Benefits/Costs of Access Control Near Interchanges

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Problem Statement

- Access connections near an interchange off-ramp can cause safety and operational problems
- Is it cost-effective to control access by acquiring more LA ROW?

Times photo (2000) — MIKE PEASE

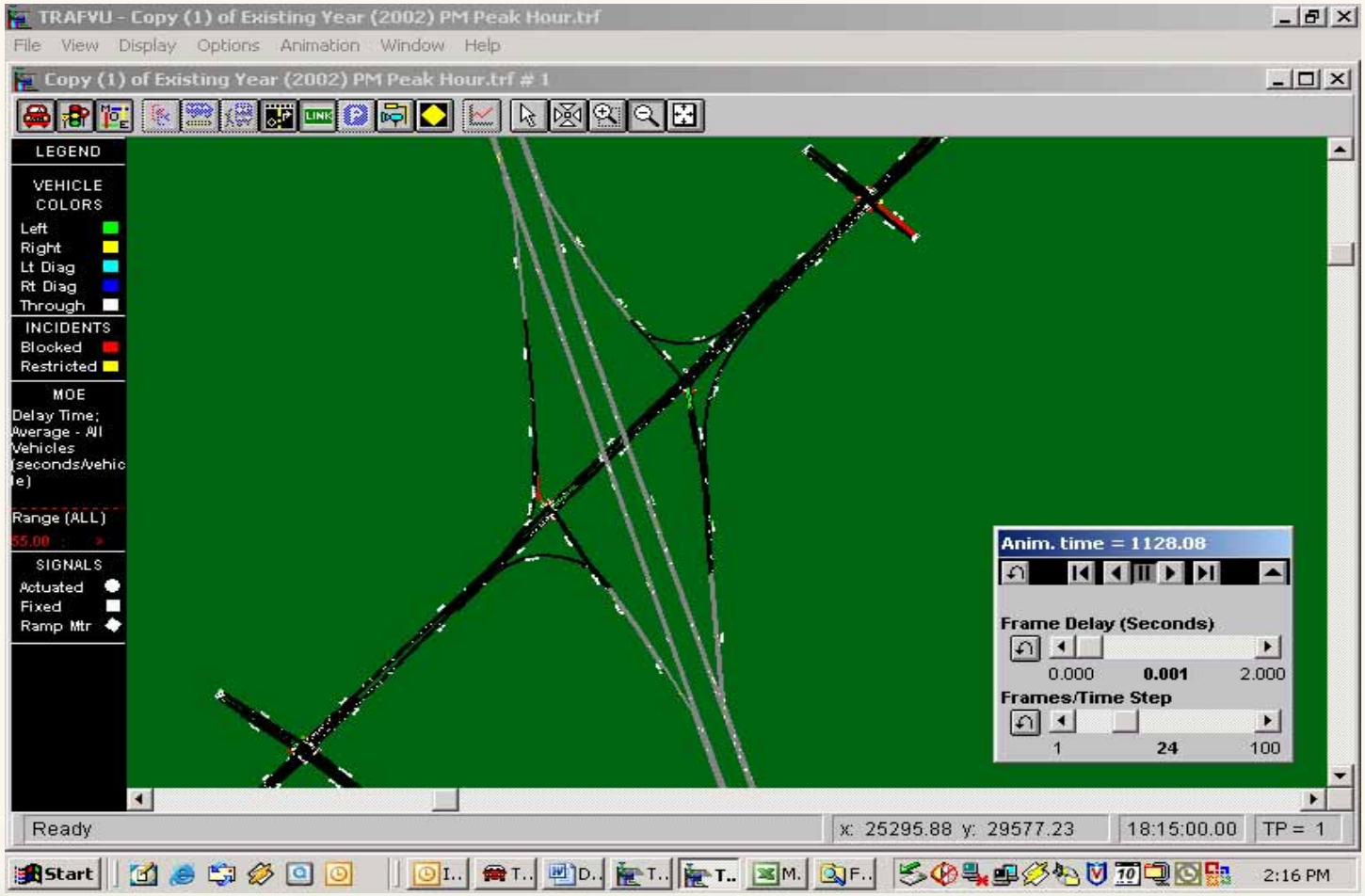
Background

- Interchanges attract development
  - Seldom any coordinated plan
- FDOT has no control over land-use
- Current practice is to acquire 100 ft of LA ROW in urban areas, 300 ft in rural areas
- ROW costs are prohibitive in developed interchange areas

