

November 2023

Ocean Road Elementary School Travel Plan



Prepared By

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Introduction

This Safe Routes to School (SRTS) travel plan is for Ocean Road Elementary School, located in Point Pleasant Borough, Ocean County. This plan was prepared by Greater Mercer Transportation Management Association, a nonprofit, public-private partnership dedicated to promoting and providing transportation choices designed to reduce congestion, improve mobility, increase safety, and further sustainability in Mercer and Ocean County. Established in 1984, the association consists of large and small employers, local governments, metropolitan planning organizations, and state agencies who share a commitment to providing transportation choices that are good for the community, good for commuters, good for business, and good for the environment. Point Pleasant Borough and Ocean Road Elementary School were interested in creating a school travel plan to explore ways to support and encourage safe walking and biking to school.

Travel Plan Goals

A School Travel Plan documents specific challenges to walking and biking to school and identifies short-term and long-term solutions to address these issues. The objective of the School Travel Plan is to create a safer walking and bicycling environment for students so that more students and their parents can comfortably choose active transportation for the trip to school. An increase in students walking and biking contributes to additional Safe Routes to School goals, including improving the overall health of children through increased physical activity and reducing congestion and the accompanying negative environmental impacts of automobile trips to school.

Safe Routes to School

Safe Routes to School is a federal, state, and local program that aims to make it safer and more accessible for students to walk and bike to school. Safe Routes to School programs incorporate the Six E's: engagement, equity, engineering, encouragement, education, and evaluation to achieve its goals.

The NJ Safe Routes to School Program, provided by Greater Mercer TMA in Mercer and Ocean County and the NJ Safe Routes to School Resource Center, is sponsored by the New Jersey Department of Transportation with funding from the Federal Highway Administration.

Setting and School Description

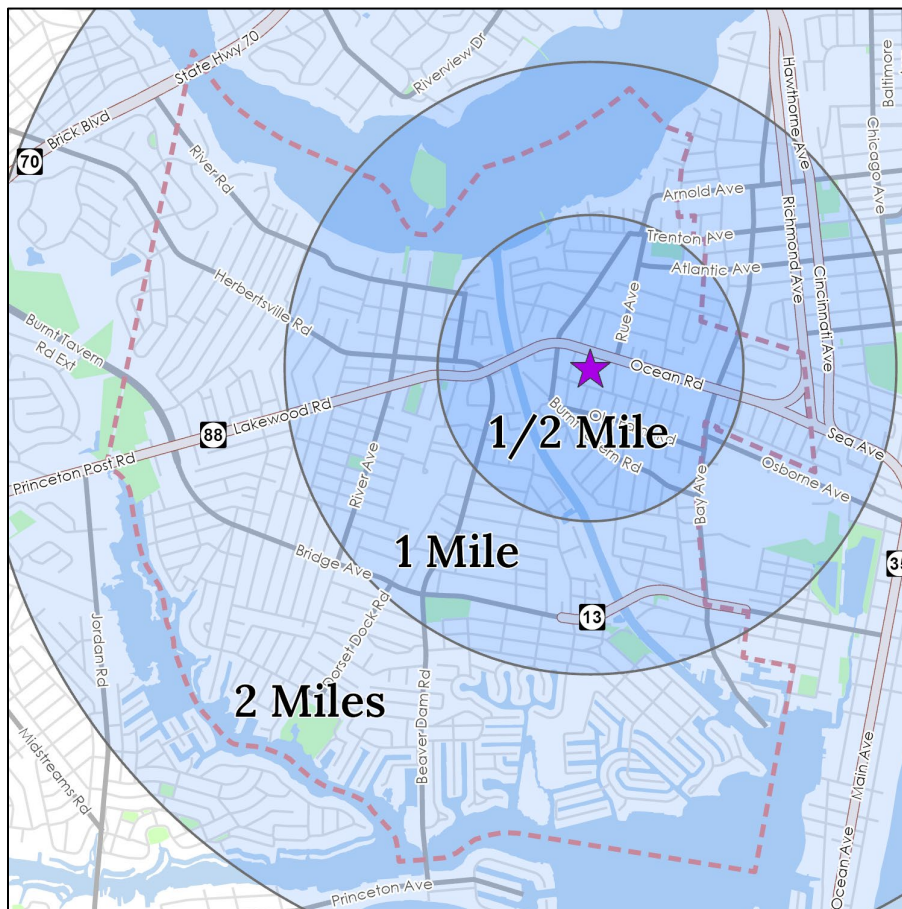
Point Pleasant Borough is a densely populated, 3.49 square mile shore community with 5,425.7 people per square mile. In the 2020 Census, the population was reported as 18,941 residents. The community is bounded by the Manasquan River, Beaver Dam Creek, Metedeconk River, and Brick Township. Two arterials bisect the Borough from west to east- State Route 88 (Ocean Road) and Bridge Avenue. Arnold Avenue and State Route 88 join at a bridge over the Pt. Pleasant Canal. Ocean Road Elementary School is surrounded primarily by a residential layout. State Route 88 is a busy arterial bordering the north side of Ocean Road School's property and connecting Point Pleasant Borough to the beach and to State Route 35 and the Point Pleasant Beach business district. The Point Pleasant Borough business district is located less than a mile and a half walk from the school along Bridge Avenue (County Route 632).

Ocean Road Elementary School is located at 1210 Benedict Street, Point Pleasant Borough, New Jersey, 08742. Ocean Road Elementary School is part of the Point Pleasant Borough School District. The District serves students in pre-kindergarten through twelfth grade in two elementary schools - Nellie F. Bennett Elementary School and

Ocean Road Elementary School, one middle school - Memorial Middle School, and one high school - Point Pleasant Borough High School.

Residents of Point Pleasant Borough have the opportunity to walk and bike to school. Most of the students who attend Ocean Road Elementary School live within 1.6 miles, and the entirety of the Borough is located within 2 miles, as the crow flies, of the school (Map 1). The longest possible walk for a Point Pleasant Borough household to the elementary school is about 1.6 miles. Ocean Road Elementary School mainly serves Point Pleasant Borough residents.

Map 1: Location of Ocean Road Elementary School



The Traffic Circulation Plan included in the Borough of Point Pleasant Master Plan presents a vision and implementation strategy to provide for a safer, stronger, and more efficient bicycle and pedestrian network. Parsons Brinkerhoff generated a [Bicycle and Pedestrian Circulation Study in 2013](#), which included assessing current conditions and potential recommendations to improve safety. A Complete Streets Policy was adopted in June 2011, [Ordinance No. 2011-06](#).

School Demographics

For the 2023-2024 school year, there were 481 students enrolled at Ocean Road Elementary School. The following table summarizes the number of students by grade.

<i>Table 1: Number of Students Per Grade (2023 – 2024 School Year)</i>	
Grade	Number of Students
Pre-K	8
Kindergarten	73
1st Grade	77
2nd Grade	83
3rd Grade	80
4th Grade	70
5th Grade	90
<i>Total</i>	<i>481</i>

According to the NJ Department of Education 2021-22 School Performance Report:

- 21.4% of students had disabilities
- 10.7% of students were Hispanic
- 10.9% were economically disadvantaged

Working Groups and Partnerships

Greater Mercer TMA developed this plan in partnership with the Working Group shown below. Key partners for implementation are also listed. An asterisks (*) indicates which members also participated in the October 25th walk audit.

<i>Table 2: Working Groups and Partnerships</i>		
Organization-2023	Role/Responsibility	Contact
Greater Mercer Transportation Management Association	Key Partner	Steve daCosta, AICP* Senior Planner sdacosta@gmtma.org
Greater Mercer Transportation Management Association	Key Partner	Kathleen Ebert* Safe Routes to School Coordinator kebert@gmtma.org
Greater Mercer Transportation Management Association	Key Partner	Chris Townley, AICP* Transportation Planning Specialist ctownley@gmtma.org
Point Pleasant Borough	Key Partner	Frank Pannucci Borough Administrator pannucci@ptboro.com
Point Pleasant Borough Police Department	Community Partner	Chief Adam Picca apicca@ptboropd.com
Point Pleasant Borough Police Department	Community Partner	Lt. Dave Radsniak* dradsniak@ptboropd.com
Point Pleasant Borough	Consultant Engineer	John LeCompte* Associate Engineer, PP, PE, CME Remington & Vernick Engineers John.LeCompte@rve.com
Point Pleasant Borough	Consultant Engineer	Brian Jillson* Senior Engineering Technician Remington & Vernick Engineers brian.jillson@rve.com
Ocean Road Elementary School	School Partner	Sheila Buck Principal sbuck@pointpleasant.k12.nj.us
Point Pleasant Borough Complete Streets	Community Partner	Beth Degen* Complete Streets Advocate degenbeth@gmail.com
Other Community Members	Walk Audit Participants	Parents and Residents*
*Participated in the October 25, 2023 walk audit		

Existing School Travel Conditions

Arrival

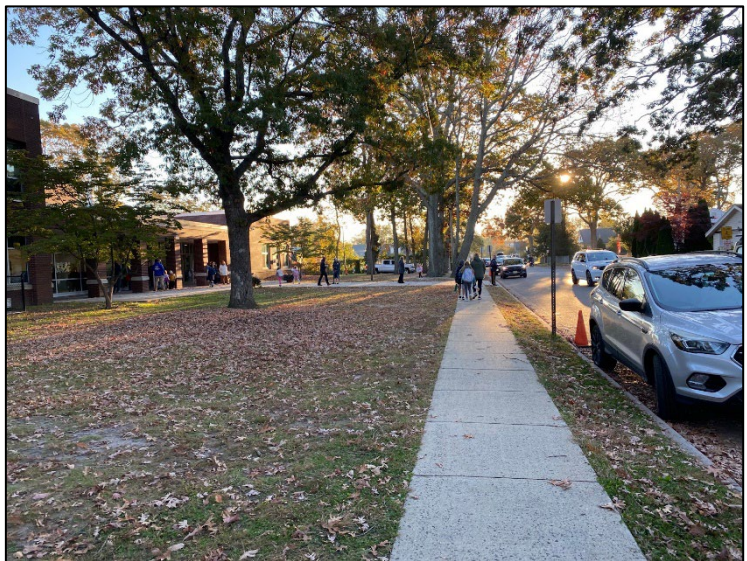
Arrival begins around 7:55 a.m., with school beginning at 8:10 a.m. Ocean Road Elementary School students arrive primarily via bus and family car, and a small percentage of students walk and bike to school.

