Mobility Impacts: Presentation Overview

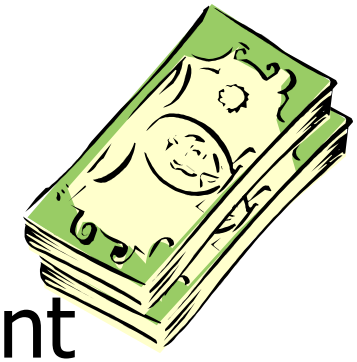
- Access Management Mobility Improvements
- The Science of Access Management
  - By Treatment
- Studies

Themes for Texas Access Management

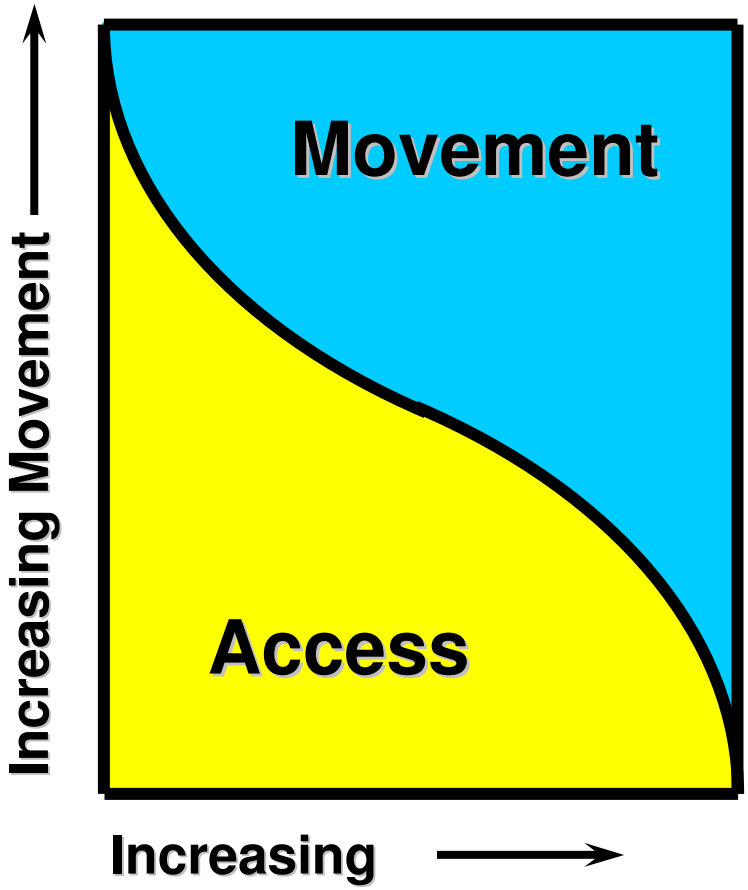
- Improve Safety

- Increase Mobility

- Protect Infrastructure Investment



Hierarchy of Roadways in a Functionally Designed System



Functional Class

Freeway

Major Arterial

Minor Arterial

Major Collector

Minor Collector

Local

Cul-de-Sac

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Hierarchy of Roadways in a Functionally Designed System

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What Is Important When Driving?

- Safety
- Arriving On time (mobility)
- Getting your (tax) dollars' worth

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Access Management Guiding Principles for Texas

- Improve safety and mobility
- Provide reasonable access to developments
- Promote local government partnerships

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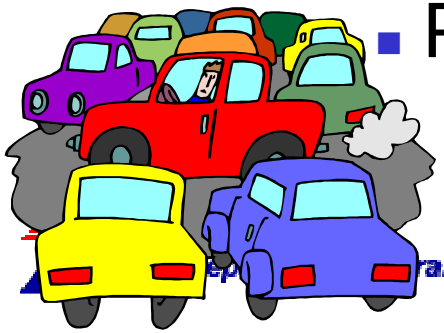
Access Management Guiding Principles for Texas

- "Safety and Mobility"
  - Safety
    - Reducing conflict points reduces crash potential
    - ~ 50% of all crashes are intersection-related
      - Driveways are intersections, too!
    - More than 3,500 people die in Texas crashes each year
    - Increase driver expectancy

Access Management Guiding Principles for Texas

- "Safety and Mobility"
  - Mobility
    - Allow Through traffic to move more efficiently (less "stop and go" traffic)
    - Preserve roadway capacity (reduced delay)
    - Separate speed differentials
    - Less braking and hard acceleration
    - Reduce fuel consumption/emissions



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Access Points and Free-flow Speed (NCHRP 420)

