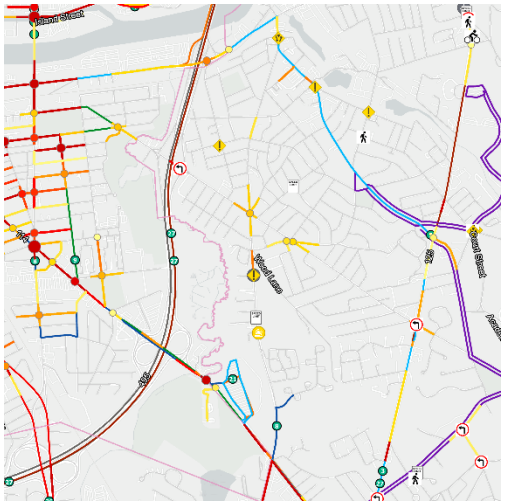
Merrimack Valley visionzero
Safe Streets and Roads for All

MV Vision Zero Plan Draft

08/28/24



Merrimack Valley Planning Commission
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massDOT
Massachusetts Department of Transportation

Front Matter

Policy Statement

MV Vision Zero is a commitment by the Merrimack Valley Metropolitan Planning Organization to eliminate all injury crashes by the year 2050 because life-changing injuries and death are unacceptable consequences of travel by any mode.

About the Merrimack Valley Metropolitan Planning Organization

Fifteen member communities fall within the Merrimack Valley's federally designated metropolitan planning region. The Merrimack Valley Planning Commission (MVPC) supports these communities by facilitating various environmental, economic development, transportation, and technology planning services. Staff within MVPC also support the Merrimack Valley Metropolitan Planning Organization (MVMPO), which is the region's transportation policy board. This body manages the regional federally required Continuing, Cooperative, and Comprehensive (3C) transportation planning process, which ensures infrastructure planning and funding coordination across the local, state, and federal levels of government

Endorsement Letter

Dear Members of the Merrimack Valley Community,

Since 2017, 140 people have been killed and 1,080 people have sustained life-changing injuries in transportation-related crashes in the Merrimack Valley. Although driver deaths are declining, risk for people who walk, bike, or use public transportation (also known as Vulnerable Road Users) is increasing. Some contributing factors to this disturbing trend are heavier cars, faster speeds, and persistent social stress, but another critical factor is that the transportation network has historically been designed to prioritize travel time reduction, resulting in danger by design for all roadway users. Through this plan, we acknowledge that walking, biking and taking transit all improve transportation efficiency, but these benefits can only be realized while also prioritizing safety.

Often, we look to advancements in technology to solve critical problems. This has long been the response to transportation safety. And to the benefit of many, we have indeed seen improvements to vehicle safety, roadway

design, post-crash emergency response and medical care. However, finding a way to balance the many needs of the transportation network while prioritizing safety requires not only technological advancement, but also holistic thinking. This is why we are committed to the Vision Zero approach.

Vision Zero seeks to harmonize transportation activities for the safety and well-being of all road users, thereby creating a more sustainable and inclusive urban environment. Endorsement of this plan signifies a commitment to a transportation system that prioritizes safety, enhances quality of life, and fosters a sense of community resilience. This plan emphasizes collaboration across all municipalities and stakeholder groups in recognition of our shared responsibility in eliminating fatal and severe injuries.

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Background and Context

What is Vision Zero?

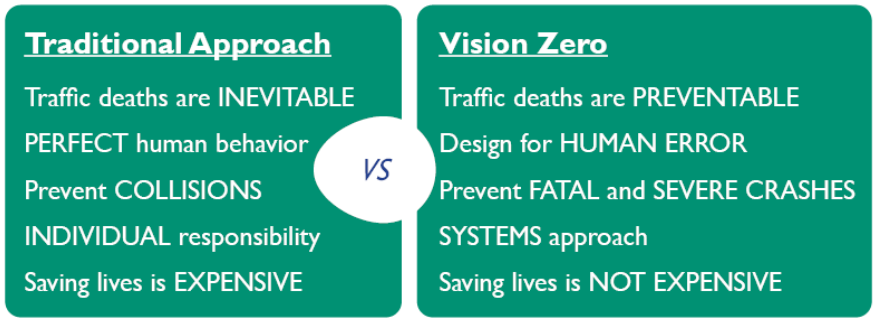
Vision Zero Guiding Principles

It seems obvious that human life should be valued above convenience, however our nation's typical approach to roadway engineering has not reflected this. Vision Zero replaces the status quo of planning for drivers' convenience and speed with a holistic, systems-based transportation planning approach—an approach that has been effectively eliminating severe injury and fatal crashes since it was first introduced in Sweden in the 1990s. Above all else, Vision Zero advances a goal of zero serious injuries and fatalities on roadway networks and posits that this goal is indeed attainable.

Vision Zero focuses on crash severity over crash frequency. An intersection with five crashes—but no injuries—is a lower priority for intervention than an intersection where a single crash has resulted in an injury or fatality. Crashes resulting in property damage only may be cause for concern, but these crashes do not necessarily indicate serious risk of death. This approach informs the project lists included in this Plan, which include the region's roadways with the greatest risk of tragic outcomes.

Often, improving roadway safety is considered expensive due to the high costs to implement permanent changes to roadway characteristics, update traffic signals, or purchase new technology. These costs, however, do not compare to the unquantifiable costs of a life human life lost to a neglected safety update at a known, high-risk location.

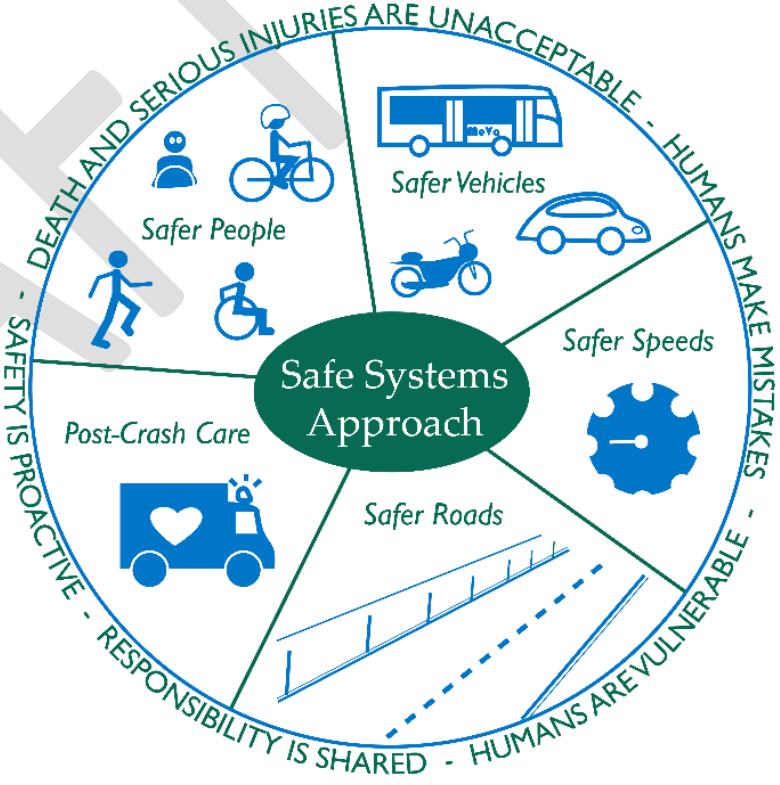
Traffic deaths are preventable—even with the acknowledgement that humans will make mistakes. By using a redundant, safe-systems approach, engineers, planners, and other government officials can design for human error to protect all users.



Safe Systems Approach

Safe Systems actualize Vision Zero. This solutions-based approach offers six guiding principles:

- **Death and serious injuries are unacceptable** – *A Safe System Approach prioritizes the elimination of crashes that result in death and serious injuries.*
- **Humans make mistakes** – *People will inevitably make mistakes and decisions that can cause or contribute to crashes, but the transportation system can be designed and operated to accommodate certain types and levels of human mistakes to avoid death and serious injuries when a crash occurs.*
- **Humans are vulnerable** – *Human bodies have physical limits for tolerating crash forces before death or serious injury occurs; therefore, it is critical to design and operate a transportation system that is human-centric and accommodates physical human vulnerabilities.*
- **Responsibility is shared** – *All stakeholders—including government at all levels, the transportation industry, advocates, researchers, and the general public—are vital to preventing fatalities and serious injuries on our roadways.*
- **Safety is proactive** – *Proactive tools should be used to identify and address roadway safety issues rather than solely reacting to crashes after the fact.*
- **Redundancy is crucial** – *Reducing risks requires that all elements of the transportation system be strengthened so that if one element fails, other elements still protect people. In fig. 2, each wedge represents a different component of the systems approach.*



The graphic above is adapted from the US DOT Federal Highway Administration Safe Systems Approach

Case Studies for Safety Improvements

Many projects in the Merrimack Valley are already using the safe systems approach. These projects have reduced the risk of severe injuries, enabled mode shift, and promoted safety culture.

Amesbury/Salisbury Trail Connector at I-95

A collaborative effort between two municipalities and a nonprofit resulted in the creation of an important connection under I-95. Since its opening, vulnerable nonmotorists enjoy a comfortable shared use path separated from a high injury, high volume road.

Groveland Improvements along Main Street and 113 Bridge

The town of Groveland used Safe Routes to School funds to add new striping, delineators, and an aesthetic treatment to reduce undefined roadway space, improving comfort and safety for VRUs and drivers.

Lawrence Intersection Improvements at 28 (South Broadway) and Mt. Vernon Street

MassDOT and the City added sidewalk extensions in the intersection's adjacent parking lane to improve visibility of non-motorists in the crosswalk. New lane delineations reduced confusion for turning cars. Signal upgrades introduced protected left-turn phasing. Although this intersection was just completed in 2021, injury crashes already seem to be declining.

Shared use path tunnel under I-95.

Route 1 and Glen Road, Rowley

Rowley Intersection Improvements at Glen Road and Rt. 1

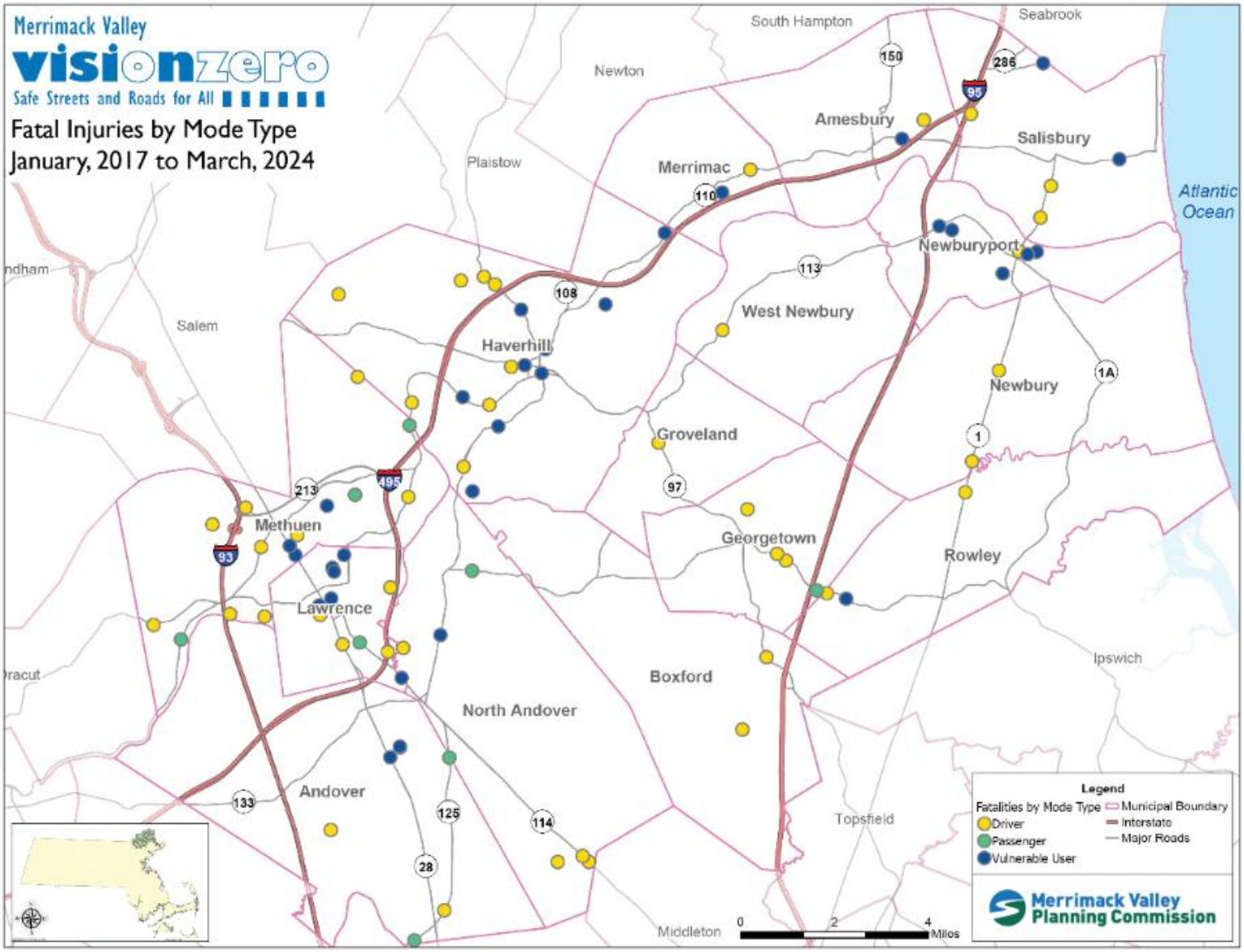
MassDOT upgraded traffic signals and pavement markings at a high injury intersection which include a bike box. These interventions improve drivers' awareness of VRUs and cyclists' safety.

Relevance to The Merrimack Valley

The maps on the next two pages depict the spatial distribution of fatal and severe injury crashes between January 2017 and March 2024. Both maps differentiate whether a crash impacted a driver(s), passenger(s) and/or vulnerable road users (VRUs). VRUs may be anyone who walks, bikes or rolls but please note that a motorcyclist is considered a motorists and not a VRU.

As expected, higher density population areas also have higher volumes of road users and therefore higher crash densities. It is noteworthy that there has been at least one fatality in each of the Merrimack Valley's municipalities, and that the average number of deaths per municipality in just a seven year span is five.

When considering individual crashes, it is possible to dismiss their individual contributing factors. Viewing traffic violence in the larger context of 140 fatalities and 1,080 injuries demonstrates the urgency of the region's shared problem—a problem that can be overcome in part by accepting shared responsibility.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Safe Streets and Roads for All
Fatal Injuries by Mode Type
January, 2017 to March, 2024
South Hampton
Seabrook
Newton
Amesbury
Salisbury
Plaistow
Merrimac
Atlantic Ocean
Newburyport
West Newbury
Salem
Haverhill
Newbury
Groveland
Methuen
Georgetown
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Boxford
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Fatalities by Mode Type
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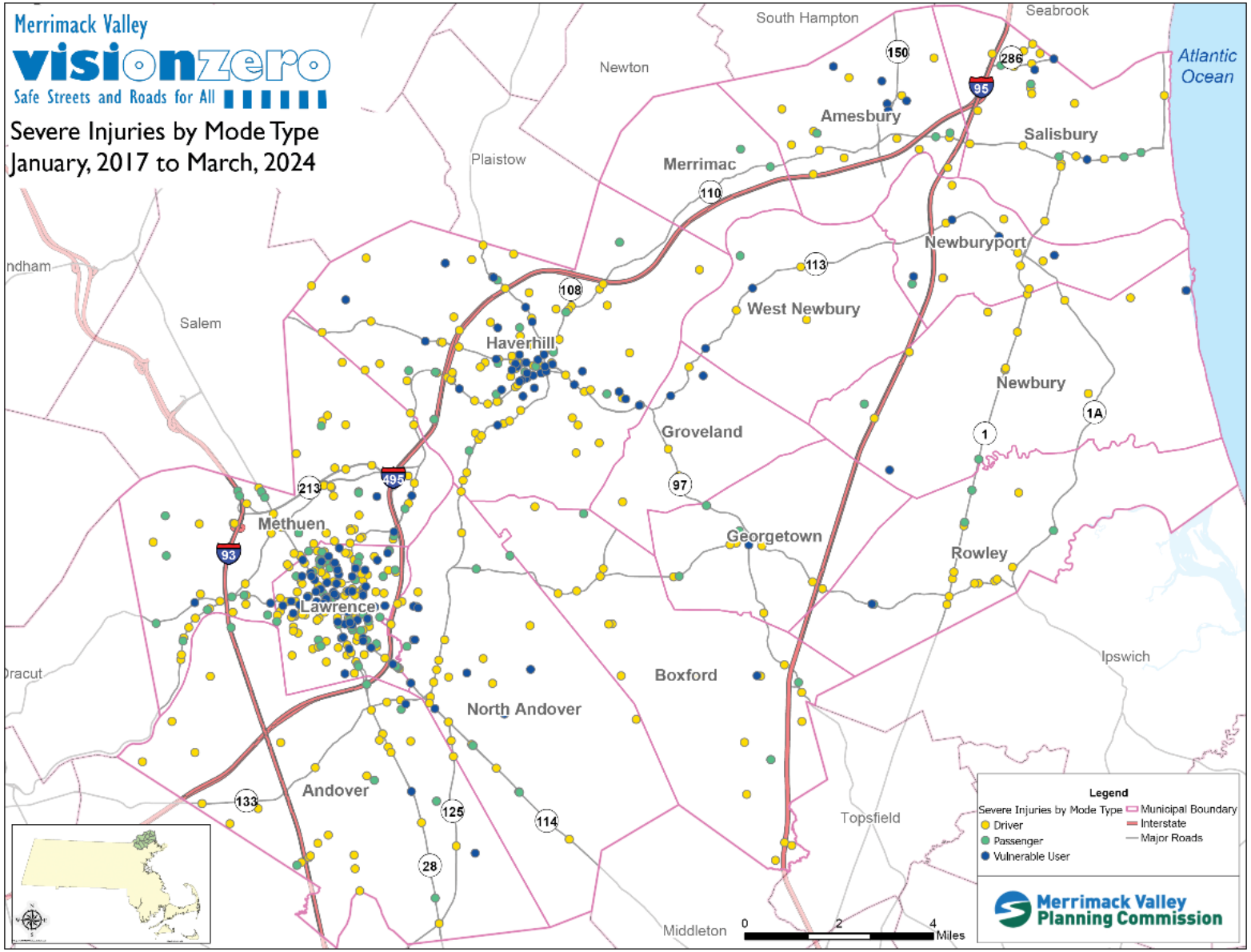
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Severe Injuries by Mode Type
Driver
Passenger
Vulnerable User
Municipal Boundary
Interstate
Major Roads
Merrimack Valley Planning Commission

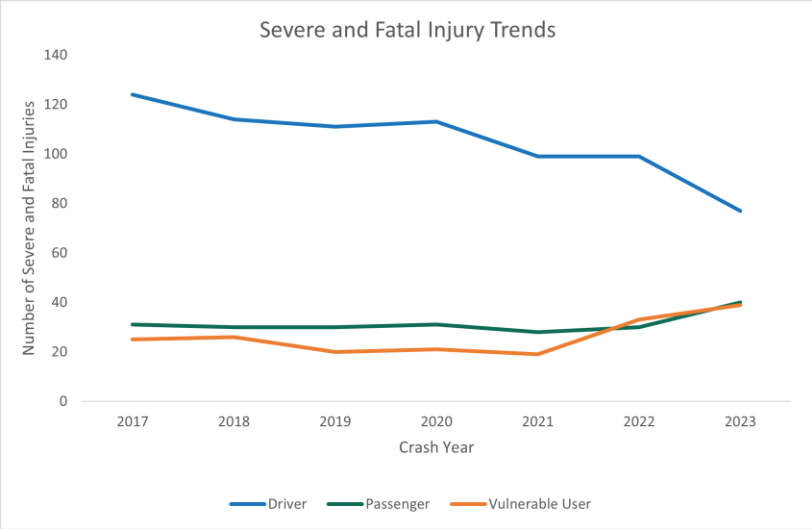
What does an Action Plan Accomplish?

