



Neighborhood Traffic Calming Program

Transportation & Mobility Division

October 2022

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01 Program Overview and Goals

Overview of Neighborhood Traffic Calming Program

The City of Hilliard Neighborhood Traffic Calming Program aims to enhance safety and livability on local streets in Hilliard neighborhoods. Encouraging slower vehicle speeds through traffic calming creates a safer and more pleasant environment for taking a walk, playing outside, or enjoying the outdoors. Slower speeds create safer streets for everyone, and crashes are less severe the slower a vehicle is driving.

Creating more enjoyable local streets starts with setting speed limits that are safe for everyone using the street, including those walking and biking. On streets where people are traveling over the posted speed limit (speeding), traffic calming can be used to encourage drivers to travel at the posted speed limit. This program is intended to provide traffic calming improvements to reduce speeding, reduce crashes, encourage walking and biking on local streets, and improve the quality of life in residential neighborhoods across Hilliard. The program contains a step-by-step process for achieving traffic calming primarily through engineering, with the added support of education and enforcement initiatives. This Guide outlines the street selection criteria, traffic calming process, and countermeasure options for local streets.

Neighborhood Traffic Calming Program Goals

There are three main goals for the Hilliard Neighborhood Traffic Calming Program. The goals are for the program to be driven by data, focused on roadway changes, and accessible to the public.

1. **Driven by Data:** The City of Hilliard has approximately ten years of vehicle speed and volume data for many neighborhood streets; this data ensures that resources are focused where the most significant speeding is occurring. New speed data is collected routinely and after major roadway geometry changes. Crash data is also considered in the neighborhood traffic calming process, although historically, there have been minimal crashes on local streets. Residents' concerns are also a consideration. Concerns are collected through a centralized database accessible to both the Hilliard Police Department and the Division of Transportation and Mobility.
2. **Focused on Roadway Changes:** The Hilliard Neighborhood Traffic Calming Program proactively implements roadway changes instead of relying solely on education and enforcement. Roadway changes do not need to be expensive, may address multiple safety concerns, and can include low-cost materials, such as paint, planters, and flex posts on low-speed/low-volume streets where crashes are minor.
3. **Accessible to the Public:** The City of Hilliard Neighborhood Traffic Calming Program is published online to ensure that the process is transparent to the public. Information accessible to the public includes eligibility requirements for traffic calming, the prioritization rubric, the program timeline, and the traffic calming countermeasure toolbox. The countermeasure toolbox will include a photo of each treatment, a description of the safety benefits, and a cost scale. This allows the public to learn more about the traffic calming strategies that can be considered for different locations and for different safety concerns.



02 Understanding Speeding

Definitions

85th Percentile Speed: The speed at or below which 85 percent of vehicles travel.

Cul-de-Sac: A street having only one end open to traffic and the other end permanently terminated with a vehicular turn around provided.

Cut-Through Traffic: Traffic that uses local or network collector streets to travel through a neighborhood without having an origin or destination within the neighborhood.

Local Street: A street that is not classified in a higher system (collector/arterial). Local streets primarily provide direct access to abutting land and access to higher systems. These roads offer basic access to local users and may discourage through traffic. Cul-de-sac streets and neighborhood side streets are included in this category.¹

Loop Street: A street that has both of its termini on the same street.

Network Collector Street: A street that penetrates development subareas and neighborhoods, collecting traffic from local streets and channeling it into the arterial systems. Though a minor amount of through traffic may be carried on collector streets, these streets primarily provide access to adjacent users from within residential, commercial, and industrial areas.¹

Posted Speed: The maximum lawful speed for a particular location, as displayed on a regulatory sign.²

Speeding: Exceeding the posted speed limit or driving too fast for conditions.³

StealthStat™: A traffic data collector that collects speed data in targeted areas.⁴

Target Speed: The highest operating speed at which vehicles should ideally operate on a roadway in a specific context.²

Contributing Factors

The deployment of StealthStat™ units has allowed the City of Hilliard to differentiate between isolated speeding incidents and recurring speeding problems. The City has been deploying StealthStat™ units since 2013 to collect speed data. StealthStat™ units consist of small boxes that are mounted on existing poles. Each box contains a radar device that collects and logs the speed of vehicles approaching the unit from both directions. Unlike more prominent signs or units, the StealthStat™ units collect data without drivers knowing that their speed is being collected. This typically results in data that is representative of actual speed conditions on the street.

After nearly a decade of data collection, common characteristics of streets with systemic speeding concerns have become apparent. These include:

- Streets that are too wide, typically wider than 36 feet.
- Streets that are too long.
- Streets that directly connect between two arterial streets (see Figure 4 on page 11).
- Streets where on-street parking is prohibited/underutilized.

The City of Hilliard Neighborhood Traffic Calming Program is focused on addressing the conditions on streets that have one or more of the above characteristics.

¹ "Hilliard Comprehensive Plan." Hilliard, OH, United States (2011). <https://hilliardohio.gov/comprehensive-plan/>.

² "Setting Speed Limits," Institute of Transportation Engineers, accessed July 7, 2022, <https://www.ite.org/technical-resources/topics/speed-management-for-safety/setting-speed-limits/y>.

³ Forbes, Gerald J. et al. "Methods and Practices for Setting Speed Limits: An Informational Report." Federal Highway Administration, Washington, DC, 2012. https://safety.fhwa.dot.gov/speedmgt/ref_mats/fhwasa12004/.

⁴ "StealthStat II: Covert Traffic Data Collector," Kustom Signals, Inc., accessed August 17, 2022, <https://kustomsignals.com/traffic-data/stealthstat>.



