Highway Factors Group Attachment – SR A1A Safety Review Study 2013

Ft Lauderdale, FL

HWY18FH013

(33 pages)

Safety Reviews

SR A1A\Fort Lauderdale Beach Blvd. from Mercedes River Small Bridge to SR 838 (Sunrise Boulevard)

Section No: multiple Mileposts: N.A.
3R Project FM No. 430601-1-52-1
Safety Review FM No. 230094-5-32-1
Task Work Order No. 16

Prepared for

Florida Department of Transportation
District Four Traffic Operations Office
Safety Section

First Submittal: April 30, 2012
Revised Submittal: March 11, 2013

Prepared by

Kimley-Horn and Associates, Inc.

Project Manager: Suzanne Danielsen, P.E.

Engineers Certification

I, J. Suzanne Danielsen, P.E. # 42533, certify that I currently hold an active Professional Engineers License in the State of Florida and am competent through education or experience to provide engineering services in the civil and traffic engineering disciplines contained in this plan, print, specification or report. I further certify that this 3R Safety Review was prepared by me or under my responsible charge as defined in Chapter 61G15-18.001 F.A.C. and that all statements, conclusions and recommendations made herein are true and correct to the best of my knowledge and ability.

Study Roadway:	**SR A1A\Fort Lauderdale Beach Boulevard**
Section Nos.:	**86050000, 8600500, 86050100, 86180000**
Project Start:	**Mercedes River Small Bridge**
Project End:	**SR 838 (Sunrise Boulevard)**
Project Location:	**Broward County, Florida**

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10.27.14

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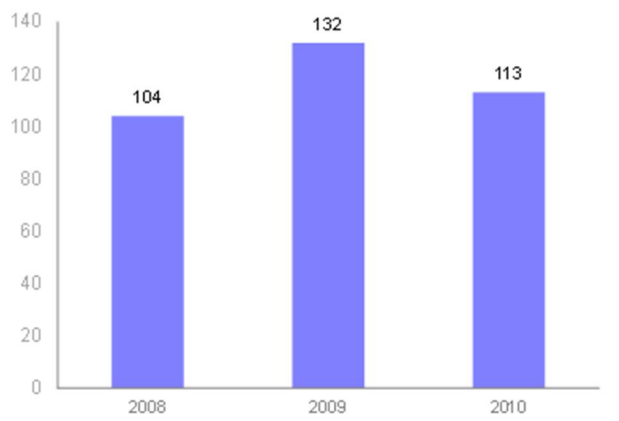
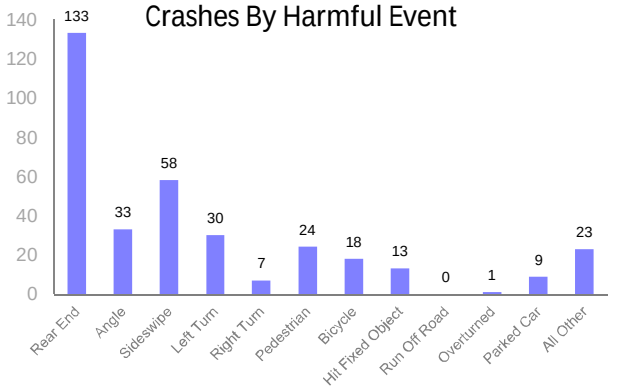
3R SAFETY REVIEW SUMMARY

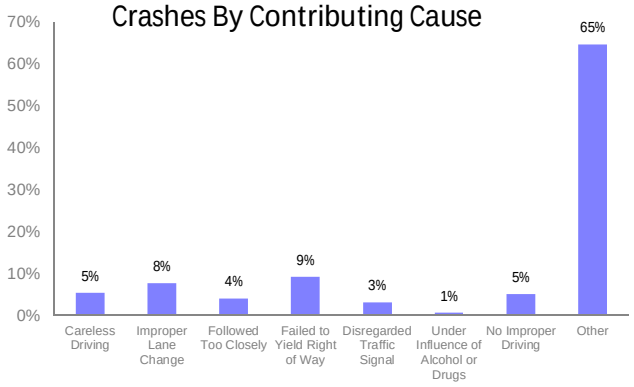
Crashes By Year



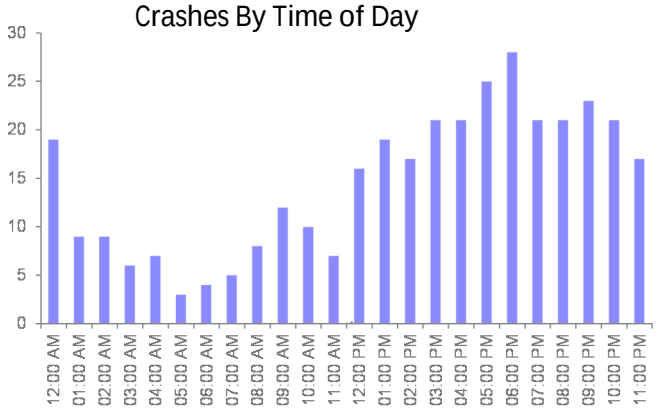
Crashes By Harmful Event



Crashes By Contributing Cause



Crashes By Time of Day



CONCLUSIONS AND RECOMMENDATIONS

Based upon crash data review and analysis, and field reviews, the following conclusions were identified for 3R project # 430601.1 on State Road A1A:

- A total of 349 crashes occurred between January 2008 and December 2010. These crashes included 155 injury crashes and four fatal crashes.
- Overall, the crashes are spread within project limits. The percentage of dark condition crashes is higher than the statewide average (46 percent vs. 34 percent).
- There were 24 pedestrian crashes (7 percent) and 18 bicycle crashes (5 percent).
- Saturdays and Sundays had a higher frequency of crashes than the weekdays.

Based upon results of the study, we recommend the following:

- The Traffic Operations Office is in the process of completing a Road Safety Audit (RSA) on SR A1A between SR 842 (Las Olas Boulevard) and Vistamar Street. Pedestrian and bicycle safety is a main focus area of this RSA. The Traffic Operations Office should coordinate with the 3R project manager to identify RSA recommendations that may be implemented through the 3R project.
- Conduct a vulnerable road user safety study for SR A1A between Mercedes River Small Bridge and SR 842 (Las Olas Boulevard).
- The Traffic Operations Office should request the Community Traffic Safety Team (CTST) Coordinator to inform law enforcement agencies of high incidence of crashes due to alcohol/drug use within project limits.
- Analyze congestion related crashes and evaluate if ATMS upgrades such as communication enhancements and improved detection capabilities could lead to cost-effective crash reductions.