MV Vision Zero is a safety action plan that lays out a region-specific framework to achieve the goal of zero roadway deaths and injuries. It is a public resource to be used by municipal leadership and members of the Merrimack Valley public to work towards eliminating all fatal and injury crashes by 2050. Eliminating roadway deaths and severe injuries yields a safe, equitable, and multimodal future for our region.

A formal, MPO-endorsed Vision Zero plan not only enables coordination across multiple municipalities, but it also renders all municipalities and MeVa, the regional transit authority, eligible to apply for *implementation funding* through the Safe Streets and Roads for All (SS4A) discretionary federal aid program. By selecting the deadline of 2050, the region will track progress and hold itself accountable, allocating engineering resources to the most at-risk segments and intersections identified through the plan's safety analysis.

Application to the Merrimack Valley

A flexible and nuanced approach is paramount to accommodate the region's various community types and sizes. To be a resource for each Merrimack Valley community, the plan must account for the full spectrum of safety issues occurring across the region. The planning process identified three guiding principles to help ensure a meaningful and practicable path to reach Vision Zero.



Graph Source: MassDOT Impact Portal

Principle One: Prioritize Safety for All Users

MV Vision Zero recognizes that roadways support many modes of travel—not just driving. As such, the plan prioritizes the safety of all over the convenience of drivers alone. Region-wide, the rate of fatalities and severe injuries sustained by drivers is slowly declining; however, fatality

and severe injury rates for vulnerable users and passengers are alarmingly increasing.

The Merrimack Valley Metropolitan Planning Organization (MVMPO) Transportation Improvement Program (TIP) is an investment plan for the regional transportation network that is used to program federal aid to support transportation and transit projects. Reshaping the TIP's decision-making scoring process reinforces the fact that death and serious injuries are unacceptable side-effects of the region's current transportation network. Recent revisions demonstrate MVMPO's commitment to Vision Zero by prioritizing projects that improve safety for all roadway users. A new scoring tool evaluates potential projects by the following criteria:

Is the potential project:

- *located on the region's Trends-Based High Injury Network (HIN);*
- *located on the region's Risk-Based HIN;*
- *intended to implement a strategy detailed in the MV Vision Zero Plan;*
- *offering an innovative or demonstrative engineering application that could be potentially replicated in other locations; and*
- *reducing speed along the roadway.*

Positive responses to these criteria elevate the funding priority of a specific project.

Additionally, MVPC and the MVMPO will continue to support municipal and regional projects that are synergistic with a safe systems approach and the region's Vision Zero goal. MVPC will continue to encourage regional communities to take advantage of Complete Streets, Safe Routes to School, and other programs that promote safe and connected communities. Support from MVPC for these initiatives can come in the form of grant writing support, data sharing, or education and training for municipal staffs and the region's advocacy network. MOUs signed by each of the region's municipalities established an element of accountability to promote projects that provide safe travel to all road users.

Principle Two: Data Driven

MVPC's data driven planning process employed crash reports, roadway characteristics, travel demand, and crowd-sourced public input to inform the plan's structure. Crash data helped the planning team identify risky roadway segments and intersections on a High Injury Network, which in turn aided the development of regional and local priority projects. Data is one aspect of what keeps this plan *alive*. The code used to generate the HIN can be updated to reflect changing characteristics as projects are implemented and crash data evolves. A living HIN code allows each community in the region to implement consistent safety assessments—and improvements—at local levels. Maintaining an up-to-date HIN also helps

regional stakeholders allocate resources to projects with the greatest safety benefits. Providing transparent access helps regional stakeholders understand *why* particular projects must be favored for implementation over others in the event of constrained resources.

To make this data available to stakeholders in the region, MVPC commits to maintaining the region's High Injury Network by providing an up-to-date and user-friendly dashboard. Accessible data enables members of the public to champion safety improvements in their communities.

Data provides a crucial dimension to evaluate transportation risks in concert with the lived experiences shared during community engagement. Data can corroborate public perceptions of safety risks or present conflicting revelations. Lack of data on a topic of concern in our community is a guide for growth. For example, many people expressed concerns over impaired driving due to marijuana use, however crash data accessed from the MassDOT IMPACT portal reports that only 0.74 of injury and fatal crashes between 2017 and 2023 were classified as *Driver Drug Suspected*. As a result of this discrepancy, an MV Vision Zero strategy encourages collaboration between public health and safety advocates to improve data and understanding of impaired driving.

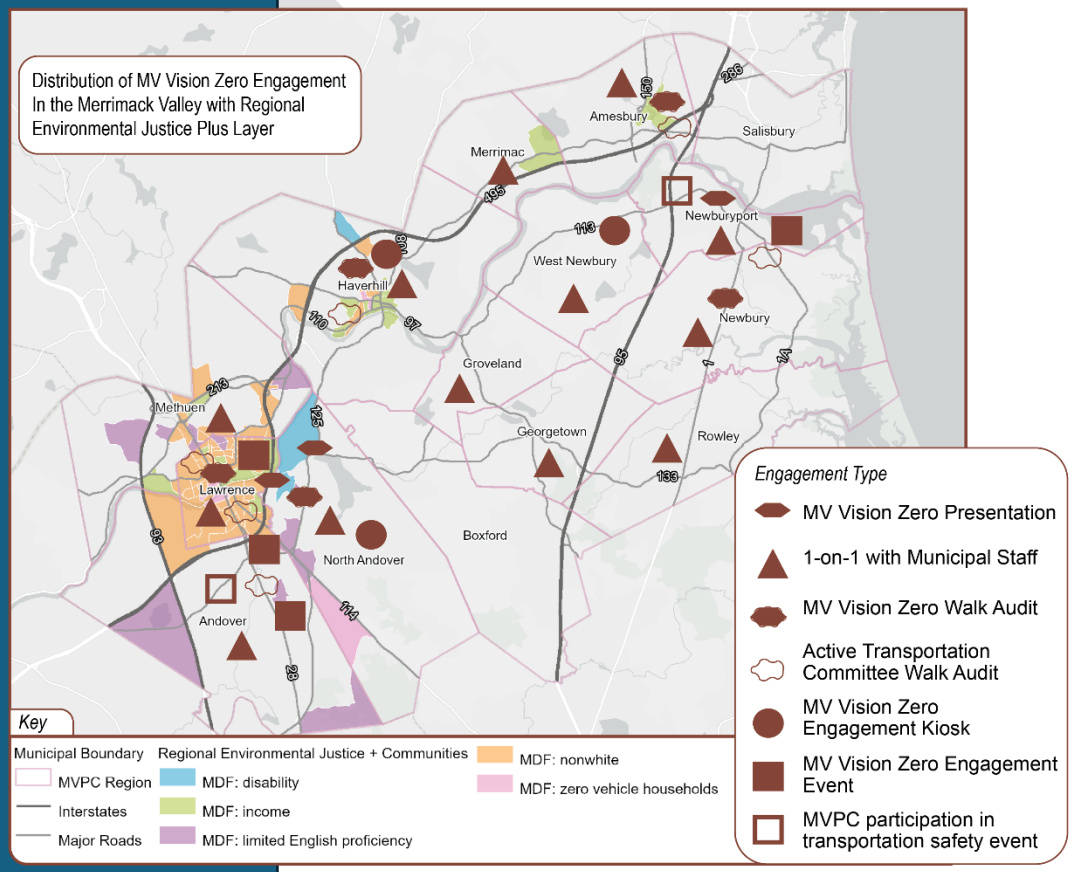
Principle Three: Equity and Engagement

Without community participation in all aspects of this plan, MVPC would miss critical traffic safety insight. MVPC consulted municipal staff, local advocacy groups, and individuals to create equitable and diverse methods for engagement. A wide range of participation opportunities included translations or live translators, digital and in person options for input, and multimedia tools to track input.

MVPC elected to use a decentralized structure for initial action plan oversight. To do this, planning process staff connected with organizations and individuals who were already activated in the safety advocacy space. MVMPO staff also leveraged activity-based tools to reach communities that tend to be under resourced regarding roadway safety. Recurring meetings with appointed municipal staff liaisons aided staff's identification of outreach opportunities provided initial insight into potential projects, strategies and barriers to achieve Vision Zero.

The diagram to the right shows the distribution of engagement over layers of Regional Environmental Justice “Plus” communities (REJ+).

REJ+ is a designation assigned to block groups with relatively high shares of residents that are especially impacted by changes in or to transportation networks. For a complete list of engagement activities and insight gathered from them, please refer to Chapter 2 Plan Development.



A Vision Zero Task Force, rebranded as the MV Vision Zero Coalition, emerged from these engagement activities and continues to grow. The coalition aims to reflect the region's demographics to ensure resources are used to implement the plan in an equitable manner. Per MOUs signed by each municipality as part of our SS4A grant application, every community's Mayor or Manager appointed a planning process liaison. Merrimack Valley's RTA, MeVa, also provided a liaison to support the planning process.

The region's municipal Vision Zero liaisons include:

- Amesbury: Lauren Blatchford, Deputy Chief
- Andover: Monica Gregoir, Planner
- Boxford: Chris Olbrot, DPW Superintendent
- Georgetown: Orlando Pacheco, Town Administrator
- Groveland: Rebecca Oldham, Town Administrator
- Haverhill: John Pettis, City Engineer
- Lawrence: Dan McCarthy, Planner
- Merrimack: Chief Shears, Chief of Police
- Methuen: Kathleen Colwell, Planning Division Director
- Newbury: Kristen Grubbs, Planning Director
- Newburyport: Geordie Vining, Senior Project Manager
- North Andover: Andrew Shapiro, Assistant Town Manager/Director of Planning and Economic Development
- Rowley: Kirk Baker, Planner
- Salisbury: Lisa Pearson, Planning Director
- West Newbury: Christine Wallace, DPW Program and Project Manager
- MeVa : Christina Minicucci, Development Director

MVMPO staff leveraged partnerships with advocates to aid the planning process. These partnerships proved instrumental in weaving context-sensitive actionable strategies into the plan. The following groups continue to support MVPC's work towards achieving Vision Zero:

- **Amesbury Age Friendly Task Force** – *Enlists and engages the Amesbury community to provide support to older adults as they age in place in Amesbury.*
- **City of Lawrence, Mayor's Health Task Force** – *Promotes healthy active living for all in Lawrence.*
- **Groundwork Lawrence** – *Supports environmental and open space improvements, healthy food access programs, youth education, employment initiatives, community programming and events.*
- **Massachusetts Vision Zero Coalition** – *Alliance of multiple advocacy groups including **Safe Roads Alliance**, who advocate for Vision Zero policy adoption in Massachusetts municipalities.*
- **MassBIKE** – *MassBike's mission is to make bicycling an integral part of human-centered communities, policies, culture, and infrastructure.*
- **MV Striders** – *A running club founded in 1979 with the mission to encourage and enhance running at all levels.*
- **MVPC Active Transportation Committee** – *Committee dedicated to expanding rail trail network and creating safe, comfortable network for non-motorists.*
- **Newburyport Livable Streets** – *Seeks to support and improve the health and well-being of our community*

through education and advocacy related to transportation infrastructure and policies.

- **Sidney Mae Olsen Rainbow Fund** – *Founded in 2023 after 5-year-old Sidney Olson was killed in an intersection, the Rainbow Fund is focused on furthering Sidney's legacy of curiosity, kindness, and community.*
- **WalkBike Andover** – *Resident-led advocacy group in Andover focused on making walking, biking, and rolling, safe and accessible to people of all ages and abilities.*
- **Walk Massachusetts** – *Makes walking safer and easier in Massachusetts to encourage better health, a cleaner environment and more vibrant communities.*

Image Source: MVPC. Attendees at the Lawrence Walk Audit, 6/25/24

We also collaborated with our state partners at MassDOT, especially:

- MassDOT District 4
- MassDOT Highway Safety Division
- MassDOT Safe Routes to School
- Mass in Motion

Plan Development

Through research, the Merrimack Valley Planning Commission's MVMPO staff have located the highest-risk sections of the region's transportation network and have identified the circumstances that contribute to severe injury and fatal crashes. This Vision Zero Plan includes a list of targeted strategies stakeholders can use to address these locations and circumstances. Using these tools and working in close collaboration, MVPC and its partners will eliminate all severe injury and fatal crashes regionwide.

Crash Data and High Injury Networks (HIN)

Mapping severe and fatal crash data is crucial to understand roadway characteristics that contribute to fatal and severe crash risk. Mapping also makes it possible to understand where resources can eliminate the potential for traffic violence. MVPC's HIN is comprised of two analyses: a Trend-Based High Injury Network (TB-HIN) and Risk-Based HIN (RB-HIN). The TB-HIN looks at where severe and fatal crashes have occurred, while the RB-HIN is a predictive analysis used to show where crashes are likely to occur.

The HIN is comprised of both segments and intersections. MVPC's HIN methodology defines a segment as a linear roadway between two intersections within a given municipality. Municipal bounds also terminate segments as factors such as posted speeds may differ from town to town. The methodology defines an intersection as the location where two or more roads converge at a single point. The methodology excludes interstates as municipal and regional governments have limited influence upon these facilities.

Trend-Based HIN Methodology

The current trends-based analysis uses the five most recent years of complete crash data—2017 through 2022—to capture trends. The methodology assigns points to crashes resulting in injury through a severity-based system with additional weight given to severe and fatal injuries. Property damage only crashes are not included in the analysis as they are not necessarily an indicator of a threat to life.

The methodology also assigns greater weight to crashes involving vulnerable road users and crashes occurring in Regional Environmental Justive Plus (REJ+) areas.

Vulnerable road users are more physically vulnerable than those in a vehicle and more likely to be injured or killed in a crash. An injury involving a VRU suggests that a road segment is used by VRUs and should therefore be prioritized to prevent further violence.

REJ+ is a MassDOT designation bestowed on communities experiencing transportation-related burdens. To qualify as an REJ+ community, a Census block group must exceed typical percentages of low income, non-white, or limited English proficiency persons relative to the region. These groups are disproportionately impacted by traffic violence based on the equity analysis summarized later in this section.

The Trends-based HIN quantifies crashes based on injury severity as follows:

- Fatality = 15 points
- Severe injury = 5 points
- Minor injury = .5 points

To account for crashes involving vulnerable road users, the total severity calculated through the process above is then multiplied by a *non-motorist factor* of 1.5 for crashes involving non-motorists.

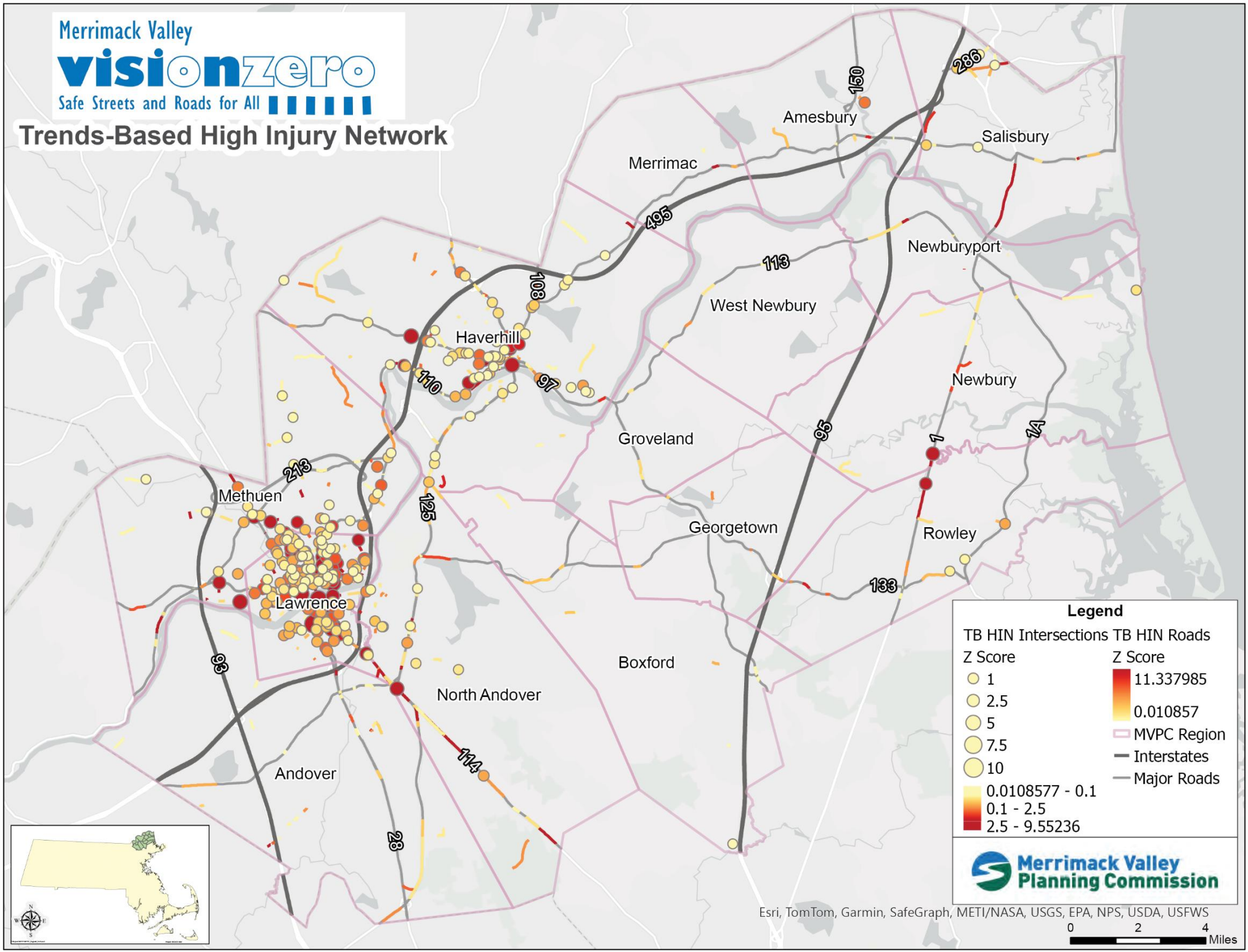
To account for communities experiencing disproportionate burdens from the transportation system, the trends-based analysis multiplies the total severity by an additional "equity factor" of 2 for crashes occurring in REJ+ communities.