Walkers and students dropped off by car are greeted by the principal and enter the southeast side of the school via the Catherine Street entrance. Some parents park their cars and walk their student(s) up to the doors, and some follow along the car drop-off queue going from east to west in front of the Catherine Street entrance, where the children get out of the car curbside.

The vice principal greets the students arriving by bus and bike, and they enter the school at the Benedict Street entrance. The school parking lot along Benedict Street has a lane reserved as a bus drop-off line.



Picture 1: Benedict Street Entrance



Picture 2: Catherine Street Entrance

Dismissal

Dismissal is staggered between 2:35 p.m. and 2:45 p.m. The bussed students are dismissed to the bus pick-up line in the lot near Benedict Street. The students who biked in grades 3-5 are dismissed to the bike racks from the Benedict Street side of the building as well. The biking students are instructed to leave the school property via Benedict Street.

Benedict Street is a one-way street heading north and intersecting with State Route 88. A teacher volunteers each day he is in attendance to direct the bike traffic at the crosswalk for the students who need to head west on State Route 88. He crosses the students each day at dismissal as it is difficult for the students to cross the busy road where two one-way lanes of traffic block the crosswalk.



Picture 3: SUV Blocking Crosswalk and Benedict and SR 88



Picture 4: Teacher Directing Traffic at Benedict & SR 88

Walkers and students picked up by family car or bike are dismissed from the Catherine Street doors. Pick-up parents park their cars along the side streets in the neighborhood near the school and wait on the school grounds outside of the doors at dismissal.



Picture 5: Students Riding Their Bikes on Catherine Street



Picture 6: Students and Parents Going Home on Catherine Street

Point Pleasant Borough School District Transportation Policy

Transportation General Information:

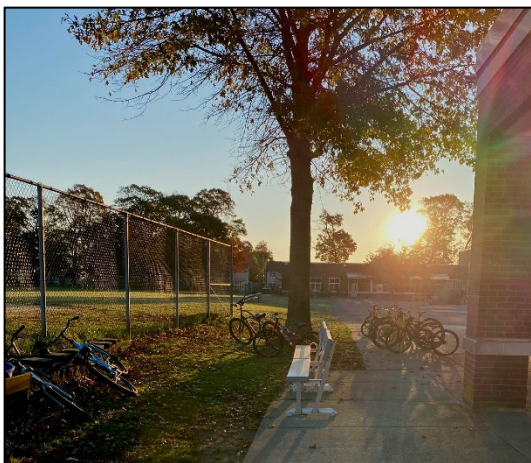
It is the policy of the Point Pleasant Board of Education to transport Borough pupils to and from district schools as follows:

- Kindergarten: All kindergarten students will be provided with transportation.
- Grades 1 - 5: Students who live more than 3/4 mile remote from the assigned school except that no child shall be required to walk across a canal bridge.
- Grades 6 - 8: Students who live more than 9/10 mile remote from the assigned school, except that no child shall be required to walk across a canal bridge.
- Medically and educationally disabled pupils in accordance with their prescribed needs.
- Pupils participating in board-approved co-curricular activities and field trips.
- Transportation to and from schools shall be provided as required by law to eligible non-public school pupils.

Elementary School Bike Policy

Students in grades 3-5 are permitted to ride their bikes to school independently with a note from their parents sent in at the beginning of the school year. The students park their bicycles at the bike racks designated for grades 3 - 5 located behind the school on the northwest side of the building.

Recently, Ocean Road School added a “Family Bike Rack” to encourage parents and/or guardians to ride with their younger students in grades K-2. As part of a local Eagle Scout project, the school requested for a small bike rack to be built so that parents can leave the younger students’ bikes at school during the day till dismissal rather than having to bring the bikes back home. Having the younger students' bike rack separate is beneficial to teach the young students how to travel to and from school safely and gives them the space to figure it out.



Picture 7: Bike Racks for Grades 3-5

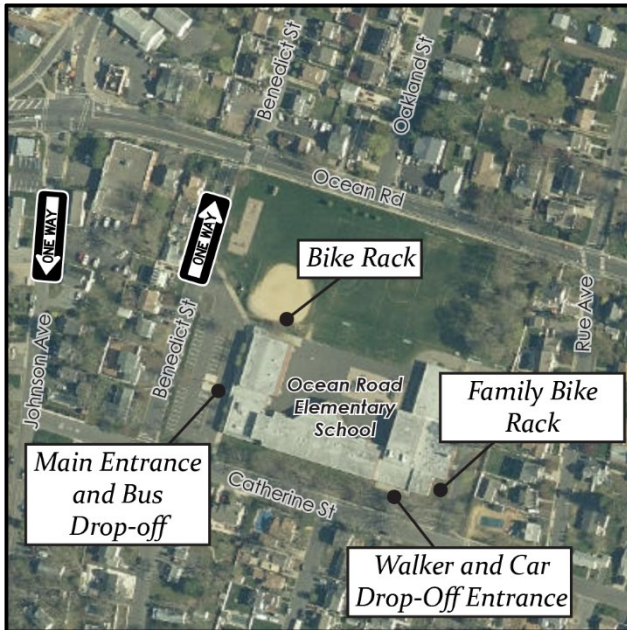


Picture 8: Family Bike Rack

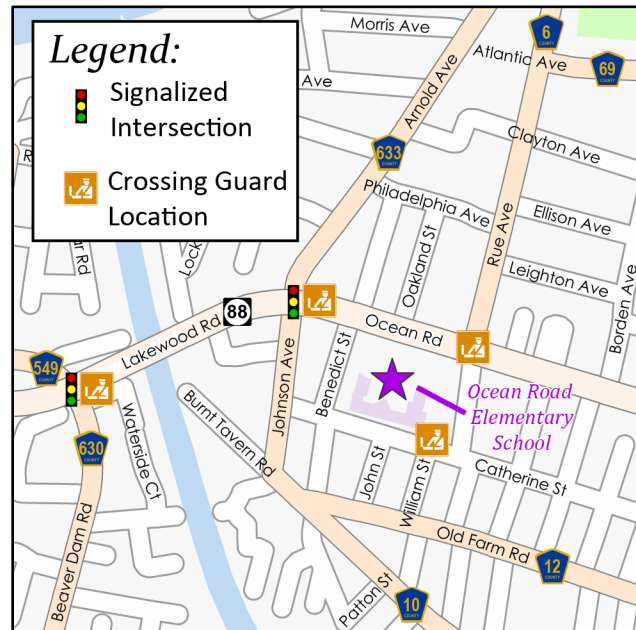
Crossing Guards

A total of three crossing guards are posted near Ocean Road Elementary School: At the intersection of State Route 88 and Arnold Avenue/Johnson Avenue, at the intersection of State Route 88 and Rue Avenue, and at the crosswalk at Catherine Street and William Street (See maps).

There is a fourth crossing guard posted at the intersection of State Route 88 and Herbertsville Road/Beaver Dam Road. This one is for the entire school district and for Ocean Road students who ride their bikes or walk to school over the bridge. Those students over the bridge are offered busing.



Map 2: School Grounds



Map 3: Crossing Guard Locations

Table 2: Typical School Day Hours		
Grade	Start Time	End Time
Pre-school Session I	8:30 AM	11:00 AM
Pre-school Session II	11:00 AM	1:30 PM
Kindergarten to 5 th Grade	8:10 AM	2:40 PM

Current Safe Routes to School Programming

Ocean Road Elementary School already has some Safe Routes to School Programming, summarized below:

- Bike Rodeo planned in partnership with the local police department and GMTMA

- Walk and Bike to School Day held each year in October and May
- Spring 5K Sunday Runday, to encourage students and their families to lead an active, healthy lifestyle
- Regularly participates in GMTMA SRTS Bookmark Contest, winning entry in 2023

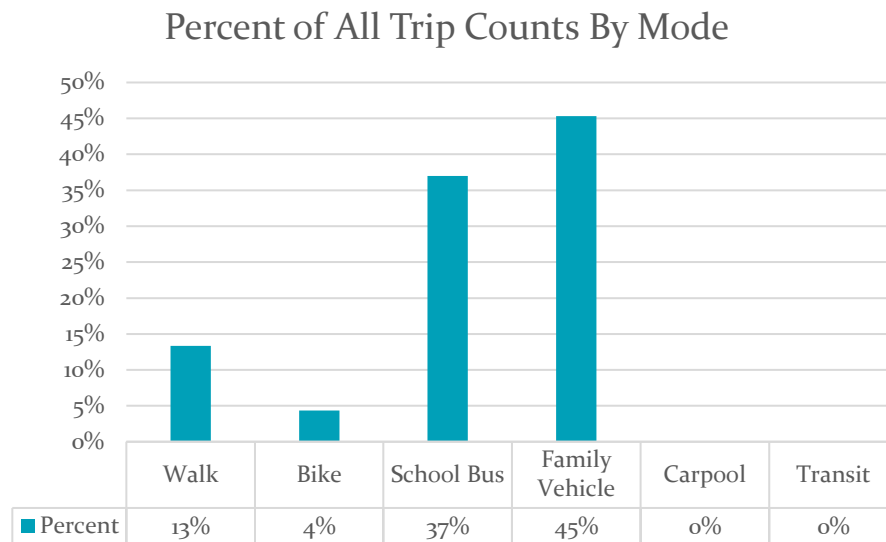
Travel Tallies

Ocean Road Elementary School conducted travel mode tallies on two occasions in October 2023: Thursday October 19th and Friday October 20th. The weather conditions for October 19th and 20th were sunny and rainy, respectively. For each of the travel tallies, students were asked, “How did you arrive at school today?” and “How do you plan to leave for home after school?” The students then raised their hands and were counted for each travel mode: walk, bike, school bus, carpool, family vehicle, transit, or other.

