

# BCCYCLE AND PEDESTRIAN SCHOOL SAFETY REVIEW STUDY 

## BUNNELL ELENENTARY SCHOOL BUNNELL, FLAGLER COUNTY, FL

Assessment \& Implementation Report | June 2017
\& ASSOCIATES

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# River to Sea Transportation Planning Organization Bicycle and Pedestrian School Safety Review Study 

Bunnell Elementary School Bunnell, Flagler County, FL

## Assessment and Implementation Report

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## Executive Summary

Kittelson and Associates, Inc. (KAI) was contracted by the River to Sea Transportation Planning Organization (R2CTPO) to prepare Assessment and Implementation Report for the Bicycle and Pedestrian School Safety Review Study for seven Flagler County schools. The Assessment Report for the Bicycle and Pedestrian School Safety Review Study will enable the R2CTPO to make recommendations for projects that will improve the walkability and bikability of students living within the school walk zone. The Implementation Report for the Pedestrian and Bicycle School Safety Review Study is based on observations and recommendations of the Assessment Report and includes cost data, ranking criterion for the recommended improvements, and the best practices to follow on old and new developments. The subject of this report is Bunnell Elementary School located at 305 N Palmetto St, Bunnell, FL 32110.

## Purpose

The purpose of the Bicycle and Pedestrian School Safety Review Study is to create a safe environment for students to walk or bicycle to school. The goal for the assessment phase of this study is to provide the R2CTPO with a comprehensive study that will delineate each of the listed school's concerns, document the observed pedestrian and bicycle circulation routes adjacent to the school sites, and then make recommendations for improvements. The assessment includes the walk zone surrounding the school and it will evaluate safety issues that may affect students walking or bicycling to school. Another goal of the assessment report is to continue the coordination among the stakeholders to implement the recommendations of these studies. The purpose of the Implementation Report for the Bicycle and Pedestrian School Safety Review Study is to conduct a constructibility review and develop a cost feasibility plan that is based upon the recommendations from Bunnell Elementary School's Assessment Report. Ultimately, the recommendations within the Implementation Report should create a safer environment for children who live within the walk zone that choose to walk or bicycle to and from the school.

To make walking and bicycling a chosen mode of transportation for students at Bunnell Elementary School, remedial measures have been recommended that should make the school walk zone safer. Many local, state, and federal laws require transportation agencies to focus on walking and bicycling infrastructure as part of the overall transportation network. The Safe, Accountable, Flexible, Efficient Transportation Equity Act (SAFETEA-LU) of 2005 established the Safe Routes to School program that explicitly focused on funding projects to enhance pedestrian and bicycling infrastructure around schools. Fixing America's Surface Transportation Act (FAST) of 2015 reinforces the Safe Routes to School program. The goal of this report is to create a safer environment along the streets adjacent to Bunnell Elementary School and recommend best practices for older and new developments.

The U.S. Department of Health and Human Services Center for Disease Control (CDC) and Prevention has determined that students are not as active as they were 10 years ago when physical activity was incorporated into each student's schedule (KidsWalk-to-School, CDC). This has caused the percentage of overweight students from ages six to eleven years to double over the past 30 years. The CDC has determined that the following are benefits associated with students who walk or ride bicycle to school.

- Increased practice of safe bicycling, walking, and navigating traffic
- Knowledge of their surrounding neighborhood environment
- Improved childhood health
- Improved sense of self-image and autonomy
- Reduce risk of childhood obesity
- Contributes to a healthy social and emotional development
- More alert students who do better in school
- Increased likelihood that students will grow up to lead a healthy lifestyle

The Safe Routes to School (SRTS) program and the CDC went on to say that not only does a safe walking and bicycling environment benefit students, but it also benefits the community in the following ways:

- Decline in traffic congestion
- Reduce the number of traffic accidents
- Improved air quality
- Improved community security
- Reduced fuel consumption
- Enhanced community accessibility
- Increased community involvement
- Improved partnerships among schools, parents, community groups, and local government leaders

Table 1 summarizes safety concerns observed within Bunnell Elementary School's walk zone with recommendations documented in this report.

## Table 1: Observations and Recommendations Summary

| Location | Responsible Agency | Observation | Recommendation |
| :---: | :---: | :---: | :---: |
| Orange St (Howe St to Moody Blvd (SR 100)) | City of Bunnell | Existing sidewalk on northeast side is a substandard, 4 feet wide sidewalk and is not well maintained. <br> Overgrown trees and shrubs block major parts of the sidewalk. | Construct a new 5 feet wide sidewalk on northeast side with ADA compliant pedestrian ramps and marked crosswalks across intersections. |
| Lemon St (Howe St to Moody Blvd (SR 100)) | City of Bunnell | Many students use Lemon street to walk to and from the school to reach Moody Blvd (SR 100). | Construct a new 5 feet wide sidewalk on southwest side with ADA compliant pedestrian ramps and marked crosswalks across intersections. |
| Moody Blvd (SR 100) and Chapel St | City of Bunnell, FDOT, Bunnell Elementary School | The flashing yellow light is on in AM drop off period between 7: 45 AM to 8:30 AM on Moody Boulevard. However, there are students who cross Moody Blvd after 8:30 AM. | Coordinate flashing yellow light timings with school arrival and dismissal periods. |
|  | City of Bunnell Police Department | Few cars are driving higher than 20 MPH speed even when the flashing yellow lights are on. | Periodically place speed monitoring trailers to remind drivers that they are driving over the posted speed limit; law enforcement officers should periodically monitor the school walk zone to ensure that motorists are following the rules; if it is found that motorists are driving over the posted speed limit then the police Department should consider issuing fines during school arrival and dismissal times. |


| Location | Responsible Agency | Observation | Recommendation |
| :---: | :---: | :---: | :---: |
| Howe St <br> Chapel St to State <br> St (US 1) | City of Bunnell | There is no sidewalk present on these streets that directly connect the school's entrance to State St (US 1) and Moody Blvd (SR 100) and are used by students to walk to and from the school. <br> Southwest corner of this intersection has a utility pole that is located in the middle of the sidewalk. The sidewalk does not have 4 feet clearance around the pole that is required for a wheelchair to pass. This is not in compliance with ADA standards. | Perform Pedestrian Accommodation Feasibility Studies for these streets* |
| Palm Ave Chapel St to State St (US 1) |  |  |  |
| Chapel Street Woodland Ave to Moody Blvd (SR 100) |  |  |  |
| Peach St <br> Howe St to Moody <br> Blvd (SR 100) |  |  |  |
| Fig St Howe St to Moody Blvd (SR 100) |  |  |  |
| Howe St and Orange St Intersection | City of <br> Bunnell, <br> Bunnell <br> Elementary <br> School |  | Construct a 5 feet wide $\times 5$ feet wide concrete pad on the school property side that will widen the sidewalk at this corner. This will allow persons in wheelchairs to navigate around the utility pole. |

Table 1: Observations and recommendations summary

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## Introduction

In the winter of 2016/2017, a comprehensive bicycle and pedestrian safety review was performed for Bunnell Elementary School in Bunnell, Flagler County. The purpose of this study is to evaluate the walk zone of Bunnell Elementary School for any safety issues that students might encounter if they choose to walk or ride their bicycles to school. This review included an information-gathering and coordination meeting with the School, Flagler County School Board representatives, City of Bunnell, Flagler County, and R2CTPO officials. The coordination meeting was followed by a field review by the consultants. The review also included analysis of mapped conditions including infrastructure mapping and crash reports. The results of this review have been synthesized into the following existing conditions and safety improvement recommendations report.

## Background on Bunnell Elementary School

Bunnell Elementary School is located at 1305 N Palmetto St, Bunnell, FL. It is to the west of Moody Blvd (SR 100) and north of State St (US 1) in the northern corner of Bunnell downtown area. The School currently has 1240 enrolled students. The school campus spans approximately 20 acres and is situated amongst the urban neighborhoods in Downtown Bunnell. Figure 1 shows the school location.


## Assessment Report

This section of the report will document existing condition within the Bunnell Elementary School walk zone, summarize the coordination meeting, and observations from the field review. Each school, in co-ordination with the Flagler County School Board establishes a walk zone. The walk zone is the area around the school within which no school bus service is provided. County guidelines recommend a one mile radius walk zone around elementary schools, and two mile radius walk zone around middle schools. In both cases, the walk zone excludes pedestrian hazardous areas as per 2016 Florida State Statute Title XLVIII K-20 Education Code, Chapter 1006. More details about this statute are included in Appendix A. Hazardous areas are generally identified as areas that are separated from the school by major physical barriers such as Interstate Highways, even if they are within the designated radius.

The Assessment Report for the Bicycle and Pedestrian School Safety Review Study will enable the R2CTPO to make recommendations for projects that will improve the walkability and bikability of students living within the school walk zone.

## Existing Conditions Analysis

The existing bicycle and pedestrian infrastructure, safety conditions, and surrounding land uses at each school were evaluated through map review, administrator and school safety officer inputs, and field visits. The field visits included observation of the drop off and pickup periods, and complete review of the presence, absence, and condition of bicycle and pedestrian infrastructure within the walk zone.

Figure 2 shows the walk zone for Bunnell Elementary School that covers most of the Downtown Bunnell area and is approximately bound by State St (US 1) to the southwest and extends up to the Flagler County Government Center to the northeast. Bunnell Elementary School and its walk zone primarily serves residential neighborhoods in Downtown Bunnell area.


Bunnell Elementary School building


Peach Street is typical of residential streets within the walk zone


Figure 2: School walk zone

## Existing Conditions Analysis

Pedestrian Infrastructure: Although Bunnell Elementary School is a neighborhood school situated in Downtown Bunnell area, most the streets within the walk zone do not have dedicated pedestrian facilities such as sidewalks and marked crosswalks. State St (US 1) and Moody Blvd (SR 100) are two major arterials within the walk zone. Both of these streets have 5 feet wide sidewalks on both sides. Apart from these two streets, following streets have 4 feet wide sidewalk on one side - Palm Ave (Chapel St to State St (US1), Orange St (Howe St to Moody Blvd (SR 100)), Chapel St (east of Moody Blvd (SR 100)), Bacher St (east of Moody Blvd (SR 100)), Anderson St (east of Moody Blvd (SR 100)). There are continuous six feet wide sidewalks around the school campus. Sidewalk on Orange St is not well maintained and is not used by students.

Most of the streets within the walk zone are two lane residential street with open drainage where students and other pedestrians generally walk in the street. However, it was observed during the field visit that students had to move on to the grass shoulder and open drainage areas whenever cars were passing them.

Most of the marked crosswalks are limited to Moody Blvd (SR 100) and State St (US 1). There are two marked crosswalks at un-signalized intersections across Moody BIvd (SR 100). One at the intersection of Chapel St and Moody Blvd (SR 100) is extremely well used by students and is guarded by a crossing guard during AM arrival and PM dismissal periods.
State St (US 1) and Moody Blvd (SR 100) is the only signalized intersection within the walk zone and has marked crosswalks on all of its four legs. However, this intersection is not used by students as there are not any students who walk or bike to school living southwest of State Street (US 1).

Bicycle Infrastructure: Standard 5 feet wide bike lanes are present on the northeast segment of Moody Blvd (SR 100) till the intersection of Palmetto St and Moody Blvd (SR 100). There are no dedicated bike facilities apart from these bike lanes. A small segment of shared use path/trail connects the northeast corner of school's campus to Joanne B King Park to the north. However, as there are no residential areas that lie north of the school's campus, this trail is not used by students to walk or bike to school.

Crash Analysis: There were 14 reported pedestrian and bicycle crashes within the walk zone in last six years (2010-2015) including 1 fatal and 11 injury crashes. None of these were school related. These crashes are summarized in the tables below. Detailed crash reports of these crashes are also included in Appendix H.

| Pedestrian <br> Crashes | Bicycle <br> Crashes | Fatal <br> Crashes | Injury <br> Crashes | Property <br> Damage Only <br> Crashes |
| :---: | :---: | :---: | :---: | :---: |
| 11 | 3 | 1 | 11 | 2 |


| Year | Pedestrian Crashes | Bicycle Crashes |
| :---: | :---: | :---: |
| 2010 | 1 | 1 |
| 2011 | 3 | 0 |
| 2012 | 4 | 0 |
| 2013 | 2 | 1 |
| 2014 | 0 | 0 |
| 2015 | 1 | 1 |




Crosswalk across Bunnell Elementary School's main entrance gate on Palmetto St.


Marked Crosswalk at Chapel St and Moody Blvd (SR 100) is heavily used by students and is guarded by a crossing guard during AM arrival and PM dismissal periods.


Sidewalks were recently built all around the Bunnell Elementary School's campus.


Orange Ave between Howe St and Moody Blvd (SR 100) has a 4 feet wide sidewalk on its north side. This sidewalk is not well maintained and rarely used.

Existing Land Use: Most of the existing land uses within the school's walk zone consists of single family detached residential houses. Some properties do have multifamily units in form of duplexes or twins. All commercial and Retail land uses are clustered around Moody Blvd (SR 100) and State St (US 1). Other large land uses within the walk zone include the Bunnell Elementary School, Joanne B. King Park, and the Flagler County Government Center. Figure 4 maps the existing land uses.


Figure 4: Existing land use

School Campus: The school campus has seven entrances along all four sides of its campus. The entrances on Magnolia St and Chapel Street are used only by maintenance and service staff.

The main entrance located on Palmetto St is used by parents to enter during drop off and pick up periods. It is also used by visitors and school staff to access the surface parking lot fronting the school building. The two lane wide drop-off/pick-up loop also forms the drive aisle that services two bays of staff and visitor surface car parking. Although the loop is two lanes wide, the school requires a single file drop-off and pick-up. The total length of the loop is approximately 1,000 feet and can fit 35 cars. During the field review, it was observed that PM pick up queue backs onto Palmetto St and Magnolia St till the intersection of Orange St and Magnolia St.

School buses use Palmetto St to enter the school campus and pull over into bus bays along Howe St between Lemon St and Fig St. School buses use Orange St to exit the school campus. The entrance gate on Howe St between Lemon St and Fig St is used by students to enter the school building after getting off the buses. This entrance is also used by students who walk and bike to school.

It was also observed during the field review that few parents stop on the surface parking lot at the intersection of Lemon St and Howe St as well as on grass shoulders on east side of Howe St to drop-off and pick-up students. This is mainly done to avoid waiting in queues inside th school pick-up and drop-off queues.

The school campus has a designated bicycle parking rack inside the school campus after the entrance gate at Howe St and Lemon St.

The school campus saw major renovations in 2007. During the field review, all the pedestrian infrastructure including sidewalks and crosswalks inside the school campus were observed to


PM pick-up queue


School bus bays on Howe St between Lemon St and Fig St


Figure 5: School campus

## Coordination Meeting

The coordination meeting for Bunnell Elementary School was held at the Old Kings Elementary School's campus on February 1st, 2017. The meeting was attended by representatives from the Flagler County School Board, Bunnell Elementary School, City of Bunnell, Flagler County Sheriff's Office, River to Sea TPO, and Kittelson \& Associates.

- Kristen Bates, City of Bunnell
- Bobby Bossardet, Flagler County School District
- Stephan Harris, River to Sea TPO
- Wendy Hickey, Flagler County Planning and Zoning
- Aditya Inamdar, Kittelson \& Associates
- Deputy Ralph Lilavois, Sheriff's Office
- Chad Lingenfelter, Florida DOT District 5, Traffic Operations and Safety
- Like Liu, Kittelson \& Associates
- Winnie Oden, Flagler County School District
- Marcus Sanfilippo, Principal, Bunnell Elementary School
- Alex Spiller, Flagler County Engineering

Stephan Harris and Aditya Inamdar introduced the purpose and explained the study background. This introduction was followed up a group discussion. Following were the main points of the follow up discussion:

- Bunnell Elementary School hours were confirmed to be from 8:50 AM - 3:20 PM
- Site review periods for arrival/dismissal was decided as follows:

Arrival field review period- 7:30 AM - 9:00 AM
Dismissal field review period- 2:30 PM - 4:00 PM

- The school was started in 1972 and was the only elementary school in Flagler County at that time. School saw major renovations and additions in 2007.
- There are around 1240 students currently enrolled in Bunnell Elementary School.
- Around $56 \%$ or around 675 students are transported by 16 school buses.
- Around $30 \%$ or little over 370 students are dropped off and picked up by parents.
- Around $14 \%$ or over 170 students walk or bike to school.
- There is one crossing guard present at the intersection of Moody Boulevard (SR 100) and Chapel Street
- Parents queue along Palmetto Street and Magnolia Street for drop-off and pick-up.
- Parents use entrance gate located on Palmetto Street for drop-off and pick-up.
- The school enforces a single line drop-off and pick-up.
- Most of the students who walk or bike to school live in neighborhoods located southeast and southwest of the school campus.
- Very few students walk or bike to school from west of the school and no students walk from the north.
- Walkers and bikers entrance gate is located at the intersection of Howe Street and Lemon Street.
- There is only one signal located in the school's walk zone. It is at the intersection of Moody Boulevard (SR 100) and State Street (US 1).
- No students walk or bike to school from south if State Street (US 1)
- Buses drop-off and pick-up students on Howe Street. The bus pull over area is located between Lemon Street and Palmetto Street.
- A private school is located at the intersection of Church Street and Moody Boulevard (SR 100). The school hours for this private school are similar to Bunnell Elementary School's. There was a concern expressed that this leads to some traffic congestion along Moody Boulevard during the drop-off and pick-up period.
- City of Bunnell has a desire to make Moody Boulevard a main street with streetscape improvements to make it a pedestrian and bicycle friendly environment. There is no time line associated with this proposal.
- Most of the local residential streets have 50 feet ROW with 20-22 feet asphalt and open swale drainage on both sides.
- A trail connection exists from the intersection of Howe Street and Palmetto to Joanne B King Park, located north of the school campus.
- The school has a desire to see sidewalk on more streets in the immediate vicinity of the school's campus, especially along Lemon Street.
- There is a 20MPH school zone with flashing yellow signal on Moody Boulevard (SR 100).


## Field Review Observations

The field review for Bunnell Elementary school was conducted on February 2nd, 2017 by Kittelson and Associates. The weather conditions on the day of the review were typical for the season in Bunnell, FL. The weather was dry and sunny with clear skies. The temperatures ranged from low 60s to mid 70s. The field review observed the drop-off activity from 7:30 to 9:00 AM and pick-up activity from 2:30 to 4:00 PM. The field review also included documenting conditions within the school's walk zone.

Following are the observations from the field review.

## General Observations:

- There are seven entrance gates to the school campus. The main entrance gate is along Palmetto Street and is used by parents to drop-off and pick-up students as well as by school staff and visitors. Entrance along Howe Street at the intersection of Lemon Street is used by walkers and bikers as well as students transported by school buses. Two other entrances along Howe Street at the intersection of Orange street and Chapel Street are used by school staff. One entrance at the intersection of Chapel Street and Palm Street is used for maintenance activity. Two entrances along Magnolia Street are used for Kindergarten pick-up and drop-off and by school staff.


## Drop-Off Observations:

Intersection of Moody Boulevard (SR 100) and Chapel Street

- This is the only location where crossing guard is present.


Main entrance gate on Palmetto St


School bus bays and entrance on Howe St used by students who walk and bike to school.

- The school zone is limited to one block either sides of the crosswalk across Moody Boulevard (SR 100). The crosswalk has refuge island.
- Flashing yellow school zone light is on between 7: 45 AM to 8:30 AM on Moody Boulevard.
- Around 60 students crossed this intersection between 8:05AM and 8: 35 AM.
- Most of the students come in groups of 5-15 students.
- There were few students who crossed after the flashing yellow light was turned off at 8:30 AM. The crossing guard mentioned that this was a major problem, as vehicles drive at the higher speed limit of 35 MPH once the flashing yellow is turned off.
- All students who cross Moody Boulevard cross at the designated crosswalk as per crossing guard's instructions, but students use different streets - Chapel Street, Peach Street, Orange Street, or Lemon Street on west side of Moody Boulevard (SR 100) to reach the school campus.
- Although there is sidewalk on northeast side along Chapel Street, east of Moody Boulevard, students do not walk on the sidewalk.
- Students also do not use sidewalk in Orange Street as it is not well maintained. Overgrown trees and shrubs block major parts of the sidewalk.


## Entrance Gate at Howe Street and Lemon street

- This gate is used by all students who walk or bike to school as well as by students transported by buses.


Marked crosswalk at Chapel St and Moody Blvd (SR 100)


Magnolia st looking southwest. The wide sidewalk was recently constructed all around the school's campus

- A large bus pull over area fronts the school building along Howe St between Lemon street and Palmetto Street.
- Few parents drop their kids near the intersection of Lemon St and Howe St to avoid the long drop off queues.
- When school buses arrive, two physical barriers are put across Howe Street and Lemon Street at this intersection to stop traffic during the period when school buses are offloaded.


