Appendix D: Safety Technical Memorandum

Bluffton Parkway Corridor Study

Safety Analysis

TECHNICAL MEMORANDUM

June 2025

LOWCOUNTRY AREA TRANSPORTATION STUDY

Contents

1.0 Introduction 3
Purpose 3
Organization of Technical Memorandum 3
2.0 Data Collection and Processing 5
Data Collection and Acquisition 5
Data Cleaning 5
Data Processing and Segregation 5
3.0 Crash Frequency Analysis 6
Descriptive Analysis 6
Crash Hotspots 11
4.0 Crash Rate Analysis 12
Intersection 12
Segment 13
5.0 Site-Specific Analysis and Recommendations 14
Intersection Analysis 14
Segment Analysis 17
Site-Specific Contributing Factors and Recommended Countermeasures 19

Figures

Figure 1-1 Bluffton Parkway Corridor Study Area 3
Figure 3-1 Crash Counts by Year 6
Figure 3-2 Crash Counts by Month 7
Figure 3-3 Crash Counts by Day 7
Figure 3-4 Crash Proportion by Severity 8
Figure 3-5 Crash Counts by Time of Day 8
Figure 3-6 Crash Proportion by Prime Contributing Factor 9
Figure 3-7 Crash Proportion by Manner of Collision 9
Figure 3-8 Crash Proportion by Light Condition 10
Figure 3-9 Crash Proportion by Road Surface Condition 10
Figure 3-10 Crash Proportion by Speeding 10
Figure 3-11 Vehicular and Bicycle/Pedestrian Crash Hotspots 11

Tables

Table 4-1 Intersection Crash Rates 12
Table 4-2 Segment Crash Rates 13
Table 5-1 Intersection Site Conditions 16
Table 5-2 Roadway Segment Conditions 18
Table 5-3 Site-Specific Near- and Long-Term Strategies 20

Acronyms and Abbreviations

FHWA	Federal Highway Administration
HSIP	Highway Safety Improvement Plan
KABCO Scale	Severity of Injuries Assessed by Crash Scene Investigators; K: A victim was killed. A: The victim(s) suffered incapacitating injuries that require hospitalization and/or transport for medical care. B: Injuries to victim(s) were evident to the officers at the scene, but they were non-disabling lacerations, scraped, or minor bruises. C: The victim(s) suffered possible injuries. O: There were no apparent injuries involved in the crash.
MEV	100 Million Entering Vehicles
MVMT	100 Million Vehicle Miles Traveled
PDO	Property Damage Only
SCDOT	South Carolina Department of Transportation
SCDPS	South Carolina Department of Public Safety

1.0 Introduction

Purpose

The Bluffton Parkway Safety Analysis Technical Memorandum is a component of the Bluffton Parkway Corridor Study which evaluates existing traffic and safety conditions and identifies potential improvements to Bluffton Parkway from S.C. 170 (Okatie Highway) to U.S. 278.

As part of this evaluation, a safety study was conducted to understand the factors contributing to crashes along Bluffton Parkway in the Study Area. The analysis focused on identifying locations with high crash frequency and high crash rates. This data-driven approach provides insights into current roadway safety conditions and helps identify contributing crash factors. **Figure 1-1** shows the Bluffton Parkway study area.

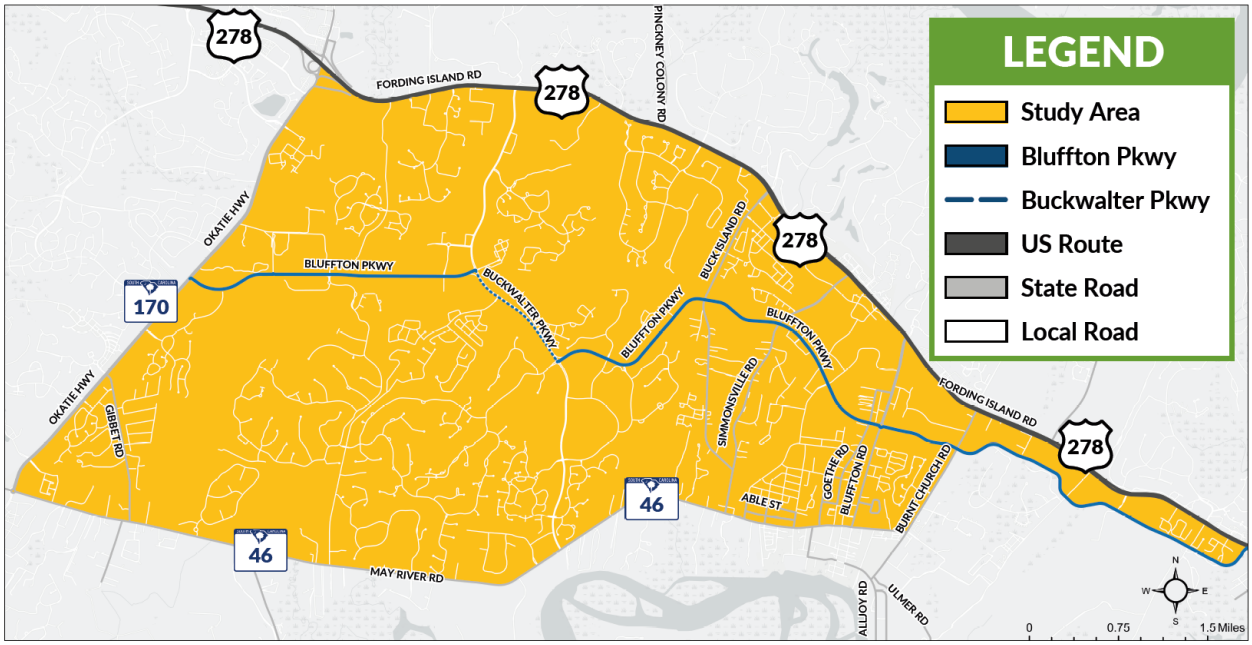


Figure 1-1 Bluffton Parkway Corridor Study Area

Organization of Technical Memorandum

This technical memorandum is divided into five sections, as described below:

- **Section 1** introduces the purpose of the safety analysis and the guiding documents for the memorandum. This section concludes with an overview of the technical memorandum's organization.
- **Section 2** describes the methods associated with data collection, acquisition, and the assumptions made during the data cleaning process.