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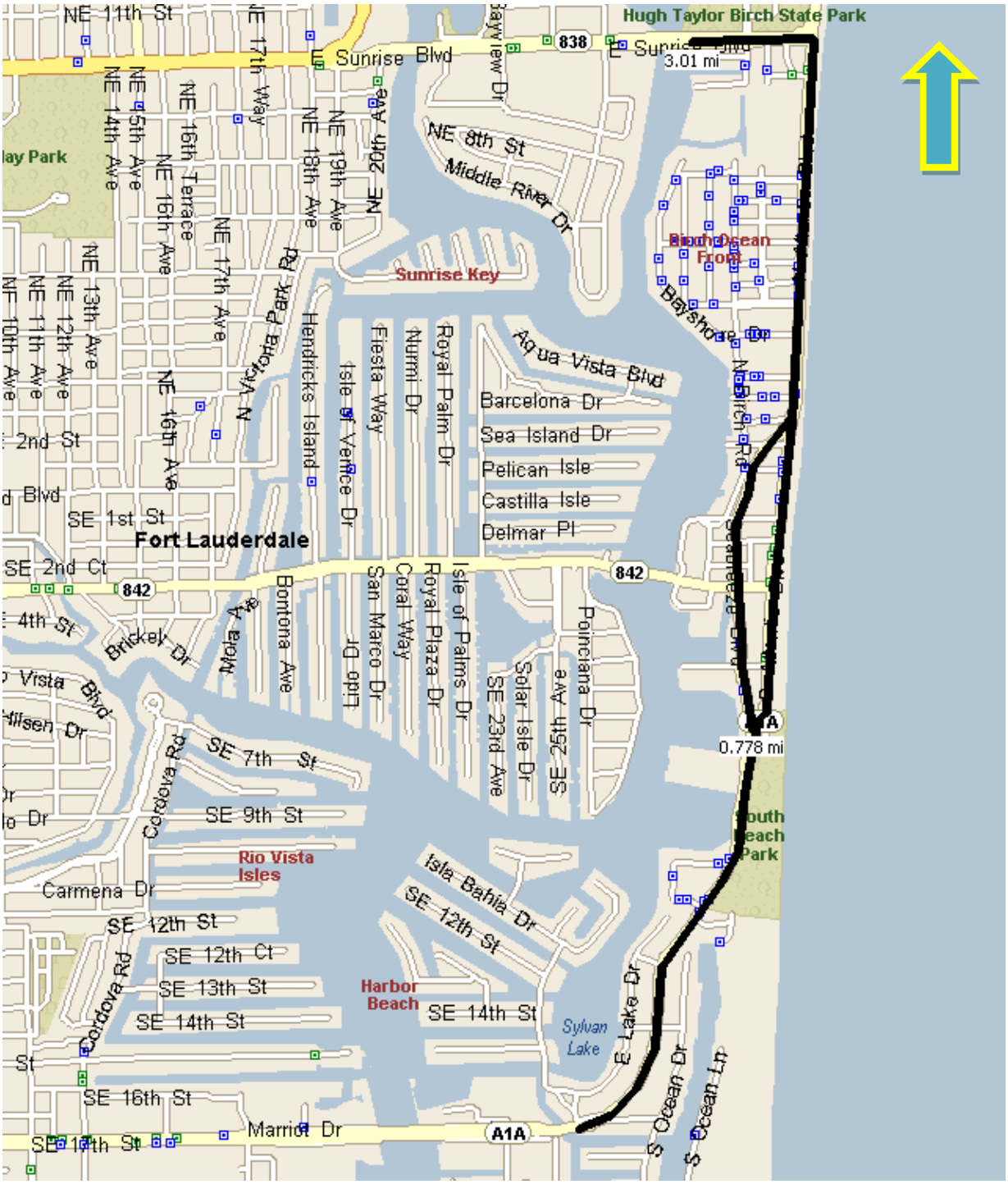
INTRODUCTION

The Florida Department of Transportation (FDOT) – District Four has retained Kimley-Horn and Associates, Inc. to perform safety reviews under a districtwide contract specific to 3R (resurfacing, restoration, and rehabilitation) projects. State Road A1A from the Mercedes River Small Bridge to SR 838 (Sunrise Boulevard) in Broward County is the focus of this 3R Safety Review. A project location map is included as Figure 1.

The purpose of this memorandum is to identify and document roadway safety issues which require further evaluation within a detailed safety report and those that should be considered for resolution within the 3R scope for the subject corridor. It is our understanding that the Engineer of Record (EOR) for the subject project is tasked with evaluating horizontal and vertical roadway design elements (such as clear zone and sight distance requirements, cross slopes, side slopes, drainage, turn radii, etc.) during the design phase and implementing corrective actions as outlined in the Department's Plans Preparation Manual and design standards. As such, the scope of this 3R Safety Review does not include analysis of roadway design elements.

This evaluation includes a summary of existing roadway characteristics, coordination with local stakeholders, a review of historic crash data for the most recent 3-year period, and a field review during peak crash period(s) to identify probable causes for identified crash patterns. Based upon the data collected and analyzed, safety recommendations were identified for implementation in the 3R project or for further study.

Figure 1: Location Map



Source: Microsoft Streets & Trips

ROADWAY CHARACTERISTICS

Roadway characteristics of the study corridor were compiled from numerous sources including FDOT's Roadway Characteristics Inventory (RCI) database, 2010 Florida Traffic Information Database, and field reviews. Table 1 summarizes roadway characteristics of the SR A1A corridor.

Table 1: Roadway Characteristics

Section/Milepost Limits	86050000/2.040-3.320 86005000/0.750-1.190 86050100/0.000-0.926 86180000/1.540-2.960	
State Road No./Name(s)	State Road A1A	
Roadway Type/Orientation	Four lane north-south roadway	
Functional Classification	Urban minor arterial	
FDOT Access Classification	Access class 7	
Speed Limit	35 mph south of Harbor Drive, 30 mph north of Harbor Drive	
Signalized Intersections	19 signalized intersections (including pedestrian signals)	
Lighting	Decorative and standard lighting	
Drainage	Curb and gutter	
2010 Traffic Volumes - Daily(vpd)/AM Peak (vph)/ PM Peak(vph)	South of SR 838: 31,500/1,450/2,850 South of SR 842 (NB): 13,800/725/1,180 South of SR 842 (SB): 16,000/950/1,150	
Pedestrian Facilities	Sidewalks	Both sides
	Crosswalks	Mid-block and at intersections
Bicycle Facilities	Designated bike lanes provided along SR A1A	
Transit Service/Facilities	Route(s)	BCT Routes 11 and 40

STAKEHOLDER COORDINATION

In an effort to gain current perspectives and needs regarding operation of the corridor under study, input was sought from the following stakeholders:

- Broward County Traffic Engineering Division
- City of Fort Lauderdale Engineering and Police Departments
- Fort Lauderdale Beach Community Redevelopment Area (CRA)

The above agencies were contacted Thursday, April 26, 2012. The Fort Lauderdale Beach CRA was again contacted Tuesday, March 5, 2013. The Broward County Traffic Engineering Division (BCTED) provided the following comments, which are primarily facility improvements:

- SE 17 St and Eisenhower - Replace mast arms due to the excessive corrosion, re-utilize existing foundations.
- SE 17 St and 23 Avenue - Replace mast arms due to the excessive corrosion, re-utilize existing foundations.

City of Fort Lauderdale planning and engineering staff offered the following:

- The City is currently taking on various efforts that have to do with public realm improvements along this corridor especially as it relates to the Central Beach. Beach CRA staff is working directly with a team of consultants that are undertaking conceptual designs for streetscape improvements. In addition the City's Transportation and Mobility Department is working on various related efforts looking at Greenway opportunities as well as reducing speeds, and creating a more walkable, pedestrian-friendly environment.

We have not received comments from the Fort Lauderdale Beach CRA.

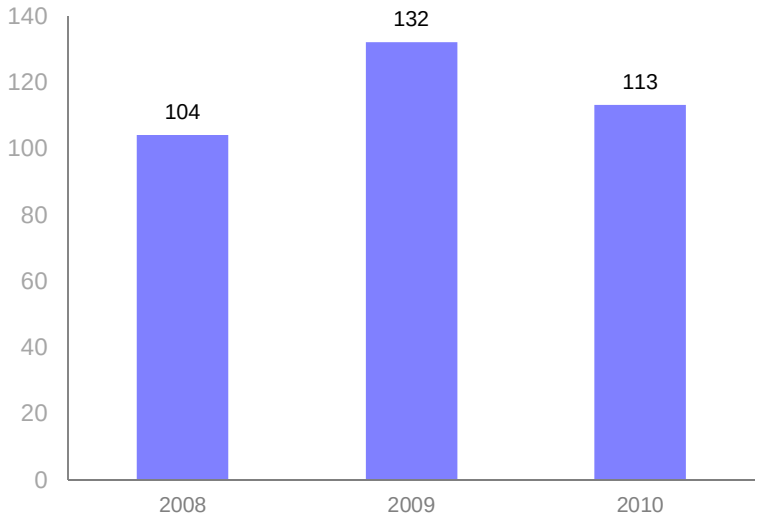
CRASH DATA ANALYSIS

Crash data for the most recent three years (2008-2010) available from the Department's Crash Analysis Reporting (CAR) system database were utilized. A cursory review of police crash reports was performed to verify accuracy of the electronic crash database for angle and "all other" crashes. FDOT's high crash location and high crash segment lists were reviewed, the results of which are summarized in a later section of this report.

Crashes by Year

A total of 349 crashes occurred within the study corridor between January 2008 and December 2010. These crashes included 155 injury crashes and four fatal crashes.

