



**RHODE ISLAND  
VULNERABLE ROAD USER  
SAFETY ASSESSMENT**

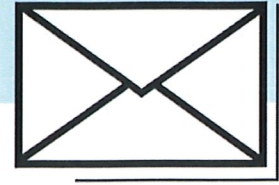
**2023**



# TABLE OF CONTENTS

Director’s Message.....	iii
Introduction.....	1
Overview of Vulnerable Road User Safety Performance.....	1
Environmental Justice .....	6
Key Findings .....	8
Performance Targets.....	8
Summary of Quantitative Analysis .....	9
Pedestrian Risk Scoring Factors.....	11
RIDOT State Road Crosswalk Inventory and Countermeasure Selection Guidance .....	14
Bicycle Mobility Plan (BMP) .....	14
Summary of Consultation.....	18
Program of Strategies .....	19
Strategy 1: Reduce VRU exposure to vehicular traffic .....	19
Strategy 2: Install proven safety countermeasures to reduce VRU crashes at high-risk locations.....	19
Strategy 3: Implement candidate projects from the Bicycle Mobility Plan .....	20
Implementation.....	21





## DIRECTOR'S MESSAGE

Even one traffic death or serious injury is unacceptable on Rhode Island's roadways. The State's safety stakeholders and partners are committed to improving safety for all roadway users by bringing fatalities to ZERO by 2050.

The 2023 Vulnerable Road User (VRU) Safety Assessment builds on that commitment by conducting a data-driven analysis of VRU safety in the State and identifying strategies to reduce fatalities and serious injuries. The VRU Safety Assessment builds upon statewide efforts, such as the Strategic Highway Safety Plan (SHSP), the Highway Safety Improvement Program (HSIP), Pedestrian Safety Scoring, and Bicycle Mobility Plan, to implement projects considering crash histories, road characteristics, and demographic/equity factors with higher risk of severe VRU injuries.

The VRU Safety Assessment focuses on pedestrians, bicyclists, and other non-motorized users to help achieve safety goals and targets. To realize the full potential of this assessment, we need to support and commitment from you—the residents of Rhode Island—to create and sustain a positive safety culture for all road users of the roadway.

A handwritten signature in black ink, appearing to read 'Peter Alviti, Jr.', written over a large, stylized circular flourish.

Peter Alviti, Jr. P.E.

Director

Rhode Island Department of Transportation



# INTRODUCTION

A Vulnerable Road User (VRU) is a non-motorist with a Fatality Analysis Reporting System (FARS) person attribute code for pedestrian, bicyclist, other cyclist, and person on personal conveyance. A VRU Safety Assessment analyzes the safety performance of a State with respect to these vulnerable users, with an emphasis on fatal and serious injuries, and the State's plan to improve safety.

Rhode Island's most recent Strategic Highway Safety Plan (SHSP), published in 2022, featured Pedestrians and Cyclists as Emphasis Areas. Rhode Island recognizes VRU safety is of high importance and is considered in the overall direction of safety for the State through the SHSP. A key element of the SHSP was to incorporate the elements and principles of the [Safe System Approach](#), as outlined by USDOT's [National Roadway Safety Strategy](#) (NRSS). The VRU Safety Assessment uses the Safe System framework to understand safety issues in the State and propose programs, projects, and strategies to reduce fatalities and serious injuries.

# OVERVIEW OF VULNERABLE ROAD USER SAFETY PERFORMANCE

In 2022, Rhode Island experienced 51 roadway fatalities with 7 being VRUs. Over the past 5 years, there has been a relatively flat trend for VRU fatalities, with an outlier year in 2020 (see *Figure 1*). *Figure 2* shows the number for VRU fatal and serious injuries by type.

*Table 1. VRU Fatalities and Serious Injuries from 2018 to 2022.*

Vulnerable Road User	2018	2019	2020	2021	2022
Pedestrian Fatalities	8	8	17	7	7
Bicyclist Fatalities	1	0	2	2	0
Pedestrian Serious Injuries	40	53	57	47	37
Bicyclist Serious Injuries	12	10	13	15	10
Total	61	71	89	71	54

*Source: Fatality Analysis Reporting System (FARS) and RIDOT Traffic Research Unit*



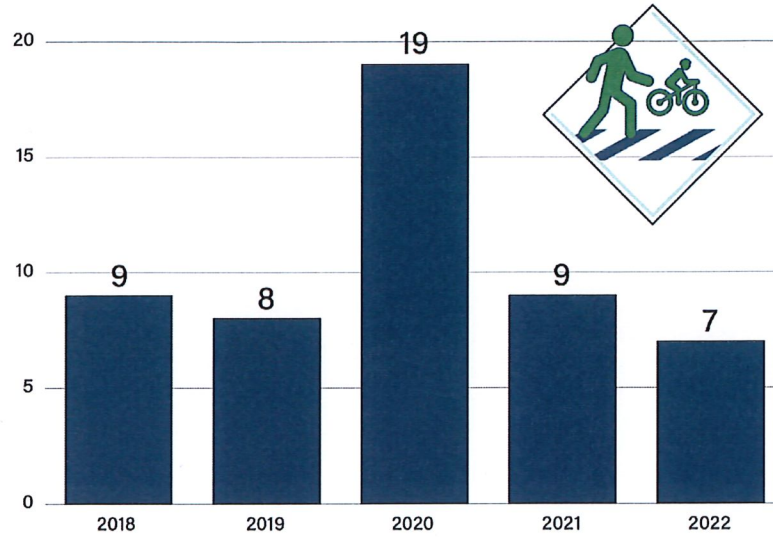


Figure 1. Vulnerable Road User Fatalities by Year.

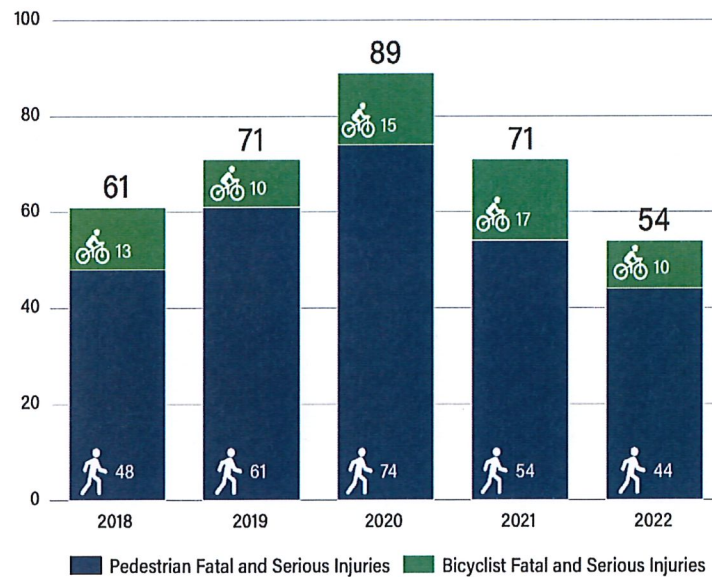


Figure 2. Vulnerable Road User Fatal and Serious Injuries 2018 to 2022.

Vulnerable road user fatalities and serious injuries (denoted by K and A, respectively, on the KABCO injury severity scale) have made up between 17 and 22 percent of total fatalities and serious injuries in Rhode Island (see Table 2) throughout the past five years.