- **Section 3** presents the descriptive statistics that provide a general overview of crashes on Bluffton Parkway between S.C. 170 (Okatie Highway) and U.S. 278 for the years of 2017 to 2023.
- **Section 4** describes the crash rate analysis including crash rates by segments and intersections. This section concludes with a summary identifying five segments and intersections with higher crash rates than others in the study corridor.
- **Section 5** describes the site-specific analysis conducted as part of this study. Areas with high crash frequency and high crash rates are assessed and identified. Recommended strategies are presented for both the near-term (0-5 years) and long-term (>5 years) to address problem areas at high priority locations.

2.0 Data Collection and Processing

Data Collection and Acquisition

The crash and roadway data used in this study were derived from multiple sources. Crash data were obtained from the South Carolina Department of Transportation (SCDOT) for the seven-year period from 2017 to 2023. These records include key attributes such as the context, conditions, and outcomes of crashes within the study corridor, including severity of the crash and manner of collision.

Roadway data, used primarily for the site-specific analysis, was collected from Google Maps Street View, Google Earth Pro, and aerial imagery, which provided additional context on roadway conditions that may have contributed to crashes. ArcGIS Pro was used to visualize, organize, and present the data for further analysis.

Crash attributes used in this study are based on the Uniform Traffic Collision Report Forms (TR-310) completed by investigating officers. Per South Carolina state law, any collision on a public highway that results in at least $1,000 in total property damage, or results in injury or death must be reported to the South Carolina Department of Public Safety (SCDPS) using form TR-310. Collisions occurring on private property or reported on any form other than the TR-310 are excluded from the dataset.

Data Cleaning

ArcGIS Pro was used to spatially visualize the data for further analysis once crash data was received. The data was cleaned to ensure only crashes in the study corridor were selected. Since there was no specific indicator to distinguish between segment and intersection crashes, a buffer of 250 feet from the intersection was applied to identify crashes at each intersection or intersection-related. Any crash that occurred outside of the buffer area was considered a segment-related crash. A total of five fatal crashes and another 35 severe injury crashes were recorded within the study corridor during the analysis period.

Data Processing and Segregation

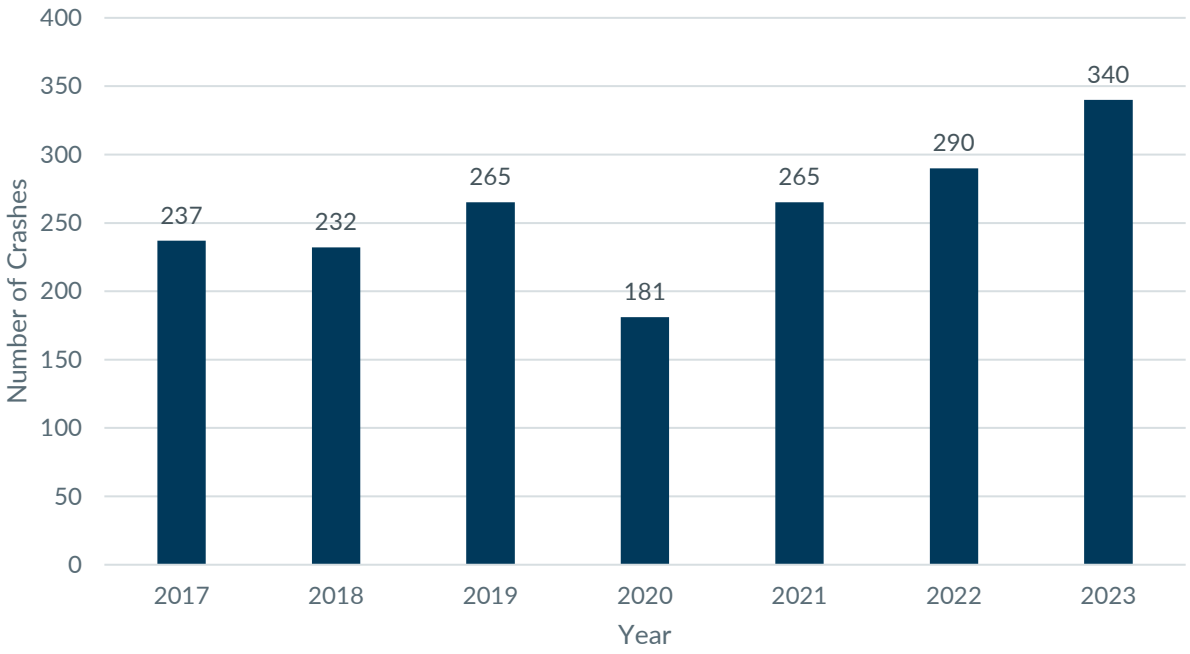
From 2017 to 2023, a total of 1,810 crashes occurred within the study corridor. These crash records were used to develop the descriptive statistics in **Section 1.0** of this report. All crashes were used to create a crash hotspot map and to calculate crash rates. For more detailed site-specific analysis, geometric roadway characteristics were considered in addition to the crashes and crash rates.

3.0 Crash Frequency Analysis

Descriptive Analysis

The following descriptive statistics were generated for the study corridor spanning from S.C. 170 (Okatie Highway) to U.S. 278, for the years 2017 to 2023.