To assign a severity to each road segment and intersection, the trends-based methodology sums the severity of crashes along a road segment or within 150 feet of an intersection.

MVPC's MVMPO staff selected HIN-inclusion thresholds for road segments and intersections by calculating the percentage of severe and fatal injuries and percentage of roadway or total intersections accounted for at various severity levels. To account for a significant number of severe and fatal injuries, the final trends-based HIN includes roads segments and intersections with a severity greater than or equal to the average.

- *75.1% of severe and fatal injury crashes occurred on 6.51% of all regional roadways*.
- *38.25% of severe and fatal injury crashes occurred at 2.7% of all regional intersections*.

The plan's appendix includes a detailed description of the Trends-Based coding process.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Trends-Based High Injury Network
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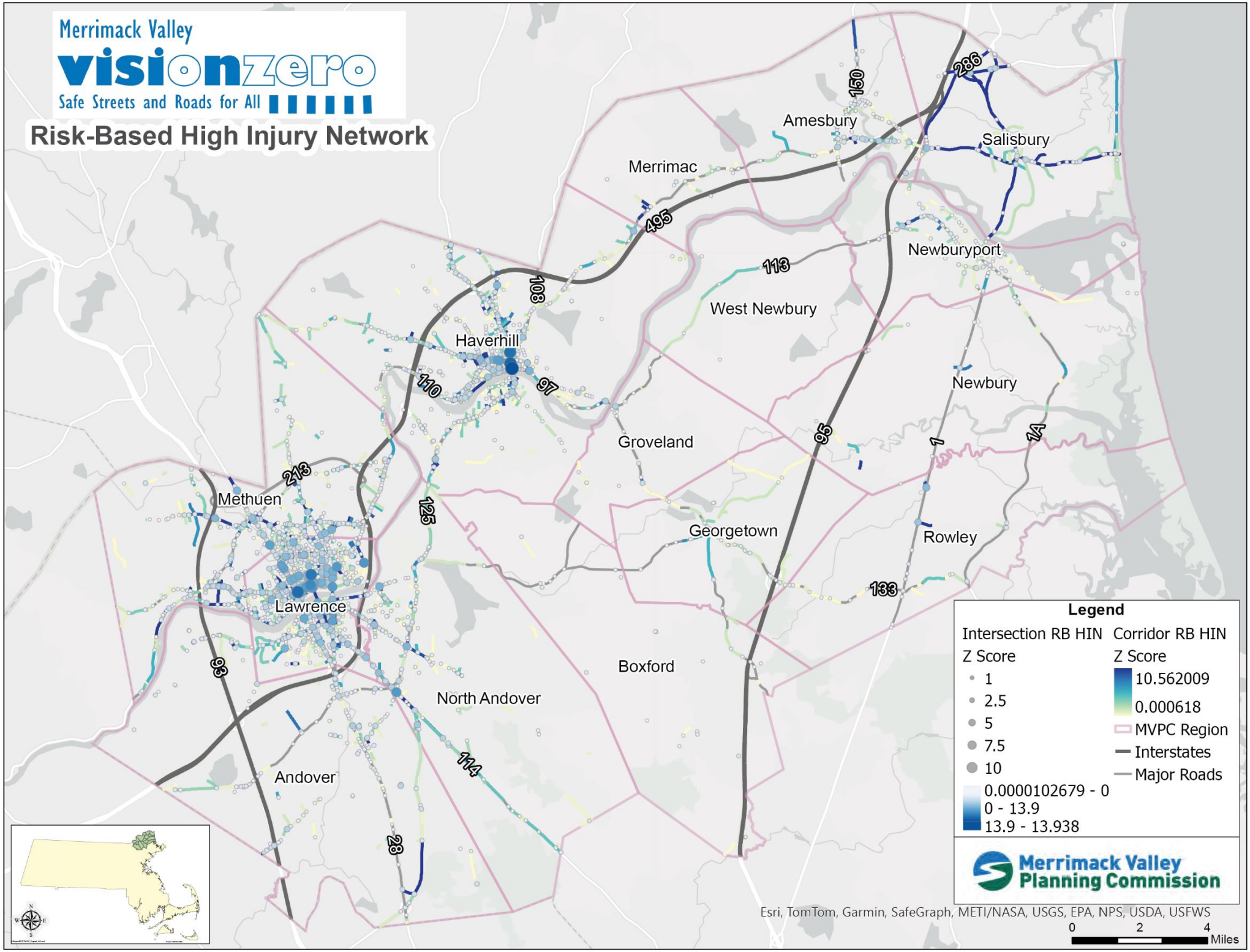
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Risk-Based HIN Methodology

The Risk-Based HIN was developed by a consultant, BETA Group Inc. The technical consultant used MassDOT IMPACT crash data from 2003-2022 for the purpose of training a random forest regression model (a machine learning prediction model) to predict high-risk intersections and corridors in the MVPC region.

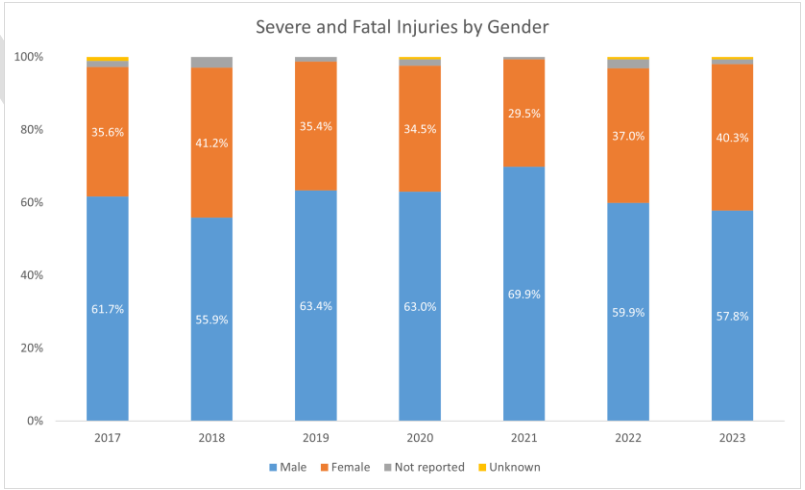
The overall goal of the code is to assign weighted severity to crashes in the MVPC region, taking into consideration the presence of a fatal or serious injury crash, the presence of vulnerable road users, and if the crash is within a regional environmental justice plus (REJ+) Census block group.

The methodology sums crash severity values at intersections and on corridors to provide an average severity value per year for each intersection and corridor in the network. The random forest model then uses the geometric and traffic features of the roadways and intersections (provided by MassDOT IMPACT data) to learn and predict which variables contribute the most to higher average severity values in the region. The result of both the intersection and corridor risk-based HIN's is a layer of predicted intersections and segments with the highest risk, as well as trained regression models for both HIN's which provide insights to the most important IMPACT variables in predicting high-risk locations.

Injury Demographics

Understanding victims' common characteristics is as relevant as the roadway characteristics identified in the Risk-Based and Trend-Based HINs. Knowing who are the victims of traffic violence is not only important on a human level, but this data also improves the effectiveness of proposed countermeasures.

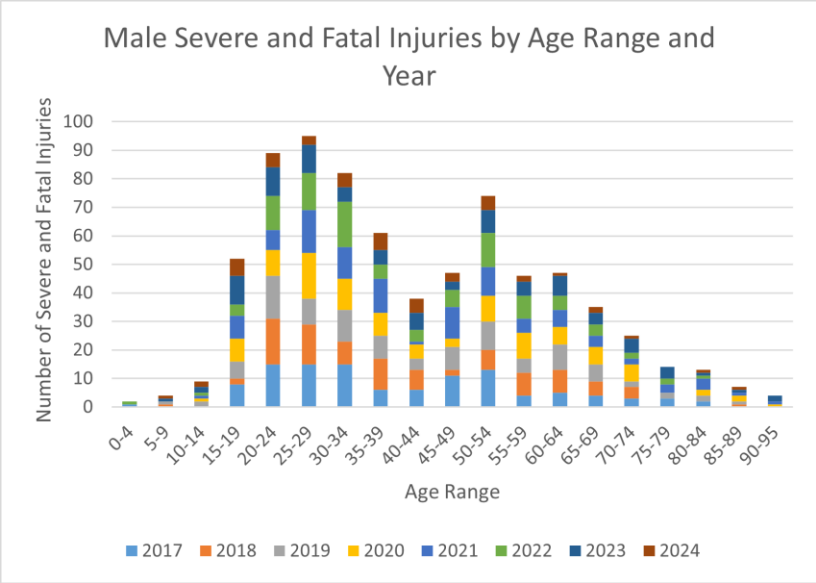
Overall, men are more likely to be victims of a fatal or severe injury than women. This is consistent across all years with the most even distribution in 2018 with 55.9% male victims and 41% female victims. 2021 was the largest discrepancy by age with 69.9% male victims and 29% female victims.



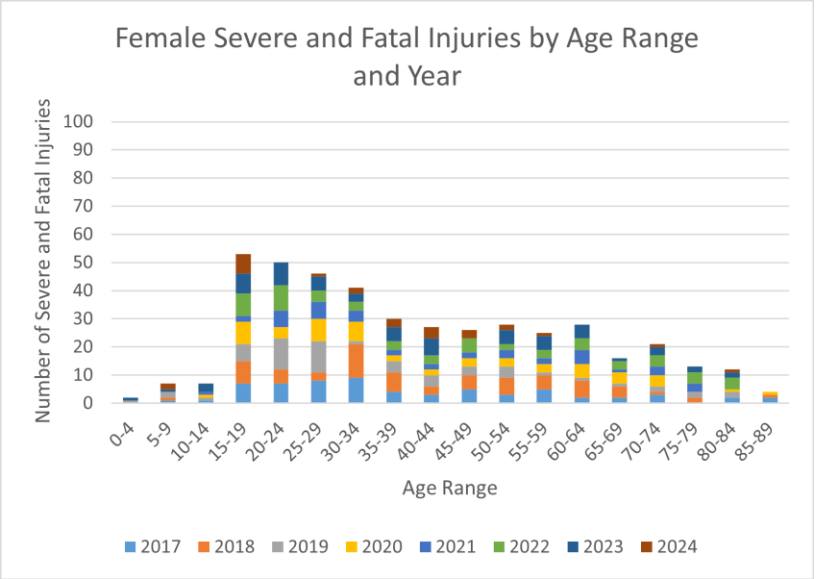
Data source MassDOT IMPACT

Looking closer at a breakdown of gender and age, men and women had similar risk of severe and fatal injuries from infancy until 14 years old. Outcomes differentiate after that age. In our region, women have the highest risk of being killed or injured in a crash between the ages of 15 and 19 years old while the risk for men peaks in the 25 to 29 age range and again in the 50 to 54 range.

Although both male and female vulnerable users between the ages of 15 and 19 had the largest share of injuries among vulnerable users, there were no fatalities in this age group. One possible explanation for the spike in vulnerable user injury for 15 to 19 year olds is that this is usually when childeren first gain independent mobility, either due to getting their license or being able to travel alone. Countermeasures that target this age group are reflected in the strategies at the end of this document.



Data Source: MassDOT IMPACT



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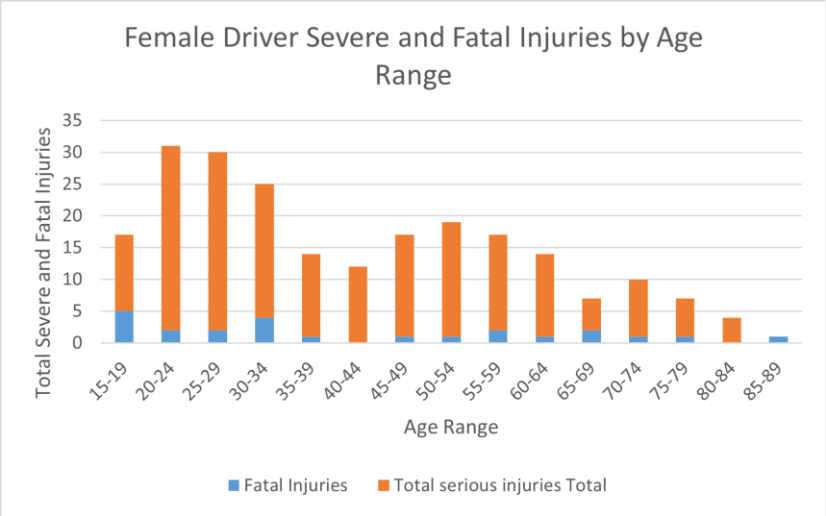
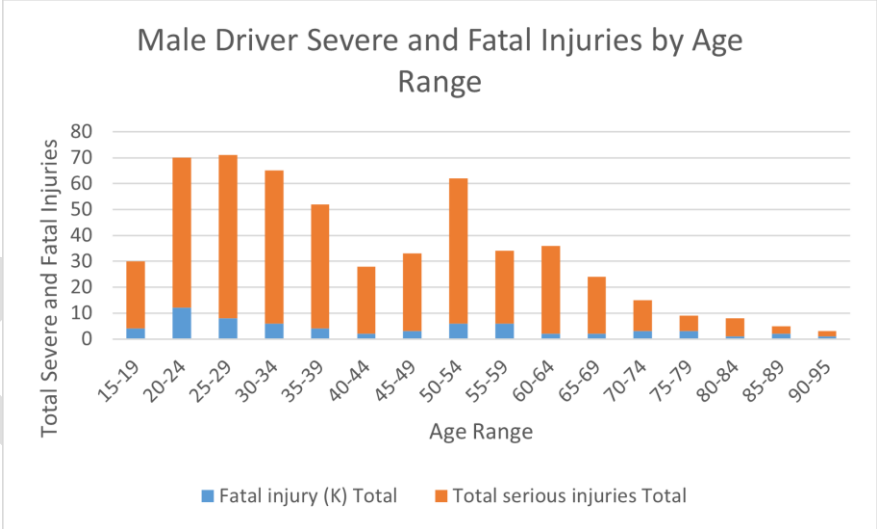
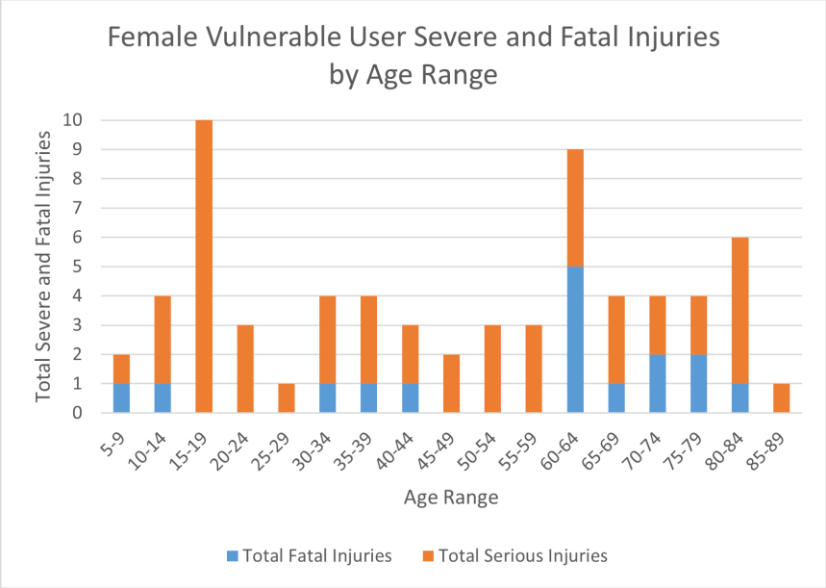
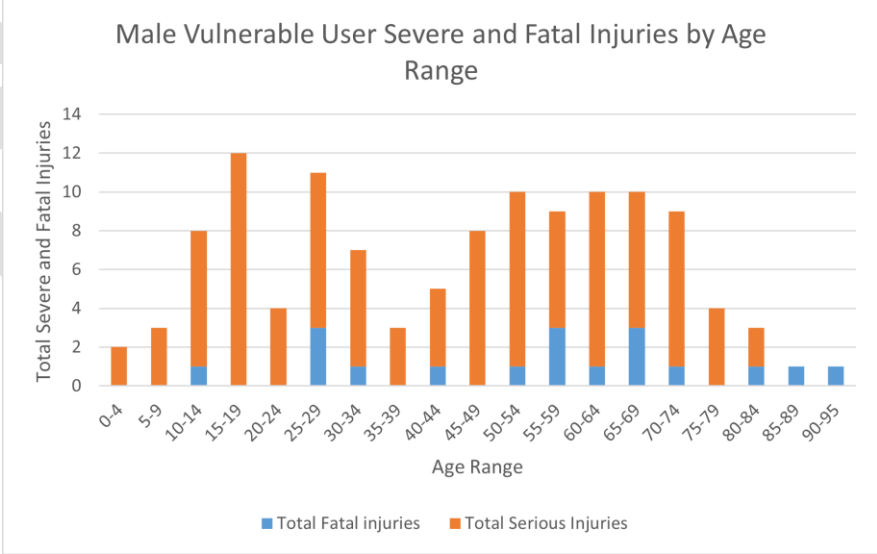








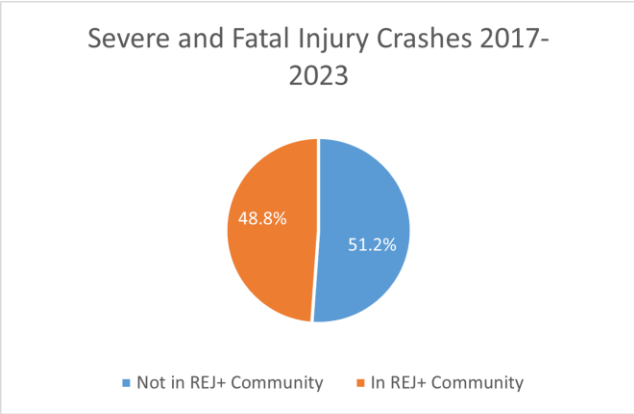
Data source for all graphs this page: MassDOT IMPACT

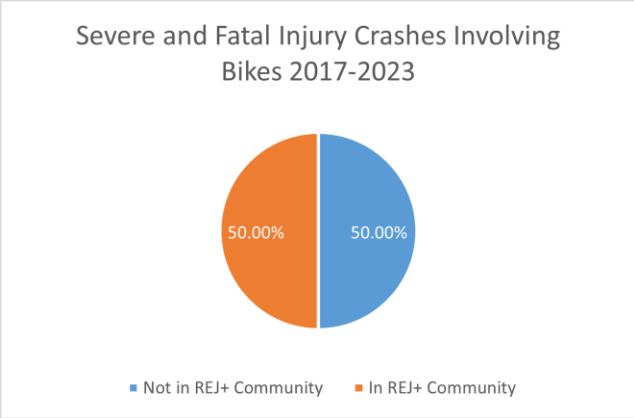
Equity Analysis

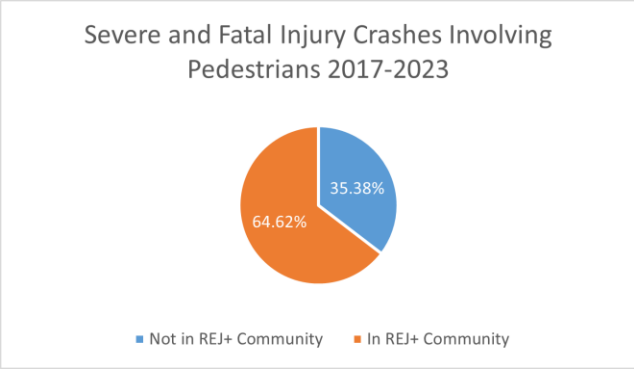
Keeping equitable access to transportation at the forefront of MV Vision Zero, MVPC's MVMPO staff conducted an analysis to examine how traffic violence impacts REJ+ communities. Staff found that although REJ+ communities make up less than 10% of geographic space, 48.8% of all fatal and injury crashes took place on road segments and intersections located in REJ+ designated areas. This means that our most vulnerable populations are also disproportionately impacted by transportation violence. When reviewing fatal and injury crashes involving bicyclists, REJ+ communities are overrepresented, making up 50 percent of all fatal injuries. Meanwhile, pedestrian injury and fatal crashes made up a staggering 64.62% of all crashes in REJ+ communities.

