Moving Together 23

Equity-Focused Pedestrian Safety Initiatives

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VHB

massDOT
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U.S. Department of Transportation
Federal Highway Administration

RIDOT Midblock Crossing

Process for Selecting Countermeasures at Uncontrolled Pedestrian Crossing Locations

This process follows the steps outlined in the *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations* (FHWA-SA-17-072). Each numbered step includes multiple options and components below for agencies to consider; these options are not necessarily sequential, and the agency does not need to complete all activities within each step. Underlined text in the flowchart indicates a hyperlink to an online resource containing additional information.

1 Collect data and engage the public

- Collect pedestrian crash and safety data
  - Location and conditions
  - Crash maps
  - Crash reports
- Review existing traffic safety plans
  - SHSP
  - HSIP
  - HSP
- Evaluate pedestrian accommodation and traffic safety policies
  - Complete Streets
  - Vision Zero
- Initiate a PSAP
- Review pedestrian master plans for proposed projects
- Document informal public comments
- Conduct a walkability audit

2 Inventory conditions and prioritize locations

- Inventory pedestrian crossings and observed traffic behavior
- Classify pedestrian crossings
  - Controlled
  - Uncontrolled
- Inventory roadway characteristics
- Screen the network for high-crash or high-risk locations
  - Analyze "hot spots" or crash cluster locations
  - Develop a systemic analysis approach

3 Analyze crash types and safety issues

- Diagram crash reports
- Identify crash factors
- Conduct an RSA
- Lead an informal site visit

4 Select countermeasures

- Review Table 1 (roadway features)
  - AADT
  - Number of lanes
  - Median presence
  - Speed limit
- Review Table 2 (safety issues)
  - Conflicts at crossings
  - Excessive speed
  - Visibility issues
  - Other

5 Consult design and installation resources

- MUTCD
  - Part 2: Signs
  - Part 3: Markings
  - Part 4: Highway Traffic Signals
- AASHTO Guide for the Design of Pedestrian Facilities
- Local design guidance and selection criteria
  - PEDSAFE
  - Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations

6 Identify opportunities and monitor outcomes

- Identify implementation opportunities
  - Routine maintenance activities
  - STIP
- Consider funding options
  - HSIP
  - Other (TAP, CMAQ, STBG)
- Construct improvements
  - Review design considerations
  - Conduct public outreach
- Monitor results of implementation
  - Track performance measures
  - Obtain public feedback
  - Analyze crash data

Abbreviations:

AADT	annual average daily traffic
AASHTO	American Association of State Highway and Transportation Officials
CMAQ	Congestion Mitigation and Air Quality
HSIP	Highway Safety Improvement Program
HSP	Highway Safety Plan
MUTCD	*Manual on Uniform Traffic Control Devices*
PSAP	Pedestrian Safety Action Plan
RSA	Road Safety Audit
SHSP	Strategic Highway Safety Plan
STBG	Surface Transportation Block Grant
STIP	State Transportation Improvement Program
TAP	Transportation Alternatives Program

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Safe Roads for a Safer Future

EDC-4 Safe Transportation for Every Pedestrian:
https://safety.fhwa.dot.gov/ped_bike/step/resources/

Network Screening/Systemic Analysis

- Identified key factors and criteria
- Utilized existing data sets
  - MIRE Inventory
  - HPMS Data
  - Census Data
  - Historic Traffic Data
  - State Traffic Commission Records
- Assessed weight
- Developed "Score" for each roadway segment
  - Higher the score, the more risk for pedestrians

Network Screening Factors

Variable	Weight
Traffic Volume	High
Speed Limit	High
Population Density Score	High
Zero Vehicle Household Score	High
Roadway Configuration	Medium
Urbanized Area	Medium
School Access	Medium
Employment Density/Businesses	Medium
Pedestrian Crash History	Medium
Transit Access/Bus Stops	Medium
Population 65 Plus	Medium
Park Access	Low
Drivers Under 44	Low

Weight Factors

High: 0.140

Median: 0.070

Low: 0.044

With 13 factors, multiply weighted result by 9.345 to get an overall score out of 100

Scoring Criteria—Highly Weighted Factors

Variable	Scoring Criteria	Score
Traffic Volume	< 500	2
	< 1,500	4
	< 7,000	6
	< 20,000	8
	< 40,000	10
	≥ 40,000	8
Population Density	1-10 percentile	1
	11-20 percentile	2
	21-30 percentile	3
	31-40 percentile	4
	41-50 percentile	5
	51-60 percentile	6
	61-70 percentile	7
	71-80 percentile	8
	81-90 percentile	9
	91-100 percentile	10

Variable	Scoring Criteria	Score
Posted Speed Limit	≤ 25	1
	30-35	5
	40-55	10
	60+	5
Zero Vehicle Households	1-10 percentile	1
	11-20 percentile	2
	21-30 percentile	3
	31-40 percentile	4
	41-50 percentile	5
	51-60 percentile	6
	61-70 percentile	7
	71-80 percentile	8
	81-90 percentile	9
	91-100 percentile	10

