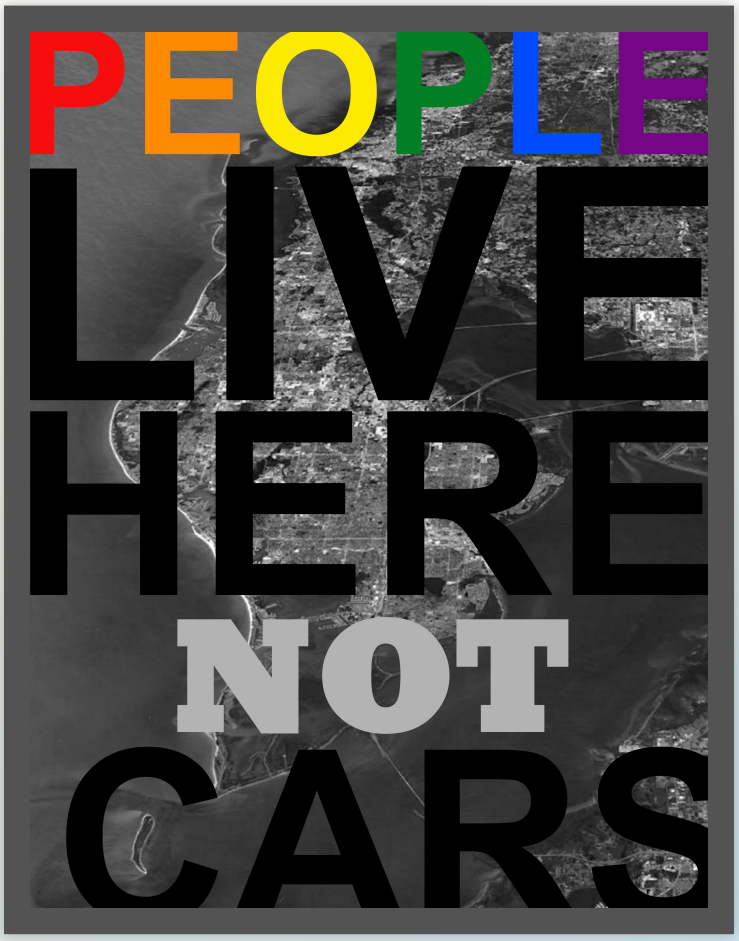
SAFE STREETS PINELLAS

Action Plan Technical Appendix

Adopted March 10, 2021
Updated February 2023



SAFE STREETS PINELLAS ART CONTEST
1ST PLACE

Appendices

SAFE STREETS PINELLAS

Crowdsource Summary

Appendix

A

SAFE STREETS PINELLAS

OBJECTID	Type	Votes	Comment
7212	Drivers go too fast		Vehicles use this to bypass the Curlew Rd/US 19 intersection and speed down the streets.
7225	Drivers go too fast		Drivers going the speed limit are passed by cars weaving in and out of lanes going at least 10 miles an hour faster.
7227	Drivers go too fast		Cars weaving in and out of lanes passing cars that are keeping the speed limit.
7230	Drivers go too fast		Most drivers are exceeding 35 MPH speed limit, some drivers use this section of Landmark Dr as a race track. This is a school area and mostly residential area.
7233	Drivers go too fast	3	Many vehicles speeding on Pinellas Point Drive S. including city buses as well as private vehicles and work vehicles
7235	Drivers go too fast	3	No sidewalks, streetlights
7237	Drivers go too fast	1	I travel this street every time I gout and I always go the speed limit. Almost all the time, cars pass me, which means they are all speeding.
7241	Drivers go too fast	5	School bus stops and lots of bicyclists on this route, too many drivers speeding, tailing cars doing the speed limit, aggressive drivers.
7242	Drivers go too fast		Our neighborhood has an increasing number of small children. The speed limit is 30 mph, which can be lowered to 25 mph, but this is still too fast. Many motor vehicles drive much too fast through the neighborhood, and many do not stop at stop signs!
7246	Drivers go too fast		The drivers are speeding constantly on 137th/Antilles even though this is a school zone. Yesterday a 10 year old girl was nearly hit by a speeder trying to cross the street on her bike where I put the dot on the map. Maybe speed bumps especially in front of the school would help slow the drivers down.
7251	Drivers go too fast		Countryside Blvd going through from Main Street to Curlew. It is a race track, people easily doing 20 mph over the speed limit. This is a neighborhood and children are playing! This road needs sped bumps.
7256	Drivers go too fast		We need warning signs of the construction to slow drivers on the ramp from I-275.
7258	Drivers go too fast		Default 30mph speed limit is Way too fast for this and other streets with children playing and dogs been walked. If nearby 137th, a major street is 25 MPH, these more residential streets should be 20
7263	Drivers go too fast		We live on a lake with ducks, walkers and kids everywhere. Drivers use Paloma as a cut off from Alt 19 to get downtown. WE NEED SPEEDBUMPS and decreased speed. Speeding tickets before someone gets hit
7264	Drivers go too fast		Speeding drivers use Grove St. during rush hours as an alternate to Drew. Evenings and late night patrons of Drifters Sports Pub use it to avoid being noticed by police on Drew.
7269	Drivers go too fast		dangerous and inefficient intersection. Good candidate for roundabout analysis. The street south to Main St needs more crosswalks and parking
7271	Drivers go too fast		Drivers fly down this road doing 45 in a 25
7272	Drivers go too fast		
7273	Drivers go too fast	4	Speeding from 4th St S/Pinellas Point drive onto 62nd Ave S has increased incrementally over the past month and I see no police presence/speed traps. This is a residential area with 35 mph and cars are going well above that speed limit.

OBJECTID	Type	Votes	Comment
7274	Drivers go too fast	11	Cars cannot see around the bend - there are many bicyclists on this stretch
7277	Drivers go too fast		Need enforcement. There is no respect for the bike lanes, stop signs, and any signs in general, speed limits and pedestrian crosswalk. Large semi trucks constantly take the non truck roads.
7278	Drivers go too fast		Drivers speed trying to beat the light at intersection with Curlew Road.
7279	Drivers go too fast	1	Drivers leaving light at Curlew going east on Tampa Rd. go too fast and nearly hit drivers turning south onto Oakleaf.
7280	Drivers go too fast	4	SpeedI got on this street is ridiculous, cars often in excess of 60 mph in a 35 zone.
7281	Drivers go too fast		Drivers race on this stretch of road
7282	Drivers go too fast	4	Passing buses, crossing double line, drifting into bike lane
7283	Drivers go too fast	5	Between 68th Ave S and PPDS, speeding thru neighborhood
7284	Speed limit is too high	6	Motorcyclist extreme high speed everyday
7285	Drivers go too fast	3	
7286	Drivers go too fast		Drivers drive over the speed limit and in wrong direction. It is a one-way street heading south. Just about everyday I see a driver headed in opposite direction of one way.
7289	Drivers go too fast		Need traffic calming and better enforcement of speed limits
7290	Drivers go too fast		We need traffic calming or better enforcement of speed limits
7293	Drivers go too fast	2	Regardless of the speed bumps vehicles and motorcycles are dangerously speeding at high speed. There are children that play on this street! There are no sidewalks! Families walk and also walk their dogs! Please.
7294	Drivers go too fast		
7295	Drivers go too fast	8	While there are speed bumps located on Fairway Ave S, there is a long stretch of roadway between two of the speed bumps where people are going up to 45-50 mph.
7300	Drivers go too fast		Place speed humps on this road. Cars/motorcycle later exceed the speed limit in a dangerous manner daily. There are children riding bikes, people walking their dogs, joggers etc
7301	Drivers go too fast	15	Place speed humps on this road. Cars/motorcycle later exceed the speed limit in a dangerous manner daily. There are children riding bikes, people walking their dogs, joggers etc
7302	Drivers go too fast	4	Speeding from mlk to the country club. Vehicles going well over the speed limit
7303	Drivers go too fast	3	We need speed control here
7304	Drivers go too fast	4	We need speed control here
7305	Drivers go too fast	7	We need speed control someone is going to be killed if we don't get it.
7306	Speed limit is too high	2	Speed is out of control on PPD
7308	Drivers go too fast		Need speed control ppl are almost hit daily
7309	Drivers go too fast	3	Very high speeds at peak rush hours, also very late at night. Some speed traps at visible times would be a great deterrent!
7345	Drivers go too fast		Even though we have speed bumps people go 40 mph through here!
7346	Drivers go too fast		Drivers speed through in between the speed bumps
7348	Drivers go too fast	3	
7349	Speed limit is too high	1	
7350	Speed limit is too high		

OBJECTID	Type	Votes	Comment
7353	Drivers go too fast	2	Every single day there are people driving way too fast (over 10 mph above posted speed limit). I live right off this road and see it first hand. There is very little police activity to deter this problem. I understand there are bigger issues. But when we've had to call 911 multiple times to report wrecks, something has to be done. My kids ride their bikes. This can't be ignored any longer.
7354	Drivers go too fast		The speed limit on this stretch needs to be reduced from higher speeds on 4 lane like MLK and also 31st The once speed is lowered it needs to stay consistent. Right now people coming to Pinellas Point Dr S From the highway use this road as a high speed zone
7356	Speed limit is too high	1	Northbound drivers often will not merging traffic from the NB on ramp at Roy Hanna Drive or Pinellas Point Drive. I'm not sure what it's called there. It's near Maximo Park. It causes very dangerous situations.
7363	Speed limit is too high	3	I-175 should be removed to create an at-grade boulevard with bike lanes and mid-block pedestrian crossings.
7364	Drivers go too fast	1	This intersection would likely be better suited with a four way stop versus a signaled intersection.
7365	Drivers go too fast	1	Maybe they could speed trap more often, or park an empty cruiser like they do on the Bayway and St. Pete Beach.
7415	Drivers go too fast	6	The speed limit should be lowered on this road. A consistent speed limit of 25 or 30 MPH would be helpful rather than the changing speed limits.
7416	Drivers go too fast		A Stop sign at this corner would slow traffic using Beltrees as a cut-through and improve safety.
7421	Drivers go too fast		People speed and aggressively pass to get into the left lane and get on the hwy before the light changes, because they know it is a long light. This is a pedestrian area next to the dog park.
7423	Drivers go too fast		More patrolling. I drive to work at night around 730, and people are flying past me, weaving in and out of traffic. They have to be driving 15+ mph over the speed limit
7424	Drivers go too fast		Too many speeders on a street with walkers, joggers, children
7435	Drivers go too fast		Traffic calming is needed.
7437	Drivers go too fast	1	Lots of speeding
7446	Drivers go too fast		
7448	Drivers go too fast		Drivers Will not yield to let us out and if we take a right we can't get into the left lane to go south because there's no lane changing there if we turn right to use the red light to go south on McMullen booth there is a no U-turn sign
7450	Drivers go too fast		Drivers too fast and crosswalk needed
7451	Drivers go too fast	1	Drivers use this street as a cut through and drive very fast....over 45mph
7463	Drivers go too fast		Drivers exit 19SB and speed on Frontage Rd and then re-enter 19. Frontage Rd is being used as a passing lane. Frontage Rd is 35 MPH with driveways.
7464	Drivers go too fast		NOISE ISSUE AT NIGHT UNDER OVERPASS
7489	Drivers go too fast		Someone is going to get killed
7490	Drivers go too fast		Someone is going to get killed
7496	Drivers go too fast		

OBJECTID	Type	Votes	Comment
7500	Drivers go too fast		On Douglas Ave, south of Mainstreet, the speed limit is 15 and then goes to 25. Cars & trucks speed on the road constantly. It is a safety issue as there are lots of pedestrians in Downtown Dunedin. I've seen many close calls.
7501	Drivers go too fast		This area is a small section of 4 lanes with a visibility issue. Drivers speed and often drag race at all hours. There are been several wrecks and near misses.
7502	Drivers go too fast		We need traffic calming! Cars see a long strait wide uninterrupted view of road. Spending is constant. Many bikers and walkers and people crossing the streets. Please do something to slow the cars down.
7505	Drivers go too fast		There is an opportunity to remove this stoplight (79th St @ Central Ave) and replace with roundabout to slow traffic. Traffic often exceeds 45+mph on this stretch.
7510	Drivers go too fast		Drivers exceed speed by up to 40 mph
7511	Drivers go too fast		Drivers exceed speed by up to 40 mph
7512	Drivers go too fast		Drivers exceed speed by up to 40 mph
7514	Drivers go too fast		Speed bumps needed at east end of 102nd Ave to slow down the speeders. Speeding cars make it difficult for cars to exit Tulip St and 52nd St and to enhance the safety of bicyclists.

Collision Assessment

Appendix B

SAFE STREETS PINELLAS

Collision Assessment

Date: April 14, 2020

To: Sarah Caper, Forward Pinellas

From: Kathrin Tellez, Fehr & Peers

Subject: Safe Streets Pinellas Initial Collision Assessment

Introduction

This memorandum presents initial findings from the collision analysis conducted on reported crashes from January of 2015 to December of 2019 in Pinellas County. The collision analysis identifies how contextual factors such as time of day, driving under the influence, and age and gender influence the number of fatal and severe collision in Pinellas County. Collisions from 2015 to 2019 were analyzed with a focus on collisions involving those killed or severely injured (KSI). Severe injury collisions are those which result in extreme and long-term consequences, including permanent disability, lost productivity and wages, and other life altering impacts. Throughout this memo, KSI is used to signify collisions where someone was killed or severely injured while driving, walking, biking, or traveling on a motorcycle.

This collision analysis is the first step in the data-driven Vision Zero process to address fatal and severe injuries for people who are walking, biking, or driving; identify high-risk roadway characteristics and locations; develop countermeasures to address these crashes; and ultimately, devise a Vision Zero Action Plan for Pinellas County to eliminate traffic-related deaths and severe injuries.

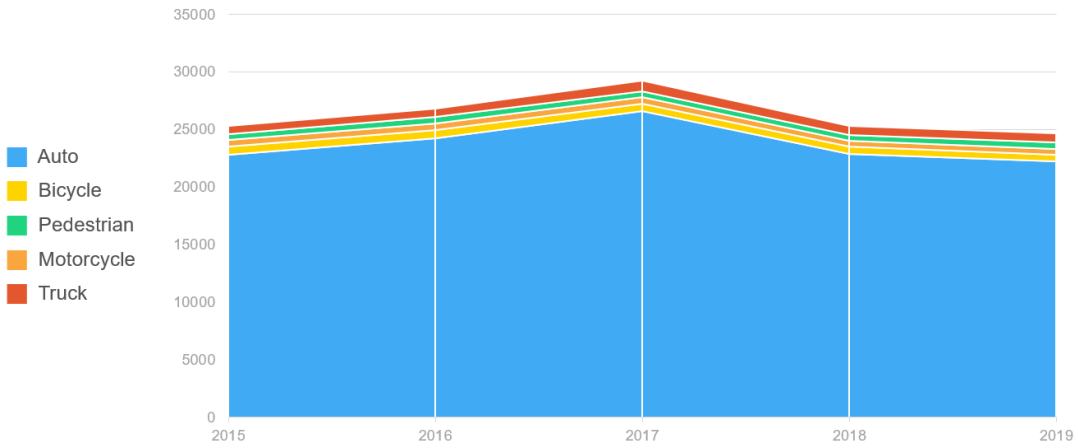
Collision Landscape Summary

The collision assessment analyzed data from the Pinellas Crash Data Management System (CDMS). This assessment focuses on the five years between 2015 and 2019. In that five year period, a total of 131,193 collisions were reported in Pinellas County, with 3 percent of those collisions resulting in fatalities or serious injuries. Data from the last few months of 2019 is still being refined, and some small shifts in collision details may occur in the coming months as the 2019 data

is finalized. Therefore, the numbers presented in this assessment may be refined over time, or conflict with other published data for 2019.

Most collisions involved only automobiles (118,627 collisions), representing 90 percent of all collisions. Trucks and bicyclists were each involved in three percent of crashes (3,850 truck-involved collisions and 3,389 bicyclist-involved collisions), and pedestrians and motorcyclists were each involved in two percent of all crashes (2,641 pedestrian-involved collisions and 2,686 motorcyclist-involved collisions), as displayed on Chart 1.

Chart 1
Collisions in Pinellas County (2015-2019)



Over the last 5-year period, reported collisions peaked in 2017 with the number of total collisions on the decline since 2017; although the total number of collisions is trending down, collisions involving pedestrians are increasing. Key Findings of our collision assessment include:

- Overall collisions overwhelmingly involve automobiles (90 percent), collisions that result in a KSI disproportionally include a vulnerable (bicyclist, pedestrian or motorcyclist) roadway user (40 percent), with pedestrians accounting for 40 percent of people killed on Pinellas County roadways.
- Alcohol is two or more times as likely to be involved in a KSI collision than a non-KSI collision.
- The highest share of overall collisions occurs between 3 and 6 PM, including collisions that result in a KSI. However, collisions that occur between 6 PM and 6 AM are more likely to result in a KSI than between 6 AM and 6 PM.
- The majority of collisions in Pinellas County do not take place at an intersection.
- KSI collisions are slightly more likely to occur during winter and spring months (December through April) versus other months.
- More than 60 percent of KSI collisions occur on less than 10 percent of roadways, including portions of US 19, Park Boulevard, Gulf to Bay Boulevard, Bay Drive, 4th Street and 38th Avenue.
- On average, two people are killed or severely injured on Pinellas County roadways each day.

How does Pinellas County Compare?

Florida has the unfortunate distinction of having 8 of the 10 most dangerous metropolitan areas for pedestrians, as documented in the Dangerous by Design 2019 report, with the Tampa/St. Petersburg-Clearwater area placing 9th on the list. When looking at the total number of collisions that resulted in a fatality or injury, Pinellas County ranks 7th in the state, behind Miami-Dade, Broward, Orange, Hillsborough, Palm Beach and Duval counties based on data representing 2014 through 2018 (Source: https://www.flhsmv.gov/). However, when normalized by population, Pinellas County drops to 45th in the state (meaning 44 Florida counties have a collision rate per capita higher than Pinellas County) with the surrounding Counties of Hillsborough, Pasco, and Manatee having lower rates of fatal and injury collisions per capita than Pinellas County.

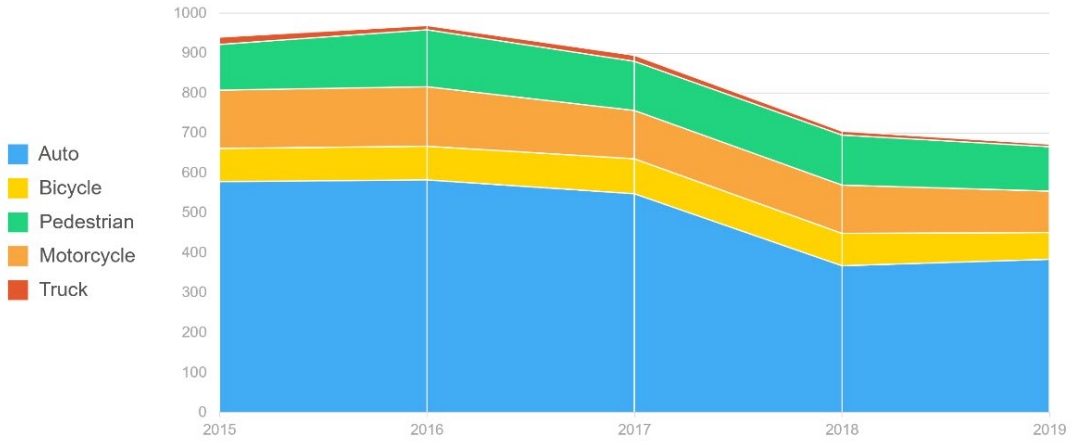
When considering only fatal crashes, Pinellas County has one of the lower rates in the State, slightly less than the surrounding communities. Based on 2018 data, the motor vehicle crash death rate in Pinellas County was 13.1 persons per 100,000 of population, as compared to a state-wide average of 15.5 (http://www.flhealthcharts.com/). Vehicle collisions are one of the leading non-health related causes of death within Pinellas County, and severe injury collisions can significantly degrade the quality of life for residents.

Killed or Severely Injured (KSI) Collision by Mode of Travel

Within Pinellas County, a total of 4,181 collisions resulted in a death or serious injury between 2015 and 2019, or 3 percent of overall collisions. Of those collisions, 60 percent involved vehicles as the only mode of travel involved. Motorcycle and pedestrian crashes resulted in the second highest number of collisions at 15 percent each. Bicycle collisions account for 10 percent of KSI crashes. Similar to overall collisions, KSI collisions have decreased over the past five years with KSI collisions decreasing for all modes expect pedestrians, as shown in Chart 2.

Since 2015, pedestrians are disproportionally more likely to be involved in a KSI collision. In 2015, pedestrians were involved in approximately 12 percent of KSI collisions, with that percentage increasing to almost 17 percent in 2019. The representation of bicyclists in KSI collisions has remained somewhat constant at about 9 to 10 percent of KSI, similarly motorcyclists remained at about 15 percent representation. Motor vehicle occupants, including automobiles and trucks, declined from approximately 63 percent of KSIs to 58 percent.

Chart 2
Killed or Severely Injured Collisions in Pinellas County (2015-2019)

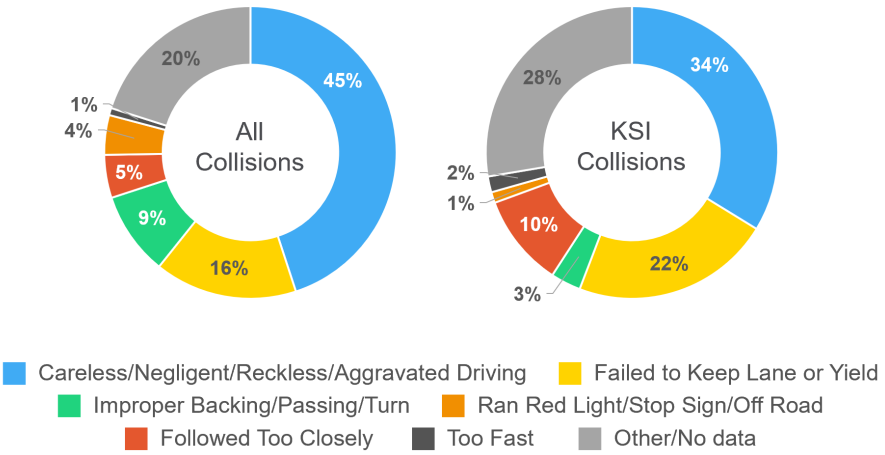


Further refining the data to only collisions that result in a fatality show that pedestrians are disproportionally represented and comprise 40 percent of fatalities. Motorcyclists comprise 22 percent of fatalities, and bicyclists 5 percent of fatalities. The remaining 33 percent of fatalities are in a motor vehicle. Roadway safety improvements targeted at improving pedestrian safety would yield the largest potential to reduce overall fatal collisions. For the purposes of the collision assessment, trucks are defined as vehicles with a weight of more than 10,000 pounds.

High-Level Collision Causes

There are many reasons why collisions occur – such as speeding, aggressive driving, or failure to yield the right-of-way. As shown in Chart 3, careless/negligent driving and reckless/aggravated driving account for 45 percent of total collisions during this period, as compared 34 percent of KSI collisions. Failure to keep in proper lane and yield to the-right-of-way account for the second highest cause of collisions with 16 percent of all crashes in Pinellas County, but 22 percent of KSIs. Speed was a primary factor in 1 percent of all collisions, but 2 percent of KSI collisions.

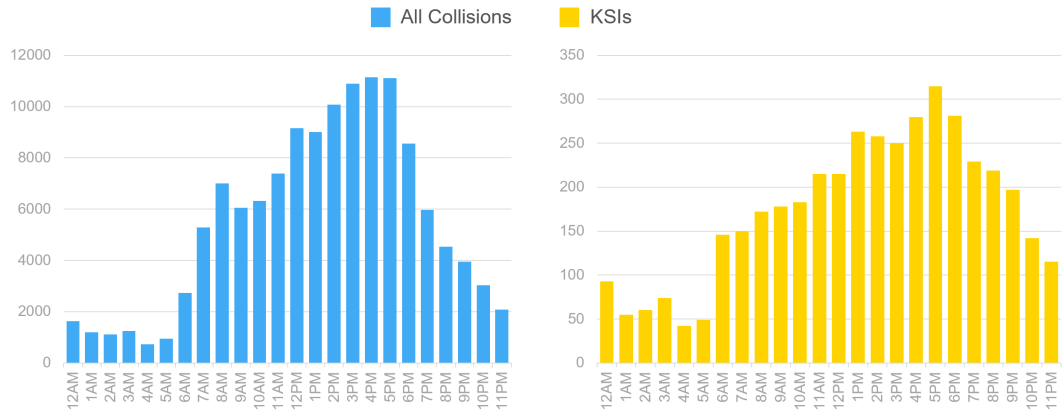
Chart 3
Cause of Collision (2015-2019)



Time of Day

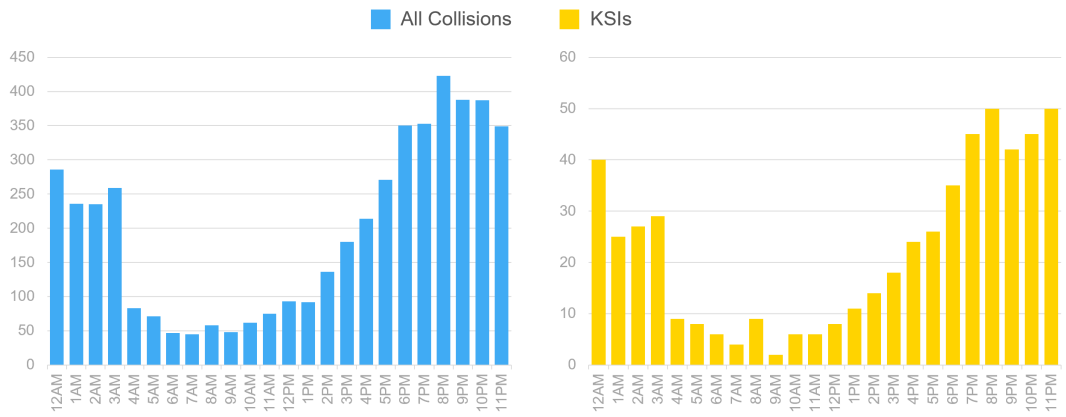
Evaluating the timing of collisions can provide context about the surrounding traffic and lighting conditions, which informs the selection of countermeasures. Almost 60 percent of all collisions occur between noon and 7 PM, with 25 percent of collisions occurring between 3 and 6 PM, coinciding with the typical peak travel times for automobile travel (Chart 4). While most KSI collisions occur between 4 and 7 PM (Chart 4), KSI collisions represent a greater proportion of overall collisions between 9 PM and 6 AM.

Chart 4
Collisions by Time of Day (2015-2019)



Collisions that involve a driver under the influence (which is defined by a blood alcohol level over the legal limit, or under the influence of illegal drugs or other medication) time of day were are shown in Chart 5. When evaluating DUIs collisions by time of day, collisions peak between 6 PM and 3 AM, accounting for 69 percent of all DUI collisions. After 3 AM, collisions decrease and remain relatively even distributed until 6 PM. The peak in DUI collisions between 6 PM and 3 AM is likely due to drivers attending social venues, like bars or festivities in evenings and night. The peak in DUI collisions decreasing after 3AM also corresponds with patronages at bars which are not allowed to serve alcohol past 2 AM.

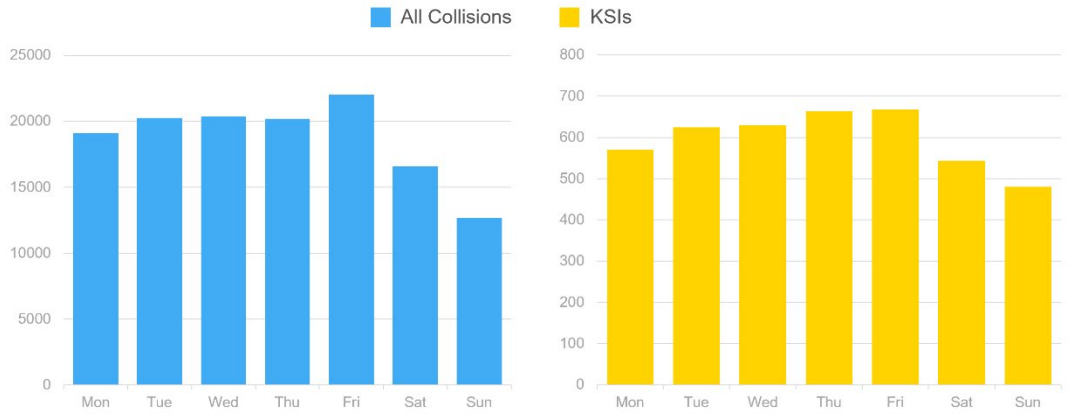
Chart 5
DUI Collisions by Time of Day (2015-2019)



Day of Week

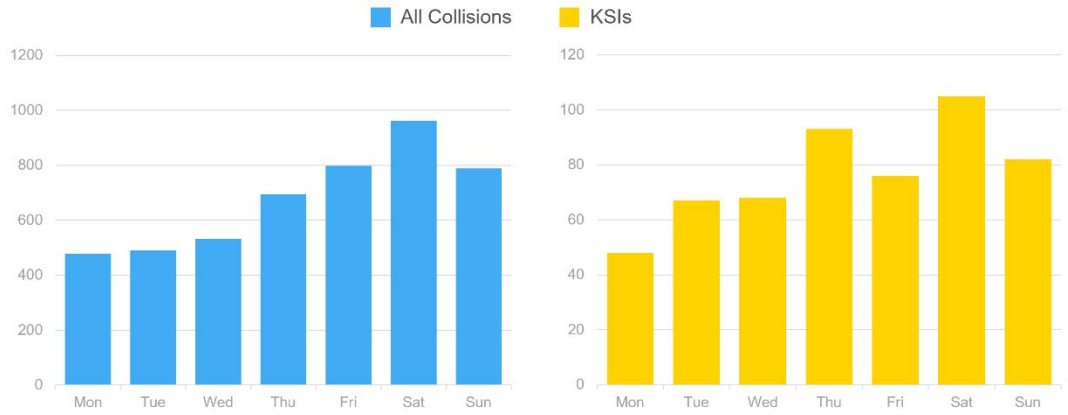
The distribution of all collisions is relatively evenly distributed Monday through Thursday, with a peak on Friday (Chart 6). Sundays have the lowest number of average collisions of any day of the week. Review of traffic count data from the Florida Department of Transportation Traffic Monitoring Site indicates that travel on Saturdays and Sundays is typically less than on weekdays by 10 to 25 percent, depending on location, with roadways closer to beach communities having less variation in weekday versus weekend travel. KSI collisions follow a relatively similar distribution as all collisions with a peak in KSI collisions on Thursday and Fridays (Chart 7). KSI collisions are lowest on Sundays, similar to all collisions, partially attributable to less people driving on Sundays.

Chart 6
Collisions by Day of Week (2015-2019)



When assessing DUI collisions by day of the week, collisions peak on Saturdays with 20 percent of DUI collisions happening that day. DUI collisions begin to rise on Thursdays with a 4 percent increase between Wednesday and Thursday and peak with the highest collisions of the week on Saturdays. Mondays and Tuesdays have the lowest DUI collisions.

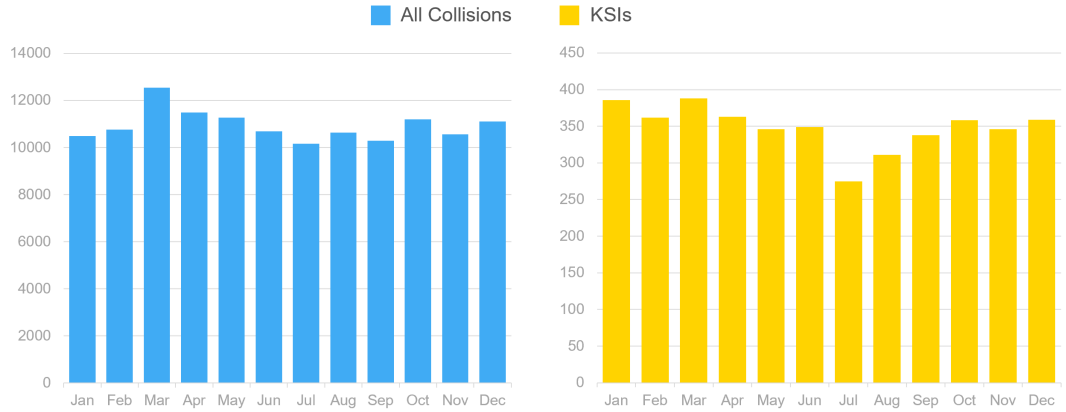
Chart 7
DUI Collisions by Day of Week (2015-2019)



Month of Year

Collisions by month of year are relatively evenly distributed throughout the year as shown on Chart 9, with the most collisions occurring in March. KSI collisions decline as compared to average during the summer months (July, August and September), as shown in Chart 10. KSI collisions peak in winter and early spring, indicative of changes in collisions with seasonal populations and activities, such as Spring Break.