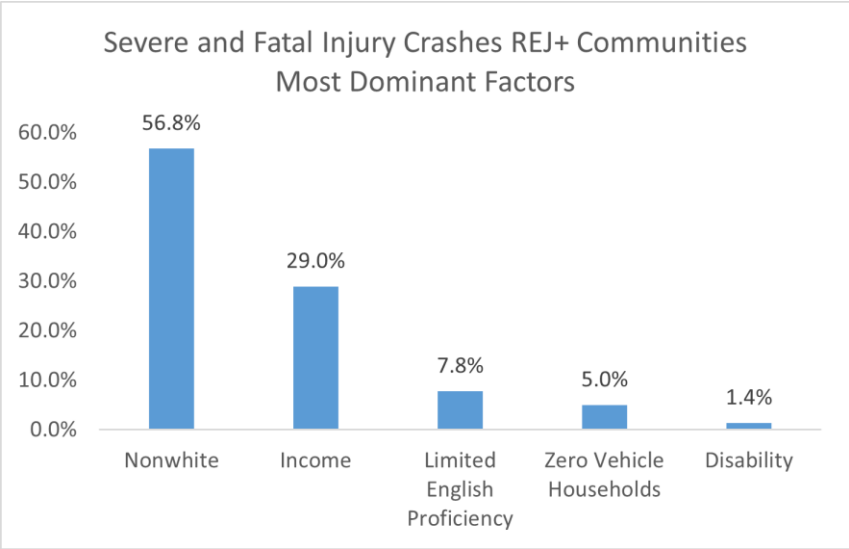
According to US Census data from 2020, about 60% of the Merrimack Valley population is white, while almost 40% is Black, Latino, or Asian. MVPC's MVMPO staff found that non-white and low-income communities are the most disproportionately represented in fatal and injury crashes. The trauma of traffic violence disproportionately impacts communities that are already more likely to experience transportation system burdens.

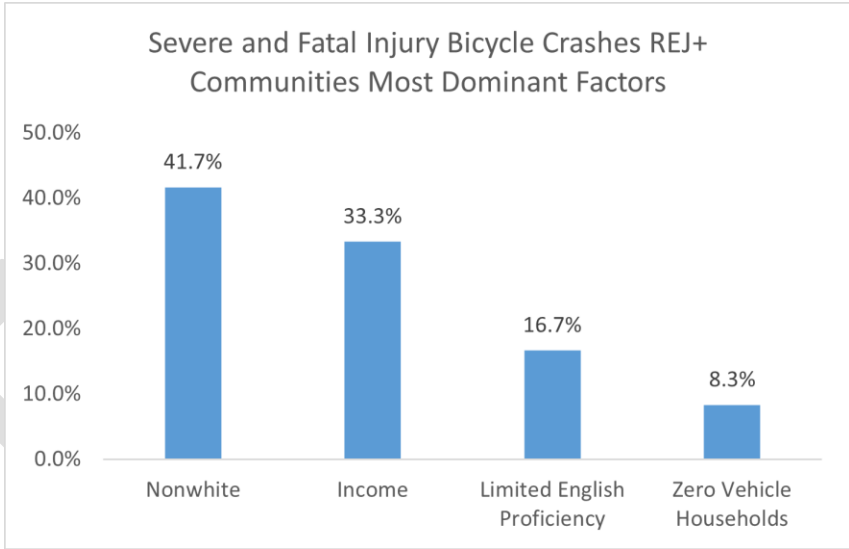
Data source for all charts this page: MassDOT IMPACT











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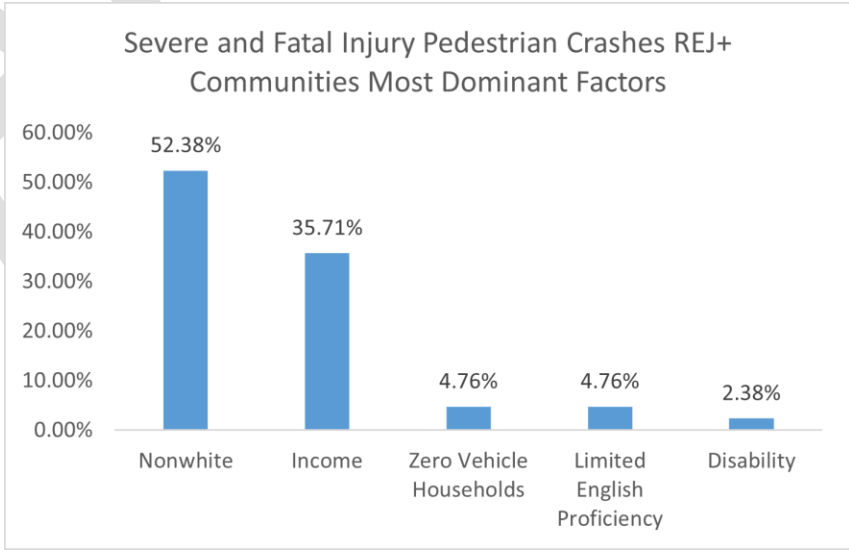


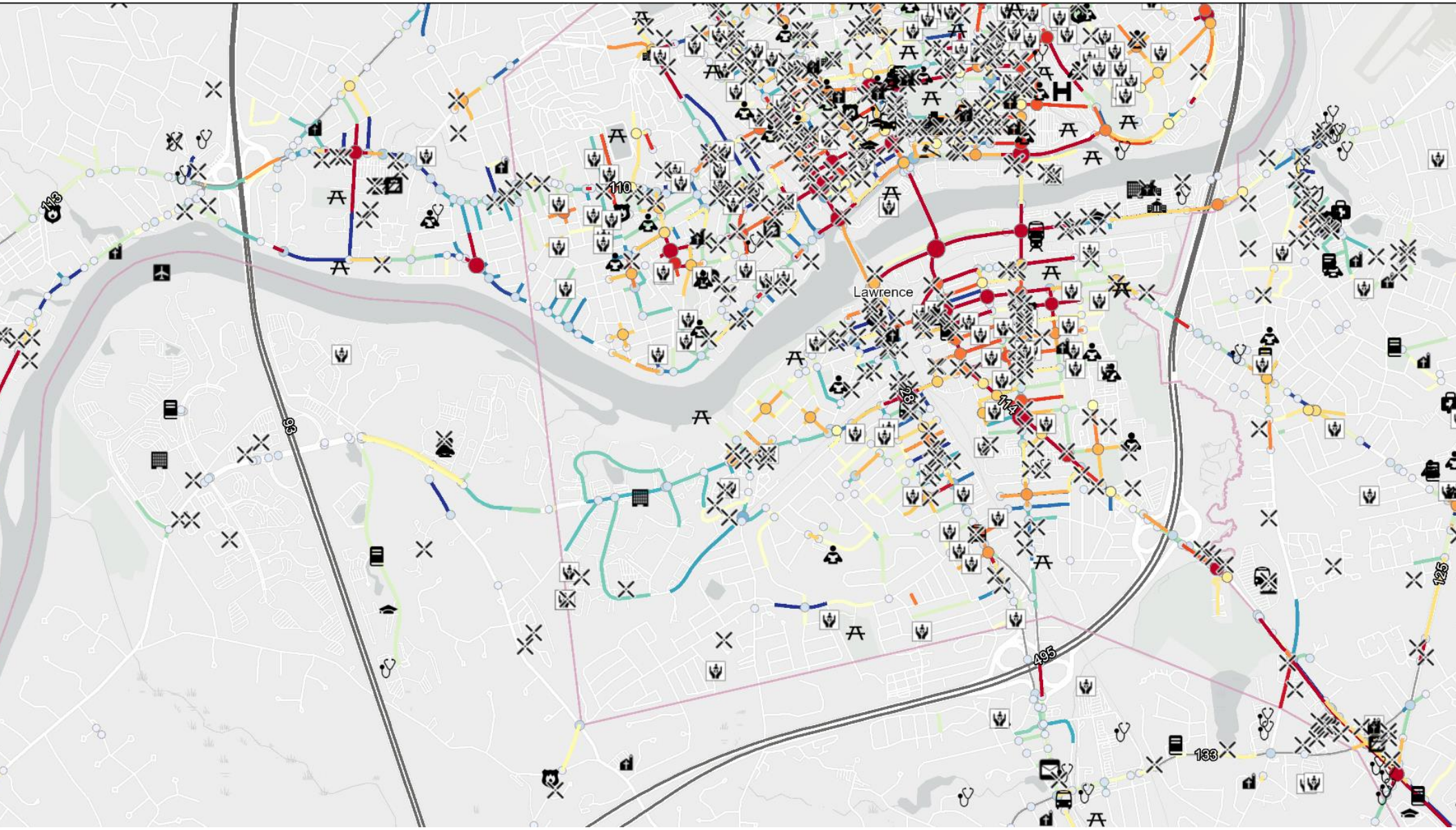
The impact of a safe, multimodal, and equitable transportation network is underscored by the Community Health Needs Assessments (CHNAs) produced by the three major hospitals serving the Merrimack Valley. All three hospitals' CHNA documents indicated transportation as a barrier for access to healthcare services. The 2022 CHNA from Anna Jaques Hospital explicitly states the need for "partnerships with regional transportation providers and community partners to enhance access to affordable and safe transportation to healthcare services." Similarly, Lawrence General Hospital identifies that a "Lack of gainful and reliable employment is linked to several barriers to care, including lack of health insurance, inability to pay for health care services and copays, and inability to pay for transportation to enable individuals to receive services."

The 2022 Holy Family Hospital CHNA reiterates that "Key informants identified the access and affordability of transportation as one the biggest missing community services in the area, and one of the biggest obstacles to healthy living in the community." These reports highlight transportation as an equity issue. Because many who cannot afford a vehicle walk, bike, or use transit, designing transportation facilities to address the safety needs of the region's most at-risk populations is synergistic with designing to protect the most vulnerable road users — pedestrians, bicyclists, and transit users. Improving safety promotes community wellbeing and enables a more equitable transportation network.

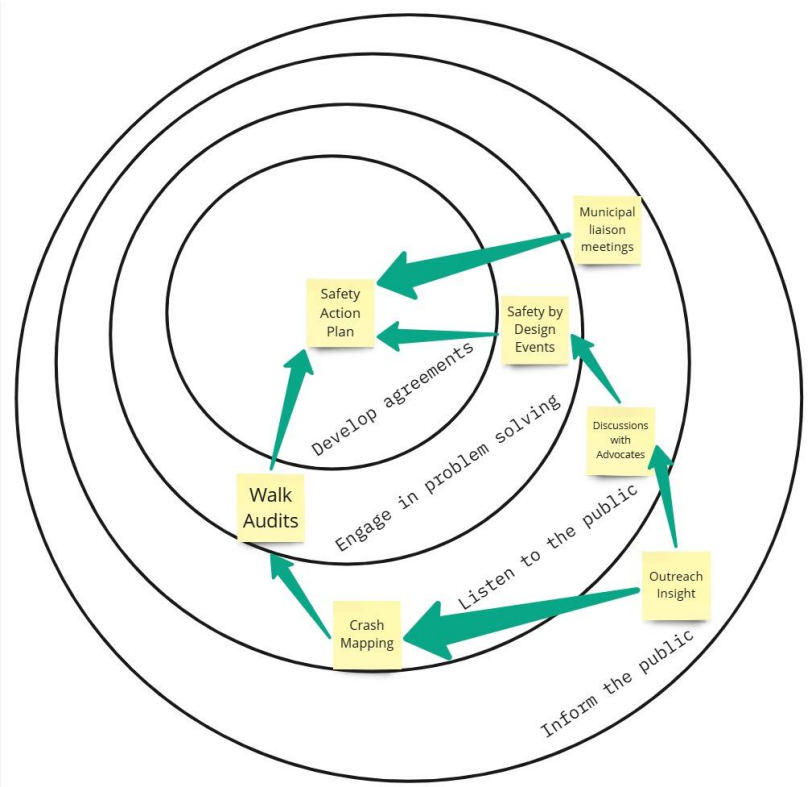
The term *public asset* indicates a facility that supports a community's access to education, quality food shopping, medical care, public services, and religious centers, among other valuable community uses. Locations with a high density of these assets are often on or adjacent to the High Injury Network. On the next two pages, screen captures of the Public Asset GIS layer is shown over the High Injury Network. The zoomed-in view on page 24 make it clear how correlated equitable access to public assets are with need for safe transportation. In this case, a barrier may not necessarily be distance, but may instead be at minimum, perceptions of comfort, and at maximum, the risk of injury or life.

HIN Heat Map and Public Assets

HIN Heat Map and Public Assets - Andover, Lawrence, Methuen and North Andover



Engagement/Crowdsourcing



Engagement activities informed key parts of the MV Vision Zero Planning structure. MVPC's MVMPO staff recognized that it is necessary to have a flexible approach to engage the public in a meaningful way. As depicted in the graphic above, different activities informed different levels of participation.

Inform the Public

Outreach Insight

In response to input from the planning process's municipal liaisons, and in the spirit of reciprocity, MV Vision Zero staff attended regional activities including a post-crash debrief with MeVa, monthly attendance at the Newburyport Livable Streets, Andover Complete Streets, and Regional Active Transportation Committee meetings. Attendance at these events informed prioritization lists by shedding light on big-picture transportation goals at municipal and regional levels.

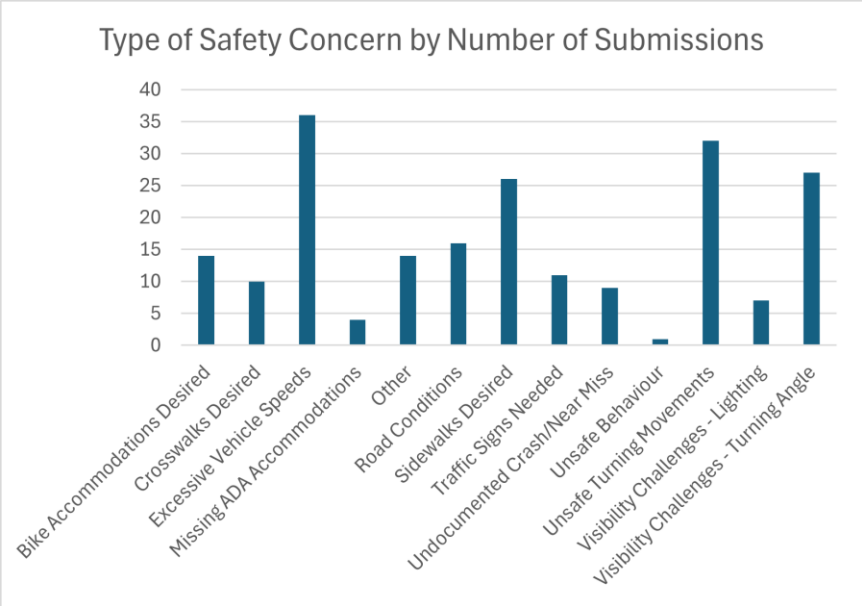
Listen to the Public

Crowd-Sourced Crash Mapping

MVPC's MVMPO staff used a crowdsourced mapping tool to collect locally known safety concerns on the transportation system. To date, staff have received over 200 mapped reports in 12 of 15 communities.

Staff promoted this map by setting up paper maps in Haverhill City Hall, at the West Newbury Town Project Fair, and in the North Andover Library. MVPC staff transferred safety concerns into a digital ArcGIS layer, that has been available online since the outset of the planning process. Staff requested that all municipal liaisons post a link to the feedback tool on their municipal websites. The mapping tool was also linked on an FAQ handout which was

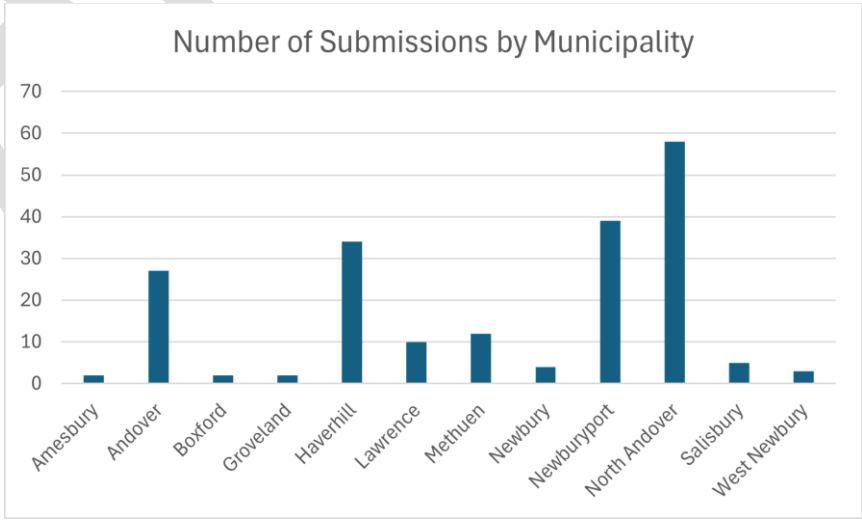
distributed at various events and posted on community bulletin boards.



Respondents most commonly reported concerns about excessive vehicle speeds and unsafe turning movements. Reports indicate both perceived risk and actual risks, which are both relevant. Perceived risk reduces one's actual use of a transportation facility, thereby reducing access and opportunity. This corresponds to work MVPC's MVMPO staff completed for their recent Metropolitan Transportation Plan (MTP). The number of respondents indicating a desire for sidewalks demonstrates a desire for comfortable, safe facilities that will improve access and connectivity.

The share of geographic locations where safety concerns were marked highlight demographic gaps. The crowdsourcing map will be left active for people to add input. This will allow MVPC to continue outreach in hopes of reaching a fully representative audience.

