Pedestrian and Bicyclist Intersection Safety Indices

User Guide

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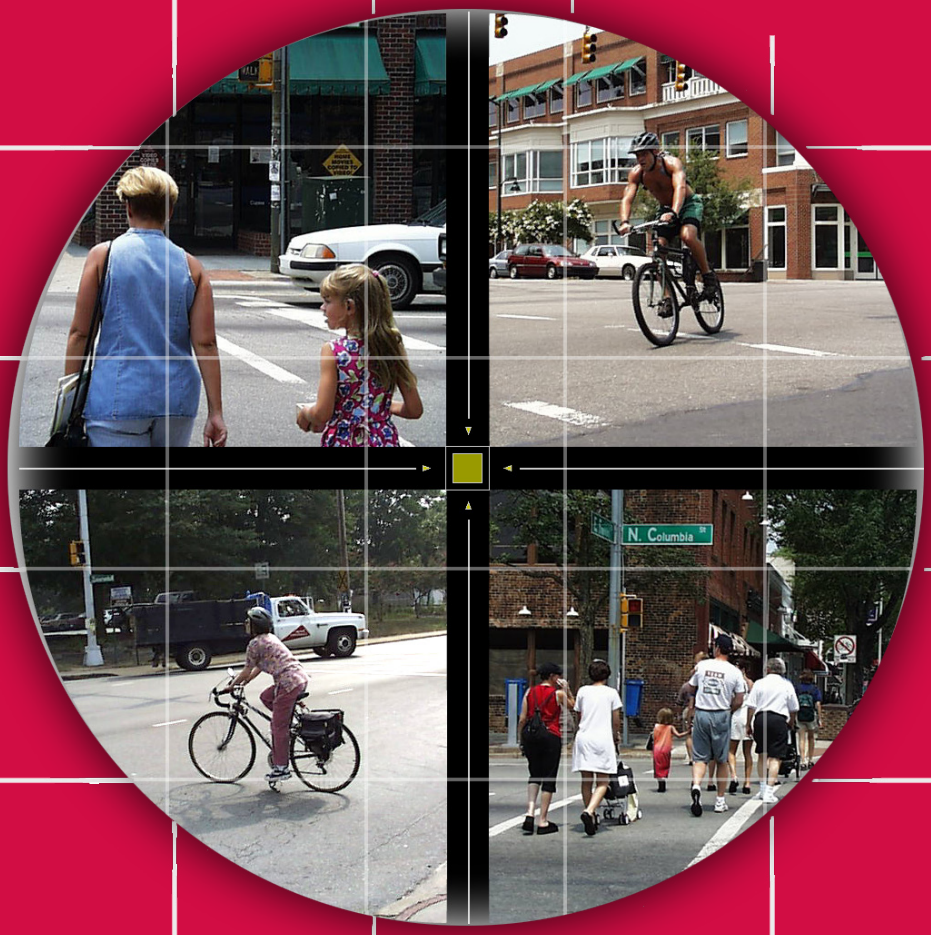

U.S. Department of Transportation
Federal Highway Administration

Research, Development, and Technology
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Pedestrian and Bicycle Safety

Foreword

The primary objective of this study was to develop safety indices to allow engineers, planners, and other practitioners to proactively prioritize intersection crosswalks and intersection approaches with respect to pedestrian and bicycle safety. The models in this study use easily collected, observable characteristics of an intersection to produce safety index values. Practitioners will be able to use these models on a small or large scale to determine where best to focus efforts to improve pedestrian and bicyclist safety.

Michael Trentacoste, Director
Director, Office of Safety
Research and Development

Notice

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16. Abstract
The primary objective of this study was to develop safety indices to allow engineers, planners, and other practitioners to proactively prioritize intersection crosswalks and intersection approaches with respect to pedestrian and bicycle safety. The study involved collecting data on pedestrian and bicycle crashes, conflicts, avoidance maneuvers, and subjective ratings of intersection video clips by pedestrian and bicycle experts. There were a total of 68 intersection crosswalks selected for the pedestrian analysis from the cities of Philadelphia, PA; San Jose, CA; and Miami-Dade County, FL. The bicycle analysis included 67 intersection approaches from Gainesville, FL; Philadelphia, PA; and Portland and Eugene, OR.

Prioritization models were developed based on expert safety ratings and behavioral data. Indicative variables included in the pedestrian safety index model included type of intersection control (signal or stop sign), number of through lanes, 85th percentile vehicle speed, main street traffic volume, and area type. Indicative variables in the bicycle safety models (for through, right-turn, and left-turn bike movements) included various combinations of: presence of bicycle lane, main and cross street traffic volumes, number of through lanes, presence of on-street parking, main street speed limit, presence of traffic signal, number of turn lanes, and others. Through this User Guide, practitioners will be able to use the safety indices to identify which crosswalks and intersection approaches have the highest priority for in-depth pedestrian and bicycle safety evaluations and subsequently use other tools to identify and address potential safety problems.

17. Key Words	18. Distribution Statement
Pedestrian safety, bicyclist safety, safety index, safety rating, crosswalk safety, intersection prioritization.	No restrictions. This document is available to the public through the National Technical Information Service, Springfield, VA 22161.

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Unclassified	Unclassified	59	

SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
	NOTE: volumes greater than 1000 L shall be shown in m^3			
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE (exact degrees)		
^oF	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	^oC
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	$candela/m^2$	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
		TEMPERATURE (exact degrees)		
^oC	Celsius	1.8C+32	Fahrenheit	^oF
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	$candela/m^2$	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.
(Revised March 2003)

Table of Contents

This User Guide is accompanied by two Microsoft® Excel™ spreadsheets:

- Ped ISI Calculator.xls
- Bike ISI Calculator.xls

These spreadsheets can be used to calculate safety index values quickly and precisely for the Ped ISI or Bike ISI.

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CHAPTER 1. OVERVIEW

WHAT ARE THE PEDESTRIAN AND BICYCLE INTERSECTION SAFETY INDICES?

The Pedestrian and Bicycle Intersection Safety Indices (Ped ISI and Bike ISI) are a set of models that enable users to identify intersection crossings and intersection approach legs that should be the greatest priority for undergoing pedestrian and bicycle safety improvements. Using observable characteristics of an intersection crossing or approach leg, the tool produces a safety index score, with higher scores indicating a greater priority for an indepth safety assessment. Each leg of an intersection may have different characteristics affecting pedestrian or bicyclist safety; therefore the tools are intended to provide an evaluation of the safety of an individual crossing (Ped ISI) or approach leg (Bike ISI) rather than evaluating the intersection as a whole. A practitioner can use the tool to develop a prioritization scheme for a group of pedestrian crossings or bicyclist approaches. This method enables the practitioner to prioritize and proactively address sites that are the most likely to be a safety concern for pedestrians or bicyclists.

WHY ARE PED ISI AND BIKE ISI NEEDED?

The need to address pedestrian and bicyclist safety is ever present. National crash statistics for 2004 show that 4,641 pedestrians and 725 pedalcyclists were killed in crashes, accounting for approximately 13 percent of all traffic fatalities in the United States.[(1)] Most of these crashes occur at intersections. Many States and municipalities have pedestrian and bicycle safety programs to identify and address high crash locations. Although these safety programs can treat pedestrian or bicyclist hazards as they are identified, it would be preferable to use a proactive method of prioritizing which intersections should be examined first to ensure that potentially risky locations are addressed before they become crash problems.

WHAT ARE THE BENEFITS OF PED ISI AND BIKE ISI?

Ped ISI and Bike ISI proactively prioritize pedestrian crossings and bicyclist approaches with respect to safety. They also provide forward-looking State and local planning agencies with a safety rating tool for proposed intersections. Each tool uses observable and easy-to-gather data.

WHERE CAN PED ISI AND BIKE ISI BE USED?

Ped ISI and Bike ISI were developed at urban and suburban intersections with the following characteristics:

- Three-leg and four-leg intersections.
- Signalized, two-way stop, and four-way stop.
- Traffic volumes from 600 to 50,000 vehicles per day.
- One-way and two-way roads.

- One to four through lanes.
- Speed limits from 24.1 to 72.4 kilometers per hour (km/h) (15 to 45 miles per hour (mi/h)).

Ped ISI and Bike ISI are used most appropriately at intersections that meet the above ranges. Safety index values produced for intersections with characteristics outside these ranges should be used only with the understanding that the models were not developed using intersections of that type.

STEPS FOR USING THE PED ISI AND BIKE ISI

1. **Select Sites To Evaluate—**Identify pedestrian crossings (Ped ISI) or intersection approaches (Bike ISI) to evaluate. It is not necessary to evaluate all intersections in a given locality at once, especially where there is a large number of sites. Here are some useful tips for considering how to begin selecting sites:

   – Are there sites in the planning stage that could be modified in the design phase to avoid potential problems?

   – Is there an area where there may be moderate to high pedestrian and/or bicyclist activity, such as in a central business district or near a popular pedestrian or bicyclist attractor?

   – Are there sites that have already been identified in the community (including residents or other users) as possible problems?

   – Are there sites where a crash has occurred? Typically these tend to naturally receive focused attention, but it may also prove useful to develop a safety index score to provide perspective, or to help identify what factor(s) may be affecting safety.

2. **Gather Data—**Gather data on geometric and operational characteristics of the selected sites, either through electronic databases or brief field visits. If the sites are in the planning stages, determine what characteristics the sites are expected to have. See the list of data required for the safety indices on page 7. A sample data collection form is available in Appendix A.

3. **Calculate Index Values—**Use Ped ISI and Bike ISI to produce index values for each site. Each site will receive a safety index value between 1 (safest) and 6 (least safe). The Ped ISI equation is shown on page 8; the Bike ISI equation is shown on page 11. Example calculations of index values are found starting on page 20. Users may also opt to use the Quick Reference Tables found in Appendix B to determine safety index values when a computer is not available.

4. **Prioritize Sites—**Sort sites according to index values. Sites with the highest index values generally have the highest priority for further indepth evaluation of pedestrian and/or bicycle safety. However, the existence of a high Ped ISI or Bike ISI value does not mean that a crosswalk or intersection approach is necessarily "hazardous." There are many characteristics and behaviors at an intersection that will result in a

pedestrian or bike crash, and no method can include all of these factors. Knowledge of the area should also be used in the prioritization of sites. The Ped ISI/Bike ISI method merely provides a way to prioritize locations to identify those which may warrant more indepth study.

CHAPTER 2. DEVELOPMENT

The Federal Highway Administration (FHWA) developed Ped ISI and Bike ISI on the basis of two measures—safety ratings (expert opinion of the safety of sites) and observed behaviors (observed interactions between pedestrians and motorists or bicyclists and motorists). These different measures provided a multifaceted approach to determining the relative safety of a pedestrian crossing or bicycle approach leg.

The research studied 68 pedestrian crossings at signalized and unsignalized intersections in Miami, FL, Philadelphia, PA, and San Jose, CA and 67 bicycle approaches at signalized and unsignalized intersections in Eugene, OR, Gainesville, FL, Philadelphia, PA, and Portland, OR. The results of the study were used to develop Ped ISI and Bike ISI.

SAFETY MEASURE: RATINGS

Experts in pedestrian and bicyclist issues viewed videos of the pedestrian crossings and bicycle approaches and rated the sites according to their perceived level of safety for a pedestrian or bicyclist. The researchers created a survey instrument designed to provide evaluators enough information about the sites to develop safety ratings. The survey presented an illustration and a video clip for each site. Evaluators were asked to view each illustration and video as if they were pedestrians crossing at the crosswalk (Figure 1 and Figure 2) or bicyclists approaching the intersection (Figure 3 and Figure 4).

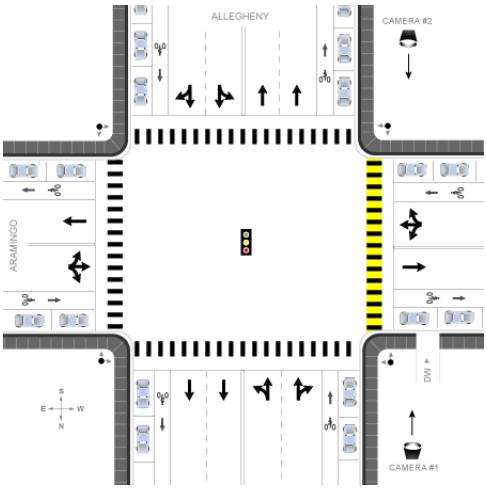


Figure 1. Sample illustration for pedestrian survey.

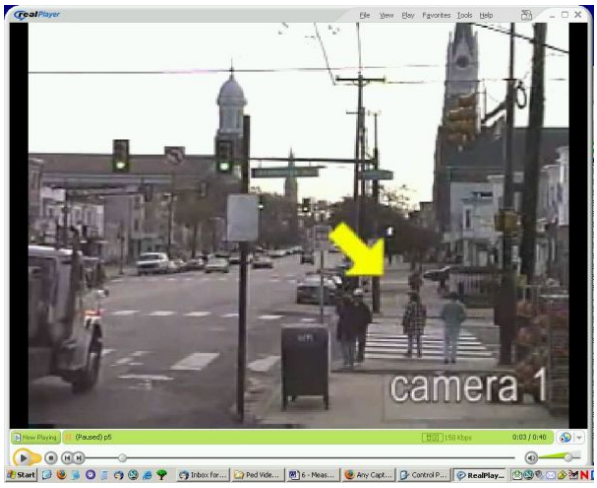


Figure 2. Sample video clip for pedestrian survey.

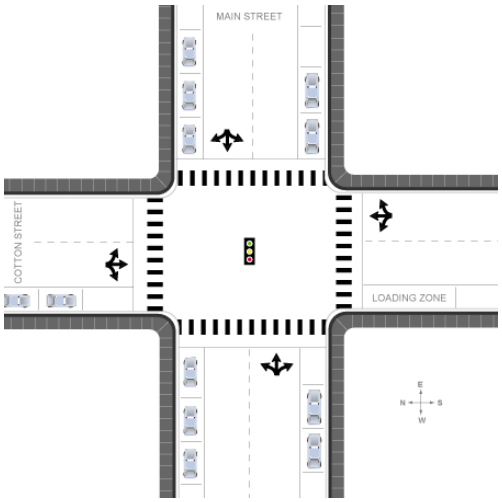


Figure 3. Sample illustration for bicycle survey.

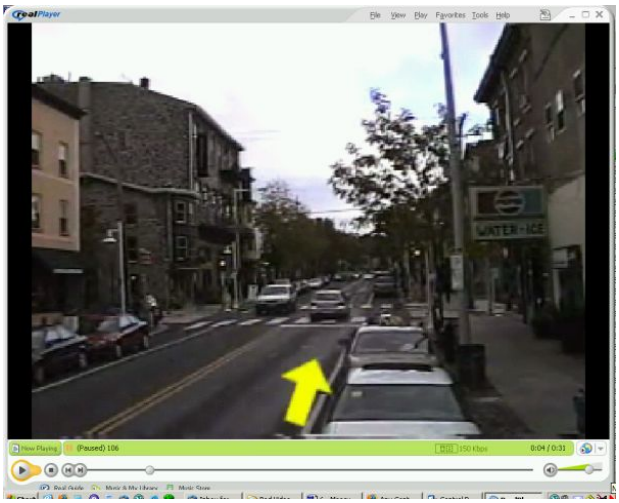


Figure 4. Sample video clip for pedestrian survey.

The evaluators rated the sites on a scale of 1 to 6, according to their sense of safety and comfort. If the conditions were such that they felt very comfortable as pedestrians or bicyclists and highly likely to walk or ride at the site, they were instructed to give a rating of "1." If the conditions were such that they felt very uncomfortable as pedestrians or bicyclists and highly unlikely to walk or ride at the site, they were instructed to give a rating of "6." They also had the option of "not enough information" if they believed that they had insufficient information from the illustration and/or video to make an informed rating. Each evaluator in the pedestrian safety survey gave one rating per crosswalk. Each evaluator in the bicyclist safety survey gave one rating for each movement that a bicyclist could make at the intersection (e.g., through, left, and/or right).

