RESOLUTION NO. 2022- 366

RESOLUTION TO ADOPT THE USDOT "TOWARD ZERO DEATHS" INITIATIVE OF ZERO ROADWAY FATALITIES AND SERIOUS INJURIES AND TO ADOPT THE CUMBERLAND COUNTY BICYCLE AND PEDESTRIAN SAFETY ACTION PLAN

WHEREAS, the City of Vineland intends to adopt a goal of zero roadway fatalities and serious injuries, known as "Vision Zero" or "Toward Zero Deaths," by 2050 for the City; and

WHEREAS, the *Cumberland County Bicycle and Pedestrian Safety Action Plan* has been developed by committee to support the goal of zero roadway fatalities and serious injuries.

NOW THEREFORE BE IT RESOLVED that the City of Vineland hereby adopts the "Toward Zero Deaths" initiative and commits to develop the tools to help strengthen the community's approach to roadway safety and save lives; and

BE IT FURTHER RESOLVED that the City of Vineland does adopt and commit to the eventual goal of zero roadway fatalities and serious injuries in the City; and

BE IT FURTHER RESOLVED that the City of Vineland hereby adopts the *Cumberland County Bicycle and Pedestrian Safety Action Plan*.

Adopted:

_____
President of Council

ATTEST:

_____
City Clerk

Recorded Vote

AYE	NO	ABSTAIN	ABSENT

The forgoing is a true copy of a resolution adopted by the governing body of the City of Vineland on _____

_____
City Clerk

CITY OF
VINELAND
WHERE IT'S ALWAYS GROWING SEASON

David J. Maillet, PE
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MEMORANDUM

August 25, 2022

TO: Bob Dickenson, Business Administrator

FROM: David J. Maillet, PE, City Engineer

RE: Chestnut Avenue Safety Improvements and Rehabilitation
City Eng. Project No.: 22-022

In order to move forward with grant application for the above referenced project, please have the two attached resolutions placed onto City Council Agenda for approval at their September 13, 2022 meeting. Deadline for the application is September 15, 2022.

One resolution formally adopts the State's "Towards Zero Deaths" initiative as well as the finalized "Cumberland County Bicycle and Pedestrian Safety Action Plan, 2022". The TZD initiative is an aspirational goal of zero road fatalities by 2050. The draft of the SAP was referenced in the resolution to support the road diet and substantive safety improvements for Chestnut Avenue last November.

The other resolution is approval to make the application for $20,000,000 implementation funding with a $5,000,000 local match through the Safe Streets and Roads For All funding.

This new source of funding specifically provides funding for creation of Safety Action Plans and for implementation of those plans. To my knowledge, in New Jersey, there are only a handful of Safety Action Plans that have been finalized and the City of Vineland is well positioned to get fully funded for this Safety Project.

Enc.(s)

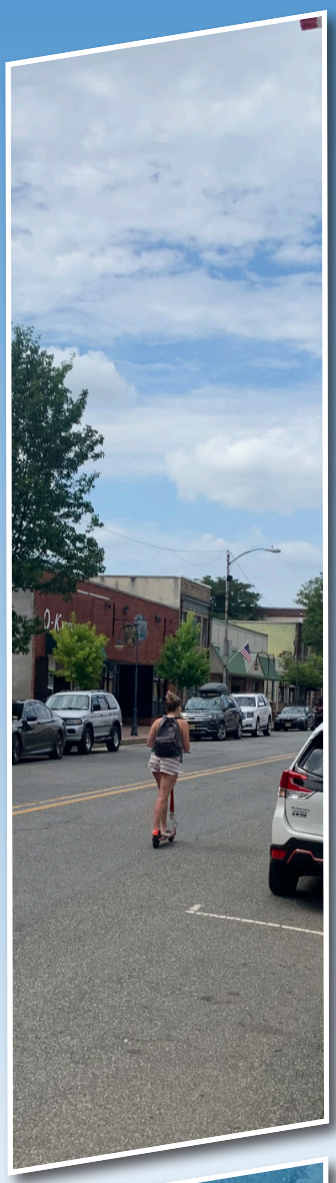
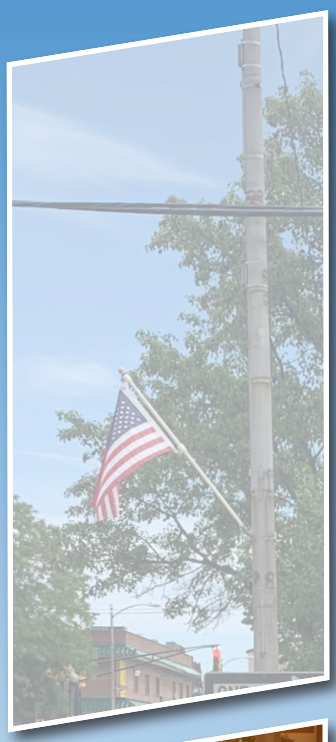
Cc: Mayor Fanucci (w/enc.)
Sue Baldosaro, CFO (w/enc.)

Cumberland County

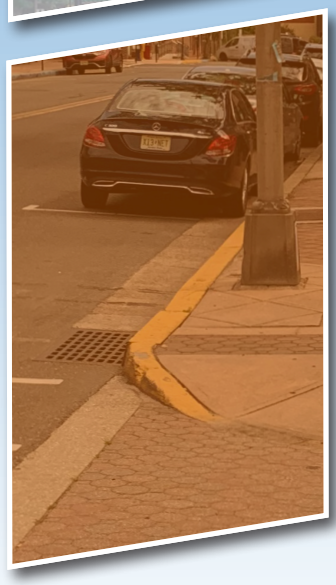
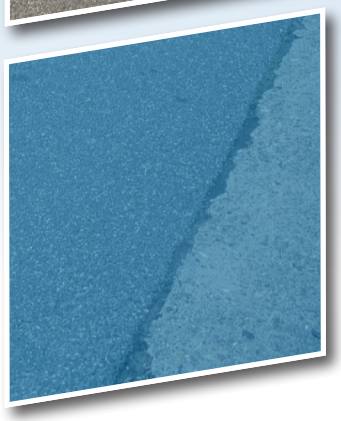
Bicycle & Pedestrian Safety Action Plan

2022





SJTPO
Cumberland County
BIKE PED
SAFETY ACTION PLAN

South Jersey Transportation Planning Organization 2022

South Jersey Transportation Planning Organization (SJTPO) Staff:

Executive Director: Jennifer Marandino, PE
Program Manager: Alan J. Huff
Public Outreach Coordinator: Melissa Melora

South Jersey Transportation Planning Organization

SJTPO Policy Board:

Chairman: Leonard Desiderio
Sea Isle City

Vice Chairman: Benjamin H. Laury
Salem County

Secretary/Treasurer: John W. Risley
Atlantic County

Cumberland County
George Castellini

City of Atlantic City
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New Jersey Transit
Louis Millan

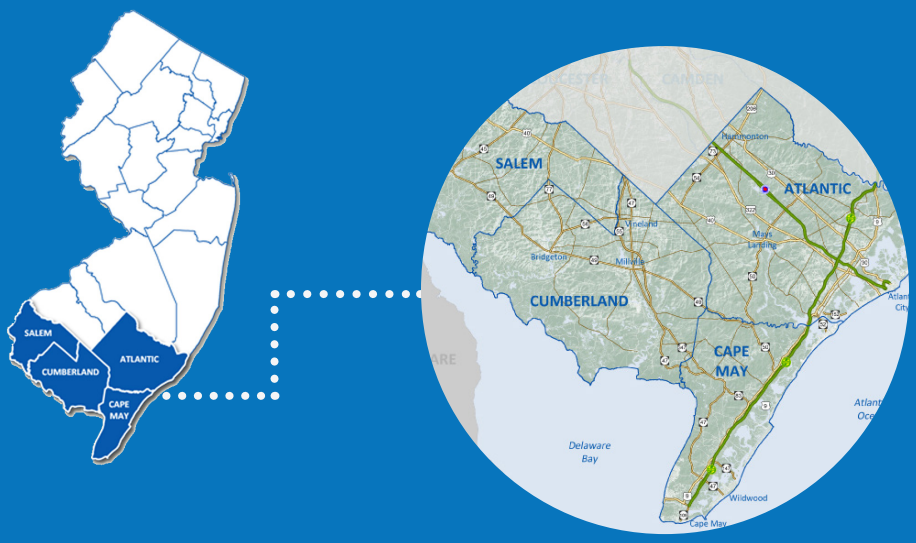
Cape May County
Gerald Thornton

City of Vineland
Anthony Fanucci

Alloway Township
P. Edward McKelvey

NJDOT
Sudhir B. Joshi

SJTA
Stephen Mazur



SJTPO Region serves...

68
Municipalities

4
Counties

588,786
People *(2020)*

Cumberland County Bike-Ped Safety Action Plan

Prepared for

South Jersey Transportation Planning Organization
782 South Brewster Road, Unit B-6
Vineland, NJ 08361

Cumberland County
164 West Broad Street
Bridgeton, NJ 08302

Prepared by

Urban Engineers, Inc.
220 Lake Drive East, Suite 300
Cherry Hill, NJ 08002

In association with:

FHI Studio
926 Haddonfield Road
Cherry Hill, NJ 08002

Civic Eye Collaborative
55 McCoy Avenue
Metuchen, NJ 08840

Special thanks to the members of the Steering Committee who guided the development of this plan:

Safety Action Plan Steering Committee:

City of Vineland
Kathleen Hicks
David Maillet
Rick Caudill
Stephanie Wakeley
Amy Holmes
Brian Myers

City of Millville
Samantha Silvers
Brian Prohowich
Wayne Johnson
Michelle Nothaft

City of Bridgeton
Kevin Rabago, Sr.

Cumberland County
John Knoop
Douglas Whitaker
Robert Brewer
Matthew Pisarski

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Executive Summary

Over the past two decades transportation experts have worked to make pedestrian and bicycle safety a top priority. This is in large part a response to the glaring reality that pedestrians and bicyclists are disproportionately killed or seriously injured in crashes throughout the United States and in the State of New Jersey. There has also been a change in the roles and responsibilities of transportation systems to not only account for motorists but to provide safe accommodations for all users including bicyclists, pedestrians, transit riders, and the mobility impaired. This paradigm shift seeks to address unintended consequences of previous auto-oriented development that have negatively impacted the safety of pedestrians and bicyclists by providing measures to address identified deficiencies.

"Bicycle and pedestrian crashes represent 2.9% of all crashes in Cumberland County but 21.6% of all fatal and serious injury crashes"

SJTPO, along with its agency partners NJDOT and FHWA have adopted a vision of eliminating all traffic-related death and serious injury crashes. This long-term vision will require time to change attitudes and behaviors, as well as physical improvements to the roadway system. To that end, this plan is recognized as a step towards achieving this aspirational goal as set forth in the 2020 New Jersey Strategic Highway Safety Plan and in the recent USDOT National Roadway Safety Strategy.

SJTPO acquired funding administered by NJDOT through the FHWA Highway Safety Improvement Program (HSIP) to initiate this project on behalf of its subregion. The purpose of this project is to develop a Bicycle and Pedestrian Safety Action Plan for Cumberland County. This Plan documents a number of action-oriented tasks geared towards advancing multiple data-driven bicycle and pedestrian projects via New Jersey's Local Safety Program, the federal Highway Safety Improvement Program (HSIP), and other potential funding sources.

Using a strategic, data-driven approach to prioritize locations with the greatest bicycle and pedestrian safety needs, projects have been developed that identify implementable countermeasures with demonstrated safety benefits for these locations. In addition, through this effort applications were prepared for New Jersey's Local Safety Program. Additional tasks for the project include developing a toolbox of bicycle and pedestrian countermeasures, conducting a series of Pedestrian Road Safety Audits, and engaging key stakeholders and members of the local community through multiple rounds of outreach to identify both project locations and appropriate countermeasures that are community supported.

Crash Analysis Results

Extensive analysis was conducted of five-year crash data (2012-2016) to determine crash attributes and patterns throughout Cumberland County. High crash locations were identified through a methodology that was developed to not only prioritize high bicycle and pedestrian crash locations but also locations where funds, such as HSIP could be implemented. Key findings from the crash analysis include the following:

Bike-Ped crashes were concentrated in the most populated centers of the County

- 91% of all bicycle and pedestrian crashes occurred in Bridgeton, Millville, and Vineland
- 27 of the Top 29 ranked bicycle and pedestrian locations were located entirely within Bridgeton, Millville, and Vineland

Top locations were predominantly corridors

- Corridors dominated the Top location lists as they had higher weighted crash values
- Many high-ranking intersections were located within high-ranking corridors

Highest-ranking locations were located in Environmental Justice/Limited English Proficient Communities

- Many locations had 2x the percentage of linguistically isolated households than the County average
- 93% of all Top 29 ranked high crash locations had community Demographic Index values within the State's 70th percentile.

Six behaviors contribute to most bike-ped crashes

- 1) Speed, 2) Distraction/Inattention, 3) Failure to Stop, 4) Lack of facilities for biking, walking, and crossing, 5) Improper turning maneuvers, 6) Failure to Yield

Action Items

- The Chestnut Avenue Corridor was identified as a top priority in this effort but was not able to be immediately advanced due to funding constraints. Identify and secure funding to advance comprehensive safety improvements, including roadway reconfiguration along the Chestnut Avenue Corridor (see Appendix C).

- Five roadway corridors identified as top priorities were able to be advanced through this effort as applications for funding consideration through NJ's Local Safety Program, utilizing federal HSIP funding. Once approved SJTPO shall lead design assistance before projects are advanced to construction by local roadway owners.

- In partnership with local roadway owners conduct further study, identify funding sources, and advance bicycle and pedestrian-focused safety improvement projects for the remaining locations identified on the Top 29 list (see Appendix A)...

- Continue to coordinate with the Steering Committee to monitor crash data, implement and monitor the Cumberland County Bicycle & Pedestrian Safety Action Plan and conduct crash analysis for projects implemented using 3-year pre- and post-construction crash data.

- Advance safety strategies, including the FHWA proven safety countermeasures (Appendix J), across the remaining Top 29 list locations as well as across the roadway network, as appropriate.

- Conduct further study to identify criteria for bicycle and pedestrian systemic countermeasures to be advanced as standalone systemic projects as well as to be incorporated into all projects, including limited scope projects, such as repaving.

Introduction

Cumberland County is a rural county in the South Jersey Transportation Planning Organization's (SJTPO) region with three distinct urban centers – Vineland, Millville, and Bridgeton. These three cities contain over two-thirds of the County's 157,000 residents with the remainder of the County dominated by farmland, woodlands, preserved open space, and small villages. The rural nature of the County, combined with an abundance of natural resources and preserved land, tends to concentrate walking and biking trips within the three urban centers or along trail networks.

The Cumberland County Bicycle and Pedestrian Safety Action Plan looks at five years of crash data between January 1, 2012 to December 31, 2016. Within this five-year period there were 536 bicycle and pedestrian crashes in the County, of which 44 resulted in fatal and serious injury crashes. In total, there were 18,422 crashes in Cumberland County during this period with pedestrian and bicycle crashes representing 2.9% of all crashes. While bicycle and pedestrian crashes only represent a small portion of total crashes, they often are more severe and account for 21.6% of all fatal and serious injury crashes.

Therefore, the goal of the Plan is to address safety needs for cyclists and pedestrians in Cumberland County, New Jersey. The objective is to identify high-crash intersections and corridors on County and Local roadways then introduce countermeasures to improve safety. Project locations were evaluated using crashes within a five-year period (2012-2016).

Previous network screening efforts performed by the SJTPO and the New Jersey Department of Transportation (NJDOT) were first reviewed. These network screening lists identify and rank locations for safety improvement. Understanding that previous network screening efforts did not comprehensively capture most recent bicycle and pedestrian crash severity within the context of all crashes, a revised data-driven methodology was developed for screening locations within the County that followed the Highway Safety Manual (HSM) and current best practices.

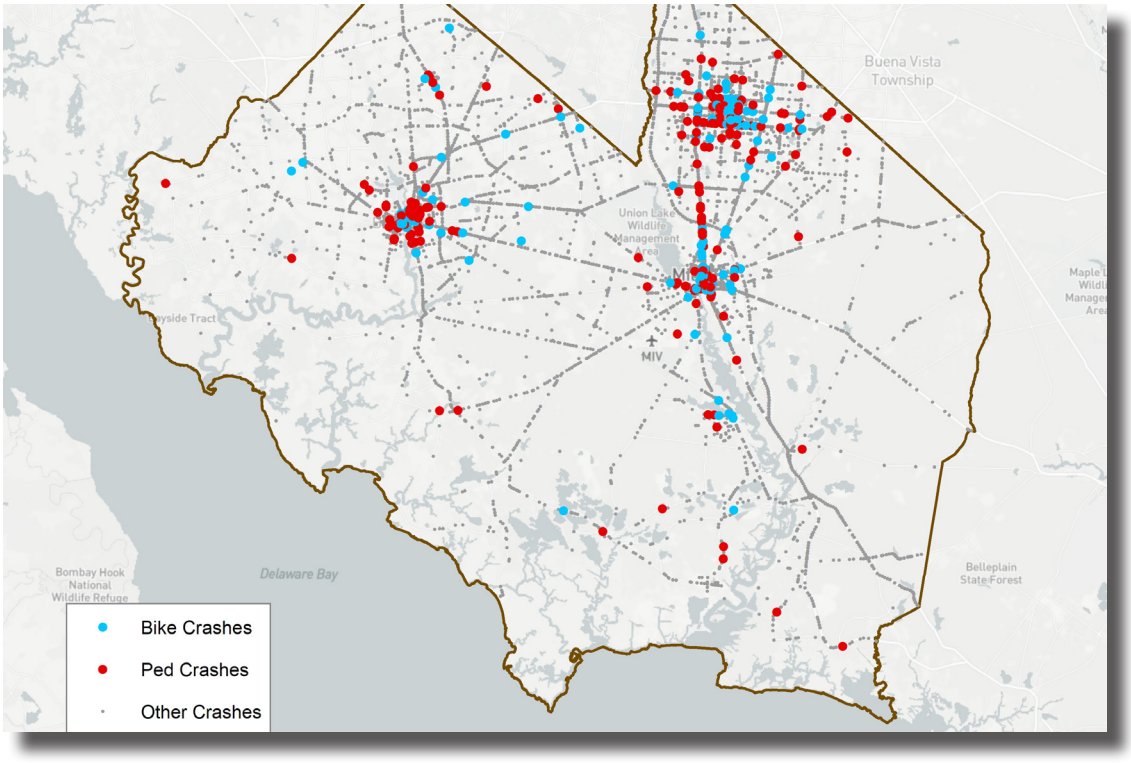
The revised screening criteria identifies intersections and corridors as high-crash locations using a data-driven screening process. This process was used to identify locations where Highway Safety Improvement Program (HSIP) funds and or other safety funds could be implemented.

Network Screening

The following describes the five step screening process and documents the criteria and methodology used to identify high-crash locations with a focus on bicyclists and pedestrians. As a result of this process, a list of candidate intersections and corridors were developed for SJTPO, County, and Municipal review (See Appendix A).

The process to identify safety projects includes the following steps:

1. **Identify Intersections and Corridors – Define and identify intersections and corridors in Cumberland County.**
2. **Initial Screening – Intersections and corridors were weighted and ranked based on the number and severity of bicycle and pedestrian crashes. Crashes were summarized via lists and using ArcGIS Analysis Tools.**
3. **Location Selection – After the Initial Screening process, top candidate locations were identified for additional review with County and local stakeholders and the public. Corridor locations were selected by elected officials with this feedback.**
4. **Project Location Analysis – Selected locations were analyzed in detail. Including detailed crash record review, the development of crash diagrams, and conducting Road Safety Audits.**
5. **Countermeasure Selection and Refinement – Top candidate corridors were chosen for further evaluation and detailed engineering analysis including: Traffic Analysis, Highway Safety Manual (HSM) Analysis, and Concept Designs with Cost Estimates**



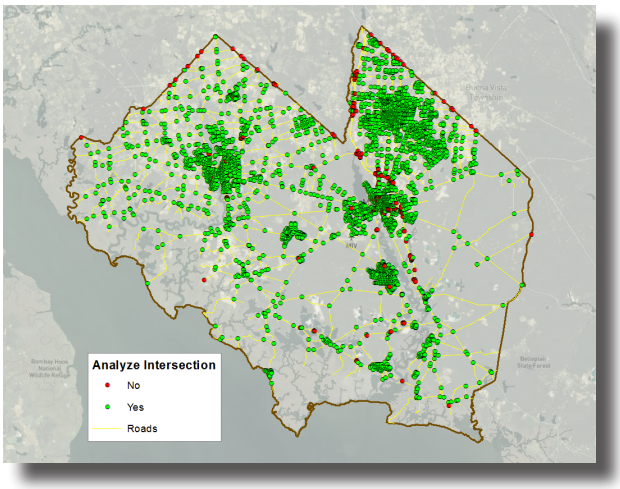
1. Identify Intersections and Corridors

NJDOT Roadway Data

Urban developed intersection and corridor datasets using NJDOT Straight Line Diagram Data. This data was obtained from the New Jersey Straight Line Diagrams Program, part of the Bureau of Transportation Data and Safety. The data was provided in a geodatabase format which contained linear roadway files and multiple data tables that could be plotted on the roadway network using Linear Referencing.

Intersection Points

The intersection points were created using a Geoprocessing (Intersect) function in ArcGIS. This process created a point at all locations where two roadway lines intersected resulting in 3,983 Geometric Intersections in Cumberland County.



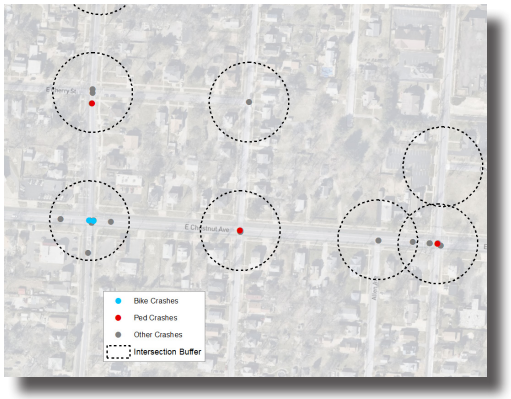
Intersection Processing

Geometric intersections were screened to produce the correct set of intersections for analysis. When a computer calculates intersections between two linear features, it creates points for all intersecting lines, without evaluating whether the location represents an actual roadway intersection. This simple intersect method produces a number of points at non-roadway intersections which needed to be identified and removed prior to crash analysis.

Examples of points that required removal:

- **Bridges, where one road passes over another**
- **Highway Ramp merges**
- **Turning movements in addition to the primary intersection**
- **Alleys**
- **Two-close intersections**

There were 320 intersection points in Cumberland County that were removed from the analysis set, leaving 3,663 intersections to be processed.

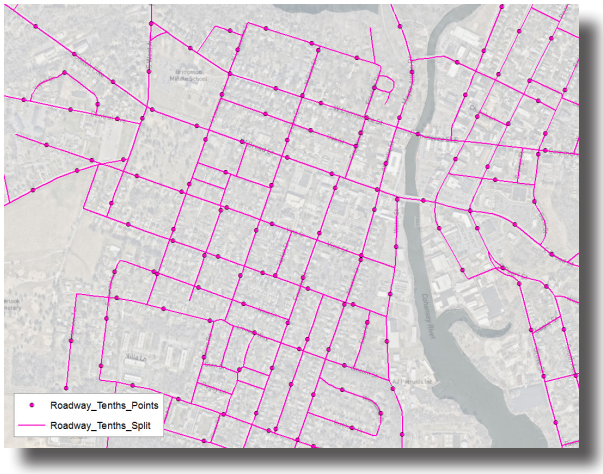


Intersection Buffer

A 125-foot buffer at each intersection point was chosen to represent crashes occurring at an intersection. Buffers around each intersection point were created using GIS. These buffers were used to select and summarize crashes occurring at each intersection.

Roadway Corridors

This project used one-mile segments to identify high-crash corridors in Cumberland County. The one-mile segment length was chosen to match and compare to previous safety studies conducted in the SJTPO region. The one-mile segment also provided a length compatible with NJDOT's Pedestrian Safety Management System (PSMS) analysis. In order to identify the highest one-mile segments in the county, a sliding scale analysis was performed.



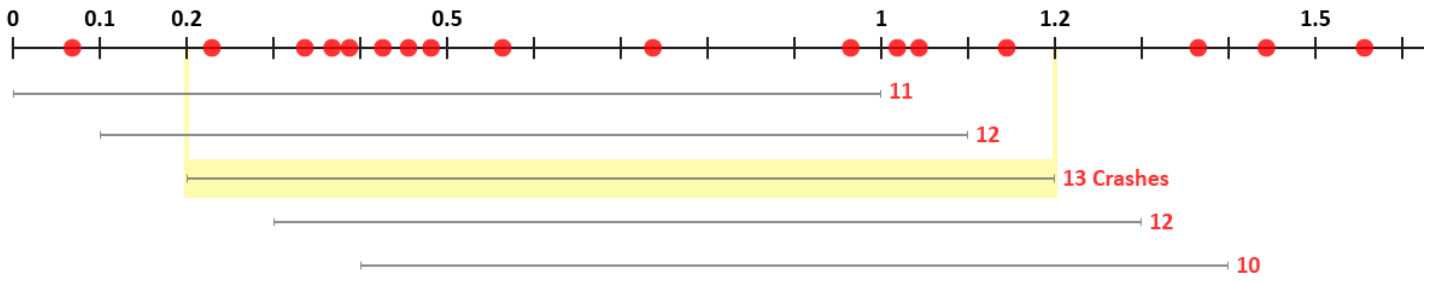
Corridor Processing – Sliding Scale Analysis

A sliding-scale analysis identifies high-crash corridors using limits that are not fixed, but rather slide along a route incrementally. The project team chose a segment length of one-mile, and an increment length of a tenth of a mile. To perform the sliding scale analysis, Urban plotted points at tenth of a mile increments, and then split the roadway network into tenth of a mile segments.

Within Cumberland County, there were 2,063 unique State Roadway Identifiers (SRIs), containing 1,347 miles of roadway. Dividing into tenth of a mile segments produced 14,157 segments; most were one tenth of a mile long, but others were smaller depending on the limits of the SRI.

These roadway tenth segments were then combined to form multiple overlapping one-mile segments. This method permits the identification of the highest one-mile segments by finding the combination of start and end mileposts that capture the highest number of crashes. These corridors were used to select and summarize the crashes occurring along the corridor.

The top ranked corridors contained overlapping segments sharing the same tenth increments. Therefore, an iterative method was used to rank a corridor and then exclude overlapping tenth segments before ranking the next highest corridor.



2. Initial Screening

Crash history was the initial screening criteria since the goal of this project is to find suitable projects to advance safety improvements. The preliminary screening process used the most recent five years of available crash data (2012-2016). Crashes were summarized for each intersection and corridor segment in the County.

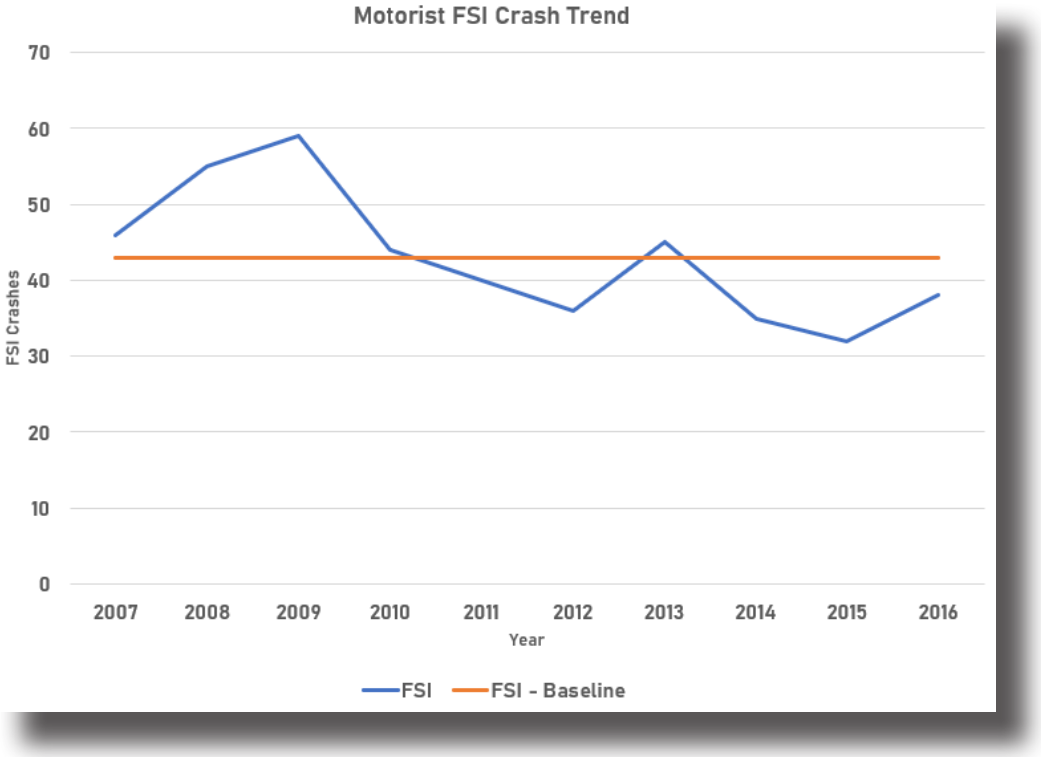
Crash Data

Crash data was obtained from NJDOT's Voyager application in a tabular format. The data was queried using Cumberland County and a five-year analysis period (2012 – 2016). The results of this query produced a crash dataset containing 18,410 reported crashes. The crashes were plotted in GIS as points.

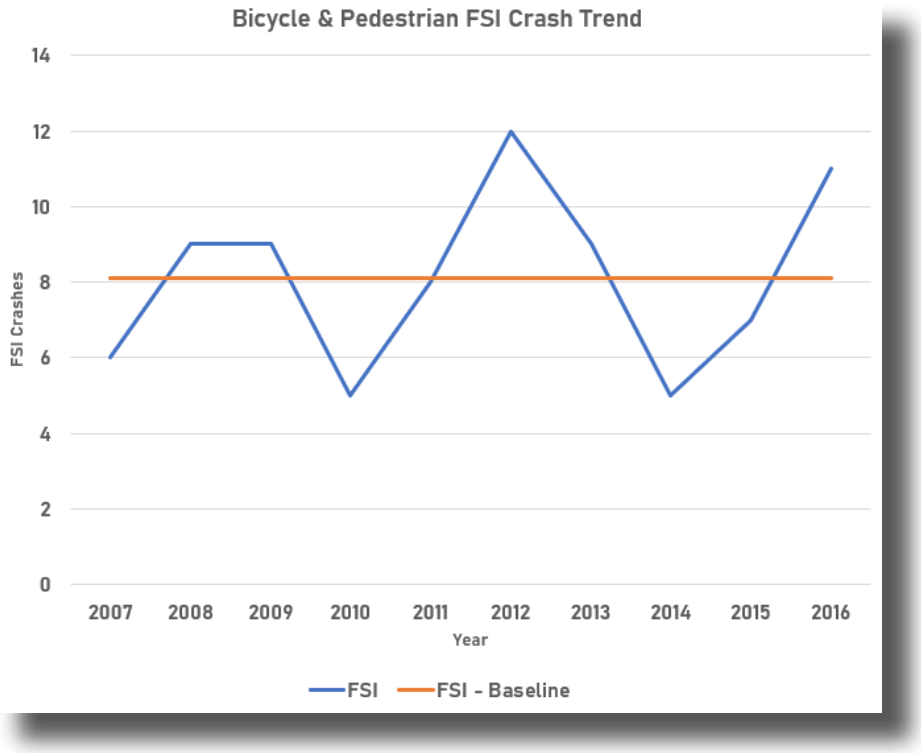
The intersection buffers and one-mile sliding scale corridors were used to summarize the crashes using a spatial join process in GIS.

Crash Trends

Crash history and baseline trends involving fatalities and serious injuries (FSI) were analyzed for Cumberland County using a ten-year analysis period (2007 - 2016). The results are shown below for both motorists and bicycle/pedestrians.



From 2007 to 2016 FSI motorist crashes reduced by 17%.



However, from 2007 to 2016 bicycle and pedestrian FSI crashes increased by 83%.

Bicycle and Pedestrian Focus

The purpose of this project is to identify solutions for intersection and corridor safety improvement projects, with an emphasis on improving bicycle and pedestrian safety. Crashes involving bicyclist or pedestrians received heightened scrutiny through dedicated tabulation and weighted crash severity so as to aid in the ranking and comparisons of locations. This method allowed for locations to be ranked by bicycle and pedestrian crash severity and or all crash severity.

Weighted Crash Severity

Crash severity is a critical factor to consider for any safety analysis. Crashes resulting in injuries or fatalities should receive increased examination during screening. Locations with high-severity crashes are the best candidates for safety improvement projects, and the best use of HSIP funds. Identifying and ranking locations based on severity requires the use of weighting factors. The state of New Jersey weighs Fatal and Incapacitating injuries the same (K=A, see the Highway Safety Manual KABCO Scale). The severity weights established by NJDOT and used by SJTPO area as follows:

Severity Calculation (K=A)

- **Fatal & Incapacitating × 29.17**
- **Moderate Pain × 10.67**
- **Pain × 6.06**
- **Property Damage Only × 1**

Highway Safety Manual KABCO Scale

- **K – Fatal**
- **A – Serious Injury**
- **B – Moderate Injury**
- **C – Compliant of Pain**
- **O – No injury***

**Property damage under $500 is not eligible for this designation*

Results

Following GIS processing, the project team had intersection and corridor crash summaries for the entire county. Lists were first ranked by crash severity for bicycle and pedestrian crashes, followed by crash severity for all crashes, and then the total number of crashes. Crash summaries were used to sort candidate intersections and corridors for review.

The results of the initial screening were presented to project stakeholders. Comments about each

								Bike/Ped		All	
Top 25	Rank	Type	Type_Rank	Municipality	Location	SRI	Jurisdiction	K=A	Crashes	K=A	Crashes
1	1	Corridor	C-1	Vineland City	Chestnut Avenue	06141029__	Municipal	97.38	14	900.1	276
1a	8	Intersection	I-1	Vineland City	Chestnut Ave & East Ave	06141029__ & 06141025__	Municipal	46.90	4	279.2	90
1b	16	Intersection	I-3	Vineland City	Melrose St & Chestnut Ave	06141331__ & 06141332__ & 061	Municipal	33.01	4	62.2	18
2	2	Corridor	C-2	Millville City	High Street	06101010__	Municipal	95.61	16	513.8	188
2a	36	Intersection	I-13	Millville City	High St & Broad St	06101010__ & 06101015__ & 061	Municipal	23.79	4	79.8	25
2b	37	Intersection	I-14	Millville City	High St & Mcneal St	06101010__ & 06101271__	Municipal	22.79	3	50.0	15
3	3	Corridor	C-3	Vineland City	East Avenue	06141025__	Municipal	80.36	8	508.5	179
4	4	Corridor	C-4	Vineland City	Park Avenue	00000540__	Municipal	55.96	8	562.4	208
4a	18	Intersection	I-4	Vineland City	Park Ave & East Ave	00000540__ & 06141025__	Municipal	30.17	2	94.6	31
5	5	Corridor	C-5	Millville City	Fourth Street	06101237__	Municipal	52.51	5	228.0	71
5b	19	Intersection	I-5	Millville City	Sassafras St & 4th St	06101265__ & 06101237__	Municipal	30.17	2	33.2	5
6	6	Corridor	C-6	Millville City	Third Street	00000555__	Municipal	50.51	3	409.8	152
7	7	Corridor	C-7	Vineland City	Seventh Street	06141362__	Municipal	49.58	10	366.7	119
8	9	Corridor	C-8	Bridgeton City	Irving Avenue	00000552__	County	46.58	7	361.0	171
9	10	Corridor	C-9	Bridgeton City	Atlantic Street	06011182__	Municipal	39.52	5	121.7	48
10	12	Corridor	C-11	Vineland City	Oak Road	06000681__	County	35.23	2	322.2	93
11	13	Corridor	C-12	Bridgeton City	Grove Street	06000609S_	County	35.23	2	116.3	38
12	14	Corridor	C-13	Vineland City	South East Boulevard	06000615S_	Municipal	33.46	4	289.2	89
13	15	Intersection	I-2	Millville City	High St & Sharp St	06101010__ & 06000667__ & 0	County	33.46	4	120.3	31
14	17	Corridor	C-14	Bridgeton City	Laurel Street	06011181__	Municipal	30.85	6	148.4	84
15	31	Corridor	C-19	Millville City, Commercial Township	East Buckshutem Road	06000670__	County	27.40	3	185.0	49
16	32	Corridor	C-20	Vineland City	Chestnut Avenue	06141029__	Municipal	26.24	6	665.0	231
17	33	Corridor	C-21	Bridgeton City	Commerce Street	06000670__	County	24.79	5	170.9	71
18	34	Corridor	C-22	Bridgeton City, Upper Deerfield Township	North Laurel Street	06000606__	County	24.24	4	258.4	106
19	38	Corridor	C-24	Millville City	Oak Street	06101251__	Municipal	22.34	3	130.4	42
20	39	Corridor	C-25	Millville City	Fifth Street	06101229__	Municipal	22.34	3	114.5	45
21	40	Corridor	C-26	Vineland City	Almond Street	06141359__	Municipal	22.34	3	104.8	45
22	41	Corridor	C-27	Vineland City	Fourth Street	06141348__	Municipal	21.34	2	283.9	104
23	42	Corridor	C-28	Vineland City	Brewster Road	06000672__	County	20.18	5	282.5	121

3. Location Selection

location were collected during a series of meetings with stakeholders and outreach to the public. Through this process the list of candidate high-crash locations were narrowed down to prioritize for further analysis through the subsequent steps in the network screening process.

State Routes Removed from lists

State Routes were included in the preliminary analysis. The results were provided to SJTPO and NJDOT to assist with future studies. Since the objective of the Bicycle and Pedestrian Safety Action Plan is to improve safety on County and Local roadways, only those roadways were advanced in this study.

County Review (July 2018)

Cumberland County and SJTPO reviewed the first set of lists in July of 2018. 25 Intersections and 56 corridors were provided for review. The County Engineer provided comments that some of the locations had recent construction. They noted that some of the improvements should remove the candidates from consideration for safety improvement projects. 7 Corridors and 2 intersections were removed from the list due to recent or planned improvements and constraints that would prevent substantive safety improvements.

SJTPO Review with Municipalities (August & September 2018)

SJTPO held meetings with Vineland City, Millville City, and Bridgeton City in the summer of 2018. 49 Corridors and 23 intersections were discussed during these meetings. Three candidates (2 Corridors and 1 intersection) were removed from future consideration due to planned improvement projects.

Steering Committee Meeting #1 (October 2018)

In Fall of 2018, the first Steering Committee meeting was held. The purpose of this meeting was to convene stakeholders representing the County, NJDOT, FHWA, Vineland, Millville, and Bridgeton to discuss the Plan's scope, schedule, and deliverables. During the meeting 45 Corridors and 22 intersections were discussed. Ultimately, the Top 29 locations were identified through this meeting and advanced for public feedback, of these 29 locations 22 were Corridors and 7 intersections (see Appendix A). Additional information was provided by Steering Committee members on appropriate venues and strategies to consider when conducting outreach with communities.

Public Outreach – Round 1 (Fall & Winter 2018/2019)

In lieu of formal public workshops, Round 1 outreach activities consisted of an online mapping tool, and a series of pop-up or in-person outreach events at public locations in Vineland, Millville, and Bridgeton. The purpose of the online mapping tool and pop-up outreach events was to obtain input from the public on the Top 29 candidate locations; namely which locations should be prioritized for improvement and to obtain general feedback on bicycle and pedestrian safety issues as well as ideas on how to make biking and walking safer in Cumberland County. As a result of the feedback received the Top 29 list was narrowed down to a list of priority candidate safety locations. These priority locations were then presented to public officials and approved for further analysis via Resolutions of Support. See Public Outreach section for further information.

Note: Ultimately, six corridors were approved for further analysis. These Top 6 locations were entirely made up of corridors. Corridors dominated the Top location lists as they had higher weighted crash values. In addition, many high-ranking intersections were located within the high-ranking corridors.

4. Project Location Analysis

Pedestrian Road Safety Audits

The next step in the Plan's five-step project location screening process were to conduct a series of Pedestrian Road Safety Audits (PRSAs) for each of the identified Top 6 candidate locations. This task was necessary to bring together a multidisciplinary team of local, county, state and regional agencies and subject matter experts to 1) conduct a first-hand evaluation of existing conditions at candidate locations, and 2) work together to identify safety concerns and develop initial improvement recommendations. PRSA results were critical to evaluating the suitability of the candidate corridors for safety improvement projects. Further information regarding the PRSAs can be found in Pedestrian Road Safety Audit section.

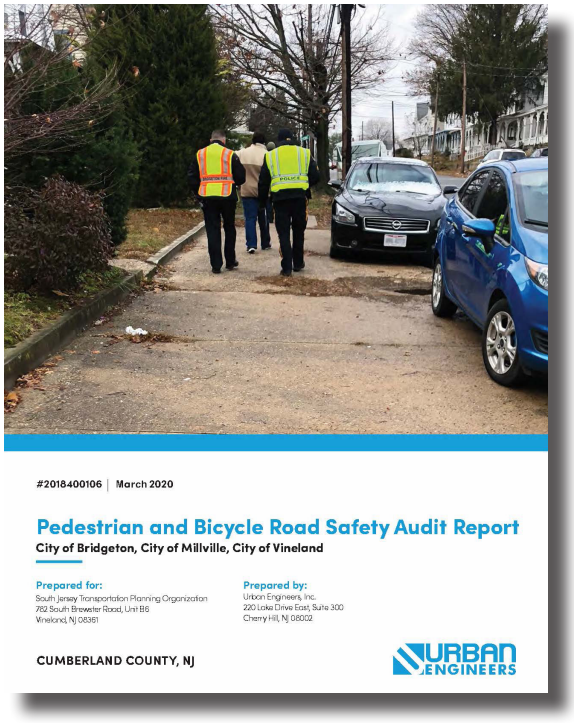
The project team also used additional criteria to evaluate the suitability of identified corridors for safety improvement projects. The following types of information was collected and analyzed to aid in the selection of projects for safety improvements:

Traffic Volumes
- **Average Daily Traffic (ADT)**

Municipal and Stakeholder Support
- **Meeting with County and Municipal representatives**

Roadway Characteristics and Geometry
- **Dimensions & Radii**
- **Typical Sections**

Environment - Area and Land Use Considerations
- **Pedestrian and Bicycle activity**
- **Right-of-way Impacts and Constraints**
- **Land Use**
- **Transit**
- **Environmental/Historic Resources Considerations**
- **Utility Impacts and Constraints**



Construction Cost/ Cost Estimate

1. **Initial cost of countermeasures – Includes all construction/implementation costs (capital, materials, labor, ROW, etc.)**
2. **Service Life (years) – The expected Life Span, in years, of each countermeasure before replacement is necessary.**
3. **Annual Maintenance – The cost to maintain and/or operate each countermeasure each year.**
4. **Salvage Value – The remaining value, if any, at the end of the system life of the countermeasure.**

Symbol	Meaning	Definition
✔	*Limited safety benefit potential*	
✔✔	*Limited to moderate safety benefit potential*	
✔✔✔	*Moderate safety benefit potential*	
✔✔✔✔	*High safety benefit potential*	
$	*Low cost*	*Could be accomplished through maintenance*
$$	*Medium cost*	*May require some engineering or design and funding may be readily available*
$$$	*High cost*	*Longer term; may require full engineering, ROW acquisition and new funding*
◔	*Short term*	*Could be accomplished within 1 year*
◑	*Medium term*	*Could be accomplished in 1 to 3 years; may require some engineering*
◕	*Long term*	*Could be accomplished in 3 years or more; may require full engineering*

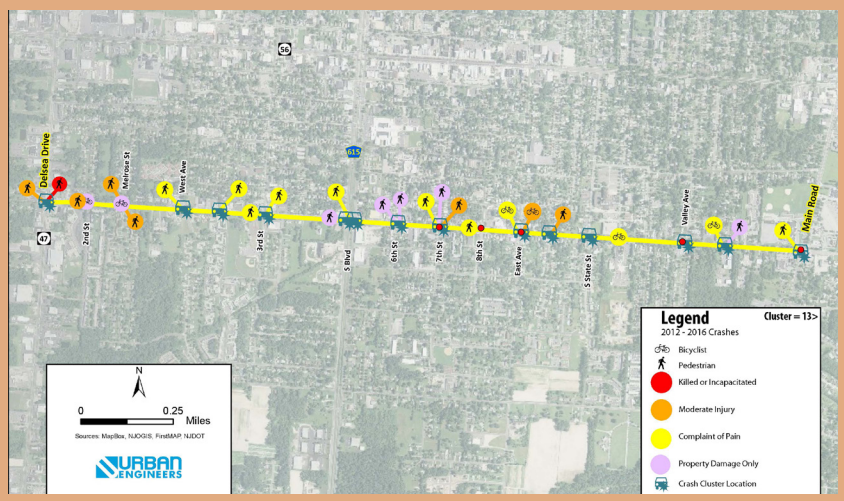
5. Countermeasure Selection and Refinement

The following corridors were ultimately selected for concept development and to prepare for applications for New Jersey's Local Safety Program.

- **Vineland – Chestnut Avenue (MP 0.24 to MP 2.30)**
- **Vineland – East Avenue (MP 0.76 to MP 1.69)**
- **Millville – High Street (MP 0.00 to MP 0.99)**
- **Millville – 3rd Street/Wheaton Avenue (CR 555) (MP 10.05 to 10.83)**
- **Bridgeton – Irving Avenue (CR 525) (MP 0.07 to MP 1.14)**
- **Bridgeton – Atlantic Street (MP 0.06 to MP 0.90)**

Chestnut Avenue (MP 0.24 to MP 2.30) – Was identified through the networking screening process as the #1 highest crash severity location in Cumberland County. A Pedestrian Road Safety Audit was conducted on December 5, 2019 to identify safety issues and potential solutions. However, the cost and magnitude of proposed solutions exceeded that of SJTPO's Local Safety Program budget. As such a detailed analysis was not completed for this corridor. This corridor is a priority of SJTPO and the City of Vineland due to its extensive history of serious injury and fatal crashes. Funding sources are being explored by the City of Vineland, SJTPO, and other agency partners to progress substantive safety improvements within this corridor.

Refer to Appendix C for materials related to Chestnut Avenue analysis and public outreach.



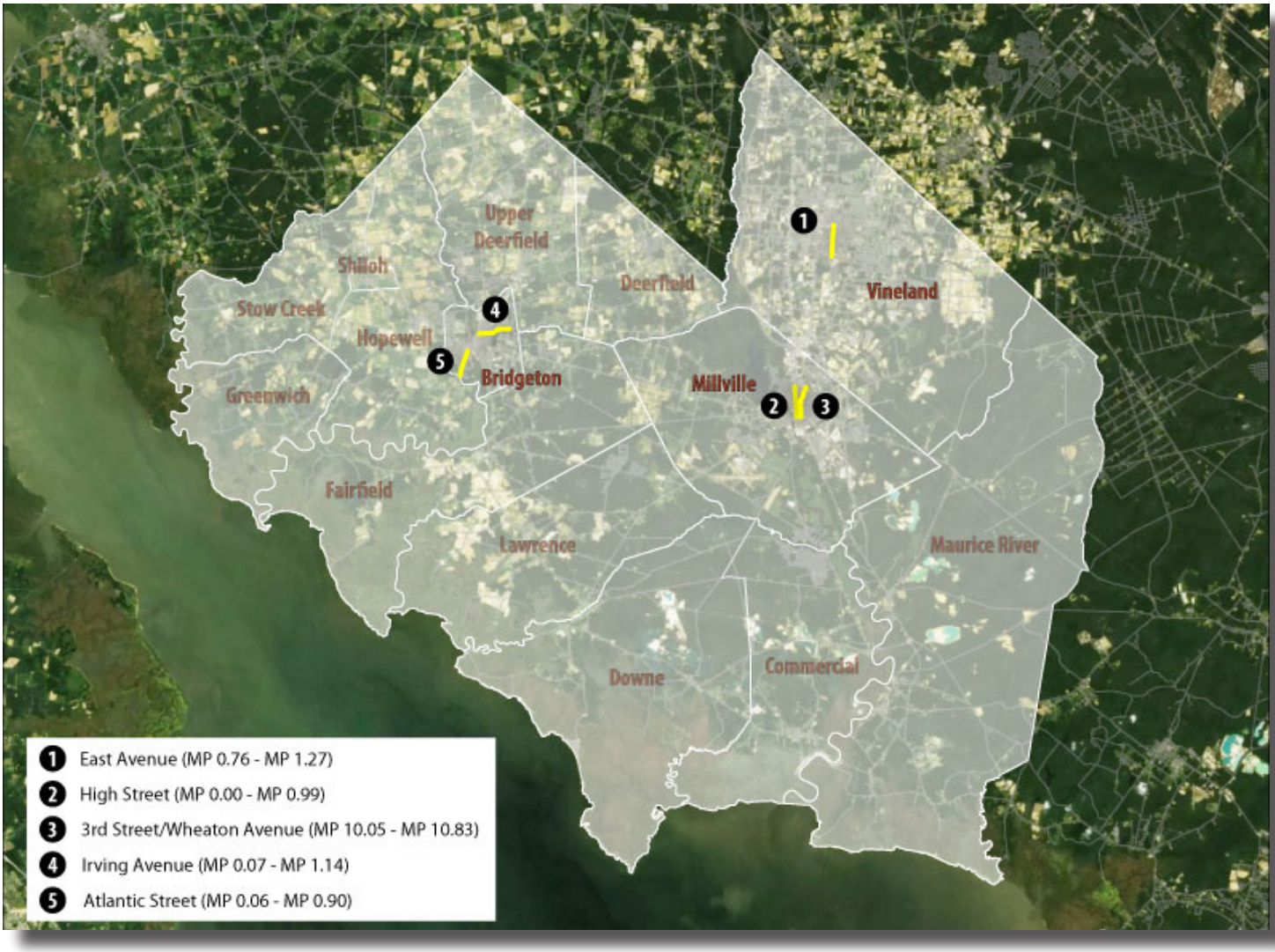
The last step in the network screening process was to evaluate the selected Top 5 safety locations using the Highway Safety Manual (HSM), which provides the tools needed to conduct qualitative and quantitative safety analyses and improves decision making based on safety performance and predicted cost benefit ratio. HSM memos were prepared in coordination with NJDOT to communicate predicted crash reduction.

Public Outreach – Round 2 (Fall & Winter 2020/2021)

Before concepts were developed a robust second round of Public Outreach was conducted, both in Spanish and English, to obtain feedback from the public on safety countermeasures that could be implemented at the Top 5 safety locations. Feedback received during this round of public outreach were presented to Steering Committee members to solicit endorsement of countermeasures and formal Resolutions of Support.

Further information can be found in Public Outreach section.

Final Safety Locations advanced for Concept Development



Equity

Socio-economic and demographic census data mapping revealed high percentages of Environmental Justice (EJ) populations and underserved communities within Cumberland County. Therefore, a strong emphasis was placed on engaging EJ populations and advancing projects in communities that are overburden by crash impacts and underserved by their existing transportation network.

The project team coordinated with the Steering Committee to determine best methods to equitably engage with their communities. It was determined that the public outreach approach would include the following equity tools and considerations:

- **Translation of project materials; providing interpretation at meetings**
- **Hold meetings at transit and ADA accessible locations**
- **Hold meetings at community centers or other known locations within the community**
- **Hold meetings over the course of several hours to accommodate shift employees**
- **Provide activities for kids at meetings**
- **Conduct in-person outreach at cultural events, community centers, seniors centers, etc.**

See Public Outreach section for more information on efforts.

Demographic Index

A wide range of demographic descriptors have been used by researchers and in EJ screening tools to represent the "social vulnerability" characteristics of a disadvantaged population. The 2020 New Jersey SHSP requires the Demographic Index as a baseline analysis indicator for determining EJ communities as denoted under Executive Order 12898.

Executive Order (EO) 12898, addressing EJ issues, refers to low-income and minority populations. We define these two core factors as:

- **Low-Income:** **The number or percent of a block group's population in households where the household income is less than or equal to twice the federal "poverty level."**
- **Minority:** **The number or percent of individuals in a block group who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino. That is, all people other than non-Hispanic white-alone individuals. The word "alone" in this case indicates that the person is of a single race, since multiracial individuals are tabulated in another category – a non-Hispanic individual who is half white and half American Indian would be counted as a minority by this definition.**

The Demographic Index in USEPA's EJSCREEN Tool is created using the two demographic indicators that were explicitly named in EO 12898, low-income and minority. For each Census block group, these two indicators are simply averaged together. The Demographic Indexes count each indicator as adding to overall potential susceptibility of the population in a block group, and assumes the demographic indicator have equal and additive impacts.

EJSCREEN

EJSCREEN uses demographic factors as very general indicators of a community's potential susceptibility to the types of environmental factors included in this screening tool, as explained further in the EJSCREEN Technical Documentation. EJSCREEN has been designed in the context of EPA's EJ policies, including EPA's Final Guidance on Considering Environmental Justice During the Development of an Action. That guidance document explained EPA's focus on demographics as an indicator of potential susceptibility to environmental pollution.