03 Program Implementation

Typical Timeline

The timeline for the Neighborhood Traffic Calming Program is based on the City of Hilliard budget cycle and staff resources. All projects begin by selecting a street and determining its eligibility. Projects are prioritized using a point-based system, and concept plans are developed for the highest priority projects. Both types of projects are evaluated routinely after implementation. A sample timeline can be seen in Table 1 on the next page.

Rapid Implementation Projects (Low-Cost): Rapid implementation projects, which are lower cost and can be installed with little to no design, may be implemented the same year, subject to funding in the capital budget.



Figure 1: Rapid implementation projects typically use lower cost materials and are installed temporarily. (Source: Toole Design)

Full Design Projects (Medium to High-Cost): Projects that require more extensive design will have a period of public involvement and review before the City of Hilliard begins its budget process in July. Because getting community consensus and completing a design can take time, the minimum amount of time to complete a full design project is two years. City Council will review and approve any projects that require engineering design to ensure consensus and support from the neighborhood and City Council before the expenditure of significant funds. If approved, funding for the traffic calming project can be incorporated into the capital improvement budget, which goes into effect the following January. After construction documents are created, the traffic calming plan can be implemented, generally between May and October.



Figure 2: Traffic circles are an example of a full design project. (Source: Toole Design)

	Rapid Implementation Projects	Full Design Projects
January	Street Selection and Determination of Eligibility	
February	Project Prioritization	
March	Concept Plan Development	
April	Traffic Calming Plan Implementation	Public Involvement and Review
May		Staff Recommendation
June		City Council Approval
July		
August		
September	Construction Documents	
October		
November		
December		
January	Evaluation (Routinely)	Traffic Calming Plan Implementation
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December	Evaluation (Routinely)	

Implementation Process

The Neighborhood Traffic Calming Program is a ten-step process that takes a minimum of 2 years to complete for full design projects and one year to complete for rapid implementation projects. For rapid implementation projects, steps 5-8 below (*italicized*) are omitted.

1. Street Selection
2. Determination of Eligibility
3. Project Prioritization
4. Traffic Calming Concept Plan Development
5. *Public Involvement and Review*
6. *Staff Recommendation*
7. *City Council Approval*
8. *Construction Documents*
9. Traffic Calming Plan Implementation
10. Evaluation

The sections below cover each step in greater detail.

1. Street Selection

The City of Hilliard will select streets for neighborhood traffic calming based on existing speed data that has been collected over several years. **Appendix A: Local Streets with Known Speeding Concerns** includes a list of streets where data has shown that 85th percentile speeds are significantly higher than posted speed limits. Data has been collected on many other local streets where 85th percentile speeds were not significantly higher than posted speed limits.

New speed data will be collected under the following scenarios:

- Existing speed data is more than 4 years old.
- Development changes have happened in the vicinity of the street.
- Residents have concerns about a street for which the City has not already collected data.

2. Determination of Eligibility

Streets are eligible for traffic calming based on the following requirements:

- Must be a local or network collector street according to the City's current Thoroughfare Map (Figure 4 on the next page).
- Must NOT be listed as a major or minor arterial street on the City's current Thoroughfare Plan and Comprehensive Plan (Figure 4 on the next page).
- Must have an 85th percentile speed greater than 3 miles per hour over the posted speed limit.
- Must **NOT** be a cul-de-sac or loop street.

Figure 3 shows an example of a network collector and a local street in Hilliard, both of which are street types that may be eligible for traffic calming under this program. Network collector streets on which homes directly front and local streets that serve as the primary street entering a neighborhood are typically the most eligible streets for the Neighborhood Traffic Calming Program.



Figure 3: Network collectors (left) and local streets (right) can both be eligible for the Neighborhood Traffic Calming Program.