## Entrance Gate on Palmetto Street

- Parents enter through this gate and loop around the internal drive aisle to drop off students.
- This gate opens at 8:30 AM for drop off. Around 50 cars are already in the queue when the gate opens.
- The longest drop off queue is observed between 8:15 AM to 8:30 AM when the queue backs along Palmetto Street and Magnolia Street till Orange Street.
- No west bound left turn is allowed into the school campus from Palmetto Street between8:00-9:30 AM and 2:00 to 4:00 PM.


## Pick-Up Observations:

## Intersection of Moody Boulevard (SR 100) and Chapel Street

- Crossing guard is present from 2:30 to 4:00 PM
- Around 50 students crossed this intersection during this period.
- Students use Lemon Street, Orange Street, and Peach Street to come till Moody Boulevard (SR 100) and cross Moody Boulevard at this intersection.


## Entrance Gate at Howe Street and Lemon street

- Students are dismissed at 3:20PM and walkers and bikers start coming out of this gate.
- School buses arrive around 3:20 PM and two physical barriers are put across Howe Street and Lemon Street at this intersection to stop traffic during the period when students board school buses.
- Students walk in the street along Lemon Street, Orange Street, and Peach Street. Except for Orange Street, no other streets have sidewalk. Sidewalk on one side of Orange Street is substandard and not maintained.


## Entrance Gate on Palmetto Street

- Long car queues are formed along Palmetto Street and Magnolia Street for pick-up.
- Cars are not allowed to queue inside the school campus before 3:05 PM.
- The longest queues are observed between 3:05 to 3:20 PM and reach till the intersection of Magnolia Street and Peach Street.


## Walk Zone Observations:

- Moody Boulevard (SR 100) and State street (US 1) are two major arterials within the walk zone. All other streets are local 2 lane streets with open drainage swales. Only couple of these local streets have sidewalks.
- Sidewalks are present on both sides of Moody Boulevard (SR 100) and State Street (US 1). Only few other local streets have sidewalks, and that too only on one side.


Movable barriers are placed across Howe St and Orange Ave during PM dismissal period to stop vehicular traffic.


PM pick up queue backing on to Magnolia St.

## Implementation Report

This section of the report will build on analysis and observations documented in the Assessment Report to make recommendations. Purpose of the Implementation Report for the Bicycle and Pedestrian School Safety Review Study is to conduct a constructibility review and develop a cost feasibility plan. While only a relatively small subset of the students living within the Bunnell Elementary School's walk zone, walk or bike to school, there are opportunities to improve their safety, and also to make walking and biking a more inviting option for more students. Location specific recommendations are listed below.

## Walk Zone Related Recommendations:

## Location: Orange St (Howe St to Moody Blvd (SR 100))

Observation: Existing sidewalk on northeast side is a sub-standard, 4 feet wide sidewalk and is not well maintained. Overgrown trees and shrubs block major parts of the sidewalk.

Recommendation: Construct a new 5 feet wide sidewalk on northeast side with ADA compliant pedestrian ramps and marked crosswalks across intersections.

## Location: Lemon St (Howe St to Moody Blvd (SR 100))

Observation: Many students use Lemon street to walk to and from the school to reach Moody Blvd (SR 100).

Recommendation: Construct a new 5 feet wide sidewalk on southwest side with ADA compliant pedestrian ramps and marked crosswalks across intersections.

## Location: Moody BIvd (SR 100) and Chapel St

Observation: Crossing guard mentioned during the field review that the flashing yellow light is on in AM drop off period between 7: 45 AM to 8:30 AM on Moody Boulevard. However, there are students who cross Moody Blvd after 8:30 AM.

Recommendation: Coordinate flashing yellow light timings with school arrival and dismissal periods.

Observation: Crossing guard mentioned during the field review that few cars are driving higher than 20 MPH speed even when the flashing yellow lights are on.

Recommendation: Periodically place speed monitoring trailers to remind drivers that they are driving over the posted speed limit; law enforcement officers should periodically monitor the school walk zone to ensure that motorists are following the rules; if it is found that motorists are driving over the posted speed limit then the Flagler County Sheriff's Office should consider issuing fines during school arrival and dismissal times.

## Location: Howe St (Chapel St to State St (US 1) Palm Ave (Chapel St to State St (US 1) Chapel Street (Woodland Ave to Moody Blvd (SR 100)) Peach St (Howe St to Moody Blvd (SR 100)) Fig St (Howe St to Moody Blvd (SR 100))

Observation: There is no sidewalk present on these streets that directly connect the school's entrance to State St (US 1) and Moody Blvd (SR 100) and are used by students to walk to and from the school.

Recommendation: Perform Pedestrian Accommodation Feasibility Studies for these streets.

The goal for these studies is to identify a feasible exclusive pedestrian facility. Preferably, the facility will provide physical separation in the form of a curb, landscaped strip, or other physical element between the roadway and an ADA compliant pedestrian facility. These studies should identify the costs, right of way, and takings implications of various approaches, and may also recommend spot improvements, crossing treatments, and traffic calming. Interim solutions can be implemented as long as these do not compromise the ultimate goal of providing an exclusive pedestrian facility.

Based on the preliminary measurements taken during the field review, there seems to be enough width within the ROW from edge of pavement to property line to include 5 or 6 feet wide sidewalks. However, the existing open drainage pattern would have to be transformed into closed drainage with curb and gutter to accommodate new sidewalks.

If constructing a sidewalk is deemed infeasible, a low cost alternative option is to stripe advisory shoulders. Advisory shoulder is a new treatment type in the United States and FHWA has design guidance in its newly released report titled 'Small Town and Rural Multimodal Networks'. According to this report, advisory shoulders create usable shoulders for bicyclists and pedestrians on a roadway that is otherwise too narrow to accommodate one. These shoulders are generally delineated by a dashed skipped lane marking. Narrow two lane roads can be reduced to a two-way center travel lane with advisory shoulders on both sides. Motorists on the center lane may only enter the shoulder when no bicyclists or pedestrians are present to pass the oncoming traffic. The shoulder when no bicyclists or pedestrians are present to pass the oncoming traffic.


Peach Street looking southeast from the school's entrance towards Moody Blvd (SR 100)


Fig Street looking southeast from the school's entrance towards Moody Blvd (SR 100)

Based the FHWA's Small Town and Rural Multi-modal Networks report, roads with advisory shoulder accommodate low to moderate volumes of twoway motor vehicle traffic and provide a prioritized space for bicyclists and pedestrians with little or no widening of the paved roadway surface. It is recommended to use signs to warn road users of the special characteristics of the street.

Potential signs include:

- A pedestrian (W11-2) warning sign with ON ROADWAY legend plaque.
- Use a Two-Way Traffic warning sign (W6-3) to clarify two-way operation of the road if any confusion exists.

In order to install advisory shoulders, an approved request to experiment is
 required as detailed in the MUTCD 2009, Sec. 1A.10. FHWA is also accepting


The advisory shoulder space is a visually distinct area on the edge of the roadway, offering a prioritized space for people to bicycle and walk. The preferred width of the advisory shoulder space is 6 feet. Absolute minimum width is 4 feet when no curb and gutter is present.


Preferred and potential traffic volumes and speed limits for advisory shoulder treatment.


Unlike a conventional shoulder, an advisory shoulder is a part of the traveled way, and it is expected that vehicles will regularly encounter meeting or passing situations where driving in the advisory shoulder is necessary and safe. When vehicles traveling in opposite directions meet, motorists may need to enter the advisory shoulder for clear passage.
 with a similar treatment called "dashed bicycle lanes."

## Advisory Shoulder

Advisory shoulders create usable shoulders for bicyclists on a roadway that is otherwise too narrow to accommodate one. The shoulder is delineated by pavement marking and optional pavement color, Motorists may only enter the shoulder when no bicyclists are present and must overtake these users with caution due to potential oncoming traffic

| BENEFITS |  |
| :---: | :---: |
| - Provides a delineated but nonexclusive space avalable for biking on a roadway otherwise too narrow for dedicated shoulders. | - Increases predictability and clarifies desired lateral positioning between people bicycling or walking and people driving in a narrow roadway. |
| due to reduced motor vehicle travel speeds. $\%$ | - May function as an miterim measure where plans include shoulder widening in the future. |
| - Minimizes potental impacts to visual or natural resources through efficient use of existing space. | - Supports the natural environment through reduced paved surface requirements. |
| - Functions well within a rural and small |  |

Bicycle and Pedestrian Advisory Shoulders.
Source: FHWA Small Town and Rural Multi-modal Networks, December 2016.


Utility pole blocks the sidewalk on the southwest corner of Howe St and Orange St.
requests for experimentation with a similar treatment called "dashed bicycle lanes."

## Location: Howe St and Orange St

 intersectionObservation: Southwest corner of this intersection has a utility pole that is located in the middle of the sidewalk. The sidewalk does not have 4 feet clearance around the pole that is required for a wheelchair to pass. This is not in compliance with ADA standards.

Recommendation: Construct a 5 feet wide $\times 5$ feet wide concrete pad on the school property side that will widen the sidewalk at this corner. This will allow persons in wheelchairs to navigate around the utility pole.

## School Campus Related Recommendations:

There were no significant issues identified on the school campus as part of the coordination meeting or as part of the field review. Overall school campus circulation system seemed to work well. All the pedestrian and parking facilities within the school campus were identified as ADA compliant. Therefore, there are no school campus related recommendations as part of this report.

## Recommended Priority Projects:

This section lists all the recommended priority engineering and construction projects that address the observations and recommendations noted in the earlier section. However, it does not list educational, enforcement, and policy changes which are also recommended in the earlier section.

The following engineering and construction projects are recommended to be implemented as part of this Bunnell Elementary School Bicycle and Pedestrian school Safety Review study:

## Orange St

- Construct a new 5 feet wide sidewalk on northeast side with ADA compliant pedestrian ramps and marked crosswalks across intersections.


## Lemon St

- Construct a new 5 feet wide sidewalk on southwest side with ADA compliant pedestrian ramps and marked crosswalks across intersections.


## Howe St and Orange St intersection

- Construct a 5 feet wide $\times 5$ feet wide concrete pad on the school property side that will widen the sidewalk at this corner.

1. Construct a new five feet wide sidewalk on northeast side of Orange St between Howe St and Moody Blvd (SR 100) with ADA compliant pedestrian ramps and marked crosswalks across intersections.
2. Construct a new five feet wide sidewalk on southwest side of Lemon St between Howe St and Moody Blvd (SR 100) with ADA compliant pedestrian ramps and marked crosswalks across intersections.queues.

## 3. Moody Blvd (SR 100) and Chapel St Intersection

Coordinate flashing yellow light timings with school arrival and dismissal periods.

[-] School Walk Zone

Figure 4: Improvements map

## Constructibility Matrix of Priority Projects:

The matrix in Table 3 shows the estimated cost for recommended priority projects. FDOT item average unit costs from 1st December 2015 to 30th November 2016 for Area 7 that includes Flagler county were used to develop the constructibility matrix. The costs shown in the constructibility matrix include construction and labor fees. Grading costs are not included. These improvements are based on field observations and should be verified by a contractor prior to construction.

| Location | Description of Project | Pay Item Number | Pay Item Description | Plan Qty | Unit | Unit <br> Price | Contract Amount |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Orange Street | Construct a new 5 feet wide sidewalk on northeast side with ADA compliant pedestrian ramps and marked crosswalks across intersections. | 01104 | Removal Of <br> Existing Concrete <br> Pavement | 280 | SY | \$27 | \$7,620 |
|  |  | 011011 | Clearing \& Grubbing | 0.2 | AC | \$7,029 | \$1,410 |
|  |  | 057012 | Performance Turf, Sod | 700 | SY | \$3 | \$2,030 |
|  |  | 337-7-41 | Asph Conc Fc, Traffic B, Fc-12.5, Pg 76-22 | 168 | TN | \$92 | \$15,510 |
|  |  | 05272 | Detectable Warnings | 40 | SF | \$25 | \$1,020 |
|  |  | 071111123 | Thermoplastic, Std, White, Solid, 12" | 40 | LF | \$2 | \$70 |
| Lemon Street | Construct a new 5 feet wide sidewalk on southwest side with ADA compliant pedestrian ramps and marked crosswalks across intersections. | 011011 | Clearing \& Grubbing | 0.2 | AC | \$7,029 | \$1,410 |
|  |  | 057012 | Performance Turf, Sod | 700 | SY | \$3 | \$2,030 |
|  |  | 337-7-41 | Asph Conc Fc, Traffic B, Fc-12.5, Pg 76-22 | 168 | TN | \$92 | \$15,510 |
|  |  | 05272 | Detectable <br> Warnings | 40 | SF | \$25 | \$1,020 |
|  |  | 071111123 | Thermoplastic, Std, White, Solid, 12" | 80 | LF | \$2 | \$140 |


|  | Construct a | 337-7-41 | Asph Conc Fc, Traffic | 1 | TN | \$92 | \$100 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 5 feet wide x |  | B, Fc-12.5, Pg 76-22 |  |  |  |  |
|  | 5 feet wide |  |  |  |  |  |  |
|  | concrete pad |  |  |  |  |  |  |
|  | on the school |  |  |  |  |  |  |
|  | property side |  |  |  |  |  |  |
| Howe St and Orange | that will widen |  |  |  |  |  |  |
| St Intersection | the sidewalk |  |  |  |  |  |  |
|  | at this corner. |  |  |  |  |  |  |
|  | This will allow |  |  |  |  |  |  |
|  | persons in |  |  |  |  |  |  |
|  | wheelchairs to |  |  |  |  |  |  |
|  | navigate around |  |  |  |  |  |  |
|  | the utility pole. |  |  |  |  |  |  |
| TOTAL |  |  |  |  |  |  | \$47,870 |
| 40\% Contingency |  |  |  |  |  |  | \$19,150 |
| GRAND TOTAL |  |  |  |  |  |  | \$67,020 |

Table 3: Constructibility matrix

## Appendices

## A. 2016 Florida Statutes Excerpts

# The 2016 Florida Statutes 

Title XLVIII
K-20 EDUCATION CODE

Chapter 1006
SUPPORT FOR LEARNING
(1) DEFINITION.-As used in this section, the term "student" means any public elementary school student whose grade level does not exceed grade 6.

## (2) HAZARDOUS WALKING CONDITIONS.-

(a) Walkways parallel to the road.-

1. It shall be considered a hazardous walking condition with respect to any road along which students must walk in order to walk to and from school if there is not an area at least 4 feet wide adjacent to the road, not including drainage ditches, sluiceways, swales, or channels, having a surface upon which students may walk without being required to walk on the road surface. In addition, whenever the road along which students must walk is uncurbed and has a posted speed limit of 50 miles per hour or greater, the area as described above for students to walk upon shall be set off the road by no less than 3 feet from the edge of the road.
2. Subparagraph 1 . does not apply when the road along which students must walk:
a. Is a road on which the volume of traffic is less than 180 vehicles per hour, per direction, during the time students walk to and from school; or
b. Is located in a residential area and has a posted speed limit of 30 miles per hour or less.
(b) Walkways perpendicular to the road.-It shall be considered a hazardous walking condition with respect to any road across which students must walk in order to walk to and from school if:
3. The traffic volume on the road exceeds the rate of 360 vehicles per hour, per direction (including all lanes), during the time students walk to and from school and if the crossing site is uncontrolled. For purposes of this subsection, an "uncontrolled crossing site" is an intersection or other designated crossing site where no crossing guard, traffic enforcement officer, or stop sign or other traffic control signal is present during the times students walk to and from school.
4. The total traffic volume on the road exceeds 4,000 vehicles per hour through an intersection or other crossing site controlled by a stop sign or other traffic control signal, unless crossing guards or other traffic enforcement officers are also present during the times students walk to and from school. Traffic volume shall be determined by the most current traffic engineering study conducted by a state or local governmental agency.
(c) Crossings over the road.-It shall be considered a hazardous walking condition with respect to any road at any uncontrolled crossing site which students must walk in order to walk to and from school if:
5. The road has a posted speed limit of 50 miles per hour or greater; or
6. The road has six lanes or more, not including turn lanes, regardless of the speed limit.

## (3) IDENTIFICATION OF HAZARDOUS CONDITIONS.-

(a) When a request for review is made by the district school superintendent with respect to a road over which a state or local governmental entity has jurisdiction concerning a condition perceived to be hazardous to students in that district who live within the 2-mile limit and who walk to school, such condition shall be inspected jointly by a representative of the school district, a representative of the state or local governmental entity with jurisdiction over the perceived hazardous location, and a representative of the municipal police department for a municipal road, a representative of the sheriff's office for a county road, or a representative of the Department of Transportation for a state road. If the jurisdiction is within an area for which there is a metropolitan planning organization, a representative of that organization shall also be included. The governmental representatives shall determine whether the condition constitutes a hazardous walking condition as provided in subsection (2). If the governmental representatives concur that a condition constitutes a hazardous walking condition as provided in subsection (2), the governmental entity with jurisdiction shall report that determination in writing to the district school superintendent, who shall initiate a formal request for correction as provided in subsection (4).
(b) If the governmental representatives are unable to reach a consensus, the reasons for lack of consensus shall be reported to the district school superintendent, who shall provide a report and recommendation to the district school board. The district school board may initiate a proceeding under chapter 86 seeking a determination as to whether the condition constitutes a hazardous walking condition as provided in subsection (2) after providing at least 30 days' notice in writing to the state or local governmental entity having jurisdiction over the road of its intent to do so unless, within 30 days after such notice is provided, the state or local governmental entity concurs in writing that the condition is a hazardous walking condition as provided in subsection (2) and provides the position statement pursuant to subsection (4). If a proceeding is initiated under this paragraph, the district school board has the burden of proving such condition by the greater weight of evidence. If the district school board prevails, the district school superintendent shall report the outcome to the Department of Education and initiate a formal request for correction of the hazardous walking condition as provided in subsection (4).

## (4) TRANSPORTATION; CORRECTION OF HAZARDS.-

(a) A district school board and other governmental entities shall work cooperatively to identify conditions that are hazardous along student walking routes to school, and a district school board shall provide transportation to students who would be subjected to such conditions. Additionally, state or local governmental entities with jurisdiction over a road along which a hazardous walking condition is determined to exist shall correct the condition within a reasonable period of time.
(b) Upon a determination pursuant to subsection (3) that a hazardous walking condition exists, the district school superintendent shall request a position statement with respect to correction of such condition from the state or local governmental entity with jurisdiction over the road. Within 90 days after receiving such request, the state or local governmental entity shall inform the district school superintendent whether the entity will include correction of the hazardous walking condition in its next annual 5-year transportation work program and, if so, when correction of the condition will be completed. If the hazardous walking condition will not be included in the state or local governmental entity's next annual 5-year transportation work program, the factors justifying such conclusion must be stated in writing to the district school superintendent and the Department of Education.
(c) State funds shall be allocated for the transportation of students subjected to a hazardous walking condition. However, such funding shall cease upon correction of the hazardous walking condition or upon the projected completion date, whichever occurs first.
(5) CIVIL ACTION.-In a civil action for damages brought against a governmental entity under s. 768.28, the designation of a hazardous walking condition under this section is not admissible in evidence.
(6) INTERLOCAL AGREEMENTS.-This section does not prohibit a district school board and other governmental entities from entering into an interlocal agreement pursuant to s. 163.31777 that addresses the identification and correction of hazardous walking conditions, if such agreement:
(a) Implements the Safe Paths to Schools Program as provided in s. 335.066; or
(b) Establishes standards for the safety of students walking to school and procedures for identifying and correcting hazardous walking conditions that meet or exceed the standards and procedures provided in subsections (2), (3), and (4).

History.—s. 297, ch. 2002-387; s. 2, ch. 2015-101.