Scoring Criteria—Medium Weighted Factors

Variable	Scoring Criteria	Score
Traffic Volume	1 lane	2
	2 lanes, divided	4
	2 lanes, undivided	6
	3 or 4 lanes	8
	> 4 lanes	10
Urbanized Area	Urban	10
	Rural	1
Population Density	1-10 percentile	1
	11-20 percentile	2
	21-30 percentile	3
	31-40 percentile	4
	41-50 percentile	5
	51-60 percentile	6
	61-70 percentile	7
	71-80 percentile	8
	81-90 percentile	9
	91-100 percentile	10

Variable	Scoring Criteria	Score
School Access	≤ ¼ mile	10
	> ¼ mile	1
Zero Vehicle Households	1-10 percentile	1
	11-20 percentile	2
	21-30 percentile	3
	31-40 percentile	4
	41-50 percentile	5
	51-60 percentile	6
	61-70 percentile	7
	71-80 percentile	8
	81-90 percentile	9
	91-100 percentile	10
Pedestrian Crash History	≤ 250 feet from a crash	10
	> 250 feet from a crash	1
Transit Access & Bus Stops	≤ ¼ mile—network distance	10
	> ¼ mile—network distance	1

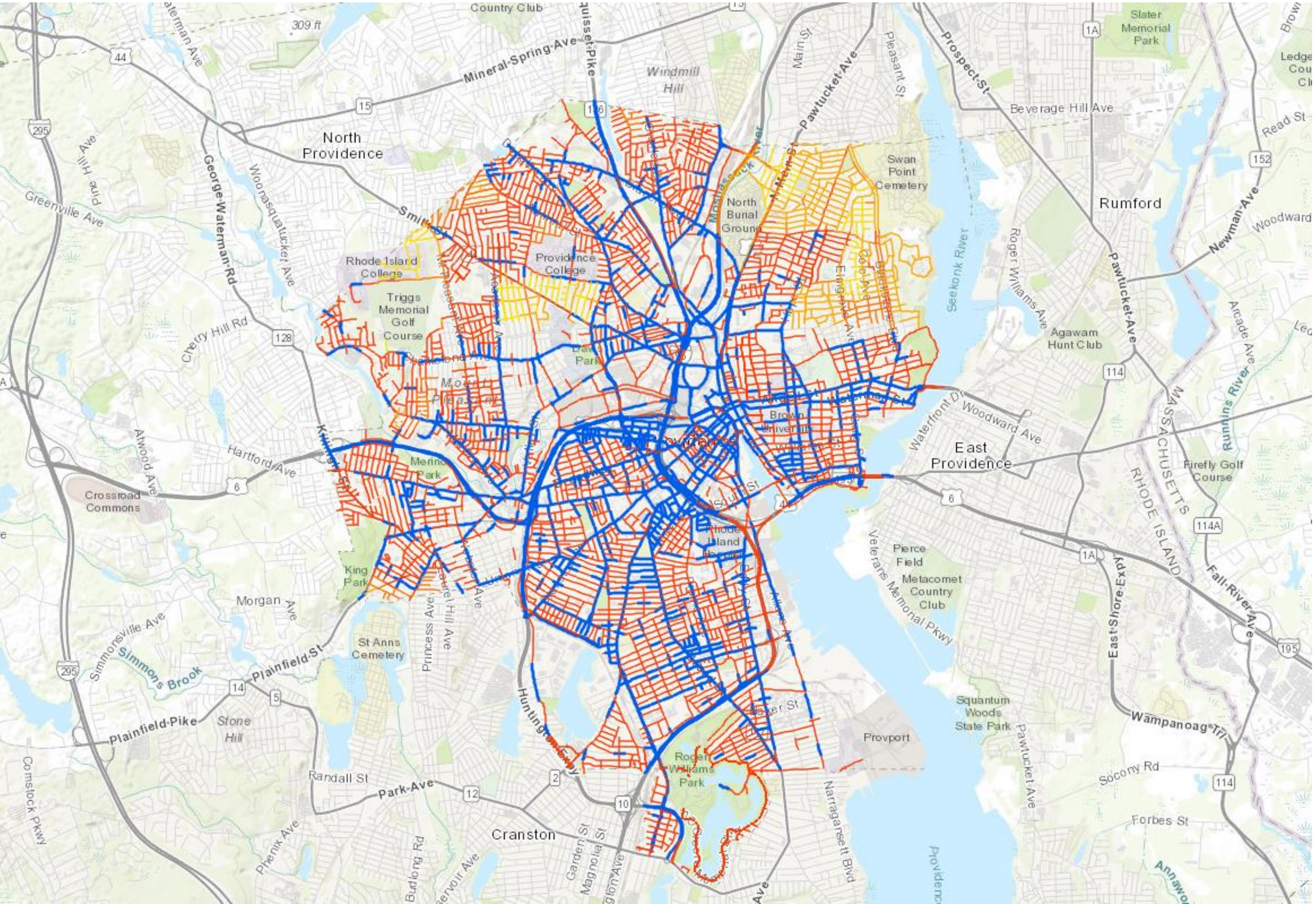
Scoring Criteria—Low Weighted Factors

Variable	Scoring Criteria	Score
Park Access	≤ ¼ mile	10
	> ¼ mile	1
Drivers Under 44	1-10 percentile	1
	11-20 percentile	2
	21-30 percentile	3
	31-40 percentile	4
	41-50 percentile	5
	51-60 percentile	6
	61-70 percentile	7
	71-80 percentile	8
	81-90 percentile	9
	91-100 percentile	10