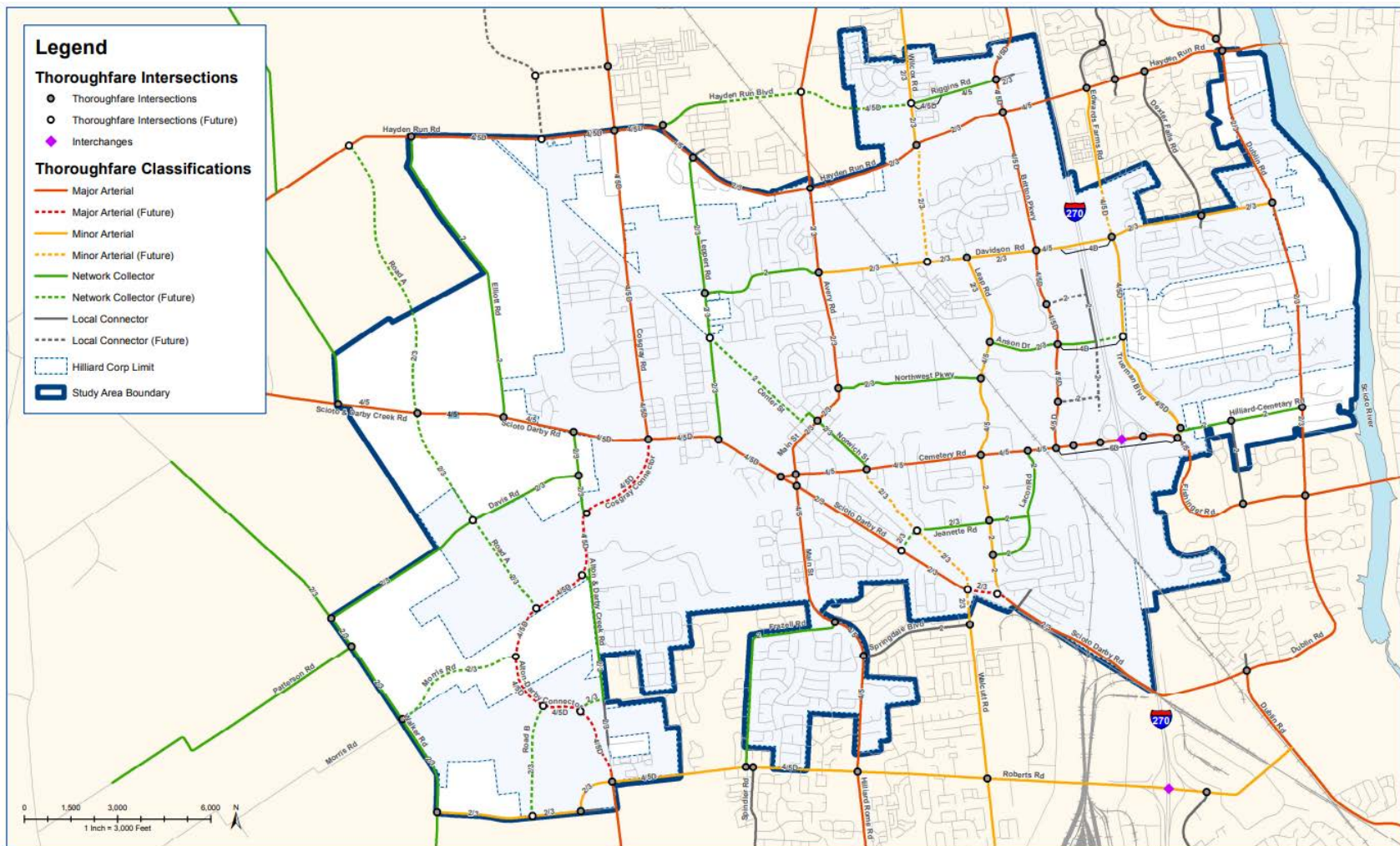


Figure 4: City of Hilliard 2011 Thoroughfare Map. (Source: City of Hilliard Comprehensive Plan)

Note: Any future adopted versions of the Thoroughfare Map will supersede the map shown in Figure 4.

3. Project Prioritization

The City of Hilliard will not be able to immediately fund all traffic calming plans for every local street, so the Prioritization Rubric in Table 2 will be used to prioritize projects. The point-based prioritization system considers percentile speed and crash history as the primary prioritization criteria, with vicinity to schools, cut-through traffic, traffic volumes, and pedestrian generators as the secondary criteria. The rubric for prioritization is shown in Table 2.

4. Traffic Calming Concept Plan Development

After priority local streets have been identified, traffic calming concept plans will be developed for both rapid implementation and full design projects. In conjunction with the neighborhood, the Transportation & Mobility Division will use engineering judgement and national best practices to select one or more countermeasures from the Traffic Calming Toolbox in **Appendix C: Traffic Calming Toolbox**. Resources used to aid in this decision-making process can be seen in **Appendix B: National Traffic Calming Guidance**.

On most streets, rapid implementation projects will be implemented and evaluated before considering full design projects.

If necessary, funding for the plans will be included in the proposed capital budget. The plan development process will include schematic design if necessary for the traffic calming countermeasure(s) chosen.

5. Public Involvement and Review

Only full design projects will include a period of public involvement and review. This period will occur as the plan is being developed. The public engagement strategy will include raising awareness and fostering discussion.

To make residents aware that traffic calming is being considered, the City will communicate through various traditional and electronic methods. Each neighborhood considered for a full design traffic calming project is required to provide one neighborhood representative to serve as liaison between City staff and the citizens

Table 2: City of Hilliard Traffic Calming Prioritization Rubric

Criteria		Point Definitions	Points Available
Primary	85th Percentile Speed	2 points for every 1 mph above the posted speed limit	30
	Crash History	5 points for each crash within the last 5 years	25
Secondary	Vicinity to Schools	7.5 points per school if the street fronts a school, provides access to a school, or is within a 20-mph school zone	15
	Cut-Through Traffic	10 points if a street connects between two Thoroughfare Plan streets 5 points if a street connects a large neighborhood	10
	Traffic Volumes	1 point for ADT <1000 2 points for ADT 1000-1499 3 points for ADT 1500-1999 4 points for ADT 2000-2499 5 points for ADT 2500-2999 6 points for ADT 3000-3499 7 points for ADT 3500-3999 8 points for ADT 4000-4499 9 points for ADT 4500-5000 10 points for ADT 5000+	10
	Pedestrian Generators	1 point for each major transit stop, park, regional trail, or civic facility within 1000 feet of the street 2 points for each major transit stop, park, regional trail, or civic facility along the street	5
	Additional Concerns	1 point if a street has visibility restrictions 1 point if a street is an important bike connection route 1 point if a street has no sidewalks 1 point if a street is >1000 feet long 1 point if a street is >=36 feet wide	5
Total			100

within the neighborhood. Communication with the neighborhood representative will be primarily via email but could include in person or virtual meetings.

To gain feedback and foster open dialogue regarding traffic calming, residents will be invited to the relevant meetings where the traffic calming project will be discussed. For high-cost projects where significant changes to the local street are being considered, neighborhood-specific meetings may be held. Projects that do not require public involvement and review will skip steps 5-8 and can be implemented the same year.

6. Staff Recommendation

After the development of a traffic calming plan and the period of public involvement and review, staff from the Transportation & Mobility Division will recommend a select number of plans for inclusion in the City of Hilliard budget for the following year. The number of plans selected for inclusion will depend on the anticipated scale of cost for each plan. This recommendation typically occurs in late summer, as the capital budget process begins.