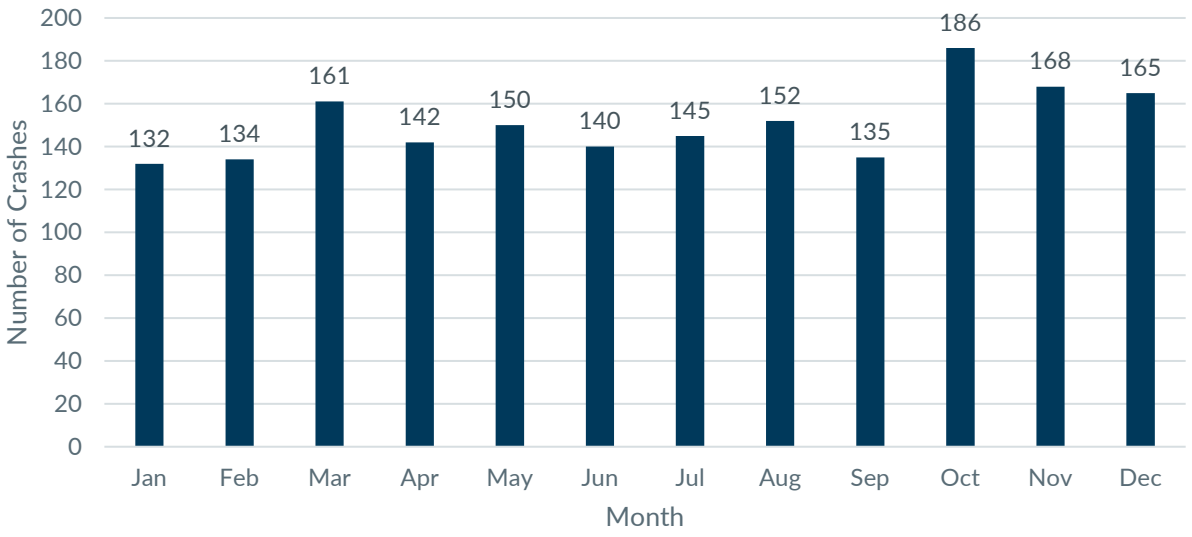
Figure 3-1 shows the annual trend of crash counts along the study corridor. A noticeable decline occurred in 2020, likely due to reduced travel during the COVID-19 pandemic, followed by a steady increase in crashes in subsequent years.



Source: SCDOT Crash Data, 2017-2023

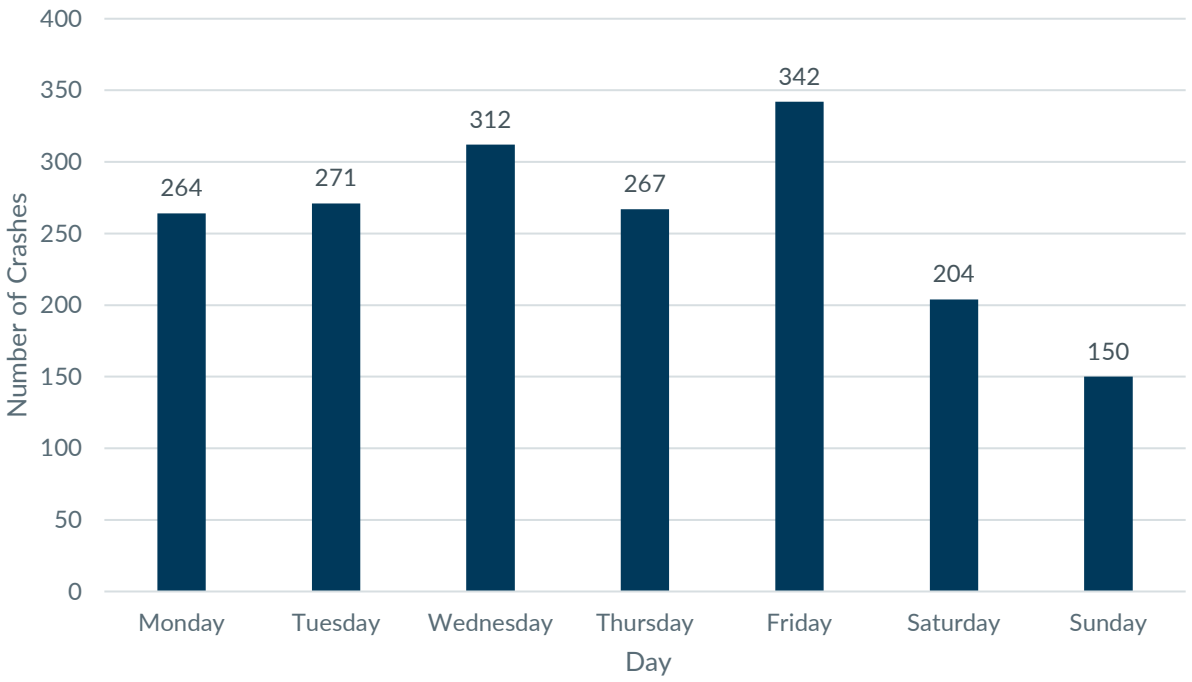
Figure 3-1 Crash Counts by Year

Figure 3-2 shows that October had the highest number of crashes along the study corridor during the seven-year period. **Figure 3-3** shows that Fridays experienced the highest number of crashes among all the days of the week, approximately 17% higher than the weekday average. In contrast, Sundays recorded the lowest number of crashes.



