

# Safe Speeds on City Streets

## Creating a Neighborhood Traffic Management Program

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April 2021



## Acknowledgements

In summer 2020, the Missoula City Council asked staff to investigate travel speed and the possibility of reducing speed limits on local streets as part of an update to the Public Works manual. Staff conducted a comprehensive review of safety, travel speed, state statutes, and City practices. This report represents the culmination of this research and includes an outline for the creation and management of a Neighborhood Traffic Management Program, a holistic approach to addressing transportation safety through better coordination of existing staff time and resources.

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## Abstract

The streets of Missoula are shared by people walking, driving, and riding bicycles or other low-speed mobility devices. As Missoula grows, so does the potential for conflict within these spaces. City staff and elected officials already receive frequent complaints about traffic speeds and safety within residential neighborhoods but do not currently have a process in place to systematically and efficiently plan improvements city-wide; nor is there a process to assess the trade-offs of improving one location as opposed to others. To date, the City has and is committed to promoting safety and equity through plans, policies, and infrastructure investments mostly targeted on main roads.

In order to address the increased likelihood and consequences of traffic crashes, enhance the Neighborhood Greenway network, advance the mode split goals adopted in the Long Range Transportation Plan, and keep the city a place where all modes of transportation are facilitated and all walks of life are welcomed, the City of Missoula is now considering policies to better manage traffic on lower volume streets and within residential neighborhoods.

This white paper synthesizes recent safety research, which has identified vehicle travel speed as a leading determinant of crash severity and frequency, reviews travel speed reduction methods, including emerging best practices around speed limit reduction, and proposes a new Neighborhood Traffic Management Program as a way to mitigate speed-related safety issues on local-jurisdiction streets in Missoula.



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## I. BACKGROUND

The City of Missoula is committed to a multimodal strategy to improve the safety, equity, cost-effectiveness, and overall user satisfaction of the transportation network. As part of this strategy, City Council and the Metropolitan Planning Organization (MPO) have adopted community-wide policy and planning documents that set explicit goals for both safety and transportation mode share — the percentages of people who travel by different means. Historically, transportation officials have focused efforts on higher volume arterials, as more crashes happen where there are more cars, and these streets often need complex (and costly) facilities for people to bike and walk safely, comfortably, and conveniently. However, all arterials in the City of Missoula are either owned, maintained, or both by the Montana Department of Transportation, and projects that improve safety and balance mode share along arterials require an incredible amount of time, resources, and funding to complete (e.g. Russell Street). City officials are therefore turning attention to locally owned neighborhood streets and the potential to improve safety and encourage more non-motorized trips along them. Two plans, in particular, the 2019 Community Transportation Safety Plan (CTSP)<sup>1</sup> and the 2016 Long Range Transportation Plan (LRTP)<sup>2</sup> best highlight the potential of engaging with neighborhood streets to achieve these goals.

The CTSP takes a Vision Zero approach towards the goal of reducing the number of serious injuries and eliminating traffic fatalities within the Missoula planning area. The basic premise of Vision Zero is that people will make mistakes while moving around, but that those mistakes should not cause catastrophic injuries, let alone fatalities. The CTSP looks at crash indicators and identifies three emphasis areas in which Missoula can make substantial improvements towards achieving Vision Zero: intersections, non-motorized users, and high-risk behaviors, such as impaired and distracted driving, unbelted occupants, and speeding. Nationally, one of the leading indicators of crash frequency and severity is vehicle travel speed, and speed has a role to play in all three CTSP emphasis areas. Higher volume streets typically have higher speeds and crash numbers. Though again, solutions on these streets require significant time, money, and cross jurisdictional coordination. By better managing traffic on residential streets, City of Missoula staff can concurrently address each of the three emphasis areas and do so in a more timely and cost effective manner.

Looking 30 years into the future, the LRTP estimates population growth and projected levels of funding and models various options for allocating resources to accomplish established transportation goals. One thing is clear in all contemplated scenarios: it is not possible to mitigate increased and increasing congestion by adding motor

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<sup>1</sup>*Missoula Community Transportation Safety Plan*. Missoula Metropolitan Planning Organization. June 2019. (2020). Retrieved from [https://www.ci.missoula.mt.us/DocumentCenter/View/49937/2019\\_CTSP\\_FINAL](https://www.ci.missoula.mt.us/DocumentCenter/View/49937/2019_CTSP_FINAL)

<sup>2</sup>*Activate Missoula 2045, Missoula Long Range Transportation Plan (LRTP)*. Missoula Metropolitan Planning Organization. 2017. (2020). Retrieved from <https://www.ci.missoula.mt.us/DocumentCenter/View/39171/2016-LRTP>



vehicle capacity. Even if there were enough funds available to apply this strategy, expanding the roadway network to such a degree would have negative effects on 1) access and mobility for people who cannot, should not, or prefer not to drive everywhere, 2) the already strained state and local maintenance budgets, and 3) the clean air and water Montanans are constitutionally guaranteed.<sup>3</sup> Accepting this reality, Missoula's leaders have committed to a multimodal strategy to maximize the efficiency of limited resources. If people who want to bike, walk, take transit, and use other modes than driving alone can do so safely, comfortably, and conveniently then there is more street and parking space available for those who must drive. This approach reduces construction costs and maintenance burdens overtime and can help mitigate the funding shortfall between identified needs and available resources. To guide this multimodal strategy, the LRTP includes project prioritization and policy recommendations and guidance. One of the strongest recommendations in the LRTP is to implement a network of Neighborhood Greenways:<sup>4</sup> low-stress, locally-owned neighborhood streets that are prioritized for biking and walking through a combination of signage, striping, traffic calming, and intersection enhancements.

In order for Neighborhood Greenways to attract people to bike and walk, they need to be safe, both in perception and reality. City staff fields frequent complaints about speeding, traffic crashes, and other requests for service related to transportation safety on local residential streets. Some of these concerns are more pressing than others, yet the City has not had a consistent and systematic approach to address them. In summer 2020, City Council asked staff to investigate travel speed and the possibility of reducing travel speeds on local streets as part of an update to the Public Works manual. Coincidentally, the National Association of City Transportation Officials released *City Limits: Setting Safe Speed Limits on Urban Streets* in July. Leaning heavily on *City Limits*, this white paper: assesses the dangers and underlying causes of speeding, reviews travel speed reduction methods, including emerging best practices around speed limit reduction, and outlines a novel Neighborhood Traffic Management Program as a way to mitigate speed-related safety issues on local-jurisdiction streets in Missoula.

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<sup>3</sup> "Montana Constitution," Article IX, Sec. 1 "Protection and Improvement." Ballotpedia. Retrieved from. [https://ballotpedia.org/Article\\_IX,\\_Montana\\_Constitution](https://ballotpedia.org/Article_IX,_Montana_Constitution)

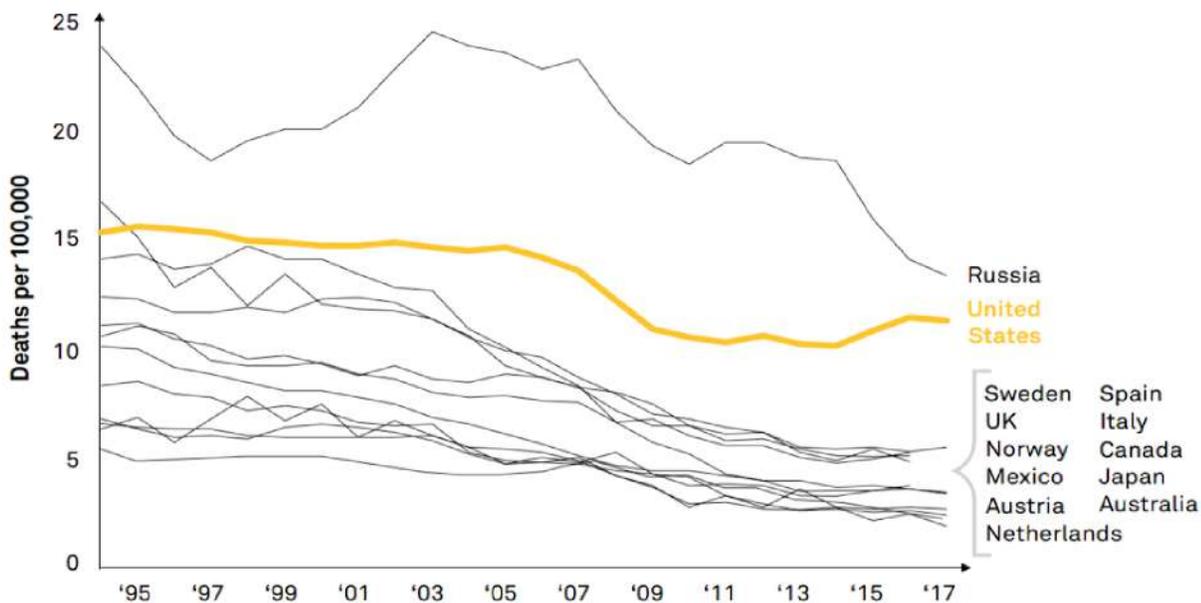
<sup>4</sup>*Bicycle Facilities Master Plan*. Missoula Metropolitan Planning Organization. 2017. (2020). Retrieved from <https://www.ci.missoula.mt.us/DocumentCenter/View/39172/2016-Bicycle-Facilities-Master-Plan?bidId=>

## II. THE SPEED PROBLEM

### A. An Alarming Trend

Nationally, more than 35,000 people die in traffic crashes each year, and millions more are seriously and often permanently injured. The United States has the highest fatality rate in the industrialized world; double the rate in Canada and quadruple that in Europe. For years, traffic crashes have been the leading cause of death for children and young adults.<sup>5</sup> An alarming traffic violence trend is taking place in the United States; after decades of decline, traffic fatalities are on the rise (Figure 1).

These numbers have been growing inequitably for the most vulnerable users of our streets. Between 2009 and 2018, pedestrian deaths from traffic crashes in the US grew by almost 50%, reaching a nearly three decade high (Figure 2). In 2018 alone, 6,283 pedestrians and 857 bicyclists died as a result of Motor Vehicle Crashes.<sup>6</sup>



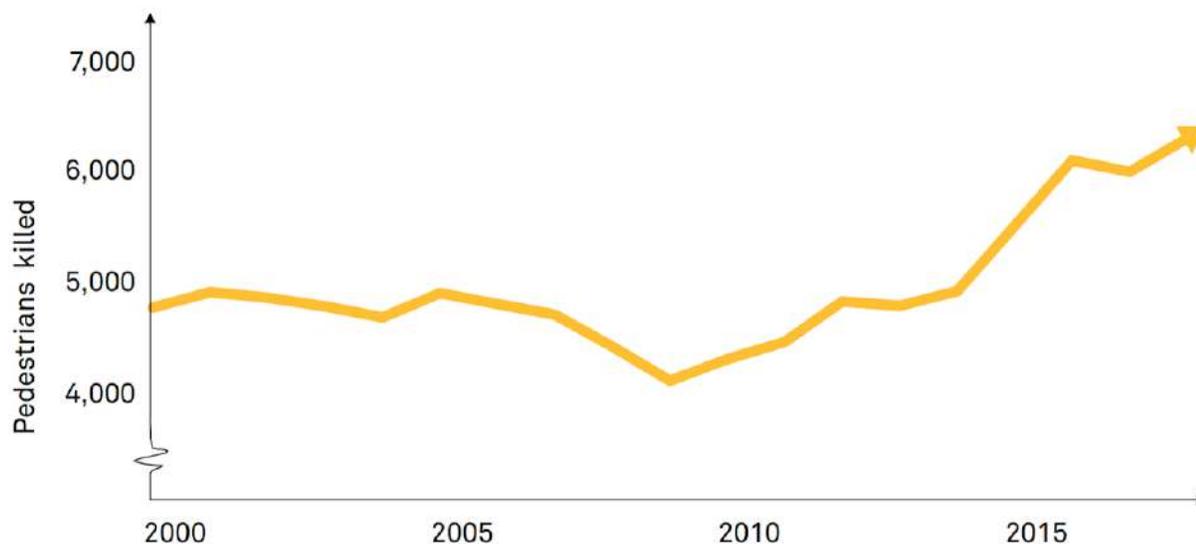
**Figure 1.** Traffic fatalities are declining in most other industrialized countries, but rising in the US.<sup>7</sup>