7. City Council Approval

Hilliard City Council will approve traffic calming projects prior to or as part of its annual capital budget approval cycle. Funding for approved projects will either be included in the capital budget, which goes into effect the following January, or be appropriated by the Hilliard City Council through a supplemental budget appropriation ordinance.

8. Construction Documents

Once the budget has gone into effect for approved traffic calming projects, construction documents will be developed for any chosen countermeasures that require design and construction. The expected completion date for the development of construction documents is typically in late spring.

9. Traffic Calming Plan Implementation

Implementation can happen after concept plan development for rapid implementation projects that do not include redesign of the roadway. For full design projects, implementation will occur after securing funding and preparing construction documents. Projects will be implemented throughout the year (May-October) based on weather and the workload of City crews.

10. Evaluation

After a project has been installed, a post-implementation evaluation will determine the effectiveness of the selected countermeasure(s) in reducing speeding and what field adjustments may be needed, if any. The data examined will include the following.

- Speeds
- Crash data
- Traffic volumes of all modes
- Observed behaviors
- Possible unintended effects (such as volume changes on surrounding streets, crashes, or cut-through traffic).

Speed data will be collected within 3 months of implementation, 1 year after implementation, and 3 years after implementation. Results from the data collection will be summarized in a brief report and shared with the neighborhood representatives or posted online. Traffic volume and crash data will be monitored periodically using readily available data sources such as the Ohio Department of Transportation GIS Crash Analysis Tool (GCAT) or StreetLight.

If the 85th percentile speed is within 3 miles per hour of the posted speed limit, no further action is required. If the 85th percentile speed was reduced but is still higher than 3 miles per hour over the posted speed limit, the street may be considered for future traffic calming prioritization. If 85th percentile speeds were not reduced, the street will be a top priority for the next fiscal year. At any time, field adjustments can be made as the Transportation & Mobility Division deems necessary.



04 Appendices

Appendix A: Local Streets with Known Speeding Concerns

The streets listed below are local streets where speed data collected by the City of Hilliard shows that the 85th percentile speed is more than 5 mph above the posted speed limit of 25 mph. All speeds are shown in units of miles per hour (mph).

Table 3: Local Streets with Known Speeding Concerns (speeds in mph).

Location	Most Recent Data Year	Posted Speed	Highest Recorded 85th Percentile Speed	Speed Differential (85th - Posted)
Lampton Pond Dr	2022	25	35	10
Schirtzinger Road	2020	25	34	9
Lacon Road	2020	25	34	9
Norwich Street	2021	25	33	8
Taylor Lane Ave	2022	25	33	8
Woodsmill Drive	2021	25	32	7
Strider Lane	2022	25	32	7
Dayspring Dr	2020	25	32	7
Davidson Rd	2022	25	32	7
Jeffrelyn Dr	2020	25	32	7
Davidson Run Dr	2018	25	31	6
Hoffman Farms Drive	2020	25	31	6
Heather Ridge Dr	2018	25	31	6
Carrington Way	2019	25	31	6
Darby Glen Blvd	2020	25	31	6
Old Creek Road	2020	25	31	6

Appendix B: National Traffic Calming Guidance

Selecting a traffic calming countermeasure is a complicated decision that considers the desires of the community, the abilities of the City, and the existing research. Below are several national resources that provide guidance in choosing specific countermeasures. The headings are links to the full resource for more information.

[Crash Modification Factors Clearinghouse](#)

The Crash Modification Factor (CMF) Clearinghouse is a database that stores research studies that have identified crash modification factors for various roadway treatments. The Clearinghouse also includes guidance and resources on using CMFs in road safety practice.

[Federal Highway Administration \(FHWA\) Engineering Speed Management Countermeasures: A Desktop Reference of Potential Effectiveness in Reducing Crashes \(2014\)](#)

This resource contains crash modification factors and crash reduction factors for various traffic calming countermeasures. The studies included in the resource typically specify the street type on which the countermeasure was implemented to facilitate comparison. Many crash reduction figures in **Appendix C: Traffic Calming Toolbox** come from this resource.

[\(FHWA\) Engineering Speed Management Countermeasures: A Desktop Reference of Potential Effectiveness in Reducing Speed \(2014\)](#)

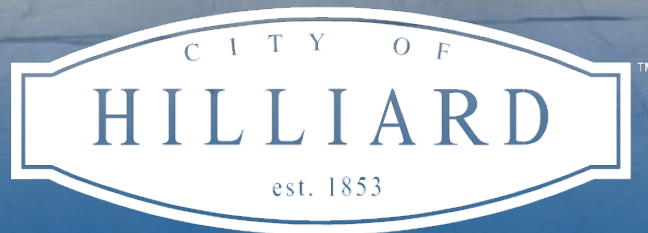
This resource contains studies that use pre- and post-implementation data to understand the efficacy of several different traffic calming countermeasures in various roadway contexts. Many speed reduction figures in **Appendix C: Traffic Calming Toolbox** come from this resource.

[\(FHWA\) Traffic Calming ePrimer \(2019\)](#)

This resource provides a reference for in-depth resource on specific treatments. It is used to understand the effects that each countermeasure is expected to have on traffic speeds and volumes. Additionally, the ePrimer gives insight into the effects of traffic calming measures on non-personal passenger vehicles (such as emergency services, fire department vehicles, snowplows, and others) and on non-motorists (such as pedestrians and bicyclists). The cost scales in **Appendix C: Traffic Calming Toolbox** come from this resource.

[FHWA Speed Management Toolkit](#)

This toolkit includes existing guides, informational resources, and research evidence for speed management. It also describes countermeasures that reduce speeds and/or crashes and explains what effects can be expected from each countermeasure. The last section of the toolkit includes several tip sheets for communications experts and other professionals involved in the traffic calming program.