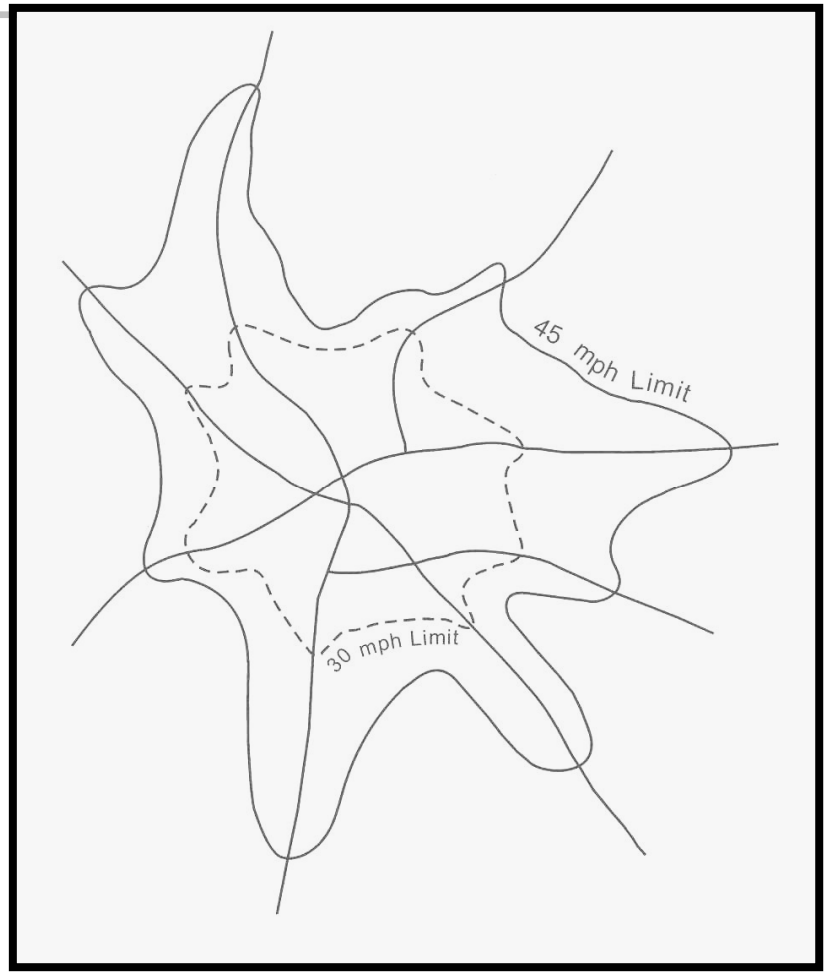
Access Points and Free-flow Speed	
Access points per mile	Reduction in free-flow speed, mph
0	0.0
10	2.5
20	5.0
30	7.5
40 or more	10

Travel Time and Signal Density (NCHRP 420)

Percentage Increase in Travel Times as Signal Density Increases	
Signals per Mile	Percent Increase in Travel Times (compared with 2 signals per mile)
2.0	0
3.0	9
4.0	16
5.0	23
6.0	29
7.0	34
8.0	39

Mobility Provides Economic Impacts

- Market area is important to business success
  - Reduction of travel speeds means smaller market areas



Graphic from ITE, *Transportation and Land Development*

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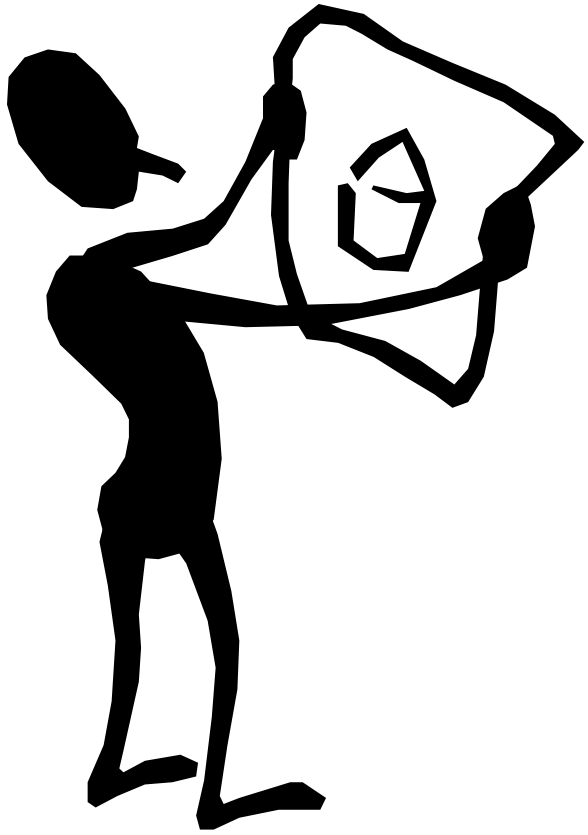
The Science of Access Management: Ensuring Mobility

Considerations by Treatment

- Unsignalized Spacing
- Signalized Spacing
- Raised Medians
- Acceleration / Deceleration Lanes

Unsignalized Access Spacing

- Engineering considerations:
  - Functional intersection area
  - AASHTO guidance
  - Stopping sight distance
  - Intersection sight distance
  - Case-by-case
    - No cookbooks allowed!