Figure 2: Crashes by Year



Crashes by Type

As shown in Figure 3 and Table 2, the most frequent crash types are rear end (38 percent) and sideswipe (17 percent). Further, there were 24 pedestrian crashes (7 percent) and 18 bicycle crashes (5 percent).

Figure 3: Crashes by Harmful Event

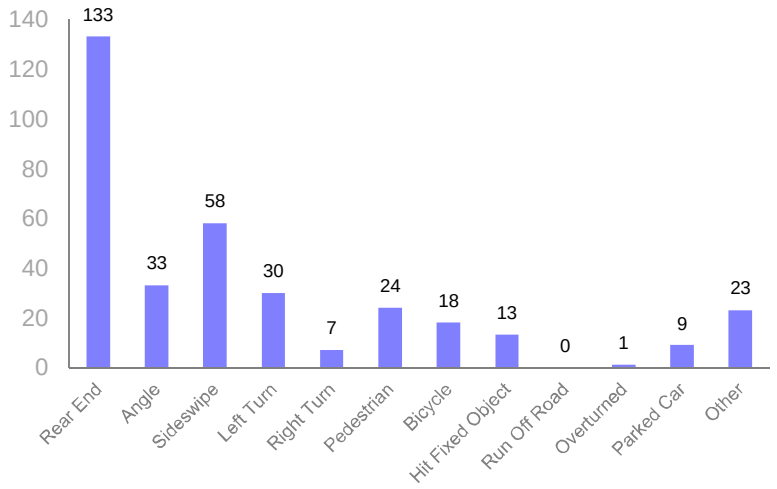


Table 2: Crashes by Harmful Event

Crash Type	Number of Crashes	Percent of Crashes
Rear End	133	38%
Angle	33	9%
Left-Turn	30	9%
Right-Turn	7	2%
Sideswipe	58	17%
Pedestrian	24	7%
Bicycle	18	5%
Hit Fixed Object	13	4%
Run Off Road	0	0%
Overturned	1	0%
Parked Car	9	3%
Other	23	7%
Total	349	100%

Note: Due to rounding, cumulative percentage may not equal 100 percent.

Crashes by Contributing Cause

The most frequently cited contributing cause for the crashes is failure to yield right-of-way (9 percent).

Table 3: Crashes by Contributing Cause

Contributing Cause	Number of Crashes	Percentage
Careless Driving	19	5%
Improper Lane Change	27	8%
Following Too Closely	14	4%
Failure to Yield Right-of-Way	32	9%
Disregarding Traffic Signal	11	3%
Under Influence – Alcohol/Drugs	2	1%
No Improper Driving	18	5%
Other	226	65%
Total	349	100%

Crashes by Lighting Condition

Table 4 shows that 54 percent of crashes occurred during daylight conditions and 46 percent occurred during dark conditions. Overall, the percentage of dark condition crashes is higher than the statewide average (46 percent vs. 34 percent). While street lighting is present along SR A1A, street lights are turned off or reduced between June and October during turtle nesting season.

Table 4: Crashes by Lighting Condition

Lighting Conditions	Number of Crashes	Percent of Crashes
Daylight	187	54%
Dusk/Dawn	18	5%
Dark (Street Light)	140	40%
Dark (No Street Light)	3	1%
Unknown	1	0%
Total	349	100%

In January 2013 a report to retroactively justify current lighting conditions along SR A1A between SE 5th Street and NE 18th Street was finalized. Along the west side of SR A1A are 35-foot high cobra head style fixtures while 14.5-foot high fixtures were installed along the east side in 2012. Lighting fixtures on the west side of the street are turned off between June and October for turtle-nesting season as shields

installed on the cobra head fixtures have been deemed non-compliant with respect to turtle light requirements. The report concludes that the existing lighting system is justified and should remain. The report also shows that the number of nighttime crashes in 2012 between June and October increased in comparison to the same period of time in the two previous years.

Crashes by Surface Condition

As shown in Table 5, 89 percent of crashes occurred when the roadway surface was dry and nine percent when the surface was wet. The percentage of wet crashes is lower than the statewide average (9 percent vs. 14 percent). The 3R project may help to reduce wet pavement crashes through resurfacing of the pavement.

Table 5: Crashes by Surface Condition

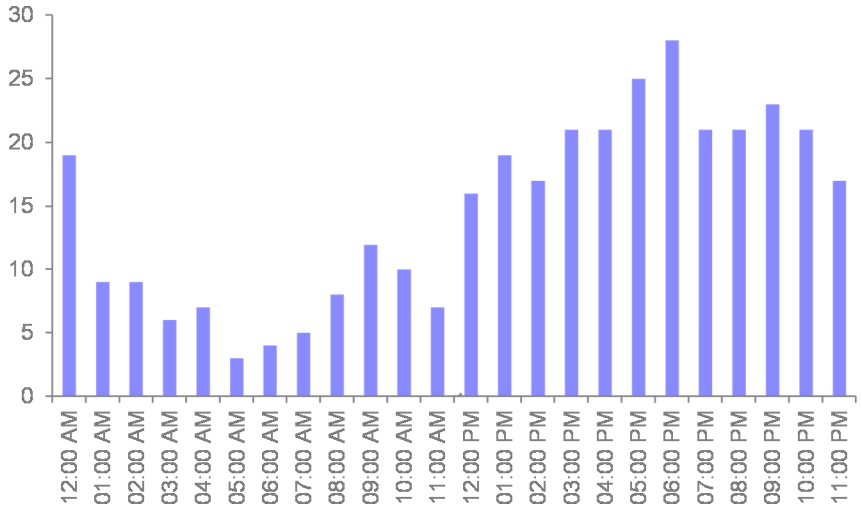
Surface Conditions	Number of Crashes	Percent of Crashes
Dry	312	89%
Wet	33	9%
Other	4	1%
Total	349	100%

Note: Due to rounding, cumulative percentage may not equal 100 percent.

Crashes by Time of Day

Figure 4 depicts the distribution of crashes by hour. The highest number of crashes occurred between 6:00 p.m. and 7:00 p.m. We recommend that the Traffic Operations Office analyze congestion related crashes and evaluate if Advance Traffic Management System (ATMS) upgrades (e.g., communication enhancements, improved detection capabilities, etc.) could lead to cost-effective crash reductions.

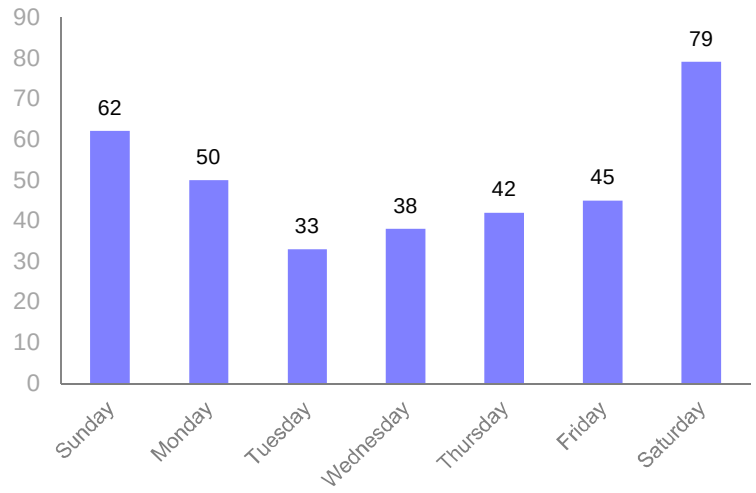
Figure 4: Crashes by Time of Day



Crashes by Day of Week

Figure 5 depicts the distribution of crashes by day of week. The frequency of crashes during weekends is higher than weekdays. Tourism related activities may be contributory to a high frequency of weekend crashes.