Appendix C: Traffic Calming Toolkit

Neighborhood Traffic Calming Program

Transportation & Mobility Division

October 2022

Introduction

The City of Hilliard has a multitude of traffic calming countermeasures that can be deployed to slow traffic on local streets as part of the Neighborhood Traffic Calming Program.

The traffic calming countermeasures listed below fall into the categories of pavement marking, signage, vertical deflection, horizontal deflection, vertical elements, education, and enforcement. Within each category, countermeasures are generally listed from least to most expensive. Each countermeasure is listed with a short description, temporary vs. permanent considerations, maintenance considerations, impact to City services, speed and crash reduction effectiveness, and an approximate cost scale. Cost scales are shown in Table 2 below.

Table 1: Traffic Calming Countermeasure Cost Scales

Symbol	Cost Scale
\$	Less than \$6,000 (Low)
\$\$	\$6,000 - \$15,000 (Medium)
\$\$\$	More than \$15,000 (High)

The information for speed reductions, crash reductions, and cost scales in this section is based on national traffic calming guidance, as listed in Appendix B. In general, the speed and crash reduction figures in this toolbox come from the *FHWA Engineering Speed Management Countermeasures Desktop References*, and the cost scales come from the *FHWA Traffic Calming ePrimer*. The cost scales represent the cost of a single installation of each traffic calming measure (e.g., a single speed hump). In general, costs will be higher for installations that employ multiple countermeasures or impact drainage. Inflation should also be considered in project costs.

Table 2: Traffic Calming Countermeasure Summary Table

	Speed Reduction Effectiveness	Crash Reduction Effectiveness	Maintenance	Impact to City Services	Cost Scale
Pavement Markings					
Center and Edge Line Striping	Low	Medium	Low	Low	Low
High-Visibility Crosswalks	Low	Medium	Low	Low	Low
Advanced Yield Markings	Low	Low	Low	Low	Low
Narrowed Travel Lanes	Low	Medium	Medium	Medium	Low
Transverse Bars/Optical Speed Bars	Medium	Medium	Low	Low	Low
SLOW Pavement Marking	Low	High	Low	Low	Low
Signs					
Speed Feedback Signs	Medium	Low	Medium	Low	Low
Vertical Deflection					
Speed Cushions	High	High	Medium	Medium	Medium
Speed Humps	High	High	High	High	Medium
Speed Tables	High	High	High	Medium	Medium
Raised Crosswalks	High	Medium	High	High	Medium
Horizontal Deflection					
On-Street Parking	Low	High	Low	Low	Low
Curb Extensions/Bump outs	Low	Low	High	Medium	Medium
Chicanes	High	Low	High	High	High
Chokers	Low	Low	Medium	Medium	High
Traffic Circles	Medium	High	Medium	Medium	High
Median Islands	Medium	Medium	Medium	Medium	High
Other Vertical Elements					
Street Trees	Medium	Low	Medium	Low	Low
Planter Boxes	Medium	Low	High	Medium	Low
Flex Posts/Bollards	Medium	Low	High	Medium	Low
Education and Enforcement					
High Visibility Enforcement			Low	Low	Medium

Legend

Low
Medium
High
Unknown

Pavement Markings

Center and Edge Line Striping

Description and Key Safety Features:

Center lines are the yellow lines in the middle of a roadway, while edge lines are white lines that indicate the edge of the traveled way. Center and edge lines can visually narrow a roadway or a travel lane to encourage slower driving speeds.

Temporary vs. Permanent Considerations:

Paint may be used for a temporary installation. Thermoplastic can be used for more permanent installations.

Maintenance Considerations: Low

Impact on City Services: Low

Speed Reduction: 0-4 mph

Crash Reduction: 24%¹

Cost Scale: \$



Source: City of Hilliard
Location: Hilliard, OH

¹Elvik, R. and Vaa, T., "Handbook of Road Safety Measures." Oxford, United Kingdom, Elsevier, (2004). https://www.cmfclearinghouse.org/study_detail.cfm?stid=14.

Pavement Markings

High-Visibility Crosswalks

Description and Key Safety Features:

Center lines are the yellow lines in the middle of a roadway, while edge lines are white lines that indicate the edge of the traveled way. Center and edge lines can visually narrow a roadway or a travel lane to encourage slower driving speeds.

Temporary vs. Permanent Considerations:

Paint may be used for a temporary installation. Thermoplastic can be used for more permanent installations.

Maintenance Considerations: Low

Impact on City Services: Low

Speed Reduction: Unknown

Crash Reduction: 19-40%²

Cost Scale: \$



Source: Toole Design
Location: Washington, DC

² Chen, L., C. Chen, and R. Ewing. "The Relative Effectiveness of Pedestrian Safety Countermeasures at Urban Intersections - Lessons from a New York City Experience." Presented at the 91st Annual Meeting of the Transportation Research Board, January 22-26, Washington, DC, 2012.

Pavement Markings

Advanced Yield Markings

Description and Key Safety Features:

Center lines are the yellow lines in the middle of a roadway, while edge lines are white lines that indicate the edge of the traveled way. Center and edge lines can visually narrow a roadway or a travel lane to encourage slower driving speeds.

Temporary vs. Permanent Considerations:

Paint may be used for a temporary installation. Thermoplastic can be used for more permanent installations.