Source: SCDOT Crash Data, 2017-2023

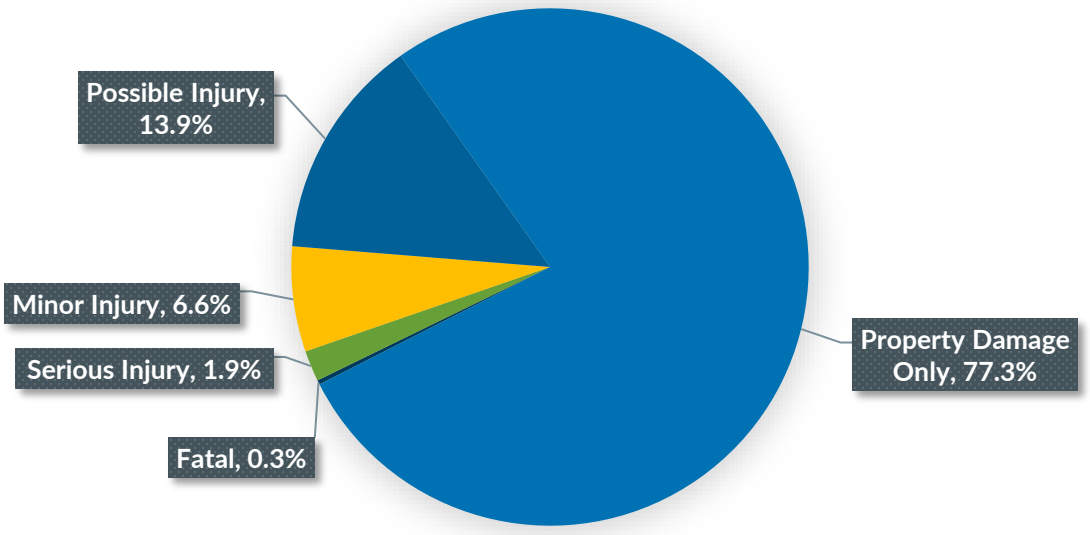
Figure 3-2 Crash Counts by Month



Source: SCDOT Crash Data, 2017-2023

Figure 3-3 Crash Counts by Day

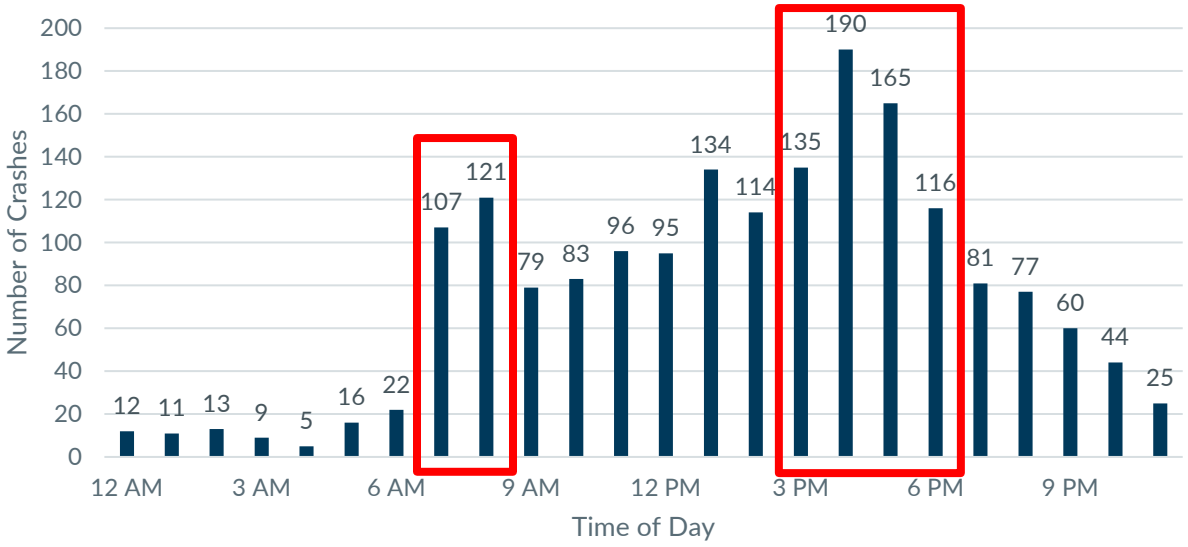
Figure 3-4 shows that of the 1,810 crashes on Bluffton Parkway, approximately 77.3% did not result in an apparent injury, while approximately 20.5% resulted in a suspected minor or possible injury. Crashes resulting in suspected serious or fatal injuries represent approximately 2.2% of the total.



Source: SCDOT Crash Data, 2017-2023

Figure 3-4 Crash Proportion by Severity

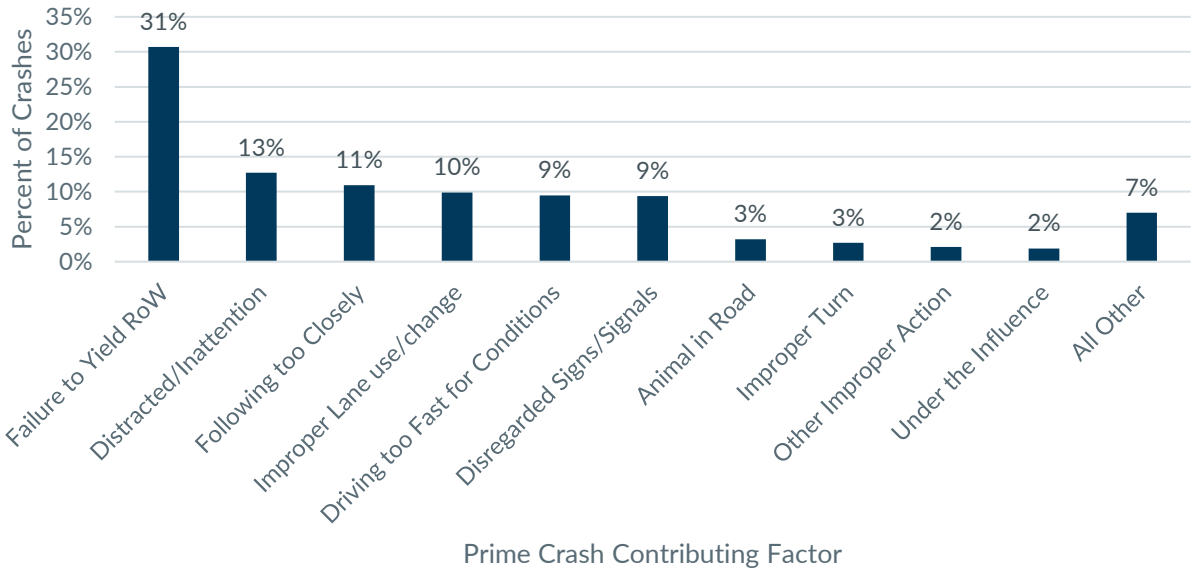
Figure 3-5 illustrates that between 2017 and 2023, the highest number of crashes in the study corridor occurred during the afternoon peak period (3:00 PM to 7:00 PM). There was also a noticeable increase of crashes in the morning peak period (7:00 AM and 9:00 AM).