<sup>5</sup> Webb, C. N. *Motor vehicle traffic crashes as a leading cause of death in the United States, 2015* (Traffic Safety Facts Crash•Stats. Report No. DOT HS 812 499). Washington, DC: National Highway Traffic Safety Administration. (Feb. 2018) Retrieved from <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812499>

<sup>6</sup> *Fatality Analysis Reporting System (FARS)*. NHTSA. Year. (07 Jan. 2021). Retrieved from <https://www-fars.nhtsa.dot.gov/Main/index.aspx>

<sup>7</sup> City Limits. (2020, June/July). Retrieved from [https://nacto.org/wp-content/uploads/2020/07/NACTO\\_CityLimits\\_SinglePages.pdf](https://nacto.org/wp-content/uploads/2020/07/NACTO_CityLimits_SinglePages.pdf)

PEDESTRIAN FATALITIES HAVE BEEN STEADILY RISING SINCE 2009



**Figure 2.** Pedestrian fatalities in the United States.<sup>8</sup>

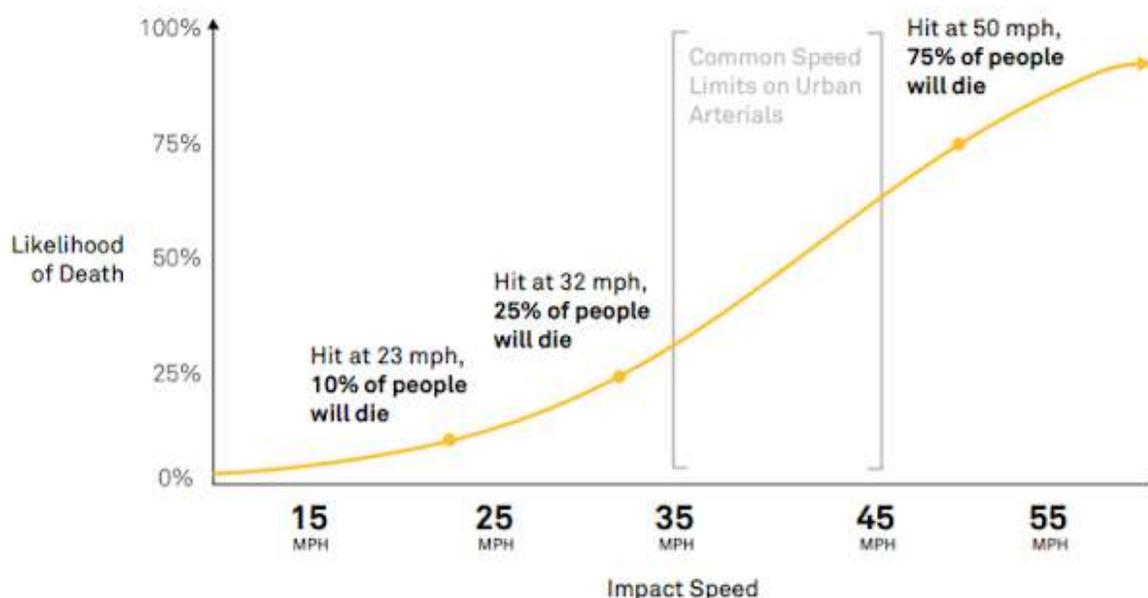
People walking and biking are an increasingly large percentage of all fatalities on the road. For the past five years, pedestrians and bicyclists have accounted for almost 20% of all road fatalities, despite making up only 11% of road users. These tragedies are the result of an approach to transportation policy and roadway design that prioritizes automobile speed and convenience over safety and comfort for all people.

## B. Increase in Fatality Risk

Research has long established that speeding increases the likelihood of collisions, that those collisions will cause injuries, and that those injuries will be serious.<sup>9</sup> For vehicle occupants, speeding compromises the efficiency of their car’s occupant protection equipment. For people outside of vehicles, there is an exponential relationship between vehicle speed and mortality risk (Figure 3).

<sup>8</sup> City Limits. (2020, June/July). Retrieved from [https://nacto.org/wp-content/uploads/2020/07/NACTO\\_CityLimits\\_SinglePages.pdf](https://nacto.org/wp-content/uploads/2020/07/NACTO_CityLimits_SinglePages.pdf)

<sup>9</sup> *Literature Review of Vehicle Travel Speeds and Pedestrian Injuries*, DOT HS 809 021. NHTSA. 1999. (23 Nov. 2020). Retrieved from <https://one.nhtsa.gov/people/injury/research/pub/hs809012.html>



**Figure 3.** The likelihood of fatality increases exponentially with vehicle speed.<sup>10</sup>

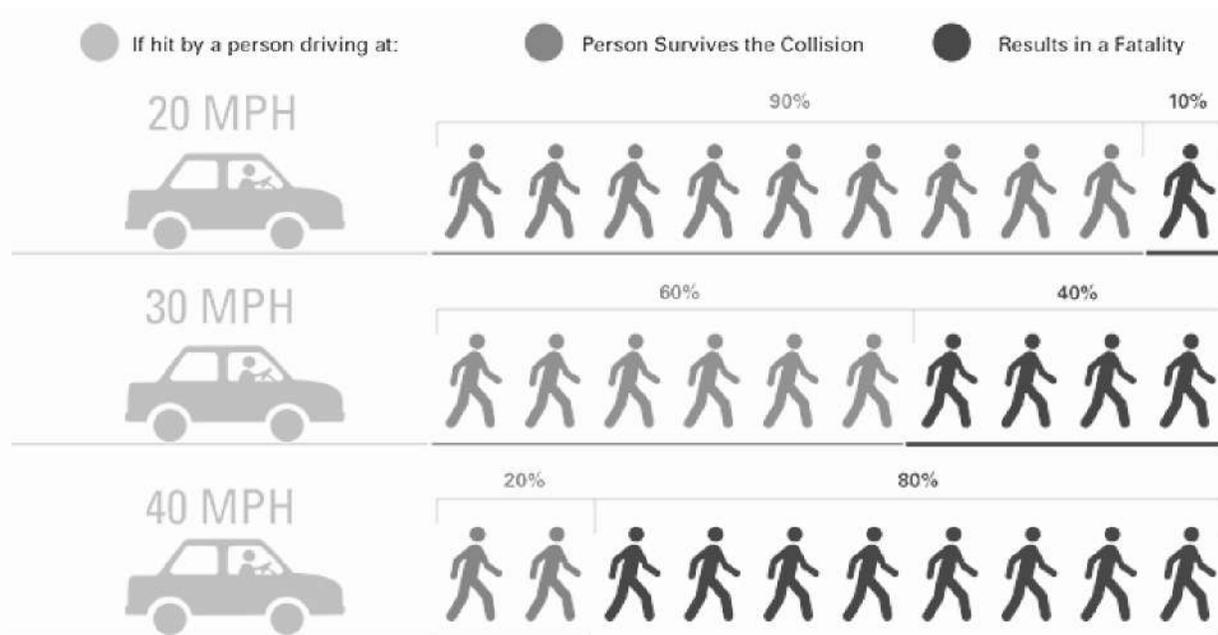
A person hit by a car traveling 30mph is up to twice as likely to die as someone hit by a car going 25mph and 5 times as likely to die as someone hit by a car going 20mph.<sup>11</sup> Put another way, the average adult faces a 5-7% mortality risk when struck by a vehicle traveling 20mph, a 15% mortality risk at 25mph, and a 30% mortality risk at 30mph.<sup>12</sup> Some studies have shown an even higher risk (Figure 4). A 2019 comprehensive and systematic literature review of over fifty pedestrian safety studies found that mortality risk rises by about 17% on average per mile per hour increase in vehicle travel speed.<sup>13</sup> These striking statistics are for the average, able-bodied adult and the severity risk only increases when crashes involve vulnerable, young, and/or elderly people.

<sup>10</sup> City Limits. (2020, June/July). Retrieved from [https://nacto.org/wp-content/uploads/2020/07/NACTO\\_CityLimits\\_SinglePages.pdf](https://nacto.org/wp-content/uploads/2020/07/NACTO_CityLimits_SinglePages.pdf)

<sup>11</sup> Rosen, E and Sander, U. *Pedestrian fatality risk as a function of car impact speed*, *Accident Analysis and Prevention*, Vol 41.3 Source. 2009. (23 Nov. 2020). Retrieved from <https://www.sciencedirect.com/science/article/abs/pii/S0001457509000323>

<sup>12</sup>Barry-Jester, A. *Why The Rules Of The Road Aren't Enough To Prevent People From Dying*. Source. 2015. (2020). Retrieved from <https://fivethirtyeight.com/features/why-the-rules-of-the-road-arent-enough-to-prevent-people-from-dying/>

<sup>13</sup>Hussain Q, Feng H, Grzebieta R, Brijs T, Olivier J. *The relationship between impact speed and the probability of pedestrian fatality during a vehicle-pedestrian crash: A systematic review and meta-analysis*. *Accident Analysis and Prevention* 2019 Aug;129:241-249. 2019. (2020). Retrieved from doi: 10.1016/j.aap.2019.05.033.



**Figure 4.** Vehicle Speed comparison to chance of Pedestrian Injury and Fatality.<sup>14</sup>

### C. Physics of Speeding

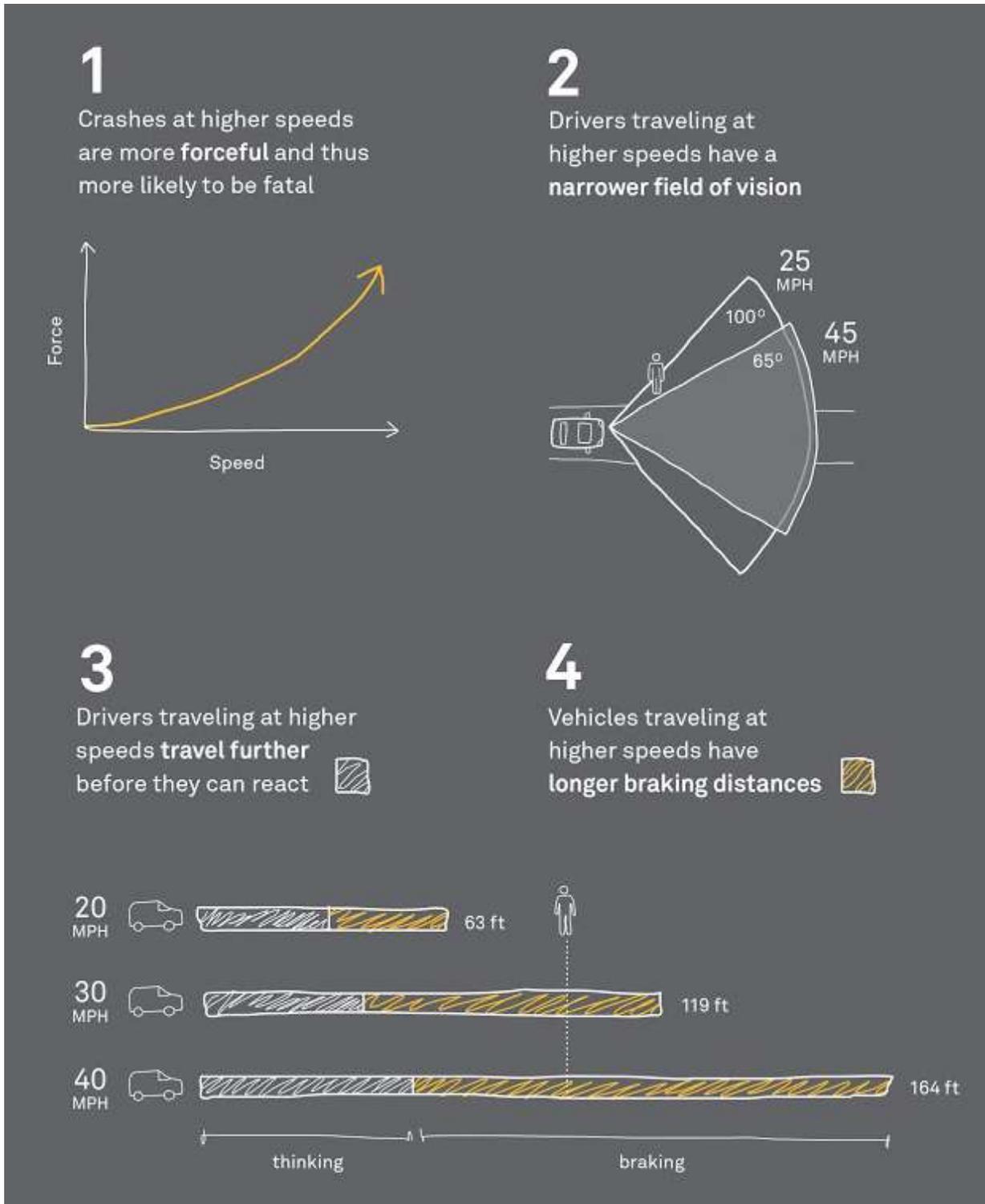
Drivers who speed are simultaneously increasing risk for others while decreasing their ability to control their vehicles.<sup>15</sup> Vehicle control, referring to a person’s ability to change or initiate vehicle movement, comprises driver response time and vehicle braking distances. Driver response time refers to the amount of time it takes a vehicle operator to perceive and respond to a hazard and is affected by factors such as experience, stress, and fatigue.<sup>16</sup> Though driver response time is unique for each driver, it is also true that speeding drivers have less time to identify and react to what is happening around them.<sup>17</sup> It is thus a given that the driver response time in a faster-moving vehicle will constitute a longer distance traveled as the driver responds to the circumstances. Once the driver *does* hit the brakes in response to a hazard, vehicle braking distance will be longer; this too is an exponential factor. For example, a car travelling 40mph takes almost three times as much distance to stop as a car travelling 20mph (Figure 5).