SAFETY MEASURE: OBSERVED BEHAVIORS AT INTERACTIONS

Researchers videotaped each site and watched later to record behaviors during interactions between pedestrians and motorists or bicyclists and motorists. Recorded behaviors included changes in speed or direction by a pedestrian, bicyclist, or motorist in response to the presence of another party. For example, researchers would record instances when a pedestrian stopped before or during a crossing because of an oncoming vehicle and when a right-turning motorist slowed or stopped to avoid a bicyclist. In total, researchers recorded 1,898 bicyclist-motorist interactions and 1,095 pedestrian-motorist interactions.

For more detail on the underlying research and model development, see the final research report entitled *Pedestrian and Bicyclist Intersection Safety Indices: Final Report.*[2]

CHAPTER 3. PEDESTRIAN AND BICYCLE INTERSECTION SAFETY INDICES

Below are the model equations for Ped ISI and Bike ISI. The user should keep in mind that these tools were developed to evaluate the safety of an individual crosswalk or approach leg, not the intersection as a whole. Thus, if a standard 4-leg intersection is to be evaluated, there will be 4 pedestrian safety scores, 1 for each crossing, and 12 bicycle safety scores, 3 for each leg. Higher index values indicate areas of greater safety concern. Those locations with higher index values should be prioritized for more indepth safety evaluation.

NOTE: The user may choose to average the index values for each leg together to form an index value for an entire intersection. The decision of whether this method is appropriate will depend on the user's knowledge of the area being evaluated and the understanding of how the information will be used.

DATA REQUIRED

The following is a list of data required for each safety index (*main street* defined as the street containing the crossing or approach of interest, not the street with the higher functional class or higher traffic volume):

Ped ISI

- Type of traffic control for leg of crossing (signal, stop sign, or neither).
- Number of through vehicle lanes on main street (total through lanes in both directions).
- Eighty-fifth percentile traffic speed on main street.
- Average daily traffic (ADT) of main street.
- Predominant development type surrounding the intersection (commercial or not commercial).

Bike ISI

- Presence of bicycle lane on main street.
- ADT on main and cross streets.
- Number of through vehicle lanes on cross street.
- Number, type, and configuration of traffic lanes on main street approach.
- Speed limit on main street.
- Presence of onstreet parking on main street approach.
- Type of traffic control on approach of interest (signal or no signal).

PED ISI

The Ped ISI model consists of one equation that determines the safety index score for a single pedestrian crossing. The model is presented in Table 1 below. A detailed description of the variables follows the table. Figure 5 illustrates a pedestrian crossing.

Table 1. Ped ISI model and variable descriptions.

Ped ISI = 2.372—1.867**SIGNAL**—1.807**STOP** + 0.335**THRULNS** + 0.018**SPEED** + 0.006(**MAINADT*SIGNAL)** + 0.238**COMM** where:		
Ped ISI	*Safety index value (pedestrian)*	
SIGNAL	Signal-controlled crossing	0 = no 1 = yes
STOP	Stop-sign controlled crossing	0 = no 1 = yes
THRULNS	Number of through lanes on street being crossed (both directions)	1, 2, 3, …
SPEED	Eighty-fifth percentile speed of street being crossed	Speed in miles per hour
MAINADT	Main street traffic volume	ADT in thousands
COMM	Predominant land use on surrounding area is commercial development (i.e., retail, restaurants)	0 = not predominantly commercial area 1 = predominantly commercial area

Variable Descriptions

SIGNAL (Signal Control)

This variable is "1" if movements of vehicles and pedestrians at the crossing of interest are controlled by a traffic signal.

STOP (Stop Control)

This variable is "1" if vehicle traffic on the leg with the crossing of interest must stop for a stop sign.

THRULNS (Through Lanes)

This variable is the number of through lanes on the street with the crossing of interest, not including exclusive turn lanes. However, since crosswalks that cross the stem of T-intersection do not have through lanes to cross, turning lanes are included in the count for THRULNS for these crosswalks.

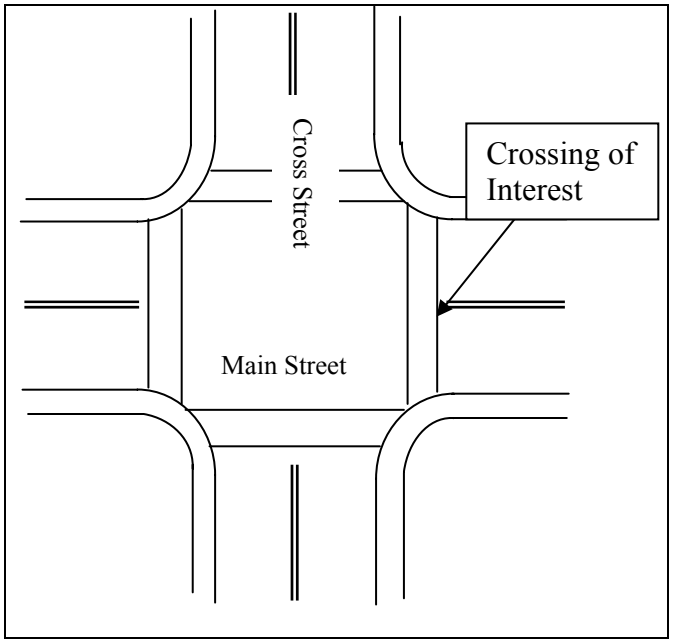


Figure 5. Illustration of pedestrian crossing.

SPEED (Vehicle Speed)

This variable is the 85th percentile speed in mi/h of free-flowing vehicles on the street with the crossing of interest. If speed data are obtained for a street on both sides of the intersection (both approaches), the values should be averaged to provide the value for the Ped ISI model. If actual speed data are not available, the user may use the speed limit or an estimate of the 85th percentile speed.

MAINADT (Main Street ADT)

This variable is the ADT volume (in thousands) of the street with the crossing of interest (main street). This is the total traffic in both directions.

COMM (Commercial Development)

This variable is "1" if the predominant land use of the surrounding area is commercially developed. Commercial development is defined as retail shops, banks, restaurants, gas stations, and other businesses that sell to the general public.

BIKE ISI

The Bike ISI consists of three equations. Each equation determines the safety index score for a single bicycle movement, either straight through, right turn, or left turn. The models are presented in Table 2 below. A detailed description of the variables follows the table**.** Figure 6 illustrates a bicycle approach.

Table 2. Bike ISI models and variable descriptions.

Through	Bike ISI = 1.13 + 0.019**MAINADT** + 0.815**MAINHISPD** + 0.650**TURNVEH** + 0.470(**RTLANES*BL**) + 0.023(**CROSSADT*NOBL**) + 0.428(**SIGNAL*NOBL**) + 0.200**PARKING**
Right Turn	Bike ISI = 1.02 + 0.027**MAINADT** + 0.519**RTCROSS** + 0.151**CROSSLNS** + 0.200**PARKING**
Left Turn	Bike ISI = 1.100 + 0.025**MAINADT** + 0.836**BL** + 0.485**SIGNAL** + 0.736(**MAINHISPD*BL**) + 0.380(**LTCROSS*NOBL**) + 0.200**PARKING**

where:

Bike ISI	*Safety index values (through, right, left)*	
BL	Bike lane presence	0 = NONE or wide curb lane (WCL) 1 = bike lane (BL) or bike lane crossover (BLX)
CROSSADT	Cross street traffic volume	ADT in thousands
CROSSLNS	Number of through lanes on cross street	1, 2, …
LTCROSS	Number of traffic lanes for cyclists to cross to make a left turn	0, 1, 2, …
MAINADT	Main street traffic volume	ADT in thousands
MAINHISPD	Main street speed limit ≥ 56.3 km/h (35 mi/h)	0 = no 1 = yes
NOBL	No bike lane present	0 = BL or BLX 1 = NONE or WCL
PARKING	Onstreet parking on main street approach	0 = no 1 = yes
RTCROSS	Number of traffic lanes for cyclists to cross to make a right turn	0, 1, 2, …
RTLANES	Number of right turn traffic lanes on main street approach	0, 1
SIGNAL	Traffic signal at intersection	0 = no 1 = yes
TURNVEH	Presence of turning vehicle traffic across the path of through cyclists	0 = no 1 = yes

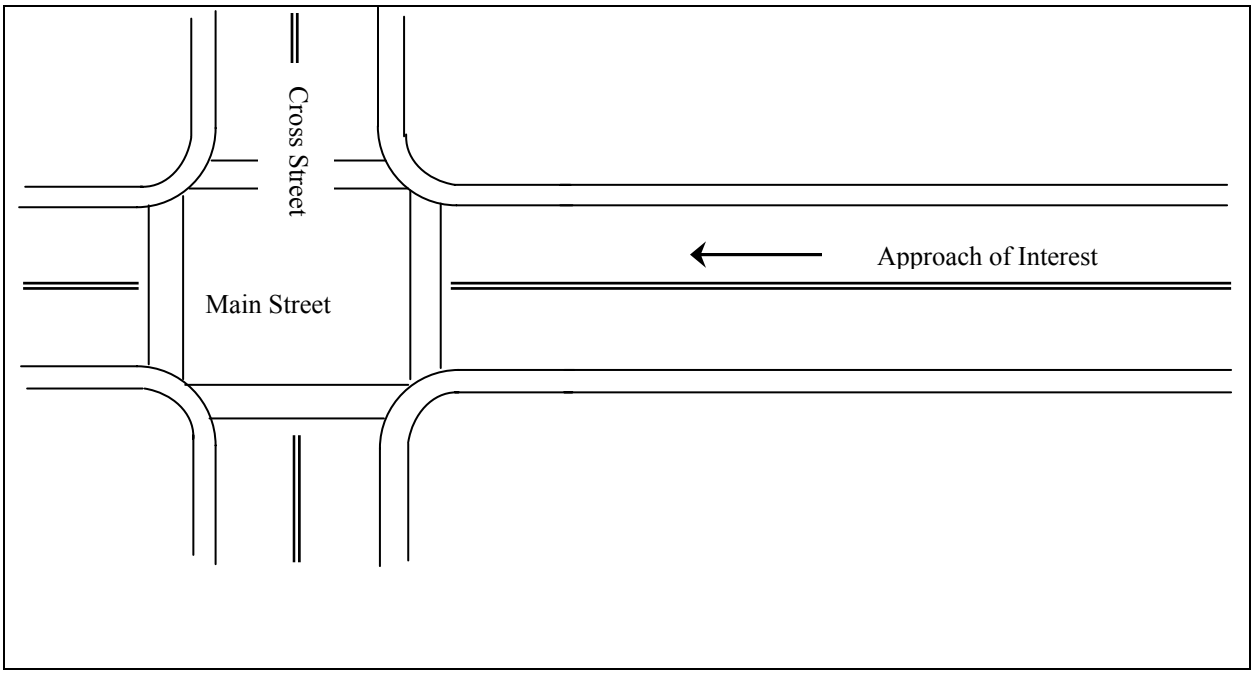


Figure 6. Illustration of bicycle approach.

Variable Descriptions

BL (Bike Lane)

This variable is "1" if there is a bike lane on the approach (defined as BL or BLX in Figure 7). Variable is "0" if there is no bicycle lane ("None") or simply a wide curb lane ("WCL"). In some cases, there may be a paved shoulder that, while not marked for bicycles, might serve as a de facto bike lane. If this paved shoulder is narrow (i.e., 0.3 to 0.9 meter (m) (1 to 3 feet (ft)), define BL as "0." If the paved shoulder is relatively wide (i.e., 1.2 m (4 ft) or greater), define BL as "1."

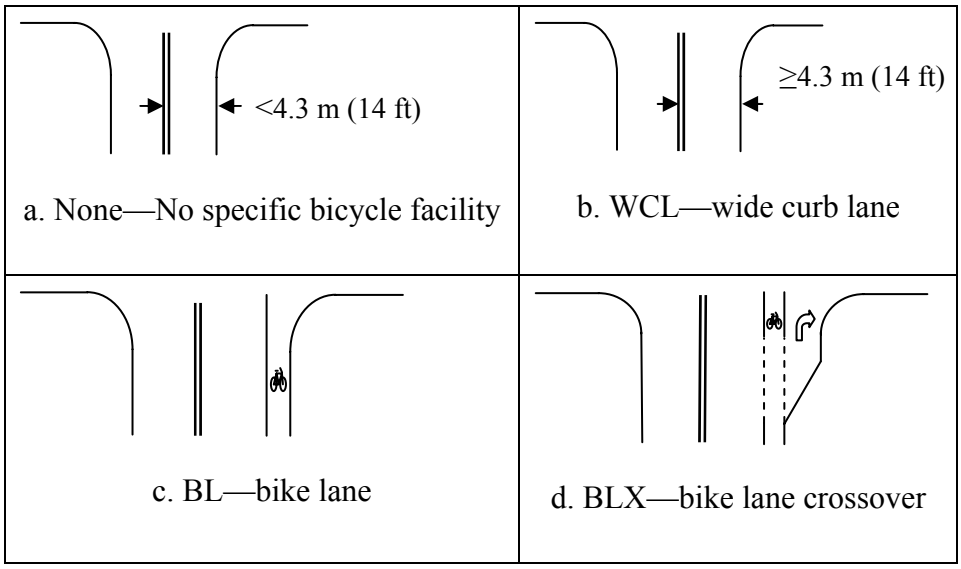


Figure 7. Bicycle facility types.

CROSSADT (Cross Street ADT)

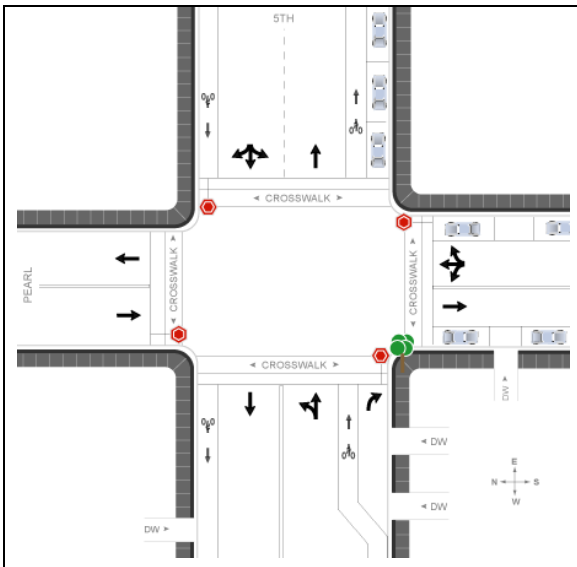
This variable is the average daily traffic volume (in thousands) of the street intersecting the approach leg of interest. This is the total traffic in both directions.

CROSSLNS (Cross Street Through Lanes)

This variable is the number of through lanes on the street intersecting the approach leg of interest.

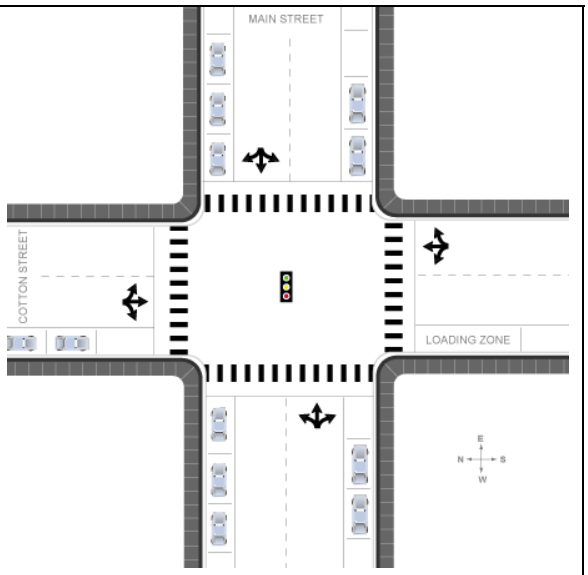
LTCROSS (Lanes to Cross for Left Turn)

This variable is the number of traffic lanes that a bicyclist on the approach of interest must cross and/or enter to make a left turn at the intersection. This variable assumes that the bicyclist is riding in a bike lane (either right-side or left-side bike lane) or on the right-hand side of the road if no bike lane is present. If this variable is not applicable (e.g., no left turn possible or permitted), the value of RTCROSS would be zero. See Figure 8 for example illustrations.



