

DISTRICT 4 ROAD SAFETY AUDIT REPORT

SR-A1A (OCEAN BOULEVARD) BRIDGE

FROM: EAST CAMINO REAL

TO: BEACH CLUB WAY

SECTION: 93 060 000

MILE POST: 1.127 TO 1.409

TASK WORK ORDER No. 37

CONTRACT No: C-9E65

FM No. 429650-2-32-01

PREPARED FOR:

FLORIDA DEPARTMENT OF TRANSPORTATION, DISTRICT 4



Engineer's Certification

I, Anthony D. Chaumont, P.E. #72473, 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 Road Safety Audit (RSA) 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 (Ocean Boulevard) Bridge
Section No: 93 060 000
Project Start: Milepost 1.127
Project End: Milepost 1.409
Project Location: Palm Beach County

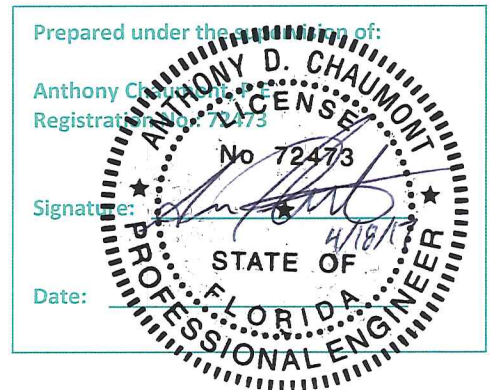


Table of Contents

Road Safety Audit Process	3
Road Safety Audit Purpose	3
Road Safety Audit Team Members	3
<i>Core Road Safety Audit Team Members</i>	4
<i>Road Safety Audit Stakeholders with FDOT D4</i>	4
<i>Road Safety Audit Stakeholders with City of Boca Raton</i>	4
<i>Additional Road Safety Audit Stakeholders:</i>	4
<i>Stakeholder Coordination</i>	4
Study Corridor	6
Traffic Control Devices for Movable Span Signals	6
Proposed Bridge Rehab Typical	7
General Observations – Short Term Recommendations	8
<i>Bike Markings</i>	8
<i>Curve Warning</i>	8
<i>Barrier Delineation</i>	9
<i>Bus Stop</i>	10
General Observations – Mid Term Recommendations	12
<i>Nighttime Signal Visibility</i>	12
<i>Mid-block Crosswalk</i>	12
General Observations – Long Term Recommendations	13
<i>Sidewalk Gaps</i>	13
Maintenance Items to Consider	14
Crash Data Analysis	18
Road Safety Audit Findings Summary	1
Overview Map	2
Road Safety Audit Findings Details – Spot Observations	3

List of Figures

Figure 1: Project Location	1
Figure 2: Boca Raton Inlet Bridge Panorama Looking East	2
Figure 3: Worn Signs	4
Figure 4: AM Field Review with City of Boca Raton Staff	5
Figure 5: Existing Configuration	7
Figure 6: Proposed Configuration	7
Figure 7: Recreational Cyclist Traversing Boca Raton Inlet Bridge	8
Figure 8: Enthusiast Cyclist Traversing Boca Raton Inlet Bridge	8
Figure 9: Southbound Approach to Boca Raton Inlet Bridge	9
Figure 10: Southbound Approach to Bridge Curve in Daytime	9
Figure 11: Southbound Approach to Bridge Curve at Nighttime	9
Figure 12: Barrier Delineation	10
Figure 13: Northbound Bus Stop Location at Ponce de Leon	10
Figure 14: Northbound Bus Stop Image at Ponce de Leon	10
Figure 15: Mid-block Crosswalk Concept	11
Figure 16: Drawbridge Signal Nighttime View	12
Figure 17: Northbound Approach to Camino Real at Night	12
Figure 18: Mid-block Pedestrian Crosswalk	12
Figure 19: Northbound Approach to Bridge	13
Figure 20: Southbound View on East Side of Bridge	13
Figure 21: Southbound Approach to Bridge	14
Figure 22: SR-A1A (Ocean Drive) Condition Diagram	15
Figure 23: Maintenance Items Related to Detectable Warning Surfaces and Curb Ramps	16
Figure 24: Maintenance Items Related to Signs	17
Figure 25: Sign Indicating Street Lights Turned Off for Sea Turtles	19
Figure 26 Sign Noting Sea Turtle Protection Warning Ordinance	19
Figure 27: Collision Diagram (2010 to 2014)	21