Table 2. Vulnerable Road User Safety Performance to Overall Safety Performance

Safety Measure	2018	2019	2020	2021	2022
Total K&A	367	364	402	371	302
VRU K&A	61	71	83	68	60
Percent	17%	20%	22%	19%	18%

Source: Fatality Analysis Reporting System (FARS) and RIDOT Traffic Research Unit  
 K – Fatal Injury; A – Serious Injury

In addition to the review of the overall safety performance, data analysis of roadway characteristics and demographics for vulnerable road user fatal and serious injuries are shown in Tables 3 to 9. Shown in bold text are areas where VRU fatal and serious injury crashes are overrepresented compared to total fatal and serious injury crashes.

Table 3. Area Type of VRU K&A Crashes compared to Total K&A Crashes (2018-2022).

Area Type	Total K&A Crashes		VRU K&A Crashes	
	Number of Crashes	Percent	Number of Crashes	Percent
Rural	138	14%	9	4%
Urban	864	86%	208	<b>96%</b>

Note: 147 crashes were Unknown and removed for this analysis  
 Source: Fatality Analysis Reporting System (FARS) and RIDOT Traffic Research Unit  
 K – Fatal Injury; A – Serious Injury

Table 4. Functional Class of VRU K&A Crashes Compared to Total K&A Crashes (2018-2022).

Functional Class	Total K&A Crashes		VRU K&A Crashes	
	Number of Crashes	Percent	Number of Crashes	Percent
Interstate	115	9%	11	4%
Expressway	76	6%	7	3%
Principal Arterial	497	39%	114	<b>44%</b>
Minor Arterial	292	23%	82	<b>31%</b>
Major Collector	155	12%	27	10%
Minor Collector	18	1%	2	1%
Local	111	9%	19	7%

Note: 144 crashes were Unknown and removed for this analysis  
 Note: Crashes on Interstate and Expressway include VRUs being struck from disabled vehicles and first responders  
 Source: Fatality Analysis Reporting System (FARS) and RIDOT Traffic Research Unit  
 K – Fatal Injury A – Serious Injury





Table 5. Lighting Conditions of VRU K Crashes Compared to Total K (2018-2022).

Light Condition	Total K Crashes		VRU K Crashes	
	Number of Crashes	Percent	Number of Crashes	Percent
Daytime	128	43%	15	28%
Dark – Lighted	105	35%	26	<b>49%</b>
Dark – Not Lighted	45	15%	8	15%
Dark – Other Lighting	20	7%	4	<b>8%</b>

Note: "Dark – Other Lighting" includes "Dusk," "Dawn," and "Dark – Unknown Lighting"

Note: 3 crashes had unknown lighting

Source: Fatality Analysis Reporting System (FARS) and RIDOT Traffic Research Unit; K – Fatal Injury

Table 6. Traffic Control of VRU K&A Crashes Compared to Total K&A Crashes (2018-2022).

Traffic Control	Total K&A Crashes		VRU K&A Crashes	
	Number of Crashes	Percent	Number of Crashes	Percent
No Controls	753	64%	154	62%
Pavement Markings	148	11%	24	<b>16%</b>
Traffic Signal	132	13%	39	10%
Stop Sign	100	9%	18	7%
Other Signs	33	3%	11	<b>4%</b>
Flashing Traffic Control	8	1%	4	<b>2%</b>

Note: 281 crashes were Unknown and removed for this analysis

Note: "Other Signs" includes "School Zone Signs," "Warning Signs," and "Yield Signs"

Source: Fatality Analysis Reporting System (FARS) and RIDOT Traffic Research Unit; K – Fatal Injury; A – Serious Injury

Table 7. Number of Lanes of VRU K&A Crashes Compared to Total K&A Crashes (2018-2022).

Number of Lanes	Total K&A Crashes		VRU K&A Crashes	
	Number of Crashes	Percent	Number of Crashes	Percent
1	56	3%	12	<b>4%</b>
2	748	46%	127	45%
3	80	5%	11	4%
4	222	14%	34	12%
5	28	2%	8	<b>3%</b>
6	5	< 1%	0	0%

Note: 504 crashes were coded as "0" or unknown and were removed from the analysis

Source: Fatality Analysis Reporting System (FARS) and RIDOT Traffic Research Unit

K – Fatal Injury; A – Serious Injury



Table 8. Posted Speed Limit of VRU K&A Crashes Compared to Total K&A Crashes (2018-2022).

Posted Speed Limit (mph)	Total K&A Crashes		VRU K&A Crashes	
	Number of Crashes	Percent	Number of Crashes	Percent
≤ 25	711	43%	203	<b>70%</b>
30	57	3%	16	<b>5%</b>
35	255	15%	33	11%
40 – 45	115	7%	8	3%
50 – 55	151	9%	8	3%
> 55	36	2%	3	1%

Note: 340 crashes were coded as "0" and were removed for this analysis  
 Source: Fatality Analysis Reporting System (FARS) and RIDOT Traffic Research Unit  
 K – Fatal Injury  
 A – Serious Injury

Table 9. Age in VRU K&A Injuries Compared to Total K&A Injuries (2018-2022).

Age Range	Total K&A Injuries		VRU K&A Injuries	
	Number of Injuries	Percent	Number of Injuries	Percent
0-9	19	1%	11	<b>4%</b>
10-19	132	9%	28	<b>10%</b>
20-29	388	25%	44	15%
30-39	291	19%	45	16%
40-49	206	13%	35	12%
50-59	211	14%	50	<b>17%</b>
60-69	158	10%	45	<b>16%</b>
70-79	77	5%	18	<b>6%</b>
80-89	35	2%	11	<b>4%</b>
90+	11	<1%	3	<b>1%</b>

Note: 4 injuries were blank or unknown and were removed for this analysis  
 Source: Fatality Analysis Reporting System (FARS) and RIDOT Traffic Research Unit  
 K – Fatal Injury  
 A – Serious Injury





## ENVIRONMENTAL JUSTICE

The Rhode Island Department of Environmental Management (DEM) strongly believes that no community should be burdened with adverse environmental and public health consequences. DEM defines EJ as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, Tribal affiliation, disability, English language proficiency, or income with respect to access to the State's natural resources and the development, implementation, and enforcement of environmental laws, regulations, and policies.<sup>1</sup>

DEM defines an Environmental Justice Focus Area as any census tract that meets one or more of the following criteria:

- › Annual median household income is not more than 65 percent of the statewide annual median household income.
- › Minority population is equal to or greater than 40 percent of the population.
- › 25 percent or more of the households lack English language proficiency.
- › Minorities comprise 25 percent or more of the population and the annual median household income of the municipality in the proposed area does not exceed 150 percent of the statewide annual median household income.

When considering EJ areas, an analysis showed that VRU fatal and serious injury crashes accounted for 20 percent of statewide total fatal and serious injuries (see Table 10). However, when analyzing VRU fatal and serious injuries, 31 percent occurred in EJ areas, meaning that the risk of severe injury is increased for VRUs in EJ areas. The analysis also showed that 59 percent of statewide VRU fatal and serious injuries occurred in EJ areas (see Figure 3), compared to 38 percent for total statewide fatal and serious injury crashes.

