

HISTORY OF THE
HIGHWAY CAPACITY MANUAL

TexITE - Houston Chapter

November 10, 2010

Michael Y. Ereti

City of Houston

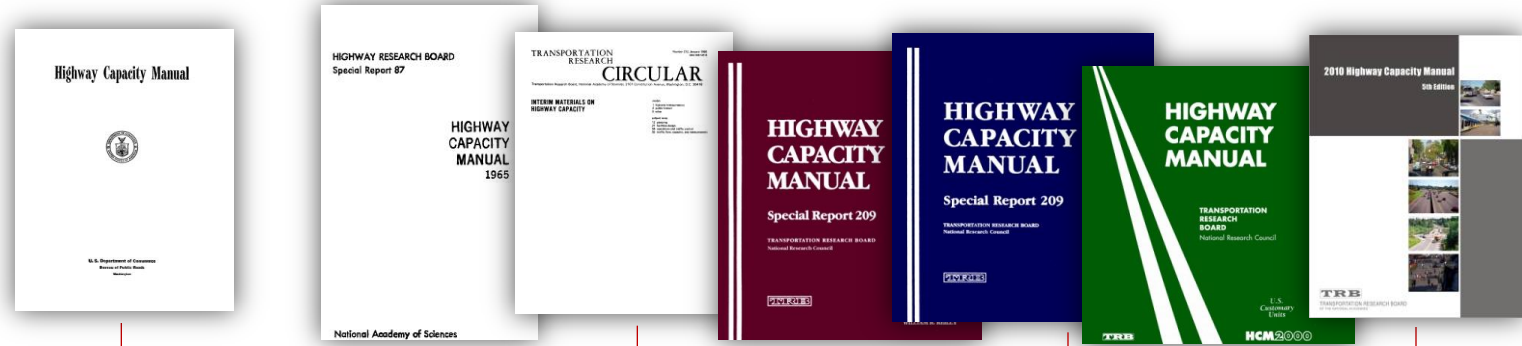
Department of Public Works & Engineering



- THE NEW GUY (Michael Ereti)
 - Consultant (10 years)
 - City Traffic Engineer, SA (3 years)
 - City of Houston (1 year)
- TRB/NCHRP
 - Chosen Poison (passion)
 - Currently Serve on Four Research Panels (3-88, 3-99, 15-43, 07-17)
- DISCLAIMER



THE HISTORY OF HCM



1950 HCM
147 pp.

1965 HCM
411 pp.

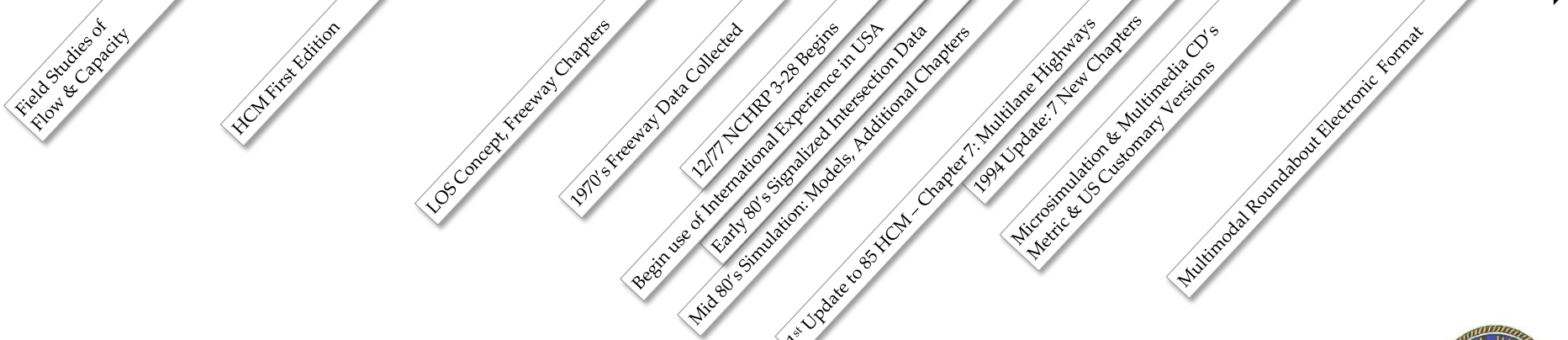
Circular 212
276 pp.