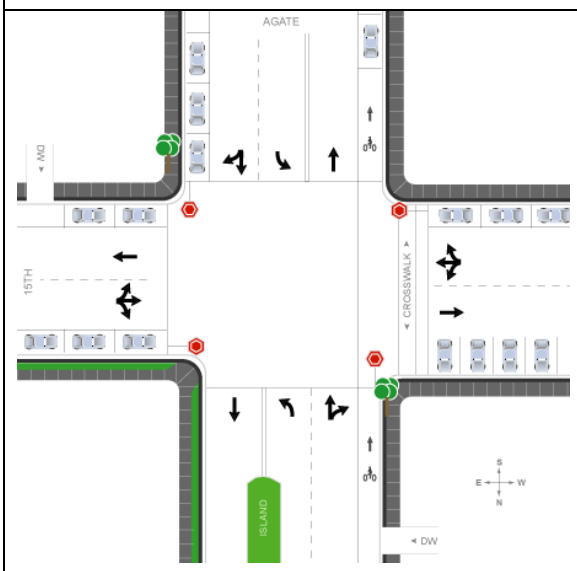
LTCROSS = 1

a. A bicyclist* in the bike lane will need to enter only one lane to make a left turn.



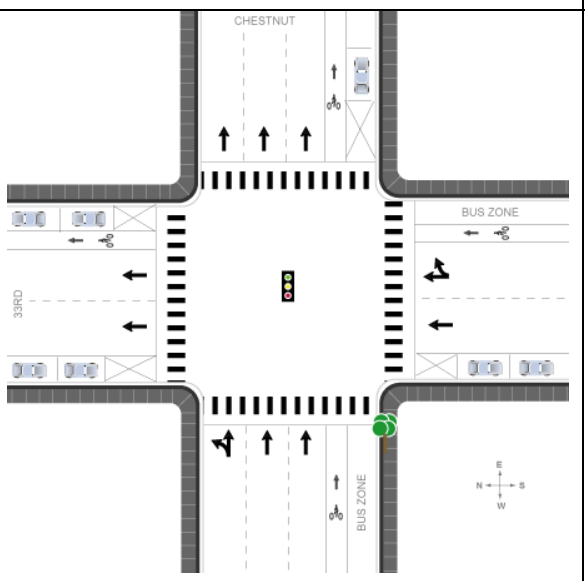
LTCROSS = 1

b. A bicyclist* (assumed to be riding on the right hand side of the road) must enter only one lane to make a left turn.



LTCROSS = 2

c. A bicyclist* in the bike lane will need to cross one lane and enter one lane (total of two) to make a left turn.



LTCROSS = 3

d. A bicyclist* (assumed riding in the bike lane) will need to cross two lanes and enter one lane (total of three) to make a left turn.

* Bicyclist approaches the intersection from the bottom leg in these examples.

Figure 8. Examples of LTCROSS values.

MAINADT (Main Street ADT)

This variable is the ADT volume (in thousands) of the approach leg of interest. This is the total traffic in both directions.

MAINHISPD (Main Street Speed Limit Over 35)

This variable is "1" if the speed limit of the leg of interest is 56.3 km/h (35 mi/h) or higher.

NOBL (No Bike Lane)

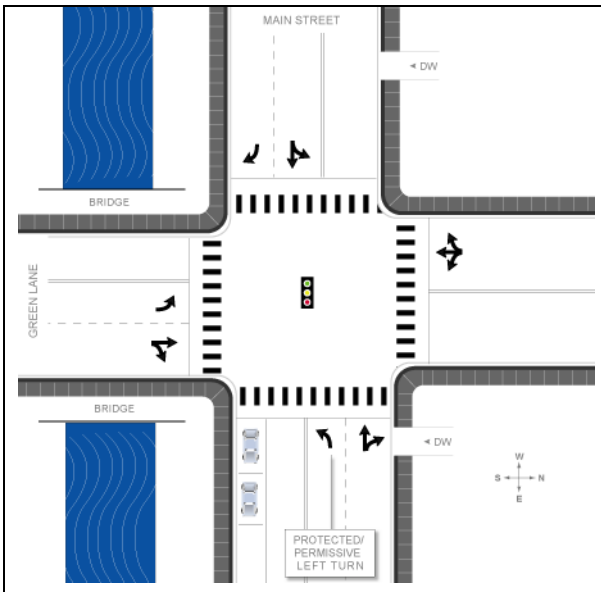
This variable is "1" if there is **no** bike lane on the approach (defined as "None" or "WCL" in Figure 7 above). Variable is "0" if there is a bicycle lane ("BL" or "BLX").

PARKING (Onstreet Parking)

This variable is "1" if there is onstreet parking on the approach of interest.

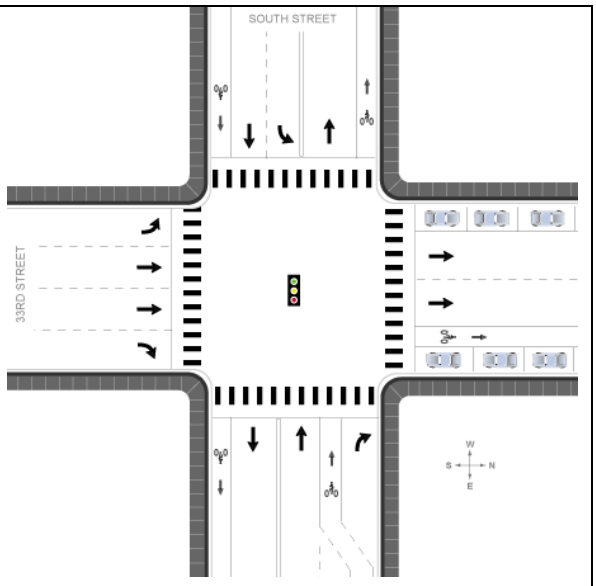
RTCROSS (Lanes to Cross for Right Turn)

This variable is the number of traffic lanes that a bicyclist on the approach of interest must cross to make a right turn at the intersection. This variable assumes that the bicyclist is riding in a bike lane (either right-side or left-side bike lane) or on the right-hand side of the road if no bike lane is present. Under these assumptions, the value of RTCROSS will typically be zero. If the bike lane is a bike lane crossover (BLX in Figure 7 above), it is assumed that the bicyclist (knowing that the bicyclist was going to make a right turn), left the bike lane and held to the right shoulder of the road. In this case, the value of RTCROSS would be zero. If this variable is not applicable (e.g., no right turn possible or permitted), the value of RTCROSS would be zero. See Figure 9 for example illustrations.



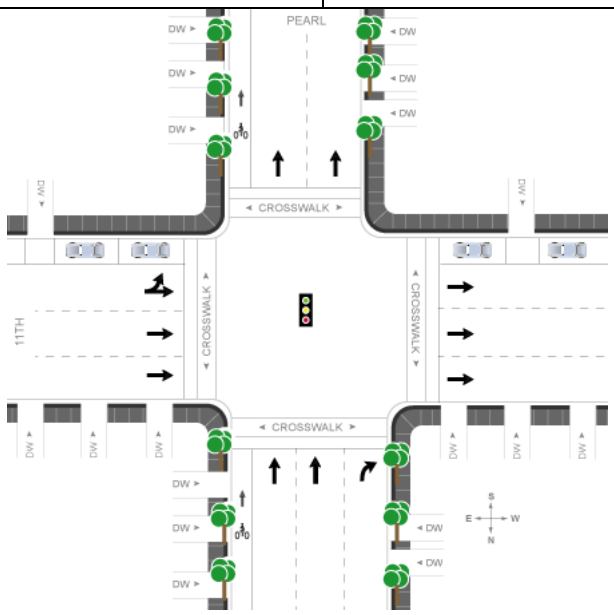
RTCROSS = 0

a. A bicyclist* (assumed to be riding on the right hand side of the road) will not need to cross or enter any lanes to make a right turn.



RTCROSS = 0

b. A bicyclist* (assumed to have left the bike lane and held to the right shoulder) will not need to cross or enter any lanes to make a right turn.



RTCROSS = 3

c. A bicyclist* (assumed to be riding in the left-side bike lane) will need to cross two lanes and enter one lane (total of three) to make a right turn.

* Bicyclist approaches the intersection from the bottom leg in these examples.

Figure 9. Examples of RTCROSS values.

RTLANES (Right-Turn Lanes)

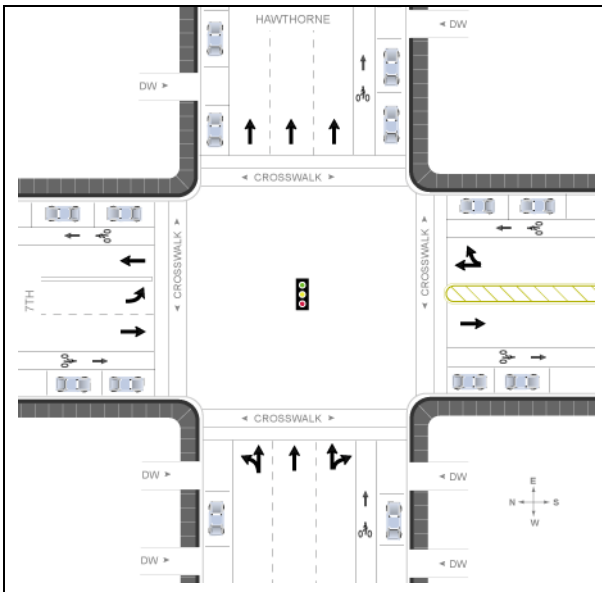
This variable is the number of exclusive right-turn traffic lanes on the leg of interest.

SIGNAL (Signalized Intersection)

This variable is "1" if the intersection is controlled by a traffic signal.

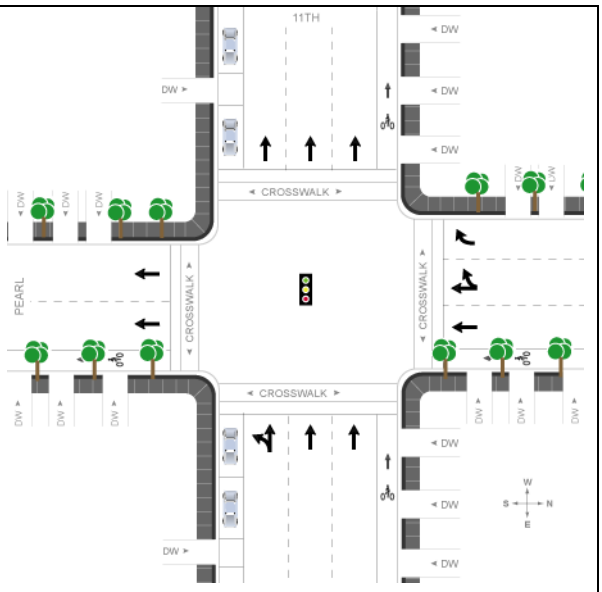
TURNVEH (Turning Vehicles)

This variable is "1" if it would be reasonable to assume that the path taken by through cyclists at the intersection is regularly crossed by vehicles turning right from the main approach to the cross street. A lack of turning traffic would occur with a bike lane crossover, since turning motorists would have merged over already. It could also occur with one-way cross streets, if the one-way flow prevents motorists from turning in front of through bicyclists. See Figure 10 for example illustrations.



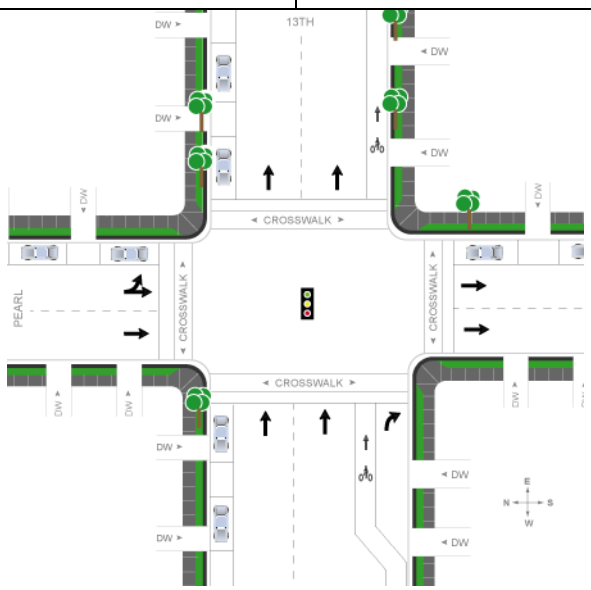
TURNVEH = 1

a. The path of through bicyclists can be intersected by vehicles turning right from the main approach onto the cross street.



TURNVEH = 0

b. The path of through bicyclists will not be intersected by vehicles turning right from the main approach onto the cross street (cross street is one-way to the left).



TURNVEH = 0

c. The path of through bicyclists (assumed to be in the bike lane when they reach the intersection) will not be intersected by vehicles turning right from the main approach onto the cross street.

* Bicyclists approach the intersection from the bottom leg in these examples.

Figure 10. Examples of TURNVEH values.

CHAPTER 4. EXAMPLES OF PED ISI AND BIKE ISI APPLICATION

The following section provides several examples which illustrate how to apply Ped ISI and Bike ISI at various sites. Each example has several site photos and a list of intersection characteristics. The example calculation of the safety index value is done with the spreadsheet calculators that accompany the User Guide. An example of using the quick reference tables is performed with the pedestrian example 1 and bicycle example 1.

PEDESTRIAN EXAMPLE

The example for Ped ISI is a four-leg, signalized intersection in a mostly residential area. The crossing of interest is on the southwest leg. Figure 11, Figure 12, and Figure 13 show onstreet and overhead photos of the site, with the crossing of interest pointed out with a white arrow.

Figure 11. Crosswalk view of pedestrian example intersection.

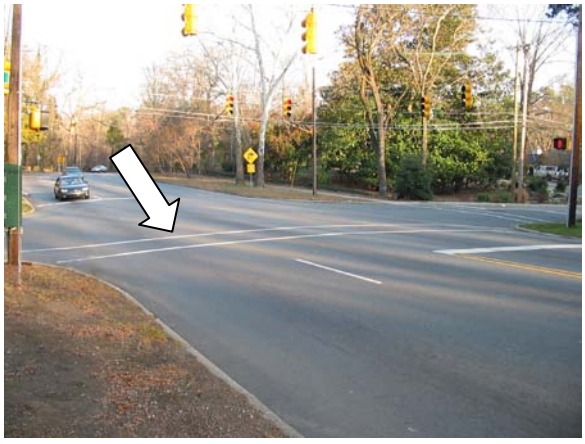


Figure 12. Diagonal view of pedestrian example intersection.

Figure 13. Overhead view of pedestrian example intersection (image courtesy of the United States Geological Survey).

This crossing location has the following characteristics:

- Signalized intersection.
- Four through lanes on the main road (two in each direction).
- Eighty-fifth percentile speed on the main road is 67.6 km/h (42 mi/h).
- Main road ADT is 22,000 vehicles per day.
- Surrounding area is residential.

Once these characteristics are entered into the spreadsheet calculator, the resulting Ped ISI value is 2.7 (Figure 14).

	A	B	D
1		**Pedestrian Safety Index Model**	
2			
3			**Crosswalk 1**
4		Name of crosswalk	Pedestrian Example #1
6	SIGNAL	Signalized (1=yes, 0=no)	1
7	STOP	Stop Controlled (1=yes, 0=no)	0
8	THRULNS	Number of Through Lanes on Main St	4
9	SPEED	85th Percentile Speed on Main St	42
10	MAINADT	Main Street ADT	22000
11	COMM	Commercial Area (1=yes, 0=no)	0
13		**Safety Index value =**	**2.7**

Figure 14. Spreadsheet calculation of Ped ISI value.