<sup>14</sup> US Department of Transportation, Literature Reviewed on Vehicle Travel Speeds and Pedestrian Injuries. March 2000. Retrieved from <https://www.ite.org/technical-resources/topics/speed-management-for-safety/speed-as-a-safety-problem/>

<sup>15</sup>National Center for Statistics and Analysis. *Speeding: 2017 data (Traffic Safety Facts. DOT HS 812 687)*. Washington, DC: National Highway Traffic Safety Administration. 2019. (2020). Retrieved from <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812687>

<sup>16</sup>Drożdźiel, P., Tarkowski, S., Rybicka, I., & Wrona, R. *Drivers’ reaction time research in the conditions in the real traffic*. Open Engineering, 10(1), 35-47. 2020. (23 Nov 2020). Retrieved from <https://doi.org/10.1515/eng-2020-0004>

<sup>17</sup>*A Guide to 20mph Limits*. Royal Society for the Prevention of Accidents. 2019. (2020). Retrieved from <https://www.rospa.com/media/documents/road-safety/a-guide-to-20mph-limits.pdf>

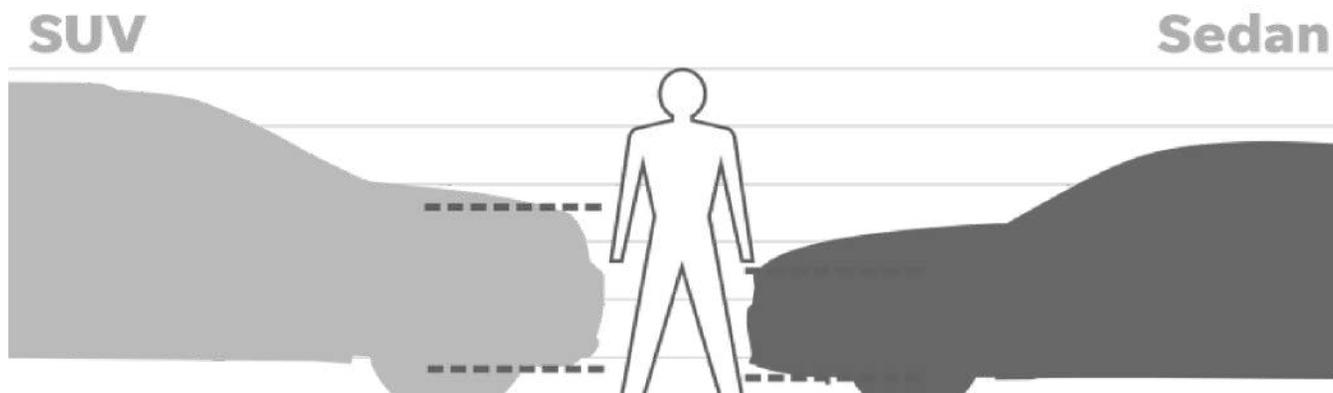


**Figure 5. How Speed Kills.**<sup>18</sup>

<sup>18</sup> City Limits. (2020, June/July). Retrieved from [https://nacto.org/wp-content/uploads/2020/07/NACTO\\_CityLimits\\_SinglePages.pdf](https://nacto.org/wp-content/uploads/2020/07/NACTO_CityLimits_SinglePages.pdf)

Additionally, a driver's field of vision narrows as the speed at which they are traveling increases; they can perceive less of their surroundings at higher speeds. In an urban environment, this means the faster a person is driving the less ability they have to see and respond to a person approaching a crosswalk, a dog running out of a yard, or a child emerging from a parked car. If a vehicle's speed is such that the driver does not have enough visual awareness or physical space between them and the hazard before reacting and braking, they do not have control of their vehicle.

Upon striking the pedestrian, the speed and size of the vehicle play a critical role in the amount of force received. Applying Newton's Second Law of Motion, there is a clear association between the *mass* of a vehicle and the *acceleration* (change in speed) on the force exerted onto a pedestrian. Another important compounding risk factor is the front-end-profile of the striking vehicle. Ironically, safety regulations for vehicle operators have led to an increase in vehicle size and thus a decrease in safety for people outside of the vehicle. Increased front-end-profiles are intended to provide increased protection to drivers in a crash. Conversely, those larger vehicles threaten pedestrians' safety by hitting them above the legs, which is more likely to send the struck pedestrian under the vehicle instead of up and over the hood, and lead to immediate life-threatening internal bleeding if the trauma breaks the pelvis or crushes vital, abdominal organs.



**Figure 6.** Size Does Matter. SUV front ends are taller, so they strike pedestrians higher on their bodies. That means they're more likely to kill a pedestrian than a car that would strike a person's leg.

Vehicle travel speeds and the risks they present are certainly contributing to the concerning rise of vehicle crashes and non-motorized fatalities. The next section shows how current traffic laws, roadway design, and prevailing attitudes around vehicular travel "prioritize speed and convenience over human lives"<sup>19</sup> and present an increasing risk to people driving, biking, and walking in urban areas.

<sup>19</sup>*Rethinking Safety, City Limits*. NACTO. 2020. (Sept. 2020). Retrieved from <https://nacto.org/publication/city-limits/the-need/rethinking-safety/>



### III. SPEEDING IN MISSOULA

The 2019 Community Transportation Safety Plan (CTSP)<sup>20</sup> provides an in-depth analysis of crashes in the Missoula area; all statistics and figures in this section come from the plan unless otherwise noted. Crashes in Missoula are following national trends in some regards, and diverging from them in others. Fortunately, Missoula’s “severe” crashes (fatal and serious injuries) are going down. Unfortunately, after a steady decline in total crashes during the early 21st century, numbers have recently been rising (Figure 7). There were 11,277 reported crashes in Missoula between 2013 and 2017, with 2016 and 2017 seeing the highest numbers of crashes since Missoula started keeping records. In 2017 dollars, these crashes cost the community an estimated \$2.7 billion in wage and productivity losses, medical expenses, administrative expenses, motor vehicle damage, insurance (and uninsured) costs, and lost quality of life.

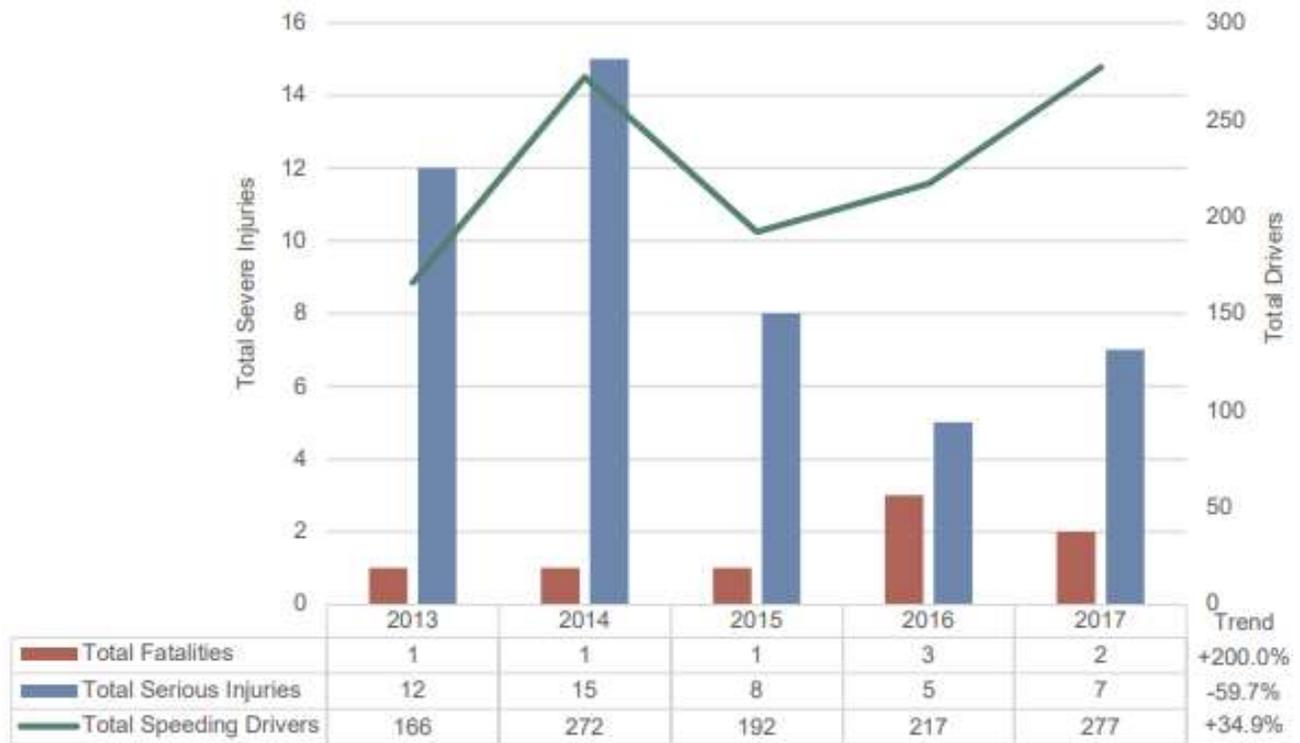
Speed-related crashes are one of the categories on the rise, increasing from 166 crashes in 2013 to 277 crashes in 2017 (Figure 8). Over the course of the 5-year study period, there were 1,105 speed related crashes involving 1,124 drivers (approximately 56% of all speeding driver crashes involved only one vehicle) and 2,181 people overall. These crashes resulted in 8 fatalities (5 of which were not the driver), 47 serious injuries, and 336 minor or possible injuries. Speed-related crashes accounted for 10% of all crashes, 11% of severe injury crashes, and 20% of fatalities; if one is in a speeding-related crash, the odds are higher that the crash will be incapacitating or fatal. Severe crashes primarily occurred on principal arterials (36%) and major collectors (19%). In general, as speed limits increase, crash numbers, and often crash rates, also increase. However, speeding on local streets, which typically have lower speed limits, leads to many crashes and high severity crashes too. The majority of speed-related crashes actually occurred on local streets (37%), followed by principal arterials (24%). The risk of collision is also higher for an individual vehicle that drives at a higher speed relative to the other traffic on the road. On local streets, this traffic is more likely to be non-motorized and therefore presents a larger gap in operating speeds from surrounding drivers.

