Proprietary Tensioned Cable System:

Results of a Three Year In Service Evaluation

Ohio Department of Transportation

District 8

E. Thomas Arnold, Jr., E.I.

Introduction

- Existing Conditions
- Cable Barrier Installation
- 3-Year ISPE
- Crash Trends
- Notable Crash Types
- Conclusion

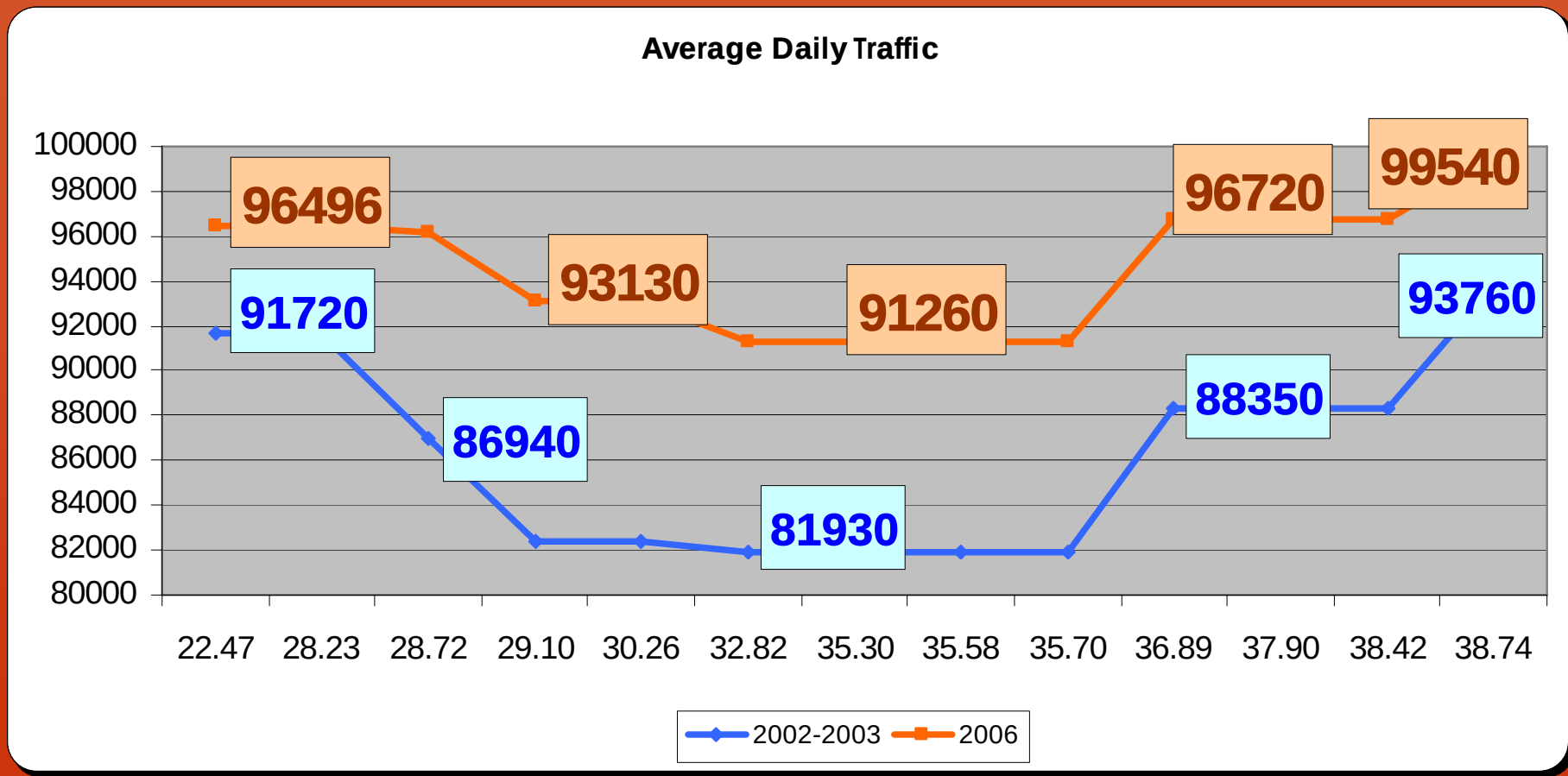
Existing Conditions

Existing Conditions

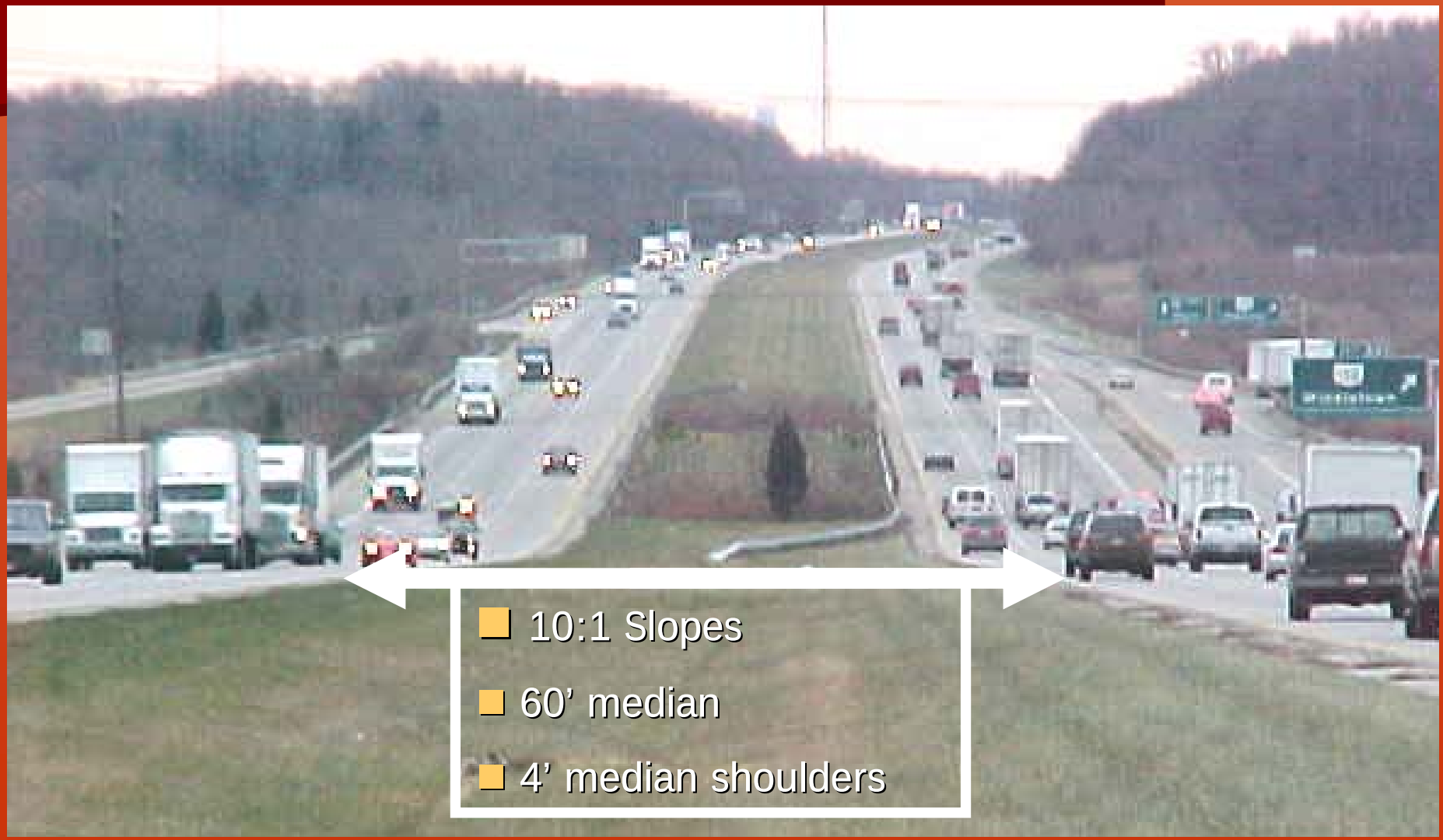
- IR-75 from SR-129 to SR-73 in Butler and Warren Counties
- Urban Interstate
- 3 lanes in each direction

