A LOOK AHEAD TO THE 2010 HCM

2010 Highway Capacity Manual
5th Edition

TRB
TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES
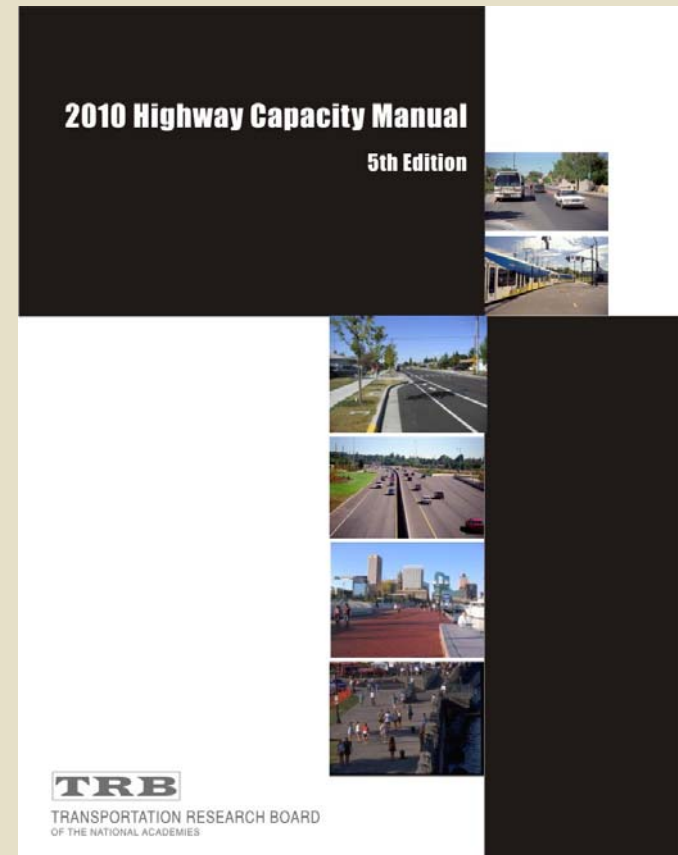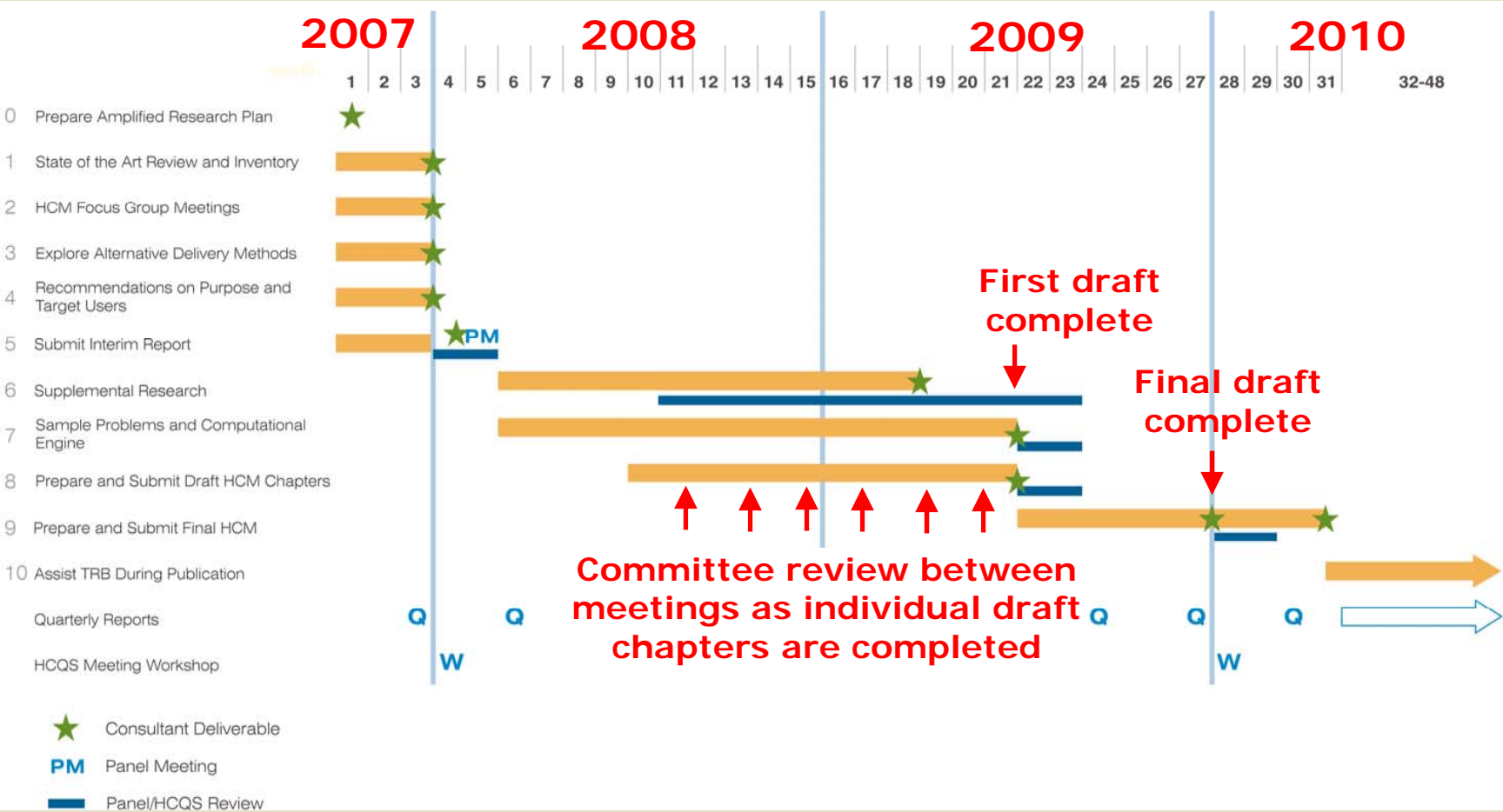
Overview of NCHRP 3-92 – Production of the 2010 HCM