Network Screening—Scoring Results

- Compiled data sets to create a score for each road segment
  - Incorporating factors that prioritized areas where walkability and safety is a major concern
- Developed ArcGIS based map
  - Color coded to show roadways with greater potential pedestrian risk
- Output includes:
  - Score by 0.1-mile segment
  - Corridor score based on similar roadway characteristics (average)
- Assists RIDOT in prioritizing intersections and corridors for improvements

Scoring Results



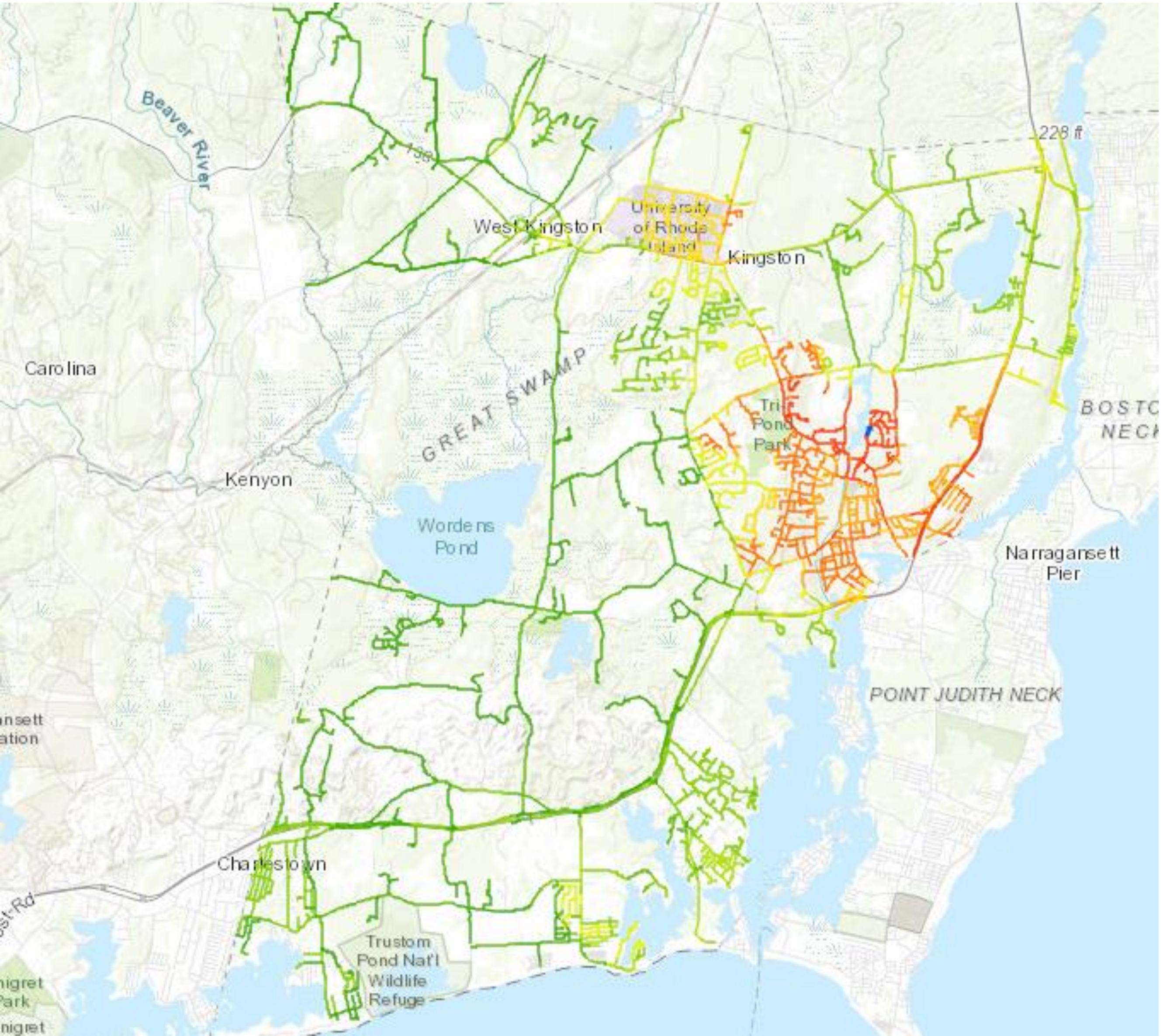
Providence, RI

Legend – Segment Scoring

PERCENT_TOTAL

- 95.000001% - 99.9%
- 76.500001% - 95%
- 64.900001% - 76.5%
- 54.300001% - 64.9%
- 44.600001% - 54.3%
- 36.200001% - 44.6%
- 27.600001% - 36.2%
- 19.500001% - 27.6%
- 12.100001% - 19.5%
- 0% - 12.1%