Using the Ped ISI model equation, the calculation is as follows:

Ped ISI = 2.372−1.867**SIGNAL**−1.807**STOP** + 0.335**THRULNS** + 0.018**SPEED** + 0.006**(MAINADT*SIGNAL)** = 0.238**COMM**

Ped ISI = 2.372−1.867***1**−1.807***0** + 0.335***4** + 0.018***42** + 0.006**(22*1)** = 0.238***0**

Ped ISI = 2.7

Notice that the ADT value must be entered in thousands (i.e., 22 instead of 22,000) for the equation. The spreadsheet calculator allows the user to enter the ADT as a whole value.

Another way to determine the Ped ISI value is to go directly to the quick reference tables of Ped ISI values in Appendix B. These tables are provided for various combinations of traffic control and area type. For the example above, Table 9 in Appendix B corresponds to a signalized crossing in a noncommercial area (Figure 15). Going into that table with 4 through lanes, 85th percentile speed of 67.6 km/h (42 mi/h) (use the column of the nearest value, i.e., 64.4 km/h (40 mi/h)), and 22,000 ADT (use the row with 20,000 ADT), the Ped ISI value is 2.7.

Main Rd Thru Lns		1 Through Lane					2 Through Lanes					3 Through Lanes					4 Through Lanes				
Main Rd Speed		25	30	35	40	45	25	30	35	40	45	25	30	35	40	45	25	30	35	40	45
ADT	1000	1.3	1.4	1.5	1.6	1.7	1.6	1.7	1.8	1.9	2.0	2.0	2.1	2.1	2.2	2.3	2.3	2.4	2.5	2.6	2.7
	5000	1.3	1.4	1.5	1.6	1.7	1.7	1.7	1.8	1.9	2.0	2.0	2.1	2.2	2.3	2.4	2.3	2.4	2.5	2.6	2.7
	10000	1.4	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.0	2.0	2.1	2.2	2.3	2.4	2.4	2.4	2.5	2.6	2.7
	15000	1.4	1.5	1.6	1.7	1.7	1.7	1.8	1.9	2.0	2.1	2.1	2.1	2.2	2.3	2.4	2.4	2.5	2.6	2.7	2.7
	20000	1.4	1.5	1.6	1.7	1.8	1.7	1.8	1.9	2.0	2.1	2.1	2.2	2.3	2.4	[illegible]	[illegible]	2.5	2.6	2.7	2.8
	25000	1.4	1.5	1.6	1.7	1.8	1.8	1.9	2.0	2.0	2.1	2.1	2.2	2.3	2.4	[illegible]	[illegible]	2.5	2.6	2.7	2.8
	30000	1.5	1.6	1.7	1.7	1.8	1.8	1.9	2.0	2.1	2.2	2.1	2.2	2.3	2.4	2.5	2.5	2.6	2.7	2.7	2.8
	35000	1.5	1.6	1.7	1.8	1.9	1.8	1.9	2.0	2.1	2.2	2.2	2.3	2.4	2.4	2.5	2.5	2.6	2.7	2.8	2.9
	40000	1.5	1.6	1.7	1.8	1.9	1.9	2.0	2.0	2.1	2.2	2.2	2.3	2.4	2.5	2.6	2.5	2.6	2.7	2.8	2.9
	45000	1.6	1.7	1.7	1.8	1.9	1.9	2.0	2.1	2.2	2.3	2.2	2.3	2.4	2.5	2.6	2.6	2.7	2.7	2.8	2.9
	50000	1.6	1.7	1.8	1.9	2.0	1.9	2.0	2.1	2.2	2.3	2.3	2.4	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0

1 mi/h = 1.6 km/h

Figure 15. Quick reference table—pedestrian (signalized and noncommercial area).

BICYCLE EXAMPLE 1

Example 1 for Bike ISI is the westbound approach of a four-leg, signalized intersection. Figure 16, Figure 17, and Figure 18 show onstreet and overhead photos of the approach of interest (indicated by arrow).

Figure 16. Street view of bicycle example 1.

Figure 17. Street view of bicycle example 1.

Figure 18. Overhead photo of bicycle example 1 (image courtesy of the United States Geological Survey).

This approach has the following characteristics:

- Signalized intersection.
- Speed limit of 56.3 km/h (35 mi/h) on the main road.
- One exclusive right-turn lane and one exclusive left-turn lane on the approach.
- No bicycle facility on the approach.
- No onstreet parking on the approach.
- Main road ADT is 17,000 vehicles per day.
- Cross street ADT is 28,000 vehicles per day.
- Four through lanes on the cross street.

Once these characteristics are entered into the spreadsheet calculator, the resulting Bike ISI values are 4.0 for through movement, 2.1 for right turns, and 3.2 for left turns (Figure 19).

	A	B	F
1	**Bicycle Safety Index Models**		
2			**Approach 1**
3		Name of approach leg	Bicycle Example #1
5	MAINADT	Main Street ADT	17000
6	MAINHISPD	Main street speed limit ≥ 35 mph (1=yes, 0=no)	1
7	TURNVEH	Presence of turning vehicle traffic across the path of through cyclists (1=yes, 0=no)	1
8	RTLANES	Number of right turn traffic lanes on main street approach	1
9	BL	Bike lane present (1=yes, 0=no)	0
10	CROSSADT	Cross street traffic volume	28000
11	SIGNAL	Traffic signal at intersection (1=yes, 0=no)	1
12	PARKING	On-street parking on main street approach (1=yes, 0=no)	0
13	RTCROSS	Number of traffic lanes for cyclists to cross to make a right turn	0
14	CROSSLNS	Number of through lanes on cross street	4
15	LTCROSS	Number of traffic lanes for cyclists to cross to make a left turn	3
18		**Safety Index Through Value =**	**4.0**
19		**Safety Index Right Turn Value =**	**2.1**
20		**Safety Index Left Turn Value =**	**3.2**
21			

1 mi/h = 1.6 km/h

Figure 19. Spreadsheet calculation of safety index values for bicycle example 1.

Using the Bike ISI model equations, the calculations are as shown in Table 3:

Table 3. Bike ISI model equations.

Through	Bike ISI = 1.13 + 0.019**MAINADT** + 0.815**MAINHISPD** + 0.650**TURNVEH** + 0.470(**RTLANES*BL**) + 0.023(**CROSSADT*NOBL**) + 0.428(**SIGNAL*NOBL**) + 0.200**PARKING** Bike ISI = 1.13 + 0.019***17** + 0.815***1** + 0.650***1** + 0.470(**1*0**) + 0.023(**28*1**) + 0.428(**1*1**) + 0.200***0** Bike ISI = 4.0
Right Turn	Bike ISI = 1.02 + 0.027**MAINADT** + 0.519**RTCROSS** + 0.151**CROSSLNS** + 0.200**PARKING** Bike ISI = 1.02 + 0.027***17** + 0.519***0** + 0.151***4** + 0.200***0** Bike ISI = 2.1
Left Turn	Bike ISI = 1.100 + 0.025**MAINADT** + 0.836**BL** + 0.485**SIGNAL** + 0.736(**MAINHISPD*BL**) + 0.380(**LTCROSS*NOBL**) + 0.200**PARKING** Bike ISI = 1.100 + 0.025***17** + 0.836***0** + 0.485***1** + 0.736(**1*0**) + 0.380(**3*1**) + 0.200***0** Bike ISI = 3.2

Using the quick reference tables for bicycle example 1, the following results are found:

"Through" safety index value

Since there are four "through" bicycle tables (Tables 14, 15, 16, and 17 in Appendix B), it is necessary to start with Table 15 for "Signalized Intersection" and "No Bike Lane" (shown here in Figure 20, full-size table available in Appendix B). Across the top of the table, the user would select the column for "35 mph or more," "No parking," "1 Right-Turn Lane," and "Yes" for potential turning vehicles. Down the side of the table, it is necessary to interpolate the Main and Cross ADT values. The table shows that the through safety index value will lie between 3.7/3.9 and 3.9/4.1 (the exact calculation performed in Figure 19 above shows that the actual value is 4.0).

Main Rd Spd Lmt		35 mph or more								Less than 35 mph							
Parking		Yes				No				Yes				No			
RT Lanes		No RT Lane		1 RT Lane		No RT Lane		1 RT Lane		No RT Lane		1 RT Lane		No RT Lane		1 RT Lane	
Turning Vehicle		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Main ADT	Cross ADT																
1000	1000	3.3	2.6	3.3	2.6	3.1	2.4	3.1	2.4	2.5	1.8	2.5	1.8	2.3	1.6	2.3	1.6
	5000	3.4	2.7	3.4	2.7	3.2	2.5	3.2	2.5	2.5	1.9	2.5	1.9	2.3	1.7	2.3	1.7
	10000	3.5	2.8	3.5	2.8	3.3	2.6	3.3	2.6	2.7	2.0	2.7	2.0	2.5	1.8	2.5	1.8
	20000	3.7	3.1	3.7	3.1	3.5	2.9	3.5	2.9	2.9	2.2	2.9	2.2	2.7	2.0	2.7	2.0
	30000	3.9	3.3	3.9	3.3	3.7	3.1	3.7	3.1	3.1	2.5	3.1	2.5	2.9	2.3	2.9	2.3
	40000	4.2	3.5	4.2	3.5	4.0	3.3	4.0	3.3	3.3	2.7	3.3	2.7	3.1	2.5	3.1	2.5
5000	1000	3.3	2.7	3.3	2.7	3.1	2.5	3.1	2.5	2.5	1.9	2.5	1.9	2.3	1.7	2.3	1.7
	5000	3.4	2.8	3.4	2.8	3.2	2.6	3.2	2.6	2.6	2.0	2.6	2.0	2.4	1.8	2.4	1.8
	10000	3.5	2.9	3.5	2.9	3.3	2.7	3.3	2.7	2.7	2.1	2.7	2.1	2.5	1.9	2.5	1.9
	20000	3.8	3.1	3.8	3.1	3.6	2.9	3.6	2.9	3.0	2.3	3.0	2.3	2.8	2.1	2.8	2.1
	30000	4.0	3.4	4.0	3.4	3.8	3.2	3.8	3.2	3.2	2.5	3.2	2.5	3.0	2.3	3.0	2.3
	40000	4.2	3.6	4.2	3.6	4.0	3.4	4.0	3.4	3.4	2.8	3.4	2.8	3.2	2.6	3.2	2.6
10000	1000	3.4	2.8	3.4	2.8	3.2	2.6	3.2	2.6	2.6	2.0	2.6	2.0	2.4	1.8	2.4	1.8
	5000	3.5	2.9	3.5	2.9	3.3	2.7	3.3	2.7	2.7	2.1	2.7	2.1	2.5	1.9	2.5	1.9
	10000	3.6	3.0	3.6	3.0	3.4	2.8	3.4	2.8	2.8	2.2	2.8	2.2	2.6	2.0	2.6	2.0
	20000	3.9	3.2	3.9	3.2	3.7	3.0	3.7	3.0	3.1	2.4	3.1	2.4	2.9	2.2	2.9	2.2
	30000	4.1	3.5	4.1	3.5	3.9	3.3	3.9	3.3	3.3	2.6	3.3	2.6	3.1	2.4	3.1	2.4
	40000	4.3	3.7	4.3	3.7	4.1	3.5	4.1	3.5	3.5	2.9	3.5	2.9	3.3	2.7	3.3	2.7
20000	1000	3.6	3.0	3.6	3.0	3.4	2.8	3.4	2.8	2.8	2.2	2.8	2.2	2.6	2.0	2.6	2.0
	5000	3.7	3.1	3.7	3.1	3.5	2.9	3.5	2.9	2.9	2.3	2.9	2.3	2.7	2.1	2.7	2.1
	10000	3.8	3.2	3.8	3.2	3.6	3.0	3.6	3.0	3.0	2.4	3.0	2.4	2.8	2.2	2.8	2.2
	20000	4.1	3.4	4.1	3.4	3.9	3.2	3.9	3.2	3.2	2.6	3.2	2.6	3.0	2.4	3.0	2.4
	30000	4.3	3.6	4.3	3.6	4.1	3.4	4.1	3.4	3.5	2.8	3.5	2.8	3.3	2.6	3.3	2.6
	40000	4.5	3.8	4.5	3.8	4.3	3.7	4.3	3.7	3.7	3.1	3.7	3.1	3.5	2.9	3.5	2.9
30000	1000	3.8	3.2	3.8	3.2	3.6	3.0	3.6	3.0	3.0	2.4	3.0	2.4	2.8	2.2	2.8	2.2
	5000	3.9	3.3	3.9	3.3	3.7	3.1	3.7	3.1	3.1	2.4	3.1	2.4	2.9	2.2	2.9	2.2
	10000	4.0	3.4	4.0	3.4	3.8	3.2	3.8	3.2	3.2	2.6	3.2	2.6	3.0	2.4	3.0	2.4
	20000	4.3	3.6	4.3	3.6	4.1	3.4	4.1	3.4	3.4	2.8	3.4	2.8	3.2	2.6	3.2	2.6
	30000	4.5	3.8	4.5	3.8	4.3	3.6	4.3	3.6	3.7	3.0	3.7	3.0	3.5	2.8	3.5	2.8
	40000	4.7	4.1	4.7	4.1	4.5	3.9	4.5	3.9	3.9	3.2	3.9	3.2	3.7	3.0	3.7	3.0
40000	1000	4.0	3.4	4.0	3.4	3.8	3.2	3.8	3.2	3.2	2.5	3.2	2.5	3.0	2.3	3.0	2.3
	5000	4.1	3.4	4.1	3.4	3.9	3.2	3.9	3.2	3.3	2.6	3.3	2.6	3.1	2.4	3.1	2.4
	10000	4.2	3.6	4.2	3.6	4.0	3.4	4.0	3.4	3.4	2.7	3.4	2.7	3.2	2.5	3.2	2.5
	20000	4.4	3.8	4.4	3.8	4.2	3.6	4.2	3.6	3.6	3.0	3.6	3.0	3.4	2.8	3.4	2.8
	30000	4.7	4.0	4.7	4.0	4.5	3.8	4.5	3.8	3.9	3.2	3.9	3.2	3.7	3.0	3.7	3.0
	40000	4.9	4.3	4.9	4.3	4.7	4.1	4.7	4.1	4.1	3.4	4.1	3.4	3.9	3.2	3.9	3.2
50000	1000	4.2	3.5	4.2	3.5	4.0	3.3	4.0	3.3	3.4	2.7	3.4	2.7	3.2	2.5	3.2	2.5
	5000	4.3	3.6	4.3	3.6	4.1	3.4	4.1	3.4	3.5	2.8	3.5	2.8	3.3	2.6	3.3	2.6
	10000	4.4	3.8	4.4	3.8	4.2	3.6	4.2	3.6	3.6	2.9	3.6	2.9	3.4	2.7	3.4	2.7
	20000	4.6	4.0	4.6	4.0	4.4	3.8	4.4	3.8	3.8	3.2	3.8	3.2	3.6	3.0	3.6	3.0
	30000	4.9	4.2	4.9	4.2	4.7	4.0	4.7	4.0	4.0	3.4	4.0	3.4	3.8	3.2	3.8	3.2
	40000	5.1	4.4	5.1	4.4	4.9	4.2	4.9	4.2	4.3	3.6	4.3	3.6	4.1	3.4	4.1	3.4

1 mi/h = 1.6 km/h

Figure 20. Quick reference table—bicycle through (signalized with no bike lane).

"Right turn" safety index value

There is only one table for right turn safety index values, Table 18, (shown here in Figure 21, full-size table available in Appendix B). Across the top of the table, the user would select the column for "4 Cross Street Through Lanes," "No" onstreet parking, and "0" RT Cross Lanes (lanes to cross to make a right turn). Down the side of the table, it is necessary to interpolate the Main ADT values. The table shows that the through safety index value will lie between 1.9 and 2.2 (the exact calculation performed in Figure 19 above shows that the actual value is 2.1).