Methodology

- Operational Analysis
  - Extend the operational life of interchange
  - Delay savings by increasing the length of access controlled frontage
- Safety Analysis
  - Effects of access spacing on crash frequency
- B/C Analysis
  - Computing B/C ratio for three scenarios

Original Interchange Model



Operational Analysis (Corsim)

- Modify the existing interchange configuration to an average urban diamond design
- Simulate the operational impacts of 200 feet access spacing
- Continue to simulate the impacts of access spacing at 200-foot increments

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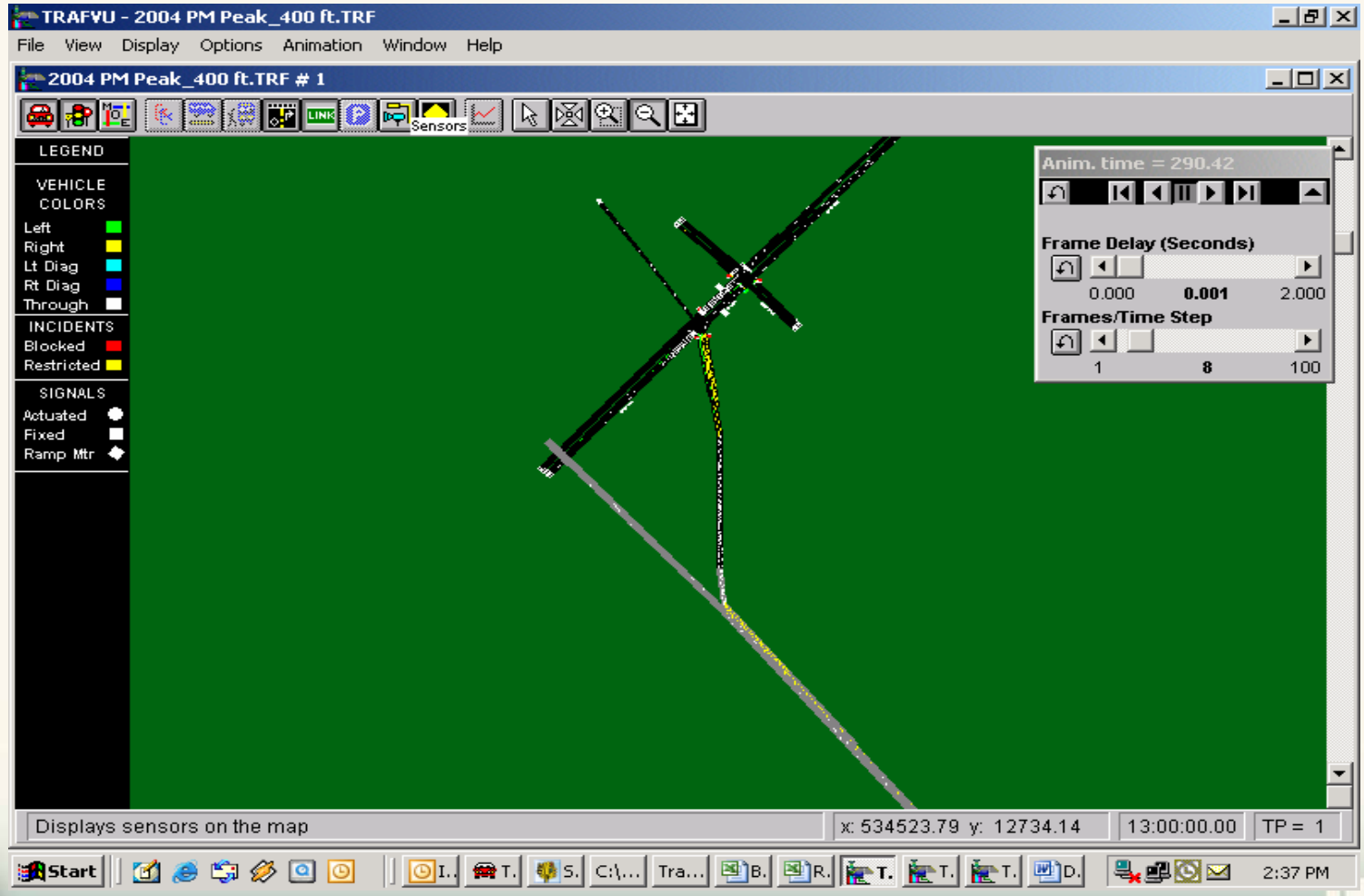
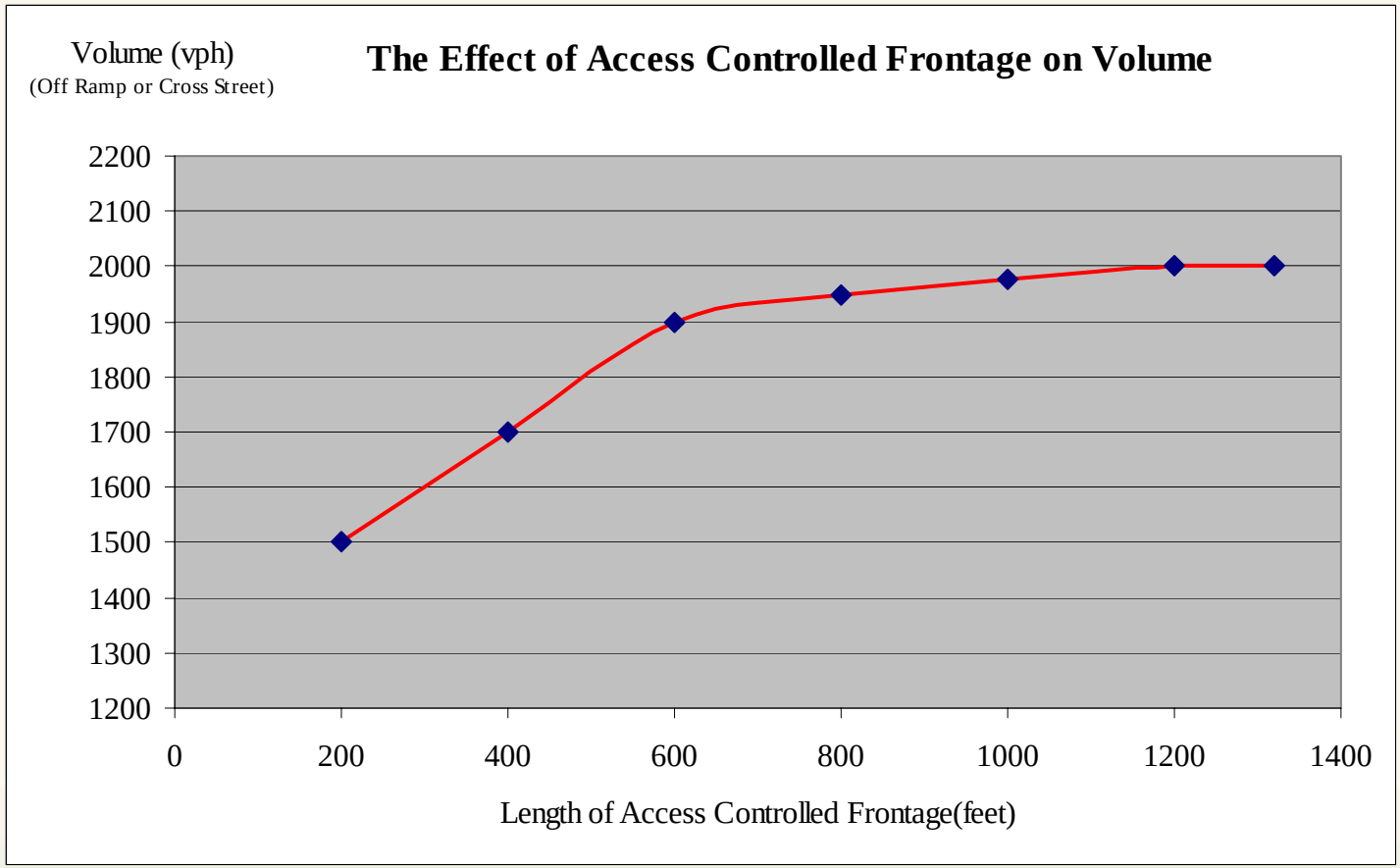
New Simulation Model



Assumptions

- Traffic volume proportion on freeway ramp
- Traffic volume proportion on arterial
- Intersection turning movement counts
- Proportion of weaving vehicles
- Heavy vehicle percentage
- Signal progression effects