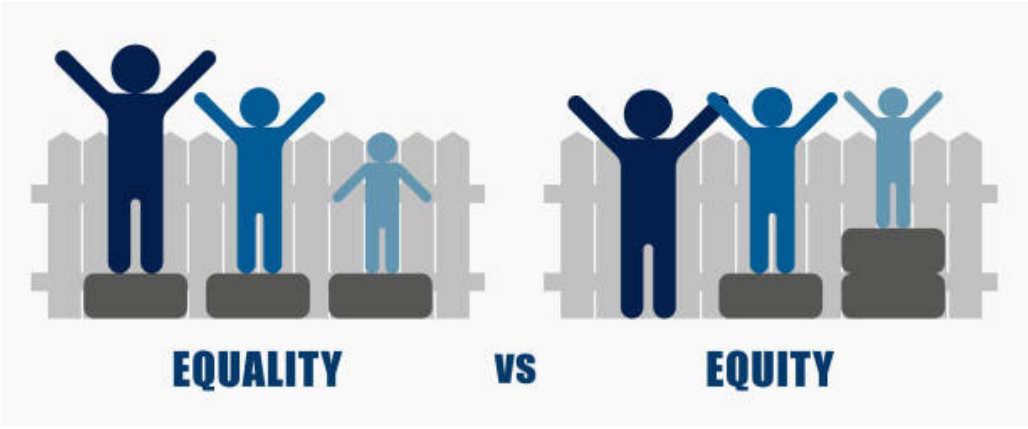
Altogether EJSCREEN includes seven demographic indicators and a demographic index:

- **People of color:** **The percent of individuals in a block group who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino. That is, all people other than non-Hispanic white-alone individuals. The word "alone" in this case indicates that the person is of a single race, not multiracial.**
- **Low-income:** **The percent of a block group's population in households where the household income is less than or equal to twice the federal "poverty level."**
- **Unemployment rate:** **The percent of a block group's population that did not have a job at all during the reporting period, made at least one specific active effort to find a job during the prior 4 weeks, and were available for work (unless temporarily ill).**
- **Linguistic isolation:** **Percent of people in a block group living in linguistically isolated households. A household in which all members age 14 years and over speak a non-English language and also speak English less than "very well" (have difficulty with English) is linguistically isolated.**
- **Less than high school education:** **Percent of people age 25 or older in a block group whose education is short of a high school diploma.**
- **Under age 5:** **Percent of people in a block group under the age of 5.**
- **Over age 64:** **Percent of people in a block group over the age of 64.**

EJSCREEN includes an index that is based on the above demographic indicators:

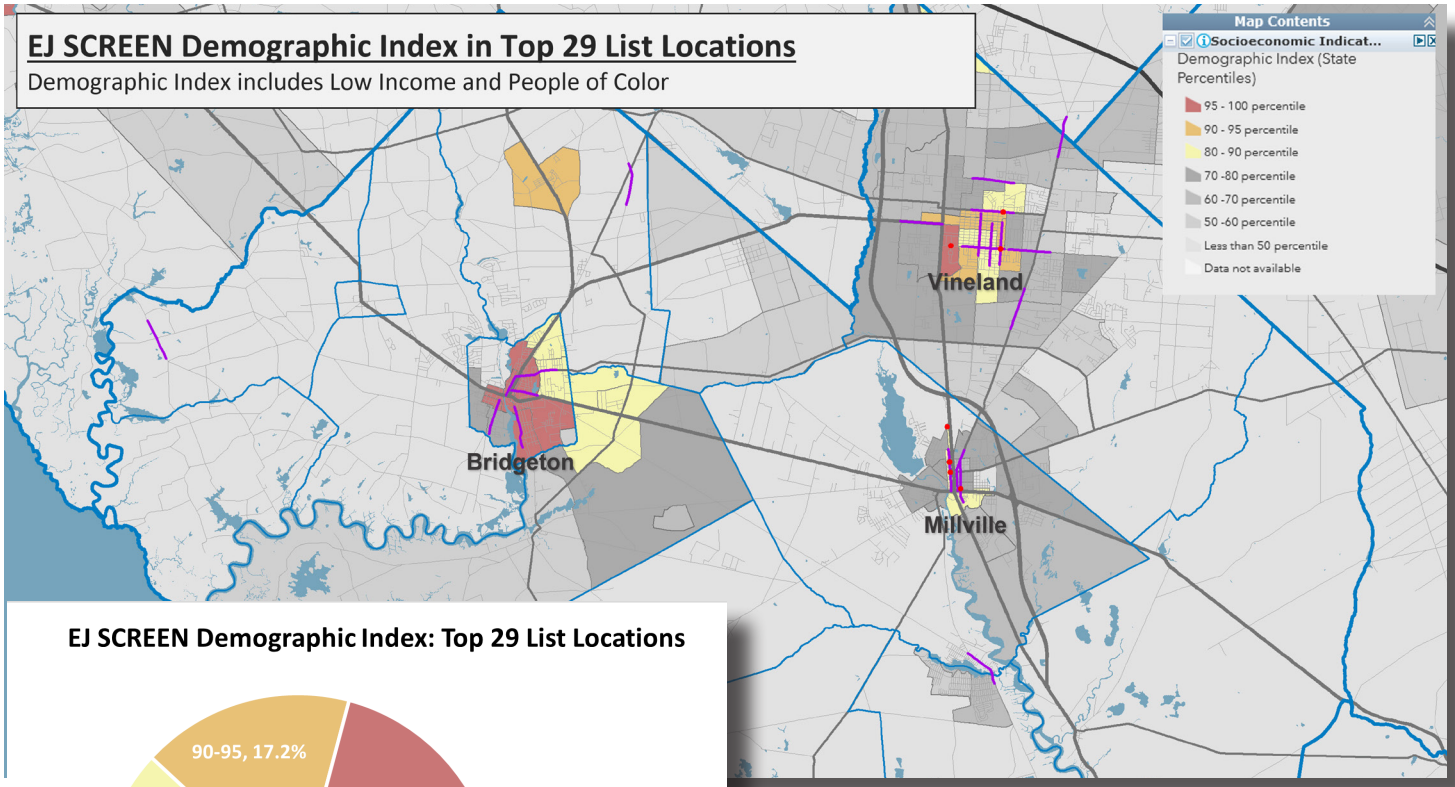
- **Demographic Index is based on the average of two demographic indicators; low-income and people of color.**

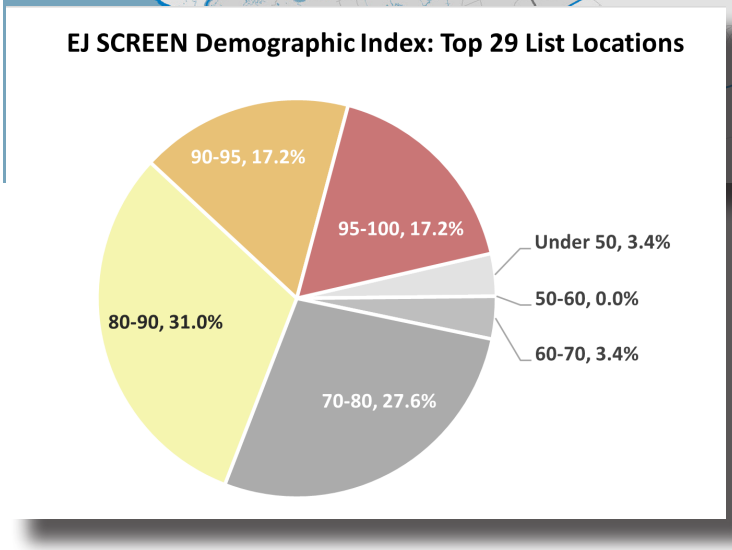
For more details on EJSCREEN please visit https://www.epa.gov/ejscreen.



From an equity perspective, the safety improvements proposed and supported through the Cumberland County Bicycle and Pedestrian Safety Action Plan are reparative in nature - focused on addressing issues from outdated design that prioritized automobile movement over the needs of nearby residents. Design improvements prioritize speed reduction, provision of pedestrian access, as well as improving the visibility of pedestrians within Cumberland County.

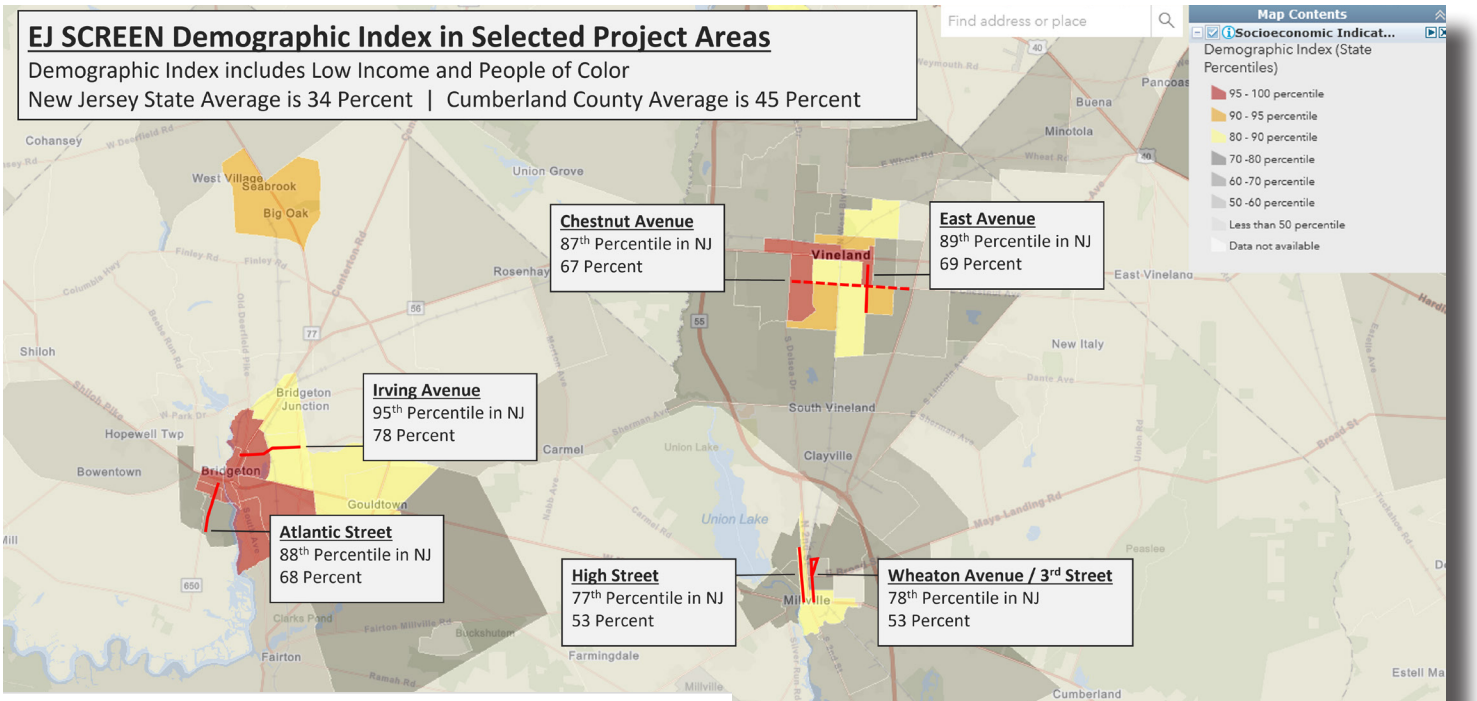
Top 29 - EJSCREEN Analysis Results

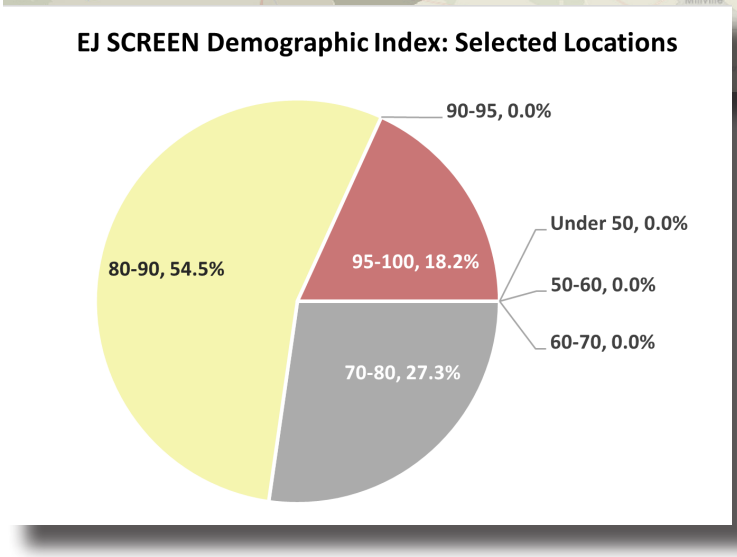




Approximately, 93% of the Top 29 List locations have a Demographic Index value of 70 percentile or higher, indicating a higher percentage of low-income and people of color than 70 percent of areas in New Jersey.

Top 6 - EJSCREEN Analysis Results





All of the six selected locations have a Demographic Index value of 70 percentile or higher, indicating a higher percentage of low-income and people of color than 70 percent of areas in New Jersey. All of these projects immediately serve areas where over 50 percent of the population is low-income or people of color.

Public Outreach

Essential to planning community supported improvements is meaningful public involvement and proactive engagement that achieves consensus among a diverse set of stakeholders. SJTPO is committed to promoting transportation improvements needed in the region and project development, while keeping the public engaged in the planning process. SJTPO also actively seeks to provide a transparent process that considers the needs of groups traditionally not well-served by existing transportation system. SJTPO's EJ Report recommends strategies to target outreach events in areas that are accessible to these underserved groups and tailor messaging and communication methods to try and maximize equitable access for these populations.

A central theme in the Cumberland County Bicycle and Pedestrian Safety Action Plan is public involvement and outreach. During the project's first round of public outreach, people informed the project team on their traveling experiences, in particular regarding bicycle and pedestrian safety in Cumberland County. Public outreach events throughout the County were conducted by transportation experts, these events included display boards highlighting high-crash locations. In addition to the events, an online website was created for the public to submit comments regarding bicycle pedestrian safety and map specific locations of concern. The comments and feedback provided by the public during Round 1 were combined with the technical analysis of the crash data and resulted in the decision to select six (6) high-crash corridors to become the focus of the project; crash corridors in Bridgeton, Millville, and Vineland.

A robust and comprehensive public outreach approach was developed in coordination with local, county, and regional partners that complied with the goals of the SJTPO Public Involvement Plan (PIP). This approach included two separate rounds of public outreach and deployed numerous tools and techniques both in English and Spanish.

Bicycle and Pedestrian Toolbox

Cumberland County is dominated by farmland, woodland, and small villages. With the exception of the three urban centers – Vineland, Millville, and Bridgeton biking and walking infrastructure can be sparsely seen. To improve bicycle and pedestrian safety in Cumberland County requires a thoughtful and strategic approach that includes targeted educational efforts. Tools were developed to explain how countermeasures are intended to function and address common misconceptions. This toolbox included informational videos and a packet that explain benefits of countermeasures, typical costs, and local New Jersey examples were countermeasures have been successfully implemented.

Videos

Short informational videos were developed in both English and Spanish that covered the following topics:

- Project Overview
- Pedestrian Hybrid Beacon
- Leading Pedestrian Interval
- Pedestrian Crossing Island
- Bike Lanes
- Curb Extensions
- High Visibility Crosswalks

YouTube **Note: Videos can be found on SJTPO's YouTube channel – link here**

Toolbox Sheets

Informational one-page sheets were developed that covered the following countermeasures:

- Pedestrian Crossing Islands
- Pedestrian Hybrid Beacons
- Road Diets
- Leading Pedestrian Intervals
- Corridor Access Management
- Walkaways
- Roundabouts
- High-Visibility Crosswalks
- Curb Extensions
- Rectangular Rapid-Flashing Beacon
- Street Lighting
- Raised Pedestrian Crossings
- Bike Lanes


Pedestrian Crossing Islands

Description

Pedestrian crossing islands – also known as center islands or refuge islands – are raised islands placed in the center of the road that provide a refuge area for people who are crossing at intersections or midblock locations. They enable pedestrians to cross the road in two stages, i.e. crossing one direction of traffic, pausing in the island to wait for an adequate gap in opposing traffic, and then completing the crossing. This significantly reduces a pedestrian's exposure to vehicular traffic.

Applicability

Crossing islands are most effective when used on roadways with three or more lanes of traffic, inadequate visibility, excessive vehicle speeds, and/or high traffic volumes. Locations that may benefit from pedestrian crossing islands include:

- Mid-block or other un-signalized crossing locations
- Approaches to multi-lane intersections
- Transit stops or other pedestrian activity generators

Considerations

FHWA recommends that crossing islands are at least 4 feet wide and of adequate length to provide space for pedestrians to stand and wait for gaps in traffic before crossing. Crossing islands are often used in conjunction with other safety countermeasures including high-visibility crosswalks, pedestrian warning signs, overhead lighting, and curb extensions. Additional considerations:

- Ensure that islands are visible to motorists by using street lights, signs, and/or reflectors.
- Crossing islands must meet ADA requirements for pedestrian access
- Crossing islands at intersections or near driveways may affect left-turn access

Safety Benefit

- 56% reduction in pedestrian crashes (CMF = 0.44)

Estimated Cost

Typical construction costs for a 6 foot wide 10 foot long island range from $8,200 to $33,000. Cost estimates include grading, excavation, grubbing, and other site preparations often required. Costs vary based on site conditions and the design of crossing island.

Local/Regional Examples

- Brigantine Avenue, Brigantine, Atlantic County, NJ

REFERENCES

- FHWA Proven Safety Countermeasures Fact Sheets
- FHWA Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE)
- FHWA Desktop Reference for CMFs
- NJ Safe Routes to School (NJSRS) - Implementation Cost

Toolbox sheets can be found in Appendix I

Website

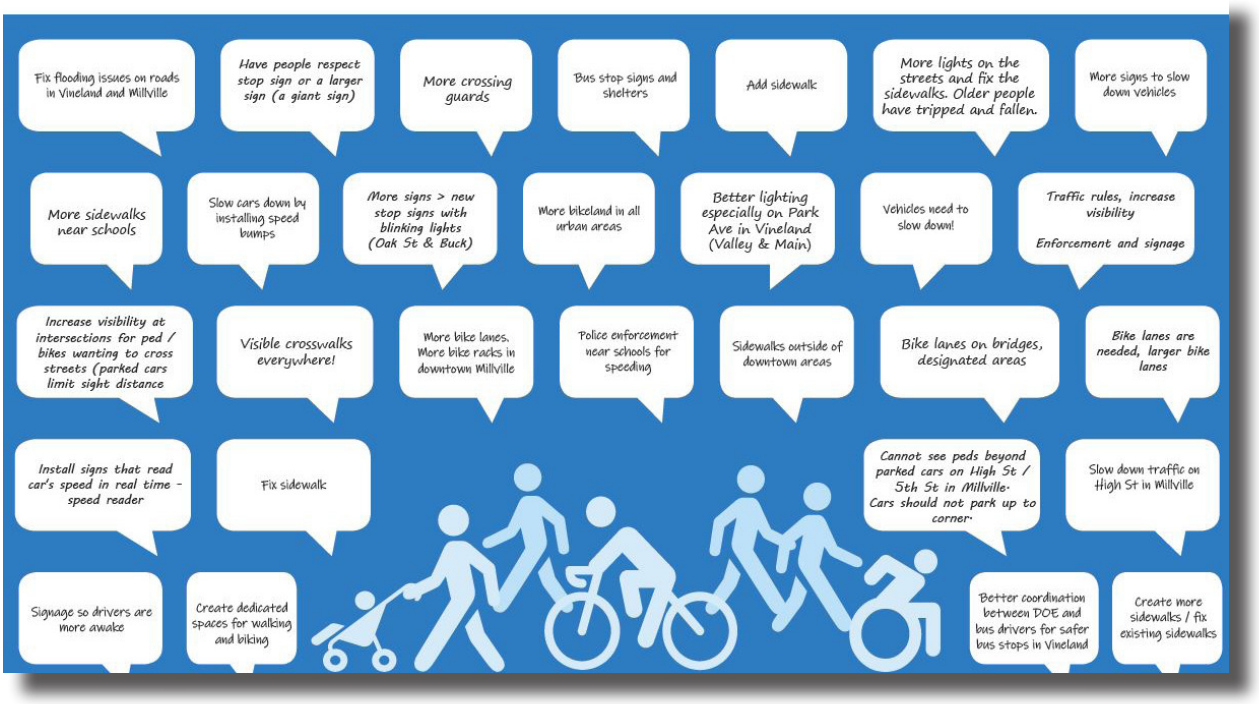
SJTPO hosted a dedicated project website throughout the project on their existing website www.sjtpo.org/cumberlandsap/. The project team coordinated with SJTPO staff to provide content and periodic updates to keep webpage visitors well informed of the project. During the second round of public outreach the project website was utilized to upload virtual public workshop videos and online surveys. The website address and information pertaining to key project milestones were also shared through SJTPO's social media accounts (Twitter, Facebook). All content was provided in English and Spanish.

Social Media

Social media continues to be one of the most common ways people learn about projects and stay engaged. Social media posts were utilized as part of this projects public outreach efforts to provide awareness of the project, engage the public, and solicit feedback. To optimize engagement, a social media schedule was provided to SJTPO that outlined social post content and dates to publish.

Bi-lingual (Spanish & English)

Early demographic analysis identified that Cumberland County contained high percentages of Limited English Proficiency (LEP) Spanish speaking households, in particular within the three urban centers of the County. Therefore, funds and staff were appropriately tasked with developing Spanish materials and providing Spanish translation at outreach events throughout the project. Eliminating the possibility of language being a barrier to involvement for community members was of upmost importance to SJTPO and its municipal and County partners.



Round 1 – Public Outreach

The purpose of the first round of public outreach was to educate the public on bicycle and pedestrian safety measures and also to obtain meaningful feedback to narrow the Top 29 list of candidate locations in Cumberland County down to six (6) priority locations. This first round consisted of three in-person outreach events. These outreach events deployed a "go the stakeholder" approach to elicit greater engagement, awareness, and participation. Outreach events were advertised using bi-lingual flyers and events were held with Spanish-speaking staff present to share information and facilitate outreach. This round of outreach deployed the following additional outreach strategies in coordination and consultation with SJTPO and the project Steering Committee:

Pop-ups

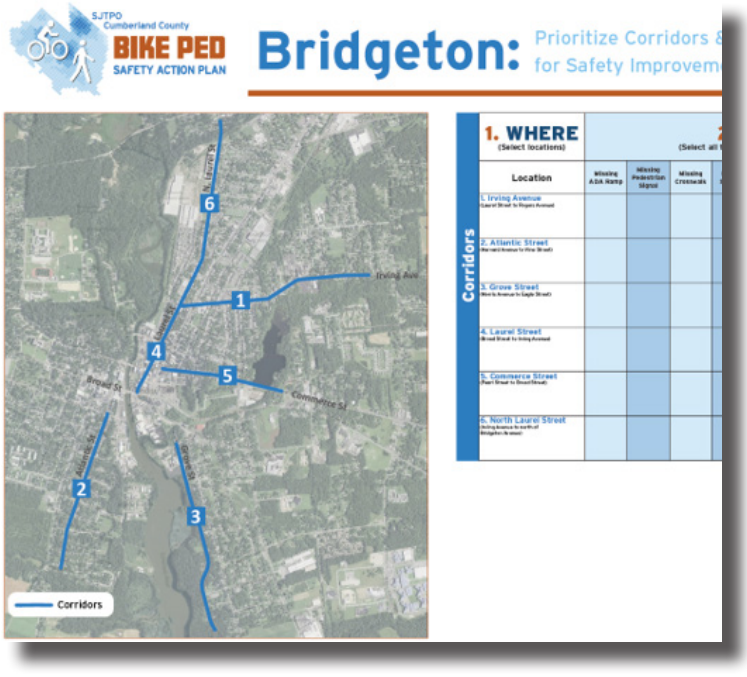
Pop-up outreach events consisted of a kiosk with materials set up to provide for interactive engagement and activities that encouraged obtaining public feedback and input. Deploying a "go to stakeholder approach" pop-up outreach events were held at the following locations:

- **Cumberland Mall**
- **Cumberland County College Student Center**
- **Vineland Public Library – ESL Class**
- **Vineland Public Library – Lobby**
- **SJTPO Citizen's Advisory Committee Meeting**
- **Bridgeton Public Library Used Book Sale**
- **Holly City Family Success Center**
- **Boys and Girls Club of Vineland**

Altogether these events obtained feedback from over 150 people. Additionally, more than 200 flyers were distributed to the public.

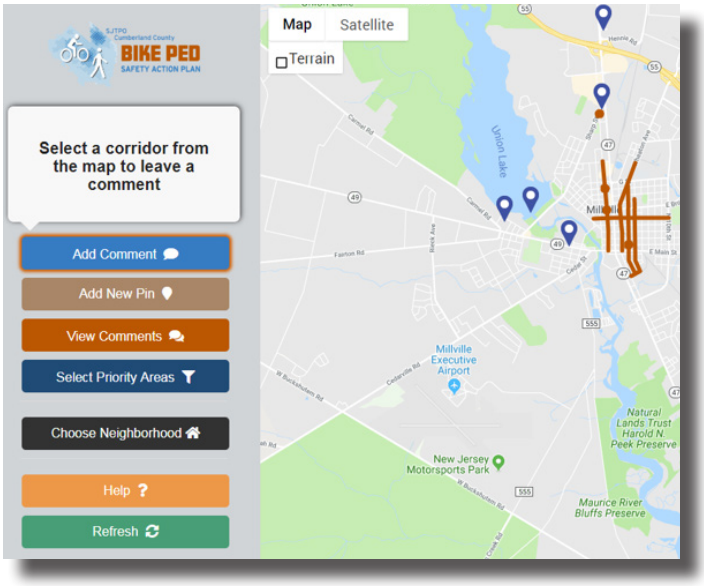
Display Boards & Dot Exercises

Display boards were utilized during round 1 to obtain feedback on public perception of bicycle and pedestrian safety issues on the Top 29 candidate locations. Display boards included crash data and maps depicting candidate locations. Public participants were given the opportunity provide their input on which of these locations were most uncomfortable and or dangerous for biking and walking through placing dots.



Web Mapping

An online web mapping application was created to better understand public experience with biking and walking and provide opportunities to reach residents who typically do not participate in planning processes in Cumberland County. Through the web application participants were able to map areas of safety concern and provide input for locations where bicycle and pedestrian safety improvements are desired.



Summary

Public feedback on issues at all of the Top 29 high crash locations (e.g., missing sidewalks, missing crosswalks, poor sidewalk condition, no bike lanes/ shoulders, etc.) was obtained. This feedback was averaged with weighted crash data to prioritize locations that were both data driven and publically supported. Results of the Round 1 - Public Outreach process and prioritization process were presented to public officials. These activities allowed the Project Team ,with input from elected officials, to narrow down the list of high crash locations to approximately 6 priority locations.

CUMBERLAND COUNTY BICYCLE AND PEDESTRIAN SAFETY ACTION PLAN
SUMMARY OF BIKE/PED CRASH DATA AND INPUT RECEIVED DURING ROUND 1 OUTREACH - BRIDGETON, MILLVILLE, & VINELAND

Potential Project Locations Vineland receives 3 project location slots Millville receives 2 project location slots Bridgeton receives 2 project location slots	Location Type	City	Ownership	City Rank from Crash Data and Public Votes	City Rank from Crash Data	Crash Data (Weight)	City Rank from Public Votes	Public Votes (# of red dots)
Chestnut Ave (Uses 2 Project Location Slots)	**Combined Corridor**	**Vineland**	**Municipal**	**1**	**1**	**123.62**	**1**	**20**
Chestnut Ave (2nd St to Myrtle St)	Corridor	Vineland	Municipal	5	2	97.38	10	7
Chestnut Av & East Av	Intersection	Vineland	Municipal	6	8	46.9	6	9
Chestnut Ave (State St to Holmes Av)	Corridor	Vineland	Municipal	15	14	26.24	14	4
East Ave (Florence St to Plum St)	**Combined Corridor**	**Vineland**	**Municipal**	**2**	**3**	**80.36**	**3**	**15**
East Ave (Florence St to Plum St)	Corridor	Vineland	Municipal	6	3	80.36	11	6
Chestnut Av & East Av	Intersection	Vineland	Municipal	6	8	46.9	6	9
Park Ave (3rd St to Broadlawn Ter)	**Combined Corridor**	**Vineland**	**County**	**3**	**5**	**55.96**	**2**	**19**
Park Av (3rd St to Broadlawn Ter)	Corridor	Vineland	County	4	5	55.96	6	9
Park Av & East Av	Intersection	Vineland	Municipal	10	13	30.17	5	10
Seventh St (Catherine St to Wood St)	**Corridor**	**Vineland**	**Municipal**	**10**	**7**	**49.58**	**11**	**6**
Oak Rd (3rd St to Valley Rd)	**Corridor**	**Vineland**	**County**	**6**	**10**	**35.23**	**4**	**13**
South West Blvd (Chestnut Av to Peach St)	**Corridor**	**Vineland**	**Municipal**	**14**	**11**	**33.46**	**13**	**5**
Almond St (2nd St to East Av)	**Corridor**	**Vineland**	**Municipal**	**16**	**15**	**22.34**	**15**	**3**
Fourth St (Chestnut Av to Erin St)	**Corridor**	**Vineland**	**Municipal**	**17**	**16**	**21.34**	**16**	**1**
Brewster Rd (Menantico Rd to Barbara Dr)	**Corridor**	**Vineland**	**County**	**12**	**17**	**20.18**	**6**	**9**
Melrose St & Chestnut Av	**Intersection**	**Vineland**	**Municipal**	**12**	**12**	**33.01**	**11**	**6**
High St (Main St to Harrison Av)	**Combined Corridor**	**Millville**	**Municipal**	**1**	**1**	**95.61**	**1**	**17**
High St (Main St to Harrison Av)	Corridor	Millville	Municipal	2	1	95.61	2	9
High St & Broad St	Intersection	Millville	Municipal	9	9	23.79	8	4
High St & Mcneal St	Intersection	Millville	Municipal	10	10	22.79	8	4
4th St (Railroad Av to F St)	**Combined Corridor**	**Millville**	**Municipal**	**3**	**3**	**52.51**	**5**	**5**
4th St (Railroad Av to F St)	Corridor	Millville	Municipal	5	3	52.51	8	4
Sassafras St & 4th St	Intersection	Millville	Municipal	11	7	30.17	12	1
3rd St / Wheaton Av (Main St to N of G St)	**Corridor**	**Millville**	**Municipal**	**4**	**5**	**50.51**	**4**	**6**
East Buckshutem Rd (Silver Run Rd to Magnolia Dr)	**Corridor**	**Millville**	**County**	**7**	**8**	**27.4**	**5**	**5**
Oak St (Dock St to 10th St)	**Corridor**	**Millville**	**Municipal**	**11**	**11**	**22.34**	**8**	**4**
5th St (Railroad Av to D St)	**Corridor**	**Millville**	**Municipal**	**8**	**11**	**22.34**	**3**	**8**
High St & Sharp St	**Intersection**	**Millville**	**Municipal**	**5**	**6**	**33.46**	**5**	**5**
Irving Ave (Laurel St to Rogers Av)	**Corridor**	**Bridgeton**	**County**	**1**	**1**	**46.58**	**1**	**14**
Atlantic St (Harvard Av to Vine St)	**Corridor**	**Bridgeton**	**Municipal**	**3**	**2**	**39.52**	**4**	**13**
Grove St (Morris Av to Eagle St)	**Corridor**	**Bridgeton**	**County**	**2**	**3**	**35.23**	**1**	**14**
Laurel St (Broad St to Irving Av)	**Corridor**	**Bridgeton**	**Municipal**	**5**	**4**	**30.85**	**5**	**7**
Commerce St (Pearl St to Broad Av)	**Corridor**	**Bridgeton**	**County**	**3**	**5**	**24.79**	**1**	**14**
North Laurel St (Irving Av to N of Bridgeton Av)	**Corridor**	**Bridgeton**	**County**	**6**	**6**	**24.24**	**5**	**7**

Round 2 – Public Outreach

Disclaimer: The COVID-19 pandemic constrained the second round of public outreach. Significant time was dedicated to developing a new approach to public outreach that complied with safety guidelines and the Governor's Executive orders.

The purpose of the second round of public outreach was to obtain feedback from the public on safety countermeasures that could be implemented at the Top 5 priority locations. Based on previous experiences implementing safety improvement projects in the region some proven safety countermeasures can be controversial within communities, especially if they have a perceived or real impact on traffic operations. As such, the second round of public outreach focused on clearly explaining how countermeasures are intended to function, how countermeasures provide real safety benefits, and address common misconceptions. To that end tools from the bicycle and pedestrian toolbox (see Appendix I) were used to educate and explain potentially controversial countermeasures.

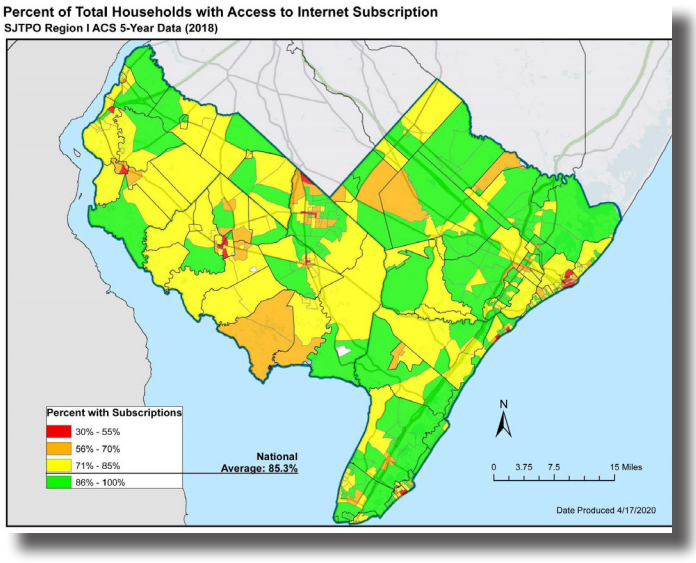
Virtual Public Workshops

In-person outreach was not permitted due to the COVID-19 pandemic. Therefore, virtual public workshops were conducted. The virtual public workshops were prerecorded and utilized toolbox videos along with crash data to explain benefits of select countermeasures at Top 5 priority locations. Altogether, three (3) virtual public workshops were conducted in English and one (1) conducted in Spanish. In advance of the workshops extensive effort was given to provide public notice of the meeting to residents and business owners adjacent to the Top 5 priority locations.

Low Internet Accessibility

While developing the revised public outreach approach, it was discovered that each of the Top 5 priority locations were located within communities with Low Internet Accessibility. This equity concern presented an unintended barrier to public involvement. As such several innovative non-virtual public outreach options were provided.

A map of census data indicating low-internet accessibility can be found in the Appendix K.

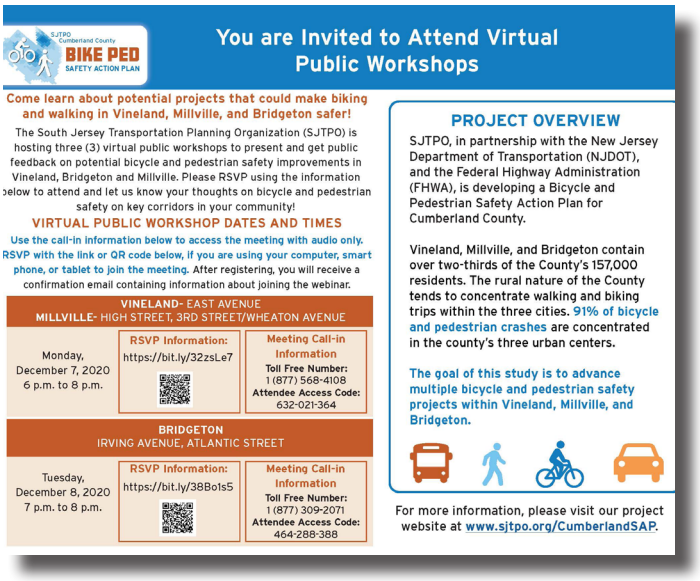


Call-in meeting options

All virtual public workshops included call-in features to allow for those without internet access to attend and participate via the key page.

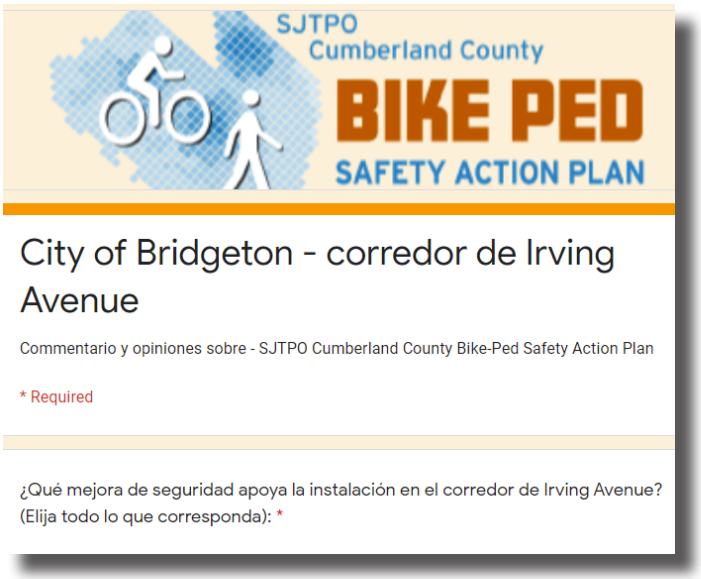
Mailers

Public notice and virtual public workshop invitations were mailed to all residents and business owners within 250-feet of the Top 5 priority locations. These mail invitations were both in English and Spanish. In total, over 9,500 mailers were delivered to residential and commercial addresses.



Online Surveys

Public feedback and input on possible safety countermeasures was also captured through online surveys. Online surveys were developed for each of the Top 5 priority locations in both English and Spanish. Online survey links were then dispersed and published through multiple communication channels, such as social media, project website, and digital ads.



Digital ads

A digital advertisement campaign was deployed for 90 days to further solicit public feedback. Online surveys and toolbox videos were digitally advertised throughout Cumberland County via Facebook and YouTube sponsored ads. Altogether, the digital ads were seen 154,497 times and were clicked 1,637 times. This approach reached an average of 1,360 people each day on social media and led to an increase in feedback as well as SJTPO social media followers.

Council Meetings

Public feedback received during the second round of public outreach was summarized and presented to roadway owners (municipal engineers and County engineer) with the purpose of receiving formal Resolutions of Support. As requested, presentations to City Council were conducted to attain buy-in from elected officials. This step was critical in advancing safety improvement concepts at the Top 5 priority locations for New Jersey's Local Safety Program funds.

Pedestrian Road Safety Audits

Following the basic format of traditional Road Safety Audits (RSAs), the pedestrian/bicycle RSA is a focused and formal safety performance examination of an existing or future road or intersection by a multi-disciplinary audit team. PRSAs can be used on a project of any size and can be conducted on facilities with a history of crashes, or during the design phase of a new roadway or planned upgrade. PRSA audit teams 1) identify and evaluate any potential safety issues, and 2) develop pedestrian/bicycle related countermeasures for all abilities. PRSAs provide transportation agencies and team members a better understanding of the needs of pedestrians and bicyclists by following the FHWA Pedestrian Road Safety Audit Guidelines and Prompt Lists (Publication FHWA-SA-07-007). Implementation of improvement strategies identified through this process in New Jersey may be eligible for Federal Highway Safety Improvement Program (HSIP) funds. These identified improvements are noted in the following sections of this report.

The PRSA event has three basic components:

- **Pre-Audit: Audit team analyzes and discusses study area crash data and related issues.**
- **Field Visit: The audit team walks the corridor to identify safety issues and examine conditions.**
- **Post-Audit: The audit team shares findings and develops a list of problems and potential strategies.**

In order to gain a true understanding of the selected corridors' existing conditions, a focused and formal safety performance examination of each corridor was conducted by a multi-disciplinary audit team. These examinations were conducted during four PRSA events. Following the FHWA guidance, the needs of bicyclists and pedestrians were stressed during these events. A formal separate PRSA report was submitted to SJTPO documenting the results and recommendations of the PRSAs conducted for the following corridors:

Vineland
- **Chestnut Avenue (MP 0.24 to MP 2.30)**
- **East Avenue (MP 0.76 to MP 1.69)**

Millville
- **High Street (MP 0.00 to MP 0.99)**
- **3rd Street/Wheaton Avenue (CR 555) (MP 10.05 to 10.83)**

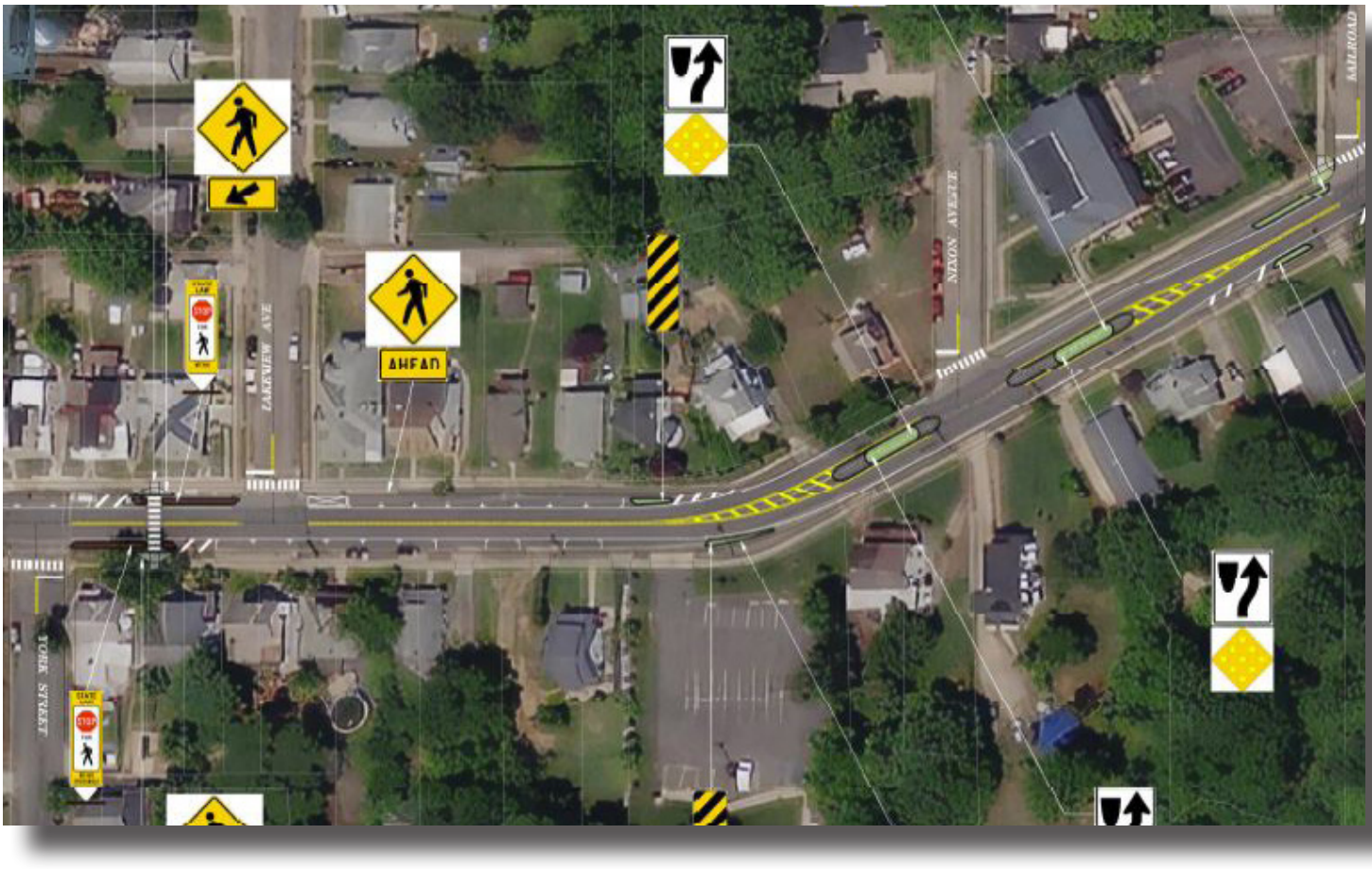
Bridgeton
- **Irving Avenue (CR 525) (MP 0.07 to MP 1.14)**
- **Atlantic Street (MP 0.06 to MP 0.90)**

Concept Development

Concept plans showing approved countermeasures at each of the Top 5 safety locations were developed using a combination of aerial photography and GIS base mapping to depict lane configurations, on-street parking, bike facilities, sidewalk, streetscape enhancements, traffic calming features, and any other changes to the existing roadway. Throughout the concept development process coordination occurred between the project team, roadway owners, and other decision-makers (i.e., municipal engineer, County engineer, NJDOT, and elected officials) to ensure that concept plans have broad support.

Once concepts were completed and formally approved for Local Safety Program funding applications, cost estimates, and necessary documentation were prepared to satisfy program requirements. This documentation included explanation of crash history, purpose & need, socio-economic data, and environmental screening.

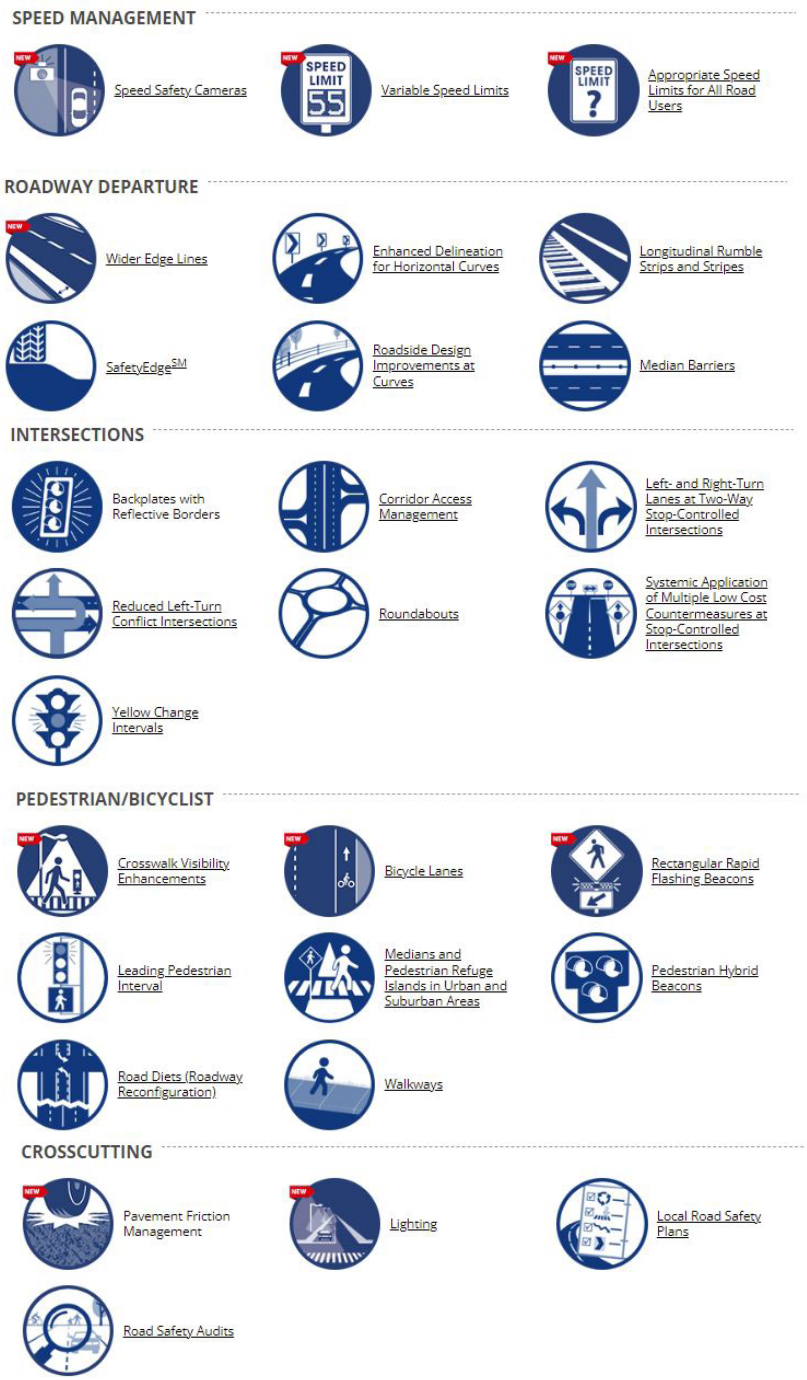
Note: Each concept was formally approved for funding applications via Resolutions of Support (see Appendix B).



Proven Safety Countermeasures

The primary focus of concept development was deploying appropriate countermeasures that fit the context of each corridor while addressing the crash history and identified safety issues at the location, paying particular attention to the most vulnerable road users bicyclists and pedestrians. Wherever possible FHWA Proven Safety Countermeasures were proposed as they have shown through research to be effective in reducing roadway fatalities and serious injuries. Transportation agencies throughout the country are encouraged to consider widespread implementation of the 28 countermeasures identified by the FHWA.

Further information on current FHWA Proven Safety Countermeasures can be found in Appendix J.



Safe System Approach

The USDOT has recently adopted the Safe System approach as the guiding paradigm to address roadway safety. The Safe System approach has been embraced by the transportation community as an effective way to address and mitigate the risks inherent in our enormous and complex transportation system. It works by building and reinforcing multiple layers of protection to both prevent crashes from happening in the first place and minimize the harm caused to those involved when crashes do occur. It is a holistic and comprehensive approach that provides a guiding framework to make places safer for people. This is a shift from a conventional safety approach because it focuses on both human mistakes AND human vulnerability, and designs a system with many redundancies in place to protect everyone.

The SJTPO's ongoing safety programs are working towards a future with zero roadway fatalities and serious injuries. The concept development approach also focused on supporting the guiding principles of this new approach.

A Safe System approach incorporates the following principles:

1. **Death and Serious Injuries are Unacceptable. A Safe System approach prioritizes the elimination of crashes that result in death and serious injuries.**
2. **Humans Make Mistakes. People will inevitably make mistakes and decisions that can lead or contribute to crashes, but the transportation system can be designed and operated to accommodate certain types and levels of human mistakes, and avoid death and serious injuries when a crash occurs.**
3. **Humans Are Vulnerable. Human bodies have physical limits for tolerating crash forces before death or serious injury occurs; therefore, it is critical to design and operate a transportation system that is human-centric and accommodates physical human vulnerabilities.**
4. **Responsibility is Shared. All stakeholders – including government at all levels, industry, non-profit/advocacy, researchers, and the general public – are vital to preventing fatalities and serious injuries on our roadways.**
5. **Safety is Proactive. Proactive tools should be used to identify and address safety issues in the transportation system, rather than waiting for crashes to occur and reacting afterwards.**
6. **Redundancy is Crucial. Reducing risks requires that all parts of the transportation system be strengthened, so that if one part fails, the other parts still protect people.**

Source: FHWA.

East Avenue – MP 0.76 to MP 1.69

City of Vineland

East Avenue is classified as an urban major collector. The road section is two-lanes, undivided, with a posted speed limit of 30 mph between Walnut Road and Grape Street. During school hours the posted speed limit drops within the Cunningham Academy school zone section where the speed is posted 25 mph. North of Grape Street the posted speed limit is 35 mph. There is 1 signalized intersection within the project area but its upgrade is included in another project, 12 unsignalized intersections, one (1) 4-way stop controlled intersection and numerous driveways. The ADT along East Avenue ranges from approximately 5,250 to 7,700 in the southern and northern portions of the project area respectively. East Avenue provides access to downtown Vineland and is an important north-south connector be within Vineland.

Sidewalks are provided along both sides of East Avenue north of the Chestnut. Sidewalk is only provided along the western curbline of East Avenue from Chestnut Avenue to Humbert Street. There is a section of the eastern curbline where sidewalk is provided between Florence Avenue and the apartment complex driveway. Basic transverse bar crosswalks are provided at select intersections. Most intersections do not have marked crosswalks. No crosswalks are high visibility.

Project area has high speeds inconsistent with the adjacent land use and density. Project area is the site of 149 crashes. Of which the predominant crash types are Right Angle (36.9%), Rear End (20.8%), and Sideswipe (12.7%). The project area also experienced four (4) pedestrian crashes of which all resulted in some degree of injury.

Deficiencies include:

- **ADA compliant curb ramps and/or are not in conformance with the 2009 MUTCD**
- **Many signalized and unsignalized intersections have insufficient illumination at night**
- **High speeds within project area**
- **Lack of marked pedestrian crossing locations**
- **No high visibility crosswalks**
- **Lack of sidewalk/pedestrian facilities**
- **Problems negotiating movements at 4-way stop controlled intersection**

Concept Description

Continuous sidewalk along both sides of the entirety of the corridor from Walnut Road to Elmer Street was selected. A mid-block crosswalk with ADA compliant curb extensions treatment with a RRFB and appropriate signage was chosen between Florence Avenue and Washington Avenue. This alternative sought to address the pedestrian safety needs in proximity to the Regency Court and Spring Garden apartments, while providing traffic calming to the corridor. The following other treatments were chosen: 6" wide edgeline through the entirety of the corridor, replacing existing crosswalks with high visibility crosswalks, a gateway and traffic calming median island treatment was chosen at the northernmost leg of the Walnut Road and East Avenue intersection. This treatment would include depressed median island in front of driveways and a possibility for plantings and a City of Vineland welcome sign. Doubling up of Stop Signs, advance transverse thermoplastic rumble strips, and a

flashing beacon at the intersection of Walnut Road and East Avenue. In addition, a bus pull-off bay in front of the Cunningham Academy School was chosen in coordination with the Vineland School District. ADA improvements throughout the corridor where required.

Full concept plan can be found in Appendix D.

High Street – MP 0.00 to MP 0.99
City of Millville

High Street is classified as an urban major collector. The road section is two-lanes, undivided, with a posted speed limit of 30 mph between Walnut Road and Grape Street. During school hours the posted speed limit drops within the Cunningham Academy school zone section where the speed is posted 25 mph. There is 4 signalized intersections within the project area, 9 unsignalized intersections all stop controlled on minor street/cross street approaches, and numerous driveways. The ADT along High Street ranges from approximately 5,200 to 11,500 in the southern and northern portions of the project area respectively. High Street serves as the downtown central business district of Millville and is an important north-south connector between Millville and Vineland.

Sidewalks are provided along both sides of High Street through the entirety of the project corridor. Basic transverse bar crosswalks are provided at each intersection. The crosswalk at High Street/Pine Street also includes artwork within the transverse bars. This crosswalk is considered to be the only high visibility crosswalk within the project area.

Project area has high speeds inconsistent with the adjacent land use and density. Project area is the site of 208 crashes. Of which the predominant crash types are Right Angle (24%), Rear End (12%), and Sideswipe (12%). The project area also experienced eleven (11) pedestrian crashes of which nine (9) resulted in some degree of injury. There were also four (4) bicyclist crashes of which all resulted in some degree of injury.

Deficiencies include:

- **ADA compliant curb ramps and/or are not in conformance with the 2009 MUTCD**
- **Many signalized and unsignalized intersections have insufficient illumination at night**
- **High speeds within project area**
- **Gap acceptance**
- **Lack high visibility crosswalks**
- **Problems negotiating movements at intersections (i.e., left turns)**
- **Failure to stop for pedestrians in marked crosswalks**
- **High number of closely spaces driveways**
- **Distance between marked crosswalks**

Concept Description

ADA compliant curb extensions at existing intersections where possible throughout the entirety of the corridor was selected. A mid-block crosswalk with ADA compliant curb extensions treatment with a RRFB and appropriate signage was chosen between Depot Street and Powell Street. High visibility crosswalks and edgelines with parking stall markings to delineate parking lane/stalls and travel lane was chosen. A dual-left turn lane between Foundry Street and Harrison Avenue and curb extensions to align motorists to travel lanes, shorten pedestrian crossing distances, and provide traffic calming was selected. ADA improvements throughout the corridor where required.

Full concept plan can be found in Appendix E.

3rd Street/Wheaton Avenue (CR 555) – MP 10.05 to MP 10.83

City of Millville

3rd Street is classified as an urban local. The road section is two-lanes, undivided, with a posted speed limit of 25 mph. There are 2 signalized intersections within the 3rd Street section of the project area, 5 unsignalized intersections all stop controlled on minor street/cross street approaches, and various residential driveways. The ADT along 3rd Street is listed as approximately 3,500. 3rd Street serves as main residential street and north-south connector between Millville and Vineland as it is signed as County Route 555.

Sidewalks are provided along both sides of 3rd Street through the entirety of the project corridor. Basic transverse bar crosswalks are provided at the signalized Broad Street and Main Street/Route 49 intersections.

Wheaton Avenue is classified as an urban minor arterial. The road section is two-lanes, undivided, with a posted speed limit of 25 mph. There is one signalized intersection at the project corridor boundary at the G Street intersection and 4 unsignalized skewed intersections that are stop controlled on minor street approaches.

Project area has high speeds inconsistent with the adjacent land use and density. Project area is the site of 154 crashes. Of which the predominant crash types are Right Angle (49%), Rear End (10%), and Struck Parked Vehicle (12%). The project area also experienced four (4) pedestrian crashes of three (3) resulted in some degree of injury with one resulting in serious injury.

Deficiencies include:

- **ADA compliant curb ramps and/or are not in conformance with the 2009 MUTCD**
- **Many signalized and unsignalized intersections have insufficient illumination at night**
- **High speeds within project area**
- **Gap acceptance**
- **Lack high visibility crosswalks**
- **Failure to stop for pedestrians in marked crosswalks**

- **Skewed intersections with poor sightlines**
- **Distance between marked crosswalks**

Concept Description

ADA compliant curb extensions at existing intersections on 3rd Street from Main Street/Route 49 to G Street where possible was selected. A marked crosswalk at Oak Street across 3rd Street. High visibility crosswalks and edgelines with parking stall markings to delineate parking lane/stalls and travel lane was chosen. A left turn lane at G Street/3rd Street intersection. Closure of 3rd Street/ Wheaton Avenue intersection and closure of Wheaton Avenue roadway between F Street and 4th Street. Changing Wheaton Avenue circulation pattern from bi-directional to one-way northbound. Changing of 4th Street circulation between F Street and G Street to provide one-way access to G Street. ADA improvements throughout the corridor where required.

Full concept plan can be found in Appendix F.

Irving Avenue (CR 525) – MP 0.07 to MP 1.14

City of Bridgeton

Irving Avenue is classified as an urban minor arterial. The road section is two-lanes, undivided, with a posted speed limit of 35 mph between Burlington Road (CR 638) and Manheim Avenue (CR 669) and 25 mph between Manheim Avenue and Pearl Street (Rt 77). There are 3 signalized intersections within the project area, 14 unsignalized intersections, a railroad crossing, and numerous driveways. The ADT along Irving Avenue ranges from approximately 6,500 to 6,700. Irving Avenue provides access to downtown Bridgeton and is an important east-west arterial between Bridgeton and the surrounding communities.

Sidewalks are provided along both sides of the project corridor on Irving Avenue from Pearl Street to Manheim Avenue. East of the Manheim Avenue, sidewalk is provided along the northern curbline up to Rogers Street and briefly along the southern curbline approaching Manheim Avenue. Basic transverse bar crosswalks are provided at most marked crosswalks. High visibility crosswalks are provided at some of the intersection legs at Magnolia Avenue, Manheim Avenue, and Burlington Road.

Irving Avenue has high speeds inconsistent with the adjacent land use and density. Project area is the site of 210 crashes. Of which the predominant crash types are Struck Parked Vehicle (25.2%) Right Angle (20.9%), and Rear End (14.2%). The project area also experienced nine (9) pedestrian crashes of which all resulted in some degree of injury.