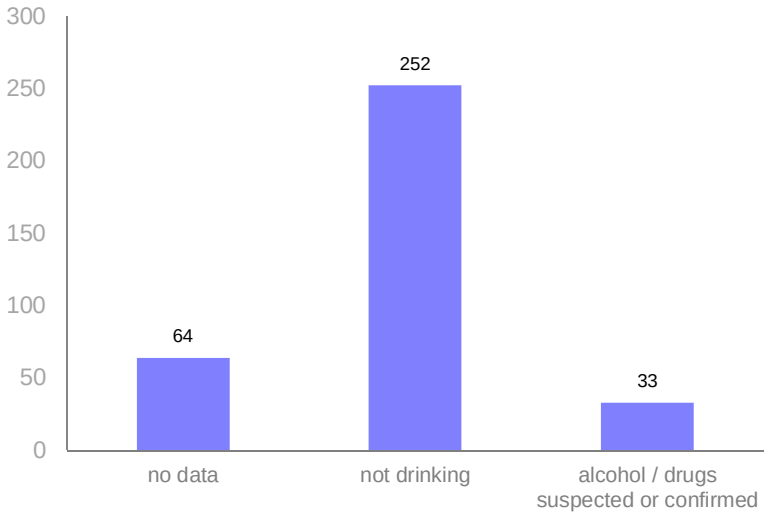
Figure 5: Crashes by Day of Week



Crashes by Alcohol/Drug Use

Figure 6 depicts the distribution of crashes by alcohol/drug use. Over nine percent of crashes are attributed to alcohol/drug use. Tourism related activities may be contributory to a high frequency of crashes due to alcohol/drug use. The Traffic Operations Office should request the Community Traffic Safety Team (CTST) Coordinator to inform law enforcement agencies of high incidence of crashes due to alcohol/drug use within project limits.

Figure 6: Crashes by Alcohol/Drug Use



Crashes by Location

Figure 7 depicts the distribution of crashes by location. In general, the crashes are spread throughout the corridor (instead of few locations with a very high frequency of crashes). Proximity to the beach and the presence of tourists may contribute to widespread crash occurrences noted within the project limits. The locations with 15 or more crashes include:

- Birch Road and SR 838/Sunrise Boulevard
- SR 838/Sunrise Boulevard and SR A1A
- SR 842/Las Olas Boulevard and SR A1A (Seabreeze Boulevard)
- SR 842/Las Olas Boulevard and SR A1A (NB)

Crashes at these locations are analyzed in detail later in this report.

Pedestrian and Bicycle Crashes

Figures 8 and 9 depict the distribution of pedestrian and bicycle crashes, respectively. Based on Figures 8 and 9, the following observations are made:

- Twenty four pedestrian crashes were reported within the study segment between 2008 and 2010. Four pedestrian crashes resulted in fatalities. Twenty-two pedestrian crashes occurred between Riomar Street and Holiday Drive.
- Eighteen bicycle crashes were reported within the study segment between 2008 and 2010. Eight bicycle crashes occurred between Vistamar Street and Bayshore Drive.

The Traffic Operations Office has completed the following studies that focused on pedestrian and bicycle crashes within project limits:

- As part of an FDOT contract selection assignment three consultant teams conducted Road Safety Audits (RSA) on SR A1A between SR 842 (Las Olas Boulevard) and Vistamar Street. Pedestrian and bicycle safety was a main focus area of these RSAs. The Traffic Operations Office's RSA consultant was tasked with consolidating the recommendations of the three teams into one document. The Traffic Operations Office should coordinate with the 3R project manager to identify RSA recommendations that may be implemented through the 3R project.
- The Traffic Operations Office conducted a Pedestrian Safety Assessment at the intersection of SR A1A and Alhambra Circle. Traffic Operations staff should be contacted for further detail.

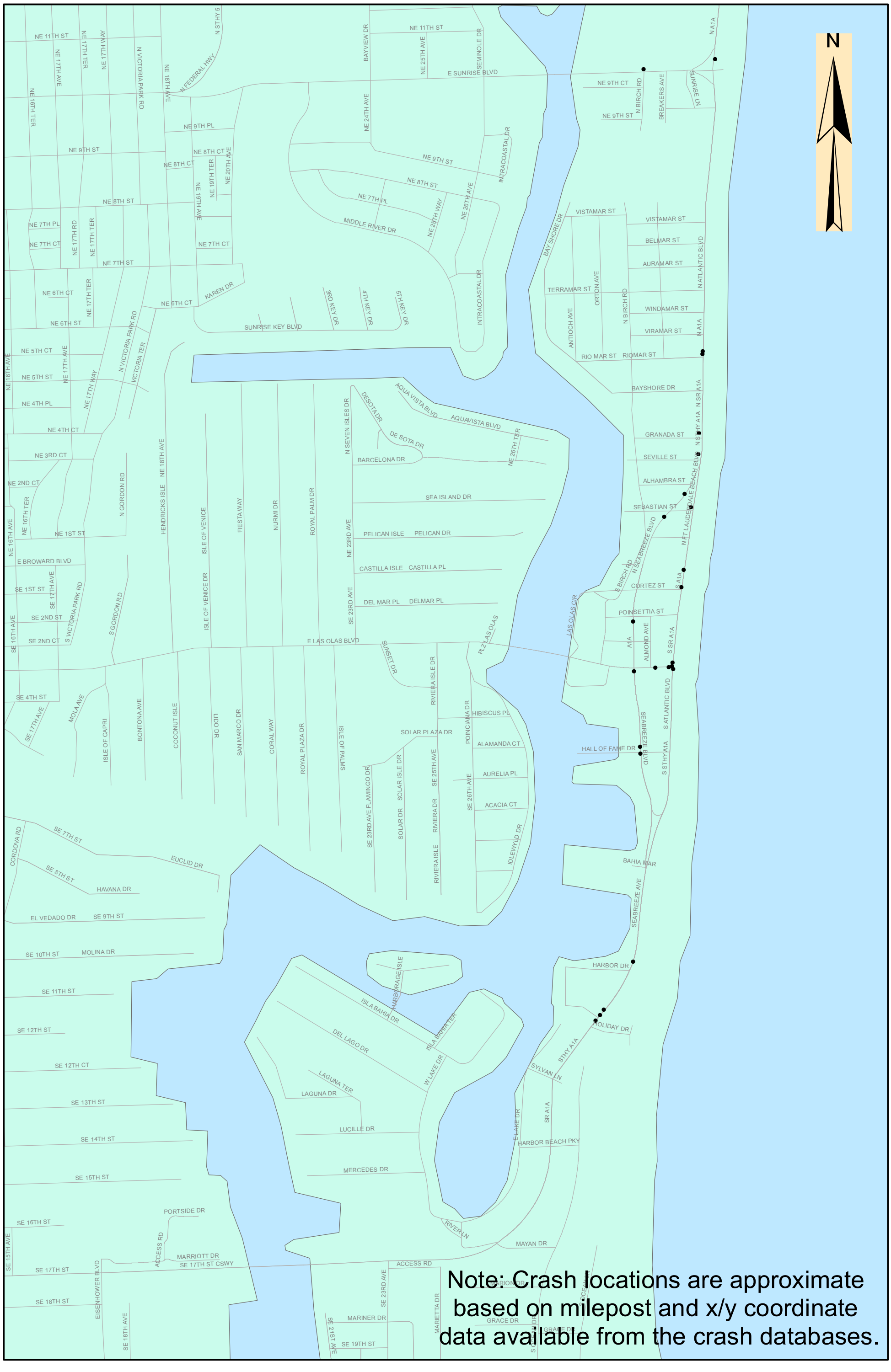
As shown in Figures 8 and 9, six pedestrian crashes and five bicycle crashes occurred between Mercedes River Small Bridge and SR 842 (Las Olas Boulevard). Further, three out of six pedestrian crashes within this segment resulted in fatalities (see Figure 10). Therefore, we recommend a vulnerable road user safety study for SR A1A between Mercedes River Small Bridge and SR 842 (Las Olas Boulevard).

Fatal Crashes

Figure 10 depicts the distribution of fatal crashes. There were four fatal crashes within the study corridor between 2008 and 2010. All four fatal crashes involved pedestrians. Three fatal crashes occurred during dark (with street light) conditions and one fatal crash occurred at dusk. Two fatal crashes occurred in the vicinity of Harbor Drive (south). The Traffic Operations Office reviews fatal crashes through a separate contract and recommends engineering countermeasures if warranted.

Figure 7: Crashes within 3R Project 430601 (SR A1A)

Figure 8: Pedestrian Crashes within 3R Project 430601 (SR A1A)



Note: Crash locations are approximate based on milepost and x/y coordinate data available from the crash databases.

