Welcome

Access Management At Intersections Part II

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Instructors

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Poll Question

- Which of the following is not considered a principle of access management at intersections?
  A. Preserve the functional area of intersections
  B. Eliminate access
  C. Separate conflict points
  D. Promote intersection hierarchy

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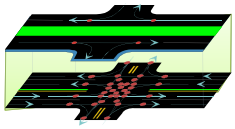
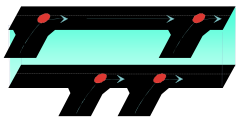
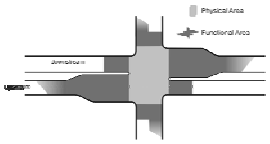
Principles of Access Management



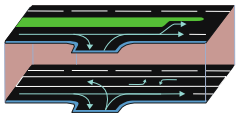
Limit the number of conflict points for all modes



Separate the conflict points for all modes



Preserve the functional area of intersections



Provide reasonable access at each property

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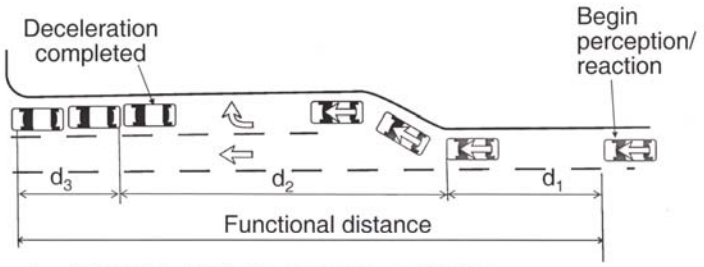
Review

Elements of Upstream Functional Distance



d_1 = distance traveled during perception-reaction time

d_2 = distance traveled while maneuvering laterally and decelerating to a stop

d_3 = queue storage length

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Course Objectives

- Identify and cite the major advantages and disadvantages, applications and safety benefits of access management techniques being used at intersections.
- Identify techniques to improve intersection operations and safety.
- Identify implementation practices.

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Course Overview

1. Access connection spacing and corner clearance
2. Driveway channelizing islands & turn restrictions
3. Medians
4. Turn bays/turn lanes

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1. Access Spacing and Corner Clearance

- Corner Clearance is the distance provided between a roadway intersection and the nearest access connection
- Corner Clearance is a special case of access connection spacing

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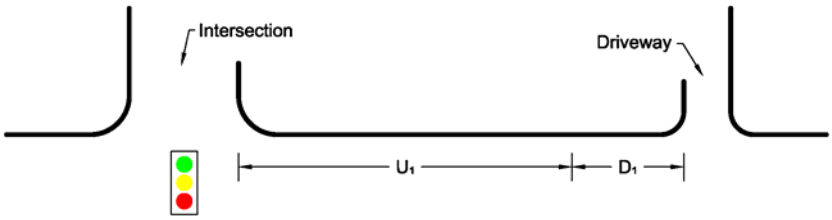
Ideal Upstream Corner Clearance



U_1 = upstream functional distance of the intersections

D_1 = downstream functional distance of the driveway

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Upstream Corner Clearance

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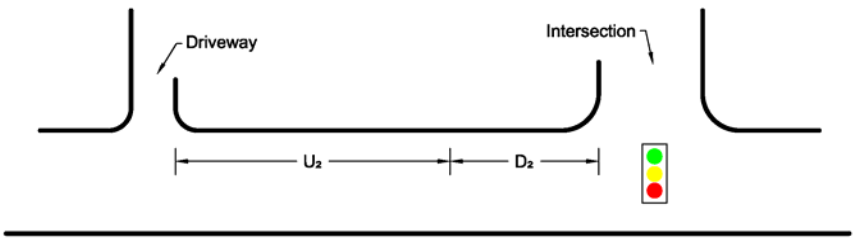
Ideal Downstream Corner Clearance