*Table 10. Comparison of K&A crashes in EJ Areas.*

	Statewide K&A Crashes	EJ Areas K&A Crashes	
	Number of Crashes	Number of Crashes	Percent
Total K&A Crashes	1,944	704	38%
VRU K&A Crashes	391	231	59%
Percentage	20%	<b>31%</b>	-

<sup>1</sup> <https://dem.ri.gov/environmental-protection-bureau/initiatives/environmental-justice>

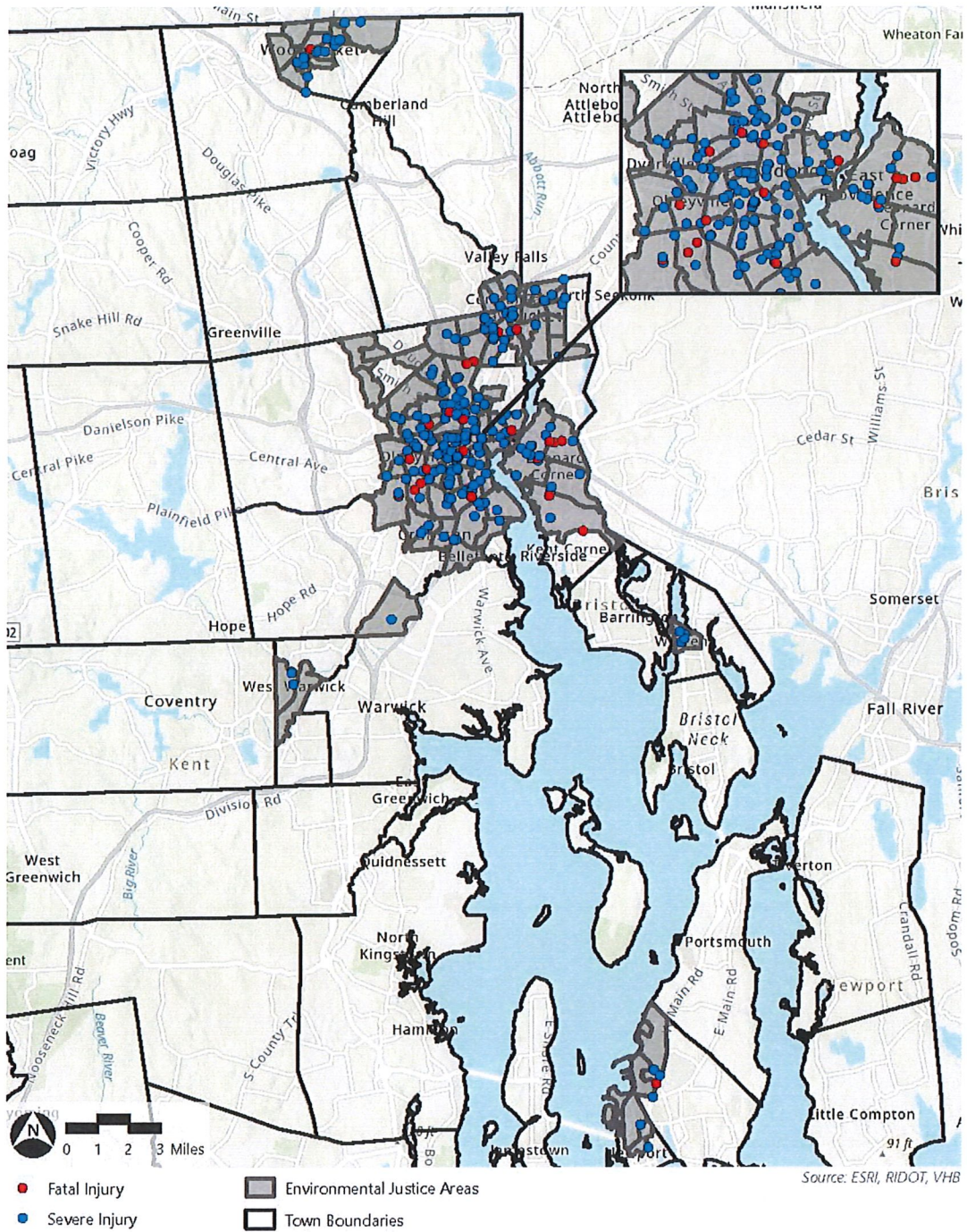


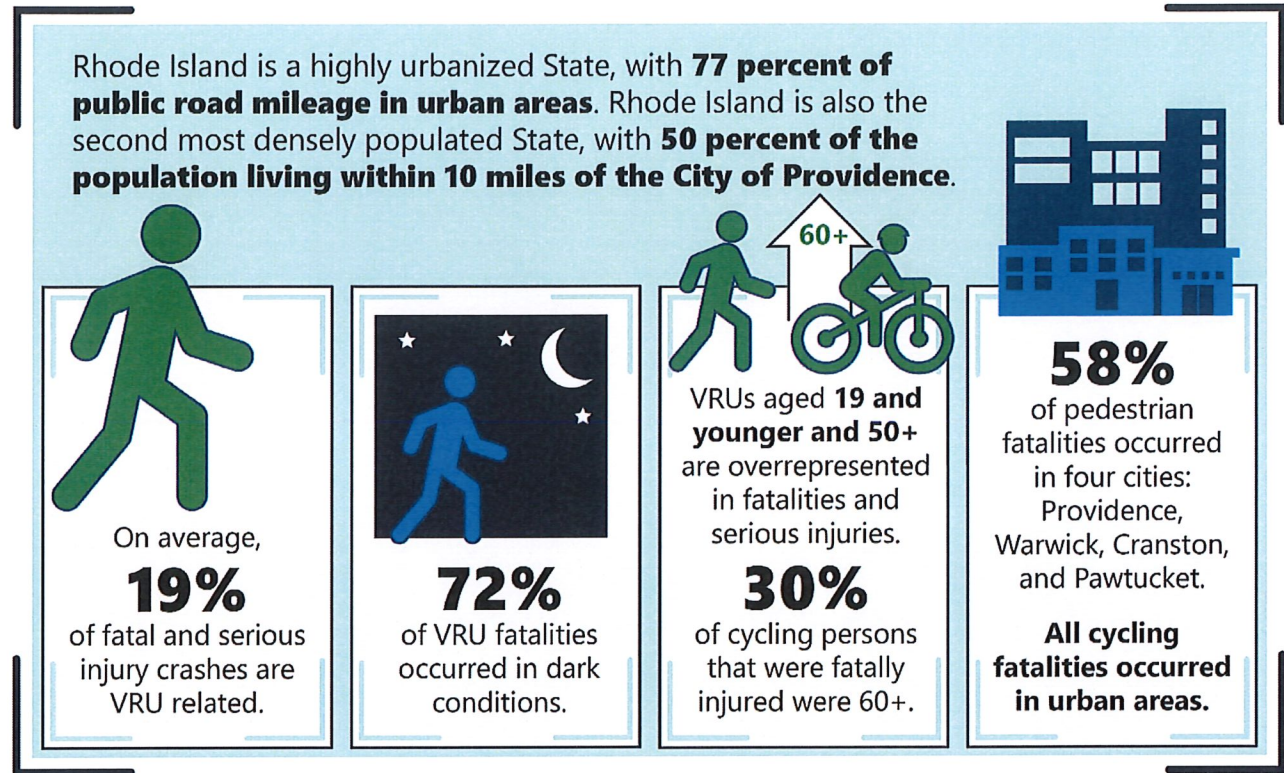
Figure 3. VRU fatal and serious injury crashes in EJ areas.





## KEY FINDINGS

The following summarizes key findings from the data analysis:



These findings support the need for a Safe System Approach addressing both infrastructure and behavior, so that when humans make mistakes it does not lead to fatal or serious injury.