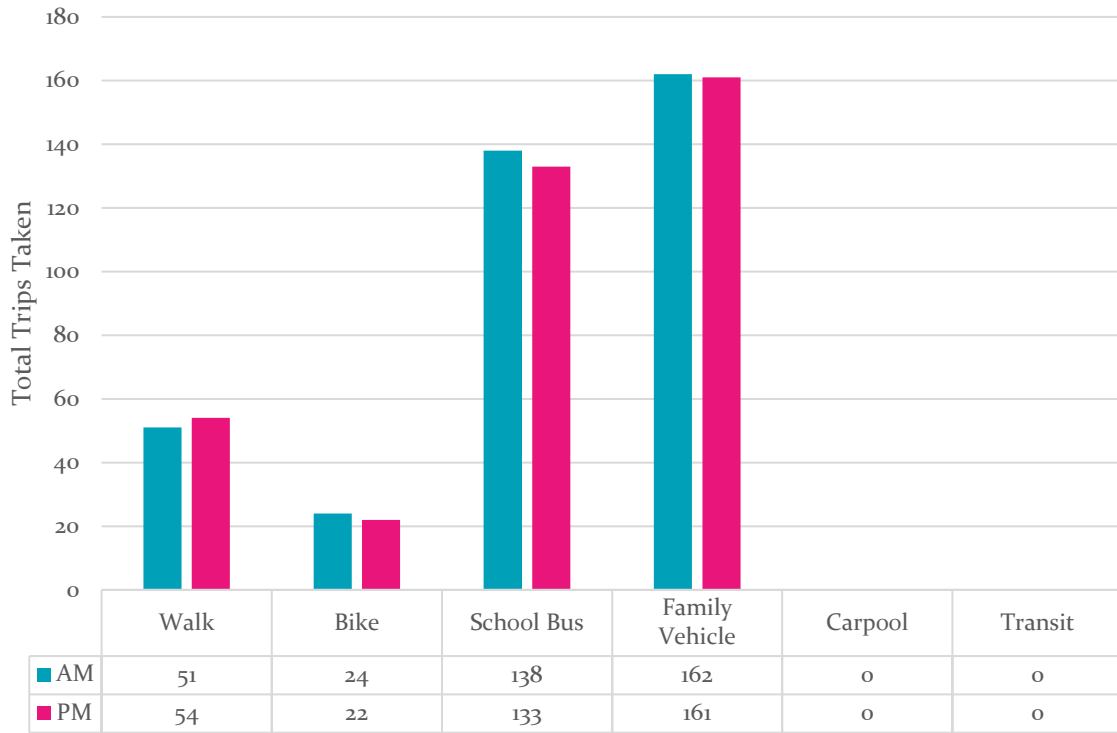
The results of these tallies found that the most common way students of Ocean Road Elementary School arrived or departed from school was via “family vehicle” (45%) followed by “school bus” (37%), “walk” (13%), and “bike” (4%). No students arrived via carpool or transit. The rainy weather on Friday had only a small effect on the total number of walkers and bicyclists.

Point Pleasant Borough is relatively dense for a suburb, and a large percentage of households live within a 15-minute walk to Ocean Road Elementary School. Therefore, the low percentage of walkers or cyclists may reflect the lack of pedestrian amenities in the area around Ocean Road Elementary School, primarily a lack of a complete sidewalk network. Thus, additional pedestrian infrastructure is likely to have a large positive effect on the number of walkers and bikers to and from Ocean Road Elementary School.

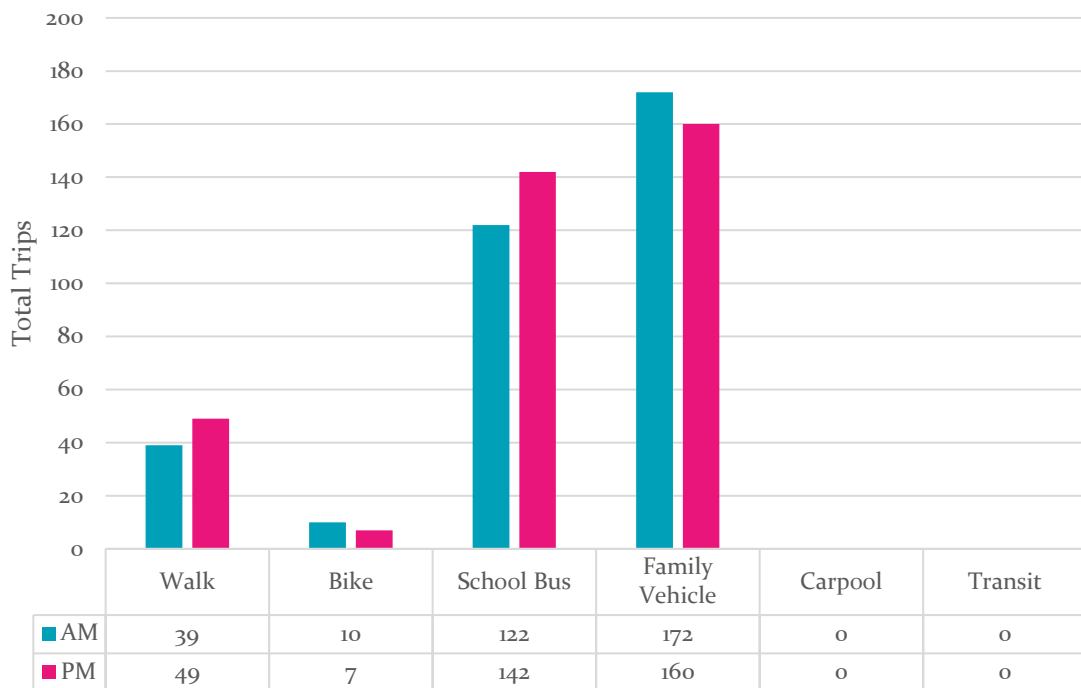
The following figures and tables summarize this data.



Thursday AM and PM Trips by Mode



Friday AM and PM Trips by Mode

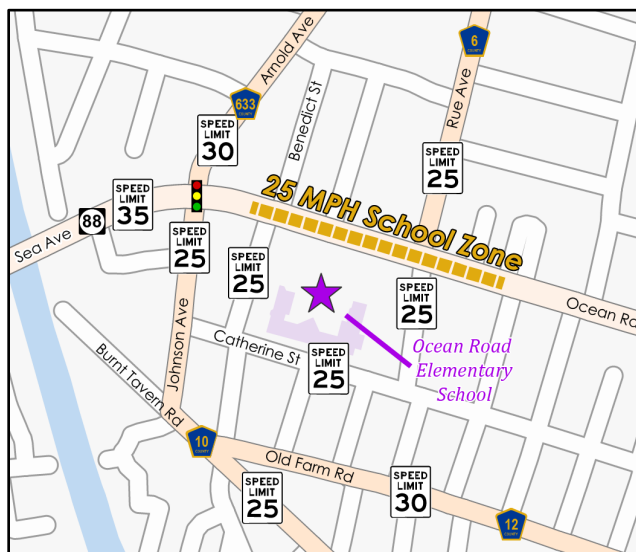


In New Jersey, a common criterion for elementary school students to receive school bus transportation is a door-to-door (home-to-school) distance greater than 2 miles. In Point Pleasant Borough, specifically in the Ocean Road School catchment area, no student lives greater than 2 miles away from Ocean Road School, and not more than approximately 1.6 miles from the school. The Point Pleasant Borough school district provides courtesy busing for elementary students in grades 1-5 who live more than $\frac{3}{4}$ mile from the school, and no student shall be required to walk across a canal bridge. The school district also buses medically and disabled students and all Kindergarteners. Increasing and improving bicycle and pedestrian safety infrastructure in Point Pleasant Borough and reducing traffic hazards would provide families with greater confidence that walking, rolling, and biking to school would be safer and viable alternatives.

Speed Limits

Map 4 shows the speed limits of State Route 88, County Routes near Ocean Road Elementary School, and local roads immediately adjacent to the school. As the map shows, all local roads surrounding the school have speed limits of 25 MPH. While State Route 88 (Ocean Road), which borders the school to the north, has a speed limit of 35 MPH, there is a 25 MPH school speed zone in front of Ocean Road Elementary School. The school speed zone is communicated to drivers via two flashing 25 MPH school zone signs. The signs only flash in the mornings and evenings and need to be manually activated by the crossing guard stationed at Rue Avenue and State Route 88. They are on a timer and need to be re-activated every 25 minutes. Two of the County Routes, Old Farm Road (County Route 12) and Arnold Avenue (County Route 633), have speed limits of 30 MPH. However, Arnold Avenue's speed limit changes to 25 MPH just south of State Route 88.

Map 4: Speed Limits Around Ocean Road Elementary School



Existing Pedestrian Infrastructure

The study area around Ocean Road Elementary School has a very fragmented sidewalk network. Only State Route 88 and the north side of Johnson Avenue have a complete sidewalk network on both sides of the street. All other County Routes and local roads have either an incomplete network or no sidewalks. This is especially true for the neighborhoods just south of State Route 88.

Map 5: Existing Sidewalks Around Ocean Road Elementary School

Legend

- Sidewalks
 - Existing Sidewalk
- Other
 - Ocean Road Elementary School
 - Study Area Border

0 0.13 0.25 0.5 Miles

Crash Data

A pedestrian and bicyclist involved crash analysis for the Ocean Road Elementary School study area was conducted using the New Jersey Division of Highway Traffic Safety's crash analysis tool, Numetric. Crash data for Point Pleasant Borough was collected in November 2023. Numetric compiles data based on crash reports provided by the New Jersey Department of Transportation (NJDOT). The crash reports come from NJTR-1 police reports, which are filled out by the responding officer and submitted to NJDOT. They include location, time of day, the severity of the injury, whether pedestrians or bicyclists were involved, and other circumstances related to the crash. The crash data provided by Numetric is comprehensive but not exhaustive, so the data should be used for exploratory purposes only. Crashes are not included in this data for various reasons, including incomplete crash reports and unreported crashes.