Figure 9: Bicycle Crashes within 3R Project 430601 (SR A1A)

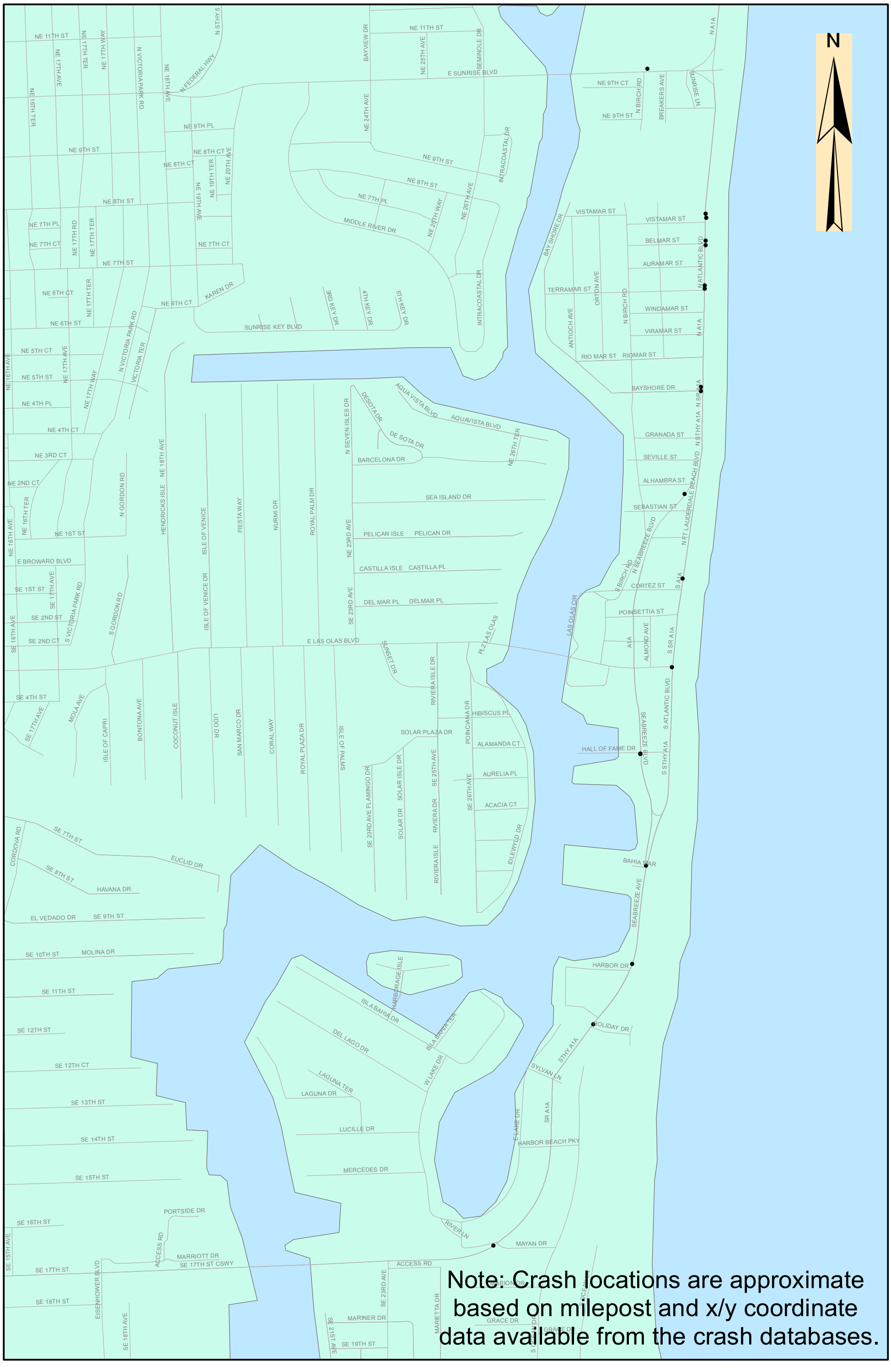
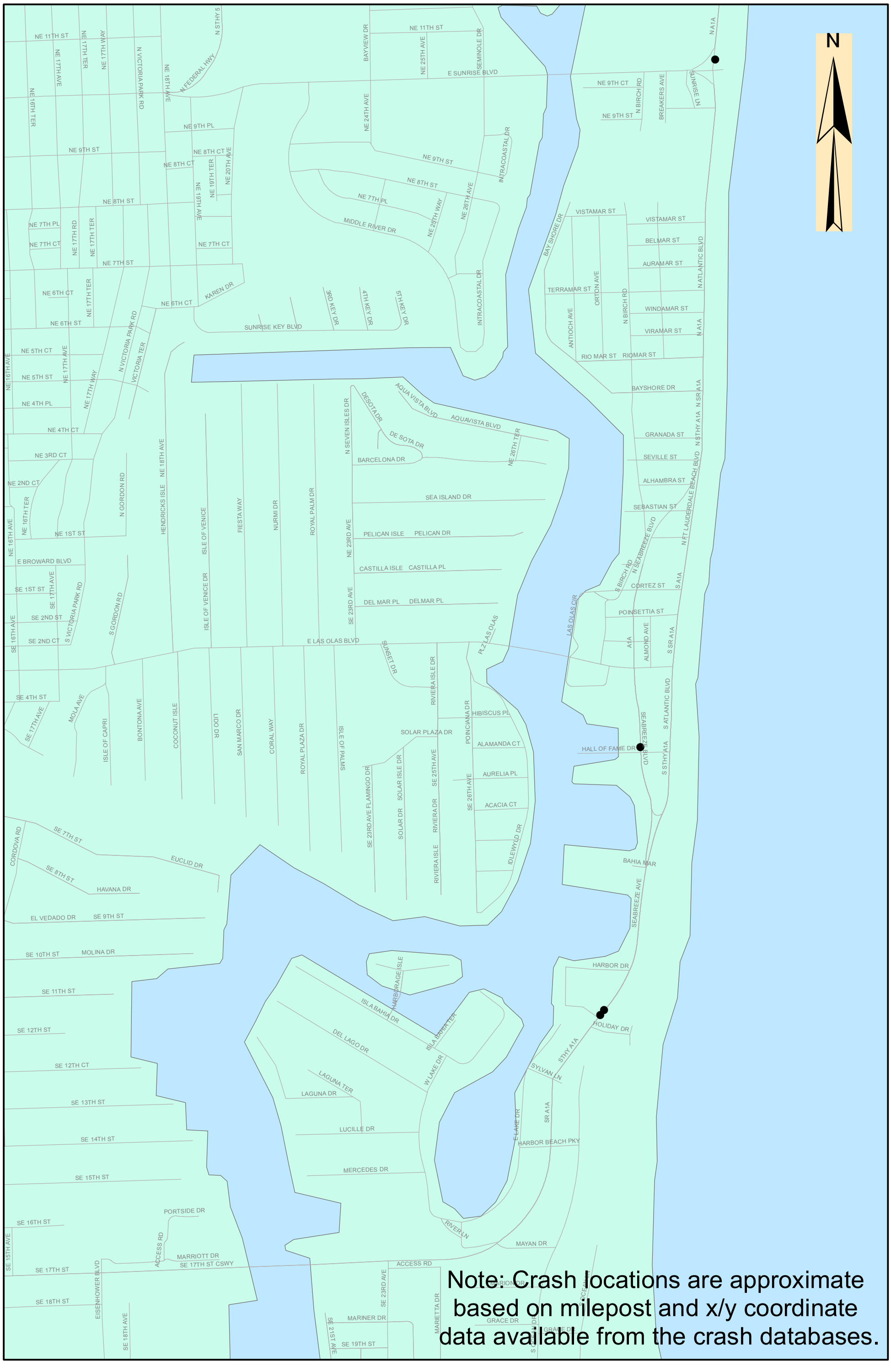


Figure 10: Fatal Crashes within 3R Project 430601 (SR A1A)



Note: Crash locations are approximate based on milepost and x/y coordinate data available from the crash databases.