Chart 8
Collisions in Pinellas County by Month of Year (2015-2019)



Hit and Run

Hit and run collisions, or collisions where a party to the collision does not remain at the scene, account for 17 percent of overall reported collisions in Pinellas County, as shown in Chart 11. For all collisions, pedestrians are more likely to be involved in a hit and run than other travel modes. For KSI collisions, 7 percent were hit and run, with pedestrians and bicyclists overrepresented, with 14 percent of KSI hit and run collisions involving a pedestrian and 10 percent involving a bicyclist.

Chart 9
Hit and Run Collisions in Pinellas County (2015-2019)

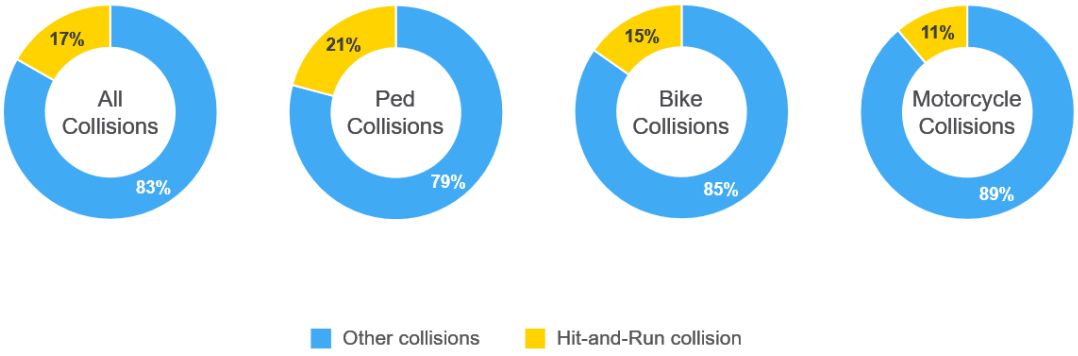
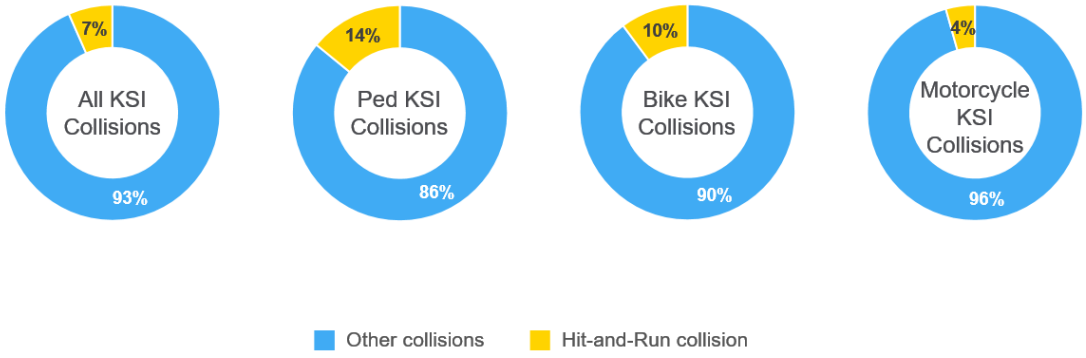


Chart 10
Hit and Run KSI Collisions in Pinellas County (2015-2019)



Under the Influence

Driving under the influence of alcohol and/or drugs increases the likelihood of a collision resulting in serious injury or a fatality. From 2015 to 2019, four percent of collisions involved a driver under the influence, as shown in Chart 11. For collisions that resulted in someone being killed or severely injured, the percentage triples to 13 percent, with pedestrians disproportionately being the victim, as shown in Chart 12. For the purposes of this analysis. intoxication refers to alcohol use over the legal limit, or under the influence of illegal drugs or other medication, and this analysis refers only to the condition of the driver.

Chart 11
Collisions with Drivers Intoxicated (2015-2019)

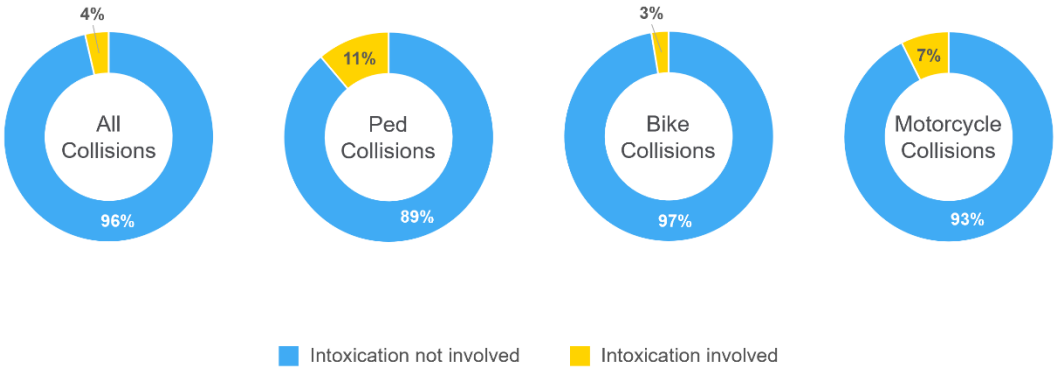
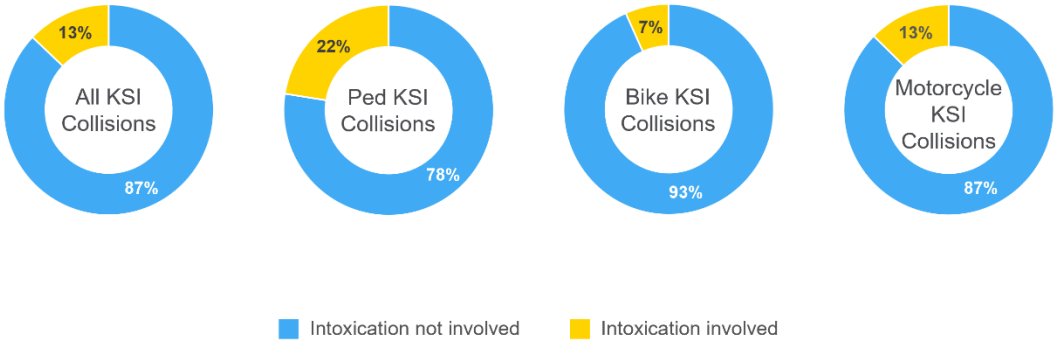


Chart 12
KSI Collisions with Drivers Intoxicated(2015-2019)



Location Type

The majority (65 percent) of collisions in Pinellas County did not occur within the limits of an intersection, as shown on Chart 16. A collision is defined as being at an intersection if the first harmful event occurs within the limits of one. Pedestrian collisions disproportionately (71 percent) do not take place at intersections. For collisions involving someone killed or severely injured, pedestrian collisions (72 percent) disproportionately do not occur at intersections, as shown on Chart 17.

Chart 14
All Collisions by Location (2015-2019)

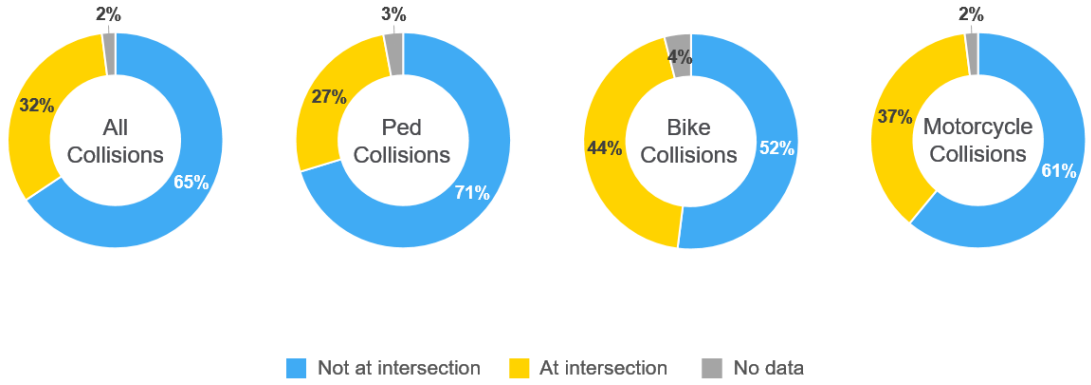
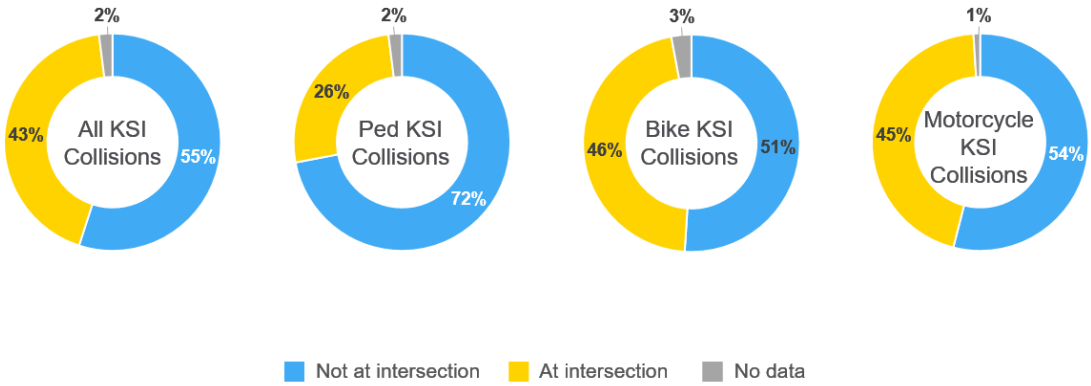


Chart 15
KSI Collisions by Location (2015-2019)



Pedestrian Location

Pedestrians are more likely than any other roadway user group to be killed in a roadway collision in Pinellas County. The reported location of pedestrians at the time of collision is summarized in Table 1 for all collisions and KSI collisions, as this location information could help inform countermeasures. As compared to all pedestrian-involved collisions, pedestrians are more likely to be killed or severely injured while waiting to cross a street, walking along a roadway with traffic, walking on the sidewalk and working in the roadway.

Table 1. Pedestrian Location at Time of Collision (2015-2019)

Location	All Collisions	KSI Collisions
Crossing	49%	37%
Waiting to cross	9%	**16%**
Walking along roadway with traffic	8%	**15%**
Walking in sidewalk	6%	**8%**
Walking along roadway against traffic	4%	4%
In road	1%	1%
K-12 going to or from school	1%	0%
Working in road	1%	**3%**
Shoulder/median/adjacent to roadway	1%	0%
Other/unknown/no data	19%	16%

Source: CDMS, 2015-2019 and Fehr & Peers.

Collisions by Sex and Age

Men are more likely to be involved in a collision than women, and significantly more likely to be involved in a KSI collision than women, as shown on Chart 17. Drivers between the ages of 20 and 29 are also more likely to be involved in a collision, with drivers over 40 less likely to be involved in a collision, as shown on Chart 18.

Chart 16
Collisions by Sex of Driver (2015-2019)

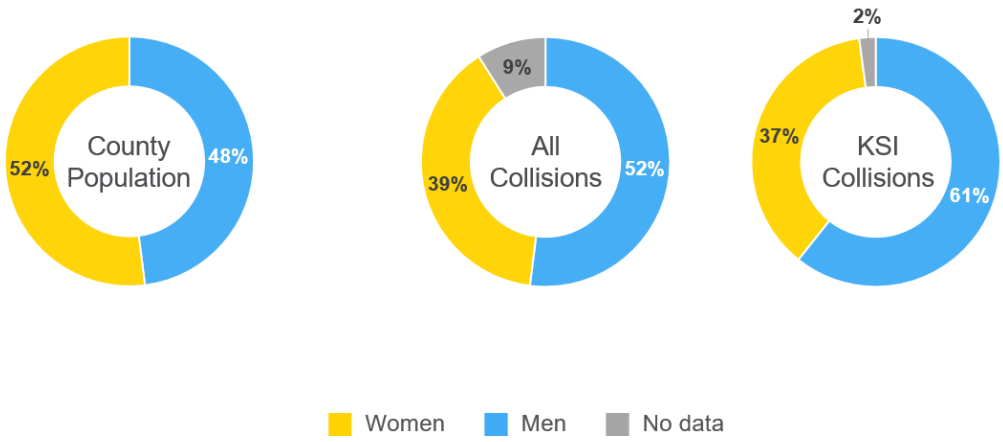
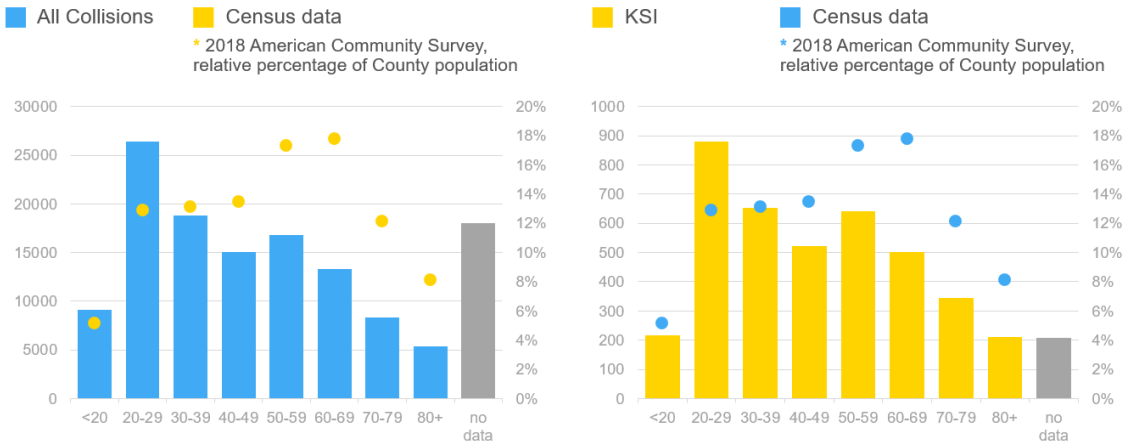


Chart 17
Collisions by Age of Drive (2015-2019)



High Injury Network and Next Steps

An outcome of this project is the development of a high injury network. The high injury network highlights streets with a high concentration of severe injuries and deaths. To develop the network, we recommend a two-step process based on the 2015 to 2019 data, the first step being data-driven and the second manual. In the first step, we will use an automated GIS tool to identify collision clusters and select nearby street segments. Because collisions are typically concentrated, the purely data-driven tool tends to identify short, discontinuous street segments near intersections or hot-spots. These segments provide a helpful indication of where collisions are occurring but stop short of creating a connected network that can guide planning decisions.

The next would be to manually refine the raw segments into a more continuous, final high-injury network consisting of *corridors* and *hot spots*. For corridors, we propose identifying a linear patterns in collisions, with a threshold of a continuous string of intersections that had more than 1 KSI collision per intersection. A threshold of distance between collisions, such as a 1/4-mile or 1/2-mile should be identified.

Hot spots are intersections where a higher density of KSI collisions occurred. Based on the preliminary data analysis, a threshold of three of more KSI collisions per intersection is a likely starting point to identify a hot spot, although different weights could be applied to different collision types (severe injury vs. fatal) or modes.

The collision data above will also be assessed by demographics to assess if any one group is being disproportionately affected by collisions in Pinellas County, with preliminary analysis presented on Figure 6. Figure 7 shows the top 25 KSI locations within the County.

Once we develop both the high injury network and have an assessment of demographics in the County, we can begin to prepare safety countermeasures in conversation with Forward Pinellas.