- Project began in October 2007
- Final Draft Delivered to TRB in January 2010
- Scheduled for publication by TRB by the end of 2010
- Research Team includes:
  - Kittelson & Associates, Inc. (Prime)
  - Polytechnic University
  - Texas Transportation Institute
  - University of Florida

NCHRP 3-92 Project Schedule

2007   **2008**   **2009**   **2010**

| month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32-48 |

0   Prepare Amplified Research Plan

1   State of the Art Review and Inventory

2   HCM Focus Group Meetings

3   Explore Alternative Delivery Methods

4   Recommendations on Purpose and Target Users

5   Submit Interim Report   PM

6   Supplemental Research

7   Sample Problems and Computational Engine

8   Prepare and Submit Draft HCM Chapters

9   Prepare and Submit Final HCM

10   Assist TRB During Publication

Quarterly Reports   Q   Q   Q   Q   Q

HCQS Meeting Workshop   W   W

First draft complete

Final draft complete

Committee review between meetings as individual draft chapters are completed

★ Consultant Deliverable

PM Panel Meeting

▬ Panel/HCQS Review

Project	Project Title	Project Objective(s)
NCHRP 3-60	Capacity and Quality of Service of Interchange Ramp Terminals	Develop improved methods for capacity and quality-of-service analysis of interchange ramp terminals, for a full range of interchange types.
NCHRP 3-64	Highway Capacity Manual Applications Guide	Develop a HCM Applications Guide that shows how to appropriately apply HCM methodologies to real-world problems and indicate when other methods may be more appropriate.
NCHRP 3-65	Applying Roundabouts in the United States	Develop methods of estimating the safety and operational impacts of U.S. roundabouts and refine the design criteria used for them.
NCHRP 3-70	Multimodal Level of Service Analysis For Urban Streets	Develop a framework and enhanced methods for determining levels of service for auto, transit, bicycle, and pedestrian modes on urban streets, in particular with respect for the interaction among the modes.
NCHRP 3-75	Analysis of Freeway Weaving Sections	Develop improved methods for capacity and level-of-service analysis of freeway weaving sections.
NCHRP 3-79	Measuring and Predicting the Performance of Automobile Traffic on Urban Streets	Develop techniques to measure the performance of auto traffic on urban streets for real-time applications; develop procedures to predict the performance of auto traffic on urban streets.
NCHRP 3-82	Default Values for Capacity and Quality of Service Analyses	Determine appropriate default values for inputs to HCM analyses; develop a guide to select default values for various applications.
NCHRP 3-85	Guidance for the Use of Alternative Traffic Analysis Tools in Highway Capacity Analyses	Enhance the guidance in the HCM for the selection and use of alternative traffic analysis tools.
NCHRP 3-92	Production of the Year 2010 Highway Capacity Manual	Develop the 2010 edition of the HCM.
FHWA	Evaluation of Safety, Design, and Operation of Shared-Use Paths (DTFH61-00-R-00070)	Develop a level-of-service estimation method for shared-use paths to assist path designers and operators on how wide to make new or rebuilt paths, and on whether to separate the different types of users.