At the time of this analysis, data entry was only complete up until 2021, and data is still being added for the years 2022 and 2023. This analysis uses a five-year period from 2018 to 2022. Only crashes within the Ocean Road Elementary School study area are included in this report. Crashes outside the study area are only used to compare the frequency of pedestrian and cyclist crashes relative to the study area. In addition, this analysis also excludes 46 pedestrian and bicyclist crashes that occurred in Point Pleasant Borough, but that did not include location information. Map 6 displays the location of pedestrian or bicyclist crashes and their severity, as well as the study area boundary and 10 and 15 minute Ocean Road Elementary School walksheds.

In total, 15 pedestrian or bicyclist crashes occurred within the study area, all of which occurred between 2019 and 2022. There were no reported crashes in the study area in 2018. Of the 15 crashes, 12 were bicyclists, with the remaining three being pedestrians involved. The majority, 60%, resulted in no or possible injury, 33% resulted in suspected minor injury, and 1 resulted in suspected serious injury. There were no fatal pedestrian or bicyclist crashes during this time period. The 15 crashes in the study area represent 23% of all crashes in Point Pleasant Borough. This is proportional to the 21% of Point Pleasant's roadway miles that are within the study area. Lastly, six of the 15 crashes occurred in the summer months when school was not in session.

Pedestrian and Bicycle Crashes were concentrated on just a few roads:

- State Route 88 (Ocean Road) - 7 crashes
- Arnold Avenue (County Route 633) - 3 crashes
- Old Farm Road (County Route 12) - 1 crash
- Bay Avenue (County Route 604) - 1 crash
- Benedict Street - 1 crash
- Catherine Street - 1 crash
- Partridge Run - 1 crash

A complete list of pedestrian or bicyclist-involved crashes from 2018-2022 is listed in Appendix A.



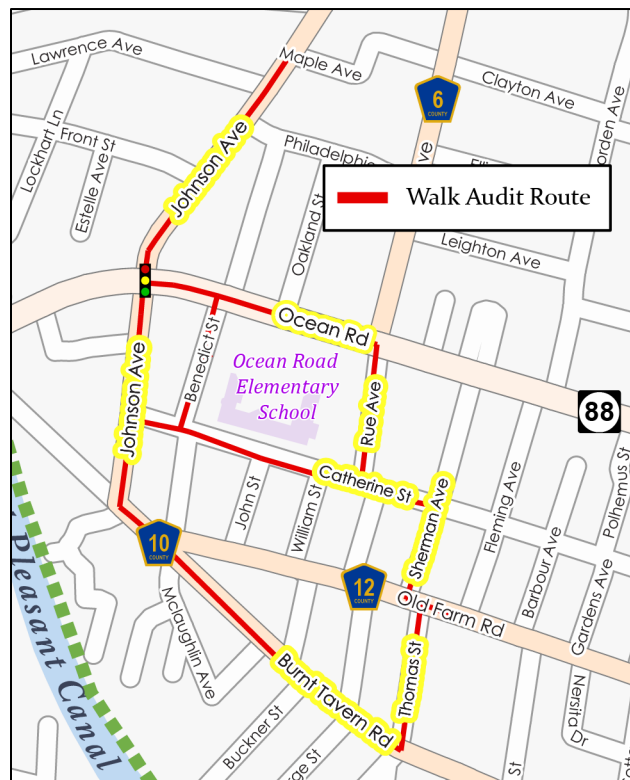
Audit Findings and Recommended Infrastructure Improvements

The following sections discuss the findings of the walk audit. It is divided up into three sub-sections. The first section provides a general overview of the walk audit conducted. The following two sections, “General Findings and Recommendations” and “Intersection & Corridor Findings and Recommendations,” summarize the issues and recommendations found during the walk audit. The “General Findings and Recommendations” section summarizes issues that were observed multiple times during the audit or issues that are not on a major corridor. The “Intersection & Corridor Findings and Recommendations” describes issues and recommendations at key intersections and corridors.

Description of Walk Audits

Pedestrian safety conditions near the Ocean Road Elementary School in Point Pleasant Borough were assessed by conducting a walk audit on October 25, 2023. Among the attendees were Ocean Road Elementary School parents and Borough residents, local government representatives, and three members of GMTMA. The audit aims to identify strengths and weaknesses of the existing infrastructure available to students to walk or bike to school and offer recommendations based on the findings.

The walk audit covered the immediate area around the school, as well as some of the streets to the south and a short section of Arnold Avenue to the north. See the included map for the exact locations.



Map 7: October 25, 2023 Walk Audit Route

General Findings and Recommendations

Sidewalks

There are sidewalks immediately around the perimeter of the Ocean Road Elementary School, along State Route 88 (Ocean Road) and on some of the streets on the northern side of State Route 88. However, most residential streets have no sidewalks or incomplete segments that would force families to walk on-road to reach Ocean Road Elementary School.

Additionally, during the audit, it was noted that while Arnold Avenue has sidewalks and is a major walking route for students and parents, there are no ADA curb ramps at most of the intersections. Where sidewalks do exist, other obstructions were noted during the walk audit, such as low-hanging tree branches and landscaping blocks encroaching on the clear walking path.

If all proposed sidewalks are installed it would benefit approximately 670 households, 577 to the south of State Route 88 and 95 to the north of State Route 88.

Recommendations

- Install sidewalks at the following locations:
 - Burnt Tavern Road from Bay Avenue to Johnson Avenue
 - Johnson Avenue from the existing sidewalk near State Route 88 to Burnt Tavern Road
 - Catherine Street from John Street to Gardens Avenue
 - Old Farm Road from Burnt Tavern Road to Bay Avenue
 - John Street between Old Farm Road and Catherine Street
 - George Street between Old Farm Road and Catherine Street
 - William Street between Burnt Tavern Road and William Street
 - Borden Avenue between Leighton Avenue and Briarcliff Avenue
 - Borden Avenue between Rosewood Avenue and Trenton Avenue
 - Connect the gap in the sidewalk on Buckner Street/South Street near George Street
 - Hulse Road from the driveway at 1515 Hulse Road to Wood Wild Drive
 - Bay Avenue from Old Farm Road to Burnt Tavern Road
- Relocate the crossing guard on Catherine Street from the William Street intersection to the John Street intersection after the new sidewalks are installed.
- Add ADA-compliant curb ramps along Arnold Avenue at the following intersections:
 - Front Street
 - Philadelphia Avenue
 - Lawrence Avenue



Picture 9: Intersection missing curb ramps on Arnold Avenue



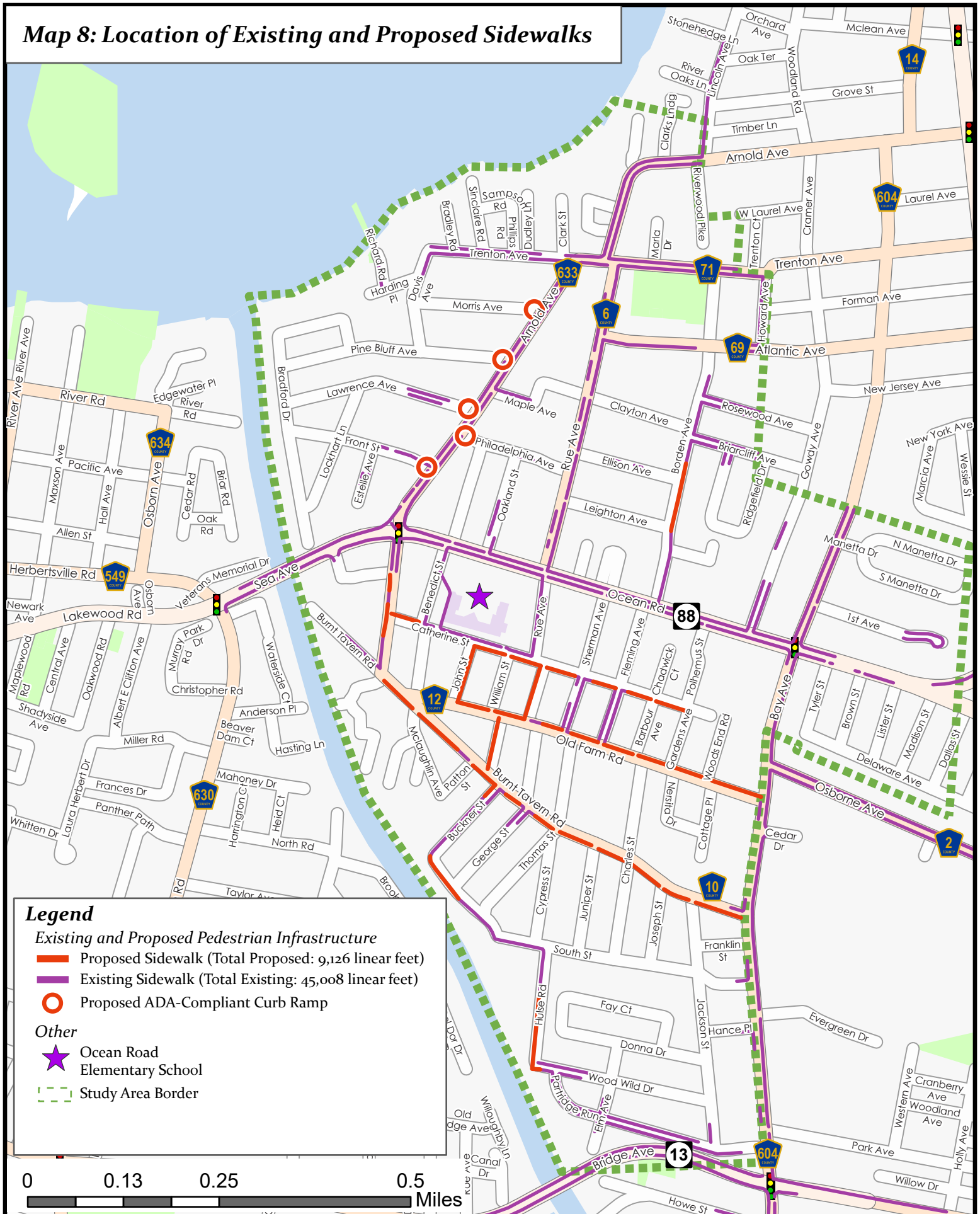
Picture 10: Landscape Blocks Obstructing Sidewalk



Picture 11: Low-hanging Branches along Ocean Rd

- Pinebluff Avenue
- Morris Avenue
- Conduct a curb ramp survey to determine additional intersections where ADA-compliant curb ramps are missing.
- Ensure that there is a minimum 48" clear width along all sidewalks, as required by PROWAG R302.2, multiple obstructions were noticed during the walk audit.
- Ensure that there is a minimum 80" vertical clearance along all sidewalks, as required by PROWAG R402.4, including trimming low tree branches as necessary.