Operational Effects



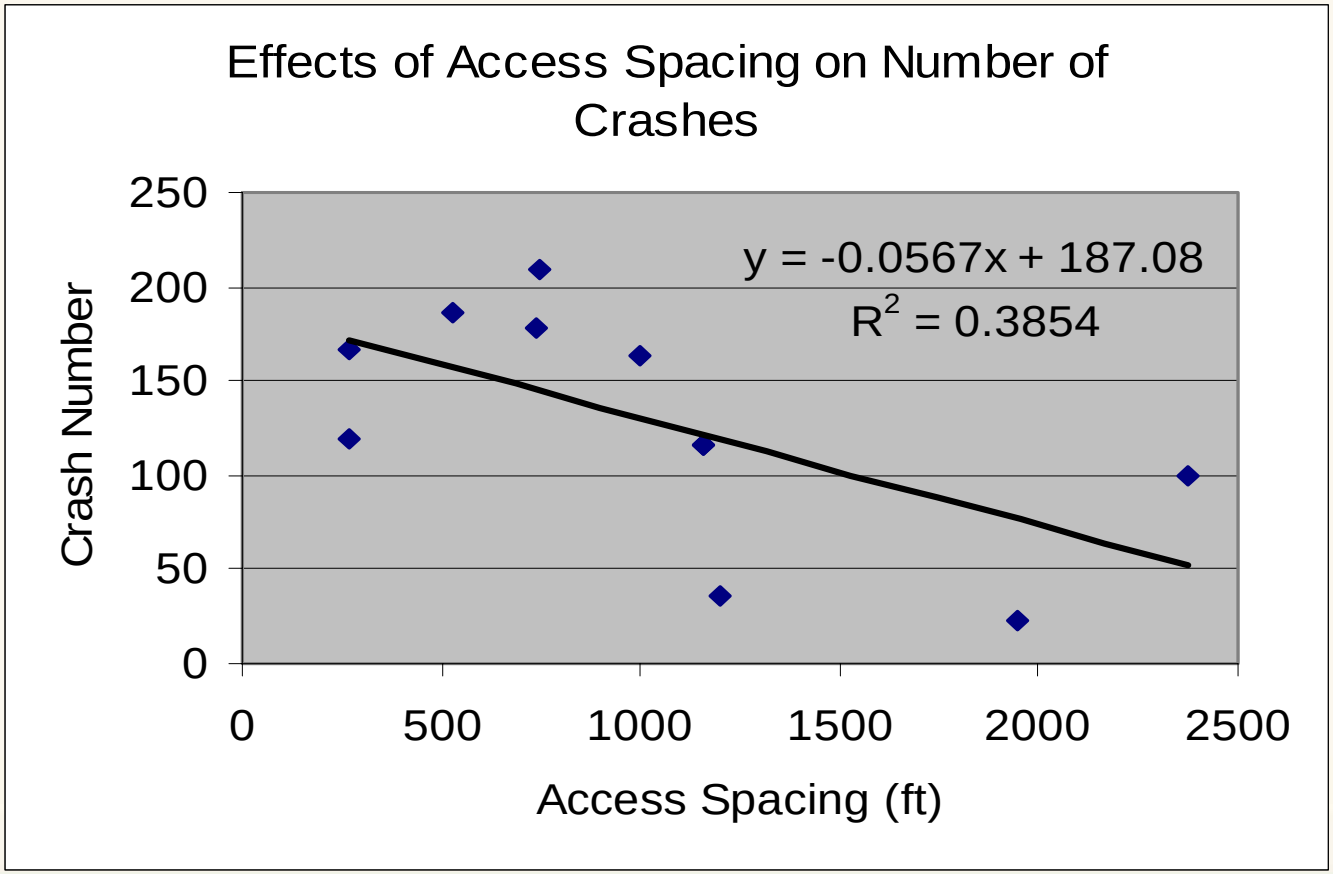
Reduced Delay (per hour)

- 20 years
- Total reduced delay for 600’ vs. 200’ is about 6950 veh-hrs
- Total reduced delay for 1320’ vs. 200’ is about 7730 veh-hrs