U_2 = upstream functional distance of the driveway

D_2 = downstream functional distance of the intersection

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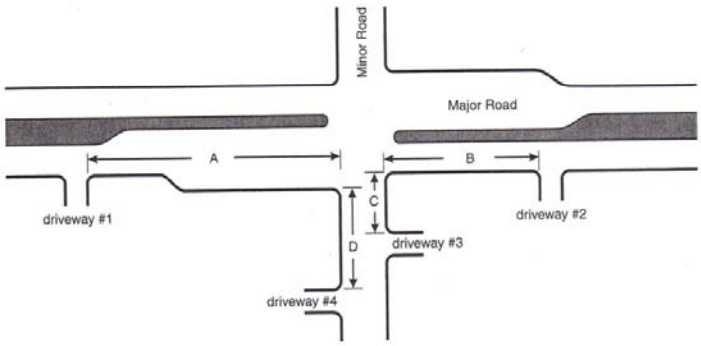
Corner Clearance Overview



- Based on functional intersection area and probability of blockage on side streets.

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Probability of Driveway Blockage Near Signalized Intersection

Flow in Lane Adjacent To Driveway (vph)	Duration of Red Phase (s)	Corner Clearance in Feet (1)			
		25	50	75	100
200	15	20	5	1	
	25	40	16	5	
	35	58	31	13	5
	44	71	46	24	11
400	15	50	23	9	3
	25	77	53	30	15
	35	90	75	55	35
	45	96	88	74	56

Source: Access Mgt. Manual, TRB 2003, Table 9-13

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Poll Question

What is the probability of driveway blockage near a signalized intersection with the following conditions?

- Traffic flow in the lane adjacent to the driveway = 300 vph
- Red phase = 35 seconds
- Corner clearance = 100 ft.

A. 35%

B. 5%

C. 44%

D. Approximately 20%

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Probability of Driveway Blockage Near Signalized Intersection

Flow in Lane Adjacent To Driveway (vph)	Duration of Red Phase (s)	Corner Clearance in Feet (1)			
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	35	58	31	13	5
	44	71	46	24	11
400	15	50	23	9	3
	25	77	53	30	15
	35	90	75	55	35
	45	96	88	74	56

Source: Access Mgt. Manual, TRB 2003, Table 9-13

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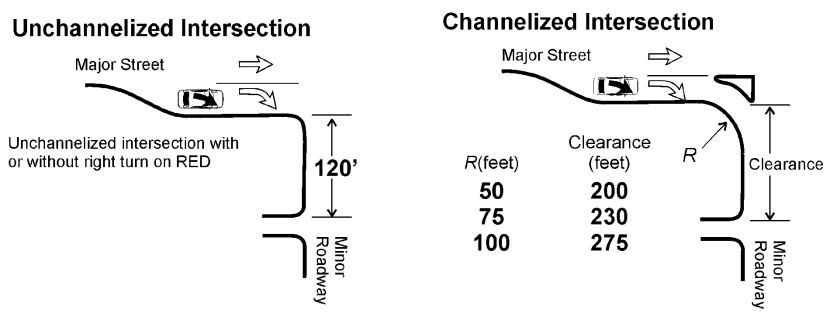
Minimum Downstream Corner Clearance



Source: Transportation and Land Development, ITE 2002, Figure 6-23

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Administrative Issues

- Adopt Access Management Standards
- Have written criteria and procedures for:
  a) Appeal when an application is denied
  b) Deviations from adopted access management standards
- Specify what constitutes a significant change

Options for Small Corner Sites

- Where site frontage prevents adequate corner clearance, options include:
  – Require driveway as far from intersection as possible
  – Limit access to street with lower functional classification
  – Encourage shared access with adjacent properties
  – Limit volume of traffic that may use connection through conditions in access permit
  – Limit movements to right in/out only

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Orientation of Corner Parcel