Deficiencies include:

- **ADA compliant curb ramps and/or are not in conformance with the 2009 MUTCD**
- **Many signalized and unsignalized intersections have insufficient illumination at night**
- **High speeds within project area**

- **Lack of marked pedestrian crossing locations**
- **Lack of high visibility crosswalks**
- **Lack of continuous sidewalk/pedestrian facilities**
- **Problem horizontal curves and crosswalks in proximity**
- **Lack of pavement delineation**

Concept Description

A crosswalk with an ADA compliant median pedestrian crossing island treatment with a RRFB and appropriate signage was chosen at the eastern curbline of Church Street across Irving Avenue. This alternative seeks to address the pedestrian safety needs and crossing demand to the shopping plaza there while providing traffic calming to the corridor. The following other treatments were chosen: 6" wide edgeline was proposed through the entirety of Irving Avenue. Replacing existing crosswalks with high visibility crosswalks, detached curb extension treatments at select intersections within the Irving Avenue corridor. Median islands with depressed median islands between Bank Street and Railroad Avenue on Irving Avenue to provide traffic calming into and out of the horizontal curves. Sidewalk installation along both sides of Irving Avenue where required per ADA and where non-existent between Pearl Street and Burlington Road. Site improvements to provide for ADA compliant sidewalks and on-street parking where possible.

Full concept plan can be found in Appendix G.

Atlantic Street – MP 0.06 to MP 0.90

City of Bridgeton

This corridor consists of approximately 1 mile of Atlantic Street from the Vine Street (CR 697) intersection to the Harvard Avenue intersection. This stretch of Atlantic Street is primarily low-density single family detached residential. Atlantic Street parcels gradually transition from larger to smaller heading north towards Vine Street. It is important to note that the Cumberland County Jail is located just outside the project corridor between Vine Street and Broad Street (Rt 49). The project area also falls within an area designated by the Bridgeton Historical Society as the Glen View District.

Atlantic Street is classified as an urban major collector. The road section is two-lanes, undivided, with a posted speed limit of 25 mph. There are 12 unsignalized intersections and numerous driveways. The ADT along Atlantic Street is approximately 1,800 vehicles. Atlantic Street provides access to important arterials in Bridgeton and is also used to bypass Fayette Street going North South.
Sidewalks are provided along both sides of the project corridor Atlantic Street. Basic transverse bar crosswalks are provided at most marked crosswalks. Newly installed high visibility crosswalks are provided at the Vine Street/Atlantic Street intersection.

Atlantic Street has high speeds inconsistent with the adjacent residential land use and density. Corridor has also experienced a high number of pedestrian crashes while maintaining a low vehicle ADT. Project area is the site of 54 crashes. Of which the predominant crash types are Struck Parked

Vehicle (61.1%) Right Angle (12.9%), and Pedestrian (9.2%). The project area has experienced five (5) pedestrian crashes of which all resulted in some degree of injury.

Deficiencies include:

- **ADA compliant curb ramps and/or are not in conformance with the 2009 MUTCD**
- **Many signalized and unsignalized intersections have insufficient illumination at night**
- **High speeds within project area**
- **Lack of marked pedestrian crossing locations**
- **Lack of high visibility crosswalks**
- **Lack of lighting**
- **Offset intersection at Vine Street**
- **Lack of pavement delineation**

Concept Description

6" wide edgeline was proposed through the entirety of the corridor detached curb extension treatments at the Atlantic Street and Vine Street intersection Converting the Atlantic Street/Vine Street intersection to a All-way Stop with Doubling up of Stop Signs. Striping of a centerline on Atlantic Street. ADA improvements throughout the corridor was also proposed.

Full concept plan can be found in Appendix H.

Action Items

Goal

To reduce fatal and serious injury crashes involving bicyclists and pedestrians in Cumberland County in support of the State's goal of zero roadway fatalities by 2050.

Objective

Employ identified strategies across the network, prioritizing locations where bicycle and pedestrian activity and crashes are present. Employ a strategic, data-driven approach to first target locations with the greatest bicycle and pedestrian safety needs, identify implementable countermeasures with demonstrated safety benefits, identify funding opportunities, and prepare funding applications for selected projects on County and local roadways.

The following are recommended actions items for local and County stakeholders:

- **The Chestnut Avenue Corridor was identified as a top priority in this effort but was not able to be immediately advanced due to funding constraints. Identify and secure funding to advance comprehensive safety improvements, including roadway reconfiguration along the Chestnut Avenue Corridor (see Appendix C).**

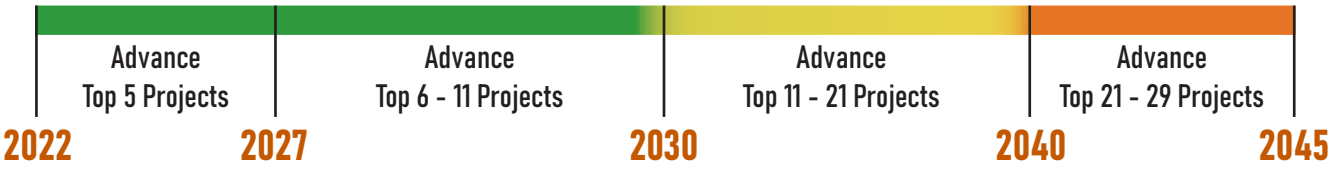
- **Five roadway corridors identified as top priorities were able to be advanced through this effort as applications for funding consideration through New Jersey's Local Safety Program, utilizing federal Highways Safety Improvement Program (HSIP) funding. Once approved SJTPO shall lead design assistance before projects are advanced to construction by local roadway owners.**

- **In partnership with local roadway owners conduct further study, identify funding sources, and advance bicycle and pedestrian-focused safety improvement projects for the remaining locations identified on the Top 29 list (see Appendix A). While dependent upon funding availability, all efforts should be made to advance bicycle and pedestrian priority locations from the project design phase to construction within the goal timeline.**

- **Continue to coordinate with the Steering Committee to monitor crash data, implement and monitor the Cumberland County Bicycle & Pedestrian Safety Action Plan and conduct crash analysis for projects implemented using 3-year pre- and post-construction crash data.**
- **Advance safety strategies, including the FHWA proven safety countermeasures (Appendix J), across the remaining Top 29 list locations as well as across the roadway network, as appropriate.**

- **Conduct further study to identify criteria for bicycle and pedestrian systemic countermeasures to be advanced as standalone systemic projects as well as to be incorporated into all projects, including limited scope projects, such as repaving.**

Goal Timeline



Appendix A
Top 29 Screening List

Top 29 Corridors & Intersections

Ranked by Bicycle & Pedestrian Crash Severity / does not include State Routes

SJTPO Cumberland County BIKE PED SAFETY ACTION PLAN

Indicates stand-alone intersection

Indicates intersection located on high-ranking corridor

Indicates corridor has been combined with adjacent high ranking corridor

						Bike/Ped		All					
Rank	Type Rank	Municipality	Location	SRI	Jurisdiction	K=A	Crashes	K=A	Crashes	Street Start	Street End	MP Start	MP End
1	Corridor-1	Vineland City	Chestnut Avenue	06141029__	Municipal	159.80	27	1990.9	663	Delsea Drive	Main Road	0.24	2.3
1	Corridor-1	Vineland City	Chestnut Avenue	06141029__	Municipal	97.38	14	900.1	276	2nd St	Myrtle St	0.5	1.5
1A	Intersection-1	Vineland City	Chestnut Ave & East Ave	06141029__ & 06141025__	Municipal	46.90	4	279.2	90				
1B	Intersection-3	Vineland City	Melrose St & Chestnut Ave	06141331__ & 06141332__ & 06141029__	Municipal	33.01	4	62.2	18				
☆ 2	Corridor-2	Millville City	High Street	06101010__	Municipal	95.61	16	513.8	188	Main St	Harrison Ave	0	1
2A	Intersection-6	Millville City	High St & Broad St	06101010__ & 06101015__ & 06101253__	Municipal	23.79	4	79.8	25				
2B	Intersection-7	Millville City	High St & Mcneal St	06101010__ & 06101271__	Municipal	22.79	3	50.0	15				
☆ 3	Corridor-3	Vineland City	East Avenue	06141025__	Municipal	80.36	8	508.5	179	Florence Ave	Plum St	0.9	1.9
4	Corridor-4	Vineland City	Park Avenue	00000540__	County	55.96	8	562.4	208	3rd St	Broadlawn Terrace	33.98	34.98
4A	Intersection-4	Vineland City	Park Ave & East Ave	00000540__ & 06141025__	Municipal	30.17	2	94.6	31				
5	Corridor-5	Millville City	Fourth Street	06101237__	Municipal	52.51	5	228.0	71	Railroad Ave	F St	0	1
5A	Intersection-5	Millville City	Sassafras St & 4th St	06101265__ & 06101237__	Municipal	30.17	2	33.2	5				
☆ 6	Corridor-6	Millville City	Third Street & Wheaton Ave	00000555__	Municipal	50.51	3	409.8	152	Main St	North of G St	10.05	11.05
7	Corridor-7	Vineland City	Seventh Street	06141362__	Municipal	49.58	10	366.7	119	Catherine St	Wood St	0.1	1.1
☆ 8	Corridor-8	Bridgeton City	Irving Avenue	00000552__	County	46.58	7	361.0	171	Laurel St	Rogers Ave	0	1
☆ 9	Corridor-9	Bridgeton City	Atlantic Street	06011182__	Municipal	39.52	5	121.7	48	Harvard Ave	Vine St	0	0.9
10	Corridor-10	Vineland City	Oak Road	06000681__	County	35.23	2	322.2	93	3rd St	Valley Rd	2.24	3.24
11	Corridor-11	Bridgeton City	Grove Street	060006095_	County	35.23	2	116.3	38	Morris Ave	Eagle St	0.18	1.18
12	Corridor-12	Vineland City	South West Boulevard	060006155_	Municipal	33.46	4	289.2	89	Chestnut Ave	Peach St	3.52	4.52
13	Intersection-2	Millville City	High St & Sharp St	06101010__ & 06000667__ & 06101336__	County	33.46	4	120.3	31				
14	Corridor-13	Bridgeton City	Laurel Street	06011181__	Municipal	30.85	6	148.4	84	Broad St	Irving Ave	0	0.5
15	Corridor-14	Millville City, Commercial Township	East Buckshutem Road	06000670__	County	27.40	3	185.0	49	Silver Run Rd	Magnolia Dr	12.52	13.52
16	Corridor-15	Vineland City	Chestnut Avenue	06141029__	Municipal	26.24	6	665.0	231	State St	Holmes Ave	1.6	2.6
17	Corridor-16	Bridgeton City	Commerce Street	06000670__	County	24.79	5	170.9	71	Pearl St	Broad St	0	1
18	Corridor-17	Bridgeton City, Upper Deerfield Township	North Laurel Street	06000606__	County	24.24	4	258.4	106	Irving Ave	North of Bridgeton Ave	0	1
19	Corridor-18	Millville City	Oak Street	06101251__	Municipal	22.34	3	130.4	42	Dock St	10th St	0	0.83
20	Corridor-19	Millville City	Fifth Street	06101229__	Municipal	22.34	3	114.5	45	Railroad Ave	D St	0.2	1.13
21	Corridor-20	Vineland City	Almond Street	06141359__	Municipal	22.34	3	104.8	45	2nd St	East Ave	0.1	1.01
22	Corridor-21	Vineland City	Fourth Street	06141348__	Municipal	21.34	2	283.9	104	Chestnut Ave	Erin St	0.2	1.14
23	Corridor-22	Vineland City	Brewster Road	06000672__	County	20.18	5	282.5	121	Menantico Rd	Barbara Dr	0.41	1.41

☆ *Location advanced for concept development and New Jersey's Local Safety Program funding*

Appendix B
Resolutions of Support

Irving Avenue

RESOLUTION NO. 307-21

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF BRIDGETON APPROVING THE ADVANCEMENT OF TWO CITY OF BRIDGETON ROADWAY CORRIDOR LOCAL SAFETY PROGRAM APPLICATIONS TO ACCESS FEDERAL HIGHWAY SAFETY IMPROVEMENT PROGRAM (HSIP) FUNDS

WHEREAS, New Jersey has been designated by the Federal Highway Administration (FHWA) as a Focus State for Pedestrians and Bicycles due to its disproportionally high and increasing number of serious injury and fatal crashes among bicyclists and pedestrians; and

WHEREAS, bicycles and pedestrians are involved in 2.9 percent of crashes, but 21.6 percent of fatal and serious injury crashes in Cumberland County; and

WHEREAS, the South Jersey Transportation Planning Organization (SJTPO) has conducted bicycle and pedestrian crash data analyses associated with a Countywide Bicycle and Pedestrian Safety Action Plan to provide local access to federal Highway Safety Improvement Program (HSIP) funds, through the State's Local Safety Program; and

WHEREAS, these analyses have identified:

(1) The Irving Avenue (CR 552) corridor, between Pearl Street (RT 77) and Burlington Road (CR 638) as the highest ranked corridor in Bridgeton by public votes and for Bicycle and Pedestrian crashes; and

(2) Atlantic Street corridor, between Vine Street and Harvard Avenue as the second highest ranked corridor in Bridgeton by Bicycle and Pedestrian crashes and the third ranked corridor by public votes; and

WHEREAS, the federal Highway Safety Improvement Program (HSIP), is a data-driven program tasked with advancing substantive safety improvements to maximize safety rather than simply meet minimum standards; and

WHEREAS, the two above noted project corridors have been advanced via Resolution No. 156-19 to permit the SJTPO to conduct detailed analyses, data collection, public outreach, and stakeholder collaboration in partnership with the City to access federal HSIP funding; and

WHEREAS, the two above noted project corridors were analyzed by Pedestrian Road Safety Audit (PRSA) teams in December 2019 to identify road safety concerns and opportunities for improvements, paying particular attention to pedestrians and bicyclists; and

WHEREAS, the City of Bridgeton was a participant in this audit, and has reviewed, the recommendations of the audit team; and

WHEREAS, SJTPO's technical effort has identified and recommended safety improvements along these corridors with the purpose of maximizing safety at these high crash locations without the contribution of any matching funds from the City; and

WHEREAS, these safety improvements have been recommended:

(1) The Irving Avenue (CR 552) corridor, proposed safety improvements between Pearl Street (RT 77) and Burlington Road (CR 638) include curb extensions, high visibility crosswalks, installation of pedestrian activated flashing beacon at select location, installation of pedestrian crossing island and a mid-block crosswalk east of Church Street, construction of ADA compliant pedestrian facilities, installation of traffic calming median islands and depressed median islands, installation of sidewalk where gaps exist to provide continuous network along both sides of entire corridor, relocation of crosswalk at York Street to mid-block between York Street and Lakeview Avenue, realigning crosswalk at Magnolia Avenue, signage and striping; and

(2) The Atlantic Street corridor, proposed safety improvements between Vine Street and Harvard Avenue include curb extensions, pavement delineation through edgeline and centerline striping, conversion of Vine Street to a 4-way stop controlled intersection with double Stop Signs, sightline improvements, construction of ADA compliant pedestrian facilities, high visibility crosswalks, signage and striping; and

WHEREAS, the Irving Avenue corridor is under the jurisdiction of the County of Cumberland and signed as County Route 552; and

WHEREAS, on-street parking may differ from what is allowed per the current City Municipal Code, thus an update to the Ordinance may be needed during the design phase.

NOW THEREFORE, **BE IT RESOLVED**, by the City Council of the City of Bridgeton that the City of Bridgeton does hereby support the SJTPO recommended safety improvements along the Irving Avenue (CR 552) and Atlantic Street corridors, which will allow the City to access federal HSIP funds to advance safety projects along these corridors to maximize safety.

BE IT FURTHER RESOLVED, that the involvement of the City Engineer is hereby authorized throughout the Local Safety Program project delivery process in order to advance the proposed work;

BE IT FURTHER RESOLVED, that the City will enter into an interlocal agreement with the County of Cumberland to perform any necessary engineering and construction services as it pertains to these corridor improvements.

ADOPTED at a Regular meeting of the City Council of the City of Bridgeton held on the 7th day of December, 2021.

ATTEST:

Nichole Almanza, RMC, CMR
Municipal Clerk

Edward Bethea, Council President

APPROVED

Albert B. Kelly, Mayor

Cumberland County
Board of County Commissioners

164 West Broad Street
Bridgeton, NJ 08302

ADOPTED

RESOLUTION 2022-283

Meeting: April 26, 2022 6:00 PM

RESOLUTION APPROVING THE ADVANCEMENT OF THE TWO CITY OF MILLVILLE ROADWAY CORRIDOR LOCAL SAFETY PROGRAM APPLICATIONS TO ACCESS FEDERAL HIGHWAY SAFETY IMPROVEMENT PROGRAM (HSIP) FUNDS

WHEREAS, New Jersey has been designated by the Federal Highway Administration (FHWA) as a Focus State for Pedestrians and Bicycles due to its disproportionally high and increasing number of serious injury and fatal crashes among bicyclists and pedestrians; and

WHEREAS, bicycles and pedestrians are involved in 2.9 percent of crashes, but 21.6 percent of fatal and serious injury crashes in Cumberland County; and

WHEREAS, the South Jersey Transportation Planning Organization (SJTPO) has conducted bicycle and pedestrian crash data analyses associated with a Countywide Bicycle and Pedestrian Safety Action Plan to provide local access to federal Highway Safety Improvement Program (HSIP) funds, through the State's Local Safety Program; and

WHEREAS, these analyses have identified:

(1) The High Street corridor, between Main Street (NJ 49) and Harrison Avenue as the highest-ranked corridor in Millville by public votes for Bicycle and Pedestrian crashes; and

(2) The signed County Route 555 (3rd Street/Wheaton Avenue) corridor, between Main Street (RT 49) and G Street as the second-highest ranked corridor in Millville by public votes for Bicycle and Pedestrian crashes; and

WHEREAS, the federal Highway Safety Improvement Program (HSIP), is a data-driven program tasked with advancing substantive safety improvements to maximize safety rather than

simply meet minimum standards; and

WHEREAS, the two above noted project corridors have been advanced via City of Millville Resolution No. 179-2019 to permit the SJTPO to conduct detailed analyses, data collection, public outreach, and stakeholder collaboration in partnership with the City and County to access federal HSIP funding; and

WHEREAS, the two above noted project corridors were analyzed by Pedestrian Road Safety Audit (PRSA) teams in January 2020 to identify road safety concerns and opportunities for improvements, paying particular attention to pedestrians and bicyclists; and

WHEREAS, the City of Millville and Cumberland County were participants in this audit and have reviewed the recommendations of the audit team; and

WHEREAS, SJTPO's technical effort has identified and recommended safety improvements along these corridors with the purpose of maximizing safety at these high crash locations without the contribution of any matching funds from the City and County; and

WHEREAS, these safety improvements have been recommended:

(1) The High Street corridor, proposed safety improvements between Main Street (NJ 49) and Harrison Avenue include detached and or traditional curb extensions (where feasible), high visibility crosswalks, installation of a pedestrian-activated flashing beacon at a select location, construction of ADA compliant pedestrian facilities, leading pedestrian interval at High Street/Broad Street, rightsizing of roadway north of Foundry Street with the installation of a dual center turn-lane with pedestrian refuge islands at intersections, signage and striping; and

(2) The signed County Route 555 (3rd Street), proposed safety improvements between Main Street (NJ 49) and G Street include detached and or traditional curb extensions (where

feasible), edgeline striping, high visibility crosswalks, retroreflective backplates at High Street/Broad Street, in-street signage at uncontrolled marked crosswalks, pedestrian-activated flashing beacon at select locations, leading pedestrian interval at High Street/Broad Street; and

WHEREAS, the Wheaton Avenue portion of County Route 555 has a narrow cross-section of 22 feet and is the site of seventy-two (72) of the one hundred and fifty-four (154) total crashes within the project corridor, has been described by the 2013 City of Millville Transportation Improvement Study as having both safety and operational issues due to its narrow cross-section and angled intersections; and

WHEREAS, the county route designation could be applied to other roadways in the vicinity to address existing safety and operational issues on the Wheaton Avenue portion of County Route 555; and

WHEREAS, SJTPO's technical effort has identified and recommended safety improvements along this portion of the County Route 555 corridor with the purpose of maximizing safety at this high crash location without the contribution of any matching funds from the City and County; and

WHEREAS, these safety improvements have been recommended:

1. Closure of Wheaton Avenue between 3rd Street and D Street, closure of Wheaton Avenue between F Street and 4th Street, designation and restriping of Wheaton Avenue as a one-way northbound between D Street and F Street, installation of a curb extension to restrict two-way traffic southbound onto Wheaton Avenue at Wheaton Avenue/G Street, remove the designation of this portion of Wheaton Avenue as County Route 555 from 3rd Street to G Street; and

2. Designate 3rd Street from Wheaton Avenue to G Street and G Street from 3rd Street to Wheaton Avenue as County Route 555.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF THE COUNTY OF CUMBERLAND, as follows:

That this Board does hereby support the SJTPO recommended safety improvements along the High Street and County Route 555 (3rd Street/Wheaton Avenue) corridors, which will allow the City to access federal HSIP funds to advance safety projects along these corridors to maximize safety.

Passed and adopted at a regular meeting of the Board of County Commissioners held at the Cumberland County Administration Building, 164 West Broad Street, Bridgeton, New Jersey on Tuesday, April 26, 2022 at 6:00 p.m. prevailing time.

RESULT:	**ADOPTED [UNANIMOUS]**
MOVER:	Carol Musso, Commissioner
SECONDER:	George Castellini, Commissioner
AYES:	Albrecht, Castellini, Musso, Romero, Sileo, Pearson, Barber

CERTIFICATION

I CERTIFY THAT THE FOREGOING IS A TRUE COPY OF A RESOLUTION ADOPTED BY THE CUMBERLAND COUNTY BOARD OF COUNTY COMMISSIONERS AT A MEETING HELD ON APRIL 26, 2022.

Jeffrey Ridgway

JEFFREY RIDGWAY
INTERIM CLERK TO THE BOARD

East Avenue

CITY OF VINELAND, NJ

RESOLUTION NO. 2021-_554__

A RESOLUTION APPROVING THE ADVANCEMENT OF A ROADWAY CORRIDOR LOCAL SAFETY PROGRAM APPLICATION FOR FEDERAL HIGHWAY SAFETY IMPROVEMENT PROGRAM (HSIP) FUNDS FOR S. EAST AVENUE BETWEEN WALNUT ROAD AND ELMER STREET.

WHEREAS, New Jersey has been designated by the Federal Highway Administration (FHWA) as a Focus State for Pedestrians and Bicycles due to its disproportionally high and increasing number of serious injury and fatal crashes among bicyclists and pedestrians; and

WHEREAS, bicycles and pedestrians are involved in 2.9 percent of crashes, but 21.6 percent of fatal and serious injury crashes in Cumberland County; and

WHEREAS, the South Jersey Transportation Planning Organization (SJTPO) has conducted bicycle and pedestrian crash data analyses associated with a Countywide Bicycle and Pedestrian Safety Action Plan to provide local access to federal Highway Safety Improvement Program (HSIP) funds, through the State's Local Safety Program; and

WHEREAS, these analyses have identified the East Avenue corridor, between Elmer Street and Walnut Road as the second highest ranked corridor in Vineland by public votes for Bicycle and Pedestrian crashes; and

WHEREAS, the federal Highway Safety Improvement Program (HSIP), is a data-driven program tasked with advancing substantive safety improvements to maximize safety rather than simply meet minimum standards; and

WHEREAS, the above noted project corridor has been advanced via Resolution No. 2019-112 to permit the SJTPO to conduct detailed analyses, data collection, public outreach, and stakeholder collaboration in partnership with the City to access federal with HSIP funding; and

WHEREAS, the above noted project corridors were analyzed by Pedestrian Road Safety Audit (PRSA) teams in January 2020 to identify road safety concerns and opportunities for improvements, paying particular attention to pedestrians and bicyclists; and

WHEREAS, the City Vineland was a participant in this audit, and has reviewed the recommendations of the audit team; and

WHEREAS, SJTPO's technical effort has identified and recommended safety improvements along these corridors with the purpose of maximizing safety at these high crash locations without the contribution of any matching funds from the City; and

WHEREAS, safety improvements have been recommended along the East Avenue corridor, between Elmer Street and Walnut Road, including installation of a mid-block crosswalk with a curb extension, high visibility crosswalks, installation of a pedestrian activated rectangular rapid flashing beacon at select locations, construction of ADA compliant pedestrian facilities, installation of median island at the entrance of East Avenue starting at MP 0.76, installation of sidewalk along both sides of East Avenue wherever missing, reconfiguration of existing curbline and sidewalk to provide a bus pull-out bay in front of the Cunningham Academy School, replacement of impacted utilities, and miscellaneous items therein, signage and striping; and

Res. No. 2021-554

CITY OF VINELAND, NJ

NOW THEREFORE, BE IT RESOLVED, that the Mayor and City Council of the City of Vineland do hereby support the SJTPO recommended safety improvements along the East Avenue corridor, which will allow the City to seek federal HSIP funds to advance safety projects along this corridor to maximize safety and pedestrian accessibility.

Adopted: November 23, 2021

President of Council eaa

ATTEST:

City Clerk kp

CERTIFICATION

I, Keith Petrosky, RMC, Municipal Clerk of the City of Vineland, Cumberland County, New Jersey, do hereby certify that the foregoing Resolution is a true and correct copy of a Resolution adopted by the Council of the City of Vineland, at a meeting conducted on November 23, 2021 at City Hall, Vineland, New Jersey.

(SEAL)

Keith Petrosky, RMC
Municipal Clerk

High Street & 3rd Street/Wheaton Avenue

RESOLUTION NO. 211-2022

A RESOLUTION APPROVING THE ADVANCEMENT OF TWO CITY OF MILLVILLE ROADWAY CORRIDOR LOCAL SAFETY PROGRAM APPLICATIONS TO ACCESS FEDERAL HIGHWAY SAFETY IMPROVEMENT PROGRAM (HSIP) FUNDS

WHEREAS, New Jersey has been designated by the Federal Highway Administration (FHWA) as a Focus State for Pedestrians and Bicycles due to its disproportionally high and increasing number of serious injury and fatal crashes among bicyclists and pedestrians; and

WHEREAS, bicycles and pedestrians are involved in 2.9 percent of crashes, but 21.6 percent of fatal and serious injury crashes in Cumberland County; and

WHEREAS, the South Jersey Transportation Planning Organization (SJTPO) has conducted bicycle and pedestrian crash data analyses associated with a Countywide Bicycle and Pedestrian Safety Action Plan to provide local access to federal Highway Safety Improvement Program (HSIP) funds, through the State's Local Safety Program; and

WHEREAS, these analyses have identified:

(1) The High Street corridor, between Main Street (RT 49) and Harrison Avenue as the highest ranked corridor in Millville by public votes for Bicycle and Pedestrian crashes; and

(2) The signed County Route 555 (3rd Street/Wheaton Avenue) corridor, between Main Street (RT 49) and G Street as the second highest ranked corridor in Millville by public votes for Bicycle and Pedestrian crashes; and

WHEREAS, the federal Highway Safety Improvement Program (HSIP), is a data-driven program tasked with advancing substantive safety improvements to maximize safety rather than simply meet minimum standards; and

WHEREAS, the two above noted project corridors have been advanced via Resolution No. 179-2019 to permit the SJTPO to conduct detailed analyses, data collection, public outreach, and stakeholder collaboration in partnership with the City to access federal HSIP funding; and

WHEREAS, the two above noted project corridors were analyzed by Pedestrian Road Safety Audit (PRSA) teams in January 2020 to identify road safety concerns and opportunities for improvements, paying particular attention to pedestrians and bicyclists; and

WHEREAS, the City of Millville was a participant in this audit and has reviewed the recommendations of the audit team; and

WHEREAS, SJTPO's technical effort has identified and recommended safety improvements along these corridors with the purpose of maximizing safety at these high crash locations without the contribution of any matching funds from the City; and

WHEREAS, these safety improvements have been recommended:

(1) The High Street corridor, proposed safety improvements between Main Street (RT 49) and Harrison Avenue include detached and or traditional curb extensions (where feasible), installation of bike lanes, (where feasible), high visibility crosswalks, installation of pedestrian activated flashing beacon at select location, construction of ADA compliant pedestrian facilities, leading pedestrian interval at High Street/Broad Street, rightsizing of roadway north of Foundry Street with the installation of a dual center turn-lane with pedestrian refuge islands at intersections, signage and striping; and

(2) The signed County Route 555 (3rd Street), proposed safety improvements between Main Street (RT 49) and G Street include detached and or traditional curb extensions (where feasible), edge line striping, high visibility crosswalks, retroreflective backplates at High Street/Broad Street, in-street signage at uncontrolled marked crosswalks, pedestrian activated flashing beacon at select locations, leading pedestrian interval at High Street/Broad Street; and

WHEREAS, the Wheaton Avenue portion of County Route 555 has a narrow cross-section of 22 feet and is the site of seventy-two (72) of the one hundred and fifty-four (154) total crashes within the project corridor, has been described by the 2013 City of Millville Transportation Improvement Study as having both safety and operational issues due to its narrow cross-section and angled intersections; and

WHEREAS, the county route designation could be applied to other roadways in the vicinity to address existing safety and operational issues on the Wheaton Avenue portion of County Route 555; and

WHEREAS, SJTPO's technical effort has identified and recommended safety improvements along this portion of the County Route 555 corridor with the purpose of maximizing safety at this high crash location without the contribution of any matching funds from the City; and

WHEREAS, these safety improvements have been recommended:

(1) Closure of Wheaton Avenue between 3rd Street and D Street, closure of Wheaton Avenue between F Street and 4th Street, designation and restriping of Wheaton Avenue as a one-way northbound between D Street and F Street, installation of a curb extension to restrict two-way traffic southbound onto Wheaton

Avenue at Wheaton Avenue/G Street, remove the designation of this portion of Wheaton Avenue as County Route 555 from 3rd Street to G Street; and

(2) Designate 3rd Street from Wheaton Avenue to G Street and G Street from 3rd Street to Wheaton Avenue as County Route 555.

NOW THEREFORE, BE IT RESOLVED, that the Mayor and City Council of the City of Millville do hereby support the SJTPO recommended safety improvements along the High Street and County Route 555 (3rd Street/Wheaton Avenue) corridors, which will allow the City to access federal HSIP funds to advance safety projects along these corridors to maximize safety.

Moved By: McQuade

Seconded By: Sooy

VOTING	In Favor	Against	Abstain	Absent
Lisa M. Orndorf	X			
Joseph Sooy	X			
Benjamin J. Romanik	X			
Charles Kirk Hewitt	X			
Robert W. McQuade, Jr.	X			

CERTIFICATION

I certify that the foregoing is a true copy of a Resolution adopted by the Board of Commissioners, of the City of Millville in the County of Cumberland, at a meeting thereof held on June 8, 2022.

Jeanne M. Parkinson

Jeanne M. Parkinson, City Clerk

Appendix C
Chestnut Avenue

CITY OF VINELAND, NJ

RESOLUTION NO. 2021- 553

A RESOLUTION APPROVING THE ADVANCEMENT OF A ROAD DIET AND OTHER SUBSTANTIVE SAFETY IMPROVEMENTS ON CHESTNUT AVENUE BETWEEN MAIN ROAD AND DELSEA DRIVE.

WHEREAS, New Jersey has been designated by the Federal Highway Administration (FHWA) as a Focus State for Pedestrians and Bicycles due to its disproportionally high and increasing number of serious injury and fatal crashes among bicyclists and pedestrians; and

WHEREAS, the New Jersey 2020 Strategic Highway Safety Plan (SHSP) has established the goal of reducing the occurrence of serious injury, fatality, and injury crashes by 14 percent over the next five years with bicyclists and pedestrian safety as an emphasis area; and

WHEREAS, bicycles and pedestrians are involved in 2.9 percent of crashes, but 21.6 percent of fatal and serious injury crashes in Cumberland County; and

WHEREAS, the South Jersey Transportation Planning Organization (SJTPO) has conducted bicycle and pedestrian crash data analyses associated with a Countywide Bicycle and Pedestrian Safety Action Plan; and

WHEREAS, these analyses have identified:

(1) Chestnut Avenue corridor, between Delsea Drive (RT 47) and Main Road (CR 555) as the number one ranked municipal roadway in Cumberland County for serious injuries and fatalities of pedestrians and serious injuries and fatalities of bicyclists; and

(2) Chestnut Avenue corridor, between Delsea Drive (RT 47) and Main Road (CR 555), as the number one ranked corridor in the City of Vineland by public votes for Bicycle and Pedestrian crashes; and

(3) Between 2012 and 2016, A total of 663 crashes occurred within the Chestnut Avenue corridor, between Delsea Drive (RT 47) and Main Road (CR 555). Of these 663 crashes, 224 resulted in some degree of injury with six (6) resulting in serious injury and fatality; and

(4) Right-Angle, Same Direction (Sideswipe), and Same Direction (Rear End) crashes represent 72% of all crashes within the Chestnut Avenue corridor, between Delsea Drive (RT 47) and Main Road (CR 555); and

WHEREAS, the above noted project corridor was analyzed by Pedestrian Road Safety Audit (PRSA) team in January 2020 to identify road safety concerns and opportunities for improvements, paying particular attention to pedestrians and bicyclists; and

WHEREAS, the City Vineland was a participant in this audit, and has reviewed, the recommendations of the audit team; and

WHEREAS, the report recommends the implementation of a 4-Lane to 3-Lane conversion, commonly referred to as a Road Diet, of Chestnut Avenue, between Delsea Drive (RT 47) and Main Road (CR 555); and

WHEREAS, the FHWA designated Road Diets (Roadway Reconfigurations) as a Proven Safety Countermeasure in January 2012; and

WHEREAS, Research approved by the FHWA on 4-Lane to 3-Lane Road Diet conversions have shown to reduce all crash types between 19 percent and 47 percent; and

WHEREAS, Road Diets are recommended on roadways with a current and future average daily traffic of 25,000 or less; and

Res. No. 2021-553

CITY OF VINELAND, NJ

WHEREAS, Chestnut Avenue, between Delsea Drive (RT 47) and Main Road (CR 555) has a current and projected average daily traffic of well under 25,000; and

WHEREAS, Travel-time analysis submitted to the City of Vineland shows that a 3-Lane "Road Diet" configuration between Delsea Drive (RT 47) and Main Road (CR 555) will not have a significant impact on travel times; and

WHEREAS, Community outreach was conducted by the City of Vineland's Health and Engineering Departments to identify the public's opinion of and experience traveling along Chestnut Avenue; and

WHEREAS, 521 residents submitted surveys to the City of Vineland documenting their thoughts and experiences; and

WHEREAS, these surveys have identified

(1) The majority of respondents feel that Chestnut Avenue is unsafe for walking, bicycling, and driving

(2) Major concerns were focused around speeding and difficulty making left turns

(3) Respondents ranked importance above 9 out of 10 for the need for safety improvements and their receptiveness to significant changes to achieve safety

(4) Respondents stated that their priorities about changes centered on pedestrian safety, speed reduction, and efficiency of traffic flow

NOW THEREFORE, BE IT RESOLVED, that the Mayor and City Council of the City of Vineland do hereby support substantive safety improvements on Chestnut Avenue, between Delsea Drive (RT 47) and Main Road (CR 555), specifically, the implementation of a 4-Lane to 3-Lane roadway conversion, commonly referred to as a Road Diet. The emphasis of this effort will be to substantively improve safety for all users, particularly focused on the safety of vulnerable bicyclists and pedestrians.

BE IT FURTHER RESOLVED that the Mayor and Council may consider any further recommendations from the City Engineer to further address, if necessary, safety for all users of Chestnut Avenue.

Adopted: November 23, 2021

President of Council eaa

ATTEST:

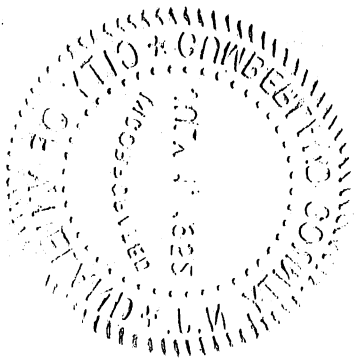
City Clerk kp

CERTIFICATION

I, Keith Petrosky, RMC, Municipal Clerk of the City of Vineland, Cumberland County, New Jersey, do hereby certify that the foregoing Resolution is a true and correct copy of a Resolution adopted by the Council of the City of Vineland, at a meeting conducted on November 23, 2021 at City Hall, Vineland, New Jersey.

(SEAL)

Keith Petrosky, RMC
Municipal Clerk



CITY OF VINELAND
WHERE IT'S ALWAYS GROWING SEASON

CHESTNUT AVENUE

Moving Vineland Forward

YOUR OPINION COUNTS!

Help your community by taking our survey about road safety on Chestnut Ave.

Scan this QR Code with your smartphone

Paper surveys also available at this location.

CITY OF
VINELAND
WHERE IT'S ALWAYS GROWING SEASON

Have questions about this Survey? Call (856) 794-4000 ext. 4254

CITY OF VINELAND
WHERE IT'S ALWAYS GROWING SEASON

CHESTNUT AVENUE

Moviendo Vineland Adelante

¡SU OPINIÓN CUENTA!

Ayude a su comunidad respondiendo nuestra encuesta sobre seguridad vial en Chestnut Ave.

Escanee este código QR con su teléfono inteligente

Las encuestas en papel también están disponibles en esta ubicación.

CITY OF VINELAND
WHERE IT'S ALWAYS GROWING SEASON

¿Tiene preguntas sobre esta encuesta? Llame a (856) 794-4000 ext. 4254

CITY OF VINELAND
WHERE IT'S ALWAYS GROWING SEASON

AMY HOLMES
HEALTH EDUCATOR
aholmes@vinelandcity.org
www.vinelandcity.org

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PO Box 1508
Vineland, NJ 08362-1508
Phone: (856) 794-4131
Fax: (856) 794-4608

CHESTNUT AVE. ROAD SAFETY SURVEY *Encuesta de Seguridad Vial De Chestnut Avenue*
(Corridor between DELSEA DR. and MAIN ROAD *Corredor entre Delsea Drive y Main Road*)

1. **Of the following, which applies to you? (Check all that apply.)**
   De los siguientes, ¿Cuál aplica a usted? (Marque todo lo que corresponda.)
   - ☐ **I live on Chestnut Avenue.** *Vivo en Chestnut Avenue*
   - ☐ **I work on Chestnut Avenue.** *Trabajo en Chestnut Avenue*
   - ☐ **I conduct personal business on Chestnut Avenue (shopping, banking, medical/legal appointments, go to places of worship, etc.).** *Realizo negocios personales en Chestnut Avenue (compras, bancos, citas médicas/legales, ir a lugares de culto, etc.)*
   - ☐ **My child goes to school on Chestnut Avenue.** *Mi hijo va a la escuela en Chestnut Avenue.*
   - ☐ **I use Chestnut Ave. as a pass-through route (to get from one part of Vineland to another).** *Utilizo Chestnut Avenue como ruta de paso (para llegar de una parte de Vineland a otra).*

2. **How safe do you think Chestnut Avenue is for <u>each</u> of the following modes of transportation?**
   ¿Qué tan seguro crees que es Chestnut Avenue para cada uno de los siguientes modos de transporte?

	Very Unsafe *Muy inseguro*	**Somewhat Unsafe** *Algo inseguro*	**Neutral**	**Somewhat Safe** *Algo seguro*	**Very Safe** *Muy seguro*	**Not Applicable** *No Aplicable*
Driving *Conducción*						
Walking *Caminar*						
Biking *Ciclismo*						
School/Public Buses *Transporte Público/escolar*						
Ride-share (i.e., taxi, Uber, Lyft) *Viaje compartido (es decir, taxi, Uber)*						

3. **In general, do <u>drivers</u> usually behave well on Chestnut? (Circle one) <u>Yes</u>** *Sí* **<u>No</u> <u>Don't know</u>** *No Sè*
   En general, ¿los conductores suelen comportarse bien en Chestnut? (*Circule uno arriba)*

   a. **<u>If "no"</u>, what do you usually see drivers doing? (Check all that apply.)** *<u>Si "no"</u>, ¿qué suele ver hacer a los conductores? (Marque todo lo que corresponda.)*
      - ☐ **Did not yield to people crossing the street.** *No cedió a la gente que cruza la calle.*
      - ☐ **Turned into people crossing the street.** *Manejó una virada mientras gente cruzaba la calle.*
      - ☐ **Drove too fast.** *Manejó demasiado rápido.*
      - ☐ **Sudden/unexpected lane changes.** *Cambios repentinos/inesperados de carril.*
      - ☐ **Stopping short (sudden stopping).** *Detenerse corto (parada repentina).*
      - ☐ **Sped up to make it through traffic lights or drove through red traffic lights.** *Aceleró para pasar los semáforos o condujo pasando los semáforos rojos.*
      - ☐ **Drivers backing out of driveways without looking** *Conductores saliendo de las entradas sin mirar.*

4. **In general, do <u>pedestrians</u> usually behave well on Chestnut? (Circle one) <u>Yes</u>** *<u>Sí</u>* **<u>No</u> <u>Don't know</u>** *<u>No Sè</u>*
En general, ¿los peatones suelen comportarse bien en Chestnut? (*Circule uno arriba)*

   a. **<u>If "no"</u>, what do you usually see pedestrians doing? (Check all that apply.)** *<u>Si "no"</u>, ¿qué suele ver hacer a los peatones? (Marque todo lo que corresponda.)*
      - ☐ **Jaywalking** *Imprudencia peatonal*
      - ☐ **Crossing against signals** *Cruzando en contra de señales*
      - ☐ **Stopping in the road before continuing to cross.** *Detenerse en la carretera antes de seguir cruzando*
      - ☐ **Wheelchairs/mobility scooters using the road instead of sidewalks** *Sillas de ruedas/escúter de movilidad usando la carretera en lugar de las aceras*

5. **In general, do <u>bicyclists</u> usually behave well on Chestnut? (Circle one) <u>Yes</u>** *<u>Sí</u>* **<u>No</u> <u>Don't know</u>** *<u>No Sè</u>*
En general, ¿los ciclistas suelen comportarse bien en Chestnut? (*Circule uno arriba)*

   a. **<u>If "no"</u>, what do you usually see bicyclists doing? (Check all that apply.)** *<u>Si "no"</u>, ¿qué suele ver hacer a los ciclistas? (Marque todo lo que corresponda.)*
      - ☐ **Crossing outside of cross-walks** *Cruzan fuera de los paseos peatonales*
      - ☐ **Crossing against signals** *Cruzan contra señales*
      - ☐ **Riding in car lanes** *Transitan en carriles de vehículos*
      - ☐ **Riding on sidewalks** *Transitan en las aceras*
      - ☐ **Stopping in the road before continuing to cross** *Se detienen en la carretera antes de seguir cruzando*
      - ☐ **Riding against traffic** *Transitan contra el tráfico*

6. **Write below any other safety concerns you may have.**
Escriba a continuación cualquier otro problema de seguridad que pueda tener.

_____

7. **On a scale of 0 to 10, tell us how important it is to you that safety (for drivers, pedestrians, and bicyclists) be improved on Chestnut Avenue.** *En una escala de 0 a 10, díganos Cuán importante es para usted que la seguridad (para conductores, peatones, y ciclistas) se mejore en Chestnut Avenue.*

Very Unimportant					**Neutral**					**Very Important**
<u>Muy Poco Importante</u>					*<u>Neutral</u>*					*<u>Muy Importante</u>*
0	1	2	3	4	5	6	7	8	9	10

8. **On a scale of 0 to 10, tell us how <u>receptive you are to changes</u> which will significantly improve safety on Chestnut Avenue.** *En una escala de 0 a 10, díganos cuán <u>receptivo es usted</u> a los cambios que mejorarán significativamente la seguridad en Chestnut Avenue.*

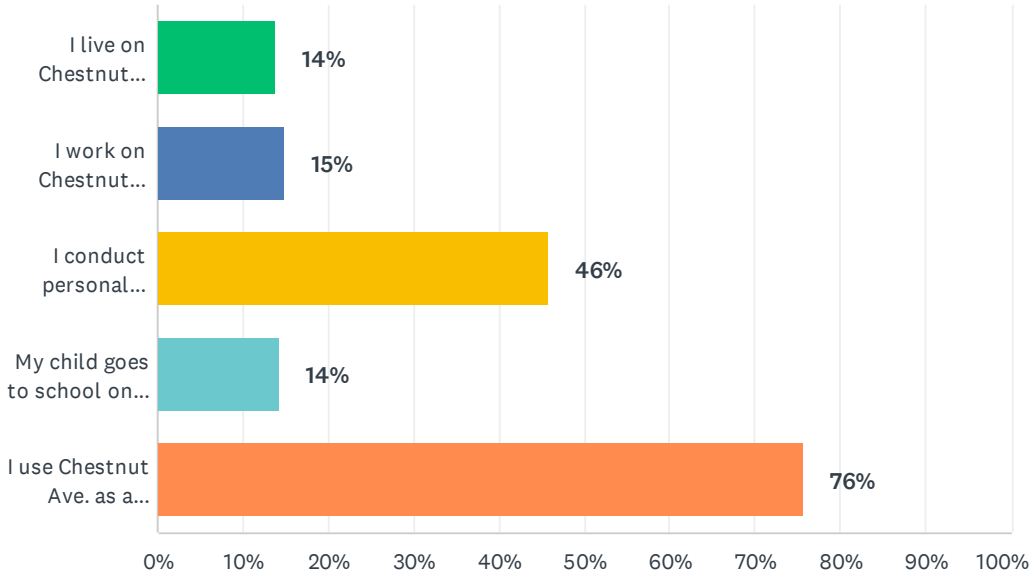
Very Unreceptive					**Neutral**					**Very Receptive**
<u>Muy Poco Receptivo</u>					*<u>Neutral</u>*					*<u>Muy Receptivo</u>*
0	1	2	3	4	5	6	7	8	9	10

9. **When you think about changes to improve Chestnut Avenue, what is your first concern?**
Cuando piensa en cambios para mejorar Chestnut Avenue, ¿cuál es su primer preocupación?

_____

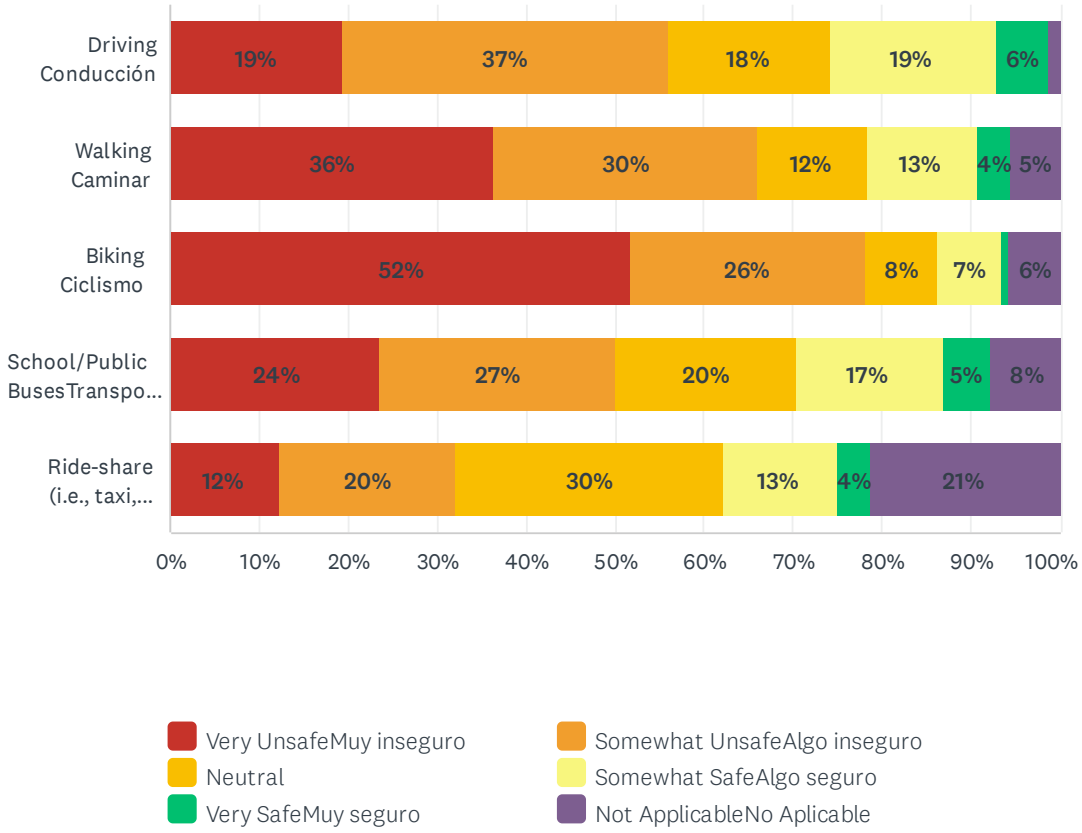
Q1 Of the following, which applies to you? (Check all that apply.) De los siguientes, ¿Cuál aplica a usted? (Marque todo lo que corresponda.)

Answered: 463 Skipped: 0



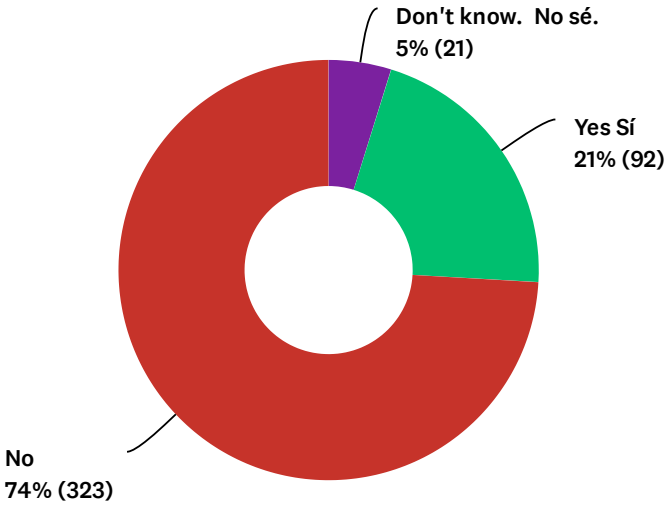
Q2 How safe do you think Chestnut Avenue is for each of the following modes of transportation? ¿Qué tan seguro crees que es Chestnut Avenue para cada uno de los siguientes modos de transporte?

Answered: 437 Skipped: 26



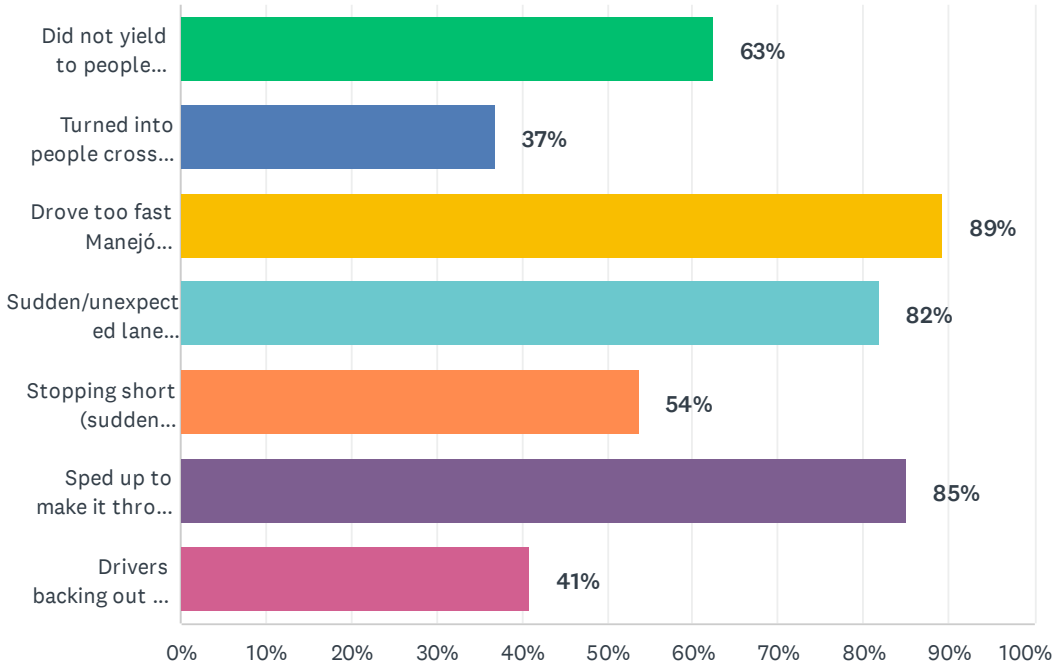
Q3 In general, do DRIVERS usually behave well on Chestnut? En general, ¿los CONDUCTORES suelen comportarse bien en Chestnut?

Answered: 436 Skipped: 27



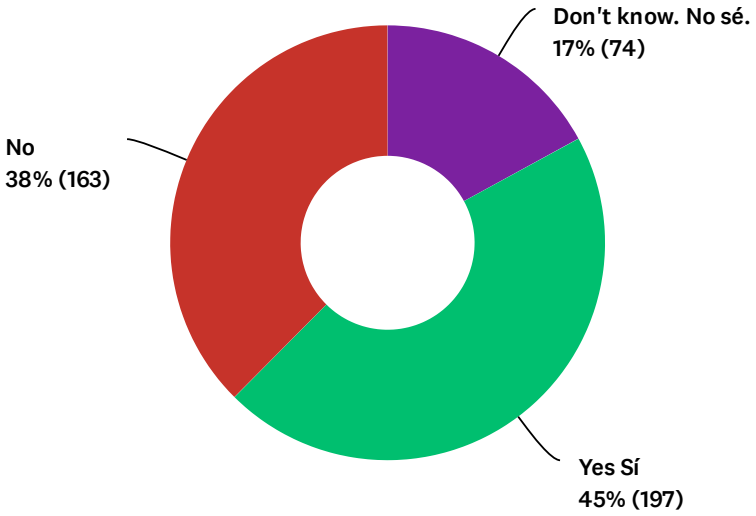
Q4 What do you usually see drivers doing? (Check all that apply.) ¿Qué suele ver hacer a los conductores? (Marque todo lo que corresponda.)

Answered: 320 Skipped: 143



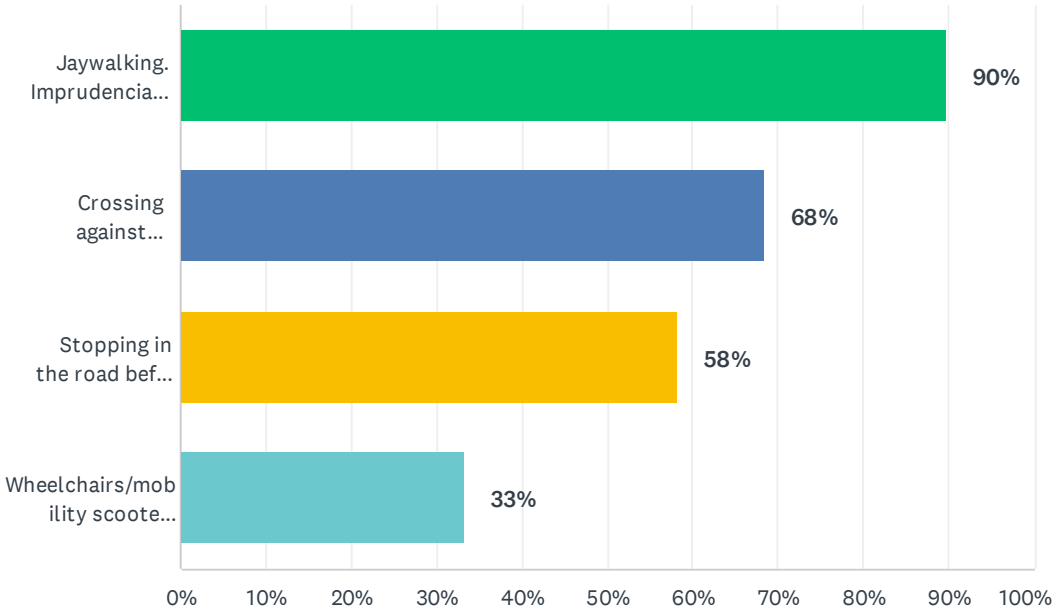
Q5 In general, do PEDESTRIANS usually behave well on Chestnut? En general, ¿los PEATONES suelen comportarse bien en Chestnut?