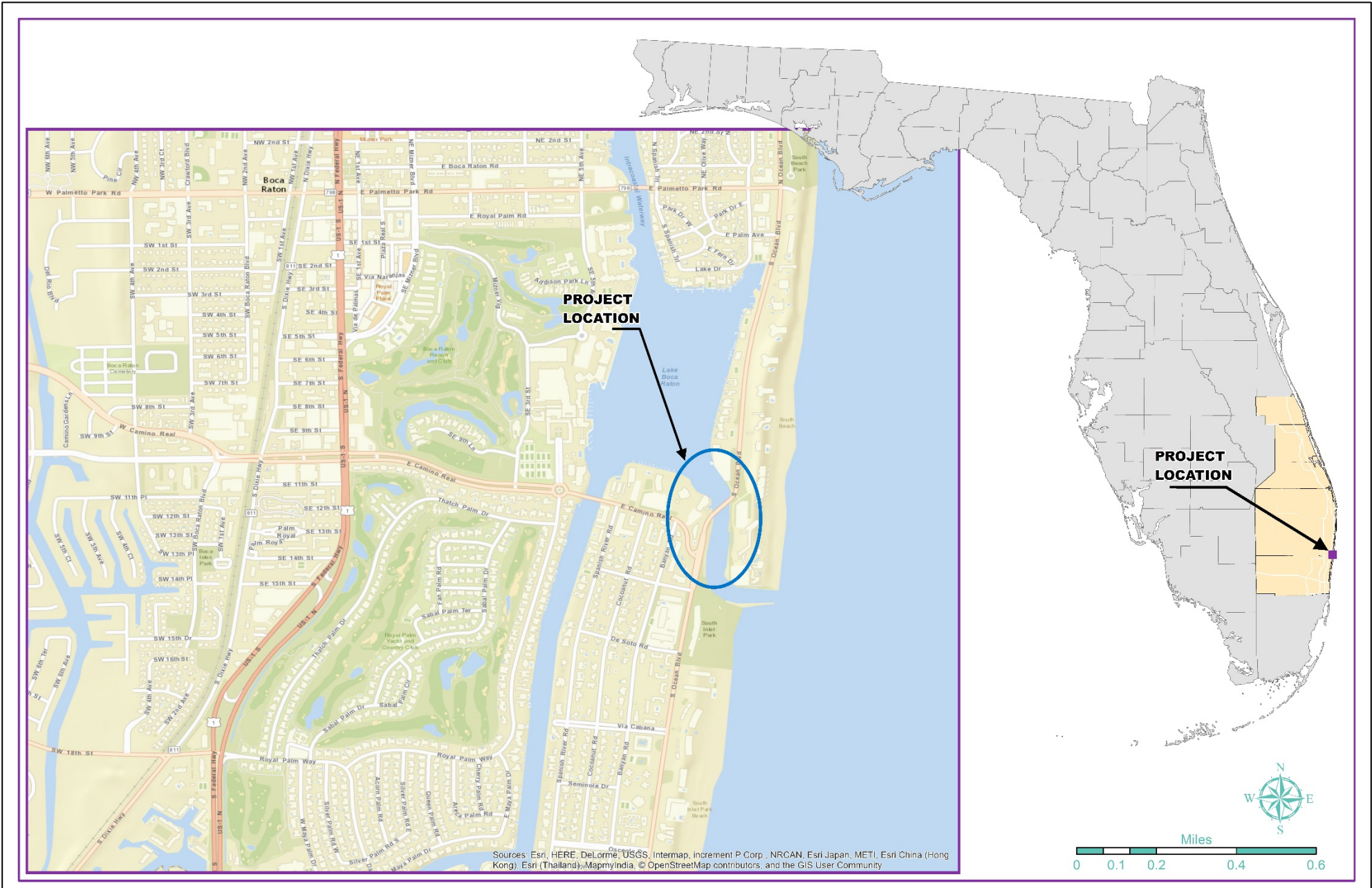


Figure 1: Project Location



Figure 2: Boca Raton Inlet Bridge Panorama Looking East

Road Safety Audit Process

The Federal Highway Administration's (FHWA) Safety Office has established the Road Safety Audits (RSA) process as a way to further enhance the overall safety performance of roadways for all users. An RSA is the formal safety performance examination of an existing or future road or intersection by an independent, multidisciplinary team. It qualitatively estimates and reports on potential road safety issues and identifies opportunities for improvements in engineering, education, enforcement, and emergency response to improve safety for all road users.

The goal of an RSA is to save money and time and reduce the number and severity of crashes. RSAs are a low-cost, proactive approach to safety that considers all road users and identifies opportunities to enhance safety and reduce the number and severity of crashes.

A typical RSA consists of the following steps:

1. Identify project or road in service to be audited.
2. Select RSA team.
3. Conduct pre-audit meeting to review project information.
4. Perform field observations under various conditions.
5. Conduct audit analysis and prepare report of findings.
6. Present audit findings to Project Owner/Design Team.
7. Project Owner/Design Team prepares formal response.
8. Incorporate findings into project when appropriate.