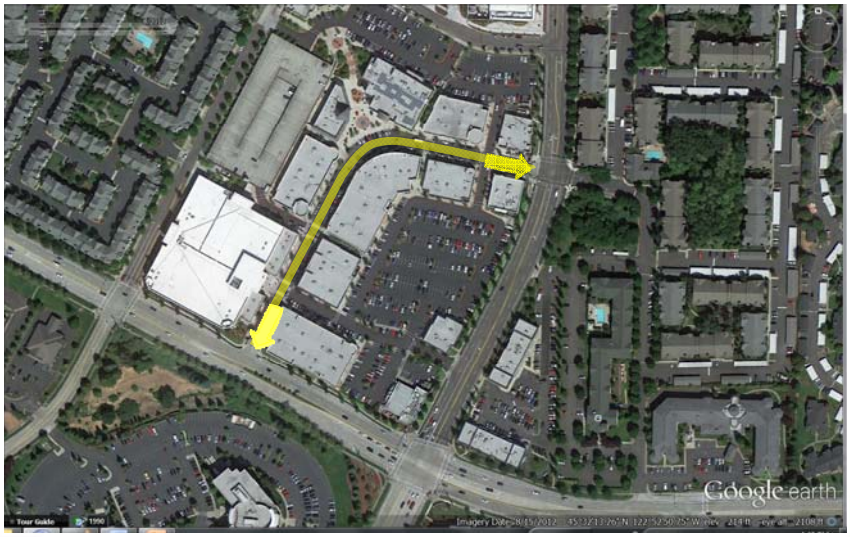
Source: Virgil Stover

Other Considerations

- When roadways are of the same classification, limit access to the downstream frontage
- Allow access to both roadways if, the permitting agency finds that access on both frontages will improve traffic operations or safety on the public roadway system

Service Road Example

Service Road Example



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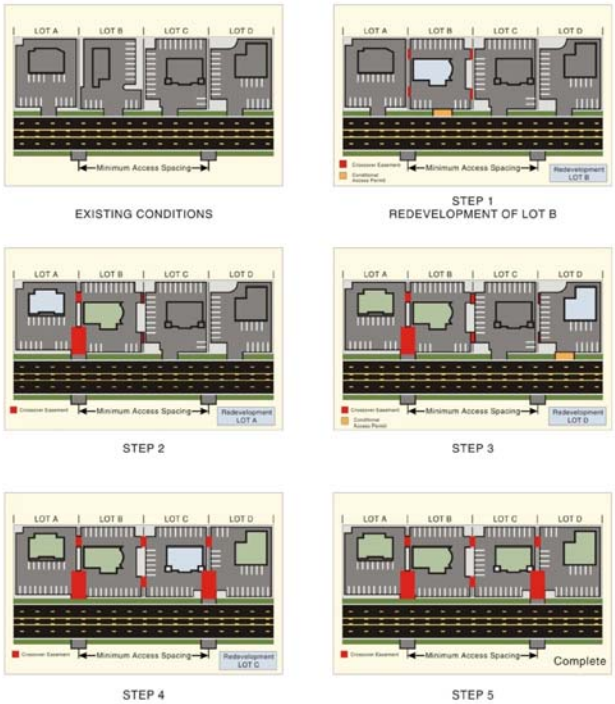
Regulatory Options

- Address parcels under same ownership or consolidated for development as one property for access review
  - Unified access and circulation plan to tie outparcels into on-site circulation system of larger site
  - Minimum connections for reasonable access, not maximum available under access spacing standards



Source: Kittelson & Associates, Inc.

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Retrofit Example

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Retrofit Example

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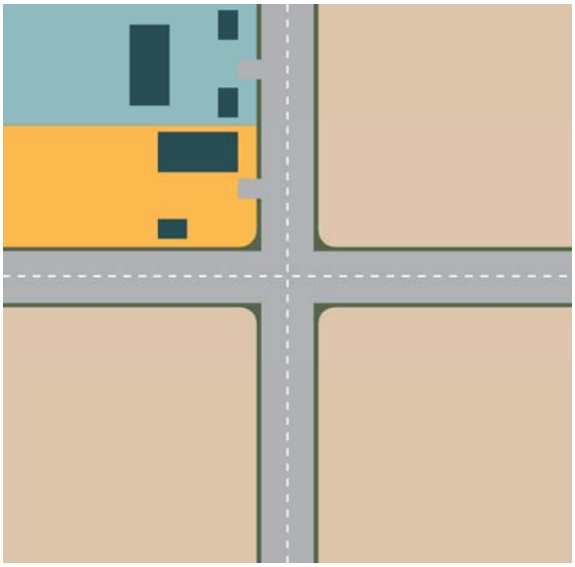
Importance of Site Planning