HIGH CRASH SPOTS AND SEGMENTS

The high crash spots and segments lists as provided by the Department based on crashes occurring between 2008 and 2010 were reviewed. Table 6 lists high crash locations whereas Table 7 lists high crash segments.

Table 6: High Crash Spots

Location	2008	2009	2010
SR 838/Sunrise Boulevard	Yes	No	Yes
Cortez Street and SR A1A (NB)	No	Yes	No
SR 842/Las Olas Boulevard and SR A1A (Seabreeze Boulevard)	Yes	Yes	No
SR 842/Las Olas Boulevard and SR A1A (NB)	Yes	Yes	No
Holiday Drive	No	No	Yes
Harbor Drive	No	No	Yes

Notes:
(1) Locations with a minimum of 8 crashes and a confidence level of 99.95% or higher are identified as high crash spots in urban areas. A confidence level represents the percent probability that the crash rate of the study location is high in comparison to the statewide average for comparable locations.

Table 7: High Crash Segments

Segment (approximate)	Length (miles)	2008	2009	2010
SR 842/Las Olas Boulevard between Birch Road and SR A1A (NB)	0.191	Yes	Yes	Yes
SR A1A (NB) between SR 842/Las Olas Boulevard and Castillo Street	0.300	Yes	Yes	No
SR A1A (SB) between Cortez Street and SE 5 Street/Leavitt Drive	0.400	Yes	Yes	Yes
SR 838/Sunrise Boulevard between ICWW and SR A1A	0.150	No	No	Yes

Notes:
(1) Segments with a minimum of 8 crashes and a confidence level of 99.95% or higher are identified as high crash segments in urban areas.
(2) High crash segments are defined by mileposts.

FIELD REVIEW AND LOCATION SPECIFIC CRASH DATA

A field review was conducted between 3:30 p.m. and 5:30 p.m. on Tuesday April 17th, 2012. Field conditions were sunny and dry. The field review focused on areas of high crash concentration as well as a general review of the overall corridor.

General Observations
The following observations were made along the corridor during the field review:

- SR A1A is a four-lane divided roadway (with a one-way pair) within the study limits. Posted speed limit is 30 mph. The study corridor is characterized by closely spaced driveways.

- Pedestrians and bicyclists were observed throughout the corridor. Both signalized and unsignalized crosswalks are provided within project limits. Frequently pedestrians cross SR A1A outside of designated crosswalks. Designated bike lanes are provided along SR A1A. The 3R project's scope (as of April 24, 2012) indicates the project is expected to maintain existing pedestrian and bicycle facilities, upgrade ADA ramps, upgrade signs per MUTCD, and assess the feasibility of implementing context sensitive solutions.

- In Street Pedestrian Crossing (R1-6) signs were observed at some unsignalized crosswalks.

- Both standard (cobra head) and decorative street lighting is present within project limits. Due to turtle nesting, street lights along SR A1A are reduced/turned off between March and October.

- Bus stops were observed near intersections and at mid-block locations throughout the corridor.

Birch Road and SR 838/Sunrise Boulevard

Figure 11 provides a summary of 24 crashes that occurred at the subject intersection between 2008 and 2010. Noticeable crash types include:

- Rear end (13 crashes/54 percent)
- Dark conditions (12 crashes/50 percent)

A review of rear end crashes shows that nine crashes occurred on the eastbound approach and four crashes occurred on the westbound approach. These crash patterns do not warrant further study.

A review of dark condition crashes does not show discernable patterns. Street lighting is provided on the south side of SR 838 (Sunrise Boulevard). While the percentage of dark condition crashes exceeds the statewide average, an average crash rate of four per year may not warrant a lighting study.

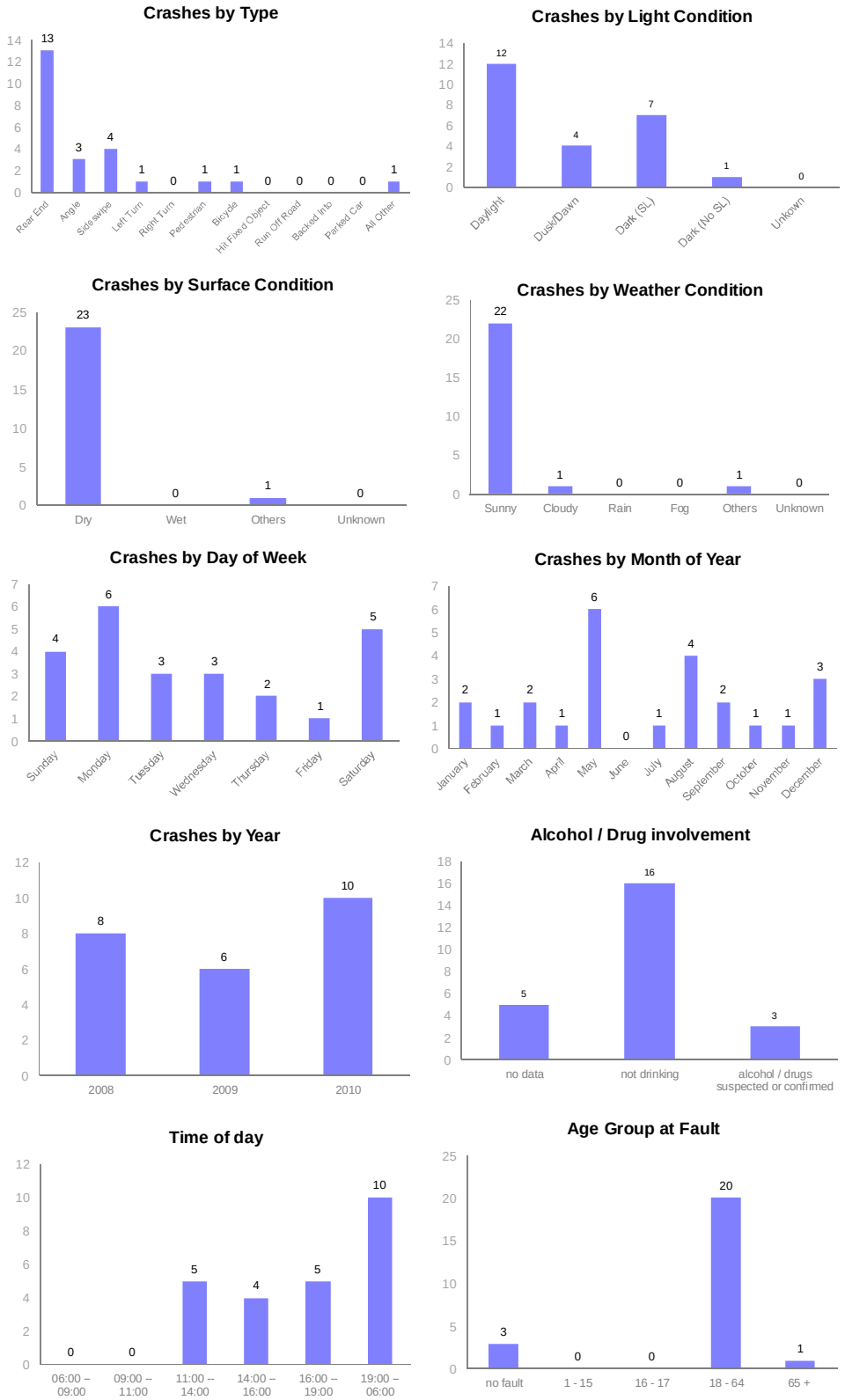
Other observations:

- The median on the east side of the intersection encroaches into the crosswalk (see Photograph 2). The 3R project should consider modifying the median to provide a clear path for pedestrians.

Photograph 1: Eastbound SR 838

Photograph 2: Crosswalk on the east side (looking north)

Figure 11: Summary of Crashes on Birch Road and SR 838/Sunrise Boulevard



SR A1A and SR 838/Sunrise Boulevard

Figure 12 provides a summary of 19 crashes that occurred at the subject intersection between 2008 and 2010. Noticeable crash types include:

- Rear end (10 crashes/53 percent)
- Dark conditions (8 crashes/42 percent)
- Wet pavement (5 crashes/26 percent)

While the percentages of rear end, dark conditions, and wet pavement crashes are overrepresented, an average of fewer than four crashes per year does not warrant a safety study.