1985 HCM
459 pp.

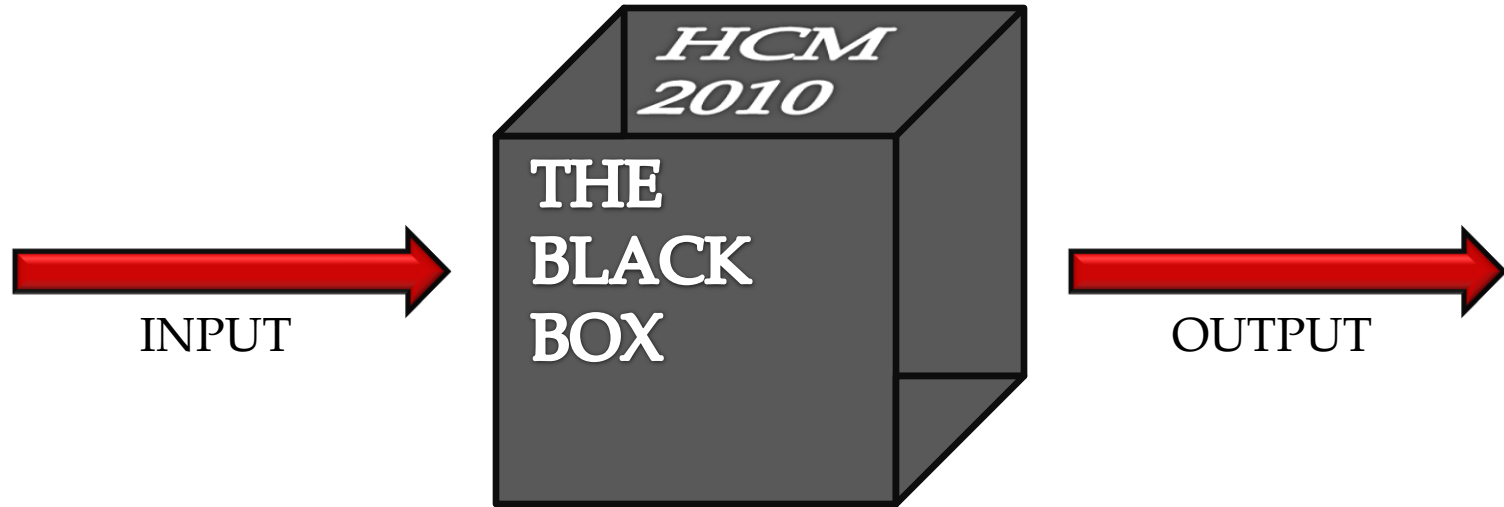
1994 HCM
7 new chapters

2000 HCM
1200+ pp.

2010 HCM



WHERE HCM IS HEADING



- Worksheets
- Computational Software (electronic version)
- Very Complicated Methodologies
- Lack of Understanding (interpretation of results)

MAJOR CHANGES FOR 2010 HCM

- Guidance on integrating Microsimulation & HCM
- Multimodal (complete streets) LOS Analysis
- Software (source code)
- Active Traffic Management
- Partially electronic format (spreadsheets)
- New 2010 HCM support website



ORGANIZATION OF 2010 HCM

- Volume 1 – Concepts
- Volume 2 – Uninterrupted Flow Facilities
 - Freeways, Rural Highways, Rural Roads
- Volume 3 – Interrupted Flow Facilities
 - Urban Arterials, Intersections, Roundabouts
 - Signals at Freeway Interchanges
 - Bicycle and Pedestrian Paths
- Volume 4 – Supplemental Materials
(electronic version)



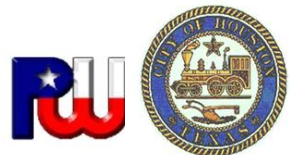
Vol. 1 – CONCEPTS OF CAPACITY

- Target Audience: Managers, Students
 - Nine chapters that cover...
- Concepts
 - Traffic Flow, Capacity, Quality of Service
 - Modal characteristics
- Capacity Analysis Applications
 - How to apply the HCM
 - How and when to use Microsimulation
 - Interpretation and presentation of results