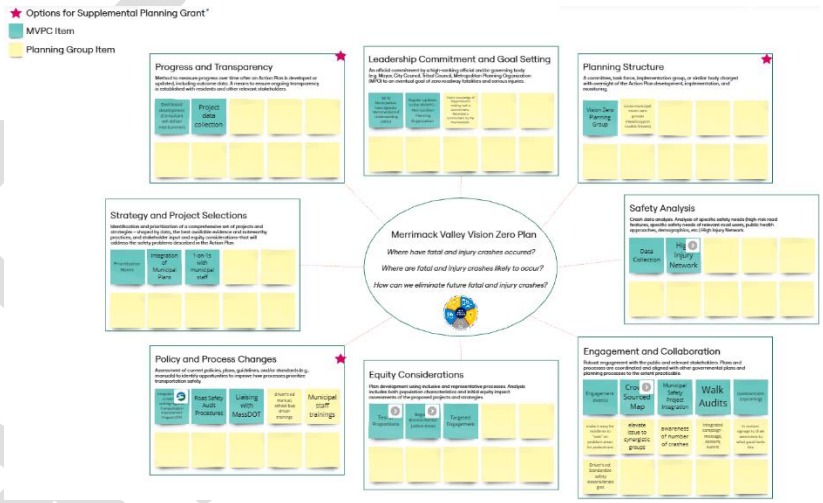
One of the immediate outcomes of this tool was to identify potential locations for future walk audits. MVPC staff also have used the tool to consider countermeasures at locations that coincide with the region's High Injury Network.



Discussions with Advocates

MVPC had ongoing, informal, one-on-one conversations with various community members, including transportation engineers, bus drivers, dog walkers, teachers, parents, children, and people who commute to the region for work. MVPC also participated in five different opportunities where staff shared their work on Vision Zero with safety advocates. These events included:

A. A presentation and engagement session with the Merrimack Valley Striders, a regional running club.
B. A round-table discussion with state organizations, MassBIKE, WalkMassachusetts, and the Sidney Mae Olsen Rainbow Fund, which is an Andover-based organization promoting wellness and active, joyful living for children in memory of Sidney Olson who was killed by a truck while in a crosswalk in 2023.
C. A presentation of the Trends-Based High Injury Network to the Newburyport Livable Streets members.
D. Tabling at the Mass in Motion Event in Lawrence with language support from the City of Lawrence Mayor's Health Task Force. Attendance at this family-friendly event provided an opportunity to discuss transportation safety issues with Lawrence residents as well as to promote the Safe and Connected Streets event in Lawrence.
E. A discussion with three local advocates to discuss how a regional Vision Zero Coalition could mentor and support other safety initiatives.
F. A meeting with the Safe Streets Alliance, an advocacy group based out of Medford who are part of the growing Massachusetts Vision Zero Coalition, to discuss how MPOs can participate in state-wide roadway safety initiatives.



Local safety advocates who joined the MV Vision Zero brainstorming session could offer suggestions in a Miro board using the Vision Zero Plan framework.

Municipal Liaison Meetings

Municipal liaisons attended three meetings throughout the planning process: two meetings as a group and one meeting set up as individual office-hours to discuss crash data specific to each liaison's respective community. During these one-on-one meetings, MVPC used the MassDOT IMPACT portal test of proportions tool to present community-specific trends and gather insight.

Municipal liaisons' responses to questions about Vision Zero barriers informed context-sensitive opportunities for further engagement and collaboration, policy process changes and strategy, and project selections. Staff organized notes taken during the open discussion portion of the meetings into categories to quantify the most significant barriers to roadway safety improvements.

The most recurrent barriers identified by municipal liaisons were historic roadway designs that do not prioritize safety; issues of volume management at new developments; and lack of collaboration and transparency from local and state partners to initiate safety improvement projects. Financial barriers were also often identified, but more often in regard to limited staff capacity than to lack of funding opportunity.

Walk Audits

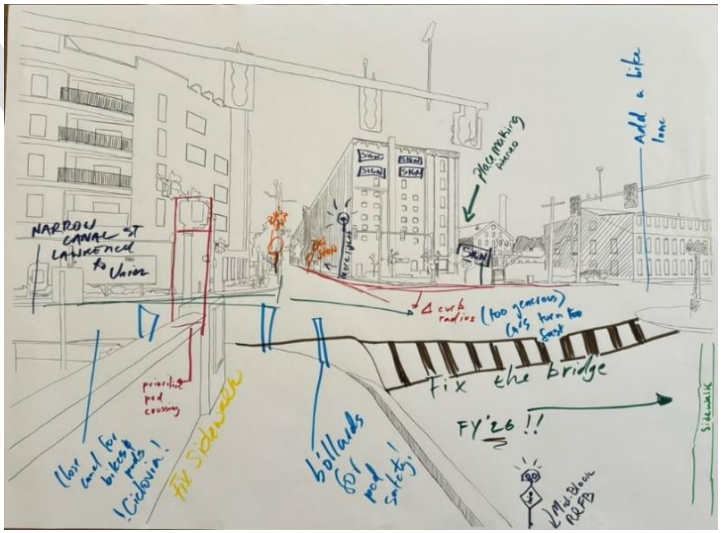
Closing out the scheduled public engagement for the planning portion of MV Vision Zero, MVPC staff hosted 5 walk audits in 5 municipalities across the region. The locations were selected to represent an urban, suburban and rural location. Two of the locations were selected due to high ranking on the TB-HIN, while two others were based on the RB-HIN. One location was based primarily on the input gathered from the crowd sourcing map, however it was also present on the RB-HIN. Four out of the five locations were in REJ+ Communities. Walk audits had Spanish-Language support in Haverhill and Lawrence, lasted for an hour and a half with the goal being to examine high-crash areas and consider appropriate safety improvements from a vulnerable road user (VRU) perspective. Walk audits also served to generate discussion at a low barrier to enter with multiple stakeholders including residents, elected officials, municipal staff and MassDOT staff. It was an important step at launching inter-departmental coordination for future projects. Reports with suggested countermeasures, additional insight and data summaries were generated from each walk audit.

Safety By Design Events

MVPC staff aim to make MV Vision Zero 2050 a reality by making tangible the vision of a transportation network free from death and severe injuries. We designed activities for four events that were aligned with the Vision Zero principle that "safety is proactive". Participants illustrated, mapped or otherwise communicated what would be possible in a safe future where fatal and severe injury crashes are in the past. These in-person events made it possible to gather insight from people who are often underrepresented through surveys, virtual meetings or other, formal engagement settings. Local partnerships were integral to the success of these outreach strategies, and MVPC staff are grateful to the Sidney Mae Olsen Fund, Merrimack

Valley Striders, Newburyport Livable Streets, and the City of Lawrence for supporting MV Vision Zero.

Images top and bottom depict illustrations from Safe and Connected Streets in Lawrence, a bilingual, safety by design event. Illustrations over existing roadways depict improvements that center pedestrians and transit users.



Ultimately, MVPC categorized insight gained at Safety By Design events as responses to three questions:

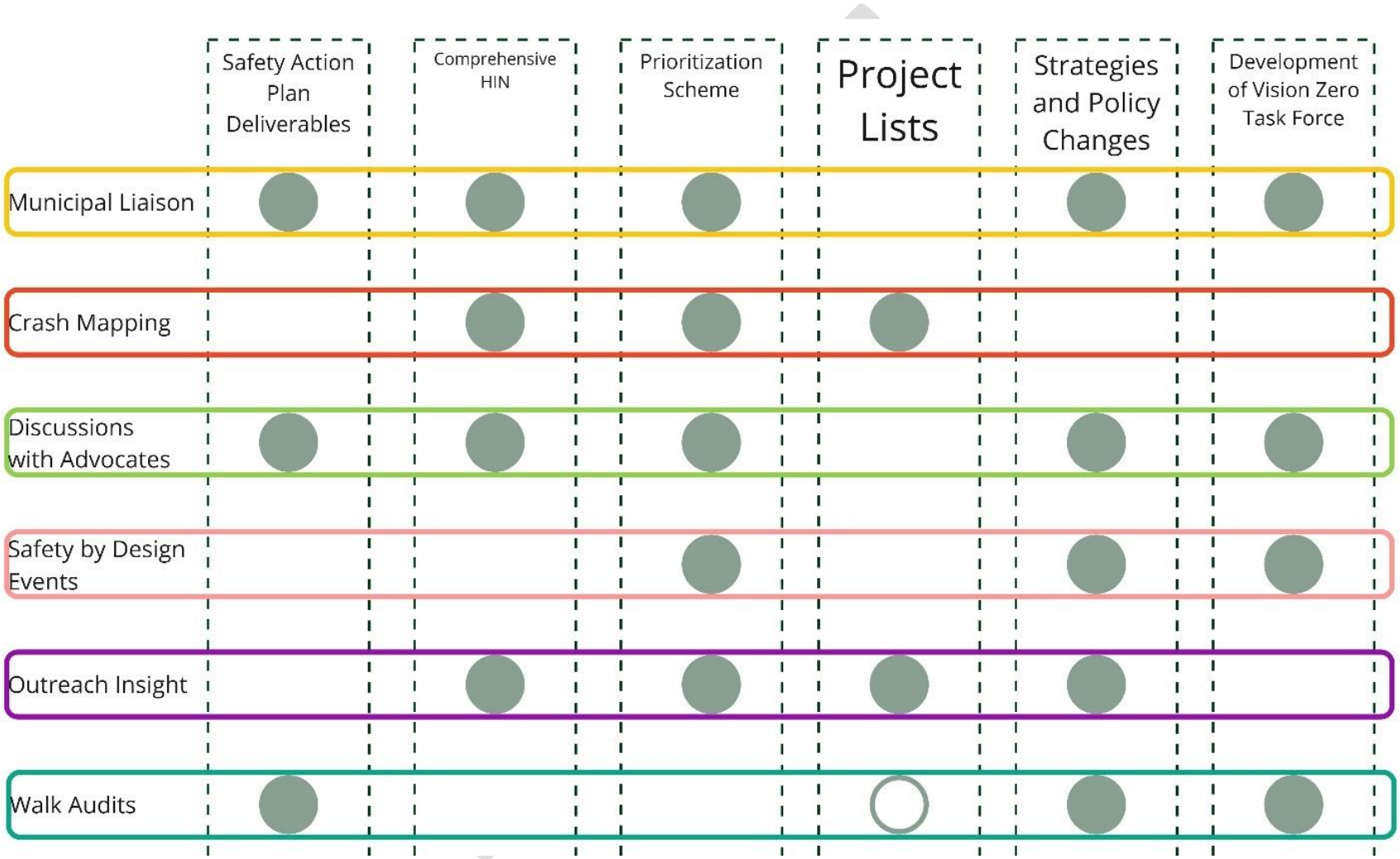
- What would a transportation system free from fatal and severe injuries enable for our communities?
- What are the steps we need to take to achieve that vision?
- What are the barriers to begin that process?

Develop Agreements

Safety Action Plan

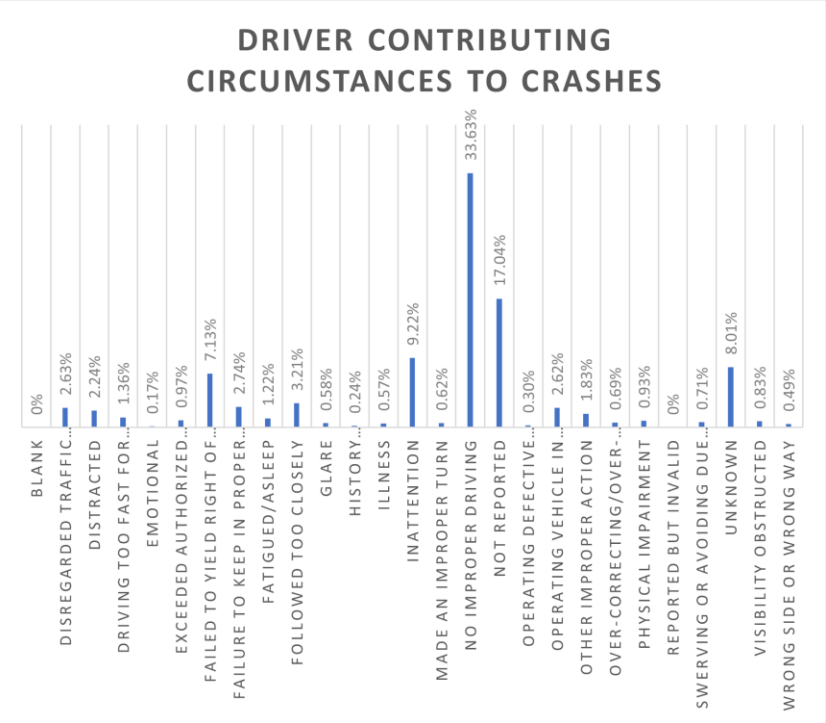
Collaboration with the public guided different parts of the decision-making process. The chart on the next page shows how each engagement activity type informed different components of MV Vision Zero. All input, regardless of an individual's experience or level of participation, provided value to the planning process and ultimate plan. The outlined circle in the *walk audits* row indicates that the project lists were informative of the walk audit locations.

Image on the left depicts community input at the Feaster Five engagement table where members of the public were asked to fill in wedges of the Safe Systems wheel with safety improvement suggestions.


Safety Action Plan Deliverables
Comprehensive HIN
Prioritization Scheme
Project Lists
Strategies and Policy Changes
Development of Vision Zero Task Force
Municipal Liaison
Crash Mapping
Discussions with Advocates
Safety by Design Events
Outreach Insight
Walk Audits

Projects & Strategies

According to MassDOT's IMPACT portal, 33.63% of drivers who contribute to injury crashes exhibit *no improper driving*. This suggests that the historic design of our transportation system enables drivers to travel in a way that puts themselves and others at risk. Accepting the status quo, then, implies that roadway injuries and deaths are inevitable. Vision Zero asserts that they are not.



Source: MassDOT Impact Portal Test of Proportions Tool

Vision Zero thinking also asserts that safety is proactive. To be proactive, designers must acknowledge the roadway characteristics that enable dangerous driving. Research consistently finds speed as a significant factor in predicting crash severity.

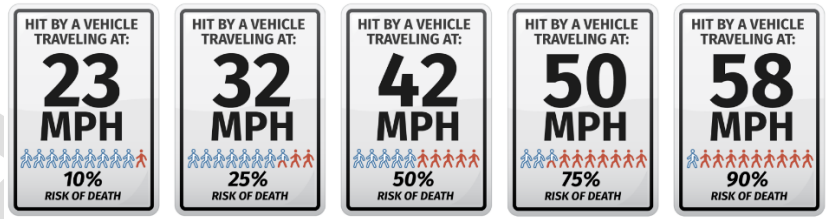
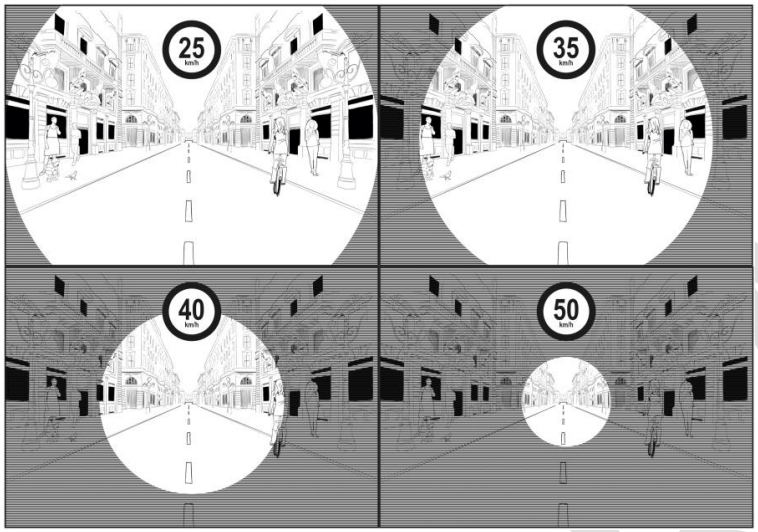


Image Source: Fatality Analysis Reporting System; Early Estimates of Motor Vehicle Traffic Fatalities and Fatality Rate by Sub-Categories in 2020, DOT HS 813 118, June 2021; AAA Foundation for Traffic Safety, Impact Speed and a Pedestrian's Risk of Severe Injury or Death; National Traffic Speeds Survey III: 2015, DOT HS 812 485, March 2018.

Drivers' peripheral vision is increasingly limited as speeds increase. Roadway characteristics can further limit drivers' cones of vision.



Cone of Vision at Different Speeds by Claudio Olivares Medina

MVPC generated the plan's strategies list by considering various actions that will address safety barriers explicitly shared by municipal staff and members of the public. The safe systems approach informs each strategy.

Strategies are tailored to the specific needs of Merrimack Valley communities and include countermeasures that will have the greatest impact. The plan's strategies are catalogued based on their relation to the plan's goals, however, most strategies address more than one goal. For example, while the number of *Safe Streets* strategies far exceeds the number of *Safe Speeds* strategies, many of the street-based strategies are intended to lower speeds.

The *Safety Culture* bucket is broad and addresses driving behaviors, interdepartmental and intergovernmental coordination, and capacity building. Expansion of multimodal transportation consequently increases the potential for mode conflict. As such, *Safety Culture* includes countermeasures specifically related to building awareness of VRUs.

Strategies

	Category	Policy or process change description	Cost	Timeline	Lead Agency	Partners	VZ Principle	Goal
1	Safe Speeds	Track and support automated speed enforcement efforts; advocate for revenue that is generated by automated enforcement be dedicated to roadway infrastructure projects in the region in which they are generated.	$	Mid-Term	Municipalities/ MassDOT	PD	Responsibility is shared	Reduce conflict at traffic stops, equitable enforcement and funding opportunity.
2	Safe Speeds	Develop target speeds for key roadways and design interventions, be they enforcement, education, or engineering, to achieve target speeds.	$$	Mid-Term	Municipalities	MVPC	Safety is proactive	Develop conext-sensitive speeds or facilitate design to do so.
3	Safe Streets	MVPC to review state and municipal projects at all stages of design process.	n/a	Ongoing	MVPC	State and Municipal Staff	Safety is proactive	Prioritize road user safety over driver delay in operations and design decisions.
4	Safe Streets	Establish a quick build library for use by municipalities to pilot safety measures.	$$	Near-Term	MVPC	Municipalities	Safety is proactive	Encourages municipalities to trial safety improvements at a lower cost, temporary basis.
5	Safe Streets	RTA to consult HIN and work with MVPC to determine bus shelter locations.	$	Ongoing	MeVa	MVPC/MassDOT	Humans are vulnerable	Transition from flag stop to fixed stop system with safe and

								comfortable boarding locations.
6	Safe Streets	Train public safety professionals and town managers to balance the trade-offs that design elements supporting rapid response design elements and safe speeds.	$	Mid-Term	MVPC	Municipal Staff	Responsibility is shared	Educate decision makers on Vision Zero thinking
7	Safe Streets	Work with municipalities to design and implement quick build safety demonstration projects.	$	Near-Term	MVPC	Municipal Staff	Safety is proactive	Encourage municipalities to trial safety improvements and find solutions at a low cost, temporary basis.
8	Safe Streets	Identify and eliminate sidewalk gaps on existing high-priority active transportation corridors.	$$$	Mid-Term	MVPC/Municipalities/MassDOT		Humans are vulnerable	Support safe multi-modality.
9	Safe Streets	Identify and eliminate bicycle network gaps on existing high-priority active transportation corridors.	$$$	Long-Term	MVPC/Municipalities/MassDOT		Humans are vulnerable	Support safe multi-modality.
10	Safe Streets	DPW develop plans/procedures to remove snow from sidewalks and bike facilities in a timely fashion (to ensure vulnerable users are protected from vehicle paths).	$$	Mid-Term	Muncipal DPW	Contractors	Humans are vulnerable	Ensures vulnerable users are protected from vehicle paths.