Maintenance Considerations: Low

Impact on City Services: Low

Speed Reduction: Unknown

Crash Reduction: 11%³

Cost Scale: \$



Source: Toole Design
Location: Colorado Springs, CO

³ Zegeer, C., R. Srinivasan, B. Lan, D. Carter, S. Smith, C. Sundstrom, N. Thirsk, C. Lyon, B. Persaud, J. Zegeer, E. Ferguson, and R. Van Houten. "Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments", National Cooperative Highway Research Program, Research Report 841, Washington, D.C., 2017.
https://www.cmfclearinghouse.org/study_detail.cfm?stid=487.

Pavement Markings

Narrowed Travel Lanes

Description and Key Safety Features:

Center lines are the yellow lines in the middle of a roadway, while edge lines are white lines that indicate the edge of the traveled way. Center and edge lines can visually narrow a roadway or a travel lane to encourage slower driving speeds.

Temporary vs. Permanent Considerations:

Paint may be used for a temporary installation. Thermoplastic can be used for more permanent installations.

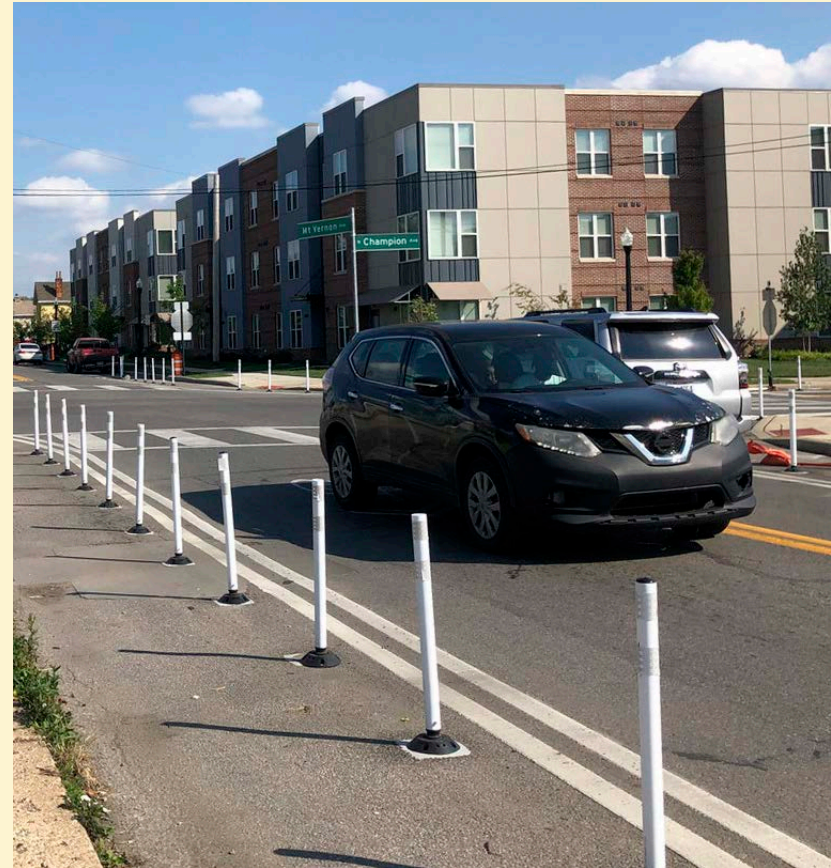
Maintenance Considerations: Medium

Impact on City Services: Medium

Speed Reduction: 0-4 mph

Crash Reduction: 27-42%⁴

Cost Scale: \$



Source: Toole Design
Location: Columbus, OH

⁴ Abdel-Aty, M.A., C. Lee, J. Park, J. Wang, M. Abuzwidah, and S. Al-Arifi. "Validation and Application of Highway Safety Manual (Part D) in Florida." Florida Department of Transportation. Tallahassee, Florida. (May 2014).
http://cmfclearinghouse.org/study_detail.cfm?stid=433.

Pavement Markings

Transverse Bars/Optical Speed Bars

Description and Key Safety Features:

Transverse bars (top right) and optical speed bars (bottom right) are pavement markings that are applied perpendicular to the roadway to increase drivers' awareness of their speed. Transverse bars are often used in ahead of speed humps/tables.

Temporary vs. Permanent Considerations:

Paint may be used for a temporary installation. Thermoplastic can be used for more permanent installations.

Maintenance Considerations: Low

Impact on City Services: Low

Speed Reduction: 0-7 mph

Crash Reduction: 32%

Cost Scale: \$

Note: The crash reduction figure is based on a study of converging chevron markings.



Source: Toole Design
Location: Boston, MA



Source: Iowa State University

Pavement Markings

SLOW Pavement Marking

Description and Key Safety Features:

Pavement markings reading “SLOW” can be used in specific contexts, such as school zones, to encourage drivers to slow down.

Temporary vs. Permanent Considerations:

Paint may be used for a temporary installation. Thermoplastic can be used for more permanent installations.

Maintenance Considerations: Low

Impact on City Services: Low

Speed Reduction: 0-3 mph

Crash Reduction: 38%⁵

Cost Scale: \$



Source: New Jersey School Zone Design Guide, NJDOT

⁵ Lyon, C., B. Persaud, and K. Eccles. "Safety Evaluation of Two Curve Warning Treatments: In-Lane Curve Warning Pavement Markings and Oversized Chevron Signs". Presented at the 96th Annual Meeting of the Transportation Research Board, Paper No. 17-00432, Washington, D.C., (2017).
https://www.cmfclearinghouse.org/study_detail.cfm?stid=482.

Signs

Speed Feedback Signs

Description and Key Safety Features:

Speed feedback signs digitally display the speed of a motorist as they drive past the sign. These signs are accompanied by speed limit signs so that drivers can see how their speed compares to the speed limit.

Temporary vs. Permanent Considerations:

Portable signs or trailers can be used for temporary installations. Signs can also be installed in the ground for more permanent installations.