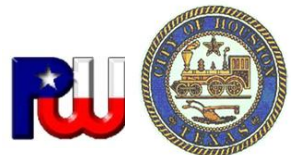
Vol. 2 – UNINTERRUPTED FLOW FACILITIES

- Target Audience: Technical People
- Six Chapters:
 - Freeways and their component sections
 - Basic sections, ramp merge/diverge, weaving
 - Multi-lane Rural Highways
 - Two-lane Rural Roads



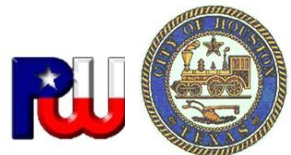
Vol. 3 – INTERRUPTED FLOW FACILITIES

- Target Audience: Technical & Professional People
- Eight Chapters:
 - Urban Arterials
 - Signalized Intersections
 - Unsignalized Intersections
 - Roundabouts
 - Signals at Freeway Interchanges
 - Bike and Pedestrian Paths
- Multimodal Level of Service



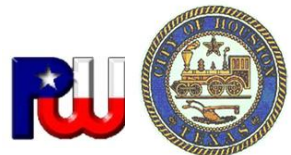
Vol. 4 – SUPPLEMENTAL MATERIALS

- Target Audience: Engineers & Programmers
- 12 Chapters, all electronic, on the web
 - More detailed descriptions of methods
 - Worked example problems
- Annotated Software Source Code
- Technical Reference Library
- HCM Application Guide
- New: Active Traffic Management



SOFTWARE DEVELOPER FRIENDLY 2010 HCM

- Software
 - Source code available to all
 - Illustrate how to program the methods
 - Can be used to verify commercial software
- Will not compete with commercial software
 - Will have very limited user interface
 - Will work only for simple and limited example problems



WEBSITE

2010 Highway Capacity Manual

5th Edition

TRB

HCQS

Publications

Contact

Research

Highway Capacity Volumes

1. Concepts
2. Uninterrupted Flow Facilities
3. Interrupted Flow Facilities
4. Applications Guide



Updates

- NEW Chapter 26 (Adopted):** Interchange Ramp Terminals
- NEW Chapter X (Evaluation Copy):** Local Urban Streets
- NEW NCHRP Report XXX:** Analysis of Freeway Weaving Sections

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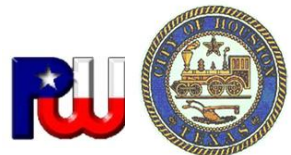


TRB TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES



UNINTERRUPTED FLOW FACILITIES UPDATES

- New speed-flow equations (update equations)
- New Freeway Analysis software
- New Weaving Method
- Ramp Junction methodology update
- Service volume tables (FDOT)



INTERRUPTED FLOW FACILITIES UPDATES

- New Multimodal Level of Service Method
- New Methods for Arterials and Signals
- New Method for Signals in an Interchange
- New Method for Roundabouts



MULTIMODAL LEVEL OF SERVICE

- Simultaneous analysis of LOS for: Auto Drivers, Bus Riders, Bicyclists, & Pedestrians
- A method for allocating scarce street right-of-way to the various modal users of the street.
- Based on user performance measures findings of NCHRP 3-70



WHAT IS GOOD PEDESTRIAN EXPERIENCE?