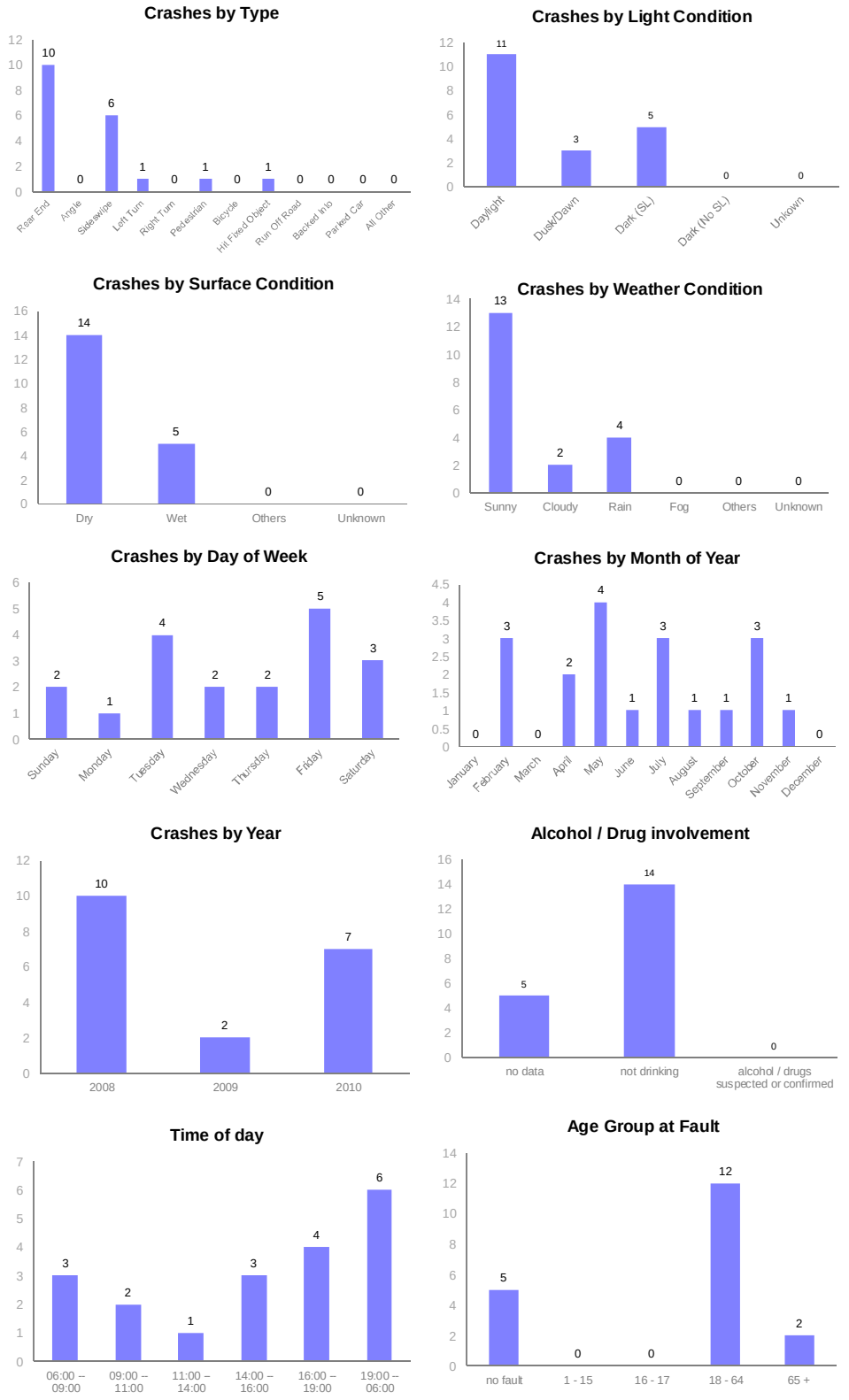
Other observations:

- Advance lane assignment signs (see Photograph 3) on the eastbound approach are partially hidden due to other signs. The 3R project should consider relocating the subject lane assignment signs to improve visibility.

Photograph 3: Partially hidden lane assignment signs

Photograph 4: Southbound SR A1A

Figure 12: Summary of Crashes on SR A1A and SR 838/Sunrise Boulevard



SR 842/Las Olas Boulevard and SR A1A (Seabreeze Boulevard)
Figure 13 provides a summary of 32 crashes that occurred at the subject intersection between 2008 and 2010. There were no discernable crash patterns. This intersection was evaluated under an RSA study by the Traffic Operations Office (see page 10).

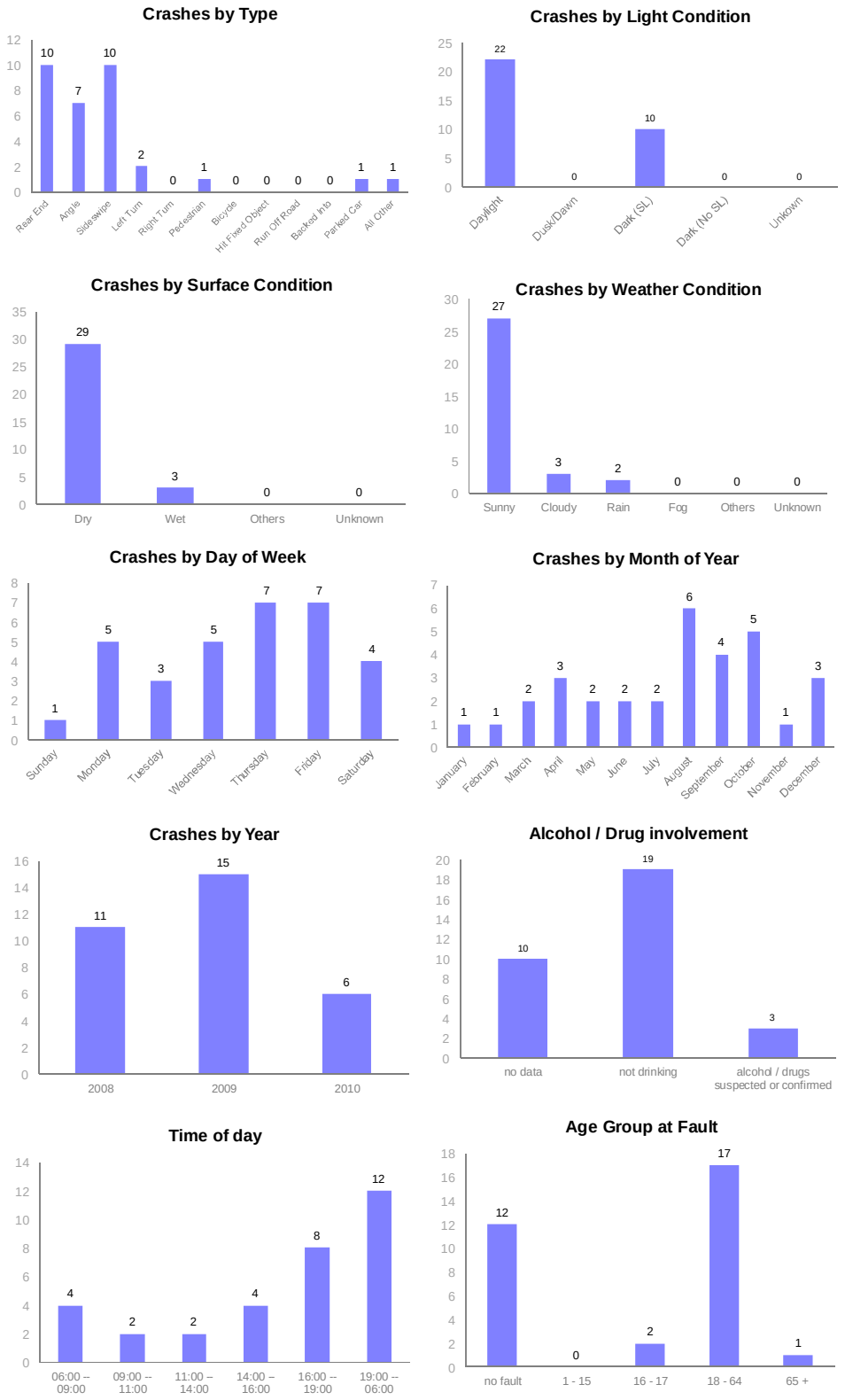
Other observations:

- Significant pedestrian and bicycle use was observed during the p.m. hours. One pedestrian crash occurred at this intersection. Countdown signals are provided. The 3R project should consider installing high emphasis crosswalks.