Maintenance Considerations: Medium

Impact on City Services: Low

Speed Reduction: 0-7 mph

Crash Reduction: 0-10%

Cost Scale: \$-\$\$



Source: Franklin Neighborhood Traffic Calming Program
Location: Franklin, TN

Vertical Deflection

Speed Cushions

Description and Key Safety Features:

A speed cushion is made up of multiple rounded bumps that stretch across a roadway, perpendicular to the direction of travel, with narrow gaps in between the bumps. Passenger cars will travel over the speed cushion, while wider vehicles can pass through the speed cushion without their tires traveling directly over it. Speed cushions do not delay wide vehicles, such as fire trucks, as much as speed humps do.

Temporary vs. Permanent Considerations:

Rubber speed cushions can be bolted into a roadway, which allows for relatively easy removal. More permanent speed cushions consist of asphalt.

Maintenance Considerations: Medium

Impact on City Services: Medium

Speed Reduction: 5-7 mph

Crash Reduction: 30-50%

Cost Scale: \$-\$\$

Note: The crash reduction figure is based on a study of speed humps.



Source: NACTO Urban Street Design Guide



Source: Toole Design
Location: Kirkland, WA

Vertical Deflection

Speed Humps

Description and Key Safety Features:

A speed hump is a long, rounded bump that stretches across a roadway, perpendicular to the direction of travel. It can be uncomfortable to travel over the speed hump too quickly, so drivers will slow down as they approach and pass the speed hump. A series of speed humps maximizes speed reduction benefits. Emergency vehicles experience a few seconds of delay as they travel over speed humps.

Temporary vs. Permanent Considerations:

Rubber speed humps can be bolted into a roadway, which allows for relatively easy removal. More permanent speed humps consist of asphalt.

Maintenance Considerations: High

Impact on City Services: High

Speed Reduction: 5-8 mph

Crash Reduction: 30-50%

Cost Scale: \$\$



Source: Toole Design

Vertical Deflection

Speed Tables

Description and Key Safety Features:

A speed table is a trapezoidal shaped bump (flat on top) that stretches along a roadway, similar to a speed hump. Speed tables are generally less effective at traffic calming than speed humps, but they also result in less delay for emergency vehicles. They can be installed as part of a series to maximize speed reduction benefits.

Temporary vs. Permanent Considerations:

Rubber speed tables can be bolted into a roadway, which allows for relatively easy removal. More permanent speed tables consist of asphalt.

Maintenance Considerations: High

Impact on City Services: Medium

Speed Reduction: 3-9 mph

Crash Reduction: 35-95%

Cost Scale: \$\$



Source: City of Akron

Location: Akron, OH



Source: National Association of City Transportation Officials (NACTO)

Vertical Deflection

Raised Crosswalks

Description and Key Safety Features:

A raised crosswalk is an elevated section of roadway, similar in shape to a speed table, that is marked and signed for people to cross. Raised crosswalks are generally less effective at traffic calming than speed humps but result in less delay for emergency vehicles. They can be installed as part of a series to maximize speed reduction and pedestrian safety benefits.

Temporary vs. Permanent Considerations:

Crosswalk markings can be applied to rubber speed tables, which are then bolted into a roadway for a temporary installation. More permanent raised crosswalks consist of asphalt. Raised crosswalks may require drainage modifications.

Maintenance Considerations: High

Impact on City Services: High

Speed Reduction: 11 mph

Crash Reduction: 30-36%⁶

Cost Scale: \$\$



Source: www.pedbikeimages.org / Dan Burden

⁶ Elvik, R. and Vaa, T., "Handbook of Road Safety Measures." Oxford, United Kingdom, Elsevier, (2004). https://www.cmfclearinghouse.org/study_detail.cfm?stid=14.

Horizontal Deflection

On-Street Parking

Description and Key Safety Features:

The presence of parked cars narrows the available roadway width and can encourage drivers to slow down and be more cautious. Higher use of on-street parking can be encouraged by eliminating no parking zones.

Temporary vs. Permanent Considerations:

Paint may be used for a temporary or permanent installation. Additionally, materials such as large planters, barrels, or hay bales can be used to simulate parked cars.

Maintenance Considerations: Low

Impact on City Services: Low

Speed Reduction: 1-4 mph⁷

Crash Reduction: 52%⁸

Cost Scale: \$



Source: City of Hilliard
Location: Hilliard, OH



Source: Walkable City Rules by Jeff Speck

Horizontal Deflection

Curb Extensions/Bump Outs

Description and Key Safety Features:

A curb extension (or bump out) is a horizontal extension of the sidewalk into the street, resulting in a narrower roadway section. At an intersection, curb extensions can slow turning vehicles. At a crosswalk, curb extensions shorten the crossing distance for pedestrians and make them more visible to motorists.

Temporary vs. Permanent Considerations:

Temporary curb extensions can be constructed using materials such as paint, flex posts, planters, or straw wattles. Permanent curb extensions typically require new curbs and landscaping.

Maintenance Considerations: High

Impact on City Services: Medium

Speed Reduction: 1-4 mph

Crash Reduction: 15%⁹

Cost Scale: \$-\$\$\$



Source: www.pedbikeimages.org / Seth LaJeunesse



Source: www.pedbikeimages.org / Michael Austin

⁹ Federal Highway Administration, Crash Modification Factor for Corner Radius, Right-Turn Speed, and Prediction of Pedestrian Crashes at Signalized Intersections (Washington, DC: 2021) <https://doi.org/10.21949/1521692>.

Horizontal Deflection

Chicanes

Description and Key Safety Features:

A chicane is a series of alternating curves that require motorists to slow down to navigate the curved travel path. Chicanes are less effective when traffic volumes are significantly higher in one direction than the other or when traffic volumes are extremely low.