Answered: 434 Skipped: 29



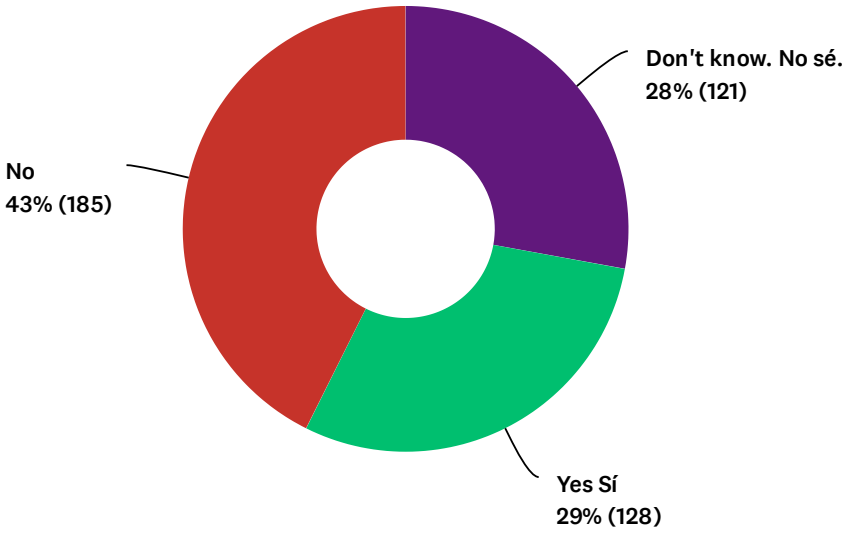
Q6 What do you usually see pedestrians doing? (Check all that apply.) ¿Qué suele ver hacer a los peatones? (Marque todo lo que corresponda.)

Answered: 165 Skipped: 298



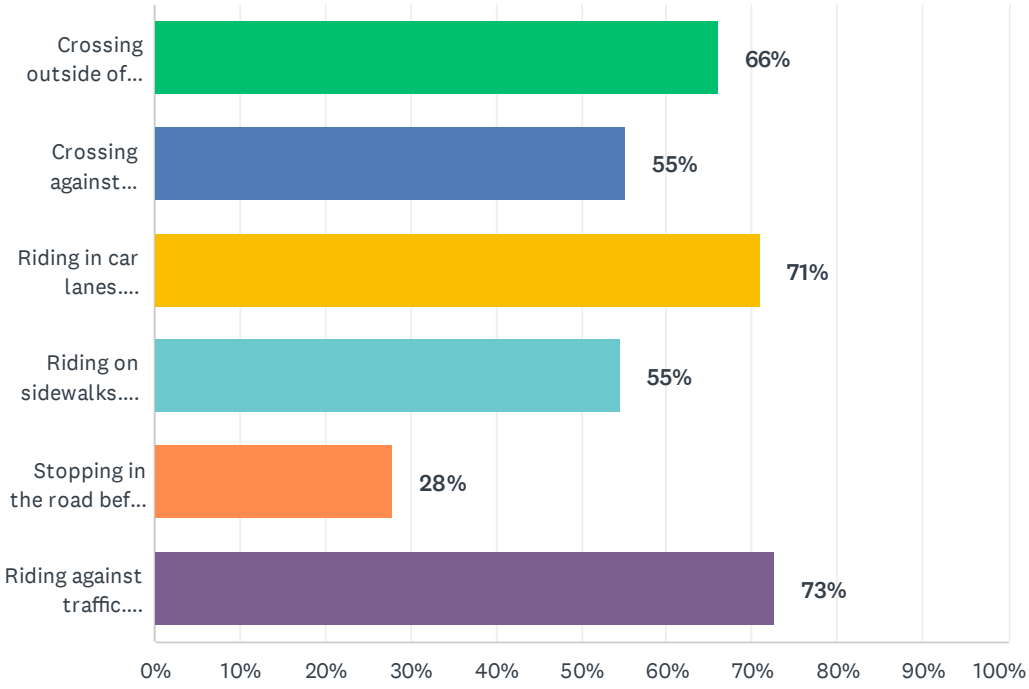
Q7 In general, do BICYCLISTS typically behave well on Chestnut? En general, ¿los CICLISTAS suelen comportarse bien en Chestnut?

Answered: 434 Skipped: 29



Q8 What do you usually see bicyclists doing? (Check all that apply.) ¿Qué suele ver hacer a los ciclistas? (Marque todo lo que corresponda.)

Answered: 183 Skipped: 280

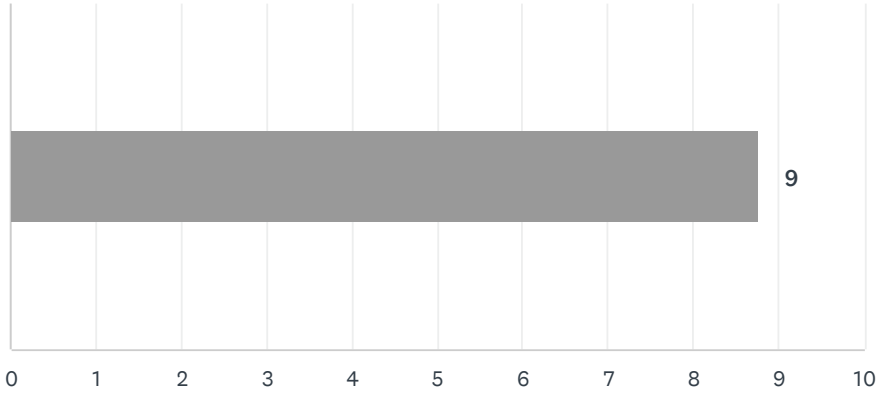


Q9 Type below any other safety concerns you may have. Escriba a continuación cualquier otro problema de seguridad que pueda tener.

Answered: 192 Skipped: 271

Q10 On a scale of 0 to 10, tell us how important it is to you that safety (for drivers, pedestrians, and bicyclists) be improved on Chestnut Avenue. En una escala de 0 a 10, díganos Cuán importante es para usted que la seguridad (para conductores, peatones, y ciclistas) se mejore en Chestnut Avenue.

Answered: 412 Skipped: 51

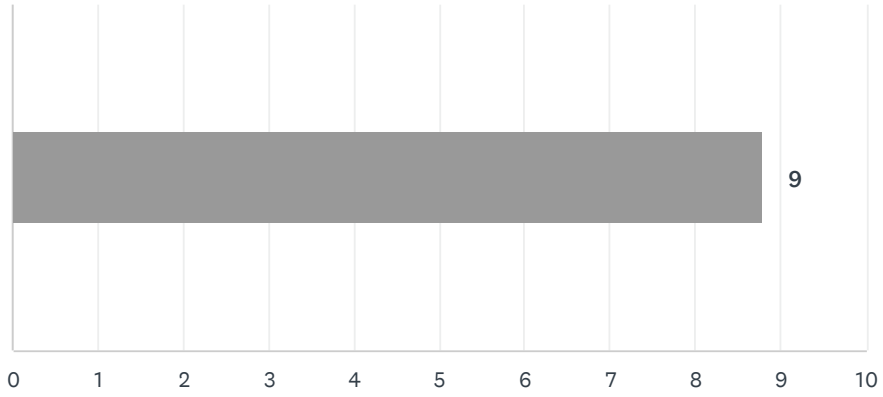


BASIC STATISTICS

MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
0.00	10.00	10.00	8.75	2.06

Q11 On a scale of 0 to 10, tell us how receptive you are to changes which will significantly improve safety on Chestnut Avenue. En una escala de 0 a 10, díganos cuán receptivo es usted a los cambios que mejorarán significativamente la seguridad en Chestnut Avenue.

Answered: 412 Skipped: 51



BASIC STATISTICS					
	MINIMUM	**MAXIMUM**	**MEDIAN**	**MEAN**	**STANDARD DEVIATION**
	0.00	10.00	10.00	8.78	2.03

Q12 When you think about changes to improve Chestnut Avenue, what is your first concern? Cuando piensa en cambios para mejorar Chestnut Avenue, ¿cuál es su primer preocupación?

Answered: 287 Skipped: 176

Chestnut Avenue Traffic Safety
Public Information Session
October 6, 2021

City Staff in attendance:
David J. Maillet, PE, City Engineer
Nick English, Health Department

5 members of the public were present.
There was no formal presentation by City staff.
There was an open discussion about Chestnut Avenue between Delsea Drive and Main Road. Some of the discussion strayed from this interest area. Below is a rough accounting of the discussion points.

DISCUSSION:

Speeding is a major concern.
There are many crashes at intersection of Chestnut & 3rd street. Public asked why there's no traffic signals between West Avenue and Boulevard. Signal desired. Staff unsure why but explained the warrant analysis needed for installation of signals.

There were claims that Chestnut Avenue, and the City generally, is not pedestrian friendly or bicycle friendly. Existing traffic signals in City, even new ones, overly favor vehicles instead of pedestrians. There are no safe places to ride bikes on Chestnut Avenue. Bike lanes and/or multi-use paths are needed.

School buses on Chestnut (at Chestnut Square Apartments) back up traffic to Delsea Drive. Then, when they turn off their red lights, cars speed to get past them. Staff has had discussions with School Transportation office. They can't put buses onto private property. Staff is looking into moving the bus stop onto Earl Drive for those students.

Traffic calming needs should include street trees. Staff agreed that street trees are a part of traffic calming, but Chestnut Avenue is so wide that they may have minimal effect.

Traffic on Delsea Drive backs up badly in this area. If Chestnut went to one lane in each direction with a center two-way-left-turn lane, it would be the same way. Staff pulled up NJDOT Traffic Count data (https://www.njtms.org/map) and announced that Delsea Drive had over 20,000 vehicles per day (vpd) between Chestnut Avenue and Almond Street. Chestnut Avenue had over 14,000 vpd between West Avenue and Earl Drive and almost 12,000 vpd between 3rd Street Terrace and 4th Street. The Federal Highway Administration does not recommend Road Diets for roads with volumes above 20,000. This explains why Delsea Drive backs up. It should work on Chestnut Avenue.

Police are slow to respond. Sometimes they come out, have to leave on another call and then come back later.

Dirtbikes and atvs speed down the street.

3rd Street is used as a cut through street. Many accidents at 3rd & 3rd St. Annex. It should be 4 way stop. Staff will investigate this.

Travel to the high school isn't pedestrian or bike friendly. Speed limits in the area seem too high. Traffic during dismissal is a mess.

Color blind people have problems recognizing the color of the signal as they're approaching. Staff indicated that there are now retroreflective backplates with borders to help with this problem. Drivers generally know that the red ball is on top and the green is on the bottom. Staff indicated that new signals in Vineland are installed with them.

> This sounds like an accessibility issue. Why not retrofit all signals with them? Staff indicated that we would normally only perform this upgrade as part of a signal replacement. City Engineering will evaluate whether we can install these without having to perform significant improvements to the signals as this is a simple solution to a common problem.

Staff indicated that the cost and funding amounts for significant safety improvements on Chestnut Avenue between Delsea and Main would make us do the work in sections. Most likely would start at Delsea and move east. Citizens present asked why do that when you know that the area around 3rd street is so bad. Staff conceded that 3rd is the most dangerous for pedestrians and that rethinking the phasing order makes sense.

There was a conversation about using social media to a greater extent. Facebook has the ability to poll people and they are more likely to show up to a meeting if they say yes in a poll. Staff will look into social media use. Generally, we have to request Public Relations department to post online.

Chestnut Avenue Public Outreach
Public Information Session #2
Meeting Minutes
October 21, 2021, 6:00 PM to 8:15 PM

City Staff Attendees (In person): David Maillet (Engineering), Rick Caudill (Engineering), Stephanie Wakeley (Engineering), Amy Holmes (Health)

Partner Staff Attendees (Virtual): Alan Huff (SJTPO), Jennifer Marandino (SJTPO), Scott Diehl (Urban Engineers), Dan Hutton (Urban Engineers)

Public Attendees (In person): Robert Larrieu (La Hacienda Bakery), Joel Larrieu (La Hacienda Bakery), Frank Lee (Chestnut Avenue Crossing Guard)

Public Attendees (Virtual): Rosa, Amelia

1. A meeting was held for traffic safety along Chestnut Avenue, between Delsea Drive and Main Road.
2. David Maillet and Amy Holmes presented a formal PowerPoint Presentation of the survey results as well as the possible traffic safety countermeasures for Chestnut Avenue.
3. A list of some of the possible Federal Highway Administration (FHWA) proven safety countermeasures that were discussed with the public were as follows:
    a. Leading pedestrian interval
    b. Median barrier
    c. Medians and pedestrian crossing islands
    d. Pedestrian hybrid beacon
    e. Road diet
    f. Walkways
    g. Bike lanes
    h. Traffic signal upgrades
4. Three public attendees provided personal stories about how the existing safety issues on Chestnut Avenue affects them.
5. After the presentation, there was an open discussion with the public. A summary of the discussion points are on the following pages.

Open Discussion:
(discussion is paraphrased and not intended to be direct quotations)

1. Public comments related to Chestnut Avenue/Third Street

- **Public Comment:** There are too many crashes at Chestnut Avenue and Third Street. Children at the Park have difficulty crossing the street. Crashes occur every few months.
- **Public Comment:** Near Third Street, found that it was harder to cross at an intersection because you have to check for traffic coming from four directions. Prefers to cross mid-block because it is easier since you only have to worry about two directions of vehicles traveling.
- **Public Comment:** Would like a traffic signal installed at Chestnut Avenue and Third Street. There is a lot of children and seniors trying to cross as well as different businesses that attract the public (car wash, laundromat, convenience stores).

City Response*: A traffic signal may not be warranted due to the volumes along Third Street. An alternative solution may be installing a pedestrian Rectangular Rapid Flashing Beacon. The pedestrian would push the button when they want to cross and the LED yellow Beacon would flash yellow indicating to a driver to stop since a pedestrian needs to cross. Another solution may be installing curb bump outs as this would decrease the distance a pedestrian has to cross the roadway.*

2. Public comments related to Chestnut Avenue/Main Road

- **Public Comment:** Near the intersection of Chestnut Avenue and Main Road, there is a lot of speeding over the existing 50 MPH speed limit. The speed limit should be lowered to 40 MPH.
- **Public Comment:** There are a lot of children walking to get to/from the Memorial school. At Chestnut Avenue and Main Road, drivers continue to make a left turn even when they no longer have the green arrow and the walk sign is shown. Also, the pedestrian walking timing interval is not long enough. It does not provide enough time for children or seniors to cross safely.

City Response*: The City will look at the existing pedestrian walking interval timing at the intersection. Staff will make recommendations to Cummerbund County since they have jurisdiction at this intersection.*

3. Public comments related to school bus stops along Chestnut Avenue

Public Comment: If there is a road diet on Chestnut Avenue, will the traffic back up more with bus stops since there will be less lanes (especially near the apartment complex)?

- **Public Comment:** Have seen the vehicles waiting behind a school bus stopped on Chestnut Avenue near Eighth Street back up to past Seventh Street. As a result, vehicles will rush to the intersection to make a left and block the intersection until it is clear for them to turn. Kids should be picked up on the side street since it is not safe on Chestnut Avenue.

***City Response**: The City will have discussions with the School Transportation office. to see if the bus stops can be moved to Earl Drive and Cherry Street. Another option may be to displace parking and have a bus pull off lane on the side of Chestnut Avenue. This would allow traffic to continue to flow along Chestnut Avenue.*

4. Public comments related to speeding and enforcement along Chestnut Avenue

- **Public Comment:** Speeding happens all the time. There is no police enforcement to hold the drivers accountable.
- **Public Comment:** Drivers speed on Chestnut, but especially between Boulevard and West. Nothing to stop or slow down drivers. Drivers continue to speed.
- **Public Comment:** Drivers ignore the "No Turn on Red" sign. Also, drivers continue to speed up through yellow and red lights.

***City Response**: The City will ensure the design for the project incorporates traffic calming countermeasures. This may include a road diet, curb bump outs, median barriers, landscaping, and other additional signage and striping. In the meantime, the City will have conversations with the Vineland Police Department for them to conduct more enforcement along Chestnut Avenue.*

5. General Public comments/questions related to Chestnut Avenue

- **Public Comment:** Chestnut Avenue is not pedestrian or bicycle friendly.

  ***City Response**: The City will ensure the design for the project incorporates pedestrian and bicycle safety countermeasures. This may include high visibility crosswalks, ADA compliant ramps at all intersections, upgrades to traffic signals for pedestrian push buttons, walkways, bike lanes, pedestrian Rectangular Rapid Flashing Beacons, and other countermeasures. A multi-use path is also a solution.*

- **Public Comment:** Removing a lane in each direction may increase the traffic delay on Chestnut Avenue.

  ***City Response**: A Road Diet Analysis was performed by the consultant (Urban Engineers). The analysis showed the reduction in lanes with a two-way center turn lane, where Chestnut Avenue would continue to have efficient traffic flow. The volumes along Chestnut Avenue (between 11,000 and 16,000) are in the range of what FHWA recommends would be a good location for a road diet (volumes below 20,000).*

- **Public Comment:** Will the side streets along Chestnut Avenue have an effect after the changes on Chestnut Avenue?

  ***City Response**: Side streets may have an unintended consequence. Cherry Street is the most vulnerable as drivers may use it as a new cut through street. The City will need to look into the design of Cherry Street to eliminate the speeding possibility. A similar design like on Wood Street and Elmer Street with striped parking and bike lanes may be a solution for Cherry Street.*

- **Public Comment:** Is a pedestrian bridge a possibility?

  ***City Response**: This solution is cost intensive. Also, this may not be used by pedestrians since pedestrians look for the quickest way to get across.*

- **Public Comment:** What is timeline for changes? Can the easier solutions be worked on now while the more in depth solutions are looked in to?

  ***City Response**: The City does not anticipate construction on this section of Chestnut Avenue until at least 2024. The cost and funding amounts for significant safety improvements would result in the construction phased out in several phases. In the meantime, the City will have discussions with the Schools, the Police Department, and internally to start the process on low-cost, intermediate solutions.*

November 15, 2021

Vineland City Council
640 E. Wood Street
Vineland, NJ 08360

RE: Letter in Support of Chestnut Avenue Road Safety Improvement Project

Dear City Council,

On of behalf of Park Towne Apartments, I am writing to express the need for road safety improvements along Chestnut Avenue (between Delsea Drive and Main Road). Chestnut Avenue needs to be safer for pedestrians, bicyclists, and motorists.

I support the City's Chestnut Avenue Road Safety Improvement Project. Changes to Chestnut Avenue are acceptable if they result in significant safety improvements. Improving safety also improves the quality of daily life for those who live, work, worship, and/or conduct personal business on Chestnut Avenue.

Thank you.

Respectfully submitted,

Gina Mave
(Signature)

11-16-2021
Date

Gina Mave
Name (Printed)

Park Towne Apartments
(Name Organization or Business)

November 15, 2021

Vineland City Council
640 E. Wood Street
Vineland, NJ 08360

RE: Letter in Support of Chestnut Avenue Road Safety Improvement Project

Dear City Council,

On of behalf of Chestnut Square Holdings, LLC, I am writing to express the need for road safety improvements along Chestnut Avenue (between Delsea Drive and Main Road). Chestnut Avenue needs to be safer for pedestrians, bicyclists, and motorists.

I support the City's Chestnut Avenue Road Safety Improvement Project. Changes to Chestnut Avenue are acceptable if they result in significant safety improvements. Improving safety also improves the quality of daily life for those who live, work, worship, and/or conduct personal business on Chestnut Avenue.

Thank you.

Respectfully submitted,

(Signature) 11/15/2021
Date

Anna Reyes
Name (Printed)

Chestnut Square Apts.
(Name Organization or Business)

November 15, 2021

Vineland City Council
640 E. Wood Street
Vineland, NJ 08360

RE: Letter in Support of Chestnut Avenue Road Safety Improvement Project

Dear City Council,

On of behalf of STATE FARM INSURANCE, I am writing to express the need for road safety improvements along Chestnut Avenue (between Delsea Drive and Main Road). Chestnut Avenue needs to be safer for pedestrians, bicyclists, and motorists.

I support the City's Chestnut Avenue Road Safety Improvement Project. Changes to Chestnut Avenue are acceptable if they result in significant safety improvements. Improving safety also improves the quality of daily life for those who live, work, worship, and/or conduct personal business on Chestnut Avenue.

Thank you.

Respectfully submitted,

(Signature)

11/16/21
Date

RICH UKNTICE
Name (Printed)

STATE FARM INSURANCE
(Name Organization or Business)

November 15, 2021

Vineland City Council
640 E. Wood Street
Vineland, NJ 08360

RE: Letter in Support of Chestnut Avenue Road Safety Improvement Project

Dear City Council,

On of behalf of Robin's Barber Shop, I am writing to express the need for road safety improvements along Chestnut Avenue (between Delsea Drive and Main Road). Chestnut Avenue needs to be safer for pedestrians, bicyclists, and motorists.

I support the City's Chestnut Avenue Road Safety Improvement Project. Changes to Chestnut Avenue are acceptable if they result in significant safety improvements. Improving safety also improves the quality of daily life for those who live, work, worship, and/or conduct personal business on Chestnut Avenue.

Thank you.

Respectfully submitted,

(Signature)

Nov 15, 2021.
Date

Robin Juan
Name (Printed)

Robin's Barber Shop
(Name Organization or Business)

November 15, 2021

Vineland City Council
640 E. Wood Street
Vineland, NJ 08360

RE: Letter in Support of Chestnut Avenue Road Safety Improvement Project

Dear City Council,

On of behalf of ERIC'S RESTAURANT, I am writing to express the need for road safety improvements along Chestnut Avenue (between Delsea Drive and Main Road). Chestnut Avenue needs to be safer for pedestrians, bicyclists, and motorists.

I support the City's Chestnut Avenue Road Safety Improvement Project. Changes to Chestnut Avenue are acceptable if they result in significant safety improvements. Improving safety also improves the quality of daily life for those who live, work, worship, and/or conduct personal business on Chestnut Avenue.

Thank you.

Respectfully submitted,

Cathy Ishii
(Signature)

11/15/21
Date

Cathy Ishii
Name (Printed)

Eric's Restaurant
(Name Organization or Business)

November 15, 2021

Vineland City Council
640 E. Wood Street
Vineland, NJ 08360

RE: Letter in Support of Chestnut Avenue Road Safety Improvement Project

Dear City Council,

On of behalf of Ash's Flower Shop, I am writing to express the need for road safety improvements along Chestnut Avenue (between Delsea Drive and Main Road). Chestnut Avenue needs to be safer for pedestrians, bicyclists, and motorists.

I support the City's Chestnut Avenue Road Safety Improvement Project. Changes to Chestnut Avenue are acceptable if they result in significant safety improvements. Improving safety also improves the quality of daily life for those who live, work, worship, and/or conduct personal business on Chestnut Avenue.

Thank you.

Respectfully submitted,

James R Ash 11/15/21

(Signature) Date

JAMES R ASH

Name (Printed)

Ash's Plant & Flower Shop

(Name Organization or Business)

URBAN ENGINEERS
220 Lake Drive East, Suite 300
Cherry Hill, NJ 08002
856.663.5550

DATE: September 21, 2021

SUBJECT: Cumberland County Bicycle and Pedestrian Safety Action Plan
Chestnut Avenue Road Diet Analysis

TO: Alan Huff - SJTPO

FROM: Chris Burke – Urban Engineers
Scott Diehl – Urban Engineers

CC: Dan Hutton – Urban Engineers

The following memo provides a summary of the traffic operations analysis results for a Road Diet concept on Chestnut Avenue from Delsea Drive (Route 47) to S Main Road (CR 555).

General Approach

The goal of this effort was to operationally analyze the Chestnut Avenue corridor to determine the impact a Road Diet concept would have on vehicular traffic. The analysis was completed using Synchro and SimTraffic. Urban previously developed a Synchro/SimTraffic PM peak hour model for the project area under SJTPO's Local Safety and CMAQ Project Development in 2015. The No Build model from this analysis was utilized as the starting point for this Road Diet concept analysis. It should be noted the analysis will focus on the signalized intersections where Turning Movement Count data was collected for the 2015 project.

Analysis

The Build model is a Road Diet concept on Chestnut Street with a three-lane cross section consisting of one through lane in each direction and a two-way-left-turn-lane (TWLTL). At the signalized intersections Chestnut Avenue consists of a left-turn lane, and a shared through-right lane. Several locations deviate from this standard Road Diet cross-section at the signalized intersections and include the following:

- ***Chestnut Avenue/Delsea Drive:*** Chestnut Avenue Westbound approach includes a dedicated right-turn lane approaching the signal.
- ***Chestnut Avenue/SE Blvd/SW Blvd:*** Due to the Chestnut Avenue left-turn lanes not being back-to-back, a four-lane cross section is needed at this intersection crossing the railroad tracks with the four lanes including one (1) through lane and one (1) left-turn lane in each direction
- ***Chestnut Avenue/S Main Road:*** Chestnut Avenue Eastbound approach includes a dedicated right-turn lane approaching the signal.

The Delsea Drive and S Main Road intersections included right-turn lanes as these locations were approaching capacity. Another key change from No Build to Build is that image detection was added to all side-street movements and any locations where lead left-turn phases are proposed on Chestnut Avenue. Under No Build conditions many signalized intersections were pre-timed with all phases using max green time. Pedestrian accommodations were also assumed as part of the Build condition with Pedestrian Push Buttons (PPB) and Countdown pedestrian signal heads.

Analysis Results

The PM peak hour No Build SimTraffic results showed all approaches operate at LOS C or better. The PM peak hour Build SimTraffic results showed all approaches operate at LOS C or better with the exception of the Northbound and Eastbound approaches at Chestnut Avenue/Delsea Drive intersection, which operate at LOS D with 45 seconds of average vehicle delay. Attached are detailed SimTraffic results that show Average Delay and Level of Service (LOS) by approach for each intersection. ***Table 1*** shows a travel time comparison between Existing Field, No Build and Build conditions for the PM peak hour.

Table 1: PM Travel Time Comparison

Intersection	Travel Time (minutes)		
	Existing-Field	No Build-SimTraffic	Build-SimTraffic
Chestnut Avenue - EB	6.1	6.5	5.7
Chestnut Avenue - WB	6.1	6.1	5.4

Table 1 shows an improvement in the Build condition travel time compared to Existing conditions. It should be noted that one through-lane of travel was removed in each direction from Existing to the Road Diet Build condition. While providing left-turn lanes on Chestnut Avenue will significantly improve safety, the key reason for this improvement in travel time for the Build condition is that image detection is provided for the side-street and lead-left turn phase movements. Under existing conditions most of the traffic signals in the project area are Pre-Timed; therefore, side-street movements will receive max green time regardless of whether there are vehicles or pedestrians present. Image detection allows for efficient use of green time for side-street movements with excess green time reverting to Chestnut Avenue. This additional green time on Chestnut Avenue provides greater travel time improvements compared to the reduction in through travel lanes.

Summary

The Chestnut Avenue Build condition analyzed included a three-lane Road Diet cross section, image detection for side-street and left-turn phase movements, and pedestrian accommodations (e.g., PPB and countdown signal heads). The PM peak Build condition travel time results showed a decrease in travel time compared to Existing and No Build conditions, which can mainly be attributed to the addition of image detection and pedestrian accommodations.

No Build PM Peak SimTraffic Results

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Intersection	NB		SB		EB		WB		ALL	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
15. Chestnut Ave and Orchard Rd	17.4	B	19.1	B	14.7	B	20.2	C	18.2	B
16. Chestnut Ave and West Ave	23.3	C	18.9	B	29.9	C	27.1	C	25.6	C
17. Chestnut Ave and East Blvd	12.5	B		-	5.7	A	23.3	C	14.3	B
18. Chestnut Ave and West Blvd		-	13.0	B	21.4	C	6.9	A	14.2	B
19. Chestnut Ave and 6th St	9.7	A	12.6	B	5.4	A	5.1	A	5.7	A
20. Chestnut Ave and 7th St	25.8	C		-	9.3	A	6.2	A	9.2	A
21. Chestnut Ave and East Ave	20.5	C	23.6	C	18.1	B	25.0	C	22.0	C
22. Chestnut Ave and State St	18.2	B	19.9	B	8.1	A	9.3	A	9.6	A
23. Chestnut Ave and Valley Ave	28.0	C	31.1	C	26.2	C	25.5	C	26.3	C
24. Chestnut Ave and Spring Rd	28.5	C	20.3	C	14.5	B	12.1	B	17.3	B
117. Chestnut Ave and Delsea Drive	28.3	C	20.2	C	46.5	D	30.5	C	28.5	C
68. Chestnut Ave and S. Main Road	21.6	C	23.2	C	39.3	D	26.2	C	27.6	C

Note: Hatched cells indicate approach does not exist or zero volume

TRAVEL TIME COMPARISONS

Travel Time Road - Direction	Travel Time (sec.)		
	Existing	No Build	% Diff.
Chestnut - EB	366	393	7%
Chestnut - WB	371	367	-1%

Build PM Peak SimTraffic Results

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Intersection	NB		SB		EB		WB		ALL	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
15. Chestnut Ave and Orchard Rd	9.1	A	10.3	B	13.6	B	18.2	B	12.8	B
16. Chestnut Ave and West Ave	27.4	C	20.8	C	20.9	C	22.8	C	22.3	C
17. Chestnut Ave and East Blvd	21.3	C		-	4.2	A	11.4	B	9.5	A
18. Chestnut Ave and West Blvd		-	19.4	B	17.2	B	3.9	A	12.8	B
19. Chestnut Ave and 6th St	24.5	C	26.1	C	5.1	A	5.1	A	6.6	A
20. Chestnut Ave and 7th St	26.8	C		-	5.9	A	9.0	A	9.2	A
21. Chestnut Ave and East Ave	21.3	C	34.2	C	14.4	B	11.9	B	19.3	B
22. Chestnut Ave and State St	21.7	C	23.6	C	5.7	A	6.0	A	7.4	A
23. Chestnut Ave and Valley Ave	24.5	C	24.4	C	14.4	B	19.3	B	17.8	B
24. Chestnut Ave and Spring Rd	26.3	C	20.9	C	13.9	B	11.9	B	16.6	B
117. Chestnut Ave and Delsea Drive	45.2	D	24.3	C	44.5	D	30.1	C	35.2	D
68. Chestnut Ave and S. Main Road	22.8	C	25.3	C	26.5	C	39.3	D	28.0	C

Note: Hatched cells indicate approach does not exist or zero volume

TRAVEL TIME COMPARISONS

Travel Time Road - Direction	Travel Time (sec.)		
	No Build	Build	% Diff.
Chestnut - EB	393	339	-14%
Chestnut - WB	367	325	-11%

#2018400106 | March 2020

Pedestrian and Bicycle Road Safety Audit Report

City of Bridgeton, City of Millville, City of Vineland

Prepared for:
South Jersey Transportation Planning Organization
782 South Brewster Road, Unit B6
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Prepared by:
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CUMBERLAND COUNTY, NJ

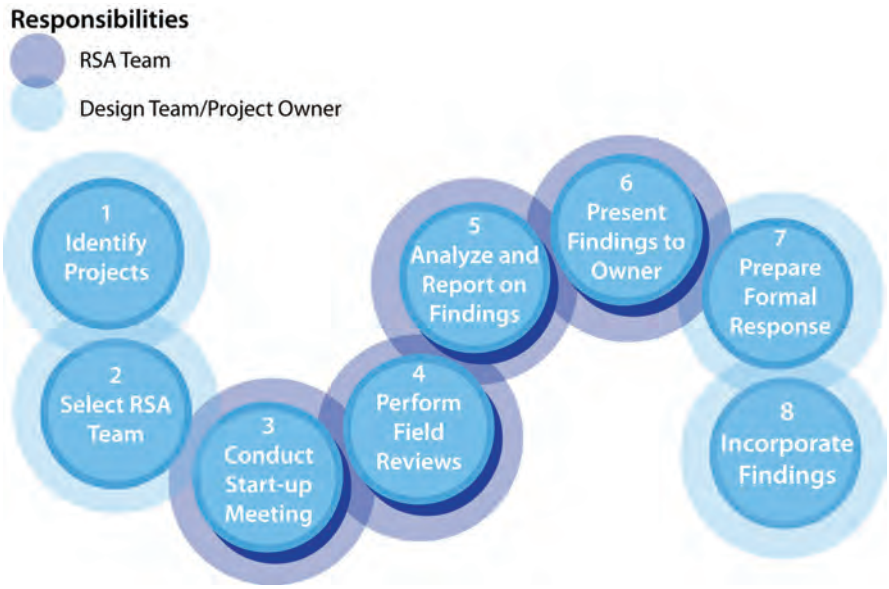
URBAN ENGINEERS

1. Introduction

As the final report for the Cities of Bridgeton, Millville, and Vineland Pedestrian/Bicycle Road Safety Audits (PRSAs), this document represents an important step towards the implementation of the South Jersey Transportation Planning Organization's Cumberland County Bicycle and Pedestrian Safety Action Plan. This plan is intended to document a number of action-orientated tasks geared towards advancing data-driven bicycle and pedestrian projects via New Jersey's Local Safety Program and the Federal Highway Safety Improvement Program (HSIP). To that end, the task of conducting a series of Pedestrian/Bicycle Road Safety Audits was necessary to bring together a multi-disciplinary team of local, county, state and regional agencies and subject matter experts to 1) conduct a first-hand evaluation of existing conditions along the selected corridors, and 2) work together to develop improvement recommendations.

Pedestrian/Bicycle Road Safety Audit Process

Following the basic format of traditional Road Safety Audits (RSAs), the pedestrian/bicycle RSA is a focused and formal safety performance examination of an existing or future road or intersection by a multi-disciplinary audit team. PRSAs can be used on a project of any size and can be conducted on facilities with a history of crashes, or during the design phase of a new roadway or planned upgrade. PRSA audit teams 1) identify and evaluate any potential safety issues, and 2) develop pedestrian/bicycle related countermeasures for all abilities. PRSAs provide transportation agencies and team members a better understanding of the needs of pedestrians and bicyclists by following the *FHWA Pedestrian Road Safety Audit Guidelines and Prompt Lists (Publication FHWA-SA-07-007)*. Implementation of improvement strategies identified through this process in New Jersey may be eligible for Federal Highway Safety Improvement Program (HSIP) funds. These identified improvements are noted in the following sections of this report.



Eight-Step RSA Process (FHWA-SA-07-07)

The PRSA event has three basic components:

- **Pre-Audit:** Audit team analyzes and discusses study area crash data and related issues.
- **Field Visit:** The audit team walks the corridor to identify safety issues and examine conditions.
- **Post-Audit:** The audit team shares findings and develops a list of problems and potential strategies.

2. Chestnut Avenue (Vineland)

The first Pedestrian/Bicycle Road Safety Audits was conducted on Thursday, December 5, 2019 at the Vineland Municipal Building in Vineland, Cumberland County, New Jersey. Eighteen stakeholders representing state, county, and local agencies participated in the audit. A list of all participants and their respective agencies is provided in ***Appendix A***.

Study Location

As shown in ***Figure 1***, the focus of this audit is a 2.3-mile section of Chestnut Avenue located in the urban area of Vineland, New Jersey. Audit limits are between NJ 47 (Delsea Drive) and CR 555 (Main Road)(MP 0.00-2.30). This corridor is a local east-west connector that bisects north-south collectors CR 615 (South West/South East Boulevard), West Avenue, and East Avenue. The corridor is surrounded by a mix of commercial and low to medium-density residential development. It is important to note that the corridor includes a park, nursing home, EMS station, two schools, and public housing.

Figure 1: Chestnut Avenue Study Area

Roadway Characteristics

Chestnut Avenue is classified as an urban major collector with a posted speed limit from (MP 0.00-0.24) of 25 mph and from (MP 0.24-2.30) of 40 mph. The corridor study area is 4-lanes, undivided, with no shoulder or on-street parking. The roadway's horizontal alignment is straight with 11 signalized and 16 unsignalized intersections.

Existing Bicycle/Pedestrian Facilities

Sidewalks are currently available along both sides of Chestnut Avenue and are typically 4'-5' in width. Sidewalk conditions vary from satisfactory to needing maintenance. Basic parallel style crosswalks are provided at signalized intersections although not always at every leg. Crosswalk conditions vary from newly stripped to in-need of restriping. There are no bicycle lanes or other bicycle infrastructure identified along the corridor.

Traffic Counts

Based on data from the NJDOT Straight Line Diagrams (SLDs), the 2017-2018 ADT along Chestnut Avenue is approximately 13,500 vehicles per day within the study area. A copy of available data can be found in ***Appendix B***. Additional traffic counts of the study area will be conducted during upcoming project tasks. This data will be added to the PRSA report as a supplement to ***Appendix B*** and will used to 1) complete a Highway Safety Manual (HSM) analysis of the study area, and 2) inform the evaluation of potential countermeasures.

Transit

The study corridor is serviced by NJ Transit routes #313 and #553 with stops at NJ 47 (Delsea Drive) and route #408 with stops at CR 555 (Main Road). All NJ Transit routes mentioned only service stops at the termini of the Chestnut Avenue Study Corridor.

Community Profile

Population and income characteristics from the U.S. Census Bureau's 2013-2017 American Community Survey (ACS) estimates were used to compile a community profile of residents within 0.25 miles of the study area. A summary of the demographics is listed below.

Characteristics	Chestnut Avenue (0.25 mile buffer)	Cumberland County
Population	***5,849***	***154,952***
Black or African American	*18%*	*19%*
*Hispanic/Latino**	*61%*	*30%*
White	*62%*	*66%*
Asian	*<1%*	*1%*
American Indian/Alaskan	*<1%*	*1%*
Two or More Races	*3%*	*5%*
Other	*16%*	*8%*
Population by Age		
Age 0-4	*8%*	*7%*
Age 0-17	*26%*	*24%*
Age 18+	*74%*	*76%*
Age 65+	*11%*	*14%*
Households	***2,193***	***50,596***
*Linguistically Isolated Households***	*22%*	*8%*
*Speak Spanish****	*93%*	*91%*
Income		
<$15,000	*22%*	*14%*
$15,000 - $25,000	*16%*	*12%*
$25,000 - $50,000	*23%*	*24%*
$50,000 - $75,000	*16%*	*17%*
$75,000+	*23%*	*33%*

Table 1: Community Profile of Chestnut Avenue Study Corridor

*Hispanic population can be of any race, **Households in which no one 14 and over speaks English "very well", ***Percentage of Linguistically Isolated Households that speak spanish as their primary language

In addition to the community profile in *Table 1*, a map was created using U.S. Census Bureau's 2014-2018 American Community Survey (ACS) estimates to identify the prevalence of zero-vehicle households in proximity to the City of Vineland study areas. Many census tracts abutting the study corridors are above the County average of 10.3% for zero-vehicle households, as shown below in *Figure 2*.

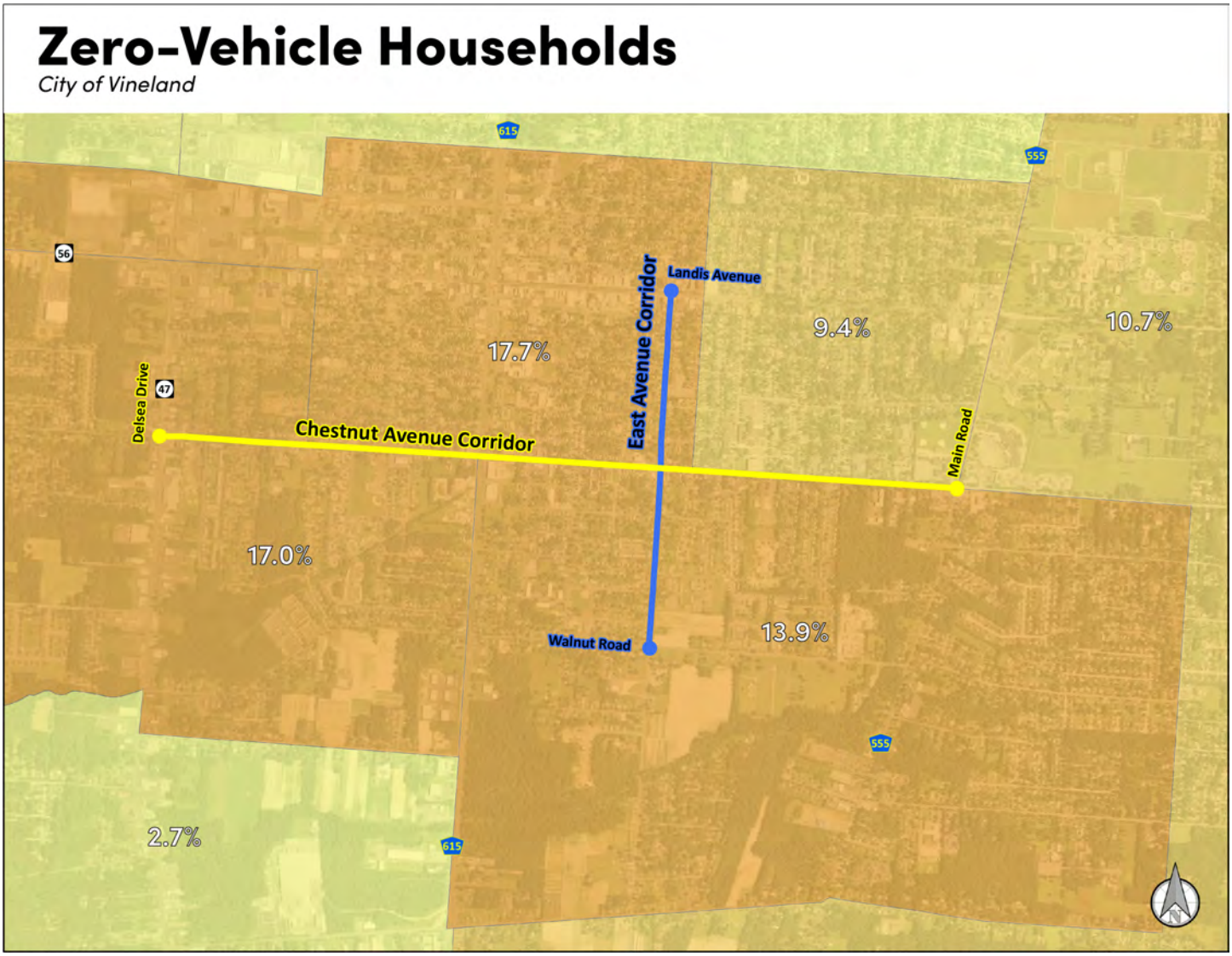


Figure 2: Percentage of Zero-Vehicle Households in Vineland, NJ

Crash Data Analysis

Crash data analysis was based on reportable crash records provided by the New Jersey Department of Transportation (NJDOT). In New Jersey, a crash is considered reportable when there is property damage of $500 or more, or a person is injured or killed. Crash data between the years of 2012-2016 was obtained from the NJDOT via the SafetyVoyager data portal. Detailed crash maps of every bicycle crash, pedestrian crash, and motorist crash that resulted in serious injury or fatality, as well as, crash clusters 13> are provided in *Appendix C.*

Conducted using the HSM approved crash severity methodology of weighing incapacitating injury (A) and fatality (K) equally (K=A), the crash data analysis and crash maps consider both (K) and (A) crashes as equally serious. Crash data of the study area provided detailed information on the characteristics of each crash. Of note, it is important to mention that of the 8 crashes that occurred during Dark (Unlit) conditions, 3 were pedestrians. In New Jersey, 75% of all fatal

pedestrian crashes occur during dawn, dusk, or dark conditions. A summary of the study area crash data analysis and crash characteristics are as follows:

Year	Crashes	Injured	Killed/Incapacitated
2012	*148*	*54*	*4*
2013	*112*	*40*	*1*
2014	*126*	*47*	*1*
2015	*155*	*51*	*0*
2016	*122*	*32*	*0*
Total	**663**	**224**	**6**

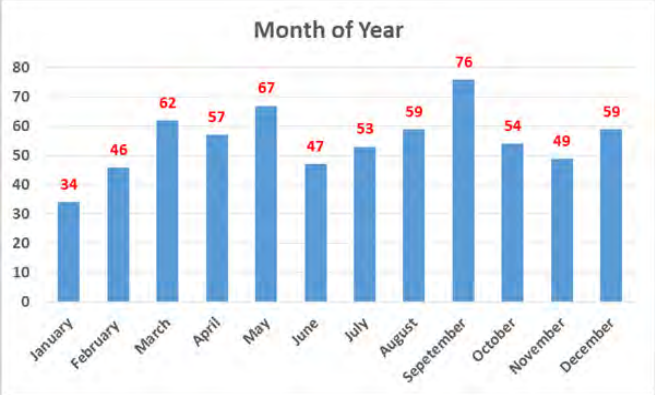
Table 2: Total Crashes by Year - Chestnut Avenue Study Corridor

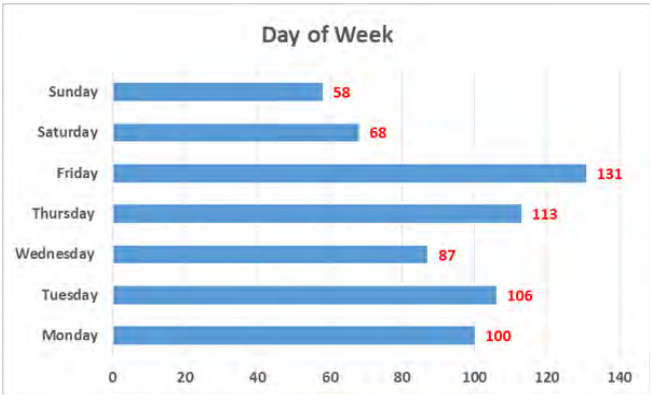
		Total Crashes	Percentages
Road Surfaces	*Dry*	*538*	*81.1%*
	Wet	*124*	*18.7%*
Illumination	*Daylight*	*515*	*77.7%*
	Dusk	*16*	*2.4%*
	Dark (Lit)	*122*	*18.4%*
	Dark (Unlit)	*8*	*1.2%*

Table 3: Environmental Conditions - Chestnut Avenue Study Corridor

	Total Crashes	Percentage
Struck Parked Vehicle	*21*	*3.2%*
Fixed Object	*38*	*5.7%*
Animal	*1*	*0.2%*
Encroachment	*3*	*0.5%*
Backing	*24*	*3.6%*
Overturned	*1*	*0.2%*
Opposite Direction (Sideswipe)	*6*	*0.9%*
Opposite Direction (Head-on)	*10*	*1.5%*
Left-Turn/U-Turn	*51*	*7.7%*
Right Angle	***171***	***25.8%***
Same Direction (Sideswipe)	***92***	***13.9%***
Same Direction (Read End)	***218***	***32.9%***
Pedalcyclist	*7*	*1.1%*
Pedestrian	*20*	*3.0%*

Table 4: Collision Type - Chestnut Avenue Study Corridor





Pedestrian and Bicyclist Crashes

During the 2012-2016 analysis period there were a total of 20 pedestrian and 7 bicyclist crashes, representing 4.1% of all crashes within the study area. Of the total number of crashes during this period, pedestrian and bicyclist crashes disproportionately resulted in serious injury or fatality (KA), representing 20% of all KA crashes. Moreover, three of the 8 crashes that occurred under dark un-lit conditions involved pedestrians.

Crash Type	Total Crashes	Percentage
Collision with Pedestrian	*20*	*74.1%*
Collision with Cyclist	*7*	*25.9%*
Crash Severity		
Fatality	*0*	*0.0%*
Incapacitating Injury	*2*	*7.4%*
Moderate Injury	*4*	*14.8%*
Pain	*13*	*48.1%*
Property Damage Only	*8*	*29.6%*

Table 5: Pedestrian and Bicycle Crash Summary

Pedestrian and Bicyclist Crash Contributing Factors

To better understand the factors that contributed to pedestrian and bicyclist crashes, New Jersey TR-1 (NJ TR-1) crash reports were procured from NJDOT. The details in these reports were crucial to putting pedestrian and bicyclist related crashes in context. Pursuant the content of the NJ TR-1s, the following are contributing factors that were witnessed for crashes within the study corridor.

Pedestrian & Bicyclist Contributing Factors
Crashes often occur at or near intersections
Many crash victims have Limited English Proficiency (LEP)
Motorist speeds are too high
Crashes in crosswalks are often due to Left-Hand turn movements

Table 6: NJ TR-1 Report Analysis

Findings and Recommendations

Presented here are the findings and potential solutions identified during the Chestnut Avenue PRSA. The identified potential solutions are given ratings based on their projected safety benefit, cost, and time frame to implement. Safety benefit potential is based primarily on studies and research provided by the Federal Highway Administration's (FHWA) Crash Modification Factors (CMFs). When CMFs are not available, the FHWA Proven Safety Countermeasures, Highway Safety Manual (HSM), and current peer-reviewed research on countermeasures are used. All safety benefits are approximate.

This section describes the site-specific and corridor-wide recommended improvements. The recommendations derived from each PRSA event are noted along with their projected safety benefit, time frame, cost, as well as, the facility's jurisdiction. Ratings used in the recommendation tables are described as follows:

Legend

Symbol	Meaning	Definition
✔	*Limited safety benefit potential*	
✔✔	*Limited to moderate safety benefit potential*	
✔✔✔	*Moderate safety benefit potential*	
✔✔✔✔	*High safety benefit potential*	
$	*Low cost*	*Could be accomplished through maintenance*
$$	*Medium cost*	*May require some engineering or design and funding may be readily available*
$$$	*High cost*	*Longer term; may require full engineering, ROW acquisition and new funding*
◔	*Short term*	*Could be accomplished within 1 year*
◑	*Medium term*	*Could be accomplished in 1 to 3 years; may require some engineering*
◕	*Long term*	*Could be accomplished in 3 years or more; may require full engineering*

The following represents the specific findings and recommendations made by the PRSA team. All recommendations and designs should be thoroughly evaluated with due diligence and designed as appropriate by the roadway owner and/or a professional engineer for conformance to all applicable codes, standards, and best practices.

No.	Recommendation	Safety Benefit	Cost	Time Frame	Jurisdiction
Corridor-Wide					
1	*Road/bicycle-pedestrian safety code enforcement campaign (i.e. StreetSmart)*	✔	$	◔	*Vineland*
2	*Narrow driveways where possible*	✔	$$	◑	*Vineland/ Property Owners*
3	*Inspect and replace faded, damaged or outdated signage as needed (i.e. signs mounted below 7', faded lettering on speed limit signs, crooked stop signs)*	✔	$	◔	*Vineland*
4	*Conduct a bi-lingual road/bicycle-pedestrian safety campaign (i.e. StreetSmart)*	✔	$	◔	*Vineland*
5	*Inspect, repave and restripe the roadway as needed*	✔	$$	◑	*Vineland*
6	*Install or reinstall detached Detectable Warning Surfaces (DWS) to be aligned in compliance with ADA and inspect, repair, and construct sidewalks in compliance with ADA as needed*	✔	$$	◑	*Vineland/NJDOT*
7	*Carry sidewalks through driveways per ADA design standards*	✔	$$	◑	*Vineland*

8	*Develop an access management plan within the study area for vehicles and pedestrians (i.e. driveway consolidation, barriers to prevent jaywalking)*	✔✔	**$**	◑	*Vineland*
9	*Update complete streets policy in accordance with the NJDOT Complete & Green Streets for All Model Policy Guide*	✔✔	**$**	◔	*Vineland*
10	*Perform corridor-wide signal upgrades (replace 8" traffic signal heads with 12", install backplates with retro-reflective border, evaluate clearance intervals, update to countdown pedestrian signal heads, replace push buttons in compliance with ADA, etc.)*	✔✔	**$$$**	◕	*Vineland/NJDOT*
11	*Convert existing crosswalks to high-visibility continental or ladder style, check placement and alignment*	✔✔	**$**	◔	*Vineland/NJDOT*
12	*Remove sidewalk on southside of study corridor and install a shared-use path per NJ Complete Streets Design Guide*	✔✔	**$$**	◑	*Vineland/NJDOT*
13	*Convert Chestnut Avenue to a 3-lane section (2 travel lanes, TWLTL and shoulders; i.e. road diet)*	✔✔✔	**$$**	◕	*Vineland*
14	*Perform a lighting analysis of the study area, including roadway and pedestrian scale lighting; prepare plans/upgrades according to results*	✔✔✔	**$$$**	◑	*Vineland/NJDOT*
15	*Create a taskforce that meets after a pedestrian or bicycle fatality to perform a mini-road safety audit to better understand how the crash happened and what immediate improvements can be made to avoid repeat crashes at the location*	✔✔✔	**$**	◔	*Vineland*
Site-Specific					
Segment: 2nd Street-Earl Drive					
16	*Install midblock pedestrian crossing improvements (i.e. Pedestrian Hybrid Beacon (PHB) or Rectangular Rapid Flash Beacon (RRFB) with a high visibility continental or ladder style crosswalk and crossing island)*	✔✔✔	**$$$**	◕	*Vineland*
Segment: Tarkiln Drive-3rd Street					
17	*Conduct circulation study of 3rd Street*	✔	**$$**	◑	*Vineland*
18	*Close Normandie Lane access to Chestnut Avenue*	✔	**$$**	◔	*Vineland*
19	*Install barriers to prevent jaywalking (i.e. greenery, 2'-3' wall, fence, benches etc.)*	✔✔	**$$**	◔	*Vineland*

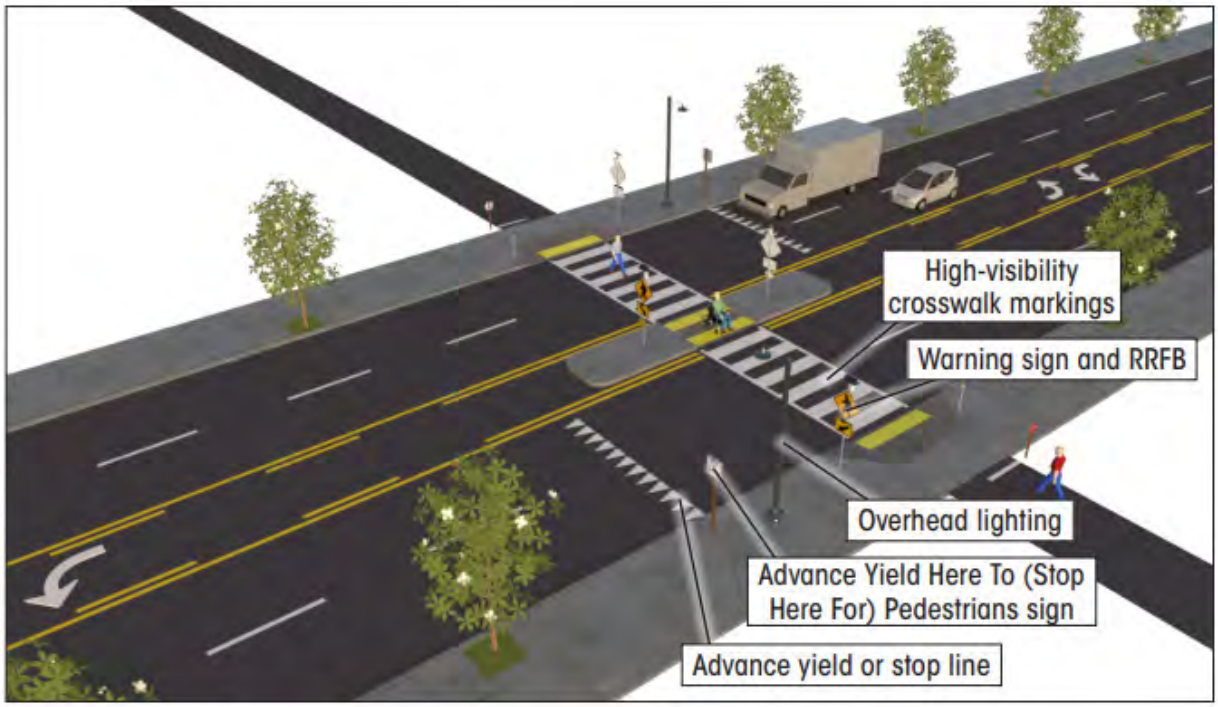
20	*Install midblock pedestrian crossing improvements (i.e. Pedestrian Hybrid Beacon (PHB) or Rectangular Rapid Flash Beacon (RRFB) with a high visibility continental or ladder style crosswalk and crossing island)*	✔✔✔	**$$$**	◕	*Vineland*
Intersection: "The Boulevards"					
21	*Install railroad crossing gates*	✔	**$$**	◕	*Vineland/ County/Conrail*
22	*Study and evaluate intersection (i.e. address non-compliant crossings, traffic and pedestrian safety, signal placement, and signal timing concerns)*	✔✔✔	**$$$**	◕	*Vineland/ County/Conrail*
Vineland Fire Station No. 1					
23	*Install advance warning signal and stripe roadway appropriately in front of Fire/EMS Station (i.e. "Do Not Block The Box")*	✔	**$$**	◑	*Vineland*
Intersection: East Avenue					
24	*Study intersection to reduce and realign lanes*	✔✔✔	**$$**	◑	*Vineland*
25	*Upgrade signals to current standards*	✔✔✔	**$$**	◑	*Vineland*
26	*Install leading pedestrian interval (LPI) or all pedestrian phase*	✔✔✔	**$**	◔	*Vineland*
Intersection: 7th Street					
27	*Complete signal upgrade to current standards*	✔✔	**$$$**	◑	*Vineland*
Intersection: State Street					
28	*Perform a MUTCD signal warrant analysis for removal*	✔	**$$**	◑	*Vineland*
Intersection: Valley Avenue					
29	*Consider replacement of signalized offset intersection with a modern roundabout; must be accompanied by a 3-lane section (2 travel lanes, TWLTL and shoulders; i.e. road diet)*	✔✔✔✔	**$$$**	◕	*Vineland*
Intersection: Main Road					
30	*Address lane confusions (i.e. delineate lane configuration at the intersection approaches)*	✔	**$**	◔	*Vineland/County*
31	*Install bumpouts or reduce turning radii*	✔✔	**$$**	◑	*Vineland/County*
32	*Install leading pedestrian interval (LPI) or all pedestrian phase*	✔✔✔	**$**	◔	*Vineland/County*

Table 7: Chestnut Avenue PRSA Recommendations

Recommendation Visualizations

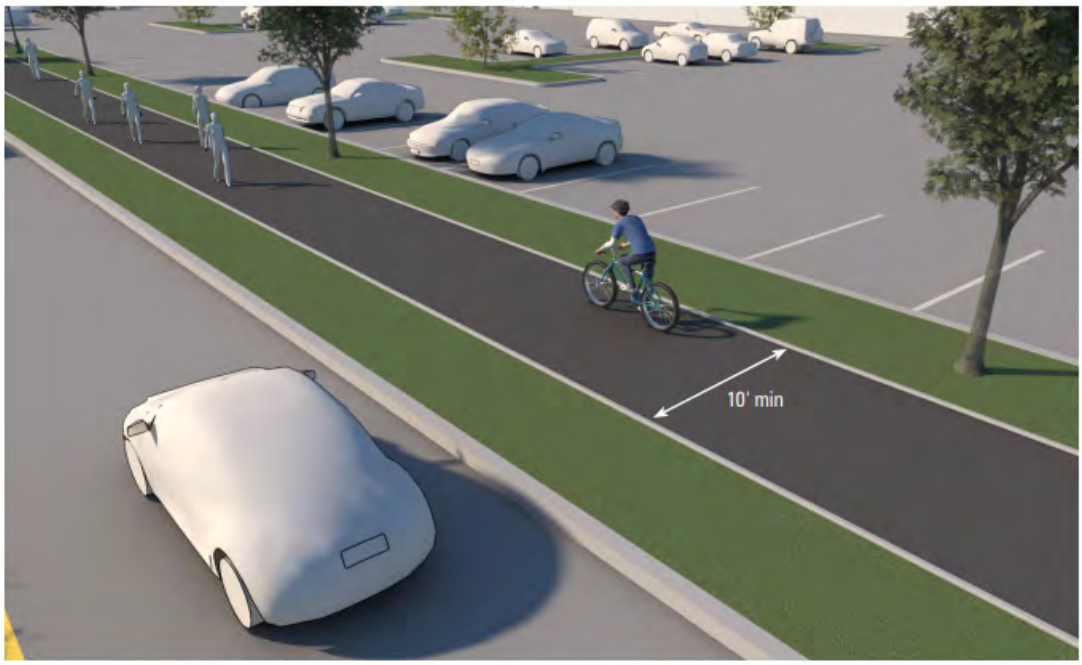
Examples of some of the site-specific and corridor-wide safety recommendations identified in ***Tables 7*** are shown below. These examples are based on current best practices and design standards from the *2017 NJ Complete Streets Design Guide* (CSDG), NACTO's *Urban Street Design Guide* (NACTO-US), and the Federal Highway Administration (FHWA), including sources contained therein. Visual representations of select aforementioned recommendations help to better communicate their potential safety benefit, cost, and time frame.