Attachments

Figure 1 Total Collisions from 2015 – 2019

Figure 2 KSI Collisions from 2015 – 2019

Figure 3 Pedestrian KSI from 2015 – 2019

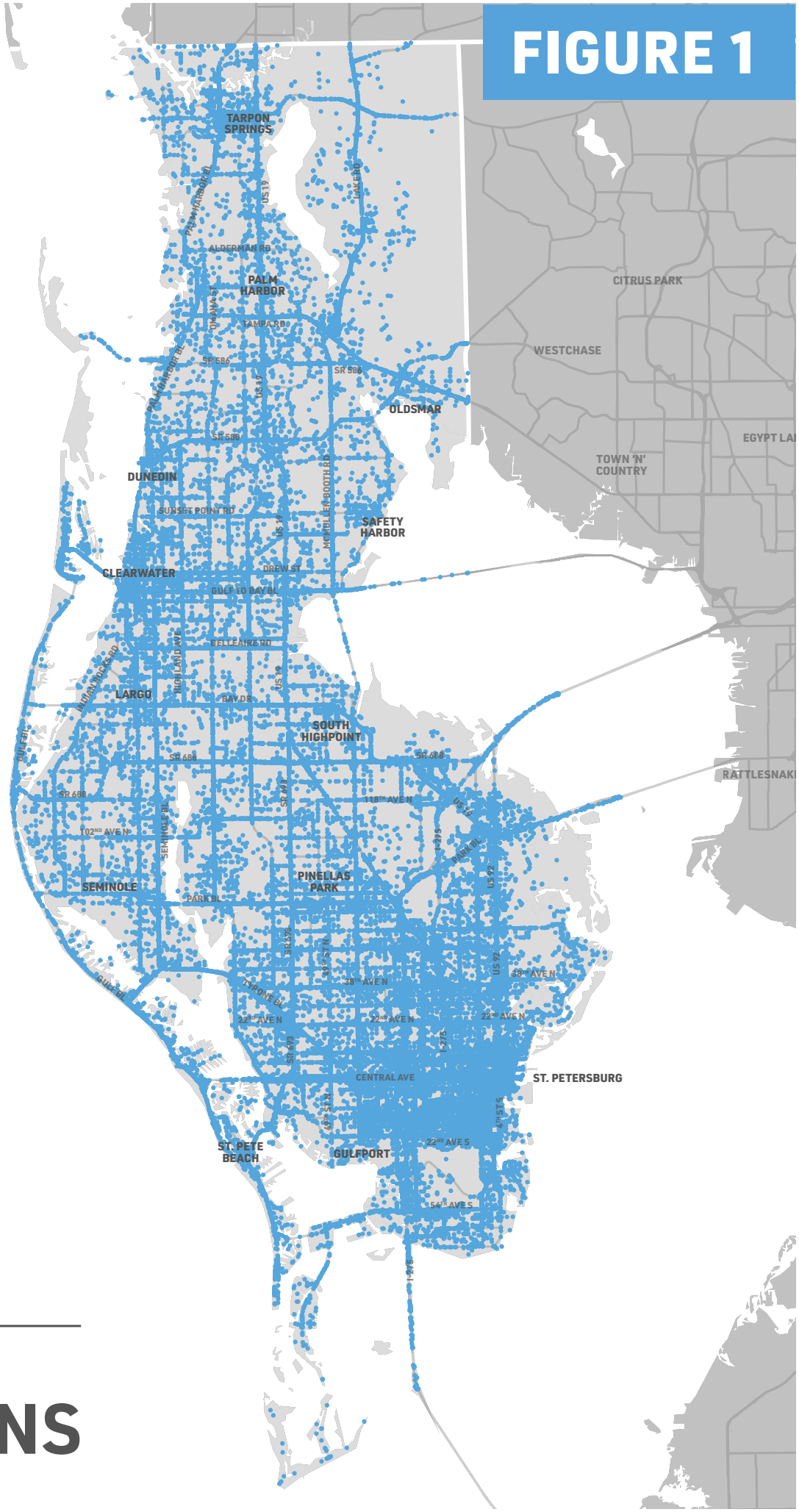
Figure 4 Bicyclist KSI from 2015 – 2019

Figure 5 Motorcyclist KSI from 2015 – 2019

Figure 6 KSI Locations and Demographic Data 2015 – 2019

Figure 7 Top 25 KSI Collision Locations 2015 – 2019

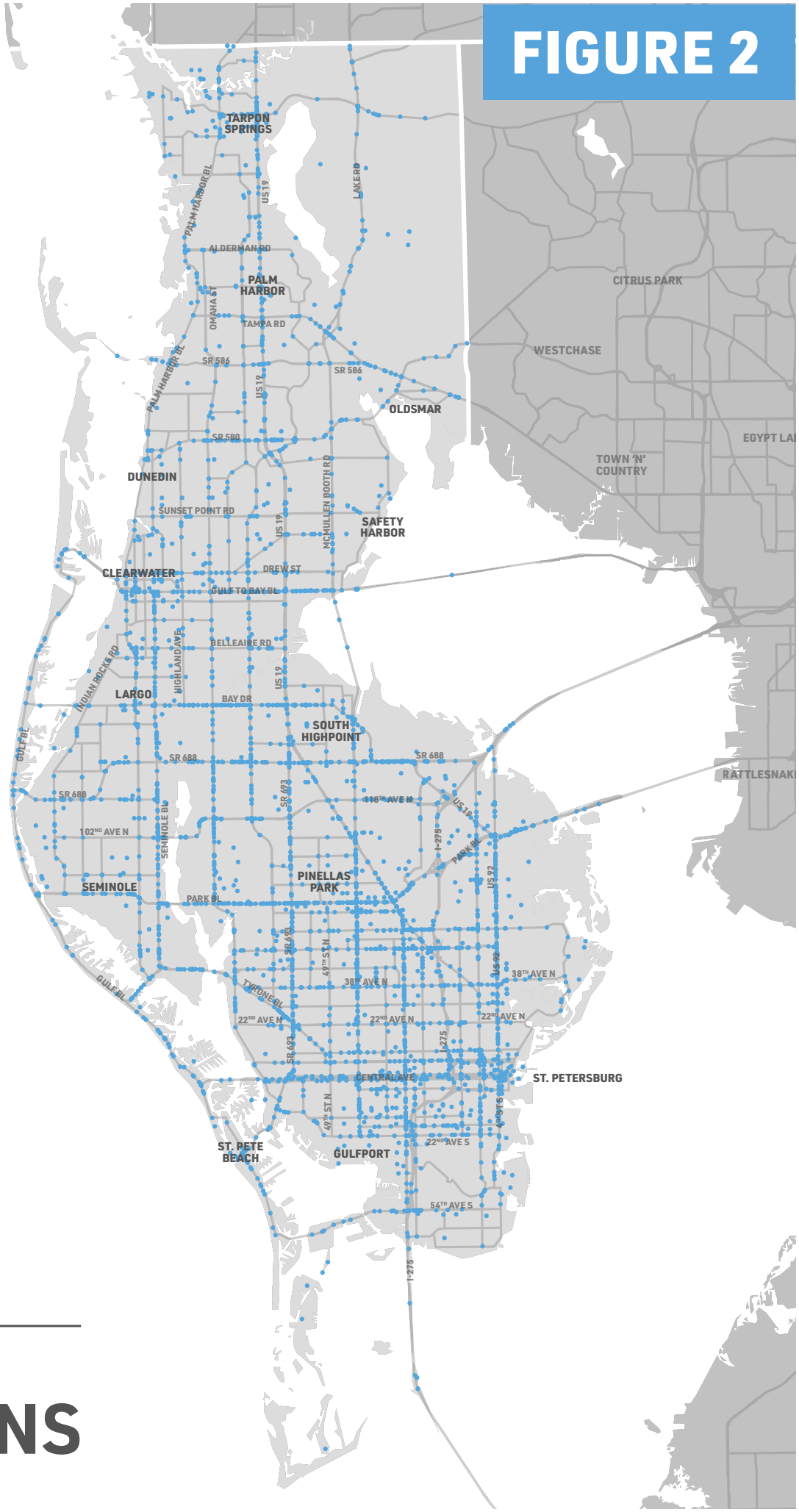
FIGURE 1



ALL COLLISIONS

2015 – 2019

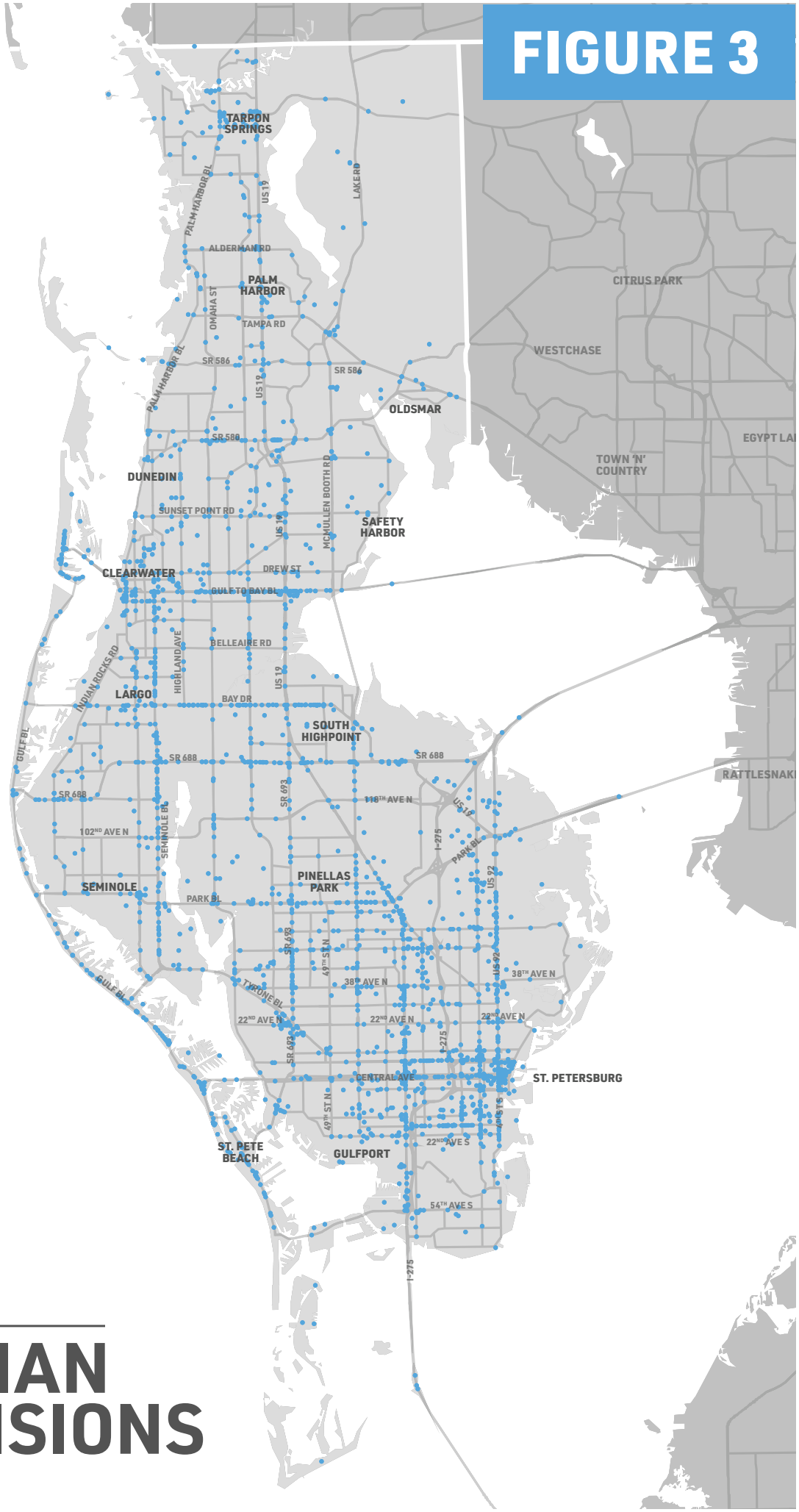
FIGURE 2



KSI COLLISIONS

2015 – 2019

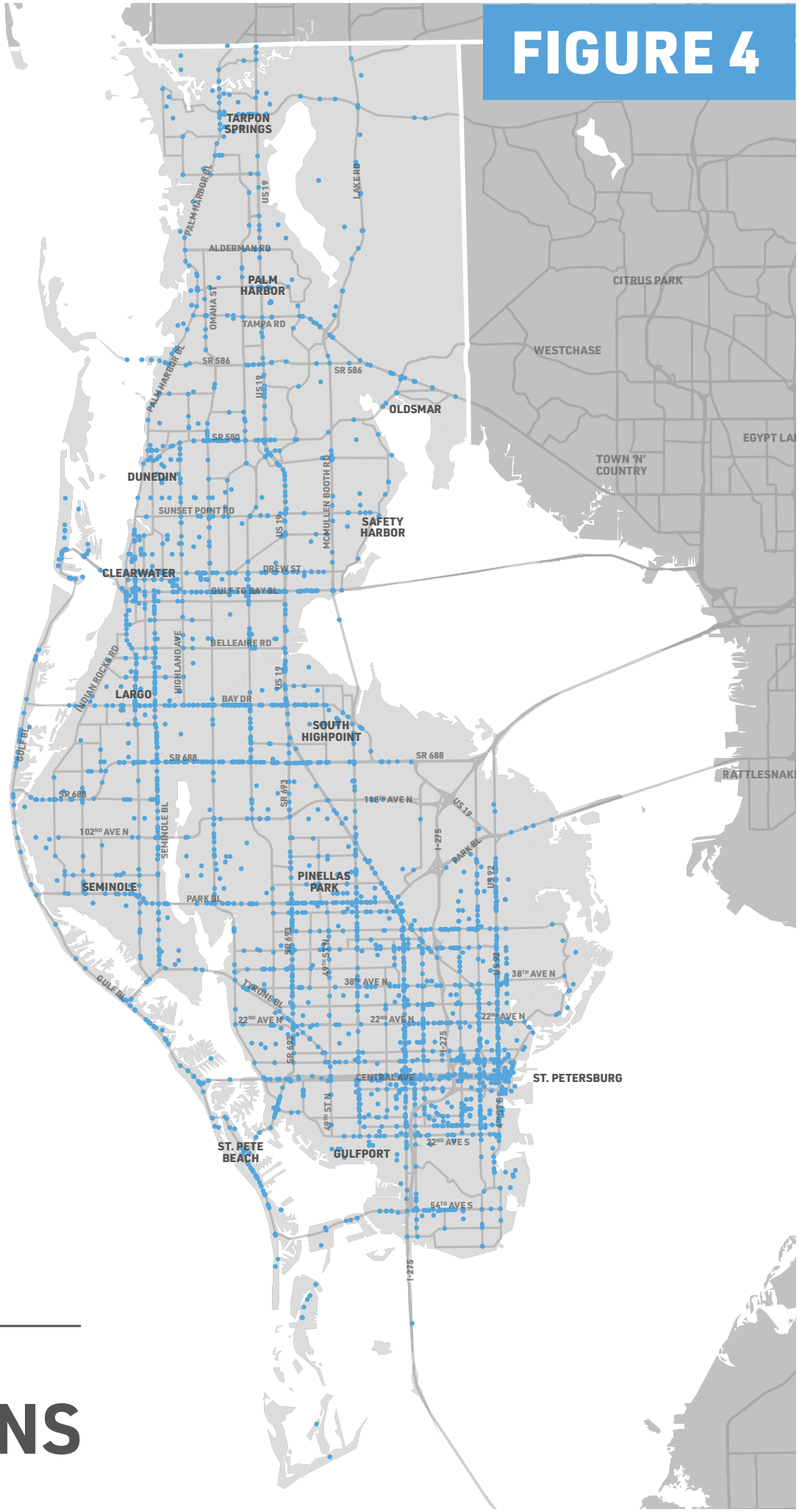
FIGURE 3



PEDESTRIAN KSI COLLISIONS

2015 – 2019

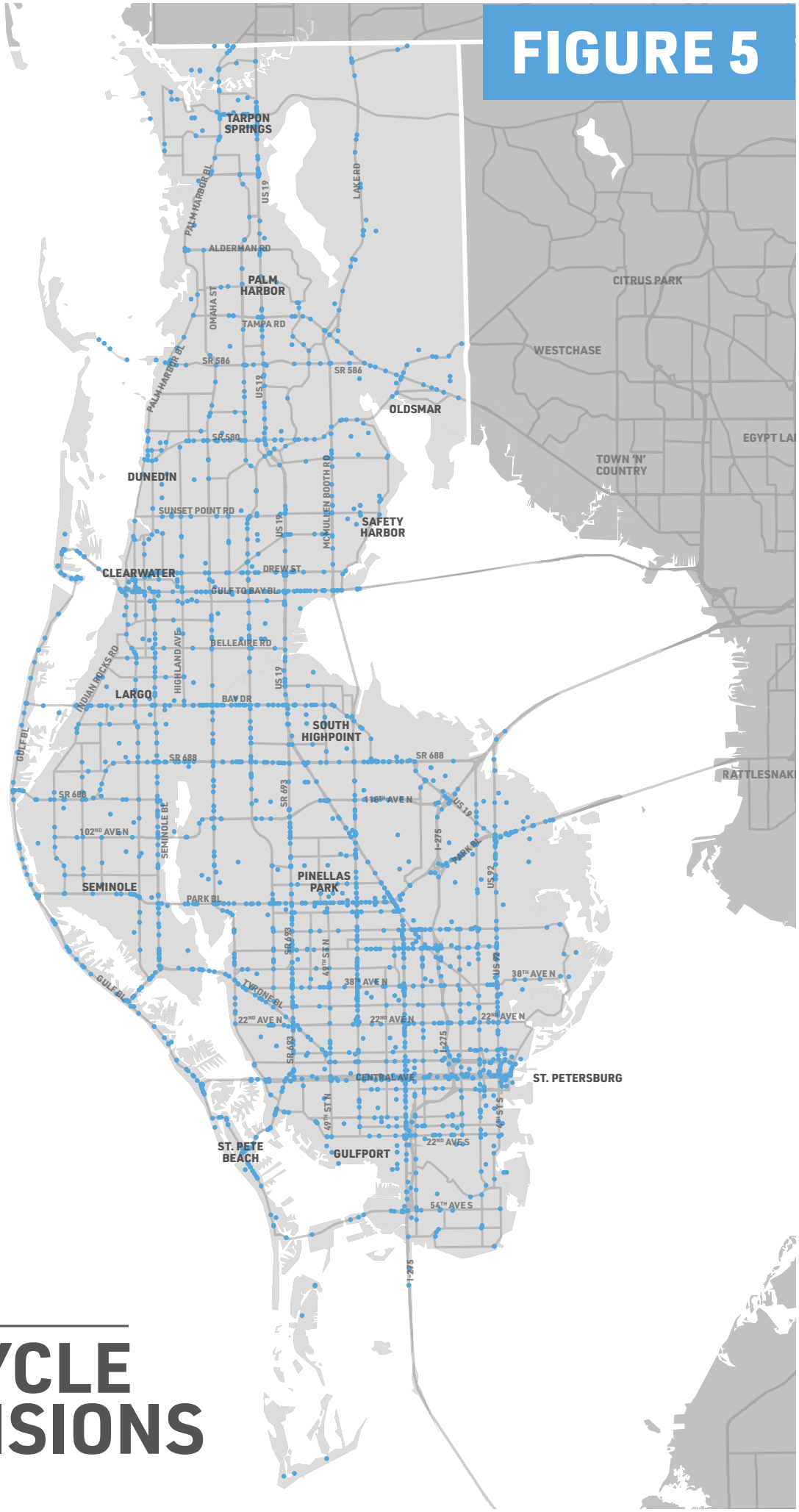
FIGURE 4



BIKE KSI COLLISIONS

2015 – 2019

FIGURE 5

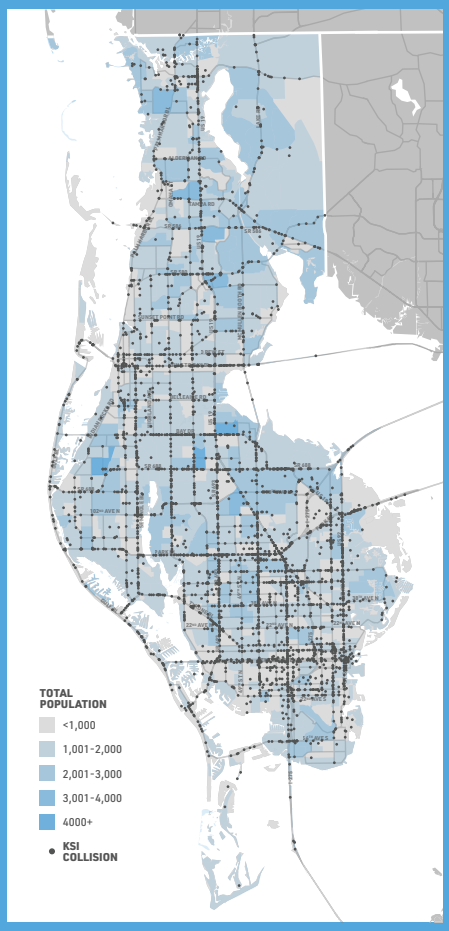


MOTORCYCLE KSI COLLISIONS

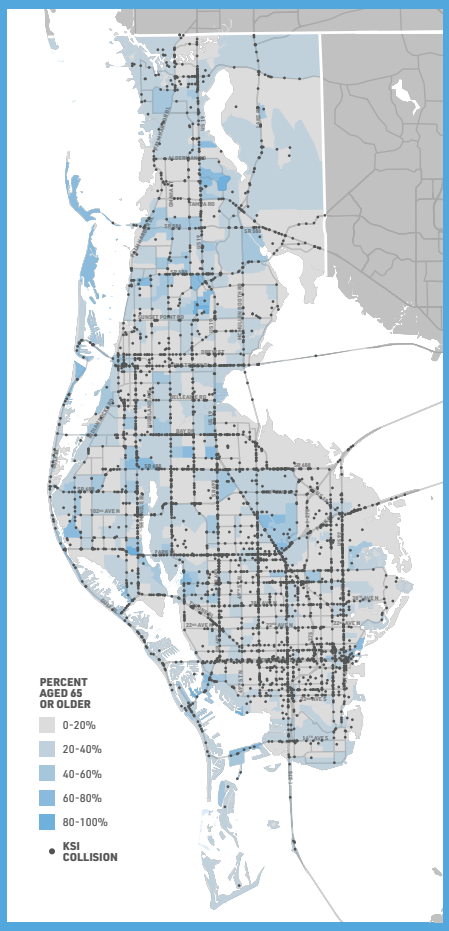
2015 – 2019

FIGURE 6

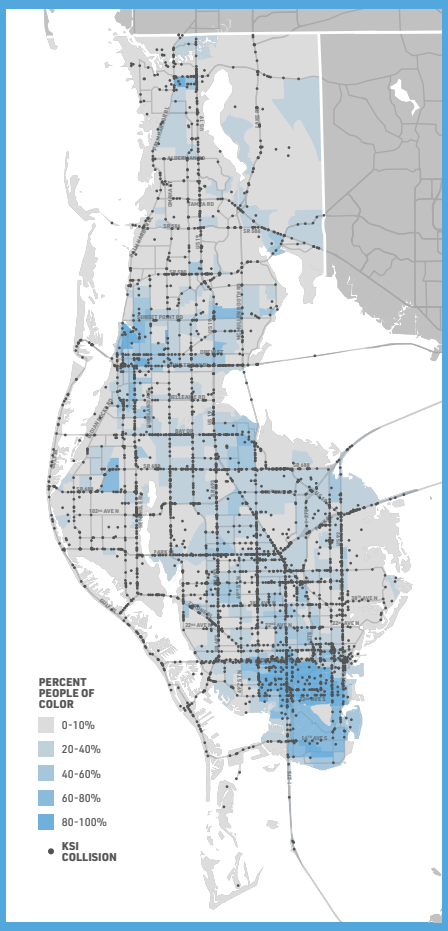
TOTAL POPULATION



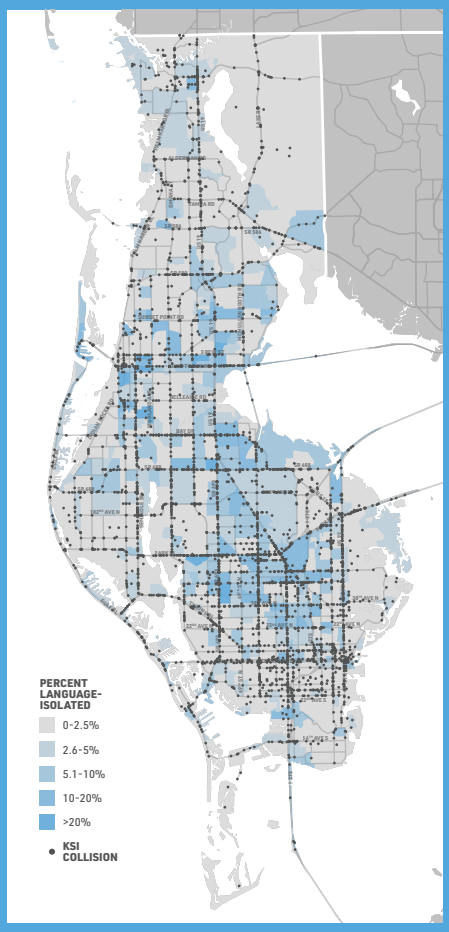
SENIORS



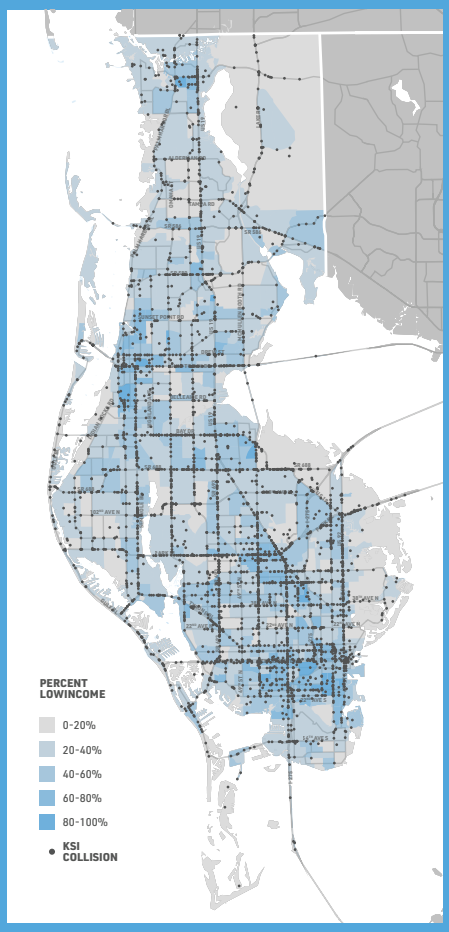
PEOPLE OF COLOR



LANGUAGE ISOLATION



LOW-INCOME COMMUNITIES



WALKING AND BIKING TO WORK

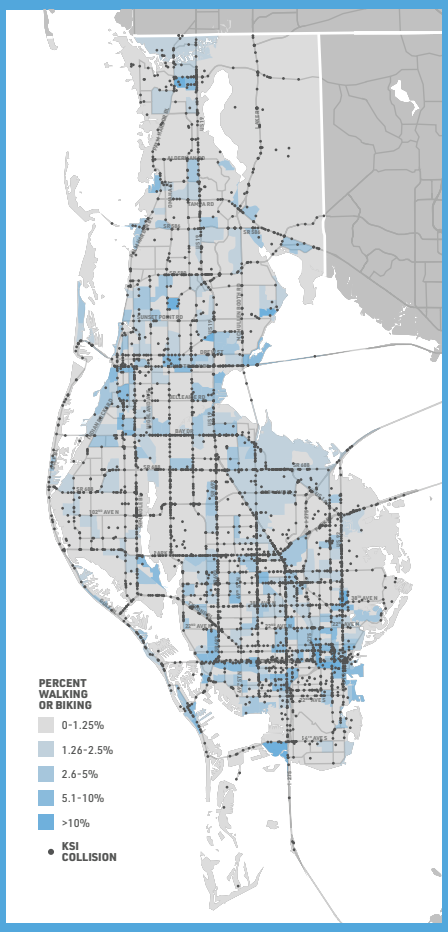
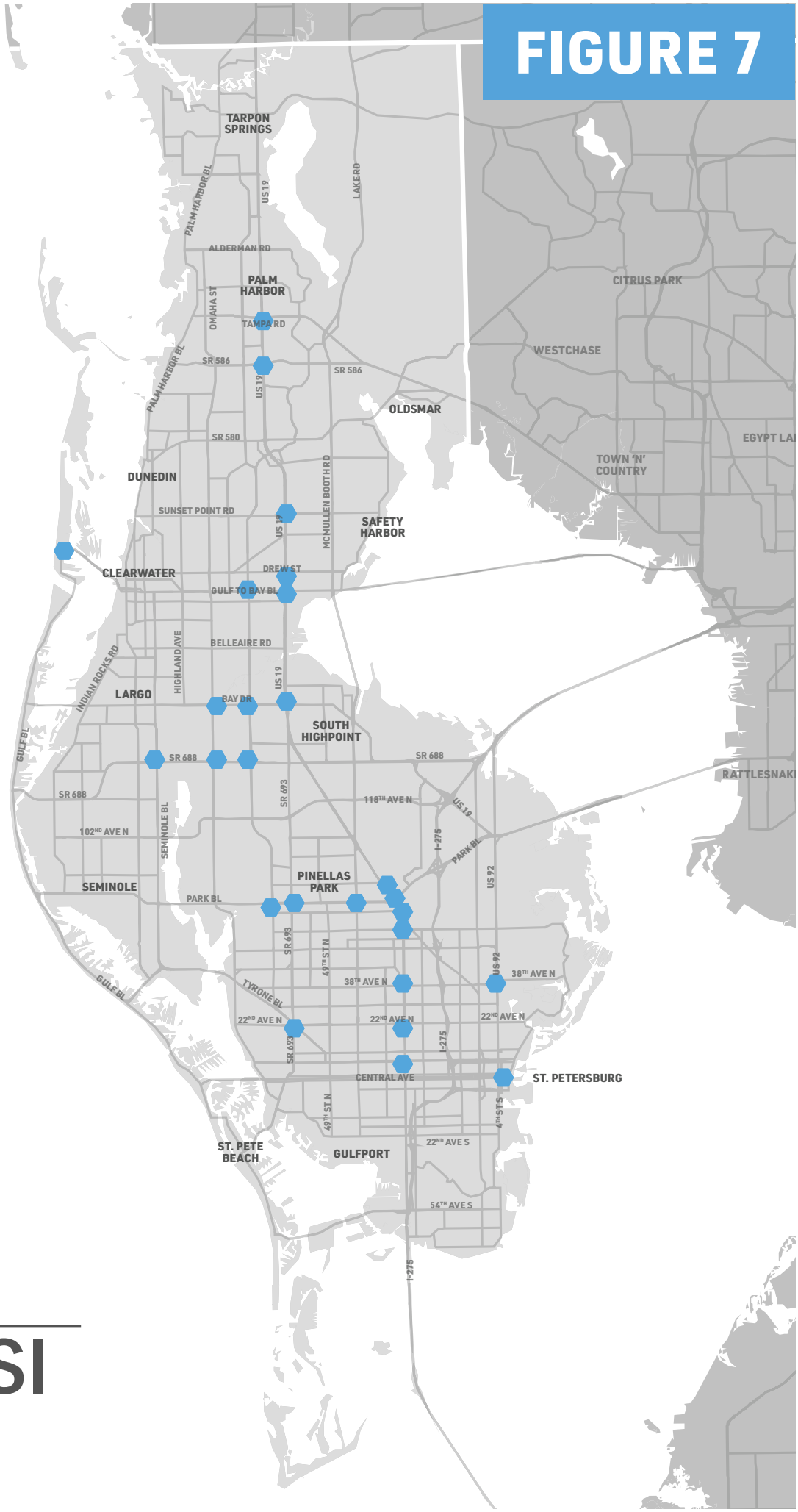


FIGURE 7



TOP 25 KSI

COLLISION LOCATIONS

2015 – 2019

Demonstration Project Planning

Appendix C

SAFE STREETS PINELLAS

Memorandum

Date:	November 16, 2020
To:	Sarah Caper, AICP, Forward Pinellas
From:	Kathrin Tellez, AICP, PTP, Fehr & Peers Laura Herrscher, AICP, PGA
Subject:	**Safe Streets Pinellas** **Nursery Road/Duke Energy Trail Demonstration Summary**

Introduction

Several demonstration projects are being developed and implemented as part of the Safe Streets Pinellas project, which is the Vision Zero effort for Pinellas County. The goal of these demonstration projects is to build interest around Vision Zero by showcasing how transportation safety projects, including transportation safety campaigns, can be implemented in Pinellas County and to test countermeasures that could be included in the Vision Zero Action Plan. The nature of the demonstration projects varies and incorporates a range of elements. The concept, process followed, and intended performance measures for each demonstration will be documented in a series of memos and the final Action Plan.

This memorandum summarizes an educational event that was held at the Nursery Road crossing of the Duke Energy Trail and serves as an update to our technical memorandum dated July 14, 2020 (attached for reference). As the demonstration projects also serve as a guide to future collaborations between Forward Pinellas and partner agencies, the following describes pre-event activities, day-of-event activities, and an event summary.

Event Preparation

Pinellas County and the City of Clearwater had planned to install a rectangular rapid flashing beacon (RRFB) at the Duke Energy Trail crossing on Nursery Road, which was identified as a potential safety device that could be installed at the crossing after a May 2019 collision in which a bicyclist was killed while crossing the roadway at this location. Numerous factors are considered in the identification of identify candidate locations for RRFB installations, including the posted speed limit and prevailing travel speeds, amount of vehicle travel, amount of bicycle and pedestrian travel, expected yielding rates, number of travel lanes and crossing distance, and presence of parking. Additional details are provided in the July 14, 2020 memorandum.

Installation of the RRFB was scheduled for October 2020. Since RRFBs are not new to Pinellas County, the demonstration project was centered around honoring the crash victim, Carmen Charrez, as well as education around how to correctly use the device as both a person who is driving, or a person who is walking or bicycling.

Prior to the event

Prior to the event, there were several coordination calls between Forward Pinellas, City of Clearwater, and Pinellas County staff to finalize the construction schedule and other event details. Field visits were also conducted around the time the RRFB was being installed to document the process. The following specific items were conducted in preparation for the event:

- Create Save the Date notice to disseminate via e-mail, social media, and website to communicate date, time, location, and event details sent two weeks prior to event (see Figure 1

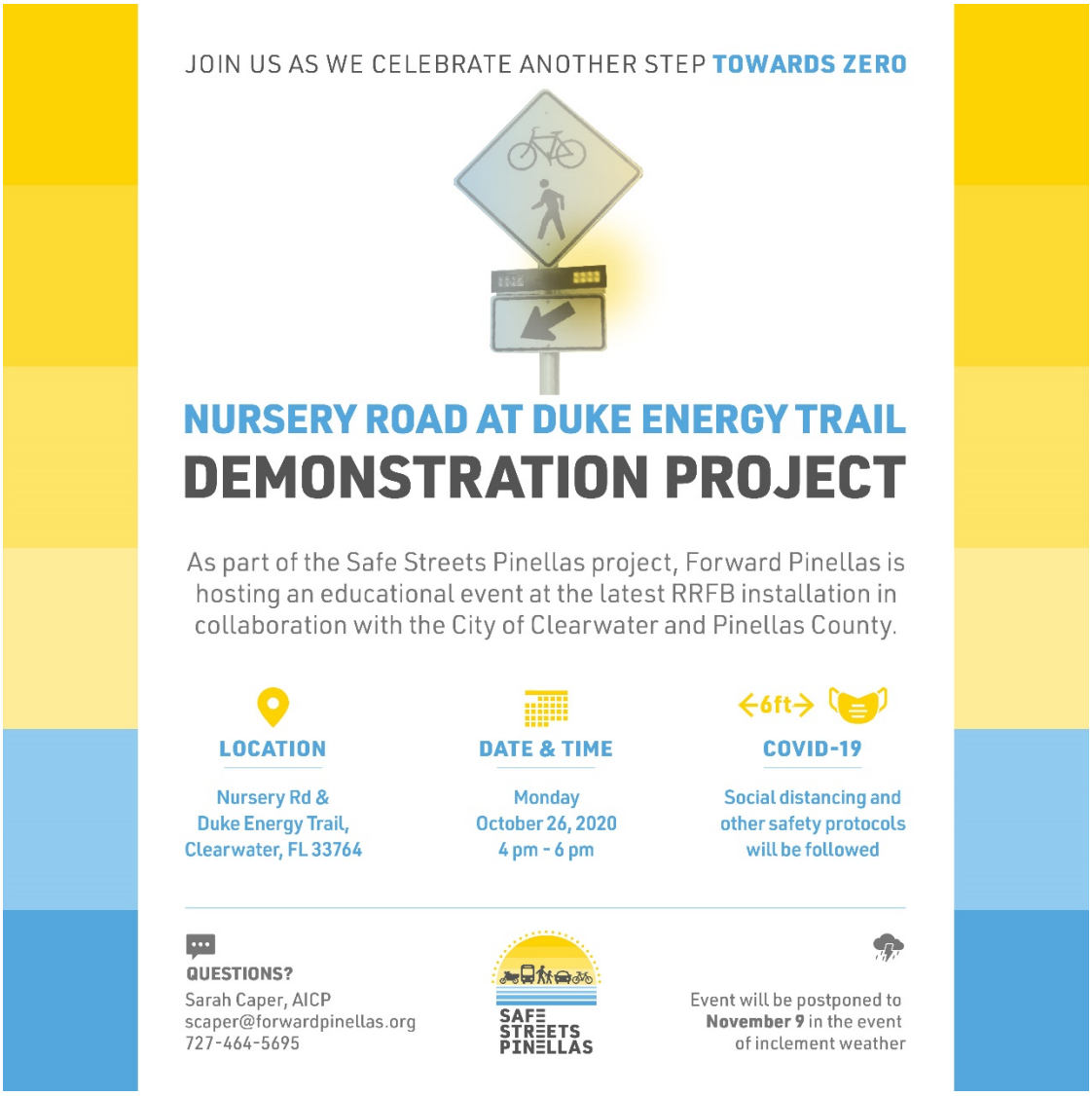


Figure 1 Save the Date Announcement

- Outreach to the family of the crash victim to coordinate their participation as well as installation of a memorial
- Outreach to local media with press release and invitation to the event
- Coordinate with Task Force, Ambassadors and local government staff
- Develop COVID-19 protocols and plan for social distancing, sanitizing, etc.
- Develop materials list for day of event, including tables, table clothes, tents, pens, garbage bags, clip boards, tape, tape measure, easels, safety vests, sanitizing items, velocity reader, Safe Streets Pinellas stencils and spray chalk, water, and snacks, and identify team member responsible for bringing each item
- Develop informational materials, such as the collision summary board (See Figure 2)
- Develop survey instrument and QR code with printed cards and QR code displays to obtain feedback from trail users and event attendees
- Develop/source educational materials (Figure 3) and other items, such as the Safe Streets Pinellas coloring books, pins, and logo bags
- Prepare name tags for elected officials, local government staff, and project team staff attending event

Staff from Forward Pinellas and the consulting team arrived a few hours early to set-up the tables, place Safe Streets Pinellas logos on the trail surface, and prepare for the event.



Figure 2 Collision Trends Board

In addition to honoring the crash victim, Carmen Charrez, another focus of the event was to raise awareness of the purpose of RRFBs and the correct usage for all roadway users. Custom educational materials were developed and are available as a 5 X 7 flyer, as well as electronically for use on social media.

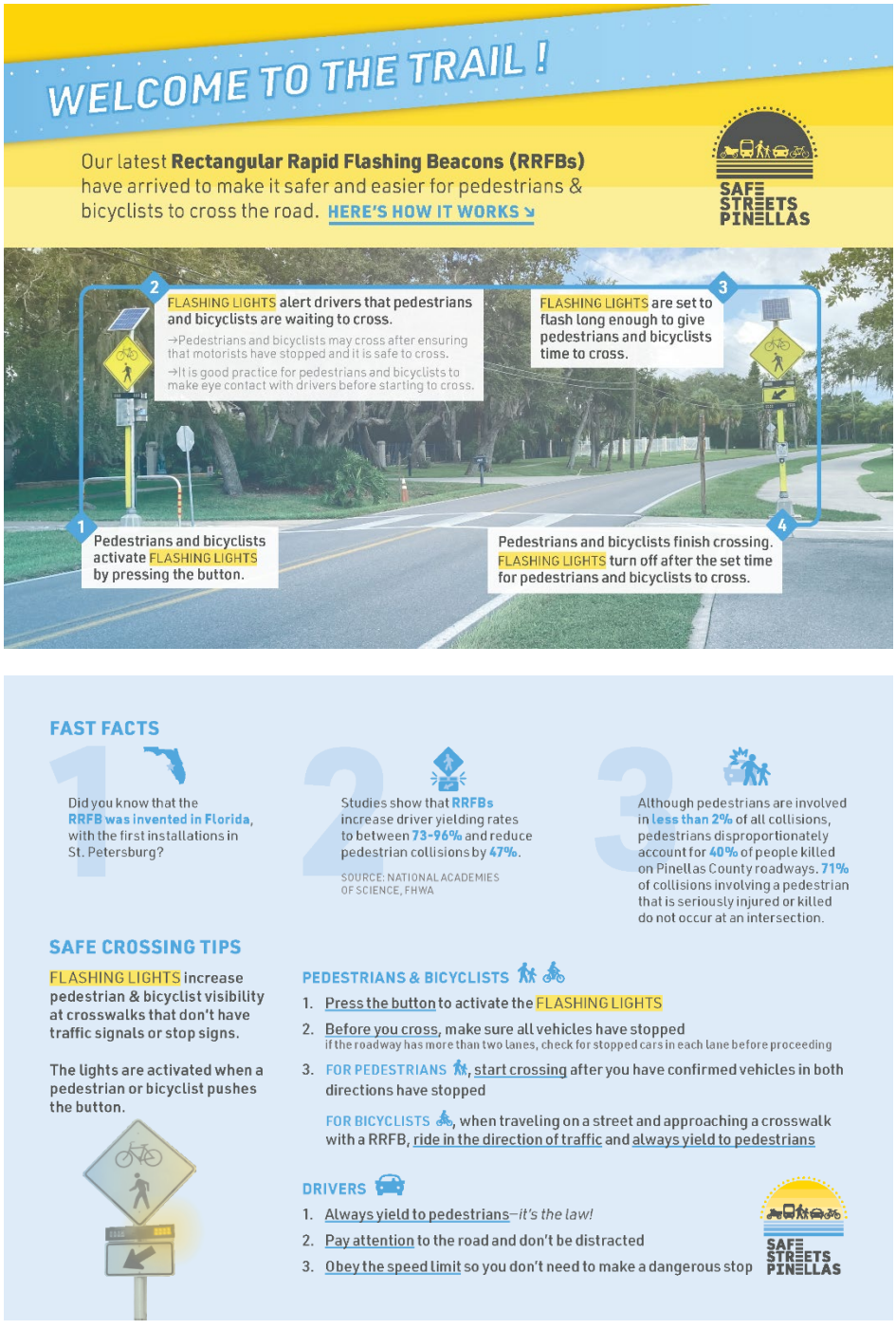


Figure 3 RRFB Educational Flyer

Event Summary

The event was held on Monday, October 26, 2020 from 4:00 – 6:00 PM and consisted of three main elements.

1. Ceremony honoring the victim of a fatal collision at this location

Family members and friends of the crash victim, Carmen Charrez, attended the event and ceremony to unveil a roadside memorial. Commissioner Dave Eggers began by acknowledging how safety improvements such as RRFBs will increase roadway safety and underscored the importance of the Safe Streets Pinellas project because there is much more work to be done in driving down fatal and serious injury crashes on the transportation system. The victim's sister spoke on behalf of the family and expressed their hope that other lives will be saved because of the attention and recognition that improvements must be made. Whit Blanton, Forward Pinellas Executive Director, concluded the ceremony by discussing the importance of creating a safety-focused culture of all users of the transportation system. The roadside memorial was unveiled.

2. Public engagement and education

This demonstration was an opportunity to provide education about proper use of an RRFB and general safety information for trail users. A tent and table on either side of the road were set up with educational materials, a feedback survey with QR code to access, comment forms, and staff to answer questions and discuss the Safe Streets Pinellas project with trail users. Forward Pinellas Staff were also interviewed by local media outlets, and video of use of the RRFB was collected for use in developing a public safety video.

On this day, there were about 25 trail users during the two-hour event, which is in the range of recorded trail users for other days (15 to 35 users in a 2-hour period). The record high temperatures on this day may have deterred some from using the trail during the event time period. Comments were collected and some included concerns about speeding, high truck traffic, and a lack of regard for safety around the trail crossing. Suggestions included speed bumps to enhance traffic calming. Comment forms and completed surveys are included in the final plan documentation.

3. Informal observations and data collection of trail users and motorists

Data collection and observations of traffic and trail user behavior were taken during the event. A velocity reader was used to gauge the speed of vehicles approaching the RRFB; vehicle, pedestrian, and bicyclist counts were taken, correct use and yielding to the RRFB were observed and recorded, as well as other data and general observations. General summary of data and observations during the demonstration event:

- 12 pedestrians
- 9 bicyclists
- All pedestrians activated RRFB to cross
- 2 bicyclists activated RRFB to cross
- Vehicle yield rate to RRFB was 89 percent
- Speeds captured ranged from 15-55 mph (posted speed is 35 mph)
    - Average speed – 37 mph
    - 50th percentile – 50 mph
    - 85th percentile – 43 mph
    - Average speeds were higher for vehicles traveling eastbound on Nursery Road

Lessons Learned

This was the first collaboration of Forward Pinellas with the City of Clearwater and Pinellas County to host an educational event at a new RRFB. While the event overall was a success, there were elements that could be improved and other elements that were unexpected, like record temperatures in October.

Successes

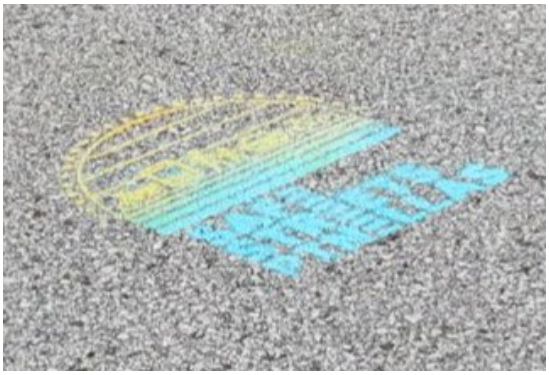
- RRFB was installed and operational as scheduled prior to the event
- Memorial sign was installed prior to the event to family specifications
- Materials developed for this event are available for future events
- High yield rate suggests a positive impact of the RRFB, and is consistent with other published data on the benefits of RRFBs

Opportunities for Refinement

- Event activities and visibility may have impacted speed and behaviors; vehicles may have traveled slower and yielded at higher rates due to the level of activity during the event, meaning that the observed yielding rates may not reflect typical conditions, and more typical travel speeds could be higher that documented. Plan for data collection to occur separate from a large event that could skew results.
- Low use of RRFB by bicyclists may indicate the placement of the buttons may not be convenient to the travel path of the trail. Push buttons are typically placed to maximize visibility by people driving (near-side of crossing) which is a less convenient place for people who are bicycling to activate. At other crossings, installation of dual push buttons could be considered as well as passive activation, meaning the trail user does not need to push the button. However, these design treatments tend to significantly add to the cost of device installation and could reduce the number of locations where safety devices are installed.
- Other treatments that could be considered paired with an RRFB include speed feedback signs, additional pavement markings and advanced warning signs, and the potential for targeted enforcement. A more expansive treatment would be to widen the roadway in the vicinity of the crossing to provide a median refuge as a way to introduce horizontal deflection in the path of vehicle travel, and allow people who bicycle and walk to cross one lane of travel at a time. However, those types of improvements can often require reconstruction of the roadway.

Event Photos













This completes our summary of the Nursery Road demonstration project. Please call Kathrin Tellez at (321) 754-9902 if you have questions.

Memorandum

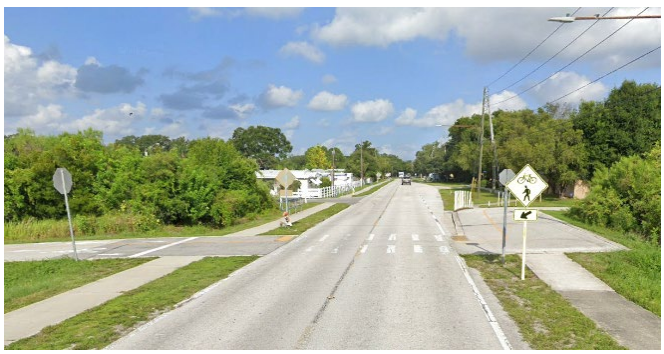
Date:	July 14, 2020
To:	Sarah Caper, Forward Pinellas
From:	Kathrin Tellez, Fehr & Peers Laura Herrscher, PGA Peyton McLeod, PGA
Subject:	**Safe Streets Pinellas Nursery Road Demonstration Project Concept**

Introduction

Up to four demonstration projects are scheduled to be developed and implemented as part of Safe Streets Pinellas. The goal of these demonstration projects is to build interest around Vision Zero by showcasing different transportation safety projects and transportation safety campaigns can be implemented in Pinellas County, and to test potential countermeasures that could be included in the Vision Zero Action Plan. The nature of the demonstration projects will be varied and incorporate a range of elements. Discussion with the project Task Force and Forward Pinellas staff, and review of historical collision data, led to interest in conducting a demonstration project at trail crossings. Based on a review of the collision data, and conversations with Pinellas County and City of Clearwater staff, the Duke Energy Trail crossing of Nursery Road (Figure 1) was identified as a candidate demonstration project location.