Temporary vs. Permanent Considerations:

Temporary chicanes can be constructed using materials such as paint, flex posts, planters, and plastic barricades. Permanent chicanes require new curbs and typically include landscaping as well. Signage should be installed in both temporary and permanent cases.

Maintenance Considerations: High

Impact on City Services: High

Speed Reduction: 3-9 mph

Crash Reduction: Unknown

Cost Scale: \$\$-\$\$\$



Source: Imagine Kalamazoo 2025

Location: Kalamazoo, MI



Source: Scott Wainwright

Horizontal Deflection

Chokers

Description and Key Safety Features:

A choker is a traffic calming device that narrows the roadway by using curb extensions. Chokers can allow two vehicles to pass through the choker side-by-side, or they can narrow the roadway so that opposing vehicles must take turns traveling through the choker.

Temporary vs. Permanent Considerations:

Temporary chokers can be constructed using materials such as paint, flex posts, and planters. Permanent chokers require new curbs and typically include landscaping as well.

Maintenance Considerations: Medium

Impact on City Services: Medium

Speed Reduction: 0-4 mph

Crash Reduction: Unknown

Cost Scale: \$\$-\$\$\$



Source: Transportation Alternatives / Michael Lydon



Source: Scott Wainwright

Horizontal Deflection

Traffic Circles

Description and Key Safety Features:

A traffic circle is a raised island in the middle of an intersection. Vehicles entering the intersection slow down to navigate around the circle. Large vehicles may have to turn left in front of the circle.

Temporary vs. Permanent Considerations:

Temporary traffic circles can be constructed using materials such as paint, flex posts, planters, plastic barricades, and parking stops. Permanent traffic circles typically include new curbs and landscaping. Signage should be installed in both temporary and permanent cases.

Maintenance Considerations: Medium

Impact on City Services: Medium

Speed Reduction: 4 mph

Crash Reduction: 39%¹⁰

Cost Scale: \$\$-\$\$\$



Source: Toole Design
Location: Denver, CO



Source: Toole Design
Location: Kirkland, WA

Horizontal Deflection

Median Islands

Description and Key Safety Features:

A median island is a raised island located along the street centerline that visually narrows the adjacent lanes. Median islands near neighborhood entrances provide a visual cue to slow down while entering the neighborhood.

Temporary vs. Permanent Considerations:

A temporary median island can be constructed using materials such as paint, flex posts and planters. Permanent median islands are typically constructed with concrete, and they require new curb and landscaping. At crosswalks, median islands require detectable warning surfaces. Signage should be installed in both temporary and permanent cases.

Maintenance Considerations: Medium

Impact on City Services: Medium

Speed Reduction: 0-9 mph

Crash Reduction: 0-44%

Cost Scale: \$\$\$



Source: Toole Design
Location: Seattle, WA

Other Vertical Elements

Street Trees

Description and Key Safety Features:

Street trees help create a “closed in” feeling along a street, causing motorists to slow down. They also provide other benefits, such as beautifying the area, providing shade for sidewalks, and cooling the neighborhood in the summer.

Temporary vs. Permanent Considerations:

N/A

Maintenance Considerations: Medium

Impact on City Services: Low

Speed Reduction: 1-6 mph

Crash Reduction: No change

Cost Scale: \$



Source: Toole Design
Location: Norfolk, VA

Note: Speed and crash reduction figures are based on studies for general landscaping.

Other Vertical Elements

Planter Boxes

Description and Key Safety Features:

Planter boxes can be used to create temporary installations of many different traffic calming countermeasures, such as chicanes, curb extensions, or traffic circles. They beautify a neighborhood and create an opportunity for community members to take ownership of their neighborhood by caring for the plants.

Temporary vs. Permanent Considerations:

Planter boxes are often used for temporary installations, but some planters may be appropriate for more permanent use.

Maintenance Considerations: High

Impact on City Services: Medium

Speed Reduction: 1-6 mph

Crash Reduction: No change

Cost Scale: \$

Note: Speed and crash reduction figures are based on studies for general landscaping.



Source: DC Department of Transportation (@DDOTDC on Twitter)

Other Vertical Elements

Flex Posts/Bollards

Description and Key Safety Features:

Flex posts can be used to create temporary installations of many different traffic calming countermeasures, such as chicanes, curb extensions, or traffic circles. Flex posts can help to narrow a roadway and provide visual cues to drivers that the roadway has changed.

Temporary vs. Permanent Considerations:

Flex posts are usually used in temporary installations because of their low cost and ease of installation. Bollards require less maintenance and may be used for more permanent installations.

Maintenance Considerations: High

Impact on City Services: Medium

Speed Reduction: 0-9 mph

Crash Reduction: 0-30%

Cost Scale: \$



Source: Toole Design

Location: Columbus, OH



Source: www.pedbikeimages.org / Dan Burden

Education and Enforcement

High Visibility Enforcement

Description and Key Safety Features:

High visibility enforcement involves officers stationed in a specific area to educate and train drivers. The public is alerted in advance (through the media) of where and when high visibility enforcement will take place. The officers do not focus on writing tickets, but instead focus on making drivers aware of safety issues.

Temporary vs. Permanent Considerations:

N/A

Maintenance Considerations: Low

Impact on City Services: Low

Speed Reduction: Unknown

Crash Reduction: Unknown

Cost Scale: \$\$

Note: The speed and crash reduction of high visibility enforcement depends on the individual agency's program details.



Source: Noteworthy Practice Booklet – Speed Management, ITE & FHWA
Location: Oro Valley, AZ