

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



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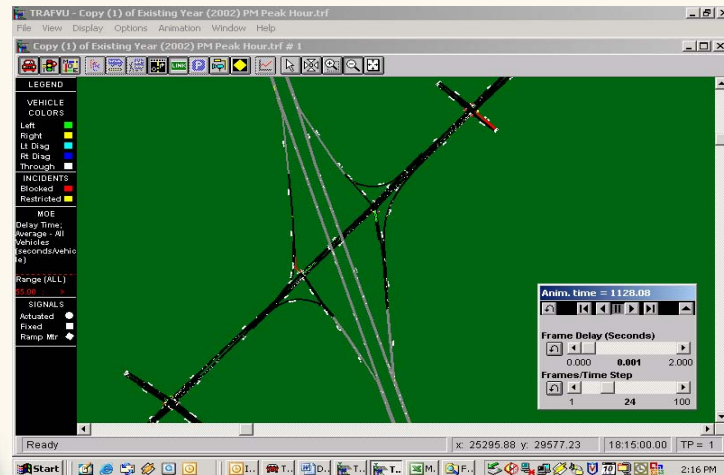
Methodology

- 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



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Original Interchange Model



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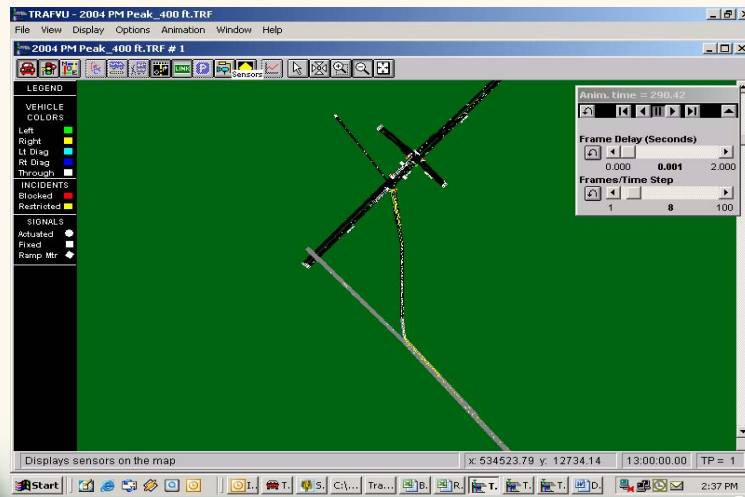
Operational Analysis (Corsim)

- 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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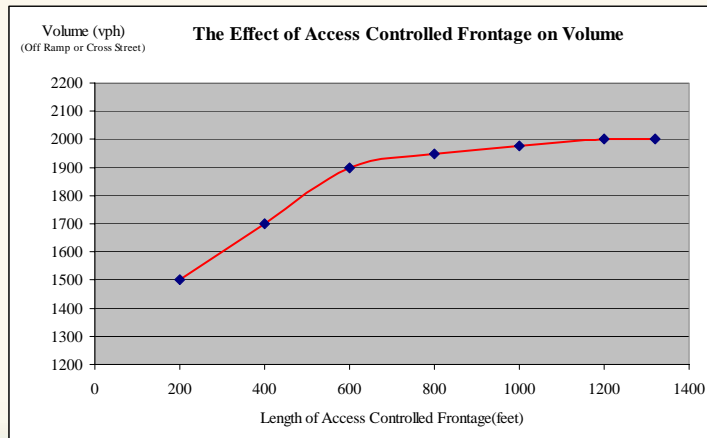
New Simulation Model



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



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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



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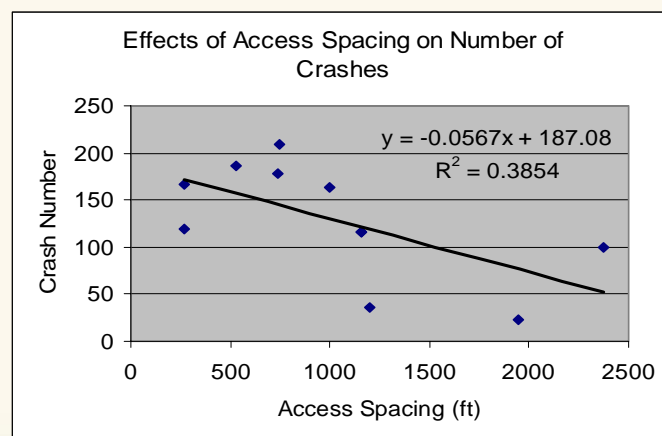
Safety Analysis