Midblock Pedestrian Crossing Improvements (i.e. RRFB or PHB with crosswalk and crossing island)



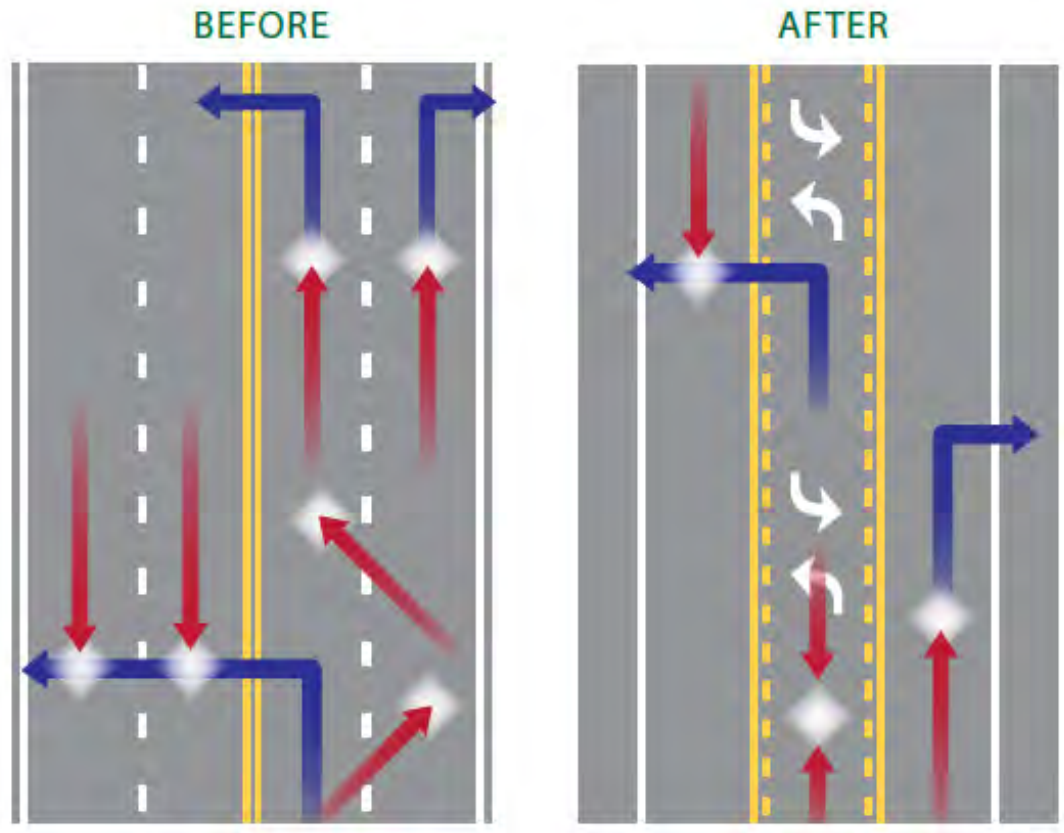
Source: (FHWA-SA-18-018)

Shared-use path



Source: (CSDG)

Road Diet Configuration (i.e. 3-lane section, 2 travel lanes with TWLTL)

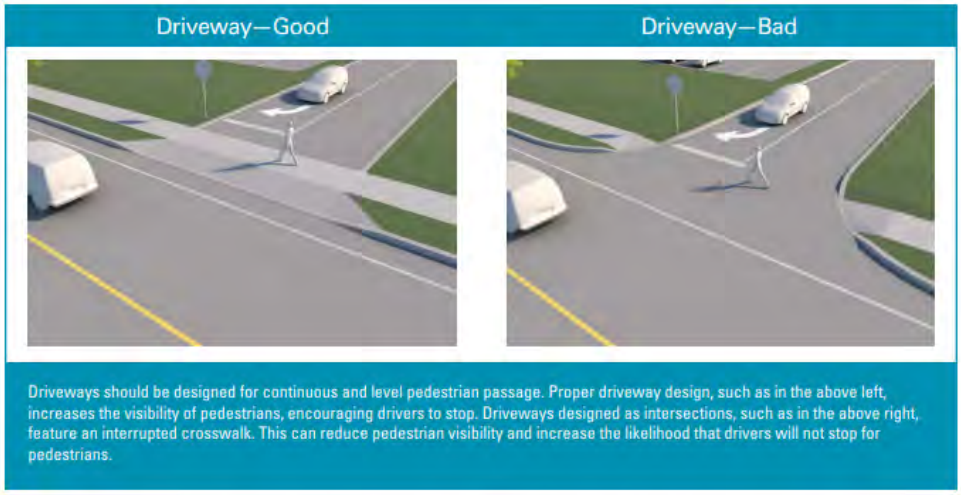


Source: (FHWA-SA-14-028)

Modern Roundabout

Source: (CSDG)

Driveway Design (i.e. Carrying sidewalk through driveway)



Source: (CSDG)

Pedestrian Access Management (i.e. barriers, fences etc.)

Photo Caption: (Google Earth) Newark, DE

Road Owner Response

As the roadway owner, City of Vineland is encouraged to use the findings of the PRSA as a guide for designing improvements to address the safety issues. Whereas the PRSA findings and recommendations are numerous, City of Vineland should use its experience in planning and engineering to determine which recommendations in *Table 7* can be prioritized, and seek opportunities to implement maintenance recommendations at their earliest convenience.

An important part of the PRSA process is the road owner's response: an acknowledgment of the audit's findings and recommendations, and their planned follow-up. In responding to the PRSA's findings, the road owner must take into account all the competing objectives involved when implementing the recommendations, and foremost among them is available resources. Because the audit process generated a long and wide-ranging list of improvements, the road owner is expected to implement these recommended improvements as the time and funds allow in coordination with other projects, priorities and intersecting roadway owners (i.e. NJDOT, Cumberland County).

City of Vineland delivered their response following the finalization of the findings and recommendations, a copy of which can be found in *Appendix D*.

Appendix A

Audit Team Members

Name	Agency
City of Vineland	
Chestnut Avenue Corridor - Pedestrian Road Safety Audit - December 5, 2019	
Alan Huff	*SJTPO*
Stephanie Wakeley	*SJTPO*
Joe Rapp	*NJDOT*
Leroy Gould	*NJDOT*
Jelena Lasko	*NJDOT*
Robert Brewer	*Cumberland County Planning Department*
Cassandra Rodriguez	*Cumberland County Planning Department*
David Maillet	*Vineland Engineering Department*
Rick Caudill	*Vineland Engineering Department*
Ryan Headley	*Vineland Planning Department*
Amy Holmes	*Vineland Health Department*
Nicholas English	*Vineland Health Department*
Douglas Whitaker	*Cumberland County Engineering Department*
Patrick Farley	*Cross County Connection TMA*
Scott Diehl	*Urban Engineers*
Bill McGarrigel	*Urban Engineers*
Daniel Hutton	*Urban Engineers*
Jay Etzel	*Urban Engineers*
East Avenue Corridor - Pedestrian Road Safety Audit - December 20, 2019	
Alan Huff	*SJTPO*
Stephanie Wakeley	*SJTPO*
Douglas Whitaker	*Cumberland County Engineering Department*
David Maillet	*Vineland Engineering Department*
Ryan Headley	*Vineland Planning Department*
Daniel Hutton	*Urban Engineers*
City of Bridgeton	
Irving Avenue Corridor & Atlantic Street Corridor - Pedestrian Road Safety Audits - December 11, 2019	
Alan Huff	*SJTPO*
Stephanie Wakeley	*SJTPO*
Leroy Gould	*NJDOT*
Jelena Lasko	*NJDOT*
William Riviere	*NJDOT*
Robert Brewer	*Cumberland County Planning Department*
Cassandra Rodriguez	*Cumberland County Planning Department*
Jessica Atkinson	*Cumberland County Health Department*
Douglas Whitaker	*Cumberland County Engineering Department*
Anthony Bertolini	*Bridgeton Police Department*
Todd Bowen	*Bridgeton Fire Department*
Eric Derer	*Cross County Connection TMA*
Daniel Hutton	*Urban Engineers*
Scott Diehl	*Urban Engineers*
Jay Etzel	*Urban Engineers*

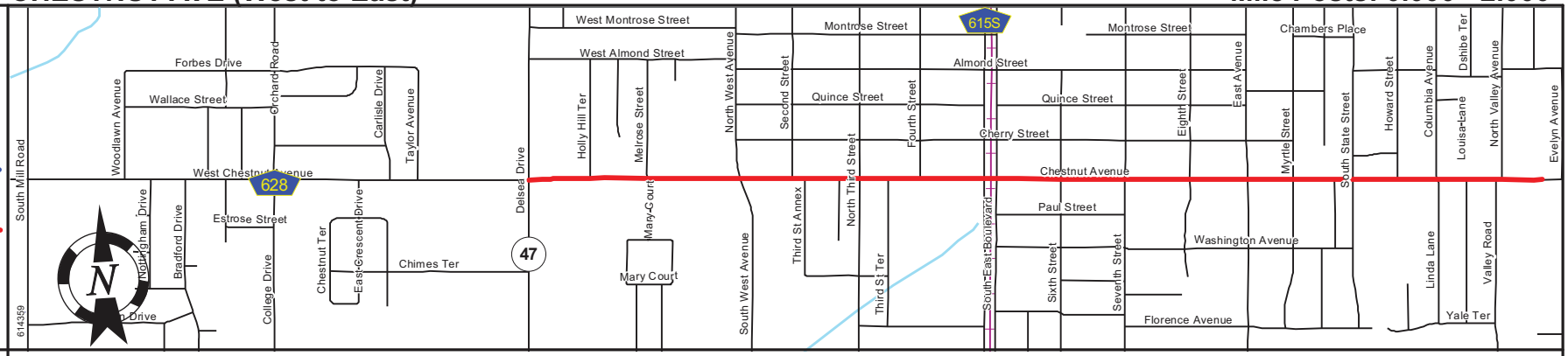
City of Millville	
High Street Corridor & 3rd Street Corridor - Pedestrian Road Safety Audits - January 6, 2020	
Alan Huff	*SJTPO*
Stephanie Wakeley	*SJTPO*
Joe Rapp	*NJDOT*
Leroy Gould	*NJDOT*
William Riviere	*NJDOT*
Robert Brewer	*Cumberland County Planning Department*
Cassandra Rodriguez	*Cumberland County Planning Department*
Jessica Atkinson	*Cumberland County Health Department*
Brian Prohowich	*Millville Engineering Department*
Michelle Baker	*Millville Engineering Department*
Samantha Silvers	*Millville Planning Department*
William Stonick III	*Millville Police Department*
Douglas Whitaker	*Cumberland County Engineering Department*
Jason Simmons	*Cross County Connection TMA*
Daniel Hutton	*Urban Engineers*
Scott Diehl	*Urban Engineers*

Appendix B

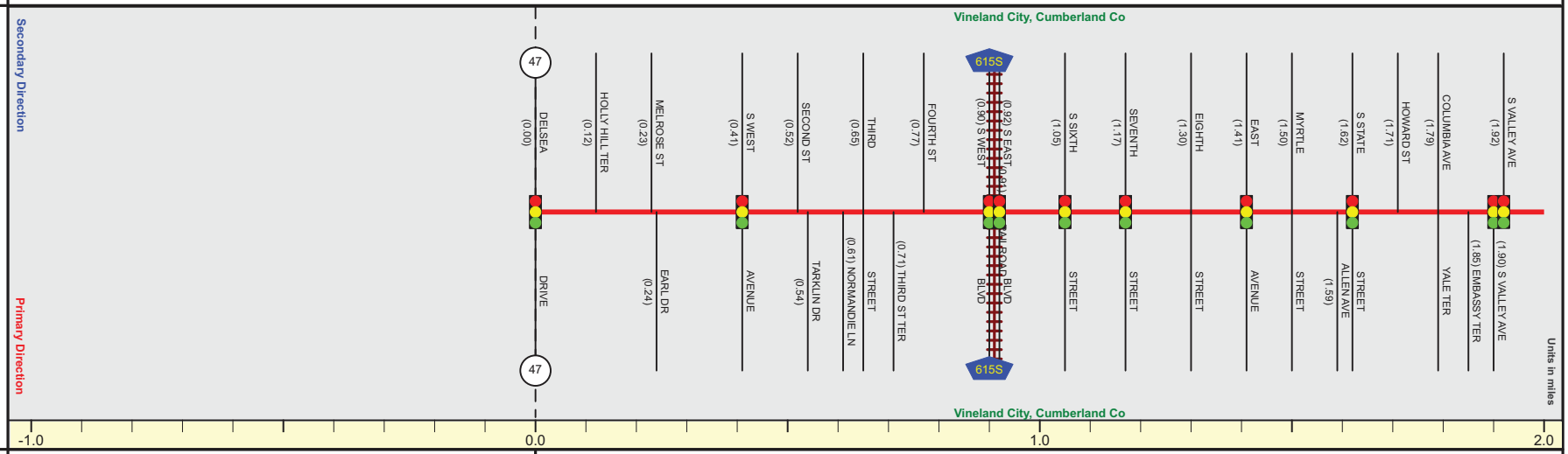
Traffic Counts

CHESTNUT AVE (West to East)

Mile Posts: 0.000 - 2.000



Pavement	
Shoulder	
Number of Lanes	
Speed Limit	
Street Name	



Street Name		Chestnut Avenue
Jurisdiction		Municipal
Functional Class		Urban Major Collector
Federal Aid - NHS Sy		STP
Control Section		
Speed Limit	25	40
Number of Lanes		4
Med. Type		None
Med. Width		0
Pavement		48
Shoulder		0
Traffic Volume	14,246 (2018)	11,685 (2018) 11,990 (2017)
Traffic Sta. ID	8-8-107	8-8-106 8-7-104
Structure No.		
Enlarged Views		

Begin Chestnut Ave MP=0.00

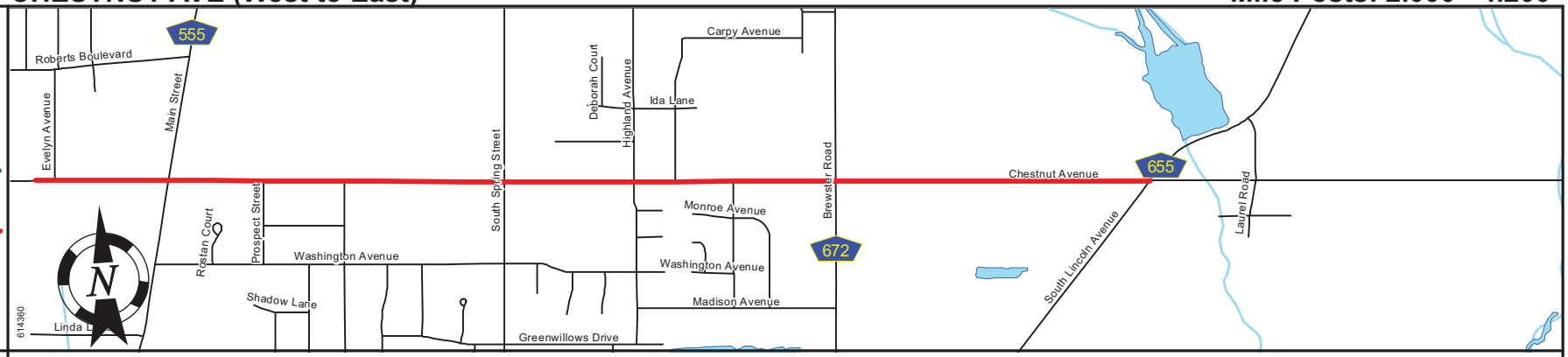
Page Created: March, 2019

SRI = 06141029__

Date last inventoried: October 2015

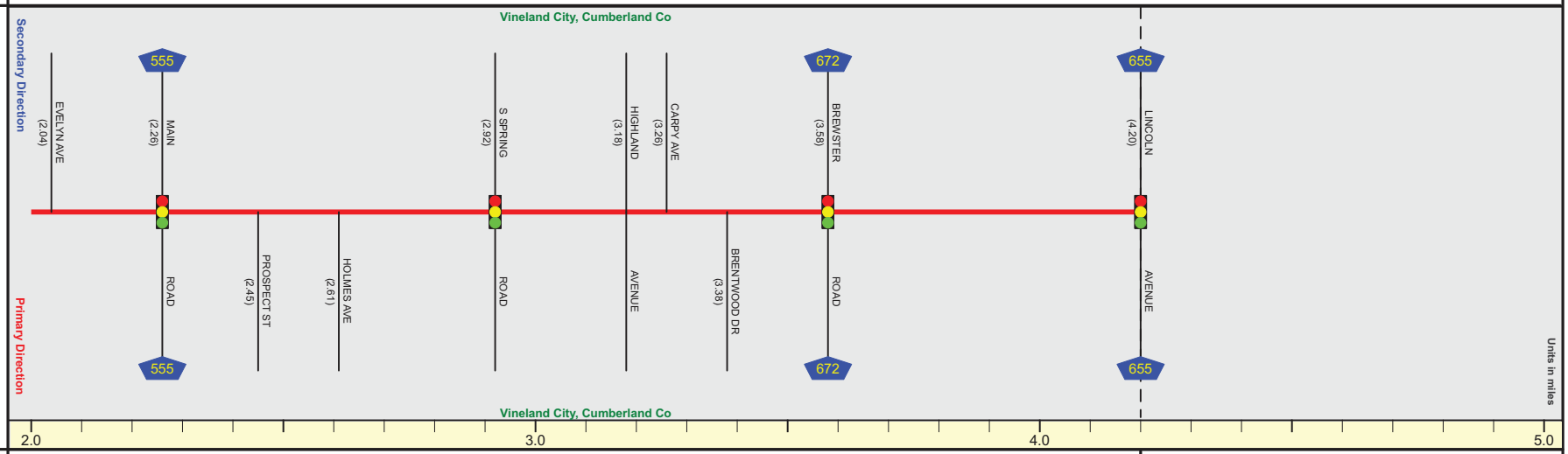
CHESTNUT AVE (West to East)

Mile Posts: 2.000 - 4.200



Pavement	
Shoulder	
Number of Lanes	
Speed Limit	
Street Name	

Interstate Route 287
US Route 22
NJ Route 33
County Road 689
Interchange Number 2
Grade Separated Interchange
Traffic Signal
Traffic Monitoring Sites WIM AVC VOL
Road Underpass
Road Overpass



Street Name	Chestnut Avenue						
Jurisdiction	Municipal						
Functional Class	Urban Major Collector						
Federal Aid - NHS Sy	STP						
Control Section							
Speed Limit	40		50				End Chestnut Ave MP=4.20
Number of Lanes	4		2				
Med. Type	None						
Med. Width	0						
Pavement	48	24	36	24	36	24	
Shoulder	0	8	1	8	0	8	
Traffic Volume	16,240 (2018)	11,433 (2017)				4,668 (2018)	
Traffic Sta. ID	8-8-103	8-8-102				8-8-100	
Structure No.							
Enlarged Views							

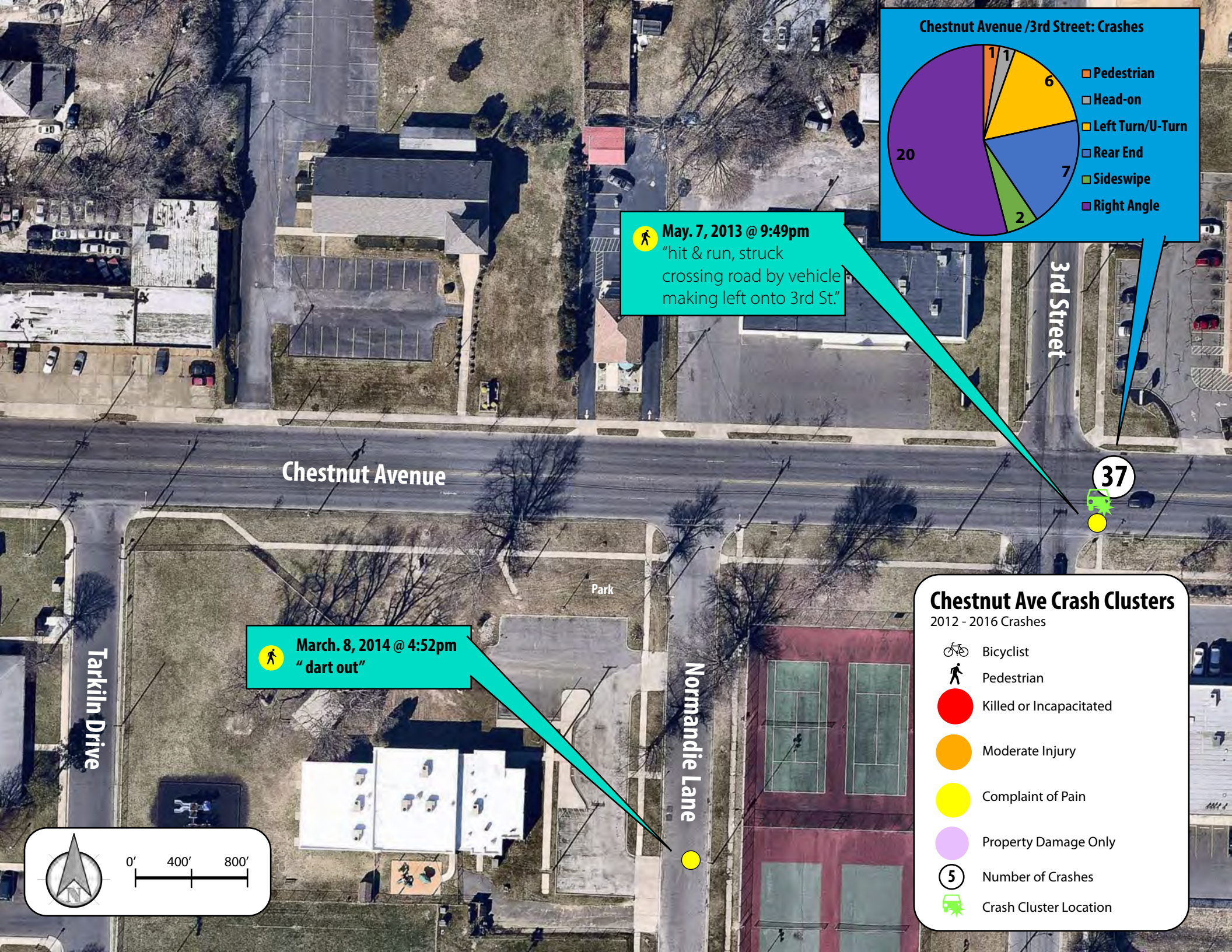
Page Created: March, 2019

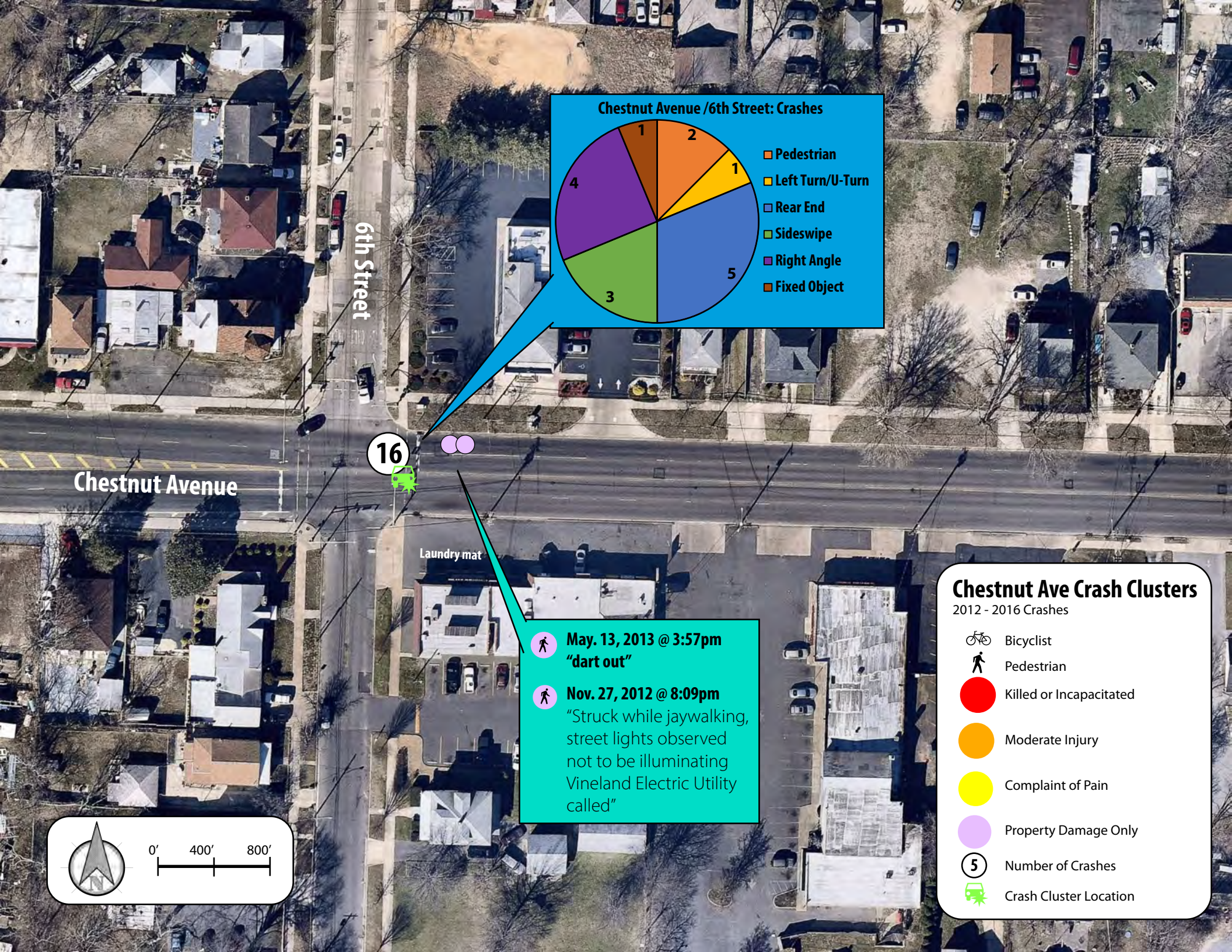
SRI = 06141029__

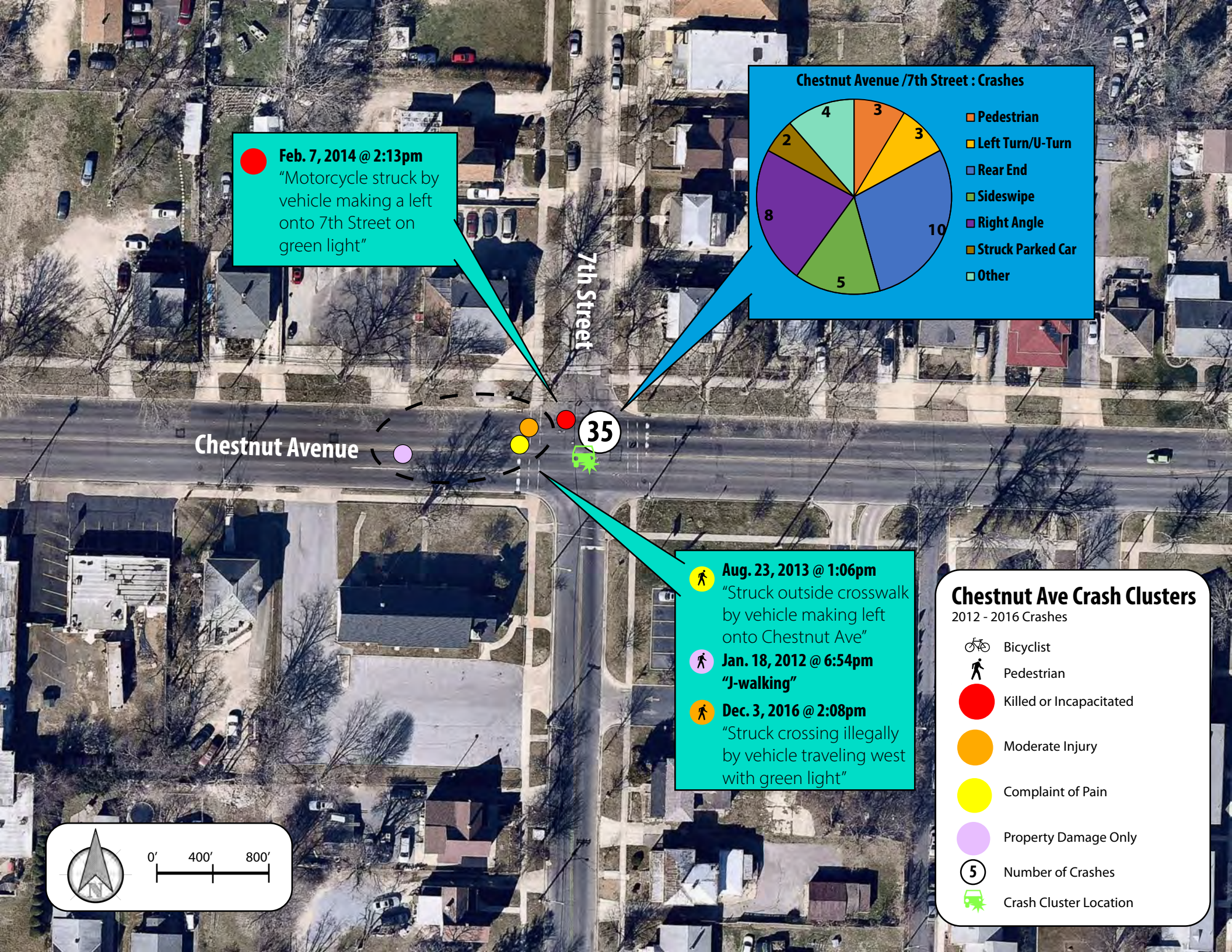
Date last inventoried: October 2015

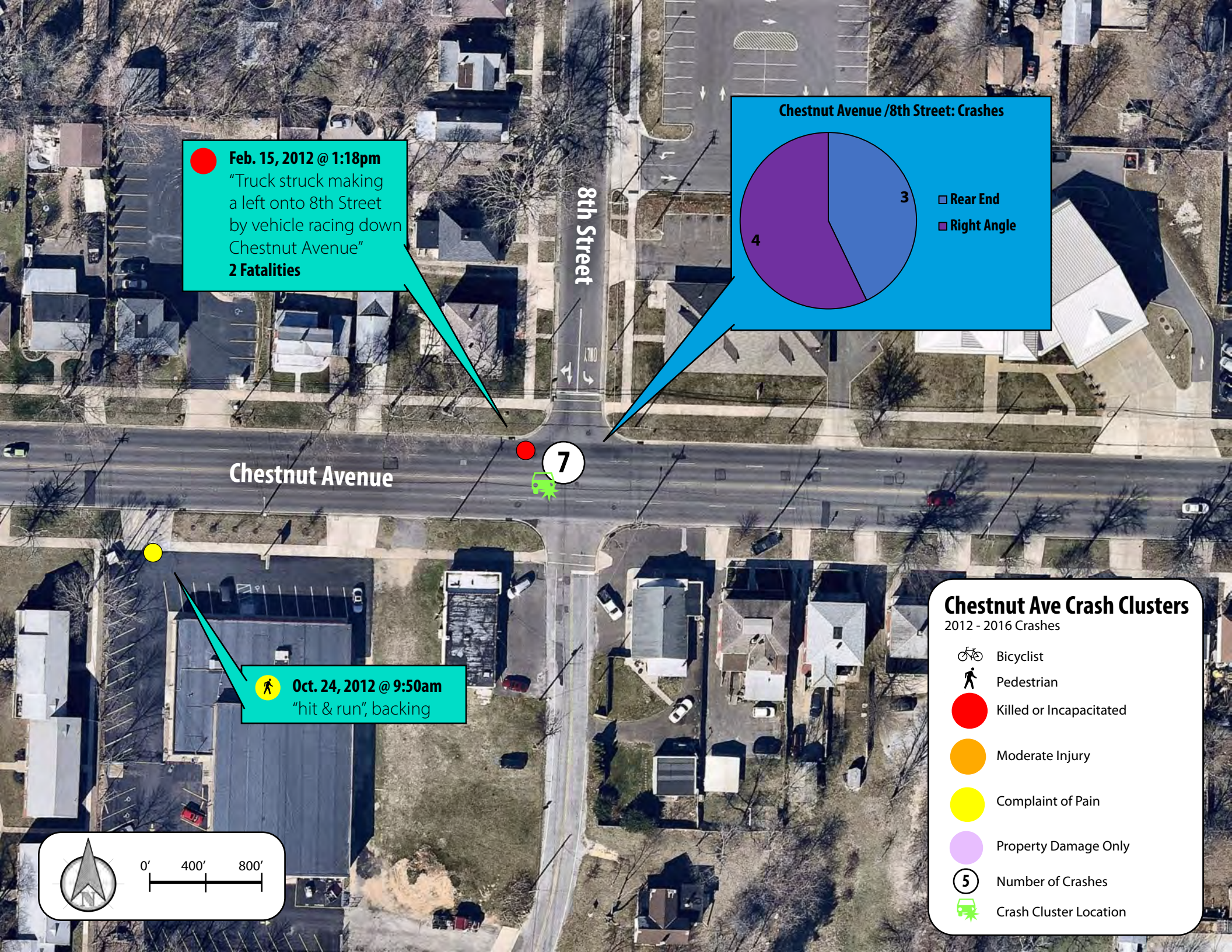
Appendix C

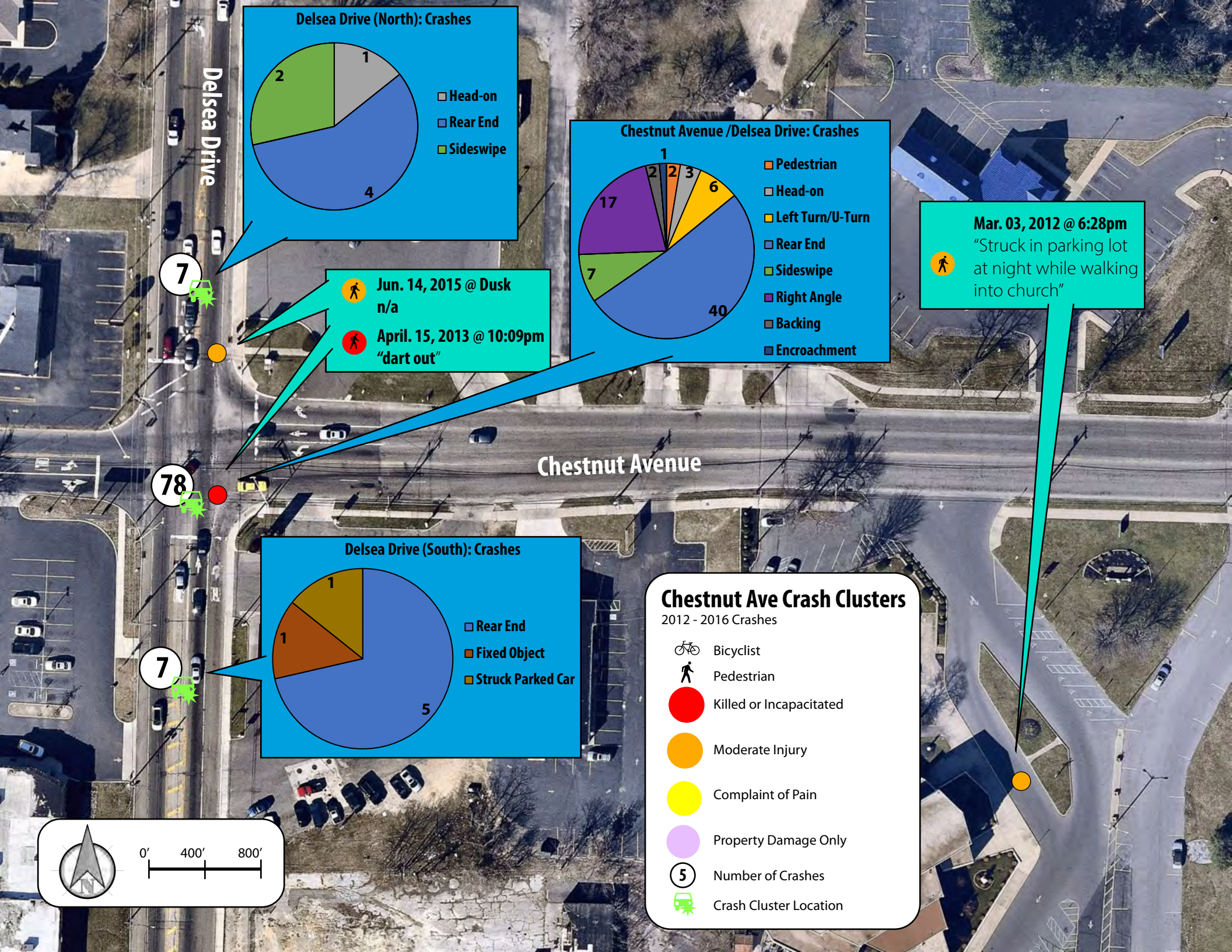
Crash Maps

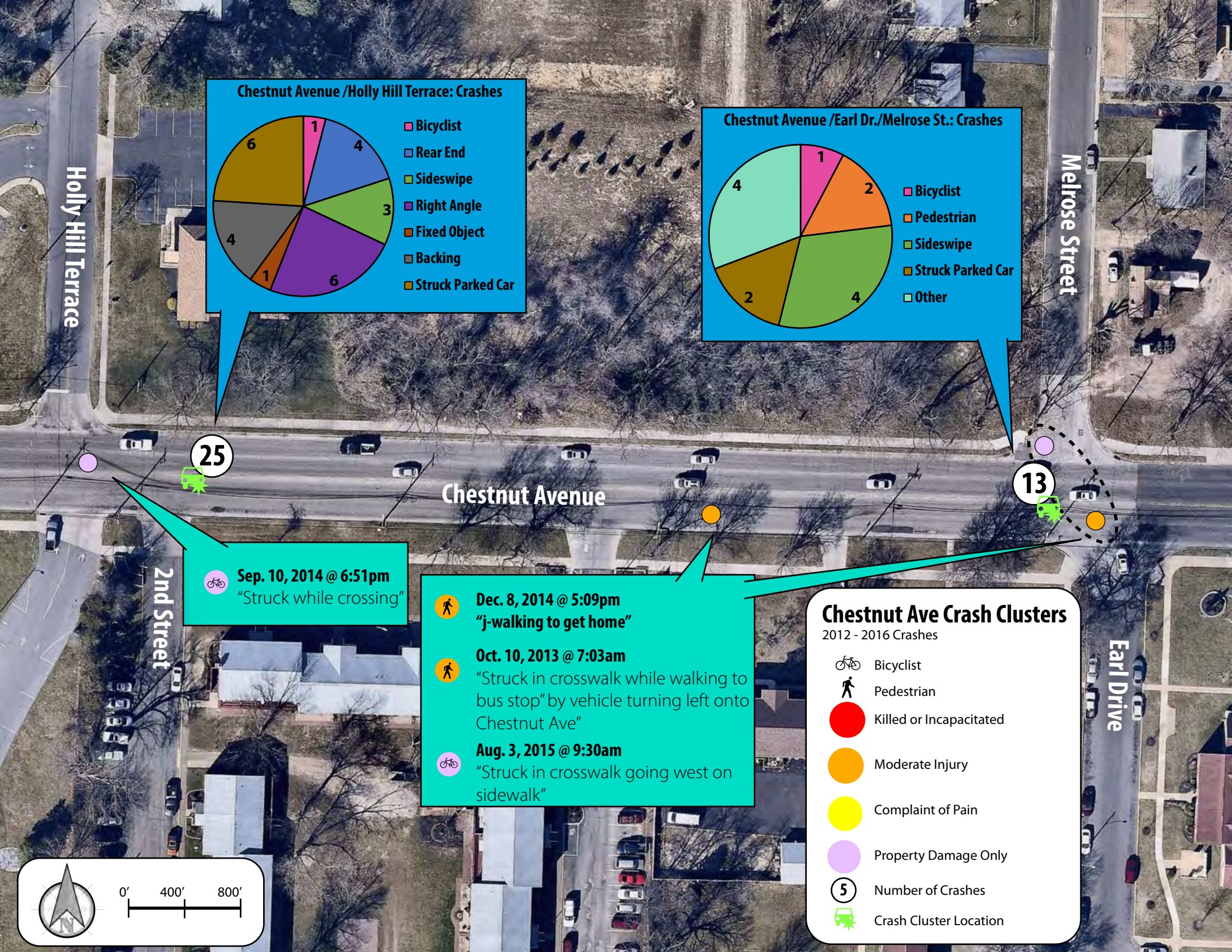

Chestnut Avenue /3rd Street: Crashes
1
1
6
7
2
20
Pedestrian
Head-on
Left Turn/U-Turn
Rear End
Sideswipe
Right Angle
May. 7, 2013 @ 9:49pm
"hit & run, struck crossing road by vehicle making left onto 3rd St."
3rd Street
Chestnut Avenue
37
Park
March. 8, 2014 @ 4:52pm
" dart out"
Tarkiln Drive
Normandie Lane
0'
400'
800'
N
Chestnut Ave Crash Clusters
2012 - 2016 Crashes
Bicyclist
Pedestrian
Killed or Incapacitated
Moderate Injury
Complaint of Pain
Property Damage Only
5
Number of Crashes
Crash Cluster Location

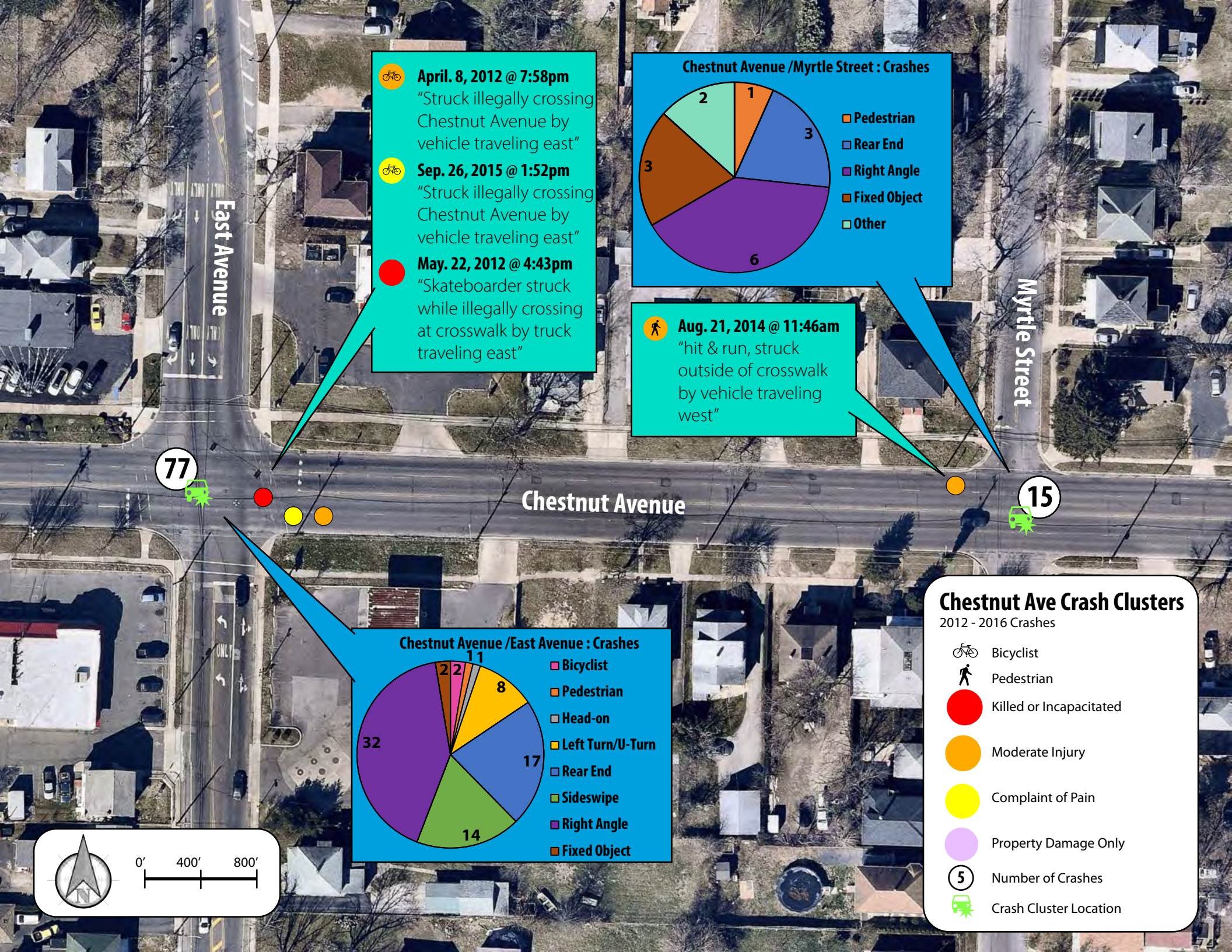

Chestnut Avenue /6th Street: Crashes
1
2
1
4
5
3
Pedestrian
Left Turn/U-Turn
Rear End
Sideswipe
Right Angle
Fixed Object
6th Street
Chestnut Avenue
16
Laundry mat
May. 13, 2013 @ 3:57pm
"dart out"
Nov. 27, 2012 @ 8:09pm
"Struck while jaywalking, street lights observed not to be illuminating Vineland Electric Utility called"
Chestnut Ave Crash Clusters
2012 - 2016 Crashes
Bicyclist
Pedestrian
Killed or Incapacitated
Moderate Injury
Complaint of Pain
Property Damage Only
5
Number of Crashes
Crash Cluster Location
0'
400'
800'

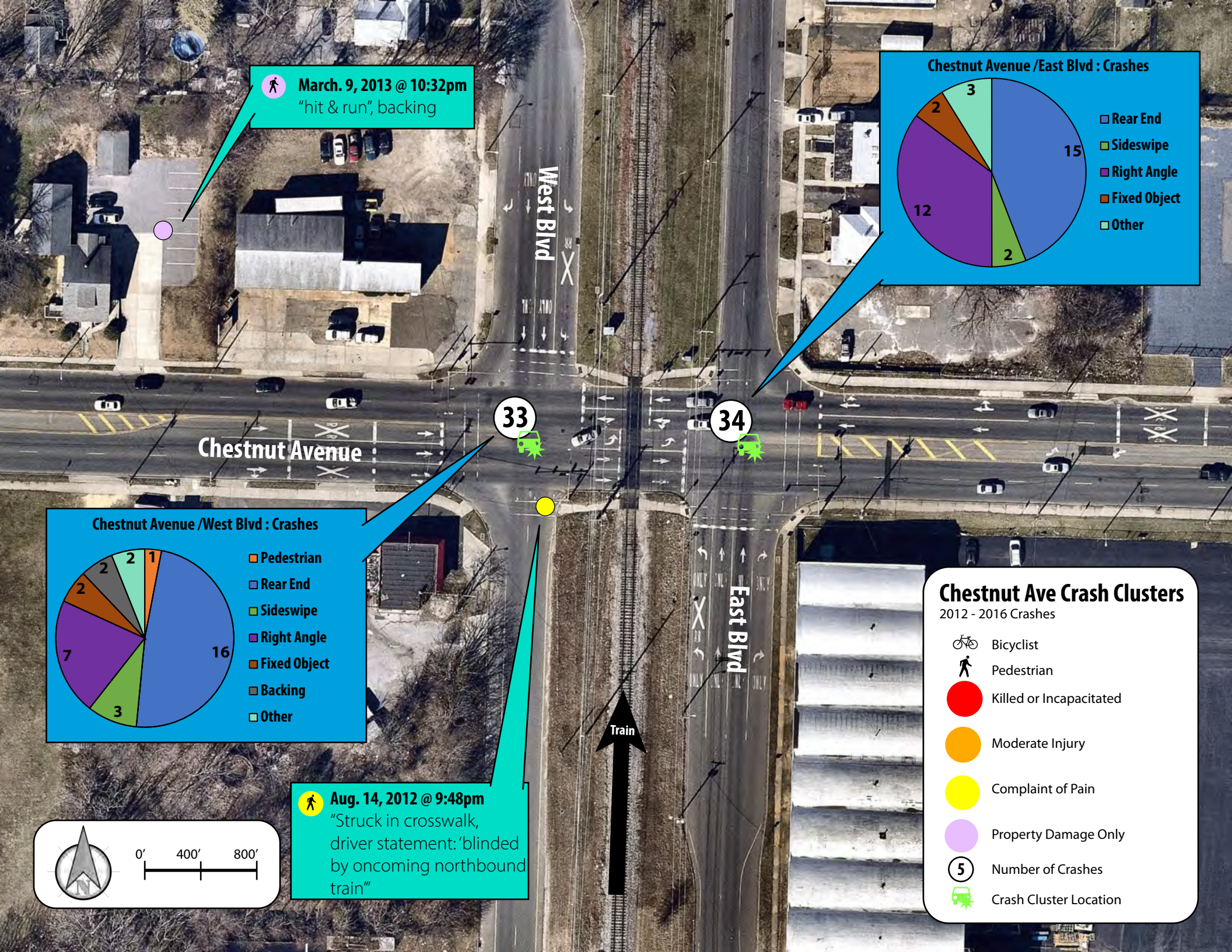

Chestnut Avenue /7th Street : Crashes
3
3
10
5
8
2
4
Pedestrian
Left Turn/U-Turn
Rear End
Sideswipe
Right Angle
Struck Parked Car
Other
Feb. 7, 2014 @ 2:13pm
"Motorcycle struck by vehicle making a left onto 7th Street on green light"
7th Street
Chestnut Avenue
35
Aug. 23, 2013 @ 1:06pm
"Struck outside crosswalk by vehicle making left onto Chestnut Ave"
Jan. 18, 2012 @ 6:54pm
"J-walking"
Dec. 3, 2016 @ 2:08pm
"Struck crossing illegally by vehicle traveling west with green light"
Chestnut Ave Crash Clusters
2012 - 2016 Crashes
Bicyclist
Pedestrian
Killed or Incapacitated
Moderate Injury
Complaint of Pain
Property Damage Only
5
Number of Crashes
Crash Cluster Location
N
0'
400'
800'

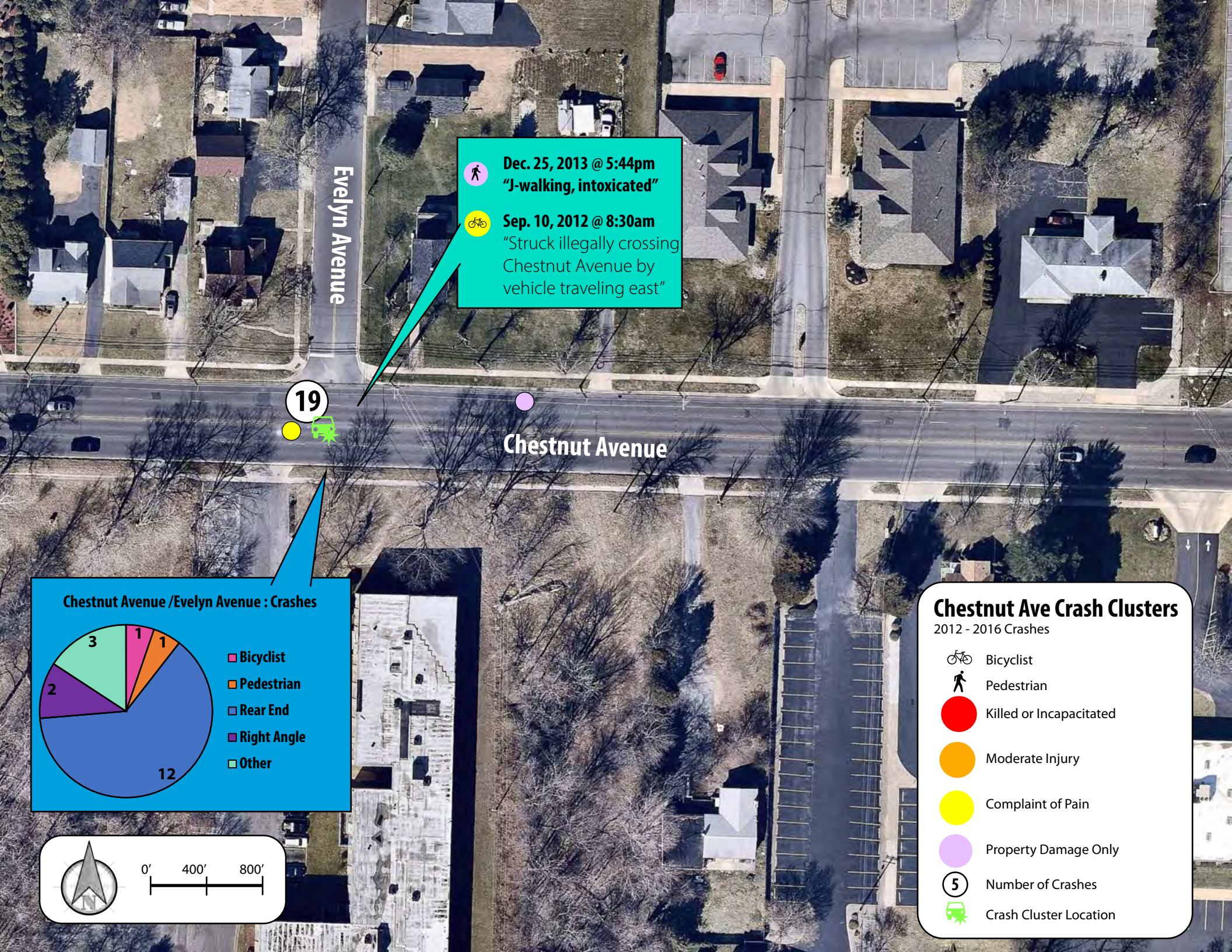

Feb. 15, 2012 @ 1:18pm
"Truck struck making a left onto 8th Street by vehicle racing down Chestnut Avenue"
2 Fatalities
Chestnut Avenue /8th Street: Crashes
3
4
Rear End
Right Angle
8th Street
ONLY
Chestnut Avenue
7
Oct. 24, 2012 @ 9:50am
"hit & run", backing
0'
400'
800'
Chestnut Ave Crash Clusters
2012 - 2016 Crashes
Bicyclist
Pedestrian
Killed or Incapacitated
Moderate Injury
Complaint of Pain
Property Damage Only
5
Number of Crashes
Crash Cluster Location