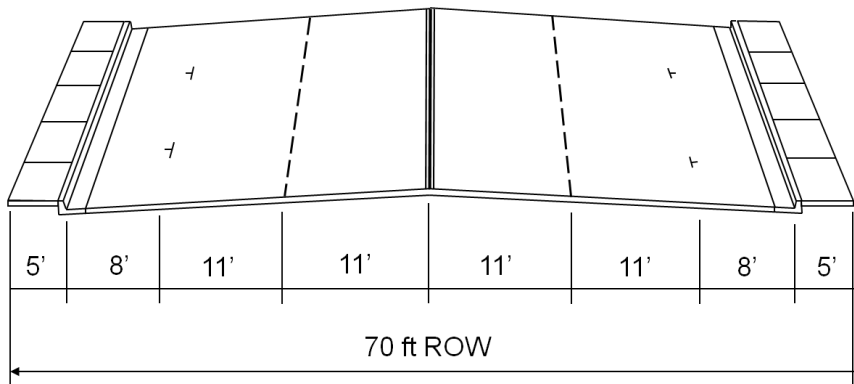


HCM2000: Ped LOS A



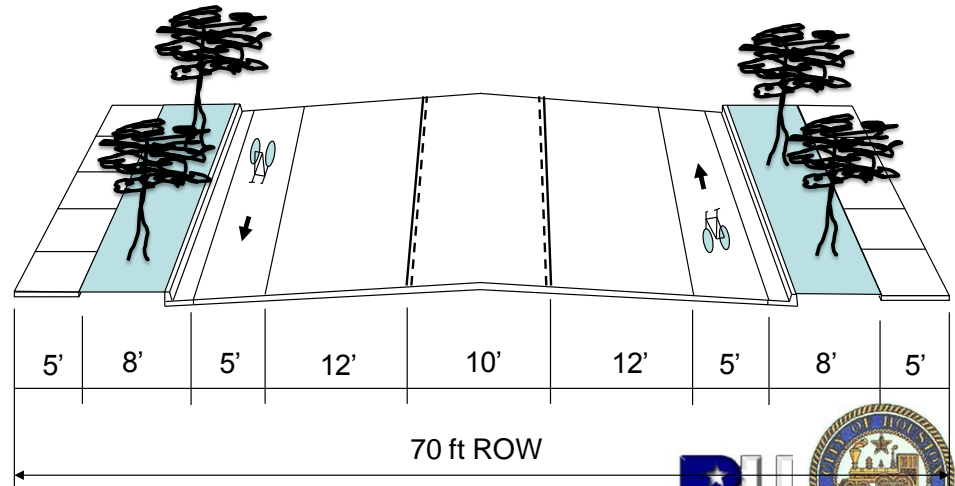
HCM2000: Ped LOS D

SHARING THE STREET – COMPLETE STREETS



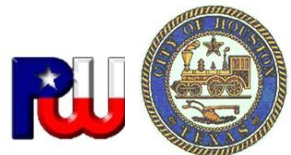
Mode	Before	After
Auto	C	D
Bus	B	C
Bicycle	F	D
Pedestrian	E	E

BEFORE



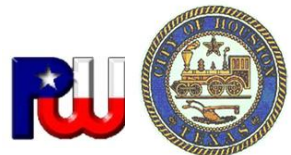
URBAN STREET ANALYSIS

- Predicts Stops (new), Speed, Queues
- Models Signal Coordination
 - Force offs, yields
- Mixed Street: Signal, Stops, Roundabouts
- Sensitive to Access Management
 - Driveways, Median breaks