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<sup>20</sup>Missoula Community Transportation Safety Plan. Missoula Metropolitan Planning Organization. 2019. (2020). Retrieved from [https://www.ci.missoula.mt.us/DocumentCenter/View/49937/2019\\_CTSP\\_FINAL](https://www.ci.missoula.mt.us/DocumentCenter/View/49937/2019_CTSP_FINAL)



**Figure 7.** Missoula Metropolitan Planning Area Crash and Injury Trends.



**Figure 8.** Speed related crashes and severe injuries caused.<sup>21</sup>

Speeding is listed as a crash indicator if the driver was exceeding the posted speed limit or driving too fast for conditions. As these conditions are analyzed by responding officers and not engineers, speeding is likely an underreported indicator of crashes. Indeed it is arguable that every crash is a result of someone not reacting in enough time to apply brakes or take evasive action and is, therefore, a result of driving too fast for conditions. In Missoula, those conditions are changing as the population grows, density increases, and more people are biking and walking without appropriate facilities.

In the crash data, the speed limit was reported as '0' in 22% of speeding driver incidents, indicating that the speed limit is unknown. These aside, 30% of crashes occurred on streets with a speed limit of 25mph and under, 45% at 30 – 60mph, and 25% at 65 – 80mph.

<sup>21</sup> Missoula Community Transportation Safety Plan. Missoula Metropolitan Planning Organization. June 2019. (2020). Retrieved from [https://www.ci.missoula.mt.us/DocumentCenter/View/49937/2019\\_CTSP\\_FINAL](https://www.ci.missoula.mt.us/DocumentCenter/View/49937/2019_CTSP_FINAL)

## IV. CONTRIBUTING FACTORS

Clearly, speeding is a risky behavior nationally and locally, with graver consequences for the most vulnerable road users. Most people want to follow reasonable laws and do not want to chance hurting others. So why then, do people speed? There are a variety of factors, both physical and psychological, that contribute to drivers’ tendency to speed. Some of these factors are found nationwide while others are regionally-specific — including existing conditions on some Missoula roadways that render typical vehicular travel speeds, even those that have historically been considered acceptable, inappropriately high. Statistics in this chapter are all excerpted from the Missoula Community Transportation Safety Plan (CTSP) unless otherwise noted.<sup>22</sup>

### A. Roadway Design

Roadway design plays perhaps the largest role in determining how fast people drive. Lane widths, presence or absence of on-street parking and/or bike lanes, frequency of driveways and other access points, tree canopy, proximity of buildings to the roadway, topography, sight distance, and other elements of the built environment all contribute to people’s perception of how fast it is safe to travel. These factors are elements engineers use to determine “design speed” when planning and constructing roadways. Design speed is also determined by looking at the functional class of the roadway, anticipated operating speed (the combination of driver expectation and speed limit), and surrounding land uses. Engineers then create conditions so that a driver can easily and safely drive the speed limit. Ironically, this means the design speed is set at least 5-10 mph higher than the speed limit, which in turn encourages most drivers to speed due to the absence of visual cues that they should slow down. The Average Running Speeds table from the AASHTO Green Book (Table 1) shows the relationship of design speed to average travel speed, demonstrating that design speed enables travel speeds higher than posted speed limits, or safe for a densifying urban area. Conversely, changes to the design of the roadway that create perceptions of risk, such as narrower vehicle lanes, on-street parking, street trees, etc., actually have the effect of lowering travel speeds and therefore enhancing the safety of the street.

Design Speed (mph)	Average Running Speed (mph)
15	15
20	20
25	24
30	28
35	32
40	36
45	40
50	44
55	48
60	52
65	55
70	58
75	61
80	64

**Table 1. Average Running Speeds.**

<sup>22</sup> Missoula Community Transportation Safety Plan. Missoula Metropolitan Planning Organization. June 2019. (2020). Retrieved from [https://www.ci.missoula.mt.us/DocumentCenter/View/49937/2019\\_CTSP\\_FINAL](https://www.ci.missoula.mt.us/DocumentCenter/View/49937/2019_CTSP_FINAL)

## B. Posted Speed Limits

Posted speed limits are closely connected with roadway design. When new speed limits are considered, they are typically set using a percentile-based method by observing how fast 85% of the population is currently driving and then setting a speed limit rounded to the nearest 5mph. The National Committee on Uniform Traffic Control Devices (NCUTCD) recently found that the top criteria used in setting speed limits were: speed of vehicles, statutory requirements, crash history, context (location), geometrics (curve), and facility classification type.<sup>23</sup> Another study asked engineers what the most relied-upon measures were to determine speed limits and the top responses were 85th percentile speed (88% of responses) and design speed (21% of responses).<sup>24</sup> Despite the overwhelming use of the 85th percentile method, the NCUTCD has observed “there is not strong evidence that, within a given traffic flow, the 85th percentile speed equates to the speed with the lowest crash involvement rate on all road types.” In addition, the same safety study included the warning that unintended consequences of the reliance on using the 85th percentile speed for changing speed limits in speed zones include higher operating speeds and thus new, higher 85th percentile speeds in the speed zones, as well as an increase in operating speeds outside the speed zones.<sup>25</sup> “This tail-wagging-the-dog approach forces engineers to set and adjust speed limits to match observed driver behavior instead of working to bring driver behavior in line with safety goals and the law.”<sup>26</sup> In Missoula, speed limits have been set mostly by historical precedent via deference to state law, which states that the speed limit on all roads in an urban district is 25mph unless otherwise adjusted through an engineering and traffic investigation. Speed limits are looked at more closely in the following chapter.

## C. Lack of Complete Bicycle and Pedestrian Networks

Missoula’s residential roads are a heterogeneous mix of bicycle, pedestrian, and driving conditions. In many neighborhoods, especially those that are more rural or are dominated by lower socio-economic conditions, sidewalks are degraded or missing. People walking are forced onto the street in many locations and this leads to an unpredictable environment for drivers. On many of the collectors and arterials bike lanes are inconsistent and often end just in advance of busy intersections where designated facilities are needed the most. City officials have designated some local streets as Neighborhood Greenways that prioritize biking and walking. These streets should have lower speeds and volumes than other streets, but there are few infrastructure treatments to

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<sup>23</sup>NCUTCD Proposal for Changes to the manual on Uniform Traffic Control Devices. NCUTCD. 2019. (2020). Retrieved from <https://ncutcd.org/wp-content/uploads/Sponsor%20Comments/2019B/Attach04.19B-MKG-02.LineWidthforCAV.pdf>

<sup>24</sup>Fitzpatrick, Kay & Mccourt, Randy & Das, Subasish. (2019). Current Attitudes among Transportation Professionals with Respect to the Setting of Posted Speed Limits. Transportation Research Record Journal of the Transportation Research Board. 10.1177/0361198119838504.

<sup>25</sup>Safety Study, Reducing Speeding-Related Crashes Involving Passenger Vehicles. National Transportation Safety Board. 2017. (2020). Retrieved from <https://la-bike.org/wp-content/uploads/2018/08/NTSB-report-SS1701.pdf>

<sup>26</sup>City Limits. (2020, June/July). Retrieved from [https://nacto.org/wp-content/uploads/2020/07/NACTO\\_CityLimits\\_SinglePages.pdf](https://nacto.org/wp-content/uploads/2020/07/NACTO_CityLimits_SinglePages.pdf)



accomplish this. The lack of complete networks for people biking and walking creates conditions in which drivers need to exercise more caution, most readily achieved by driving slower.

## D. Inclement Weather and Surface Conditions

Snow and ice on the road hinder a driver's ability to control their vehicle. Approximately 43% of speeding driver crashes occurred during inclement weather conditions (rain, severe wind, fog, or snow) and 81% occurred on inclement road conditions (wet, snow, ice, or frost).<sup>27</sup> Sunlight, additionally, can create visibility issues for drivers — shining directly into the windshield or, in Missoula's tree-canopied neighborhoods, causing flicker vertigo. Relatedly, in the shoulder seasons when many people are biking and walking to and from school, sunrise and sunset take place at peak commute times, with the resulting glare and shadows often making it difficult to see. Despite our long winters (with reduced daylight hours) and the common perception that most crashes happen at night, 56% of Missoula's reported crashes occurred in daylight conditions.

## E. New Development

In Missoula's edge-of-town communities, especially on newly developed land, roads are wider, trees are smaller, and visibility is expansive. Though sidewalks usually exist in these neighborhoods, the openness creates an environment in which drivers may feel more comfortable traveling at excess speeds. These conditions, furthermore, are a possible future faced by Missoula's older neighborhoods that anticipate impending death and removal of the — largely homogenous — Norwegian Maple tree canopy.

## F. Intersections

Intersection crashes make up nearly half (46%) of all crashes, and 33% of speed-related crashes take place at intersections. Intersection crashes may be influenced by a variety of driver behaviors such as disregarding traffic signals and signs, improperly judging gaps when executing turns, making hurried and unpredictable driving maneuvers around other drivers, and traveling at high speeds. The traffic control conditions of the intersections themselves thus play an important role. Missoula has many uncontrolled intersections, sometimes leading to driver confusion about who has the right-of-way or even the assumption that if their approach is uncontrolled then cross traffic must be stopped. For this reason, design manuals specify sight triangles, or the distance from an intersection from which a driver can safely see traffic approaching from the cross street with sufficient time to yield or stop. According to the AASHTO Green Book, a driver traveling 25 mph who is braking in response to a

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<sup>27</sup> *Missoula Community Transportation Safety Plan*. Missoula Metropolitan Planning Organization. 2019. (2020). Retrieved from [https://www.ci.missoula.mt.us/DocumentCenter/View/49937/2019\\_CTSP\\_FINAL](https://www.ci.missoula.mt.us/DocumentCenter/View/49937/2019_CTSP_FINAL)



hazard will travel 91.9 feet before applying the brake and another 60 feet before coming to a complete stop; 151.9 feet in total. While the Missoula Public Works Manual was recently updated to reflect AASHTO guidance on sight triangles, many currently uncontrolled intersections do not meet the sight triangles for 25mph speeds.

## G. Truck Routes

Many local residential streets see some amount of heavy truck traffic. Though Missoula has an established truck route system which overlaps with major collectors and arterials, industrial and other land uses within and adjacent to neighborhoods require large truck access. Twenty-six percent (26%) of all large truck crashes and 14% of severe injury crashes involving large trucks occur on local streets.<sup>28</sup> This increases the risks to non-motorists on these streets.

## H. Age of Drivers

In Montana, teenagers can begin driving as early as 14.5 years old in conjunction with a driver's education course and, without driver's education, at 16 years old. Unsurprisingly, speeding drivers tend to be younger. The CTSP found that 45% of speed related crashes involved drivers under 25 years of age.

## I. Social Disregard for Speed

Perceptions around speed and speed limits also contribute to speeds that are higher than are appropriate in urban environments. Speeding has few social stigmas associated with it and most people assume that speed limits are set for optimal safety and efficiency.<sup>29</sup> Posted speed limits are therefore considered by many to be the speed they should be driving on a certain street, as opposed to the maximum threshold for safety. Furthermore, speeding is typically only enforced when drivers are in egregious violation of posted speed limits *and* there happens to be an officer who witnesses it. People regularly drive faster than set speed limits knowing their behavior will likely go unpunished and thinking it will save time. However, the time savings for typical trips within urban areas are measured in seconds, not minutes, and are often offset by waiting at the next red light while putting people inside and outside vehicles at risk.<sup>30</sup> The high-risk and low-reward nature of speeding is often disregarded.