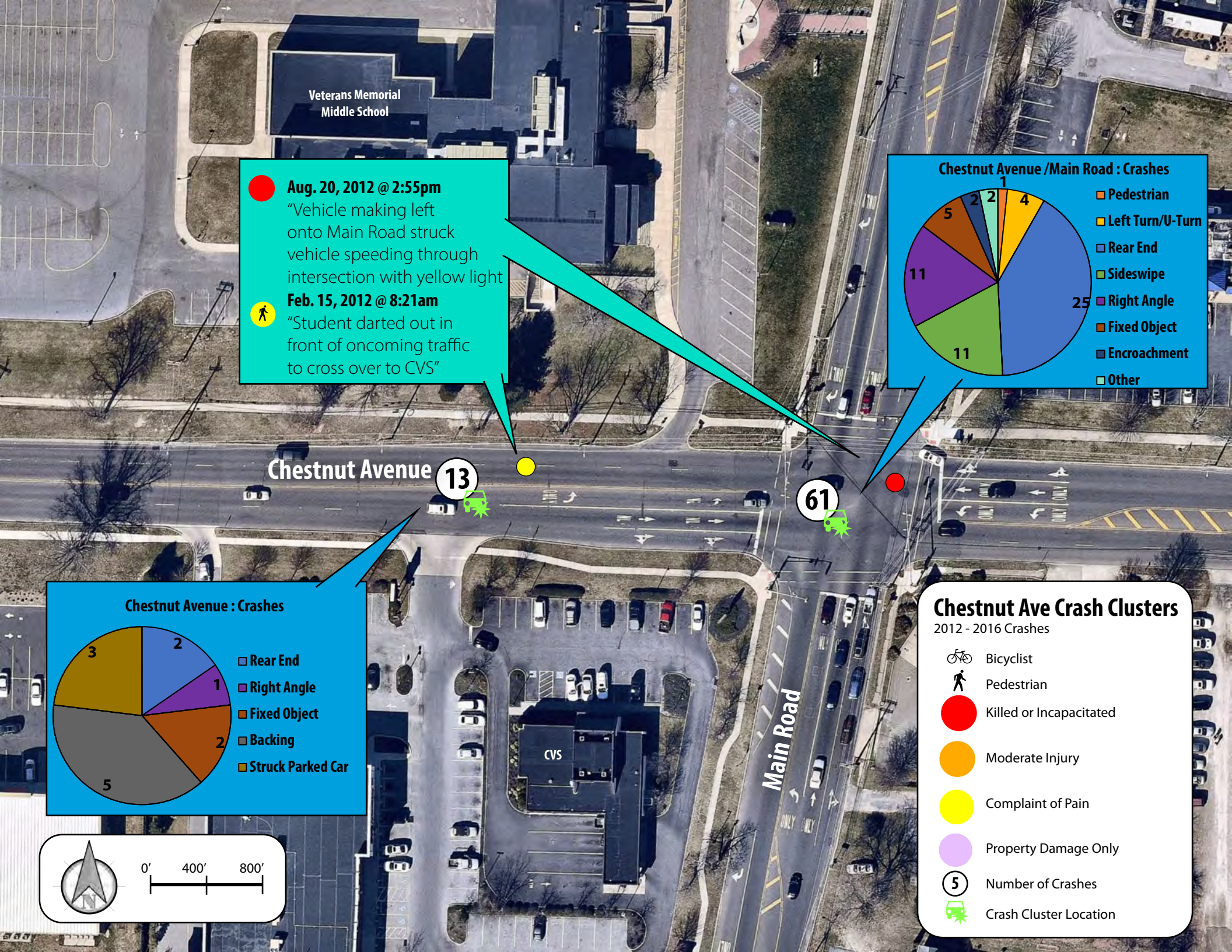

Delsea Drive
Chestnut Avenue
Delsea Drive (North): Crashes
1
2
4
Head-on
Rear End
Sideswipe
7
Jun. 14, 2015 @ Dusk
n/a
April. 15, 2013 @ 10:09pm
"dart out"
Chestnut Avenue /Delsea Drive: Crashes
1
2
2
3
6
17
7
40
Pedestrian
Head-on
Left Turn/U-Turn
Rear End
Sideswipe
Right Angle
Backing
Encroachment
Mar. 03, 2012 @ 6:28pm
"Struck in parking lot at night while walking into church"
78
7
Delsea Drive (South): Crashes
1
1
5
Rear End
Fixed Object
Struck Parked Car
Chestnut Ave Crash Clusters
2012 - 2016 Crashes
Bicyclist
Pedestrian
Killed or Incapacitated
Moderate Injury
Complaint of Pain
Property Damage Only
5
Number of Crashes
Crash Cluster Location
N
0'
400'
800'

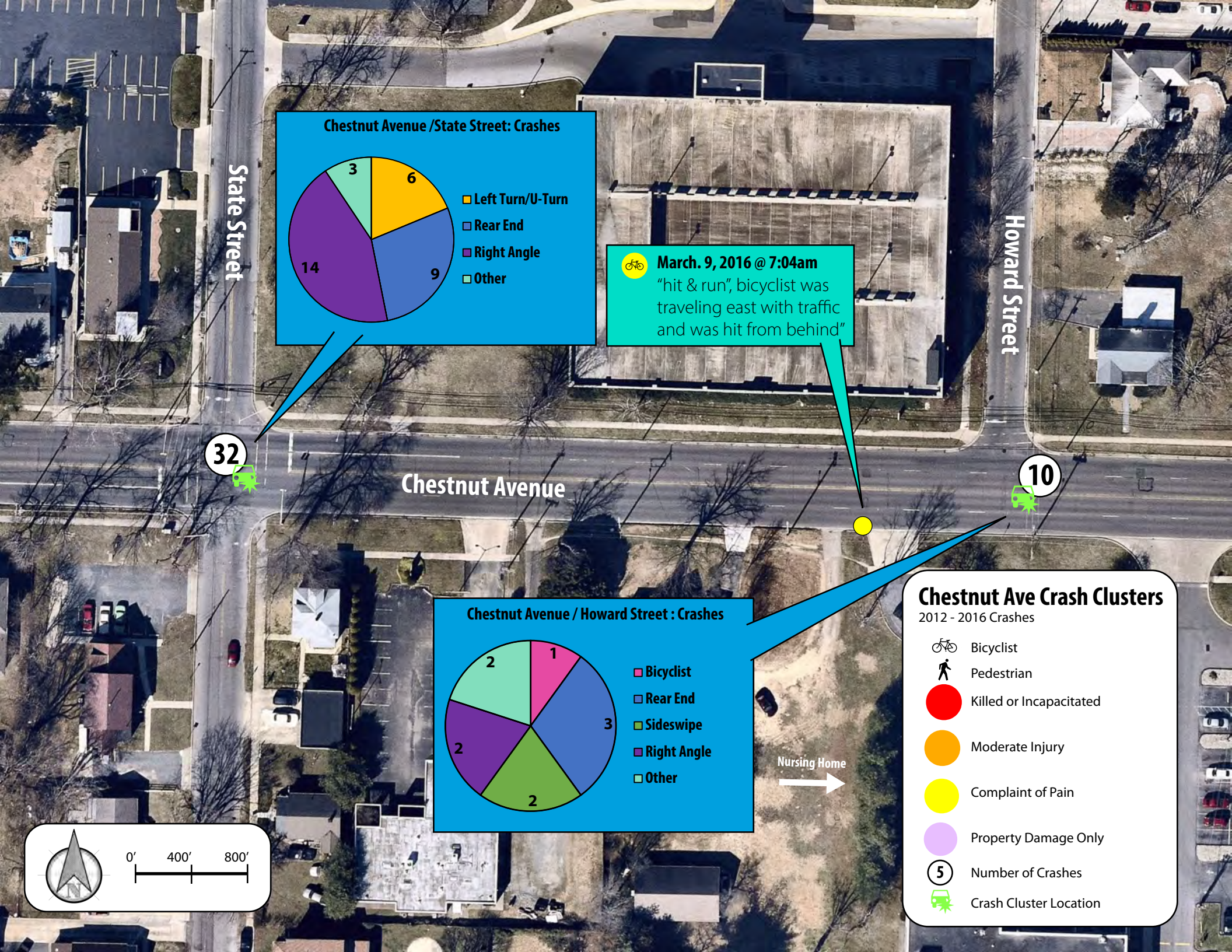

Chestnut Avenue /Holly Hill Terrace: Crashes
1
4
3
6
1
4
6
Bicyclist
Rear End
Sideswipe
Right Angle
Fixed Object
Backing
Struck Parked Car
Chestnut Avenue /Earl Dr./Melrose St.: Crashes
1
2
4
2
4
Bicyclist
Pedestrian
Sideswipe
Struck Parked Car
Other
Holly Hill Terrace
Melrose Street
Chestnut Avenue
2nd Street
Earl Drive
25
13
Sep. 10, 2014 @ 6:51pm
"Struck while crossing"
Dec. 8, 2014 @ 5:09pm
"j-walking to get home"
Oct. 10, 2013 @ 7:03am
"Struck in crosswalk while walking to bus stop" by vehicle turning left onto Chestnut Ave"
Aug. 3, 2015 @ 9:30am
"Struck in crosswalk going west on sidewalk"
Chestnut Ave Crash Clusters
2012 - 2016 Crashes
Bicyclist
Pedestrian
Killed or Incapacitated
Moderate Injury
Complaint of Pain
Property Damage Only
5
Number of Crashes
Crash Cluster Location
N
0′
400′
800′

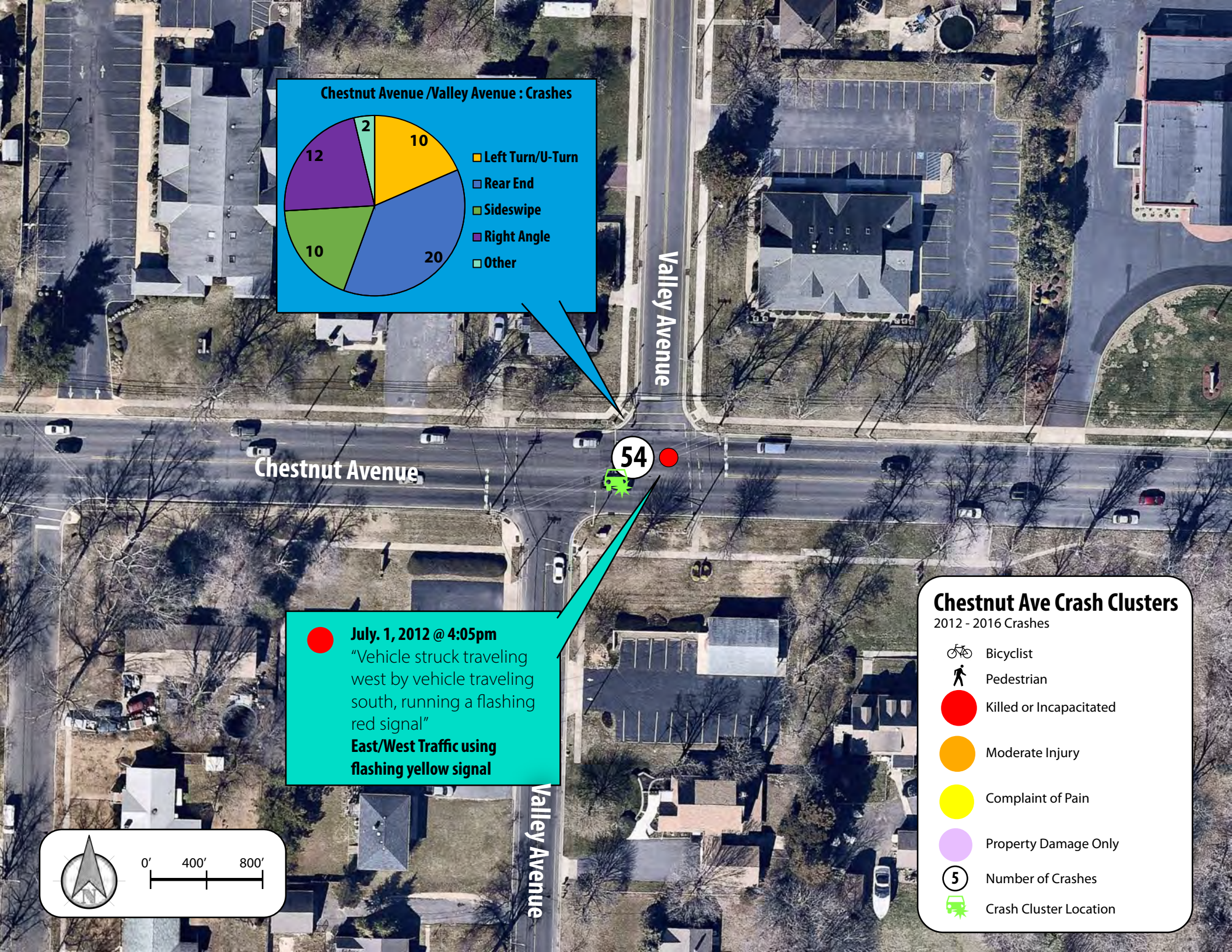

East Avenue
Chestnut Avenue
Myrtle Street
77
15
April. 8, 2012 @ 7:58pm
"Struck illegally crossing Chestnut Avenue by vehicle traveling east"
Sep. 26, 2015 @ 1:52pm
"Struck illegally crossing Chestnut Avenue by vehicle traveling east"
May. 22, 2012 @ 4:43pm
"Skateboarder struck while illegally crossing at crosswalk by truck traveling east"
Aug. 21, 2014 @ 11:46am
"hit & run, struck outside of crosswalk by vehicle traveling west"
Chestnut Avenue /Myrtle Street : Crashes
1
3
6
3
2
Pedestrian
Rear End
Right Angle
Fixed Object
Other
Chestnut Avenue /East Avenue : Crashes
32
17
14
8
2
2
1
1
Bicyclist
Pedestrian
Head-on
Left Turn/U-Turn
Rear End
Sideswipe
Right Angle
Fixed Object
0′
400′
800′
Chestnut Ave Crash Clusters
2012 - 2016 Crashes
Bicyclist
Pedestrian
Killed or Incapacitated
Moderate Injury
Complaint of Pain
Property Damage Only
5
Number of Crashes
Crash Cluster Location

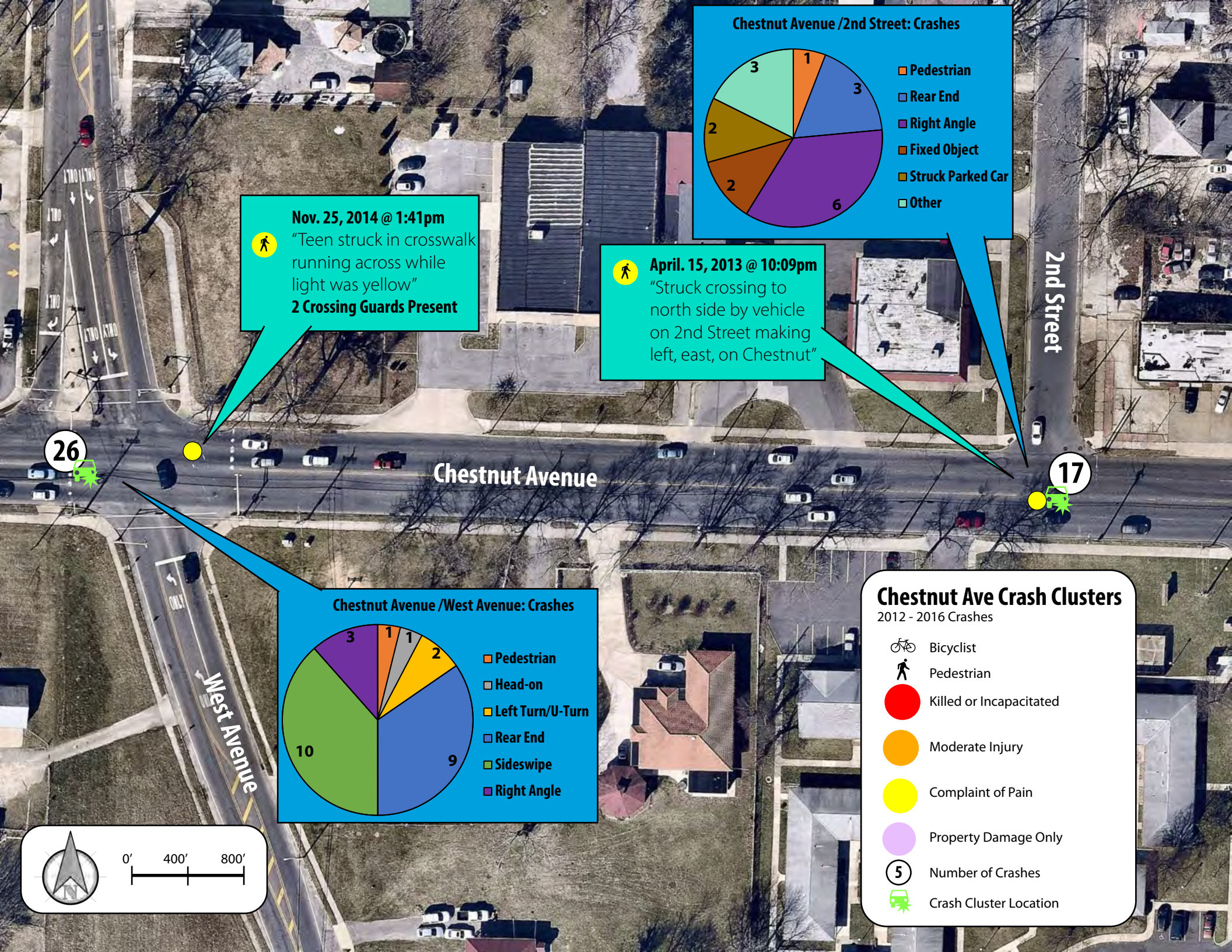

March. 9, 2013 @ 10:32pm
"hit & run", backing
West Blvd
Chestnut Avenue
33
34
East Blvd
Train
Chestnut Avenue /East Blvd : Crashes
3
2
15
12
2
Rear End
Sideswipe
Right Angle
Fixed Object
Other
Chestnut Avenue /West Blvd : Crashes
1
2
2
2
16
7
3
Pedestrian
Rear End
Sideswipe
Right Angle
Fixed Object
Backing
Other
Aug. 14, 2012 @ 9:48pm
"Struck in crosswalk, driver statement: 'blinded by oncoming northbound train'"
N
0'
400'
800'
Chestnut Ave Crash Clusters
2012 - 2016 Crashes
Bicyclist
Pedestrian
Killed or Incapacitated
Moderate Injury
Complaint of Pain
Property Damage Only
5
Number of Crashes
Crash Cluster Location


Evelyn Avenue
Chestnut Avenue
19
Dec. 25, 2013 @ 5:44pm
"J-walking, intoxicated"
Sep. 10, 2012 @ 8:30am
"Struck illegally crossing Chestnut Avenue by vehicle traveling east"
Chestnut Avenue /Evelyn Avenue : Crashes
1
1
2
12
3
Bicyclist
Pedestrian
Rear End
Right Angle
Other
0′
400′
800′
Chestnut Ave Crash Clusters
2012 - 2016 Crashes
Bicyclist
Pedestrian
Killed or Incapacitated
Moderate Injury
Complaint of Pain
Property Damage Only
5
Number of Crashes
Crash Cluster Location

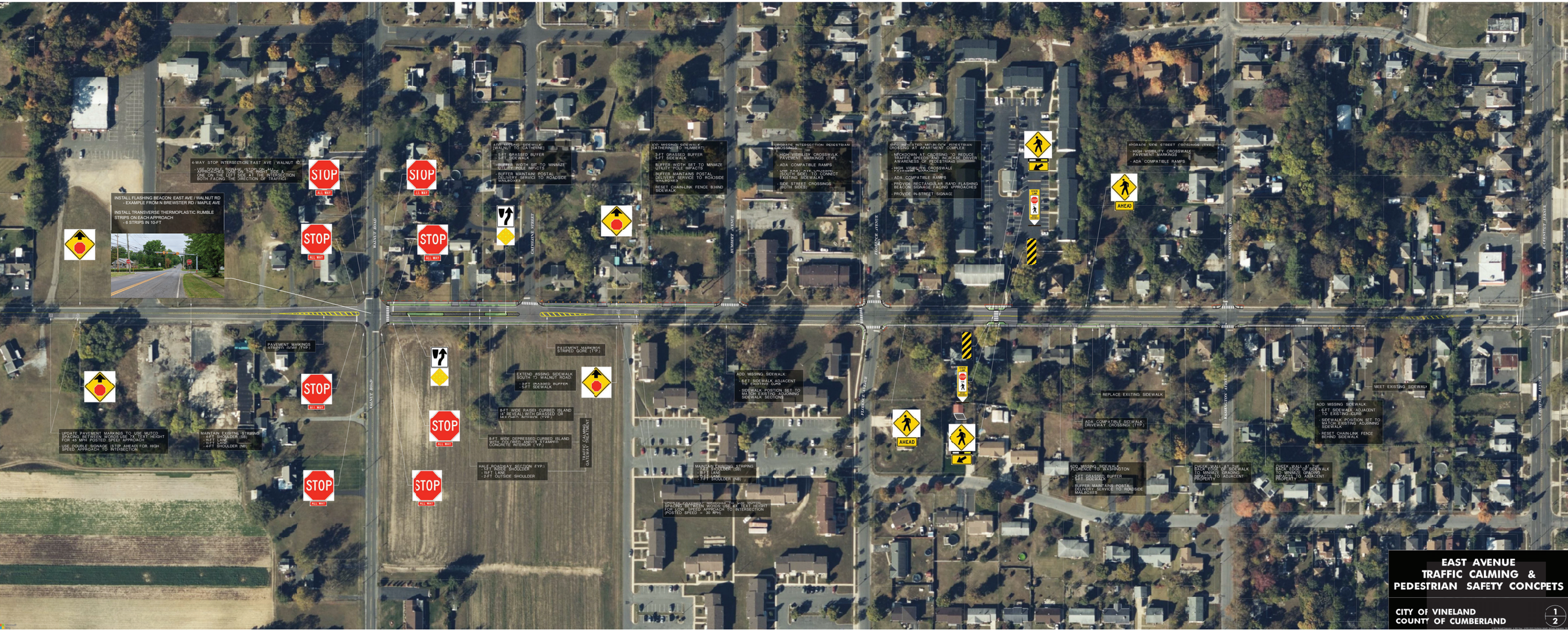

Veterans Memorial Middle School
Aug. 20, 2012 @ 2:55pm
"Vehicle making left onto Main Road struck vehicle speeding through intersection with yellow light
Feb. 15, 2012 @ 8:21am
"Student darted out in front of oncoming traffic to cross over to CVS"
Chestnut Avenue
13
61
Main Road
CVS
Chestnut Avenue /Main Road : Crashes
1
2
2
4
5
11
25
11
Pedestrian
Left Turn/U-Turn
Rear End
Sideswipe
Right Angle
Fixed Object
Encroachment
Other
Chestnut Avenue : Crashes
2
1
2
5
3
Rear End
Right Angle
Fixed Object
Backing
Struck Parked Car
N
0'
400'
800'
Chestnut Ave Crash Clusters
2012 - 2016 Crashes
Bicyclist
Pedestrian
Killed or Incapacitated
Moderate Injury
Complaint of Pain
Property Damage Only
5
Number of Crashes
Crash Cluster Location


Chestnut Avenue /State Street: Crashes
3
6
14
9
Left Turn/U-Turn
Rear End
Right Angle
Other
March. 9, 2016 @ 7:04am
"hit & run", bicyclist was traveling east with traffic and was hit from behind"
State Street
Howard Street
Chestnut Avenue
32
10
Chestnut Avenue / Howard Street : Crashes
2
1
3
2
2
Bicyclist
Rear End
Sideswipe
Right Angle
Other
Nursing Home
0'
400'
800'
N
Chestnut Ave Crash Clusters
2012 - 2016 Crashes
Bicyclist
Pedestrian
Killed or Incapacitated
Moderate Injury
Complaint of Pain
Property Damage Only
5
Number of Crashes
Crash Cluster Location


Chestnut Avenue /Valley Avenue : Crashes
10
20
10
12
2
Left Turn/U-Turn
Rear End
Sideswipe
Right Angle
Other
Valley Avenue
Chestnut Avenue
54
July. 1, 2012 @ 4:05pm
"Vehicle struck traveling west by vehicle traveling south, running a flashing red signal"
East/West Traffic using flashing yellow signal
Valley Avenue
0'
400'
800'
N
Chestnut Ave Crash Clusters
2012 - 2016 Crashes
Bicyclist
Pedestrian
Killed or Incapacitated
Moderate Injury
Complaint of Pain
Property Damage Only
5
Number of Crashes
Crash Cluster Location


Chestnut Avenue /2nd Street: Crashes
1
3
6
2
2
Pedestrian
Rear End
Right Angle
Fixed Object
Struck Parked Car
Other
Nov. 25, 2014 @ 1:41pm
"Teen struck in crosswalk running across while light was yellow"
2 Crossing Guards Present
April. 15, 2013 @ 10:09pm
"Struck crossing to north side by vehicle on 2nd Street making left, east, on Chestnut"
2nd Street
Chestnut Avenue
26
17
Chestnut Avenue /West Avenue: Crashes
1
1
2
9
10
3
Pedestrian
Head-on
Left Turn/U-Turn
Rear End
Sideswipe
Right Angle
West Avenue
ONLY
0′
400′
800′
Chestnut Ave Crash Clusters
2012 - 2016 Crashes
Bicyclist
Pedestrian
Killed or Incapacitated
Moderate Injury
Complaint of Pain
Property Damage Only
5
Number of Crashes
Crash Cluster Location

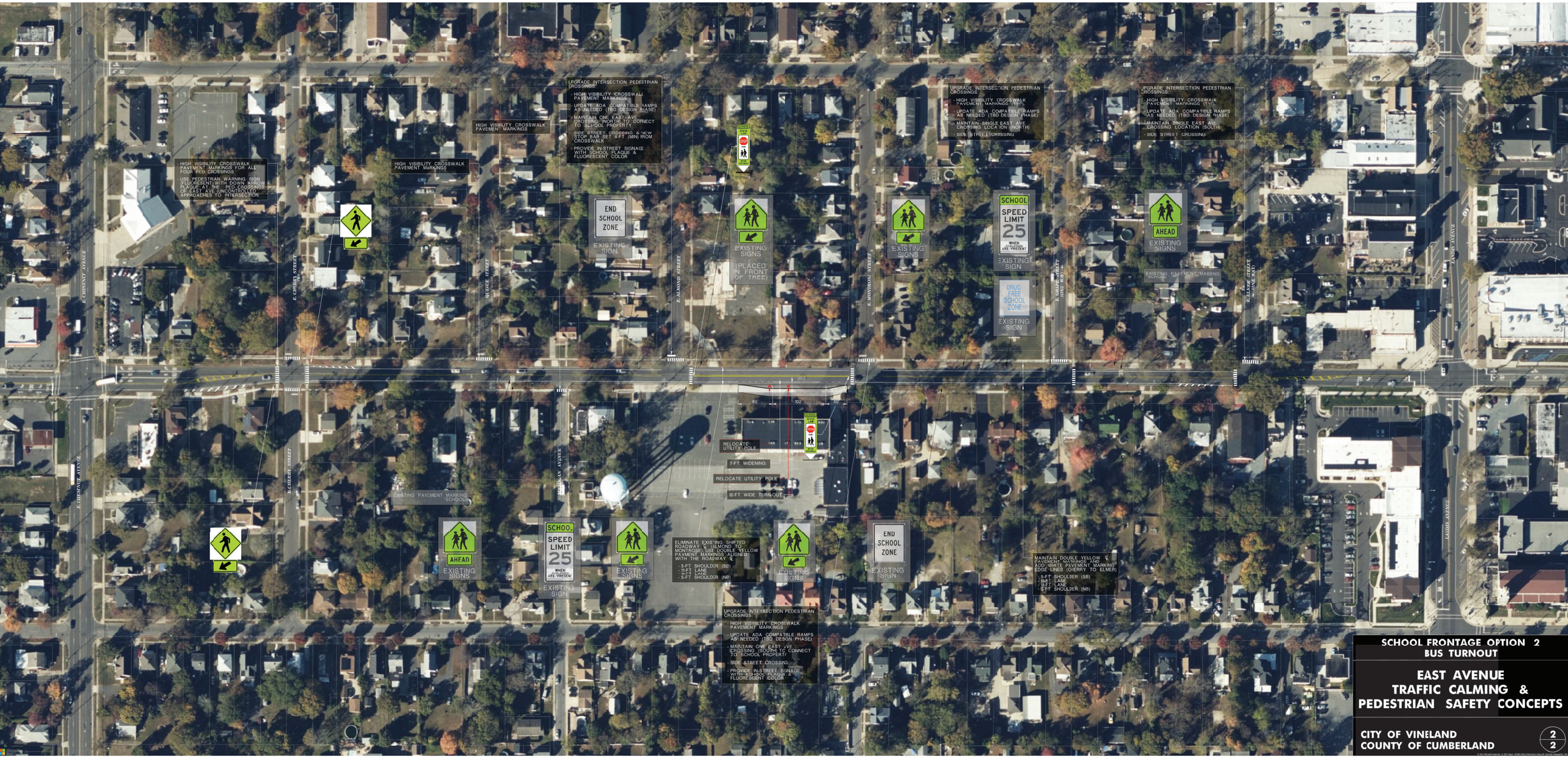
Appendix D
East Avenue



EAST AVENUE TRAFFIC CALMING & PEDESTRIAN SAFETY CONCPETS

CITY OF VINELAND
COUNTY OF CUMBERLAND

1
2



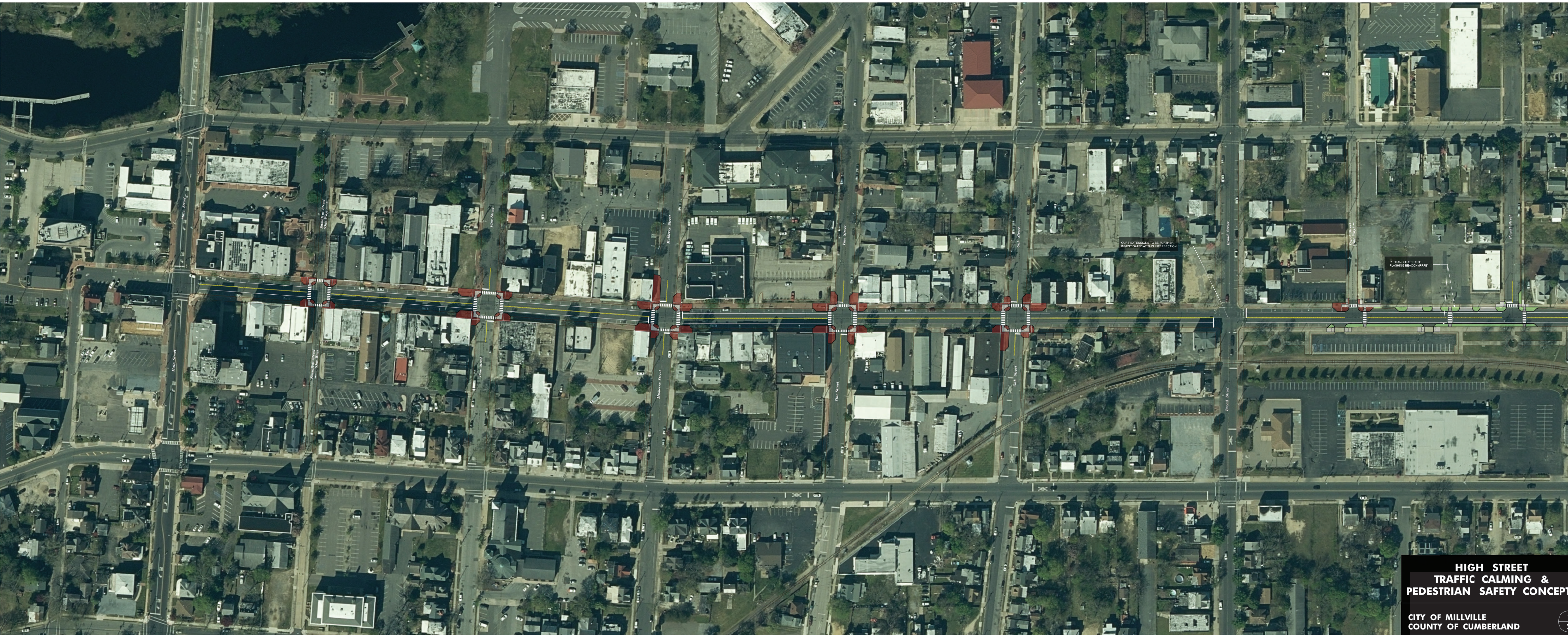
SCHOOL FRONTAGE OPTION 2
BUS TURNOUT

EAST AVENUE TRAFFIC CALMING & PEDESTRIAN SAFETY CONCEPTS

CITY OF VINELAND
COUNTY OF CUMBERLAND

2
2

Appendix E
High Street



CURB EXTENSIONS TO BE FURTHER INVESTIGATED AT THIS INTERSECTION
RECTANGULAR RAPID FLASHING BEACON (RRFB)
Broad Street
Depot Street (One Way)
HIGH STREET
TRAFFIC CALMING &
PEDESTRIAN SAFETY CONCEPTS
CITY OF MILLVILLE
COUNTY OF CUMBERLAND
1
2

HIGH STREET TRAFFIC CALMING & PEDESTRIAN SAFETY CONCEPTS

CITY OF MILLVILLE
COUNTY OF CUMBERLAND

Appendix F
3rd Street/Wheaton Avenue

3RD STREET & WHEATON AVE TRAFFIC CALMING & PEDESTRIAN SAFETY CONCEPTS

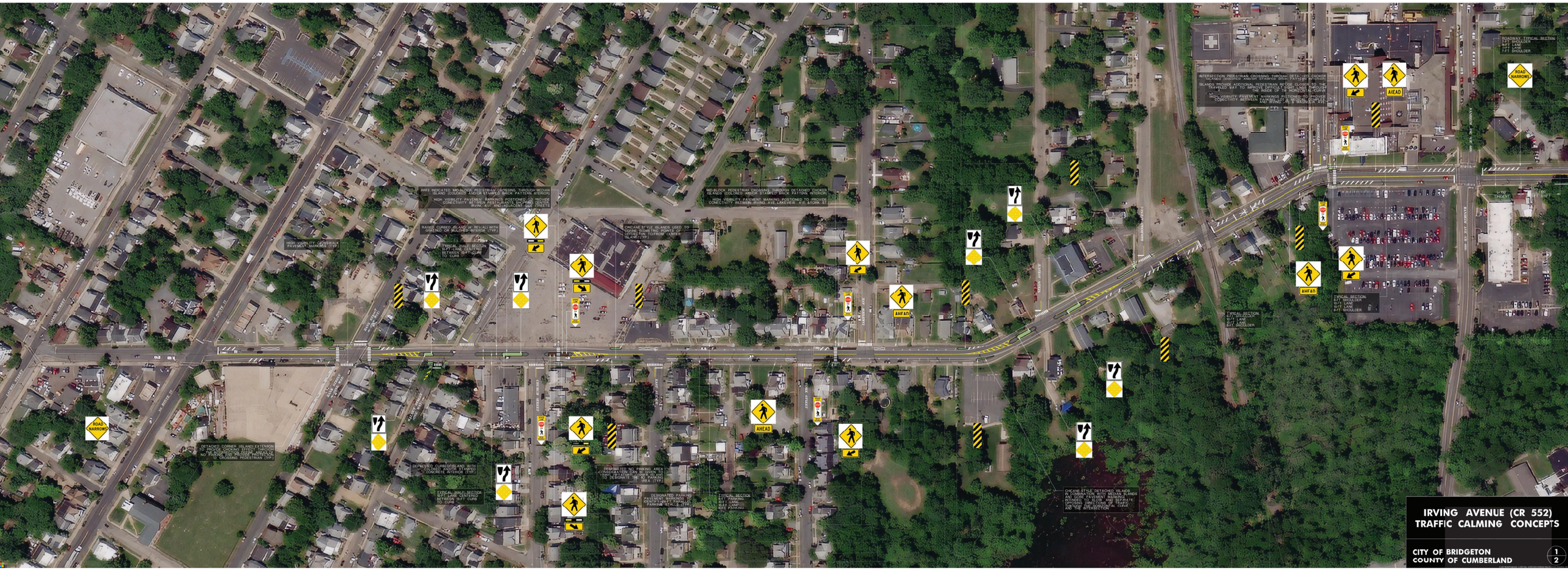
CITY OF MILLVILLE
COUNTY OF CUMBERLAND

1
2

3RD STREET & WHEATON AVE TRAFFIC CALMING & PEDESTRIAN SAFETY CONCEPTS

CITY OF MILLVILLE
COUNTY OF CUMBERLAND

Appendix G
Irving Avenue


RRFB INDICATED. MID-BLOCK PEDESTRIAN CROSSING THROUGH MEDIAN ISLAND (COLORED CHEVRON STAMPED BRICK PATTERN INTERIOR)
HIGH VISIBILITY PAVEMENT MARKINGS POSITIONED TO PROVIDE CONCIVILITY BETWEEN RESTAURANTS SHOPPING CENTER RVWK, AVE. AND ADJACENT SIDE STREETS
RAISED CURBED ISLAND (4' REVEAL) WITH GRASSED OR MULCHED INTERIOR (TYP.)
TYPICAL SWALE SECTION 10-FT LANE CENTERED BETWEEN 3-FT CURB TO CURB
HIGH VISIBILITY CROSSWALK PAVEMENT MARKING (TYP.)
MID-BLOCK PEDESTRIAN CROSSING THROUGH DETACHED CHOKER ISLANDS (COLORED AND/OR STAMPED BRICK PATTERN INTERIOR)
HIGH VISIBILITY PAVEMENT MARKING POSITIONED TO PROVIDE CONCIVILITY BETWEEN IRVING AVE, LAKEVIEW AVE, & IVORY ST
CHICANE STYLE ISLANDS USED TO DEFINE GEOMETRIC POINTS OF CURVATURE TO/FROM CENTER ISLAND (TYP.)
AHEAD
INTERSECTION PEDESTRIAN CROSSING THROUGH DETACHED CHOKER ISLANDS (COLORED AND/OR STAMPED BRICK PATTERN INTERIOR)
ISLANDS PROVIDE ADDITIONAL PEDESTRIAN REFUGE CLOSER TO THE TRAVELED WAY TO IMPROVE DRIVER SIGHT LINES THROUGH THE NARROW OF THE MOUNTABLE CURB
HIGH VISIBILITY PAVEMENT MARKINGS POSITIONED TO PROVIDE CONCIVILITY BETWEEN FAIRVIEW AVE, & WOODRUFF ST
AHEAD
ROAD NARROWS
AHEAD
ROADWAY TYPICAL SECTION
11-FT SHOULDER
9-FT LANE
7-FT SHOULDER
TYPICAL SECTION
8-FT SHOULDER
10-FT LANE
10-FT LANE
8-FT SHOULDER
TYPICAL SECTION
8-FT SHOULDER
9-FT LANE
9-FT LANE
8-FT SHOULDER
AHEAD
ROAD NARROWS
DETACHED CORNER ISLANDS EXTENSION TO PROVIDE ONGOING STEED STATION NO PARKING AND REVISED PATH FOR O CROSSING PEDESTRIAN (TYP.)
DEPRESSED CURB/ISLAND WITH COLORED AND/OR STAMPED CONCRETE INTERIOR (TYP.)
TYPICAL SWALE SECTION 10-FT LANE CENTERED BETWEEN 3-FT CURB TO CURB
DESIGNATED NO PARKING AREA CONSIDERATION CAN BE GIVEN TO DESIGNATE THE 30 PARKING SPACES (TYP.)
DESIGNATED PARKING PAVEMENT MARKINGS TO IDENTIFY KEET PARKING FARKING DETAILS (TYP.)
TYPICAL SECTION
8-FT PARKING
10-FT LANE
10-FT LANE
8-FT PARKING
CHICANE STYLE DETACHED ISLANDS IN COMBINATION WITH MEDIAN ISLANDS AND DOW PAVEMENT MARKINGS TO DEFINE GEOMETRIC POINTS OF CURVATURE OPPOSING DIRECTIONS OF TRAFFIC AND THE AREA SECTION
IRVING AVENUE (CR 552)
TRAFFIC CALMING CONCEPTS
CITY OF BRIDGETON
COUNTY OF CUMBERLAND
1
2

ROADWAY TYPICAL SECTION:
7-FT SHOULDER
11-FT LANE
11-FT LANE
7-FT SHOULDER

ROAD NARROWS

MANHEIM AVE. (CR 668)

CORAL AVE

SPRING STREET

CEDARBROOK AVE

ROGERS STREET

IRVING STREET

BURLINGTON ROAD (CR 638)

ADD MISSING SIDEWALK SEGMENT
6-FT GRASSED BUFFER
4-FT SIDEWALK

ADD MISSING SIDEWALK SEGMENT
6-FT GRASSED BUFFER
4-FT SIDEWALK

ADD MISSING SIDEWALK SEGMENT FROM EWING ST TO BURLINGTON RD
3-FT GRASSED BUFFER
4-FT SIDEWALK

STATE LAW STOP FOR PEDESTRIAN IN CROSSWALK

AHEAD

6-FT WIDE SHOULDER

L=100'
TANGENT

L=100'
4° SHIFT

ADD MISSING SIDEWALK SEGMENT
TRANDITION 6-FT GRASSED BUFFER
TO 3-FT GRASSED BUFFER
4-FT SIDEWALK

ADD MISSING SIDEWALK SEGMENT
6-FT GRASSED BUFFER
4-FT SIDEWALK

ADD MISSING SIDEWALK SEGMENT
6-FT GRASSED BUFFER
4-FT SIDEWALK

ROADWAY TYPICAL SECTION:
8-FT SHOULDER/PARKING
11-FT LANE
11-FT LANE
6-FT SHOULDER

ADD MISSING SIDEWALK SEGMENT (GENERAL COMMENTS):

- SIDEWALK FOSITION WILL BE DETERMINED TO UTILIZE EXISTING ROW AREA, MINIMIZE IMPACTS AND AVOID UTILITIES

- DRIVEWAY APRONS TO BE RECONSTRUCTED AS NEEDED TO PROVIDE SIDEWALK ADA COMPATABILITY ACROSS DRIVEWAYS

ADD MISSING SIDEWALK SEGMENT
3-FT GRASSED BUFFER
4-FT SIDEWALK

AHEAD

EXISTING DRAINAGE INLET, FIRE HYDRANT AND UTILITY POLE TO REMAIN

EXISTING UTILITY POLE TO BE RELOCATED

RELOCATE OR REMOVE EXISTING PAT TELEPHONE

EXISTING UTILITY POLES TO REMAIN

ADD MISSING SIDEWALK SEGMENT
6-FT SIDEWALK ADJACENT TO CURB

PROVIDE ON-STREET PARKING SPACES (5) FOR DELI PROPERTY STALL DIMS: 8-FT x 24-FT (WxL)

EXISTING UTILITY POLE TO BE RELOCATED

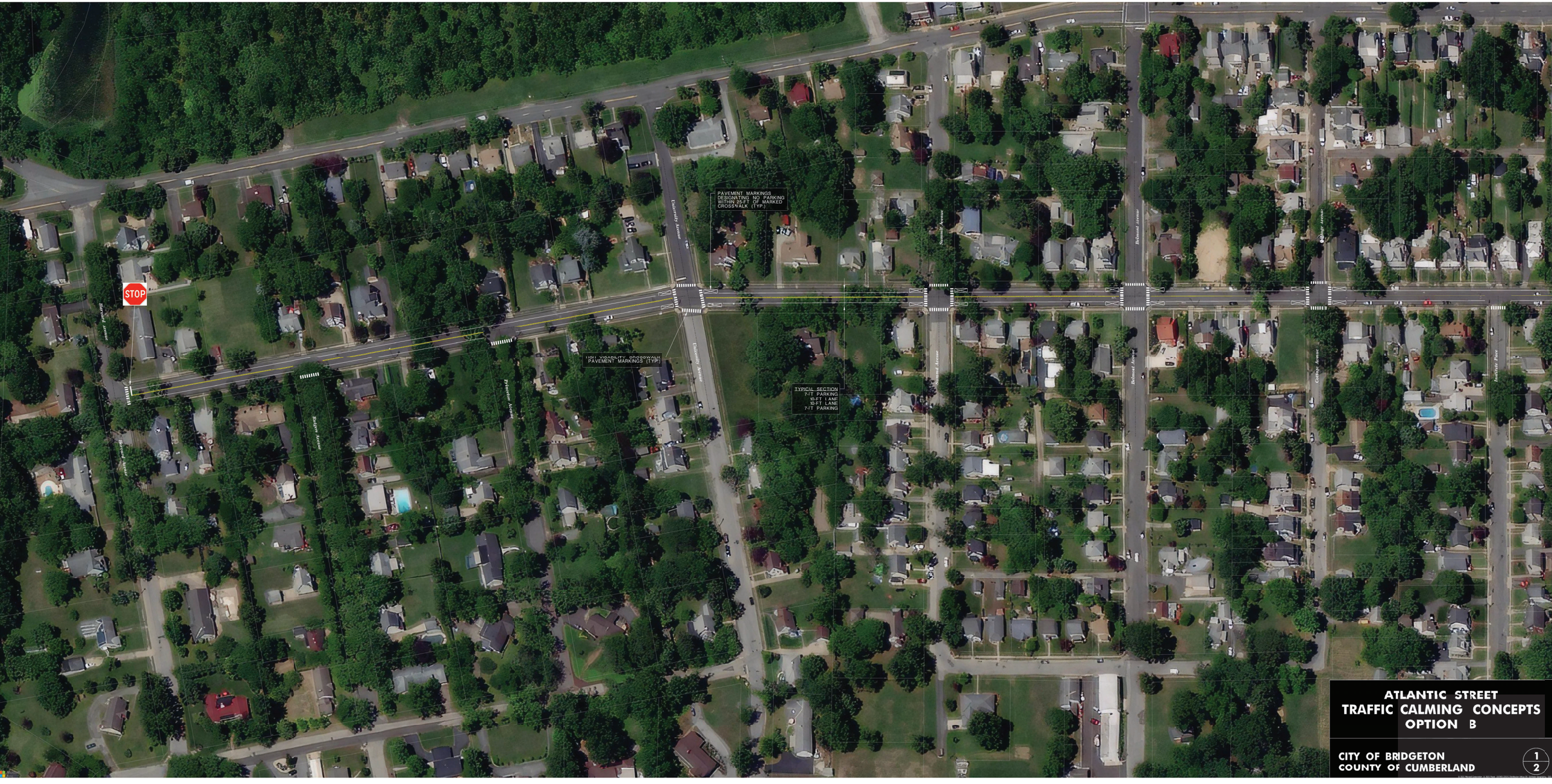
EXSTING PRIVATE SIGN TO REMAIN

IRVING AVENUE (CR 552) MISSING SIDEWALK SEGMENTS

CITY OF BRIDGETON
COUNTY OF CUMBERLAND

2
2

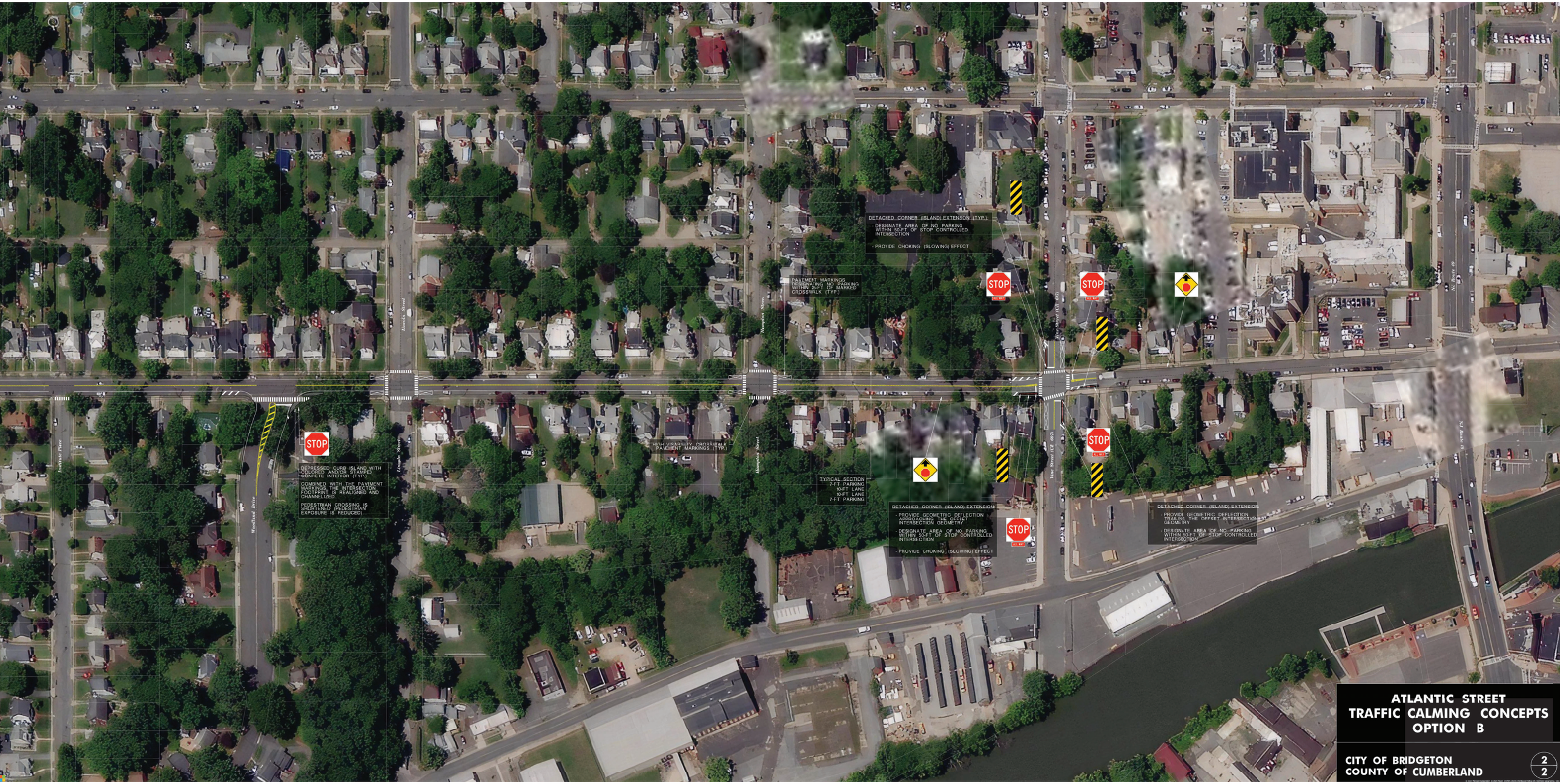
Appendix H
Atlantic Street



ATLANTIC STREET
TRAFFIC CALMING CONCEPTS
OPTION B

CITY OF BRIDGETON
COUNTY OF CUMBERLAND

1
2



ATLANTIC STREET TRAFFIC CALMING CONCEPTS OPTION B

CITY OF BRIDGETON
COUNTY OF CUMBERLAND

2
2

Appendix I
Toolbox Sheets

Pedestrian Crossing Islands

Description

Pedestrian crossing islands – also known as center islands or refuge islands – are raised islands placed in the center of the road that provide a refuge area for people who are crossing at intersections or midblock locations. They enable pedestrians to cross the road in two stages; i.e. crossing one direction of traffic, pausing in the island to wait for an adequate gap in opposing traffic, and then completing the crossing. This significantly reduces a pedestrian's exposure to vehicular traffic.

Applicability

Crossing islands are most effective when used on roadways with three or more lanes of traffic, inadequate visibility, excessive vehicle speeds, and/or high traffic volumes. Locations that may benefit from pedestrian crossing islands include:

- Mid-block or other un-signalized crossing locations
- Approaches to multi-lane intersections
- Transit stops or other pedestrian activity generators

Considerations

FHWA recommends that crossing islands are at least 4 feet wide and of adequate length to provide space for pedestrians to stand and wait for gaps in traffic before crossing. Crossing islands are often used in conjunction with other safety countermeasures including high-visibility crosswalks, pedestrian warning signs, overhead lighting, and curb extensions. Additional considerations:

- Ensure that islands are visible to motorists by using street lights, signs, and/or reflectors
- Crossing islands must meet ADA requirements for pedestrian access
- Crossing islands at intersections or near driveways may affect left-turn access

Safety Benefit

- 56% reduction in pedestrian crashes (CMF = 0.44)

Estimated Cost

Typical construction costs for a 6 foot wide 10 foot long island range from $8,200 to $33,000. Cost estimates include grading, excavation, grubbing, and other site preparations often required. Costs vary based on site conditions and the design of crossing island.

Local/Regional Examples

- Brigantine Avenue, Brigantine, Atlantic County, NJ

REFERENCES

- *FHWA Proven Safety Countermeasures Fact Sheets*
- *FHWA Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE)*
- *FHWA Desktop Reference for CMFs*
- *NJ Safe Routes to School (NJSRS) - Implementation Cost*

Pedestrian Hybrid Beacons

Description

A pedestrian hybrid beacon (PHB) is a traffic control device designed to help pedestrians and bicyclists safely cross multi-lane or higher-speed roadways at midblock crossings and uncontrolled intersections. The beacon rests in dark until activated via pushbutton or other form of detection. Once activated, the beacon displays a sequence of flashing and solid lights that indicate when pedestrians should cross and when it is safe for drivers to proceed.

Applicability

- PHBs are best suited for uncontrolled crossings of multi-lane roads where gaps in traffic are not large enough or vehicles speeds or volumes are too high for pedestrians to cross safely.
- As a safety strategy to reduce pedestrian crash risk, the PHB is an intermediate option between a flashing beacon and a full pedestrian signal because it assigns right of way and provides stop control, while also reducing vehicle delay by allowing motorists to proceed once the pedestrian has cleared their side of the travel lane.