Scoring Results



South Kingstown, RI

Legend – Segment Scoring

PERCENT_TOTAL

- 95.000001% - 99.9%
- 76.500001% - 95%
- 64.900001% - 76.5%
- 54.300001% - 64.9%
- 44.600001% - 54.3%
- 36.200001% - 44.6%
- 27.600001% - 36.2%
- 19.500001% - 27.6%
- 12.100001% - 19.5%
- 0% - 12.1%

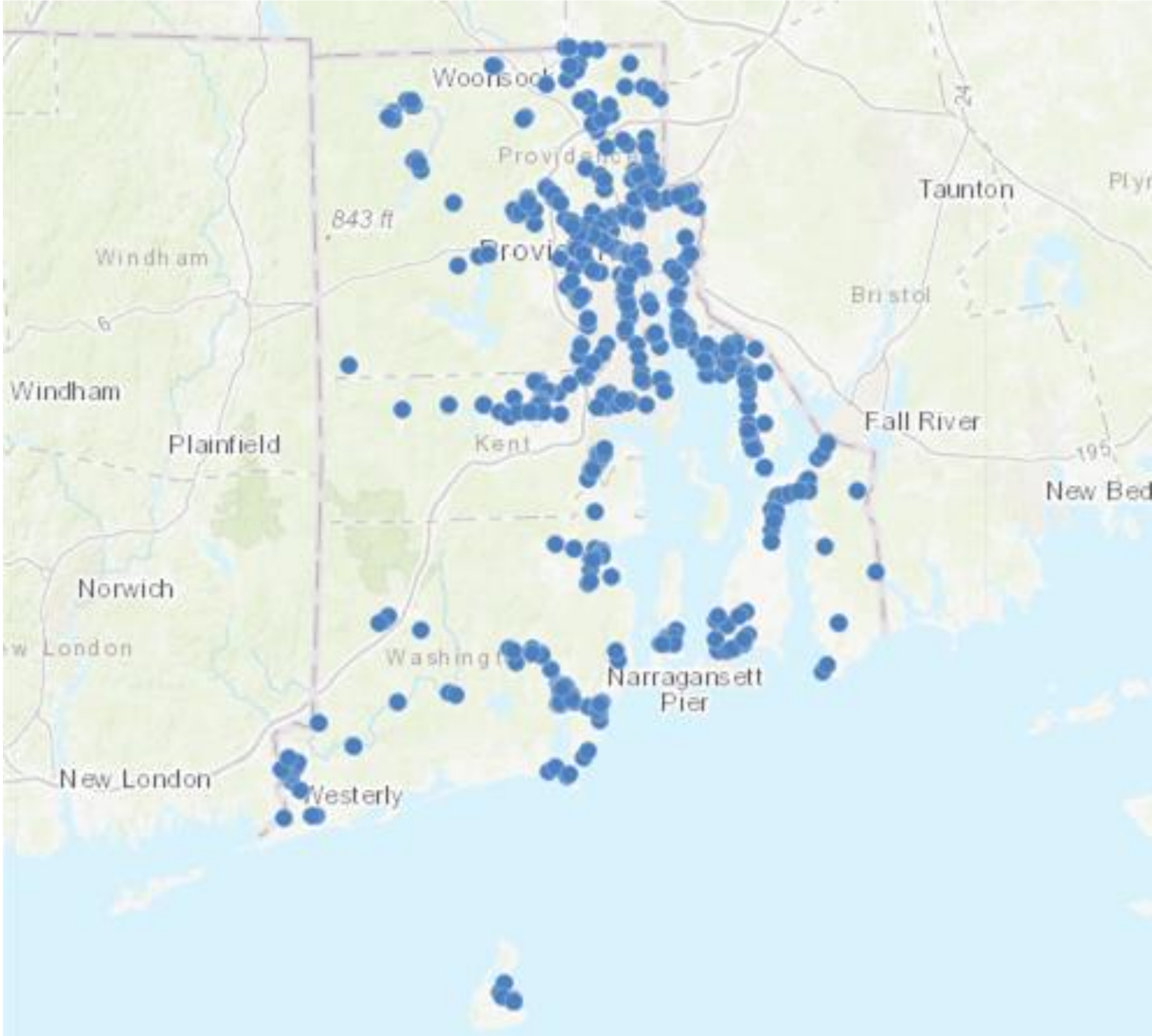
Statewide Crossing Inventory

Identify Crosswalk Locations

- Over 750 uncontrolled or midblock crosswalks
- Identified using State Traffic Commission (STC) records and supplemented with field inventory