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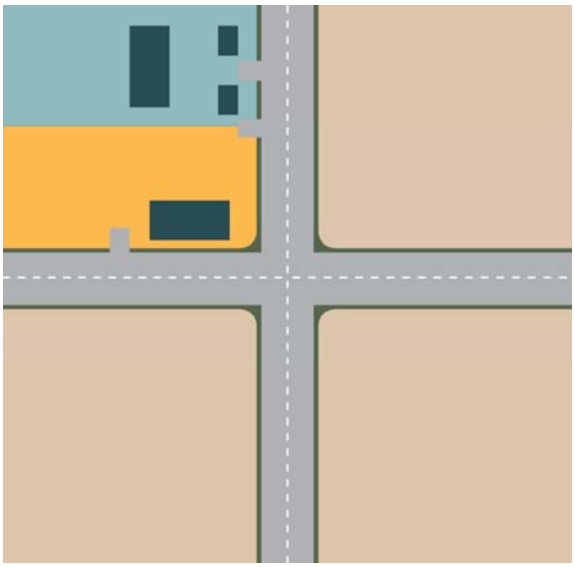
Importance of Site Planning



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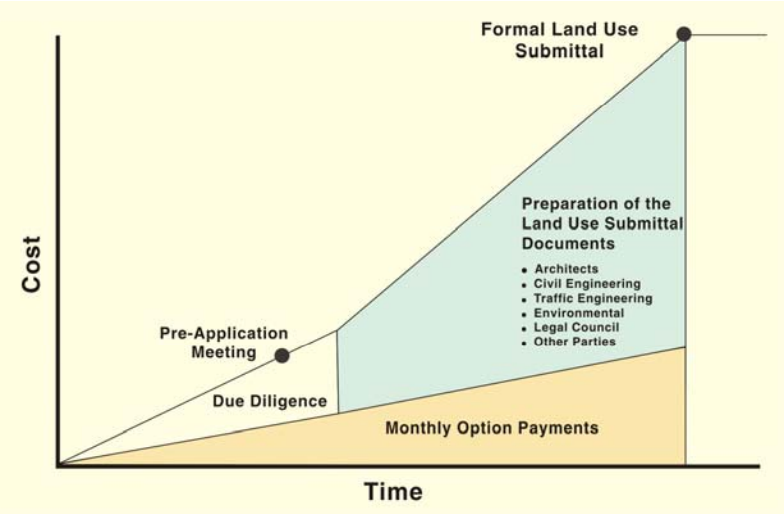
Importance of Site Planning



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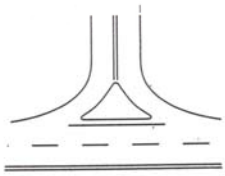
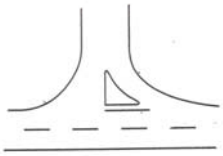
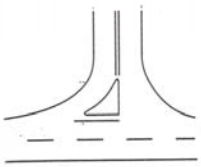
2. Channelizing Islands



a.



b.



c.

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Channelizing Island Example

Photo: Ralph Bentley, Kittelson & Associates, inc.

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Channelizing Island Example

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Violations are Common

Source: Florida Department of Transportation

Channelizing Island Example

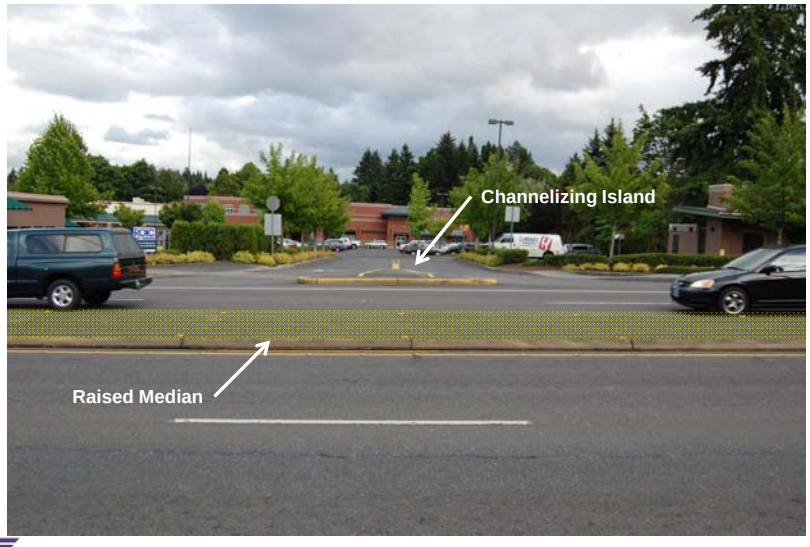

Photo: Kittelson & Associates, Inc.