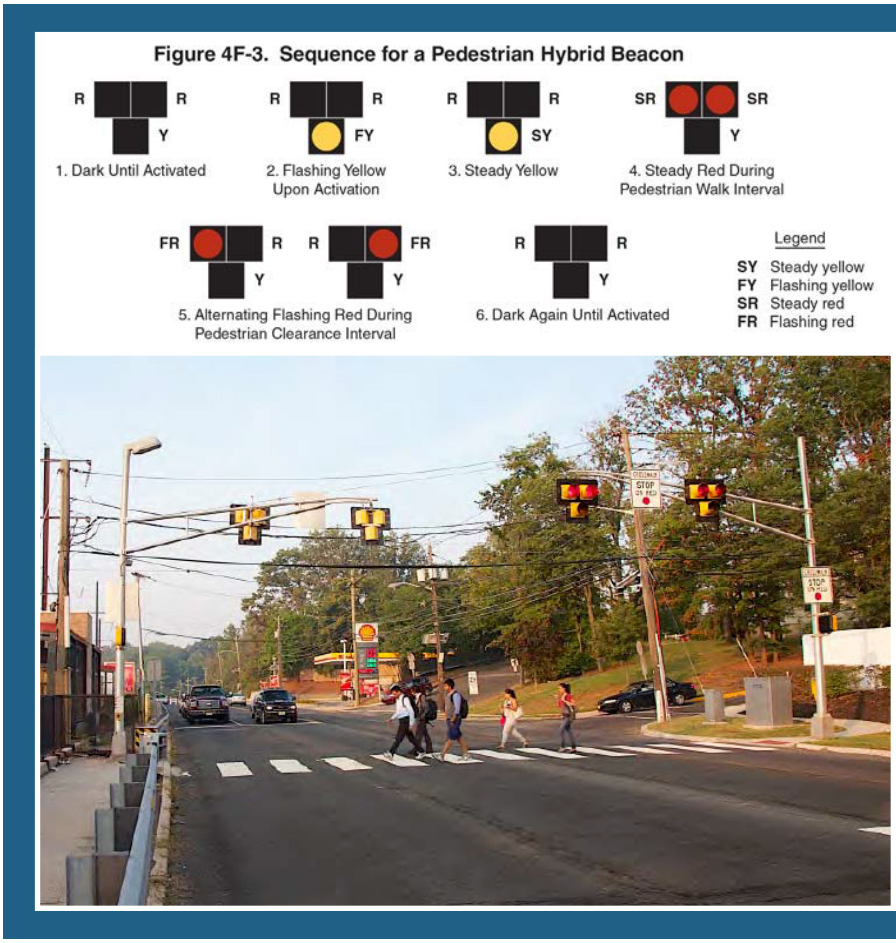
Considerations

The Manual on Uniform Traffic Control Devices (MUTCD) provides guidance on the pedestrian volume warrants, design features, and restrictions associated with PHBs:

- The pedestrian volume thresholds for a PHB are significantly lower than a traffic signal; thus this treatment may be considered for locations where traffic signals are not warranted.
- PHBs must be installed at locations with a marked crosswalk and are typically accompanied by signage, striping, curb ramps, and pedestrian countdown signals.
- PHBs are not widely implemented, so agencies should consider an education and outreach effort when implementing a PHB within a community.

Estimated Cost

The average cost for a PHB is around $58,000. PHBs are typically less expensive to implement and maintain than standard traffic signals.



Safety Benefits

- 69% reduction for pedestrian crashes (CMF = 0.31)
- 29% reduction for all crash types (CMF = 0.71)
- 15% reduction for serious injury and fatal crashes (CMF = 0.85)

Regional Examples

- NJ 27, Woodbridge, Middlesex County, NJ

REFERENCES

- *FHWA Proven Safety Countermeasures Fact Sheets*
- *FHWA Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE)*
- *CMF Clearinghouse, CMF IDs: 2911, 2917, 2922*

Road Diets

Description

The purpose of a road diet is to optimize street space to benefit all users. Also referred to as roadway reconfigurations, a common example of a road diet converts a four-lane undivided roadway to a three-lane roadway with two through lanes and a center two-way left-turn lane (TWLTL). The space that is gained by the reduction in lanes can be repurposed for a variety of uses, including the implementation of bicycle lanes, bus pull-offs, shoulders, or on-street parking.

Applicability

Typical applications of a road diet occur on four-lane undivided roadways and other multi-lane streets with excess traffic capacity. Roadway reconfigurations should be considered for roads with documented safety concerns, low-to-moderate traffic volumes, and along priority walking and bicycling routes.

Considerations

In addition to the safety and quality of life benefits that road diets provide, traffic volumes and potential impacts to vehicle operations are important considerations when evaluating road diet applications. Road diets are typically considered for roadways with an average daily traffic (ADT) of less than 20,000 vehicles per day, although ADT can go up to 25,000 in special cases.

Estimated Cost

The cost of a typical road diet reconfiguration is about $25,000 to $40,000 per mile, depending on the amount of lane lines that need to be repainted. Designs that include extending sidewalks or building a raised median can costs $100,000 per mile or more. A road diet can be a low or no-cost safety solution when planned in conjunction with a regular pavement overlay.

Regional Examples

- Broad Street (NJ 45), Woodbury, Gloucester County, NJ
- West Avenue (CR 619), Ocean City, Cape May County, NJ
- Parkway Avenue (CR 634), Ewing, Mercer County, NJ

Safety Benefits

- 19 to 47% reduction for all types of crashes (CMF = 0.81 to 0.53)
- Improved pedestrian safety due to the elimination of multiple-threat crashes
- Improved bicycle safety when bicycle lanes are included
- Reduction of rear-end and left-turn crashes because left-turning drivers exit the traffic stream and use the center lane to make turns
- Reduced right-angle crashes as side street motorists cross three travel lanes instead of four
- More consistent vehicle speeds and reduced lane weaving

REFERENCES

- *FHWA Proven Safety Countermeasures Fact Sheets*
- *FHWA Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE)*
- *Evaluation of Lane Reduction "Road Diet" Measures on Crashes, FHWA-HRT-10-053*

Leading Pedestrian Intervals

Description

Failure to yield to pedestrians in the crosswalk by turning vehicles is a common contributing factor to intersection crashes. A leading pedestrian interval (LPI) is a traffic signal timing adjustment that gives pedestrians the opportunity to enter an intersection 3-7 seconds before vehicles are given a green indication. By giving pedestrians a head start, LPIs improve the visibility of crossing pedestrians and allow them to better establish their presence in the crosswalk, thereby increasing the chances that motorists will yield to them.

Applicability

- LPIs are typically applied where heavy turning traffic comes into conflict with crossing pedestrians and both volumes are high enough to warrant a dedicated interval for pedestrians.
- Additional locations where LPIs are considered include intersections with dedicated right turn lanes, wide roadways with multiple lanes, and locations with high concentrations of senior citizens, children, or wheelchairs users.

Considerations

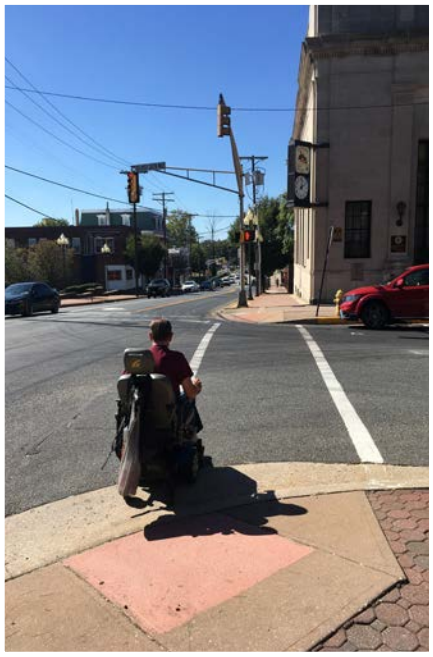
The Manual on Uniform Traffic Control Devices (MUTCD) provides guidance on LPI signal timing requirements. LPIs are not compatible with signals that have a leading protected left turn.

Estimated Cost

Costs for implementing LPIs are very low since only signal timing adjustments are required. This makes LPIs an easy and inexpensive countermeasure that can be incorporated into pedestrian safety plans, policies, and projects and become routine agency practice.

Regional Examples

- Approximately 50 traffic signals in Jersey City, Hudson County, NJ



Safety Benefits

- 59% reduction in pedestrian crashes at intersections (CMF = 0.41)
- Increased visibility of crossing pedestrians
- Increased likelihood of motorists yielding to pedestrians

REFERENCES

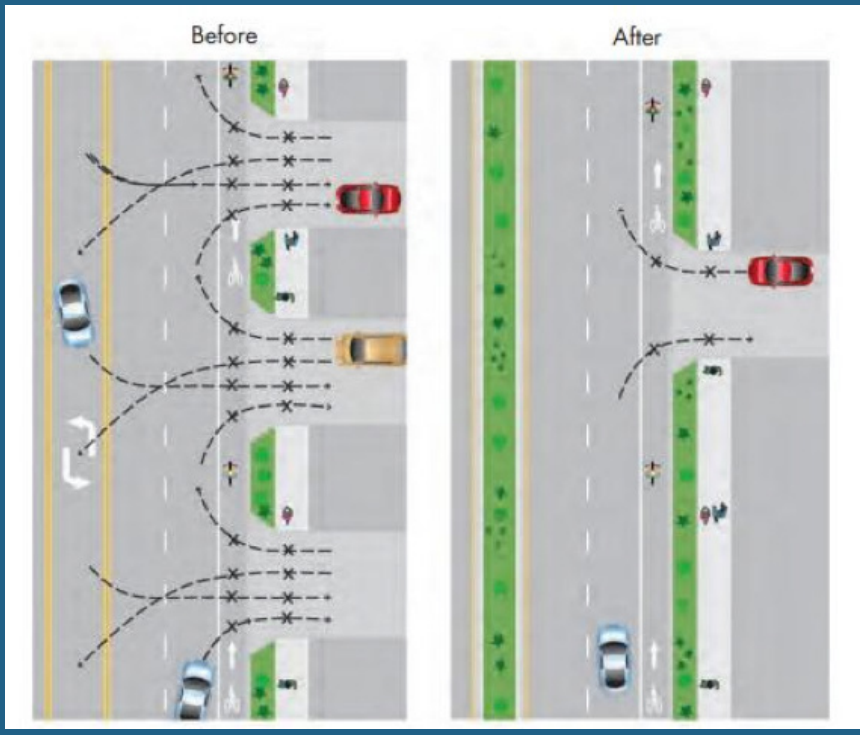
- *FHWA Proven Safety Countermeasures Fact Sheets*
- *FHWA Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE)*
- *Transportation Research Record – Safety Effectiveness of LPIs*

Corridor Access Management

Description

Access management refers to the planning, design, application, and control of entry and exit points along a roadway, including intersections with roads and driveways. Thoughtful access management along a corridor can simultaneously enhance safety for all modes, facilitate walking and biking, and reduce trip delay and congestion. Common access management strategies include:

- Driveway closure, consolidation, narrowing, or relocation
- Limited-movement designs for driveways (such as right-in/right-out only)
- Raised medians that preclude across-roadway movements



Applicability

Every intersection, from a signalized intersection to an unpaved driveway, has the potential for conflicts between vehicles, pedestrians, and bicycles. Auto-oriented commercial corridors with closely spaced businesses, particularly those featuring wide and/or multiple driveway openings, are prime candidates for access management improvements.

Considerations

Successful corridor access management requires balancing multimodal safety and corridor mobility with the access needs of adjacent land uses and property owners. Primary considerations when considering access modifications include traffic circulation patterns, parking layouts, and business operations.

Estimated Cost

Costs for access management improvements can vary significantly based on the application. Stand-alone retrofits of existing corridors will likely be more costly than access management improvements that are integrated into rehabilitation projects or new construction. Incorporating pedestrian and bicycle-friendly access management principles into zoning codes and land development ordinances is a low-cost way to realize safety improvements in the long term.

Safety Benefits

- 5 to 23% reduction in total crashes along two-lane rural roads (CMF = 0.95 to 0.77)
- 25 to 31% reduction in injury/fatal crashes along urban/suburban arterials (CMF = 0.75 to 0.69)
- Reduction in pedestrian exposure to turning vehicles

REFERENCES

- *FHWA Proven Safety Countermeasures Fact Sheets*
- *Highway Safety Manual (HSM)*

Walkways

Description

A walkway is any type of defined travel space that can be used by pedestrians and is separated from moving vehicles. Types of walkways include sidewalks, shared use paths, and paved roadway shoulders, with concrete, asphalt, brick, and pavers commonly used as materials.

Applicability

Well-designed sidewalks improve safety and mobility for all types of pedestrians including children, senior citizens, and those using wheelchairs or other mobility-assisted devices. Sidewalks are appropriate on most types of roads and should be included wherever pedestrian activity is observed or anticipated. In rural or suburban areas where sidewalks are not feasible or demand is extremely low, roadway shoulders can provide an area for pedestrians to walk.

Considerations

- Both the FHWA and the Institute of Transportation Engineers (ITE) recommend a minimum width of 5 feet for a sidewalk or walkway, which allows two people to pass comfortably or walk side-by-side.
- Wider sidewalks should be installed near schools, at transit stops, in downtown areas, or anywhere high concentrations of pedestrians exist. Sidewalks should be continuous along both sides of a street and should be fully accessible to all pedestrians, including those in wheelchairs.
- Establishing a continuous network of walkways in communities that currently lack sidewalks will usually take time and occur in phases. Even small sidewalk projects can provide the groundwork for later development of a continuous system.

Safety Benefits

- 65 to 89% reduction in pedestrian crashes (CMF = 0.35 to 0.11)

Estimated Cost

Costs for walkways can vary considerably depending on factors including the length, base material, need for right-of-way acquisition, impacts to utilities, and whether curb ramps are needed. When developing cost estimates for new sidewalk, it is important to specify whether or not curb and drainage is included. For example, the average cost for concrete sidewalk is approximately $32 per square foot, compared to $150 per square foot for concrete sidewalk with curb.

Regional Examples

- Landis Avenue, Vineland, Cumberland County, NJ
- Main Street (CR 553), Downe, Cumberland County, NJ

REFERENCES

- *FHWA Proven Safety Countermeasures Fact Sheets*
- *FHWA Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE)*
- *FHWA Desktop Reference for CMFs*

Roundabouts

Description

Modern roundabouts are circular intersections designed to eliminate left turns by requiring traffic to exit to the right of the circle. Unlike traditional signalized intersections, vehicles flow and merge through roundabouts without having to stop, and unlike traffic circles, entering traffic yields to circulating traffic. Roundabouts are typically installed to reduce vehicular speeds, improve safety by eliminating angle collisions, help traffic flow more efficiently, and serve as gateway treatments.

Applicability

Roundabouts provide substantial safety and operational benefits compared to other intersection types, and FHWA encourages agencies to consider roundabouts for new construction projects as well as existing intersections that exhibit safety or operational issues. Roundabouts can be implemented in both urban and rural areas under a wide range of traffic conditions and can replace signals, two-way stop controls, and all-way stop controls.

Considerations

When determining whether to install a roundabout, general considerations include traffic volumes, pedestrian and bicycle volumes, effects on pedestrian route directness, the design vehicle, the number of travel lanes, and available rights-of-way. Additional considerations:

- Roundabouts should be designed for slow speeds with geometry that facilitates motor vehicles yielding to pedestrians and bicyclists
- Roundabouts are not recommended if they would increase difficulty for pedestrians navigating the intersection, and are typically not appropriate for the intersection of two multi-lane roads
- On low speed and low volume non-arterial streets, consider installing mini-circles or smaller-scale roundabouts

Safety Benefits

- Up to 82% reduction in severe crashes converting from a two-way stop-controlled intersection (CMF = 0.18)
- Up to 78% reduction in severe crashes converting from a signalized intersection (CMF = 0.22)

Estimated Cost

Landscaped roundabouts at neighborhood intersections can be installed for approximately $45,000 to $150,000. The cost for roundabouts on arterial streets can be more than $500,000 depending on the size, site conditions, and need to acquire right-of-way.

Regional Example

- US 322/Rowan Boulevard Intersection, Glassboro, Gloucester County, NJ

REFERENCES

- *FHWA Proven Safety Countermeasures Fact Sheets*
- *FHWA Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE)*
- *Highway Safety Manual (HSM)*

High-Visibility Crosswalks

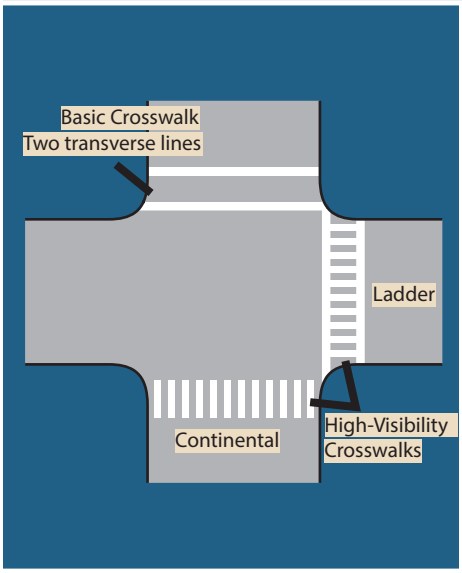
Description

Marked crosswalks indicate optimal or preferred locations for pedestrians to cross the road and establish right-of-way between motorists and pedestrians. In contrast to basic crosswalk markings which consist of two transverse lines, high-visibility crosswalk markings (also known as ladder or continental markings) feature a longitudinal striping pattern. This pattern is more visible to oncoming motorists and helps to highlight the crossing location, discourage drivers from encroaching into the crosswalk, and reinforce the driver's requirement to yield to pedestrians.

Applicability

The Manual on Uniform Traffic Control Devices (MUTCD) provides guidance on when to mark crosswalks based on traffic volumes, posted speeds, and other roadway characteristics. While high-visibility markings can be used at any given crosswalk, typical applications include:

- Midblock and other un-signalized crossing locations
- Intersections with high potential for conflicts between vehicles and pedestrians
- Areas with heavy pedestrian activity including commercial corridors and business districts



Considerations

- Ideally, crosswalks should be used in conjunction with other measures such as signage, lighting, and/or curb extensions to improve the safety of a pedestrian crossing, particularly on multi-lane roads with average daily traffic (ADT) above 10,000 vehicles
- Crosswalk markings must be placed to include the ramp so that a wheelchair does not have to leave the crosswalk to access the ramp
- Crosswalk locations should be convenient for pedestrian access and follow desire lines

Estimated Cost

The average cost to install a high-visibility crosswalk is approximately $2,500.

Safety Benefits

- 40% reduction in pedestrian crashes (CMF = 0.60)
- An FHWA study found that longitudinal markings were detected at about twice the distance upstream as transverse markings during daytime conditions

Regional Examples

- Broad Street (NJ 49), Bridgeton, Cumberland County, NJ
- Rowan Boulevard, Glassboro, Gloucester County, NJ

REFERENCES

- *FHWA Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE)*
- *CMF Clearinghouse, CMF ID: 4123*

Curb Extensions

Description

Curb extensions (also known as bump-outs or neckdowns) reduce the effective street width at pedestrian crossing locations by extending the sidewalk and curb line into the parking lane. Curb extensions help to improve safety by reducing pedestrian crossing distances, visually and physically narrowing the roadway, improving visibility between pedestrians and oncoming motorists, and preventing vehicles from illegally parking in crosswalks. Curb extensions shield on-street parking at the intersections and do not reduce parking supply. Installing a curb extension is often referred to as “daylighting” an intersection due to the significant improvement in visibility.

Applicability

Since curb extensions cannot block travel lanes, they are typically installed on streets that have a parking lane or shoulder. Locations that may benefit from curb extensions include:

- Intersections or mid-block locations with long pedestrian crossing distances
- Locations where reduced turning speeds and/or increased visibility are desired
- Busy pedestrian corridors with narrow sidewalks where additional space for pedestrians waiting at intersections or curb ramp layout is needed

Considerations

Curb extensions are often used in conjunction with other safety countermeasures including high-visibility crosswalks, pedestrian warning signs, overhead lighting, and pedestrian crossing islands. Additional considerations when designing curb extensions:

- The turning needs of larger vehicles, such as school buses, transit vehicles, and emergency vehicles
- Ensuring adequate drainage, particularly at curb ramps

Safety Benefits

Studies have shown that curb extensions are effective at reducing wait times to cross the road, decreasing the percentage of vehicles that pass before yielding, and increasing the distance that vehicles yield in advance of the crosswalk. In residential neighborhoods, curb extensions can effectively reduce traffic speeds by approximately 3 - 4 mph.

Estimated Cost

The cost of a single curb extension can range from $8,000 to $80,000 depending on the design and site conditions. Drainage modifications, landscaping, crossing islands, and the need to relocate physical features such as utilities, transit stops, or traffic equipment increase cost. Altogether, the average cost of a standard curb extension with material and labor is $8,000 to $16,500.

Regional Examples

- Landis Avenue, Vineland, Cumberland County, NJ
- Broad Street (NJ 45), Woodbury, Gloucester County, NJ

REFERENCES

- *FHWA Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE)*
- *PBIC Evaluation of Pedestrian-related Roadway Measures*
- *NCHRP 841 - Development of CMFs for Uncontrolled Pedestrian Crossing Treatments*
- *FHWA-SA-14-101 - Engineering Speed Management Countermeasures: A Desktop Reference of Potential Effectiveness in Reducing Speed (July, 2014)*
- *UNC Highway Safety Research Center - Costs for Pedestrian and Bicyclist Infrastructure Improvements (2013)*

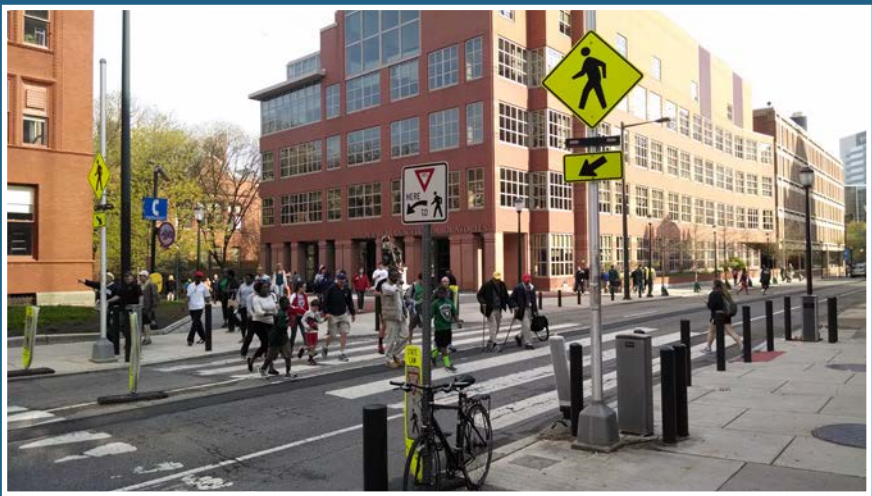
Rectangular Rapid-Flashing Beacon

Description

Rectangular Rapid-Flashing Beacons (RRFBs) are pedestrian-actuated devices that use LED flashing beacons in combination with warning signs to alert motorists to pedestrians and bicyclists crossing the road at un-signalized locations. The RRFB design differs from the standard flashing beacon by utilizing a much faster rapid-pulsing flash rate, a brighter light intensity, and a different shape.

Applicability

RRFBs are appropriate at pedestrian crossings locations where there is significant demand and identified safety issues, but a full traffic signal or pedestrian hybrid beacon may not be warranted. This can include multi-lane roads and other locations where high traffic volumes make pedestrian crossings challenging. RRFBs are typically used on roads with speed limits between 25 and 35 mph. With higher speeds, the use of a pedestrian hybrid beacon should be considered, particularly when average daily traffic is above 15,000 vehicles/day.



Considerations

- RRFBs should be used in conjunction with marked crosswalks and standard crossing warning signage/markings. Curb extensions and advance yield or stop pavement markings and signs may be used to supplement RRFBs.
- RRFB applications on multi-lane roads are most effective when there is a median/refuge island so that beacons can be placed on both sides of the road as well as the center island.
- RRFBs should not be used in conjunction with YIELD, STOP, or traffic signal control.
- Solar-power panels can be used to eliminate the need for a power source.

Estimated Cost

Cost is approximately $15,000 to $25,000 for purchase and installation of two units (one on either side of the street). This estimated cost includes solar panels for powering the units, pad lighting, and indication units.

Safety Benefit

47% reduction in pedestrian crashes at midblock crossing locations (CMF = 0.53)

Regional Example

- Tilton Road, Northfield, Atlantic County, NJ

REFERENCES

- *FHWA Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE)*
- *NCHRP 841 - Development of CMFs for Uncontrolled Pedestrian Crossing Treatments*
- *CMF Clearinghouse, CMF ID: 9124*
- *NJ Safe Routes to School (NJSRS) - Implementation Cost*
- *FHWA 09-009 - Rectangular Rapid Flash Beacon (RRFB)*

Street Lighting

Description

Appropriate quality and placement of street lighting can enhance the built environment as well as increase comfort and safety for all road users. However, street lighting is often focused on the needs of motorists and not necessarily the safety of pedestrians. On average in New Jersey, nearly two-thirds of fatal pedestrian crashes occur during low-light conditions. Without sufficient lighting, motorists are often unable to see pedestrians with enough time to stop.

Applicability

Overhead lighting can be used to illuminate any street or highway and typically sits at least 20 feet above street level. Based on local standards, pedestrian crossing areas are often supplemented with brighter or additional lighting at both the crosswalks and approaches to the crosswalks. In commercial areas, downtowns, and main street environments, pedestrian-scale lighting may be placed over the sidewalks to improve pedestrian comfort, security, and safety. Pedestrian-scale lighting typically sits 12 to 18 feet above sidewalk level.

Considerations

- At midblock crossing locations, luminaires should be placed in between the approaching vehicles and the crosswalk.
- Install lighting on both sides of wide arterials and streets in commercial districts. Lighting should be designed to achieve uniform lighting levels so that areas are not under or over-lit.

Estimated Cost

The average cost for a pedestrian-scale light standard is approximately $5000, while overhead roadway lighting at intersections can range from $10,750 to $42,000 per crosswalk.

Safety Benefit

Up to 59% reduction for pedestrian crashes (CMF = 0.41)

Regional Examples

- Landis Avenue, Vineland, Cumberland County, NJ
- High Street, Millville, Cumberland County, NJ
- Commerce Street, Bridgeton, Cumberland County, NJ

REFERENCES

- *FHWA Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE)*
- *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations (FHWA)*
- *CMF Clearinghouse, CMF ID: 441*

Raised Pedestrian Crossings

Description

Raised pedestrian crossings and intersections are ramped speed tables spanning the entire width of the road that help reduce vehicle speeds and enhance the pedestrian crossing environment. Raised pedestrian crossings are typically located midblock and cover the width of the crosswalk, while raised intersections are essentially speed tables that cover an entire intersection. Both treatments encourage motorists to yield to pedestrians because they increase pedestrian visibility and force motorists to slow down.

Applicability

Raised pedestrian crossings tend to be applied most often on two-lane business streets in urban environments, and can be used both at intersections and midblock locations. Because they are designed for speeds in ranges below 35 mph, they are generally not appropriate for higher-speed roads.

Considerations

- Raised crossings are generally avoided on arterial streets and primary routes for heavy trucks, bus transit, and emergency response vehicles. They may also be inappropriate for crossings on curves or steep roadway grades.
- The crosswalks on each approach of a raised intersection enable pedestrians to cross the road at the same level as the sidewalk, thus eliminating the need for curb ramps. However, detectable warning pads must be provided to mark the boundary between the sidewalk and the street.

Estimated Cost

Raised crosswalks cost approximately $2,000 to $20,000 depending on drainage conditions and materials. The cost of a raised intersection is highly dependent on the size of the intersection and can range from $25,000 to $100,000.

Safety Benefit

Studies have shown that raised crosswalks can help to lower overall vehicle speeds and increase the rate of motorists yielding to pedestrians at crossing locations.

Regional Examples

- Broad and Walnut, Philadelphia, PA

REFERENCES

- *FHWA Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE)*
- *Safe Routes to School (SRTS) Guide*
- *NCHRP 841 - Development of CMFs for Uncontrolled Pedestrian Crossing Treatments*
- *City of Cambridge, MA, Preliminary Results: Effects of Columbia Street Traffic Calming Project on Driver Behavior*

Bike Lanes

Description

Bike lanes are used to create on-street, separated travel facilities for bicyclists. They provide safety benefits to all roadway users by separating operational spaces, reducing conflicts between pedestrians and bicyclists riding on sidewalks, and allowing for motorists to safely pass bicyclists in the roadway. Bike lanes also help to visually narrow the roadway and encourage lower motor vehicle speeds.

Applicability

Bike lanes are typically considered for roads where there is demand for bicycling and motor vehicle volumes/speeds are too high for most bicyclists to ride comfortably with traffic. Reallocating existing street space by narrowing travel lanes, removing travel lanes, or reconfiguring shoulders/parking lanes are common ways to create space for bike lanes.

Considerations

- The form of bike lanes can vary from conventional 5-foot wide bike lanes to buffered bike lanes, separated bike lanes, and two-way cycle tracks. Choosing the appropriate facility type requires careful planning and design, particularly in regards to intersection treatments.
- Provide adequate space between the bike lane and parked cars so that opening car doors do not create a hazard for bicyclists.
- Avoid termination of bike lanes where bicyclists are left in a vulnerable situation. Ideally, bike lanes should be planned and implemented as part of a planned and connected bicycle network.

Estimated Cost

The cost of installing bicycle facilities depends on the type of facility and whether the project involves restriping, resurfacing, or reconstruction. Striping and signing a bike lane using existing shoulder space can cost as low as $1,000-11,000 per mile, while moving curb lines or adding shoulders to create bike lanes can be much more expensive and cost up to $150,000-500,000 per mile.

Safety Benefits

- 14% reduction in bicycle crashes for installing bicycle lanes (CMF = 0.86)
- Lack of safe bicycle facilities often leads to bicyclists riding on sidewalks, which can pose a safety risk to pedestrians. Bike lanes provide a designated space that allows bicyclists to safely use the roadway.
- Pedestrian safety and comfort is also improved when bicyclists ride in the road instead of on the sidewalk.

Regional Examples

- Wood Street & Elmer Street, Vineland, Cumberland County, NJ
- West Avenue, Ocean City, Atlantic County, NJ
- Atlantic Avenue, Longport, Atlantic County, NJ

REFERENCES

- *FHWA Bicycle Safety Guide and Countermeasure Selection System (PEDSAFE)*
- *CMF Clearinghouse, CMF ID: 9244*

Appendix J
FHWA Proven Safety Countermeasures

OFFICE OF SAFETY

Proven Safety Countermeasures

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Proven Safety Countermeasures

Speed Safety Cameras

Safe Speeds is a core principle of the Safe System Approach since humans are less likely to survive high-speed crashes. Enforcing safe speeds has been challenging; however, with more information and tools communities can make progress in reducing speeds. Agencies can use speed safety cameras (SSCs) as an effective and reliable technology to supplement more traditional methods of enforcement, engineering measures, and education to alter the social norms of speeding. SSCs use speed measurement devices to detect speeding and capture photographic or video evidence of vehicles that are violating a set speed threshold.

Safety Benefits:

Fixed units can reduce crashes on urban principal arterials up to:

54% for all crashes.[4]

47% for injury crashes.[4]

P2P units can reduce crashes on urban expressways, freeways, and principal arterials up to:

37% for fatal and injury crashes.[2]

Mobile units can reduce crashes on urban principal arterials up to:

20% for fatal and injury crashes.[5]

In New York City, fixed units reduced speeding in school zones up to 63% during school hours.[6]

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/speedmgt/.

FHWA-SA-21-070

Applications

Agencies should conduct a network analysis of speeding-related crashes to identify locations to implement SSCs. The analysis can include scope (e.g., widespread, localized), location types (e.g., urban/suburban/rural, work zones, residential, school zones), roadway types (e.g., expressways, arterials, local streets), times of day, and road users most affected by speed-related crashes (e.g., pedestrians, bicyclists).

SSCs can be deployed as:

- **Fixed units**—a single, stationary camera targeting one location.
- **Point-to-Point (P2P) units**—multiple cameras to capture average speed over a certain distance.
- **Mobile units**—a portable camera, generally in a vehicle or trailer.

The table below describes suitable circumstances for SSC deployment.[1]

Considerations

- SSCs can produce a crash reduction upstream and downstream, thus generating a spillover effect.[2]
- Public trust is essential for any type of enforcement. With proper controls in place, SSCs can offer fair and equitable enforcement of speeding, regardless of driver age, race, gender, or socio-economic status. SSCs should be planned with community input and equity impacts in mind.
- Using both overt (i.e., highly visible) and covert (i.e., hidden) enforcement may encourage drivers to comply with limits everywhere, not only at sites they are aware are enforced.
- Agencies should conduct evaluations regularly to determine if SSCs are accomplishing safety goals and whether changes in strategy, scheduling, communications, or public engagement are necessary.
- Agencies should conduct a legal and policy review to determine if SSCs are authorized within a jurisdiction and how the authorization and other traffic laws will affect a SSC program.
- Agencies should develop an SSC program plan with consideration of the USDOT SSC guidelines for planning, public involvement, stakeholder coordination, implementation, maintenance, evaluation, etc.[3]

Considerations for Selection	Fixed	P2P	Mobile
Problems are long-term and site-specific.	X	X	—
Problems are network-wide, and shift based on enforcement efforts.	—	—	X
Speeds at enforcement site vary largely from downstream sites.	—	X	X
Overt enforcement is legally required.	X	X	X
Sight distance for the enforcement unit is limited.	X	X	—
Enforcement sites are multilane facilities.	X	X	—

1 Thomas et al. Speed Safety Camera Program Planning and Operations Guide. FHWA, (2021).
2 Montella et al. "Effects on speed and safety of point-to-point speed enforcement systems". Accident Analysis and Prevention, Vol. 75, (2015). Note that this is an international study.
3 Speed Enforcement Camera Systems Operational Guidelines. NHTSA, (2008).
4 Shin et al. "Evaluation of the Scottsdale Loop 101 automated speed enforcement demonstration program." Accident Analysis and Prevention, Vol. 41, (2009).
5 Li et al. "A Before-and-After Empirical Bayes Evaluation of Automated Mobile Speed Enforcement on Urban Arterial Roads." Presented at the 94th Annual Meeting of the Transportation Research Board, Paper No. 15-1563, Washington, D.C., (2015). Note that this is an international study.
6 Automated Speed Enforcement Program Report 2014-2017. New York City DOT, (2018).

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Variable Speed Limits

Selecting appropriate speed limits on roadways is important in maintaining a safe and efficient transportation network. Speed limits are established with an engineering study based on inputs like traffic volumes, operating speeds, roadway characteristics, and crash history. However, conditions on the roadway are susceptible to change in a short amount of time (e.g., congestion, crashes, weather). Drivers typically determine their operating speeds under normal weather conditions on a straight roadway section with good pavement quality and adequate sight distances. If ideal conditions do not exist and the roadway does not meet the driver's expectations, there is a greater chance that a driver error could result in a crash. Providing variable speeds limits (VSLs) capable of adapting to changing circumstances could reduce crash frequency and severity.

Speed management strategies, including VSLs, are integral to the Safe Speeds element of the Safe System Approach. Because humans are unlikely to survive high-speed crashes, VSLs reduce speeds so that human injury tolerances are accommodated in three ways: improving visibility, providing additional time for drivers to stop, and reducing impact forces.

Safety Benefits:

VSLs can reduce crashes on freeways up to:

34%
for total crashes.[1]

65%
for rear-end crashes.[1]

51%
for fatal and injury crashes.[1]

Benefit/Cost Ratios range between[1]

9:1 - 40:1

Applications

VSLs use prevailing information on the roadway, like traffic speed, volumes, weather, and road surface conditions, to determine appropriate speeds and display them to drivers. This strategy improves safety performance and traffic flow by reducing speed variance (i.e., improving speed harmonization). VSLs may also improve driver expectation by providing information in advance of slowdowns and potential lane closures, which could reduce the probability for secondary crashes. VSLs can mitigate adverse weather conditions or to slow faster-moving traffic as it approaches a queue or bottleneck.

Agencies can implement VSLs for the following applications:


CONGESTION


INCIDENTS


WORK ZONES


INCLEMENT WEATHER

Considerations

- Particularly effective on urban and rural freeways and high-speed arterials with posted speed limits greater than 40 mph.
- Often implemented as part of Active Traffic Management (ATM) plans or incorporated into existing Road Weather Information Systems.
- When used with ATM, VSLs can mitigate rear-end, sideswipe, and other crashes on high-speed roadways.
- May be implemented as a regulatory and/or an advisory system.
- Can be applied to an entire roadway segment or individual lanes.

Source: WSDOT

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/speedmgt/ref_mats/.

1 Avelar et al. Developing Crash Modification Factors for Variable Speed Limit. FHWA, (2020).

FHWA-SA-21-054

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Appropriate Speed Limits for All Road Users

There is broad consensus among global roadway safety experts that speed control is one of the most important methods for reducing fatalities and serious injuries. Speed is an especially important factor on non-limited access roadways where vehicles and vulnerable road users mix.

A driver may not see or be aware of the conditions within a corridor, and may drive at a speed that feels reasonable for themselves but may not be for all users of the system, especially vulnerable road users, including children and seniors. A driver traveling at 30 miles per hour who hits a pedestrian has a 45 percent chance of killing or seriously injuring them.[1] At 20 miles per hour, that percentage drops to 5 percent.[1] A number of cities across the United States, including New York, Washington, Seattle and Minneapolis, have reduced their local speed limits in recent years in an effort to reduce fatalities and serious injuries, with most having to secure State legislative authorization to do so.

States and local jurisdictions should set appropriate speed limits to reduce the significant risks drivers impose on others—especially vulnerable road users—and on themselves. Addressing speed is fundamental to the Safe System Approach to making streets safer, and a growing body of research shows that speed limit changes alone can lead to measurable declines in speeds and crashes.[2]

Safety Benefits:

Traffic fatalities in the City of Seattle decreased 26 percent after the city implemented comprehensive, city-wide speed management strategies and countermeasures inspired by Vision Zero. This included setting speed limits on all non-arterial streets at 20 mph and 200 miles of arterial streets at 25 mph.[5]

One study found that on rural roads, when considering other relevant factors in the engineering study along with the speed distribution, setting a speed limit no more than 5 mph below the 85th-percentile speed may result in fewer total and fatal plus injury crashes, and lead to drivers complying closely with the posted speed limit.[6]

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/speedmgt/ref_mats/.

Applications

Posted speed limits are often the same as the legislative statutory speed limit. Agencies with designated authorities to set speed limits, which include States, and sometimes local jurisdictions, can establish non-statutory speed limits or designate reduced speed zones, and a growing number are doing so. While non-statutory speed limits must be based on an engineering study, conducted in accordance with the *Manual on Uniform Traffic Control Devices* (MUTCD) involving multiple factors and engineering judgment, FHWA is also encouraging agencies to use the following:[3]

- Expert Systems tools.
  - USLIMITS2.
  - NCHRP 966: Posted Speed Limit Setting Procedure and Tool.
- Safe System approach.

Based on international experience and implementation in the United States, the use of 20 mph speed zones or speed limits in urban core areas where vulnerable users share the road environment with motorists may result in further safety benefits.[4]

Considerations

When setting a speed limit, agencies should consider a range of factors such as pedestrian and bicyclist activity, crash history, land use context, intersection spacing, driveway density, roadway geometry, roadside conditions, roadway functional classification, traffic volume, and observed speeds.

To achieve desired speeds, agencies often implement other speed management strategies concurrently with setting speed limits, such as self-enforcing roadways, traffic calming, and speed safety cameras. Additional information is in the following FHWA resources:

- FHWA Speed Management website.
- Self-Enforcing Roadways: A Guidance Report.
- Noteworthy Speed Management Practices.
- Jurisdiction Speed Management Action Plan Development Package.
- Traffic Calming ePrimer.

1 Reducing the speed limit to 20 mph in urban areas: Child deaths and injuries would be decreased.
2 Lowering the speed limit from 30 to 25 mph in Boston: effects on vehicle speeds.
3 FHWA's Methods and Practices for Setting Speed Limits: An Informational Report, (2012).
4 Recommendations of the Academic Expert Group for the 3rd Global Ministerial Conference on Road Safety.
5 https://safety.fhwa.dot.gov/speedmgt/ref_mats/fhwasa20047/sec8.cfm#foot813
6 Safety and Operational Impacts of Setting Speed Limits below Engineering Recommendations.

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Safety Benefits:

Wider edge lines can reduce crashes up to:

37%
for non-intersection, fatal and injury crashes on rural, two-lane roads.[2]

22%
for fatal and injury crashes on rural freeways.[3]

Benefit Cost Ratio
25:1
for fatal and serious injury crashes on two-lane rural roads.[4]

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/roadway_dept/night_visib/pavement-markings.cfm.

FHWA-SA-21-055

Wider Edge Lines

Roadway departures account for over half of all traffic fatalities in the United States. If drivers cannot clearly identify the edge of the travel lanes and see the road alignment ahead, the risk of roadway departure may be greater. Wider edge lines enhance the visibility of travel lane boundaries compared to traditional edge lines. Edge lines are considered "wider" when the marking width is increased from the minimum normal line width of 4 inches to the maximum normal line width of 6 inches.[1]

Applications

Wider edge lines increase drivers' perception of the edge of the travel lane and can provide a safety benefit to all facility types (e.g., freeways, multilane divided and undivided highways, two-lane highways) in both urban and rural areas.[2] Wider edge lines are most effective in reducing crashes on rural two-lane highways, especially for single-vehicle crashes.[3] Agencies should also consider implementing a systemic approach to wider edge line installation based roadway departure crash risk factors. Potential risk factors for two-lane rural roads include:

- Pavement and shoulder widths.
- Presence of curves.
- Traffic volumes.
- History of nighttime crashes.

Considerations

- Wider edge lines are relatively low cost.
- Wider edge lines can be implemented using existing equipment during maintenance procedures like re-striping and resurfacing, with the only cost increase being the additional material.
- Paint may have a lower initial cost, but more durable materials (e.g., thermoplastic) may result in a lower life cycle cost based on their longer service life.
- As the number of automated vehicles increases on roadways, wider edge lines may provide better guidance for these vehicles' sensors.

Source: Texas Transportation Institute

1 Manual on Uniform Traffic Control Devices, Section 3A.06. FHWA, (2009).
2 Park et al. "Safety effects of wider edge lines on rural, two-lane highways." Accident Analysis and Prevention Vol. 48, pp.317-325, (2012).
3 Potts et al. Benefit/Cost Evaluation of MoDOT's Total Striping and Delineation Program: Phase II. Missouri Department of Transportation, (2011).
4 Abdel-Rahim et al. Safety Impacts of Using Wider Pavement Markings on Two-Lane Rural Highways in Idaho. Idaho Transportation Department, (2018).

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Safety Benefits:

Chevron Signs

25% reduction in nighttime crashes.[1]

16% reduction in non-intersection fatal and injury crashes.[2]

Oversized Chevron Signs

15% reduction in fatal and injury crashes.[3]

Sequential Dynamic Chevrons

60% reduction in fatal and injury crashes.[3]

In-Lane Curve Warning Pavement Markings

35 - 38% reduction in all crashes.[4,5]

New Fluorescent Curve Signs or Upgrade Existing Curve Signs to Fluorescent Sheeting

18% reduction in non-intersection, head-on, run-off-road, and sideswipe in rural areas.[1]

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/roadway_dept/countermeasures/horicurves/.

FHWA-SA-21-035

Enhanced Delineation for Horizontal Curves

Enhanced delineation at horizontal curves includes a variety of potential strategies that can be implemented in advance of or within curves, in combination, or individually.

Potential Strategies	In Advance of Curve	Within Curve
Pavement markings (standard width or wider)	✓	✓
In-lane curve warning pavement markings	✓	
Retroreflective strips on sign posts	✓	✓
Delineators		✓
Chevron signs		✓
Enhanced Conspicuity (larger, fluorescent, and/or retroreflective signs)	✓	✓
Dynamic curve warning signs (including speed radar feedback signs)	✓	
Sequential dynamic chevrons		✓

Enhanced delineation treatments can alert drivers to upcoming curves, the direction and sharpness of the curve, and appropriate operating speed.

Agencies can take the following steps to implement enhanced delineation strategies:

1. Review signing practices and policies to ensure they comply with the Manual on Uniform Traffic Control Devices (MUTCD) principles of traffic control devices. Consistent practice for similar curves sets the appropriate driver expectancy.
2. Use the systemic approach to identify and treat problem curves. For example, Minnesota uses risk factors that include curve radii between 500 and 1,200 ft, traffic volumes between 500 and 1,000 vehicles per day, intersection in the curve, and presence of a visual trap.[1]
3. Match the appropriate strategy to the identified problem(s), considering the full range of enhanced delineation treatments. Once the MUTCD requirements and recommendations have been met, an incremental approach is often beneficial to avoid excessive cost.

Chevron signs with retroreflective strips on sign posts installed along a curve. Source: FHWA

1 Albin et al. Low-Cost Treatments for Horizontal Curve Safety 2016. FHWA-SA-15-084, (2016).
2 Srinivasan et al. Safety Evaluation of Improved Curve Delineation. FHWA-HRT-09-045, (2009).
3 Lyon et al. Safety Evaluation of Two Curve Warning Treatments: In-Lane Curve Warning Pavement Markings and Oversized Chevron Signs. Presented at the 96th TRB Annual Meeting, Paper No. 17-00432, (2017).
4 Hallmark, S. Evaluation of Sequential Dynamic Chevrons on Rural Two-lane Highways. FHWA, (2017).
5 Donnell et al. Reducing Roadway Departure Crashes at Horizontal Curve Sections on Two-lane Rural Highways. FHWA-SA-19-005, (2019).

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Longitudinal Rumble Strips and Stripes

Longitudinal rumble strips are milled or raised elements on the pavement intended to alert drivers through vibration and sound that their vehicle has left the travel lane. They can be installed on the shoulder, edge line, or at or near the center line of an undivided roadway.

Rumble stripes are edge line or center line rumble strips where the pavement marking is placed over the rumble strip. This can increase the visibility and durability of the pavement marking during wet, nighttime conditions, and can improve the durability of the marking on roads with snowplowing operations.

Safety Benefits:

Center Line Rumble Strips

44-64%

reduction in head-on fatal and injury crashes on two-lane rural roads.[4]

Shoulder Rumble Strips

13-51%

reduction in single vehicle, run-off-road fatal and injury crashes on two-lane rural roads.[4]

With roadway departure crashes accounting for more than half of the fatal roadway crashes annually in the United States, rumble strips and stripes are designed to address these crashes by alerting distracted, drowsy, or otherwise inattentive drivers who drift from their lane. They are most effective when deployed systemically.

Transportation agencies should consider milled center line rumble strips (including in passing zone areas) and milled edge line or shoulder rumble strips with bicycle gaps for systemic safety projects, location-specific corridor safety improvements, as well as reconstruction or resurfacing projects.

Considerations

- Rumble strips are relatively low-cost, and economic analyses have indicated benefit/cost ratios that exceed 100.[1]
- Where rumble strips cannot be placed due to noise concerns, agencies may consider a design using an oscillating sine wave pattern (also known as "mumble strips") that reduces noise outside of the vehicle. However, the safety benefits of this design need more study.[2]
- Maintenance concerns:
  - Where rumble strips are placed along a pavement joint, there are typically no issues with joint stability if the pavement structure and joint was already in good condition.
  - Studies have shown no evidence of issues related to snow, ice, or rain build-up in the rumble strip.[3]

Shoulder rumble strips and center line rumble stripes are installed on this roadway. Source: FHWA

Example of an edge line rumble stripe. Source: Missouri DOT

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/roadway_dept/pavement/rumble_strips/.

FHWA-SA-21-036

1 Himes, S., and McGee, H. Decision Support Guide for the Installation of Shoulder and Center Line Rumble Strips on Non-Freeways. Federal Highway Administration Report No. FHWA-SA-16-115. (August 2016).
2 Bedsole et al. *Did You Hear That?* Public Roads Magazine, Volume 80, No. 4. FHWA Publication No. FHWA-HRT-17-002, (2017).
3 NCHRP Synthesis 339: Centerline Rumble Strips – A Synthesis of Highway Practices, (2005).
4 NCHRP Report 641: Guidance for the Design and Application of Shoulder and Centerline Rumble Strips, (2009).

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Proven Safety Countermeasures

SafetyEdge℠

The SafetyEdge℠ technology shapes the edge of the pavement at approximately 30 degrees from the pavement cross slope during the paving process. This safety practice eliminates the potential for vertical drop-off at the pavement edge, has minimal effect on project cost, and can improve pavement durability by reducing edge raveling of asphalt.

Safety Benefits:

11%
reduction in fatal and injury crashes.[2]

21%
reduction in run-off-road crashes.[2]

19%
reduction in head-on crashes.[2]

Benefit-Cost Ratio Range[3]

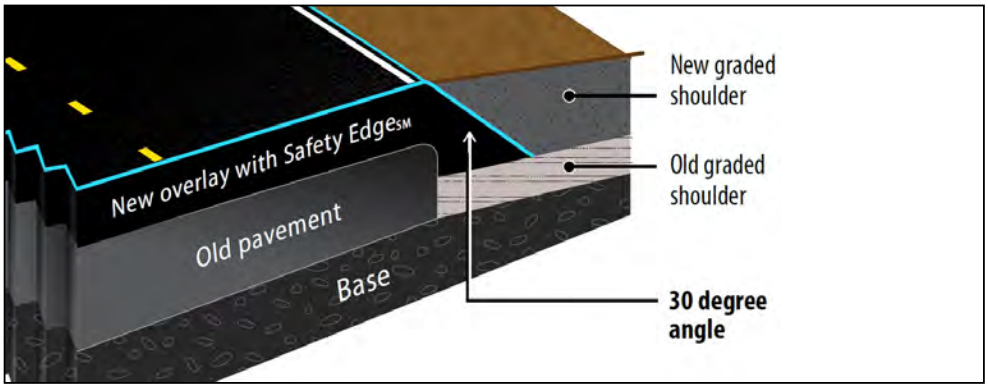
700:1 to 1,500:1

Rural road crashes involving edge drop-offs are 2-4 times more likely to include a fatality than other crashes on similar roads.[1] Vehicles may leave the roadway for various reasons ranging from distracted driver errors to low visibility, or to the presence of an animal on the road. Exposed vertical pavement edges can cause vehicles to become unstable and prevent their safe return to the roadway. The SafetyEdge℠ gives drivers the opportunity to return to their travel lane while maintaining control of their vehicle.

The SafetyEdge℠ technology only requires adding one of several commercially available devices to the screed or endgate when placing hot-mix asphalt. Forms for shaping the edge of concrete pavement are simpler and can be made on site by the contractor. Some agencies allow the SafetyEdge℠ to remain exposed while a segment is under construction, unlike conventional pavement edges. However, before construction ends, agencies should bring the adjacent roadside flush with the top of the pavement for both the SafetyEdge℠ and traditional pavement edge. Over time, regardless of the edge type, the edge may become exposed due to settling, erosion, and tire wear. When this occurs, the gentle slope provided by the SafetyEdge℠ is preferred versus the traditional vertical pavement edge.

Transportation agencies should develop standards for implementing the SafetyEdge℠ systemwide on all new asphalt paving and resurfacing projects where curbs and/or guardrail are not present, while also encouraging standard application for concrete pavements.

Example of the SafetyEdge℠ after backfill material settles or erodes. Source: FHWA



Cross-section view of an overlay with the SafetyEdge℠. Source: FHWA-SA-17-044

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/safetyedge/.

1 Hallmark et al. Safety Impacts of Pavement Edge Drop-offs, (Washington, DC: AAA Foundation for Traffic Safety: 2006), p 93.
2 Donnell et al. Development of Crash Modification Factors for the Application of the SafetyEdge℠ on Two-Lane Rural Roads. FHWA-HRT-17-081, (2017).
3 Safety Effects of the SafetyEdge℠, FHWA-SA-17-044, (2017).

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Safety Benefits:

Flatten sideslope from 1V:3H to 1V:4H:

8%

reduction for single-vehicle crashes.[2]

Flatten sideslope from 1V:4H to 1V:6H:

12%

reduction for single-vehicle crashes.[2]

Increase the distance to roadside features from 3.3 ft to 16.7 ft:

22%

reduction for all crashes.[3]

Increase the distance to roadside features from 16.7 ft to 30 ft:

44%

reduction for all crashes.[3]

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/roadway_dept/countermeasures/safe_recovery/clear_zones/.

FHWA-SA-21-029

Roadside Design Improvements at Curves

Horizontal curves account for 27 percent of all fatal crashes and 80 percent of all fatal crashes at curves are roadway departure crashes.[1] Roadside design improvements at curves is a strategy encompassing several treatments that target the high-risk roadside environment along the outside of horizontal curves. These treatments can reduce roadway departure fatalities and serious injuries by giving vehicles the opportunity to recover safely and by reducing crash severity.

Roadside design improvements can be implemented alone or in combination, and are particularly recommended at horizontal curves—where data indicates a higher risk for roadway departure fatalities and serious injuries.

Roadside Design Improvements to Provide for a Safe Recovery

In cases where a vehicle leaves the roadway, having strategic roadside design elements, including an added or widened shoulder, flattened sideslopes, or a widened clear zone can provide drivers with an opportunity to regain control and re-enter the roadway in their lane or come to a safe stop before rolling over or encountering a fixed object.

- A **clear zone** is an unobstructed, traversable roadside area that allows a driver to stop safely or regain control of a vehicle that has left the roadway. Agencies should avoid adding new fixed objects such as trees and utility cabinets or poles in the clear zone. AASHTO's *Roadside Design Guide* details the clear zone width adjustment factors to be applied at horizontal curves.
- **Slope flattening** reduces the steepness of the sideslope to increase drivers' ability to keep the vehicle stable, regain control of the vehicle, and avoid obstacles. Slopes of 1V:4H or flatter are considered recoverable (i.e., drivers can retain control of a vehicle by slowing or stopping). Slopes between 1V:3H and 1V:4H are generally considered traversable, but non-recoverable (i.e., errant vehicle will continue to the bottom of the slope).
- **Adding or widening shoulders** gives drivers more recovery area to regain control in the event of a roadway departure.

Roadside Design Improvements to Reduce Crash Severity

Since not all roadside hazards can be removed, relocated, or redesigned at curves, installing roadside barriers to shield unmovable objects or steep embankments may be an appropriate treatment. Three common types of roadside barriers are:

- **Cable barrier** is a flexible barrier made from steel cables mounted on weak steel posts. Flexible barriers are more forgiving and have the most deflection.
- **Metal-beam guardrail** is a semi-rigid barrier where a W-beam or box-beam is mounted on steel or timber posts. These deflect less than cable barriers, so they can be located closer to objects where space is limited.
- **Concrete barrier** is a rigid barrier that has little to no deflection.

Clear zone provided on the outside of the curve. Source: FHWA.

1 Fatality Analysis Reporting System.
2 NCHRP Report 617: Accident Modification Factors for Traffic Engineering and ITS Improvements, (2008).
3 Elvik, R., and Vaa, T. Handbook of Road Safety Measures, (2004).

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8%

of all fatalities on divided highways are due to head-on crashes.[1]

Safety Benefits:

Median Barriers Installed on Rural Four-Lane Freeways

97%

reduction in cross-median crashes.[2]

Median Barriers

Median barriers are longitudinal barriers that separate opposing traffic on a divided highway and are designed to redirect vehicles striking either side of the barrier. Median barriers significantly reduce the number of cross-median crashes, which are attributed to the relatively high speeds that are typical on divided highways. AASHTO's *Roadside Design Guide* (RDG) recommends guidelines for the use of median barriers on high-speed, fully controlled-access roadways for locations where the median is 30 ft in width or less and the average daily traffic (ADT) is greater than 20,000 vehicles per day (vpd). For locations with median widths greater than 50 ft and where the ADT is less than 20,000 vpd, a median barrier is optional. For locations where the median is between 30 and 50 feet, the RDG suggests an analysis to determine the cost effectiveness of median barrier installation. Median barriers can be cable, metal-beam, or concrete.

- **Cable barriers** are flexible barriers, made from steel cables mounted on weak steel posts, resulting in less occupant impact force as it absorbs energy from the crash, capturing or redirecting the vehicle. Due to larger deflection, median width is an important consideration. These barriers are more adaptable to slopes typically found in medians. Cable barriers tend to require more frequent maintenance and repair than other barrier types.
- **Metal-beam guardrails** are considered semi-rigid barriers, where the W-beam or box-beam is mounted to steel or timber posts. When impacted, they are designed to deform and deflect, absorbing some of the crash energy and redirecting the vehicle. Metal-beam guardrails often do not require maintenance after minor impacts. They deflect less than cable barriers, so they can be located closer to objects where space is limited.
- **Concrete barriers** are usually rigid and result in little to no deflection. They redirect rather than absorb energy from the impact. Rigid concrete barriers seldom require repair or maintenance. Some agencies have used portable concrete barriers as median barriers. These barriers require repositioning after an impact but are typically less maintenance than a post mounted barrier.

To reduce cross-median crashes, transportation agencies should review their head-on crash history on divided highways to identify hot spots. Agencies should also consider implementing a systemic approach to median barrier placement based on cross-median crash risk factors. Potential risk factors include:

- Traffic volumes.
- Vehicle classifications.
- Median crossover history.
- Crash incidents.
- Vertical and horizontal alignment.
- Median terrain configurations.

Median cable barrier prevents a potential head-on crash.
Source: Washington State DOT

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/roadway_dept/countermeasures/reduce_crash_severity/.