Map 8: Location of Existing and Proposed Sidewalks



Crosswalks

Due to the lack of sidewalks in the residential area on the south side of State Route 88, there are very few crosswalks. Where they are present, they consist of the standard parallel line crosswalk and often do not connect to an ADA-accessible ramp or direct people to a safe place to walk. On the north side of State Route 88, there are more frequent crosswalks, especially for the side streets on Rue Avenue and Arnold Avenue, the majority of which are the standard parallel line crosswalks. This type of crosswalk is much less visible compared to continental crosswalks. Continental crosswalks should be installed along with the new sidewalks, and anywhere a walking path exists, or where drivers need to be alerted of a high-volume crossing. The existing parallel line crosswalks should be phased out and upgraded to continental crosswalks.



Picture 12: Adult and children forced to walk in the street due to lack of sidewalks and crosswalks

There is no marked crosswalk to cross Arnold Avenue between the intersection of State Route 88 and the border with Point Pleasant Beach. Adding a marked crossing with a Rectangular Rapid Flashing Beacon (RRFB) along this segment should be considered. Near the school, there are three marked crossings to get across State Route 88: Arnold Avenue, Benedict Street, and Rue Avenue. Arnold Avenue has a traffic signal and a crossing guard during arrival/dismissal. Rue Avenue also has a crossing guard, but Benedict Street is an uncontrolled intersection with no crossing guard.

Recommendations

- Conduct a crosswalk survey to determine where crosswalks are faded or missing and need to be repainted.
- Replace standard crosswalks with continental crosswalks for any intersection on a major road.
- Add crosswalks to key side street intersections missing crosswalks.
- Add painted yield lines in front of crosswalks along major roads; this will further enhance visibility and guide vehicles on where to stop. These are typically added to mid-block crossings but can also be added to crosswalks at intersections.
- Consider adding a marked crosswalk on Arnold Avenue with a Rectangular Rapid Flashing Beacon (RRFB)

Biking

Many students and parents were observed biking to and from the school during dismissal on the day of our walk audit, in spite of the lack of bicycle facilities on the streets. Many people bike on the sidewalk due to the perceived safety, however, riding on the sidewalk is often more dangerous due to conflicts between bicyclists and drivers at driveways and intersections, where drivers are not looking for cyclists. Providing bicycle infrastructure would greatly improve safety for cyclists and could increase the number of students biking to school.

An option for improving bike safety would be to establish a bicycle boulevard route to Ocean Road Elementary School. Bicycle boulevards are linear corridors of interconnected, traffic-calmed streets where bicyclists are afforded an enhanced level of safety and comfort. Most local streets near Ocean Road Elementary School already have slower-moving traffic and low traffic volume, making them suitable candidates for bicycle boulevards. Adding additional traffic calming measures and route signage to these streets may increase parent's willingness to allow their children to bike to school.

Recommendations

- Evaluate the street network around Ocean Road Elementary School and establish bicycle boulevard routes to the school.



Picture 13 Bike Boulevard Signage in Princeton, NJ



Picture 14: Bicycle Boulevard Signage in Princeton, NJ

Intersection and Corridor Findings and Recommendations

This section addresses more specific issues observed at key intersections near Ocean Road Elementary School. These include State Route 88 and Arnold Avenue, State Route 88 and Benedict Street, State Route 88 and Rue Avenue, and Rue Avenue and Clayton Street.

State Route 88 (Ocean Road)

State Route 88 (Ocean Road) is a main thoroughfare through Point Pleasant Borough. The posted speed limit is 35 MPH, which is reduced to 25 MPH when the school zone lights are on. It is a two-lane road with one lane in either direction in this area and carries roughly 12,000 vehicles per day, according to NJ DOT traffic counts. While crossing distances are short along most of the street near the school due to the fairly narrow lanes (10-11 feet wide), the volume and speed of traffic often make crossing difficult and unsafe.

Some of the crosswalk and school zone warning signs along State Route 88 are the older yellow color and are beginning to fade. Also, the older style warning beacon signs for the school zone speed limit have small numerals for the speed limit, which can be difficult to read. Walk audit participants were also informed that the warning beacons are on a timer for 25 minutes and must be turned back on multiple times during arrival and dismissal

Recommendations

- Upgrade all school zone and crosswalk warning signs to have a fluorescent yellow-green background with a black legend and border.
- Upgrade the warning beacon and school speed limit signage so the speed limit is more visible to drivers. Radar Speed Feedback signs could also be included to alert drivers of their speed.



Picture 15: Example of faded yellow warning sign along State Route 88



Picture 16: Existing school zone sign with warning beacons along State Route 88



Picture 17: Overhead School Speed Limit Warning Beacons in Hopewell Township



Picture 18: Speed Limit Warning Beacons in Brick Township at Midstreams Elementary.

- Install “Slow School” Pavement Markings (MUTCD Section 7C.03) before the school zone in either direction on State Route 88.

- Add “School” plaque (S4-3P) to all school zone approaches as recommended in the NJ School Zone Design Guidelines.
- Consider reducing the speed limit on State Route 88. The school zone speed limit of 25 MPH could be reduced to 15 MPH. Hoboken has done this in their school zones. Due to how narrow the street is and the lack of buffer between traffic and the sidewalks, the 35 MPH posted speed limit should be examined and possibly reduced to 25 MPH at all times.

Arnold Avenue (County Route 633), Johnson Avenue (County Route 10) & State Route 88 (Ocean Road) Intersection

This is a major intersection near the Ocean Road Elementary School and one of the crossing guard locations. State Route 88 is four lanes from the eastbound approach, where vehicles are coming over the nearby bridge, with a dedicated left turn lane and a through lane/right turn lane at the intersection. The westbound approach has a dedicated right turn onto Arnold Avenue and a through/left turn lane. The Arnold Avenue approach has a channelized right turn to head west on State Route 88 and a through/left turn lane to head eastbound on State Route 88 or south onto Johnson Avenue.

Standard parallel line crosswalks are used at all four legs of the intersection, but due to the number of lanes, crossing distances are long, and the current pedestrian phase is too short. The crossing of State Route 88 is 59 feet at the eastern side of the intersection and 65 feet at the western side. A review of the pedestrian clearance time found that the current clearance times did not meet the recommended 3.5 feet per second for crossing State Route 88 at both the east and west crosswalks. The current pedestrian phase gives 6 seconds for the walk interval and 13 seconds for the pedestrian clearance interval. In order to meet 3.5 feet per second standards, this needs to be increased to 7 seconds for the walk interval and 19 seconds for the pedestrian clearance interval. Due to the large volume of young children who cross State Route 88 at this intersection, a pedestrian clearance of 3.0 feet per second should be considered. Also, the crosswalk in the channelized right turn from Arnold Avenue to State Route 88 has no yield signage or pavement markings.



Picture 19: Existing crosswalk at Arnold Avenue and State Route 88 without pedestrian warning signs or yield markings.

Recommendations

- Upgrade the crosswalks from the standard parallel lines to continental/bar crosswalks.
- Reduce the lane width on State Route 88 eastbound after the traffic signal. Currently, it measures 24 feet from the double yellow line to the curb, with no edge line. At a minimum, an edge line with gore striping would encourage drivers to stay closer to the center of the road, and the narrower lane should

help slow down drivers. In the long term, moving the curb line in would help narrow the road and could be paired with a curb extension on Johnson Avenue.

- Install curb extensions at the Johnson Avenue and State Route 88 corners to reduce the crossing distance. Johnson Avenue is a one-way road heading away from the intersection and is approximately 30' wide. Green infrastructure could be included in the curb extensions to help with storm-water management as well.
- Add crosswalk warning signs and yield pavement markings for the crosswalk in the channelized right turn from Arnold Avenue onto State Route 88.
- Timing for the pedestrian signals is not adequate and needs to be evaluated and adjusted.
- In addition to adjusting pedestrian signal timings, include a leading pedestrian interval. A leading pedestrian interval (LPI) gives pedestrians the opportunity to enter the crosswalk at an intersection 3-7 seconds before vehicles are given a green indication. Pedestrians can better establish their presence in the crosswalk before vehicles have priority to turn right or left.



Picture 20: Example of striping used to narrow a lane on Young Road in Hamilton Township.

Benedict Street & State Route 88 (Ocean Road) Intersection

The main entrance for Ocean Road Elementary School is on Benedict Street, which is a one-way street heading northbound, intersecting State Route 88 with a misaligned intersection and continuing north. There are standard parallel line crosswalks across Benedict Street on either side of State Route 88 and one Continental-style crosswalk across State Route 88. For any vehicles dropping off students, including the school buses, the most common way to exit the neighborhood is through the Benedict Street and State Route 88 intersection, leading to many drivers trying to make left and right turns from Benedict Street onto State Route 88 during arrival and dismissal. This is a difficult turn for drivers due to traffic volume on State Route 88 and poor sight lines for drivers on Benedict Street, causing drivers to encroach into the crosswalk to get a better view of the oncoming traffic. This poses a significant risk to students crossing Benedict Street.

To safely cross State Route 88, students are directed to utilize the traffic signal at Arnold Avenue, where a crossing guard is stationed. From there, they can proceed along the sidewalk on the southern side of State Route 88 and cross Benedict Street to reach the school. Since there are so many cars trying to exit from Benedict Street, many students choose to walk down Johnson Avenue, where there are no sidewalks, to avoid Benedict Street. However, since Johnson Avenue is one-way in the opposite direction, students who bike home and are headed east to Arnold Avenue or over the bridge have no option but to go through this intersection. Currently, a teacher assists the students who are biking to get through the intersection since there is presently no crossing guard at this location.