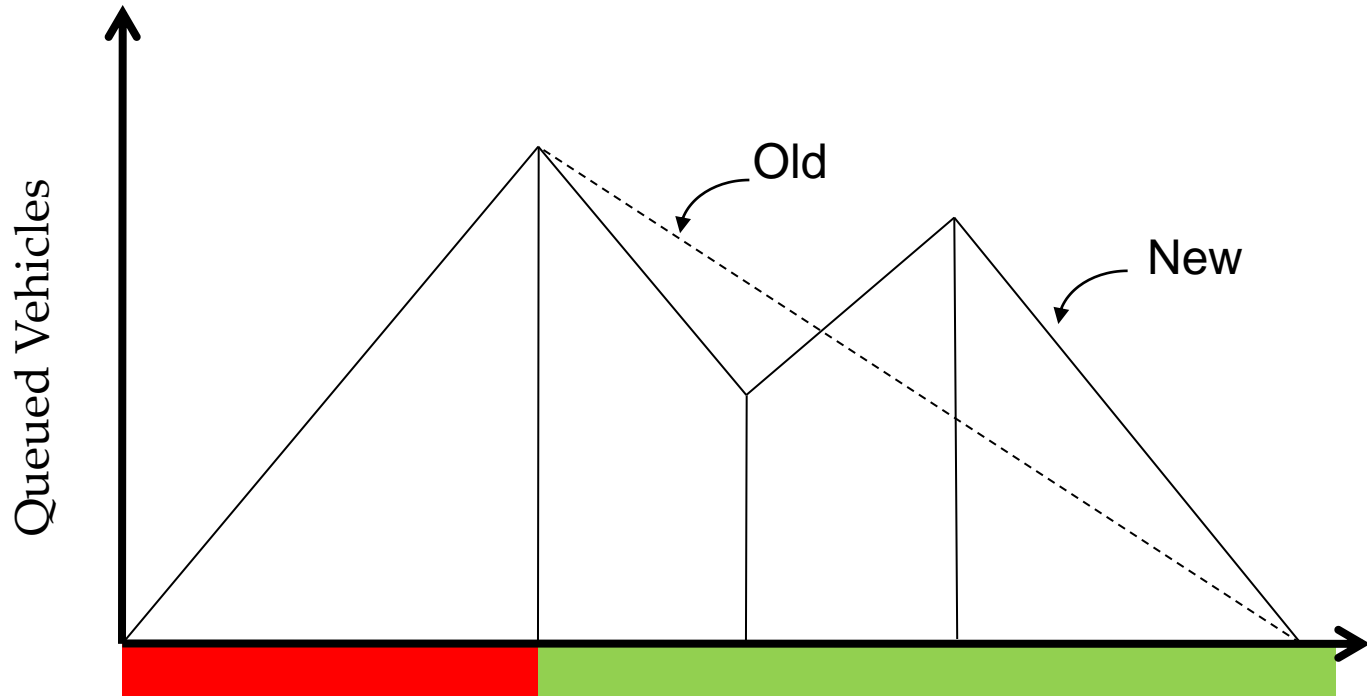
SIGNALIZED INTERSECTION UPDATES

- Incremental Queue Analysis (IQA)
- Traffic Actuated Signals
 - Min. green passage time, recall, dual entry, Dallas phasing, simultaneous gap out, detector length.
- Left turn Queue overflow check (new)
- Volume/capacity ratio check (new)
- Level of Service for Bicycles & Pedestrians (new)