1 Fatality Analysis Reporting System.
2 NCHRP Report 794: Median Cross-Section Design for Rural Divided Highways, (2011).

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FHWA-SA-21-037

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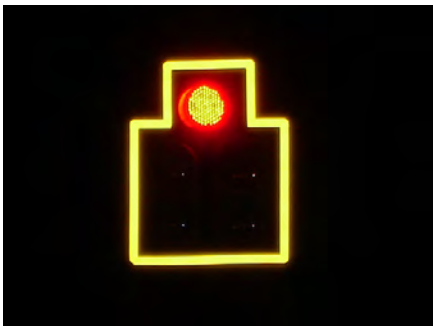
Backplates with Retroreflective Borders

Backplates added to a traffic signal head improve the visibility of the illuminated face of the signal by introducing a controlled-contrast background. The improved visibility of a signal head with a backplate is made even more conspicuous by framing it with a 1- to 3-inch yellow retroreflective border. Signal heads that have backplates equipped with retroreflective borders are more visible and conspicuous in both daytime and nighttime conditions.

Safety Benefits:

15%
reduction in total crashes.[1]

This treatment is recognized as a human factors enhancement of traffic signal visibility, conspicuity, and orientation for both older and color vision deficient drivers. This countermeasure is also advantageous during periods of power outages when the signals would otherwise be dark, providing a visible cue for motorists to stop at the intersection ahead.



Retroreflective borders are highly visible during the night. Source: South Carolina DOT

Considerations

Transportation agencies should consider backplates with retroreflective borders as part of their efforts to systematically improve safety performance at signalized intersections. Adding a retroreflective border to an existing signal backplate is a very low-cost safety treatment. This can be done by either adding retroreflective tape to an existing backplate or purchasing a new backplate with a retroreflective border already incorporated. The most efficient means of implementing this proven safety countermeasure is to adopt it as a standard treatment for signalized intersections across a jurisdiction or State.

Implementation challenges include minimizing installation time, accessing existing signal heads, and structural limitations due to added wind load in instances where an entire backplate is added. Agencies should consider the design of the existing signal support structure to determine if the design is sufficient to support the added wind load.

Signal backplate framed with a retroreflective border. Source: FHWA

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://rosap.ntl.bts.gov/view/dot/42807.

1 Sayed, T., Leur, P., and Pump, J., "Safety Impact of Increased Traffic Signal Backboards Conspicuity." 2005 TRB 84th Annual Meeting: Compendium of Papers CD-ROM, Vol. TRB#05-16, Washington, D.C., (2005).

FHWA-SA-21-039

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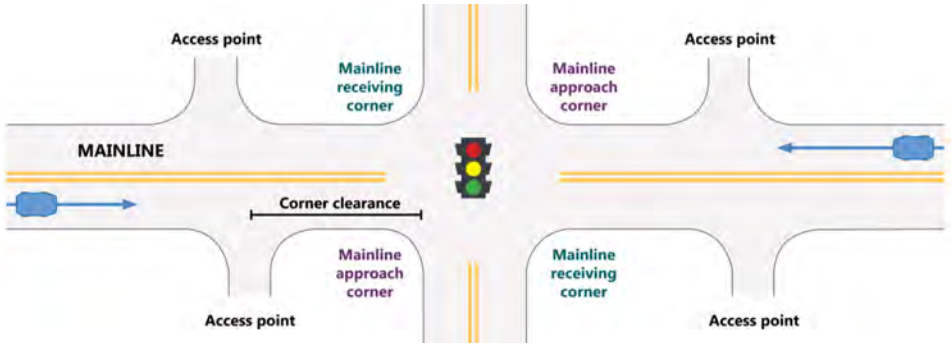
Corridor Access Management

Access management refers to the design, application, and control of entry and exit points along a roadway. This includes intersections with other roads and driveways that serve adjacent properties. Thoughtful access management along a corridor can simultaneously enhance safety for all modes, facilitate walking and biking, and reduce trip delay and congestion.



Schematic of an intersection and adjacent access points. Source: FHWA

Every intersection, from a signalized intersection to an unpaved driveway, has the potential for conflicts between vehicles, pedestrians, and bicyclists. The number and types of conflict points—locations where the travel paths of two users intersect—influence the safety performance of the intersection or driveway. FHWA developed corridor-level crash prediction models to estimate and analyze the safety effects of selected access management techniques for different area types, land uses, roadway variables, and traffic volumes.[1]

The following access management strategies can be used individually or in combination with one another:

- Reduce density through driveway closure, consolidation, or relocation.
- Manage spacing of intersection and access points.
- Limit allowable movements at driveways (such as right-in/right-out only).
- Place driveways on an intersection approach corner rather than a receiving corner, which is expected to have fewer total crashes.[2]
- Implement raised medians that preclude across-roadway movements.
- Utilize designs such as roundabouts or reduced left-turn conflicts (such as restricted crossing U-turn, median U-turns, etc.).
- Provide turn lanes (i.e., left-only, right-only, or interior two-way left).
- Use lower speed one-way or two-way off-arterial circulation roads.

Successful corridor access management involves balancing overall safety and mobility for all users along with the needs of adjacent land uses.

Tandem roundabouts with a continuous raised median eliminates left-turn and across-roadway conflicts. Source: FHWA

Safety Benefits:

Reducing driveway density

5-23%
reduction in total crashes along 2-lane rural roads.[3]

25-31%
reduction in fatal and injury crashes along urban/suburban arterials.[4]

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/intersection/cam/index.cfm.

1 Gross et al. Safety Evaluation of Access Management Policies and Techniques. FHWA-HRT-14-057, (2018).
2 Le et al. Safety Evaluation of Corner Clearance at Signalized Intersections. FHWA-HRT-17-084, (2018).
3 Harwood et al. Prediction of the Expected Safety Performance of Rural Two-Lane Highways. FHWA-RD-99-207, (2000).
4 Elvik, R. and Vaa, T., Handbook of Road Safety Measures. Oxford, United Kingdom, Elsevier, (2004).

FHWA-SA-21-040

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Dedicated Left- and Right-Turn Lanes at Intersections

Auxiliary turn lanes—either for left turns or right turns—provide physical separation between turning traffic that is slowing or stopped and adjacent through traffic at approaches to intersections. Turn lanes can be designed to provide for deceleration prior to a turn, as well as for storage of vehicles that are stopped and waiting for the opportunity to complete a turn.

Safety Benefits:

Left-Turn Lanes

28-48%

reduction in total crashes.[1]

Positive Offset Left-Turn Lanes

36%

reduction in fatal and injury crashes.[2]

Right-Turn Lanes

14-26%

reduction in total crashes.[1]

Left- and right-turn lanes on a two-lane road. Source: City of Greeley, CO

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://www.fhwa.dot.gov/publications/research/safety/02103/02103techbrief.pdf.

FHWA-SA-21-041

While turn lanes provide measurable safety and operational benefits at many types of intersections, they are particularly helpful at two-way stop-controlled intersections. Crashes occurring at these intersections are often related to turning maneuvers. Since the major route traffic is free flowing and typically travels at higher speeds, crashes that do occur are often severe. The main crash types include collisions of vehicles turning left across opposing through traffic and rear-end collisions of vehicles turning left or right with other vehicles following closely behind. Turn lanes reduce the potential for these types of crashes.

Installing left-turn lanes and/or right-turn lanes should be considered for the major road approaches for improving safety at both three- and four-leg intersections with stop control on the minor road, where significant turning volumes exist, or where there is a history of turn-related crashes. Pedestrian and bicyclist safety and convenience should also be considered when adding turn lanes at an intersection. Specifically, offset left- and right-turn lanes will lengthen crossing distances for pedestrians.

Offset Turn Lanes

Providing offset of left- and right-turn lanes to increase visibility can provide added safety benefits, and is preferable in many situations, particularly at locations with higher speeds, or where free-flow or permissive movements are possible.

At turn lanes with zero or negative offset, turning vehicles can block sightlines. For left-turn lanes, this usually involves opposing left-turning vehicles occupying the turn lanes at the same time. For right-turn lanes, this typically involves right-turning vehicles from the major road and vehicles entering the intersection from the minor road. In both scenarios, adding positive offset to turn lanes enhances the sight distance to approaching vehicles that conflict with the turning movement. Offset turn lanes should be considered when there is a high frequency of these types of conflicts in order to reduce the likelihood of a severe crash.

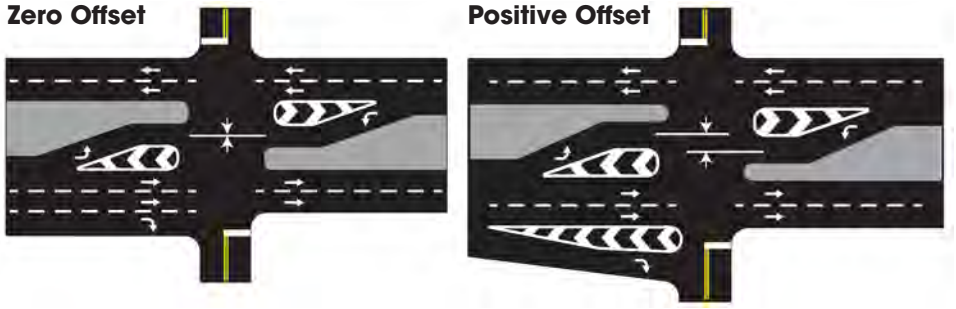

Illustration comparing zero offset to positive offset of left- and right-turn lanes. Source: FHWA

1 Harwood et al. Safety Effectiveness of Intersection Left- and Right-Turn Lanes. FHWA-HRD-02-089, (2002).
2 Persaud et al. Safety Evaluation of Offset Improvements for Left-Turn Lanes. FHWA-HRT-09-035, (2009).

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Reduced Left-Turn Conflict Intersections

Reduced left-turn conflict intersections are geometric designs that alter how left-turn movements occur. These intersections simplify decision-making for drivers and minimize the potential for higher severity crash types, such as head-on and angle. Two highly effective designs that rely on U-turns to complete certain left-turn movements are known as the Restricted Crossing U-turn (RCUT) and the Median U-turn (MUT).

Safety Benefits:

RCUT
Two-Way Stop-Controlled to RCUT:
54%
reduction in fatal and injury crashes.[2]

Signalized Intersection to Signalized RCUT:
22%
reduction in fatal and injury crashes.[3]

Unsignalized Intersection to Unsignalized RCUT:
63%
reduction in fatal and injury crashes. [4]

MUT
30%
reduction in intersection-related injury crash rate.[5]

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/intersection/rltci/index.cfm.

FHWA-SA-21-030

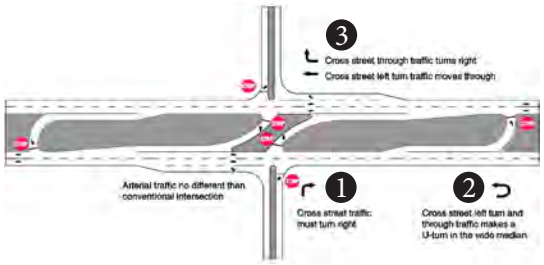
Restricted Crossing U-turn

The RCUT intersection, also known as a J-Turn, Superstreet, or Reduced Conflict Intersection, modifies the direct left-turn and through movements from cross-street approaches. Minor road traffic makes a right turn followed by a U-turn at a designated location—either signalized or unsignalized—to continue in the desired direction. The RCUT is suitable for and adaptable to a wide variety of circumstances, ranging from isolated rural, high-speed locations to urban and suburban high-volume, multimodal corridors. It is a competitive and less costly alternative to constructing an interchange. RCUTs work well when consistently used along a corridor, but also can be used effectively at individual intersections. Studies have shown that installing an RCUT can result in a 30-percent increase in throughput and a 40-percent reduction in network intersection travel time.[1]

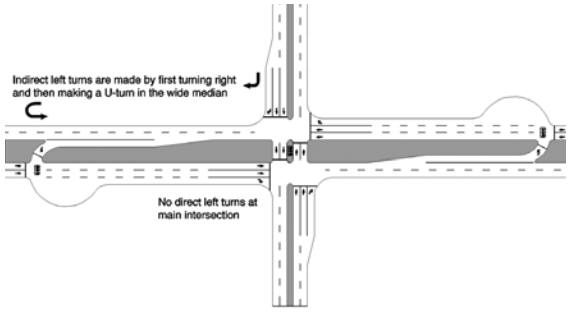
Median U-turn

The MUT intersection modifies direct left turns from the major approaches. Vehicles proceed through the main intersection, make a U-turn a short distance downstream, followed by a right turn at the main intersection. The U-turns can also be used for modifying the cross-street left turns, similar to the RCUT.

The MUT is an excellent choice for intersections with heavy through traffic and moderate left-turn volumes. Studies have shown a 20- to 50-percent improvement in intersection throughput for various lane configurations as a result of implementing the MUT design. When implemented at multiple intersections along a corridor, the efficient two-phase signal operation of the MUT can reduce delay, improve travel times, and create more crossing opportunities for pedestrians and bicyclists.



Example of a unsignalized RCUT intersection. Source: FHWA



Example of a MUT intersection. Source: FHWA

1 Hugher and Jagannathan. Restricted Crossing U-Turn Intersection. FHWA-HRT-09-059, (2009).
2 Edara et al. Evaluation of J-turn Intersection Design Performance in Missouri. MoDOT, (2013).
3 Hummer and Rao. Safety Evaluation of a Signalized Restricted Crossing U-Turn. FHWA-HRT-17-082, (2017).
4 Hummer et al. Superstreet Benefits and Capacities. FHWA/NC/2009-06, NC State University, (2010).
5 Synthesis of the Median U-Turn Treatment, Safety, and Operational Benefits, FHWA-HRT-07-033, (2007).

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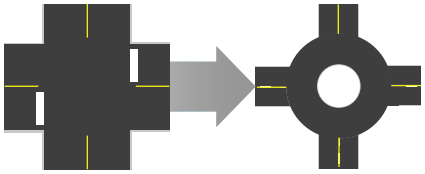
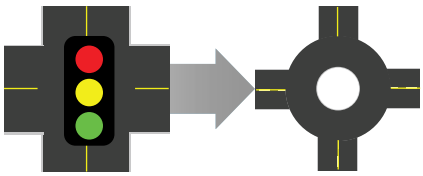
Safety Benefits:

Two-Way Stop-Controlled Intersection to a Roundabout



82%
reduction in fatal and injury crashes.[1]

Signalized Intersection to a Roundabout



78%
reduction in fatal and injury crashes.[1]

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/intersection/roundabouts/index.cfm.

FHWA-SA-21-042

Roundabouts

The modern roundabout is an intersection with a circular configuration that safely and efficiently moves traffic. Roundabouts feature channelized, curved approaches that reduce vehicle speed, entry yield control that gives right-of-way to circulating traffic, and counterclockwise flow around a central island that minimizes conflict points. The net result of lower speeds and reduced conflicts at roundabouts is an environment where crashes that cause injury or fatality are substantially reduced.

Roundabouts are not only a safer type of intersection; they are also efficient in terms of keeping people moving. Even while calming traffic, they can reduce delay and queuing when compared to other intersection alternatives. Furthermore, the lower vehicular speeds and reduced conflict environment can create a more suitable environment for walking and bicycling.

Roundabouts can be implemented in both urban and rural areas under a wide range of traffic conditions. They can replace signals, two-way stop controls, and all-way stop controls. Roundabouts are an effective option for managing speed and transitioning traffic from high-speed to low-speed environments, such as freeway interchange ramp terminals, and rural intersections along high-speed roads.

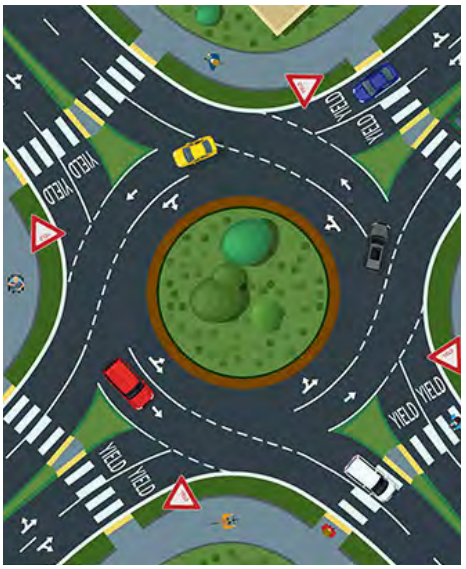


Illustration of a multilane roundabout. Source: FHWA

Example of a single-lane roundabout. Source: FHWA

1 AASHTO. The Highway Safety Manual, American Association of State Highway Transportation Professionals, Washington, D.C., (2010).

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Systemic Application of Multiple Low-Cost Countermeasures at Stop-Controlled Intersections

This systemic approach to intersection safety involves deploying a package of multiple low-cost countermeasures, including enhanced signing and pavement markings, at a large number of stop-controlled intersections within a jurisdiction. These countermeasures increase driver awareness and recognition of the intersections and potential conflicts.

Safety Benefits:

10%
reduction of fatal and injury crashes at all locations/types/areas.

15%
reduction of nighttime crashes at all locations/types/areas.

27%
reduction of fatal and injury crashes at rural intersections.

19%
reduction of fatal and injury crashes at 2-lane by 2-lane intersections.

Average Benefit-Cost Ratio

12:1

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/intersection/stop/fhwasa18047.pdf.

There are several benefits to systemically applying multiple low-cost countermeasures at stop-controlled intersections, including,

- Resources are maximized because the treatments are low cost.
- A high number of intersections can receive treatment.
- Improvements are highly cost-effective, with an average benefit-cost ratio of 12:1, even assuming a conservative 3-year service life.

Example of countermeasures on the through approach.
Source: South Carolina DOT

Example of countermeasures on the stop approach.
Source: South Carolina DOT

The low-cost countermeasures for stop-controlled intersections generally consist of the following treatments:

On the Through Approach

- Doubled-up (left and right), oversized advance intersection warning signs, with supplemental street name plaques (can also include flashing beacon).
- Retroreflective sheeting on sign posts.
- Enhanced pavement markings that delineate through lane edge lines.

On the Stop Approach

- Doubled-up (left and right), oversized advance "Stop Ahead" intersection warning signs (can also include flashing beacon).
- Doubled-up (left and right), oversized Stop signs.
- Retroreflective sheeting on sign posts.
- Properly placed stop bar.
- Removal of vegetation, parking, or obstructions that limit sight distance.
- Double arrow warning sign at stem of T-intersections.

Source: T. Le et al. "Safety Effects of Low-Cost Systemic Safety Improvements at Signalized and Stop-Controlled Intersections," 96th Annual Meeting of the Transportation Research Board, Paper Number 17-05379, January 2017.

FHWA-SA-21-031

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Safety Benefits:

36-50%
reduction in red light running.[2]

8-14%
reduction in total crashes.[2]

12%
reduction in injury crashes.[2]

Yellow Change Intervals

At a signalized intersection, the yellow change interval is the length of time that the yellow signal indication is displayed following a green signal indication. The yellow signal confirms to motorists that the green has ended and that a red will soon follow.

Since red-light running is a leading cause of severe crashes at signalized intersections, it is imperative that the yellow change interval be appropriately timed. Too brief an interval may result in drivers being unable to stop safely and cause unintentional red-light running. Too long of an interval may result in drivers treating the yellow as an extension of the green phase and invite intentional red-light running. Factors such as the speed of approaching and turning vehicles, driver perception-reaction time, vehicle deceleration, and intersection geometry should all be considered in the timing calculation.

Transportation agencies can improve signalized intersection safety and reduce red-light running by reviewing and updating their traffic signal timing policies and procedures concerning the yellow change interval. Agencies should institute regular evaluation and adjustment protocols for existing traffic signal timing. Refer to the *Manual on Uniform Traffic Control Devices* for basic requirements and further recommendations about yellow change interval timing. As part of strategic signal system modernization and updates, incorporating automated traffic signal performance measures (ATSPMs) is a proven approach to improve on traditional retiming processes. ATSPMs provide continuous performance monitoring capability and the ability to modify timing based on actual performance, without requiring expensive modeling or data collection.[1]

Appropriately timed yellow change intervals can reduce red-light running and improve overall intersection safety. Source: FHWA

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/intersection/signal/fhwasa13027.pdf.

FHWA-SA-21-043

1 Federal Highway Administration. "Automated Traffic Signal Performance," (2020).
2 NCHRP Report 731: Guidelines for Timing Yellow and All-Red Intervals at Signalized Intersections, (2011).

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Crosswalk Visibility Enhancements

Poor lighting conditions, obstructions such as parked cars, and horizontal or vertical roadway curvature can reduce visibility at crosswalks, contributing to safety issues. For multilane roadway crossings where vehicle volumes are in excess of 10,000 Average Annual Daily Traffic (AADT), a marked crosswalk alone is typically not sufficient. Under such conditions, more substantial crossing improvements could prevent an increase in pedestrian crash potential.

Three main crosswalk visibility enhancements help make crosswalks and the pedestrians, bicyclists, wheelchair and other mobility device users, and transit users using them more visible to drivers. These include high-visibility crosswalks, lighting, and signing and pavement markings. These enhancements can also assist users in deciding where to cross. Agencies can implement these features as standalone or combination enhancements to indicate the preferred location for users to cross.

Safety Benefits:

High-visibility crosswalks can reduce pedestrian injury crashes up to:

40% [1]

Intersection lighting can reduce pedestrian crashes up to:

42% [2]

Advance yield or stop markings and signs can reduce pedestrian crashes up to:

25% [3]

High-visibility crosswalks

High-visibility crosswalks use patterns (i.e., bar pairs, continental, ladder) that are visible to both the driver and pedestrian from farther away compared to traditional transverse line crosswalks. They should be considered at all midblock pedestrian crossings and uncontrolled intersections. Agencies should use materials such as inlay or thermoplastic tape, instead of paint or brick, for highly reflective crosswalk markings.

Improved Lighting

The goal of crosswalk lighting should be to illuminate with positive contrast to make it easier for a driver to visually identify the pedestrian. This involves carefully placing the luminaires in forward locations to avoid a silhouette effect of the pedestrian.

Enhanced Signing and Pavement Markings

On multilane roadways, agencies can use "YIELD Here to Pedestrians" or "STOP Here for Pedestrians" signs 20 to 50 feet in advance of a marked crosswalk to indicate where a driver should stop or yield to pedestrians, depending on State law. To supplement the signing, agencies can also install a STOP or YIELD bar (commonly referred to as "shark's teeth") pavement markings.

In-street signing, such as "STOP Here for Pedestrians" or "YIELD Here to Pedestrians" may be appropriate on roads with two- or three-lane roads where speed limits are 30 miles per hour or less.

Source: FHWA

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/ped_bike/step/docs/techSheet_VizEnhancemt2018.pdf.

1 Chen, L., C. Chen, and R. Ewing. The Relative Effectiveness of Pedestrian Safety Countermeasures at Urban Intersections - Lessons from a New York City Experience. (2012).
2 Elvik, R. and Vaa, T. Handbook of Road Safety Measures. Oxford, United Kingdom, Elsevier, (2004).
3 Zeeger et al. Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments, FHWA, (2017).

FHWA-SA-21-049

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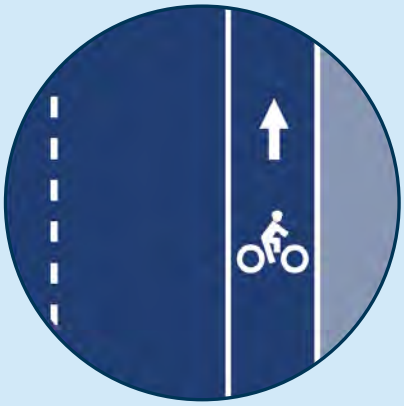

Bicycle Lanes

Most fatal and serious injury bicyclist crashes occur at non-intersection locations. Nearly one-third of these crashes involve overtaking motorists[1]; the speed and size differential between vehicles and bicycles can lead to severe injury. To make bicycling safer and more comfortable for most types of bicyclists, State and local agencies should consider installing bicycle lanes. These dedicated facilities for the use of bicyclists along the roadway can take several forms. Providing bicycle facilities can mitigate or prevent interactions, conflicts, and crashes between bicyclists and motor vehicles, and create a network of safer roadways for bicycling. Bicycle Lanes align with the Safe System Approach principle of recognizing human vulnerability—where separating users in space can enhance safety for all road users.

Safety Benefits:

Bicycle Lane Additions can reduce crashes up to:

49%

for total crashes on urban 4-lane undivided collectors and local roads.[6]

30%

for total crashes on urban 2-lane undivided collectors and local roads.[6]

Separated bicycle lane in Washington, DC. Source: Alex Baca, Washington Area Bicyclist Association

Separated bicycle lanes may provide further safety benefits. FHWA is anticipating completion of research in Fall 2022.

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/fhwasa18077.pdf.

FHWA-SA-21-051

Applications

FHWA's *Bikeway Selection Guide* and *Incorporating On-Road Bicycle Networks into Resurfacing Projects* assist agencies in determining which facilities provide the most benefit in various contexts. Bicycle lanes can be included on new roadways or created on existing roads by reallocating space in the right-of-way.

In addition to the paint stripe used for a typical bicycle lane, a lateral offset with painted buffer can help to further separate bicyclists from vehicle traffic. State and local agencies may also consider physical separation of the bicycle lane from motorized traffic lanes through the use of vertical elements like posts, curbs, or vegetation.[2] Based on international experience and implementation in the United States, there is potential for further safety benefits associated with separated bicycle lanes. FHWA is conducting research on separated bicycle lanes, which includes the development of crash modification factors, to be completed in 2022 to address significant interest on this topic.

Considerations

- City and State policies may require minimum bicycle lane widths, although these can differ by agency and functional classification of the road.
- Bicycle lane design should vary according to roadway characteristics (e.g., motor vehicle volumes and speed) in order to maximize the facility's suitability for riders of all ages and abilities and should consider the travel needs of low-income populations likely to use bicycles. The *Bikeway Selection Guide* is a useful resource.
- While some in the public may oppose travel lane narrowing if they believe it will slow traffic or increase congestion, studies have found that roadways did not experience an increase in injuries or congestion when travel lane widths were decreased to add a bicycle lane.[3]
- Studies and experience in US cities show that bicycle lanes increase ridership and may help jurisdictions better manage roadway capacity without increased risk.
- In rural areas, rumble strips can negatively impact bicyclists' ability to ride if not properly installed. Agencies should consider the dimensions, placement, and offset of rumble strips when adding a bicycle lane.[4]
- Strategies, practices, and processes can be used by agencies to enhance their ability to address equity in bicycle planning and design.[5]

1 Thomas et al. Bicyclist Crash Types on National, State, and Local Levels: A New Look. Transportation Research Record 673(6), 664-676, (2019).
2 Separated Bike Lane Planning and Design Guide. FHWA-HEP-15-025, (2015).
3 Park and Abdel-Aty. "Evaluation of safety effectiveness of multiple cross sectional features on urban arterials". Accident Analysis and Prevention, Vol. 92, pp. 245-255, (2016).
4 FHWA Tech Advisory Shoulder and Edge Line Rumble Strips, (2011).
5 Sandt et al. Pursuing Equity in Pedestrian and Bicycle Planning. FHWA, (2016).
6 Avelar et al. Development of Crash Modification Factors for Bicycle Lane Additions While Reducing Lane and Shoulder Widths. FHWA, (2021).

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Rectangular Rapid Flashing Beacons (RRFB)

A marked crosswalk or pedestrian warning sign can improve safety for pedestrians crossing the road, but at times may not be sufficient for drivers to visibly locate crossing locations and yield to pedestrians. To enhance pedestrian conspicuity and increase driver awareness at uncontrolled, marked crosswalks, transportation agencies can install a pedestrian actuated Rectangular Rapid Flashing Beacon (RRFB) to accompany a pedestrian warning sign. RRFBs consist of two, rectangular- shaped yellow indications, each with a light-emitting diode (LED)-array-based light source.[1] RRFBs flash with an alternating high frequency when activated to enhance conspicuity of pedestrians at the crossing to drivers.

For more information on using RRFBs, see the Interim Approval in the *Manual on Uniform Traffic Control Devices (MUTCD)*.[1]

Safety Benefits:

RRFBs can reduce crashes up to:

47%

for pedestrian crashes.[4]

RRFBs can increase motorist yielding rates up to:

98%

(varies by speed limit, number of lanes, crossing distance, and time of day).[3]

RRFBs used at a trail crossing.
Source: LJB

Applications

The RRFB is applicable to many types of pedestrian crossings but is particularly effective at multilane crossings with speed limits less than 40 miles per hour.[2] Research suggests RRFBs can result in motorist yielding rates as high at 98 percent at marked crosswalks, but varies depending on the location, posted speed limit, pedestrian crossing distance, one- versus two-way road, and the number of travel lanes.[3] RRFBs can also accompany school or trail crossing warning signs.

RRFBs are placed on both sides of a crosswalk below the pedestrian crossing sign and above the diagonal downward arrow plaque pointing at the crossing.[1] The flashing pattern can be activated with pushbuttons or passive (e.g., video or infrared) pedestrian detection, and should be unlit when not activated.

Considerations

Agencies should:[2]

- Install RRFBs in the median rather than the far-side of the roadway if there is a pedestrian refuge or other type of median.
- Use solar-power panels to eliminate the need for a power source.
- Reserve the use of RRFBs for locations with significant pedestrian safety issues, as over-use of RRFB treatments may diminish their effectiveness.

Agencies shall not:[2]

- Use RRFBs without the presence of a pedestrian, school or trail crossing warning sign.
- Use RRFBs for crosswalks across approaches controlled by YIELD signs, STOP signs, traffic control signals, or pedestrian hybrid beacons, except for the approach or egress from a roundabout.

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/ped_bike/step/docs/techSheet_RRFB_2018.pdf.

1 *MUTCD* Interim Approval 21 - RRFBs at Crosswalks.
2 "Rectangular Rapid Flash Beacon" in PEDSAFE: Pedestrian Safety Guide and Countermeasure Selection System. FHWA, (2013).
3 Fitzpatrick et al. "Will You Stop for Me? Roadway Design and Traffic Control Device Influences on Drivers Yielding to Pedestrians in a Crosswalk with a Rectangular Rapid-Flashing Beacon." Report No. TTI-CTS-0010. Texas A&M Transportation Institute, (2016).
4 NCHRP Research Report 841 Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments, (2017).

FHWA-SA-21-053

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Safety Benefits:

13%

reduction in pedestrian-vehicle crashes at intersections.[1]

Leading Pedestrian Interval

A leading pedestrian interval (LPI) gives pedestrians the opportunity to enter the crosswalk at an intersection 3-7 seconds before vehicles are given a green indication. Pedestrians can better establish their presence in the crosswalk before vehicles have priority to turn right or left.

LPIs provide the following benefits:

- Increased visibility of crossing pedestrians.
- Reduced conflicts between pedestrians and vehicles.
- Increased likelihood of motorists yielding to pedestrians.
- Enhanced safety for pedestrians who may be slower to start into the intersection.

FHWA's Handbook for *Designing Roadways for the Aging Population* recommends the use of the LPI at intersections with high turning vehicle volumes. Transportation agencies should refer to the *Manual on Uniform Traffic Control Devices* for guidance on LPI timing and ensure that pedestrian signals are accessible for all users. Costs for implementing LPIs are very low when only signal timing alteration is required.

An LPI allows a pedestrian to establish a presence in the crosswalk before vehicles are given a green indication. Source: FHWA

LPIs reduce potential conflicts between pedestrians and turning vehicles. Source: FHWA

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/ped_bike/step/resources/docs/fhwasa19040.pdf.

FHWA-SA-21-032

1 Goughnour, E., D. Carter, C. Lyon, B. Persaud, B. Lan, P. Chun, I. Hamilton, and K. Signor. "Safety Evaluation of Protected Left-Turn Phasing and Leading Pedestrian Intervals on Pedestrian Safety." Report No. FHWA-HRT-18-044. Federal Highway Administration. (October 2018)

U.S. Department of Transportation
Federal Highway Administration

Medians and Pedestrian Refuge Islands in Urban and Suburban Areas

A **median** is the area between opposing lanes of traffic, excluding turn lanes. Medians in urban and suburban areas can be defined by pavement markings, raised medians, or islands to separate motorized and non-motorized road users.

A **pedestrian refuge island** (or crossing area) is a median with a refuge area that is intended to help protect pedestrians who are crossing a road.

Safety Benefits:

Median with Marked Crosswalk

46%

reduction in pedestrian crashes.[2]

Pedestrian Refuge Island

56%

reduction in pedestrian crashes.[2]

Pedestrian crashes account for approximately 17 percent of all traffic fatalities annually, and 74 percent of these occur at non-intersection locations.[1] For pedestrians to safely cross a roadway, they must estimate vehicle speeds, determine acceptable gaps in traffic based on their walking speed, and predict vehicle paths. Installing a median or pedestrian refuge island can help improve safety by allowing pedestrians to cross one direction of traffic at a time.

Transportation agencies should consider medians or pedestrian refuge islands in curbed sections of urban and suburban multilane roadways, particularly in areas with a significant mix of pedestrian and vehicle traffic, traffic volumes over 9,000 vehicles per day, and travel speeds 35 mph or greater. Medians/refuge islands should be at least 4-ft wide, but preferably 8 ft for pedestrian comfort. Some example locations that may benefit from medians or pedestrian refuge islands include:

- Mid-block crossings.
- Approaches to multilane intersections.
- Areas near transit stops or other pedestrian-focused sites.

Example of a road with a median and pedestrian refuge islands. Source: City of Charlotte, NC

Median and pedestrian refuge island near a roundabout. Source: www.pedbikeimages.org / Dan Burden

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/ped_bike/step/docs/techSheet_PedRefugeIsland2018.pdf.

1 National Center for Statistics and Analysis. (2020, March). Pedestrians: 2018 data (Traffic Safety Facts. Report No. DOT HS 812 850). National Highway Traffic Safety Administration

2 Desktop Reference for Crash Reduction Factors, FHWA-SA-08-011, September 2008, Table 11.

FHWA-SA-21-044

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Safety Benefits:

55%
reduction in pedestrian crashes.[2]

29%
reduction in total crashes.[3]

15%
reduction in fatal and serious injury crashes.[3]

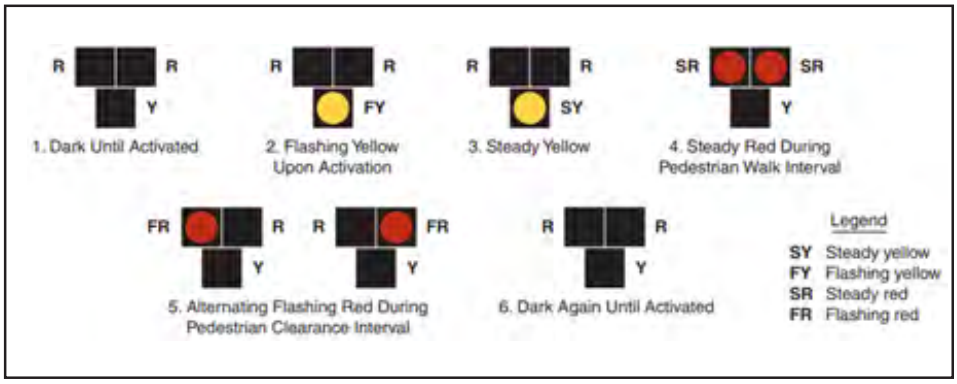
Example of PHBs mounted on a mast arm. Source: FHWA

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/ped_bike/step/resources/docs/fhwasa18064.pdf.

FHWA-SA-21-045

Pedestrian Hybrid Beacons

The pedestrian hybrid beacon (PHB) is a traffic control device designed to help pedestrians safely cross higher-speed roadways at midblock crossings and uncontrolled intersections. The beacon head consists of two red lenses above a single yellow lens. The lenses remain "dark" until a pedestrian desiring to cross the street pushes the call button to activate the beacon, which then initiates a yellow to red lighting sequence consisting of flashing and steady lights that directs motorists to slow and come to a stop, and provides the right-of-way to the pedestrian to safely cross the roadway before going dark again.



Sequence for a PHB. Source: MUTCD 2009 Edition, p. 511, FHWA

Nearly 74 percent of pedestrian fatalities occur at non-intersection locations, and vehicle speeds are often a major contributing factor.[1] As a safety strategy to address this pedestrian crash risk, the PHB is an intermediate option between a flashing beacon and a full pedestrian signal because it assigns right of way and provides positive stop control. It also allows motorists to proceed once the pedestrian has cleared their side of the travel lane(s), reducing vehicle delay.

Transportation agencies should refer to the *Manual on Uniform Traffic Control Devices* (MUTCD) for information on the application of PHBs.

In general, PHBs are used where it is difficult for pedestrians to cross a roadway, such as when gaps in traffic are not sufficient or speed limits exceed 35 miles per hour. They are very effective at locations where three or more lanes will be crossed or traffic volumes are above 9,000 annual average daily traffic. Installation of a PHB must also include a marked crosswalk and pedestrian countdown signal. If PHBs are not already familiar to a community, agencies should conduct appropriate education and outreach as part of implementation.

1 National Center for Statistics and Analysis. (2020, March). Pedestrians: 2018 data (Traffic Safety Facts. Report No. DOT HS 812 850). National Highway Traffic Safety Administration
2 Zegeer et al. NCHRP Report 841: Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments. TRB, (2017).
3 Fitzpatrick, K. and Park, E.S. Safety Effectiveness of the HAWK Pedestrian Crossing Treatment, FHWA-HRT-10-042, (2010).

U.S. Department of Transportation
Federal Highway Administration

Safety Benefits:

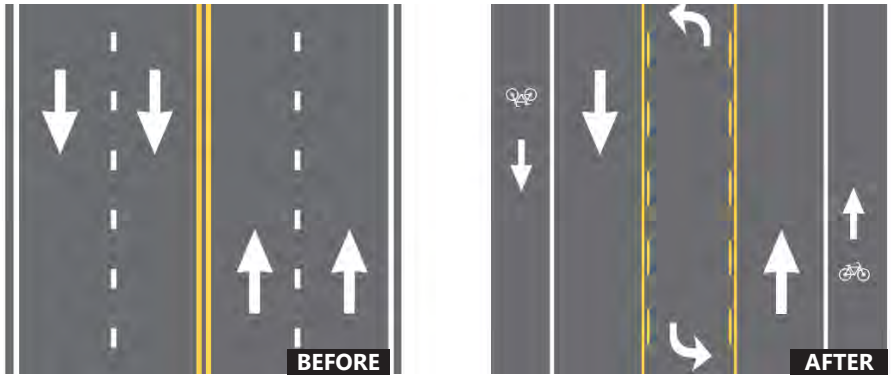
4-Lane to 3-Lane Road Diet Conversions

19-47%

reduction in total crashes.[1]

Road Diets (Roadway Reconfiguration)

A Road Diet, or roadway reconfiguration, can improve safety, calm traffic, provide better mobility and access for all road users, and enhance overall quality of life. A Road Diet typically involves converting an existing four-lane undivided roadway to a three-lane roadway consisting of two through lanes and a center two-way left-turn lane (TWLTL).



Before and after example of a Road Diet. Source: FHWA

Benefits of Road Diet installations may include:

- Reduction of rear-end and left-turn crashes due to the dedicated left-turn lane.
- Reduced right-angle crashes as side street motorists cross three versus four travel lanes.
- Fewer lanes for pedestrians to cross.
- Opportunity to install pedestrian refuge islands, bicycle lanes, on-street parking, or transit stops.
- Traffic calming and more consistent speeds.
- A more community-focused, Complete Streets environment that better accommodates the needs of all road users.

A Road Diet can be a low-cost safety solution when planned in conjunction with a simple pavement overlay, and the reconfiguration can be accomplished at no additional cost. Typically, a Road Diet is implemented on a roadway with a current and future average daily traffic of 25,000 or less.

Road Diet project in Honolulu, Hawaii. Source: Leidos

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/road_diets/.

1 *Evaluation of Lane Reduction "Road Diet" Measures on Crashes*, FHWA-HRT-10-053, (2010).

ZERO IS OUR GOAL
A SAFE SYSTEM IS HOW WE GET THERE

FHWA-SA-21-046

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Safety Benefits:

Sidewalks

65-89%

reduction in crashes involving pedestrians walking along roadways.[3]

Paved Shoulders

71%

reduction in crashes involving pedestrians walking along roadways.[3]

Walkways

A walkway is any type of defined space or pathway for use by a person traveling by foot or using a wheelchair. These may be pedestrian walkways, shared use paths, sidewalks, or roadway shoulders.

With more than 6,200 pedestrian fatalities and 75,000 pedestrian injuries occurring in roadway crashes annually,[1] it is important for transportation agencies to improve conditions and safety for pedestrians and to integrate walkways more fully into the transportation system. Research shows people living in low-income communities are less likely to encounter walkways and other pedestrian-friendly features.[2]

Well-designed pedestrian walkways, shared use paths, and sidewalks improve the safety and mobility of pedestrians. Pedestrians should have direct and connected network of walking routes to desired destinations without gaps or abrupt changes. In some rural or suburban areas, where these types of walkways are not feasible, roadway shoulders provide an area for pedestrians to walk next to the roadway, although these are not preferable.

Transportation agencies should work towards incorporating pedestrian facilities into all roadway projects unless exceptional circumstances exist. It is important to provide and maintain accessible walkways along both sides of the road in urban areas, particularly near school zones and transit locations, and where there is a large amount of pedestrian activity. Walkable shoulders should also be considered along both sides of rural highways when routinely used by pedestrians.

Example of a sidewalk in a residential area. Source: pedbikeimages.org / Burden

Paved shoulder used as a walkway. Source: pedbikeimages.org / Burden

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=1.

FHWA-SA-21-047

1 National Center for Statistics and Analysis. (2020, March). Pedestrians: 2018 data (Traffic Safety Facts. Report No. DOT HS 812 850). National Highway Traffic Safety Administration.
2 Gibbs, et all. Income Disparities in Street Features that Encourage Walking. Bridging the Gap, (2012, March).
3 Gan et al. Update of Florida Crash Reduction Factors and Countermeasures to Improve the Development of District Safety Improvement Projects. Florida DOT, (2005).

U.S. Department of Transportation
Federal Highway Administration

Safety Benefits:

HFST can reduce crashes up to:

63%
for injury crashes at ramps.[2]

48%
for injury crashes at horizontal curves.[2]

20%
for total crashes at intersections.[3]

Automated application of HFST.
Source: FHWA

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/roadway_dept/pavement_friction/high_friction/.

FHWA-SA-21-052

Pavement Friction Management

Friction is a critical characteristic of a pavement that affects how vehicles interact with the roadway, including the frequency of crashes. Measuring, monitoring, and maintaining pavement friction—especially at locations where vehicles are frequently turning, slowing, and stopping—can prevent many roadway departure, intersection, and pedestrian-related crashes.

Pavement friction treatments, such as High Friction Surface Treatment (HFST), can be better targeted and result in more efficient and effective installations when using continuous pavement friction data along with crash and roadway data.

Continuous Pavement Friction Measurement

Friction data for safety performance is best measured with Continuous Pavement Friction Measurement (CPFM) equipment. Spot friction measurement devices, like locked-wheel skid trailers, cannot safely and accurately collect friction data in curves or intersections, where the pavement polishes more quickly and adequate friction is so much more critical. Without CPFM equipment, agencies will assume the same friction over a mile or more.

CPFM technology measures friction continuously at highway speeds and provides both network and segment level data. Practitioners can analyze the friction, crash, and roadway data to better understand and predict where friction-related crashes will occur to better target locations and more effectively install treatments.[1]

High Friction Surface Treatment

HFST consists of a layer of durable, anti-abrasion, and polish-resistant aggregate over a thermosetting polymer resin binder that locks the aggregate in place to restore or enhance friction and skid resistance. Calcined bauxite is the aggregate shown to yield the best results and should be used with HFST applications.

Applications

HFST should be applied in locations with increased friction demand, including:

- Horizontal curves.
- Interchange ramps.
- Intersection approaches.
  - Higher-speed signalized and stop-controlled intersections.
  - Steep downward grades.
- Locations with a history of rear-end, failure to yield, wet-weather, or red-light-running crashes.
- Crosswalk approaches.

Considerations

- HFST is applied on existing pavement, so no new pavement is added.
- If the underlying pavement structure is unstable, then the HFST life cycle may be shortened, resulting in pre-mature failure.
- The automated installation method is preferred as it minimizes issues often associated with manual installation: human error due to fatigue, inadequate binder mixing, improper and uneven binder thickness, delayed aggregate placement, and inadequate aggregate coverage.
- The cost can be reduced when bundling installations at multiple locations.

1 Izeppi et al. Continuous Friction Measurement Equipment as a Tool for Improving Crash Rate Prediction: A Pilot Study. Virginia Department of Transportation, (2016).
2 Merritt et al. Development of Crash Modification Factors for High Friction Surface Treatments. FHWA, (2020).
3 NCHRP Report 617: Accident Modification Factors for Traffic Engineering and ITS Improvements, (2008).

U.S. Department of Transportation
Federal Highway Administration

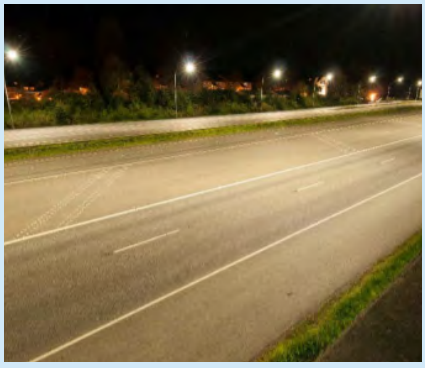
Safety Benefits:

Lighting can reduce crashes up to:

42%
for nighttime injury pedestrian crashes at intersections.[1]

33-38%
for nighttime crashes at rural and urban intersections.[1]

28%
for nighttime injury crashes on rural and urban highways.[1]



Source: WSDOT

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/roadway_dept/night_visib/roadwayresources.cfm.

FHWA-SA-21-050

Lighting

The number of fatal crashes occurring in daylight is about the same as those that occur in darkness. However, the nighttime fatality rate is three times the daytime rate because only 25 percent of vehicle miles traveled (VMT) occur at night. At nighttime, vehicles traveling at higher speeds may not have the ability to stop once a hazard or change in the road ahead becomes visible by the headlights. Therefore, lighting can be applied continuously along segments and at spot locations such as intersections and pedestrian crossings in order to reduce the chances of a crash.

Adequate lighting (i.e., at or above minimum acceptable standards) is based on research recommending horizontal and vertical illuminance levels to provide safety benefits to all users of the roadway environment. Adequate lighting can also provide benefits in terms of personal security for pedestrians, wheelchair and other mobility device users, bicyclists, and transit users as they travel along and across roadways.

Applications

Roadway Segments

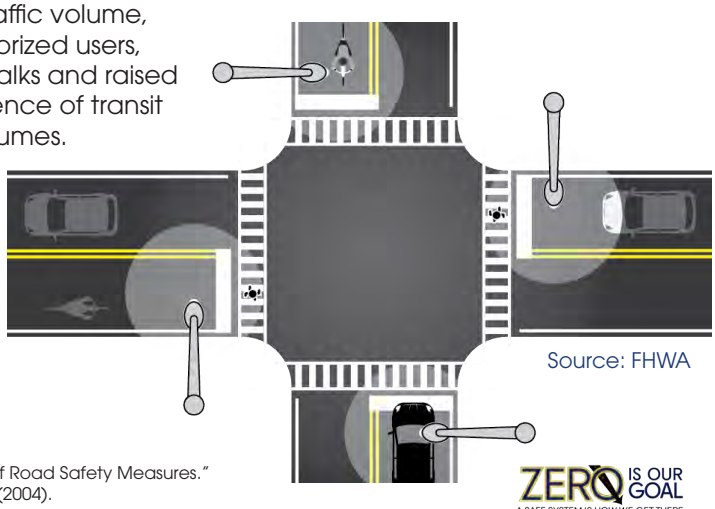
Research indicates that continuous lighting on both rural and urban highways (including freeways) has an established safety benefit for motorized vehicles.[1] Agencies can provide adequate visibility of the roadway and its users through the uniform application of lighting that provides full coverage along the roadway and the strategic placement of lighting where it is needed the most.

Intersections and Pedestrian Crossings

Increased visibility at intersections at nighttime is important since various modes of travel cross paths at these locations. Agencies should consider providing lighting to intersections based on factors such as a history of crashes at nighttime, traffic volume, the volume of non-motorized users, the presence of crosswalks and raised medians, and the presence of transit stops and boarding volumes.

Considerations

Most new lighting installations are made with breakaway features, shielded, or placed far enough from the roadway to reduce the probability and/or severity of fixed-object crashes. Modern lighting technology gives precise control with minimal excessive light affecting the nighttime sky or spilling over to adjacent properties. Agencies can equitably engage with underserved communities to determine where and how new and improved lighting can most benefit the community by considering their priorities, including eliminating crash disparities, connecting to essential neighborhood services, improving active transportation routes, and promoting personal safety.



Source: FHWA

1 Elvik, R. and Vaa, T., "Handbook of Road Safety Measures." Oxford, United Kingdom, Elsevier, (2004).

U.S. Department of Transportation
Federal Highway Administration

Safety Benefits:

Agencies have experienced the following benefits after LRSP implementation:

25%
reduction in county road fatalities in Minnesota.

17%
reduction in fatal and serious injury crashes on county-owned roads in Washington State.

35%
reduction in severe curve crashes in Thurston County, WA.

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/LRSPDIY/.

FHWA-SA-21-033

Local Road Safety Plans

A local road safety plan (LRSP) provides a framework for identifying, analyzing, and prioritizing roadway safety improvements on local roads. The LRSP development process and content are tailored to local issues and needs. The process results in a prioritized list of issues, risks, actions, and improvements that can be used to reduce fatalities and serious injuries on local roads. FHWA has developed several resources including an LRSP Do-It-Yourself website which further explains the process and includes resources local agencies and their partners need to create and implement an LRSP.[1]

Approximately 75 percent of rural roads are owned by local agencies.[2] While local roads are less traveled than State highways, they have a much higher rate of fatal and serious injury crashes.[2] Developing an LRSP is an effective strategy to improve local road safety for all road users and support the goals of a State's overall Strategic Highway Safety Plan (SHSP).

Although the development process and resulting plan can vary depending on the local agency's needs, available resources, and targeted crash types, aspects common to LRSPs include:

- Stakeholder engagement representing the 4E's: engineering, enforcement, education, and emergency medical services.
- Collaboration among municipal, county, Tribal, State, and/or Federal entities to leverage expertise and resources.
- Identification of target crash types and crash risk with corresponding recommended proven safety countermeasures.
- Timeline and goals for implementation and evaluation.

Local road agencies should consider developing an LRSP to be used as a tool for reducing roadway fatalities, injuries, and crashes.[3] LRSPs can help agencies create a prioritized list of improvements. LRSPs are also a proactive risk management technique to demonstrate an agency's responsiveness. The plan should be viewed as a living document that can be updated to reflect changing local needs and priorities.

Infographic showing the LRSP process. Source: FHWA

1 https://safety.fhwa.dot.gov/LRSPDIY/
2 Anderson et al. Noteworthy Practices: Addressing Safety on Locally-Owned and Maintained Roads A Domestic Scan, FHWA-SA-09-019, (2010).
3 Developing Safety Plans: A Manual for Local Rural Road Owners, FHWA-SA-12-017, provides guidance on developing an LRSP.

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Safety Benefits:

10-60%
reduction in total crashes.[1]

Road Safety Audit

While most transportation agencies have established traditional safety review procedures, a road safety audit (RSA) or assessment is unique. RSAs are performed by a multidisciplinary team independent of the project. RSAs consider all road users, account for human factors and road user capabilities, are documented in a formal report, and require a formal response from the road owner. (See the eight steps for conducting an RSA below.)

Source: FHWA

RSAs provide the following benefits:

- Reduced number and severity of crashes due to safer designs.
- Reduced costs resulting from early identification and mitigation of safety issues before projects are built.
- Increased opportunities to integrate multimodal safety strategies and proven safety countermeasures.
- Expanded ability to consider human factors in all facets of design.
- Increased communication and collaboration among safety stakeholders.
- Objective review by independent multidisciplinary team.

RSAs can be performed in any phase of project development, from planning through construction. Agencies may focus RSAs specifically on motorized vehicles, pedestrians, bicyclists, motorcyclists, or a combination of these roadway users. Agencies are encouraged to conduct an RSA at the earliest stage possible, as all roadway design options and alternatives are being explored.

Multidisciplinary team performs field review during an RSA. Source: FHWA

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/rsa/.

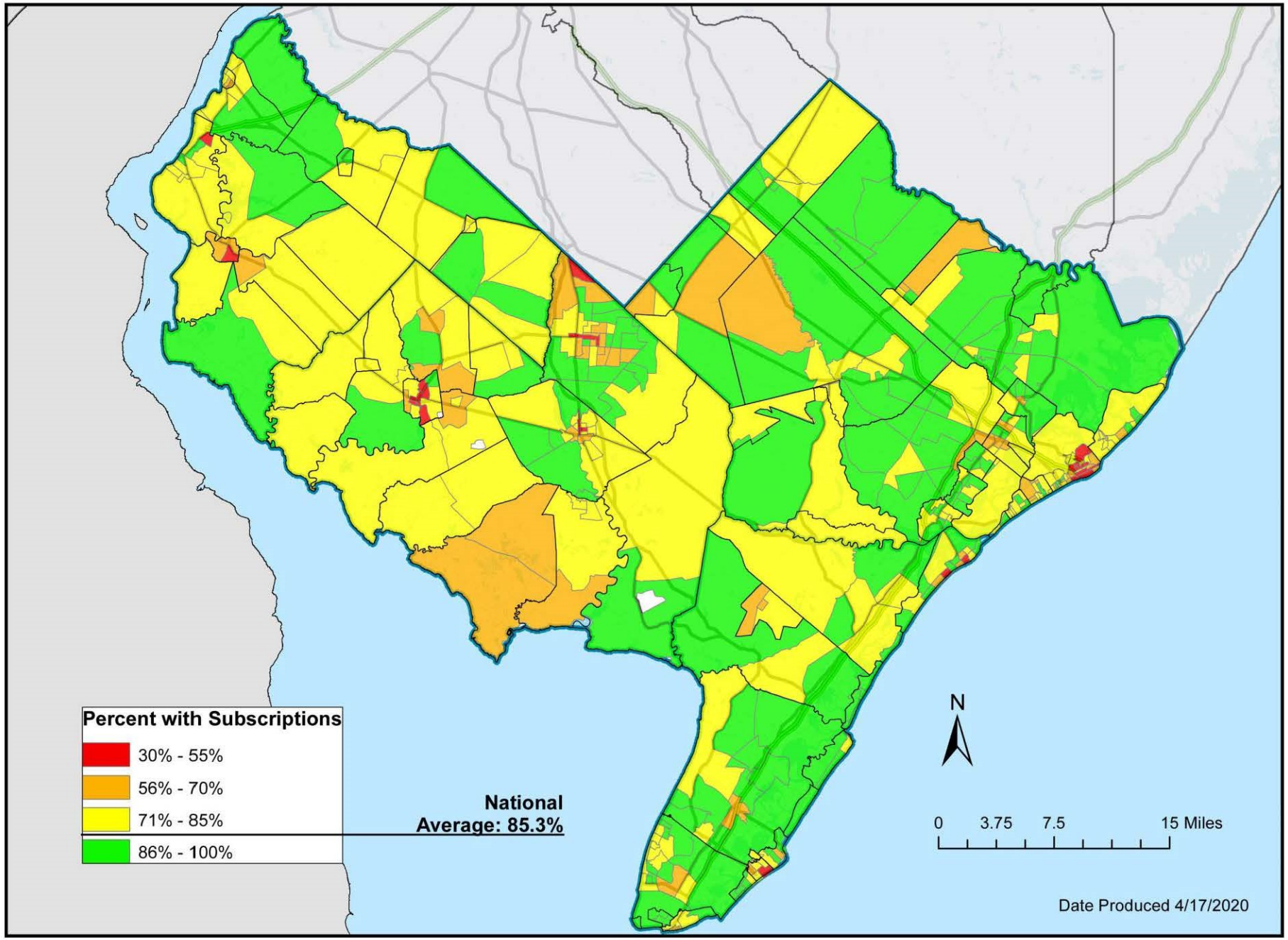
1 Road Safety Audits: An Evaluation of RSA Programs and Projects, FHWA-SA-12-037; and FHWA Road Safety Audit Guidelines, FHWA-SA-06-06.

FHWA-SA-21-048

Appendix K
Regional Internet Access

Percent of Total Households with Access to Internet Subscription

SJTPO Region I ACS 5-Year Data (2018)



SJTPO