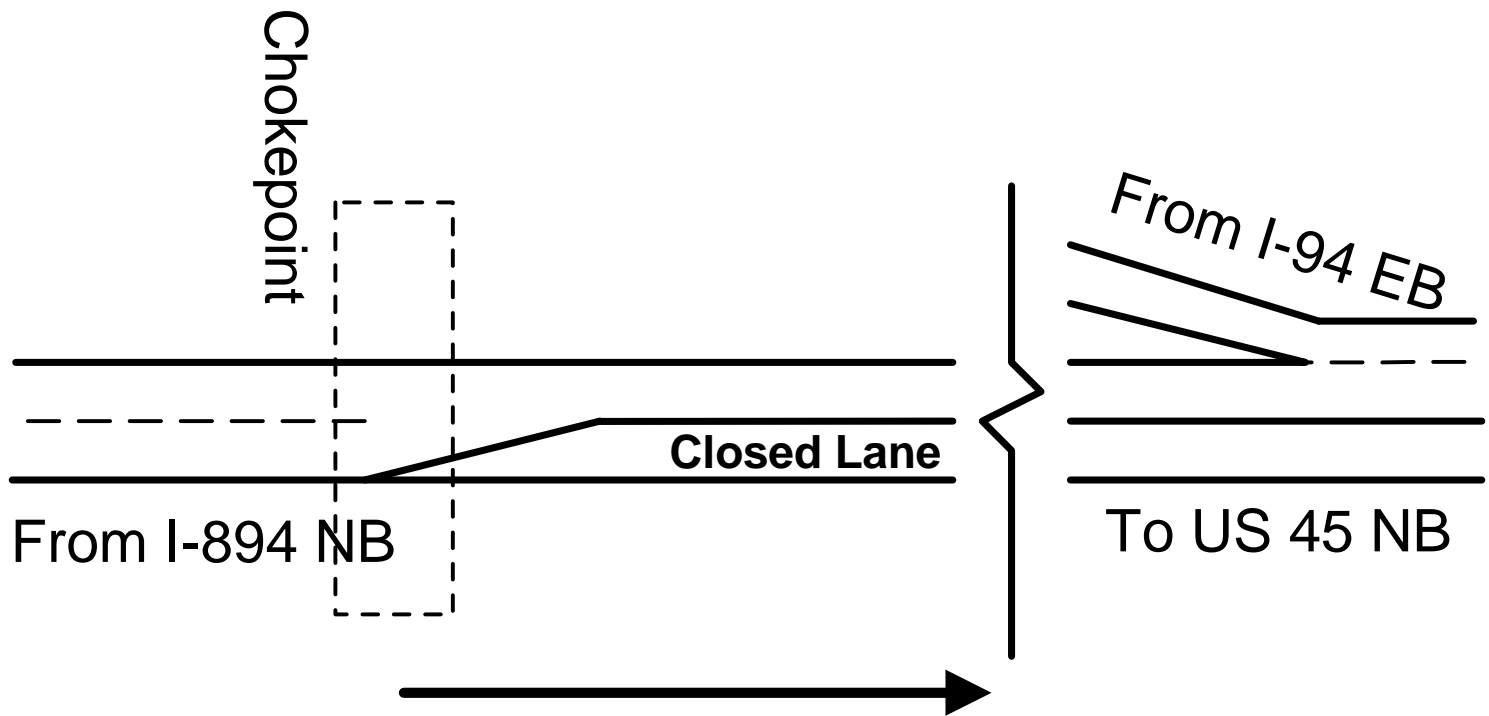
# Findings

WZ effect extent	4.2 miles upstream of WZ entrance		
Trip diversion	Entering corridor		-7,100 / -10%
Number of vehs / % change	Off ramps		+4,450 / -22%
	On ramps		-5,500 / -23%
	Entering from S. of Zoo		-17,050 / -20%

# Findings

Vehicle mix changes	9,372 fewer smaller vehicles 220 fewer trucks and buses 641 more combination trucks
Lane distribution changes	More traffic using shoulder lane More Combination trucks using median lane

# Work Zone 2 (2-to-1 lane)



# Findings

Morning peak period Volume; Speed; Occupancy	Started 35 min earlier; No change in duration 1,820 vphpl; 17.3 mph; 27.5%
Afternoon peak period Volume; Speed; Occupancy	Started 20 min earlier; Lasted 1h 50min longer 1,670 vphpl; 18.7 mph; 27.5%
Mid-day Volume; Speed; Occupancy	1,560 vphpl; 13.3 mph; 30.9%