Existing Conditions

- 22% Trucks throughout this time frame



Median Characteristics



Cross-Over Crash Experience

- 11 fatal cross-over crashes occurred from October 2000 through December 2001
- No common contributing factors identified

Low Cost/Short Term Countermeasures

- Increased State Highway Patrol presence
- Installed rumble strips

Crashes Reduced until OSP Presence Relaxed

Cable Barrier Installation

Brifen Installation

Concrete Barrier	$4,500,000
Mounding	$2,800,000
Barrier Guardrail	$1,200,000
Cable Barrier	$1,045,000

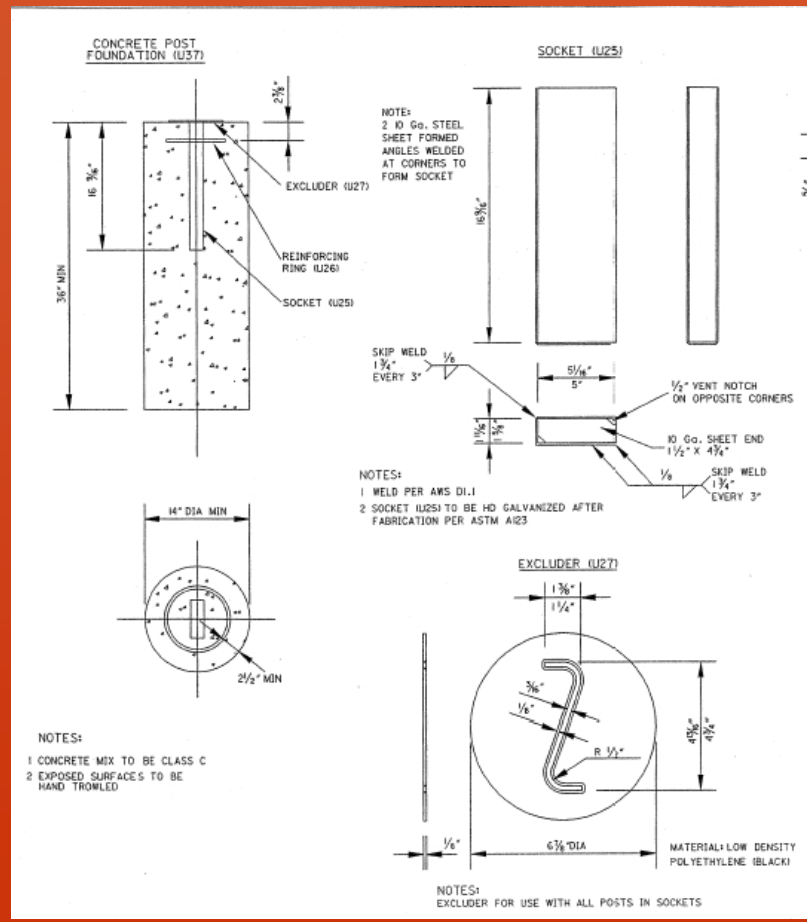
System Description

- 14.5 miles of wire rope installed on IR-75 in Butler and Warren Counties
- Cost: $1,045,000 (2001 dollars)

System Description

- Approx. 85% (12.5 miles) driven posts and

  15% (2 miles) socketed posts
- 4 pre-tensioned wire ropes woven around posts
- Posts spaced at approx. 10’



System Description

- The wire rope is located approximately 14’ from the edge line

3-Year In-Service Performance Evaluation

ISPE

- FHWA Approved
  - Used in over 30 Countries
  - 2nd installation in US
  - 1st in Ohio
- ODOT was required to perform a 3-year ISPE

ISPE

TENSIONED CABLE GUARDRAIL
ACCIDENT REPORT AND EVALUATION FORM
Ohio Department of Transportation

CRASH LOCATION

County: BUTLER Route: IR-75 Milepost: 24.1 Direction: NORTHBOUND
Horizontal curve: Tangent Length: _____ ft. Direction: n/a

COLLISION DATA (Sketch accident on reverse side or attach separately)

Date of Accident: 4/13/06 Day of Week: Thursday Time: 10:59pm
Weather: Clear/Cloudy and Dry
Estimated Angle of Impact: 15 degrees
Estimated Speed at Impact: 65 mph
Result of collision: Stopped in Contact
Describe sequence of events leading to accident: Unit 1 made an improper lane change, sideswiped a truck, lost control, and struck the wire rope

VEHICLE AND OCCUPANT

Vehicle Type: Car Vehicle Make: Honda Model: Prelude Year: 1986
Describe Damage to Vehicle: Disabling damage to the Front Left Corner
Total Occupants: 2
Describe Occupant Injuries: (Seating position/Were seat belts used/Air bag deployed?):
Seat belts were in use; airbags were not deployed; no injuries were sustained

HARDWARE

Impact Location (Check One): Cable ☒ Terminal section ☐ Other: _____
Describe Damage to Barrier: _____
Rate Overall Barrier Performance: Good

REPAIR

Number of posts damaged: 8 Was cable damaged?: _____
Did cable maintain tension? Yes
Cost to repair:

Labor	Material	Equipment	Total
$724.72	$755.17	$243.36	$1,723.25

Repair problems? (Difficulties in obtaining parts/repair guidance/or other): _____