## B. Americans with Disabilities Accessibility Guidelines Excerpts

### 4.7 Curb Ramps.

4.7.1 Location. Curb ramps complying with 4.7 shall be provided wherever an accessible route crosses a curb.
4.7.2 Slope. Slopes of curb ramps shall comply with 4.8.2. The slope shall be measured as shown in Fig. 11. Transitions from ramps to walks, gutters, or streets shall be flush and free of abrupt changes. Maximum slopes of adjoining gutters, road surface immediately adjacent to the curb ramp, or accessible route shall not exceed 1:20.
4.7.3 Width. The minimum width of a curb ramp shall be 36 in ( 915 mm ), exclusive of flared sides.
4.7.4 Surface. Surfaces of curb ramps shall comply with 4.5 .
4.7.5 Sides of Curb Ramps. If a curb ramp is located where pedestrians must walk across the ramp, or where it is not protected by handrails or guardrails, it shall have flared sides; the maximum slope of the flare shall be 1:10 (see Fig. 12(a)). Curb ramps with returned curbs may be used where pedestrians would not normally walk across the ramp (see Fig. 12(b)).
4.7.6 Built-up Curb Ramps. Built-up curb ramps shall be located so that they do not project into vehicular traffic lanes (see Fig. 13).
4.7.7 Detectable Warnings. A curb ramp shall have a detectable warning complying with 4.29.2. The detectable warning shall extend the full width and depth of the curb ramp.
4.7.8 Obstructions. Curb ramps shall be located or protected to prevent their obstruction by parked vehicles.
4.7.9 Location at Marked Crossings. Curb ramps at marked crossings shall be wholly contained within the markings, excluding any flared sides (see Fig. 15).
4.7.10 Diagonal Curb Ramps. If diagonal (or corner type) curb ramps have returned curbs or other well-defined edges, such edges shall be parallel to the direction of pedestrian flow. The bottom of diagonal curb ramps shall have 48 in ( 1220 mm ) minimum clear space as shown in Fig. 15(c) and (d). If diagonal curb ramps are provided at marked crossings, the 48 in ( 1220 mm ) clear space shall be within the markings (see Fig. 15(c) and (d)). If diagonal curb ramps have flared sides, they shall also have at least a 24 in ( 610 mm ) long segment of straight curb located on each side of the curb ramp and within the marked crossing (see Fig. 15(c)).
4.7.11 Islands. Any raised islands in crossings shall be cut through level with the street or have curb ramps at both sides and a level area at least 48 in ( 1220 mm ) long between the curb ramps in the part of the island intersected by the crossings (see Fig. 15(a) and (b)).

### 4.8 Ramps.

4.8.1* General. Any part of an accessible route with a slope greater than $1: 20$ shall be considered a ramp and shall comply with 4.8. Appendix Note
4.8.2* Slope and Rise. The least possible slope shall be used for any ramp. The maximum slope of a ramp in new construction shall be 1:12. The maximum rise for any run shall be 30 in ( 760 mm ) (see Fig. 16). Curb ramps and ramps to be constructed on existing sites or in existing buildings or facilities may have slopes and rises as allowed in $4.1 .6(3)(a)$ if space limitations prohibit the use of a $1: 12$ slope or less. Appendix Note
4.8.3 Clear Width. The minimum clear width of a ramp shall be 36 in ( 915 mm ).
4.8.4* Landings. Ramps shall have level landings at bottom and top of each ramp and each ramp run. Landings shall have the following features:
(1) The landing shall be at least as wide as the ramp run leading to it.
(2) The landing length shall be a minimum of 60 in ( 1525 mm ) clear.
(3) If ramps change direction at landings, the minimum landing size shall be 60 in by $60 \mathrm{in}(1525 \mathrm{~mm}$ by 1525 mm ).
(4) If a doorway is located at a landing, then the area in front of the doorway shall comply with 4.13.6. Appendix Note
4.8.5* Handrails. If a ramp run has a rise greater than 6 in ( 150 mm ) or a horizontal projection greater than 72 in (1830 mm), then it shall have handrails on both sides. Handrails are not required on curb ramps or adjacent to seating in assembly areas. Handrails shall comply with $\underline{4.26}$ and shall have the following features:
(1) Handrails shall be provided along both sides of ramp segments. The inside handrail on switchback or dogleg ramps shall always be continuous.
(2) If handrails are not continuous, they shall extend at least 12 in ( 305 mm ) beyond the top and bottom of the ramp segment and shall be parallel with the floor or ground surface (see Fig. 17).
(3) The clear space between the handrail and the wall shall be $1-1 / 2 \mathrm{in}(38 \mathrm{~mm})$.
(4) Gripping surfaces shall be continuous.
(5) Top of handrail gripping surfaces shall be mounted between 34 in and 38 in ( 865 mm and 965 mm ) above ramp surfaces.
(6) Ends of handrails shall be either rounded or returned smoothly to floor, wall, or post.
(7) Handrails shall not rotate within their fittings. Appendix Note
4.8.6 Cross Slope and Surfaces. The cross slope of ramp surfaces shall be no greater than 1:50. Ramp surfaces shall comply with 4.5.

## C. City of Bunnell Zoning Map and Future Land Use Map


$\qquad$ MAJOR ROADS
ACTIVE RAILWAY MUNICIPAL LIMITS
(JUNE, 2011)*
$\qquad$ MAJOR HYDROLOGY CITIES
FLAGLER COUNTY PARCELS (2008)
florida counties

(i) $E[\& \square$


## 

D. FHWA Guidelines for New Sidewalk Installation

| Legislation |
| :--- |
| Funding |
| Guidance |
| Resources |
| State <br> Coordinator and <br> FHW Division <br> Coordinator |
| Each State has a <br> Bicycle and <br> Pedestrian <br> Foordinator, and <br> each FHWA Division <br> office has a point of <br> Contact. <br> Contact |
| For more information, <br> please contact Dan <br> Goodman, 202-366- <br> 9064. |

## Designing Sidewalks and Trails for Access

## Chapter 4 - Sidewalk Design Guidelines and Existing Practices

| $<$ Previous | Contents | Next $>$ |
| :--- | :--- | :--- |

Sidewalks form the backbone of the pedestrian transportation network. According to the Institute of Transportation Engineers, Technical Council Committee 5A-5 (1998), sidewalks "reduce the incidence of pedestrian collisions, injuries, and deaths in residential areas and along two-lane roadways." Without sidewalks, public rights- of-way are inaccessible to all pedestrians, including people with disabilities. When sidewalks are not available, pedestrians are forced to share the street with motorists, access to public transportation is restricted, and children might not have safe play areas. Because Federal regulations do not require agencies to build sidewalks, the decision is left to States and local agencies. Some agencies prioritize sidewalk installation, while others do not.

Accessible pedestrian facilities should be considered part of every new public right-of-way project where pedestrians are permitted. Sidewalk installation and the linking of pedestrian routes to transportation stops and major corridors should always be a priority. The decision to install sidewalks should not be optional. "Sidewalks should be built and maintained in all urban areas, along non-Interstate public highway rights-of-way, in commercial areas where the public is invited, and between all commercial transportation stops and public areas" (Institute of Transportation Engineers, Technical Council Committee 5A-5, 1998). This chapter examines the elements and characteristics of sidewalks that have the greatest impact on access. These characteristics include grade, cross-slope, and the design of specific elements such as curb ramps, driveway crossings, and intersections.

### 4.1 Location Research

The researchers visited a variety of sidewalk locations to determine what access provisions were being made for pedestrians. Eighteen jurisdictions across the United States were selected; some were chosen for their pedestrian-friendly reputations, while others were visited because the researchers had other business in the area. Measurements were taken during these visits to determine if the access needs of people with disabilities were being addressed and where improvements needed to be made.

During the site visits, local transportation officials responsible for sidewalk design and construction were interviewed about the ways their agencies were making sidewalks more accessible. Officials contacted included engineers responsible for implementing access improvements, ADA compliance officers, pedestrian/bicycle coordinators, and planners overseeing the construction of access features for new construction and renovations.

The interviews indicated that many sidewalk professionals have a desire to make sidewalks accessible. Designers and builders are beginning to realize that the standard pedestrian is a myth and that, in reality, sidewalk users are very diverse. However, there remains a need to provide information to designers and builders on ways to develop accessible facilities within the constraints of existing facilities, as well as in new construction.

During the visits, it became clear that techniques needed to be developed to accurately measure sidewalk elements such as curb ramps, driveway crossings, and medians.
Techniques to quickly and accurately assess sidewalk environments were adapted from the Universal Trail Assessment Process (UTAP), originally developed to assess access conditions on recreational trails. The tools used to measure sidewalks were identical to those used in the UTAP, with the addition of a profile gauge to record small changes in level and raised tactile surfaces (see Section 5.1 for more information about the UTAP). The terminology and measurement process was standardized to ensure consistency among personnel.

General information about each sidewalk feature was recorded, including type, dimensions, and location with respect to other sidewalk elements. A data sheet was developed for quick recording of general access information. More detailed measurements of curb ramps, driveway crossings, and medians were recorded on a separate form. Up to 10 grade segments, 8 lengths, and 6 transition heights were recorded for these elements for full characterization of the dimensions and grades of each ramp, street, and gutter.

### 4.2 Design Guideline Comparisons

In addition to visiting a variety of sidewalk locations, the researchers identified existing guidelines that could be applied to public rights-of-way. The guidelines were collected from Federal, State, and city agencies, as well as private research and advocacy organizations. Guidelines for sidewalks were compiled in Tables 4-2.1 to 4-2.4. Guidelines for curb ramps were compiled in Tables 4-3.1 to 4-3.4. Both sets of tables are located at the end of this chapter.

The degree of accessibility provided by each guideline depends on the focus of the authorizing agency or organization. For example, the design guidelines produced by the American Association of State Highway and Transportation Officials (AASHTO) focus primarily on vehicle use, whereas ADAAG emphasizes accessible design for pedestrians. The AASHTO guidelines for public rights-of-way are titled A Policy on Geometric Design of Highways and Streets; however, the document is commonly referred to as the AASHTO Green Book. This terminology will be used throughout this report to avoid confusion with the AASHTO guidelines for bicycle and shared-use paths.

The Federal accessibility guidelines (the ADA Standards for Accessible Design and UFAS) were originally developed for accessible routes in buildings and on building sites. Many of the requirements for accessible routes can be extrapolated to public rights-of-way. In 1994, the U.S. Access Board developed draft accessibility guidelines, proposed by ADAAG (1994), that specifically applied to public rights-of-way. Even though proposed Section 14 (1994) is now reserved, some State DOTs have adopted it as their accessibility standard for public rights-of-way. Some State and local transportation agencies have also developed their own standards for sidewalk design because traditional guidelines, such as the AASHTO Green Book, do not include comprehensive sidewalk recommendations. Other organizations, such as the Institute of Transportation Engineers and the Federal Highway Administration, have also developed sidewalk and curb ramp design recommendations.

### 4.3 Access Characteristics

The design of a sidewalk can be described by a variety of characteristics. This report focuses on sidewalk characteristics that have the greatest impact on accessibility, such as grade and surface type. Other characteristics such as location, type of street, and climate also affect the pedestrian friendliness of a sidewalk but do not directly impact access. Access characteristics directly affect usability of a sidewalk. The amount of attention paid to these details will determine whether a facility is accessible or not. Even mildly difficult features in combination can add up to an inaccessible pathway.

### 4.3.1 Grade

Grade (slope) is defined as the slope parallel to the direction of travel and is calculated by dividing the vertical change in elevation by the horizontal distance covered. For example, a path that gains 2 m in elevation over 50 m of horizontal distance has a grade of 4 percent. Although some guidelines use the term "slope" instead of "grade," the term "grade" is used in this report to avoid confusion with cross-slope.

Running grade is defined as the average grade along a contiguous grade. Maximum grade is defined as a limited section of path that exceeds the typical running grade. In the pedestrian environment, maximum grade should be measured over 0.610 m ( 24 in ) intervals (the approximate length of a wheelchair wheelbase, or a single walking pace). When measuring sidewalk grade, both running grade and maximum grade should be determined. Measuring running grade only does not give an accurate understanding of the sidewalk environment because small steep sections may not be detected. Figure $4-1$ provides an example of a typical grade that is fairly negotiable, with a maximum grade that could be very difficult for some users to traverse. In the illustration, the running grade between Points A and D is 5 percent, but the grade between Points $B$ and $C$ is 14 percent. A person who could negotiate a 5 percent grade might not be able to negotiate a 14 percent grade, even for short distances.

Figure 4-1: Maximum grades can make a sidewalk difficult to traverse, even if the overall running grade is moderate.


The rate of change of grade is defined as the change in grade over a given distance. The rate of grade change is determined by measuring the grade and the distance over which it occurs for each segment of the overall distance. For the purposes of this report, rate of change of grade is measured over $0.610 \mathrm{~m}(2 \mathrm{ft})$ intervals, which represent the approximate length of a single walking pace and a wheelchair wheelbase (Figure 4-2). In the sidewalk environment, rate of change of grade should not exceed 13 percent. An example of a 13 percent change in grade occurs at a curb ramp if the slope of the gutter is 5 percent and the slope of the curb ramp is 8 percent (Figure $4-2$ ).

Figure 4-2: The gutter slopes counter to the slope of the curb ramp to promote drainage.


If the rate of change of grade exceeds 13 percent over a $0.610 \mathrm{~m}(2 \mathrm{ft})$ interval, the ground clearance of the footrests and or antitip wheels might be compromised. Antitip wheels are placed on the back of some wheelchairs to improve stability and prevent tipping. Even wheelchair users traveling slowly can get stuck if the footrest or antitip wheels get caught.

If the rate of change of grade exceeds 13 percent, the dynamic stability of the sidewalk user can also be significantly compromised, depending on the speed at which the wheelchair user goes through the curb ramp. Dynamic stability is compromised because the negative slope of the gutter causes the wheelchair to rotate forward. However, upon reaching the bottom of the transition, the wheelchair begins to pitch back rapidly as the wheelchair travels up onto the positive slope in front of the chair (Figure 4-3). Rapid changes in grade can also cause a wheelchair user traveling with speed to flip over backward, as illustrated in Figure 4-4. Any amount of height transition between the curb ramp and the gutter can intensify problems for wheelchair users.

Figure 4-3: Excessive slope differences between gutter and ramp can cause a wheelchair to tip forward.


Figure 4-4: Excessive slope differences between a gutter and a ramp can cause wheelchairs to flip over backward.


Counter slope is defined as a grade that is opposite to the general running grade of a path. For example, at a curb ramp, the slope of the gutter is generally counter to the slope of the ramp (Figure 4-2). According to ADAAG, the counter slope to a curb ramp should not exceed 5 percent (ADAAG, U.S. Access Board, 1991). If the counter slope of a curb ramp exceeds 5 percent, the rate of change of grade is likely to exceed 13 percent, depending upon the grade of the ramp.

The guidelines and recommendations that were reviewed for running grade and maximum grade are included in Tables 4-2.1 through 4-2.4, located at the end of this chapter. ADAAG and UFAS specify that the maximum grade of an accessible route on a building site be no more than 8.33 percent with a maximum rise of 0.760 m ( 30 in ). Grades greater than 5 percent require handrails and level landings at least 1.525 m ( 60 in ) wide. If the ramp turns, the landing dimensions should be $1.525 \mathrm{~m} \times 1.525 \mathrm{~m}$ ( $60 \mathrm{in} \times 60 \mathrm{in}$ ). A ramp with level landings at both ends is illustrated in Figure 4-5. The distance between level landings is dependent on the grade of the ramp. For example, if the ramp grade is 8.33 percent, a level landing is required at least every $9.1 \mathrm{~m}(30 \mathrm{ft})$. However, if the grade of the ramp is 6.5 percent, a level landing is required only every 12 m ( 40 ft ). (ADAAG, U.S. Access Board, 1991; UFAS, U.S. DoD et al., 1984). Level landings provided at regular intervals allow wheelchair users and others a place to rest, turn around, and gain relief from prevailing grade demands. Level landings at storefronts and driveway crossings can also provide valuable resting spots for sidewalk users.

Figure 4-5: Ramps must have level landings (based on ADAAG Fiqure 16, U.S. Access Board, 1991).


The AASHTO Green Book recommends that the running grade of sidewalks be consistent with the running grade of adjacent roadways. Section 14.2.1 (2a) in ADAAG proposed Section 14 (1994), now reserved, permits the running grade of the sidewalk to be consistent with the grade of adjacent roadways but recommends that the minimum feasible slope be used (U.S. Access Board, 1994b). State guidelines examined concur with the Federal accessibility standards, proposed Section 14 (1994), or the AASHTO Green Book.

### 4.3.2 Cross-Slope

Cross-slope is defined as the slope measured perpendicular to the direction of travel. Unlike grade, cross-slope can be measured only at specific points. Steep cross-slopes can make it difficult for wheelchair or crutch users to maintain lateral balance and can cause wheelchairs
to veer downhill or into the street. Cross-slope is determined by taking measurements at intervals throughout a section of sidewalk and then averaging the values.

Running cross-slope is defined as the average cross-slope of a contiguous section of sidewalk. Often within the typical running cross-slope, there are inaccessible maximum cross-slopes that exceed the running cross-slope. The distance over which a maximum cross-slope occurs significantly influences how difficult a section of sidewalk is to negotiate.

Rate of change of cross-slope is defined as the change in cross-slope over a given distance. Rate of change of cross-slope can be measured by placing a digital level a specified distance before and after a maximum cross-slope. The specified distance should be about 0.610 m ( 2 ft ) to represent the approximate stride of a pedestrian or the wheelbase of a wheelchair.

A cross-slope that changes so rapidly that there is no planar surface within $0.610 \mathrm{~m}(2 \mathrm{ft})$ could create a safety hazard. As the wheelchair moves over a surface that is severely warped, it will first balance on the two rear wheels and one front caster. As the wheelchair moves forward, it then tips onto both front casters and one rear wheel. This transition could cause the wheelchair user to lose control and tip over.

Proposed Section 14 (1994) specifies that sidewalks should lie in a continuous plane with a minimum of surface warping. Nonplanar surfaces are frequently found at driveway crossing flares and curb ramps without landings. Rapidly changing cross-slopes can cause one wheel of a wheelchair or one leg of a walker to lose contact with the ground (Figure 4-6) and also can cause walking pedestrians to stumble or fall.

Figure 4-6: When cross-slopes change rapidly over a short distance, wheelchair use becomes extremely unstable.


Most sidewalks are built with some degree of cross-slope, to allow water to drain into the street and to prevent water from collecting on the path. Water puddles pose a slipping hazard to sidewalk users and are even more difficult to negotiate when frozen into ice sheets in colder climates.

The guidelines and recommendations that were reviewed for running cross-slope are included in Tables 4-2.1 through 4-2.4 at the end of this chapter. ADAAG and the State pedestrian facility guidelines reviewed for this report do not permit cross-slopes to exceed 2 percent. The AASHTO Green Book requires the cross-slope of roads to be at least 1.5 percent to permit adequate drainage. The AASHTO Green Book does not provide cross-slope specifications for sidewalks. No guidelines or recommendations for maximum cross-slopes on sidewalks were identified.

### 4.3.3 Width

The widths of sidewalks not only affect pedestrian usability but also determine the types of access and other pedestrian elements that can be installed. For example, a $1.525-\mathrm{m}$ ( 60 -in)
sidewalk is probably wide enough to accommodate pedestrian traffic in a residential area, but a much wider sidewalk would be necessary to include amenities such as street furniture or newspaper stands. Design width is defined as the width specification the sidewalk was intended to meet; it extends from the curb or planting strip to any buildings or landscaping that form the opposite borders of the sidewalk. Minimum clearance width is defined as the narrowest point on a sidewalk. An inaccessible minimum clearance width is created when obstacles such as utility poles protrude into the sidewalk and reduce the design width. A reduction in the design width could also create a minimum clearance width.

Although most guidelines require sidewalk design widths to be at least $1.525 \mathrm{~m}(60 \mathrm{in})$ wide, larger design widths can accommodate more pedestrians and improve ease of access. The AASHTO Green Book, the Oregon Department of Transportation guidebook, and other guidelines recommend wider design widths in areas with high volumes of pedestrians. The sidewalk width often depends on the type of street. In general, residential streets have narrower sidewalks than commercial streets.

The guidelines and recommendations that were reviewed for minimum clearance width are included in Tables 4-2.1 through 4-2.4 at the end of this chapter. Most of the guidelines reviewed concur with ADAAG, which specifies that the minimum passage width for wheelchairs should be $0.815 \mathrm{~m}(32 \mathrm{in})$ at a point and 0.915 m ( 36 in ) continuously (ADAAG, U.S. Access Board, 1991). Additional width is necessary for turning and maneuvering.

The width of the sidewalk is also affected by pedestrian travel tendencies. Pedestrians tend to travel in the center of sidewalks to separate themselves from the rush of traffic and avoid street furniture, vertical obstructions, and other pedestrians entering and exiting buildings. Pedestrians avoid the edge of the sidewalk close to the street because it often contains utility poles, bus shelters, parking meters, sign poles, and other street furniture. Pedestrians also avoid traveling in the 0.610 m ( 24 in ) of the sidewalk close to buildings to avoid retaining walls, street furniture, and fences (OR DOT, 1995). The sidewalk area that pedestrians tend to avoid is referred to as the shy distance. Taking into account the shy distance, only the center $1.830 \mathrm{~m}(6 \mathrm{ft})$ of a $3.050-\mathrm{m}(10-\mathrm{ft})$ sidewalk is used by pedestrians for travel, as shown in Figure 4-7. Thus, the effective width of a sidewalk, not the design width, constitutes the sidewalk area needed to accommodate anticipated levels of pedestrian traffic.

Figure 4-7: Most pedestrians prefer to travel in the center of the sidewalk.