Field Inventory Database

- Consistent documentation
- Created application for tablet using Survey123
- Ease of use for RIDOT
- Photo Inventory (GPS Located)
- Field and behavioral data



Countermeasure Selection

Review of Best Practices

- FHWA STEP Guidance
- FHWA Every Day Counts (EDC) Initiatives
- MUTCD Interim Approvals
- State Best Practices Review
- Speed vs Crash Severity Relationship

Development of Countermeasure Selection Criteria

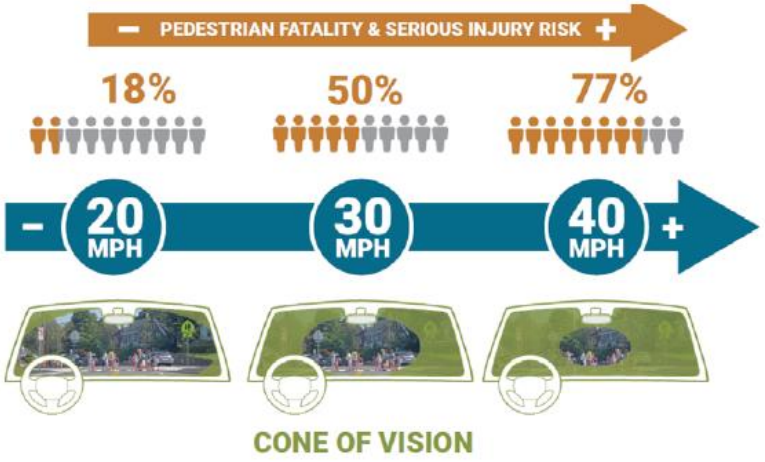


Table 1. Application of pedestrian crash countermeasures by roadway feature.

Roadway Configuration	Posted Speed Limit and AADT								
	Vehicle AADT <9,000			Vehicle AADT 9,000–15,000			Vehicle AADT >15,000		
	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph
2 lanes (1 lane in each direction)	❶ 2 4 5 6	❶ 5 6 7 9	① 5 6 ❼ ❾	❶ 4 5 6	❶ 5 6 7 9	① 5 6 ❼ ❾	❶ 4 5 6 7 9	① 5 6 7 9	① 5 6 ❾
3 lanes with raised median (1 lane in each direction)	❶ 2 3 4 5	❶ ❸ 5 7 9	① ❸ 5 ❼ ❾	① 3 4 5 7 9	① ❸ 5 ❼ ❾	① ❸ 5 ❼ ❾	① ❸ 4 5 7 9	① ❸ 5 ❼ ❾	① ❸ 5 ❾
3 lanes w/o raised median (1 lane in each direction with a two-way left-turn lane)	❶ 2 3 4 5 6 7 9	❶ ❸ 5 6 7 9	① ❸ 5 6 ❾	① 3 4 5 6 7 9	① ❸ 5 6 ❼ ❾	① ❸ 5 6 ❾	① ❸ 4 5 6 7 9	① ❸ 5 6 ❾	① ❸ 5 6 ❾
4+ lanes with raised median (2 or more lanes in each direction)	❶ ❸ 5 7 8 9	❶ ❸ 5 7 8 9	① ❸ 5 8 ❾	① ❸ 5 7 8 9	① ❸ 5 ❼ 8 ❾	① ❸ 5 8 ❾	① ❸ 5 ❼ 8 ❾	① ❸ 5 8 ❾	① ❸ 5 8 ❾
4+ lanes w/o raised median (2 or more lanes in each direction)	❶ ❸ 5 6 7 8 9	① ❸ 5 ❻ 7 8 9	① ❸ 5 ❻ 8 ❾	① ❸ 5 ❻ 7 8 9	① ❸ 5 ❻ ❼ 8 ❾	① ❸ 5 ❻ 8 ❾	① ❸ 5 ❻ ❼ 8 ❾	① ❸ 5 ❻ 8 ❾	① ❸ 5 ❻ 8 ❾

Given the set of conditions in a cell,

- \# Signifies that the countermeasure is a candidate treatment at a marked uncontrolled crossing location.
- ● Signifies that the countermeasure should always be considered, but not mandated or required, based upon engineering judgment at a marked uncontrolled crossing location.
- ○ Signifies that crosswalk visibility enhancements should always occur in conjunction with other identified countermeasures.*

The absence of a number signifies that the countermeasure is generally not an appropriate treatment, but exceptions may be considered following engineering judgment.

1. High-visibility crosswalk markings, parking restrictions on crosswalk approach, adequate nighttime lighting levels, and crossing warning signs
2. Raised crosswalk
3. Advance Yield Here To (Stop Here For) Pedestrians sign and yield (stop) line
4. In-Street Pedestrian Crossing sign
5. Curb extension
6. Pedestrian refuge island
7. Rectangular Rapid-Flashing Beacon (RRFB)**
8. Road Diet
9. Pedestrian Hybrid Beacon (PHB)**

*Refer to Chapter 4, 'Using Table 1 and Table 2 to Select Countermeasures,' for more information about using multiple countermeasures.