Cross Lanes		1 Cross Street Through Lane				2 Cross Street Through Lanes				4 Cross Street Through Lanes			
Parking		Yes		No		Yes		No		Yes		No	
RT Cross Lns		0	1	0	1	0	1	0	1	0	1	0	1
Main ADT	1000	1.4	1.9	1.2	1.7	1.5	2.1	1.3	1.9	1.9	2.4		2.2
	5000	1.5	2.0	1.3	1.8	1.7	2.2	1.5	2.0	2.0	2.5		2.3
	10000	1.6	2.2	1.4	2.0	1.8	2.3	1.6	2.1		2.6	1.9	2.4
	20000											2.2	2.7
	30000	2.2	2.7	2.0	2.5	2.3	2.9	2.1	2.7	2.6	3.2	2.4	3.0
	40000	2.5	3.0	2.3	2.8	2.6	3.1	2.4	2.9	2.9	3.4	2.7	3.2
	50000	2.7	3.2	2.5	3.0	2.9	3.4	2.7	3.2	3.2	3.7	3.0	3.5

Figure 21. Quick reference table—bicycle right turn.

"Left turn" safety index value

Since there are four "left turn" bicycle tables (Tables 19, 20, 21, and 22 in Appendix B), it is necessary to start with Table 20 for "Signalized Intersection" and "No Bike Lane" (shown here in Figure 22, full-size table available in Appendix B). Across the top of the table, the user would select the column for "35 mph or more," "3" LT Cross lanes (lanes to cross to make a left turn), and "No" onstreet parking. Down the side of the table, it is necessary to interpolate the Main ADT values. The table shows that the through safety index value will lie between 3.0 and 3.2 (the exact calculation performed in Figure 19 above shows that the actual value is 3.2).

Main Street Spd Lmt		35 mph or more						Less than 35 mph					
LT Cross Lns		1		2		3		1		2		3	
Parking		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
ADT	1000	2.2	2.0	2.6	2.4	3.0	2.8	2.2	2.0	2.6	2.4	3.0	2.8
	5000	2.3	2.1	2.7	2.5	3.1	2.9	2.3	2.1	2.7	2.5	3.1	2.9
	10000	2.4	2.2	2.8	2.6	3.2	3.0	2.4	2.2	2.8	2.6	3.2	3.0
	20000						3.2	2.7	2.5	3.0	2.8	3.4	3.2
	30000	2.9	2.7	3.3	3.1	3.7	3.5	2.9	2.7	3.3	3.1	3.7	3.5
	40000	3.2	3.0	3.5	3.3	3.9	3.7	3.2	3.0	3.5	3.3	3.9	3.7
	50000	3.4	3.2	3.8	3.6	4.2	4.0	3.4	3.2	3.8	3.6	4.2	4.0

1 mi/h = 1.6 km/h

Figure 22. Quick reference table—bicycle left turn (signalized with no bike lane).

BICYCLE EXAMPLE 2

Example 2 for Bike ISI is the westbound approach of a three-leg, signalized intersection. Figure 23, Figure 24, and Figure 25 show onstreet and overhead photos of the approach of interest (indicated by arrow).

Figure 23. Street view of bicycle example 2.

Figure 24. Street view of bicycle example 2.

Figure 25. Overhead view of bicycle example 2 (image courtesy of the United States Geological Survey).

This approach has the following characteristics:

- Signalized intersection.
- T-intersection (no right turn possible on approach of interest).
- Speed limit of 48.3 km/h (30 mi/h) on the main road.
- One exclusive left-turn lane on the approach.
- Bicycle lane on the approach.
- No onstreet parking on the approach.
- Main road ADT is 10,000 vehicles per day.
- Cross street ADT is 6,000 vehicles per day.
- Two through lanes on the cross street.

Once these characteristics are entered into the spreadsheet calculator, the resulting Bike ISI values are 1.3 for through movements, 1.6 for right turns, and 2.7 for left turns (Figure 26). These values can also be obtained from Tables 14, 18, and 19 in Appendix B.

	A	B	G
1	**Bicycle Safety Index Models**		
2			**Approach 2**
3		Name of approach leg	Bicycle Example #2
5	MAINADT	Main Street ADT	10000
6	MAINHISPD	Main street speed limit ≥ 35 mph (1=yes, 0=no)	0
7	TURNVEH	Presence of turning vehicle traffic across the path of through cyclists (1=yes, 0=no)	0
8	RTLANES	Number of right turn traffic lanes on main street approach	0
9	BL	Bike lane present (1=yes, 0=no)	1
10	CROSSADT	Cross street traffic volume	6000
11	SIGNAL	Traffic signal at intersection (1=yes, 0=no)	1
12	PARKING	On-street parking on main street approach (1=yes, 0=no)	0
13	RTCROSS	Number of traffic lanes for cyclists to cross to make a right turn	0
14	CROSSLNS	Number of through lanes on cross street	2
15	LTCROSS	Number of traffic lanes for cyclists to cross to make a left turn	2
18		**Safety Index Through Value =**	**1.3**
19		**Safety Index Right Turn Value =**	**1.6**
20		**Safety Index Left Turn Value =**	**2.7**

1 mi/h = 1.6 km/h

Figure 26. Spreadsheet calculation of bike ISI values for bicycle example 2.

BICYCLE EXAMPLE 3

Example 3 for Bike ISI is the westbound approach of a four-leg, signalized intersection. Figure 27, Figure 28, and Figure 29 show onstreet and overhead photos of the approach of interest (indicated by arrow).

Figure 27. Street view of bicycle example 3.

Figure 28. Street view of bicycle example 3.

Figure 29. Overhead view of bicycle example 3 (image courtesy of the United States Geological Survey).

This approach has the following characteristics:

- Signalized intersection.
- Speed limit of 56.3 km/h (35 mi/h) on the main road.
- One exclusive left-turn lane on the approach.
- No bicycle facility on the approach.
- Onstreet parking on the approach.
- Main road ADT is 17,000 vehicles per day.
- Cross street ADT is 18,000 vehicles per day.
- Four through lanes on the cross street.

Once these characteristics are entered into the spreadsheet calculator, the resulting Bike ISI values are 4.0 for through movements, 2.3 for right turns, and 3.4 for left turns (Figure 30). These values can also be obtained from Tables 15,18, and 20 in Appendix B.

	A	B	H
1	**Bicycle Safety Index Models**		
2			**Approach 3**
3		Name of approach leg	Bicycle Example #3
5	MAINADT	Main Street ADT	17000
6	MAINHISPD	Main street speed limit ≥ 35 mph (1=yes, 0=no)	1
7	TURNVEH	Presence of turning vehicle traffic across the path of through cyclists (1=yes, 0=no)	1
8	RTLANES	Number of right turn traffic lanes on main street approach	0
9	BL	Bike lane present (1=yes, 0=no)	0
10	CROSSADT	Cross street traffic volume	18000
11	SIGNAL	Traffic signal at intersection (1=yes, 0=no)	1
12	PARKING	On-street parking on main street approach (1=yes, 0=no)	1
13	RTCROSS	Number of traffic lanes for cyclists to cross to make a right turn	0
14	CROSSLNS	Number of through lanes on cross street	4
15	LTCROSS	Number of traffic lanes for cyclists to cross to make a left turn	3
18		**Safety Index Through Value =**	**4.0**
19		**Safety Index Right Turn Value =**	**2.3**
20		**Safety Index Left Turn Value =**	**3.4**
21			

Figure 30. Spreadsheet calculation of bike ISI values for bicycle example 3.

CHAPTER 5. Q & A ON MODEL APPLICATION

Q: Is there a specific safety index value at which safety improvements would be recommended at a site?

A: No, the purpose of this tool is not to dictate specific safety index values to serve as "warrants" for safety treatments. Rather, the purpose is to assign safety index values to crossings and bicycle approaches with the goal of providing the practitioner with the means to prioritize these sites for the purpose of further safety evaluation. For example, a practitioner may have 30 crossings in his or her jurisdiction to evaluate with respect to pedestrian safety. The practitioner would use Ped ISI to assign safety index values to each of the 30 crossings. The crossings with the highest values would be the first crossings where the practitioner should conduct indepth evaluations to determine if pedestrian safety problems exist at those sites. Such an evaluation may include an investigation into the crash history of the site, which may lead to countermeasure recommendations from other resources such as PEDSAFE. Other evaluations may include pedestrian counts and behavior studies or pedestrian conflict analysis.

Q: Can the Ped ISI or Bike ISI values from each leg be combined to produce a safety index value for the whole intersection?

A: If the user wishes to produce a safety index value for an entire intersection, the suggested method is to average the index values from all legs. However, caution should be used in this approach. Some intersections may have one leg that is high priority for safety evaluation (high index value) and three legs that are low priority (low index values). If the leg safety index values are averaged at this intersection, the result will be a low intersection safety index, and the high priority of the one leg may go unnoticed.

Q: Do all three Bike ISI values (through, right, and left) need to be calculated each time?

A: If bicyclist traffic is expected to perform all three maneuvers at the intersection, it is advisable to evaluate the safety of all maneuvers—through, right, and left.

Q: Are Ped ISI and Bike ISI to be used only at four-leg intersections or can they be used for intersections with three, five, and six legs?

A: Ped ISI and Bike ISI were developed using three-leg and four-leg intersections. Since the models produce safety index values for individual legs instead of an entire intersection, it is possible to use Ped ISI and Bike ISI at intersections with five and six legs. Many of the factors that affect pedestrian or bicyclist safety at four-legged intersections would affect safety similarly at five-leg or six-leg intersections. However, safety index values produced for five-leg or six-leg intersections should be used only with the understanding that the models were not developed using intersections of that type.

Q: Can Ped ISI and Bike ISI be used to prioritize midblock crossings?

A: No, Ped ISI and Bike ISI were developed for intersections only.

Q: Can Ped ISI and Bike ISI be used to prioritize legs of a roundabout?

A: No, Ped ISI and Bike ISI were developed for signalized or stop-controlled intersections only.

CHAPTER 6. COUNTERMEASURE SELECTION

Once pedestrian crossings and bicycle approaches to intersections have been prioritized for indepth safety evaluation using Ped ISI and Bike ISI, the practitioner will have many options for evaluation, analysis, and treatment. The authors recommend PEDSAFE and BIKESAFE as excellent tools to assist in the selection of appropriate countermeasures. PEDSAFE is available from FHWA.[3] The online version can be accessed at www.walkinginfo.org/pedsafe. BIKESAFE is also available from FHWA.[4] The online version can be accessed at www.bicyclinginfo.org/bikesafe.

PEDSAFE and BIKESAFE are designed to recommend treatments for specific safety problems. To make full use of the information provided in these tools, the practitioner will need to gather knowledge of the most common safety problems at each site to be addressed. Examining the types of crashes that occur at the site or analyzing behavior of pedestrians, bicyclists, and motorists at the site can provide knowledge of safety problems.

PEDSAFE

The PEDSAFE guide provides details on 49 different types of safety treatments which can be used to improve pedestrian safety and/or mobility. It also includes information on the specific types of countermeasures which may be appropriate for addressing such objectives as the following:

- Reducing speed of motor vehicles.
- Improving sight distance and visibility for motorists and pedestrians.
- Reducing volume of motor vehicles.
- Reducing pedestrian exposure to traffic (e.g., reducing crossing distance).
- Improve compliance with traffic laws.
- Eliminating behaviors that lead to crashes.

A listing of pedestrian-related treatments for each of these eight performance objectives is given by "categories" of treatments; including pedestrian facility design, roadway design, intersection design, traffic calming, traffic management, and signals and signs. For example, to reduce the speed of motor vehicles, possible roadway design treatments include adding a bike lane or shoulder, road narrowing, reducing the number of lanes, driveway improvements, curb radius reduction, and adding a right-turn slip lane.

The PEDSAFE guide also gives a description of 12 specific pedestrian crash types (e.g., dart/dash, walking along roadway, turning vehicle, multiple-threat), with corresponding countermeasure options for each crash type. PEDSAFE also contains writeups for 71 case studies of pedestrian improvements which have been implemented in the United States. Also, the expert system software is provided to allow a user to input the type of pedestrian safety problem, along with the location or roadway section characteristics, such as intersection or midblock, type of control devices (e.g., traffic signal, stop sign, no control), number of lanes,

and traffic volume. The software then will generate a "short list" of countermeasure options based on the type of pedestrian safety problem and site characteristics.

BIKESAFE

The BIKESAFE guide also gives similar types of information on countermeasures for bike-related crashes. For example, countermeasure options are given for the following objectives:

- Provide safe onstreet facilities/space for bicyclists.
- Provide offroad paths or trails for bicyclists.
- Provide and maintain quality surfaces for bicyclists.
- Provide safe intersections for bicyclists.
- Improve motorist behavior/compliance with traffic laws.
- Improve bicyclist behavior/compliance with traffic laws.

Potential measures to improve bike safety at intersections include curb-radii revisions, roundabouts, intersection markings, sight-distance improvements, turning restrictions, and the redesign of the bike/motor vehicle merge area. BIKESAFE also provides a matrix of potential bike safety treatments which correspond to 13 different types of bicycle crashes.

The BIKESAFE guide also provides details of over 50 case studies from the United States and abroad related to past safety improvements. As with PEDSAFE, the BIKESAFE guide includes a countermeasure selection tool which allows an engineer, planner, or other safety professional to enter the basic crash information or performance objectives for a location or section along with site characteristics. The expert system software will then give a short list of candidate countermeasures which may be appropriate for those conditions.

APPENDIX A. DATA COLLECTION FORMS

Table 5. Pedestrian safety index—example data collection sheet.

		Crosswalk 1	Crosswalk 2	Crosswalk 3	Crosswalk 4
	Name of crosswalk				
SIGNAL	Signalized (1=yes, 0=no)				
STOP	Stop Controlled (1=yes, 0=no)				
THRULNS	Number of Through Lanes on Main St				
SPEED	85th Percentile Speed on Main St				
MAINADT	Main Street ADT				
COMM	Commercial Area (1=yes, 0=no)				

Sketch of intersection (show all lanes and pavement markings; use back of sheet if necessary):

Table 6. Bicycle safety index—example data collection sheet.

		Approach 1	Approach 2	Approach 3	Approach 4
	Name of approach leg				
MAINADT	Main Street ADT				
MAINHISPD	Main street speed limit = 35 mph (1=yes, 0=no)				
TURNVEH	Presence of turning vehicle traffic across the path of through cyclists (1=yes, 0=no)				
RTLANES	Number of right turn traffic lanes on main street approach				
BL	Bike lane present (1=yes, 0=no)				
CROSSADT	Cross street traffic volume				
SIGNAL	Traffic Signal at intersection (1=yes, 0=no)				
PARKING	On street parking on main street approach (1=yes, 0=no)				
RTCROSS	Number of traffic lanes for cyclists to cross to make a right turn				
CROSSLNS	Number of through lanes on cross street				
LTCROSS	Number of traffic lanes for cyclists to cross to make a left turn				

Sketch of intersection (show all lanes and pavement markings; use back of sheet if necessary):

APPENDIX B. QUICK REFERENCE TABLES

The following quick reference tables provide safety index values for users of Ped ISI and Bike ISI. The scale for the index values is as follows:

Table 7. Ped ISI and Bike ISI values.

Values Defined
1 (safest, lowest priority for further evaluation)
2
3
4
5
6 (least safe, highest priority for further evaluation)

Table 8. Pedestrian safety index—signalized crossing in a commercial area.