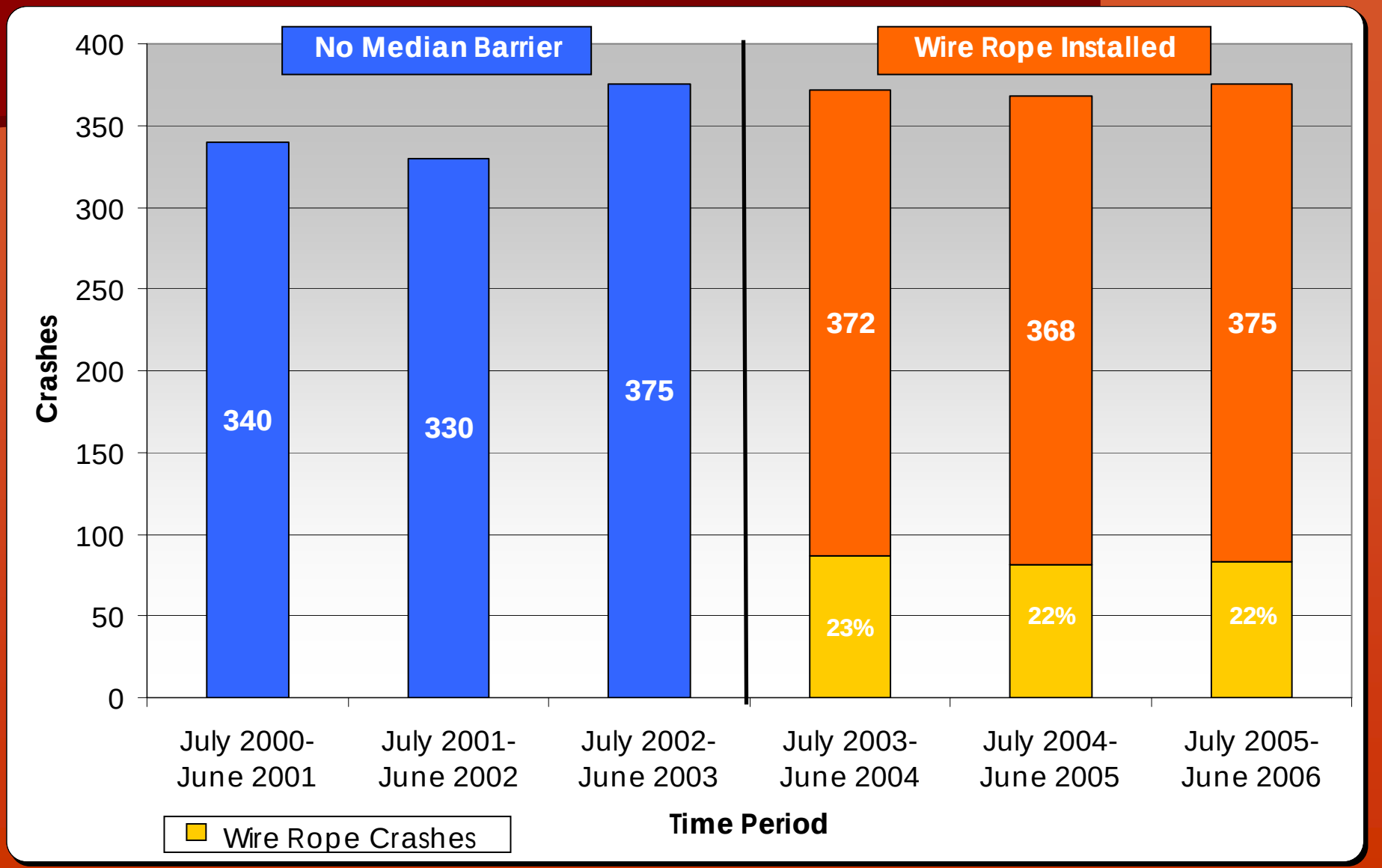
Attach any supporting information, sketches, photos, accident reports, etc.
Evaluator: Tommy Arnold Date: September 11, 2006
Title: Transportation Engineer

Submit to Standards Engineer, Office of Roadway Engineering, Central Office, Thank you!

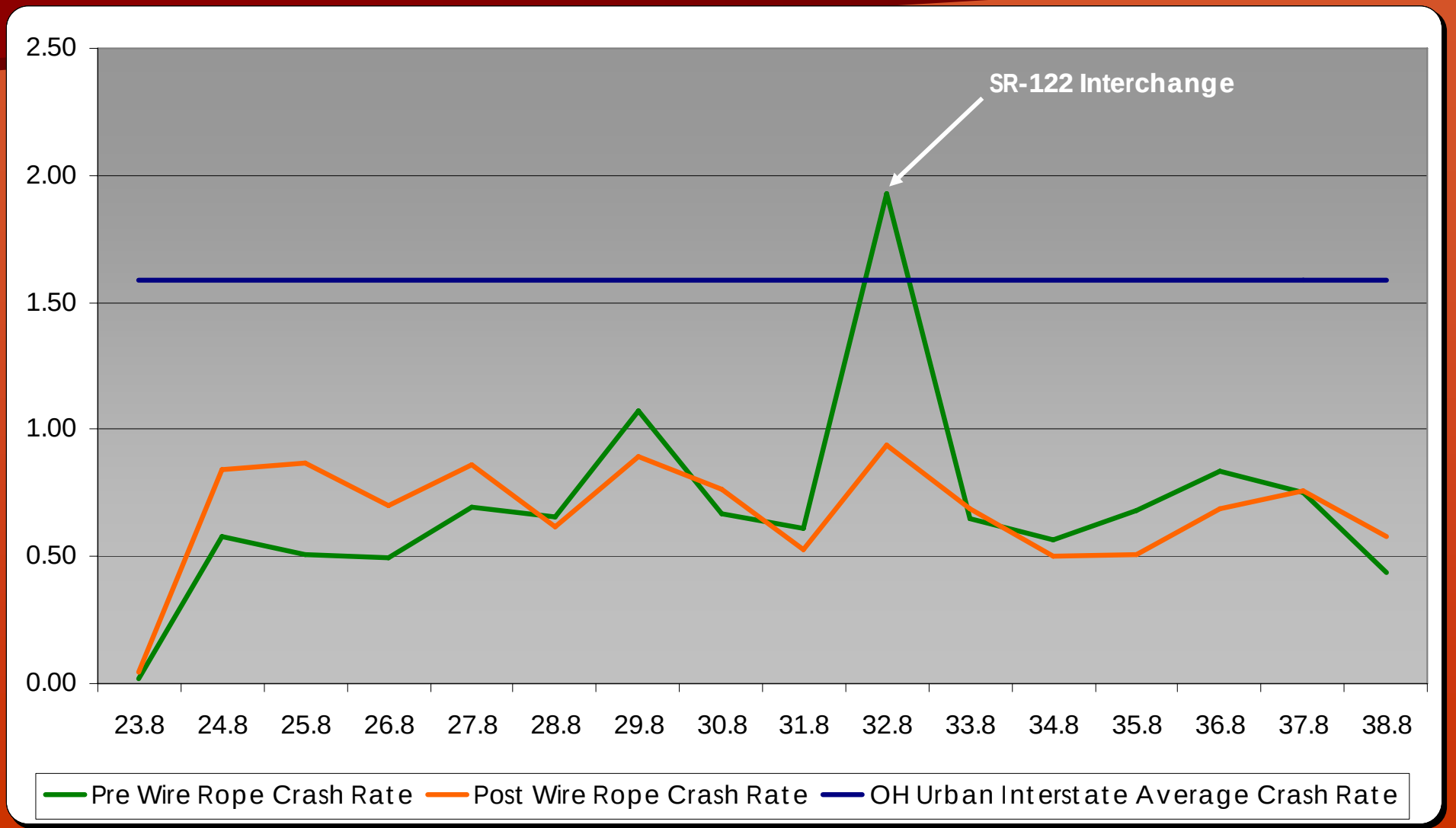
- Weekly inspection of crashes
- Completion of Evaluation forms
  - OH-1 crash data
  - Inspected damage
  - Repair costs
- Annual submittal of ISPE report to FHWA describing crash experience