Document Structure

- Integrated approach
  - Incorporate non-auto material into appropriate facility chapter
    - Mainly the signalized, unsignalized, and urban streets chapters
  - Pros:
    - All information for a particular facility type available in one chapter
    - Follows industry trend toward considering "transportation" needs rather than "highway" needs
    - Non-auto considerations might be more likely to be considered

Document Structure

- Volume 3 Multi-Modal Facilities
  - Urban Streets
  - Signalized Intersections
  - Two-way Stop-Controlled Intersections
  - Exclusive Pedestrian and Bicycle Facilities
  - All-way Stop-Controlled Intersections
  - Roundabouts
  - Interchange Ramp Terminals

Multimodal LOS Measure Issues

- Current measures generally reflect a traffic engineer's perspective
  - Capacity, delay
  - Florida & NCHRP 3-70 research shows these aren't the key issues for travellers
    - ➢ Auto volumes, particularly, are important

HCM 2000: Ped LOS A

HCM 2000: Ped LOS D

Focus Group Findings

- Many jurisdictions don't require multimodal analyses
  - Therefore, they are not performed
- Jurisdictions that do want to perform bike/ped analyses don't find the current HCM capacity-based measures useful
  - Maryland & Florida use measures of user comfort
- Most bike & ped facilities don't have capacity issues
  - No need to analyze them using HCM procedures

Quality of Service

- **Definition:** QOS is the perception of how well a facility operates from the traveler's perspective

- Recent research has quantified traveler perceptions of multimodal facilities to develop QOS indexes
  - Indexes incorporate multiple factors

- Anticipated that future research will develop similar indexes for other facilities (e.g. roundabouts)

Target Uses

- Transportation planners
  - Long-range multimodal transportation planning
  - Assist in evaluating different project alternatives
  - Project prioritization
- Project designers
  - Aid in designing facilities to a design LOS for each mode
  - Evaluate impacts of designs on all modes
- Agency staff & decision-makers
  - Set LOS standards for different modal facility types
- Traffic engineers
  - Evaluate projects against multimodal LOS standards
  - Identify potential mitigation measures

polytechnic UNIVERSITY

Texas Transportation Institute

UF UNIVERSITY of FLORIDA

Effect of Right-turning Vehicles

- Pedestrian delay is important
  - Frustration
  - Potential safety issues
- More than waiting for a "WALK"
  - Cars affect delay also
- Research correlated right-turns to pedestrian impacts (Hubbard, Awwad, and Bullock, 2007)
 - Delays
  - Evasive maneuvers