Source: SCDOT Crash Data, 2017-2023

Figure 3-5 Crash Counts by Time of Day

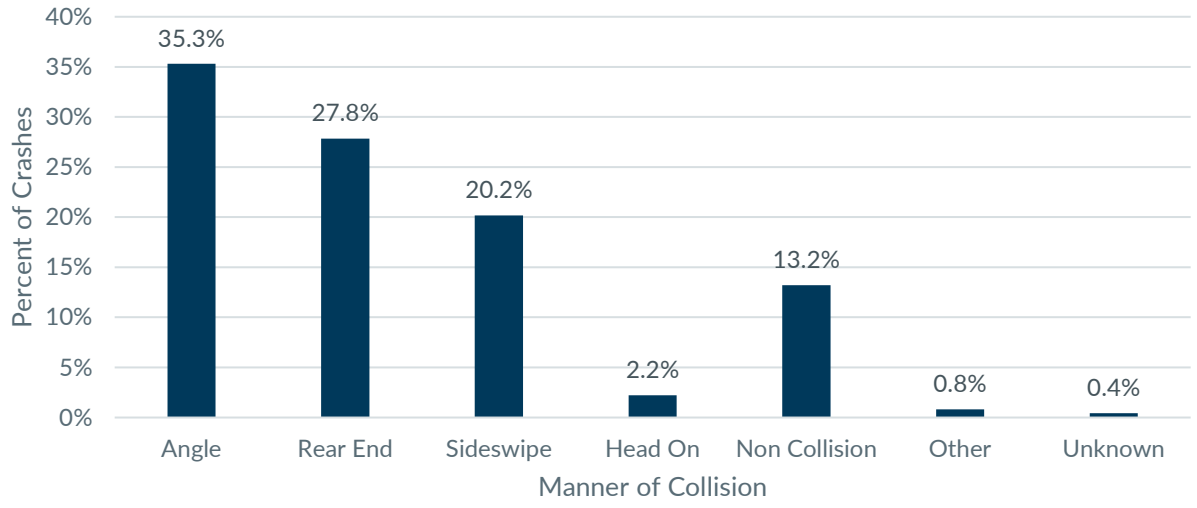
Figure 3-6 shows the proportion of primary contributing factors for crashes along Bluffton Parkway. Failure to yield the right of way was found to be the most common (31%) contributing factor, followed by driver distraction/inattention (13%). Other top contributing factors include following too closely, improper lane use, and driving too fast for conditions.



Source: SCDOT Crash Data, 2017-2023

Figure 3-6 Crash Proportion by Prime Contributing Factor

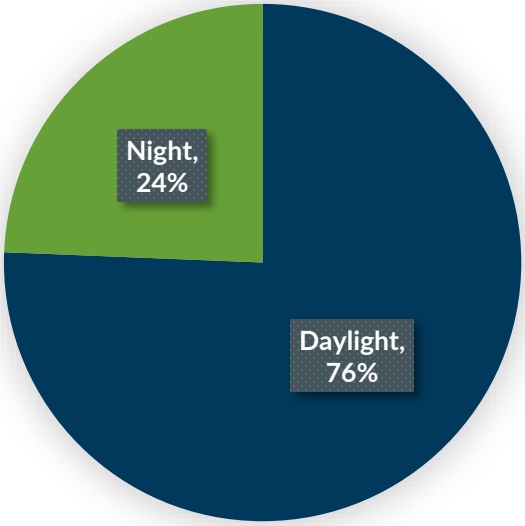
Figure 3-7 indicates that the most common crash type along the study corridor between 2017 and 2023 was angle crashes, comprising 35.3% of all incidents. Rear-end collisions accounted for approximately 27.8%, while sideswipe crashes made up 20.2% of the total.



Source: SCDOT Crash Data, 2017-2023

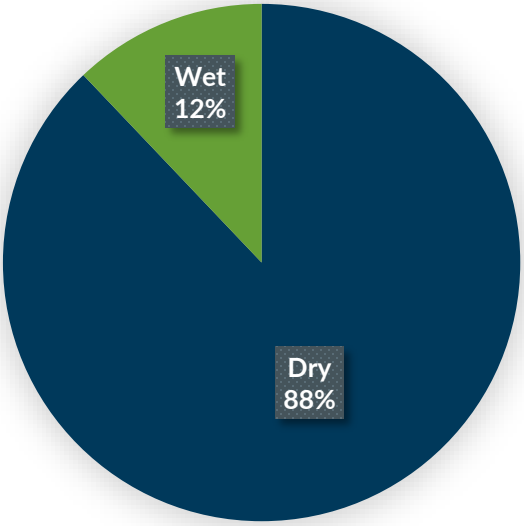
Figure 3-7 Crash Proportion by Manner of Collision

Figure 3-8 shows out of the total crashes that occurred, a majority (76%) occurred during daylight. **Figure 3-9** shows out of the total crashes that occurred, a majority (88%) occurred when the road surface was dry and the remaining 12% occurred when the road surface was wet. **Figure 3-10** shows that only 7% of all crashes involved a speeding driver as a contributing factor.