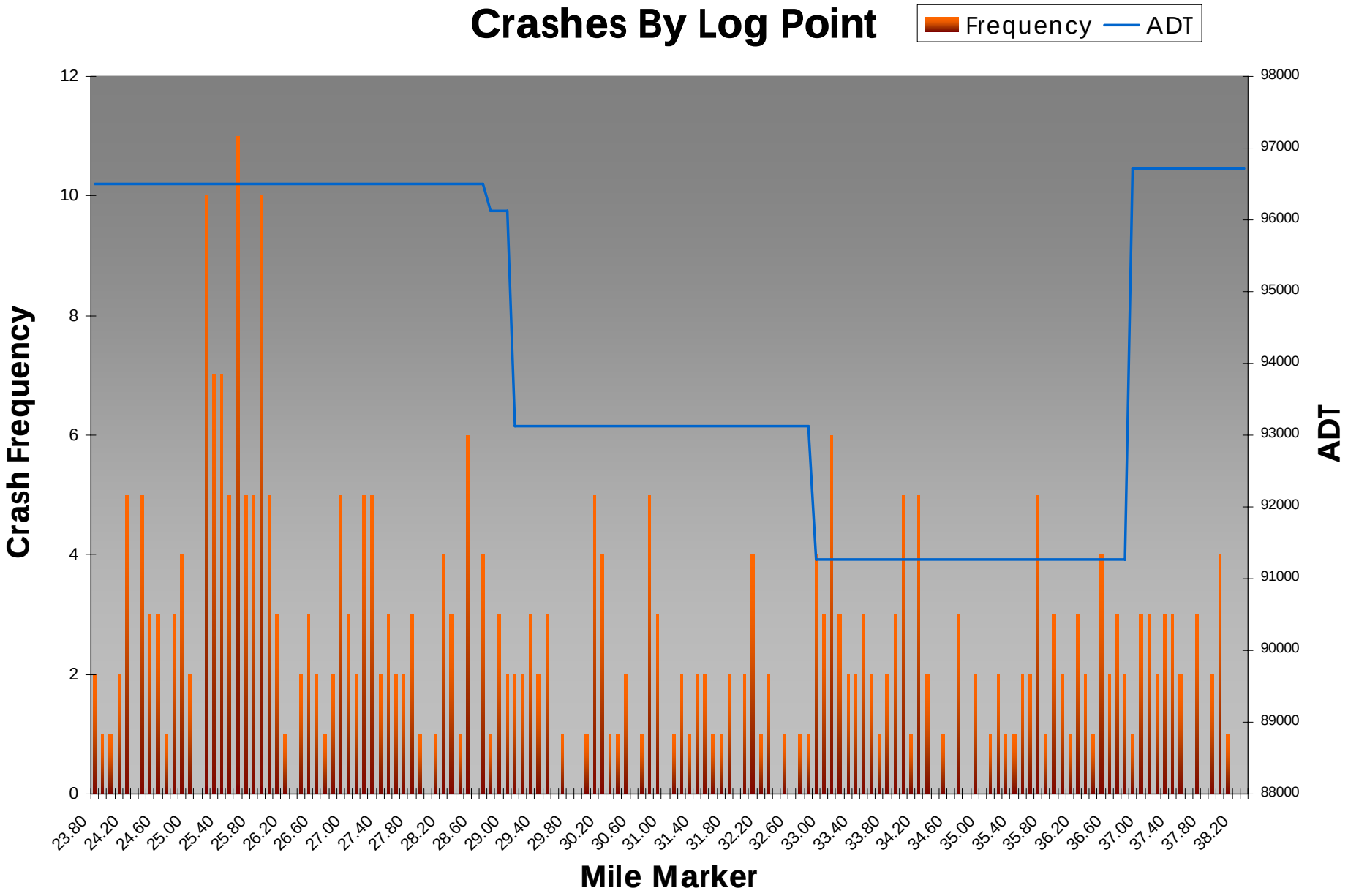
Crash Trends

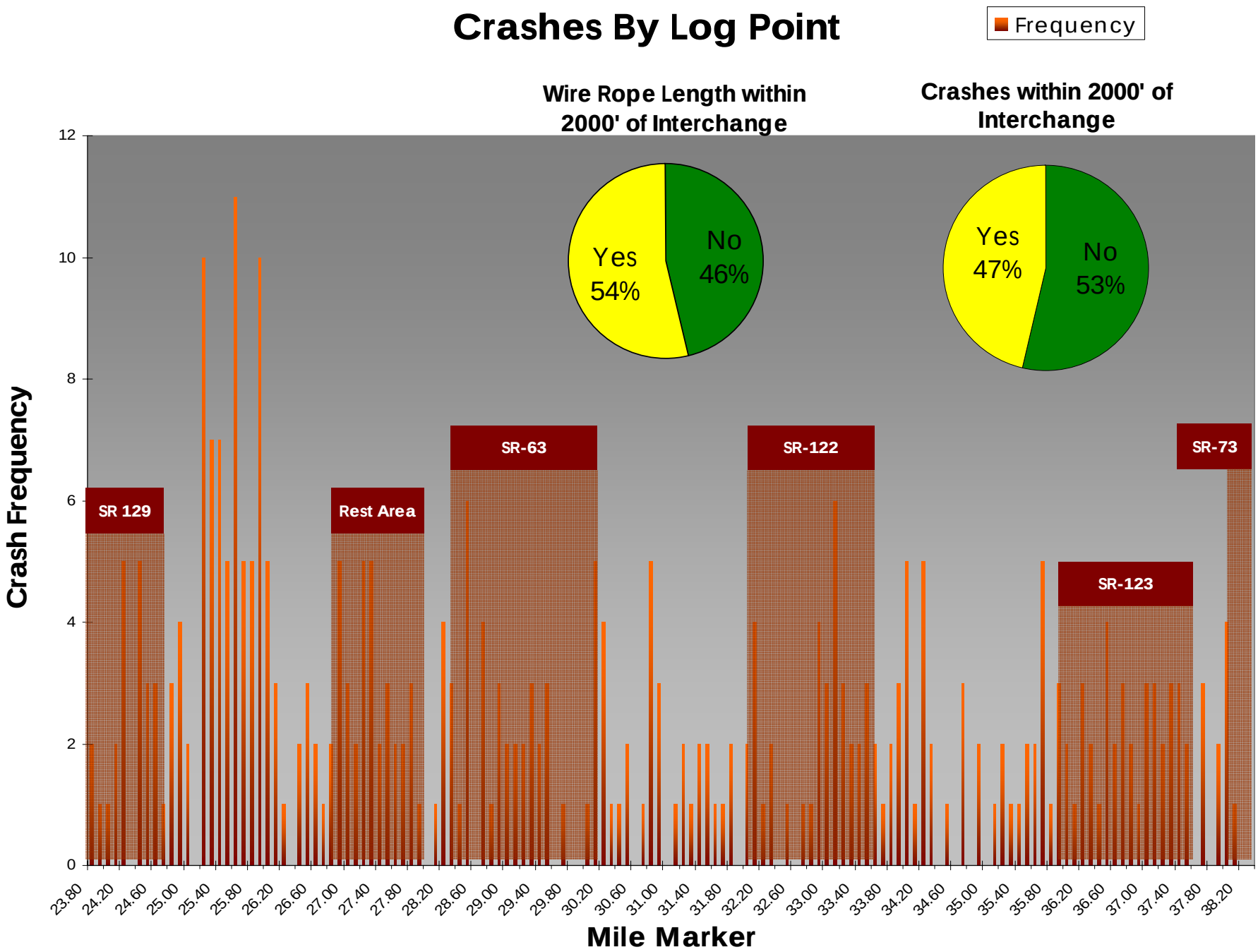
Total Crash Comparison



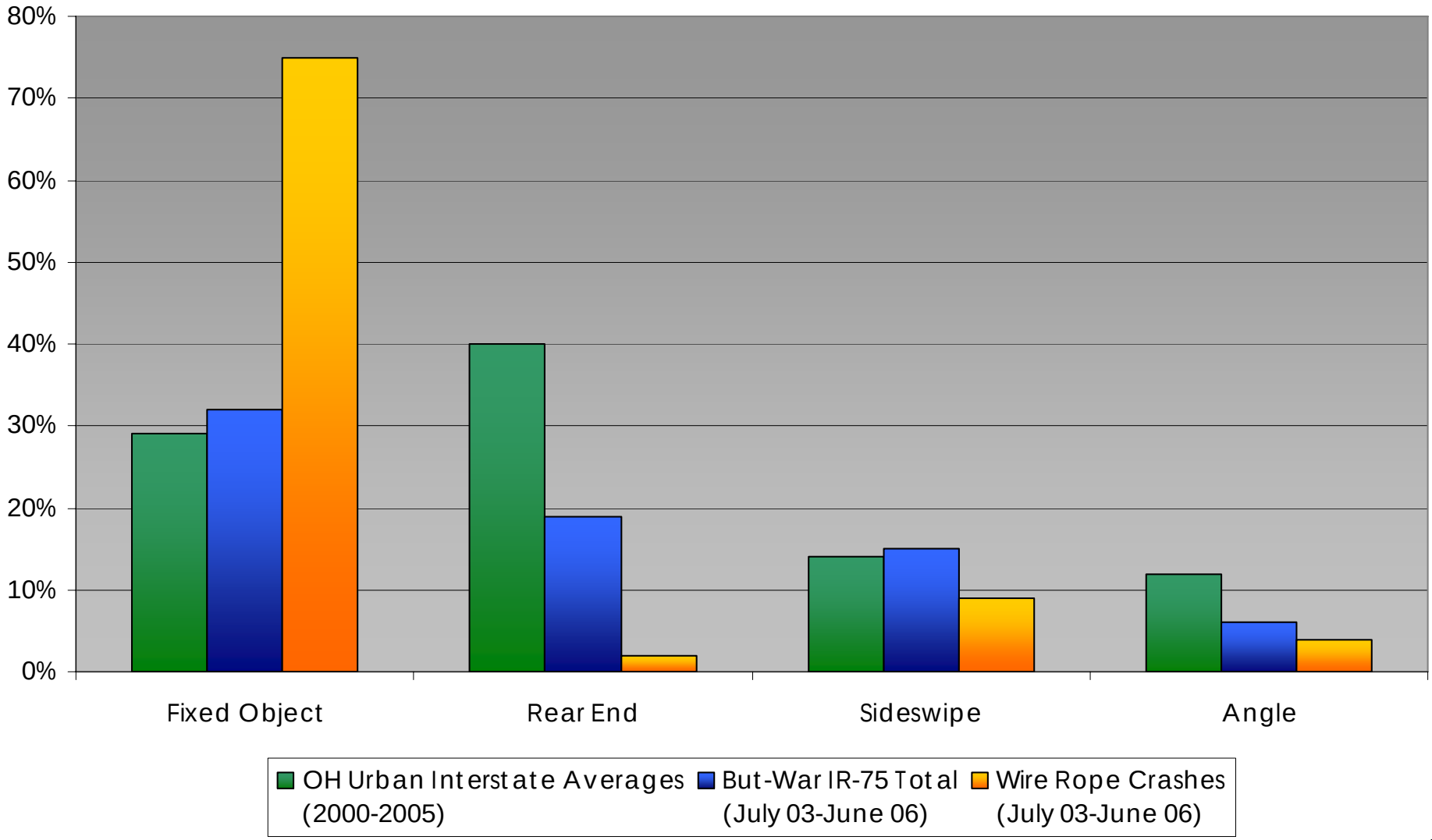
1-Mile Crash Rate Comparison




Crashes By Log Point
Frequency
ADT
Crash Frequency
ADT
Mile Marker
0
2
4
6
8
10
12
88000
89000
90000
91000
92000
93000
94000
95000
96000
97000
98000
23.80
24.20
24.60
25.00
25.40
25.80
26.20
26.60
27.00
27.40
27.80
28.20
28.60
29.00
29.40
29.80
30.20
30.60
31.00
31.40
31.80
32.20
32.60
33.00
33.40
33.80
34.20
34.60
35.00
35.40
35.80
36.20
36.60
37.00
37.40
37.80
38.20