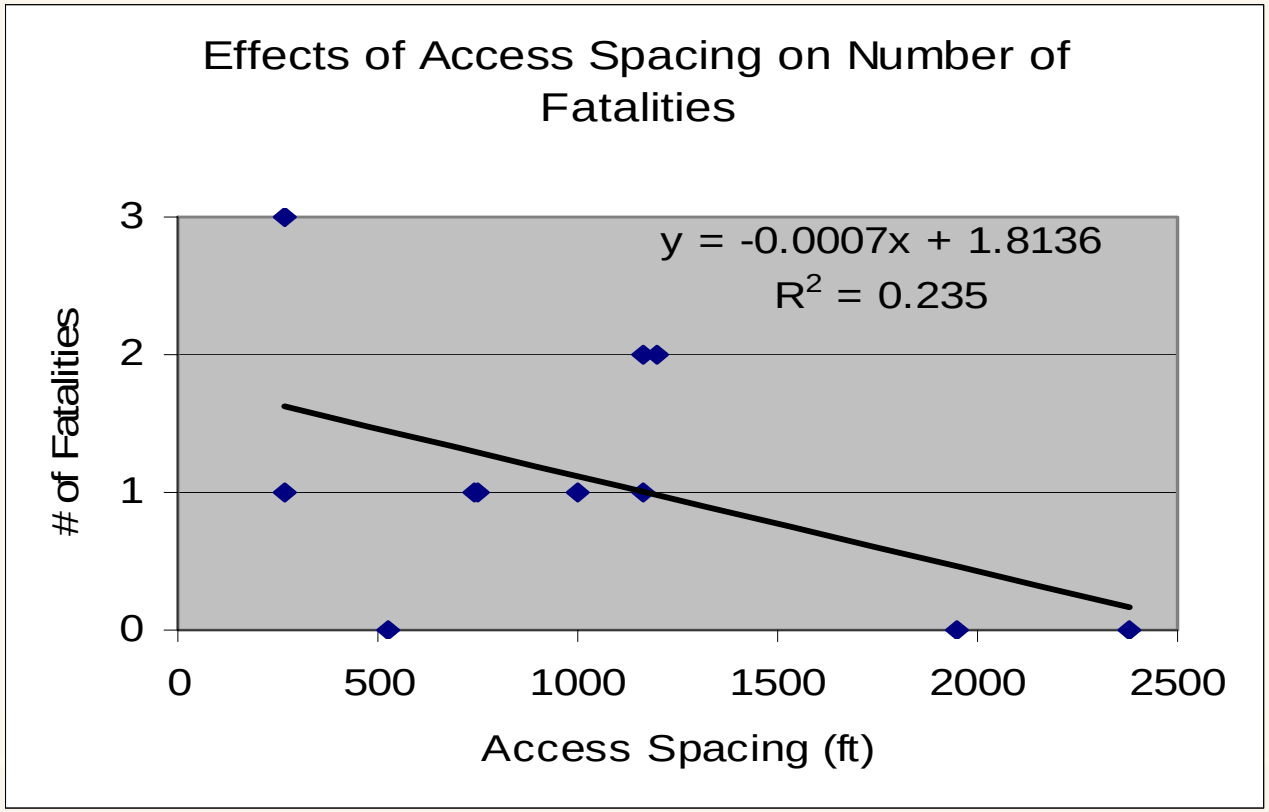
Safety Analysis

- Objective
  - to relate crash frequency to the length of access controlled frontage
- Data Collection
  - 8 Study Sites
  - Crash Data from Year 1999 to 2003