Road Safety Audit Purpose

This RSA was conducted to focus on pedestrian/bicycle safety along SR-A1A (Ocean Boulevard) traversing the Boca Raton Inlet Bridge waterway in the City of Boca Raton in Palm Beach County. This RSA was conducted on Monday and Tuesday, October 3 and 4, 2016.

The RSA at SR-A1A (Ocean Boulevard) was conducted to:

- Evaluate roadway and roadside features, design elements, and local conditions (glare, night visibility, adjacent land uses, etc.) that would increase the likelihood and severity of pedestrian or bicycle crashes.
- Review first-hand the interaction of the various design elements with each other and the surrounding road network.
- Observe how roadway users are interacting with the roadway facility and other roadway users.
- Determine if the needs of all roadway users are adequately and safely met.
- Explore emerging operational trends and/or safety issues at that location.

The objective of this RSA was to answer the following questions:

- What environmental, design, and behavioral elements present potential safety concerns at this location; to what extent, and under what circumstances?
- What engineering, education, and enforcement opportunities exist to eliminate or mitigate identified safety concerns?

Road Safety Audit Team Members

Tindale Oliver conducted pre-audit coordination with stakeholders to familiarize and engage potential partners on the RSA process and outcomes and to provide participants with an opportunity to exchange information and ideas and to ask questions. In addition to the core RSA team, stakeholders in the audit included representatives from FDOT Traffic Operations, the MPO, and local bike groups.

Core Road Safety Audit Team Members

- Anthony Chaumont, P.E., Tindale Oliver
- Kevin Moderie, P.E., Tindale Oliver

Road Safety Audit Stakeholders with FDOT D4

- Daniel Gonzalez, Engineering Section Manager, FDOT D4
- Bodler Barthelemy, P.E., Project Designer/Manager, FDOT D4
- Alexander Barr, P.E., Complete Streets Coordinator, FDOT D4
- Eric Blasewicz, GIS Coordinator, FDOT D4
- Richard Creed, P.E., District Roadway Design Engineer, FDOT D4
- Shandra Davis, Project Manager, FDOT D4
- Ramon Otero, P.E., Structures Design Engineer, FDOT D4
- Satya Pinapaka, P.E., Traffic Safety Engineer, In-house Safety Consultant, AECOM
- Alberto O. Sardinas, Project Manager, FDOT D4
- Yujing "Tracey" Xie, P.E., Safety Engineer, FDOT D4
- Thomas Miller, Bike/Pedestrian Safety Program Specialist, FDOT D4

Road Safety Audit Stakeholders with City of Boca Raton

- Michael Righetti, Transportation Analyst, City of Boca Raton
- Doug Hess, Transportation Planning Engineer, City of Boca Raton
- Maria Tejera, Traffic Engineer, City of Boca Raton

Additional Road Safety Audit Stakeholders:

- John Danielsen, P.E., Structural Engineer, HDR
- Franchesca Taylor, AICP, Bike-Ped-TDM Coordinator, Palm Beach MPO
- Chief Daniel Alexander, Police Chief, Boca Raton Police Department
- Captain Earl Brown, Palm Beach District Commander (Troop K), Florida Highway Patrol
- Captain David Moss, Palm Beach County Sheriff's Office District 7 – West Boca Raton

- Captain Patrick Johnson, County Sheriff's Office District 1 – West Palm Beach
- Staff from Bicycle Generation (local bike shop) in Deerfield Beach

Stakeholder Coordination

Key information from stakeholders included the following:

- City of Boca Raton staff emphasized the City's desire to have continuous bike facilities along the heavily traveled SR-A1A; this includes future bike lanes along the Boca Raton Inlet Bridge.
- In addition to continuous bike lanes, City of Boca Raton staff mentioned that there are sidewalk gaps within the study area.
- City staff indicated that a pedestrian crossing is planned at Ponce de Leon Road to access the South Inlet Park entrance.
- City staff noted that a number of signs are very worn throughout the study area; these maintenance items are noted later in the report.



Figure 3: Worn Signs



Figure 4: AM Field Review with City of Boca Raton Staff

- Coordination with the bridge’s designer indicated that the concept plans are not finalized; they are investigating the possibility of maintaining a 4-5 foot bike lane on the west side of the bridge. This would provide a riding path for southbound cyclists and provide a walking path for the draw bridge tender.
- Bicycle Generation noted that a bike group of ~60 people typically meets at the Cove parking lot and ride north past the Boca Inlet Bridge. Also noted were the following:
 - When asked about sharrows as an alternative, participants did not mind them and believed they would help, but they preferred bike lanes.
 - The bridge feels tight, and cyclists would prefer to have bike lanes.
 - For novice bicyclists, the sidewalks can be difficult to use, as walkers or people with strollers typically take the entire width of the sidewalk.
 - The grates on the bridge are slippery to ride on. Metal plates such as those recently constructed on Hillsboro Boulevard would help.