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Turn Restrictions

Conditions of the Connection Permit

- Movements
- Vehicles
- Volume

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New Jersey Code

Section 16:47-3.5 of the New Jersey State Access Management Code includes a procedure for determining vehicular use limitations (peak hour trips) for nonconforming lots as a condition of the access permit.

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Median Separator Within Functional Distance

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Left-Turn Barrier

Photos: Kittelson & Associates, Inc.

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3. Medians

- Positive Control Over Left-turns
- Improve Safety
- Pedestrian Refuge
- Aesthetics

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Median Example

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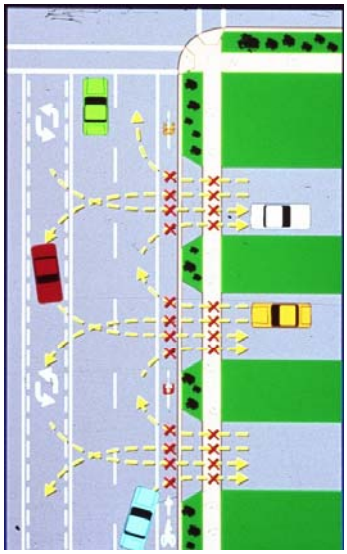
Uncontrolled Accesses Create 8 Potential Ped/Bike Conflict Points at Every Driveway



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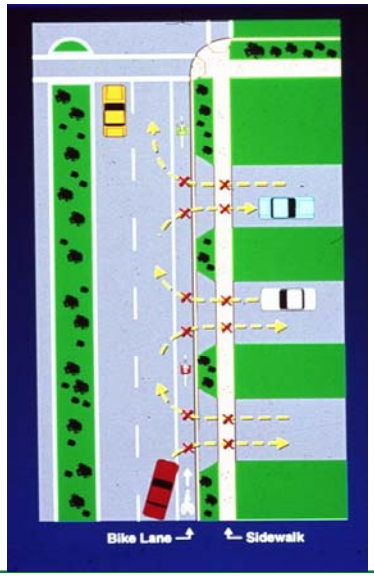
A Non-traversable Median Eliminates Left-Turn Vehicle Conflicts with Bicyclists and Pedestrians



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Poll Question

Have you ever used the Highway Safety Manual in making an access management decision?

Yes or No

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Medians & Highway Safety Manual

Chapter 13.4.2.6: Raised Median

- Provide raised median where no median exists
  - Urban (Two-lane and Multilane) and Rural (Multilane)
  - Shows crash reduction with raised median

Chapter 13.4.2.7: Change the Width of an Existing Median

- Rural multilane and urban arterials

Can use Part C predictive methodology for four lane roadways

Chapter 13.14: Access Management and Driveways

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HSM on Raised Medians

Table 13-11. Potential Crash Effects of Providing a Median on Multi-Lane Roads (8)

Treatment	Setting (Road Type)	Traffic Volume	Crash Type (Severity)	CMF	Std. Error
Provide a median	Urban (Arterial Multilane[(a)])	Unspecified	All types (Injury)	0.78[7]	0.02
			All types (Non-injury)	1.09[7]	0.02
	Rural (Multilane[(a)])		All types (Injury)	0.88	0.03
			All types (Non-injury)	0.82	0.03

Base Condition: Absence of raised median.

Chapter 13.4.2.6: Raised Median

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HSM Example Problem

- *HSM* sample problem – A 4 lane undivided urban roadway is to be reconstructed by adding a 22 foot raised median. The roadway is 2 miles long and there have been 36 crashes over the past 3 years. What is the predicted annual crash reduction of injury crashes by adding the median?