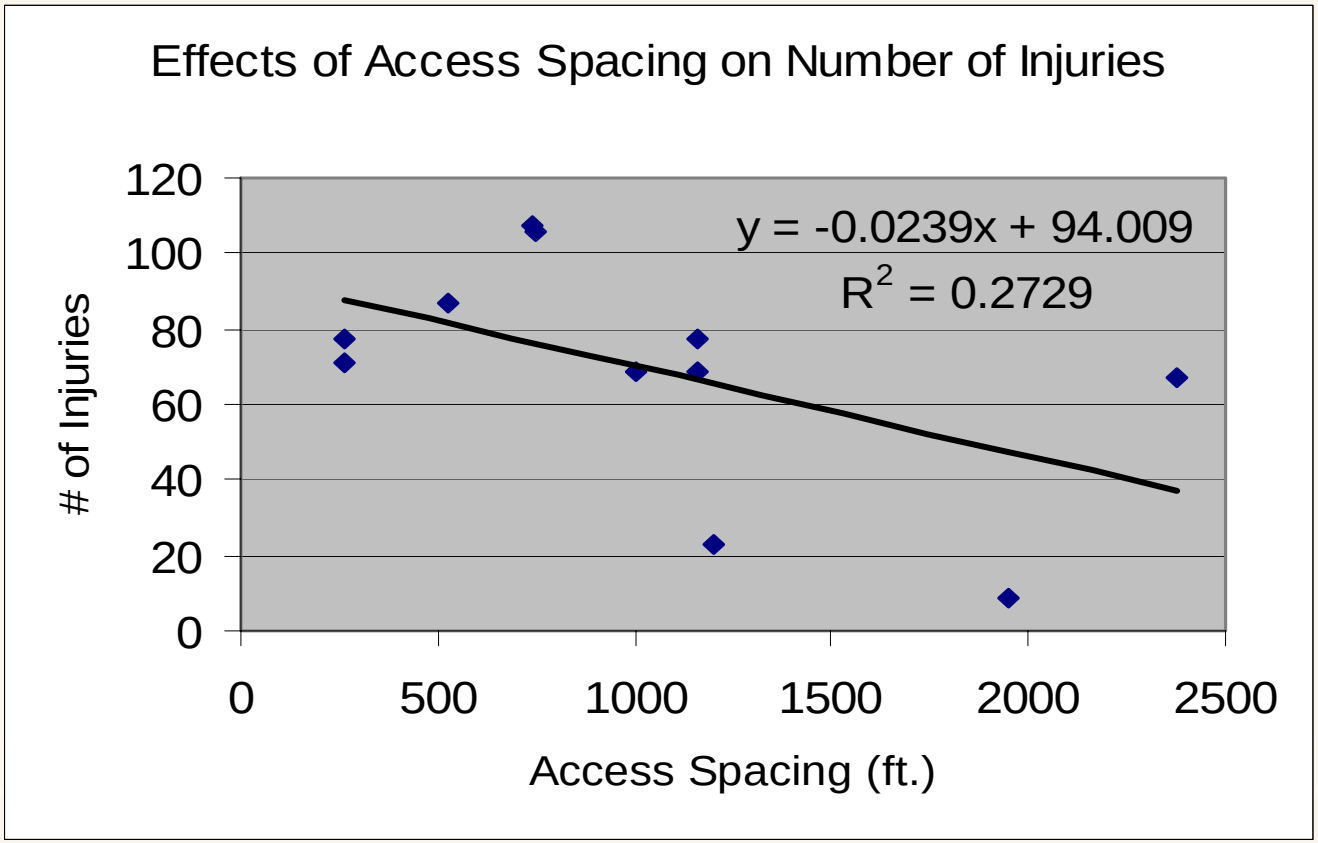
Safety Analysis



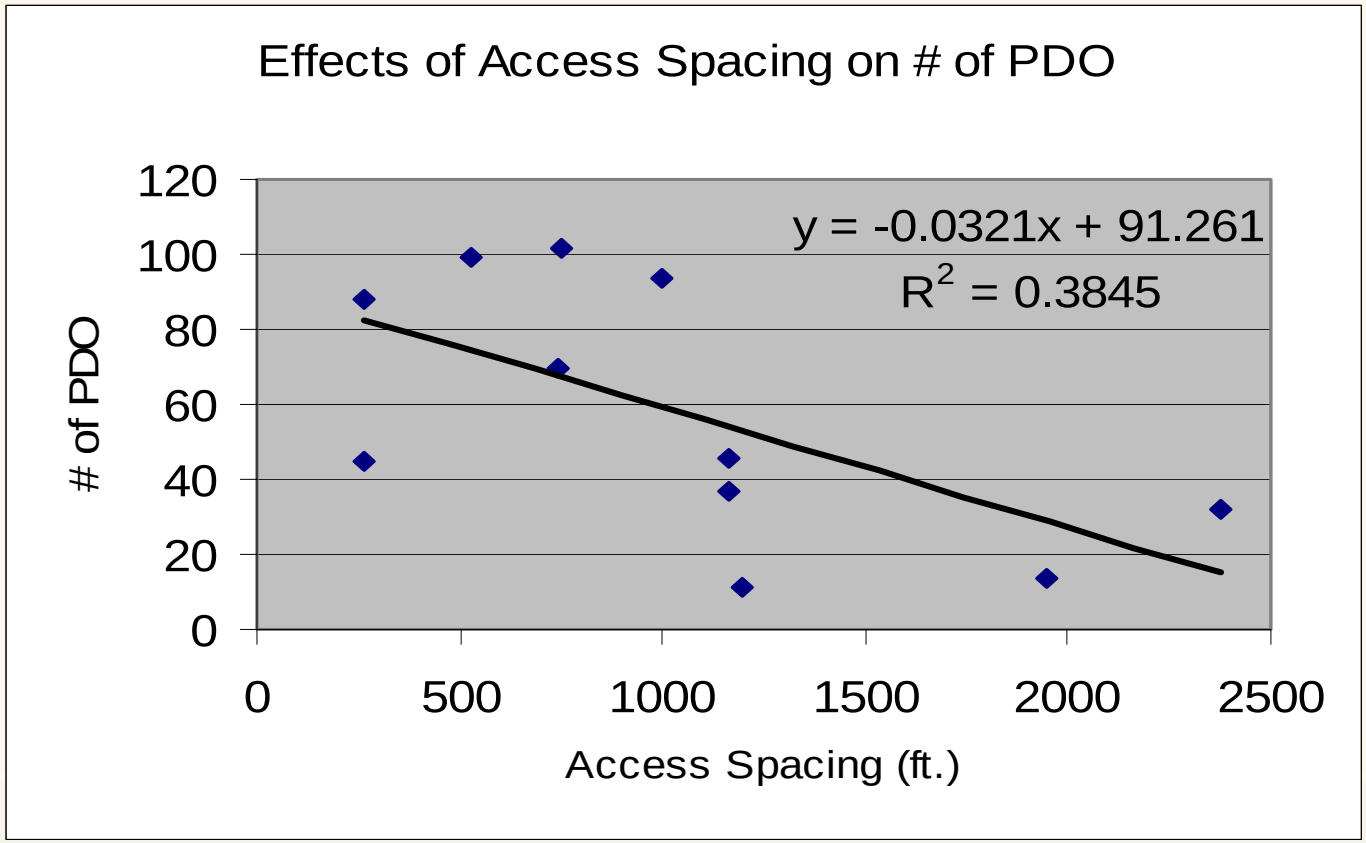
Safety Analysis (Cont'd)