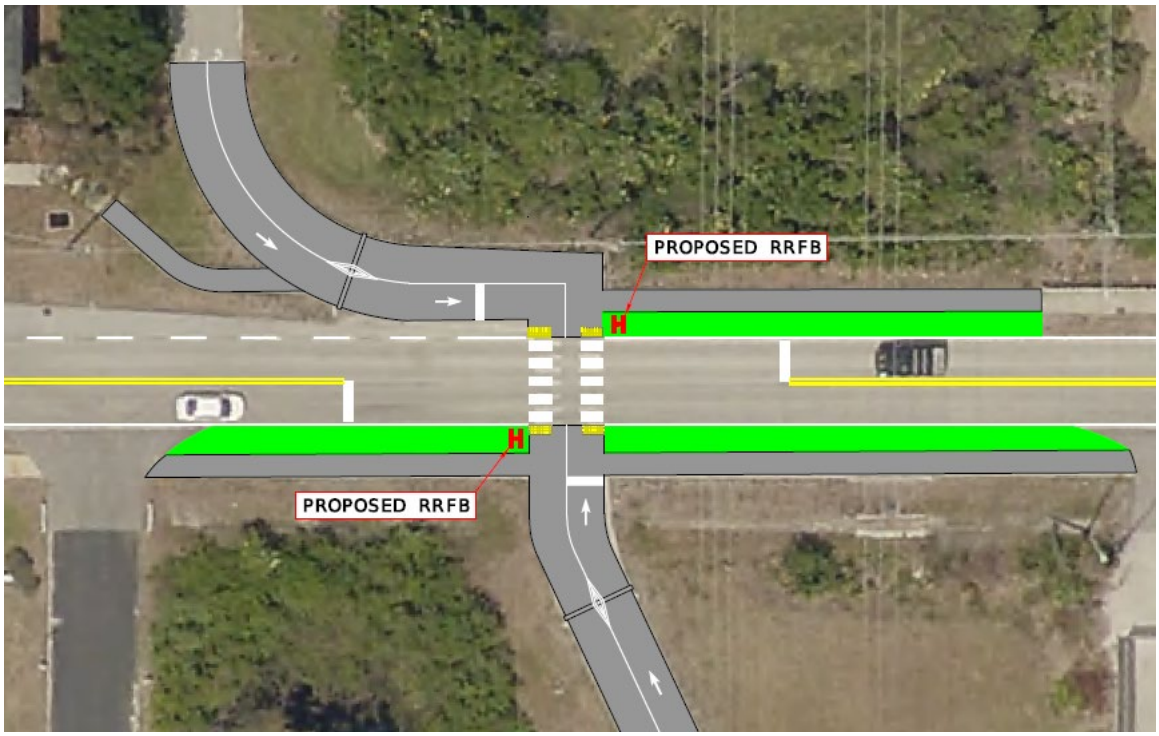
Figure 1. Duke Energy Trail Crossing at Nursery Road





Pinellas County and the City of Clearwater are planning to install a rectangular rapid flashing beacon (RRFB) at this location using the County's standard design plans for RRFBs. This installation was identified after a May 2019 collision in which a bicyclist was killed while crossing Nursery Road at the Duke Energy Trail. As part of the research conducted to determine the appropriateness of an RRFB at this location, the County collected extensive data that includes video-based trail user counts by mode, motor vehicle speed, and volume data for Nursery Road at the trail crossing. Preliminary discussions with County staff indicate installation of the RRFB could be coordinated with the demonstration project. A concept plan of the standard RRFB design at the crossing is shown as Figure 2.

Figure 2. Preliminary RRFB Concept



The following summarizes an evaluation of the crossing to identify if an RRFB is the most appropriate crossing treatment, and if there are other crossing treatments that could be paired with installation of an RRFB. Following the evaluation, two demonstration project options are outlined for consideration by Forward Pinellas, Pinellas County and the City of Clearwater, followed by a discussion of next steps.

Crossing Evaluation

As shown on Figure 1, Nursery Road is a two-lane roadway. It has a posted speed limit of 35 miles per hour, and based on data collected in 2019, the average daily traffic volumes on Nursey Road at the crossing are approximately 6,500 vehicles per day. Average speeds for vehicles approaching the crossing are in-line with the speed limit of 35 miles per hour; however, the 85th percentile speed of vehicles approaching the crossing is 40 miles per hour. On a typical summer

day, between 20 and 50 pedestrians and between 20 and 75 bicyclists cross Nursery Road at the Duke Energy Trail (variation due to day of week and weather).

Operations of the trail crossing were evaluated to confirm the appropriateness of the previously identified RRFB and identify other potential candidate crossing treatments. For this assessment, we used the Xwalk+ tool developed by Fehr & Peers based on research from the National Cooperative Highway Research Program, Federal Highway Administration, Institute of Transportation Engineers' (ITE) Pedestrian/Bicycle Council, and interviews with various cities throughout the country. The tool combines academic research on crosswalk treatment effectiveness with national best practices. Key inputs for the tool are noted below, with the inputs used for this analysis noted in parenthesis:

- speed limit (or observed speed if available) (40 miles per hour)
- crossing volume (15 pedestrians/bicyclists in peak hour)
- roadway volumes (650 vehicles in peak hour)
- crossing distance (20 feet)
- number of lanes (2 lanes)
- presence of bicyclists (yes)
- presence of transit (no)
- presence of a median (no)
- presence of on-street parking (no)
- expected motorist compliance (yielding) (moderate)

Based on the results of the assessment (analysis worksheet is attached), the level of service (LOS) for pedestrians and bicyclists crossing Nursery road is poor (LOS F), primarily due to the prevailing speed of vehicles traveling on Nursery Road. Results of the analysis indicate that a RRRB is an appropriate crossing treatment, that could also be paired with high visibility crosswalk markings, advance yield lines and advance signage for maximum benefit. A demonstration project on Nursery Road at the Duke Energy Trail could incorporate some or all of these elements, in addition to an educational component.

Demonstration Project Options

Two options are proposed for a demonstration project at this location. Option 1 would tie the demonstration project to the installation of the RRFB and include educational and awareness components. Option 2 includes temporary installation of safety countermeasures and an educational event to raise awareness of pedestrian and bicyclist safety. The second option is provided in the event that installation of the RRFB is scheduled beyond the 2020 calendar year with Option 1 being the preferred demonstration project option.

Option 1 - Coincides with RRFB Installation

Based on the initial conversation with staff from Forward Pinellas, Pinellas County, and City of Clearwater, installation of the RRFB could occur within the next three to six months. An education and awareness campaign centered on the installation itself would raise awareness about the proper use of RRFBs. Since observational data was recently collected, this option offers an opportunity to conduct a before and after study of data.

Phase 1 (before RRFB installation)

- Review and summarize previously collected volume (trail and road) and speed data, including notable findings such as speed by direction, trail volume, and time of day user counts to identify nighttime and use of the trail after closing hours.
- Conduct a motorist yielding study by reviewing existing video footage using an established protocol for what constitutes appropriate yielding behavior.
- Assist with potential refinement of the standard RRFB plan such as identifying other crossing enhancements, additional trail signage and markings, roadway signage and markings, and crossing treatments.
- Coordinate with Pinellas County and City of Clearwater to determine feasibility of temporary enhancements to test during Phase 2. Some temporary features could be:
    - an extended barrier along the north side of the trail to better channelize pedestrian and bicycle movements to the crosswalk
    - a mirror for southbound trail users to aid in the crossing
    - temporary lighting
    - refreshed trail pavement markings if not part of planned improvements
- Prepare a detailed logistics plan for remaining Phase 1 and Phase 2 activities.
- Share pre-event information on social media platforms to raise awareness.
- Encourage Task Force and project ambassadors to share event information with their networks.
- Conduct outreach with Bike/Walk Tampa Bay and other interested advocacy groups.
- Inquire whether family members of the crash victim would like to participate in the event and share their story.
- Invite media to attend and participate.
- Encourage members of these groups, Task Force members, and others to gather at the event to demonstrate a visible presence at the site.

Phase 2 (with RRFB installation)

- Convene a team of event facilitators on site to coordinate the event, collect data, take photos, coordinate social media messaging, and support other needs of the event. Depending on the complexity of the final event, and the number of temporary crossing elements, a minimum of 6 people would be needed to stage the event. For an event with more temporary elements that require set-up, monitoring, and removal, approximately 10-12 people would be needed. It is expected that the event would include Forward Pinellas staff, local government staff, task force members, and consultant staff members.
- Prepare and disseminate educational materials about how to use the RRFB. Other related educational materials could also be handed out.
- Conduct trail volume counts while on-site to supplement existing data, use for event documentation, and inform elements of the before and after study.
- Prepare a trail user survey to gather input and feedback
- Prepare and staff an “energizing station”

  - Stock table with water, snacks, Safe Streets Pinellas project information, and general safety materials.
  - Hand out survey cards with website and information about completing the survey. Survey responses will provide useful information such as origin and destination of trail trips, trip purpose, demographics, user knowledge of RRFBs, desired trail system improvements, other safety concerns, etc.

Phase 3 (after RRFB installation)

- Conduct a second motorist yielding study and compare results to Phase 1 findings. It is not recommended to conduct this task during Phase 2 to avoid effects related to the awareness event.
- Prepare report summarizing before and after study findings, notable trends, event participation with performance measurements, and survey results.

Option 2 - Temporary Demonstration Project

Option 2 describes temporary features that can be installed prior to the RRFB if it appears the timing of Pinellas County's project will not coincide with the schedule and pace of the Safe Streets Pinellas project. Many elements are the same as Option 1 and will inform the final Safe Streets Pinellas improvement plan.

Phase 1

- Review and summarize previously collected volume (trail and road) and speed data, including notable findings such as speed by direction, trail volume, and time of day user counts to identify nighttime and use of the trail after closing hours.
- Conduct a motorist yielding study by reviewing existing video footage using an established protocol for what constitutes appropriate yielding behavior.
- Assist with potential refinement of the standard RRFB plan such as identifying other crossing enhancements, additional trail signage and markings, roadway signage and markings, and crossing treatments.

  Through the course of contributing to the design, we would identify crossing elements that could be installed on a temporary basis, including advanced stop markings, Safe Streets Pinellas logo on the crossing approach, additional trail channelizers to discourage street crossings outside of the crossing, median signage indicating that vehicles must yield to pedestrians within the crosswalk.

  Pending the resources of partner agencies, a speed trailer could be staged on Nursery Road in advance of the crossing to alert drivers to their travel speed during the event. If available, temporary signage could also be installed for the duration of the demonstration. All materials for the demonstration project would be selected to be temporary in nature and allow for an evaluation for a more permanent installation.

- Prepare a detailed logistics plan for remaining Phase 1 and Phase 2 activities, based on the final design of temporary crossing elements.
- Share pre-event information on social media platforms to raise awareness.
- Encourage Task Force and project ambassadors to share event information with their networks.
- Conduct outreach with Bike/Walk Tampa Bay and other interested advocacy groups.
- Inquire whether family members of the crash victim would like to participate in the event and share their story.

- Invite media to attend and participate.
- Encourage members of these groups, Task Force members, and others to gather at the event to demonstrate a visible presence at the site.

Phase 2 (without RRFB installation)

- Convene a team of event facilitators on-site to implement the temporary design identified in Phase 1. As more elements are expected to be temporary in nature, it is expected that up to 10-12 people might be needed to stage the event and will include Forward Pinellas staff, local government staff, task force members, and consultant staff.
- Share information about permanent improvements planned for the crossing.
- Conduct trail volume counts while on site to supplement existing data, use for event documentation, and inform elements of the before and after study.
- Prepare a trail user survey to gather input and feedback
- Prepare and staff an “energizing station”
    - Stock table with water, snacks, Safe Streets Pinellas project information, and general safety materials.
    - Hand out survey cards with website and information about completing the survey. Survey responses will provide useful information such as origin and destination of trail trips, trip purpose, demographics, user knowledge of RRFBs, desired trail system improvements, other safety concerns, etc.

Phase 3 (Design Feedback)

- Prepare report summarizing event participation with performance measurements, survey results, and assessment of effectiveness of temporary crossing elements.
- Contribute to the final design of crossing treatments based on feedback from the demonstration project.

Next Steps

We welcome discussion about each demonstration project option. Once an option has been selected, we will begin with Phase 1 planning.

The schedule for Option 1 will largely depend on coordination with Pinellas County and City of Clearwater staff, availability of preliminary design plans, and the potential schedule of RRFB installation. The schedule for Option 2 would be dependent on partner availability to select a date, and provide feedback on temporary measures, but could be implemented within 2 months.

Following review and discussion with partner agencies a final plan with details on needed materials, volunteers and event logistics will be prepared.

Attachment:

Trail Crossing Assessment

XWalk+

Location Nursery Road at Duke Energy Trail

User Kathrin Tellez

Date : 7-14-2020

Type Uncontrolled Intersection

Input Parameters	Value	Intersection Characteristics	Yes	No
Speed Limit	40	Frequent at-grade transit?	○	●
Peak Hour Pedestrian Vol	15	Bicycle lanes?	○	●
Major Road Peak Hour Volume Total	650	Heavy bicycle traffic?	●	○
Major Road Peak Hour Vol Dir 1	300	Major/minor road intersection?	○	●
Major Road Peak Hour Vol Dir 2	350	Midblock/off-set intersection?	●	○
Avg Pedestrian Walking Speed	3	Heavy truck traffic?	○	●
15th Percentile Crossing Speed	3	Existing infrastructure limit treatments?	○	●
Ped start-up/end clearance time	5	On-street parking?	○	●
Pedestrian Crossing Distance	20	Downtown area?	○	●
1st Half Crossing Distance	10	Built-up area of an isolated community?	○	●
2nd Half Crossing Distance	10	Median refuge island?	○	●
Number of Lanes	2	Sufficient width for a median?	○	●
Actual Total Pedestrian Delay	0			
Expected Motorist Compliance	Moderate			

◀ 1 of 2 Recommendations ▶

Overhead Flashing Beacon or In-Pavement Flashers

TREATMENT IDENTIFICATION MATRIX FOR UNCONTROLLED LOCATIONS

PEDESTRIAN LEVEL OF SERVICE	EXPECTED MOTORIST COMPLIANCE		
	LOW (or Speed > 35 MPH)	MODERATE	HIGH
LOS A-D (average delay up to 30 seconds)	**LEVEL 3** 2 Lane Road: In-Pavement Flashers, Overhead Flashing Beacons Multi-Lane Road: RRFB Plus LEVELS 1 and 2	**LEVEL 2** Curb Extentions, Bus Bulb, Reduced Curb Radii, Staggered Pedestrian Refuge Plus LEVEL 1	**LEVEL 1** High Visibility Crosswalk Markings, Advanced Yield Lines, Advance Signage
LOS E-F (average delay greater than 30 seconds)	LEVEL 4 PHB*, RRFB, or Direct Pedestrians to Nearest Safe Crossing Plus LEVELS 1, 2, and 3	**LEVEL 3** 2 Lane Road: In-Pavement Flashers, Overhead Flashing Beacons Multi-Lane Road: RRFB Plus LEVELS 1 and 2	**LEVEL 2** Curb Extentions, Bus Bulb, Reduced Curb Radii, Staggered Pedestrian Refuge Plus LEVEL 1

Signalized or Unsignalized Crossing?	Unsignalized Crossing
Pedestrian LOS	F
Candidate Pedestrian Treatment Identified	**Overhead Flashing Beacon or In-Pavement Flashers**
Candidate for Median Refuge Island?	NO
Candidate for Road Diet?	NO
Other Treatments for Consideration**	RRFB
Paired Treatments for Consideration**	Curb Extensions, Bus Bulb, Reduced Curb Radii, Staggered Pedestrian Refuge, High Visibility Crosswalk Markings, Advance Yield Lines, Advance signage

Memorandum

Date:	December 15, 2022
To:	Chelsea Favero, AICP, Forward Pinellas
From:	Kathrin Tellez, AICP, PTP, Fehr & Peers Peyton McLeod, PTP, PGA
Subject:	**Safe Streets Pinellas Demonstration Project 1st Ave S @ 2nd St S – St. Petersburg**

Introduction

Among the demonstration projects developed and implemented as part of Safe Streets Pinellas, the installation of a protected intersection concept was identified for the intersection at 1st Avenue S and 2nd Street S in St. Petersburg. The City of St. Petersburg substantively completed construction of the improvement in May 2022, with minor work continuing into the summer. Details of the process and intersection treatment are documented in a prior memorandum dated October 9, 2020 (provided as Attachment A). A memorandum dated January 18, 2021 documented initial "Before" installation roadway user behavior to compare to "After" installation data (provided as Attachment B). This memorandum builds upon the prior analysis to document "After" data and provide a comparison of observations made during the two data collection periods. The results of a community survey are also presented.

Overall Findings

The results of the data collection and survey effort indicate that construction of the protected intersection elements has:

- Reduced the mean speed of right turning motorists from 17 mph to 16 mph, the 85th percentile speed from 23 to 19 mph, and reduced the maximum observed turning speed from 32 mph to 24 mph, indicating that the demonstration project treatment has been effective in reducing the likelihood of serious injury or death resulting from future potential collisions with vulnerable users.
- Reduced the frequency of near-miss events at the intersection between people walking/bicycling and people driving.

Additionally, the project has received a favorable response the residents who participated in the survey and the city has not received any negative feedback as of the date of this technical memorandum.

Project Photos

Aerial and ground level pictures were taken of the intersection after completion of the project, with highlights below shown in Figures 1 through 6. Before photos are provided in the prior documents.



Figure 3: Side Aerial View with Top of Photo Facing South

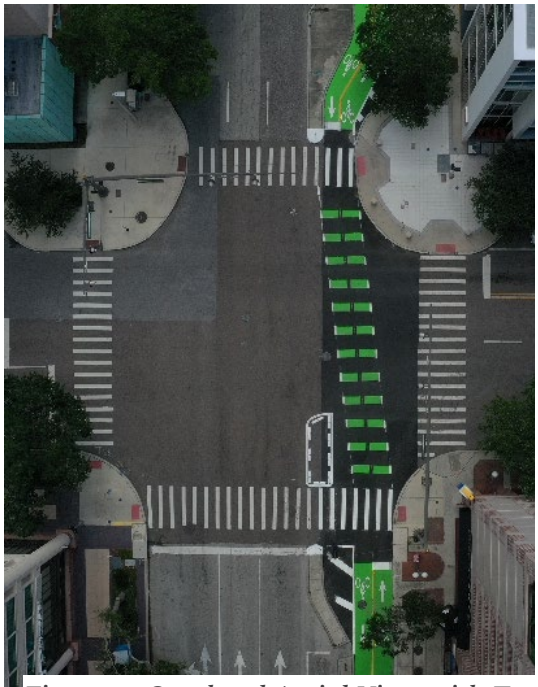


Figure 2: Overhead Aerial View with Top of Photo Heading East

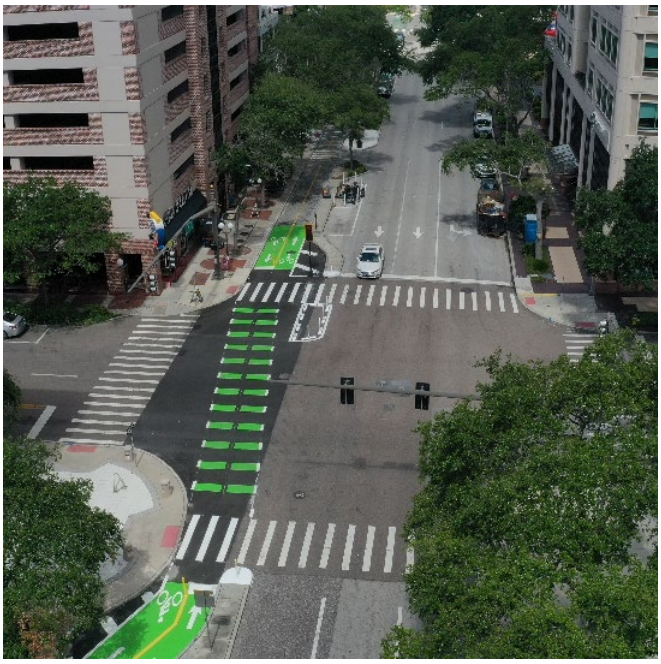


Figure 1: Side Aerial View with Top of Photo Facing West



Figure 4: Ground Level Bicycle Crossing Facing West



Figure 5: Ground Level Cycle Track Facing East



Figure 6: Bicycle and Pedestrian Crossing Facing West

Data Collection

The Pinellas Trail operates as a two-way cycle track through the urban downtown area in St. Petersburg where there is a high volume of bicycle and pedestrian travel that conflicts with vehicles turning right from 1st Ave S to 2nd St S. Pre-installation data collection took place in November and December 2020, totaling approximately 4.5 hours of observations across a weekend morning and several weekday periods. Post-installation data collection followed a similar schedule, consisting of 90-minute periods on Thursday, September 8, 2022 (11:30 AM – 1:00 PM), Tuesday, September 13, 2022 (4:30 – 6:00 PM), and Saturday, September 2022 (9:00 – 10:30 AM), and supplemented by additional speed data collected on the afternoon of Friday, October 14, 2022; the first of these periods experienced a significant thunderstorm that started towards the end of the data collection period.

Primary data elements observed during the Before and After data collection periods are summarized in the tables below.

Vulnerable User Counts – Before (on Pinellas Trail Crossing 2nd St S)

User Type	Count (Total)	Count (Weekend)	Count (Weekday)
Bicycle	154	144	10
Pedestrian	139	82	57
Scooter	10	8	2
Skateboard	0	0	0
Total	303	234	69

Vulnerable User Counts – After (on Pinellas Trail Crossing 2nd St S)

User Type	Count (Total)	Count (Weekend)	Count (Weekday)
Bicycle	125	95	30
Pedestrian	210	100	110
Scooter	8	4	4
Skateboard	5	3	2
Total	348	202	146

Overall, people walking and bicycling represent the majority of vulnerable roadway users (VRUs), defined as people outside of a vehicle, like a pedestrian or person in a wheelchair, crossing 2nd Street S. During the initial data collection period, people bicycling represented about 50 percent of the VRUs, decreasing to about 36 percent in the after-data collection period. There could be some seasonal reasons for the decrease in bicycling activity. Additionally, COVID-19 restrictions could have suppressed pedestrian activity during the before data collection period which took place in November and December of 2020.

The behavior of people walking and bicycling across the intersection along the trail was also documented. Before the treatment, about half of people walking started crossing the intersection when the don't walk sign was illuminated. That level increased to about 63 percent with the intersection treatment. When these crossing instances were noted, there were no conflicting vehicle movements. The number of people bicycling on a red light stayed about the same between the before and after condition (about 70 percent).

Pedestrian Crossing Starts by Signal Phase

Pedestrian Signal Phase	# Incidents (groups crossing) - Before	# Incidents (groups crossing) - After
Walk	40	56
Flashing Don't Walk/Countdown	14	22
Don't Walk	32	74

Bicycle Crossing Starts by Signal Phase

Bicycle Signal Phase	# Incidents (groups crossing) - Before	# Incidents (groups crossing) - After
Green	44	54
Yellow	0	0
Red	20	26

The level of people driving yielding to people in the crosswalk when both roadway users had the green light was also documented, with a notable increase in non-yielding behavior with the implementation of the project. Caution should be used as this is a relatively low sample size; however, additional treatments such as implementing a leading pedestrian interval could give people walking and bicycling a head start to the crossing and make them more visible to drivers.

Drivers Yielding on Green to Bikes/Peds Crossing

Yield	Before	After
Yes	44	19
No	4	11
Total	**48**	**30**

Speed data for people driving and making the eastbound right turn was also documented, with a modest decrease in the mean travel speed, but almost an 18 percent reduction in the 85th percentile speed and a 25 percent decrease in the maximum speed from 32 miles per hour to 24 hours per hour, reducing the likelihood that a crash between a right-turning vehicle and someone in the crosswalk would result in a fatality.

Eastbound Right Turn Speed (1st Ave S to 2nd St S)

Characteristic	Speed (mph) – Before	Speed (mph) – After
Sample Size	95	40
Minimum Speed	5	3
Maximum Speed	32	24
Mean Speed	17	16
50th Percentile	16	16
85th Percentile	23	19

During the approximately 5 hours of observations when the above data was collected, two near miss interactions were noted. Near misses are events that could have resulted in a crash if one of the roadway users had not taken evasive action. It is notable that the frequency of near misses has decreased with implementation of the project as there were 13 near mises observed during a similar time frame in the before condition.

Summary of Conflicts/Near Misses (After Period Only)

Trail User Mode	Mode in Conflict	Observation of Conflict
Bicycle	Vehicle	Motorist braked hard to avoid collision with two bicyclists crossing with the signal
Pedestrian	Vehicle	Pedestrian stopped to avoid motorist who had failed to yield

Crash data was also reviewed and since the start of construction there have been six reported crashes at the intersection. Four were property damage only and the remaining two resulted in a non-incapacitating injury. One crash involved the eastbound right-turn movement, where a driver making the eastbound right-turn across the trail failed to yield the right-of-way and struck a bicyclist. The person bicycling suffered non-incapacitating injuries. The driver was cited for failing to yield the right-of-way.

Public Feedback

Part of the project evaluation is feedback from the general public to gauge if there is support for this type of treatment not only at the intersection of 1st Avenue S and 2nd Street S but at other similar intersections in the area. Since completion of construction in August 2022 and the writing of this technical memorandum, the City of St. Petersburg has not received any unsolicited feedback, either positive or negative, from the public. As is common, when people perceive something to be positive or neutral, feedback is typically not received. An on-line survey was developed and disseminated to the public in conjunction with information about the project, as shown on **Figure 7**. The flyer includes educational information about the treatment and the overall project goals. A sticker with a QR code linking people to a survey was attached to flyers that were handed out to business along the corridor after completion of construction. Information about the project was also shared through the St. Petersburg social media channels as well as at various city committee meetings. A copy of the survey questions is provided as **Attachment B**.

The survey was open for about 4-weeks with 14 completed surveys; all survey respondents live in St. Petersburg. While this is a low response rate and the findings of the survey are not statistically significant, coupled with the lack of complaints to the city and the overall positive responses from the survey respondents, it appears that overall people are generally in support of the project as it improves the comfort and safety for people walking and bicycling while not significantly changing the experience for people driving. The following provides some key highlights of the survey responses:

- About 60 percent of respondents travel through the intersection about once a week, about 25 percent at least once a day, and the remainder about once a month or less.
- 75 percent bicycle through the intersection and the remainder walk. Vehicle drivers were not represented in the survey results.
- 33 percent have not had a near-miss incident at the intersection. Of those who described their near-miss experiences, most were related to people driving not yielding to people walking or bicycling through the intersection. A frequent bicyclist through the intersection noted that the instances of people driving making the turn when they are still in the crosswalk has decreased dramatically since the intersection modifications were implemented.
- About 75 percent of respondents noted that the visibility of people walking and bicycling has improved this this improvement was implemented.

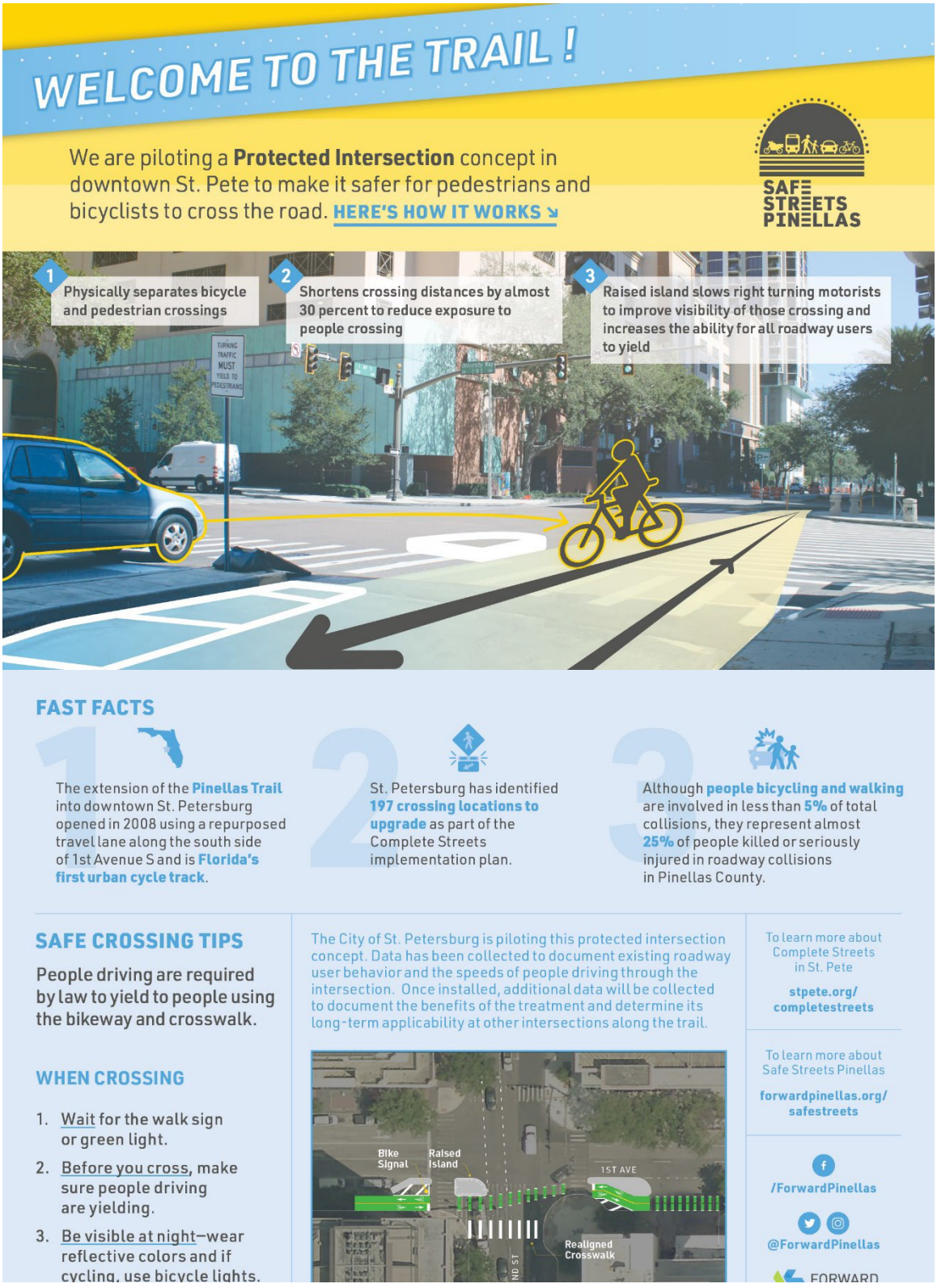


Figure 7: Protected Intersection Flyer

- Top three safety concerns at this intersection of the respondents are:
    - People driving too fast
    - People driving not seeing people in the crosswalk
    - People driving not coming to a complete stop before turning right across the crosswalk/people driving not obeying the signal indication
- All respondents would be supportive of the treatment becoming permanent at this location and expanded to other locations along the trail
- Other feedback received includes:
    - *"This is a great safety improvement. Please make it permanent and keep up the good work. Also, please close Central Ave to cars. Thanks!"*
    - *"Make pedestrians/folks on bikes the priority. Educate everywhere and always so folks now how to use these new devices. What's the etiquette so that all (drivers and vulnerable walkers/bikers) are working together for safe travels. Folks should know… when you visit DTSP with your vehicle, you are secondary to the mobile humans not encased in two-ton metal on wheels."*
    - *"I'm all for more of these bikeways being added across the city. Many areas could definitely use them."*
    - *"It's so helpful. It truly makes more people choose to bike when it is safer."*
    - *"We need pedestrian safety all over St. Petersburg and a vast sidewalk network!"*

Project Costs

As others look to implement low-cost and quick build safety improvements, it is important to understand the range of costs associated with the planning, design, construction, and evaluation components. The City of St. Petersburg also plans to replicate the improvement at several other locations along the corridor and keeping track of the costs can support grant applications and ensure sufficient funding is available.

For this initial pilot project, the planning, conceptual design, and evaluation costs were borne by Forward Pinellas as a part of the Safe Streets Pinellas project. This included:

- Working with the City of St. Petersburg to identify a potential transportation safety improvement that could be piloted in the city as a part of the Safe Streets Pinellas project
- Development of detailed concept plans
- Conduct before data collection and documentation related to speeds, near-misses, yielding behavior and signal compliance
- Conduct after data collection and documentation related to speeds, near-misses, yielding behavior and signal compliance
- Develop public engagement materials, including educational flyer and survey

The planning, concept plan, and evaluation costs totaled about $25,000.

Preparation of the construction design documents cost the city approximately $20,000. This included some one-time research costs of material options and treatment standards. Designs for subsequent similar treatments in St. Petersburg would likely be significantly less.

Construction of the project occurred in mid-2022 at a time when significant supply chain issues were being experienced related to building materials, specifically the green paint used to paint the bicycle facilities. Additionally, as the construction project is small in comparison to typical projects, the contractor was unable to take advantage of economies of scale. The construction cost totaled about $65,000, which included about $10,000 in paint costs to refresh the green lane markings along the east side of the roadway.

In total, the planning, design, construction and evaluation costs for the protected intersection and other associated elements was about $110,000. It is expected that subsequent treatments can be constructed elsewhere in the city for a much lower overall cost.

Summary

The results of the data collection and survey effort indicate that construction of the protected intersection elements has:

- Reduced the mean speed of right turning motorists from 17 mph to 16 mph, the 85th percentile speed from 23 to 19 mph, and reduced the maximum observed turning speed from 32 mph to 24 mph, indicating that the demonstration project treatment has been effective in reducing the likelihood of serious injury or death resulting from future potential collisions with vulnerable users.
- Reduced the frequency of near-miss events at the intersection between people walking/bicycling and people driving.

Additionally, the project has received a favorable response the residents who participated in the survey and the city has not received negative feedback as of the date of this technical memorandum.

While the overall results of the assessment are positive in terms of slowing people driving and reducing the frequency of near-miss events, there are a few potential opportunities for enhancements based on the low rates of compliance with the pedestrian signal, indicative that the signal timing may not be reflect of the urban environment. It is recommended that as part of a larger effort throughout downtown that the city consider:

- Reducing overall cycle lengths (45 to 60 seconds is common in urban areas with compact intersections, like much of downtown St. Petersburg).
- Implementing leading pedestrian intervals to allow people walking and bicycling to have a head start to become more visible to people driving.
- Eliminate the parking space on the south side of 1st Avenue S just west of 2nd Street to improve the visibility to drivers that there may be a cyclist about to enter the intersection and evaluate other intersections where parked vehicles could impede the visibility of trail users.