Photograph 5: Southbound Seabreeze Boulevard

Photograph 6: Eastbound Las Olas Boulevard

Figure 13: Summary of Crashes on SR 842/Las Olas Blvd. and SR A1A (Seabreeze Blvd.)



SR 842/Las Olas Boulevard and SR A1A (Northbound)

Figure 14 provides a summary of 18 crashes that occurred at the subject intersection between 2008 and 2010. Noticeable crash types include:

- Pedestrian (4 crashes/22 percent)
- Dark conditions (10 crashes/56 percent)

Three pedestrian crashes occurred during dark conditions. A 'Turning Vehicles Yield to Pedestrians' (R10-15) sign was observed on the mast arm facing eastbound traffic. Based on our field observations the following recommendations are made for implementation through the 3R project:

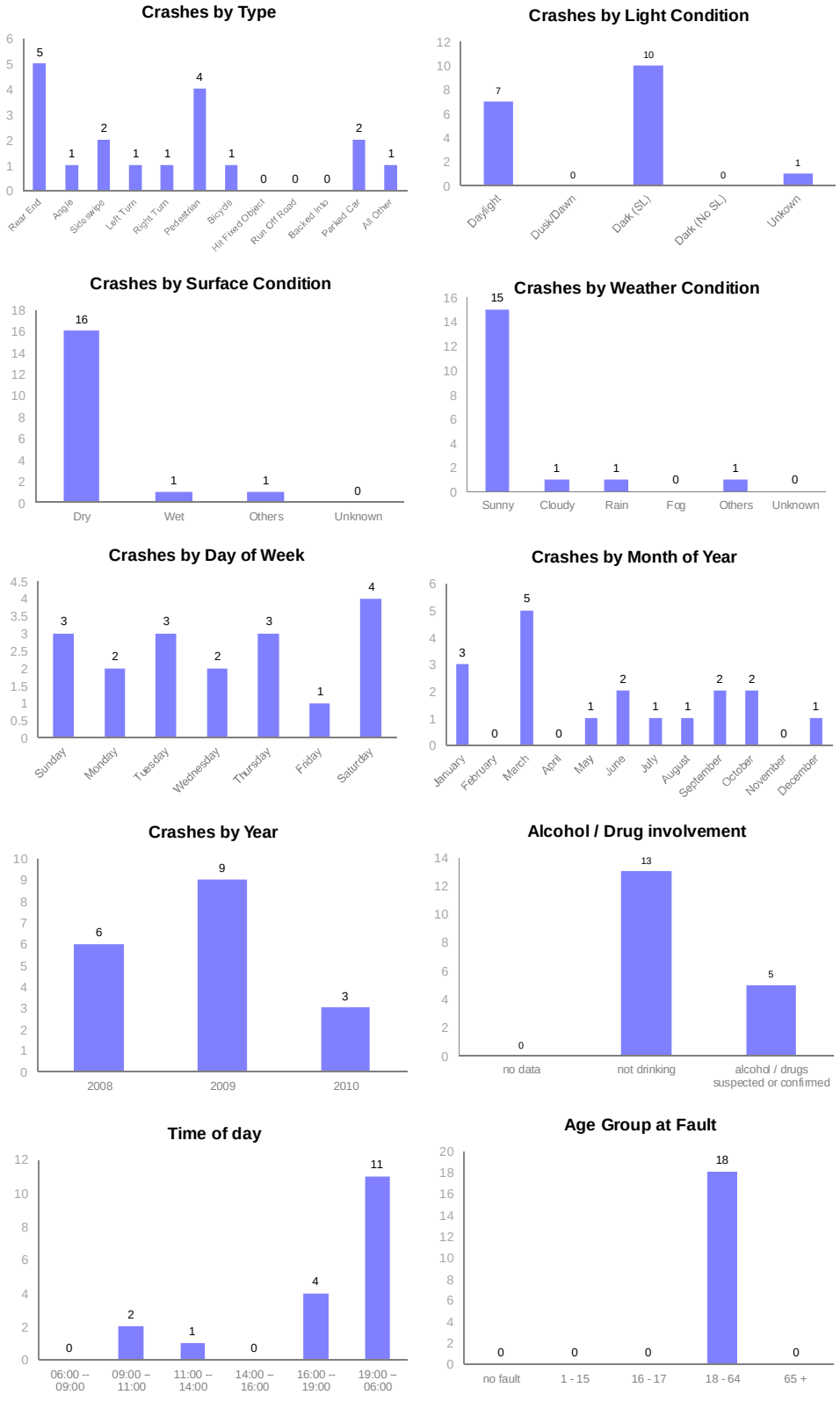
- Install high emphasis crosswalks.
- Install fluorescent green pedestrian crossing (W11-2 and W16-7P) signs at the crosswalks.
- Install a 'Turning Vehicles Yield to Pedestrians' (R10-15) sign facing northbound left turns.

This intersection was evaluated under an RSA study by the Traffic Operations Office (see page 10).

Photograph 7: Looking south from northwest corner

Photograph 8: Looking south from southwest corner

Figure 14: Summary of Crashes on SR 842/Las Olas Blvd. and SR A1A (Northbound)



SUMMARY AND RECOMMENDATIONS

Based upon crash data analysis and field review findings, the following conclusions are identified:

- A total of 349 crashes occurred within the study segment between 2008 and 2010. These crashes included 155 injury crashes and four fatal crashes.
- Overall, the crashes are spread throughout the project limits. The percentage of dark condition crashes is higher than the statewide average (46 percent vs. 34 percent).
- There were 24 pedestrian crashes (7 percent) and 18 bicycle crashes (5 percent). Four pedestrian crashes resulted in fatalities; three fatal crashes occurred between Mercedes River Small Bridge and south of SR 842 (Las Olas Boulevard).
- Saturdays and Sundays had a higher frequency of crashes than the weekdays.
- The signalized intersections at SR 838 (Sunrise Boulevard) and Birch Road, SR 838 (Sunrise Boulevard) and SR A1A, SR A1A (Seabreeze Boulevard) and SR 842 (Las Olas Boulevard), and SR A1A (NB) and SR 842 (Las Olas Boulevard) experienced more than 15 crashes between 2008 and 2010 and was subjected to a detailed data analysis.

Based upon results of this study, we recommend the following:

- The Traffic Operations Office conducted a Road Safety Audit (RSA) on SR A1A between SR 842 (Las Olas Boulevard) and Vistamar Street. Pedestrian and bicycle safety is a main focus area of this RSA. The Traffic Operations Office should coordinate with the 3R project manager to identify RSA recommendations that may be implemented through the 3R project.
- Conduct a vulnerable road user safety study for SR A1A between Mercedes River Small Bridge and SR 842 (Las Olas Boulevard).
- The Traffic Operations Office should request the Community Traffic Safety Team (CTST) Coordinator to inform law enforcement agencies of high incidence of crashes due to alcohol/drug use within project limits.
- Analyze congestion related crashes and evaluate the appropriateness of ATMS upgrades such as communication enhancements and improved detection capabilities that could lead to cost-effective crash reductions.

A summary of crash data discussed herein is shown in Table 8.

Table 8: Crash Summary by High Crash Locations

Location	Rear End	Angle	Left Turn	Right Turn	Sideswipe	Pedestrian	Bicycle	Hit Fixed Object	Run Off Road	Parked Car	All Other	Total
SR 838 and Birch Road	13	3	1		4	1	1				1	24
SR 838 and SR A1A	10		1		6	1		1				19
SR A1A (SB) and SR 842	10	7	2		10	1				1	1	32
SR A1A (NB) and SR 842	5	1	1	1	2	4	1			2	1	18