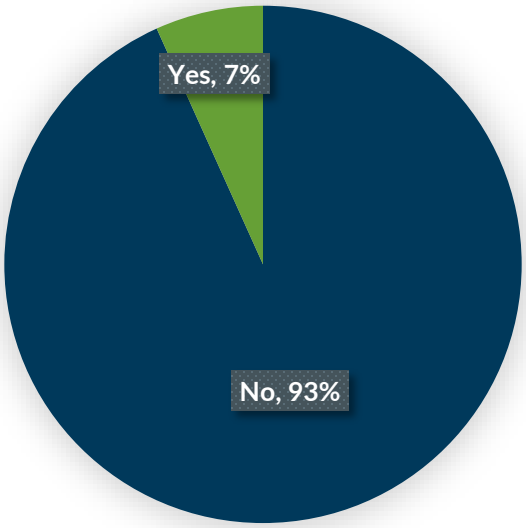
Source: SCDOT Crash Data, 2017-2023

Figure 3-8 Crash Proportion by Light Condition



Source: SCDOT Crash Data, 2017-2023

Figure 3-9 Crash Proportion by Road Surface Condition



Source: SCDOT Crash Data, 2017-2023

Figure 3-10 Crash Proportion by Speeding

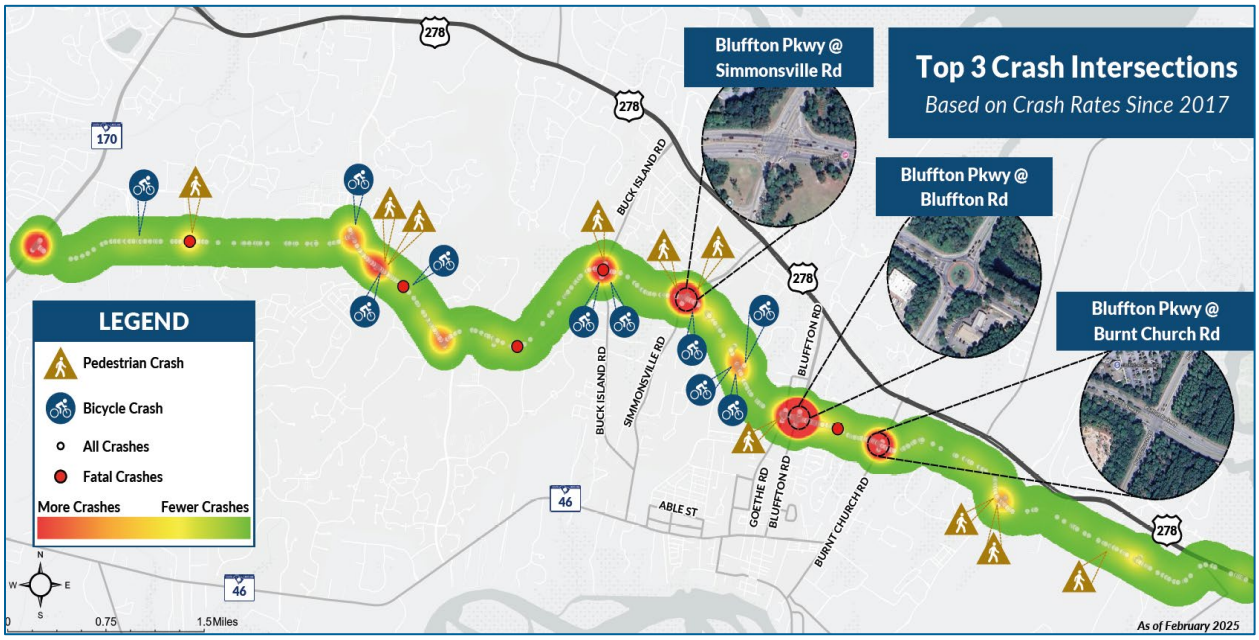
Crash Hotspots

The crash hotspot analysis was conducted using ArcGIS Pro and the Kernel Density function, applying the cleaned crash frequency data to identify high-crash areas within the study corridor. The Kernel Density tool calculates and illustrates the density of crash events across a specified area, In this case, it was used to pinpoint high density crash locations, or “hotspots”, to help identify specific locations for potential safety improvements. Hotspots were identified for crashes occurring within intersections as well as crashes occurring along roadway segments.

Vehicular Crashes

Figure 3-11 displays crash hotspots within the study corridor, with crash frequencies increasing from green (low) to red (high). Red dots in the figure indicate the locations of the five fatal crashes along the study corridor.

The hotspot analysis demonstrates that the roundabout at the intersection of Bluffton Parkway and Bluffton Road has the greatest number of crashes followed by the intersection of Bluffton Parkway and Goethe Road. Other locations with elevated crash frequencies include the intersections with S.C. 170 (Okatie Highway), Buck Island Road, Simmonsville Road, Burnt Church Road, and the Buckwalter Parkway segment between both segments of Bluffton Parkway. **Figure 3-11** also highlights the bicycle and pedestrian crash locations along the study corridor. A total of 26 crashes Involving pedestrians or bicyclists were recorded.



Source: SCDOT Crash Data, 2017-2023

Figure 3-11 Vehicular and Bicycle/Pedestrian Crash Hotspots

4.0 Crash Rate Analysis

Intersection

Table 4-1 presents intersection crash rates along the study corridor. Crash rates were calculated using crash counts and traffic volumes collected in the Fall of 2024. The top five intersections with the highest crash rates are highlighted in the table, presented in crash counts per 100 million entering vehicles (MEV). These locations align with the crash hotspots identified in the previous section based on crash frequency.

Table 4-1 Intersection Crash Rates

Intersection	Intersection Crash Counts	Crash Rate per 100 MEV
S.C. 170 (Okatie Highway)	93	93.1
Station Parkway	4	7.5
River Ridge Drive	13	20.9
Hampton Parkway	37	56.8
Inspiration Avenue	5	8.4
Innovation Drive	8	13.3
Buckwalter Parkway	45	50.6
Carolina Bluff Drive	60	67.1
Shell Hall Drive	14	18.6
Bluffton Parkway	49	54.5
Crossings Boulevard	15	19.6
Trotting Hill Lane	5	6.6
Buck Island Road	84	89.1
Simmonsville Road	137	128.3
Oliver Court	27	29.7
Scott Way	9	10.9
Persimmon Street	26	29.9
Red Cedar Street	49	56.1
Goethe Road	66	86.1
Bluffton Road (SC 46)	458	441.5
Bluestone Apartment Road	16	28.7
Burnt Church Road	109	134.2
Centre Drive	8	12.6
Tanger Driveway	14	22.8
Malphrus Road	43	61.9
Kellie Court	10	20.7
Buckingham Plantation Drive	20	38.9

Segment

Table 4-2 presents crash rates for different segments along the study corridor. Rates were calculated using crash counts, average daily traffic (ADT), and the length of the segment. The top five segments with the highest crash rates are highlighted in the table. The overall average crash rate for all segments is 45.04 crashes per 100 million vehicle miles traveled (MVMT).