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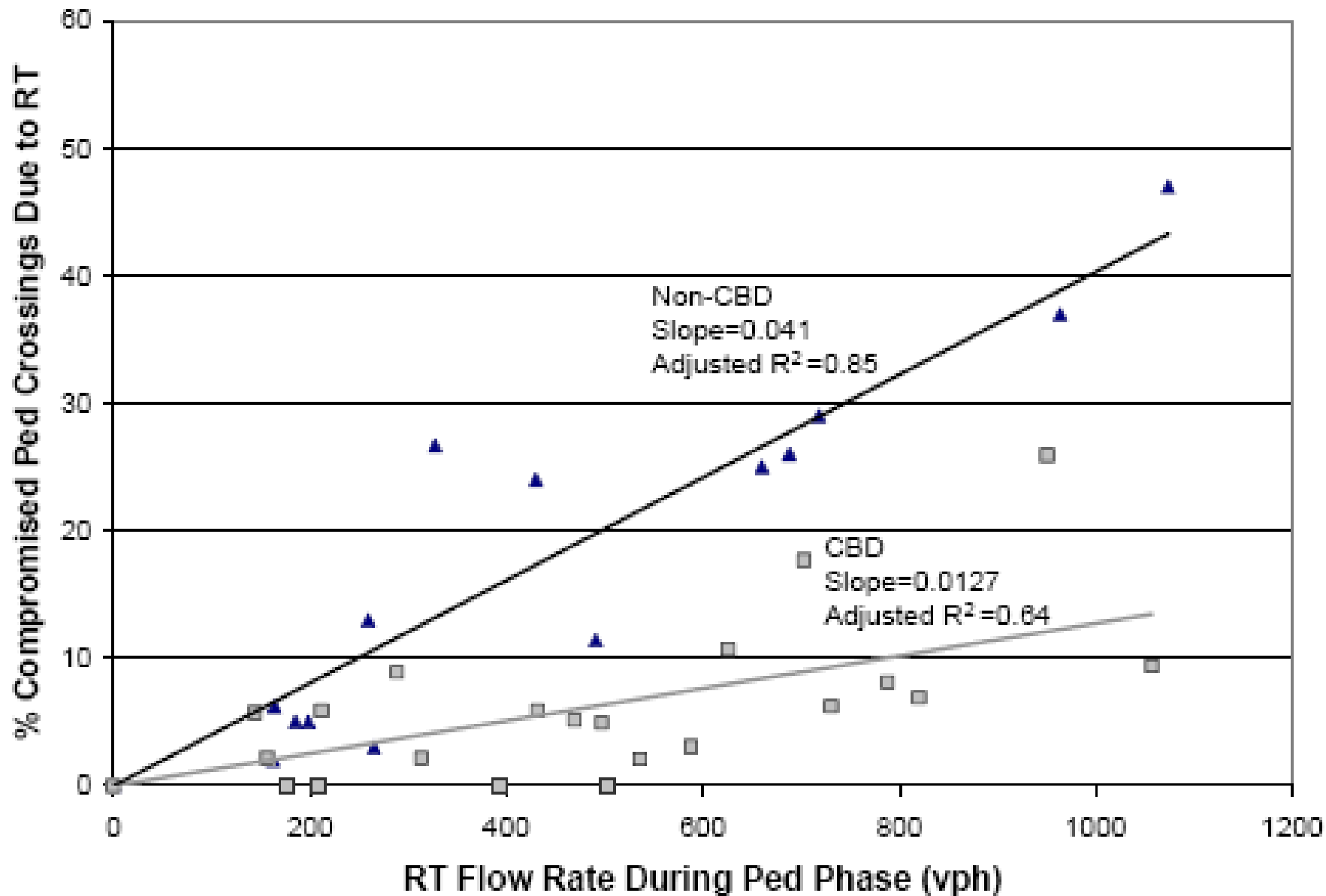
Right Turn Volume versus Percent Compromised Pedestrian Crossings, Linear Regression for CBD and Non-CBD Crosswalks
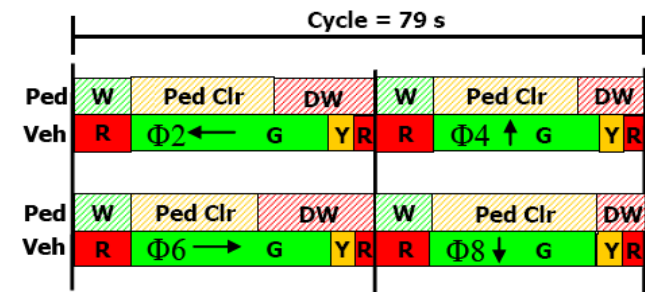
Effect of Right-turning Vehicles

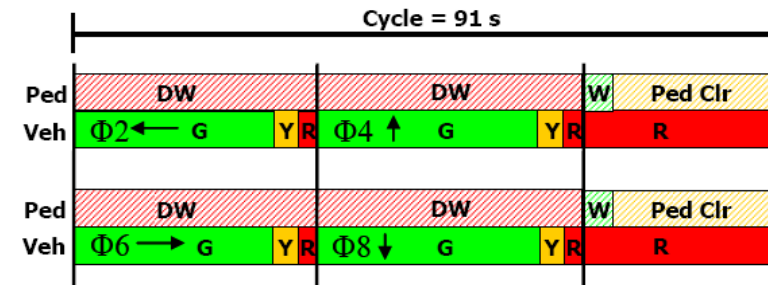- Provides a basis for implementing alternative tools:
  - Leading pedestrian intervals can provide enhanced visibility
  - Curb extensions may reduce crossing requirements
  - All-pedestrian phase (Barnes Dance)
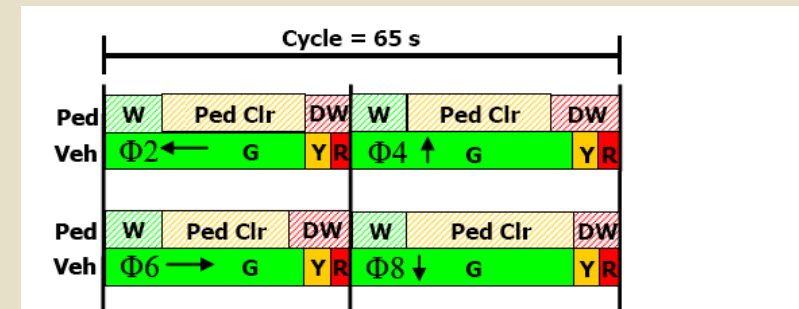
a) Concurrent Pedestrian Signal Timing