When right-of-way is acquired for sidewalk construction, it is important that adequate width be included to make the facility accessible. If sidewalks are not currently included, the agency responsible for sidewalk construction might consider purchasing additional right-ofway to anticipate future construction. When improving existing facilities, designers should consider purchasing additional right-of-way or narrowing the vehicle portion of the roadway.

### 4.3.4 Passing Space and Passing Space I nterval

Passing space is defined as a section of path wide enough to allow two wheelchair users to pass one another or travel abreast (Figure 4-8). The passing space provided should also be designed to allow one wheelchair user to turn in a complete circle (Figure 4-9).

Figure 4-8: Passing spaces should be included at intervals on narrow sidewalks to allow wheelchair users to pass one another.


Figure 4-9: Wheelchair users require $1.525 \mathrm{~m} \times 1.525 \mathrm{~m}$ ( $60 \mathrm{in} \times 60 \mathrm{in}$ ) to maneuver in a complete circle.


Passing space interval is defined as the distance between passing spaces. Passing spaces should be provided when the sidewalk width is narrow for a prolonged extent because of a narrow design width or continuous obstacles.

Many agencies and private organizations do not provide guidelines for passing space or passing space intervals. Those that do provide guidelines concur with ADAAG Section 4.3.4, which specifies that accessible routes with less than 1.525 m ( 60 in ) of clear width must provide passing spaces at least 1.525 m ( 60 in ) wide at reasonable intervals not exceeding 61 m (200 ft). If turning or maneuvering is necessary, a turning space of $1.525 \mathrm{~m} \times 1.525 \mathrm{~m}$ ( 60 in $\times 60$ in) should be provided (ADAAG, U.S. Access Board, 1991).

### 4.3.5 Vertical Clearance

Vertical clearance is defined as the minimum unobstructed vertical passage space required along a sidewalk. Vertical clearance is often limited by obstacles such as building overhangs, tree branches,signs, and awnings.

The guidelines and recommendations that were reviewed for minimum allowable vertical clearance are included in Tables 4-2.1 through 4-2.4 at the end of this chapter. The majority of guidelines require a minimum of 2.030 m ( 80 in ) of unobstructed vertical passage space.However, Oregon and Pennsylvania require 2.1 and 2.4 m ( 83 and 94 in ) of vertical passage space, respectively (OR DOT, 1995; PA DOT, 1996).ADAAG states that circulation spaces, such as corridors, should have at least 2.030 m ( 80 in ) of head room. ADAAG further specifies that if the vertical clearance of an area next to a circulation route is less than 2.030 m ( 80 in ), elements that project into the circulation space must be protected by a barrier to warn people who are visually disabled or blind (ADAAG, U.S. Access Board, 1991).

### 4.3.6 Changes in Level

Changes in level are defined as vertical height transitions between adjacent surfaces or along the surface of a path. In the sidewalk environment, curbs without curb ramps, cracks (Figure 4-10), and dislocations in the surface material are common examples of changes in level. Changes in level also can result at expansion joints between elements such as curb ramps and gutters.

Figure 4-10: Changes in level are often caused by tree roots that break through the sidewalk surface.


Changes in level can cause ambulatory pedestrians to trip or catch the casters of a manual wheelchair, causing the chair to come to an abrupt stop. People who are blind or who have low vision might not anticipate changes in level such as a buckling brick sidewalk.

The following conditions were observed to cause changes in level:

- Buckled bricks
- Cracks
- Curbs without ramps
- Drainage grates
- Grooves in concrete
- Heaving and settlement due to frost
- Lips at curb ramp frames
- Railroad tracks
- Roots
- Small steps
- Tree grates
- Uneven transitions between streets, gutters, and ramps

The guidelines and recommendations that were reviewed for changes in level are included in Tables 4-2.1 through 4-2.4 at the end of this chapter. The Federal accessibility standards permit changes in level less than 6 mm ( 0.25 in ) high to be vertical but require changes in level between 6 mm and $13 \mathrm{~mm}(0.25 \mathrm{in}$ and 0.50 in$)$ to have a maximum bevel of 50 percent, as shown in Figure 4-11. A ramp is required for changes in level that exceed 13 mm ( 0.50 in ) (US DOJ, 1991; UFAS, U.S. DoD et al., 1984).

Figure 4-11: Vertical and beveled changes in level [ADAAG, Figure 7 (c, d), U.S. Access
Board, 1991]. Board, 1991].


### 4.3.7 Grates and Gaps

A grate is a framework of latticed or parallel bars that prevents large objects from falling through a drainage inlet but permits water and some debris to fall through the slots (Figure 4-12). A gap is defined as a single channel embedded in the travel surface of a path. Gaps are often found at intersections where railroad tracks are embedded into the road surface.

Figure 4-12: Wheelchair casters and cane and crutch tips can easily get caught in wide grates.


Wheelchair casters and crutch tips can get caught in poorly aligned grate and gap openings. ADAAG specifies that grates located in walking surfaces should have spaces no greater than 13 mm ( 0.5 in ) wide in one direction. It also states that gratings with elongated openings should be oriented so that the long dimension is perpendicular to the dominant direction of travel (ADAAG, U.S. Access Board,1991). Although ADAAG does not directly address gaps, the similarity of a gap to a single grate slot suggests that ADAAG's grate specifications also apply to gaps.

### 4.3.8 Obstacles and Protruding Objects

Obstacles in the pedestrian environment are defined as objects that limit the vertical passage space, protrude into the circulation route, or reduce the clearance width of the sidewalk. Obstacles with large overhangs that protrude into the path of travel can be hazardous for people with visual impairments if they are difficult to detect. The full width of the circulation path should be free of protruding objects. Obstacles that reduce the minimum clearance width, such as decorative planters on a narrow sidewalk, can create significant barriers for wheelchair or walker users.

Most guidelines for accessibility concur with the ADAAG specifications for protruding objects. ADAAG states that objects projecting from walls that have leading edges between 0.685 m and 2.030 m ( 27 in and 80 in ) should not protrude more than $100 \mathrm{~mm}(4 \mathrm{in})$ into walks and passageways. Freestanding objects mounted on posts or pylons may overhang a maximum of 0.305 m ( 12 in ) from 0.685 m to 2.030 m ( 27 in to 80 in ) above the ground (ADAAG, U.S. Access Board, 1991), as shown in Figure 4-13.

During the sidewalk assessments, potential obstacles and protruding objects were measured as they occurred along the sidewalk. Characteristics of obstacles measured in the sidewalk assessment include height, amount of overhang over the supporting structure (if any), and minimum clearance width around the obstacle.

The following objects can make a sidewalk difficult for some users to traverse if they protrude into the pathway or reduce the vertical or horizontal clear space:

- Awnings
- Benches
- Bike racks
- Bollards
- Cafe tables and chairs
- Drinking fountains
- Fire hydrants
- Folding business signs
- Grates
- Guy wires
- Landscaping
- Mailboxes (public and private)
- Newspaper vending machines
- Parking meters
- Planters
- Public telephones (mounted)
- Puddles
- Signal control boxes
- Sign poles
- Snow
- Street vendors' carts
- Street light poles
- Street sculptures
- Telephone booths
- Telephone/utility poles and their stabilizing wires
- Traffic sign poles
- Transit shelters
- Trash bags and cans
- Tree, bush, and shrub branches
- Utility boxes


### 4.3.9 Surface

Surface is defined as the material on which a person walks or wheels in the pedestrian environment. The type of surface often determines how difficult an area is to negotiate. For example, wood floors can be traversed without much difficulty by most people, while a gravel surface can be impossible for some people, especially wheelchair users,to cross. Surfaces in sidewalk environments are generally concrete or asphalt but commonly include tile, stone, and brick.

Most guidelines for accessibility adhere to ADAAG, which defines accessible surfaces as firm, stable, and slip-resistant. Firm and stable surfaces resist deformation,especially by indentation or the movement of objects. For example, a firm and stable surface, such as concrete, resists indentation from the forces applied by a walking person's feet and reduces the rolling resistance experienced by a wheelchair (U.S. Access Board, 1994a). When a pedestrian or wheelchair user crosses a surface that is not firm or stable, energy that would otherwise cause forward motion deforms or displaces the surface instead.

Figure 4-13: Obstacles mounted on posts should not protrude more than 0.305 m ( 12 in ) into a circulation corridor [ADAAG, Figure 8(d), U.S. Access Board, 1991].


A slip-resistant surface provides enough frictional counterforce to the forces exerted in ambulation to permit effective travel (ibid.). For example, a slip-resistant surface prevents a person's shoes, crutch tips, or tires from sliding across the surface while bearing weight.A broom finish is used on many concrete sidewalks to provide sufficient slip resistance for pedestrians. The AASHTO Green Book requires sidewalks to have all-weather surfacing. The surface texture of curb ramps should be coarse enough to provide slip resistance when wet.

Although asphalt and concrete are the most common surfaces for sidewalks,many sidewalks are designed using brick or cobblestones. Although these surfaces are decorative, they increase the amount of work required for mobility. In addition, brick and cobblestone have inherent changes in level that are often tripping hazards. Alternatives to brick sidewalks include colored concrete stamped to look like brick, and asphalt or concrete paths with brick trim. Both alternatives preserve the decorative quality of brick but are easier for people with disabilities to negotiate.

### 4.4 Sidewalk Elements

### 4.4.1 Curb Ramps

Curb ramps provide critical access between the sidewalk and the street for people with mobility impairments. Without curb ramps, people who use wheelchairs cannot access the sidewalk. Curb ramps are most commonly found at intersections but may also be used at midblock crossings and medians. The implementing regulations for Title II of the ADA require curb ramps to be included in all new construction of sidewalks. The regulations also require curb ramps to be installed where existing pedestrian walkways cross a curb or other barrier (US DOJ, 1994b). Although no city surveyed has installed curb ramps in all existing pedestrian walkways, some cities have initiated aggressive plans calling for up to 500 curb ramp installations per year.

### 4.4.1.1 Curb ramp components

Although there are a variety of curb ramp designs, each type of curb ramp comprises some or all of the following elements, which are illustrated in Figure 4-14:

Figure 4-14: Components of a curb ramp.


- Landing - level area of sidewalk at the top of a curb ramp facing the ramp path.
- Approach - section of the accessible route flanking the landing of a curb ramp. The approach may be slightly graded if the landing level is below the elevation of the adjoining sidewalk.
- Flare - sloped transition between the curb ramp and the sidewalk. The path along the flare has a significant cross-slope and is not considered an accessible path of travel. When the sidewalk is set back from the street, returned curbs often replace flares (see Figure 4-20, p. 44).
- Ramp - sloped transition between the street and the sidewalk where the grade is constant and the cross-slope is at a minimum (preferably less than 2 percent).
- Gutter - trough or dip used for drainage purposes that runs along the edge of the street and the curb or curb ramp.


### 4.4.1.2 Curb ramp specifications

Curb ramps should be designed to minimize the grade, cross-slope, and changes in level experienced by users. Most agencies use standard drawings to design curb ramps. Some of these guidelines are compiled in Tables 4-3.1 to 4-3.4 at the end of this chapter. The majority of the guidelines reviewed agree with ADAAG Section 4.7 specifications for curb ramps.

### 4.4.1.2.1 Ramps

According to ADAAG, the slope of a curb ramp should not exceed 8.33 percent,and the crossslope should not exceed 2 percent. ADAAG also states that the least severe slope should be used in every situation. In retrofitting situations in which space prohibits the installation of an 8.33 percent ramp, ADAAG allows a slope between 8.33 percent and 10 percent for a maximum rise of 150 mm ( 6 in ) or a slope between 10 percent and 12.5 percent for a maximum rise of 75 mm ( 3 in ) (ADAAG,U.S. Access Board, 1991), as demonstrated in Figure 4-15.

Figure 4-15: Alternative slope profiles for alterations when an 8.33 percent slope is not achievable.


Curb ramp widths should depend on the volume of pedestrian traffic at the specified intersection. Although ramp widths are permitted to vary, they must always be wide enough for comfortable use by wheelchair users. For this reason, ADAAG specifies that curb ramps
should be at least 0.915 m ( 36 in ) wide, not including the width of the flared sides (ADAAG, U.S. Access Board, 1991). The AASHTO Green Book states that curb ramps, a minimum of 1.0 m ( 39 in ) wide or of the same width as the approach sidewalk, should be provided at crosswalks (AASHTO, 1995).

Curb ramps that are too wide and curb ramps with gradual slopes are difficult for pedestrians with visual impairments to detect. Adding a $0.610 \mathrm{~m}(2 \mathrm{ft})$ detectable warning at the bottom of these types of ramps will improve detectability. In many cities, grooves, which are intended to work as detectable warnings, are placed along the top of the ramp and/or on the ramp surface. However, grooves are difficult for people with visual impairments to detect.In addition, detectable warnings are most effective if placed at the location of the hazard. For sidewalks, the hazard occurs at the transition point between the sidewalk and the street. Section 4.4.2 contains additional information for pedestrians with visual impairments.

### 4.4.1.2.2 Gutters

The slopes of adjacent gutters and streets significantly affect the overall accessibility of curb ramps. When the rate of change of grade between the gutter and the ramp exceeds 13 percent over a $0.610-\mathrm{m}$ ( $2-\mathrm{ft}$ ) interval, wheelchair users can lose their balance. Any amount of height transition between the curb ramp and the gutter can compound the difficulties caused by rapidly changing grades. According to ADAAG, the slope of the road or gutter surface immediately adjacent to the curb ramp should not exceed 5 percent, and the transition between the ramp and the gutter should be smooth (ADAAG, U.S. Access Board, 1991). Section 4.3 .1 contains additional information on rate of change of grade.

### 4.4.1.2.3 Landings

Curb ramp landings allow people with mobility impairments to move completely off the curb ramp and onto the sidewalk, as shown in Figure 4-16. Curb ramps without landings force wheelchair users entering the ramp from the street, as well as people turning the corner, to travel on the ramp flares (Figures 4-17 and 4-18). According to ADAAG, the landing should be a level surface at least 0.915 m ( 36 in ) wide to prevent pedestrians from having to cross the curb ramp flare. ADAAG Section 14 (1994) recommends a $1.220-\mathrm{m}$ ( 48 -in) landing for perpendicular curb ramps and a $1.525-\mathrm{m}$ ( $60-\mathrm{in}$ ) landing for parallel curb ramps (U.S. Access Board,1994b).

Figure 4-16: This wheelchair user is maneuvering successfully a curb ramp because a level landing is provided.


Figure 4-17: This wheelchair user will have difficulty entering the sidewalk because the curb ramp lacks a landing.


Figure 4-18: This wheelchair user will have difficulty traveling around the corner because the curb ramp lacks a landing.


### 4.4.1.2.4 Flares

The flared sides of curb ramps provide a graded transition between the ramp and the surrounding sidewalk (Figure 4-19). Flares are not considered an accessible path of travel because they are generally steeper than the ramp and often feature significant cross-slopes with excessive rate of change of cross-slope. According to ADAAG, if the landing width is less than $1.220 \mathrm{~m}(48 \mathrm{in})$, then the slope of the flares at the curb face should not exceed 8.33 percent. If the landing width is greater than 1.220 m ( 48 in ), a 10 percent slope is acceptable (ADAAG, U.S. Access Board, 1991). If the curb ramp is located where a pedestrian might normally walk, flares are useful indicators to people with visual disabilities. Flares may be replaced with returned curbs if the curb ramp is located where a pedestrian does not have to walk across the ramp or if the sides are protected by guardrails or handrails (Figure 4-20).

Figure 4-19: Flares provide a sloped transition between the ramp and the surrounding sidewalk and are designed to prevent ambulatory pedestrians from tripping.


Figure 4-20: Returned curbs may be used when the curb ramp is located outside the pedestrian walkway, such as in a planting strip.


### 4.4.1.3 Curb ramp types

Curb ramps can be configured in a variety of patterns, depending on the location, type of street, and existing design constraints. Curb ramps are often categorized by their position relative to the curb line. The three most common and basic configurations are termed perpendicular, parallel, and diagonal.

### 4.4.1.3.1 Perpendicular curb ramps

The path of travel along a perpendicular curb ramp is oriented at a 90 -degree angle to the curb face. Perpendicular curb ramps are difficult for wheelchair users to negotiate if they do not have a level landing (Figure 4-21). When the sidewalk is very narrow, it can be costly to purchase additional right-of-way to accommodate a landing for perpendicular curb ramps. An alternative to purchasing more land is to extend the corner into the parking lane with a curb extension (also known as a bulbout). In addition to providing space for a level landing,curb extensions calm traffic, reduce the crossing distance, and provide a larger refuge for pedestrians to congregate while waiting to cross the street (reference Section 4.4.9 for additional information on curb extensions). An additional option for providing landings is to increase the overall width of the sidewalk by adding right-of-way from the roadway. Perpendicular curb ramps are often installed in pairs at a corner (Figure 4-22). For new construction, Section 14 (1994) proposed that two perpendicular curb ramps with level landings should be provided at street crossings. This recommendation was included because two accessible perpendicular curb ramps are generally safer and more usable for pedestrians than a single curb ramp.

Figure 4-21: Without level landings, perpendicular curb ramps are problematic for wheelchair users and others to travel across.


### 4.4.1.3.2 Diagonal curb ramps

Diagonal curb ramps are single curb ramps installed at the apex of a corner (Figure 4-23). Diagonal curb ramps force pedestrians descending the ramp to proceed into the intersection before turning to the left or right to cross the street. This puts them in danger of being hit by turning cars. A marked clear space of 1.220 m ( 48 in ) at the base of diagonal curb ramps is necessary to allow ramp users in wheelchairs enough room to maneuver into the crosswalk (Figure 4-23) (ADAAG, U.S. Access Board, 1991).A designer's ability to create a clear space
at a diagonal curb ramp might depend on the turning radius of the corner. For example, a tight turning radius requires the crosswalk line to extend too far into the intersection and exposes pedestrians to being hit by oncoming traffic. In many situations, diagonal curb ramps are less costly to install than two perpendicular curb ramps. Although diagonal curb ramps might save money, they create potential safety and mobility problems for pedestrians, including reduced maneuverability and increased interaction with turning vehicles, particularly in areas with high traffic volumes. Diagonal curb ramps are not

Figure 4-22: Two perpendicular curb ramps with level landings maximize access for pedestrians at intersections.


Figure 4-23: If diagonal curb ramps are installed, a $1.220-\mathrm{m}$ ( 48 -in) clear space should be provided to allow wheelchair users enough room to maneuver into the crosswalk.


### 4.4.1.3.3 Parallel curb ramps

The path of travel along a parallel curb ramp is a continuation of the sidewalk, as shown in Figure 4-24. Parallel curb ramps provide an accessible transition to the street on narrow sidewalks. However, if the landing on parallel curb ramps is not sloped toward the gutter (no more than 2 percent), water and debris can pool there and obstruct passage along the sidewalk. Parallel curb ramps also require those wishing to continue along the sidewalk to negotiate two ramp grades, unless a wide buffer zone permits the sidewalk to be set back behind the ramps.A combination perpendicular and parallel ramp will significantly reduce the ramp grades for people who wish to continue along the sidewalk (Figure 4-25).

Figure 4-24: Parallel curb ramps work well on narrow sidewalks but require users continuing on the pathway to negotiate two ramp grades.


Figure 4-25: A combination curb ramp is a creative way to avoid steep curb ramps and still provide level landings.


### 4.4.1.3.4 Built-up curb ramps

Built-up curb ramps are oriented in the same direction as perpendicular curb ramps but project out from the curb. For this reason, built-up curb ramps can be installed on narrow sidewalks but are most often installed in parking lots. If an edge protection is not provided on built-up curb ramps between the ramp and the sidewalk, people with visual disabilities might not be able to distinguish between the sidewalk and the street.According to ADAAG, built-up curb ramps should not extend into a vehicular traffic lane (ADAAG,U.S. Access Board, 1991). Built-up curb ramps also should not extend into bicycle lanes because they might present a hazard for cyclists.

Built-up curb ramps have additional drainage requirements because they block the gutter. Possible solutions include providing drainage inlets or placing a drainage pipe under the curb ramp (Figures 4-26 and 4-27).

Figure 4-26: Built-up curb ramp with drainage inlets.



### 4.4.1.4 Curb ramp placement

In addition to specifying curb ramp designs, most transportation agencies provide specifications for their placement. Curb ramp placement can be especially complicated in retrofit situations.

Relocating or redesigning the intersection and street furniture can be expensive. Many sidewalk characteristics, including width, elevation of buildings, and position of street furniture, can affect the curb ramp design chosen. In retrofit situations in which sidewalk width is limited, parallel curb ramps might provide more gradual slopes and landings.

Curb ramps that force users to cross storm drain inlets often present hidden risks to pedestrians. The grates covering such inlets can catch the casters of wheelchairs or the tips of canes and walkers, causing falls and injuries. Water at the base of curb ramps can obscure the transition from the ramp to the gutter and cause pedestrians to misjudge the terrain. Puddles at the base of curb ramps can also freeze and cause users to slip. Locating drain inlets uphill from curb ramps will reduce the amount of water that collects at the base.