This completes our after assessment of the demonstration project for the protected intersection at 1st Avenue S at 2nd Street. Please contact Kathrin at k.tellez@fehrandpeers.com or (321) 754-9902 if you have questions.

Attachment A Safe Streets Pinellas Demonstration Project 1st Ave S @ 2nd St S – St. Petersburg – Before Data

Attachment B Survey Questions

Attachment A

Memorandum

Date:	October 9, 2020
To:	Sarah Caper, Forward Pinellas
From:	Kathrin Tellez, Fehr & Peers Laura Lockwood-Herrscher, Patel, Greene, and Associates
Subject:	**Safe Streets Pinellas** **1st Avenue S at 2nd Street Protected Intersection Demonstration Project Concept**

Introduction

Several demonstration projects will be developed and implemented as part of the Safe Streets Pinellas project. The goal of these demonstration projects is to build interest around Vision Zero by showcasing how transportation safety projects and transportation safety campaigns can be implemented in Pinellas County and to test safety countermeasures that may be included in the Vision Zero Action Plan. The nature of the demonstration projects is expected to vary and incorporate a range of elements. The concept, process followed, and intended performance measures for each demonstration will be documented in a series of memos and the final Action Plan.

Project Context

The City of St. Petersburg has identified the intersection at 1st Avenue S and 2nd Street S as a location to test the effectiveness of protected intersection concepts, as the intersection incorporates an urban crossing of the Pinellas Trail and has a high volume of bicycle and pedestrian travel that conflicts with turning vehicles. In 2008, the extension of the Pinellas Trail into downtown St. Petersburg opened using a repurposed travel lane along the south side of 1st Avenue S and is Florida's first urban cycle track. This segment of the trail travels within an urban environment along a one-way street with on-street parking and dense intersection spacing. Collision history at this intersection is minimal, but as bicyclists and users of the trail have increased, the potential for additional conflicts with vehicular traffic is rising and numerous close calls have been observed at several intersections along 1st Avenue S. Safety improvements along the trail are under consideration by the City and protected intersection treatments at 5th Street S and 6th Street S have already been designed with initial concepts. A street level Google Maps image of the intersection is provided in Figure 1.



Figure 1 *Source: Google Maps*

Protected intersections improve safety for bicyclists and pedestrians as they cross intersections. Corner islands, curb extensions, and colored paint are used to delineate the bicycle path across an intersection, parallel to the crosswalk and can allow a two-stage left turn. Figure 2 is an example of a protected intersection.



Figure 2 *Source: John Greenfield*

Approach

This demonstration project is intended to help inform City design standards for permanent protected intersections, and provide proof of concept to City staff, decision makers and the public. It will also serve as an example for other communities in Pinellas County. The demonstration project would use nonpermanent materials to install protected crossing elements at the southeast quadrant of the intersection at the location of the Pinellas Trail, and would not change the existing curb line.

Elements are planned to include:

- Physical barriers consisting of temporary curbing (Tuff curb), flexisticks, delineator posts and other approved materials
- Shape, size, and location of curb extensions and corner refuge islands
- Painted elements, such as forward stop bars and colored paint for the crossings
- Signal timing modifications, such as leading bicycle intervals
- Relocation of existing bicycle signal

Several meetings have been held amongst Forward Pinellas Staff, City transportation and engineering staff, and staff from the Safe Streets Pinellas consultant team to further develop the design concept, materials to be used, and duration of the temporary installation. Forward Pinellas and the consultant team will be responsible for developing scaled concept plans with materials specifications. City of St. Pete staff will be responsible for signing and sealing (if needed) the concept plan into a construction document and coordinating with other City departments and/or a contractor to install the demonstration project elements.

Performance Measures

Part of the demonstration project is the collection/documentation of before and after data to determine if the temporary design treatments yield the expected safety benefits. As part of the demonstration, we plan to collect and summarize the following information:

Before Installation

- Review and summarize overall collision history (2015 – 2019)
- Observe driver yielding behavior
- Observe bicyclist and pedestrian behavior
- Conduct spot speed survey of drivers turning from eastbound 1st Avenue S to 2nd Street S

Within Six-Weeks of Installation

- Observe driver yielding behavior
- Observe bicyclist and pedestrian behavior
- Conduct spot speed survey of drivers turning from eastbound 1st Avenue S to 2nd Street S
- Develop user-survey in collaboration with St. Pete and Forward Pinellas staff to solicit feedback from community

Longer-Term Performance Measures

- Review and summarize overall collision history post installation
- Track/monitor frequency of repair and replacement of elements, including the curb elements, delineators, and pavement markings

It is expected that the consultant team will partner with St. Pete and Forward Pinellas Staff for the before and near-term documentation of performance measures, with St. Pete responsible for the documentation of longer-term performance measures, if that information is desired. The before and short-term after performance measures findings will be summarized in a technical memorandum and incorporated into the final Action Plan.

Next Steps

A draft concept plan was presented and discussed on October 1, 2020. Based on that discussion and the feedback received, a refined concept plan is being prepared and will be provided to Forward Pinellas and St. Pete in advance of our next scheduled discussion on October 20, 2020. We expect one final round of revisions to finalize the concept plan and associated materials list.

The before installation performance measures documentation will be scheduled to occur within the next four weeks, with a goal for the consultant team to observe at least 100 interactions and obtain 100 vehicle speeds. A detailed data collection plan will be prepared and shared with St. Pete and Forward Pinellas prior to the commencement of data collection.

The after installation performance measures will be scheduled within six weeks of installation, provided installation occurs prior to December 31, 2020.

Attachment B

Memorandum

Date:	January 18, 2021
To:	Sarah Caper, AICP, Forward Pinellas
From:	Kathrin Tellez, AICP, PTP, Fehr & Peers Laura Herrscher, AICP, PGA
Subject:	**Safe Streets Pinellas Demonstration Project 1st Ave S @ 2nd St S – St. Petersburg**

Introduction

As part of the demonstration projects developed and implemented as part of the Safe Streets Pinellas project, the installation of a protected intersection concept was identified for the intersection at 1st Avenue S and 2nd Street S in St. Petersburg. The City of St. Petersburg plans to construct the improvement in the next few months. Details of the process and intersection treatment are documented in a technical memorandum dated October 9, 2020. The purpose of this memorandum is to document initial "Before" installation roadway user behavior to compare to "After" installation data.

Data Collection

The Pinellas Trail operates as a two-way cycle track through the urban downtown area in St. Petersburg where there is a high volume of bicycle and pedestrian travel that conflicts with vehicles turning right from 1st Ave S to 2nd St S. On Saturday, November 7, 2020 data and observations were taken between 9 – 10:30 am at the southeast quadrant of the intersection of 1st Ave S and 2nd St S where the improvements will be installed. Data were subsequently collected during several weekday periods throughout December 2020 for a total of approximately three hours. A copy of the data collection instrument is attached.

Collecting this information before the improvement is constructed will provide base level data to compare against after the improvement has been open for use. During the data collection windows, approximately 300 vulnerable roadway users were observed crossing the intersection, and 95 people driving vehicles were observed making the eastbound right-turn. Several near misses were also observed. These are defined as an incident that could have resulted in a collision, but one or more roadway users took evasive action.

Key observations include:

- People driving yielded to people walking and bicycling 92 percent of the time.
- More than half of pedestrian groups started crossing the intersection either on the walk countdown or during a do not walk phase (53 percent)
- About 30 percent of bicycling groups started crossing the intersection on red light
- The mode split between bicyclists and pedestrians is notably different on the weekend (64 percent bicycles) than on weekdays (15 percent bicycles)

Vulnerable User Counts (on Pinellas Trail Crossing 2nd St S)

User Type	Count (Total)	Count (Weekend)	Count (Weekday)
Bicycle	153	144	10
Pedestrian	139	82	57
Scooter	10	8	2

Crossings by Signal Phase – Total

Pedestrian Signal Phase	# Incidents (groups crossing)	Bicycle Signal Phase	# Incidents (groups crossing)
Walk	40	Green	44
Don't Walk	32	Red	20
Flashing/Countdown	14		

Crossings by Signal Phase – Weekend

Pedestrian Signal Phase	# Incidents (groups crossing)	Bicycle Signal Phase	# Incidents (groups crossing)
Walk	19	Green	39
Don't Walk	20	Red	18
Flashing/Countdown	6		

Crossings by Signal Phase – Weekday

Pedestrian Signal Phase	# Incidents (groups crossing)	Bicycle Signal Phase	# Incidents (groups crossing)
Walk	21	Green	5
Don't Walk	12	Red	2
Flashing/Countdown	8		

Eastbound Right Turn Speed (1st Ave S to 2nd St S)

Characteristic	Speed (mph) - Total	Speed (mph) - Weekend	Speed (mph) - Weekday
Sample Size	95	35	60
Low Speed	5	14	5
High Speed	32	32	32
Mean Speed	17	21	16
50th Percentile	16	19	14
85th Percentile	23	28	19

Vehicle Yield on Green to Bike/Peds Crossing

Yield	Total	Weekend	Weekday
Yes	44	7	37
No	4	1	3





Summary of Conflicts/Near Misses

Trail User Mode	Mode in Conflict	Observation of Conflict
Bicycle	Vehicle	Very close call with a WB bicyclist and EB motor vehicle turning right. Signal was green for both, but driver failed to see bicyclist in the crosswalk. Both came to a complete stop facing each other in the crosswalk
Pedestrian	Vehicle	EB vehicle turning right on green signal stopped in crosswalk for 3 pedestrians
Bicycle and Scooter	Vehicle	2 bikes and 1 scooter crossing on red signal stopped midway in crosswalk when vehicle traveling NB on 2nd St approached and had green signal (vehicle had right of way)
Bicycle	Pedestrian	Pedestrian traveling SB crossing 1st Ave with "walk" signal (right of way) had near miss with bike traveling WB on trail with red signal. Bike swerved to miss pedestrian
Bicycle	Vehicle	Near miss for group of 3 bicyclists crossing on red signal with vehicle traveling SB on 2nd St with green light
Pedestrian	Vehicle	Near miss for 2 pedestrians crossing on "don't walk" signal with vehicle traveling NB on 2nd St. Vehicle came to a halt and waited for them to finish crossing.
Bicycle	Vehicle	EB cyclist yielded to vehicle turning right on green (both had green)
Bicycle	Vehicle	2 bicyclists waited in crosswalk for SB vehicle with green signal to pass – close
Bicycle	Bus	Bus turning right on green signal did not yield to 6 bicyclists also with green signal
Pedestrian	Vehicle	2 EB pedestrians crossing against the signal almost hit by motorist
Vehicle	Vehicle	Near rear end collision related to first motorist yielding to trail user
Bicycle	Vehicle	Bicyclist crossing against the signal had to brake hard to avoid collision
Pedestrian	Vehicle	Motorist had to brake hard to avoid collision with pedestrian crossing against the signal

Key Findings

The observations and data collection result in the following key-findings:

- Average vehicle speed through the intersection was 17 miles per hour, which is about the upper limit of survivability for a vulnerable roadway user who is hit by vehicle. Speed ranged from 5 to 32 miles per hour.
- Low compliance of vulnerable road users (VRUs) with bicycle and pedestrian signals
    - Compliance seemed to depend on whether the signal was red or already green upon arrival.
    - Only two instances of VRUs waiting for a green/walk signal were noted.
- Two incidents with bus:
    - Bus did not come to complete stop for red light, slowing to 14 mph, no VRUs present in crosswalk.
    - Bus did not yield to bicyclists using trail crossing when light was green for both vehicles and trail users. Bus slowed to 20 mph for turn.
    - Speed of buses observed turning were faster than one would have expected.
- Near misses:
    - Multiple near misses due to non-compliance of signals by VRUs
- Observed NB bicyclists using general use lanes and not complying with traffic signal.
    - One observation of a bicyclist having to stop in the middle of the intersection to avoid oncoming traffic from the opposite direction.

This completes our initial data collection summary. Please contact Kathrin Tellez at (321) 754-9902 if you have questions.




HIPPO


HIPPO

Pinellas Trail Bikeway User Survey

Thank you for your feedback on our protected intersection pilot project. Your feedback as well as a data-driven safety and speed related evaluation will be used to determine if the City of St. Petersburg should deploy similar intersection treatments elsewhere along the Pinellas Trail bikeway, and at other locations in the city.

1. 1. How often do you use the bikeway in downtown St. Pete?

Mark only one oval.

- ◯ a. Every day
- ◯ b. Once a week
- ◯ c. 2-3 times a month
- ◯ d. Once a month
- ◯ e. This is my first time
- ◯ f. Never
- ◯ Other: _____

2. 2. I typically travel through the intersection of 1st Avenue South and 2nd Street South using a(n):

Mark only one oval.

- ◯ a. Bicycle
- ◯ b. Just my feet (walking)
- ◯ c. E-Scooter
- ◯ d. Skateboard
- ◯ e. Roller Blades
- ◯ f. Motorcycle
- ◯ g. Vehicle
- ◯ h. Bus
- ◯ Other: _____

3. 3. Have you had a near-miss incident at this intersection or other intersection along the bikeway? A near-miss is defined as an “almost” collision, but someone took evasive action to prevent the collision. If yes, please describe in "other" section.

Mark only one oval.

- ◯ a. Yes
- ◯ b. No
- ◯ Other: _____

4. 4. How do you think this project has improved safety at the intersection?



Mark only one oval.

- a. It hasn't
- b. Eastbound right-turn vehicles seem to be driving slower
- c. Visibility of bicyclists and pedestrians has improved
- Other: _____

5. 5. How concerned are you about your overall safety while using the bikeway through downtown St. Pete?

Mark only one oval.

- a. Not at all concerned
- b. Somewhat concerned
- c. Very concerned
- d. Only when crossing an intersection
- e. Concern for my safety keeps me from using the bikeway downtown
- Other: _____

6. 6. Select your top three safety concerns at the intersection of 1st Avenue South and 2nd Street South:

Check all that apply.

	First	Second	Third
a. People driving too fast	☐	☐	☐
b. People driving not seeing people in the crosswalk	☐	☐	☐
c. People driving not obeying traffic signal	☐	☐	☐
d. People driving not coming to a complete stop before making right-turns	☐	☐	☐
e. People in crosswalk not visible enough to drivers	☐	☐	☐
f. Bikeway and sidewalk users not obeying traffic signal	☐	☐	☐
g. People driving are distracted	☐	☐	☐
h. People using the bikeway are distracted	☐	☐	☐
i. Conflicts between people bicycling and other bikeway users	☐	☐	☐
j. Signal cycle length is too short	☐	☐	☐
k. Signal cycle length is too long	☐	☐	☐
l. Other	☐	☐	☐

7. 7. Would you be supportive of this device or something similar being made permanent?

Mark only one oval.

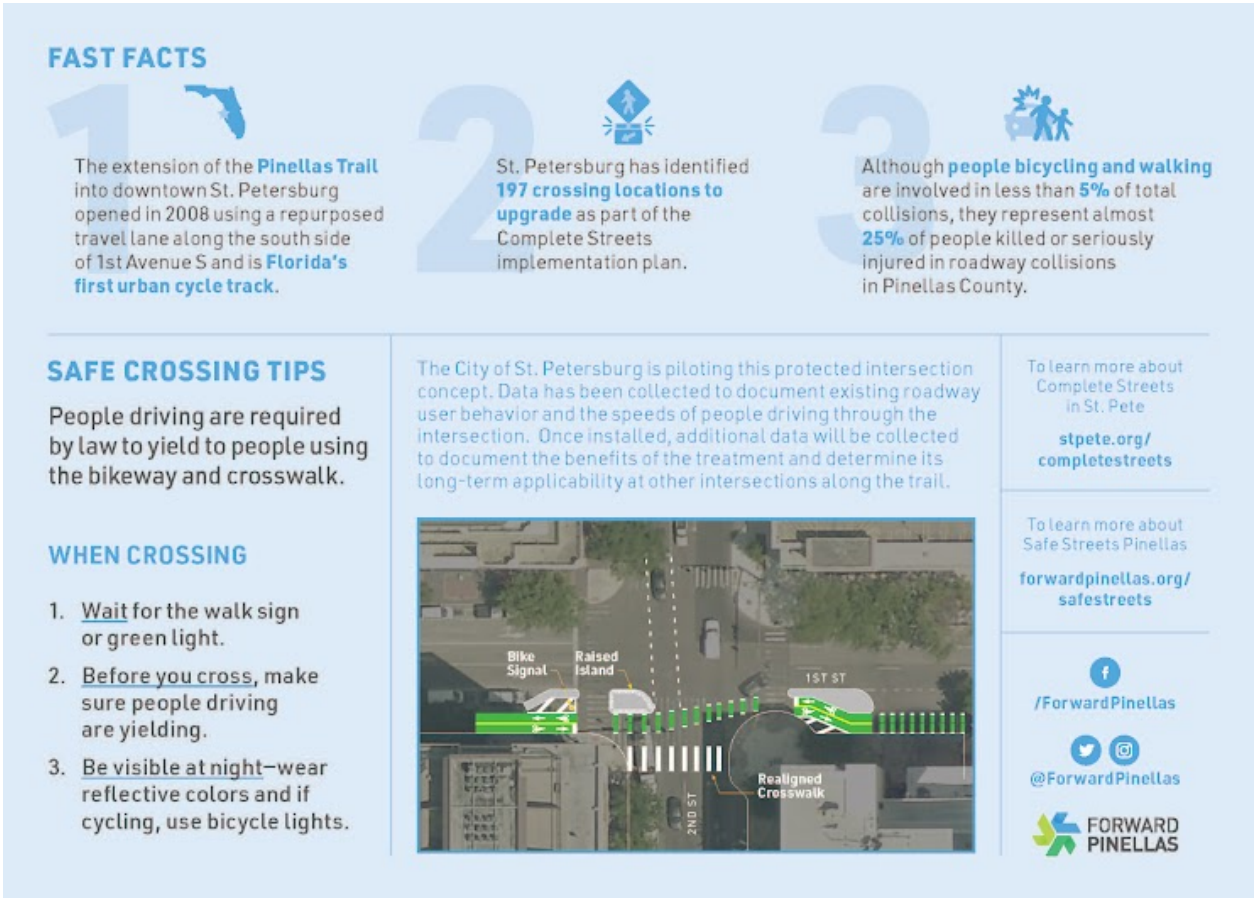
- Yes
- No
- Maybe

8. 8. Would you be supportive of this device or something similar deployed at other locations in St. Petersburg?

Mark only one oval.

- Yes
- No
- Maybe

9. 9. Is there any additional feedback you would like to provide? If you answered no or maybe to questions 8 or 9, a longer response here will help us understand your concerns as we work to make the transportation system safer for all roadway users in St. Pete and Pinellas County.



10. What is your residential zip code (optional)?

This content is neither created nor endorsed by Google.

Memorandum

Date:	February 2, 2023
To:	Chelsea Favero, AICP, Forward Pinellas
From:	Kathrin Tellez, AICP, PTP, Fehr & Peers
Subject:	**Safe Streets Pinellas** **Indian Rocks Beach Demonstration Project Process**

Introduction

As part of Safe Streets Pinellas project, several demonstration projects were planned in various contexts around the County with a goal of building interest around the Vision Zero movement by showcasing how transportation safety projects and transportation safety campaigns can be implemented in Pinellas County. Additionally, the demonstration projects will test safety countermeasures that will be included in the Action Plan and documented for future use and adaptation. The nature of each demonstration projects varies and incorporates a range of elements. The concept, process followed, and intended performance measures for each demonstration were documented in a series of memos and the final Action Plan.

Project Context

Four demonstration projects were identified for implementation as a part of Safe Streets Pinellas, including piloting a protected intersection concept in St. Petersburg (completed September 2022), a near-miss analysis in Dunedin (completed February 2021), and an educational event in the Clearwater area with the installation of a new traffic safety device (completed November 2020).

A desire to conduct a demonstration project in a beach community was expressed and Forward Pinellas approached Indian Rocks Beach (IRB) to discuss potential demonstration project opportunities. While few beach community roadways are on the High Injury Network, beach communities face different transportation challenges than other communities in the County, including higher levels of visitor activities, greater fluctuations in overall activity, and a more limited roadway network. Gulf Boulevard serves as the major roadway providing regional and local circulation in IRB.

To identify potential demonstration projects in IRB, Forward Pinellas convened a brainstorming session consisting of IRB, the Florida Department of Transportation (FDOT) and Forward Pinellas staff, as well as the consultant team, to discuss transportation challenges in IRB and identify potential demonstration projects.

This memorandum documents the ideas that were discussed and presents the refined demonstration project ideas that were identified to aid IRB, FDOT, and Forward Pinellas in selecting a demonstration project to advance. While ultimately no specific demonstration project was selected, the process did result in some changes to a resurfacing project that was underway at the time the demonstration projects were being discussed.

As Gulf Boulevard is the major roadway connecting the beach communities, the discussion, held on October 6, 2020, focused on the context of the various segments throughout IRB. The section north of 5th Avenue N., is operated and maintained by Pinellas County, and provides a typical 3-lane cross section, low-rise residential uses, sidewalks, and marked bicycle lanes. The portion south of 5th Avenue N. (SR 699) is maintained and operated by FDOT and provides a two-lane cross section for vehicles with a bicycle and pedestrian path flush with the roadway, delineated by pavement markings. Land uses along Gulf Boulevard south of 5th Avenue N. include a greater mixture of commercial and residential uses, with higher levels of development density.

The discussion focused on the segment of Gulf Boulevard between 5th Avenue N. and 1st Avenue as this area is a hub of activity for IRB. While some improvements have been installed, such as green backed bicycle lanes on northbound Gulf Boulevard at the approach to 5th Avenue N., there are opportunities to enhance the roadway to improve safety outcomes.

Several transportation challenges along the corridor were discussed:

- High density of unmarked pedestrian/bicyclist crossings at driveways and minor side- street intersections with Gulf Boulevard where drivers are not necessarily expecting pedestrians/bicyclists. Pedestrians/bicyclists are not clear on their designated path of travel. This creates confusion for all roadway users.
- Areas where the pedestrian path is not well defined, with degraded surfaces, plant overgrowth and other debris that decrease the effective width of the pedestrian path as well as its visibility as a pedestrian path. This results in pedestrians walking in lanes designated for other roadway users.
    - During the meeting IRB staff noted that they would coordinate internally to review procedures for notifying property owners about maintaining vegetation that extends into the public right-of-way.
- Drainage issues that result in water ponding in the pedestrian and bicycle areas and limiting the pedestrian and bicycle travel way.
- Vehicle travel speeds in excess of the posted limit.
- Vehicles observed using the bicycle/pedestrian path areas to pass other vehicles on the right, while other vehicles are waiting to make left-turns.

Forward Pinellas, in collaboration with the City of IRB and the non-profit organization IRB Action 2000, recently completed the City of Indian Rocks Beach Gulf Boulevard Visioning Study. The study identifies several transportation concerns in the area, including bicycle and pedestrian safety related to visibility along side streets and at crosswalks.

Some pictures along the corridor from 2020 are shown on the next page.






LUNCH
DINNER


KOLB PARK
October 23
BIKE LANE




STOP
FOR
PEDESTRIANS
IN
CROSSWALKS

Demonstration Project Ideas

Based on the discussion of transportation issues and challenges in IRB, four potential demonstration projects were identified, with a focus on Gulf Boulevard between 5th Avenue N. and 1st Avenue:

- Crosswalk plan
- Temporary raised crosswalk
- Evaluation of enhanced pavement markings
- Safety education campaign.

Additional details are provided below. Projects related to maintenance were not considered further, including pavement maintenance, maintaining landscaping, and removing debris, or those related to drainage issues. Drainage improvements were recently completed in the southern portion of IRB from Park Boulevard to 5th Ave N, which is expected to address some of the drainage issues identified. Completion of this project occurred in spring 2022 and was coordinated with an underground utility project.

Crosswalk Plan – The consultant team would develop a conceptual signing and striping plan for Gulf Boulevard between 5th Avenue N. and 1st Avenue. The plan would identify crosswalk design treatments for side-streets and driveways, including the potential for enhanced treatments in mixing and conflict zones. The plan could also identify the placement and spacing of markings for the pedestrian path. This plan could also identify the placement of delineators (flexisticks) at specific locations to create a visual barrier between the bicycle/pedestrian facilities and vehicle traffic. These could be at locations where vehicles routinely enter the bicycle and pedestrian area to pass a vehicle that is waiting to turn left. The plan could also include identification of locations to replace and/or install features such as truncated domes. It is expected that the concept plan would be converted by others into a construction document and installed by FDOT as part of a planned repaving project on Gulf Boulevard that is expected within the next 5 years.

Temporary Raised Crosswalk – The pedestrian crossing of Gulf Boulevard at 4th Avenue N. experiences high levels of pedestrian activity, as 4th Avenue N. provides public beach access across from retail and restaurant uses. As part of the demonstration project, the consultant team would develop a concept plan for a temporary raised crosswalk across Gulf Boulevard at 4th Avenue N.; since a potential temporary product is not on the FDOT approved products list, we would assist in the process to develop a developmental specification for the temporary device. One potential option is a rubberized speed table that can also serve as a raised pedestrian crossing. These speed tables are appropriate for roadways with speeds up to 30 miles per hour and have been installed in numerous other locations in the State, including Sarasota. As part of this project, the consultant team could also develop crosswalk marking plans for the currently unmarked crossing of 4th Avenue N. at Gulf Boulevard. A before/after study of vehicle speeds and yielding rates to bicyclists and pedestrians at the crossing would also be conducted. As the facility is owned and operated by FDOT, FDOT would be responsible for preparation of final construction documents, and installation of the temporary crossing device, pavement markings and signage.

Evaluation of Pavement Markings – There are three pedestrian crossings on Gulf Boulevard between 5th Avenue N. and 1st Avenue with a rectangular rapid flashing beacon. Despite the enhanced crossing device, some vehicles do not yield to pedestrians and drivers travel in excess of the posted speed along the corridor. Additional pavement markings, including horizontal signage, to alert drivers to the pedestrian crossing would be installed as part of this demonstration project option. Before and after field observations would be conducted to assess if the enhanced pavement markings were effective in reducing vehicle speeds across the crossing and improving

yielding behavior. For this demonstration project option, the consultant team would develop conceptual signing plans, and conduct before/after observations. As the facility is owned and operated by FDOT, FDOT would be responsible for preparation of final construction documents, and installation of the pavement markings and horizontal signage.

Safety Education Campaign – The IRB Visioning Study identified the need for an educational campaign to raise awareness of bicycle and pedestrian safety laws. An educational campaign could be developed as the demonstration project, which could include identification and development of traffic safety educational materials, including pedestrian and bicycle laws, rights, and responsibilities. The safety campaign could also reinforce the 30 mile per hour speed limit on Gulf Boulevard within the city limits. We could also craft messages to post on the IRB website, social media or changeable message signs, and provide information to include in utility bills.

Information could also be developed in a format suitable for posting in various places around IRB where there are high levels of visitor activity that might not be reached through other means. The campaign could also identify locations to install speed feedback signs. We could also develop materials for IRB staff to share/promote at community events.

Data Collection

In addition to collaborative sessions to identify safety concerns, demonstration project ideas, and discussion about how the project would move forward, data collection was completed and documented separately in a memo dated December 22, 2020. The data helped the project team with decision making and further vet some of the ideas. Key findings from the data collection effort include:

- 85th percentile vehicle speed through the area is within the posted speed limit (30 miles per hour). Maximum observed speed was 36 miles per hour, with one driver observed being issued a speeding ticket during the observation window.
- High levels of people driving yielding to people crossing the roadway
- Multiple near misses occurred when there was vehicle congestion and sight distance for people driving northbound was blocked by vehicles waiting to make a southbound left-turn
- During the observation window, 20 percent of crossing activities of Gulf Boulevard at 4th Avenue North occur outside of the designated crossing location

Based on a review of the collision data and the field observations, some additional considerations for incorporation into a demonstration project were developed including:

- Incorporation of advance stop bars to help improve visibility of the intersection when vehicles are stopped in the corridor
- Installation of a raised intersection concept with crossings on both the north and south side of the intersection
- Decrease the curb radius at 4th Avenue North to decrease the effective crossing distance and slow vehicles turning to 4th Avenue North
- Shift the crosswalk south to eliminate the offset with the intersection; this could require reducing the effective driveway width to the public parking on 4th Avenue North, west of Gulf Boulevard

The full data collection summary is provided as Attachment A.

Demonstration Project Outcome

Ultimately, FDOT, IRB and Forward Pinellas could not agree on a specific demonstration project to pursue as a part of the demonstration project series for Safe Streets Pinellas. The construction of a temporary raised crosswalk was the preferred project of both Forward Pinellas and IRB staff, but at the time, FDOT staff were not supportive of the idea as there was not yet a standard developed for implementation of a temporary raised crosswalk on a roadway without curb and gutter. FDOT staff working on the drainage improvement were supportive of the incorporation of additional striping elements, and ultimately extended the green bike lane markings further south along the corridor, as shown in the photo below (view looking north from 4th Avenue N).



Other high conflict areas also received green bike lane conflict zone markings (view below is looking south from Miami Avenue).



Enhanced stencils to denote where people should walk or bike along the corridor were also included, as shown in the picture on the following page.



Lessons Learned

After several rounds of brainstorming sessions and open discussions with all parties, it was clear that consistency and compliance with state regulations and manuals, such as the Manual for Uniform Traffic Control Devices (MUTCD) and coordination with future resurfacing projects programmed in the FDOT Five-Year Work Program is essential. This memo documents the steps taken, lessons learned, and essential items to address for improvements along state roadways.

- Communication with all agencies and organizations should start as early as possible.
- Identify all key agency staff who should be involved in discussions from day one, including a champion that can help navigate the FDOT process.
- Determine main concerns/issues that could be addressed.
- Understand limitations, challenges, and obstacles:
    - Design guidelines/specifications
    - Manuals dictating how and what can be implemented
    - Approved materials
    - Process of approval
    - Funding
    - Process to pilot a treatment that is not included in a manual or specification, but has been proven elsewhere to achieve FDOT goals of reducing fatalities and serious injuries on our roadways
- Build consensus about a project(s) or countermeasure to move forward with and explore further with the agreement it would lead to implementation.
- Identify which agency and who at each agency is responsible for certain aspects, such as decision-making power over variations or exceptions.

Some essential considerations were also identified:

- Timeline/schedule of project.
- Other projects in the area running concurrently and/or programmed in the immediate future.

- Awareness of FDOT Five-Year Work Program and upcoming projects for resurfacing and reconstruction.
- Determine how performance will be measured.
- Develop a Community Awareness Plan to communicate the improvement, provide educational information and tools about safe use and benefits of safety countermeasures constructed.
- Future maintenance responsibilities and agreements that will need to be executed.
- Data collection and analysis efforts (if needed).
- Concept development and design plans
    - Who will be responsible for developing the concept(s)?
    - Who will be responsible for design plans and costs?
- Construction phase considerations
    - Who will pay for construction?
        - Awareness of funding types available
        - Eligibility of project for certain funding types
    - Maintenance of traffic and traffic control plans
    - Cost estimates
- Planning consistency requirements (TIP/STIP) for funding authorization and approval.

This completes the documentation of the Demonstration Project process for Gulf Boulevard in Indian Rocks Beach. Please contact Kathrin at k.tellez@fehrandpeers.com or (321) 754-9902 if you have questions.

- Attachment A Data Collection Summary – December 2020

Memorandum

Date:	December 22, 2020
To:	Sarah Caper, AICP, Forward Pinellas
From:	Kathrin Tellez, AICP, PTP, Fehr & Peers
Subject:	**Safe Streets Pinellas** **Indian Rocks Beach Demonstration Project**

Introduction

Several demonstration projects will be developed and implemented as part of the Safe Streets Pinellas project, which is the Vision Zero effort for Pinellas County. The goal of these demonstration projects is to build interest around Vision Zero by showcasing how transportation safety projects and transportation safety campaigns can be implemented in Pinellas County and to test safety countermeasures that could be included in the Vision Zero Action Plan. The nature of the demonstration projects will vary and incorporate a range of elements. The concept, process followed, and intended performance measures for each demonstration will be documented in a series of memos and the final Action Plan.

Several demonstration project alternatives are under consideration for Indian Rocks Beach, as detailed in our technical memorandum dated October 21, 2020, and include:

- Development of an enhanced crosswalk plan
- Installation of a temporary raised crosswalk
- Installation and evaluation of enhanced pavement markings
- Development of a safety education campaign

The preparation of a crosswalk plan or installation of a temporary raised crosswalk emerged as the ideas that should be further evaluated. To aid in the selection of the preferred demonstration project, some initial data was collected at a key location in Indian Rocks Beach to capture vehicle speeds as well as observe the behavior of people walking, driving and bicycling through the area.

Data Collection

The data collection effort focused on Gulf Boulevard at 4th Avenue North. Data was collected on November 27th between 10 AM and noon. It was a sunny and warm day with moderate levels of beach activity as it was a holiday. A velocity speed gun was used to assess the approximate speed of vehicles traveling both northbound and southbound on Gulf Boulevard at 4th Avenue North. Where there were platoons of vehicles, only the speed of the first vehicle was captured as

that vehicle set the pace for the remaining people driving. Observations of the behavior of all roadway users was also documented.