Signalized Access Considerations

Signalized Intersection Spacing

- Consider within the functional design
- Consider future signal locations when laying out streets
- Optimal and uniform signal spacing is essential if efficient progression and appropriate speeds for arterial streets are to be achieved

Signalization Variables

- Roadway Speed and Traffic Volumes
- Cycle Length and Offset
- Signal spacing
- Efficiency of progression
- Reference
  - *Texas Manual on Uniform Traffic Control Devices*

Raised Median Considerations

Why and When to Consider a Raised Median

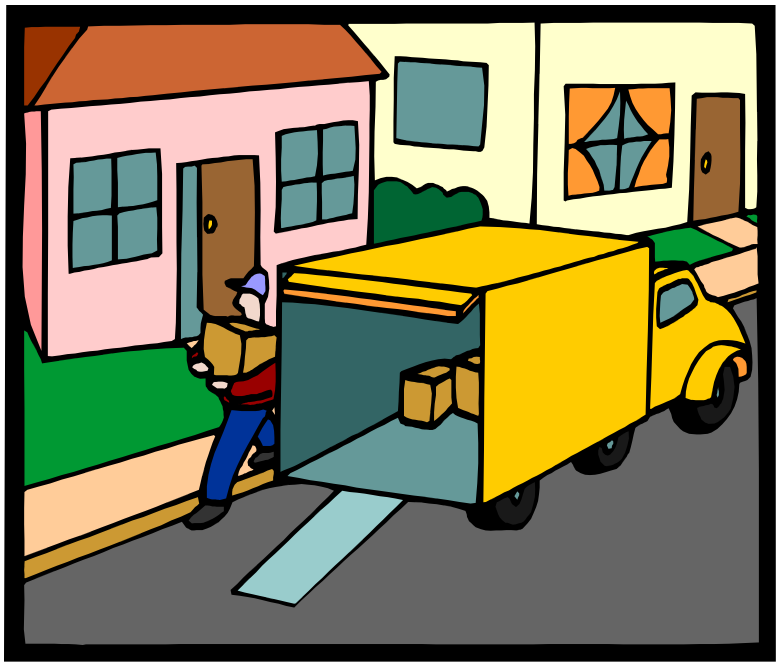
- Play critical role of operations and safety of roadway
- Roadways where aesthetic considerations are a high priority
- Multilane roadways with a high level of pedestrian activity

When to Consider a Raised Median

- High crash locations or where it is desirable to limit left turns to improve safety
  - Clear safety benefit
- When ADTs exceed 20,000 vpd

Keep in Mind….Delivery Mobility

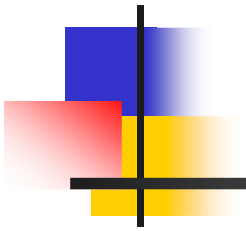
- Need adequate locations and width to handle U-turns
  - Can flare intersections or use loons
  - Jughandles/MI U-turn
- Alternate routes to handle delivery truck traffic



Acceleration and Deceleration Lanes

Acceleration / Deceleration Lanes

- For left and right turns
- Include taper, storage lengths and accel/decel lengths
- Auxiliary lane thresholds in the TxDOT *Access Management Manual*
- TxDOT *Roadway Design Manual* should be used for designing accel/decel lane lengths



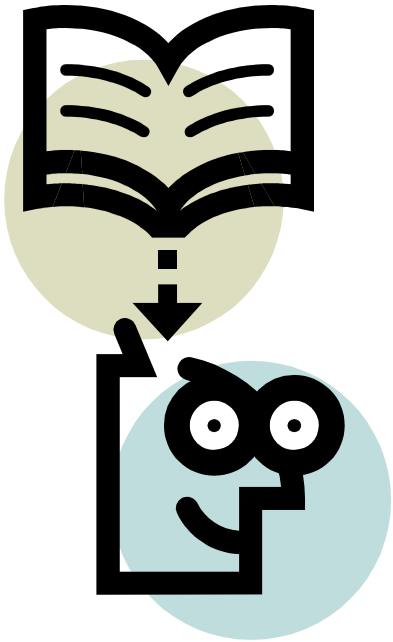
Texas Studies

Micro-simulation Operational Analysis

- Investigate the impacts of raised median installation and driveway density by traffic volume
  - 3 case studies
  - 3 theoretical corridors
- Selecting a micro-simulation tool for access management alternatives analysis
  - Input and output characteristics