Table 4-2 Segment Crash Rates

Start	End	Length (mi)	Segment Crashes	Crash Rate Per 100 MVMT
S.C. 170 (Okatie Highway)	Station Parkway	0.321	2	11.7
Station Parkway	River Ridge Drive	0.429	8	34.1
River Ridge Drive	Hampton Parkway	0.471	15	59.9
Hampton Parkway	Inspiration Ave	0.771	13	27.9
Inspiration Ave	Innovation Drive	0.194	3	26.2
Innovation Drive	Buckwalter Parkway	0.284	6	45.9
Buckwalter Parkway	Carolina Bluff Dr	0.305	28	120.2
Carolina Bluff Drive	Shell Hall Dr	0.507	32	82.9
Shell Hall Drive	Bluffton Parkway	0.244	15	83.8
Bluffton Parkway	Crossings Boulevard	0.461	12	40.9
Crossings Boulevard	Trotting Hill Lane	0.740	12	21.7
Trotting Hill Lane	Buck Island Road	0.325	11	45.1
Buck Island Road	Simmonsville Road	0.683	27	55.5
Simmonsville Road	Oliver Court	0.223	10	54.7
Oliver Court	Scott Way	0.148	2	16.9
Scott Way	Persimmon Street	0.166	0	0.0
Persimmon Street	Red Cedar Street	0.150	0	0.0
Red Cedar Street	Goethe Road	0.500	6	18.0
Goethe Road	S.C. 46 (Bluffton Rd)	0.102	0	0.00
S.C. 46 (Bluffton Rd)	Bluestone Apartment Rd	0.440	11	39.6
Bluestone Apartment Road	Burnt Church Road	0.234	15	115.1
Burnt Church Road	Centre Drive	0.319	10	51.1
Centre Drive	Tanger Driveway	0.390	4	17.2
Tanger Driveway	Malphrus Road	0.440	16	62.4
Malphrus Road	Kellie Ct	0.946	14	27.6
Kellie Court	Buckingham Plantation Drive	0.211	16	157.0

5.0 Site-Specific Analysis and Recommendations

Intersection Analysis

From all the intersections along the study corridor, the five intersections with the highest crash rates were chosen for further analysis. These intersections were ranked based on the severity of crashes using the KABCO scale, with priority given to those with the highest number of KAB (fatal and injury-related) crashes. If two intersections had the same number of KAB crashes, the one with the higher total number of crashes was ranked higher.

The KABCO scale corresponds to the severity of the injuries as assessed by law enforcement responding to investigate the scene as follows:

- K = A victim was killed.
- A = The victim suffered incapacitating injuries that require hospitalization and/or transport for medical care.
- B = Injuries to victims were evident to officers at the scene, but they were non-disabling lacerations, scrapes, or minor bruises.
- C = A victim suffered possible injuries.
- O = There were no apparent injuries involved in the crash.

For purposes of this analysis, only KAB severity injuries were assessed.

Table 5-1 details the characteristics of each intersection, along with crash severity and total crash counts. If applicable, intersection control type (stop controlled, signalized or roundabout) was noted. Roadway striping conditions were assessed as either good, fair, worn, or no striping:

- Good: Clearly visible, unbroken striping
- Fair: Faded striping with moderate wear
- Worn: Poor visibility due to heavy fading
- No striping: Absent markings

Traffic signs were present at most intersections. Median types could be divided or undivided, with some intersections having a divided median only on the major road. Intersections were also assessed for crosswalks and sidewalks to support pedestrians and bicyclists.

Table 5-1 presents crash counts by severity at each intersection, along with total crash counts. Among the five intersections analyzed, one fatal injury crash occurred at the intersection of Bluffton Parkway and Buck Island Road. This intersection also had the second highest number of fatal, serious, and minor injury crashes. The highest number of fatal, serious, and minor injury crashes occurred at the intersection of Bluffton Parkway and Simmonsville Road.

Table 5-1 identifies the most common manner of collision occurring at each intersection. The most common crash types at signalized and unsignalized intersections were angle crashes and rear end crashes. At the roundabout intersection of Bluffton Parkway and Bluffton Road, the dominant crash type was same direction sideswipe crashes.

Bicycle and Pedestrian Crashes

Pedestrian and bicycle related crashes were observed at Bluffton Parkway and Buck Island Road, and Bluffton Parkway and Simmonsville Road. **Figure 3-11** also highlights the bicycle and pedestrian crash locations along the study corridor. A total of 26 crashes Involving pedestrians or bicyclists were recorded. These included one fatal, four serious injury crashes, 13 minor injury crashes, seven possible injury crashes, and one property damage only pedestrian and bicycle crash. The top three locations with the highest number of pedestrian and bike crashes are as follows:

1. Buckwalter Parkway and Lake Point Dr (six crashes – one serious injury [KABCO type A], four minor injury [KABCO type B], one possible injury [KABCO type C])
2. Buckwalter Parkway segment between Lake Point Dr and Shell Hall Dr (three crashes – one fatal [KABCO type K], one serious injury [KABCO type A], one possible injury [KABCO type C])
3. Bluffton Parkway and Simmonsville Rd (three crashes –one serious injury [KABCO type A], one possible injury [KABCO type C], one no injury [KABCO type O])

Table 5-1 Intersection Site Conditions

Rank	Intersection Name	On Curve	Intersection Control	Striping	Traffic Sign	Median Type	Sidewalk/ Crosswalk	Total Crashes	Total KAB Crashes	Dominating Type of Crash	Ped/ Bike Crash
1	Bluffton Parkway and Simmonsville Rd	Yes	Signalized	Good	Present	Divided (major road)	Yes, both, full	137	16	Angle Crash (47%)	3
2	Bluffton Parkway and Buck Island Rd	No	Signalized	Good	Present	Divided (major road)	Yes, both, partial	84	15 (1 K)	Angle Crash (50%)	2
3	Bluffton Parkway and Bluffton Rd	No	Roundabout	Good	Present	Divided	Yes, both, full	458	8	Same Direction Sideswipe (49%)	0
4	Bluffton Parkway and Okatie Highway	No	Signalized	Good	Present	Divided	Yes, both, full	93	8	Rear End (62%)	0
5	Burnt Church Rd	No	Signalized	Good	Present	Divided (major road)	Yes, both, partial	109	6	Angle Crash (57%)	0

Segment Analysis

For each of the five segments with the highest crash rates, roadway characteristics are detailed in **Table 5-2.** This includes the segment length, site description, curve presence, striping condition, signage presence, number of lanes, lane width, shoulder width, and median width. The segments were ranked using a method similar to the intersection ranking i.e. segments with higher number of KAB crashes (fatal, serious, and minor injuries) were ranked higher.