**It should be noted that the PHB and RRFB are not both installed at the same crossing location.

This table was developed using information from: Zegeer, C.V., J.R. Stewart, H.H. Huang, P.A. Lagerwey, J. Feaganes, and B.J. Campbell. (2005). Safety effects of marked versus unmarked crosswalks at uncontrolled locations: Final report and recommended guidelines. FHWA, No. FHWA-HRT-04-100, Washington, D.C.; FHWA. Manual on Uniform Traffic Control Devices, 2009 Edition. (revised 2012). Chapter 4F, Pedestrian Hybrid Beacons. FHWA, Washington, D.C.; FHWA. Crash Modification Factors (CMF) Clearinghouse. http://www.cmfclearinghouse.org/; FHWA. Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE). http://www.pedbikesafe.org/PEDSAFE/; Zegeer, C., R. Srinivasan, B. Lan, D. Carter, S. Smith, C. Sundstrom, N.J. Thirsk, J. Zegeer, C. Lyon, E. Ferguson, and R. Van Houten. (2017). NCHRP Report 841: Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments. Transportation Research Board, Washington, D.C.; Thomas, Thirsk, and Zegeer. (2016). NCHRP Synthesis 498: Application of Pedestrian Crossing Treatments for Streets and Highways. Transportation Research Board, Washington, D.C.; and personal interviews with selected pedestrian safety practitioners.

Countermeasure Selection

Pedestrian Crossing Guidance

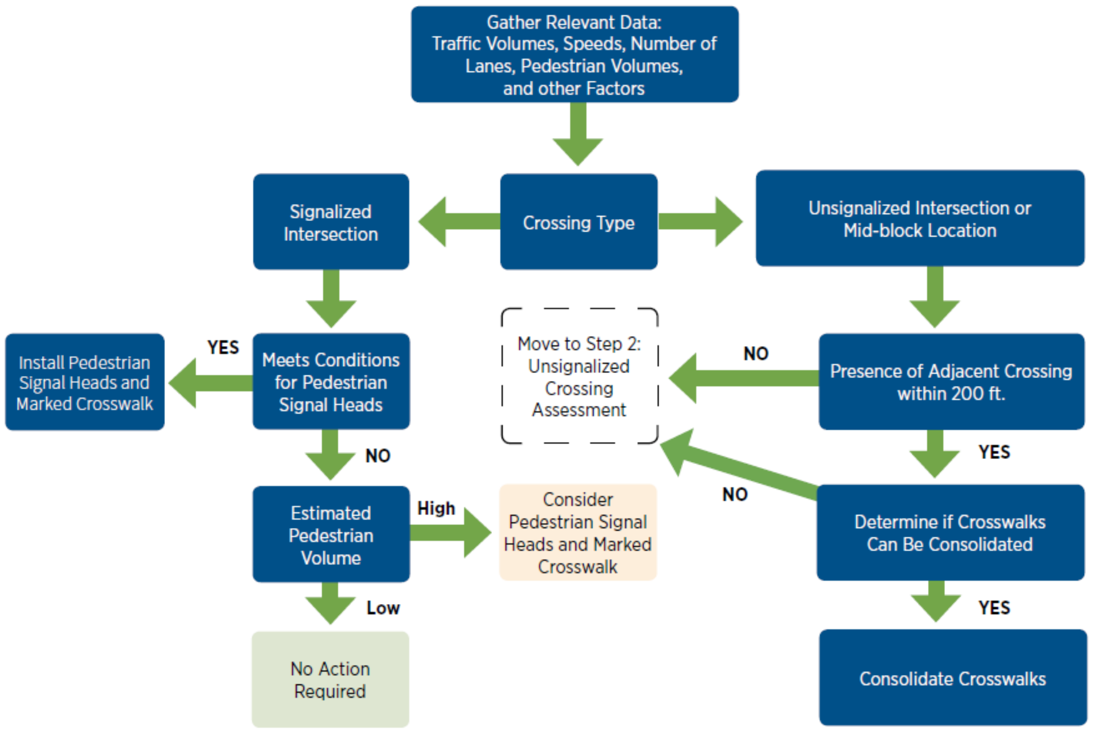
Step 1: Document Existing Characteristics/Signalized Crossing Assessment