Recommendations

- Re-evaluate the need for a crossing guard at this location.
- Evaluate the traffic flow in the area and consider changing the direction of Benedict Street.

- Discuss trimming of hedges/vegetation with property owners on the Benedict Street and State Route 88 corner, which are obstructing drivers' view of eastbound traffic on State Route 88.
- Consider a contra-flow bike lane on Johnson Avenue to allow students who bike to avoid the Benedict Street intersection. This would also require changing the traffic signal at State Route 88 and Johnson Avenue.
- Add sidewalks along Johnson Avenue and Catherine Street (previously recommended in the sidewalk section) to connect pedestrians to Ocean Road Elementary School without using the Benedict Street intersection.
- Implementing some of the recommendations from the State Route 88 section can help control speeds and assist drivers exiting from Benedict Street.

Rue Avenue (County Route 6) & State Route 88 (Ocean Road) Intersection

Rue Avenue is the next intersection where a crossing guard is posted heading east from Arnold Avenue. It is a major crossing point for students, as well as a heavily trafficked street for drivers since the prior two streets heading northbound between Arnold Avenue and Rue Avenue have a restricted left turn. State Route 88 and Rue Avenue have one lane in each direction, and there are stop signs on Rue Avenue but no stop controls on State Route 88.

The crosswalks on all four legs of this intersection are in reasonably good condition, yet the pavement quality along State Route 88 near this junction is notably deteriorated and in need of resurfacing. Across State Route 88, there are Continental-style crosswalks with parallel lines. However, across Rue Avenue, there are only the standard parallel line crosswalks. Additionally, a pedestrian warning sign along the eastbound approach of State Route 88 toward Rue Avenue needs to be better positioned. It is located too close to a utility pole. It twists in the wind, creating noise by hitting the utility pole. In response, residents have taken it upon themselves to secure the sign behind the utility pole, thereby obstructing the sign.



Picture 21: Pedestrian warning sign at State Route 88 and Rue Avenue obstructed by a utility pole

During conversations with the crossing guard, it was revealed that a fellow guard had a harrowing near-miss experience at this intersection. A crash occurred when one driver rear-ended another vehicle while attempting a left turn from State Route 88 onto Rue Avenue, subsequently propelling the car perilously close to the crossing guard. The concerning safety record of this intersection is underscored by a total of nineteen crashes at or near this location between 2017 and 2021. Notably, over half of these incidents occurred in 2021 alone.

Recommendations

- Relocate the pedestrian warning sign along State Route 88 on the eastbound approach to Rue Avenue away from the utility pole so it does not create noise in the wind.

- Install a pedestrian-actuated Rectangular Rapid Flashing Beacon (RRFB) to accompany the pedestrian warning sign. These systems are a proven safety countermeasure and have been used throughout New Jersey.



Picture 22: Example of a Rectangular Rapid Flashing Beacon (RRFB) used with pedestrian warning signs in Summit, NJ

- In lieu of using pedestrian warning signs with RRFBs, consider creating an all-way stop at State Route 88 and Rue Avenue. One of the warrants for an all-way stop from the MUTCD (Section 2B.07) is as follows:

“An accident problem, as indicated by five or more reported accidents in a 12-month period of a type susceptible to correction by a multi-way stop installation. Such accidents include right- and left-turn collisions, as well as right-angle collisions.”

There were ten crashes at State Route 88 and Rue Avenue in 2021, four of which were right-angle crashes and three rear-end crashes. An all-way stop at this intersection would reduce conflicts between the high volume of left turns from State Route 88 heading north onto Rue Avenue. The need to control left-turn conflicts and the need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes are additional warrants for an all-way stop. Ocean Road Elementary School is a location that generates high pedestrian volumes.

Rue Avenue (County Road 6) & Clayton Avenue Intersection

Rue Avenue is a half-mile County road between Catherine Street near Ocean Road Elementary and Trenton Avenue, near where it intersects with Arnold Avenue. There is a continuous sidewalk on the east side of Rue Avenue between State Route 88 and Trenton Avenue, which was completed with a prior Safe Routes to School Grant. Between Catherine Street and State Route 88, there is a continuous sidewalk on the west side of Rue Avenue. South of the Clayton Avenue intersection, Rue Avenue is approximately 32 feet wide, and north of Clayton Avenue, it is nearly 40 feet wide. The northwest corner of the Rue Avenue and Clayton Avenue intersection has a very large corner radius, approximately 25 feet. In comparison, the other three corners are closer to 10 feet radii. Currently, at the intersection, there are stop signs for vehicles on Clayton Avenue but not on Rue Avenue. Also, there is only one crosswalk at the intersection on the east side of Rue Avenue across Clayton Avenue. It was noted during the walk audit that a large volume of traffic uses Rue Avenue as a cut-through to avoid traffic on Arnold Avenue, exacerbated by the fact that eastbound traffic on State Route 88 cannot make a left turn onto the two streets before Rue Avenue.

Recommendations

- Reduce the corner radius on the northwest corner of the intersection to match the other three corners. Larger corner radii encourage higher-speed turns, which are dangerous for people walking and biking. Forcing drivers to make slower turns with smaller turning radii increases safety for everyone.
- Implement a traffic calming strategy at Rue Avenue and Clayton Avenue to help reduce speeds and reduce cut-through traffic. One strategy to consider is a mini-roundabout, which is often used on local streets to help reduce speeds through uncontrolled intersections. Based on providing a 15-foot distance from the corners to a circle, there should be enough space at the current intersection to install a mini-roundabout.



Picture 23: Illustration of a mini-roundabout. Source: National Association of City Transportation Officials (NACTO) Urban Street Design Guidelines

Summary of Infrastructure and Non-infrastructure Recommendations

The recommendations in this travel plan are intended to increase safety for students on their walk or bike ride to and from school and when appropriate, encourage more students to walk or bike. The tables below identify those actions, a responsible party for implementing them, a time frame, and a level of cost for five different categories: Engineering, Education, Encouragement, Enforcement, and Evaluation. Many actions identified as “short-term” and “low cost” can make a big difference in a shorter time frame and can be accomplished with the help of local partners. This “low-hanging fruit” can be prioritized for greater impact in a shorter period of time. However, traffic calming measures are key items to address allowing students more time to cross and greater visibility (larger driver field of vision at slow speeds).

Cost estimates are for planning purposes only – a professional engineer should prepare the actual estimates used for grant application. These estimates were prepared using the SRTS Implementation Cost sheet prepared in 2022 by NV5 to support the grant application process.¹

Engineering			
Action	Time-frame	Cost	Location
ADA Curb Ramps	Short-term	\$1500 / EA	Various Locations
Curb Ramp Survey	Short-term	Not Listed	Borough Wide
Continental Crosswalk	Short-term	\$6.50 /SF	Various Locations
Crosswalk Survey	Short-term	Not Listed	Borough Wide
Painted Yield Lines in Front of Crosswalks	Short-term	\$12.50 /SF	Arnold Avenue at Route 88
Prune Overgrown Bushes	Short-term	Not Listed	Various Locations
School Zone Markings	Short-term	\$12.50 /SF	Route 88
Sidewalk Survey; GMTMA can assist in creating a map tool that can be used to report damaged sidewalks	Short-term	Free/Low	Various Locations
Regulatory and Warning Signs (ex. "Stop for Pedestrian", "End School Zone")	Short-term	\$50/SF	Route 88
Curb Extension, Painted or Physical	Painted: Short-term Physical: Medium-term	\$6,000 - \$20,000 per corner	Johnson Ave at Route 88
Install Sidewalk	Medium-term	\$75 /LF	Various Locations

¹ <https://www.saferoutesnj.org/wp-content/uploads/2022/05/Design-Treatment-Estimating-Guidelines.pdf>

Action	Time-Frame	Cost	Location
Bicycle Boulevard	Medium-term	\$150 / sign; \$7 /SF Shared-lane marking	Various Locations
Rectangular Rapid Flashing Beacon (RRFB)	Medium-term	\$10,000 Each	Route 88 at Rue Avenue
Sidewalk Repair	Medium-term	\$75 /LF	Various Locations
Radar Speed Signs	Medium-term	\$5500/EA	Route 88
Flashing Beacon/Enhanced Warning Sign	Medium-term	\$13,000 / EA	Route 88
Bike lane striping (addition of 4" white thermoplastic striping)	Medium-term	\$2.50 / LF	Johnson Avenue
Bike Symbol (Words or Arrows, assume thermoplastic)	Medium-term	\$70 / EA	Johnson Avenue
Mini roundabout	Long-term	\$35,000	Rue Avenue at Clayton Avenue

Education			
Action	Responsibility	Time Frame	Cost
Educate students, families and school staff to know ways to keep students safe around each drop-off/ pick up zones:	School, School District	Short Term / Ongoing	Low
Increase community outreach about health benefits of walking and biking to school	School, PTO	Short Term	Low
Conduct community wide outreach about Safe Routes to School actions	School, GMTMA	Short Term/ Ongoing	Low
Educate community and responsible parties about snow removal on sidewalks near schools	Public Works	Short Term/ Ongoing	Low
Walk and bike safety lessons in classrooms, at least annually.	School, GMTMA	Short Term/ Ongoing	Low
Have a community wide bicycle and pedestrian safety education campaign, such as Street Smart	Township, GMTMA, Police	Short Term	Low

<u>Encouragement</u>			
Action	Responsibility	Time Frame	Cost
Establish main walking routes, safety corridors, walking school buses – safety in numbers	School, PTO, GMTMA, Community Groups	Ongoing	Low
Conduct student and parent surveys about actions and rewards that encourage more to walk/bike and feel safer walking/biking to school	School, PTO, GMTMA	Short Term	Low
Establish programs to encourage students to walk or bike to school, ex: Golden Sneaker Award, Walking Wednesday, Walking School Bus, Bike Train	School, GMTMA	Short Term/ Ongoing	Low

<u>Enforcement</u>			
Action	Responsibility	Time Frame	Cost
Enforce speed limits, pedestrian crossings, drivers stopping for pedestrians especially when students are going to/ from school	Police	Ongoing	Low / Medium
Enforce motorist compliance with crossing guard instructions	Police	Ongoing	Low / Medium
Enforce parking laws	Police	Ongoing	Low / Medium
Conduct Street Smart safety enforcement campaigns.	Police	Ongoing	Low / Medium

<u>Evaluation</u>			
Action	Responsibility	Time Frame	Cost
Conduct student travel tallies on annual basis	School	Annual	Low
Create Bicycle Master Plan; NJDOT offers free technical assistance in creating official plans through their Local Bicycle/Pedestrian Planning Assistance Program.	NJ Department of Transportation	Short Term	Free/Low

Greater Mercer TMA can help with walk and bike to school events, walking school bus programs, youth bicycle and pedestrian education, school travel plans, and surveys that provide evaluation and feedback on local programs.