Table 13-11. Potential Crash Effects of Providing a Median on Multi-Lane Roads (8)

Treatment	Setting (Road Type)	Traffic Volume	Crash Type (Severity)	CMF	Std. Error
Provide a median	Urban		All types (Injury)	0.78[7]	0.02

➢**36/3 x (1-0.78) = 2.64 crashes/year reduction**

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HSM on Medians

Urban Highway Five Lane with Two-Way Left Turn Lane Roadway Segments

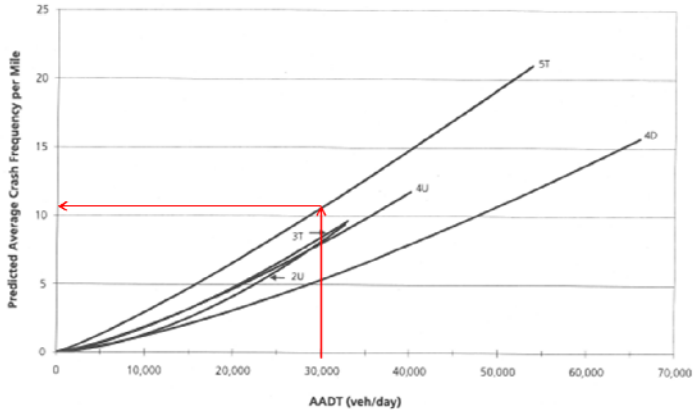

Figure 12-3. Graphical Form of the SPF for Multiple Vehicle Nondriveway collisions (from Equation 12-10 and Table 12-3)

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HSM on Medians

Urban Highway Four-Lane Divided Roadway Segments

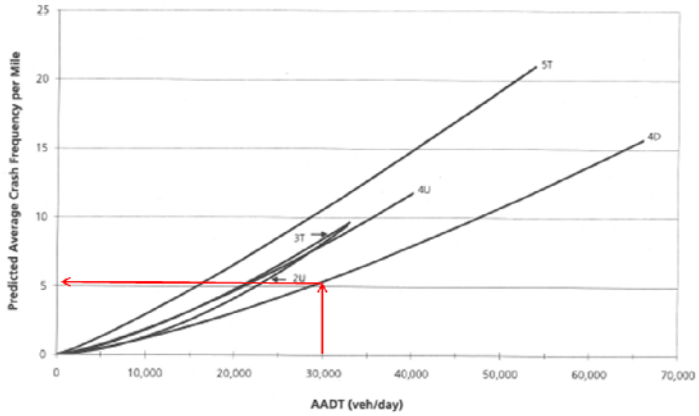

Figure 12-3. Graphical Form of the SPF for Multiple Vehicle Nondriveway collisions (from Equation 12-10 and Table 12-3)

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Highway Capacity Manual

HCM 2010
Multi-Modal LOS Evaluation

- Chapter 17 – Urban Streets takes into account various access management elements and their impacts on autos, pedestrian, and bicycle modes

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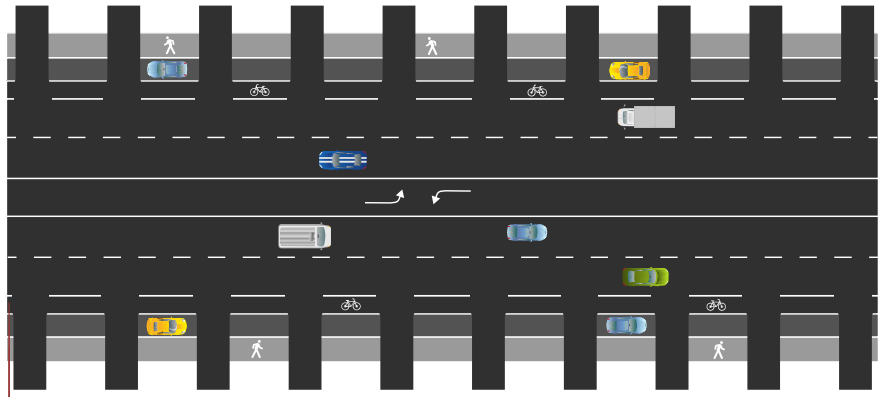
MMLOS – Existing Condition