Step 2: Unsignalized or Midblock Crossing Assessment

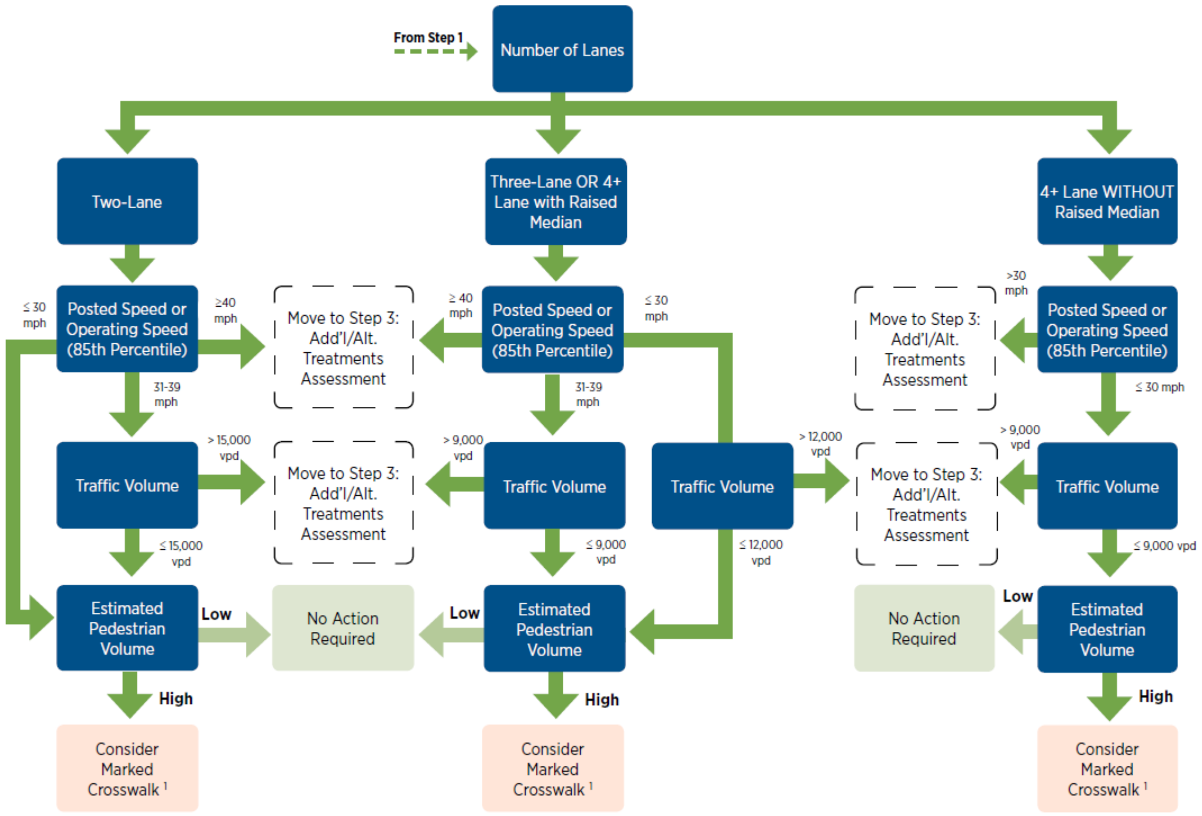
Step 3: Additional/Alternative Treatments Assessment