# Findings

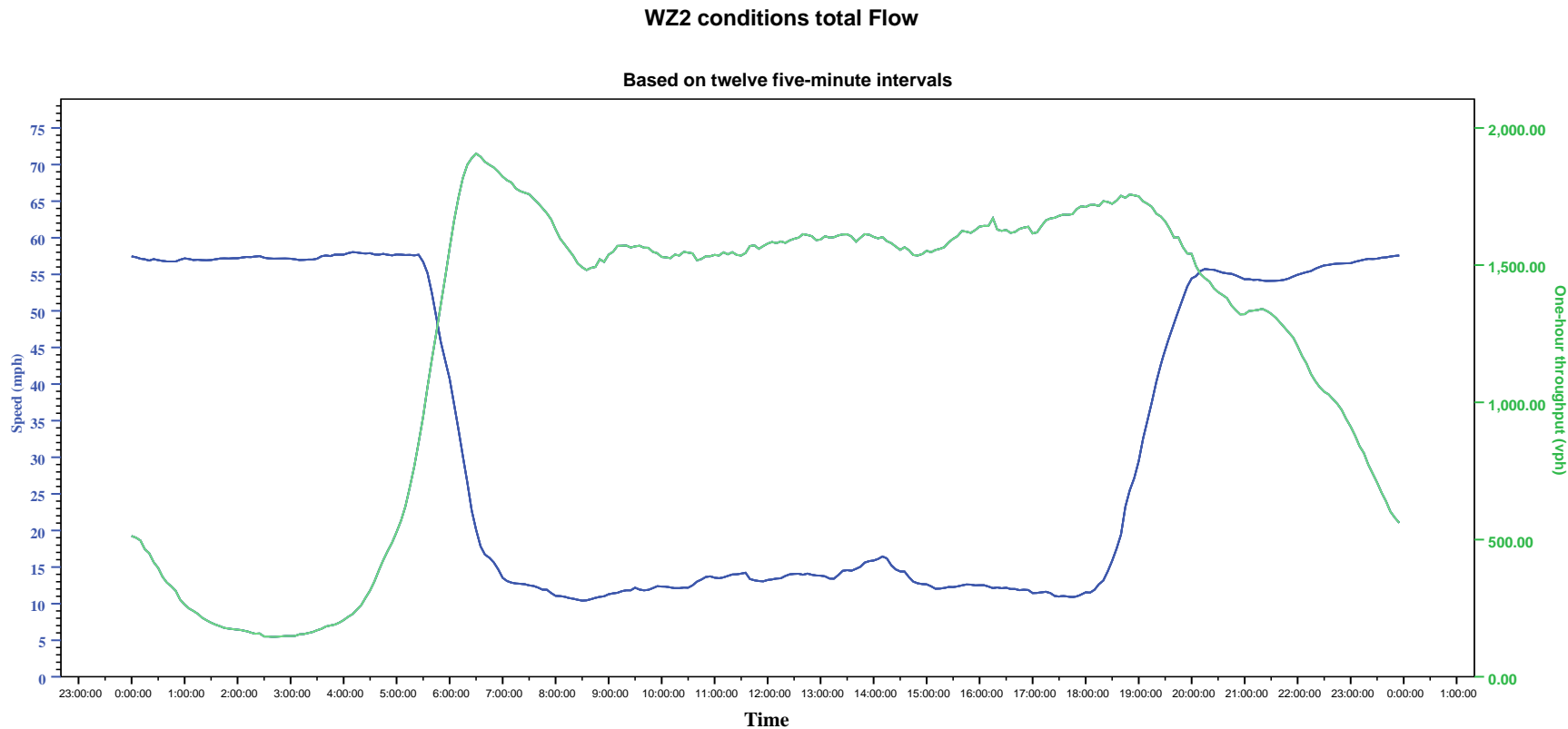
WZ effect extent	3.7 miles upstream of WZ entrance	
Trip diversion	Entering corridor	-8,100 / -11%
	Off ramps	+4,450 / -22%
	On ramps	-5,950 / -25%
	Entering bottleneck	-18,500 / -22%

# Findings

Vehicle mix changes	10,400 fewer smaller vehicles 160 fewer trucks and buses 1,310 more combination trucks
Lane distribution changes	More traffic using shoulder lane More Combination trucks using median lane



# Two capacities?



# Recommendations

In planning long-term urban freeway work zones:

- Use sustainable actual throughput, not max flow
  - Mid-day may have the lowest throughput
- Anticipate earlier congestion start/later end, longer duration (15 hours here)
  - Signal timing at ramp terminals
  - Ramp metering
  - Enforcement and tow truck hours

# Recommendations

- Expect impacts 4-5 miles upstream
  - 5 upstream interchanges here
- Anticipate that conditions may actually improve further upstream due to diverted traffic
  - Higher speeds—warn drivers of stopped traffic ahead
- Most diverted traffic may be passenger cars
- Combination vehicles did not divert
  - Provide at least one WZ lane for large vehicle use
  - Allow for turning SU trucks on alternate routes

# Acknowledgements

Thanks to

- Tom Notbohm of Wisconsin DOT
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- Tom McDonald of SWZDI