Main Rd Thru Lns		1 Through Lane					2 Through Lanes					3 Through Lanes					4 Through Lanes				
Main Rd Speed		25	30	35	40	45	25	30	35	40	45	25	30	35	40	45	25	30	35	40	45
Main ADT	1,000	1.5	1.6	1.7	1.8	1.9	1.9	2.0	2.0	2.1	2.2	2.2	2.3	2.4	2.5	2.6	2.5	2.6	2.7	2.8	2.9
	5,000	1.6	1.6	1.7	1.8	1.9	1.9	2.0	2.1	2.2	2.3	2.2	2.3	2.4	2.5	2.6	2.6	2.7	2.7	2.8	2.9
	10,000	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0
	15,000	1.6	1.7	1.8	1.9	2.0	2.0	2.0	2.1	2.2	2.3	2.3	2.4	2.5	2.6	2.6	2.6	2.7	2.8	2.9	3.0
	20,000	1.6	1.7	1.8	1.9	2.0	2.0	2.1	2.2	2.3	2.3	2.3	2.4	2.5	2.6	2.7	2.7	2.7	2.8	2.9	3.0
	25,000	1.7	1.8	1.9	1.9	2.0	2.0	2.1	2.2	2.3	2.4	2.3	2.4	2.5	2.6	2.7	2.7	2.8	2.9	3.0	3.0
	30,000	1.7	1.8	1.9	2.0	2.1	2.0	2.1	2.2	2.3	2.4	2.4	2.5	2.6	2.6	2.7	2.7	2.8	2.9	3.0	3.1
	35,000	1.7	1.8	1.9	2.0	2.1	2.1	2.2	2.3	2.3	2.4	2.4	2.5	2.6	2.7	2.8	2.7	2.8	2.9	3.0	3.1
	40,000	1.8	1.9	1.9	2.0	2.1	2.1	2.2	2.3	2.4	2.5	2.4	2.5	2.6	2.7	2.8	2.8	2.9	3.0	3.0	3.1
	45,000	1.8	1.9	2.0	2.1	2.2	2.1	2.2	2.3	2.4	2.5	2.5	2.6	2.6	2.7	2.8	2.8	2.9	3.0	3.1	3.2
	50,000	1.8	1.9	2.0	2.1	2.2	2.2	2.3	2.3	2.4	2.5	2.5	2.6	2.7	2.8	2.9	2.8	2.9	3.0	3.1	3.2

Table 9. Pedestrian safety index—signalized crossing in a noncommercial area.

Main Rd Thru Lns		1 Through Lane					2 Through Lanes					3 Through Lanes					4 Through Lanes				
Main Rd Speed		25	30	35	40	45	25	30	35	40	45	25	30	35	40	45	25	30	35	40	45
Main ADT	1,000	1.3	1.4	1.5	1.6	1.7	1.6	1.7	1.8	1.9	2.0	2.0	2.1	2.1	2.2	2.3	2.3	2.4	2.5	2.6	2.7
	5,000	1.3	1.4	1.5	1.6	1.7	1.7	1.7	1.8	1.9	2.0	2.0	2.1	2.2	2.3	2.4	2.3	2.4	2.5	2.6	2.7
	10,000	1.4	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.0	2.0	2.1	2.2	2.3	2.4	2.4	2.4	2.5	2.6	2.7
	15,000	1.4	1.5	1.6	1.7	1.7	1.7	1.8	1.9	2.0	2.1	2.1	2.1	2.2	2.3	2.4	2.4	2.5	2.6	2.7	2.7
	20,000	1.4	1.5	1.6	1.7	1.8	1.7	1.8	1.9	2.0	2.1	2.1	2.2	2.3	2.4	2.4	2.4	2.5	2.6	2.7	2.8
	25,000	1.4	1.5	1.6	1.7	1.8	1.8	1.9	2.0	2.0	2.1	2.1	2.2	2.3	2.4	2.5	2.4	2.5	2.6	2.7	2.8
	30,000	1.5	1.6	1.7	1.7	1.8	1.8	1.9	2.0	2.1	2.2	2.1	2.2	2.3	2.4	2.5	2.5	2.6	2.7	2.7	2.8
	35,000	1.5	1.6	1.7	1.8	1.9	1.8	1.9	2.0	2.1	2.2	2.2	2.3	2.4	2.4	2.5	2.5	2.6	2.7	2.8	2.9
	40,000	1.5	1.6	1.7	1.8	1.9	1.9	2.0	2.0	2.1	2.2	2.2	2.3	2.4	2.5	2.6	2.5	2.6	2.7	2.8	2.9
	45,000	1.6	1.7	1.7	1.8	1.9	1.9	2.0	2.1	2.2	2.3	2.2	2.3	2.4	2.5	2.6	2.6	2.7	2.7	2.8	2.9
	50,000	1.6	1.7	1.8	1.9	2.0	1.9	2.0	2.1	2.2	2.3	2.3	2.4	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0

Table 10. Pedestrian safety index—stop-controlled crossing in a commercial area.

Main Rd Thru Lns		1 Through Lane					2 Through Lanes					3 Through Lanes					4 Through Lanes				
Main Rd Speed		25	30	35	40	45	25	30	35	40	45	25	30	35	40	45	25	30	35	40	45
Main ADT	1,000	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0
	5,000	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0
	10,000	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0
	15,000	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0
	20,000	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0
	25,000	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0
	30,000	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0
	35,000	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0
	40,000	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0
	45,000	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0
	50,000	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0

Table 11. Pedestrian safety index—stop-controlled crossing in a noncommercial area.

Main Rd Thru Lns		1 Through Lane					2 Through Lanes					3 Through Lanes					4 Through Lanes				
Main Rd Speed		25	30	35	40	45	25	30	35	40	45	25	30	35	40	45	25	30	35	40	45
Main ADT	1,000	1.4	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.0	2.0	2.1	2.2	2.3	2.4	2.4	2.4	2.5	2.6	2.7
	5,000	1.4	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.0	2.0	2.1	2.2	2.3	2.4	2.4	2.4	2.5	2.6	2.7
	10,000	1.4	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.0	2.0	2.1	2.2	2.3	2.4	2.4	2.4	2.5	2.6	2.7
	15,000	1.4	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.0	2.0	2.1	2.2	2.3	2.4	2.4	2.4	2.5	2.6	2.7
	20,000	1.4	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.0	2.0	2.1	2.2	2.3	2.4	2.4	2.4	2.5	2.6	2.7
	25,000	1.4	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.0	2.0	2.1	2.2	2.3	2.4	2.4	2.4	2.5	2.6	2.7
	30,000	1.4	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.0	2.0	2.1	2.2	2.3	2.4	2.4	2.4	2.5	2.6	2.7
	35,000	1.4	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.0	2.0	2.1	2.2	2.3	2.4	2.4	2.4	2.5	2.6	2.7
	40,000	1.4	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.0	2.0	2.1	2.2	2.3	2.4	2.4	2.4	2.5	2.6	2.7
	45,000	1.4	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.0	2.0	2.1	2.2	2.3	2.4	2.4	2.4	2.5	2.6	2.7
	50,000	1.4	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.0	2.0	2.1	2.2	2.3	2.4	2.4	2.4	2.5	2.6	2.7

Table 12. Pedestrian safety index—uncontrolled crossing in a commercial area.

Main Rd Thru Lns		1 Through Lane					2 Through Lanes					3 Through Lanes					4 Through Lanes				
Main Rd Speed		25	30	35	40	45	25	30	35	40	45	25	30	35	40	45	25	30	35	40	45
Main ADT	1,000	3.4	3.5	3.6	3.7	3.8	3.7	3.8	3.9	4.0	4.1	4.1	4.2	4.2	4.3	4.4	4.4	4.5	4.6	4.7	4.8
	5,000	3.4	3.5	3.6	3.7	3.8	3.7	3.8	3.9	4.0	4.1	4.1	4.2	4.2	4.3	4.4	4.4	4.5	4.6	4.7	4.8
	10,000	3.4	3.5	3.6	3.7	3.8	3.7	3.8	3.9	4.0	4.1	4.1	4.2	4.2	4.3	4.4	4.4	4.5	4.6	4.7	4.8
	15,000	3.4	3.5	3.6	3.7	3.8	3.7	3.8	3.9	4.0	4.1	4.1	4.2	4.2	4.3	4.4	4.4	4.5	4.6	4.7	4.8
	20,000	3.4	3.5	3.6	3.7	3.8	3.7	3.8	3.9	4.0	4.1	4.1	4.2	4.2	4.3	4.4	4.4	4.5	4.6	4.7	4.8
	25,000	3.4	3.5	3.6	3.7	3.8	3.7	3.8	3.9	4.0	4.1	4.1	4.2	4.2	4.3	4.4	4.4	4.5	4.6	4.7	4.8
	30,000	3.4	3.5	3.6	3.7	3.8	3.7	3.8	3.9	4.0	4.1	4.1	4.2	4.2	4.3	4.4	4.4	4.5	4.6	4.7	4.8
	35,000	3.4	3.5	3.6	3.7	3.8	3.7	3.8	3.9	4.0	4.1	4.1	4.2	4.2	4.3	4.4	4.4	4.5	4.6	4.7	4.8
	40,000	3.4	3.5	3.6	3.7	3.8	3.7	3.8	3.9	4.0	4.1	4.1	4.2	4.2	4.3	4.4	4.4	4.5	4.6	4.7	4.8
	45,000	3.4	3.5	3.6	3.7	3.8	3.7	3.8	3.9	4.0	4.1	4.1	4.2	4.2	4.3	4.4	4.4	4.5	4.6	4.7	4.8
	50,000	3.4	3.5	3.6	3.7	3.8	3.7	3.8	3.9	4.0	4.1	4.1	4.2	4.2	4.3	4.4	4.4	4.5	4.6	4.7	4.8

Table 13. Pedestrian safety index—uncontrolled crossing in a noncommercial area.

Main Rd Thru Lns		1 Through Lane					2 Through Lanes					3 Through Lanes					4 Through Lanes				
Main Rd Speed		25	30	35	40	45	25	30	35	40	45	25	30	35	40	45	25	30	35	40	45
Main ADT	1,000	3.2	3.2	3.3	3.4	3.5	3.5	3.6	3.7	3.8	3.9	3.8	3.9	4.0	4.1	4.2	4.2	4.3	4.3	4.4	4.5
	5,000	3.2	3.2	3.3	3.4	3.5	3.5	3.6	3.7	3.8	3.9	3.8	3.9	4.0	4.1	4.2	4.2	4.3	4.3	4.4	4.5
	10,000	3.2	3.2	3.3	3.4	3.5	3.5	3.6	3.7	3.8	3.9	3.8	3.9	4.0	4.1	4.2	4.2	4.3	4.3	4.4	4.5
	15,000	3.2	3.2	3.3	3.4	3.5	3.5	3.6	3.7	3.8	3.9	3.8	3.9	4.0	4.1	4.2	4.2	4.3	4.3	4.4	4.5
	20,000	3.2	3.2	3.3	3.4	3.5	3.5	3.6	3.7	3.8	3.9	3.8	3.9	4.0	4.1	4.2	4.2	4.3	4.3	4.4	4.5
	25,000	3.2	3.2	3.3	3.4	3.5	3.5	3.6	3.7	3.8	3.9	3.8	3.9	4.0	4.1	4.2	4.2	4.3	4.3	4.4	4.5
	30,000	3.2	3.2	3.3	3.4	3.5	3.5	3.6	3.7	3.8	3.9	3.8	3.9	4.0	4.1	4.2	4.2	4.3	4.3	4.4	4.5
	35,000	3.2	3.2	3.3	3.4	3.5	3.5	3.6	3.7	3.8	3.9	3.8	3.9	4.0	4.1	4.2	4.2	4.3	4.3	4.4	4.5
	40,000	3.2	3.2	3.3	3.4	3.5	3.5	3.6	3.7	3.8	3.9	3.8	3.9	4.0	4.1	4.2	4.2	4.3	4.3	4.4	4.5
	45,000	3.2	3.2	3.3	3.4	3.5	3.5	3.6	3.7	3.8	3.9	3.8	3.9	4.0	4.1	4.2	4.2	4.3	4.3	4.4	4.5
	50,000	3.2	3.2	3.3	3.4	3.5	3.5	3.6	3.7	3.8	3.9	3.8	3.9	4.0	4.1	4.2	4.2	4.3	4.3	4.4	4.5

Table 14. Bicycle safety index—through movement—signalized intersection with bike lane.

Main Rd Spd Lmt		Less than 35 mph								35 mph or more							
Parking		Yes				No				Yes				No			
RT Lanes		No RT Lane		1 RT Lane		No RT Lane		1 RT Lane		No RT Lane		1 RT Lane		No RT Lane		1 RT Lane	
Turning Vehicle		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Main ADT	Cross ADT																
1,000	1,000	2.0	1.3	2.5	1.8	1.8	1.1	2.3	1.6	2.8	2.2	3.3	2.6	2.6	2.0	3.1	2.4
	5,000	2.0	1.3	2.5	1.8	1.8	1.1	2.3	1.6	2.8	2.2	3.3	2.6	2.6	2.0	3.1	2.4
	10,000	2.0	1.3	2.5	1.8	1.8	1.1	2.3	1.6	2.8	2.2	3.3	2.6	2.6	2.0	3.1	2.4
	20,000	2.0	1.3	2.5	1.8	1.8	1.1	2.3	1.6	2.8	2.2	3.3	2.6	2.6	2.0	3.1	2.4
	30,000	2.0	1.3	2.5	1.8	1.8	1.1	2.3	1.6	2.8	2.2	3.3	2.6	2.6	2.0	3.1	2.4
	40,000	2.0	1.3	2.5	1.8	1.8	1.1	2.3	1.6	2.8	2.2	3.3	2.6	2.6	2.0	3.1	2.4
5,000	1,000	2.1	1.4	2.5	1.9	1.9	1.2	2.3	1.7	2.9	2.2	3.4	2.7	2.7	2.0	3.2	2.5
	5,000	2.1	1.4	2.5	1.9	1.9	1.2	2.3	1.7	2.9	2.2	3.4	2.7	2.7	2.0	3.2	2.5
	10,000	2.1	1.4	2.5	1.9	1.9	1.2	2.3	1.7	2.9	2.2	3.4	2.7	2.7	2.0	3.2	2.5
	20,000	2.1	1.4	2.5	1.9	1.9	1.2	2.3	1.7	2.9	2.2	3.4	2.7	2.7	2.0	3.2	2.5
	30,000	2.1	1.4	2.5	1.9	1.9	1.2	2.3	1.7	2.9	2.2	3.4	2.7	2.7	2.0	3.2	2.5
	40,000	2.1	1.4	2.5	1.9	1.9	1.2	2.3	1.7	2.9	2.2	3.4	2.7	2.7	2.0	3.2	2.5
10,000	1,000	2.2	1.5	2.6	2.0	2.0	1.3	2.4	1.8	3.0	2.3	3.5	2.8	2.8	2.1	3.3	2.6
	5,000	2.2	1.5	2.6	2.0	2.0	1.3	2.4	1.8	3.0	2.3	3.5	2.8	2.8	2.1	3.3	2.6
	10,000	2.2	1.5	2.6	2.0	2.0	1.3	2.4	1.8	3.0	2.3	3.5	2.8	2.8	2.1	3.3	2.6
	20,000	2.2	1.5	2.6	2.0	2.0	1.3	2.4	1.8	3.0	2.3	3.5	2.8	2.8	2.1	3.3	2.6
	30,000	2.2	1.5	2.6	2.0	2.0	1.3	2.4	1.8	3.0	2.3	3.5	2.8	2.8	2.1	3.3	2.6
	40,000	2.2	1.5	2.6	2.0	2.0	1.3	2.4	1.8	3.0	2.3	3.5	2.8	2.8	2.1	3.3	2.6
20,000	1,000	2.4	1.7	2.8	2.2	2.2	1.5	2.6	2.0	3.2	2.5	3.6	3.0	3.0	2.3	3.4	2.8
	5,000	2.4	1.7	2.8	2.2	2.2	1.5	2.6	2.0	3.2	2.5	3.6	3.0	3.0	2.3	3.4	2.8
	10,000	2.4	1.7	2.8	2.2	2.2	1.5	2.6	2.0	3.2	2.5	3.6	3.0	3.0	2.3	3.4	2.8
	20,000	2.4	1.7	2.8	2.2	2.2	1.5	2.6	2.0	3.2	2.5	3.6	3.0	3.0	2.3	3.4	2.8
	30,000	2.4	1.7	2.8	2.2	2.2	1.5	2.6	2.0	3.2	2.5	3.6	3.0	3.0	2.3	3.4	2.8
	40,000	2.4	1.7	2.8	2.2	2.2	1.5	2.6	2.0	3.2	2.5	3.6	3.0	3.0	2.3	3.4	2.8
30,000	1,000	2.6	1.9	3.0	2.4	2.4	1.7	2.8	2.2	3.4	2.7	3.8	3.2	3.2	2.5	3.6	3.0
	5,000	2.6	1.9	3.0	2.4	2.4	1.7	2.8	2.2	3.4	2.7	3.8	3.2	3.2	2.5	3.6	3.0
	10,000	2.6	1.9	3.0	2.4	2.4	1.7	2.8	2.2	3.4	2.7	3.8	3.2	3.2	2.5	3.6	3.0
	20,000	2.6	1.9	3.0	2.4	2.4	1.7	2.8	2.2	3.4	2.7	3.8	3.2	3.2	2.5	3.6	3.0
	30,000	2.6	1.9	3.0	2.4	2.4	1.7	2.8	2.2	3.4	2.7	3.8	3.2	3.2	2.5	3.6	3.0
	40,000	2.6	1.9	3.0	2.4	2.4	1.7	2.8	2.2	3.4	2.7	3.8	3.2	3.2	2.5	3.6	3.0
40,000	1,000	2.7	2.1	3.2	2.6	2.5	1.9	3.0	2.4	3.6	2.9	4.0	3.4	3.4	2.7	3.8	3.2
	5,000	2.7	2.1	3.2	2.6	2.5	1.9	3.0	2.4	3.6	2.9	4.0	3.4	3.4	2.7	3.8	3.2
	10,000	2.7	2.1	3.2	2.6	2.5	1.9	3.0	2.4	3.6	2.9	4.0	3.4	3.4	2.7	3.8	3.2
	20,000	2.7	2.1	3.2	2.6	2.5	1.9	3.0	2.4	3.6	2.9	4.0	3.4	3.4	2.7	3.8	3.2
	30,000	2.7	2.1	3.2	2.6	2.5	1.9	3.0	2.4	3.6	2.9	4.0	3.4	3.4	2.7	3.8	3.2
	40,000	2.7	2.1	3.2	2.6	2.5	1.9	3.0	2.4	3.6	2.9	4.0	3.4	3.4	2.7	3.8	3.2
50,000	1,000	2.9	2.3	3.4	2.8	2.7	2.1	3.2	2.6	3.7	3.1	4.2	3.6	3.5	2.9	4.0	3.4
	5,000	2.9	2.3	3.4	2.8	2.7	2.1	3.2	2.6	3.7	3.1	4.2	3.6	3.5	2.9	4.0	3.4
	10,000	2.9	2.3	3.4	2.8	2.7	2.1	3.2	2.6	3.7	3.1	4.2	3.6	3.5	2.9	4.0	3.4
	20,000	2.9	2.3	3.4	2.8	2.7	2.1	3.2	2.6	3.7	3.1	4.2	3.6	3.5	2.9	4.0	3.4
	30,000	2.9	2.3	3.4	2.8	2.7	2.1	3.2	2.6	3.7	3.1	4.2	3.6	3.5	2.9	4.0	3.4
	40,000	2.9	2.3	3.4	2.8	2.7	2.1	3.2	2.6	3.7	3.1	4.2	3.6	3.5	2.9	4.0	3.4