Conclusion

Point Pleasant Borough has shown a commitment to increasing pedestrian safety in recent years, making a number of pedestrian safety improvements. The Borough has obtained grants to make these improvements, such as connecting sidewalks and adding crosswalks near the schools to create safer corridors of travel for the students.

Ocean Road Elementary School is home to over 480 students, as such, prioritizing the safety of students walking and biking to and from the school is of great importance in the Borough. The Ocean Road Elementary School Travel Plan was developed to identify issues and provide recommendations that would create a safer walking and bicycling environment in Point Pleasant Borough. The overarching goal is to allow more students and their parents to choose active transportation for the trip to school.

Issues facing the Borough include crossing busy State Route 88 and County routes, motorist speeding, damaged or obstructed sidewalks, and faded crosswalks. Parents on the walkability audit expressed concern with speeding and distracted drivers along State Route 88 and other main roads surrounding Ocean Road School, also pointing out the lack of ADA curb cuts at intersections all along Arnold Avenue. This school travel plan is only the first step in improving the safety of students who walk and bike to school. It is up to all stakeholders to work together to bring these improvements to fruition.

With most students living within 1.6 miles of Ocean Road Elementary School and dense residential development, the school is well-positioned to expand its walking and biking student body. Infrastructure improvements to address the issues detailed in this school travel plan, combined with safety programming, will undoubtedly increase safety and encourage more parents to have their children travel to school by walking or biking.

Appendix A: Pedestrian and Cyclist Crashes Near Ocean Road Elementary School from New Jersey Department of Traffic and Highway Safety, 2018-2022

Below is a table of pedestrian and cyclist crashes in the study area near Ocean Road Elementary School. The crash data is provided by Numetric and is comprehensive but not exhaustive. Crashes are not included in this data for various reasons, including incomplete crash reports and unreported crashes. See Map 6 on page 14 for crash locations.

Crash Year	Crash Severity	Crash Type	Crash Location
2021	Possible Injury	Pedalcyclist	Benedict St
2020	Possible Injury	Pedalcyclist	Catherine St
2022	Possible Injury	Pedalcyclist	NJ 88
2021	Suspected Minor Injury	Pedalcyclist	NJ 88
2021	Possible Injury	Pedalcyclist	NJ 88
2020	Suspected Minor Injury	Pedestrian	NJ 88
2020	Suspected Serious Injury	Pedestrian	NJ 88
2019	No Apparent Injury	Pedalcyclist	NJ 88
2019	Suspected Minor Injury	Pedalcyclist	Bay Ave (CR 604)
2021	No Apparent Injury	Pedalcyclist	Arnold Ave (CR 633)
2019	No Apparent Injury	Pedalcyclist	Arnold Ave (CR 633)
2020	Possible Injury	Pedestrian	Old Farm Rd
2021	Suspected Minor Injury	Pedalcyclist	Partridge Run
2021	Possible Injury	Pedalcyclist	Rue Ave
2022	Suspected Minor Injury	Pedalcyclist	Trenton Avenue (CR 71)

Appendix B: FHWA Proven Safety Countermeasures

The Federal Highway Administration is promoting safety through proven roadway design features.

For more information, see: <https://highways.dot.gov/safety/proven-safety-countermeasures>

Below is the complete list. The following pages provide a detailed explanation of select countermeasures.

OFFICE OF SAFETY

Proven Safety Countermeasures

SPEED MANAGEMENT

Speed Safety Cameras

Variable Speed Limits

Appropriate Speed Limits for All Road Users

ROADWAY DEPARTURE

Wider Edge Lines

Enhanced Delineation for Horizontal Curves

Longitudinal Rumble Strips and Stripes on Two-Lane Roads

SafetyEdgeSM

Roadside Design Improvements at Curves

Median Barriers

INTERSECTIONS

Backplates with Retroreflective Borders

Corridor Access Management

Dedicated Left- and Right-Turn Lanes at Intersections

Reduced Left-Turn Conflict Intersections

Roundabouts

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

Yellow Change Intervals

PEDESTRIANS/BICYCLES

Crosswalk Visibility Enhancements

Bicycle Lanes

Rectangular Rapid Flashing Beacons (RRFB)

Leading Pedestrian Interval

Medians and Pedestrian Refuge Islands in Urban and Suburban Areas

Pedestrian Hybrid Beacons

Road Diets (Roadway Reconfiguration)

Walkways

CROSSCUTTING

Pavement Friction Management

Lighting

Local Road Safety Plans

Road Safety Audit

FHWA-SA-21-082



Safety Benefits:

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

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

For more information on this and other FHWA Proven Safety Countermeasures, please visit <https://highways.dot.gov/safety/proven-safety-countermeasures> and <https://highways.dot.gov/safety/speed-management/reference-materials>.

Appropriate Speed Limits for All Road Users

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

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

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

Applications

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

- Expert Systems tools.
 - [USLIMITS2](#).
 - [NCHRP 966: Posted Speed Limit Setting Procedure and Tool](#).
- Safe System approach.

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

Considerations

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

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

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

¹ Reducing the speed limit to 20 mph in urban areas: Child deaths and injuries would be decreased.

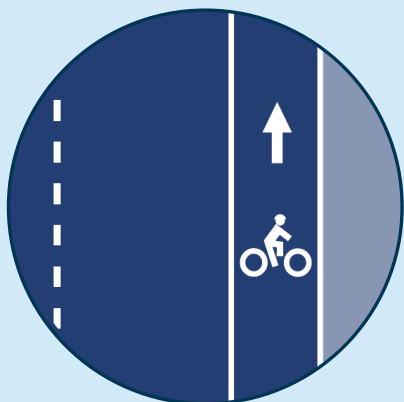
² Lowering the speed limit from 30 to 25 mph in Boston: effects on vehicle speeds.

³ FHWA's Methods and Practices for Setting Speed Limits: An Informational Report. (2012).

⁴ Recommendations of the Academic Expert Group for the 3rd Global Ministerial Conference on Road Safety.

⁵ https://safety.fhwa.dot.gov/speedmgmt/ref_mats/fhwasa20047/sec8.cfm#foot813

⁶ Safety and Operational Impacts of Setting Speed Limits below Engineering Recommendations.



Safety Benefits:

Converting traditional or flush buffered bicycle lanes to a separated bicycle lane with flexible delineator posts can reduce crashes up to:

53%

for bicycle/vehicle crashes.³

Bicycle Lane Additions can reduce crashes up to:

49%

for total crashes on urban 4-lane undivided collectors and local roads.⁷

30%

for total crashes on urban 2-lane undivided collectors and local roads.⁷



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

For more information on this and other FHWA Proven Safety Countermeasures, please visit <https://highways.dot.gov/safety/proven-safety-countermeasures> and <https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-07/fhwasa18077.pdf>.

Bicycle Lanes

Most fatal and serious injury bicyclist crashes occur at non-intersection locations. Nearly one-third of these crashes occur when motorists are overtaking bicyclists¹ because the speed and size differential between vehicles and bicycles can lead to severe injury. Many people are not comfortable riding a bicycle because of their fear that this type of crash may occur. To make bicycling safer and more comfortable for most types of bicyclists, State and local agencies should consider installing bicycle lanes. Providing bicycle facilities can mitigate or prevent interactions, conflicts, and crashes between bicyclists and motor vehicles, and create a network of safer roadways for bicycling. Bicycle Lanes align with the Safe System Approach principle of recognizing human vulnerability—where separating users in space can enhance safety for all road users.

Applications

The FHWA's [Bikeway Selection Guide](#) and [Incorporating On-Road Bicycle Networks into Resurfacing Projects](#) assist agencies in determining which facilities provide the most benefit in various contexts. Bicycle lanes can be included on new roadways or created on existing roads by reallocating space in the right-of-way through [Road Diets](#). Separated bicycle lanes, which use vertical elements—such as flexible delineator posts, curbs, or vegetation—between the bicycle lane and motorized traffic lanes provide additional safety benefits.^{2,3} For a marked bike lane without vertical elements, a lateral offset with marked buffer can help to further separate bicyclists from vehicle traffic.

Considerations

- In order to maximize a roadway's suitability for riders of all ages and abilities, bicycle lane design should vary according to roadway characteristics (number of lanes, motor vehicle and truck volumes, speed, presence of transit), user needs (current and forecasted ridership, types of bicycles and micromobility devices in use within the community, role within the bicycling network), and land-use context (adjacent land uses, types and intensity of conflicting uses, demands from other users for curbside access). Separated bicycle lanes are recommended on roadways with higher vehicle volumes and speeds, such as arterials.
- City and State policies may require minimum bicycle lane widths, although desirable bicycle lane widths

can differ by agency and functional classification of the road, current and forecasted bicycle volumes, and contextual attributes such as topography.