The intersection of Gulf Boulevard at 4th Avenue North provides public beach access and experiences high levels of pedestrian crossing activity. Land uses in the area include a mixture of uses including residential, lodging, restaurants, and retail. One vehicle travel lane is provided in each direction; a pedestrian path and bicycle path are provided in each direction flush with the vehicle travel way, delineated by pavement markings. In some places in the area, vegetation and degraded asphalt reduced the effective width of the pedestrian and bicycle travel way. At 4th Avenue North, the crosswalk placement is off set from the intersection by about 15 feet potentially due to the location of a driveway on the west side of the street. There is also parking on the east side of the crosswalk that can result in conflicts between parking maneuvers and bicyclist/ pedestrians traveling on Gulf Boulevard. There is a RRFB at the intersection. The current placement of the pushbuttons does not meet ADA requirements both in terms of distance of the push button from the crossing, and the orientation of the push button. The crosswalk markings are also faded. The speed limit on this section of Gulf Boulevard is 30 miles per hour. The speed limit transitions to 35 miles per hour around 28th Avenue North to the north, and around Park Boulevard to the south.

Key observations include:

- Vehicles yielded to people crossing the intersection 94 percent of the time (caution small sample size)
- Most people walking activated the RRFB (80 percent; 20 of 25 groups of people; 50 total people crossing street)
- About 20 percent of crossings occurred outside the designated crossing area, with some crossings occurring on the southside of the intersection, and other crossings occurring just outside the designated crossing, following a more direct path of travel
- Observed 85th percentile travel speeds were close to the posted speed limit; a person driving northbound was issued a ticket for speeding during the observation period. Maximum observed speed of travel for a person driving was 36 miles per hour during the observation period, as summarized below.
- A PSTA bus was observed traveling approximately 34 miles per hour

Vehicle Speeds

Characteristic	Speed (mph)
Sample Size	116
Max Speed – Northbound	36
Max Speed – Southbound	34
Mean Speed – Northbound	28.2
Mean Speed - Southbound	26.3
Mean Speed - Overall	27.3
85th Percentile – Northbound	31
85th Percentile – Southbound	30
85th Percentile – Overall	31

During the data collection period, there were several time periods when vehicle queues blocked the visibility of the pedestrian crossing for people traveling northbound in vehicles. Specifically, southbound vehicles waiting for a gap in traffic to either turn left onto 4th Avenue North, or into the CVS parking lot resulted in southbound vehicle queues. These queued vehicles blocked the ability of people traveling northbound from seeing a pedestrian crossing in the crosswalk. Two instances of hard breaking were observed, indicating that if the driver of the vehicle had not been paying attention, or had been traveling at excessive speeds, there may have been insufficient time and/or distance to stop the vehicle prior to colliding with a vulnerable roadway user.



Collision Review

Existing collision data was reviewed for the intersection influence area, representing all reported collisions at or within 300-feet of the intersection between 2015 and September 2020 (data available as of December 2020). During this time period, a total of 30 collisions were reported at the intersection, including two that resulted in severe or incapacitating injuries and one that resulted in a fatality, as shown on **Table 1**. Three collisions involved a person riding a bicycle, three collisions involved a person walking and two collisions involved a person driving a motorcycle. The remaining collisions involved only people in vehicles. The fatal collision involved a pedestrian, while the incapacitating collisions involved a person walking and a person riding a motorcycle.

Collision types are presented in **Table 2,** which shows that rear-end collision are the most frequent collision types at the intersection (50 percent). A rear-end collision is when the rear of one vehicle impacts the rear of another. Collisions involving a pedestrian, bicycle or hitting a fixed object each accounted for 10 percent of collisions. Angle collisions accounted for 6.7 percent of collisions. An angle crash occurs when two vehicles impact at an angle – for example, the front of one vehicle impacts the side of another vehicle. Sideswipes accounted for 3.3 percent of collisions. Sideswipe collisions are when two vehicles traveling in the same direction impact where the initial engagement does not overlap the corner of either vehicle. The impact swipes along the surface of the vehicle parallel to the direction of travel. **Table 3** presents contributing factors, which primarily include people driving in a negligent manner (30 percent), unknown or no information (20 percent), following too closely (16.7 percent), and failing to yield right-of-way (13.3 percent). Approximately10 percent of collisions involved improper backing. There are several parking areas where vehicles typically back-into the travel way across the bicycle and pedestrian path.

In approximately 16 percent of collisions, driver inattention was a contributing factor. Alcohol or drugs played a role in 2 of the 30 collisions (6.66 percent) and emotional distress was a factor in one collision (3.33 percent). Drugs or alcohol played a role in the fatal collision.

While the collision data provides useful information related to the types of collisions that are occurring at the intersection, 20 percent of reported collisions do not have information related to factors that contributed to the collision.

Table 1. Gulf Boulevard at 4th Avenue North Collision Summary (January 2015 – September 2020)

Total	Fatal	Incapacitating	Possible Injury	Non-Incapacitating	None	Bicyclist	Pedestrian	Motorcycle
88	1	2	11	2	14	3	3 (one fatal and one incapacitating)	2 (one incapacitating)

Source: Fehr & Peers, Pinellas County CDMS.

Table 2. Gulf Boulevard at 4th Avenue North Collision Type Summary (January 2015 – September 2020)

Angle	Bike	Hit Fixed Object	Left-turn	Rear-end	Sideswipe	Pedestrian	Unknown
2	3	3	1	15	1	3	2
6.7%	10.0%	10.0%	3.3%	50.0%	3.3%	10.0%	6.7%

Table 3. Gulf Boulevard at 4th Avenue North Collision Contributing Factor Summary (January 2015 – September 2020)

Improper Passing	Failed to keep in lane	Failed to yield ROW	Followed too Closely	Improper Backing	Drove too Fast	Operated Vehicle in Negligent Manner	None	Unknown
1	1	4	5	3	1	9	2	4
3.3%	3.3%	13.3%	16.7%	10.0%	3.3%	30.0%	6.7%	13.3%

Source: Fehr & Peers, Pinellas County CDMS.

Key Findings

The observations and data collection result in the following key-findings:

- 85th percentile vehicle speed through the area is within the posted speed limit (30 miles per hour). Maximum observed speed was 36 miles per hour, with one driver observed being issued a speeding ticket during the observation window.
- High levels of people driving yielding to people crossing the roadway
- Multiple near misses occurred when there was vehicle congestion and sight distance for people driving northbound was blocked by vehicles waiting to make a southbound left-turn
- During the observation window, 20 percent of crossing activities of Gulf Boulevard at 4th Avenue North occur outside of the designated crossing location

Based on a review of the collision data and the field observations, some additional considerations for incorporation into a demonstration project were developed including:

- Incorporation of advance stop bars to help improve visibility of the intersection when vehicles are stopped in the corridor
- Installation of a raised intersection concept with crossings on both the north and south side of the intersection
- Decrease the curb radius at 4th Avenue North to decrease the effective crossing distance and slow vehicles turning to 4th Avenue North
- Shift the crosswalk south to eliminate the offset with the intersection; this could require reducing the effective driveway width to the public parking on 4th Avenue North, west of Gulf Boulevard

Longer term improvements could include reconfiguring the access to the CVS parking lot to reduce conflict points along Gulf Boulevard.

This completes our initial data collection summary for Gulf Boulevard at 4th Avenue North. Please contact Kathrin Tellez at (321) 754-9902 if you have questions.

Memorandum

Date:	October 21, 2020
To:	Sarah Caper, Forward Pinellas
From:	Kathrin Tellez, Fehr & Peers Laura Lockwood-Herrscher, Patel, Greene, and Associates
Subject:	**Safe Streets Pinellas** **Indian Rocks Beach Demonstration Project**

Introduction

Several demonstration projects will be developed and implemented as part of the Safe Streets Pinellas project, which is the Vision Zero effort for Pinellas County. The goal of these demonstration projects is to build interest around Vision Zero by showcasing how transportation safety projects and transportation safety campaigns can be implemented in Pinellas County and to test safety countermeasures that could be included in the Vision Zero Action Plan. The nature of the demonstration projects will vary and incorporate a range of elements. The concept, process followed, and intended performance measures for each demonstration will be documented in a series of memos and the final Action Plan.

Project Context

Demonstration projects are currently underway in other portions of the county, including a protected intersection concept in St. Petersburg, a near-miss analysis in Dunedin, and an educational event in the Clearwater area with the installation of a new traffic safety device. As there was a desire to conduct a demonstration project in a beach community, Forward Pinellas approached Indian Rocks Beach (IRB) to discuss potential demonstration project opportunities. While few beach community roadways are on the High Injury Network, beach communities face different transportation challenges than other communities in the County, including higher levels of visitor activities, greater fluctuations in overall activity, and a more limited roadway network, with Gulf Boulevard serving as the major roadway providing regional and local circulation.

To identify potential demonstration projects in IRB, Forward Pinellas convened a brainstorming session consisting of IRB, the Florida Department of Transportation (FDOT) and Forward Pinellas staff, as well as the consultant team, to discuss transportation challenges in IRB and identify potential demonstration projects.

This memorandum documents the ideas that were discussed, and presents refined demonstration project ideas to aid IRB, FDOT and Forward Pinellas in selecting a demonstration project to advance.

As Gulf Boulevard is the major roadway connecting the beach communities, the discussion, held on October 6, 2020, focused on the context of the various segments throughout IRB. The section north of 5th Avenue N, is operated and maintained by Pinellas County, and provides a typical 3-lane cross section, low-rise residential uses, sidewalks, and marked bicycle lanes. The portion south of 5th Avenue N. is maintained and operated by FDOT and provides a two-lane cross section for vehicles with a bicycle and pedestrian path flush with the roadway, delineated by pavement markings. Land uses along Gulf Boulevard south of 5th Avenue N. include a greater mixture of commercial and residential uses, with higher levels of development density.

The discussion focused on the segment of Gulf Boulevard between 5th Avenue N. and 1st Avenue as this area is a hub of activity for IRB, and while some improvements have been installed, such as green backed bicycle lanes on northbound Gulf Boulevard at the approach to 5th Avenue N., there are opportunities to enhance the roadway to improve safety outcomes.

Several transportation challenges along the corridor were discussed:

- High density of unmarked pedestrian/bicyclist crossings at driveways and minor side-street intersections with Gulf Boulevard; drivers are not necessarily expecting pedestrians/bicyclist, and pedestrians/bicyclists are not clear on their designated path of travel. This creates confusion for all roadway users.
- Areas where the pedestrian path is not well defined, with degraded surfaces, plant overgrowth and other debris that decrease the effective width of the pedestrian path as well as its visibility as a pedestrian path; this results in pedestrians walking in lanes designated for other roadway users (during the call IRB staff noted that they would coordinate internally to review procedures for notifying property owners about maintaining vegetation that extends into the public right-of-way).
- Drainage issues that result in water ponding in the pedestrian and bicycle areas, limiting the pedestrian and bicycle travel way.
- Vehicle travel speeds in excess of the posted limit.
- Vehicles observed using the bicycle/pedestrian path areas to pass other vehicles (on the right) waiting to make left-turns.

Forward Pinellas, in collaboration with the City of IRB and the non-profit organization IRB Action 2000, recently completed the City of Indian Rocks Beach Gulf Boulevard Visioning Study. The study identifies several transportation concerns in the area, including bicycle and pedestrian safety related to visibility along side streets and at crosswalks.

Demonstration Project Ideas

Based on the discussion of transportation issues and challenges in IRB, four potential demonstration projects were identified, with a focus on Gulf Boulevard between 5th Avenue N. and 1st Avenue, including a crosswalk plan, a temporary raised crosswalk, evaluation of enhanced pavement markings, and a safety education campaign. Additional details are provided below. Projects related to maintenance were not considered further, including pavement maintenance, maintaining landscaping and removing debris, or those related to drainage issues. There are drainage improvements currently under construction in the southern portion of IRB which would address many of the drainage issues identified; the project extents are from Park Boulevard to 5th Avenue N., with project completion expected in spring 2022 and is being

coordination with an underground utility project . FDOT and IRB should develop a plan to address the deferred maintenance along the corridor, as roadway maintenance is beyond the scope of a potential demonstration project.

Crosswalk Plan – The consultant team would develop a conceptual signing and striping plan for Gulf Boulevard between 5th Avenue N. and 1st Avenue. The plan would identify crosswalk design treatments for side-streets and driveways, including the potential for enhanced treatments in mixing and conflict zones. The plan could also identify the placement and spacing of markings for the pedestrian path. This plan could also identify the placement of delineators (flexisticks) at specific locations to create a visual barrier between the bicycle/pedestrian facilities and vehicle traffic. These could be at locations where vehicles routinely enter the bicycle and pedestrian area to pass a vehicle that is waiting to turn left. The plan could also include identification of locations to replace and/or install features such as truncated domes. It is expected that the concept plan would be converted by others into a construction document and installed by FDOT as part of a planned repaving project on Gulf Boulevard that is expected within the next 5 years.

Temporary Raised Crosswalk – The pedestrian crossing of Gulf Boulevard at 4th Avenue N. experiences high levels of pedestrian activity, as 4th Avenue N. provides public beach access across from retail and restaurant uses. As part of the demonstration project, the consultant team would develop a concept plan for a temporary raised crosswalk across Gulf Boulevard at 4th Avenue N.; since a potential temporary product is not on the FDOT approved products list, we would assist in the process to develop a developmental specification for the temporary device. One potential option is a rubberized speed table that can also serve as a raised pedestrian crossing. These speed tables are appropriate for roadways with speeds up to 30 miles per hour, and have been installed in numerous other locations in the State, including Sarasota. As part of this project, the consultant team could also develop crosswalk marking plans for the currently unmarked crossing of 4th Avenue N. at Gulf Boulevard. A before/after study of vehicle speeds and yielding rates to bicyclist and pedestrians at the crossing would also be conducted. As the facility is owned and operated by FDOT, FDOT would be responsible for preparation of final construction documents, and installation of the temporary crossing device, pavement markings and signage.

Evaluation of Pavement Markings – There are three pedestrian crossings on Gulf Boulevard between 5th Avenue N and 1st Avenue with a rectangular rapid flashing beacon. Despite the enhanced crossing device, some vehicles do not yield to pedestrians and drivers travel in excess of the posted speed along the corridor. Additional pavement markings, including horizontal signage, to alert drivers to the pedestrian crossing would be installed as part of this demonstration project option. Before and after field observations would be conducted to assess if the enhanced pavement markings were effective in reducing vehicle speeds across the crossing and improving yielding behavior. For this demonstration project option, the consultant team would develop conceptual signing plans, and conduct before/after observations. As the facility is owned and operated by FDOT, FDOT would be responsible for preparation of final construction documents, and installation of the pavement markings and horizontal signage.

Safety Education Campaign – The IRB Visioning Study identified the need for an educational campaign to raise awareness of bicycle and pedestrian safety laws. An educational campaign could be developed as the demonstration project, which could include identification and development of traffic safety educational materials, including pedestrian and bicycle laws, rights and responsibilities. The safety campaign could also reinforce the 30 mile per hour speed limit on Gulf Boulevard within the city limits. We could also craft messages to post of the IRB website, social media or changeable message signs, and provide information to include in utility bills. Information could also be developed in a format suitable for posting in various places around IRB where there are high levels of visitor activity that might not be reached through other means. The

campaign could also identify locations to install speed feedback signs. We could also develop materials for IRB staff to share/promote at community events.

Next Steps

We look forward to discussing with IRB, FDOT and Forward Pinellas the preferred demonstration project. Once a preferred demonstration project has been identified, we would develop a more refined approach, and if data collection is an element of the project, discuss data collection protocols and needs, including potential performance measures. The process and outcome would be documented in the Forward Pinellas Vision Zero Action Plan, and would include lessons learned from the process. We expect the selected demonstration project would be a collaborative effort between Forward Pinellas, FDOT, the City of Indian Rocks Beach, and the consultant team, and serve as a demonstration of the value of interagency collaboration in Pinellas County to improve transportation safety outcomes for all.

Memorandum

Date: February 8, 2021

To: Sarah Caper, Forward Pinellas

From: Kathrin Tellez, Fehr & Peers

Subject: Safe Streets Pinellas Alt Route 19 at Curlew Road Near-Miss Analysis

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Introduction

This memorandum presents the results of a near-miss analysis conducted for the intersection of Alt Route 19 at Curlew Road in Dunedin. Near misses are defined as potentially high-risk interactions between roadway users that did not result in a crash. Combined with collision data, near-miss information can provide additional insights in understanding intersection safety concerns and identifying countermeasure strategies that not only address the observed collision causes, but underlying causes. The near-miss analysis was conducted as part of the Safe Streets Pinellas Vision Zero effort to provide proof of concept for near-miss technology, as well as help inform safety countermeasures that could be implemented at the intersection.

Existing Conditions

Alt Route 19 (also known as State Route 595) is a two-lane undivided highway with a posted speed limit of 40 miles per hour. There are bicycle lanes in both directions on Alt Route 19. Daily traffic volumes on this roadway are approximately 21,500 south of Curlew Road, and 16,000 north of Curlew Road. The Fred Marquis Pinellas Trail parallels Alt Route 19. This trail connects to the larger Pinellas Trail Loop and connects the area to Pasco County in the north as well as to the southern parts of Pinellas County.

Curlew Road is a two-lane divided highway with a center left-turn lane with a posted speed limit of 35 miles per hour. At the approach to Alt Route 19, a transition starts for westbound traffic to add a second travel lane. To the west of Alt Route 19, Curlew Road continues as Causeway Boulevard, a four-lane divided roadway with added turn lanes at intersections and a landscaped median. Typical daily traffic volumes on Curlew Road are approximately 14,200, and on Causeway Boulevard, daily volumes are approximately 10,000. Vehicle volumes are slightly lower on Saturdays and slightly higher on Sundays as compared to weekdays.

Recent bicycle/pedestrian counts collected at the intersection, which includes the Fred Marquis Pinellas Trail, indicate that based on 8-hours of data collection, at least 700 bicyclists and pedestrian cross the intersection on a weekday, 950 on a Saturday and 1,400 on a Sunday. This bicycle / pedestrian data was collected prior to the COVID-19 stay at home orders. Trail counts (permanent trail count station is located about 3/4th of a mile south of intersection on Alt Route 19 at Michigan Boulevard) from August 2020 show about 1,400 bicyclist and pedestrian crossings on weekends, and between 550 to 1,000 bicyclist and pedestrian crossings on weekdays, with lower volumes during periods of inclement weather.

The intersection of Alt Route 19 at Curlew Road is signalized, with the northbound, eastbound and westbound left-turns operating with permitted/protected phasing. To improve safety for Fred Marquis Pinellas Trail users, the southbound left-turn movement operates with protected phasing only, meaning that the left-turn movement does not operate concurrently with the trail crossing. There are also blank out “no right-turn arrow” signs for both the northbound and eastbound right-turn movement.

On average, there are between 30 and 45 reported collisions at the intersection each year, with five to six collisions per year resulting in severe injuries. Feedback from the community related to transportation safety at the intersection are mainly on the theme of bicyclist and pedestrian conflicts with people who drive, including:

- We need an overpass at this intersection for pedestrians and bicycles
- We need to move stop bars back, improve crosswalk visibility, provide pedestrian scale lighting and restrict right on red for all four approaches
- Drivers continue to turn despite no turn on red signal, placing trail users in danger. Maybe if flashing red lights were added it would help
- Westbound Curlew drivers frequently make right turns on red at Alt 19 northbound. Propose a lighted "no turn" sign similar to the one for North Bound Alt 19 and eastbound Curlew. The failure of drivers to obey the No Right on Red sign places users of the Pinellas trail at risk.
- The intersection of Curlew and the Causeway is highly trafficked and dangerous when crossing in any direction. Due to the Pinellas Trail crossing here as well the existing crosswalk system just isn’t enough to leave pedestrians feeling safe when crossing
- Intersection is EXTREMELY busy with traffic coming from all four directions, and bike/ped traffic on the Pinellas Trail as well as the Honeymoon Island Trail spur.

Existing collision data was reviewed for the intersection, representing all reported collisions at or within 50-feet of the intersection between 2015 and September 2020 (data available as of November 2, 2020). Not all collisions that occur within the intersection influence area (can be several hundred feet from the intersection) are included in the summary tables below as the near-miss analysis only includes potential collisions within the physical bounds of the intersection. This may result in the numbers reported below not matching the number of collisions at the intersection reported in other documents.

During this time period, a total of 88 collisions were reported at the intersection, including four that resulted in severe or incapacitating injuries, as shown on **Table 1,** with a collision diagram shown on **Figure 1**. Of the severe injuries, two were people riding motorcycles and two were people within a vehicle. Four collisions involved a person riding a bicycle, and one collision involved a person walking; injuries were not reported in those collisions. Collision types are presented in **Table 2,** which shows that rear-end collision are the most frequent collision types at the intersection (42 percent), followed by angle (14.8 percent), sideswipe (11.4 percent), and left-turn (10.2 percent). A rear-end collision is when the rear of one vehicle impacts the rear of another. An angle crash occurs when two vehicles impact at an angle – for example, the front of one vehicle impacts the side of another vehicle. Sideswipe collisions are when two vehicles traveling in the

same direction impact where the initial engagement does not overlap the corner of either vehicle. The impact swipes along the surface of the vehicle parallel to the direction of travel. Left-turn collision involve at least one vehicle turning left. In most instances, the other vehicle is traveling straight. **Table 3** presents contributing factors, which primarily include people driving in a negligent manner (41 percent), unknown or no information (28 percent), failing to yield right-of-way (10 percent), and following too closely (9 percent).

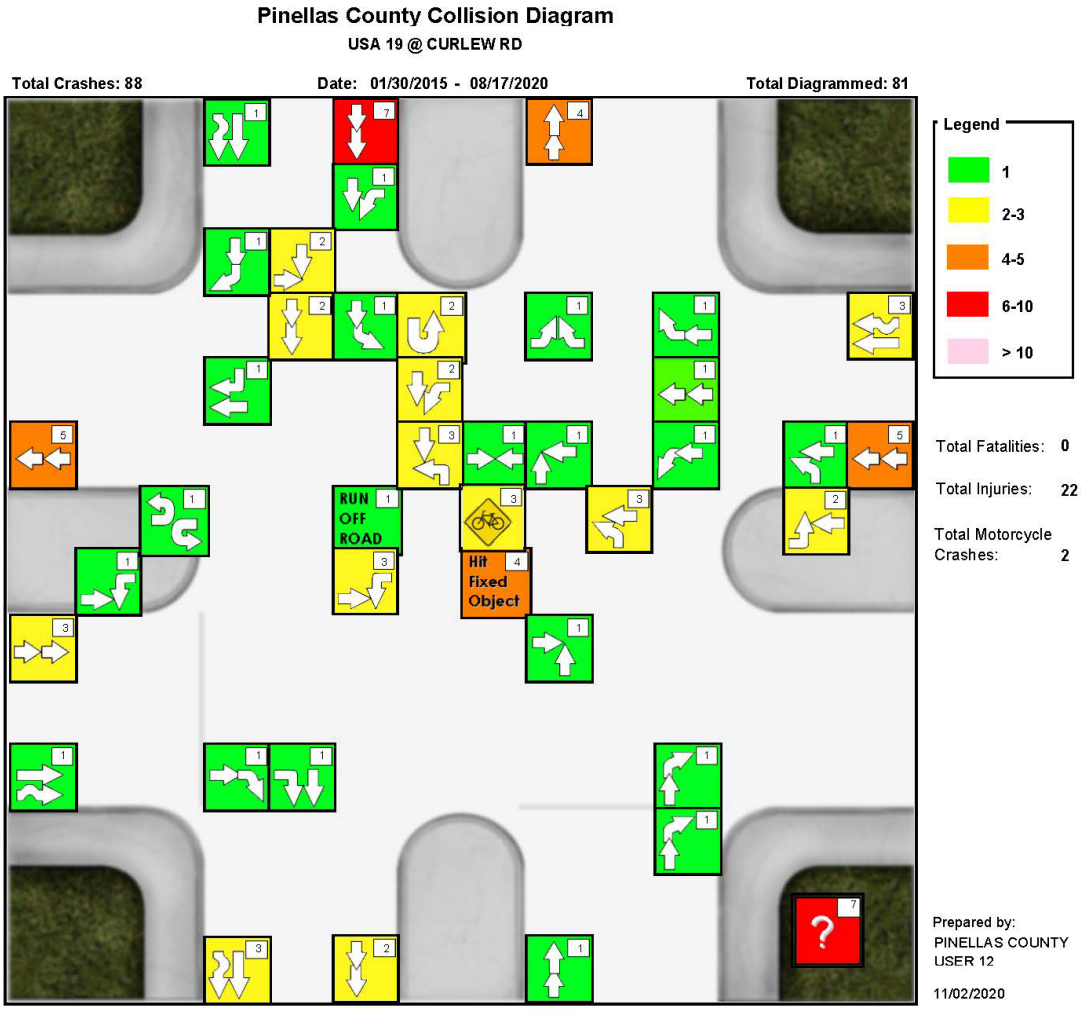


Figure 1 – Alt Route 19 at Curlew Road Collision Diagram (2015 – September 2020)

Table 1. Alt Route 19 at Curlew Road Collision Summary (January 2015 – September 2020)

Total	Fatal	Incapacitating	Possible Injury	Non-Incapacitating	None	Bicyclist	Pedestrian	Motorcycle
88	0	4	20	10	54	4	1	2 (both incapacitating)

Source: Fehr & Peers, Pinellas County CDMS.

Table 2. Alt Route 19 at Curlew Road Collision Type Summary (January 2015 – September 2020)

Angle	Bike	Head-on	Hit Fixed Object	Left-turn	Rear-end	Right-turn	Run off Road	Sideswipe	Single vehicle	Unknown	U-turn
13	3	3	4	9	37	2	1	10	1	2	3
14.8%	3.4%	3.4%	4.5%	10.2%	42.0%	2.3%	1.1%	11.4%	1.1%	2.3%	3.4%

Table 3. Alt Route 19 at Curlew Road Collision Contributing Factor Summary (January 2015 – September 2020)

Disregard Signs	Failed to keep in lane	Failed to yield ROW	Followed too Closely	Improper Backing	Improper Turning	Operated Vehicle in Negligent Manner	Run Off Road	Ran Red Light	Other	None	Unknown
1	2	9	8	1	1	36	1	4	5	13	7
1.1%	2.3%	10.2%	9.1%	1.1%	1.1%	40.9%	1.1%	4.5%	5.7%	14.8%	8.0%

Source: Fehr & Peers, Pinellas County CDMS.

While the collision data provides useful information related to the types of collisions that are occurring at the intersection, over 25 percent of reported collisions do not have information related to factors that contributed to the collision, and over 40 percent of collisions had driver behavior as a contributing factor. The near-miss data provides an opportunity to determine if there are more nuanced casual factors that could help inform intersection countermeasures.

Near Miss Analysis

To better inform the types of safety improvements that could be implemented at the intersection, a near-miss technology vendor was retained to collect and evaluate high definition video of the intersection to identify specific types of near-misses that are occurring. The firm Street Simplified collected video count data at the intersection over an approximately 4-day period in August 2020, including Saturday, Sunday and Monday operations. In total, the interactions between 91,900 people driving vehicles and 3,800 people walking and bicycling was captured. An additional 24-hours of weekday data was collected in October 2020, which captured the interaction between 28,2300 people driving vehicles and 880 people walking and bicycling. Between the August and October data collection windows, cycle lengths at the intersection were reduced by about 25 percent.

In addition to capturing the multi-modal count of each roadway user by movement, the automated video analytics catalog the speed of each roadway users, roadway user traveling through or across intersection when they do not have the right-of-way (red-light running), and every time two road users (bikes, pedestrians, or vehicles) cross paths (i.e., an interaction) and records the following information:

- Time between the arrival of both road users at a common point; this is referred to as Post Encroachment Time (PET)
- Speed of each road user
- Count of interactions
- Which road user arrived first
- Video of the interaction for further review

During August the data collection window, 360 people, representing about 0.75 percent of people driving through the intersection, were observed driving their vehicle through the intersection 10 or more miles in excess of the speed limit of 40 miles per hour on Alt Route 19 and 35 miles per hour on Curlew Road (with the southbound and westbound through movements accounting for the majority of speeding movements), 60 people who were driving ran the red light (0.07 percent of people driving), and 61 people who were bicycling or walking crossed when they did not have the crossing signal (1.6 percent of people walking or bicycling). Of the drivers whose vehicle was classified as running the red light, all vehicles were able to clear the intersection during the all-red phase. Many were traveling in excess of the posted speed limit. During the October data collection window, fewer people were observed driving through the intersection 10 or more miles in excess of the posted speed limit with 0.24 percent. The number of people driving, walking and bicycling who were classified as running the red light was similar to the August data collection period.

The PET value is an indicator of how close two roadway users were to occupying the same space at the same time. The smaller the PET value, the closer roadway users were to colliding. Within the observed data for Alt Route 19 at Curlew Road, the lowest PET value documented was 0.3 seconds for the data collection window. There were 3,003 roadway user interactions with an observed PET value between 0.3 and 5 seconds, or about 3.1 percent of roadway movements. A review of select videos with a PET value between 2 and 5 indicates that many of these

interactions were within expected gap acceptance given the movement, and that interactions with a PET of less than 2 were more problematic. Interactions with a PET less than 2 represent about 0.42 percent of travel through the intersection. The movement and frequency associated with the interactions where the PET is less than 2 is presented in **Table 4. Figures 2 through 4** highlight some of the movement trajectories for movements with the highest potential for near-miss interactions to result in a collision. The data in Table 4 also notes if the roadway user was a person driving a vehicle or a vulnerable roadway user (for this analysis, vulnerable roadway user only includes people who walk or bicycle as the technology was not able to consistently identify people riding motorcycles), as vulnerable roadway users are more likely suffer severe or fatal injuries if involved in a collision with a vehicle.

When reviewing the data in this table it is important to keep in mind the order of roadway user arrival. Take for example the interaction with the highest number of near misses, the southbound through movement and the opposing northbound left (107 interactions). As the southbound through movement occurred first and the northbound left-occurred second, most of these near-misses were left-turning vehicles waiting for a gap in traffic and turning after the opposing through movements cleared the intersection and created a gap. This is a similar circumstance for the other interactions where the through movement precedes the left-turn movement. No countermeasures were identified for these near misses.

For this same movement pair (southbound through and northbound left), there were 16 instances when the northbound left-turn movement was the first motion, and the southbound through was the second motion, meaning that a through vehicle almost collided with a left-turning vehicle. Should a collision occur, the average vehicle speed of 40 miles per hour for the vehicles making the southbound through movement indicates that there is a high likelihood for the collision to result in a severe injury or fatality for vehicle occupants. This is similar for the eastbound and westbound lefts. Since the southbound left-turn phase is protected, no vehicle-vehicle near misses were reported. There was a vehicle-vulnerable roadway user near-miss; however, in that instance, the vulnerable roadway user started crossing behind the vehicle and was not at risk for being struck.

Comparing the location of actual collisions to the location of near-misses, nine of the reported collisions involved a permitted left-turn movement and a through movement, meaning that the near-miss analysis is reflective of observed collision data. For collisions involving permissive left-turn movements, no severe or fatal injuries occurred. Other observed near-misses correlate to angle collisions, especially in the southeast and southwest corners of the intersection.

Comparison of the interactions between the August 2020 and October 2020 with problematic PETs shows the same top-three movement conflicts as presented in Table 4. Numerous problematic interactions that were observed August 2020 were not observed in October 2020. This is likely due to the smaller sample size in October versus a change in behavior as a result of the signal timing change. Additionally, as the October data was reflective of weekday conditions and August data was primarily reflective of weekend conditions, there could also be differences in weekday and weekend travel patterns, like more non-recurring trips through the intersection on weekends that may not be as familiar with intersection operations, and less congestion that could encourage higher travel speeds on weekends. Although the length of the traffic signal cycle was reduced between the August and October data collection periods, it is difficult to draw any conclusions about the effect of that change. For future studies where calculating effect of the change is desired, it is recommended that multiple days of data be collected and that data is collected on the similar days of the week (compare weekday conditions to weekday conditions).