Curb ramps ending in parking spaces are not usable when blocked by parked vehicles. This situation can be prevented through parking enforcement and warning signs but perhaps more effectively through the use of curb extensions (see Section 4.4.9 for additional information on curb extensions).

Perpendicular curb ramps should be built 90 degrees to the curb face. At a corner with a tight turning radius, a perpendicular curb ramp built 90 degrees to the curb face will be oriented toward the crosswalk. This is helpful to users because they can follow the ramp path directly across the street. Curb ramps aligned with the crosswalk also reduce the maneuvering that wheelchair users must perform to use the ramp.

At corners with larger turning radii, the curb ramp cannot always point in the direction of the crosswalk and be perpendicular to the curb face. In some cities, designers align curb ramps parallel to the crosswalk, causing the ramp face to be skewed. This design has some benefit to people with visual impairments because they can use the path of the curb ramp to direct them across the street. However, people with visual impairments tend not to rely on the direction of curb ramps because of the abundance of diagonal curb ramps that point into the center of the street.

In addition, if the curb ramp is not perpendicular to the curb, as illustrated in Figure 4-28, wheelchair users have to negotiate changing cross-slopes and changing grades simultaneously, or they have to turn while making the grade transition. Turning at the grade transition requires a wheelchair user traveling down a curb ramp to go down one edge of the ramp and try to turn while on a significant grade. Curb ramps that are perpendicular to the curb prevent wheelchair users from having to turn at the ramp to a gutter transition (Figure 4-29).

Figure 4-28: To avoid having to negotiate changing grades and changing cross-slope simultaneously, a wheelchair user has to turn at the grade transition.


Figure 4-29: Curb ramps designed with the ramp perpendicular the curb eliminate rapidly changing grades and cross-slopes at the grade transition.


### 4.4.1.5 Curb ramps and people with visual impairments

People with visual impairments do not use curb ramps in the same manner as people with mobility impairments. Although people with visual impairments can obtain helpful navigational cues from perpendicular curb ramps, they can learn the same information from the edge of the curb. Curb ramps and flare slopes that are steep enough relative to the grade of the surrounding sidewalk are more detectable than gradually sloped curb ramps or
depressed corners (GA Institute of Technology, 1979).If people with visual impairments are unable to detect a curb ramp, they will not know that they are moving into the street.Installing detectable warnings on ramps can help people with visual impairments detect the upcoming intersection (see Section 4.4.2). Some States also require minimum curb ramp slopes to improve detectability for people with visual impairments.

It is commonly believed that the orientation of curb ramps helps people with visual impairments determine the direction of the crosswalk. However, this technique is generally not taught or used because many curb ramps are not aligned with the path of travel across the street. The skew of diagonal curb ramps can be a particular source of confusion to people with visual impairments if other sidewalk cues present conflicting information about the intersection. Some dog-guide users interviewed for this project said they were most wary of diagonal curb ramps because their dogs might follow the curb ramp path out into the middle of the intersection. However, most people with visual impairments interviewed said that while a diagonal slope to the sidewalk indicated the presence of an intersection, they used other cues, such as the sound of traffic, to orient for the crossing.

### 4.4.2 Conveying I nformation to Pedestrians with Visual Impairments

All pedestrians must obtain a certain amount of information from the environment to travel along sidewalks safely and efficiently. Most pedestrians obtain this essential information visually, by seeing such cues as intersections, traffic lights, street signs, and traffic movements. People with visual impairments also use cues in the environment to travel along sidewalks.For example, the sound of traffic, the slope of curb ramps, changes in surface texture, and a shadow from an overhead awning serve as primary indicators of an upcoming intersection for people with visual impairments. Blind pedestrians also use their ability to estimate distances and directions they have walked (dead reckoning) to determine their location relative to desired destinations (Long and Hill, in Blasch et al., 1997).

Good design in the form of regularly aligned streets, simple crossing patterns, and easy-tounderstand city layouts is generally the best method to provide good orientation cues for pedestrians with visual impairments. However, accessible information might be needed in some situations to supplement existing information. Locations where supplementary information is most beneficial include irregular intersections, open spaces such as plazas, raised intersections, and curb ramps with a slope less than 8.33 percent.

Some cues that people with visual impairments use are permanent, such as the edge of the curb; other cues, such as the sound of traffic, are intermittent.Although the sound of traffic is a very effective way for people with visual impairments to identify an intersection, it is unreliable because cars are not always present. Another issue that affects the usefulness of cues is a person's familiarity with the environment. For example, a person who lives near an intersection with a pedestrian-actuated control signal might be able to identify it easily because of repeated use and familiarity with its presence. However, a person who is unfamiliar with the intersection would be less likely to detect such a device. The most reliable cues for people with visual impairments are permanent and can be detected even in unfamiliar environments.

People with visual impairments should have access to the same information as sighted pedestrians when traveling in unfamiliar areas. To accommodate all pedestrians, it is important to provide information that can be assimilated using more than one sense. For example, an intersection that contains a raised tactile surface warning, a WALK signal light, and an audible pedestrian signal would be more accessible than an intersection that provides only a WALK signal light. Redundancy and multiplicity of formats increase the likelihood that people with impairments and others will be able to make informed traveling decisions.

The most effective accessible information is easy to locate and intuitive to understand, even for pedestrians who are unfamiliar with an area. People with visual impairments stress the importance of consistency in design because accessible information added to the environment is most useful "when used in consistent locations so that the traveler can rely on their existence" and find them reliably (Peck and Bentzen, 1987). Users would benefit if each type of accessible indicator were exclusively reserved to indicate a specific situation in the pedestrian environment and consistently installed to avoid conveying conflicting and confusing information. Studies in the United Kingdom have shown that pedestrians with visual impairments can reliably detect, distinguish, and remember a limited number of
different tactile paving surfaces and the distinct meanings assigned to them (Department of the Environment, Transport, and the Regions, Scottish Office, Notified Draft, 1997).

Visual, auditory, and tactile perceptual information is very useful in detecting cues and landmarks essential to wayfinding and is also important in detecting obstacles and hazards. Mobility is defined as "the act or ability to move from one's present position to one's desired position in another part of the environment safely, gracefully, and comfortably." Wayfinding is defined as "the process of navigating through an environment and traveling to places by relatively direct paths" (Long and Hill, in Blasch et al., 1997). The long cane is a primary example of an environmental probe that allows blind pedestrians to acquire perceptual information about their immediate environment systematically and efficiently. The long cane helps users establish and maintain orientation, as well as detect and avoid hazards.

Because people with visual impairments obtain information about the environment in many ways, the most effective cues convey information in more than one format. For example, truncated domes can be detected not only by texture but by sound and color contrast as well. The greater number of sensory qualities (color, texture, resilience, and sound) the cue has, the more likely it will be detected and understood (Sanford and Steinfeld, 1985). The following are common types of accessible information added to sidewalk environments:

- Raised tactile surfaces used as detectable warnings
- Raised tactile surfaces used for wayfinding
- Materials with contrasting sound properties
- Grooves
- Contrasting colors for people with low vision
- Audible and vibrotactile pedestrian signals


### 4.4.2.1 Raised tactile surfaces used as detectable warnings

Raised tactile surfaces used as warnings employ textures detectable with the touch of a foot or sweep of a cane to indicate upcoming hazards or changes in the pedestrian environment. Many different types of raised tactile surfaces have been proven to be detectable by people with visual disabilities. However, tactile surfaces used as detectable warnings should meet the technical specifications in ADAAG (see Section 4.4.2.7) to avoid confusion with tactile surfaces used for wayfinding. Raised tactile surfaces include truncated domes, patterned panels, and other textured designs. Tactile surfaces used as detectable warnings must also provide color contrast with surrounding surface materials.

Figure 4-30: Truncated domes are an effective way of indicating a drop-off at transit platform.


Raised tactile surfaces have been shown to be very effective in actual application. BART in the San Francisco Bay Area and METRO DADE transit in Miami have used raised tactile
surfaces as systemwide warnings on platform edges since 1989 and have documented no instances of rider dissatisfaction with truncated dome surfaces (Figure 4-30). In contrast, the overall incidence of trips, slips, and falls at platform edges has been significantly reduced. In addition, BART riders exhibit an increased sense of drop-off awareness by tending to "stand farther from the platform edge than MUNI (San Francisco) riders standing at different tracks in the same stations but lacking detectable warnings" (Bentzen, Nolin, and Easton, 1994).

Domes with truncated tops are generally more comfortable than other dome designs for pedestrians to travel across (O'Leary, Lockwood, Taylor, and Lavely, 1995). Low truncated domes have been used to provide warning information in a number of countries, including the United Kingdom (Department of the Environment, Transport, and the Regions, Scottish Office, Notified Draft, 1997), and Japan (Sawai, Takato, and Tauchi, 1998).In the United States, truncated domes are required at transit platform drop-offs (US DOJ, 1991; US DOT, 1991).

The detectability of raised tactile surfaces can depend upon the degree of contrast between the surface and the surrounding surface materials. For example, raised detectable surfaces have been shown to be significantly less detectable when located adjacent to coarse aggregate concrete (Bentzen, Nolin, Easton, Desmarais, and Mitchell, 1994). Raised surfaces are thus much more effective when placed next to smooth paving materials such as brushed concrete.

Climate can determine what type of detectable surface is most appropriate for a region. For example, ice was found to obscure the textural contrast of some raised surface materials (U.S. Access Board, 1985). Surfaces that withstand scraping by snowplows, minimize the collection of precipitation such as snow and ice, and resist degradation by snowmelting additives such as salt are most effective in colder areas. Some cities in the United States have discontinued the use of truncated domes at curb ramps because the materials used wore down quickly and could not be plowed free of snow. However, New York and New Jersey, both areas that experience significant amounts of snow and ice, continue to use raised tactile surfaces (O'Leary, Lockwood,Taylor, and Lavely, 1995).

The length of raised tactile surfaces in the path of travel is most effective when "beyond the average stride in length" so that pedestrians with visual disabilities can "sense it physically, understand its meaning, and react appropriately" before the hazard is encountered (U.S. Access Board, 1995). However, there is a definite trade-off between the high detectability of raised tactile surfaces for people with visual disabilities and ease of movement for people with mobility disabilities (O'Leary, Lockwood, Taylor, and Lavely, 1995).

Several researchers suggested limiting the width of detectable warnings to no more than that required to provide effective warning for people with visual impairments "given the moderately increased level of difficulty and decrease in safety" that raised tactile surfaces on slopes pose for people with physical disabilities (Bentzen, Nolin, Easton, Desmarais, and Mitchell, 1994; Rabelle, Zabihaylo, and Gresset, 1998; Hughes, 1995). Truncated domes that are uneven or too high can cause navigation difficulties for certain sidewalk users, including some bicyclists and in-line skaters. People who use walking aids and pedestrians wearing high heels might lose some stability along ramps covered with raised tactile surfaces. Neither manual nor powered wheelchair users appear to be at significant risk of instability when traveling on ramps with raised warnings (Hughes, 1995).

### 4.4.2.2 Raised tactile surfaces used for wayfinding

Raised tactile surfaces also might provide wayfinding information to people with visual impairments, delineating paths across open plazas, crosswalks, and complex indoor environments such as transit stations. Wayfinding cues include raised tactile surfaces covered with bar patterns laid out in a path to indicate the appropriate walking direction, especially along routes where traditional cues such as property lines, curb edges, and building perimeters are unavailable. In Japan, bar tile has been used to direct pedestrians with visual impairments along transit stations and other heavily used pedestrian areas (Sawai, Takato, and Tauchi, 1998).

The city of Sacramento, California, uses a tactile guidestrip located in the center of some crosswalks to direct people with visual impairments across "irregular and complex" intersections. A San Francisco report recommended guidestrips at intersections with more than two streets, unusual crosswalks, right-turn lanes, diagonal crossings, exceptionally wide
streets, and intersections with other unusual geometric designs (San Francisco Bureau of Engineering, 1996).

Hughes (1995) recommended that "mixed" patterns of both bar tiles and dome tiles be developed for use on curb ramps to provide orientation, as well as warning information, at intersections.However, research in Japan indicated that subjects who were blind had difficulty distinguishing between detectable surfaces with bars and dots or domes.In fact, confusion between warning and guiding tiles was suspected as the cause of several train platform accidents in Japan (Bentzen, Nolin, and Easton, 1994).

### 4.4.2.3 Materials with contrasting sound properties

Adjacent surfacing materials that make different sounds when tapped by a cane can also serve as navigation cues (U.S. Access Board, 1985). Examples of materials with contrasting sound properties include concrete sidewalks next to textured metal, or paving tiles next to rubberized raised tactile surfaces. Materials with contrasting sound properties are used along curb ramps, crosswalks, and transportation platforms. Contrasting materials can also be colored differently from the surrounding paving material (Figure 4-31) or textured to provide visual and tactile information as well.

Figure 4-31: Colored stone sidewalks with concrete curb ramps have a detectable color change.


Materials used to provide sound contrasts should be appropriate to the given setting. For example, materials that degrade in harsh weather conditions or become slippery or hazardous when icy should not be installed outdoors but might be appropriate for indoor environments such as transit stations. People who use dog guides have a reduced opportunity to use sound cues, as described in this section.

### 4.4.2.4 Grooves

Grooves are common and inexpensive to install, but there is little evidence that they can be detected or used by people with visual disabilities. One study indicated that concrete panels with various groove configurations had only a 9 to 40 percent detectability rate (Templer, Wineman, and Zimring, 1982). Cane users could confuse them with the grooves between sidewalk panels and cracks in the sidewalk.

Long-cane users typically travel using a "two-point touch" technique and only scrape the tip of the cane along the ground in the "constant contact" technique when more in-depth exploration of an area is warranted. However, in general, grooves can be detected only by a cane if the constant-contact technique is used to scan the environment. For this reason, grooves are generally ineffective to warn of a potentially hazardous situation such as an intersection. In addition, dirt, snow,ice, weeds, and other debris in the sidewalk environment are likely to collect in grooves and obscure any warning provided.

### 4.4.2.5 Contrasting colors for people with low vision

Contrasting colors such as yellow paint against black asphalt can indicate a change in environment for people with low vision. Texture differences may also be detected by people with low vision. For example, although sidewalk grooves do not provide a significant tactile contrast, some people with low vision can detect groove patterns visually. The color contrast of visual warnings helps both sighted and partially sighted pedestrians to identify potentially hazardous areas.Colorized warnings are particularly useful for all pedestrians at night, when visual acuity and contrast sensitivity are impaired.Variations in surface coloring between the crosswalk and the street can also be used to mark the best path across an intersection. Reflective paint and building materials of contrasting colors are common methods used to provide visual warnings.

ADAAG Section 4.29.2 specifies that detectable warnings "shall contrast visually with adjoining surfaces, either light-on-dark, or dark-on-light." ADAAG Section A4.29.2 further specifies that "the material used to provide contrast should contrast by at least 70\%" (ADAAG, U.S. Access Board, 1991). The effectiveness of ADAAG's recommendations for color contrast was evaluated by Bentzen, Lolin, and Easton (1994). The study concluded that the ADAAG 70 percent contrast recommendation "appears adequate to provide high visual detectability" but cautioned that minimum reflectance values should also be specified for the lighter surface to limit the effects of glare. The study also reported that surfaces colored safety yellow (ISO 3864) were most frequently chosen by low vision subjects as "most visually detectable" (Bentzen, Nolin, and Easton, 1994).

During the sidewalk assessments, visual warnings used on sidewalks were observed to include painted curb edges, tinted curb ramps, colored sidewalks (Figure 4-31), colorized raised tactile warnings, and painted crosswalks.

### 4.4.2.6 Audible and vibrotactile pedestrian signals

Although people with visual impairments generally rely on traffic surges to determine when it is safe to cross an intersection, additional information about crossing conditions can be very useful when traffic sounds are sporadic or masked by ambient noise, the geometry of the intersection is irregular, or acoustics are poor. Accessible pedestrian signals can provide supplementary information, such as timing (when the signal cycle allows pedestrians to cross the street), wayfinding (which roads intersect at the junction), and orientation (the directional heading of each crosswalk). Accessible pedestrian signals are generally installed at complex intersections; intersections experiencing high volumes of turning traffic; major corridors leading to areas of fundamental importance such as post offices, courthouses, and hospitals; and places where people with visual impairments request them (Bentzen, 1998).

A number of different types of accessible pedestrian signals have been developed and were analyzed in a 1998 synthesis by B.L. Bentzen. These include audible broadcast, tactile, vibrotactile, and receiver-based systems, many of which may be integrated with each other to provide additional sources of information.

Audible traffic signals (ATSs) include devices that emit audible sounds when the signal permits pedestrians to cross.ATSs "comprise a warning system that alerts the pedestrian to the onset of a green light" (Hall, Rabelle, and Zabihaylo, 1994). Simple systems use a consistent sound to indicate when the signal has changed. More complex systems use one sound pattern to indicate north/south streets, and another sound to indicate east/west streets, providing both timing and orientation information. Others broadcast prerecorded speech messages telling the name of the street being crossed and the status of the signal cycle (Bentzen, 1998). Street crossings that can be negotiated easily by people with visual impairments are preferred to ATS systems. These systems should be installed only "as a last resort, and only when the installation will guarantee the safety of the visually impaired pedestrian" (Hall, Rabelle, and Zabihaylo, 1994).

Alternating ATS systems, in which speakers on either side of the street alternate indicator sounds, provide alignment assistance for pedestrians with visual impairments. "An alternating signal counters the masking effect of the nearby signal [and] promotes more accurate alignment before crossing and straight-line travel throughout the crossing" (Hall,Rabelle, and Zabihaylo, 1994). Alternating ATS systems result in a straighter line of travel because they allow people with visual disabilities "to align themselves more accurately before and during the crossing. . . ." (Hall, Rabelle, and Zabihaylo, 1994).

Audible information is also useful to identify pedestrian-actuated control signals. Audible pedestrian signals that alert pedestrians to the existence and location of the signal actuator include push-button devices that emit sounds.Tactile pedestrian signals include raised arrows on the signal actuator that indicate which street is controlled by the push button.Tactile pedestrian signals can also provide map information, using raised dot and line symbols to indicate details such as the number of lanes to be crossed, the direction of traffic in each lane, and whether there is a median (Bentzen, 1998).

Vibrotactile traffic devices also can provide information about the presence and location of a pedestrian-actuated signal. In vibrotactile systems, the push-button apparatus will vibrate while pedestrians are permitted to cross. Such systems allow deaf-blind pedestrians to identify the WALK interval and can be installed at medians to prevent signal overlap when audible broadcast signals are in effect (Bentzen, 1998).

Receiver-based systems provide audible or other accessible information only when triggered by a nearby pedestrian-carried receiver. The Talking Signs ® system, for example, uses transmitters that emit infrared beams containing prerecorded speech information. The speech message can label streets, transit kiosks, and other areas. The transmitters can be mounted on traffic poles, buildings, and other significant locations. Pedestrians using the system carry a receiver that picks up the infrared signals and plays them back as audible messages. This system provides both orientation and wayfinding information. The user can hone in on the transmitter's location because the messages are played most clearly when the receiver is oriented directly toward the transmitter (Bentzen, 1997, in Blasch et al.)

### 4.4.2.7 ADAAG requirements for detectable warnings

When ADAAG was first approved in 1991, it contained requirements for detectable warnings at curb ramps, transit platforms, reflecting pools, and hazardous vehicular areas. ADAAG defined a detectable warning as "a standardized surface feature built in or applied to walking surfaces or other elements to warn visually impaired people of hazards on a circulation path." Detectable warnings on walking surfaces were required to be truncated domes with a diameter of 23 mm ( 0.9 in .), a height of 5 mm ( 0.2 in .) and a center-to-center spacing of 60 mm ( 2.35 in .). In addition, detectable warnings had to offer a strong visual contrast to adjacent pedestrian surfaces and had to be an integral part of the walking surface (ADAAG, U.S. Access Board, 1991).

On April 1, 1994, the ADAAG scoping provisions for detectable warnings at curb ramps, hazardous vehicular areas, and reflecting pools were initially suspended until July 1996, and were later extended until July 26, 1998, and 2001, while the requirements for detectable warnings at transit platforms remained in effect. The requirement was initially suspended to allow the U.S. Access Board, the US DOJ, and the US DOT to consider the results of additional research on the need for and safety effects of detectable warnings at vehicularpedestrian intersections.