## PERFORMANCE TARGETS

Both the Federal Highway Administration (FHWA) and National Highway Traffic Safety Administration (NHTSA) require States to set annual safety performance targets. The Safety Performance Final Rule establishes five metrics, including number of non-motorized fatalities and serious injuries, that States must track as part of the FHWA Highway Safety Improvement Program (HSIP).

To better align with historic trends, the State sets targets using historic accumulation rates per day. Rhode Island made progress towards achieving the number of non-motorized fatalities and non-motorized serious injuries target. The actual performance for the 5-year average for 2018-2022 (69.4) was lower than the established target for the same time period (75). The actual performance was also better than the 2016-2020 baseline (77).



# SUMMARY OF QUANTITATIVE ANALYSIS

Rhode Island determined high-risk areas based on the top 15 percent (or 6 out of 39) of municipalities with the highest number of VRU fatal and serious injury crashes from 2018 to 2022. The analysis revealed that 66 percent of VRU fatal and serious injury crashes occurred in these 6 cities. **These 6 cities also account for 93 percent of the statewide VRU fatal and serious injury crashes that occurred in EJ census tracts** (see Table 11 and Figure 4).

*Table 11. High-risk municipalities based on VRU KA crashes (2018-2022).*

Municipality	Number of VRU KA Crashes	Percent of Total VRU KA Crashes	Number of VRU KA Crashes in EJ Areas
Providence	131	34%	129
Pawtucket	36	9%	32
Cranston	31	8%	15
East Providence	24	6%	21
Warwick	23	6%	-
Woonsocket	18	5%	17



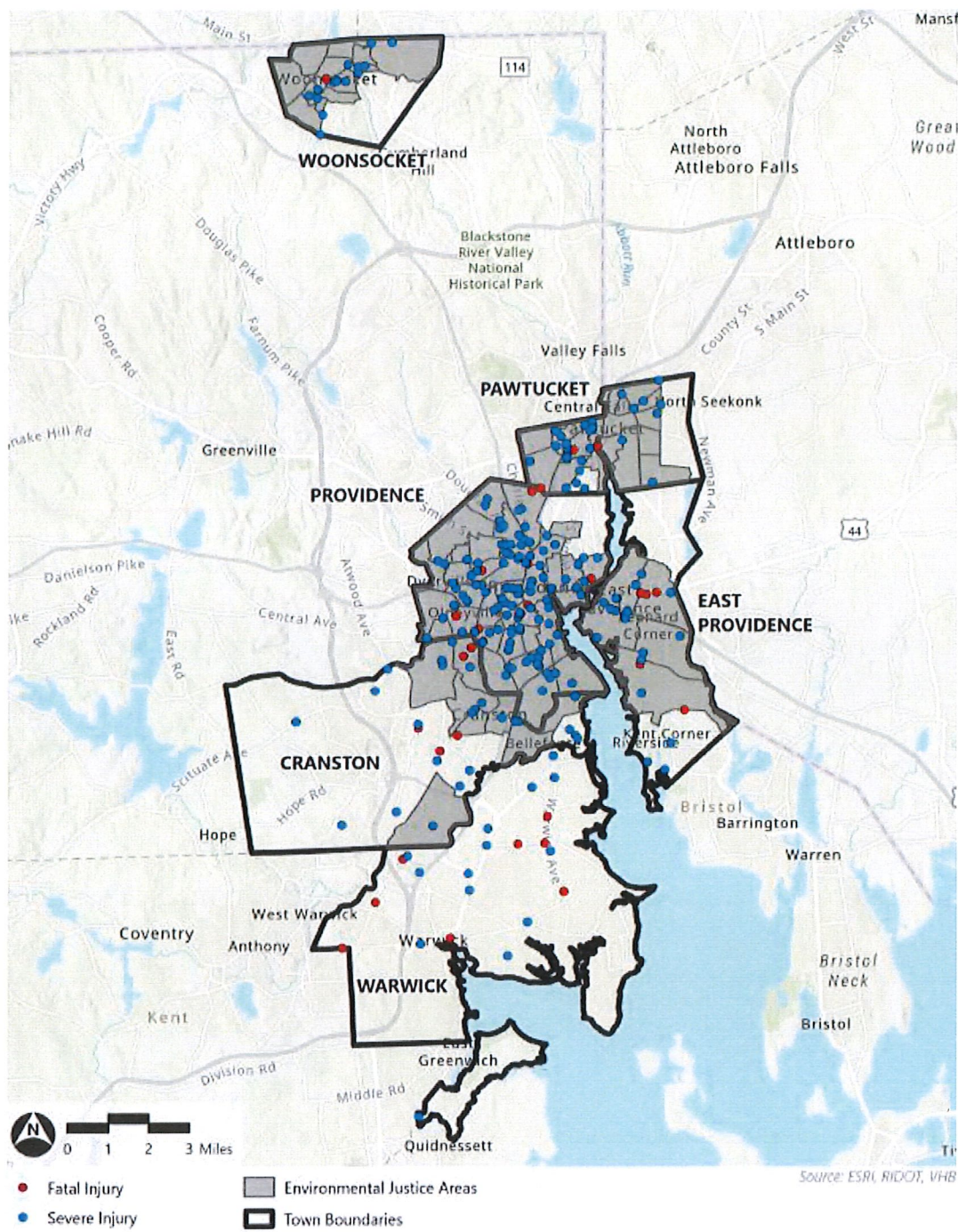


Figure 4. High-risk municipalities.



Rhode Island annually screens its network for high-risk areas related to VRU safety using a GIS tool. The State uses the systemic approach to identify risk factors and determine segments, intersections, and crossings with the highest risk for pedestrians and bicyclists. The systemic analysis allows the user to identify potential trends (geometry, traffic volumes) that have a higher occurrence of fatal and serious injury crashes using the crash and roadway data (i.e., Model Inventory of Roadway Elements [MIRE]). Once the potential risk factors are identified, the tool identifies locations with those characteristics, which have a higher risk for fatal or serious injury crashes. The user can assign a weighted “point” system for each trend to help prioritize locations based on severity or number of trends at a given site. This allows the tool to provide the user with a “ranked” list of risk-based locations. RIDOT conducts this analysis and provides the results to local agencies upon request for VRU-related assistance.

Rhode Island conducts analyses to determine candidate locations for safety improvement specifically for pedestrians and bicyclists through Pedestrian Risk Scoring Factors (segments and crossings), State Road Crosswalk Inventory and Countermeasures, and the Bicycle Mobility Plan. The candidate locations from these efforts align with EJ areas and address the need of these higher-risk communities.

## PEDESTRIAN RISK SCORING FACTORS

The pedestrian safety program uses a systemic, risk-based approach using the STEP tool (developed by RIDOT). This tool uses various attributes to assign a risk for each unsignalized crossing. For signalized crossings, RIDOT developed a systemic tool in 2022 and is incorporating it into the screening process currently and is projected to be completed in 2024. The pedestrian risk screening is based on factors including roadway characteristics, crash history, and demographic characteristics. The criteria were selected based on a systemic analysis of historic crashes as well as accounting for areas that rely heavily on vulnerable user facilities to ensure equity was considered. The following describe the 13 criteria with weights in parentheses:

- › Traffic volume (high).
- › Posted speed limit (high).
- › Population density (high).
- › Zero vehicle households (high).
- › Roadway configuration (medium).
- › Urbanized area (medium).
- › School access (medium).
- › Pedestrian crash history (medium).
- › Employment density/business (medium).
- › Transit access and bus stops (medium).
- › Park access (low).
- › Facilities (low).
- › Drivers under 44 (low).