Table 4. Alt Route 19 at Curlew Road Near-Miss Interaction Summary – PET < 2 seconds (Various Days in August 2020)

Count of Interaction	Motion 1 Movement	Mode	Motion 2 Movement	Mode	Average PET	Lowest PET	Average Speed Motion 1	Average Speed Motion 2
107	Bayshore Blvd (SB)-Through	Vehicle	Bayshore Blvd (NB)-Left	Vehicle	1.57	0.30	35.0	14.4
83	Causeway Blvd (EB)-Through	Vehicle	Curlew Rd (WB)-Left	Vehicle	1.52	0.50	27.9	14.2
51	Curlew Rd (WB)-Through	Vehicle	Causeway Blvd (EB)-Left	Vehicle	1.50	0.90	32.0	14.5
19	Bayshore Blvd (NB)-Right	Vehicle	Causeway Blvd (EB)-Through	Vehicle	1.54	0.60	17.3	30.6
16	Bayshore Blvd (NB)-Left	Vehicle	Bayshore Blvd (SB)-Through	Vehicle	1.56	0.50	16.2	40.4
14	Causeway Blvd (EB)-Left	Vehicle	Curlew Rd (WB)-Through	Vehicle	1.72	1.20	16.2	36.2
14	Curlew Rd (WB)-Left	Vehicle	Causeway Blvd (EB)-Through	Vehicle	1.73	0.80	15.8	31.9
13	Bayshore Blvd (NB)-Right	Vehicle	Bayshore Blvd (SB)-Left	Vehicle	1.79	1.10	17.8	20.0
10	Curlew Rd (WB)-Right	Vehicle	Causeway Blvd (EB)-Left	Vehicle	1.62	0.90	15.3	17.4
9	Bayshore Blvd (NB)-Right	Vehicle	East Crosswalk	Vulnerable[1]	1.58	0.40	17.4	7.4
8	Causeway Blvd (EB)-Right	Vehicle	Curlew Rd (WB)-Left	Vehicle	1.78	1.60	15.9	20.1
8	Causeway Blvd (EB)-Through	Vehicle	East Crosswalk	Vulnerable	1.40	0.90	31.2	8.0
5	Bayshore Blvd (SB)-Right	Vehicle	Bayshore Blvd (NB)-Left	Vehicle	1.84	1.60	15.5	18.3
5	Curlew Rd (WB)-Left	Vehicle	South Crosswalk	Vulnerable	1.68	0.90	17.1	10.8

Count of Interaction	Motion 1 Movement	Mode	Motion 2 Movement	Mode	Average PET	Lowest PET	Average Speed Motion 1	Average Speed Motion 2
4	Bayshore Blvd (SB)-Left	Vehicle	East Crosswalk	Vulnerable	1.75	1.50	19.1	9.1
3	Bayshore Blvd (SB)-Right	Vehicle	Curlew Rd (WB)-Through	Vehicle	1.90	1.90	16.7	26.6
3	Causeway Blvd (EB)-Left	Vehicle	North Crosswalk	Vulnerable	1.83	1.70	18.2	8.6
2	Causeway Blvd (EB)-Right	Vehicle	Bayshore Blvd (SB)-Through	Vehicle	1.55	1.30	17.1	28.9
2	Causeway Blvd (EB)-Right	Vehicle	Curlew Rd (WB)-Left	Vulnerable	1.20	0.60	14.3	12.7
2	Curlew Rd (WB)-Right	Vehicle	Bayshore Blvd (NB)-Through	Vehicle	1.35	1.20	18.8	24.9
2	Curlew Rd (WB)-Through	Vehicle	East Crosswalk	Vulnerable	1.70	1.40	43.5	10.3
1	Bayshore Blvd (NB)-Left	Vehicle	South Crosswalk	Vehicle	1.20	1.20	19.5	7.1
1	Bayshore Blvd (NB)-Through	Vehicle	North Crosswalk	Vulnerable	1.90	1.90	36.0	10.5
1	Causeway Blvd (EB)-Through	Vehicle	Bayshore Blvd (SB)-Through	Vehicle	2.00	2.00	24.6	13.7
1	East Crosswalk	Vulnerable	Bayshore Blvd (NB)-Right	Vehicle	2.00	2.00	15.0	18.1
1	Curlew Rd (WB)-Right	Vehicle	North Crosswalk	Vulnerable	2.00	2.00	16.5	7.3
1	Curlew Rd (WB)-Through	Vehicle	Bayshore Blvd (NB)-Through	Vulnerable	0.50	0.50	31.5	9.9

Note: 1. For this analysis, vulnerable roadway user only includes people who walk or bicycle
Source: Fehr & Peers, Street Simplified.



Figure 2 **All Near Misses with PET < 2.0 (August 23 and 24)**



Figure 3 **Northbound Right-Turn Near Misses with PET < 2.0 (August 23 and 24)**



Figure 4 Eastbound Right-Turn Near Misses with PET < 2.0 (August 23 and 24)

Based on our review of the reported collision data, feedback from the public and near-miss analysis, we offer the following key findings and recommendations:

- Long cycle lengths may be a contributing factor to people driving, people walking and people bicycling running red lights. Consider reducing cycle length (In October 2020, the County reduced average cycle lengths by approximately 24 percent, reducing delay for people walking or bicycling, as well as for many for vehicle movements).
- Permitted left-turn movement conflicts with opposing through movements is one of the most prevalent near-miss interactions and represents about 10 percent of collisions. Consider eliminating permitted phasing, especially during off-peak hours, when bicycle and pedestrian volumes are the highest, and at night when the added capacity of the permitted-protected phasing is not needed, and sight distance can be limited.
- Northbound right-turn vehicles turning in front of eastbound through vehicles and southbound left-turn vehicles is also a prevalent near-miss. Given the northbound right-turn prohibitions during portions of the northbound through green phase, people who drive may be accepting smaller gaps to complete the northbound right-turn movement. Consider adding a northbound right-turn overlap that runs concurrent with the westbound left-turn movement (westbound U-turn movements are already prohibited).
- Vehicles traveling Westbound on Curlew Road and Southbound on Bayshore Boulevard are five times more likely to be traveling more than 10 miles per hour over the speed limit as they travel through the intersection than the northbound or eastbound through movements. There are a variety of contributing factors, including the distance from other signalized intersections and the widening of Curlew Road to provide two westbound travel lanes about 900 feet east of the intersection. Consider the installation of advanced signage altering people who drive that a signalized intersection is ahead, or solar powered speed feedback signs to alert people who drive that they are traveling in excessive of the posted speed limit.

This concludes our near-miss assessment of the Alt Route 19 at Curlew Road intersection. Please contact Kathrin Tellez at (321) 754-9902 if you have questions.

Memorandum

Date: February 8, 2021

To: Sarah Caper, Forward Pinellas

From: Kathrin Tellez, Fehr & Peers

Subject: Safe Streets Pinellas Alt Route 19 at Curlew Road Near-Miss Analysis

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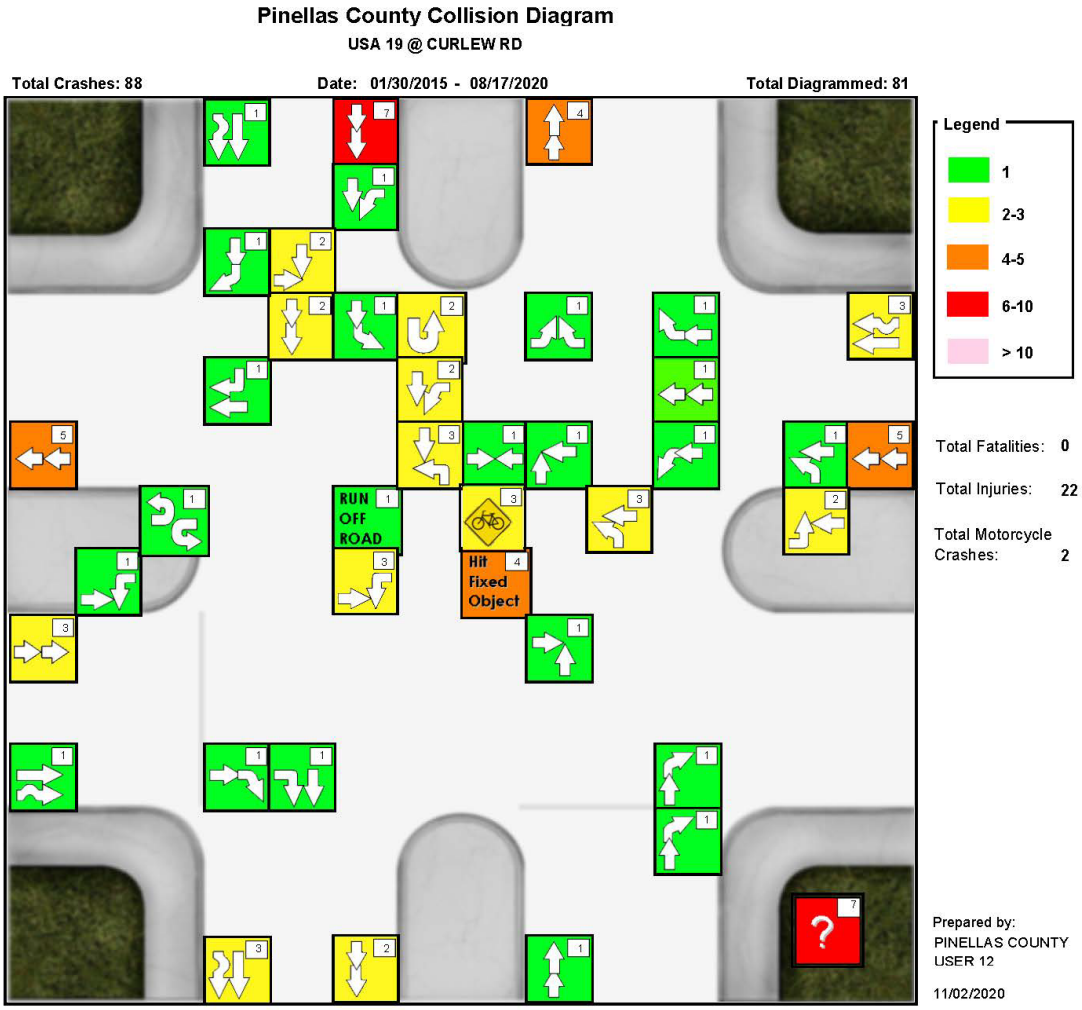


Figure 1 – Alt Route 19 at Curlew Road Collision Diagram (2015 – September 2020)

Table 1. Alt Route 19 at Curlew Road Collision Summary (January 2015 – September 2020)

Total	Fatal	Incapacitating	Possible Injury	Non-Incapacitating	None	Bicyclist	Pedestrian	Motorcycle
88	0	4	20	10	54	4	1	2 (both incapacitating)

Source: Fehr & Peers, Pinellas County CDMS.

Table 2. Alt Route 19 at Curlew Road Collision Type Summary (January 2015 – September 2020)

Angle	Bike	Head-on	Hit Fixed Object	Left-turn	Rear-end	Right-turn	Run off Road	Sideswipe	Single vehicle	Unknown	U-turn
13	3	3	4	9	37	2	1	10	1	2	3
14.8%	3.4%	3.4%	4.5%	10.2%	42.0%	2.3%	1.1%	11.4%	1.1%	2.3%	3.4%

Table 3. Alt Route 19 at Curlew Road Collision Contributing Factor Summary (January 2015 – September 2020)

Disregard Signs	Failed to keep in lane	Failed to yield ROW	Followed too Closely	Improper Backing	Improper Turning	Operated Vehicle in Negligent Manner	Run Off Road	Ran Red Light	Other	None	Unknown
1	2	9	8	1	1	36	1	4	5	13	7
1.1%	2.3%	10.2%	9.1%	1.1%	1.1%	40.9%	1.1%	4.5%	5.7%	14.8%	8.0%

Source: Fehr & Peers, Pinellas County CDMS.

While the collision data provides useful information related to the types of collisions that are occurring at the intersection, over 25 percent of reported collisions do not have information related to factors that contributed to the collision, and over 40 percent of collisions had driver behavior as a contributing factor. The near-miss data provides an opportunity to determine if there are more nuanced casual factors that could help inform intersection countermeasures.

Near Miss Analysis

To better inform the types of safety improvements that could be implemented at the intersection, a near-miss technology vendor was retained to collect and evaluate high definition video of the intersection to identify specific types of near-misses that are occurring. The firm Street Simplified collected video count data at the intersection over an approximately 4-day period in August 2020, including Saturday, Sunday and Monday operations. In total, the interactions between 91,900 people driving vehicles and 3,800 people walking and bicycling was captured. An additional 24-hours of weekday data was collected in October 2020, which captured the interaction between 28,2300 people driving vehicles and 880 people walking and bicycling. Between the August and October data collection windows, cycle lengths at the intersection were reduced by about 25 percent.

In addition to capturing the multi-modal count of each roadway user by movement, the automated video analytics catalog the speed of each roadway users, roadway user traveling through or across intersection when they do not have the right-of-way (red-light running), and every time two road users (bikes, pedestrians, or vehicles) cross paths (i.e., an interaction) and records the following information:

- Time between the arrival of both road users at a common point; this is referred to as Post Encroachment Time (PET)
- Speed of each road user
- Count of interactions
- Which road user arrived first
- Video of the interaction for further review

During August the data collection window, 360 people, representing about 0.75 percent of people driving through the intersection, were observed driving their vehicle through the intersection 10 or more miles in excess of the speed limit of 40 miles per hour on Alt Route 19 and 35 miles per hour on Curlew Road (with the southbound and westbound through movements accounting for the majority of speeding movements), 60 people who were driving ran the red light (0.07 percent of people driving), and 61 people who were bicycling or walking crossed when they did not have the crossing signal (1.6 percent of people walking or bicycling). Of the drivers whose vehicle was classified as running the red light, all vehicles were able to clear the intersection during the all-red phase. Many were traveling in excess of the posted speed limit. During the October data collection window, fewer people were observed driving through the intersection 10 or more miles in excess of the posted speed limit with 0.24 percent. The number of people driving, walking and bicycling who were classified as running the red light was similar to the August data collection period.

The PET value is an indicator of how close two roadway users were to occupying the same space at the same time. The smaller the PET value, the closer roadway users were to colliding. Within the observed data for Alt Route 19 at Curlew Road, the lowest PET value documented was 0.3 seconds for the data collection window. There were 3,003 roadway user interactions with an observed PET value between 0.3 and 5 seconds, or about 3.1 percent of roadway movements. A review of select videos with a PET value between 2 and 5 indicates that many of these

interactions were within expected gap acceptance given the movement, and that interactions with a PET of less than 2 were more problematic. Interactions with a PET less than 2 represent about 0.42 percent of travel through the intersection. The movement and frequency associated with the interactions where the PET is less than 2 is presented in **Table 4. Figures 2 through 4** highlight some of the movement trajectories for movements with the highest potential for near-miss interactions to result in a collision. The data in Table 4 also notes if the roadway user was a person driving a vehicle or a vulnerable roadway user (for this analysis, vulnerable roadway user only includes people who walk or bicycle as the technology was not able to consistently identify people riding motorcycles), as vulnerable roadway users are more likely suffer severe or fatal injuries if involved in a collision with a vehicle.

When reviewing the data in this table it is important to keep in mind the order of roadway user arrival. Take for example the interaction with the highest number of near misses, the southbound through movement and the opposing northbound left (107 interactions). As the southbound through movement occurred first and the northbound left-occurred second, most of these near-misses were left-turning vehicles waiting for a gap in traffic and turning after the opposing through movements cleared the intersection and created a gap. This is a similar circumstance for the other interactions where the through movement precedes the left-turn movement. No countermeasures were identified for these near misses.

For this same movement pair (southbound through and northbound left), there were 16 instances when the northbound left-turn movement was the first motion, and the southbound through was the second motion, meaning that a through vehicle almost collided with a left-turning vehicle. Should a collision occur, the average vehicle speed of 40 miles per hour for the vehicles making the southbound through movement indicates that there is a high likelihood for the collision to result in a severe injury or fatality for vehicle occupants. This is similar for the eastbound and westbound lefts. Since the southbound left-turn phase is protected, no vehicle-vehicle near misses were reported. There was a vehicle-vulnerable roadway user near-miss; however, in that instance, the vulnerable roadway user started crossing behind the vehicle and was not at risk for being struck.

Comparing the location of actual collisions to the location of near-misses, nine of the reported collisions involved a permitted left-turn movement and a through movement, meaning that the near-miss analysis is reflective of observed collision data. For collisions involving permissive left-turn movements, no severe or fatal injuries occurred. Other observed near-misses correlate to angle collisions, especially in the southeast and southwest corners of the intersection.

Comparison of the interactions between the August 2020 and October 2020 with problematic PETs shows the same top-three movement conflicts as presented in Table 4. Numerous problematic interactions that were observed August 2020 were not observed in October 2020. This is likely due to the smaller sample size in October versus a change in behavior as a result of the signal timing change. Additionally, as the October data was reflective of weekday conditions and August data was primarily reflective of weekend conditions, there could also be differences in weekday and weekend travel patterns, like more non-recurring trips through the intersection on weekends that may not be as familiar with intersection operations, and less congestion that could encourage higher travel speeds on weekends. Although the length of the traffic signal cycle was reduced between the August and October data collection periods, it is difficult to draw any conclusions about the effect of that change. For future studies where calculating effect of the change is desired, it is recommended that multiple days of data be collected and that data is collected on the similar days of the week (compare weekday conditions to weekday conditions).

Table 4. Alt Route 19 at Curlew Road Near-Miss Interaction Summary – PET < 2 seconds (Various Days in August 2020)

Count of Interaction	Motion 1 Movement	Mode	Motion 2 Movement	Mode	Average PET	Lowest PET	Average Speed Motion 1	Average Speed Motion 2
107	Bayshore Blvd (SB)-Through	Vehicle	Bayshore Blvd (NB)-Left	Vehicle	1.57	0.30	35.0	14.4
83	Causeway Blvd (EB)-Through	Vehicle	Curlew Rd (WB)-Left	Vehicle	1.52	0.50	27.9	14.2
51	Curlew Rd (WB)-Through	Vehicle	Causeway Blvd (EB)-Left	Vehicle	1.50	0.90	32.0	14.5
19	Bayshore Blvd (NB)-Right	Vehicle	Causeway Blvd (EB)-Through	Vehicle	1.54	0.60	17.3	30.6
16	Bayshore Blvd (NB)-Left	Vehicle	Bayshore Blvd (SB)-Through	Vehicle	1.56	0.50	16.2	40.4
14	Causeway Blvd (EB)-Left	Vehicle	Curlew Rd (WB)-Through	Vehicle	1.72	1.20	16.2	36.2
14	Curlew Rd (WB)-Left	Vehicle	Causeway Blvd (EB)-Through	Vehicle	1.73	0.80	15.8	31.9
13	Bayshore Blvd (NB)-Right	Vehicle	Bayshore Blvd (SB)-Left	Vehicle	1.79	1.10	17.8	20.0
10	Curlew Rd (WB)-Right	Vehicle	Causeway Blvd (EB)-Left	Vehicle	1.62	0.90	15.3	17.4
9	Bayshore Blvd (NB)-Right	Vehicle	East Crosswalk	Vulnerable[1]	1.58	0.40	17.4	7.4
8	Causeway Blvd (EB)-Right	Vehicle	Curlew Rd (WB)-Left	Vehicle	1.78	1.60	15.9	20.1
8	Causeway Blvd (EB)-Through	Vehicle	East Crosswalk	Vulnerable	1.40	0.90	31.2	8.0
5	Bayshore Blvd (SB)-Right	Vehicle	Bayshore Blvd (NB)-Left	Vehicle	1.84	1.60	15.5	18.3
5	Curlew Rd (WB)-Left	Vehicle	South Crosswalk	Vulnerable	1.68	0.90	17.1	10.8

Count of Interaction	Motion 1 Movement	Mode	Motion 2 Movement	Mode	Average PET	Lowest PET	Average Speed Motion 1	Average Speed Motion 2
4	Bayshore Blvd (SB)-Left	Vehicle	East Crosswalk	Vulnerable	1.75	1.50	19.1	9.1
3	Bayshore Blvd (SB)-Right	Vehicle	Curlew Rd (WB)-Through	Vehicle	1.90	1.90	16.7	26.6
3	Causeway Blvd (EB)-Left	Vehicle	North Crosswalk	Vulnerable	1.83	1.70	18.2	8.6
2	Causeway Blvd (EB)-Right	Vehicle	Bayshore Blvd (SB)-Through	Vehicle	1.55	1.30	17.1	28.9
2	Causeway Blvd (EB)-Right	Vehicle	Curlew Rd (WB)-Left	Vulnerable	1.20	0.60	14.3	12.7
2	Curlew Rd (WB)-Right	Vehicle	Bayshore Blvd (NB)-Through	Vehicle	1.35	1.20	18.8	24.9
2	Curlew Rd (WB)-Through	Vehicle	East Crosswalk	Vulnerable	1.70	1.40	43.5	10.3
1	Bayshore Blvd (NB)-Left	Vehicle	South Crosswalk	Vehicle	1.20	1.20	19.5	7.1
1	Bayshore Blvd (NB)-Through	Vehicle	North Crosswalk	Vulnerable	1.90	1.90	36.0	10.5
1	Causeway Blvd (EB)-Through	Vehicle	Bayshore Blvd (SB)-Through	Vehicle	2.00	2.00	24.6	13.7
1	East Crosswalk	Vulnerable	Bayshore Blvd (NB)-Right	Vehicle	2.00	2.00	15.0	18.1
1	Curlew Rd (WB)-Right	Vehicle	North Crosswalk	Vulnerable	2.00	2.00	16.5	7.3
1	Curlew Rd (WB)-Through	Vehicle	Bayshore Blvd (NB)-Through	Vulnerable	0.50	0.50	31.5	9.9

Note: 1. For this analysis, vulnerable roadway user only includes people who walk or bicycle
Source: Fehr & Peers, Street Simplified.



Figure 2 **All Near Misses with PET < 2.0 (August 23 and 24)**



Figure 3 **Northbound Right-Turn Near Misses with PET < 2.0 (August 23 and 24)**



Figure 4 Eastbound Right-Turn Near Misses with PET < 2.0 (August 23 and 24)

Based on our review of the reported collision data, feedback from the public and near-miss analysis, we offer the following key findings and recommendations:

- Long cycle lengths may be a contributing factor to people driving, people walking and people bicycling running red lights. Consider reducing cycle length (In October 2020, the County reduced average cycle lengths by approximately 24 percent, reducing delay for people walking or bicycling, as well as for many for vehicle movements).
- Permitted left-turn movement conflicts with opposing through movements is one of the most prevalent near-miss interactions and represents about 10 percent of collisions. Consider eliminating permitted phasing, especially during off-peak hours, when bicycle and pedestrian volumes are the highest, and at night when the added capacity of the permitted-protected phasing is not needed, and sight distance can be limited.
- Northbound right-turn vehicles turning in front of eastbound through vehicles and southbound left-turn vehicles is also a prevalent near-miss. Given the northbound right-turn prohibitions during portions of the northbound through green phase, people who drive may be accepting smaller gaps to complete the northbound right-turn movement. Consider adding a northbound right-turn overlap that runs concurrent with the westbound left-turn movement (westbound U-turn movements are already prohibited).
- Vehicles traveling Westbound on Curlew Road and Southbound on Bayshore Boulevard are five times more likely to be traveling more than 10 miles per hour over the speed limit as they travel through the intersection than the northbound or eastbound through movements. There are a variety of contributing factors, including the distance from other signalized intersections and the widening of Curlew Road to provide two westbound travel lanes about 900 feet east of the intersection. Consider the installation of advanced signage altering people who drive that a signalized intersection is ahead, or solar powered speed feedback signs to alert people who drive that they are traveling in excessive of the posted speed limit.

This concludes our near-miss assessment of the Alt Route 19 at Curlew Road intersection. Please contact Kathrin Tellez at (321) 754-9902 if you have questions.

Memorandum

Date: July 23, 2020

To: Sarah Caper, Forward Pinellas

From: Kathrin Tellez, Fehr & Peers

Subject: Safe Streets Pinellas Alt Route 19 at Curlew Road Demonstration Project Concept

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Introduction

Up to four demonstration projects are scheduled to be developed and implemented as part of Safe Streets Pinellas. The goal of these demonstration projects is to build interest around Vision Zero by showcasing how different transportation safety projects and transportation safety campaigns can be implemented in Pinellas County, and to test potential countermeasures that could be included in the Vision Zero Action Plan. The nature of the demonstration projects will be varied and incorporate a range of elements.

Discussions with the project Task Force, Forward Pinellas staff, and FDOT staff, as well as feedback from the community, led to interest in conducting a near miss assessment of the intersection of Alt Route 19 at Curlew Road in Dunedin, which also includes a trail crossing of the Fred Marquis Pinellas Trail. Although this intersection is not on the draft High Injury Network developed as part of the Safe Streets Pinellas Project, there are 5 to 6 collisions at the intersection each year that result in severe injuries and multiple reports of near-miss collisions involving vulnerable roadway users.

FDOT previously evaluated the provision of an exclusive pedestrian phase at this intersection, and based on the level of vehicle, bicycle and pedestrian volumes, as well as the intersection crossing patterns, FDOT concluded that a pedestrian only phase would not be the most effective treatment at the intersection to improve safety and that other treatments would be evaluated.

The purpose of this memo is to outline steps that could be taken as part of a Safe Street Pinellas Demonstration Project to identify other improvements that could be implemented as well as pilot the use of near miss technology in the County to better identify safety strategies as specific locations. The following describes the existing conditions at the intersection, and outlines the steps that would be taken to conduct the near miss analysis and conduct additional analysis to identify a range of safety improvements, and assess the operational effects of those potential counter measures on overall intersection operations.

Existing Conditions

Alt Route 19 (also known as State Route 595) is a two-lane undivided highway with a posted speed limit of 40 miles per hour. There are bicycle lanes in both directions on Alt Route 19. Daily traffic volumes on this roadway are approximately 21,500 south of Curlew Road, and 16,000 north of Curlew Road.

Curlew Road is a two lane divided highway with a center left-turn lane. At the approach to Alt Route 19, a transition starts for westbound traffic to add a second travel lane. To the west of Alt Route 19, Curlew Road continues as Causeway Boulevard, a four-lane divided roadway with turn-pockets at intersections and a landscaped median. Typical daily traffic volumes on Curlew Road are approximately 14,200, and on Causeway Boulevard, daily volumes are approximately 10,000.

Recent bicycle/pedestrian counts collected at the intersection, which includes the Fred Marquis Pinellas Trail, indicate that based on 8-hours of data collection, at least 700 bicyclists and pedestrian cross the intersection on a weekday, 950 on a Saturday and 1,400 on a Sunday. This data was collected prior to the COVID-19 stay at home orders. During the stay at home period, trail use increased in the Dunedin area by over 100 percent.

The intersection of Alt Route 19 at Curlew Road is signalized, with the northbound, eastbound and westbound left-turns operating with permitted/protected phasing. The southbound left-turn movement operates with protected phasing only. There are also blank out “no right-turn arrow” signs for the both the northbound and eastbound right-turn movement.

On average, there are between 30 and 45 reported collisions at the intersection each year, with five to six collisions per year resulting in severe injuries. Feedback from the community related to transportation safety at the intersection are mainly on the theme of bicyclist and pedestrian conflicts with drivers, including:

- We need an overpass at this intersection for pedestrians and bicycles
- We need to move stop bars back, improve crosswalk visibility, provide pedestrian scale lighting and restrict right on red for all four approaches
- Drivers continue to turn despite no turn on red Signal, placing trail users in danger. Maybe if flashing red lights were added it would help
- West bound Curlew drivers frequently make right turns on red at Alt 19 northbound. Propose a lighted "no turn" sign similar to the one for North Bound Alt 19 and eastbound Curlew. The failure of drivers to obey the No Right on Red sign places users of the Pinellas trail at risk.
- The intersection of Curlew and the Causeway is highly trafficked and dangerous when crossing in any direction. Due to the Pinellas Trail crossing here as well the existing crosswalk system just isn’t enough to leave pedestrians feeling safe when crossing
- Intersection is EXTREMELY busy with traffic coming from all four directions, and bike/ped traffic on the Pinellas Trail as well as the Honeymoon Island Trail spur.

Preliminary analysis was conducted based on traffic volumes collected by FDOT in February/ March 2020, including bicycle, pedestrian and vehicle volumes through the intersection. Based on an initial review of the data, Sunday afternoon is when there are the highest levels of bicycle and pedestrian travel through the intersection. During the Sunday peak hour, the intersection operates at a high LOS D/low LOS E for vehicles, mostly due to long cycle lengths. Implementing a leading pedestrian interval, permanent prohibition of right-turns on red or changing signal phasing to convert one or more protected-permitted left-turns to protected would increase average intersection delay, but could yield safety benefits to other roadway users.

Near Miss Analysis

To better inform the types of safety improvements that could be implemented at the intersection, a near miss technology vendor will be retained to collect and evaluate high definition video of the intersection to identify specific types of near misses that are occurring such that appropriate countermeasures can be identified. The firm Street Simplified has been identified to collect video count data at the intersection for a 48-hour period to include a weekday and a weekend day, and employ their suite of safety analytics to identify potential near miss collisions, red-light running, speeding, and bicycle/pedestrian interactions. Motorcyclists and other roadway users (like scooters and golf-carts) would also be accounted for in the analysis. These analytics are intended to provide insights about what intersection features are potentially contributing to collisions, and what countermeasures might be appropriate for deployment.

Based on the results of the near miss analytics, we will conduct a detailed operations analysis of the intersection based on the higher volume of the count data collected between the prior data collection effort in February/March 2020, and data collected during the near miss data collection reflecting a peak weekday hour and a peak weekend hour for both vehicles and pedestrians/ bicyclists. It is expected that data collected in February/March 2020 could be more representative of typical conditions for vehicles, but July/August 2020 conditions could have higher levels of pedestrian and bicycle activity. We will provide a comparison of February/March and July/August vehicle and non-motorized counts for stakeholder buy-in prior to conducting detailed analysis. Based on the results of the near miss analysis and the intersection operations analysis, we will evaluate the effect of a range of potential counter measures both in terms of the expected safety benefit and their effect on intersection operations.

Based on the results of the assessment, we will develop two sets of countermeasure recommendations – the first would be strategies that could be implemented through signal timing and phasing adjustments such that they could be implemented immediately. The second would be longer-term improvements that may require some level of curb modification, restriping, or other reconfiguration of the intersection.

Should the signal timing and/or phasing adjustments be implemented within a two months of the completion of the assessment, we would then retain Street Simplified to conduct an after assessment to determine if the counter measures were effective in reducing the number of potential near-misses, and to assess if there were unintended consequences associated with the signal timing and/or phasing modification. This evaluation of near-miss technology is intended to serve as a proof-of-concept to deploy near miss technologies at a larger scale as part of the Safe Street Pinellas Action Plan implementation, and other safety related projects in Pinellas County.

Next Steps

Our next steps are to authorize Street Simplified to commence with the data collection, such that the near miss analysis can be completed in combination with the detailed analysis of intersection operations. We expect that we will share the initial results of the near miss analysis with interested stakeholders as we conduct the operations analysis such that the evaluated countermeasures consider a wide range of potential improvements that are of interest to Forward Pinellas, FDOT and Pinellas County.

This completes our initial outline for the near miss demonstration project for Alt Route 19 at Curlew Road.

Engineering Counter-measure Toolbox

Appendix D

SAFE STREETS PINELLAS

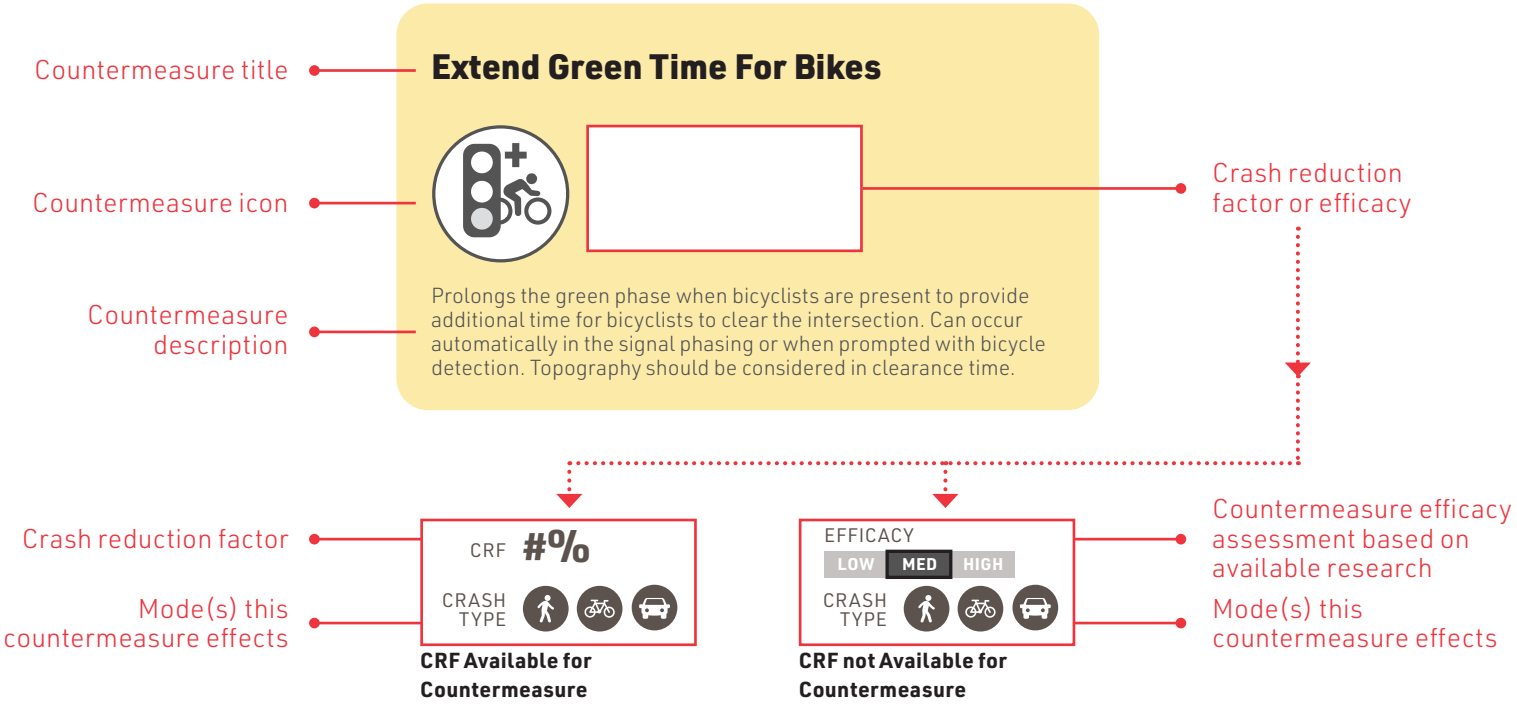
FORWARD PINELLAS VISION ZERO

Safety Countermeasures Toolbox

This Toolbox Presents Safety Countermeasures Applicable in Different Roadway Contexts Across Pinellas County

Many of the countermeasures are FDOT-approved, with an associated Crash Reduction Factor (CRF) and crash type (i.e., all modes, bicycle and pedestrian crashes only, etc.) as documented by the Federal Highway Administration. The higher the CRF (1 being the highest), the greater the expected reduction in crashes. Countermeasures without a CRF are scored on a "low-medium-high" efficacy scale based on proven safety studies; otherwise, denoted as "N/A" when limited safety studies are available. The higher the efficacy rating, the greater the expected reduction in crashes. Crash Reduction Factors shown here represent an average reduction for comparison purposes. As CRFs can be context specific and new data is continually being added, the user should consult the FHWAs Crash Modifications Factors Clearinghouse (http://www.cmfclearinghouse.org/) for the most current guidance and to identify other potential treatments that may not be documented here.