Table 15. Bicycle safety index—through movement—signalized intersection with no bike lane.

Main Rd Spd Lmt		Less than 35 mph								35 mph or more							
Parking		Yes				No				Yes				No			
RT Lanes		No RT Lane		1 RT Lane		No RT Lane		1 RT Lane		No RT Lane		1 RT Lane		No RT Lane		1 RT Lane	
Turning Vehicle		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Main ADT	Cross ADT																
1,000	1,000	2.5	1.8	2.5	1.8	2.3	1.6	2.3	1.6	3.3	2.6	3.3	2.6	3.1	2.4	3.1	2.4
	5,000	2.5	1.9	2.5	1.9	2.3	1.7	2.3	1.7	3.4	2.7	3.4	2.7	3.2	2.5	3.2	2.5
	10,000	2.7	2.0	2.7	2.0	2.5	1.8	2.5	1.8	3.5	2.8	3.5	2.8	3.3	2.6	3.3	2.6
	20,000	2.9	2.2	2.9	2.2	2.7	2.0	2.7	2.0	3.7	3.1	3.7	3.1	3.5	2.9	3.5	2.9
	30,000	3.1	2.5	3.1	2.5	2.9	2.3	2.9	2.3	3.9	3.3	3.9	3.3	3.7	3.1	3.7	3.1
	40,000	3.3	2.7	3.3	2.7	3.1	2.5	3.1	2.5	4.2	3.5	4.2	3.5	4.0	3.3	4.0	3.3
5,000	1,000	2.5	1.9	2.5	1.9	2.3	1.7	2.3	1.7	3.3	2.7	3.3	2.7	3.1	2.5	3.1	2.5
	5,000	2.6	2.0	2.6	2.0	2.4	1.8	2.4	1.8	3.4	2.8	3.4	2.8	3.2	2.6	3.2	2.6
	10,000	2.7	2.1	2.7	2.1	2.5	1.9	2.5	1.9	3.5	2.9	3.5	2.9	3.3	2.7	3.3	2.7
	20,000	3.0	2.3	3.0	2.3	2.8	2.1	2.8	2.1	3.8	3.1	3.8	3.1	3.6	2.9	3.6	2.9
	30,000	3.2	2.5	3.2	2.5	3.0	2.3	3.0	2.3	4.0	3.4	4.0	3.4	3.8	3.2	3.8	3.2
	40,000	3.4	2.8	3.4	2.8	3.2	2.6	3.2	2.6	4.2	3.6	4.2	3.6	4.0	3.4	4.0	3.4
10,000	1,000	2.6	2.0	2.6	2.0	2.4	1.8	2.4	1.8	3.4	2.8	3.4	2.8	3.2	2.6	3.2	2.6
	5,000	2.7	2.1	2.7	2.1	2.5	1.9	2.5	1.9	3.5	2.9	3.5	2.9	3.3	2.7	3.3	2.7
	10,000	2.8	2.2	2.8	2.2	2.6	2.0	2.6	2.0	3.6	3.0	3.6	3.0	3.4	2.8	3.4	2.8
	20,000	3.1	2.4	3.1	2.4	2.9	2.2	2.9	2.2	3.9	3.2	3.9	3.2	3.7	3.0	3.7	3.0
	30,000	3.3	2.6	3.3	2.6	3.1	2.4	3.1	2.4	4.1	3.5	4.1	3.5	3.9	3.3	3.9	3.3
	40,000	3.5	2.9	3.5	2.9	3.3	2.7	3.3	2.7	4.3	3.7	4.3	3.7	4.1	3.5	4.1	3.5
20,000	1,000	2.8	2.2	2.8	2.2	2.6	2.0	2.6	2.0	3.6	3.0	3.6	3.0	3.4	2.8	3.4	2.8
	5,000	2.9	2.3	2.9	2.3	2.7	2.1	2.7	2.1	3.7	3.1	3.7	3.1	3.5	2.9	3.5	2.9
	10,000	3.0	2.4	3.0	2.4	2.8	2.2	2.8	2.2	3.8	3.2	3.8	3.2	3.6	3.0	3.6	3.0
	20,000	3.2	2.6	3.2	2.6	3.0	2.4	3.0	2.4	4.1	3.4	4.1	3.4	3.9	3.2	3.9	3.2
	30,000	3.5	2.8	3.5	2.8	3.3	2.6	3.3	2.6	4.3	3.6	4.3	3.6	4.1	3.4	4.1	3.4
	40,000	3.7	3.1	3.7	3.1	3.5	2.9	3.5	2.9	4.5	3.9	4.5	3.9	4.3	3.7	4.3	3.7
30,000	1,000	3.0	2.4	3.0	2.4	2.8	2.2	2.8	2.2	3.8	3.2	3.8	3.2	3.6	3.0	3.6	3.0
	5,000	3.1	2.4	3.1	2.4	2.9	2.2	2.9	2.2	3.9	3.3	3.9	3.3	3.7	3.1	3.7	3.1
	10,000	3.2	2.6	3.2	2.6	3.0	2.4	3.0	2.4	4.0	3.4	4.0	3.4	3.8	3.2	3.8	3.2
	20,000	3.4	2.8	3.4	2.8	3.2	2.6	3.2	2.6	4.3	3.6	4.3	3.6	4.1	3.4	4.1	3.4
	30,000	3.7	3.0	3.7	3.0	3.5	2.8	3.5	2.8	4.5	3.8	4.5	3.8	4.3	3.6	4.3	3.6
	40,000	3.9	3.2	3.9	3.2	3.7	3.0	3.7	3.0	4.7	4.1	4.7	4.1	4.5	3.9	4.5	3.9
40,000	1,000	3.2	2.5	3.2	2.5	3.0	2.3	3.0	2.3	4.0	3.4	4.0	3.4	3.8	3.2	3.8	3.2
	5,000	3.3	2.6	3.3	2.6	3.1	2.4	3.1	2.4	4.1	3.4	4.1	3.4	3.9	3.2	3.9	3.2
	10,000	3.4	2.7	3.4	2.7	3.2	2.5	3.2	2.5	4.2	3.6	4.2	3.6	4.0	3.4	4.0	3.4
	20,000	3.6	3.0	3.6	3.0	3.4	2.8	3.4	2.8	4.4	3.8	4.4	3.8	4.2	3.6	4.2	3.6
	30,000	3.9	3.2	3.9	3.2	3.7	3.0	3.7	3.0	4.7	4.0	4.7	4.0	4.5	3.8	4.5	3.8
	40,000	4.1	3.4	4.1	3.4	3.9	3.2	3.9	3.2	4.9	4.3	4.9	4.3	4.7	4.1	4.7	4.1
50,000	1,000	3.4	2.7	3.4	2.7	3.2	2.5	3.2	2.5	4.2	3.5	4.2	3.5	4.0	3.3	4.0	3.3
	5,000	3.5	2.8	3.5	2.8	3.3	2.6	3.3	2.6	4.3	3.6	4.3	3.6	4.1	3.4	4.1	3.4
	10,000	3.6	2.9	3.6	2.9	3.4	2.7	3.4	2.7	4.4	3.8	4.4	3.8	4.2	3.6	4.2	3.6
	20,000	3.8	3.2	3.8	3.2	3.6	3.0	3.6	3.0	4.6	4.0	4.6	4.0	4.4	3.8	4.4	3.8
	30,000	4.0	3.4	4.0	3.4	3.8	3.2	3.8	3.2	4.9	4.2	4.9	4.2	4.7	4.0	4.7	4.0
	40,000	4.3	3.6	4.3	3.6	4.1	3.4	4.1	3.4	5.1	4.4	5.1	4.4	4.9	4.2	4.9	4.2

Table 16. Bicycle safety index—through movement—unsignalized intersection with bike lane.

Main Rd Spd Lmt		Less than 35 mph								35 mph or more							
Parking		Yes				No				Yes				No			
RT Lanes		No RT Lane		1 RT Lane		No RT Lane		1 RT Lane		No RT Lane		1 RT Lane		No RT Lane		1 RT Lane	
Turning Vehicle		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Main ADT	Cross ADT																
1,000	1,000	2.0	1.3	2.5	1.8	1.8	1.1	2.3	1.6	2.8	2.2	3.3	2.6	2.6	2.0	3.1	2.4
	5,000	2.0	1.3	2.5	1.8	1.8	1.1	2.3	1.6	2.8	2.2	3.3	2.6	2.6	2.0	3.1	2.4
	10,000	2.0	1.3	2.5	1.8	1.8	1.1	2.3	1.6	2.8	2.2	3.3	2.6	2.6	2.0	3.1	2.4
	20,000	2.0	1.3	2.5	1.8	1.8	1.1	2.3	1.6	2.8	2.2	3.3	2.6	2.6	2.0	3.1	2.4
	30,000	2.0	1.3	2.5	1.8	1.8	1.1	2.3	1.6	2.8	2.2	3.3	2.6	2.6	2.0	3.1	2.4
	40,000	2.0	1.3	2.5	1.8	1.8	1.1	2.3	1.6	2.8	2.2	3.3	2.6	2.6	2.0	3.1	2.4
5,000	1,000	2.1	1.4	2.5	1.9	1.9	1.2	2.3	1.7	2.9	2.2	3.4	2.7	2.7	2.0	3.2	2.5
	5,000	2.1	1.4	2.5	1.9	1.9	1.2	2.3	1.7	2.9	2.2	3.4	2.7	2.7	2.0	3.2	2.5
	10,000	2.1	1.4	2.5	1.9	1.9	1.2	2.3	1.7	2.9	2.2	3.4	2.7	2.7	2.0	3.2	2.5
	20,000	2.1	1.4	2.5	1.9	1.9	1.2	2.3	1.7	2.9	2.2	3.4	2.7	2.7	2.0	3.2	2.5
	30,000	2.1	1.4	2.5	1.9	1.9	1.2	2.3	1.7	2.9	2.2	3.4	2.7	2.7	2.0	3.2	2.5
	40,000	2.1	1.4	2.5	1.9	1.9	1.2	2.3	1.7	2.9	2.2	3.4	2.7	2.7	2.0	3.2	2.5
10,000	1,000	2.2	1.5	2.6	2.0	2.0	1.3	2.4	1.8	3.0	2.3	3.5	2.8	2.8	2.1	3.3	2.6
	5,000	2.2	1.5	2.6	2.0	2.0	1.3	2.4	1.8	3.0	2.3	3.5	2.8	2.8	2.1	3.3	2.6
	10,000	2.2	1.5	2.6	2.0	2.0	1.3	2.4	1.8	3.0	2.3	3.5	2.8	2.8	2.1	3.3	2.6
	20,000	2.2	1.5	2.6	2.0	2.0	1.3	2.4	1.8	3.0	2.3	3.5	2.8	2.8	2.1	3.3	2.6
	30,000	2.2	1.5	2.6	2.0	2.0	1.3	2.4	1.8	3.0	2.3	3.5	2.8	2.8	2.1	3.3	2.6
	40,000	2.2	1.5	2.6	2.0	2.0	1.3	2.4	1.8	3.0	2.3	3.5	2.8	2.8	2.1	3.3	2.6
20,000	1,000	2.4	1.7	2.8	2.2	2.2	1.5	2.6	2.0	3.2	2.5	3.6	3.0	3.0	2.3	3.4	2.8
	5,000	2.4	1.7	2.8	2.2	2.2	1.5	2.6	2.0	3.2	2.5	3.6	3.0	3.0	2.3	3.4	2.8
	10,000	2.4	1.7	2.8	2.2	2.2	1.5	2.6	2.0	3.2	2.5	3.6	3.0	3.0	2.3	3.4	2.8
	20,000	2.4	1.7	2.8	2.2	2.2	1.5	2.6	2.0	3.2	2.5	3.6	3.0	3.0	2.3	3.4	2.8
	30,000	2.4	1.7	2.8	2.2	2.2	1.5	2.6	2.0	3.2	2.5	3.6	3.0	3.0	2.3	3.4	2.8
	40,000	2.4	1.7	2.8	2.2	2.2	1.5	2.6	2.0	3.2	2.5	3.6	3.0	3.0	2.3	3.4	2.8
30,000	1,000	2.6	1.9	3.0	2.4	2.4	1.7	2.8	2.2	3.4	2.7	3.8	3.2	3.2	2.5	3.6	3.0
	5,000	2.6	1.9	3.0	2.4	2.4	1.7	2.8	2.2	3.4	2.7	3.8	3.2	3.2	2.5	3.6	3.0
	10,000	2.6	1.9	3.0	2.4	2.4	1.7	2.8	2.2	3.4	2.7	3.8	3.2	3.2	2.5	3.6	3.0
	20,000	2.6	1.9	3.0	2.4	2.4	1.7	2.8	2.2	3.4	2.7	3.8	3.2	3.2	2.5	3.6	3.0
	30,000	2.6	1.9	3.0	2.4	2.4	1.7	2.8	2.2	3.4	2.7	3.8	3.2	3.2	2.5	3.6	3.0
	40,000	2.6	1.9	3.0	2.4	2.4	1.7	2.8	2.2	3.4	2.7	3.8	3.2	3.2	2.5	3.6	3.0
40,000	1,000	2.7	2.1	3.2	2.6	2.5	1.9	3.0	2.4	3.6	2.9	4.0	3.4	3.4	2.7	3.8	3.2
	5,000	2.7	2.1	3.2	2.6	2.5	1.9	3.0	2.4	3.6	2.9	4.0	3.4	3.4	2.7	3.8	3.2
	10,000	2.7	2.1	3.2	2.6	2.5	1.9	3.0	2.4	3.6	2.9	4.0	3.4	3.4	2.7	3.8	3.2
	20,000	2.7	2.1	3.2	2.6	2.5	1.9	3.0	2.4	3.6	2.9	4.0	3.4	3.4	2.7	3.8	3.2
	30,000	2.7	2.1	3.2	2.6	2.5	1.9	3.0	2.4	3.6	2.9	4.0	3.4	3.4	2.7	3.8	3.2
	40,000	2.7	2.1	3.2	2.6	2.5	1.9	3.0	2.4	3.6	2.9	4.0	3.4	3.4	2.7	3.8	3.2
50,000	1,000	2.9	2.3	3.4	2.8	2.7	2.1	3.2	2.6	3.7	3.1	4.2	3.6	3.5	2.9	4.0	3.4
	5,000	2.9	2.3	3.4	2.8	2.7	2.1	3.2	2.6	3.7	3.1	4.2	3.6	3.5	2.9	4.0	3.4
	10,000	2.9	2.3	3.4	2.8	2.7	2.1	3.2	2.6	3.7	3.1	4.2	3.6	3.5	2.9	4.0	3.4
	20,000	2.9	2.3	3.4	2.8	2.7	2.1	3.2	2.6	3.7	3.1	4.2	3.6	3.5	2.9	4.0	3.4
	30,000	2.9	2.3	3.4	2.8	2.7	2.1	3.2	2.6	3.7	3.1	4.2	3.6	3.5	2.9	4.0	3.4
	40,000	2.9	2.3	3.4	2.8	2.7	2.1	3.2	2.6	3.7	3.1	4.2	3.6	3.5	2.9	4.0	3.4