The weights of the 13 measures are given a multiplicative factor (i.e., low = 0.04, medium = 0.07, and high = 0.14) and a score out of 100 is calculated (see 3 and Figure 6 for visual representation of the scoring). RIDOT assigned the weight for each criterion based on the historic crash data analysis. Vulnerable users were more likely to be involved in a fatal or serious injury at locations where higher volumes and speed limits were present as well as areas that are densely populated and where households that do not have personal vehicles but rely on public transit, walking, and biking to commute to school, work, etc.

The segment scoring and screening has assisted RIDOT in identifying the Top 15 percent of municipalities in Rhode Island that experienced VRU crashes based on the potential risk for vulnerable users. This allowed RIDOT to review the crosswalks within these communities and along critical corridors for





enhancements and program the work into the Statewide Transportation Improvement Plan (STIP) funded by the HSIP. Historically, many improvements were prioritized solely based on transportation data, but RIDOT has moved towards improving its pedestrian facilities with an increased focus on equity to ensure the facilities that are relied on heavily are prioritized first using the segment scoring and screening described above. Equity considerations include environmental justice areas, population density, zero vehicle households, urbanized area, school access, employment density/business, transit access and bus stops, park access, and drivers under 44.

HSIP funding is proportionally spent based on crash distribution for the three major emphasis areas (Intersections, Roadway Departure, and VRUs). Annually, RIDOT spends at least 15 percent of their HSIP funding on VRU-related projects as those crashes make up between 15 to 20 percent of the statewide fatal and serious injuries.

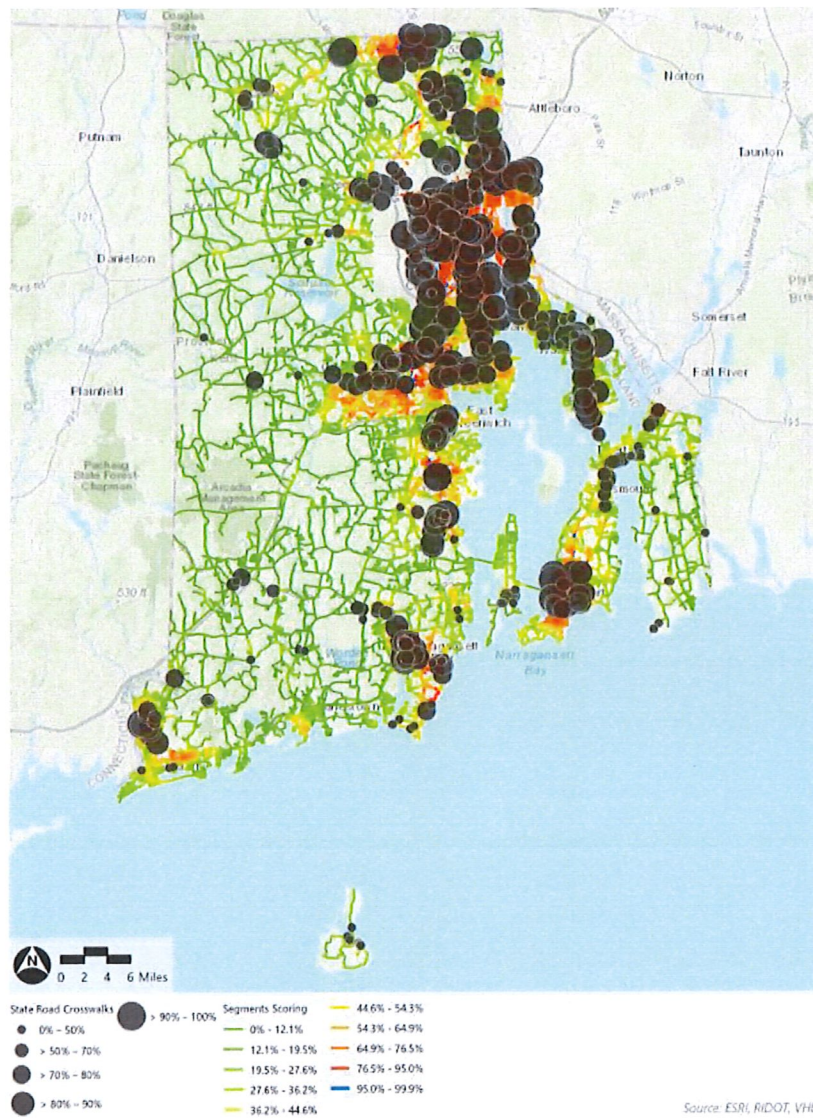


Figure 5. Map of statewide crosswalk and segment risk assessment.