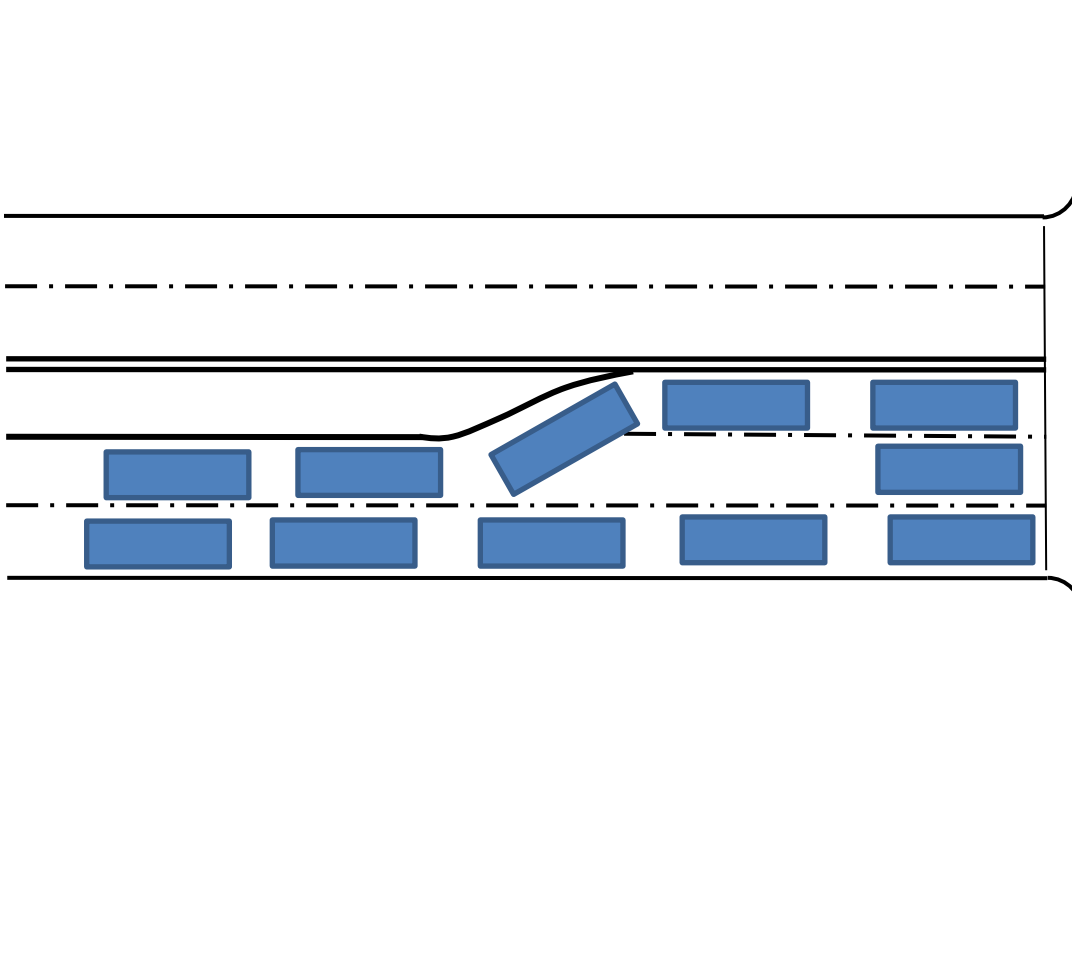


INCREMENTAL QUEUE ANALYSIS

Delay polygon for shared left-through lane with permitted lefts



LEFT TURN OVERFLOW CHECK (NEW)



If left turn overflow occurs,
review results

VOLUME/CAPACITY RATIO CHECK

- If $v/c > 1.00$
 - Then the signalized intersection LOS is “F”



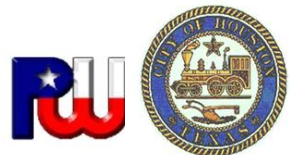
TWO-WAY STOP UPDATES

- Extended to 6-lane Arterials
- U-turns
- Analysis of shared lanes, short lanes
- Pedestrian Crossings analysis