Table 17. Bicycle safety index—through movement—unsignalized intersection with no bike lane.

Main Rd Spd Lmt		Less than 35 mph								35 mph or more							
Parking		Yes				No				Yes				No			
RT Lanes		No RT Lane		1 RT Lane		No RT Lane		1 RT Lane		No RT Lane		1 RT Lane		No RT Lane		1 RT Lane	
Turning Vehicle		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Main ADT	Cross ADT																
1,000	1,000	2.0	1.4	2.0	1.4	1.8	1.2	1.8	1.2	2.8	2.2	2.8	2.2	2.6	2.0	2.6	2.0
	5,000	2.1	1.5	2.1	1.5	1.9	1.3	1.9	1.3	2.9	2.3	2.9	2.3	2.7	2.1	2.7	2.1
	10,000	2.2	1.6	2.2	1.6	2.0	1.4	2.0	1.4	3.0	2.4	3.0	2.4	2.8	2.2	2.8	2.2
	20,000	2.5	1.8	2.5	1.8	2.3	1.6	2.3	1.6	3.3	2.6	3.3	2.6	3.1	2.4	3.1	2.4
	30,000	2.7	2.0	2.7	2.0	2.5	1.8	2.5	1.8	3.5	2.9	3.5	2.9	3.3	2.7	3.3	2.7
	40,000	2.9	2.3	2.9	2.3	2.7	2.1	2.7	2.1	3.7	3.1	3.7	3.1	3.5	2.9	3.5	2.9
5,000	1,000	2.1	1.4	2.1	1.4	1.9	1.2	1.9	1.2	2.9	2.3	2.9	2.3	2.7	2.1	2.7	2.1
	5,000	2.2	1.5	2.2	1.5	2.0	1.3	2.0	1.3	3.0	2.4	3.0	2.4	2.8	2.2	2.8	2.2
	10,000	2.3	1.7	2.3	1.7	2.1	1.5	2.1	1.5	3.1	2.5	3.1	2.5	2.9	2.3	2.9	2.3
	20,000	2.5	1.9	2.5	1.9	2.3	1.7	2.3	1.7	3.4	2.7	3.4	2.7	3.2	2.5	3.2	2.5
	30,000	2.8	2.1	2.8	2.1	2.6	1.9	2.6	1.9	3.6	2.9	3.6	2.9	3.4	2.7	3.4	2.7
	40,000	3.0	2.3	3.0	2.3	2.8	2.1	2.8	2.1	3.8	3.2	3.8	3.2	3.6	3.0	3.6	3.0
10,000	1,000	2.2	1.5	2.2	1.5	2.0	1.3	2.0	1.3	3.0	2.4	3.0	2.4	2.8	2.2	2.8	2.2
	5,000	2.3	1.6	2.3	1.6	2.1	1.4	2.1	1.4	3.1	2.5	3.1	2.5	2.9	2.3	2.9	2.3
	10,000	2.4	1.8	2.4	1.8	2.2	1.6	2.2	1.6	3.2	2.6	3.2	2.6	3.0	2.4	3.0	2.4
	20,000	2.6	2.0	2.6	2.0	2.4	1.8	2.4	1.8	3.4	2.8	3.4	2.8	3.2	2.6	3.2	2.6
	30,000	2.9	2.2	2.9	2.2	2.7	2.0	2.7	2.0	3.7	3.0	3.7	3.0	3.5	2.8	3.5	2.8
	40,000	3.1	2.4	3.1	2.4	2.9	2.2	2.9	2.2	3.9	3.3	3.9	3.3	3.7	3.1	3.7	3.1
20,000	1,000	2.4	1.7	2.4	1.7	2.2	1.5	2.2	1.5	3.2	2.5	3.2	2.5	3.0	2.3	3.0	2.3
	5,000	2.5	1.8	2.5	1.8	2.3	1.6	2.3	1.6	3.3	2.6	3.3	2.6	3.1	2.4	3.1	2.4
	10,000	2.6	1.9	2.6	1.9	2.4	1.7	2.4	1.7	3.4	2.8	3.4	2.8	3.2	2.6	3.2	2.6
	20,000	2.8	2.2	2.8	2.2	2.6	2.0	2.6	2.0	3.6	3.0	3.6	3.0	3.4	2.8	3.4	2.8
	30,000	3.1	2.4	3.1	2.4	2.9	2.2	2.9	2.2	3.9	3.2	3.9	3.2	3.7	3.0	3.7	3.0
	40,000	3.3	2.6	3.3	2.6	3.1	2.4	3.1	2.4	4.1	3.4	4.1	3.4	3.9	3.2	3.9	3.2
30,000	1,000	2.6	1.9	2.6	1.9	2.4	1.7	2.4	1.7	3.4	2.7	3.4	2.7	3.2	2.5	3.2	2.5
	5,000	2.7	2.0	2.7	2.0	2.5	1.8	2.5	1.8	3.5	2.8	3.5	2.8	3.3	2.6	3.3	2.6
	10,000	2.8	2.1	2.8	2.1	2.6	1.9	2.6	1.9	3.6	2.9	3.6	2.9	3.4	2.7	3.4	2.7
	20,000	3.0	2.4	3.0	2.4	2.8	2.2	2.8	2.2	3.8	3.2	3.8	3.2	3.6	3.0	3.6	3.0
	30,000	3.2	2.6	3.2	2.6	3.0	2.4	3.0	2.4	4.1	3.4	4.1	3.4	3.9	3.2	3.9	3.2
	40,000	3.5	2.8	3.5	2.8	3.3	2.6	3.3	2.6	4.3	3.6	4.3	3.6	4.1	3.4	4.1	3.4
40,000	1,000	2.8	2.1	2.8	2.1	2.6	1.9	2.6	1.9	3.6	2.9	3.6	2.9	3.4	2.7	3.4	2.7
	5,000	2.9	2.2	2.9	2.2	2.7	2.0	2.7	2.0	3.7	3.0	3.7	3.0	3.5	2.8	3.5	2.8
	10,000	3.0	2.3	3.0	2.3	2.8	2.1	2.8	2.1	3.8	3.1	3.8	3.1	3.6	2.9	3.6	2.9
	20,000	3.2	2.6	3.2	2.6	3.0	2.4	3.0	2.4	4.0	3.4	4.0	3.4	3.8	3.2	3.8	3.2
	30,000	3.4	2.8	3.4	2.8	3.2	2.6	3.2	2.6	4.2	3.6	4.2	3.6	4.0	3.4	4.0	3.4
	40,000	3.7	3.0	3.7	3.0	3.5	2.8	3.5	2.8	4.5	3.8	4.5	3.8	4.3	3.6	4.3	3.6
50,000	1,000	3.0	2.3	3.0	2.3	2.8	2.1	2.8	2.1	3.8	3.1	3.8	3.1	3.6	2.9	3.6	2.9
	5,000	3.0	2.4	3.0	2.4	2.8	2.2	2.8	2.2	3.9	3.2	3.9	3.2	3.7	3.0	3.7	3.0
	10,000	3.2	2.5	3.2	2.5	3.0	2.3	3.0	2.3	4.0	3.3	4.0	3.3	3.8	3.1	3.8	3.1
	20,000	3.4	2.7	3.4	2.7	3.2	2.5	3.2	2.5	4.2	3.6	4.2	3.6	4.0	3.4	4.0	3.4
	30,000	3.6	3.0	3.6	3.0	3.4	2.8	3.4	2.8	4.4	3.8	4.4	3.8	4.2	3.6	4.2	3.6
	40,000	3.9	3.2	3.9	3.2	3.7	3.0	3.7	3.0	4.7	4.0	4.7	4.0	4.5	3.8	4.5	3.8

Table 18. Bicycle safety index—right-turn movement.

Cross Lanes		1 Cross Street Through Lane				2 Cross Street Through Lanes				4 Cross Street Through Lanes			
Parking		Yes		No		Yes		No		Yes		No	
RT Cross Lns		0	1	0	1	0	1	0	1	0	1	0	1
Main ADT	1,000	1.4	1.9	1.2	1.7	1.5	2.1	1.3	1.9	1.9	2.4	1.7	2.2
	5,000	1.5	2.0	1.3	1.8	1.7	2.2	1.5	2.0	2.0	2.5	1.8	2.3
	10,000	1.6	2.2	1.4	2.0	1.8	2.3	1.6	2.1	2.1	2.6	1.9	2.4
	20,000	1.9	2.4	1.7	2.2	2.1	2.6	1.9	2.4	2.4	2.9	2.2	2.7
	30,000	2.2	2.7	2.0	2.5	2.3	2.9	2.1	2.7	2.6	3.2	2.4	3.0
	40,000	2.5	3.0	2.3	2.8	2.6	3.1	2.4	2.9	2.9	3.4	2.7	3.2
	50,000	2.7	3.2	2.5	3.0	2.9	3.4	2.7	3.2	3.2	3.7	3.0	3.5

Table 19. Bicycle safety index—left-turn movement—signalized intersection with bike lane.

Main Street Spd Lmt		Less than 35 mph						35 mph or more					
LT Cross Lns		1		2		3		1		2		3	
Parking		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Main ADT	1,000	2.6	2.4	2.6	2.4	2.6	2.4	3.4	3.2	3.4	3.2	3.4	3.2
	5,000	2.7	2.5	2.7	2.5	2.7	2.5	3.5	3.3	3.5	3.3	3.5	3.3
	10,000	2.9	2.7	2.9	2.7	2.9	2.7	3.6	3.4	3.6	3.4	3.6	3.4
	20,000	3.1	2.9	3.1	2.9	3.1	2.9	3.9	3.7	3.9	3.7	3.9	3.7
	30,000	3.4	3.2	3.4	3.2	3.4	3.2	4.1	3.9	4.1	3.9	4.1	3.9
	40,000	3.6	3.4	3.6	3.4	3.6	3.4	4.4	4.2	4.4	4.2	4.4	4.2
	50,000	3.9	3.7	3.9	3.7	3.9	3.7	4.6	4.4	4.6	4.4	4.6	4.4

Table 20. Bicycle safety index—left-turn movement—signalized intersection with no bike lane.

Main Street Spd Lmt		Less than 35 mph						35 mph or more					
LT Cross Lns		1		2		3		1		2		3	
Parking		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Main ADT	1,000	2.2	2.0	2.6	2.4	3.0	2.8	2.2	2.0	2.6	2.4	3.0	2.8
	5,000	2.3	2.1	2.7	2.5	3.1	2.9	2.3	2.1	2.7	2.5	3.1	2.9
	10,000	2.4	2.2	2.8	2.6	3.2	3.0	2.4	2.2	2.8	2.6	3.2	3.0
	20,000	2.7	2.5	3.0	2.8	3.4	3.2	2.7	2.5	3.0	2.8	3.4	3.2
	30,000	2.9	2.7	3.3	3.1	3.7	3.5	2.9	2.7	3.3	3.1	3.7	3.5
	40,000	3.2	3.0	3.5	3.3	3.9	3.7	3.2	3.0	3.5	3.3	3.9	3.7
	50,000	3.4	3.2	3.8	3.6	4.2	4.0	3.4	3.2	3.8	3.6	4.2	4.0

Table 21. Bicycle safety index—left-turn movement—unsignalized intersection with bike lane.

Main Street Spd Lmt		Less than 35 mph						35 mph or more					
LT Cross Lns		1		2		3		1		2		3	
Parking		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Main ADT	1,000	2.2	2.0	2.2	2.0	2.2	2.0	2.9	2.7	2.9	2.7	2.9	2.7
	5,000	2.3	2.1	2.3	2.1	2.3	2.1	3.0	2.8	3.0	2.8	3.0	2.8
	10,000	2.4	2.2	2.4	2.2	2.4	2.2	3.1	2.9	3.1	2.9	3.1	2.9
	20,000	2.6	2.4	2.6	2.4	2.6	2.4	3.4	3.2	3.4	3.2	3.4	3.2
	30,000	2.9	2.7	2.9	2.7	2.9	2.7	3.6	3.4	3.6	3.4	3.6	3.4
	40,000	3.1	2.9	3.1	2.9	3.1	2.9	3.9	3.7	3.9	3.7	3.9	3.7
	50,000	3.4	3.2	3.4	3.2	3.4	3.2	4.1	3.9	4.1	3.9	4.1	3.9

Table 22. Bicycle safety index—left-turn movement—unsignalized intersection with no bike lane.

Main Street Spd Lmt		Less than 35 mph						35 mph or more					
LT Cross Lns		1		2		3		1		2		3	
Parking		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Main ADT	1,000	1.7	1.5	2.1	1.9	2.5	2.3	1.7	1.5	2.1	1.9	2.5	2.3
	5,000	1.8	1.6	2.2	2.0	2.6	2.4	1.8	1.6	2.2	2.0	2.6	2.4
	10,000	1.9	1.7	2.3	2.1	2.7	2.5	1.9	1.7	2.3	2.1	2.7	2.5
	20,000	2.2	2.0	2.6	2.4	2.9	2.7	2.2	2.0	2.6	2.4	2.9	2.7
	30,000	2.4	2.2	2.8	2.6	3.2	3.0	2.4	2.2	2.8	2.6	3.2	3.0
	40,000	2.7	2.5	3.1	2.9	3.4	3.2	2.7	2.5	3.1	2.9	3.4	3.2
	50,000	2.9	2.7	3.3	3.1	3.7	3.5	2.9	2.7	3.3	3.1	3.7	3.5

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