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



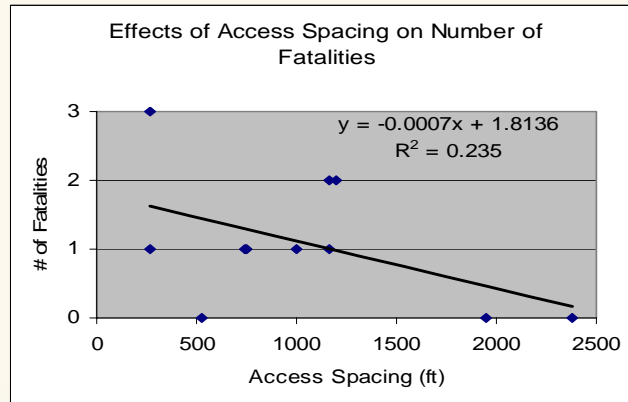
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Safety Analysis



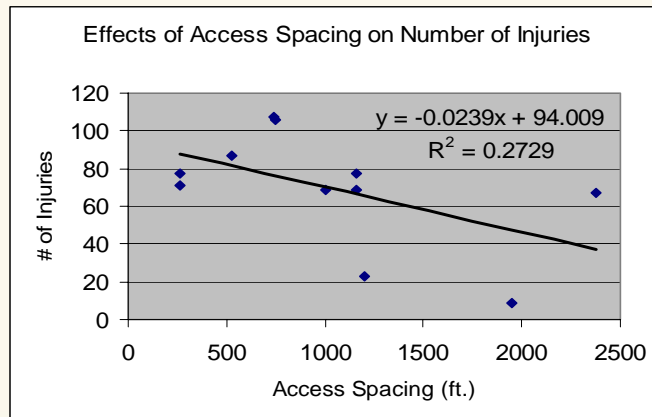
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Safety Analysis (Cont'd)



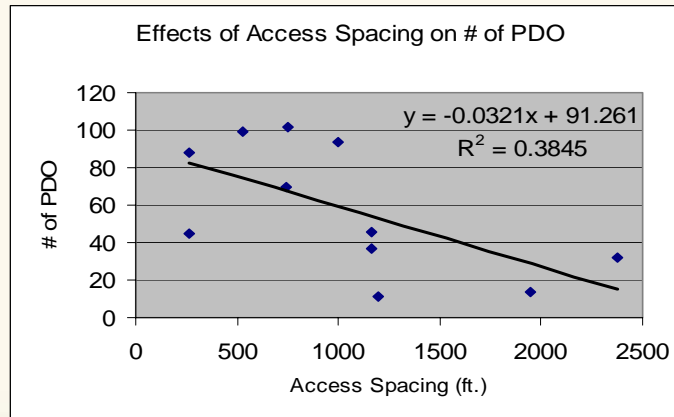
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Safety Analysis (Cont'd)



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Safety Analysis (Cont'd)



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Benefit/Cost Analysis

$B/C = \Delta \text{ user benefits} / \Delta \text{ investment cost}$

- 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



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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



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Average ROW Costs (per front foot)

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

Source: FDOT D7



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Average Cost of Crashes

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

Source: National Safety Council 2003



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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)



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B/C Ratio

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



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Benefit/Cost Ratio - 200' vs. 600'

	Urban		Rural	
	Benefit	Cost	Benefit	Cost
ROW	\$1,550,514	\$650,000	\$103,368	\$200,000
Delay	\$28,280,906	\	\$28,280,906	\
Crashes	\$1,809,178	\	\$1,809,178	\
Total	\$31,640,598	\$650,000	\$30,193,452	\$200,000
B/C Ratio	49		151	



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Benefit/Cost Ratio - 200' vs. 1320'

	Urban		Rural	
	Benefit	Cost	Benefit	Cost
ROW	\$3,085,196	\$1,820,000	\$205,680	\$560,000
Delay	\$31,256,063	\	\$31,256,063	\
Crashes	\$5,065,698	\	\$5,065,698	\
Total	\$39,406,957	\$1,820,000	\$36,527,441	\$560,000
B/C Ratio	22		65	



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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



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