The study found that, although detectable warnings were not shown to be needed at all curb ramp locations, they did provide "the blind traveler with one potential additional cue that is especially useful in a low-cue environment." Many nonvisual cues used to detect streets are intermittent, such as the sound of traffic. Detectable warning surfaces provide a permanent cue that identifies the transition between the sidewalk and the street. The study concluded that "the effectiveness of detectable warning surfaces on curb ramps depends greatly on other aspects of the design of the intersection, as well as on such social factors as the density of traffic and the skills of the traveler." The study recommended the installation of a 2 -foot-wide strip of detectable surface at the curb line as an alternative to covering the entire surface of the ramp (Hauger et al., 1996).

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## E. Letter and Questionnaire to School

## Dear Teachers:

All elementary and middle schools are participating in a Bicycle and Pedestrian School Safety Review Study, aimed at identifying procedures, programs and projects that will help improve safety for our students choosing to walk or bike to school. Additionally the study will review related factors such as: timing of traffic lights, sidewalk gaps, traffic patterns, and other factors that might affect car riders. We are working with the team of Kittelson and Associates, Inc. [Transportation Engineering/Planning] and River To Sea [Transportation, Planning, Organization]. The study will identify areas at each school and in the surrounding communities, that with some adjustments or additions, will improve safe routes for students. Gathering this information now, will help when we apply for grants to make those changes.

There are a number of parts to the study:

- The team meets with each school administration to discuss any concerns or suggestions as it relates to students' arrival and departure; followed by a field study at the school campus as well as the surrounding neighborhoods to note any impediments to safe routes for students.
- The information gathered will be presented to each school for review and discussion.
- We are asking parents/guardians to take a brief online survey. If they have students at more than one school, they will fill out the survey for the child with the birthday closest to the date on the parent letter that will be sent home. Responses will be kept confidential and no names will be associated with the responses.
- Classroom teachers will be asked to do a tally sheet two days in a row [Wednesday and Thursday, 11th and 12th]. With a show of hands, students will answer how they arrived at school that day and how they plan on returning home. This will be done school-wide in the morning. We are asking principals to briefly meet with teachers to give more specific details.

Sincerely,

Winnie Oden
Flagler Schools
District Safety Consultant

January 9, 2017

Dear Parents/Guardians Students:

All elementary and middle schools are participating in a Bicycle and Pedestrian School Safety Review Study, aimed at identifying procedures, programs and projects that will help improve safety for our students choosing to walk or bike to school. Additionally the study will review related factors such as: sidewalk gaps, timing of traffic lights, traffic patterns and other issues that might affect car riders. We are working with the team of Kittelson and Associates, Inc. [Transportation Engineering/Planning] and River To Sea [Transportation, Planning Organization]. The study will identify areas at each school and in the surrounding communities, that with some adjustments or additions, will improve safe routes for students. Gathering this information now, will help when we apply for grants to make those changes.

There are a number of parts to the study:

- The team meets with each school administration to discuss any concerns or suggestions as it relates to students' arrival and departure; followed by a field study at the school campus as well as the surrounding neighborhoods to note any impediments to safe routes for students.
- The information gathered will be presented to each school for review and discussion.
- Classroom teachers will be asked to do a tally sheet two days in a row. With a show of hands, students will answer how they arrived at school those days and how they plan on returning home.
- We are asking parents/guardians to take a brief online survey. If you have students at more than one school, you will fill out the survey for the child with the closest birthday to the date listed above.
Responses will be kept confidential and no names will be associated with the responses.

Your survey can be found at:

## http://www.saferoutesdata.org/surveyformparent.cfm?key=5112310

Thanks in advance for your prompt attention to the survey. Please complete the survey by Tuesday, January 17th. Your school's administrators will be able to answer any questions.

Sincerely,

## Winnie Oden

Flagler Schools
District Safety Consultant

## F. Best Practices

This section of the report will address the best practices which make walking and bicycling a safer mode of transportation for students. These practices are not only applicable to the walk zone but to any new or old development that supports walking and bicycling. The data gathered for this section of the report comes from the Federal Highway Administration (FHWA), Americans with Disabilities Act of 1990 (ADA), and other documents that are supported by the FDOT and the Flagler County School District.

## Sidewalk Design for New Roadways and Developments

## Findings

Sidewalk design for new roadways and developments are usually based on anticipated pedestrian demand, the type of development, whether residential, industrial, or commercial, and the jurisdiction. Developers may not want to construct sidewalks because the adjoining properties may not have sidewalks. In some cases, development requirements did not address sidewalk construction or connectivity. These conditions have led to developments that do not include sidewalk connectivity.

## Best Practices

When planning a development which is located within the walk zone of a school, safe, connected networks of sidewalks that can be easily navigated by students should be required. If it is not possible to have safe sidewalks then multi-use trails should be considered.

All sidewalks should provide for disabled pedestrians and ought to be incorporated into the planning process for all new roadways and developments. The FHWA has established the following guidelines to assist local jurisdiction with determining when and where pedestrian facilities are needed.

- Develop sidewalks as integral parts of all city streets
- If land use plans anticipate pedestrian activity then sidewalks should be constructed as part of the street development
- Sidewalks should connect nearby urban communities
- Provide sidewalks in rural and suburban areas at schools, local businesses, and industrial plants that result in pedestrian concentrations
- Provide sidewalks whenever the roadside and land development conditions are such that pedestrians regularly move along a main or high-speed highway
- Incorporate sidewalks in rural areas with higher traffic speeds and the general absence of lighting
- Construct sidewalks along any street or highway without shoulders, even if there is light pedestrian traffic

The FHWA went on to say that to initiate the sidewalk installation guidelines above and to promote accessible sidewalk facilities, municipalities should consider the following recommendations:

- Agencies should accept bids from contractors who understand and construct accessible facilities
- Require employees and contractors to demonstrate their knowledge of accessibility topics. If, at any stage of the development process (i.e., planning, design, or installation) accessibility is not addressed, hold the responsible party accountable and make improvements.
- Engineering, transportation, and public policy decision makers should partner with transit providers on projects and programs, and require that transit systems include accessible pedestrian facilities
- Consult with representatives from disability agencies and organizations during all phases of project development
- Include persons with disabilities in the first phases of programming, planning, designing, operating, and constructing pedestrian facilities
- Agencies should ensure that accessibility guidelines are followed throughout planning, project development, and construction of pedestrian facilities

Other local agencies, such as the school board within which the development falls, and the city or county planner, should make sure that the sidewalks are within the minimum set requirements, have good connectivity between residential and commercial developments, increases the allowable densities near major intersections (wider sidewalks), are near major shopping areas and transit lines, and ensure pedestrian friendly sidewalk designs. However, specific design principles must be in place before these options can be exercised. Planning for pedestrian sidewalk usage should be one of the primary goals for developers and should be an integral part of planning for walkable communities.

Appendix D presents the FHWA's guidelines of best practices for the installation of new sidewalks. New developments should consider the following sidewalk safety features to plan for walkers and bicyclists:

- Sidewalks should be constructed on both sides of the road
- Wide pathways
- Acceptable lighting
- No obstacles within walkway
- Sidewalk connectivity
- Sidewalk network
- ADA compliant
- Pedestrian facilities (e.g., shaded benches)
- Changes in grade and slope should be moderate


## Sidewalk Retrofit

## Findings

Cities, counties, and states have codes and regulations that determine how wide a sidewalk must be and how much shoulder should exist between the sidewalk and pavement. The cities and counties must also follow regulations, set by the ADA, to aid disabled pedestrians. These codes have changed as a result of society working towards consuming less energy and promoting safety and healthier lifestyles. In some older neighborhoods, sidewalks are not up to standards since ADA guidelines were not developed and implemented until the 1990s. If the roadway is retrofitted in the future, then existing sidewalks must be brought into compliance with current ADA standards.

Issues with retrofitting sidewalks may include right-of-way costs, conflicting drainage features or swales in the right-of-way, and steep grades. Some sidewalks may have all the aforementioned issues but insufficient right-ofway for retrofitting.

## Best Practices

It is best to create developments with school routes, pedestrian transit routes, and amenities within close walking distances. However, retrofitting sidewalks should be considered in older, noncompliant developments. Additional right-of-way may be required to implement retrofit recommendations.

Projects aimed at retrofitting older sidewalks should research data pertaining to what type of right-of-way exists, a cost analysis of the right-of-way purchase, cost of construction, the condition of existing sidewalks, and the benefits associated with the project. The right-of-way acquisitions process is detailed in The Real Estate Acquisition Handbook and is produced by the FDOT.

## Existing Substandard Sidewalk

## Findings

Older neighborhoods and developments that did not plan for pedestrians may have existing substandard sidewalks. Substandard sidewalk issues include the following (Pedestrian and Bicycle Information Center):

- Sidewalks are buckled, lifted, or cracked due to tree roots or other causes
- Sidewalks are blocked due to the placement of utility poles, sign posts, potholes, fire hydrants, bus benches, newspaper racks, parked cars, or other obstructions
- Sidewalks are blocked by bushes or low tree branches
- Sidewalks lack curb ramps at street corners, crosswalks, and driveways
- The driveway side slopes are steep and hard to cross
- Sidewalk shoulders and adjacent drop-offs are excessive

Any of these existing conditions may make walking and bicycling difficult. When sidewalks are obstructed or do not have curb ramps, it is difficult for walkers and bicyclists to get off the sidewalk and on to the pavement to walk around the obstruction. Driveways with steep side slopes may cause walkers to trip or bicyclists to lose balance.

## Best Practices

It is important to determine what sidewalks are substandard and those sidewalks should be placed on a prioritized list to be repaired or brought up to current standards. Maintaining existing sidewalks is paramount to providing a safe walking and bicycling environment.

The restriction of heavy vehicles on the sidewalk, installing root barriers if trees are planted too close to a sidewalk, and removing obstacles will keep sidewalks safe for students who are walking or bicycling to school. Depending on the average width of tree root spread, there should be rules that determine what species, and how far, trees must be planted from the sidewalk to prevent cracks and buckling. Trees and bushes should be kept trimmed to avoid blocking the sidewalk and to maximize the mobility of pedestrians. For obstacles that cannot be moved, regulations should be developed that prevent future installations affecting the sidewalk.

Driveways that have steep slopes should be re-graded to conform to ADA approved practices. This will allow for an easy transition between the sidewalk and the driveway for all pedestrians and bicyclists.

Curb ramps should be installed at all crossings, wherever applicable, such as at an intersection or at a mid-block crossing. Sidewalks should end at a detectable warning strip or whenever the sidewalk changes, such as at a mid-block crossing, and should conform to standards approved by the ADA. Standards set by the ADA include the width, length, slope, and texture of curb ramps and the width and length of landings, if they are needed.

## Sidewalk Maintenance

## Findings

A sidewalk that clearly has maintenance issues may inhibit pedestrian and bicyclist usage. Existing sidewalks may be hazardous to pedestrians and bicyclists if the following issues exist (FHWA):

- Step separation - a vertical displacement of 13 mm (0.5 in) or greater that could cause pedestrians to trip or prevent the wheels of a wheelchair or stroller from rolling smoothly
- Badly cracked concrete - holes and rough spots ranging from hairline cracks to indentations wider than 13 mm (0.5 in)
- Spalled areas - fragments of concrete or other building material detached from larger structures
- Settled areas that trap water - sidewalk segments with depressions, reverse cross slopes, or other indentations that make the sidewalk path lower than the curb; these depressions trap silt and water on the sidewalk and reduce the slip resistant nature of the surface.
- Tree root damage - roots from trees growing in adjacent landscaping that cause the walkway surface to buckle and crack
- Vegetation overgrowth - ground cover, trees, or shrubs on properties or setbacks adjacent to the path that have not been pruned can encroach onto the path and create obstacles
- Obstacles - objects located on the sidewalk, in setbacks, or on properties adjacent to the sidewalk that obstruct the passage space or the visibility of sidewalk users; obstacles commonly include trash receptacles, utility poles, newspaper vending machines, and mailboxes
- Blocked or inadequately protected drainage inlets and inadequate flow planning
- Temporary construction interruptions
- Inadequate patching after utility installation

Sidewalks are typically in the public right-of-ways and are the sole responsibility of the City or County, depending on who has jurisdiction over that roadway. In some cases, sidewalks are provided along privately maintained roads and common spaces and are the responsibility of a Homeowners Association (HOA) or other property management entity.

## Best Practices

- A division of the City or County should be solely dedicated to sidewalk maintenance or, if in the case of privately maintained sidewalks, should be addressed through code enforcement procedures.
- Sidewalk maintenance issues should be placed on a prioritized list of sidewalk projects to be completed.
- Maintenance issues should be solved by using strategies standard to road maintenance. This will minimize the risk of walkers and bicyclists on their way to and from school; and all maintenance issues should be handled consistently throughout the jurisdiction.


## Improving Existing Roadway Conditions

## Findings

Existing roadway conditions may not offer enough safety for walkers and bicyclists. Motorists may speed within school walk zones and not pay attention to their surroundings. Motorists pulling out of driveways may look for oncoming vehicles but may not look for walkers and bicyclists crossing the driveway.

## Best Practices

Roadway conditions can be improved to maintain safety and accessibility for walkers and students who may want to ride their bicycles to school. The following are best practices that improve existing roadway conditions for walkers and students who choose to ride their bicycles to school.

- Signage and pavement markings should be highly visible and current
- Traffic calming devices should be considered to reduce speeds
- Speed studies should be conducted to lower speed limits year-round
- ADA standards should be adhered to
- Consider one-way streets if traffic is too congested during the arrival and dismissal times
- Strict police enforcement should be imposed to deter illegal and unsafe parking practices as well as moving violations within the school zone


## Pavement Markings

## Findings

Pavement markings are essential to the transportation system to communicate and enhance the messages of roadway operational conditions by augmenting other traffic control devices. School pavement markings and crosswalk markings are especially important since they alert the motorist of walkers and bicyclists entering the pavement at crosswalks and intersections. Pavement markings can easily fade or become obliterated over time. It was observed that SCHOOL markings, which warn motorists that they will soon enter into a school zone, are often faded, cracked, or chipped.

## Best Practices

The following best practices are recommended to improve the safety, life, and effectiveness of pavement markings.

- SCHOOL pavement markings and crosswalk markings should be clear and visible in order to warn motorists that they are entering a school zone and/or children are crossing.
- The FDOT's current standard (Index No. 17346) uses a special emphasis crosswalk that lengthens the life of the crosswalk marking.
- Thermoplastic paint should be used for all pavement and school markings to enhance the visibility of walkers and bicyclists. Thermoplastic paint should be used since it is durable, retro-reflective.
- The crosswalk should align with the sidewalk ramps.
- Crosswalks should be installed where walkers and bicyclists are in the pavement for the shortest distance and time possible.
- Pavement markings should be accompanied by the proper signage.
- Pedestrian median refuges should be installed for long crosswalks with interim medians.
- Walkers and bicyclists should be dissuaded from crossing at intersections or mid-block crossings where heavy traffic exists unless accompanied by crossing guards.


## Traffic Signal Control

## Findings

Traffic signalization has an important role in promoting safety for students who walk or bicycle to school. Drivers at busy intersections can easily overlook students trying to cross a street; consequently, signals allow students the necessary time to safely cross busy intersections.

School flashing beacons (Illustration 11) also play an important role in safety. Flashing beacons alert drivers that they are entering a school zone and indicate that the displayed speed limit is in effect. It was observed that


Illustration 11: Flashing beacon traffic signal control school flashing beacons can be operated manually or can be pre-set to turn off/on during pre-programmed timeframes. Manually run school flashing beacons are usually operated by school crossing guards, who are primarily assigned to cross elementary school students. Unfortunately, this does not address the needs of middle school students.

## Best Practices

- Pedestrian signal heads should be considered at all intersections that utilize traffic control signals for motor vehicles within the school walk zones.
- Pedestrian signal buttons should be placed such that it is obvious to elementary and middle school students which buttons to press to access the desired sidewalk.
- Pedestrian signal heads should employ the countdown display which exhibits the symbols of the WALKING MAN beside the numerical countdown. This will help students to decide if they have enough time to cross or if they should wait for the next pedestrian signal phase.
- Students should be educated on the proper ways to cross an intersection when using a pedestrian signal head.
- For students who must cross more than two lanes of traffic, the assignment of crossing guards or overhead pedestrian bridges should be considered.
- U-turns and right-on-reds should be prohibited at intersections where students utilize pedestrian crossings.
- School attendance zones that have crossings at heavily congested intersections should have their walk zones re-evaluated so that students can either walk to another school or transportation could be provided.


## Enforcement and Education

## Findings

Walkers and bicyclists do not always follow proper crossing procedures. Students may dart through traffic to access the school in the mornings or access a vehicle parked across the road from the school in the afternoons. Students may also cross streets at mid-block without the aid of a crosswalk or an adult. When crosswalks do exist, students do not always follow proper crossing procedures.

Regulations are not always followed by adults dropping off/picking up students (Illustration 12). Motorists were observed to park in No Parking areas and make prohibited vehicular movements, including u-turns. Some motorists were observed to be speeding within the reduced-speed


Illustration 12: Intersection of Ohio Avenue and Scholars
Path at dismissal zone.

Students who choose to ride their bicycles to school do not always wear helmets.

## Best Practices

- Students and parents should be educated on proper crossing procedures. Parents, crossing guards, and School Resource Officers (SRO) should be the main resources for safety.
- Parents should receive flyers or recorded messages on a school-wide basis to inform them of the proper drop-off/pick-up procedures. Strict enforcement of these procedures should eventually deter parents from practicing unsafe drop-off/pick-up actions.
- Prohibited vehicular movements should be strictly handled and higher fines could be considered, where allowable by law, during the arrival and dismissal times of school.
- Helmets should always be worn by bicycling students. Parents, school staff, crossing guards, and school resource officers should encourage helmet usage. Non-compliant helmet users should be dealt with consistently and strictly.
- Encourage walking and bicycling by providing free helmets, stickers, reflective gear, or create an incentive program.
- Schools should provide a safe and secure bicycle storage facility for students who choose to ride their bicycles to school.
- Parents should be informed about the different walking and bicycling programs available and the school and its volunteers should assist in planning and implementing those programs.
- Students who are regular walkers and bicyclists should be paired with other walkers and bicyclists who live in the same area.
- Crossing guards should be involved in the re-zoning of walk zones since they have a better understanding of the distribution of the walker and bicyclist population.


## School Board Considerations

## Findings

School districts generally employ the two-mile walk route to determine the walk zone. This is not always the best option to promote safety. Students may have to cross congested intersections, too many intersections, and/or busy driveways.

Sidewalks are not always located on both sides of the road. This may encourage unsafe crossings where no crosswalks exist. Walk zones can also include sidewalks that end at an unsignalized intersection with no safe alternative to gain access to the sidewalk on the opposite side of the roadway.

It was noted that schools prefer to have one controlled point of entry that is monitored by school staff. In these cases, students who walk or ride their bicycles to school may have to cross busy driveways including drop-off/pick-up loops, bus loops, and even parent and teacher parking lots, to enter/exit the controlled point of entry.

## Best Practices

- As defined in F.S. 1006.23, the School District staff collaborates with the Sheriff's crossing guards, City and County Public Works and FDOT to evaluate a school's walk zone and its hazardous walking conditions as defined.
- In effort to avoid the inter-mingling of elementary, middle, and high school traffic, school arrival and dismissal, Flagler County School District has a three-tiered bell schedule. Further, each school separates bus traffic from parent pick-up drop-off traffic.
- It is necessary to review all new development plans within the school walk zone to ensure that developers are providing sidewalks on either side of the road and maintaining sidewalk connectivity and networking to the school. Flagler County School District is a member of city and county development review teams and reviews new site plans and subdivisions to ensure adequate area is designated for school bus stops and sidewalks. City and County land development regulations require sidewalks.
- All new schools should be planned with good sidewalk connectivity/network to all neighborhoods and developments within its walk zone.
- As required by F.S. 1006.23, Flagler County School District provides bus service to students who do not have access to safe routes to school.
- There are certain programs which promote walking and bicycling to school. Flagler County School District currently participates in such programs (e.g. Walking School Bus, SAFE KIDS Walk This Way, and International Walk to School Day). Bicycle and pedestrian safety is part of the existing elementary physical education curriculum.
- A No Backpack policy should be considered to encourage walking and bicycling to school and consideration to the following is recommended:
- All textbooks should be accessible on-line
- A set of textbooks should be available at the local library
- Provide students with a set of textbooks to keep at home
- Each school should enforce bicycle safety, helmet usage should be closely monitored for compliance, and PTA meetings to ensure parent support and compliance with these policies should be promoted.
- All teachers assisting during arrival/dismissal should wear safety vests when they are crossing students or interacting with vehicular traffic.


## G. Funding Sources

## Florida Safe Routes to School Funding

Florida's SRTS Program is 100 percent federally funded, and is managed through the Florida Department of Transportation (FDOT) on a cost-reimbursement basis. Most of Florida's SRTS funds are distributed to the seven FDOT Districts based on the number of children in grades $\mathrm{K}-8$ in the District compared to the state.