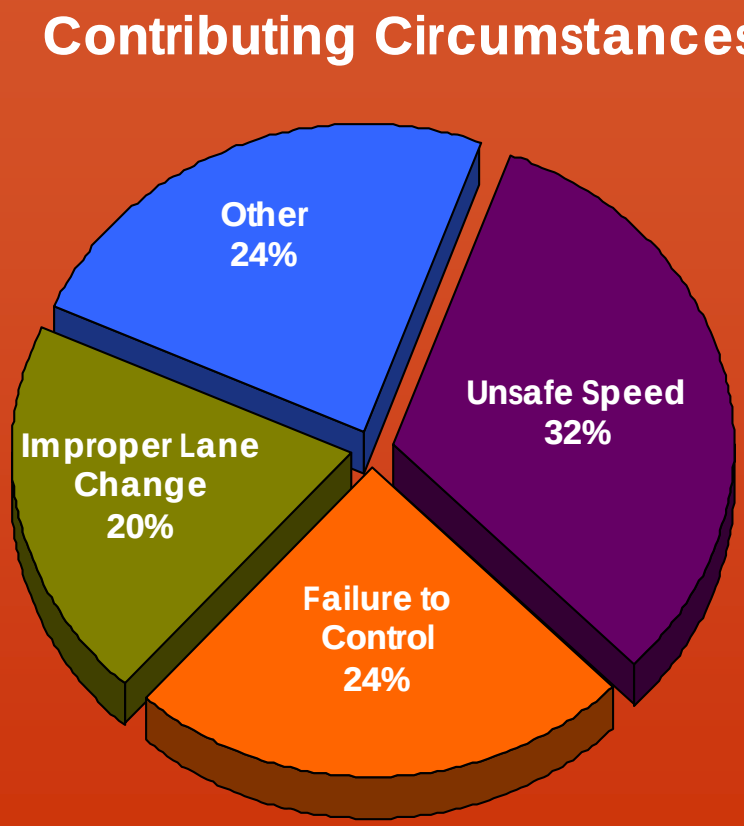

Crashes By Log Point
Frequency
Wire Rope Length within 2000' of Interchange
Yes 54%
No 46%
Crashes within 2000' of Interchange
Yes 47%
No 53%
SR 129
Rest Area
SR-63
SR-122
SR-123
SR-73
Crash Frequency
0
2
4
6
8
10
12
23.80
24.20
24.60
25.00
25.40
25.80
26.20
26.60
27.00
27.40
27.80
28.20
28.60
29.00
29.40
29.80
30.20
30.60
31.00
31.40
31.80
32.20
32.60
33.00
33.40
33.80
34.20
34.60
35.00
35.40
35.80
36.20
36.60
37.00
37.40
37.80
38.20
Mile Marker

Collision Details
Crash Type

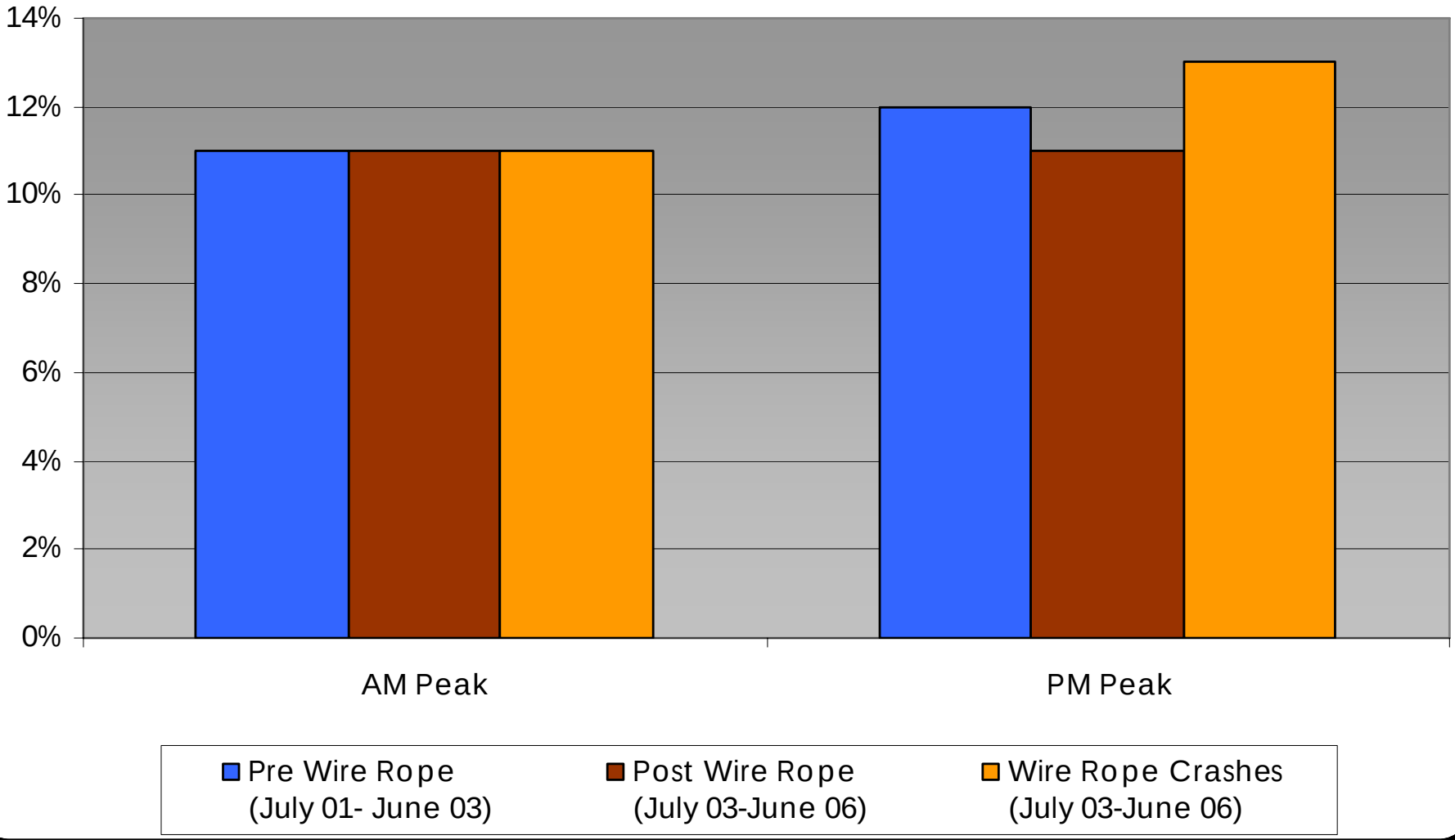


Collision Details
Crash Type

- At least 71% of the total crashes involved only 1 vehicle (not including Hit and Run crashes)
- Hit and Run crashes accounted for approx. 27% of total crashes per year