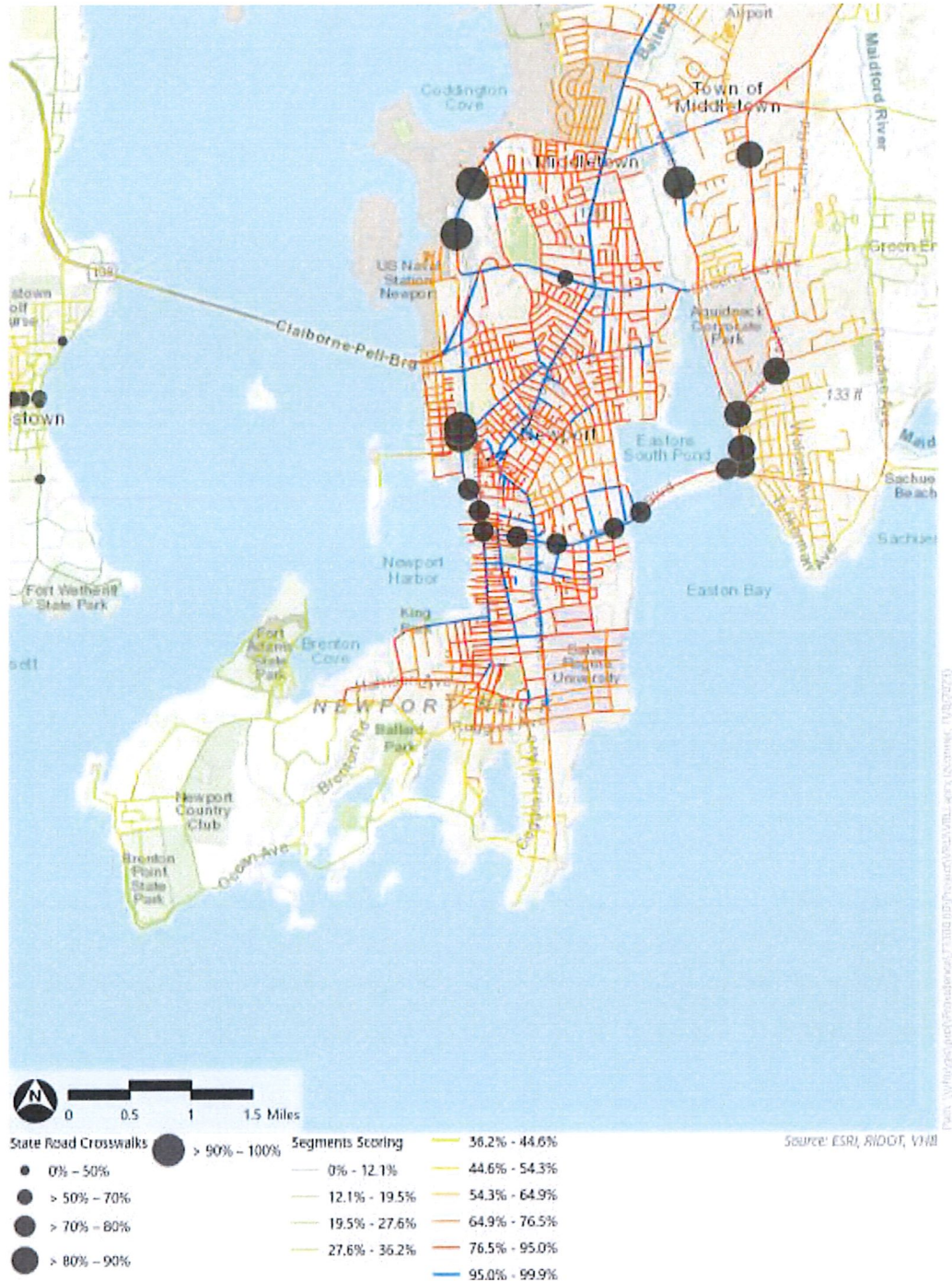


Figure 6. Example of city-specific crosswalk and segment risk assessment (City of Newport is shown here).





## RIDOT STATE ROAD CROSSWALK INVENTORY AND COUNTERMEASURE SELECTION GUIDANCE

RIDOT conducted the identification, review, and analysis of all crossings on State-maintained roadways by completing field inventories at each crossing. The field reviews were used to obtain existing conditions data such as signage/pavement marking inventory, operating speeds, and observe driver and VRU behavior. The data collection was used to identify the baseline conditions as well as identify trends and characteristics for various types of crossings. The trends and characteristics allowed RIDOT to implement pedestrian improvements systemically at similar crosswalks that have not experienced pedestrian related crashes.

Following the inventory, RIDOT developed a pedestrian crossing countermeasure flow-chart and improvement plan which incorporates various documentation including FHWA STEP Guide as well as a review of historic data and States' best practices. The flow-chart and improvement recommendations allowed RIDOT to identify improvements at all inventoried crosswalks statewide preliminarily, which assists in project planning efforts. The segment risk assessment prioritizes crosswalk locations or corridors for the implementation of the selected countermeasures for inclusion in the STIP. This approach highlights the systemic safety methodologies RIDOT has advanced to reduce fatal and serious injuries, but also prevent these crashes from occurring.

## BICYCLE MOBILITY PLAN (BMP)

In 2020, Rhode Island Statewide Planning Program published its Bicycle Mobility Plan (BMP),<sup>2</sup> which was the first statewide initiative to strategically expand the bicycle network. The plan identified a wide range of bicycle enhanced corridors, programs, and policies recommended to achieve the vision for cycling. As part of this effort, Rhode Island Statewide Planning Program developed the BMP Advisory Committee which consists of a multidisciplinary group of stakeholders representing State agencies (e.g., Department of Environmental Management, Department of Health, Department of Administration, Department of Transportation), transit organizations, cities and towns, and advocacy groups.

In order to understand the network needs for bicyclists, RIDOT analyzed connectivity (gaps in the network), equity (locations with traditionally underserved communities considering children, seniors, people of color, lower-income households, and populations with limited English proficiency, or low rates of car ownership), and safety (crash data).

Most concentrated clusters of bicycle crashes and injuries have occurred in the most densely populated and urbanized parts of the State, particularly Metro Providence, Woonsocket, and Newport. The crashes also tend to fall into one or more of the following categories:

- › At an intersection or at a driveway with no traffic control elements such as a stop sign or traffic signal.

<sup>2</sup><https://planning.ri.gov/planning-areas/transportation/long-range-transportation-plan/bicycle-mobility-plan-documents>

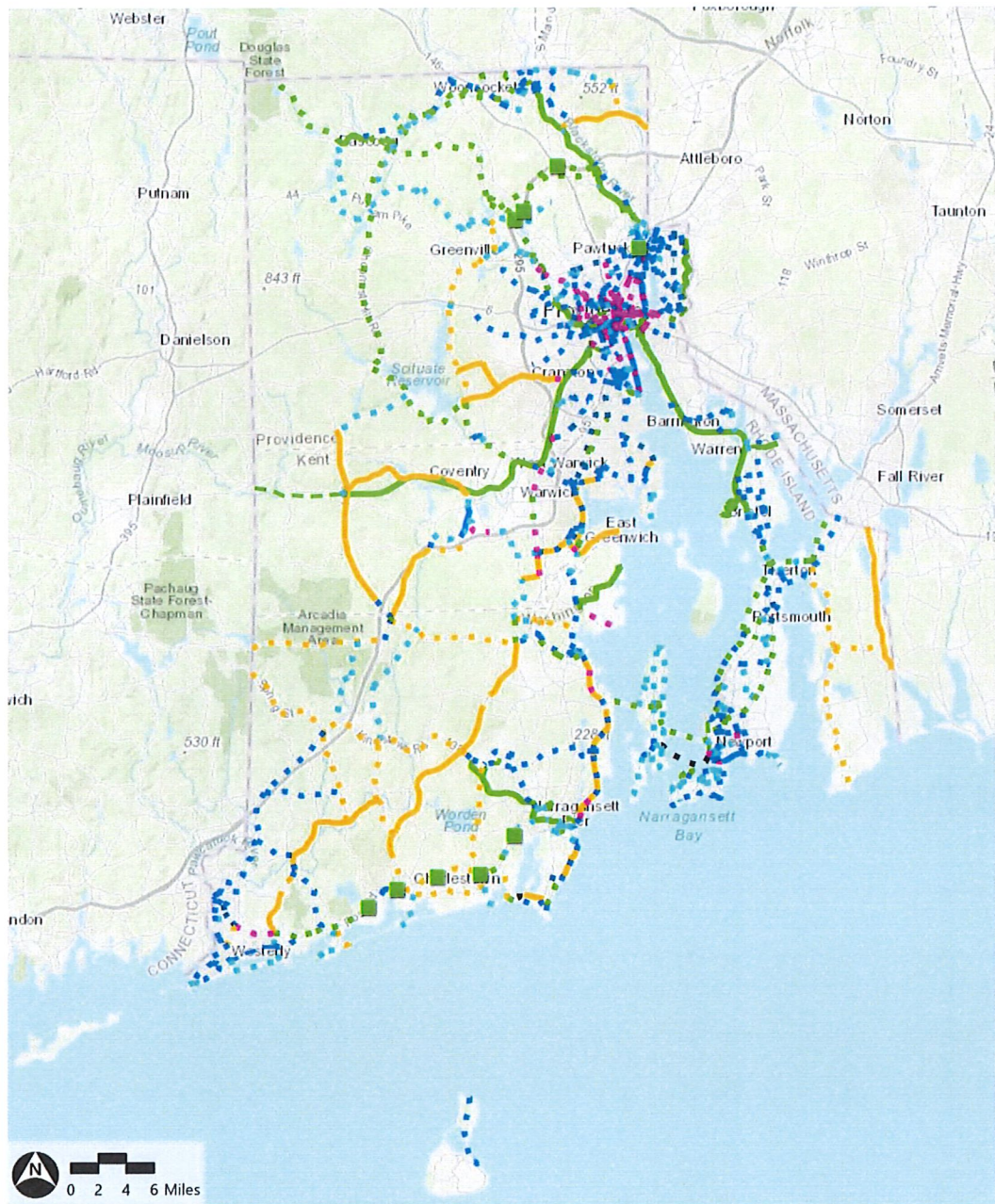


- 
- › On streets that lead to shared-use paths (i.e., path links without bicycle facilities) and at road crossings along the path corridor.
  - › At locations near commercial land uses along high-speed arterial roadways with frequent curb cuts for motor vehicle entry and exit.