- Studies have found that roadways did not experience an increase in crashes or congestion when travel lane widths were decreased to add a bicycle lane.⁴
- Studies and experience in U.S. cities show that bicycle lanes increase ridership and may help jurisdictions better manage roadway capacity.
- In rural areas, rumble strips can negatively impact bicyclists' ability to ride if not properly installed. Agencies should consider the dimensions, placement, and offset of rumble strips when adding a bicycle lane.⁵
- Bicycle lanes should be considered on roadways where adjacent land use suggests that trips could be served by varied modes, particularly to meet the safety and travel needs of low-income populations likely to use bicycles to reach essential destinations.⁶

¹ Thomas et al. *Bicyclist Crash Types on National, State, and Local Levels: A New Look*. Transportation Research Record 673(6), 664-676, (2019).

² [Separated Bike Lane Planning and Design Guide](#). FHWA-HEP-15-025, (2015).

³ (CMF ID: [11296](#)) [Developing CMFs for Separated Bicycle Lanes](#). FHWA-HRT-23-025, (2023).

⁴ Park and Abdel-Aty. *Evaluation of safety effectiveness of multiple cross sectional features on urban arterials*. Accident Analysis and Prevention, Vol. 92, pp. 245-255, (2016).

⁵ FHWA Tech Advisory [Shoulder and Edge Line Rumble Strips](#), (2011).

⁶ Sandt et al. [Pursuing Equity in Pedestrian and Bicycle Planning](#). FHWA, (2016).

⁷ (CMF ID: [10738](#), [10742](#)) [Development of Crash Modification Factors for Bicycle Lane Additions While Reducing Lane and Shoulder Widths](#). FHWA-HRT-21-012, (2021).



Safety Benefits:

**High-visibility crosswalks
can reduce pedestrian injury
crashes up to:**
40%¹

**Intersection lighting can
reduce pedestrian crashes
up to:**
42%²

**Advance yield or stop
markings and signs can
reduce pedestrian
crashes up to:**
25%³

For more information on this and other FHWA Proven Safety Countermeasures, please visit <https://highways.dot.gov/safety/proven-safety-countermeasures> and <https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-06/techSheetVizEnhancemt2018.pdf>.

Crosswalk Visibility Enhancements

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

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

High-visibility crosswalks

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

Improved Lighting

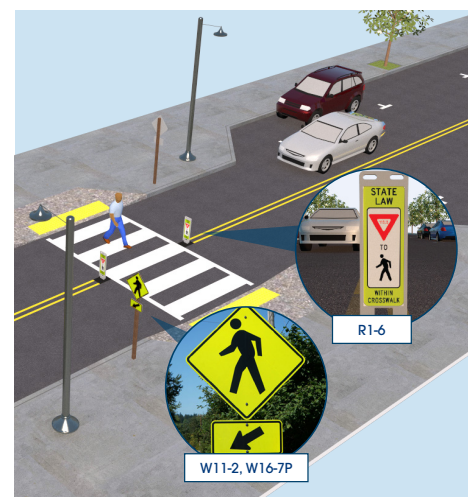
The goal of crosswalk lighting should be to illuminate with positive contrast to make it easier for a driver to visually identify the pedestrian. This involves carefully placing the luminaires in forward locations to avoid a silhouette effect of the pedestrian.

Enhanced Signing and Pavement Markings

On multilane roadways, agencies can use "YIELD Here to Pedestrians" or "STOP Here for Pedestrians" signs 20 to 50 feet in advance of

a marked crosswalk to indicate where a driver should stop or yield to pedestrians, depending on State law. To supplement the signing, agencies can also install a STOP or YIELD bar (commonly referred to as "shark's teeth") pavement markings.

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



Source: FHWA

¹ (CMF ID: 4123) Chen, L., C. Chen, and R. Ewing. The Relative Effectiveness of Pedestrian Safety Countermeasures at Urban Intersections - Lessons from a New York City Experience. (2012).

² (CMF ID: 436) Elvik, R. and Vaa, T. Handbook of Road Safety Measures. Oxford, United Kingdom, Elsevier, (2004).

³ (CMF ID: 9017) Zeeger et al. Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments, FHWA, (2017).



Safety Benefits:

13%

reduction in pedestrian-vehicle crashes at intersections.¹

Leading Pedestrian Interval

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

LPIs provide the following benefits:

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

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



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



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

For more information on this and other FHWA Proven Safety Countermeasures, please visit <https://highways.dot.gov/safety/proven-safety-countermeasures> and <https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-06/fhwasa19040.pdf>.

¹ (CMF ID: 9918) Goughnour, E., D. Carter, C. Lyon, B. Persaud, B. Lan, P. Chun, I. Hamilton, and K. Signor. "Safety Evaluation of Protected Left-Turn Phasing and Leading Pedestrian Intervals on Pedestrian Safety." Report No. FHWA-HRT-18-044. Federal Highway Administration. (October 2018)

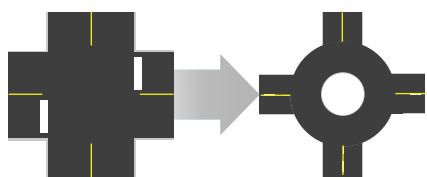


Proven Safety Countermeasures



Safety Benefits:

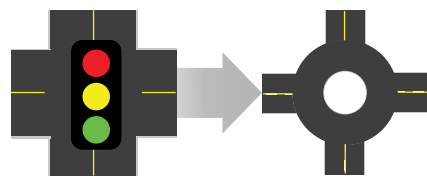
Two-Way Stop-Controlled Intersection to a Roundabout



82%

reduction in fatal and injury crashes.¹

Signalized Intersection to a Roundabout



78%

reduction in fatal and injury crashes.¹

For more information on this and other FHWA Proven Safety Countermeasures, please visit <https://highways.dot.gov/safety/proven-safety-countermeasures> and <https://highways.dot.gov/safety/intersection-safety/intersection-types/roundabouts>.

Roundabouts

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

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

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

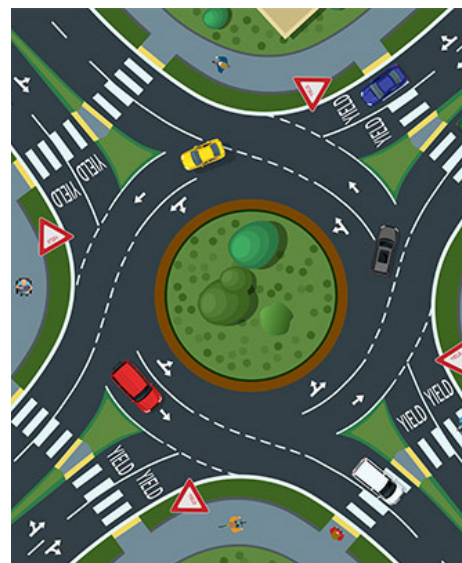


Illustration of a multilane roundabout.
Source: FHWA



Example of a single-lane roundabout. Source: FHWA

¹ (CMF ID: 211,226) AASHTO. The Highway Safety Manual, American Association of State Highway Transportation Professionals, Washington, D.C., (2010).



Safety Benefits:

RRFBs can reduce crashes up to:

47%

for pedestrian crashes.⁴

RRFBs can increase motorist yielding rates up to:

98%

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



RRFBs used at a trail crossing.
Source: LJB

For more information on this and other FHWA Proven Safety Countermeasures, please visit <https://highways.dot.gov/safety/proven-safety-countermeasures> and https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-06/techSheet_RRFB_2018.pdf.

Rectangular Rapid Flashing Beacons (RRFB)

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

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

Applications

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

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

Considerations

Agencies should:²

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

Agencies shall not:²

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

¹ *MUTCD Interim Approval 21 - RRFBs at Crosswalks*.

² "Rectangular Rapid Flash Beacon" in PEDSAFE: Pedestrian Safety Guide and Countermeasure Selection System. FHWA, (2013).

³ Fitzpatrick et al. "Will You Stop for Me? Roadway Design and Traffic Control Device Influences on Drivers Yielding to Pedestrians in a Crosswalk with a Rectangular Rapid-Flashing Beacon." Report No. TTI-CTS-0010. Texas A&M Transportation Institute, (2016).

⁴ (CMF ID: 9024) NCHRP Research Report 841 Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments, (2017).



Proven Safety Countermeasures



Safety Benefits:

Sidewalks

65-89%

reduction in crashes involving pedestrians walking along roadways.³

Paved Shoulders

71%

reduction in crashes involving pedestrians walking along roadways.³

For more information on this and other FHWA Proven Safety Countermeasures, please visit <https://highways.dot.gov/safety/proven-safety-countermeasures> and http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=1.

Walkways

A walkway is any type of defined space or pathway for use by a person traveling by foot or using a wheelchair. These may be pedestrian walkways, shared use paths, sidewalks, or roadway shoulders.

With more than 6,200 pedestrian fatalities and 75,000 pedestrian injuries occurring in roadway crashes annually,¹ it is important for transportation agencies to improve conditions and safety for pedestrians and to integrate walkways more fully into the transportation system. Research shows people living in low-income communities are less likely to encounter walkways and other pedestrian-friendly features.²

Well-designed pedestrian walkways, shared use paths, and sidewalks improve the safety and mobility of pedestrians. Pedestrians should have direct and connected network of walking routes to desired destinations without gaps or abrupt changes. In some rural or suburban areas, where these types of walkways are not feasible, roadway shoulders provide an area for pedestrians to walk next to the roadway, although these are not preferable.

Transportation agencies should work towards incorporating pedestrian facilities into all roadway projects

unless exceptional circumstances exist. It is important to provide and maintain accessible walkways along both sides of the road in urban areas, particularly near school zones and transit locations, and where there is a large amount of pedestrian activity. Walkable shoulders should also be considered along both sides of rural highways when routinely used by pedestrians.



Example of a sidewalk in a residential area.
Source: pedbikeimages.org / Burden



Paved shoulder used as a walkway. Source: pedbikeimages.org / Burden

¹ National Center for Statistics and Analysis. (2020, March). Pedestrians: 2018 data (Traffic Safety Facts. Report No. DOT HS 812 850). National Highway Traffic Safety Administration.

² Gibbs, et al. Income Disparities in Street Features that Encourage Walking. Bridging the Gap, (2012, March).

³ Gan et al. Update of Florida Crash Reduction Factors and Countermeasures to Improve the Development of District Safety Improvement Projects. Florida DOT, (2005).

Disclaimer

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