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<sup>28</sup>Missoula Community Transportation Safety Plan. Missoula Metropolitan Planning Organization. 2019. (2020). Retrieved from [https://www.ci.missoula.mt.us/DocumentCenter/View/49937/2019\\_CTSP\\_FINAL](https://www.ci.missoula.mt.us/DocumentCenter/View/49937/2019_CTSP_FINAL)

<sup>29</sup>Barry-Jester, A. *Why The Rules Of The Road Aren't Enough To Prevent People From Dying*. Source. 2015. (2020). Retrieved from <https://fivethirtyeight.com/features/why-the-rules-of-the-road-arent-enough-to-prevent-people-from-dying/>

<sup>30</sup>Ravenscraft, E. *Does speeding really get you there any faster?*. Lifehacker. 2014. (2020). Retrieved from <https://lifehacker.com/does-speeding-really-get-you-there-any-faster-1556767685#:~:text=As%20you%20can%20see%2C%20unless,that%27s%20already%20an%20hour%20long>

## V. RESPONSE OF LOCAL GOVERNMENT

Given the high personal, financial, community costs associated with traffic crashes, the City of Missoula has a social, economic, and moral imperative to identify ways to reduce the overall number of crashes and their severity. Missoula has embedded this imperative into planning and policy documents through establishment of Vision Zero goals in the CTSP and safety and mode-split goals in the LRTP. If people do not feel safe walking or biking on their neighborhood streets, they are more likely to choose to drive, which in turn can lead to a downward spiral of more crashes, decreased safety, less biking and walking. This is particularly true in Missoula's Invest Health neighborhoods where health and economic disparities combine with missing sidewalks and other infrastructure limitations. Creating a safe, comfortable environment for all modes of transportation is a critical aspect of these ambitious goals. Reducing vehicle travel speeds is one of the most effective and holistic ways Missoula can reach these goals. There are four main ways local governments can reduce travel speeds: lowering posted speed limits, altering roadway design, increasing enforcement, and providing education and encouragement.

### A. Lowering Posted Speed Limits

In 2020, Missoula City Council requested the Transportation Planning Division look into the application of a speed limit reduction on local streets. This strategy is one of the simplest ways to mitigate the risks of driving in urban settings and has been gaining popularity both nationally and internationally.

The National Cooperative Highway Research Program (NCHRP) has recently finished a speed study and is set to release a new guiding document with more context on setting speed limits including a table for "Suggested Target Speed[s] for Context/Roadway." Within this table, the types of streets this paper is focused on (i.e. Rural Town, Suburban, Urban, and Urban Core Local streets) are all classified as requiring low target speeds. While previously 30 mph has been considered low, current research suggests it is 10 mph too high for urban contexts.<sup>31</sup>

*City Limits*, the recently published comprehensive guide to understanding speeding risk and lowering speed limits in urban areas, looks at sample cases from across North America and provides guidance for local governments wishing to reduce speed limits. The best practice is to set a new statutory maximum speed limit on local streets. Several communities have adopted this "unless otherwise posted" approach and reduced speed limits on local residential streets, often down to 20mph (see inset).

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<sup>31</sup>NCHRP 17-76 *Guidance for the Setting of Speed Limits*. The National Academies of Sciences, Engineering, and Medicine. 2018. (2020). Retrieved from <https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=4052>

### **Albuquerque, NM**

The city implemented a 'bicycle boulevard' along Silver Avenue with 18 mph speed limits. The goal of using a non-standard number for such a slow speed limit is to catch the attention of drivers used to seeing 0s and 5s.<sup>32</sup>

### **Asheville, NC**

The City of Asheville lowered speed limits on forty-three local, residential streets. The streets were selected based on adjacent land use (single-family residential) and local functional classification. Only a handful of the streets received official traffic engineering studies, using the USLIMITS program.

### **Boston, MA**

*Massachusetts (MGL c. 90 § 17C)* allows "thickly settled" cities and towns to adopt a 25 mph default speed limit by ordinance for all streets unless otherwise posted. Cities and towns can also set 20 mph safety zones, which they can use their criteria to create. Boston reduced default speeds from 30mph to 25mph in 2017, and is currently seeking state approval to reduce further to 20mph.

### **Boulder, CO**

Boulder City Council voted to lower speed limits on local, residential streets from 25mph to 20mph in May 2020.

### **Bozeman, MT**

The city of Bozeman, following state law, implemented 15 mph zones by schools and parks. The goal was to minimize differential speeds; they noticed the effectiveness of police enforcement in influencing public perception towards not wanting to face legal repercussions for speeding.

### **New York, NY**

*New York State Assembly Bill 10144/Senate Bill 7892* amended section 1642 of the Vehicle and Traffic Law to allow New York City to set a speed limit of 25 miles per hour, down from 30 mph, on streets that are not part of the State highway system. This was followed by NYC Local Law 54 of 2014, which enacted a citywide speed limit of 25 mph unless otherwise posted.

### **Portland, OR**

*Oregon (Senate Bill 558)* allows all cities in the state to establish a 20 mph speed limit on all non-arterial streets in residence districts under city jurisdiction. Rule 734-020-0015 allows the use of 50th percentile studies instead of 85th percentile studies on non-residential streets.<sup>33</sup> These 20 mph, non-arterial streets are a part of Portland's *Neighborhood Greenway* network (i.e. residential streets designed to prioritize bicycling and enhance conditions for walking). The traffic volume estimates for these greenways are 1,000-2,000 cars/day and over 50-100 crossings/hr. The city also implemented traffic control designs (e.g. speed humps and traffic diverters) to disincentivize automobiles from cutting through the local streets.

### **Seattle, WA**

*WAC 468-95-045* is a modification to the State MUTCD that provides local jurisdictions with considerations about what requirements they need to meet to revise the posted speed limit.

*RCW 46.61.415* allows local agencies to establish/alter maximum limits on local streets.

### **United Kingdom**

After implementing *20's Plenty*, the city of London noticed a statistically significant improvement in biking and walking on streets with 20 mph limits.<sup>34</sup>

### **Netherlands**

Woonerfs, or roads with extreme constraints on automobile traffic, are seen across the country and present excellent examples of the potential for pedestrian-prioritized streets.

<sup>32</sup>ABQJournal News Staff. *TRAFFIC: The Need for "Non-Standard" Speed*. Albuquerque Journal. 2009. (2020). Retrieved from <https://www.abqjournal.com/17087/traffic-the-need-for-non-standard-speed.html>

<sup>33</sup>*City Limits*. NACTO. 2020. (Sept. 2020). Retrieved from <https://nacto.org/publication/city-limits/>

<sup>34</sup>*A Guide to 20mph Limits*. Royal Society for the Prevention of Accidents. 2019. (2020). Retrieved from <https://www.rospa.com/media/documents/road-safety/a-guide-to-20mph-limits.pdf>



When this strategy was explored by City officials, it was determined to be infeasible in the short-term. In Montana, speed limits are set by state law, which states that the speed limit on all roads in an urban district is 25mph unless otherwise adjusted through an engineering and traffic investigation.<sup>35</sup> It may be possible to extend the boundaries of an engineering and traffic investigation, looking at the types of conditions that exist on several local streets at once, and setting a zone-based lowered speed limit. However, this approach has its limitations.

First, though there is some evidence that speed limit reductions have led to some decreases in travel speeds even without any additional support (such as added enforcement or roadway design changes), the impacts of reducing speed limits on their own will be limited. Police cannot be everywhere, and many people will continue to drive as fast as they feel comfortable. Second, even if it was determined Missoula could lower speed limits in a blanket fashion, state law would still require speed limit signs to be posted frequently. This requirement would bring upfront and ongoing maintenance costs for Public Works, along with potentially undesirable sign clutter. Finally, a city-wide engineering and traffic investigation would take time and resources that are not currently available.

## B. Roadway Design

As described above, roadway design is the predominant determinant of travel speeds. The most effective way to reduce operating speed is to design the roadway originally for the desired speed. The City of Missoula is applying this concept in much new construction. The Sx<sup>w</sup>tpqyen Area Master Plan and its attendant Form Based Code provide great examples of how Missoula is reconsidering its approach to roadway design to encourage safer speeds and more multimodalism in the future. However, existing roadways are wide enough to allow, and even encourage, travel speeds that are higher than is safe. Retrofitting streets with design elements, such as curb extensions (bulbouts), traffic calming circles, chicanes, raised crosswalks, and other features that narrow roadway travel width, can help mitigate speeding. Altering roadway design typically requires significant planning, engineering, and construction costs, as well as coordination with multiple agencies, such as Police and Fire, to ensure appropriate access for Emergency response and other large vehicles.

Missoula has had a Traffic Calming program for over 20 years that was created to mitigate speed and other transportation safety concerns. This program has successfully installed approximately 45 traffic circles, curb

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<sup>35</sup> Montana Code Annotated. Chapters 60-1-201, 61-8-102, 61-8-303, and 61-8-310.  
[https://leg.mt.gov/bills/mca/title\\_0600/chapter\\_0010/part\\_0020/section\\_0010/0600-0010-0020-0010.html](https://leg.mt.gov/bills/mca/title_0600/chapter_0010/part_0020/section_0010/0600-0010-0020-0010.html)  
[https://leg.mt.gov/bills/mca/title\\_0610/chapter\\_0080/part\\_0010/section\\_0020/0610-0080-0010-0020.html](https://leg.mt.gov/bills/mca/title_0610/chapter_0080/part_0010/section_0020/0610-0080-0010-0020.html)  
[https://leg.mt.gov/bills/mca/title\\_0610/chapter\\_0080/part\\_0030/section\\_0030/0610-0080-0030-0030.html](https://leg.mt.gov/bills/mca/title_0610/chapter_0080/part_0030/section_0030/0610-0080-0030-0030.html)  
[https://leg.mt.gov/bills/mca/title\\_0610/chapter\\_0080/part\\_0030/section\\_0100/0610-0080-0030-0100.html](https://leg.mt.gov/bills/mca/title_0610/chapter_0080/part_0030/section_0100/0610-0080-0030-0100.html)

extensions in school zones, and a handful of other projects. However, this program required voluntary creation of Special Improvement Districts (SIDs), and as a result, the majority of installations have taken place in the more affluent neighborhoods, where people have the time and resources to follow through with SIDs. Of the nearly 20 applications that have been distributed in the last decade, only two were returned to the City and saw safety improvements installed. These too were in higher income neighborhoods. Without the ability to adequately ensure equity in distribution of City resources to address traffic safety in all neighborhoods, the Traffic Calming program, as currently structured, has not been meeting the program's intent. Unfortunately, it is not financially feasible for the City to consider major infrastructure projects on every local street.

### C. Increased Enforcement

When presented with the challenge of addressing the risks associated with high vehicle speeds, many people are quick to suggest increasing traffic enforcement. Speeding tickets certainly have the potential to create long-term behavior change for the recipients. Drivers who pass someone pulled over will slow down in the moment and may think twice about speeding on that street in the future, or what is known as deterrence. There is some evidence that targeted and increased enforcement of dangerous driving behavior, especially speeding, can reduce crashes.<sup>36</sup> Upon closer inspection though, this approach has many limitations in Missoula.

First, manual police enforcement is less effective over time than making changes to roadway design. Second, increased enforcement can exacerbate equity issues in the criminal justice system.<sup>37</sup> Third, the Missoula Police Department's limited resources do not support a meaningful increase in traffic enforcement. Traffic enforcement is currently operating with 2.5 FTE for the entire city. Even with a doubling or tripling of this staff level, Missoula would not be able to replicate efforts in the above mentioned study nor provide enough coverage to have a measurable impact on travel speeds. Fourth and finally, automated speed enforcement has been shown to reduce the percentage of speeding vehicles by 14-65% and serious injury and fatal crashes by 11-44%.<sup>38</sup> However, this national best practice is not allowed in Missoula per state law.<sup>39</sup> Though enforcement does play a critical role in transportation safety, without the resources or legal authority to follow best practices, it is clear that increased law enforcement will not significantly address speeding.

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<sup>36</sup> Sgt. James Williams, Metro Nashville Police Department, "Effect of High-Visibility Enforcement on Motor Vehicle Crashes," June 22, 2020, [nij.ojp.gov](https://nij.ojp.gov):

<https://nij.ojp.gov/topics/articles/effect-high-visibility-enforcement-motor-vehicle-crashes>

<sup>37</sup> *City Limits*. NACTO. 2020. (Sept. 2020). Retrieved from <https://nacto.org/publication/city-limits/>

<sup>38</sup> National Highway Traffic Safety Administration (2016). System Analysis of Automated Speed Enforcement Implementation. Retrieved from: [https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/812257\\_systemanalysisase.pdf](https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/812257_systemanalysisase.pdf)

<sup>39</sup> Montana Code Annotated 46-5-117

[https://leg.mt.gov/bills/mca/title\\_0460/chapter\\_0050/part\\_0010/section\\_0170/0460-0050-0010-0170.html](https://leg.mt.gov/bills/mca/title_0460/chapter_0050/part_0010/section_0170/0460-0050-0010-0170.html)

## D. Public Education and Encouragement

The National Highway Traffic Safety Administration (NHTSA) identifies education and communication as a central plank in their Speed Management Program Plan, stating “education is particularly important for developing a broad understanding of the nature and scope of speed as a traffic safety and transportation efficiency issue.”<sup>40</sup> Many cities employ public education and encouragement campaigns to help reduce travel speeds. One popular slogan, “20 Is Plenty” has been adopted in over 500 communities worldwide. In some places it is an officially adopted policy to create a systematic reduction in travel speeds in areas of regular commingling of motor vehicle, bicycle, and pedestrian traffic. In other places it is a rallying cry among citizens and neighbors who post impromptu yard signs encouraging slower speeds. A coordinated top-down and bottom-up approach to transportation safety education can help create a culture of safety and have positive impacts of speed and crash reduction. Public service announcements, neighborhood petitions, speed pledges, and other educational efforts can be combined to maximize effectiveness. However, these campaigns are only successful when initiated alongside engineering and enforcement strategies.