The federal SRTS Guidance directs that seventy to ninety percent of each state's SRTS funds go toward Infrastructure (Engineering or construction) projects, and the remaining ten to thirty percent toward Non-Infrastructure programs (Education, Encouragement, Enforcement, and Evaluation). Each state develops their SRTS Guidelines within the federal Guidance. In Florida, generally ninety percent of each District's SRTS funds will be dedicated to Infrastructure and the remaining ten percent will go toward Non-Infrastructure. However, each District Secretary can adjust the percentages within the federal limits. Projects will be awarded through a District-wide competitive process. See the Infrastructure and NonInfrastructure sections below for more specifics on the application and selection processes.

SRTS funds may not be used to supplant or replace existing funds. Because federal SRTS funds are limited:

- Applicants must prioritize their requests for Infrastructure projects and Non-Infrastructure programs.
- Applicants are encouraged to be as cost effective as possible so that more SRTS projects and programs can be funded.
- Districts will do their best to select good proposals from around their District so their SRTS funds are implemented as equitably as possible.

Source: FDOT's Guidelines for Florida's Safe Routes to School Program

Additional Funding Information for Safe Routes to School Projects can be found here: http://www.saferoutesinfo.org/program-tools/funding

## H. Pedestrian and Bicycle Crash Reports

FLORIDA TRAFFIC CRASH REPORT LONG FORM

MALL TO: DEPT. OF HIGHWAY SAFETY \& MOTOR VEHICLES, TRAFFIC CRASH
RECORDS, NELL KIRXMAN BUILDING, TALLAHASSEE, FL 32399-0537


HSMV-90903 (REV. 01/02)


FLORIDA TRAFFIC CRASH REPORT


Vehicle 1 was traveling southbound on N. Pine St. approching the intersection of E. Lambert St. Vehicle 2 was traveling in the same direction and moved to the left side of the roadway prior to the stop sign in front of vehicle 1. The driver of vehicle 2 claims that his bicycle was clipped on the right side as the trailer being pulled by vehicle 1 passed him. The impact knocked over vehicle 2 (bicycle) causing damage to the rear brake mechanism and left pedal. The driver of vehicle 2 stated that vehicle 1 went through the intersection stopping just south of E. Lambert St. on N. Pine St., waited a few minutes then left the scene before any tag identification could be made. The driver of vehicle 2 did not have any visable signs of injury, claimed he was uninjured, and declined to have a medical unit respond. Vehilce 2 did not have a front light installed and was driving on the wrong side of the road prior to point of impact.



FLORIDA TRAFFIC CRASH REPORT
DO NOT WRITE IN THIS SPACE
LONG FORM
MALL TO. DEPT. OF HIGHWAY SAFETY \& MOTOR VEHICLES, TRAFFIC CRASH RECORDS, NEIL KIRKHAN BUILDING. TALLAHASSEE, FL 32399-0537



FLORIDA TRAFFIC CRASH REPORT
NARRATIVE/DIAGRAM
mall to: dept. OF hghway safetr \& motor vehilles, traffic crash RECORDS, NEIL KIRKMAN BUILDING, TALLAHASSEE, FL 32399-0537

DO NOT WRITE IN THIS SPACE

| DATE OF CRASH | COUNTY/CTY CODE | INEST. AGENCY REPORT NLMBER | HSMV CRASH REPORT NUMBER |
| :---: | :---: | :---: | :---: | :---: |
| $10 / 18 / 10$ | $61 / 30$ | $10-7317$ | 70823227 |

Vehicle one was stopped on W. Moody Blvd about to turn north on N. State St (Turning left). Pedestrian one was standing at the northeast corner of the intersection waiting to cross N. State St (Heading west). Pedestrian one began walking across the crosswalk. Vehicle one turned left onto N. State St and collided with pedestrian one as she crossed the crosswalk.

Driver one stated that she did not see pedestrian one. Pedestrian one could not remember what happened. This officer obtained video from 100 E . Moody Blvd. The video shows pedestrian one standing at the northeast corner of the intersection, appearing to wait for the crosswalk. Pedestrian one then began walking and wasstruck by the vehicle.

Witness one stated that she did not see the accident but when she came out to see what happened she saw the number countdown on the pedestrian sign.



FLORIDA TRAFFIC CRASH REPORT LONG FORM $\square$ SHORT FORM $\square$ UPDATE $\quad \mathbf{X}$ (Electronic Version)

| Date of Crash <br> 27/Sep/2011 05:55 AM |  | Time of Crash27/Sep/2011 05:55 AM |  | $\begin{array}{\|l\|} \hline \text { Date of Report } \\ \text { 10/Apr/2012 03:15 PM } \end{array}$ | $\begin{array}{\|l\|} \hline \text { Invest. Agency Report Number } \\ \text { FHPG11OFF038940 } \end{array}$ | HSMV Crash Reporl Number 82076155 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| CRASH IDENTIFIERS |  |  |  |  |  |  |  |  |
| County Code 61 | City Code <br> 30 |  | FLAGLER |  | $\begin{aligned} & \text { Place or City of Crash } \\ & \text { BUNNELL } \end{aligned}$ | Within City Limits No | $\begin{array}{\|c} \hline \text { Time Reported } \\ 27 / \mathrm{Sep} / 2011 \\ 06: 24 \mathrm{AM} \end{array}$ | Time Dispatched <br> $27 / S e p / 2011$ <br> $06: 24 / \mathrm{AM}^{2}$ |
| Time on Scene 27/Sep/2011 $06: 30 \mathrm{AM}$ | Time Cleared Scene 27/Sep/2011 08:45 PM |  | Completed Yes | Reason (if Investigation NOT Completed) $\quad \begin{gathered}\text { Notified By } \\ \text { Law Enforcement }\end{gathered}$ |  |  |  |  |

## ROADWAY INFORMATION



VEHICLE (Check if Commercial)


## PERSON RECORD

| $\begin{array}{\|c} \hline \text { Person\# } \\ 2 \end{array}$ | $\begin{array}{\|l\|} \hline \text { Description } \\ 2 \text { Non-Motorist } \end{array}$ | Name ALEX RETTAN TAYLOR |  |  | $\begin{aligned} & \text { Date of Birth } \\ & 07 / \text { Sep/1957 } \end{aligned}$ | $\mathrm{Sex}_{\mathbf{1} \text { Male }}$ | $\begin{gathered} \text { Injury Severity } \\ 5 \text { Fatal (within } 30 \\ \text { days) } \end{gathered}$ | Phone Number |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Address | 1288 HAZELNUT ST |  | BUNNELL | State FL |  |  | Zip Code | 110 |
| Non-Motorist Description Detail 1 Pedestrian |  |  | Non-Motorist Action Prior to Crash <br> 7 Adjacent to Roadway (e.g., shoulder, median) |  |  | Non-Motorist Location at Time of Crash 6 Bicycle Lane |  |  |


| Date of Crash $27 / \mathrm{Sep} / 2011$ | $5 \mathrm{AM}$ | $\begin{aligned} & \text { of Reporl } \\ & \text { 27/Sep/2011 } \end{aligned}$ | AM | Inves | ency | port Number <br> G11OFF038940 | HSM | $\begin{array}{r}82076 \\ \hline\end{array}$ |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Non-Motorist Actions/Circumstance (First) 1 No Improper Action |  | Non-Motorist Actions/Circumstance (Second) |  |  | Non-Motorist Safety Equipment (One) <br> 1 None |  |  | Motorist Safely | ment (Two) |
| Suspected Alcohol Use 88 Unknown | Alcohol Tested 3 Test Given | $\begin{gathered} \text { Alcohol Test Type } \\ 1 \text { Blood } \end{gathered}$ | Alcohol Test Result 2 Completed |  | $\begin{array}{\|c\|} \hline \text { BAC } \\ 0.00 \end{array}$ | Suspected Drug Use 88 Unknown | $\begin{aligned} & \text { Drug Tested } \\ & 3 \text { Test Given } \end{aligned}$ | $\begin{gathered} \text { Drug Test Type } \\ \mathbf{1} \text { Blood } \end{gathered}$ | $\begin{array}{\|c} \hline \text { Drug Test Result } \\ 2 \text { Negative } \end{array}$ |
| Source of Transport to Medical Facility 88 Unknown |  | EMS Agency Name or ID |  |  | EMS Run Number |  | $\begin{aligned} & \text { Medical Facility Transported To } \\ & \text { ME OFFICE ST. AUGUSTINE } \end{aligned}$ |  |  |

## NARRATIVE

| ID Number 2073 | $\begin{aligned} & \text { Rank Name } \\ & \text { TROOPER S. HOWARD } \end{aligned}$ | Troog / Post Officer Agency Phone Number G FLORIDA HIGHWAY PATROL | Date Created Sep 30, 2011 |  |
| :---: | :---: | :---: | :---: | :---: |
| Vehicle 1 (V1) was traveling westbound on State Road 100 in the outside lane. Pedestrian 1 (P1) was traveling westbound in the marked bicycle lane. As V1 entered the curve, V1 drifted into or near the edge marker causing an unknown protruding object to struck P1. As a result of impact, P1 rotated clockwise. P1 was propelled approximately 12 feet westward and struck the roadway, the raised curb and the grass shoulder. P1 came to final rest facing northeast in the bicycle lane and on the grass shoulder. The bicycle P1 was pushing came to final rest facing northwest on it\'s leff side. V1 continued westbound on State Road io0 to destination unknown. |  |  |  |  |
| ${ }^{\star}$ Traffic Homicide Investigation Conducted By: Cpl. P. Young \#468 Florida Highway Patrol <br> *Traffic Homicide \#FHP-711-61-014 <br> *Photographs Taken By: Cpl. P. Young Florida Highway Patrol <br> Pierre Tristam Editor FlaglerLive News <br> *Deceased Alex Rettan Taylor, Born 09/07/1957 Died 09/27/11 <br> *Pronounced Deceased By:J. Cosgrove EMT/Paramedic @ 06:33 am 09/27/11 <br> $\star$ Updates To This Report Will Be Completed By: Cpl. Young <br> The initial report completed by Trooper Steven Howard. <br> On Tuesday, September 27, 2011, at 10:00 a.m., Dr. Predrag Bulic, M.D., performed an autopsy on Alex Tay \"Multiple Blunt Force Injuries.\" Manner of Death: \"Accident.\" Alex Taylor\'s <br> This traffic crash is no longer under investigation and will be re-open if new evidence is found. <br> Traffic Homicide Investigation Number: FHP 711-61-014 <br> Traffic Homicide Investigator: Master Corporal Peter G. Young |  |  |  |  |
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REPORTING OFFICER



FLORIDA TRAFFIC CRASH REPORT LONG FORM $\bar{x}$ SHORT FORM $\square$ UPDATE $\square$

HIGHWAY SAFETY \& MOTOR VEHICLES, TRAFFIC CRASH RECORDS
(Electronic Version)

| Date of Crash 18/Apr/2012 0 | 3:41 PM | Time of Crash 18/Apr/2012 08:41 PM |  | $\begin{array}{\|l\|} \hline \text { Date of Report } \\ \text { 18/Apr/2012 11:05 PM } \end{array}$ | $\begin{aligned} & \text { Invest. Agency Report Number } \\ & \text { FHPG12OFF015004 } \end{aligned}$ | HSMV Crash Reporl Number82076495 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| CRASH IDENTIFIERS |  |  |  |  |  |  |  |  |
| County Code 61 | City Code |  | unty of Crash | LAGLER | Place or City of Crash BUNNELL | Within City Limits No | $\begin{array}{\|c\|} \hline \text { Time Reported } \\ 18 / \mathrm{Apr} / 2012 \\ 09: 58 \mathrm{PM} \end{array}$ | $\begin{array}{\|c} \text { Time Dispatched } \\ 18 / A p r / 2012 \\ 10: 07 \mathrm{PM} \end{array}$ |
| $\begin{array}{\|c} \hline \text { Time on Scene } \\ 18 / \mathrm{Apr} / 2012 \\ 10: 23 \mathrm{PM} \end{array}$ | Time Clea 18/Apr/ | $\begin{aligned} & \text { ared Scene } \\ & \text { P012 11:40 } \\ & \text { PM } \end{aligned}$ | $\begin{gathered} \text { Completed } \\ \text { Yes } \end{gathered}$ | Reason (if Investigation N | NOT Completed) |  | Notified By Law | nforcement |

## ROADWAY INFORMATION



VEHICLE (Check if Commercial)


PERSON RECORD



EASTBOOE STREET

## EAST/WEST TRAVEL LANES



FLORIDA TRAFFIC CRASH REPORT
LONG FORM $\square$ SHORT FORM $\square$ UPDATE $\square$
HIGHWAY SAFETY \& MOTOR VEHICLES,
TRAFFIC CRASH RECORDS
(Electronic Version)


VEHICLE (Check if Commercial)


PERSON RECORD




## FLORIDA TRAFFIC CRASH REPORT



MAIL TO: DEPARTMENT OF HIGHWAY SAFETY \& MOTOR VEHICLES TRAFFIC CRASH RECORDS, NEIL KIRKMAN BUILDING

TALLAHASSEE, ḞL 32399-0537

| TOTAL \# OF VEHICLE SECTION(S) | 1 |
| :--- | ---: |
| TOTAL \# OF PERSON SECTION(S) | 2 |
| TOTAL \# OF NARRATIVE SECTION(S) | 1 |




$$
\text { Page } 1 \text { of } \underline{6}
$$




[^1]Page $\underline{3}$ of $\underline{6}$


HSMV 90010 S (V/P) (rev 10/10)

$$
\text { Page } \underline{4} \text { of } \underline{6}
$$

V1 was backing into driveway at 309 S. Peach St., the driver of V1 was looking rearward while the pedestrian P2 was walking in front of the V1 to cross the street. The passenger side front tire of V1 rolled over P2's left foot. P2 was transported to Florida Hospital Flagler by Flagler County EMS Med Unit \#92. No further information


HSMV 90010 S (N/D) (rev 10/10)

$$
\text { Page } 5 \text { of } 6
$$



## FLORIDA TRAFFIG CRASH REBPORT

LONG FORM $\square \underset{\text { (Shaded Areas) }}{\text { SHORT }} \square$ UPDATE $\square$
MAIL TO: DEPARTMENT OF HIGHWAY SAFETY \& MOTOR VEHICLES TRAFFIC CRASH RECORDS, NEIL KIRKMAN BUILDING TALLAHASSEE, FL 32399-0537

TOTAL \# OF VEHICLE SECTION(S) 1
TOTAL \# OF PERSON SECTION(S) TOTAL \# OF NARRATIVE SECTION(S) 1




[^2]Page 1 of 6



[^3]Page $\underline{3}$ of 6


HSMV 90010 S (V/P) (rev 10/10)
Page 4 of 6

On the above date/time, this officer, Ofc. Hristakopoulos, was dispatched to the 300 block of East Booe Street, regarding a hit and run. Upon arrival, this officer observed a white adult female laying in the roadway on her right side (see diagram). The female was later identified as Brenna Cronin. Ms. Cronin was surrounded by people upon this officers arrival. This officer spoke to Ms. Cronin, who was disoriented, but conscious. Ms. Cronin stated that she was unable to move her arms or legs, and stated she was in a lot of pain. This officer spoke to Ms. Cronin in an attemot to keep her conscious until med. rescue could arrive on scene. While this officer spoke to Ms. Cronin, this officer could overhear people in the crowd stating things such as, "she got hit hard", and "she went flying up in the air." This officer advised Ofc. Chewning to gather names of any witncsses. Ofc. Chewning advised that a woman who did not identify herself, stated that the vehicle was possibly a green Ford Escort. Ofc. Chewning also spoke with Capers McClendon, who initially stated he had observed the crash, but immediately after, recanted, saying he did not know what happened. By the time that the ambulance arrived on scene and transported Ms. Cronin to FHF, the crowd had left, and there were no cooperative witnesses. This officer did speak to a friend of Ms. Cronin's, Mr. Jarrod Eden. Mr. Eden stated that he was in his vehicle, at the intersection of E. Booe and S. Pine, and observed a small blue vehicle heading East from US1, strike Ms. Cronin, and continue Eastbound. Mr. Eden advised he did not get a good look at the vehicle, and was unable to identify the driver, or the make/model of the vehicle. This officer made contact with Ms. Cronin at FHF, where she appeared to be more well oriented. Ms. Cronin stated that she was walking across Booe Street, from North to South, in front of 306 E. Booe Street, when a vehicle came "out of nowhere", striking the right side of her body, and throwing her into the air. Ms. Cronin advised that she landed on her right side, facing South, which is the position this officer located her in. Ms. Cronin advised she could not recall what type of vehicle had struck her. There was no debris in the roadway where Ms. Cronin was struck. This officer was unable to determinc if the suspect vehicle had attempted to brake prior to striking Ms. Cronin. FHF staff advised Ms. Cronin that she had not suffered any fractures in the crash. This officer was unable to locate the suspect vehicle. No further information at this time.


[^4]Page 5 of 6


FLORIDA TRAFFIC CRASH REPORT

LONG FORM


SHORT FORM $\square$ UPDATE $\square$
MAIL TO: DEPARTMENT OF HIGHWAY SAFETY \& MOTOR VEHICLES TRAFFIC CRASH RECORDS, NEIL KIRKMAN BUILDING

TALLAHASSEE, FL 32399-0537

| TOTAL \# OF VEHICLE SECTION(S) | 1 |
| :--- | ---: |
| TOTAL \# OF PERSON SECTION(S) | 2 |
| TOTAL \# OF NARRATIVE SECTION(S) | 1 |



|  | Road System Identifier |  | 7 Forest Road <br> 8 Private Roadway |
| :---: | :---: | :---: | :---: |
| 3 | 1 Interstate 2 U.S. | 4 County <br> 5 Local |  |
| 3 | 3 State | 6 Turnpike/Toll | 77 Other, Explain in Narrative |



CRASH INFORMATION (CHECK IF PICTURES TAKEN)


[^5]


1 Not Transported
277 Other 3 Law Enforcement
HSMV 90010 S (V/P) (rev 10/10)


770 ther, Explain in Narrative 88 Unknown
HSMV 90010 S (V/P) (rev 10/10)

On the above date and time this officer, Wolfle, was dispatched to 900 E . Moody Blvd. in reference to a crash with injuries. Upon arrival this officer made contact with the Person 1, Steve M. Lynn who stated he was driving vehicle 1 west on E. 100. Person 1 began driving passed the 900 block of E. 100 when he saw Person 2 running towards the roadway (from the north). Person 1 stated that Person 2 never looked before running into the roadway and collided with his passenger side fender. There was no damage to Person 1's vehicle after it was hit by Person 2. Person 1 then pulled over his vehicle to see if Person 2 was alright. Before Person 2 could approach Person 2, Person 2 fled east on foot. The witness said she was sitting on the porch, at 900 E. Moody Blvd., with Person 2, drinking alcohol with him. Person 2 told the witness that he wanted to die and left the porch on foot towards the roadway. The witness said Person 2 then began to run full speed towards the roadway. When Person 2 entered the roadway he struck Person 1's vehicle. The witness stated that Person 2 fell onto the floor for about two minutes, and then fled the scene towards a vacant residence at the intersection of E. Moody Blvd. and N. Palmetto Street. This officer along with Ofc. Myers and two Flagler County Deputies canvassed the area of the residence with negative results. The residence was secured and showed no signs of a break in. Person 2 was then later located in-between N. Fig Street and N. Palmetto Street around the 300 block in the bushes. Person 2 was then transported to FHF by this officer for his injuries. While on scene it was discovered Person 2 suffered a broken left ankle.