Methodology

- 3 case studies and 3 theoretical corridors
- Three simulation runs of each traffic volume
  - Each run provides a random estimate of the measure
  - Analyzed peak hour
- Reduction in conflict points, travel time, speed and delay were analyzed
  - Travel time and speed of vehicles traversing the corridor
  - System delay
- Used VISSIM model



Three Case Studies (Characteristics)

Location	Corridor Length (miles)	Signals per Mile / Access Points per Mile	Median Opening Spacing (feet)	Number of Lanes Each Direction
Bryan, Texas	0.66	3.0 / 91	690 to 1,320	2
Temple, Texas	0.71	5.6 / 66	350 to 850	2
Tyler, Texas	1.47	4.1 / 46	500 to 1,500	3

- Median opening spacing for selected alternative

Texas Case Studies (Results)

Location	Percent Difference in Conflict Points	Estimated Existing ADT	Estimated Future ADT	Future Percent Difference in Travel Time	Future Actual Difference in Speed (mph)
Bryan, Texas	-60				
Temple, Texas	-56				
Tyler, Texas	-60				

- Large reduction in conflict points with raised median installation

Texas Case Studies (Results)

Location	Percent Difference in Conflict Points	Estimated Existing ADT	Estimated Future ADT	Future Percent Difference in Travel Time	Future Actual Difference in Speed (mph)
Bryan, Texas	-60	18,200	21,800		
			48,000		
Temple, Texas	-56	13,300	16,000		
Tyler, Texas	-60	24,400	29,300		
			48,000		

- Lower ADT is “existing +20%”
- Higher volume selected for further analysis

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Texas Case Studies (Results)

Location	Percent Difference in Conflict Points	Estimated Existing ADT	Estimated Future ADT	Future Percent Difference in Travel Time	Future Actual Difference in Speed (mph)
Bryan, Texas	-60	18,200	21,800	-11	2 (increase)
			48,000	-38	7 (increase)
Temple, Texas	-56	13,300	16,000	3	1 (decrease)
Tyler, Texas	-60	24,400	29,300	2	<1 (decrease)
			48,000	57	6 (decrease)

- Case-specific results
- Function of traffic patterns, median opening locations, etc.

Theoretical Scenarios (Characteristics)

Theoretical Corridor	Median Treatment	Number of Lanes in Each Direction	Number of Driveways	Driveway Spacing (feet)	Raised Median Opening Spacing (feet)
Scenario 1	TWLTL and Raised	2	18	660	660
Scenario 2	TWLTL	2	42	330	660
	Raised				
Scenario 2	TWLTL	3	42	330	660
	Raised				
Scenario 3	TWLTL	3	84	165	660
	Raised				

- ITE trip generation used, and driveways across from each other

Theoretical Corridor	Estimated Future ADT	Future Percent Difference in Travel Time	Future Actual Difference in Speed (mph)
Scenario 1	18,000 to 28,000		
Scenario 2 (2 lanes)	18,000		
	23,000		
	28,000		
Scenario 2 (3 lanes)	18,000		
	23,000		
	28,000		
	48,000		
Scenario 3 (3 lanes and higher driveway density)	18,000		
	23,000		
	28,000		
	33,000		
	38,000		
	48,000		

Theoretical Corridor	Estimated Future ADT	Future Percent Difference in Travel Time	Future Actual Difference in Speed (mph)
Scenario 1	18,000 to 28,000	Not Applicable	Not Applicable
Scenario 2 (2 lanes)	18,000	2	<1 (decrease)
	23,000	6	2 (decrease)
	28,000	31	8 (decrease)
Scenario 2 (3 lanes)	18,000	8	2 (decrease)
	23,000	8	2 (decrease)
	28,000	11	3 (decrease)
	48,000	44	9 (decrease)
Scenario 3 (3 lanes and higher driveway density)	18,000	6	2 (decrease)
	23,000	1	<1 (decrease)
	28,000	2	<1 (decrease)
	33,000	7	2 (decrease)
	38,000	22	6 (decrease)
	48,000	10	3 (decrease)

Concluding Thoughts

- Results from raised median installation are case-specific
- Caution should be used when generalizing access management impacts across corridors
- Function of: traffic volumes, driveway density, weaving (o-d patterns), median opening location and density, decel lane length, signal coordination, speed distribution, driver behavior, etc.
- Micro-simulation allows detailed corridor analysis

Micro-simulation Concluding Thoughts

- Relatively small increases in travel time are likely offset by the well-documented increase in safety
  - Texas (0-4221 research project)
  - NCHRP 395, NCHRP 420
- Must coordinate access management analysis needs with micro-simulation tool selection

Studies Outside of Texas

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