Candidate corridors for bicycle facilities installations/enhancements (see Figure 7 and Figure 8) were determined and prioritized with the following scoring criteria, and further enhanced with input from existing and planned projects (Green Economy Bond and STIP), Statewide Planning staff, the BMP Advisory Committee, and comments from the general public at community meetings:

- › Improved safety (max 25 points).
- › Density (max 20 points).
- › Potential to address bicycling hazards (max 15 points).
- › Utility (max 15 points).
- › Equity (max 10 points).
- › Health (max 10 points).
- › Economic development (max 5 points).





- |  |  |  |                                 |
|--|--|--|---------------------------------|
| <ul style="list-style-type: none"> <li><span style="color: green;">■</span> New Signal or Over/Under Pass</li> </ul> | <ul style="list-style-type: none"> <li><span style="color: blue;">■</span> Road Diet w/Bicycle Lanes</li> <li><span style="color: lightblue;">■</span> Dashed/Advisory Bicycle Lane</li> <li><span style="color: orange;">■</span> Shoulder Bicycle Lane</li> <li><span style="color: black;">■</span> Improved Ferry Service</li> <li><span style="color: green;">■</span> Funded Shared Use</li> <li><span style="color: blue;">■</span> Funded Bike Lane</li> </ul> | <ul style="list-style-type: none"> <li><span style="color: green;">■</span> Existing Bikeways</li> <li><span style="color: blue;">■</span> Shared Use Path</li> <li><span style="color: blue;">■</span> Bicycle Lane</li> <li><span style="color: orange;">■</span> State Roadway w/ 4' Shoulder and Signs</li> <li><span style="color: black;">■</span> Roadway w/ Sharrows and/or Signs</li> <li><span style="color: blue;">■</span> Future Bike Lane</li> </ul> | <p>Source: ESRI, RIDOT, VHB</p> |
|--|--|--|---------------------------------|

Figure 7. Statewide candidate bicycle treatments identified in the BMP.



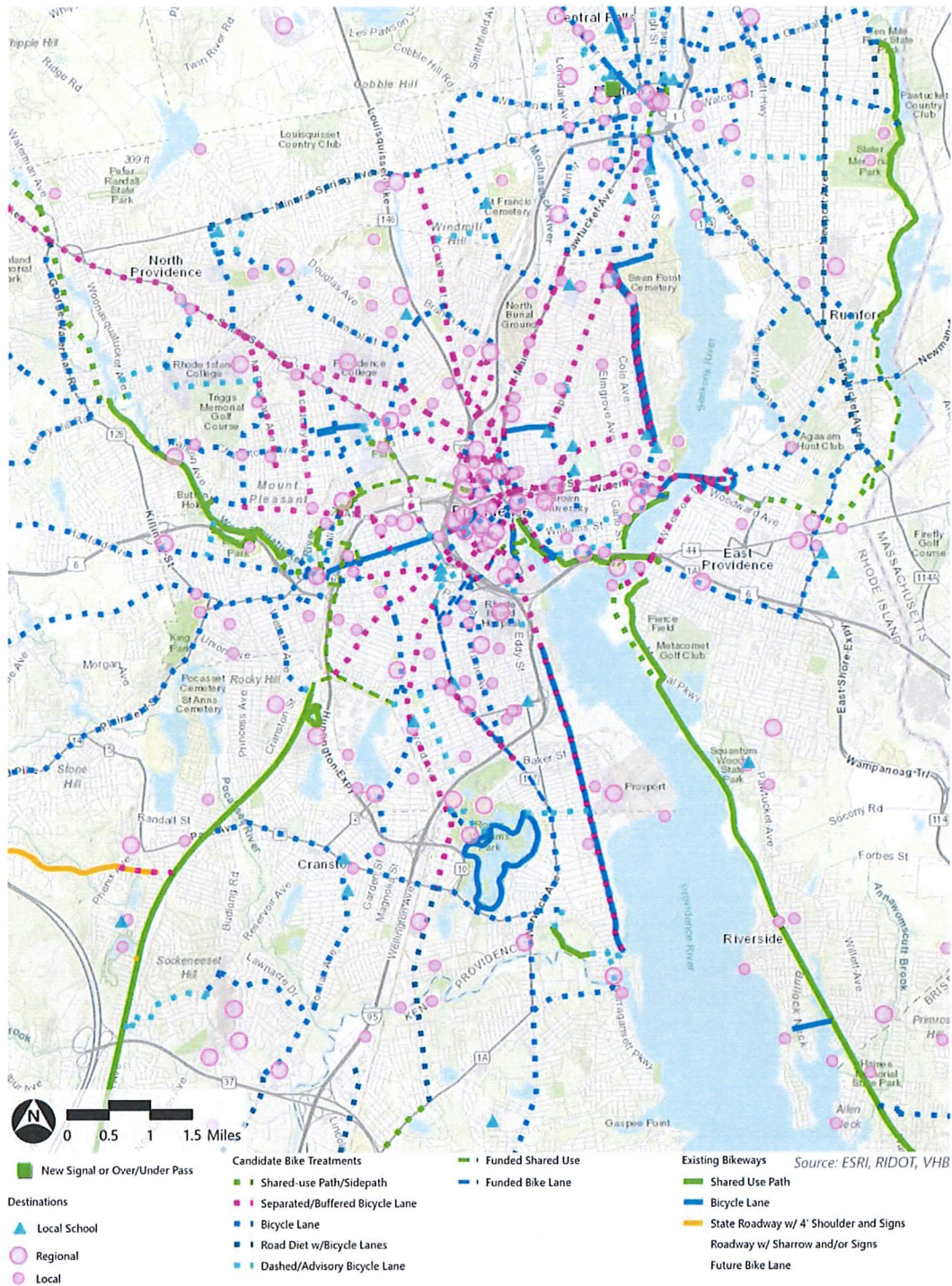


Figure 8. Example of city-specific candidate treatments in the BMP (City of Providence is shown).





# SUMMARY OF CONSULTATION

RIDOT has ongoing mechanisms to engage local stakeholders in VRU safety, but recent larger statewide efforts required extensive coordination and feedback from local agency stakeholders (i.e., the SHSP update in 2022 and BMP development in late 2020). The following describe the ongoing and past outreach conducted to local agencies regarding VRU safety.