b) Leading Pedestrian Interval

c) Exclusive Pedestrian Phase

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Shared-Use Path LOS

- FHWA research project led by Toole Design Group and NC State

- Calibrated user perception index for bikes on shared-use paths

- Accounts for effects of 5 user types:

  - Cyclists
  - Pedestrians
  - Joggers
  - Skaters
  - Child cyclists

Shared-Use Path LOS

LOS	Bicyclist Perception Index	Comments
A	> 4.0	Optimum conditions, ample ability to absorb more riders
B	> 3.5-4.0	Good conditions, some ability to absorb more riders
C	> 3.0-3.5	Meets current demand, marginal ability to absorb more riders
D	> 2.5-3.0	Nearing functional capacity
E	> 2.0-2.5	Functional capacity
F	≤ 2.0	Significant user conflicts and diminished experience

- 4 key variables:
  - # of "meeting events" with other users
  - # of delayed passing attempts
  - Path width
  - Presence of centerline

Shared-Use Path LOS

- Uses volumes of user types to estimate meetings and passings

  - Based on assumed speed distributions for each user type
  - Procedure is complex, but Excel calculator is available

Shared Use Path Flow Analysis Tool
Trail Level of Service (LOS) Calculator
Draft Spreadsheet Based on Federal Highway Administration Shared Use Path Study
North Carolina State University and Toole Design Group

Trail LOS Scale	
LOS Score	LOS Grade
X≥4.0	A
3.5≤X<4.0	B
3.0≤X<3.5	C
2.5≤X<3.0	D
2.0≤X<2.5	E
X<2.0	F

ROW #1

Segment Name	Path Width	Centerline	Volume (users per hour in 1 direction) and Mode Split							User Perception		Delayed Passings Adjustment				Prelim LOS Score	Trail Level of Service	
	Closest 0.5 ft.	0=No Centerline	Volume	Mode Split (%)*								Adj. Factor (subtract from User Percep. score)						
Name	Width (ft)	1=Centerline	One-Way (per hour)	Adult Bicyclists	Pedestrians	Runners	In-Line Skaters	Child Bicyclists	All Modes	Score	Grade	Percent	# Per Hr	Pre Adj Fac	Fin Adj Fac	Prelim LOS Score	LOS Score	LOS Grade
Example Trail	11.0	1	155.4	55.0%	20.0%	10.0%	10.0%	5.0%	100.0%	3.47	C	#####	38.17	0.32	0.32	3.15	3.15	C

*Default mode split is 55% adult bicyclists, 20% pedestrians, 10% runners, 10% in-line skaters, and 5% child bicyclists.

Click Here for Default Mode Split

ROW #2

Segment Name	Path Width	Centerline	Volume (users per hour in 1 direction) and Mode Split							User Perception		Delayed Passings Adjustment				Prelim LOS Score	Trail Level of Service	
	Closest 0.5 ft.	0=No Centerline	Volume	Mode Split (%)*								Adj. Factor (subtract from User Percep. score)						
Name	Width (ft)	1=Centerline	One-Way (per hour)	Adult Bicyclists	Pedestrians	Runners	In-Line Skaters	Child Bicyclists	All Modes	Score	Grade	Percent	# Per Hr	Pre Adj Fac	Fin Adj Fac	Prelim LOS Score	LOS Score	LOS Grade
	14.0	1	147.0	55.0%	20.0%	10.0%	10.0%	5.0%	100.0%	3.79	B	#####	34.18	0.28	0.28	3.50	3.50	B

*Default mode split is 55% adult bicyclists, 20% pedestrians, 10% runners, 10% in-line skaters, and 5% child bicyclists.

Click Here for Default Mode Split