What You'll See Inside



Safety Efficacy Sources

Application of Pedestrian Crossing Treatments for Streets and Highways, NCHRP, 2016.
Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments, NCHRP, 2017.
Evaluation of Bicycle-Related Roadway Measures, Pedestrian and Bicycle Information Center, 2014.
Evaluation of Pedestrian-Related Roadway Measures, Pedestrian and Bicycle Information Center, 2014.
2015 FDOT Highway Safety Manual Users Guide
Highway Safety Manual, AASHTO
USDOT FHWS Office of Safety

Summary of Countermeasures

A. Signal Timing & Phasing

Additional Signal Heads
Advanced Dilemma-Zone Detection
Automatic Recall Signal Timing
Extend Green Time For Bikes
Extend Pedestrian Crossing Time
Extend Yellow and All Red Time
Flashing Yellow Turn Phase
Green Wave
Leading Pedestrian Interval
New Traffic Signal
Pedestrian Phase Recall
Pedestrian Scramble
Permissive Lefts To Protected
Reduce Cycle Lengths
Separate Right-Turn Phasing

B. Intersection & Roadway Design

Close Slip Lane
Convert 2-Way Stop to All-Way Stop
Lane Narrowing
Multi-Lane Roundabout
New Sidewalk
No Passing Zone
Partial Closure/Diverter
Positive Left-Turn Off-Set
Protected Intersection
Raised Intersection
Raised Median
Realign Intersection to 90 Degrees
Repurpose Extra Travel Lanes
Road Diet
Roundabout
Speed Humps or Speed Tables
Splitter Island
Widen Shoulder
Two-Stage Gap Acceptance

C. Signs & Markings

Advance Stop Bar
Advance Warning Sign
Advance Yield Markings
Bicycles May Use Full Lane Sign
No Right Turn On Red
Parking Restrictions/Daylighting
Speed Feedback Sign
Time-Based Turn Restriction
Turn Prohibition
Variable Message Sign
Wayfinding
Yield To Pedestrians Sign

D. Bikeway Design

Bicycle Crossing (Solid Green Paint)
Bicycle Ramps
Bicycle Signal/Exclusive Bike Phase
Bike Box
Bike Detection

D. Bikeway Design, Cont.

Bike Friendly Drains
Bicycle Path Or Trail
Bike Lane
Separated Bikeway
Floating Transit Island
Green Bike Lane Conflict Zone Markings
Mixing Zone
"On Roadway" Bicycle Sign
Parking Buffer
Shared Sidewalk Sign
Signing and Striping in Support of Bicycle Boulevard
Traffic Calming in Support of Bicycle Boulevard
Trail Crossing
Two-Stage Turn Queue Bike Box
Widen Sidewalk

E. Pedestrian Crossings

ADA Ramps & Audible Push Button Upgrades
Curb Extensions
Extended Time Pushbutton
High-Visibility Crosswalk
Pedestrian Countdowns
Pedestrian Detection
Pedestrian Hybrid Beacon
Pedestrian Lighting
Pedestrian Median Barrier
Pedestrian Refuge Island
Raised Crosswalk
Remove Crossing Prohibition
Restripe Crosswalk
Rectangular Rapid Flashing Beacon
Straighten Crosswalks
Upgrade Curb Ramp

F. Other

Access Management/Close Driveway
Automated Speed Enforcement
Context-Sensitive Speed Limits
Curbside Management
Development-Related ROW Improvements
Far-Side Bus Stop
Incident Management Protocols
Intersection, Street-Scale Lighting
Keep Roadway Clear Of Debris
Speed Feedback Sign
Targeted Enforcement
Traffic Incident Management
Remove Obstructions For Sightlines
Variable Speed Limit

G. Low-Cost & Quick-Build

Hardened Centerline
Left Turn Enhanced Daylighting/Slow Turn Wedge
Paint and Plastic Curb Extension
Paint and Plastic Median
Paint and Plastic Mini Circle
Paint and Plastic Pedestrian Refuge Area
Paint and Plastic Separated Bikeway
Traffic Diverter

A. SIGNAL TIMING & PHASING

Additional Signal Heads



CRF **15%**

CRASH TYPE

Additional signal heads allow drivers to anticipate signal changes farther away from intersections, decreasing the likelihood of driver error resulting in a collision.

Advanced Dilemma-Zone Detection



CRF **39%**

CRASH TYPE

Enhances safety at signalized intersections by adjusting traffic signal timing on the fly to reduce the number of people driving that may have difficulty deciding whether to stop or proceed during a yellow phase. This may reduce rear-end crashes associated with unsafe stopping and angle crashes due to red-light running.

Automatic Recall Signal Timing



EFFICACY

LOW MED HIGH

CRASH TYPE

Signals can be put in "recall" all the time or for key time periods of the day. The "walk" and/or corresponding green signal would be displayed every signal cycle without prompting by a person walking or from vehicle detection. This can ensure bicyclists get a green signal every cycle and discourages red-light running by people biking.

Extend Green Time For Bikes



CRF **15%**

CRASH TYPE

Prolongs the green phase when bicyclists are present to provide additional time for bicyclists to clear the intersection. Can occur automatically in the signal phasing or when prompted with bicycle detection. Topography should be considered in clearance time.

Extend Pedestrian Crossing Time



CRF **15%**

CRASH TYPE

Increases time for pedestrian walk phases, especially to accommodate vulnerable populations such as children and the elderly.

Extend Yellow and All Red Time



CRF **15%**

CRASH TYPE

Extending yellow and all red time allows drivers and bicyclists to safely cross through a signalized intersection before conflicting traffic movements are permitted to enter the intersection.

Flashing Yellow Turn Phase



CRF **N/A**

CRASH TYPE

Flashing yellow turn arrow alerts drivers to proceed with caution and decide if there is a sufficient gap in oncoming traffic to safely make a turn. To be used only when a pedestrian walk phase is not called. Protected only phases should be used when pedestrians are present.

Green Wave



CRF **15%**

CRASH TYPE

Occurs when a series of traffic signals are coordinated to allow for uninterrupted bicycle traffic flow through those intersections in at least one direction. Coordinating signals to allow for bicyclist progression gives bicyclists and pedestrians more time to safely cross through the 'green wave' intersections.

A. SIGNAL TIMING & PHASING

Leading Pedestrian Interval



CRF **15%**

CRASH TYPE

Gives people walking a head start, making them more visible to drivers turning right or left. "WALK" signal comes on a few seconds before the cars get their green light. May be used in combination with No Right Turn on Red restrictions.

New Traffic Signal



CRF **25%**

CRASH TYPE

New traffic signals can help to organize travel of all modes at an intersection, limiting interactions between vehicles, pedestrians, and bicyclists with conflicting movements.

Pedestrian Phase Recall



EFFICACY

LOW **MED** HIGH

CRASH TYPE

Signals can be put in "recall" for key time periods of day such as peak business hours or school drop-off/pick-up times. During these periods the " WALK" signal would be displayed every signal cycle without prompting by a pedestrian push button.

Pedestrian Scramble



CRF **15%**

CRASH TYPE

This is a form of pedestrian 'walk' phase at a signalized intersection in which all vehicular traffic is required to stop, allowing pedestrians to safely cross through the intersection in any direction, including diagonally, if marked and signed accordingly.

Permissive Lefts to Protected



CRF **30% -55%**

CRASH TYPE

Provides a protected green arrow phase for left turning vehicles while showing a red light for both on-coming traffic and parallel pedestrian crossings. Eliminates conflicts between pedestrians and left-turning vehicles.

Reduce Cycle Lengths



CRF **15%**

CRASH TYPE

Traffic signal cycles should be kept short (preferably 90 seconds maximum) to reduce pedestrian delay. When delay is significant, pedestrians are more inclined to ignore signal indications.

Separate Right-Turn Phasing



EFFICACY

LOW MED **HIGH**

CRASH TYPE

Provides a green arrow phase for right-turning vehicles. Avoids conflicts between right-turning traffic and bicyclists or pedestrians crossing the intersection on their right.

B. INTERSECTION & ROADWAY DESIGN

Close Slip Lane



EFFICACY

LOW | MED | HIGH

CRASH TYPE

Modifies the corner of an intersection to remove the sweeping right turn lane for vehicles. Results in shorter crossings for pedestrians, reduced speed for turning vehicles, better sight lines, and space for landscaping and other amenities.

Convert 2-Way Stop to All-Way Stop

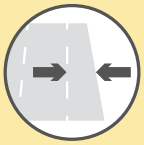


CRF **50%**

CRASH TYPE

Converting 2-way stops to all-way stops prevents motorists, bicyclists, and pedestrians from having to cross free-flowing lanes of traffic at a side-street stop-controlled intersection and reduces the risk of collision.

Lane Narrowing



CRF **30%**

CRASH TYPE

A reduction in lane width produces a traffic calming effect by encouraging motorists to travel at slower speeds, lowering the risk of collision with bicyclists, pedestrians, and other motorists.

Multi-Lane Roundabout



CRF **varies**

CRASH TYPE

Similar to a single-lane roundabout but on a multi-lane road. Studies have shown total increases in collisions but decreases in collisions where someone is killed or seriously injured with multi-lane roundabouts.

New Sidewalk

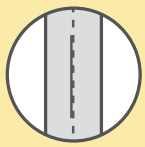


CRF **35%**

CRASH TYPE

Sidewalks and walkways are "pedestrian lanes" that provide people with space to travel within the public right-of-way that is separated from roadway vehicles. They are associated with reduced crashes where pedestrians were walking along the roadway.

No Passing Zone



EFFICACY

LOW | MED | HIGH

CRASH TYPE

Converting a passing zone (where a vehicle uses the opposing lane of traffic to pass another vehicle) to a no-passing zone may reduce head-on or run-off -the-road crashes.

Partial Closure/Diverter

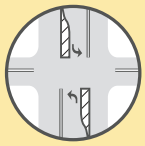


CRF **50%**

CRASH TYPE

A roadway treatment that restricts through vehicle movements using physical diversion while allowing bicyclists and pedestrians to proceed through an intersection in all directions.

Positive Left-Turn Off-Set



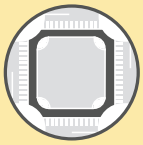
CRF **34%**

CRASH TYPE

Sifting left-turn lanes so they are not aligned directly across from the opposing left-turn lane and adjacent to the through travel lane can improve sight distance at intersections where permitted left-turn phasing is employed

B. INTERSECTION & ROADWAY DESIGN

Protected Intersection



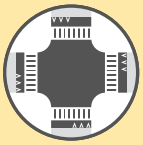
EFFICACY

LOW MED **HIGH**

CRASH TYPE

Protected intersections use corner islands, curb extensions, and colored paint to delineate the bicycle path across an intersection and allow a two-stage left-turn for bicycles parallel to the crosswalk. Provides space for drivers to yield outside the travel lane.

Raised Intersection



CRF **35%**

CRASH TYPE

Elevates the intersection to bring vehicles to the sidewalk level. Serves as a traffic calming measure by extending the sidewalk context across the road.

Raised Median



CRF **25% - 50%**

CRASH TYPE

A concrete or landscaped area, between the two directions of travel. Reduces vehicular speeding and discourages risky turning movements.

Realign Intersections to 90 Degrees



EFFICACY

LOW MED HIGH

CRASH TYPE

By eliminating acute or obtuse angles between intersection roadways, intersection sight distance may be improved, allowing motorists to see pedestrians more easily.

Repurpose Extra Travel Lanes



EFFICACY

LOW MED **HIGH**

CRASH TYPE

Repurposing travel lanes at spot locations, such as extra receiving lanes at an intersection, is a strategy used to make space for other safety improvements such as, widening sidewalks, creating space for bicycle, pedestrian, or transit lanes, and other improvements.

Road Diet



CRF **30%**

CRASH TYPE

Depending on the street, road diets may change the number of lanes, turn lanes, center turn lanes, bike lanes, parking lanes, and/or sidewalks. Road diets optimize street space to benefit all users by improving the safety and comfort of pedestrians and bicyclists, and reducing vehicle speeds and the potential for rear end collisions.

Roundabout



CRF **varies**

CRASH TYPE

Roundabouts are circular intersections designed to eliminate left turns by requiring traffic to travel in a counter-clockwise direction and exit to the right. Installed to manage vehicular speeds, reduce pedestrian exposure, improve safety at intersections through eliminating angle collisions, and help traffic flow more efficiently.

Speed Humps or Speed Tables



EFFICACY

LOW MED **HIGH**

CRASH TYPE

These traffic calming devices use vertical deflection to raise the entire wheelbase of a vehicle and encourage motorists to travel at slower speeds to avoid damage to the undercarriage of an automobile.

B. INTERSECTION & ROADWAY DESIGN

Splitter Island

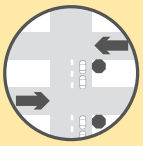


CRF **25%**

CRASH TYPE

A raised area that separates the two directions of travel on the minor street approach at an unsignalized intersection or roundabout. Helps channelize traffic in opposing directions of travel. Typically installed at skewed intersections or where speeds on minor roads are high.

Two-Stage Gap Acceptance



EFFICACY

LOW MED **HIGH**

CRASH TYPE

Two-stage gap acceptance provides a refuge in the median for vehicles making a left turn onto a busy street in two stages. This design allows people driving to focus on finding a gap in traffic in one direction of travel instead of both.

Widen Shoulder



CRF **30%**

CRASH TYPE

Widened shoulders create a separated space for bicyclists and also provide motor vehicle safety benefits, such as space for inoperable vehicles to pull out of the travel lane.

C. SIGNS & MARKINGS

Advance Stop Bar



CRF **15%**

CRASH TYPE

A stop bar placed 5 to 7 feet ahead of the crosswalk at stop signs and signals reduces instances of vehicles encroaching on the crosswalk.

Advance Warning Sign



CRF **36%**

CRASH TYPE

A sign placed to warn a person driving of an upcoming curve, stop sign, traffic signal, roundabout, pedestrian crossing, or other potential point of conflict where a person driving may need to slow down or use caution. Signs can include flashing beacons to enhance awareness.

Advance Yield Markings



CRF **25%**

CRASH TYPE

Yield lines are placed 20 to 50 feet in advance of pedestrian crossings to increase visibility of pedestrians. Can reduce the likelihood of a multiple-threat crash at unsignalized midblock crossings.

Bicycles May Use Full Lane Sign



CRF **15%**

CRASH TYPE

A sign placed on roads with lanes that are too narrow to allow safe side-by-side passing to indicate that bicyclists may occupy the full lane. This discourages unsafe passing by motorists.

No Right Turn On Red



EFFICACY

LOW **MED** HIGH

CRASH TYPE

Can help prevent crashes between vehicles turning right on red from one street and through vehicles on the cross street, and crashes involving pedestrians. Should be considered where exclusive pedestrian "WALK" phases, LPIs, sight distance issues, or high pedestrian volumes are present.

Parking Restrictions/Daylighting



EFFICACY

LOW MED **HIGH**

CRASH TYPE

By restricting parking at curbs in front of intersection crosswalks, sight lines are cleared between pedestrian crossings and oncoming motorists, reducing the risk of collision.

Speed Feedback Sign



CRF **30%**

CRASH TYPE

A roadway treatment that uses radar to alert drivers to their actual speed relative to the posted speed limit, encouraging drivers who exceed to the speed limit to slow down.

Time-Based Turn Restriction



EFFICACY

LOW **MED** HIGH

CRASH TYPE

Restricts left-turns or right-turns during certain time periods when there may be increased potential for conflict (e.g., peak periods, school hours).

C. SIGNS & MARKINGS

Turn Prohibition



EFFICACY

LOW **MED** HIGH

CRASH TYPE

Bans left or right turns at locations where a turning vehicle may conflict with pedestrians in the crosswalk or where opposing traffic volume is high. Reduces pedestrian interaction with vehicles when crossing. Important tool when road diets are infeasible and a grid network of streets is present.

Wayfinding



CRF **N/A**

CRASH TYPE

A network of signs that highlight nearby pedestrian and bicycle facilities. Can help to reduce crossings at locations with poor sight distance or limited crossing enhancements.

Yield To Pedestrians Sign



CRF **15%**

CRASH TYPE

The "Yield Here to Pedestrians" (e.g. R1-5, R1-5a) signs alert drivers about the presence of pedestrians. These signs are required with Advance Yield Lines. Other sign types (e.g. R1-6) can be placed on the centerline in the roadway.

Variable Message Sign



EFFICACY

LOW MED HIGH

CRASH TYPE

Variable message signs are electronic signs that allow for varying messages. Variable message signs can be used to warn people driving of slowdowns ahead, decreasing rear-end crashes.

D. BIKEWAY DESIGN

Bicycle Crossing (Solid Green Paint)



EFFICACY

LOW | MED | HIGH

CRASH TYPE

Solid green paint across an intersection that signifies the path of the bicycle crossing. Increases visibility and safety of bicyclists traveling through an intersection.

Bicycle Ramps



CRF **N/A**

CRASH TYPE

Connects bicyclists from the road to the sidewalk or a shared use path.

Bicycle Signal/Exclusive Bike Phase



CRF **30%**

CRASH TYPE

A traffic signal directing bicycle traffic across an intersection. Separates bicycle movements from conflicting motor vehicle, streetcar, light rail, or pedestrian movements. May be applicable for separated or buffered facilities when the bikeway is brought up to the intersection.

Bike Box



CRF **15%**

CRASH TYPE

A designated area at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase.

Bike Detection



CRF **N/A**

CRASH TYPE

Bike detection is used at signalized intersections, either through use of push-buttons, in-pavement loops, or by video or infrared cameras, to call a green light for bicyclists and reduce delay for bicycle travel. Discourages red light running by bicyclists and increases convenience of bicycling.

Bike Friendly Drains



EFFICACY

LOW | MED | HIGH

CRASH TYPE

Bike friendly drains avoid placing grating in the right-of-way that may pose a hazard to bicyclists by increasing their risk of falling.

Bicycle Path or Mixed Use Trail



CRF **80%**

CRASH TYPE

Provides a completely separate right of way that is designated for the exclusive use of people riding bicycles and walking with minimal cross-flow traffic. Paths and trails offer opportunities for the lowest stress bicycle travel.

Bike Lane



CRF **35%**

CRASH TYPE

Using designated lane markings, pavement legends, and signage, bike lanes provide dedicated street space for bicyclists, typically adjacent to the outer vehicle travel lane.

D. BIKEWAY DESIGN

Separated Bikeway



CRF **35%**

CRASH TYPE

Space on the roadway set aside for the exclusive use of bicycles and physically separated from vehicle traffic. Types of separation may include, but are not limited to, grade separation, flexible posts, physical barriers, or on-street parking.

Floating Transit Island



CRF **N/A**

CRASH TYPE

An in-street transit boarding island is used in conjunction with a separated bikeway, separating transit traffic from bicycle traffic, reducing conflict between the two modes and lowering the risk of collision.

Green Bike Lane Conflict Zone Markings



EFFICACY

LOW MED HIGH

CRASH TYPE

Green pavement within a bicycle lane to increase visibility of bicyclists and to reinforce bicycle priority. The green pavement can be either as a corridor treatment or as a spot treatment in conflict areas such as frequently used driveways.

Mixing Zone



EFFICACY

LOW **MED** HIGH

CRASH TYPE

Places a suggested bike lane within the inside portion of a dedicated motor vehicle turn lane. Lane markings delineate space for bicyclists and motorists within the same lane and indicate the intended path for bicyclists to reduce conflict with turning motor vehicles.

"On Roadway" Bicycle Sign



CRF **15%**

CRASH TYPE

Street sign that communicates to drivers that bicyclists are on the road. Signs enhance visibility for bicyclists, reminding drivers that they are on the road.

Parking Buffer



CRF **N/A**

CRASH TYPE

Pavement markings denoting door zone of parked vehicles to help bicyclists maintain safe positioning on the roadway.

Shared Sidewalk Sign



EFFICACY

LOW MED HIGH

CRASH TYPE

Signs communicate to pedestrians that bicyclists may also use the sidewalk and that bicyclists must yield to pedestrians.

Signing and Striping in Support of Bicycle Boulevard



CRF **35%**

CRASH TYPE

Bicycle boulevards are roads that encourage low automobile traffic volumes and speeds through signing and striping while giving bicyclists priority and encouraging non-motorized travel.

D. BIKEWAY DESIGN

Traffic Calming in Support of Bicycle Boulevard



EFFICACY

LOW MED **HIGH**

CRASH TYPE

Traffic calming includes measures that encourage slower speeds to bring automobile speeds closer to those of bicyclists. This has the effect of reducing in-lane passing, improving driver perception and reaction time, and reducing the severity of collisions.

Trail Crossing



CRF **N/A**

CRASH TYPE

A continental crosswalk with a bike stamp in the middle, placed at locations where trails intersect with or cross the roadway.

Two-Stage Turn Queue Bike Box



EFFICACY

LOW MED HIGH

CRASH TYPE

This roadway treatment provides bicyclists with a means of safely making a left or right turn at a multi-lane signalized intersection from a bike lane or cycle track on the opposite side of the lane. In this way, bicyclists are protected from the flow of traffic while waiting to turn.

Widen Sidewalk



CRF **N/A**

CRASH TYPE

Wide sidewalks can provide space for both pedestrians and bicyclists to use a shared facility. Wide sidewalks can be important for locations with high volumes of pedestrians.

E. PEDESTRIAN CROSSINGS

ADA Ramps & Audible Push Button Upgrades



CRF **25%**

CRASH TYPE

Curb ramps and push buttons must comply with Americans with Disability Act (ADA) standards for accessibility. Pushbuttons should be visible and conveniently located for pedestrians waiting at a crosswalk. Accessible pedestrian signals, including audible push buttons, improve access for pedestrians who are blind or have low vision.

Curb Extensions



EFFICACY

LOW **MED** HIGH

CRASH TYPE

Widens the sidewalk at intersections or midblock crossings to shorten the pedestrian crossing distance, to make pedestrians more visible to vehicles, and to reduce the speed of turning vehicles.

Extended Time Pushbutton



CRF **25%**

CRASH TYPE

A pushbutton that can be pressed to request extra time for crossing the crosswalk, beyond the standard crossing time. Ideal near senior-serving land uses.

High-Visibility Crosswalk



CRF **25% - 35%**

CRASH TYPE

A crosswalk that is designed to be more visible to approaching drivers. Crosswalks should be designed with continental markings, also known as ladder markings, and use high-visibility material such as inlay tape or thermoplastic tape instead of paint.

Pedestrian Countdowns



CRF **25%**

CRASH TYPE

Displays "countdown" of seconds remaining on the pedestrian signal. Countdown indications improve safety for all road users, and are required for all newly installed traffic signals where pedestrian signals are installed.

Pedestrian Detection



CRF **25%**

CRASH TYPE

An intersection treatment that relies on sensors to detect when a pedestrian is waiting at a crosswalk and automatically trigger the pedestrian 'walk' phase.

Pedestrian Hybrid Beacon



CRF **55%**

CRASH TYPE

Pedestrian-activated beacon used at mid-block crosswalks and side-street stop controlled crossing locations to notify oncoming motorists to stop with a series of red and yellow lights.

Pedestrian Lighting



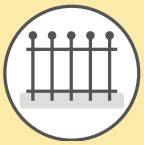
CRF **35% - 40%**

CRASH TYPE **NIGHT TIME**

At pedestrian crossings, research indicates pedestrian lighting should be placed 10 feet from the crosswalk, in between the approaching vehicles and the crosswalk. At intersections, pedestrian lighting should also be placed before the crosswalk on the approach into the intersection.

E. PEDESTRIAN CROSSINGS

Pedestrian Median Barrier



CRF **35%**

CRASH TYPE

Pedestrian median barriers restrict pedestrians from crossing the median at locations where nearby crossings are available and midblock crossings may have poor sight distance or insufficient crossing enhancements for the conditions.

Pedestrian Refuge Island



CRF **25% - 45%**

CRASH TYPE

Pedestrian refuge islands provide a protected area for pedestrians at the center of the roadway. They reduce the exposure time for pedestrian crossing the intersection. They simplify crossings by allowing pedestrians to focus in one direction of traffic at a time.

COUNTERMEASURE

Raised Crosswalk



CRF **35%**

CRASH TYPE

The crosswalk is elevated to match the sidewalk to make pedestrians more visible to approaching vehicles. Typically located at midblock crossings, they encourages motorists to yield to pedestrians and reduce vehicle speed.

Remove Crossing Prohibition



CRF **25%**

CRASH TYPE

Removes existing crossing prohibitions and provides marked crosswalk and other safety enhancements for pedestrians to cross the street.

Restripe Crosswalk



CRF **25%**

CRASH TYPE

Periodic restriping of crosswalks is necessary to ensure the traffic markings are visible. Crosswalk may be restriped with high visibility markings.

Rectangular Rapid Flashing Beacon



CRF **35%**

CRASH TYPE

Pedestrian-activated flashing lights and additional signage enhance the visibility of marked crosswalks and alert motorists to pedestrian crossings.

Straighten Crosswalks



EFFICACY

LOW **MED** HIGH

CRASH TYPE

Straightening crosswalks improves sight lines, making people walking more visible to oncoming people driving, and may shorten the crossing distance, reducing the length of time required for people walking to cross an intersection.

Upgrade Curb Ramp



CRF **N/A**

CRASH TYPE

Curb ramps must follow Americans with Disabilities Act (ADA) design guidelines. Tactile warning devices must be detectable to visually impaired pedestrians.

F. OTHER

Access Management/Close Driveway



CRF **N/A**

CRASH TYPE

Vehicles entering and exiting driveways may conflict with pedestrians and with vehicles on the main road, especially at driveways within 250 feet of intersections. Closing driveways near intersections with high crash rates related to driveways may reduce potential conflicts.

Automated Speed Enforcement



CRF **48%**

CRASH TYPE

Speed cameras are a type of automated enforcement that use cameras as well as radar or in-ground sensors to detect speed and identify the associated vehicle. Speed cameras can substantially reduce speed-related crashes.

Context-Sensitive Speed Limits



CRF **Varies**

CRASH TYPE

Reducing speed limits in combination with roadway design changes to encourage lower speeds can help reduce the severity of collisions when they do occur. Arbitrarily reducing speed limits without corresponding roadway design changes can be counterproductive.

Curbside Management



CRF **N/A**

CRASH TYPE

Curbside management can better prioritize reliable transit and safe bicycling infrastructure, freight deliveries, passenger pick-ups/drop-offs, green stormwater infrastructure, public spaces, and parking management.

Development-Related ROW Improvements



CRF **N/A**

CRASH TYPE

Request or require that developers help fund pedestrian, bicycle, and transit access infrastructure improvements around their developments.

Far-Side Bus Stop



CRF **N/A**

CRASH TYPE

Far-side bus stops are located immediately after an intersection, allowing the bus to pass through the intersection before stopping for passenger loading and unloading. Far-side stops encourage pedestrians to cross behind the bus for greater visibility, and can improve transit service reliability. Should be combined with crossing treatments at intersections. Also appropriate for school bus stops.

Incident Management Protocols



EFFICACY

LOW MED HIGH

CRASH TYPE

Use protocols to quickly move queue causing vehicles including those that are disabled or were involved in a minor crash.

Intersection, Street-Scale Lighting



CRF **40%**

CRASH TYPE **NIGHT TIME**

Street and intersection lighting helps make other road users or hazards more visible to motorists at night, improving driver perception and reaction time and reducing the risk of collision.

F. OTHER

Keep Roadway Clear of Debris



CRF **N/A**

CRASH TYPE

A smoothly paved surface free of debris enhances safety for vehicles and bicyclists.

Remove Obstructions For Sightlines



CRF **20%**

CRASH TYPE

Remove objects that may prevent drivers and pedestrians from having a clear sightline. May include installing red curb at intersection approaches to remove parked vehicles (also called "daylighting"), trimming or removing landscaping, or removing or relocating large signs.

Speed Feedback Sign



CRF **5%**

CRASH TYPE

A roadway treatment that uses radar to alert people driving to their actual speed relative to the posted speed limit, encouraging people driving who exceed to the speed limit to slow down.

Targeted Enforcement



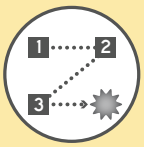
EFFICACY

LOW **MED** HIGH

CRASH TYPE

Targeted enforcement is used to reduce the most dangerous behaviors (such as speeding, distracted driving, aggressive driving, impaired driving, and red-light and stop sign running), particularly at locations with a history of such behaviors. People driving are less likely to participate in dangerous behaviors when they know there is a higher likelihood they will be caught.

Traffic Incident Management



EFFICACY

LOW MED HIGH

CRASH TYPE

Traffic incident management is a planned and coordinated multidisciplinary process to detect, respond to and clear traffic incidents so that traffic flow may be restored as safely.

Variable Speed Limit



EFFICACY

LOW **MED** HIGH

CRASH TYPE

Speed limit signs that can be adjusted depending on roadway conditions. Reducing the speed limit when conditions are less optimal such during inclement weather, poor road conditions or when there is heavy traffic can reduce the likelihood of severe crashes.

G. LOW-COST & QUICK-BUILD

Hardened Centerline



CRF **10%**

CRASH TYPE

Uses paint to widen left-turn radii and rubber curb with plastic bollards on the receiving roadway's centerline to modify the angle of motorists turning left. Widening the turning radii of left-turning vehicles expands the field of vision for drivers and increases the visibility of pedestrians.

Left Turn Enhanced Daylighting/ Slow Turn Wedge



CRF **10%**

CRASH TYPE

Uses paint and bollards to extend the curb and slow left turns at intersections of one-way to one-way or two-way streets. Widening the turning radii of left-turning vehicles expands the field of vision for drivers and increases the visibility of pedestrians.

Paint and Plastic Curb Extension



EFFICACY

LOW **MED** HIGH

CRASH TYPE

Widens the sidewalk at intersections or midblock crossings to shorten the pedestrian crossing distance, to make pedestrians more visible to motorists, and to reduce the speed of turning vehicles.

Paint and Plastic Median



CRF **25%**

CRASH TYPE

A painted median with plastic posts, between the two directions of travel. Reduces vehicular speeding and discourages risky turning movements.

Paint and Plastic Mini Circle



EFFICACY

LOW **MED** HIGH

CRASH TYPE

Mini circles use paint and soft hit posts to replace stop-controlled intersections with a circular design that calms traffic and eliminates left turns. Installed to reduce vehicular speeds, improve safety at intersections by reducing severe collisions, and help traffic flow more efficiently.

Paint and Plastic Pedestrian Refuge Area



CRF **25% - 45%**

CRASH TYPE

Paint and plastic post pedestrian refuge spaces provide a designated area for pedestrians at the center of the roadway. Pedestrian refuge areas constructed from paint and plastic should be implemented in conjunction with additional safety projects, such as an Rectangular Rapid Flashing Beacon (RRFB) or road diet, to reduce pedestrian exposure.

Paint and Plastic Separated Bikeway



CRF **35%**

CRASH TYPE

A lane on the roadway dedicated to bicycles that is physically separated from vehicles by a raised barrier of plastic posts and painted pavement.

Traffic Diverter



EFFICACY

LOW MED **HIGH**

CRASH TYPE

Traffic diverters use paint, plastic posts, and/or planters to divert auto traffic from a residential street. The diverters do allow bicycles to enter the approach, reducing conflict between bicyclists and vehicles.

Developed by Forward Pinellas in its role as the Metropolitan Planning Organization and Planning Council for Pinellas County



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