[^6]$$
\text { Page } 5 \text { of } 6
$$


Page 6 of 6

## FLORiDA TRAFFIC CRASH REPORT

LONG FORM


SHORT FORM $\square$ UPDATE $\square$
MAIL TO: DEPARTMENT OF HIGHWAY SAFETY \& MOTOR VEHICLES TRAFFIC CRASH RECORDS, NEIL KIRKMAN BUILDING TALLAHASSEE, FL 32399-0537 TALLAHASSEE, HL 3239-0537
TOTAL \# OF VEHICLE SECTION(S) $\quad 1$
TOTAL \# OF PERSON SECTION(S) $\quad 2$ TOTAL \# OF NARRATIVE SECTION(S)1

| CRASH DATE $10 / 10$ |  | TIME OF CRASH <br> 0954 | $\begin{array}{\|l} \hline \text { DATE OF REPORT } \\ 10 / 10 / 2012 \\ \hline \end{array}$ | REPORTING AGENCY CASE NUMBER $12-13229$ | $\begin{array}{r} \hline \text { HSMVCRASH REPORT NUMERR } \\ 8021310 \end{array}$ |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| CRASH IDENTIFIERS . |  |  |  |  |  |  |  |
| $\begin{gathered} \text { COUNTY CODE } \\ 61 \\ \hline \end{gathered}$ | $\begin{gathered} \text { CITY CODE } \\ 30 \end{gathered}$ | $\qquad$ |  | PLACE OR CITY OF CRASH Bunnell |  |  | TIME DISPATCHED <br> 0957 |
| TIME ON SCENE |  | $\left.\left.\right\|_{\text {TIME CLEARED SCENE }} 1020$CHECK IF <br> COMPLETED$\quad \square\right\|^{\text {REASO }}$ |  | If Investigation NOT Complete) |  |  | ${ }_{\text {d By: }} 1$ Motorist |
| ROADWAY INFORMATION (CHOOSE ONLY 1 OF 4 OPTIONS) |  |  |  |  |  |  |  |
| CRASH OCCURRED ON STREET, ROAD, HIGHWAY E. Moody Blvd. |  |  |  | $1^{\text {ATSTR }}$ | 2 AT LATITUDE AND LONGITUDE |  |  |
| $\begin{array}{\|c} \hline \text { FEET } \\ 20 \\ \hline \end{array}$ | IMILES |  |  |  | 3 AT / FROM INTERSECTION WITH STREET, ROAD, HIGHWAY <br> S. Bacher St. |  | $6^{2}$ | (4) OR FROM MILEPOST \# |  |


|  | Road System Identifier |  | 7 Forest Road 8 Private Roadway |
| :---: | :---: | :---: | :---: |
| 3 | $\begin{aligned} & 1 \text { Interstate } \\ & 2 \text { U.5. } \end{aligned}$ | 4 County 5 Local |  |
| 3 |  | 6 Turnpike/Toll | 77 Other, Explan Narrative |



Type of Intersection 1 Not at Intersection 5 Traffic Circle 1 Not at intersection
2 four-Way Intersection 5 Roundabout 2 2 Four-Way Intersection 7 Five-Point, or More $4 Y$-nntersection 77 Other, Explain in Narrative


HSMV 90010 S (E) (rev 10/10)
Page $\perp$ of 6



HSMV 90010 S (V/P) (rev 10/10)

or, Explain in Narrative 88 Unknown

On Wednesday, October 10, 2012 at approximately 0957hrs, I was dispatched to a crash with injuries located in front of the Bunnell Pharmacy, 706 E . Moody Boulevard. Upon my arrival, I made contact with person 2, who stated that she was driving vehicle 2, east on E. Moody Boulevard. Just as person 2 was passing S. Bacher Street, she noticed person 1 was in the middle of the turn lane attempting to cross the roadway from north to south. As vehicle 2 began to pass person 1 , person 1 walked into the left rear of vehicle 2. Person 2 then pulled over vehicle 2, parking in the roadway, in front of the Bunnell Pharmacy. I then made contact with person 1 who stated she was crossing the roadway. She began on the north side of E . Moody and was attempted to get to the south side of E. Moody. According to person 1, just before she reached the east bound lane, vehicle 2 hit her. After making contact with person 1, I located a witness, Clarence Lattimer (386)586-6355 who stated that he was following vehicle 2 when the accident occurred. The witnessed said that person 1 was in the middle of E . Moody Boulevard walking south when she tripped and fell into vehicle 2. Let it be noted that the roadway person 1 was crossing does not have a pedestrian crosswalk. The roadway is a two lane roadway, each road traveling in opposite directions. The roadway is separated by a turning lane. A medical unit was called due to person 1 stating that her ankle hurt. Person 1 was not transported to the hospital. No further information to report.


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## FLORIDA TRAFFIC CRASH REPORT



MAIL TO: DEPARTMENT OF HIGHWAY SAFETY \& MOTOR VEHICLES TRAFFIC CRASH RECORDS, NEIL KIRKMAN BUILDING

TALLAHASSEE, FL 32399-0537






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\text { Page } 2 \text { of } 7
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1 Not Transported
2 EMS 3 Law Enfor
77 Other Explenforcement
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2 EMS 3 Law Enforcement

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Vehicle two was heading northbound on S. Church St ( 400 Block). Vehicle one was backing out of the driveway at 406 S. Church St. Driver one stated that he did not see vehicle two and backed out of the driveway, colliding with the front of vehicle two. Driver two stated that vehicle one back out of the driveway and collided with her vehicle. When the rear of vehicle one hit the front tire of vehicle two, it spun the handlebars, causing them to hit the right ribcage of driver two.

The incident was not originally reported since there was no property damage and driver two did not believe she was injured. Driver two stated that she woke up later in the day and had trouble moving and was in a good amount of pain on her right side. Driver two then took herself to the hospital to be checked.


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FLORIDA TRAFFIC CRASH REPORT

## LONG FORM <br> $\underset{\text { (Shaded Areas) }}{\text { SHORT FORM }}$ <br> $\qquad$ <br> UPDATE <br> $\square$

MAIL TO: DEPARTMENT OF HIGHWAY SAFETY \& MOTOR VEHICLES TRAFFIC CRASH RECORDS, NEIL KIRKMAN BUILDING

TALLAHASSEE, FL 32399-0537
$\begin{array}{ll}\text { TOTAL \# OF VEHICLE SECTION(S) } & 1 \\ & 1 \\ \text { TOTAL \# OF PERSON SECTION(S) } & 1 \\ \text { TOTAL \# OF NARRATIVE SECTION(S) } & 1\end{array}$

|riace OR CITY OF CRASH $\quad$ Bunnell
${ }^{2}$
7


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On March 23, 2013 at about 2154 hours I was dispatched to a Hit-Run crash with injuries on North State St and West 100. Upon my arrival I met with a man who identified himself as Ronnie Rush. Mr. Rush stated that he was crossing the street when an unknown vehicle struck him on his right side. Mr. Rush further advised me that his hip was hurting on his right side. I tried to obtain witnesses who saw the accident happen. I spoke with numerous bystanders who stated that they didn't see the suspect vehicle, or the direction of travel they only saw Mr. Rush lying on the street. Short time later Flagler County Fire Rescue 92 arrived on scene and transported Mr. Rush to Florida Hospital Flagler. I was able to obtain physical evidence from the accident from the suspect vehicle. I obtained a passenger side, side view mirror cover from the suspect vehicle that was broken during the accident. The evidence was logged into an evidence locker at the Bunnell Police Department.
A short time later I was notified by Debbie Baxley from Florida Hospital Flagler that Mr. Rush sustained more severe injuries. Mrs. Baxley advised me that Mr. Rush obtain multiple fractures in his body, and was bleeding internally. Mrs. Baxley stated that Mr. Rush was being transported to Shands Hospital in Jacksonville. Mr. Rush was transported by ground by Flagler County Rescue later that night. At this time there was no further action taken.


[^7]

## FLORIDA TRAFFIC CRASH REPORT

## LONG FORM

MAIL TO: DEPARTMENT OF HIGHWAY SAFETY \& MOTOR VEHICLES TRAFFIC CRASH RECORDS, NEIL KIRKMAN BUILDING

TALLAHASSEE, FL 32399-0537

TOTAL \# OF VEHICLE SECTION(S) 1 TOTAL \# OF PERSON SECTION(S) $\underline{2}$

TOTAL \# OF NARRATIVE SECTION(S) 1 $\qquad$


## CRASH INFORMATION (CHECK IF PICTURES TAKEN)

|  | Light Condition |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| 1 | 1 Daylight 2 Dusk 3 Dawn 4 Dark-Lighted | S Dark-Not Lighted 6 Dark-Unknown Lighting <br> 77 Other, Explain in Narrative 88 Unknown |  |  |
| First Harmful Event |  |  | Non-Collision <br> 1 Overturn/Rollover <br> 2 Fire/Explosion <br> 3 immersion <br> 4 Jackknife <br> 5 Cargo/Equipment Loss or Shift <br> 6 Fell/Jumped From Motor Vehicle <br> 7 Thrown or Falling Object <br> 8 Ran into Water/Canal <br> 9 Other Non-Collision |  |
| First Harmful Event within Interchange |  |  |  |  |
| 2 | $\begin{aligned} & 1 \text { No } \\ & 2 \text { Yes } \\ & 88 \text { Unknown } \end{aligned}$ |  |  |  |


Work Zone Related

| 1 No |  |
| :--- | :--- |
| 1 | 1 Yes <br> 88 Unknown |



4 Work Zone /construction/ 4 Work Zone (constru
maintenance (utility) 6 Shoulders (none, low, soft, high) 7 Rut, Holes, Bumps


## Collision with Fixed Object



20 Bridge Overhead Structure
21 Bridge Pier or Support
21 Bridge Pier or Support
22 Bridge Rail
24 Curb
25 Ditch
25 Embankment
27 Guardrail Face 28 Guardrail End
29 Cable Barrier

30 Concrete Traffic Barrier 31 Other Traffic Barrier 32 Tree (standing) 33 Utility Pole/Light Support 34 Traffic Sign Support 35 Traffic Signal Support
36 Other Post, Pole or Support 36 Other
37 Fence 37 Fence
39 Other Fixed Object (wall, building, tunnel, etc.)


First Harmful Event Location

2 Off Roadway
$1 \quad 3$ Shoulde 6 Gore 7 Separator 8 Separator 8 In Parking Lane or Zone 8 In Parking Lane or Zon
9 Outside Right-of-way 88 Unknown

## WITNESSES



9 Worn, Travel-Polished Surface
10 Road Surface Condition (wet,
icy, snow, slush, etc.) icy, snow, slush, etc.)
11 Obstruction in Roadway

## 12 Debris

12 Debris
13 Traffic Control Device
13 Traffic Control Device
Inoperative, Missing or Obscured
Inoperative, Missing or Obscured
14 Non-Highway Work
77 Other, Explain in Narrative


1 None
1 None
Weather Conditions
5 Animal(s) in Roadway

| NAME | ADDRESS | CITY \& STATE | ZIPCORE |
| :---: | :---: | :---: | :---: |
| NAME | ADDRESS | EHY\&TATE | ZIP CODE |
| NAME | ADDRESS | CITY \& STATE | ZIP CODE |

NON VEHICLE PROPERTY DAMAGE

| VEHICLE \# | PERSON \# | PROPERTY DAMAGE - OTHER THAN VEHICLE | EST. AMOUNT | OWNER'S NAME $\square^{\text {(Check if Business) }}$ | ADDRE5S | CITY \& STATE | 218.0005 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| VEHICLE \# | PERSON ${ }^{\text {H }}$ | PROPERTY DAMAGE - OTHER THAN VEHICIE | ESF.AMOUT1 | OWNER'S NAME $\square$ (Check if Business) | ADDRESS | CITY \& STATE | ZIP CODE |

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\text { Page } \underline{5} \text { of } \underline{6}
$$

DIAGRAM

# FLORIDA TRAFFIC CRASH REPORT 

## S DeShazo <br> Records Dept



MAIL TO: DEPARTMENT OF HIGHWAY SAFETY \& MOTOR VEHICLES TRAFFIC CRASH RECORDS, NEIL KIRKMAN BUILDING

TALLAHASSEE, FL 32399-0537

## WG: OGTOTAE \# OF VEHICLE SECTION(S) 1 TOTAL \# OF PERSON SECTION(S) 2

Time TOTAL \# OF NARRATIVE SECTION(S) 1





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Page 2 of 5
BPD FL Accident Page 2 OF 5


HSMV 90010 S (V/P) (rev 10/10)

PEDESTRIAN


[^9]| $2015-00006693$ | 83879272 |
| :--- | ---: |

On 05/03/2015, I was dispatched to 100 E . Moody Blvd, Bunnell, Fl 32110, in reference to a vehicle which had impacted a pedestrian. I made contact with Kristy Lynn Nalesnik, WF, DOB 03/04/1982, who was driving a 2004, gray (in color), BMW X5, bearing FI tag 661QPY. Mrs. Nalesnik stated she was at the intersection of S. Church St. and E. Moody Blvd, turning left onto E. Moody Blvd. in order to travel in a westbound direction. Mrs. Nalesnik stated as she made the left turn, a black male, Freddie Lee Emanuel, DOB 06/26/1954, walked into the middle of the street and her driver side mirror impacted Mr. Emanuel. Mr. Emanuel was walking around the parking lot but complained of minor left shoulder pain. Mr. Emanuel is deaf and mute; he can only communicate through gestures. Deputy Pedersen, who was also on scene, requested Flagler County EMS to assess Mr. Emanuel's injury. Flagler County EMS assessed and cleared Mr. Emanuel at the scene.

Mr. Emanuel gestured that he was walking from the Citgo located at 100 E. Moody Blvd, to S. Church St. when he was hit by Mrs. Nalesnik's vehicle.

Mr. Emanuel was given a case card and released from the scene. Mrs. Nalesnik's vehicle received minor damage to the driver side, side view mirror. Mrs. Nalesnik was given a case card and released from the scene. No further law enforcement action taken. Photographs of the damage will be submitted with the report.


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| Steven Eugene Barneski |
| :--- |
| TRAILER |




S. Bacher St


MOTOR CARRIER NAME

| HAZ. MAT. CLASS |
| :--- | :--- |
| $\cdot$ |

CITY \& STATE



PHONE NUMBER

Trafficway
15 Low Speed Vehicle 16 (Sport) Utilty Vehicle
17 Cargo Van (10.000 bs 17 Cargo Van ( $10,000 \mathrm{lbs}$ $(4,536 \mathrm{~kg}$ ) or less)
ipassenger car
2 passenger Van
3 Pickup
7 Motor Home 8 Bus
11 Motorcycle 12 Moped 13 All Ter 18 Motor Coach
19 Other LIGht Trucks ( 10,00016 ( $4,536 \mathrm{~kg}$ ) or less) $20 \mathrm{Medium} / \mathrm{Heaw}$ Truck $10,000 \mathrm{lbs}(4,536 \mathrm{~kg})$ ) 21 Other, Explaln In Narrative 77 Other, Explain In Narrative


## नNu

${ }_{2}$ Two-Way, Not Divided 2 Two-Way, Not Divided, with a
Continuous Left Turn ane Continuous Left Turn Lane
3 Two-Way. Divided Unpro (painted>4 leet) Median BarrilerTR
 Comm/Non-Commercial 1 Interstate Carrier 3 Not In Commerce/Government 4 Not in Commerce/Other Truck

## Most Harmful Event

Non-Collision 1 Overturn/Rollover 2 Fire/Explosion 3 immersion 4 Jackknife Collision with Non-Flxed Object 5 Cargo/Equipment Loss or Shift 6 Fell/Jumped From Motor Vehilcle 8 Ran Into Water 9 Other Non-Collision [40-46 Sequence of Events onty bra Equipment Failure (blown tire, brake fallure, etc.) 41 Separation of Units 42 Ron Off Roadway, Rle 43 Ran Off Roadway, Left 44 Cross Medlan 45 Cross Centerline
45 Downhil Runaway

## Roadway Grade



Sequence of Events 4 Two-Way, Divided, Positive Median 58 One-Way Trafficway | 88 Unknown | Trailer Type |
| :--- | :--- |
| TRAILER 1 TRAILER 2 | 1 Single Seml Traifer |
| 2 Tandem Semi Trailer |  | $\begin{array}{ll}\text { TRAILER } 1 & \text { TRAILER } 2 \\ 2 \text { Single Seml Traifer } \\ 2\end{array}$

46 Downhill Runaway nprotected

PERSON:

| PERSON: | NAME OF VIOLATOR |
| :--- | :---: |
| PERSON: |  |
|  | NAME OF VIOLATOR |
| PERSON : |  |
|  | NAMEOF VIOLATOR |


| FLSTATUTE NUMBER |  |  |  |
| :---: | :---: | :---: | :---: |
| FLSTATUTE NUMEER |  |  |  |
| FLSTATUTE NUMBER |  |  |  |
|  |  |  |  |

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BPD FL Accident Pane 3 Of f


BICYCLIST


On 05/05/2015, Cpl. Mortimer and I were dispatched to the Family Dollar located at 607 E. Moody Blvd, Bunnell, FI 32110 , in reference to a hit and run involving a pedestrian. When I arrived on scene, I made contact with the pedestrian, Deshawn Terell Johnson, BM, DOB 01/05/1992, who was lying on the ground on the East side of the Family Dollar store. I observed a scrape on Mr. Johnson's head, a laceration to his right hand, and abrasions to his left forearm. Mr. Johnson was also complaining of pain in his right leg. While Flagler County Fire Rescue was tending to Mr. Johnson, Mr. Johnson stated he had purchased items from the Family Dollar, got on his bicycle, and began his ride home. Mr. Johnson stated he was behind the Family Dollar store closest to S . Bacher St , in the delivery area when an unknown white male driving in an unknown vehicle, hit him (Mr. Johnson) and left the scene. Mr. Johnson stated the white male drove around the Family Dollar toward E. Moody Blvd. Mr. Johnson stated he limped to the side of the Family Dollar store that borders S. Bacher St before he had to sit down. Mr. Johnson was transported to Florida Hospital Flagler for treatment.

Preliminary reports from individuals on scene stated the vehicle involved in the incident was a brown (in color), older model Jeep Cherokee. Cpl. Mortimer made contact with Ashley Martha Barneski, WF, DOB, 03/03/1992, who stated it was her husband, Steven Eugene Barneski Jr., WM, DOB 04/14/1990, who was driving the vehicle involved in the incident. In a sworn written statement, Mrs. Barneski stated she was inside the Family Dollar filling out an application when Mr. Barneski came inside the store and then went back outside. Mrs. Barneski stated when she was done with the application, she walked outside and Mr. Barneski and his vehicle were no longer in the parking lot. Mrs. Barneski stated she walked up the sidewalk to see if Mr. Barneski was at the Kangaroo gas station but he was not there. Mrs. Barneski stated she called Mr. Barneski and he stated to her over the phone that he was going to get coffee and his headlights went out. Mr. Barneski stated to Mrs. Barneski over the phone, by the time he went to turn the lights back on, "he saw him, went to swerve, and it was too late".

A clerk at the Family Dollar, David Evander Jackson, BM, DOB 05/01/1993, stated he saw the white male who was driving the suspect's vehicle. A photo lineup has been requested and will be presented to Mr. Jackson when it becomes available.

Mrs: Barneski made phone contact with Mr. Barneski and he agreed to meet Cpl. Mortimer and lat the courthouse


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## Narrative Continued

located at 1769 E. Moody Blvd, in order to discuss the incident. Mr. Barneski was driving a 1993 beige (in color), Jeep Cherokee Sport, bearing FI tag 253QUN. Mr. Barneski was read Miranda and agreed to answer questions pertaining to the incident, post Miranda. Mr. Barneski also completed a sworn written statement as to what occurred. Mr. Barneski stated he got in his truck to go to the BP gas station to get a cup of coffee. Mr. Barneski stated he exited the parking lot of the Family Dollar onto S. Bacher St and turned right. Mr. Barneski would then be traveling south on S. Bacher St, toward the rear of the Family Dollar store. Mr. Barneski stated, approximately ten feet from the rear corner of the Family Dollar store, his lights went out. Mr. Barneski stated he bent down to hit his high beams and hit the curb. Mr. Barneski stated: "I hit the curb and I jerked the wheel and I hit someone". During my interview of Mr. Barneski, I asked Mr. Barneski why he didn't stop to check on the person. Mr. Barneski stated he was afraid of going back to prison. Orange (in color) plastic, indicative of the plastic cover of a turn signal, was found at the scene of the crash. I observed the orange (in color), front passenger turn signal cover, of Mr. Barneski's vehicle, to be broken. The orange (in color) plastic, from the crash scene, will be submitted into evidence.

Charges are pending further investigation and witness identification of the driver. Photographs of the incident will be submitted into evidence.



[^0]:    *Where Pedestrian Accommodation Feasibility Studies are recommended, the goal is to identify a feasible exclusive pedestrian facility. Preferably, the facility will provide physical separation in the form of a curb, landscaped strip, or other physical element between the roadway and an ADA compliant pedestrian facility. These studies should identify the costs, right of way, and takings implications of various approaches, and may also recommend spot improvements, crossing treatments, and traffic calming. Interim solutions can be implemented as long as these do not compromise the ultimate goal of providing an exclusive pedestrian facility.

[^1]:    1 Not Transported
    2 EMS 3 Law Enforcement
    HSMV 90010 S (V/P) (rev 10/10)

[^2]:    HSMV 90010 S (E) (rev 10/10)

[^3]:    HSMV 90010 S (V/P) (rev 10/10)

[^4]:    HSMV $90010 \mathrm{~S}(\mathrm{~N} / \mathrm{D})(\mathrm{rev} 10 / 10)$

[^5]:    HSMV 90010 S (E) (rev 10/10)

[^6]:    HSMV 90010 S (N/D) (rev 10/10)

[^7]:    HSMV 90010 S (N/D) (rev 10/10)

[^8]:    HSMV 90010 S (V/P) (rev 10/10)

[^9]:    HSMV 90010 S (V/P) (rev 10/10)

[^10]:    HSMV 90010 S (ND) (rev 10/10)