## E. A Comprehensive Approach

All of the above strategies have their limitations, especially when considered in context of the current legal environment, jurisdictional constraints, and financial situation. In order to create safer speeds on city streets, Missoula should take a comprehensive approach and create a traffic management program that incorporates elements of each “E” of transportation safety: Engineering, Education, Encouragement, Enforcement, Evaluation, and Equity. After reviewing the current research and best practices guidelines, previous and existing traffic management tools available in Missoula, and consulting with multiple agencies and elected officials, staff is recommending the establishment of a Neighborhood Traffic Management Program. This new program should replace the existing Traffic Calming program and be data driven, responsive, flexible, fiscally responsible, and transparent. If implemented well, the Neighborhood Traffic Management Program will have a measurable and sustained impact on transportation safety.

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<sup>40</sup> National Highway Transportation Safety Administration (2014). Speed Management Program Plan. Retrieved from: <https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/812028-speedmgtprogram.pdf>



## VI. NEIGHBORHOOD TRAFFIC MANAGEMENT PROGRAM

This paper began from a City Council request to research the benefits and risks of lowering speed limits on residential streets city-wide. Staff expected to conduct a literature review, survey recent similar efforts in other communities, analyze available local safety data, and recommend a data-driven, best practice approach to reducing speed limits in Missoula. However, it became apparent that Montana state law does not support the best practices for speed limit reduction, and as such, the City administration and senior staff requested an alternative recommendation to address the safety issues this research uncovered. The result of this pivot is a recommendation to develop a more comprehensive traffic management program that, while more complex than lowering posted speed limits, has significantly more potential to improve safety in Missoula. The proposed Neighborhood Traffic Management Program (NTMP) is a comprehensive and coordinated effort to address speed and other transportation safety concerns on urban streets within its jurisdiction, thereby 1) reducing the frequency and severity of crashes, 2) slowing neighborhood traffic, 3) reducing the use of residential streets for cut through vehicle traffic, 4) providing clear process to address citizen concerns, and 5) encouraging biking and walking. City Council indicated support for this new program at a progress report presentation in December 2020.

Operating from the City of Missoula's commitment to a safe and equitable transportation network, a work team made up of representatives from Infrastructure & Mobility Planning, Engineering, and Streets Divisions, as well as emergency services, the City Attorney's office, and the Office of Neighborhoods, has been reviewing the data presented in this report and developing the NTMP. This program will revamp and replace the outdated Traffic Calming Program to be more holistic, inclusive, data-driven, and transparent by utilizing the 6 E's of transportation safety — Engineering, Education, Encouragement, Enforcement, Evaluation, and Equity — to manage traffic on residential streets. Public Works and Mobility (PWM) staff will manage this program, creating a centralized location for all citizen traffic complaints and requests for service, while coordinating with other departments. An example of the increased and improved coordination the NTMP provides is the sharing of speeding complaints between PWM staff and the Police Department to better utilize limited City resources. Multiple departments, such as PWM, PD, and the Office of Neighborhoods, will also be able to refer to the NTMP when communicating with the public. By improving the communication around the issues of traffic safety and coordinating the City's response to these concerns, the NTMP will better serve the community within existing funding and staffing levels.

## A. Data-Driven Approach

New tools, such as USLIMITS2 from the Federal Highway Administration (FHWA), provide current best practice technical guidance for selecting appropriate measures to improve safety.<sup>41</sup> However, these tools are only as effective as the data entered into them. Recent improvements in the quality of and access to crash data allow City staff to better address problem areas. The NTMP also will coordinate additional data collection needs, such as traffic speeds, traffic volumes, street widths, sight triangles, and other local conditions with Traffic Services staff.

The NTMP also draws upon current best practices for deployment of traffic management tools, and has developed a toolkit of engineering and non-engineering interventions that may be recommended when data identifies correctable problems. Posted speed limits and speed limit reductions will play a role in the management of neighborhood traffic. The current recommendation is to continue to review speed limits on an adhoc basis through the NTMP while also continuing to examine opportunities for a broader investigation of speed limits on local residential streets. Finally, staff will collect data after any implementation to determine if the traffic management strategies employed had a measurable impact on safety, recommend alterations to previous installations, and inform decision-making about future projects.

## B. Street Types and Operational Goals

Not all residential streets have the same characteristics or have the same function within the transportation network. The NTMP work team has identified different operational goals for certain types of streets, and therefore different contextual thresholds for managing traffic on them. Neighborhood Greenways, such as 4th St, Grant St, Schilling St, and Gerald St are prioritized for people of all ages and abilities to be able to bike and walk safely, comfortably, and conveniently.<sup>42</sup> As such they have lower target traffic speeds and volumes and are potentially more likely to see traffic calming features installed to achieve those targets. Other streets that have been designated as Residential Collectors, such as Beckwith St, Paxson St, and Johnson St for example, function as through streets for all users, including larger truck traffic and emergency vehicles, and therefore may have fewer traffic calming options available to them. Table 2 shows the three street types that the NTMP will address.

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<sup>41</sup> US DOT. Federal Highway Administration. <https://safety.fhwa.dot.gov/uslimits/>

<sup>42</sup> Missoula In Motion <https://www.missoulainmotion.com/greenways>

Street Type	Goal	Target Speed	Target Volume	Design Vehicle	Stop Signs	Other Considerations
<b>Neighborhood Greenway</b>	Prioritized for people of all ages & abilities to bike and walk safely, comfortably, & conveniently	15mph	<1,000 vpd, up to 1,500 vpd acceptable if speeds are low	Su30-40	As few as possible	Intersections should include wayfinding elements if possible
<b>Local Street</b>	Safe & comfortable for all users	20mph	<1,000 vpd, up to 2,000 acceptable if speeds are low	School bus	Acceptable	Coordinate with Mtn Line & Beach to ensure transit-friendly interventions
<b>Residential Collector</b>	Vehicular through street, still comfortable for residents & most non motorized users	25mph	1,000 - 6,000 vpd	WB50	Only at intersections with higher speeds & volumes	Sidewalks & bike lanes strongly recommended

**Table 2.** Street Types and Operational Goals

Projects to calm traffic on higher volume roads and those with higher functional classifications typically require more planning, engineering, funding, and public engagement than that NTMP can provide and will therefore likely be referred to the Community Investment Program (CIP) project list.

### C. Proactive Implementation

The NTMP work team will focus on implementing the program along Neighborhood Greenways, beginning with any corridors/intersections that have high crash rates, moving on to priority routes that serve as important crosstown connections, and then completing the rest of the greenways. The proactive process will include evaluation of conditions on each street adjacent to the greenways, in order to ensure installation of appropriate treatments and to minimize the risk of unintended consequences, such as shifting problems to the next block over. The work team will utilize the Proactive NTMP workflow (Appendix A) when analyzing data and will create proposed traffic management plans for each corridor as needed. These plans will be shared with adjacent property owners through mailed letters, which will include invitations to the next Neighborhood Meeting where team members will present more thorough information.

Proactive implementation will begin with the collection of baseline data for a handful of routes that have been prioritized for their capability to improve multimodal connectivity, safety, and access, and with an eye to geographic diversity and equity. Routes with known correctable crash histories receive higher priority than others. Missoula’s Neighborhood Greenway network is detailed in the Bicycle Facilities Master Plan<sup>43</sup> and includes the following corridors (staff plans to improve bolded streets first with the NTMP):

<sup>43</sup> *Bicycle Facilities Master Plan*. Missoula Metropolitan Planning Organization. 2017. (2020). Retrieved from <https://www.ci.missoula.mt.us/DocumentCenter/View/39172/2016-Bicycle-Facilities-Master-Plan?bidId=>



**S 4th St**

S 12 St W

**Burton St**

Cottonwood/Florence

**Gerald St**

Grand St

**Grant/Kensington**

Holmes

**Ivy/Franklin/Park**

Jackson/Holly

**Kent/Central**

Maurice

Missoula Ave/Wylie

Mountain View

**Myrtle/Woodford**

**Owen St**

**Pattee Creek/Ernest/Grant/Charlotte**

Plymouth

Rollins

**Schilling**

**Sherwood/Dickens/Alder/Pine**

University Ave

Waverly

**Orange to Schilling**

Eaton to Bitterroot Trail

**Broadway to Stoddard**

River St to Plymouth

**4th St to South Ave**

N 1st to N 5th

**3rd St to Bitterroot Trail**

Charlo to Phillips

**3rd St to Pattee Creek**

Vine to Van Buren

**Maurice to Reserve**

South Ave to Beckwith

Van Buren to Tom Green Park

Duncan to Rattlesnake

**3rd St to Brooks**

**Front to Railroad**

**Higgins to Brooks**

Mount to Higgins

Florence to Mount

**South Ave to 3rd St**

**Russell to RUX Trail**

Higgins to Arthur

Turner to Defoe

## D. Citizen-Directed

Missoulians have been consistently vocal, through public surveys, open houses, and online forums associated with transportation plan updates about their desire to make streets a safer place for all people. A review of public comments collected during the 2016 Long Range Transportation Plan included: several mentions of speed as a primary safety concern on our roadways, calls for safer, wider, more comfortable bicycle and pedestrian infrastructure, and mitigations for increasing traffic volumes.

Outside of these official public coordination planning processes, residents of Missoula regularly complain about and campaign for traffic safety. There has not, unfortunately, been a clear direction on how this reporting should be done and as such complaints are currently received by: Missoula Police, Traffic Services, Public Works, Engineering and Planning staff, and Missoula In Motion. As a result, existing response strategies have not been coordinated, comprehensive, or communicated effectively — both interdepartmentally and to the public. Additionally, previous requests for traffic calming have required extensive work on behalf of the citizens to



document the traffic safety issue and fundraise with their neighbors, an onerous process that has often led to inequitable distribution of traffic calming around the city.

In response to these growing issues, the NTMP will evaluate traffic complaints and calming requests from citizens in conjunction with pursuing proactive implementation of neighborhood traffic management. The City will attempt to funnel complaints/requests through one place with a public awareness campaign about the NTMP. However, the public will very likely continue to call the PD, Traffic Services, and Transportation offices with complaints/requests and it can sometimes be difficult to maintain the order in which they were received when different departments receive them. Also, there may be times that requests coincide with locations that are already under consideration, or in the queue for consideration, through proactive implementation, in which case they will likely be evaluated per the proactive schedule. The work team will utilize the Reactive NTMP workflow (Appendix B) when evaluating citizen complaints/requests. These projects will be scored and ranked using vehicle speeds, volumes, crash histories, connectivity, sidewalk presence/condition, pedestrian attractors, and equity.

## E. The Toolkit

The NTMP utilizes both a top-down and bottom-up approach to improving traffic safety. Following FHWA and other national guidance, the work team has developed a suite of engineered traffic calming interventions, as well as other non-infrastructure solutions to help manage neighborhood traffic in both proactive and reactive contexts.

### 1. City-Prompted Traffic Management Interventions

The process for identifying appropriate traffic management measures is a matter of systems thinking and analysis. First, staff will identify the primary concern that needs to be addressed such as visibility, cut-through traffic, volume control, speed control, bicycle connectivity, pedestrian accessibility, and intersection crash risk. City transportation officials then consider the efficacy of each intervention in solving the primary concern and consider pertinent transportation-related tradeoffs, including: safety for all modes, effectiveness over time, bicycle accessibility, sidewalk presence, condition, and universal accessibility, truck and large vehicle movement, emergency vehicle accessibility, aesthetic appeal, install time, maintenance, and impact to surrounding infrastructure. An important part of this process lies in recognizing the potential for unintended consequences such as diminished effectiveness of over-using an intervention or applying one that simply pushes traffic over to the adjacent roads. In order to minimize unintended consequences, staff will examine the surrounding infrastructure and traffic control as part of any traffic management assessment.