Corridor Information → 1 Mile in Length → No Curb → Two 12' Travel Lanes – Each Direction → TWLTL → 20 Access Points

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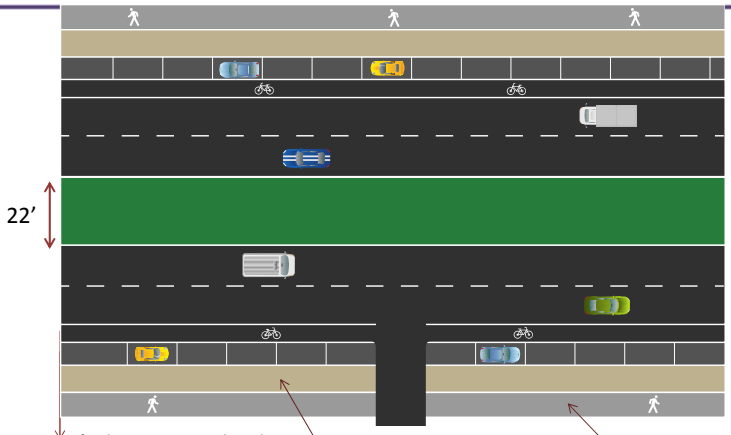
MMLOS – Modified Condition



Corridor Information	1 Mile in Length	Curb – Both Sides	Two 12’ Travel Lanes – Each Direction	22’ Raised/Grass Median	1 Access Point

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MMLOS - Results

Mode	Existing [Score (LOS)]	Modified [Score (LOS)]
Auto	**78.0% (B)**	**80.0% (B)**
Transit	**1.45 (A)**	**1.32 (A)**
Bike	**3.04 (C)**	**2.56 (B)**
Pedestrian	**2.67 (B)**	**2.53 (B)**

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4. Turn Bays and Turn Lanes

- When to use (warrants)
- Design

Photo: Kittelson & Associates, inc.

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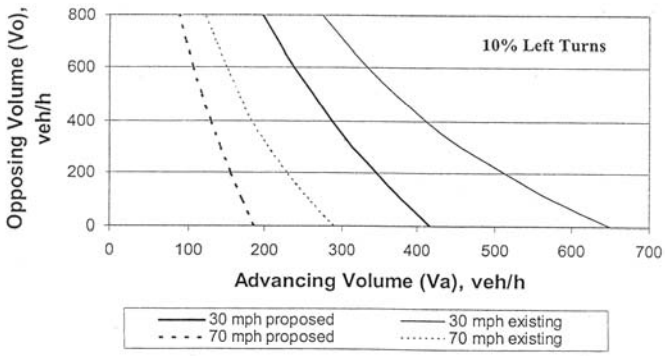
Harmelink Method for Left-turn Lanes



	Critical Gap	Time to Clear Opposing Lane
Existing (Harmelink)	5.0s	3.0s
Proposed (TTI)	5.5s	4.3s

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Effect of Left-Turn Bay on Safety

Crash Reduction		
	Signalized	Unsignalized
Total	-38%	-66%
Left-Turn	-90%	-43%

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Vancouver, B.C.

Retrofit with a Left-Turn Bay

- +20% capacity
- -25% to -50% crash Rate

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Colorado Code

Roadway Category	Left-Turn Deceleration		Right-Turn Deceleration	
	≥45 mph	< 45 mph	≥45 mph	< 45 mph
EX: Expressway, By Pass	All		10 vph	
RA: Regional Highway	10 vph		25 vph	
RB: Rural Highway	10 vph		25 vph	
NR-A: Non-Rural Principal Highway	10 vph		25 vph	
Other*	10 vph	25 vph	25 vph	50 vph

*NR-B: Non Rural Arterial; NR-C: Non-Rural Arterial; FR: Frontage Road

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Resources

- ITE, Transportation and Land Development
- TRB, Access Management Manual

- NCHRP Report 420, Impacts of Access Management Techniques
- AASHTO, A Policy on Geometric Design of Highways and Streets

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Resources

- TRB, Highway Capacity Manual
- AASHTO, Highway Safety Manual
- TRB Access Management Committee Website
  http://www.accessmanagement.info
  Conferences, presentations, etc.

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Questions

Contact Information

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