Table 5-2 also shows the crash counts by severity for each segment, along with total crash counts. Among all five segments, the one between Carolina Bluff Drive and Shell Hall Drive recorded the only fatal injury crash. This segment also had the highest number of fatal, serious, and minor injury crashes, the highest total number of crashes, and three pedestrian and bicycle related crashes. The segment from Buckwalter Parkway to Carolina Bluff Drive had the second highest total crash count.

Table 5-2 shows the manner of collision for the segment locations. The most common crash types were angle crashes and rear end crashes.

Table 5-2 Roadway Segment Conditions

Rank	Description and Length (mi)	On Curve	Posted Speed Limit	Striping	Traffic Sign	No. of Through Lane	Lane Width (ft)	Shoulder Width (ft)	Median Width (ft)	Total Crashes	Total KAB Crashes	Dominating Type of Crash	Ped/ Bike Crash
1	Carolina Bluff Dr to Shell Hall Dr (0.507)	No	45 EB 45 WB	Good	Present	2	12	0	10-30	32	4 (1 K)	Rear End and Non-Collision (26% Each)	3
2	Kellie Ct to Buckingham Plantation Drive (0.211)	No	45 EB 45 WB	Good	Present	2	12	0	20	16	3	Angle Crash (50%)	0
3	Buckwalter Pkwy to Carolina Bluff Dr (0.305)	No	45 NB 45 SB	Good	Present	2	12	0	24-36	28	2	Angle Crash (39%)	0
4	Shell Hall Dr to Bluffton Pkwy (0.244)	Yes	45 NB 45 SB	Good	Present	2	12	0	6-10	15	1	Rear End (73%)	0
5	Bluestone Apt Rd to Burnt Church Rd (0.234)	No	45 NB 45 SB	Good	Present	2	12	0	16	15	1	Rear End (38%)	0

Site-Specific Contributing Factors and Recommended Countermeasures

Based on review of crash patterns and roadway features at all intersection and segment locations, the study team summarized the identified problems, relevant roadway characteristics, and recommended near- and long-term strategies for safety improvement as shown in **Table 5-3**. The recommended strategies were selected from the Highway Safety Improvement Program (HSIP) guidance by Federal Highway Administration (FHWA) with documented crash modification factors (CMFs) used to estimate their effectiveness. It is important to note that only site locations where a dominant crash pattern or addressable roadway characteristic were included in the summary table, where an applicable safety countermeasure could be recommended. Those recommended countermeasures that coincide with the 2024 LCOG Safety Action Plan are noted in **blue italics*.

Table 5-3 Site-Specific Near- and Long-Term Strategies

Location and Type	Identified Problems	Description	Near-Term Strategies	Long-Term Strategies
Intersection: Bluffton Parkway and Okatie Highway	62% Rear End Crashes	Signalized intersection	- Improve Signal Timing (CMF 0.76) - Advance Warning Sign (CMF 0.95)	- Increase Capacity (CMF 0.72)
Intersection: Bluffton Parkway and Buck Island Road **also Identified in the 2024 LCOG Safety Action Plan (Beaufort-S-07.2)*	50% Angle Crashes	Signalized Intersection with no median on the minor approach	- Improve Signal Timing and Phasing (CMF 0.76) - Install Pedestrian Beacon (CMF 0.85)	- Increase Capacity (CMF 0.72) - Install Raised Median on the Minor Road (CMF 0.75)
Intersection: Bluffton Parkway and Simmonsville Road **also Identified in the 2024 LCOG Safety Action Plan (Beaufort-S-07.3)*	50% Angle Crashes	Signalized Intersection with no median on the minor approach	- Improve Signal Timing and Phasing (CMF 0.76) - Install Pedestrian Beacon (CMF 0.85)	- Install Raised Median on the Minor Road (CMF 0.75)

Location and Type	Identified Problems	Description	Near-Term Strategies	Long-Term Strategies
Intersection: Bluffton Parkway and Bluffton Road	49% Same Direction Sideswipe Crashes	Two Lane Roundabout	- Advance Warning Sign (CMF 0.95)	- Adding Right Turn Bypass Lane (CMF 0.75)
Intersection: Bluffton Parkway and Burnt Church Road **also Identified in the 2024 LCOG Safety Action Plan (Beaufort-S-07.8)*	57% Angle Crashes	Signalized Intersection with no median on the minor approach	- Improve Signal Timing and Phasing (CMF 0.76) - Advance Warning Sign (CMF 0.95)	- Install Raised Median on the Minor Road (CMF 0.75)
Segment: Carolina Bluff Drive to Bluffton Parkway **also Identified in the 2024 LCOG Safety Action Plan (Beaufort-N-04)*	26% Rear End and 26% Non-Collision Crashes	No Shoulder	- Install Rumble Strips (CMF 0.85) - Presence of Pedestrian Crosswalk at Midblock Locations (CMF 0.82)	- Install Paved Shoulder (CMF 0.75)

Location and Type	Identified Problems	Description	Near-Term Strategies	Long-Term Strategies
Intersection: Buckwalter Parkway and Lake Point Dr (For Pedestrian Crashes) **also Identified in the 2024 LCOG Safety Action Plan (Beaufort-S-06.3)*	6 Pedestrian Bicycle Related Crashes	Signalized Intersection	- Improve Signal Timing and Phasing (CMF 0.76) - Improve Pedestrian Signal Timing (CMF 0.84) - Install Pedestrian Beacon (CMF 0.85)	- Install Raised Median on the Minor Road (CMF 0.75)