11	Safe Streets	Work with municipalities to improve pedestrian safety at crossings using elements such as high visibility crosswalks, shortened crossing distances via curb extensions, leading pedestrian intervals, exclusive phases where appropriate, right-turn on red restrictions, and improved lighting. Prohibit and remove existing pork chop (i.e. free right, channelized right) turns at intersections.	$$$	Mid- and Long-Term	Municipal Staff	MVPC	Humans are vulnerable	Prioritize VRUs and support redundancy in our transportation network.
12	Safe Streets	Incentivize the use of rapid rectangular flashing beacons (RRFBs) or HAWK signal at high-speed mid-block crossings.	$$	Near- and Mid-Term	Municipalities	MVPC	Humans are vulnerable	Improve pedestrian safety and visibility.
13	Safe Streets	Advance sound access management principals and incentivize codes and policies that significantly reduce the introduction of new conflict points in the roadway. Remediate existing conflict points as development occurs.	$$	Near-Term		MVPC	Death and serious injuries are unacceptable	Reduce conflict points.
14	Safe Streets	Investigate and encourage the use of alternative paving, such as high-friction paving, in locations where roadway departures are prominent.	$$	Mid-Term	MVPC	DPW/PD	Responsibility is shared	Apply context-appropriate countermeasures.
15	Safe Streets	Require all routine maintenance to include safety reviews and the implementation of appropriate countermeasures.	$	Near-Term	Municipalities	DPW	Responsibility is shared	Integrate safety upgrades into current municipal schedules.

16	Safe Streets	Encourage communities to use retroreflective pavement markings and to adopt standard restriping assessments and schedules.	$	Near-Term	Municipalities	MVPC	Safety is proactive	Integrate safety upgrades into current municipal schedules.
17	Safe Streets	Create clear sidewalk policies, including management of vegetation, placement of waste, postal, sign and other potential obstructions.	$$	Near-Term	Municipalities	MVPC, possibly green spaces committees?	Safety is proactive	Maintain accessible, equitable access along pedestrian network.
18	Safe Streets	Create a toolkit of engineering countermeasures, including typical dimensions and specifications OR standard drawings.	$	Near-Term	MVPC	DPWs	Redundancy is crucial	Standardize countermeasures.
19	Safe Streets	Consult with Hazard Mitigation Plan to implement stormwater management tools to minimize ponding on roadways.	$$	Near-Term	MVPC/DPWs	Sustainability/Conservation Divisions.	Responsibility is shared	encourage inter-departmental collaboration. Maintain safe roads in inclement weather.
20	Safe Streets	Increase pedestrian phase signal at crosswalks near hospitals, community centers, and in REJ+ Communities where disabilities or seniors are predominant.	$$	Mid-Term	Municipalities	MVPC	Redundancy is crucial	Support equitable transportation regionwide.
21	Safe Streets	Develop wayfinding to guide vulnerable road users along active transportation network.	$	Near-Term	MVPC/ATC	ECCF	Humans are vulnerable	Help guide vulnerable users along safest routes. Mitigate modal conflict.
22	Safe Vehicles	When replacing fleet vehicles, encourage municipalities to purchase right-sized vehicles	$$	Mid-Term	Municipalities	MVPC	Redundancy is crucial	Mitigate severe and fatal crash outcomes.

		with appropriate crash-avoidance technology.						
23	Safe Vehicles	Encourage municipalities to upgrade crash-avoidance technology on existing vehicles such as mirrorless mirrors and side bars.	$	Near-Term	Municipalities	MVPC	Redundancy is crucial	
24	Safe Vehicles	Expand mirrorless mirrors to entire MeVa fleet.	$$	Mid-Term	MeVa	MVPC	Redundancy is crucial	Reduce visibility issues for drivers. Improve safety around bus stops.
25	Safety Culture	Use HIN as criteria for TIP projects to achieve additional points.	n/a	Ongoing	MVPC	MassDOT	Death and serious injuries are unacceptable	Prioritize funding for projects in the most high-risk areas.
26	Safety Culture	Integrate traffic safety education in school curriculums.	$	Near-Term	MVPC	Enforcement, Schools, Social Workers	Safety is proactive	Emphasize safety to new drivers, encourage peer-to-peer learning.
27	Safety Culture	Incentivize federal and state aid to support safety transportation programs.	n/a	Ongoing	MVPC	State and FHWA	Responsibility is shared	Deincentivize road expansion projects that increase capacity for cars.
28	Safety Culture	Train local DPW staff on VZ principles and countermeasures.	$	Near-Term	MVPC	DPW	Responsibility is shared	Emphasize shared responsibility.
29	Safety Culture	Facilitate coordination and organization between safety advocacy groups in the region. Support the development of new	$	Ongoing	MVPC	Municipal Staff	Responsibility is shared	Strengthen adovcacy network and build capacity.

		roadway safety champions and ambassadors.						
30	Safety Culture	Encourage towns to adopt appropriate maintenance of traffic policies when access is disrupted for vulnerable users. During construction, ensure safe access for vulnerable users by providing alternate routes with appropriate traffic controls and protections (maintenance of traffic).	$	Ongoing	Municipalities		Humans are vulnerable	Improve interdepartmental coordination and public communication. Maintain safe systems.
31	Safety Culture	Encourage municipalities to adopt code revisions that require safe and convenient access to commercial and multifamily residential sites by nonmotorized and micro-mobility modes of transportation. Require sidewalks to be installed between the public way and building entrances where parking lots are proposed.	$$	Mid-Term	Municipalities	MVPC	Safety is proactive	Enable multi-modality. Reduce mode conflict.
32	Safety Culture	Use before and after location-based campaigns to improve awareness of roadway safety and justify new engineering changes.	$$	Mid- and Long-Term	MVPC/Municipalities		Responsibility is shared	Increase public support and awareness of Vision Zero.

33	Safety Culture	Innovate new ways of communicating the need for a safety culture; where, appropriate, take risks regarding communication strategy.	$	Ongoing	MVPC/Municipalities	Municipalities	Safety is proactive	Make Safety Culture hip, contribute to an emerging technology.
34	Safety Culture	Develop Freight Management Plan offer resources for freight.	$$	Mid-Term	MVPC	Municipalities/ MassDOT	Responsibility is shared	Reduce conflicts inovlving heavy vehicles, improve roadway maintenance.
35	Safety Culture	Work with local police departments to evaluate disparities in traffic enforcement citations.	$	Near-Term	PDs	MVPC	Responsibility is shared	Equity analysis for citations.
36	Safety Culture	Perform additional research to understand influence of drugs and alcohol reporting processes.	$	Near-Term	Community Health Needs Assessment Committees	MVPC	Humans make mistakes	Determine reason for underreporting and create equitable mitigation strategies.
37	Safety Culture	Honor yearly World Day of Remembrance.	$	Ongoing	MV Vision Zero Coalition	MVPC	Death and serious injuries are unacceptable	Raise awareness for MV Vision Zero. Strengthen victim support/post crash care awareness.
38	Safety Culture	Hold quarterly meetings with MV Vision Zero Coalition.	$	Ongoing	MV Vision Zero Coalition	MVPC	Responsibility is shared	Build advocacy network. Capacity building.
39	Safety Culture	Invite communities to submit walk audit requests and execute no fewer than 4 per year.	$	Ongoing	MVPC	Municipalities/ MVVZC/community	Safety is proactive	Make vision zero visible and attainable. Support capacity building.
40	Safety Culture	Expand COA engagement in most at-risk communities.	$	Ongoing	MVPC	COAs	Humans are vulnerable	Target communities with growing elderly population to promote

								transportation safety amongst residents.
41	Safety Culture	Establish youth safety working group.	$	Phase 1	MVPC/MVVZC	Youth Services or Public Health Office	Responsibility is shared	Peer to peer engagement opportunity.
42	Safety Culture	Promote transit use amongst elderly population and caregivers.	$	Ongoing	MeVa	MVPC	Safety is proactive	Create accessible transportation options for people who are aging in place.
43	Safety Culture	Launch strategy to promote awareness of vulnerable road users in "rail trail communities".	$	Near-Term	Municipalities	ATC	Safety is proactive	Support transition for rural communities to support increased demand for VRUs
44	Safety Culture	Participate in MassDOT's Safe Routes to School and Complete Streets programs.	$	Ongoing	Municipalities	MVPC	Responsibility is shared	Take advantage of funding opportunities, cross-polinate when possible.
45	Safety Culture	Support policies that promote expansion of MeVa services.	$$	Ongoing	MeVa	MVPC	Humans are vulnerable	Transit expansion supports equitable access for people who don't drive. Additional economic benefits: See BCA for Fare Free.
46	Safety Culture	Establish age-friendly transportation committee.	$	Near-Term	MVPC	MeVa/COA	Responsibility is shared	Support safe transportation for aging in place population.
47	Safety Data	Employ data to craft and deliver campaigns targeted to end impaired driving.	$$	Near-Term	MVPC	Advocacy Groups	Humans make mistakes	

48	Safety Data	Create a shared central location for MV Vision Zero data to ensure access, consistency in reporting, data analysis and research.	$	Ongoing	MVPC		Responsibility is shared	Monitor progress towards Vision Zero Goal for accountability. Make data accessible to safety advocates.
49	Safety Data	Collect traffic data using MioVision Cameras to understand VRU and vehicle movements to apply best-practice treatments at high crash intersections.	$$	Near-Term	MVPC	Field Services Coordinator	Redundancy is crucial	Support expansion of ATN.
50	Safety Data	Update MV Vision Zero on a quinuennial basis to account for new needs based on stakeholder coordination, new research in best practices, and new technology.	$$	Mid-Term	MVPC	Municipal Liaisons.	Safety is proactive	Accountability and project monitoring.
51	Safety Data	Work with Hospitals to incorporate anonymized emergency room data into vision zero data.	$	Long-Term	Community Health Needs Assessment Committees	MVPC	Responsibility is shared	Create reliable data to be used for additional insights and understand improvements for post-crash care.
52	Safety Data	Establish a multidisciplinary working group to consistently document and evaluate the equity/vulnerability, engineering, environmental, vehicle, and behavioral factors for all deadly crashes.	$$	Mid-Term	MVPC/ MVVZC	Public Health Counselors, PDs, Emergency responders, and others TBD.	Responsibility is shared	Produce additional data to understand risk factors for fatal crashes and update HIN.

53	Safety Data	Ensure/incentivize each town to develop transparent roadway safety reporting processes, including descriptions of which department/personnel are responsible for response.	n/a	Mid-Term	MVPC	Municipal Staff	Responsibility is shared	Streamline reporting to produce consistent data and improve interdepartmental coordination.
54	Safety Data	Use data to identify which driving behaviors and characteristics correlate with severe and fatal injuries. Inform enforcement and education campaigns with the data, focusing on the curtailing the behaviors that result in the worst outcomes causing severe or fatal injury.	$	Phase 2	MVPC	PDs	Humans make mistakes	Understand and mitigate harmful behaviors.

Regional and Municipal Project Lists

One of the ways this plan guides Merrimack Valley communities to achieve Vision Zero is by proposing priority lists at regional and municipal scales. The municipal project lists show the top-five projects or top-10 for all gateway cities, but are not necessarily conclusive of all segments and intersections on the HIN in that municipality.

In addition to their HIN score, these lists incorporate local insight gathered by MVPC staff at public engagement sessions and meetings with municipal liaisons. Context-specific safety considerations augment the practicability of this plan. With the support of the MV Vision Zero consultant BETA Group Inc., a method to quantify input as additional points added to HIN scores was developed.

The template below shows how HIN scores were integrated with non-HIN criteria scores:

Segment(s) or Intersection(s)	***Total Rank***	***Average HIN Score (Z-Score)***	***Average RB-HIN Score***	***Average TB-HIN Score***	***Total non-HIN Criteria***
Use Risk- and Trends-Based maps to identify highest weighted crash segments.	Sum of Average HIN Score and non-HIN Criteria.	Average of Risk-Based (RB) and Trend-Based (TB) HIN Z- scores. In cases where the TB-HIN Z-score was 0, an average of the Z-scores was taken.	RB Z score multiplied by 6.	TB score multiplied by 6.	Sum of scores from non-HIN criteria: see explanations below.

Non-HIN Criteria;

Potential for mode conflict, potential for +4

Demand for safe, multimodal travel is growing. This was evident during community engagement events and mirrored in other regional transportation plans. Amidst this support there is also concern for increasing conflict between VRUs and vehicles. On page 17 of the Massachusetts 2050 Transportation Plan, *Beyond Mobility*, Gateway Cities and rural areas are identified to be especially at risk for unsafe, low-comfort and disconnected facilities for active transportation modes. Therefore, four additional points may be added to determine areas with high potential for mode conflict based on:

Potential for daily bike trips using MassDOT's 2022 Potential for Everyday Biking tool Low: 0, Medium: +0.5, High: +1

Potential for daily walking trips using MassDOT's 2022 Potential for Walkable Trips tool Low: 0, Medium: +0.5, High: +1

Active Transportation Network connection point: existing facility +1, conceptual +.5

On a MeVa Route +1

Proximity to Public Assets, potential for +3

A safe transportation network is an equitable one, this criterion was added to support projects that would increase connection to valuable community resources.

Proximity to public assets +1 for each asset but not to exceed 3 additional points.

Planned Projects/Development +2

The current MVMPO TIP contains a number of high cost projects. Offering points for projects that would address known developments such as a new youth center or residential development will affect traffic patterns and significantly increase roadway user volume (including nonmotorists) supports municipalities to be proactive in safety action planning.

TIP Projects without a programmed year +1

Regional/Municipal Projects that will impact volume (motorists, non-motorists, etc. – can be found on the Excel Sheet) +1

Concern on crowd-sourced map +.5

Ranked Regional Projects

The scoring method outlined in the template on page 45 is how the technical consultant from MV Vision Zero created the following lists. Please note that these lists are subject to change and an interactive dashboard to display the comprehensive HIN and priority projects is in development.

Municipality	*Segment(s) or Intersection(s)*	*Regional Priority Rank*	*Town Priority Rank*	*Total Score*
Haverhill	SR 125/Main Street: Newell to 113 Ashland to 110 Fifth to Fountain Oxford to Eighteenth Peppercorn to Meadow Lane 110 to Arlington Ledge to Talmuth Baltimore to Marsh	1	1	78.67
Lawrence	Essex Street Corridor from Union Street to Margin Street	2	1	66.3
Lawrence	SR 28 Corridor: Essex Street Andover Street Common Street	3	2	66.01
Lawrence	Union Street: Canal Street Merrimack Street Methuen Street Dorchester Street Andover Street Salem Street	4	3	57.98

	Kent Street General Street and Garden Street			
Lawrence	SR 114 Corridor:	5	4	52.43
Lawrence	Amesbury Street from Essex Street to Market Street	6	5	50.43
Lawrence	SR 110 Corridor:	7	6	44.63
North Andover	SR 125: from Andover border to SR 114 Pleasant Street Andover Road and SR 114 Leyden St to Dufton Court Sutton Street to 133 Fernview Massachusetts Avenue Main Street From Haverhill Border to NA Amazon Rock Road to Highland Terrace Holt Road Bradford Street	8	1	43.96
Lawrence	Marston and Ferry Street	9	7	39.04
Lawrence	Canal Street from Marston Street to SR 28	10	8	36.16
Lawrence	Salem and Foster Street	11	9	35.44
Haverhill	MBTA Area: SR 110 Between Finney Pl and View Street Observatory, Gilbert and Washington Washington and High Washington and SR 110	12	2	33.23
Haverhill	SR 97 / Winter Street from 125 to Pilgrim Road	13	3	33.08
Haverhill	SR 97 / Broadway and Computer Drive	14	4	32.9
Lawrence	Common Street and Franklin Street	15	10	32.06
Methuen	Route 28 /Broadway corridor improvements Including intersections of Broadway with: Osgood Annis	16	1	31.34

	Rosewood Hampshire Pleasant/Hampshire			
Newburyport	SR 133/Storey Ave from Garrison Trail to three roads intersection.	17	1	30.96
Salisbury	SR 1A from March Road to Pleasant St	18	1	30.81
Methuen	Burnham Road & Green Street	19	2	29.43
Salisbury	Collins St from NH Line to Lafayette Road	20	2	27.2
North Andover	Andover Street and 114	21	2	26.98
North Andover	Sutton Street and Main Street	22	3	25.73
Methuen	Osgood Street From Railroad/Pelham/113 intersection to Lawrence Street	23	3	25.1
Haverhill	Washington Square	24	5	23.81
Salisbury	SR 1A Near Old County Road	25	3	23.56
Andover	Harding St / Stevens St / Route 28	26	1	23.42
Newbury	SR 1 and Boston Road	27	1	20.63
Andover	Route 28 corridor from Lawrence border to Hidden Road	28	2	20.54
Salisbury	Rabbit Road from Denrael Dr to Baker Rd	29	4	20.48
Salisbury	SR 1A near 191 Beach Road	30	5	20.34
Newburyport	Water Street from State Street to Clipper City Rail Trail Phase 2	31	2	20.22
Methuen	Lawrence Street Approach to Methuen Town Center from East Street	32	4	19.8
Rowley	SR 1	33	1	19.77
Salisbury	Rabbit Road / Merrill Street / Elm Street	34	6	19.42
Haverhill	Essex Street	35	6	18.94
Groveland	SR 113/Main Street	36	1	18.89
Methuen	Lawrence Street intersections: Lawrence & Camden Lawrence & Spruce & Kenwood Lawrence & Birchwood	37	5	18.38
Methuen	East Street Corridor from Lawrence Street to SR 110	38	6	18.17

Newbury	SR 1/Newburyport Turnpike: Elm Street and SR 1 Boston Road and SR 1 Segments from Newburyport border and Sled Road	39	2	18.12
Haverhill	SR 110 Approach to 495	40	7	17.91
Methuen	Jackson Street	41	7	17.86
Haverhill	SR 125 and 113 over Basiliere Bridge	42	8	17.78
Groveland	Main Street at Elm Park (Near intersection of SR-97 and SR113)	43	2	17.2
Merrimac	SR 110/East Main Street from Bear Hill Road to Veterans Way	44	1	17.06
Salisbury	Toll Rd connecting Pike St to Main St	45	7	17.03
Amesbury	Elm Street	46	1	16.95
Methuen	East 110 Corridor	47	8	16.53
Groveland	SR 97/School Street	48	3	16.48
Andover	Dascomb Road	49	3	16.17
Amesbury	SR 110/Haverhill Road and Hillside/Route 150 Ext.	50	2	16.01
Salisbury	Main St / Toll Rd	51	8	15.95
Newburyport	SR 113/Storey Ave from West Newbury Border to Garrison Trial	52	3	14.83
Methuen	113 Pedestrian Improvements from 110 to the Loop	53	9	14.4
Newburyport	High Street from North Atkinson Street to SR 1A	54	4	14.13
Amesbury	Macy Street from Stop & Shop under 495 to Main Street	55	3	13.88
Amesbury	Macy Street (Route 110) between E Highland St and Rosedale Street	56	4	13.74
Newburyport	Henry Graf Jr Road	57	5	13.64
Andover	Whittier, Washington, Bellevue, Wildwood	58	4	13.48
Andover	Salem St at Woodland Rd / Holt Rd	59	5	13.37
Haverhill	Brandy Brow Road	60	9	13.11
Andover	Florence St	61	6	12.87
Methuen	Milk Street from East Street intersection to 113	62	10	12.76
Andover	SR 125/Andover By Pass	63	7	12.61