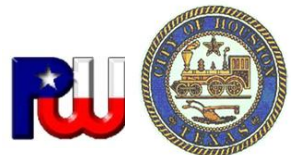
ALL WAY STOP UPDATES

- Queuing model added
- Explicit guidance for 6-lane streets

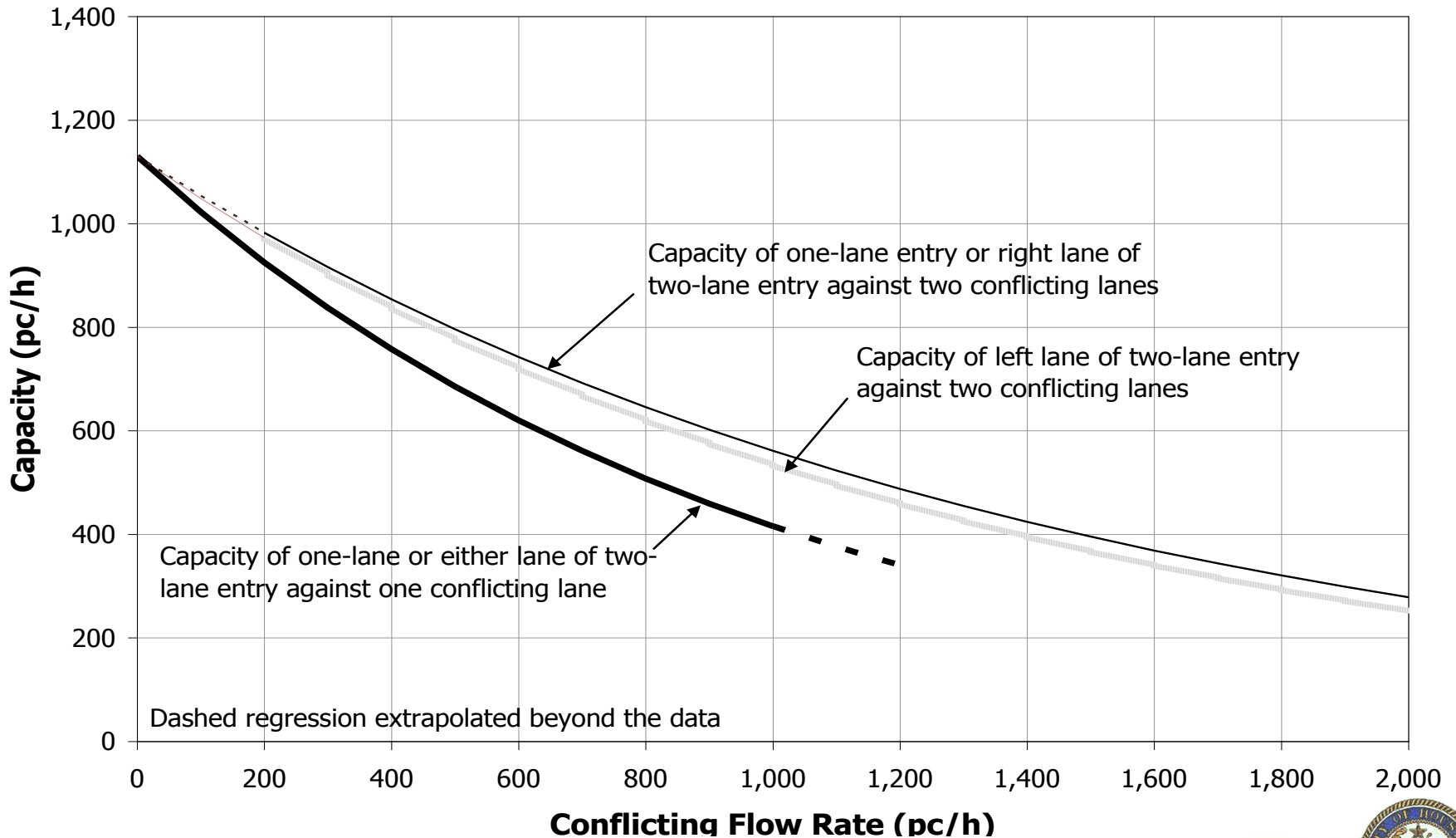


ROUNDBABOUTS UPDATE

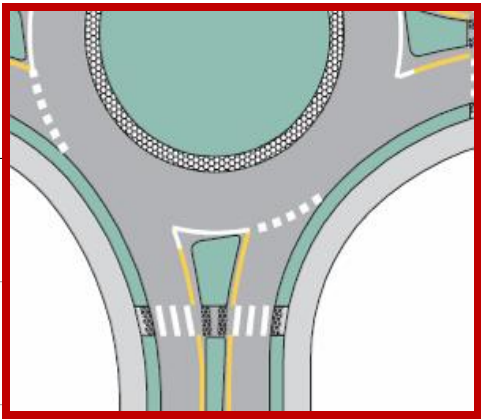
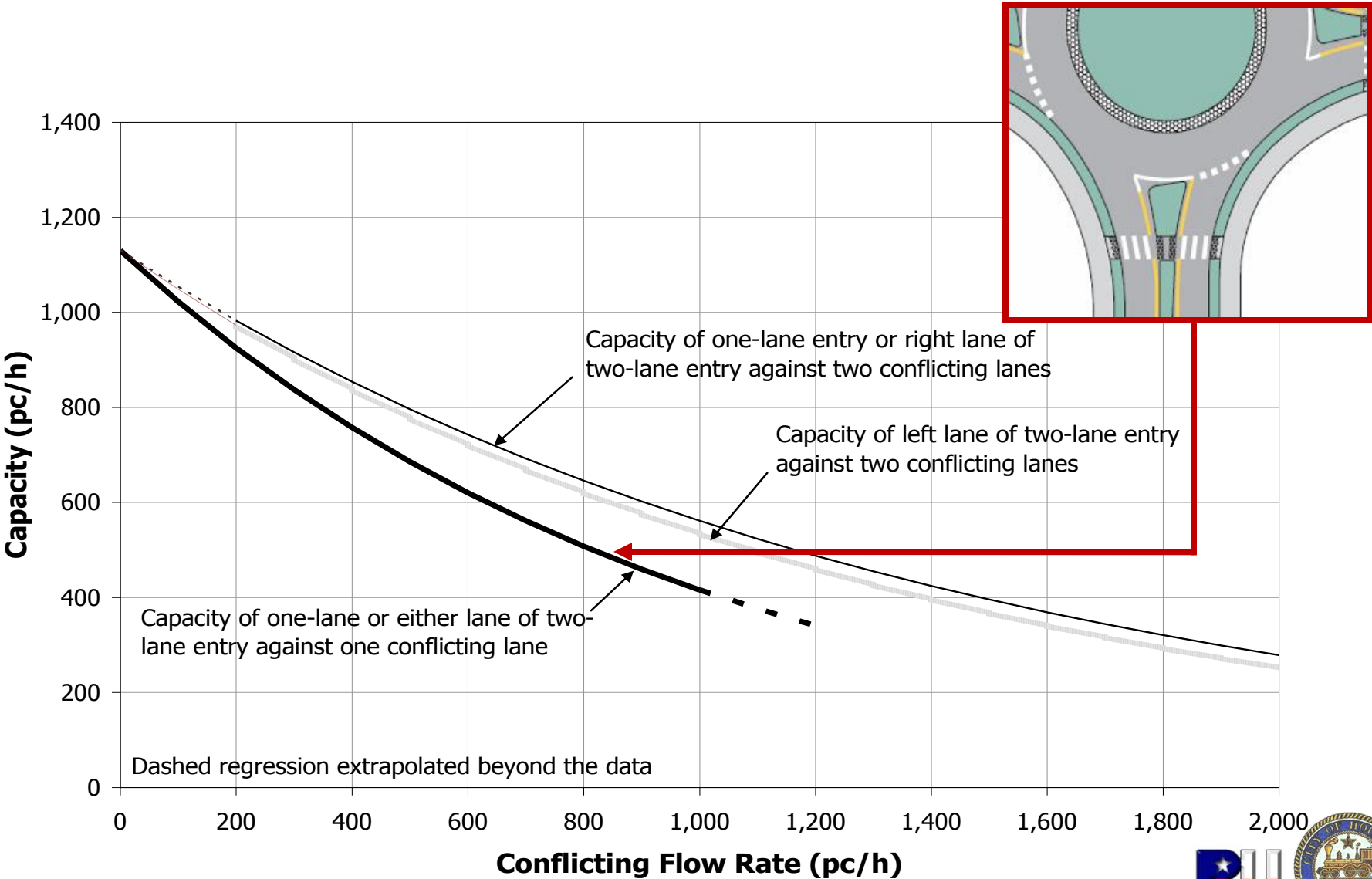
- New methodology based on US Research
 - NCHRP Report 572
- US capacities lower than rest of the world
- LOS based on delay
 - Same thresholds as for Unsignalized Intersections
 - Roundabouts held to higher standard than Signals



ROUNDBABOUT CAPACITY



CAPACITY: 1 LANE



2010 HCM (WHAT IS THE BIG DEAL?)

System Element	Chapter	Service Measure Provided			
		Auto	Ped	Bike	Transit
Freeway Facility	10	✓			
Basic Freeway Segment	11	✓			
Freeway Weaving Segment	12	✓			
Fwy. Merge/Diverge Seg.	13	✓			
Multilane Highway	14	✓		✓	
Two-Lane Highway	15	✓		✓	
Urban Street Facility	16	✓	✓	✓	✓
Urban Street Segment	17	✓	✓	✓	✓
Signalized Intersection	18	✓	✓	✓	
Two-Way Stop	19	✓	✓		
All-Way Stop	20	✓			
Roundabout	21	✓			
Interchange Ramp Term.	22	✓			
Off-Street Ped-Bike Facility	23		✓	✓	

QUESTIONS