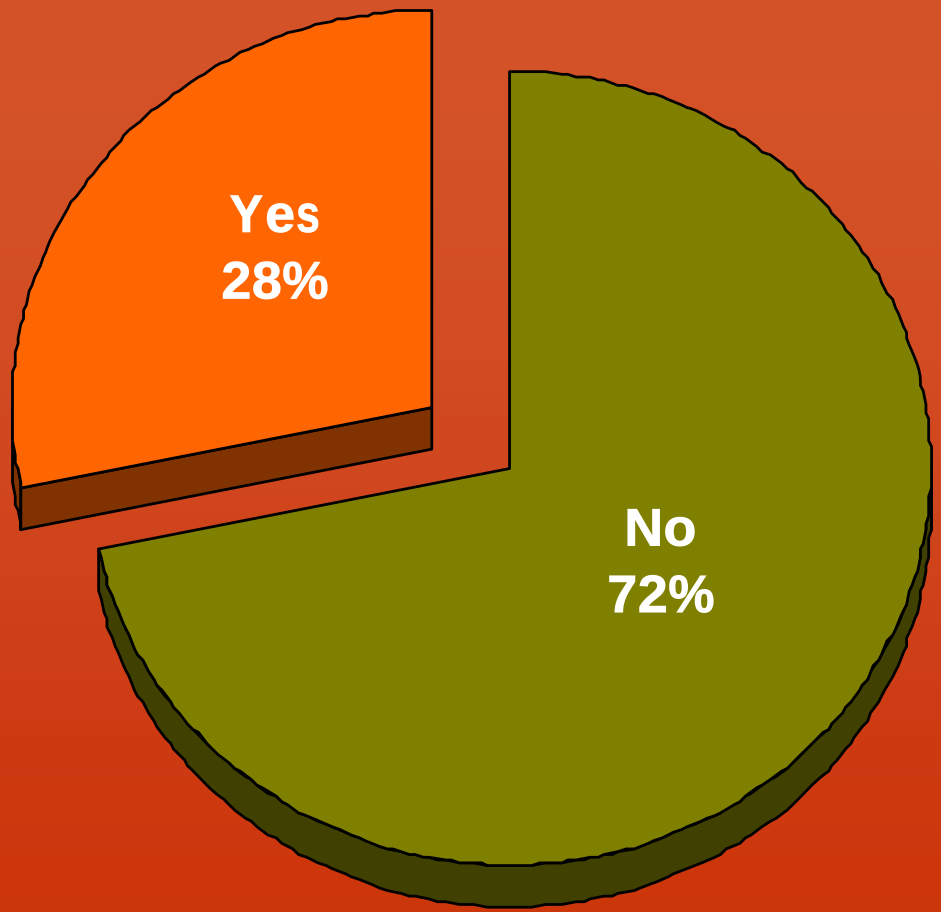


Collision Details
Peak Hour



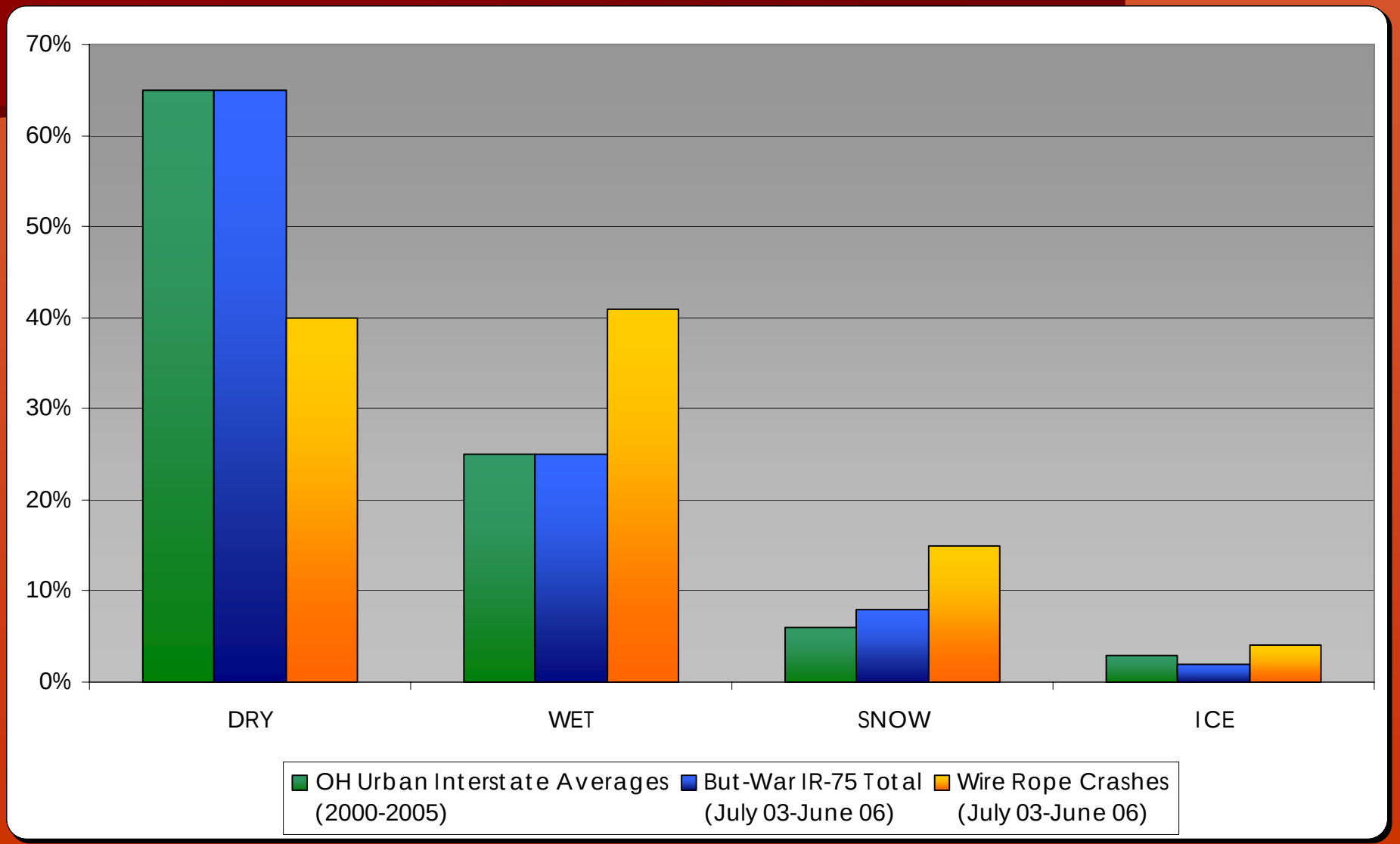
Vehicles Crossing the Ditch

- In other words, 28% of the wire rope crashes were backside hits

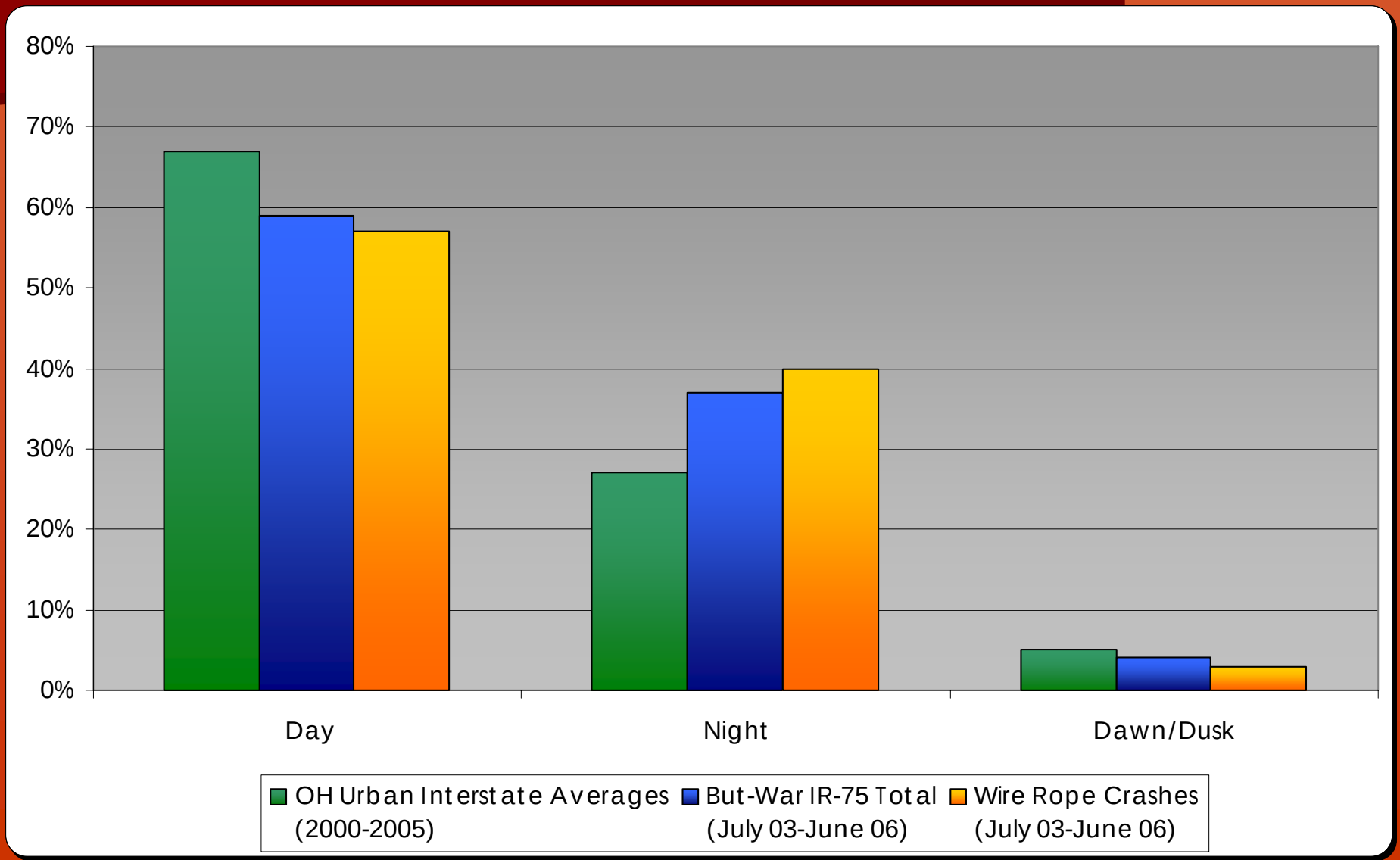


Environment Details

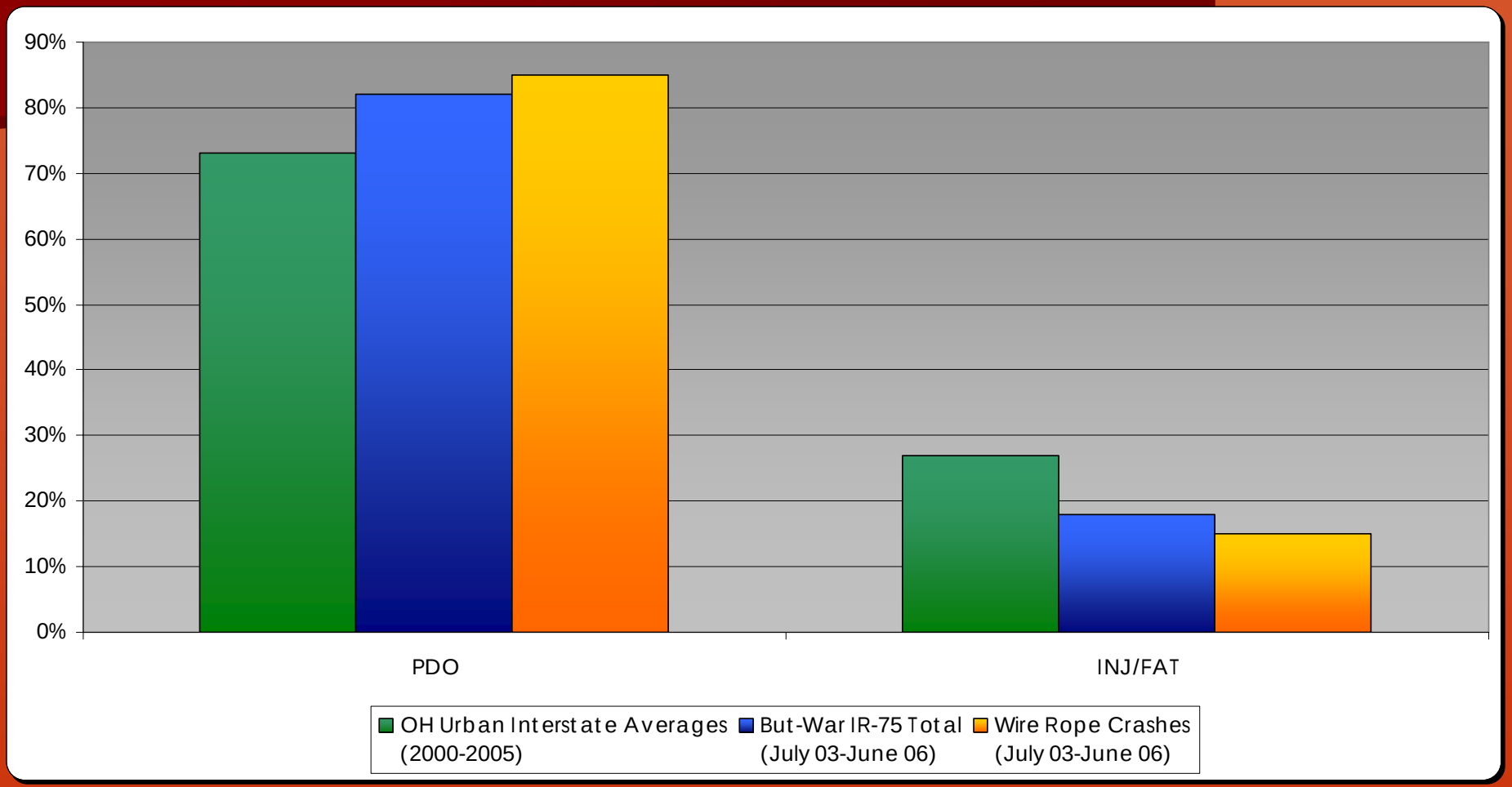
Road Condition



Environment Details
Light Condition



Crash Severity Details



- Bottom Line: No cross-over fatal or incapacitating injuries

Other Details

- No trends related to the following:
  - Age
  - Alcohol use

Notable Crash Types

Notable Crashes

- Penetration
- Entanglement
- Vehicles exceeding design criteria

Penetration

- Approx. 4 per year
- No discernable trends

- Only 3 out of 13 were back-side hits

Two ropes did maintain contact with this vehicle

Entanglement

- Only 1 crash observed from July 2003 – June 2006

Vehicles Exceeding Design Criteria

- September 6, 2006 Semi-truck hit
- Other crashes included Mac truck, single unit truck, and Fire truck

Source: *The Enquirer*. Sept. 6, 2006

Resulting Damage

- Only 1 resulted in penetration

Conclusion

Conclusion

- Cross-over crashes appear to be random events
  - Slightly higher percentage during dark conditions
  - Significantly higher percentage during wet conditions
  - Significantly higher percentage of crashes involved only 1 vehicle losing control

Conclusion

- From July 2001 to June 2003...
  - 17 fatal crashes (21 fatalities)
    - 9 cross-over fatal crashes (11 fatalities)
- From July 2003 to June 2006...
  - 4 fatal crashes (4 fatalities)
    - No cross-over fatal crashes

Questions?

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