Methuen	Pelham Corridor from Railroad/113/Osgood Intersection to Spencer Street	63	11	12.61
Salisbury	Rabbit Road / High Street	65	9	12.46
Methuen	Howe Street improvements from Archibald Street to 113 Including: Howe & Archibald & Hampstead Howe & Pond Howe & Washington	66	12	12.33
Andover	Route 133: Segment from Tewksbury Line to Haggett's Pond Rd Intersection. IRS/CRACK'D Greenwood/Lovejoy Segment in front of Bridges by EPOCH Segment from Shawsheen Square to North Andover Line	67	8	12.11
Andover	Elm Street	68	9	12.09
Newburyport	Low Street	68	6	12.09
Haverhill	SR 125 from Glenmeadow to 125 Connector	70	10	11.95
Amesbury	Main Street and Route 110	71	5	11.58
Rowley	SR 133/Haverhill Street SR 133 at Main St SR 1-A	72	2	10.8
North Andover	Sutton Street	73	4	10.34
Georgetown	Library Street	74	1	10.31
West-Newbury	Main St (Between Pentucket Regional Junior High School and Farm Ln)	75	1	10.27
Methuen	Ford Street and Greenhalge Street Intersection	76	13	9.85
Georgetown	SR 133/Andover Street	77	2	9.84
Methuen	Hampshire Road between Pelham and Salem	78	14	9.73
Rowley	Jellison Road and SR 1A	79	3	9.71
Methuen	Hampstead and Maple Street	80	15	9.62
Andover	Gould Road	81	10	9.54
Georgetown	SR 133/East Main Street across I-95	82	3	9.5
Salisbury	Main St (From High St to Lena Maes Way)	83	10	9.46

Salisbury	Broadway (Salisbury Beach)	84	11	9.34
Methuen	113 Speed mitigation: From Elm St to 110, N Lowell segment next to Hickory Hill Golf Course	85	16	8.94
Newburyport	Storey Ave/Ferry Road and Moseley Avenue or "Three Roads Intersection"	86	7	8.75
Newbury	Plum Island Boulevard & Northern Boulevard	87	3	8.58
West-Newbury	Main St (Between Maple St and Whetstone St)	87	2	8.58
Rowley	Wethersfield Street	89	4	8.5
Amesbury	Oakland, County, Chestnut	90	6	8.39
Newburyport	High Street at Plummer Ave (SR-113)	91	8	8.21
Georgetown	SR 133/East Main Street and Tenney St	92	4	8.18
Groveland	Salem Street	93	4	8.13
Georgetown	Pond Street approach and Lake/Mill intersection	94	5	7.95
Groveland	Center Street	95	5	7.45
West-Newbury	RT 113 from Church Street to Prospect Street	96	3	7.44
Andover	River Road: Old River Road to Riverside	97	11	7.38
Boxford	SR 133/Washington Street between Willow Road and Essex Street	98	1	7.27
Newburyport	Winter Street	99	9	7.03
Merrimac	SR110/East Main Street from Wallace Way to Attitash Avenue	100	2	6.41
Newburyport	Colby Farm Lane, North Atkinson Street and Low Street	101	10	6.28
Georgetown	Nelson Street	102	6	6.17
West-Newbury	RT 113 near Farm Ln	103	4	6.04
West-Newbury	RT 113 Near Harrison Ave	104	5	6.02
Newbury	Middle Road	105	4	5.53
Merrimac	Green St across Locust -Pedestrian Facilities - waiting for two additional RRFB at Union St and 110 Walking School Bus Library RRFB Corner of Union and 110 RRFB Tricky 110/locust	106	3	5.5

Groveland	Washington Street and Salem Street	107	6	5.32
Newbury	Parker Street	108	5	5
Boxford	Ipswich Road and Herrick Road	109	2	4.97
Rowley	Summer Street from 1A to Bradford Street	110	5	4.84
Newbury	SR 1A/High Road	111	6	4.81
Amesbury	High Street	112	7	4.67
Georgetown	SR 97/West Main Street	113	7	4.5
Newbury	Marlboro Street and High Street	114	7	4.41
Boxford	Ipswich Road approach to Kelsey Road intersection.	115	3	4.2
Newburyport	Hale Street	116	11	4.18
Georgetown	North St / Central Street at W Main St Intersection	117	8	4.14
Newbury	School Street and Elm Street	118	8	4
Merrimac	Locust Street	119	4	3.77
Andover	High Street	120	12	3.65
Amesbury	Kimball Road 110 to Ashley Dr	121	8	3.58
Georgetown	SR 97 at Prospect Street	122	9	3.54
Boxford	Ipswich Road from Woodhill Lane through main street intersection.	123	4	3.24
Boxford	Main Street from Lily Pond Road to Lake Shore Road	124	5	3.18
Rowley	Bradford Street and 133	125	6	3.11
Newbury	Scotland Road	126	9	2.84
Georgetown	Tenney Street	127	10	2.64
Andover	Greenwood Road: Between North and Ledge Gleason to High Plain Approach to 133	128	13	2.56
Rowley	Summer Street and Independent Street	129	7	2.54
Boxford	Main and Middletown	130	6	2.39
Boxford	Middleton Road and Endicott Road	131	7	2.24
North Andover	Main Street and Waverly	132	5	2

West-Newbury	Bridge Street / Ferry Ln (Church St)	133	6	1.65
Newbury	Fatherland Drive	134	10	1.64
Merrimac	Bear Hill Road	135	5	1.24
Boxford	Killam Hill Road (RT 97) from I-95 interchange to King Richard Dr	136	8	1.14
Georgetown	Warren Street	137	11	1
Boxford	Main and Lawrence	138	9	0.5
Boxford	SR 97 from Rowley Road to Harris Road	139	10	0.24
Boxford	Main and Maple	140	11	0

Municipal Lists

The municipal lists on the following pages show the top five highest ranking projects for each municipality and top ten highest ranking projects for the three gateway cities of Haverhill, Lawrence and Methuen.

Amesbury

Segment(s) or Intersection(s)	*Countermeasures*	*Regional Priority Rank*	*Town Priority Rank*
Elm Street	**Elm and Macy:** Curb extensions, pedestrian refuge islands, upgrade pedestrian signals with APS, countdown, extend signal clearance time, consider additional crossings, continental style crosswalks, left turn tracking lines.	46	1
SR 110/Haverhill Road and Hillside/Route 150 Ext.	Intersection realignment - split to two intersections, consider roundabout, install crosswalks on missing legs, continental style, longer clearance intervals, vehicle tracking lines for left turns, access management.	50	2
Macy Street from Stop & Shop under 495 to Main Street	Access management, improve pedestrian refuge opportunities, add RRFB at existing crosswalk, extend sidewalks with buffer, angle McDonalds driveway to avoid left turns, consider a road diet 4 to 3 lanes, connect Salisbury Trail to Amesbury Riverwalk, improve pedestrian crossings.	55	3
Macy Street (Route 110) between E Highland St and Rosedale Street	access management, see countermeasures for Main St at Route 110, reduce roadway width, add sidewalk to E Highland St and square up crosswalk, provide advance pedestrian signage	56	4
Main Street and Route 110	**Main and Macy:** use continental crosswalk, consider tighten turning radii.	71	5

Andover

Segment(s) or Intersection(s)	*Countermeasures*	*Regional Priority Rank*	*Town Priority Rank*
Route 28 corridor from Lawrence border to Hidden Road	**Harding to Stop and Shop:** Access management, road diet, provide pedestrian access into shopping center, **Sweeney to Lewis:** Reduce lane width to 11 feet. Increase parking width and long term, widen sidewalk, stripe parking spaces.	28	1
Dascomb Road	**Intersection with Frontage:** Consider roundabout, extend clearance times, advance westbound lane drop signage, narrow lanes to 11 feet where possible, **Algonquin to Durham:** Speed feedback radar sign, street lighting	49	2
Whittier, Washington, Bellevue, Wildwood	Washington & Elm has a new RRFB and curb extension. **Wildwood from Wethersfield to Salem:** Consider improved curve signage, speed feedback radar sign, **Bellevue and Brown:** Signage to direct people where to go. Reflectors.	58	3
Salem St at Woodland Rd / Holt Rd	Install stop signs at Holt Road approach, remove current crosswalk across Salem St and add a new crossing further north, perpendicular to Salem Rd, add RRFB's to Salem St crossing, adjust woodland approach to be closer to Salem St, adjust stop bar and stop signage on woodland street, evaluate adding an inprinted median island on Woodland approach	59	4
Florence St	speed feedback signage, consider traffic calming measures such as speed humps / speed tables	61	5

Boxford

Segment(s) or Intersection(s)	*Countermeasures*	*Regional Priority Rank*	*Town Priority Rank*
SR 133/Washington Street between Willow Road and Essex Street	**Willow Road:** Curb extension on the northwest side. **Essex Street:** Tighten turning radii. Remove right merge lane. Along segment: Access management at commercial driveways. Consider sidewalk with buffer. **Washington and Main:** Consider simplifying intersection and tightening turning radii. Consider a roundabout. Provide crosswalks and sidewalks to access businesses.	98	1
Ipswich Road and Herrick Road	Ddjust stop bars to be closer to the intersection, provide intersection ahead signage speed feedback signage on Ipswich Road	109	2
Ipswich Road approach to Kelsey Road intersection.	Intersection ahead signs, flashing beacon.	115	3
Ipswich Road from Woodhill Lane through main street intersection.	**Main Street intersection:** Consider removing slip lanes and simplifying the intersection. Tighten the turning radii.	123	4
Main Street from Lily Pond Road to Lake Shore Road	**South of the Lily Pond intersection:** add a speed feedback radar sign.	124	5

Georgetown

Segment(s) or Intersection(s)	Countermeasures	Regional Priority Rank	Town Priority Rank
Library Street	Narrow the lane to 11 feet and long term add a buffer to the sidewalk on north side.	74	1
SR 133/Andover Street	**Andover and Central:** Signal Optimization, update pedestrian signals	77	2
SR 133/East Main Street across I-95	Close the SB 95 to 133 EB ramp	82	3
SR 133/East Main Street and Tenney St	Realign intersection to a 90 degree T intersection	92	4
Pond Street approach and Lake/Mill intersection	No left from Pond to Lake. Realign to a T intersection at Lake Avenue with a curb extension on the south side. Realign Mill to a 90 Degree T intersection. Reflectors on guard rail.	94	5

Groveland

Segment(s) or Intersection(s)	Countermeasures	Regional Priority Rank	Town Priority Rank
SR 113/Main Street	The crosswalk by Pine Recreation Area has already been upgraded. Consider RRFB if there is not one already.	36	1
Main Street at Elm Park (Near intersection of SR-97 and SR113)	Consider intersection realignment.	43	2
SR 97/School Street	Narrow lanes to 11 feet, mark shoulder as bike lane with a buffer as is possible, provide reflective edge and center lines. Provide speed feedback radar sign near Baldwin Terrace. Provide crossing from Salem Street sidewalk to strip mall.	48	3
Salem Street		93	4
Center Street		95	5

Haverhill

Segment(s) or Intersection(s)	*Countermeasures*	*Regional Priority Rank*	*Town Priority Rank*
SR 125/Main Street: **Newell to 113** **Ashland to 110** **Fifth to Fountain** **Oxford to Eighteenth** **Peppercorn to Meadow Lane** **110 to Arlington** **Ledge to Talmuth** **Baltimore to Marsh**	**Newell to 113:** Pedestrian refuge at long crossings, provide sufficient crossing time, implement no turn on red, consider options for removing lanes at intersections (for example, combining through/right movements - Ginty /Bailey Blvd, reducing receiving lanes to just those needed) to shorten crossings and simplify operations, conduct evaluation of truck turning needs and appropriate turning radii to accommodate trucks at lower speed. **Arlington to 110:** Stripe 11 foot travel lanes, check clearance intervals, signal optimization, Improve lighting. **Fifth to Fountain:** 11 foot lanes, consider widening the sidewalk with excess width, provide curb extensions at crossing north of 5th avenue. **Oxford and Eighteenth:** Provide curb extension and RRFB to shorten crossing distance and improve visibility across Main Street at midblock crossing, and across side streets, rebuild sidewalks, reduce travel lane width to 11 feet and repurpose into wider sidewalks or bike lanes - pedestrian death. **Peppercorn to Meadow Lane** - provide additional lighting. Provide consistently 11 foot lanes. **Ledge to Talmuth** - Provide pedestrian refuge. Provide consistently 11 foot lanes. **Baltimore to Marsh** - Access management, pedestrian refuge, consider road diet to provide separated bicycle accommodation. Provide consistently 11 foot travel lanes.	1	1

MBTA Area: **SR 110 Between Finney Pl and View Street** **Observatory, Gilbert and Washington** **Washington and High** **Washington and SR 110**	**Observatory Gilbert and Washington:** Curb extensions to shorten crossing distances. Straighten crossings. **Washington and High -** formalize curb extensions. Extend curbs by crosswalk across Washington Street to shorten crossing distance. Consider providing sidewalk along Washington Street. **Washington and 110:** Consider Removal of the Washington Street slip lane. Consider narrowing the Washington Street receiving lane north of River Street. Shorten crossing distances. Provide additional high visibility crosswalk across Washington Street at Washington Avenue.	12	2
SR 97 / Winter Street from 125 to Pilgrim Road	Provide curb extensions and RRFBs at pedestrian crossings, provide consistently 11 foot lanes and bike lanes where possible, access management, realignment of intersection with Hilldale Avenue, clearance intervals, protected lefts, no turn on red	13	3
SR 97 / Broadway and Computer Drive	Signal optimization. Improve lighting.	14	4
Washington Square	Narrow travel lanes to widen sidewalks. Provide curb extensions to shorten crossing distance.	24	5
Essex Street	Narrow travel lanes. Shorten crossing distances where possible through curb extensions or median refuge islands. Consider all way stop at Essex and Washington Street. Access management.	35	6
SR 110 Approach to 495	Provide sidewalk and visible crossings.	40	7
SR 125 and 113 over Vasiliere Bridge	Consider narrowing lanes and providing a wider buffer to the sidewalk	42	8

Brandy Brow Road	Provide bike lane striping through the intersection of Brandy Brow and Amesbury Rd 125	60	9
SR 125 from Glenmeadow to 125 Connector	Provide high visibility crosswalk with curb extension and RRFB across 125 at Glen meadow. Make all crosswalks high visibility through curb extensions and/or an RRFB.	70	10

Lawrence

Segment(s) or Intersection(s)	*Countermeasures*	*Regional Priority Rank*	*Town Priority Rank*
Essex Street Corridor from Union Street to Margin Street	Stripe 11 foot lanes and parking lane, provide curb extensions to shorten crossing distances, particularly near parking to also daylight crossings, continental style crosswalks, upgrade signals to provide APS, countdown, optimize signal timing and clearance intervals, protect left turns where possible. Add RRFBs and curb extensions, as well as daylighting at mid-block crosswalks. Provide crossings by high ridership bus stops. Access management at driveways to channelize movements and provide fewer interruptions to sidewalk network. Consider removing an eastbound travel lane.	2	1
SR 28 Corridor: **Essex Street** **Andover Street** **Common Street**	Access management, narrow travel lanes to 11 feet and stripe lanes, add curb extension to tighten speeds on turns and decrease pedestrian crossing distances where there is a parking lane or overlong turning lanes, continental crosswalks, upgrade to APS where missing, clearance intervals and protected left	3	2

	turns. Consider no turn on red and median refuge islands at crossings where possible.		
Union Street: **Canal Street** **Merrimack Street** **Methuen Street** **Dorchester Street** **Andover Street** **Salem Street** **Kent Street** **General Street and Garden Street**	**In general,** Stripe lanes to 11 feet and long term, widen sidewalks or add bike lanes. Provide curb extensions to shorten crossing distances and daylight all intersections, continental style crosswalks, upgrade signals to provide APS, countdown, optimize signal timing and clearance intervals, protect left turns where possible. Consider no turn on red. **At Canal:** Determine need for three westbound lanes and consider removing one to shorten crossing and simplify intersection. **Merrimack:** Consider need for three northbound lanes. If not needed, consider repurposing to shorten crossing and simplify intersection. **Methuen Street:** Tighten curb radii, particularly on the southwest corner. **Dorchester Street:** add crossing on south side. **Andover Street:** Consider relocation of utility poles in the intersection. **Salem:** consider access management around driveways. **Kent:** accessible ramps and pole relocation. **General/Garden Street:** refer to general.	4	3
SR 114 Corridor:	**Corridor:** Narrow lanes to 11 feet, provide APS and countdown and upgrade signals, **Exeter:** provide curb extensions where there is parking to shorten crossing distances and slow turns, provide more mid-block crossing opportunities with RRFBs, continental crosswalks, access managment, protected left turn phasing, no turn on red. **Union and 114:** Consider roundabout, intersection realignment, Extend clearance time, curb	5	4

	extensions, Consider making Exeter Street one way the other direction, signal optimization and clearance intervals. **Parish Road:**clearance intervals, shorten crossing distances.		
Amesbury Street from Essex Street to Market Street	Narrow travel lanes over the bridge and provide a wider shared use path on both sides with a vertical barrier.	6	5
SR 110 Corridor:	Stripe 11-foot lanes and parking lane, provide curb extensions to shorten crossing distances, continental style crosswalks, upgrade signals to provide APS, countdown, optimize signal timing, protect left turns where possible.	7	6
Marston and Ferry Street	Consider options for shortening crossing distances, install APS, extend clearance intervals, protect left turns, implement no turn on red at all approaches.	9	7
Canal Street from Marston Street to SR 28	Narrow travel lanes and repurpose excess space into bike lanes or wider sidewalks where possible. Protected lefts, no turn on red. Optimize clearance intervals, Countdown signals and APS, Provide curb extensions at intersections. Provide high visibility midblock crossing opportunities.	10	8
Salem and Foster Street	Narrow travel lanes on Salem Street approaching intersection to slow vehicles. Curb extensions to reduce speed on turns and shortern crossing. Consider all way stop.	11	9
Common Street and Franklin Street	Provide curb extensions to shorten crossing distances and slow drivers through the intersection. Evaluate clearance intervals.	15	10

Merrimac

Segment(s) or Intersection(s)	Countermeasures	Regional Priority Rank	Town Priority Rank
SR 110/East Main Street from Bear Hill Road to Veterans Way	Restripe Bear Hill Road crosswalk to continental style, consider / evaluate temporary center island on Bear Hill Road, speed feedback signage, access management, evaluate RRFB installation at crosswalk near Senior center with pedestrian crossing ahead signage	44	1
SR110/East Main Street from Wallace Way to Attitash Avenue	Access management, install stop sign and stop bar to emery st, evaluate parking management at 123 E main st, consider narrowing travel lanes	100	2
Green St across Locust - Pedestrian Facilities - waiting for two additional RRFB at Union St and 110 **Walking School Bus** **Library RRFB** **Corner of Union and 110 RRFB** **Tricky 110/locust**	continue speed feedback signs at Union and SR 110 evaluate further bump out with flexiposts and RRFB	106	3