The NTMP will utilize a “lighter, quicker, cheaper” approach to traffic calming, meaning that proposed traffic calming interventions will be simpler, smaller scale, and lower cost than typical construction projects.<sup>44</sup> In Missoula we are referring to this process as “quick build.” For example, traffic circles installed by the NTMP will be constructed out of signs, pavement markings, plastic bollards, and other quick-to-deploy materials and will not include concrete and planted center islands, full curb reconstruction and drainage correction. This quick build approach will help staff use the NTMP to: 1) more quickly implement Neighborhood Greenways and address citizen concerns, 2) evaluate efficacy of interventions and adjust as necessary, 3) inform future planning and engineering projects, and 4) encourage community buy-in and neighborhood engagement.

Additional non-engineering resources available to the NTMP include speed trailers, which both collect data and deter speeding, and targeted enforcement. These will be employed by the NTMP as a method of first-response to speeding complaints, and may provide enough visibility to temporarily mitigate the issue.

Appendix C includes detailed information on each of these City-promoted interventions which will be listed on the Engage Missoula webpage for public access. Eventually, these will reside within the Public Works Manual. Some of the traffic management tools in the City’s toolkit require more resources than are currently programmed within the NTMP and will require CIP or other funding sources to construct. The current list of traffic management tools employed by the City of Missoula includes:

- |                                 |                                    |
|---------------------------------|------------------------------------|
| Stop & Yield Signs              | Chokers (Pinchpoint)               |
| Neighborhood Traffic Circles    | Marked Crosswalks                  |
| Curb Extensions (Bulbouts)      | Urban Hybrid Mini Roundabouts      |
| Speed Humps / Tables            | Rectangular Rapid Flashing Beacons |
| Channelization (Access Control) | Raised Crosswalks                  |
| Chicanes                        | Median Refuge Islands              |
| Diverters                       | Speed Limit Reductions             |
| In-Lane Pedestrian Sign         | Police Enforcement                 |
| Speed Trailer                   |                                    |

## 2. Publicly-Sourced Placemaking and Engagement Interventions

All good public works projects engage the public throughout the process, gleaning their perspective and ensuring they stay educated on the goings-on in their neighborhood, and therefore engaging the public is a critical part of

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<sup>44</sup> Project for Public Spaces. <https://www.pps.org/article/lighter-quicker-cheaper>



the NTMP’s success. In addition to the types of traffic management the City can provide, grassroots efforts from citizens and neighbors are essential to improving transportation safety. In coordination with the Office of Neighborhoods, PWM staff has developed a suite of “Neighborhood Energizers” to stimulate these grassroots efforts, complementing the City-led traffic management tools. The publicly-sourced placemaking and engagement interventions are meant to stimulate ideas around transforming and reclaiming public space. For example, many of the quick build engineering interventions provide blank canvases for community customization (e.g. planting, painting). Enclosing a space with plants, hanging bird feeders and art, or setting out a Little Free Library all can help contribute to a vibrant pedestrian environment that communicates a need for lower vehicle speeds. Activating public space with pedestrians, bicycle tours, or community parties is a powerful way to shift the perception and accessibility of a street to drivers. These Neighborhood Energizers, listed on the Engage Missoula Page, may be undertaken with various levels of City participation. Appendix D provides detailed information about the current list of Neighborhood Energizers which includes:

20’s Plenty Campaign	Pop-Up Hackathon	Sunday Streets	Create a Wishing Tree
Slow Down Signage	Pop-Up Park	National Night Out	Hang Something
Intersection Murals	Parklets	Block Party	Gateway Signs
Decorate Your Crosswalks	Birdfeeders	Porchfest	Guerrilla Gardening
Pop-Up Plywood Murals	Little Free Libraries	Create a Crawl / Tour	Pollinator Gardens
Pop-Up Market (Yard Sale)	Little Free Food Libraries	Scavenger Hunt	Certified Wildlife Habitat
Pop-Up Concert	Add Seating / Build a Bench	Luminaria Display	Plant a Tree
Pop-Up Work Space	Build Recycling Bins	Document Your Street	Forage for Urban Produce
Pop-Up Outdoor Games	Build Compost Bins	Document Your History	Mow and Weed Your Alley
Pop-Up Street Jam	Build Bike Racks	Create a Sculpture	Pick up Litter
Pop-Up Dog Park	Planter Boxes / Plant Wall	Make Faces	Establish a Yardshare
Pop-Up Fitness Classes	Leave a Light On	Chalk Art	Community Garden
Pop-Up Drive-In	Temporary Wayfinding	Create a Community Mural	

## F. Moving Forward

The NTMP is intended to address traffic safety problems and risks on local jurisdiction residential streets in a comprehensive, transparent, equitable, and fiscally responsible manner. Specifically, the NTMP improves the City’s response to rising concerns around traffic volumes, safety, and speed through intersection control, systems analysis, and interdepartmental synchronisation. The City prioritizes Neighborhood Greenways for implementation and this will guide the proactive approach of the NTMP. Simultaneously, staff will field complaints/requests for traffic management, collect data, score additional projects for consideration of inclusion in the program, and coordinate implementation with other agencies and members of the public.

As this program is being proposed within existing budgets and workloads, the first year of the NTMP’s

implementation will largely be dedicated to extensive data collection. While this program touts quick-build, streamlined, responsive programming, it is unclear exactly how many projects can be completed each year. The goal is to build capacity to be able to implement approximately 5 Neighborhood Greenways per year through the proactive approach while also responding to as many citizen requests as possible. There are some other factors that will contribute to the program's success.

## 1. Evaluation

The responsible deployment of the NTMP will require significant data collection both before and after implementation of projects. In addition to the types of data sources cited above to be used when initially analyzing projects, after implementation staff intends to collect and compare speed and volume data, collect neighborhood feedback, and, eventually, analyze crash data to measure effectiveness. The findings from these evaluations will be used to make any adjustments as needed to traffic calming projects and inform future traffic management and planning efforts.

## 2. Maintenance

Maintenance is another critical component of the NTMP, both in terms of providing for the care and upkeep of any traffic calming installations and in coordinating efforts with Streets Division staff and other ongoing maintenance work. Existing, permanent traffic circles are typically adopted by one or more adjacent property owners, who are tasked with weeding, pruning, watering, and general beautification. The quick build traffic calming measures of the NTMP are not likely to require as much ongoing attention. However, as they will not include concrete curbing, it is possible that instreet installations could be damaged by errant drivers, snow plows, or emergency vehicles. Staff will monitor the maintenance needs of NTMP installations and adjust the program as necessary. With managers from Traffic Services and Streets Division on the work team, staff will also be able to readily coordinate NTMP projects with ongoing maintenance activities such as milling and paving, and chip and seal projects.

**Who**

City Council asked staff to research the possibility of lowering speed limits citywide. That research yielded a recommendation to modernize and streamline the Neighborhood Traffic Management Program (NTMP). Developed by a work team made up of Public Works Infrastructure & Mobility Planning, Engineering, and Streets Divisions, Emergency Services, City Attorney, and the Office of Neighborhoods, the NTMP will be managed by the Transportation Safety Team (TST), with some ad hoc guidance from other agencies as needed.

**What**

The NTMP is a comprehensive traffic safety program that utilizes the 6 E's of transportation safety — Engineering, Education, Encouragement, Enforcement, Evaluation, and Equity — to manage traffic speeds, volumes, and safety on residential streets. This program supports Vision Zero, the city's goal to eliminate traffic-related fatalities and serious injuries, by reducing travel speeds on neighborhood streets.

**Where**

The NTMP is limited to City-owned/maintained, residential streets. These streets are broken down further into three street types based on functional classification and operational goals: Neighborhood Greenways, Local Streets, and Residential Collectors. The NTMP will be implemented proactively along Neighborhood Greenways, with priority given first to corridors with high crash rates, then to important crosstown connections, and finally to the rest of the Neighborhood Greenway network. This program will also be used by the TST to respond to citizen concerns and complaints related to speeding and traffic safety.

**When**

The NTMP will be an ongoing program, with planning and project development tasks taking place in the colder months and data collection and implementation taking place in the warmer months. The goal is to implement approximately 5 corridors per year.

**Why**

City of Missoula is committed to safe and equitable transportation and strives to keep its streets, sidewalks and paths safe for people of all ages and abilities to use all modes of transportation. The NTMP will address:

- Rising crash numbers citywide
- High crash rates on some local streets
- High crash severity at uncontrolled intersections
- 25mph inappropriate travel speed for some conditions (sight triangles, curbside sidewalks, Neighborhood Greenways)
- Increased traffic due to population growth and infill development
- Decreased traffic enforcement
- Lack of comprehensive and connected bike/ped facilities
- Lack of coherent response to citizen requests for traffic calming
- Onerous requirements on citizen-initiated traffic calming

**How**

The NTMP modernizes and streamlines existing responses to traffic safety and currently uses existing staff resources and budgets. The NTMP utilizes both a top-down and bottom-up approach to improving traffic safety, guided by clear workflows, data-driven processes, and improved coordination and communication internally and with the public. The City prioritizes Neighborhood Greenways for implementation and this will guide the proactive approach of the NTMP. Simultaneously, staff will field complaints/requests for traffic management, collect data, and score projects for implementation. Traffic management solutions will involve combinations of quick build infrastructure, targeted education and enforcement, and Neighborhood Energizers meant to increase visibility and enhance the pedestrian environment.



## VII. CONCLUSION

Nationwide, serious injuries and fatalities resulting from traffic crashes are increasing, with rates for people biking and walking rising disproportionately, and speeding is a major contributor to this alarming trend. In Missoula, the numbers are a little better than national averages, due largely to the City's commitment to creating a safe, connected, and balanced transportation network, otherwise known as Complete Streets. Still, Missoula sees hundreds of crashes each year on local streets alone (not including arterials and major collectors) and these numbers too are rising. Speeding and traffic safety are two of the most frequent complaints and requests for service from Missoulians. Staff was directed initially to explore the possibility of lowering speed limits on neighborhood streets citywide. When exploring the causes and mitigations of speeding, confronting the fact that a citywide speed limit reduction is not currently possible under state law, and reviewing existing approaches to managing traffic on local streets, staff developed a comprehensive Neighborhood Traffic Management Plan to address transportation safety. The NTMP is a coherent, organized system with which to acknowledge and address citizen concerns related to speeding and traffic safety in an equitable and timely manner. By bringing together solutions from current best available practices in both the engineering and placemaking fields (e.g. posted speed limits, roadway design, increased enforcement, public education and encouragement), this systems-based approach is expected to reduce the likelihood and consequences of traffic crashes, enhance the Neighborhood Greenway network, advance the mode split goals adopted in the Long Range Transportation Plan, and keep Missoula a place where all modes of transportation are facilitated and all walks of life are welcomed.