Safety Analysis (Cont'd)



Safety Analysis (Cont'd)



Benefit/Cost Analysis

B/C=Δ user benefits/Δ investment cost

- Alternative A: Purchasing 200 ft of LA Right of Way (Current Practice)
- Alternative B: Purchasing 600 ft of LA Right of Way
- Alternative C: Purchasing 1320 ft of LA Right of Way

Constants for Operational Benefits

- Vehicle Occupancy : 1.25 persons per vehicle
- Working Days: 250 days per year
- Average Cost of Time ($2002) $13.25 per person hour

Source: TTI Urban Mobility Study 2002

Average ROW Costs (per front foot)

- Rural Unimproved: $500
- Rural improved: $1,000
- Urban unimproved: $1,625
- Urban improved: $15,000

Source: FDOT D7

Average Cost of Crashes

- Death: $1,120,000
- Nonfatal Disability Injury: $45,500
- PDO: $8,200

Source: National Safety Council 2003

Benefits and Costs

- Benefits
  - $ Savings of Not Purchasing LA ROW on Developed Land (B1)
  - Decreased Delay (B2)
  - Fewer Crashes (B3)
- Costs
  - Initial Cost of Purchasing Additional LA Right of Way on Undeveloped Land (C1)

B/C Ratio

- Alternative A (200 ft) vs. Alternative B (600 ft)
- Alternative A (200 ft) vs. Alternative C (1320 ft)

Benefit/Cost Ratio - 200’ vs. 600’

	Urban		Rural	
	Benefit	Cost	Benefit	Cost
ROW	$6,000,000	$650,000	$400,000	$200,000
Delay	$57,536,883	\	$57,536,883	\
Crashes	$3,415,472	\	$3,415,472	\
Total	$66,952,355	$650,000	$61,352,355	$200,000
B/C Ratio	103.00		306.76	

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Benefit/Cost Ratio - 200’ vs. 1320’

	Urban		Rural	
	Benefit	Cost	Benefit	Cost
ROW	$6,000,000	$1,820,000	$400,000	$560,000
Delay	$64,037,167	\	$64,037,167	\
Crashes	$9,563,322	\	$9,563,322	\
Total	$79,6000,489	$1,820,000	$74,000,489	$560,000
B/C Ratio	43.74		132.14	

Conclusions

- The benefits of acquiring additional LA ROW near an interchange in advance of development far exceed the cost.
- Minimum Length of LA ROW: 600 feet
- Desirable Length of LA ROW: 1320 feet

Questions?