Step 4: Pedestrian Hybrid Beacon (PHB) Assessment

Countermeasure Selection



Step 1



[1] Implement static signs with marked crosswalk per MUTCD

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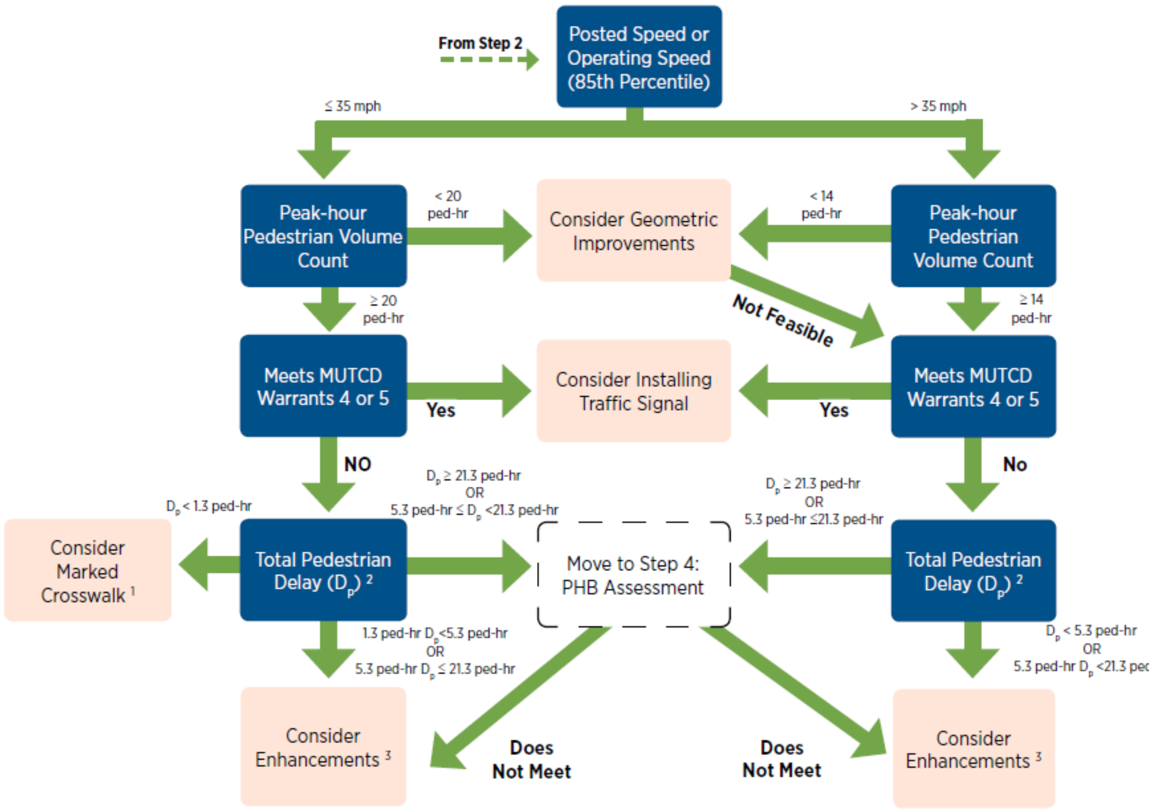
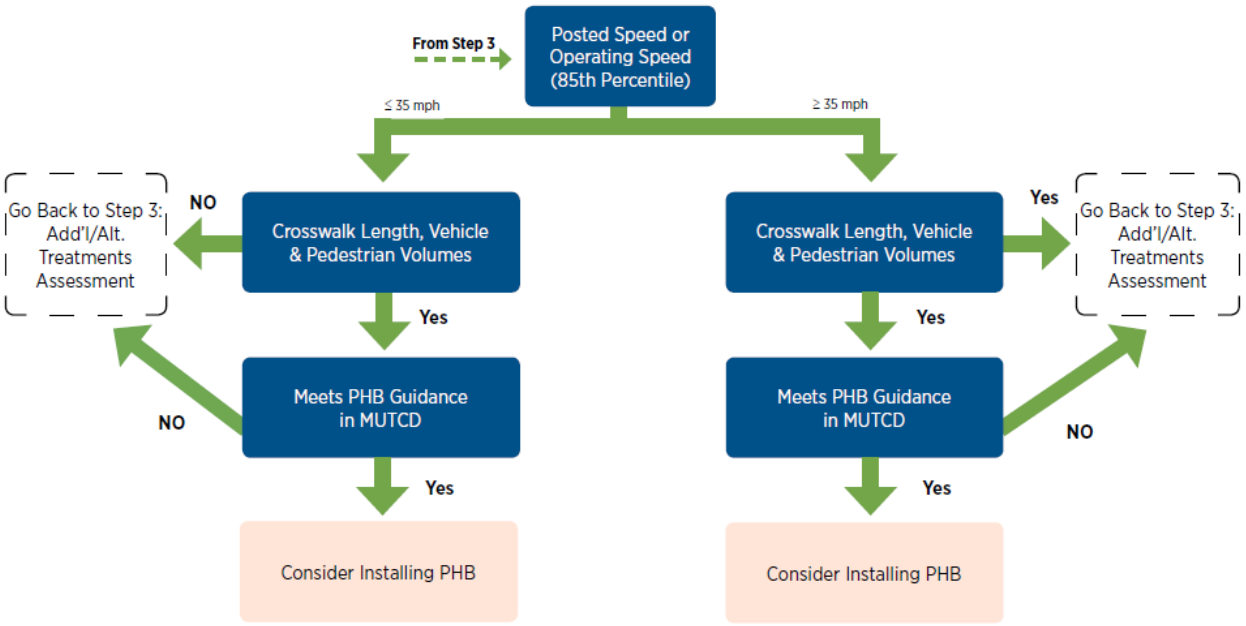
Step 2

Countermeasure Selection





[2] Refer to attached Pedestrian Delay Charts
[3] Including supplemental signs/markings, actuated beacons or Rapid Rectangluar Flashing Beacons (RRFB)

Step 3

Step 4

Avenues for Implementation

- RIDOT Maintenance
  - Short-Term Improvements
  - Signage
  - Striping
- ID-IQ On-Call Contract
  - Mid-Term Improvements
  - Began in FY2023
  - Enhancements include:
    - *Bump-outs*
    - *ADA compliant upgrades*
    - *RRFB, Flashing warning signs*
    - *Pedestrian signal equipment retrofit*
- STIP Project
  - Safety/Traffic or Bundle enhancement within existing STIP project
    - *HAWK, Traffic signal installation*

Grant Opportunities—Planning/Design

- FHWA State Transportation Innovation Council (STIC) Incentive Program, up to $100,000 per state
- FHWA Accelerated Innovation Deployment (AID) Demonstration Program, up to $1,000,000 per application
- NHTSA Non-Motorized Safety Grant, funding varies
- Work with State DOT on advancing municipal safety programs through the DOT's HSIP

U.S. Department of Transportation Federal Highway Administration

STIC State Transportation Innovation Councils

AID Demo Accelerated Innovation Deployment

NHTSA

Behavioral Initiatives

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