## VIII. REFERENCES

- 20's Plenty: The Movement for Safer Speeds in the UK. (2015, September 21). Retrieved August, 2020, from <https://www.streetfilms.org/20s-plenty-the-move-to-safer-speeds-in-the-uk/>
- A Guide to 20mph Limits. (2019, March). Retrieved from <https://www.rospa.com/rospaweb/docs/advice-services/road-safety/employers/guide-to-20mph-limits.pdf>
- ABQJournal News Staff. TRAFFIC: The Need for “Non-Standard” Speed. Albuquerque Journal. 2009. (2020). Retrieved from <https://www.abqjournal.com/17087/traffic-the-need-for-non-standard-speed.html>
- Activate Missoula 2045, Missoula Long Range Transportation Plan (LRTP). Missoula Metropolitan Planning Organization. 2017. (2020). Retrieved from <https://www.ci.missoula.mt.us/DocumentCenter/View/39171/2016-LRTP>
- Barry-Jester, A. (2015, January 15). Why The Rules Of The Road Aren't Enough To Prevent People From Dying. Retrieved August 23, 2020, from <https://fivethirtyeight.com/features/why-the-rules-of-the-road-arent-enough-to-prevent-people-from-dying/>
- Bicycle Facilities Master Plan. Missoula Metropolitan Planning Organization. 2017. (2020). Retrieved from <https://www.ci.missoula.mt.us/DocumentCenter/View/39172/2016-Bicycle-Facilities-Master-Plan?bidId=>
- Board Meeting: Safety Study: Reducing Speeding-Related Crashes Involving Passenger Vehicles. (2017, July 25). Retrieved from <https://www.nts.gov/news/events/Documents/2017-DCA15SS002-BMG-statement-o.pdf>
- City Limits. (2020, June/July). Retrieved from [https://nacto.org/wp-content/uploads/2020/07/NACTO\\_CityLimits\\_SinglePages.pdf](https://nacto.org/wp-content/uploads/2020/07/NACTO_CityLimits_SinglePages.pdf)
- Driving-Tests.org. (n.d.). 2020 Driving Statistics: The Ultimate List of Driving Stats. Retrieved August 24, 2020, from <https://driving-tests.org/driving-statistics/>
- Drożdźiel, P., Tarkowski, S., Rybicka, I., & Wrona, R. Drivers' reaction time research in the conditions in the real traffic. Open Engineering, 10(1), 35-47. 2020. (23 Nov 2020). Retrieved from <https://doi.org/10.1515/eng-2020-0004>
- Essex, A., Shinkle, D., & Teigen, A. (2017, February 16). Transportation Review: Speeding and Speed Limits. Retrieved August 23, 2020, from <https://www.ncsl.org/research/transportation/transportation-review-speed-limits.aspx>
- Fatality Analysis Reporting System (FARS). NHTSA. Year. (07 Jan. 2021). Retrieved from <https://www-fars.nhtsa.dot.gov/Main/index.aspx>
- Fitzpatrick, Kay & Mccourt, Randy & Das, Subasish. (2019). Current Attitudes among Transportation Professionals with Respect to the Setting of Posted Speed Limits. Transportation Research Record Journal of the Transportation Research Board. 10.1177/0361198119838504.
- Hussain Q, Feng H, Grzebieta R, Brijs T, Olivier J. The relationship between impact speed and the probability of pedestrian fatality during a vehicle-pedestrian crash: A systematic review and meta-analysis. Accident Analysis and Prevention 2019 Aug;129:241-249. 2019. (2020). Retrieved from doi: 10.1016/j.aap.2019.05.033.
- League of American Bicyclists. (2014). American Community Survey data report. Retrieved from [https://www.bikeleague.org/sites/default/files/Where\\_We\\_Ride\\_2014\\_data\\_web.pdf](https://www.bikeleague.org/sites/default/files/Where_We_Ride_2014_data_web.pdf)
- Literature Review of Vehicle Travel Speeds and Pedestrian Injuries, DOT HS 809 021. NHTSA. 1999. (23 Nov. 2020). Retrieved from <https://one.nhtsa.gov/people/injury/research/pub/hs809012.html>
- Madruga, P. (2012, November 16). The 85th Percentile Folly. Retrieved August 23, 2020, from <http://www.copenhagenize.com/2012/11/the-85th-percentile-folly.html>
- MDT Web Administrators, 1. (n.d.). Montana Department of Transportation. Retrieved August 23, 2020, from <https://www.mdt.mt.gov/visionzero/roads/speedlimits.shtml>
- Methods and Practices for Setting Speed Limits: An Informational Report - Safety: Federal Highway Administration. (2012, April). Retrieved August 23, 2020, from [https://safety.fhwa.dot.gov/speedmgt/ref\\_mats/fhwsa12004/](https://safety.fhwa.dot.gov/speedmgt/ref_mats/fhwsa12004/)



Miller, S., Schmitt, A., & Andersen, M. (2017, July 27). NTSB: Speed Kills, and We're Not Doing Enough to Stop It. Retrieved August 23, 2020, from <https://usa.streetsblog.org/2017/07/27/ntsb-speed-kills-and-were-not-doing-enough-to-stop-it/>

Missoula, MT Car Accidents and Speeding - Reckless Driving Auto Collisions. (2016, October 13). Retrieved August 24, 2020, from <https://www.tippcoburn.com/blog/2016/10/13/why-speeding-leads-to-serious-175415>

Missoula Community Transportation Safety Plan. Missoula Metropolitan Planning Organization. June 2019. (2020). Retrieved from [https://www.ci.missoula.mt.us/DocumentCenter/View/49937/2019\\_CTSP\\_FINAL](https://www.ci.missoula.mt.us/DocumentCenter/View/49937/2019_CTSP_FINAL)

Missoula In Motion <https://www.missoulainmotion.com/greenways>

Montana Code Annotated 2019. (2019). Retrieved August 23, 2020, from [https://leg.mt.gov/bills/mca/title\\_0610/chapter\\_0080/part\\_0030/section\\_0030/0610-0080-0030-0030.html](https://leg.mt.gov/bills/mca/title_0610/chapter_0080/part_0030/section_0030/0610-0080-0030-0030.html)

National Center for Statistics and Analysis. (2019, May) Speeding: 2017 data (Traffic Safety Facts. DOT HS 812 687). Washington, DC: National Highway Traffic Safety Administration. Retrieved from <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812687>.

National Highway Traffic Safety Administration (2016). System Analysis of Automated Speed Enforcement Implementation. Retrieved from: [https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/812257\\_systemanalysisase.pdf](https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/812257_systemanalysisase.pdf)

National Highway Transportation Safety Administration (2014). Speed Management Program Plan. Retrieved from: <https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/812028-speedmgmtprogram.pdf>

NCHRP 17-76 Guidance for the Setting of Speed Limits. The National Academies of Sciences, Engineering, and Medicine. 2018. (2020). Retrieved from <https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=4052>

NCUTCD Proposal for Changes to the 5 Manual on Uniform Traffic Control Devices. (2019, January 11). Retrieved from <https://ncutcd.org/wp-content/uploads/meetings/2019A/AttachNo12.18B-RW-03.SpeedLimitProcedures.Approved.pdf>

Neighborhood Greenways 101. (2015, November 19). Retrieved August 23, 2020, from <https://www.portlandoregon.gov/transportation/article/554110>

News Release: Deficient Roadways Cost Average Missoula Area Driver Nearly \$1,200 Annually, A Total of \$749 Million Statewide. (2019, May 07). Retrieved August 24, 2020, from <https://tripnet.org/reports/news-release-deficient-roadways-cost-average-missoula-area-driver-more-than-1200-annually-a-total-of-749-million-statewide/>

Problem Identification. (2020, May). Retrieved from [https://www.mdt.mt.gov/other/webdata/external/Planning/crash\\_data/statewide/Problem-Identification/probid.pdf](https://www.mdt.mt.gov/other/webdata/external/Planning/crash_data/statewide/Problem-Identification/probid.pdf)

Project for Public Spaces. <https://www.pps.org/article/lighter-quicker-cheaper>

Ravenscraft, E. Does speeding really get you there any faster?. Lifehacker. 2014. (2020). Retrieved from <https://lifehacker.com/does-speeding-really-get-you-there-any-faster-1556767685#:~:text=As%20you%20can%20see%2C%20unless,that%27s%20already%20an%20hour%20long>

Reducing Speeding-Related Crashes Involving Passenger Vehicles. (2017, July 25). Retrieved August 25, 2020, from <https://www.nts.gov/safety/safety-studies/Pages/SS1701.aspx>

Relationship between Speed and Risk of Fatal Injury: Pedestrians and Car Occupants. (2010, September). Retrieved from [https://nacto.org/docs/usdg/relationship\\_between\\_speed\\_risk\\_fatal\\_injury\\_pedestrians\\_and\\_car\\_occupants\\_richards.pdf](https://nacto.org/docs/usdg/relationship_between_speed_risk_fatal_injury_pedestrians_and_car_occupants_richards.pdf)

Rethinking Safety, City Limits. NACTO. 2020. (Sept. 2020). Retrieved from <https://nacto.org/publication/city-limits/the-need/rethinking-safety/>

Rosen, E and Sander, U. Pedestrian fatality risk as a function of car impact speed, Accident Analysis and Prevention, Vol 41.3 Source. 2009. (23 Nov. 2020). Retrieved from <https://www.sciencedirect.com/science/article/abs/pii/S0001457509000323>

Safety Study, Reducing Speeding-Related Crashes Involving Passenger Vehicles. National Transportation Safety Board. 2017. (2020). Retrieved from <https://la-bike.org/wp-content/uploads/2018/08/NTSB-report-SS1701.pdf>



Sgt. James Williams, Metro Nashville Police Department, "Effect of High-Visibility Enforcement on Motor Vehicle Crashes," June 22, 2020, [nij.ojp.gov: https://nij.ojp.gov/topics/articles/effect-high-visibility-enforcement-motor-vehicle-crashes](https://nij.ojp.gov/topics/articles/effect-high-visibility-enforcement-motor-vehicle-crashes)

Small, A. (2019, August 08). Lower Speed Limits Could Save Your City (and Life). Retrieved August 23, 2020, from <https://www.bloomberg.com/news/articles/2019-08-08/lower-speed-limits-could-save-your-city-and-life>

Speeding. (2020, July 23). Retrieved August 24, 2020, from <https://www.nhtsa.gov/risky-driving/speeding>

Statewide and Nonmetropolitan Transportation Planning; Metropolitan Transportation Planning. (2016, May 27). Retrieved August 23, 2020, from <https://www.federalregister.gov/documents/2016/05/27/2016-11964/statewide-and-nonmetropolitan-transportation-planning-metropolitan-transportation-planning>

Stromberg, J. (2015, April 09). States are raising their speed limits. They should do the opposite. Retrieved August 23, 2020, from <https://www.vox.com/2015/4/9/8373177/speed-limits>

Temporary Speed Hump Impact Evaluation. (2002, July). Retrieved from [https://nacto.org/docs/usdg/temporary\\_speed\\_humps\\_impact\\_evaluation\\_hallmark.pdf](https://nacto.org/docs/usdg/temporary_speed_humps_impact_evaluation_hallmark.pdf)

Traffic. (n.d.). Retrieved August 24, 2020, from <https://www.ci.missoula.mt.us/358/Traffic>

Transportation Data Management System. (n.d.). Retrieved August 24, 2020, from <https://mdt.ms2soft.com/tcds/tsearch.asp?loc=Mdt>

Transportation Fact Sheet. (n.d.). Retrieved August 24, 2020, from <http://ridetowork.org/transportation-fact-sheet>

Transportation Performance Management. (2019, April 3). Retrieved August 23, 2020, from <https://www.fhwa.dot.gov/tpm/rule.cfm>

US Department of Transportation, Literature Reviewed on Vehicle Travel Speeds and Pedestrian Injuries. March 2000. Retrieved from <https://www.ite.org/technical-resources/topics/speed-management-for-safety/speed-as-a-safety-problem/>

US DOT. Federal Highway Administration. <https://safety.fhwa.dot.gov/uslimits/>

Webb, C. N. Motor vehicle traffic crashes as a leading cause of death in the United States, 2015 (Traffic Safety Facts Crash•Stats. Report No. DOT HS 812 499). Washington, DC: National Highway Traffic Safety Administration. (Feb. 2018) Retrieved from <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812499>

What is Social Equity. (2017, February 2). Retrieved August 24, 2020, from <https://projecthumancity.com/2017/02/02/what-is-social-equity/>

Zalinger, T. (2016, July 19). Missoula streets: Maybe lower speed limit to 15 mph. Retrieved August 24, 2020, from [https://missoulain.com/news/opinion/mailbag/missoula-streets-maybe-lower-speed-limit-to-15-mph/article\\_144dfba4-af4b-5c50-ba30-08c18792abaf.html](https://missoulain.com/news/opinion/mailbag/missoula-streets-maybe-lower-speed-limit-to-15-mph/article_144dfba4-af4b-5c50-ba30-08c18792abaf.html)



## IX. APPENDIX

*Attached*

- A. Proactive NTMP Workflow**
- B. Reactive NTMP Workflow**
- C. Traffic Management Tools**
- D. Neighborhood Energizers**