- › RIDOT has worked with several municipalities on pedestrian and bicycle safety. They have developed safety action plans for multiple communities with high pedestrian activity. RIDOT has also reviewed all segments statewide and assigned a "risk" score to them. This will help RIDOT and local agencies prioritize safety for vulnerable road users.
- › Local partners are involved in road safety assessments (RSAs) that were performed at many high-risk areas to facilitate a multidisciplinary approach. RSAs provide an opportunity to gather feedback specific to a given project before any design begins.
- › Through the update of the SHSP in 2022, several workshops were conducted creating more touchpoints between stakeholders.
- › Through the BMP development, extensive outreach with planners from each city and town was completed and feedback was received at numerous public workshops and local outreach events across the State. The critical needs identified through public and stakeholder outreach were:
  - Improve connectivity.
  - Fill network gaps.
  - Overcome gaps along the State's many bridges.
  - Addressing equity and differences in access between communities.
  - Address policy gaps.
  - Fix incomplete streets.
  - Enhance bicyclist and driver education.
  - Improve safety and maintenance.
  - Explore dedicated funding option.

These needs were then incorporated into RIDOT's strategic methodology used to develop the BMP.



# PROGRAM OF STRATEGIES

The Safe System Approach was considered to address the crash trends and issues noted by the consultations. RIDOT and local agencies have been planning and implementing proven countermeasures that align with Safe System elements (i.e., Safer Roads, Safer Speeds, Safer Users, Safer Vehicles, and Post Crash Care). The State understands that redundancy is crucial by layering various types of strategies.

The Safe System approach is a framework for road safety that represents a significant shift from traditional approaches. Because the human body has limits for tolerating crash forces, those forces must be managed to not exceed certain limits, especially for VRUs without the added protection inside a vehicle. The principles of the Safe System approach anticipate human mistakes by designing and managing road infrastructure to keep the risk of a mistake low; and when a mistake leads to a crash, to mitigate the impact on the human body to help reduce fatalities and serious injuries. Road design and management should encourage safer speeds. The responsibility to create such a Safe System is shared among all transportation stakeholders, from transportation system users to roadway managers, designers, engineers, and planners. The VRU Assessment's program of projects/strategies aligns with the Safe System Approach by creating safer roads and speeds at high-crash locations and locations with higher risk of crashes occurring, even if no crash history exists. It is imperative that redundancy is built into the transportation system so that safety is never fully dependent on one facet of the system. The following strategies were developed based on crash data analysis, current HSIP practices, consultations, and the Safe System principles and elements.

## STRATEGY 1: REDUCE VRU EXPOSURE TO VEHICULAR TRAFFIC

This strategy focuses on installing and enhancing pedestrian and bicycle facilities. Having dedicated facilities for walking and bicycling reduces the exposure to traffic and increases driver awareness of VRUs traveling along, or crossing, the road. This strategy also aims to address driver impairment so that an impaired driver is less likely to collide with a pedestrian or bicyclist on dedicated facilities.

- › Install and enhance crosswalks at mid-block locations and at intersections.
- › Install bicycle lanes. The BMP has candidate locations for buffered and separated bicycle lanes, shared use paths, standard bicycle lanes, road diets with bicycle lanes, and shoulder bicycle lanes.
- › Identify and address network gaps in the sidewalk/pedestrian network.

## STRATEGY 2: INSTALL PROVEN SAFETY COUNTERMEASURES TO REDUCE VRU CRASHES AT HIGH-RISK LOCATIONS

RIDOT used the systemic approach for both pedestrians and bicyclists to determine candidate locations for safety improvements at intersections, along the roadway, and at mid-block crossings. At these locations, proven safety countermeasures will be implemented to improve safety, including the following strategies currently in use in the State:

- › Pedestrian Hybrid Beacon (PHB).
- › Rectangular Rapid Flashing Beacon (RRFB).





- › Leading Pedestrian Interval (LPI) at high-risk, high pedestrian volume, and high crash intersections.
- › Crosswalk Visibility Enhancements (e.g., signs, high visibility crosswalks, and lighting)
- › Bicycle Lanes (standard, buffered, and separated) in BMP for planned bicycle facilities (and pedestrians in the case of shared use paths).
- › Traffic Calming strategies including reduced speed limits and road diets.
- › Road Safety Assessments (RSAs).

The countermeasures above are selected using the RIDOT Countermeasure Selection Tool and Flow Chart. The tool was developed using the FHWA STEP Table 1 as the framework, but was modified based the systemic analysis conducted for VRU. The tool takes into account transportation data and considering vehicle and VRU behavior observed.

In addition, RIDOT determines the locations for RSAs to be conducted a variety of ways including but not limited to: site specific crash history, systemic analysis, request from municipality, or new transit feature (i.e. train station, bus hub). Once a location is identified for an RSA, the RSA is planned and conducted within a month unless there is a seasonal need to hold the assessment during a different time of year. RIDOT works closely with the local municipalities and stakeholders to ensure their involvement throughout the entire process and to build a long-lasting partnership on working towards improving roadway safety for all users.

## **STRATEGY 3: IMPLEMENT CANDIDATE PROJECTS FROM THE BICYCLE MOBILITY PLAN**

The projects identified from the BMP include various types of bicycle facilities (see Figure 4), with shared use paths also accommodating pedestrian use. The treatments include separated/buffered bicycle lanes, standard bicycle lanes, road diets with bicycle lanes, dashed/advisory bicycle lanes, shoulder bicycle lanes, and improved ferry service to promote regional travel. The goals of the projects include the following:

- › Improve safety by creating dedicated facilities for VRUs.
- › Provide connectivity to existing and proposed bicycle facilities.
- › Fill in gaps in the current bicycle network.
- › Include space for bicyclists on bridges.
- › Link to regional and local destinations.
- › Address State roads with narrow shoulders.



---

## IMPLEMENTATION

The 2022 SHSP (and previous iterations) includes Pedestrians and Cyclists as Emphasis Areas, meaning Rhode Island understands the significance of the issue and has been using Highway Safety Improvement Program (HSIP) funding to address the problem.

RIDOT houses the Office of Highway Safety (OHS) where the HSIP, Highway Safety Plan (HSP), and SHSP are all developed in a coordinated effort focused on developing consistent safety goals. Safety initiatives are now implemented in a more integrated and multi-disciplinary manner, providing RIDOT with more flexibility to direct resources to address particular safety needs. As part of the FAST Act, RIDOT and OHS along with the State's Office of Performance Management coordinated the development of performance measurement and targets.

The program of strategies in this VRU Safety Assessment applies to all public roads. RIDOT works with municipalities to identify and mitigate crash issues on locally-maintained roadways. RIDOT has developed a process for local agencies to request a safety improvement with the intent for local agencies to perform the "planning" step from the HSIP process. RIDOT will then determine if the improvement is eligible for HSIP funds and distribute the funds needed to the local agencies so they can administer the construction of the improvements.

To streamline the implementation of Low-Cost Safety Improvements on all public roads, to reduce fatalities and serious injuries, RIDOT implemented Indefinite Delivery, Indefinite Quantity (ID/IQ) contracting in FY2023. This uses HSIP funds and enables RIDOT to reduce project soft costs and accelerate delivery. The Office of Safety will administer these contracts with the goal of implementing projects within 6 months to a year from study. RSAs are a driver for safety improvements and RIDOT has a streamlined process in place to conduct RSAs and implement the findings using maintenance forces, ID/IQ contracts, or by bundling with capital projects.

The recommendations from the BMP are being implemented in a variety of ways. Corridors were evaluated based on the degree of effort it will take to install the recommendations. Where possible, the addition of bicycle lanes and buffered bicycle lanes will be done using RIDOT's pavement marking maintenance contracts which restripe roadways on a cyclical schedule. Other changes will be made by incorporating the recommendations into capital projects in the STIP or by using RIDOT's ID/IQ contracts. Larger projects may be advertised as standalone construction contracts.