Locust Street	Install intersection ahead signage, evaluate for sight distance, relocate stop signage, square up intersection with curb extensions, evaluate performance of squared up intersection with flexiposts, speed feedback signage	119	4
Bear Hill Road	Speed feedback signage, curve signage	135	5

Methuen

Segment(s) or Intersection(s)	Countermeasures	Regional Priority Rank	Town Priority Rank
Route 28 /Broadway corridor improvements Including intersections of Broadway with: **Osgood** **Annis** **Rosewood** **Hampshire** **Pleasant/Hampshire**	Access Management, Consider road diet with 1 lane in each direction on MA-28 with a center turn lane Fill sidewalk gaps and improve crosswalks (with consideration for crossings to businesses), upgrade pedestrian signal equipment at Village Mall / Rosewood, provide median refuge crossing island at Village Mall approach, upgrade crosswalks to zebra, consider curb extensions on Village Mall approach, upgrade signal equipment and sidewalks at Hampshire intersection, consider Hampshire lane reduction, Consider curb extensions to shorten crossings at RT 28 / Osgood St and Lawrence Street and signal optimization	16	1

Burnham Road & Green Street	Restripe continental style crosswalks, optimize signal timing, evaluate clearance intervals, consider narrowing travel lanes and creating buffer to existing bike lane, consider median refuge island on EB Haverhill St.	19	2
Osgood Street From Railroad/Pelham/113 intersection to Lawrence Street	Consider roundabout at Osgood St/Railroad St/Route 113, Restripe continental style crosswalk at Mill Falls and 29 Osgood St and install an RRFB, access management, restripe crosswalks and update pedestrian crossing equipment at Osgood / RT 28 intersection, evaluate intersection realignment to a 90 degree T intersection at Lawrence and/or Osgood Street at intersection (currently yield controlled)	23	3
Lawrence Street Approach to Methuen Town Center from East Street	Provide RRFBs at pedestrian crossings, restripe continental style sidewalks , provide curb extensions to shorten crossing distance, access management at park/sporting field exit, narrow travel lanes on East Street and realign intersection to a 90 degree T, provide speed feedback signage prior to crossing	32	4

Lawrence Street intersections: **Lawrence & Camden** **Lawrence & Spruce & Kenwood** **Lawrence & Birchwood**	**Lawrence @ Camden St/Pinewood Rd:** restripe crosswalks to continental style **Corridor**: Narrow lanes to 11 feet and add striped parking along Lawrence St, evaluate "no parking here to corner" signage on Lawrence St for improved visibility **Lawrence @ Spruce / Kenwood:** Access management, provide continental style crossings across side streets	37	5
East Street Corridor from Lawrence Street to SR 110	see priority rank 2 improvements for East St at Lawrence St improvements Provide curve signage / speed feedback signage on East St near Lawrence St intersection, repaint double yellow centerline, consider centerline rumble strips, curve signage on East St near Locust Rd, provide sidewalk on East Street west of Birchwood Road connecting to MeVa bus stop. Provide crossing at Birchwood Avenue to sidewalk on north side of East Stret, evaluate the need for sidewalks along both sides of East St, square off Birchwood and provide stop signage and stop bar, consider intersection realignment at Prospect/East/Milk Intersection	38	6
Jackson Street	Improve sidewalk connectivity along Jackson St, access management, evaluate crosswalk conditions and restripe across side streets, narrow travel lanes on Jackson St, provide pedestrian connection through Methuen Center, provide continental style crosswalk striping at Swan St/Jackson St, upgrade pedestrian signal equiptment to countdown signals, evaluate and consider repainting of turning movements (add tracking lines)	41	7

East 110 Corridor	**Near Sorrento Ave -** remove one crosswalk and upgrade second crosswalk to continental style with RRFB, **Corridor:** evaluate narrowing lanes on 110, access management	47	8
113 Pedestrian Improvements from 110 to the Loop	Upgrade pedestrian crossing at Palermo St with continental style crosswalk and RRFB, fill gaps in sidewalk, construct wider sidewalk with grass buffer, narrow travel lanes on RT 113 to 11 feet, provide connection to sidewalk on the I-495 overpass, widen sidewalks or provide shared use path along Rt 113 at the Loop.	53	9
Milk Street from East Street intersection to 113	**Timber Ln/Magna Rd intersection improvements:** Realign to a 90 degree T intersection, create a single NB/SB lane approach to Milk Street, evaluate temporary changes using flexiposts / raised islands	62	10

Newbury

Segment(s) or Intersection(s)	Countermeasures	Regional Priority Rank	Town Priority Rank
SR 1 and Boston Road	(Walk Audit Location) Provide striped / stamped curb extensions to side road with flexiposts, add flexiposts to median of Route 1, add striped/stamped teardrops to each approach, add LED intersection ahead / bicylist crossing signage, trim shrubbery on Route 1 and Boston Road, adjust and add stop bars to side street, add left turn tracking line on SB Route 1	27	1

SR 1/Newburyport Turnpike: Elm Street and SR 1 Boston Road and SR 1 Segments from Newburyport border and Sled Road	**SR 1 and Elm St:** Intersection ahead signage, emphasize speed reduction from 55 to 45 with more signage, install median island on Elm Street, evaluate adding stop bar and LED stop sign, review SB RT for potential shrubbery trimming, tighten Elm street approach, evaluate the usage of Elm Street turns onto SR 1 to see if multiple vehicles queue, if so consider curb extensions **SR 1 from Sled Road to Newburyport border:** Lower speeds, reduce speed signage from 55 to 45, narrow lanes to 11 feet, evaluate pavement resurfacing project (2023 start) for changes in driver behavior	39	2
Plum Island Boulevard & Northern Boulevard	**Plum Island Turnpike and Northern Blvd:** Construct curb extensions on northwest corner, realign to a 90 degree T intersection, speed feedback signs, pedestrian signs, access management at parking lots, move exit to northern blvd	87	3
Middle Road	**Middle Road at SR 1:** Tighten intesection approach, update clearance intervals consider adding dividing center approach island consider locations for speed feedback signage	105	4
Parker Street	Provide speed feedback radar signs, improve connection to Clipper City Rail Trail, provide buffered bike lane connection between Clipper City Rail Trail to SR 1 roundabout in Newburyport, **Parker Street and RT 1A:** Realign to a 90 degree T intersection, evaluate a taller stop sign, and repainted stop bar	108	5

Newburyport

Segment(s) or Intersection(s)	COUNTERMEASURES	Regional Priority Rank	Town Priority Rank
SR 133/Storey Ave from Garrison Trail to three roads intersection.	Consider road diet, provide a shared use path on one side of corridor to improve connections to bike trail and MEVA bus stops), access management, **Noble Street and 133**: consider intersection realignment with curb extension / pavement markings, evaluate left turn lane extension	17	1
Water Street from State Street to Clipper City Rail Trail Phase 2	Provide RRFBs at pedestrian crossings near Plum Island Coffee, install advanced pedestrian signage, provide center "yield to pedstrian" crosswalk sign, upgrade pedestrian signals (countdown signal heads and APS), **Market Square:** optimize signal timing, restipe stop bars, restructure the center median to allow for clear left turns, access management to Ferry Wharf and other waterfront parking lots, provide additional crossing opportunities through Market Square	31	2
SR 113/Storey Ave from West Newbury Border to Garrison Trial	Consider road diet, access management, widen sidewalks and provide a buffer strip, shared use path and/or buffered bike lanes, consider bike lanes between Park and Ride and Low Street, evaluate sight distance concerns from Turkey Hill Rd, evaluate curb extensions on 113 to discourage passing on shoulder around vehicles making a left onto Turkey Hill Road	52	3

High Street from North Atkinson Street to SR 1A	Install RRFB or raised pedestrian crossing near Boardman St, consider curb extension to shorten crossing distances narrow travel lanes to 11 feet, evaluate parking/shoulder width on High St, construct curb extensions to reduce crossing widths and install RRFB at Carey Ave crossing, consider pedestrian crossing signage	54	4
Henry Graf Jr Road	**At New Pasture Road:** Consider realignment to a T intersection remove the slip lane, add stop signage	57	5

North Andover

Segment(s) or Intersection(s)	*COUNTERMEASURES*	*Regional Priority Rank*	*Town Priority Rank*
SR 125: **from Andover border to SR 114** **Pleasant Street** **Andover Road and SR 114** **Leyden St to Dufton Court** **Sutton Street to 133 Fernview** **Massachusetts Avenue** **Main Street** **From Haverhill Border to NA Amazon** **Rock Road to Highland Terrace** **Holt Road** **Bradford Street**	**SR-125 at Bradford St**: T-up intersection, remove slip lanes, relocated stop signage, restripe thicker stop bar **SR-125 Corridor:** consider road diet **SR-125 at Holt Road:** consider signalizion or roundabout, depending on left turning volume, reduce lanes from 3 to 2 minimum, tighten lane widths, consider larger traffic islands **SR 125 at RT-133 / Sutton St:** RT-133 left turn tracking lines, increase median island length and width for RT 125 and Sutton St approach, restripping and pavement surface condition evaluation, for right lane of southbound **SR-125 near Pleasant St:** access management, narrow travel lanes **SR-125 near Mass Ave:** recently updated	8	1

	intersection infrastructure (2020) **SR-125 near Dufton Court:** review gas station access management		
Andover Street and 114	Upgrade to continental style crosswalks, conduct signal clearance timing modifications, stripeturn tracking lines, consider intersection realignment or roundabout	21	2
Sutton Street and Main Street	Provide pavement marking to lead into northbound right turn lane, Sutton St WB requires "left lane must turn left" signage and advanced roadway painted turning mvoement markings, reduce the length left turn pocket, improve pedestrian equipment (countdown signals) and add continetnaly style crosswalks, provide curb extensions on Main St, access management	22	3
Sutton Street	**Sutton St @ RT 125:** - recently updated intersection **Sutton St to RT I-495:** install speed feedback signage, refresh pavement markings on Sutton St	73	4
Main Street and Waverly	Restripe crosswalks, restripe stop bars, install speed feedback signs, install RRFB at crossing, install curb extension to shorten crossing distances at Main Street	132	5

Rowley

Segment(s) or Intersection(s)	*COUNTERMEASURES*	*Regional Priority Rank*	*Town Priority Rank*
SR 1	Access management, consider traffic calming measures including flexipost bumpouts at Weathersfield St intersection, evaluate improvements at SR 1 and Central street, consider 2 stage bike turn queue boxes	33	1
SR 133/Haverhill Street **SR 133 at Main St SR 1-A**	Install speed feedback signs, evaluate updates to Bradford St and Haverhill St intersection consider removal of northbound slip lane onto SR 133, adjust southbound approach stop bar, consider better 90 degree T alignment, install stop control	72	2
Jellison Road and SR 1A	Install pedestrian advance crossing signage, restripe continental style crosswalk and install an RRFB, realign intersection with Railroad Ave to 90 degree T, install speed feedback signage	79	3
Wethersfield Street	see above improvements on Wethersfield / RT 1 intersection improvements Consider stamped center median	89	4

Summer Street from 1A to Bradford Street	Summer Street and Route 1: Realign to a 90 degree T intersection, consider removal of the RT 1 SB slip lane onto Summer Street. **Corridor:** Narrow travel lanes to 11 feet, increase sidewalk width and provide buffer	110	5

Salisbury

Segment(s) or Intersection(s)	COUNTERMEASURES	Regional Priority Rank	Town Priority Rank
SR 1A from March Road to Pleasant St	Access management, narrow travel lanes, evaluate adding a pedestrian / bike crossing with HAWK / PHB signal at 1st street and Bridge Street RT 1A at Partridge Ln - evaluate sight distance, consider adding stop signage, stop bar	18	1
Collins St from NH Line to Lafayette Road	Install speed limit signage / speed feedback signs, consider striping edgelines	20	2
SR 1A Near Old County Road	Access management, consider realignment to a 90 degree T intersection at Old County road, evaluate for sight distance issues install speed feedback signage, narrow travel lanes to 11 feet	25	3
Rabbit Road from Denrael Dr to Baker Rd	speed feedback signage and access management, evaluate lane width (road diet)	29	4
SR 1A near 191 Beach Road	restripe turning lane and yellow hatched lane divider, speed feedback signage, consider road diet (thinning travel lanes)	30	5

West Newbury

Segment(s) or Intersection(s)	*Countermeasures*	*Regional Priority Rank*	*Town Priority Rank*
Main St (Between Pentucket Regional Junior High School and Farm Ln)	see countermeasures below for RT 113 near Farm Ln, speed feedback signage, evaluate sight distance of 2nd exit from school (near 6 Main Street)	75	1
Main St (Between Maple St and Whetstone St)	speed feedback signage, upgrade pedestrian crossing across Main St, consider HAWK / PHB signal with curb extension, access management, add formalized pedestrian refuge island at Maple Street, upgrade all crossings to continental / ladder style	87	2
RT 113 from Church Street to Prospect Street	Access management, evaluate crossings at West Newbury town offices, install RRFB at this location, speed feedback signage along MA-113	96	3
RT 113 near Farm Ln	Install RRFB to crossing near 30 Main St, provide school speed feedback sign, install RRFB at Pentucket School Main Street crossing, Upgrade to continental style crosswalks, consider traffic patterns for school dismissals (police detail / crossing guard), consider further speed reduction techniques at school (raised pedestrian crossings, bump outs, tighten roadway with temporary median / pavement markings	103	4

RT 113 Near Harrison Ave	Install RRFB / restripe pedestrian crossings at Harrison Ave, access management, install speed feedback signage, A**t Crane Neck St:** upgrade pedestrian signal equipment, provide continental style crosswalks, adjust clearance intervals	104	5

Appendices

Technical Documentation on High Injury Network

Trend-Based Analysis

The current trends-based analysis uses the five most recent years of complete crash data—2017 through 2022—to capture trends. The methodology assigns points-based severity to crashes resulting in injury with additional weight given to severe and fatal injuries. Property damage only crashes were not included in this analysis. The methodology also assigns greater weight to crashes involving vulnerable road users and crashes occurring in equity focus areas.

This trends-based HIN assigns scores to crashes based on injury severity as follows:

Fatality = 15 points

Severe injury = 5 points

Minor injury = .5 points

To account for crashes involving vulnerable road users, the total severity calculated through the process above is then multiplied by a "non-motorist factor" of 1.5 for crashes involving non-motorists.

To account for communities experiencing disproportionate burdens from the transportation system, an additional "equity factor" of 2 was added for crashes occurring in Regional Environmental Justice Plus (REJ+) communities.

The total weight for a crash was calculated by multiplying the severity index value by the nonmotorist factor and the equity factor. The weights assigned to crashes were then summed for crashes occurring along a road segment or near an intersection to calculate a severity value for each road segment or intersection.

Total_weight = Total severity * non-motorist factor (1.5) * equity factor (2)

To help with selecting a cutoff for road segments and intersections to be included in the HIN, values were calculated for the mean and standard deviation of the total severity for all road segments and a Z score (number of standard deviations from the mean) was assigned for each road segment. In statistics, standard deviation is a value of dispersion. A high standard deviation suggests that data is spread, while a lower standard deviation suggests that data is tightly clustered. A Z score above zero suggests that the severity score of a given segment or intersection is above what might be typically expected based on how dispersed the severity scores are for the segment and intersection datasets.

Cutoffs for road segments and intersections to be included in the final trends-based HIN were selected by calculating the percentage of severe and fatal injuries and percentage of roadway or total intersections accounted for at various Z scores.

To determine the percentage of severe and fatal injuries accounted for in the HIN, a layer of severe and fatal injury crashes at the person level was added to the map. Two spatial joins were conducted to join weighted road segments and intersections to the severe and fatal crashes. These crashes were then filtered based on the Z score from the road segments and intersections to determine the percentage of severe and fatal injuries included at various thresholds. The results are included below:

Z Score Greater than or Equal to	% of Roadway	% of Severe and Fatal Injuries
0	6.51%	75.10%
0.5	3.71%	56.19%
1	2.27%	39.92%
2	1.15%	23.09%

Z Score Greater than or Equal to	% of Intersections	% of Severe and Fatal Injuries
0	2.70%	38.25%
0.5	1.59%	31.71%
1	1.06%	25.45%
2	0.45%	14.46%

To account for a significant number of severe and fatal injuries, a cutoff of a Z score greater than or equal to 0 was selected. This means that any road segment or intersection with a severity greater than or equal to the average severity was included in the final trends-based HIN.

Risk-based analysis documentation

The Risk-based HINs uses MassDOT IMPACT crash data from 2003-2022 for the purpose of training a random forest regression model (a machine learning prediction model) to predict high-risk intersections and corridors in the MVPC region.

The overall goal of the code is to assign weighted severity to crashes in the MVPC region, taking into consideration the presence of a fatal or serious injury crash, the presence of vulnerable road users, and whether or not the crash is within a regional environmental justice + (REJ+) region.

Crash severity values will be summed at intersections and on corridors to provide an average severity value per year for each intersection and corridor in the network. The random forest model will then use the geometric and traffic features of the roadways and intersections (provided by MassDOT IMPACT data) to learn and predict which variables contribute the most to higher average severity values. The result of both the intersection and corridor risk-based HIN's will be a layer of predicted

intersections and segments with the highest risk, as well as trained regression models for both HIN's which provide insights to the most important IMPACT variables in predicting high-risk locations.

The Risk-Based HIN is developed using two Python scripts: one for intersections and another for corridors. The scripts take data from the MassDOT IMPACT crash data as well as GIS files for roads and intersections and Regional Environmental Justice + (REJ+) communities to create a map identifying intersections and corridors which are predicted to be "High Injury" within the MVPC region.

An intersection or corridor is classified as high injury based on a calculated average severity value per year. This severity value is determined by summing the individual crash severity values at a specific location. Each crash in the MVPC region is assigned a severity value based on factors such as injury status (fatal, serious injury, non-injury), the involvement of vulnerable users (pedestrians, cyclists), and the location of the crash (within an Environmental Justice (EJ) Region or not). Finally, the total severity value of an intersection or corridor is divided by the number of years of crash data to find the average severity value per year.

A machine learning model is then trained to predict the average severity values of intersections and corridors based upon roadway geometry and traffic data. The result is a GIS layer of predicted high injury intersections and corridors.

Technical Documentation on REJ+

mvpcmimap.sharepoint.com/sites/MVPCBETASS4ACoordinationTeam/SharedDocuments/Forms/AllItems.aspx?id=%2Fsites%2FMVPCBETASS4ACoordinationTeam%2FSharedDocuments%2FGeneral%2FResources%2FREJ%2B Project Description 031923 %28003%29%2Epdf&parent=%2Fsites%2FMVPCBETASS4ACoordinationTeam%2FSharedDocuments%2FGeneral%2FResources&p=true&ga=1

Walk Audit Notes/Findings

Forthcoming.