This RSA Findings Summary lists the location, observation overview, suggestion for consideration, and responsible agency for each observation. Observations and corresponding recommendations are assigned one of three levels of effort categories—Low, Medium, and High:

- “Low” improvements consist of basic improvements such as signs and pavement markings that can generally be done with in-house maintenance forces.
- “Medium” improvements are more involved and can typically be done by pushbutton forces.
- “High” improvements are the most involved in scope, may require right-of-way and public involvement, and typically will require a work program project to complete.

Observations also are assigned one of three timeframe categories: Short-Term, Mid-Term, and Long-Term.

- “Short-term” recommendations can take weeks to implement.
- “Mid-term” recommendations can months to implement.
- “Long-term” recommendations can take years to implement.

The observations and corresponding recommendations are grouped into spot observations, corridorwide observations:

- Spot observations relate to one issue at a single location.
- Corridorwide observations relate to a recurring issue throughout a study area.

The RSA Findings Details section includes field photos and images of recommended items. Spot observations are shown in yellow. Figure 28 on page 20f illustrates the relative location of observations on an aerial photo.

Study Corridor

SR-A1A (Ocean Boulevard) is a north-south 2-lane undivided roadway with 12-foot-wide lanes and a speed limit of 35 miles per hour (mph). Nearby land uses are residential. The Boca Inlet Park and South Inlet Park are located on the east side of SR-A1A (Ocean Boulevard) between Ponce de Leon Road and De Soto Road. There are a number of condo / apartments including Tierra Del Mar, Watersone Resort & Marina Boca Raton, One Thousand Ocean, and Boca Beach Club.

According to the FDOT Synopsis Report, SR-A1A (Ocean Boulevard) has approximately 10,200 daily vehicles (site number 930121 SR-A1A South End of Boca Inlet Drawbridge at Section Number 93060000 Mile Post 1.200).

The segment has a 4-foot paved shoulder on the east and west sides of SR-A1A (Ocean Boulevard); there is a 10 foot path along the west side of SR-A1A. There is one signalized intersections in the study area, at Camino Real.

Figure 1 on page *i* shows the project location.

Traffic Control Devices for Movable Span Signals

The SR-A1A (Ocean Boulevard) drawbridge signage was reviewed per FDOT Index 17890. Key findings from reviewing Index 17890 with the drawbridge include the following:

- The drawbridge striping is consistent with Index 17890 Type I: “To be used where bridge operators are full time or on a daily basis.” From the movable bridge section, the stop bar should be at least 160 feet away. The northbound stop bar is 300 feet and the southbound stop bar is 330 feet from the movable bridge section. It is noted that the stop bar locations are outside of the curve and most likely were striped there to have the best possible sight distance for northbound and southbound traffic.

- The gate should be at least 100 feet from the movable bridge section. The northbound gate is 140 feet and the southbound gate is 160 feet away from the movable bridge section. In addition to these gates, there are additional gates for the northbound and southbound approaches. The additional northbound gate is 80 feet from the other northbound gate, and the additional southbound gate is 70 feet from the other southbound gate.
- Index 17890 indicates a separation of 20 feet between a gate and the drawbridge signal. The separation between the northbound gate and the drawbridge signal is 20 feet and the southbound gate, and the drawbridge signal is 20 feet away.
- For both approaches, the stop bar is 40 feet from the bridge signal, which is in compliance with Index 17890.
- On the northbound approach there is a “DRAW BRIDGE AHEAD” sign with a flashing beacon approximately 315 feet from the drawbridge signal. This is less than the 750 feet indicated in Index 17890. However, the index allows for field adjustment, and the sign is placed appropriately to inform SR-A1A (Ocean Boulevard) vehicles and vehicles turning from Camino Real approximately 430 feet south of the drawbridge signal. Therefore, this placement is acceptable.
- On the southbound approach is a “DRAW BRIDGE AHEAD” sign with a flashing beacon approximately 430 feet from the drawbridge signal. This is less than the 750 feet indicated in Index 17890. **Consideration should be given to relocating the sign 750 feet from the drawbridge signal to match standards.**
- On both approaches, a W8-5 “SLIPPERY WHEN WET” sign is placed prior to the bridge in conformance with the Index.

Proposed Bridge Rehab Typical

Per FDOT staff, the proposed typical shifts the sidewalk to the east side (ocean side), and the 28 foot roadway has been shifted to the west (main land). Because of the particular bridge geometry, the sidewalk shifting is necessary to redistribute the added loading of a solid deck improvement and competent traffic railing.

The roadway width remains at 28 feet (11 foot travel lanes with 3 foot shoulders), the sidewalk width is increased to 5 feet.

A solid deck is being considered so, bicycle traffic will not be limited to the shoulder.

The traffic rail is an aluminum rail UK; see the Aluminum TL-4 Traffic Railing on the attachment.

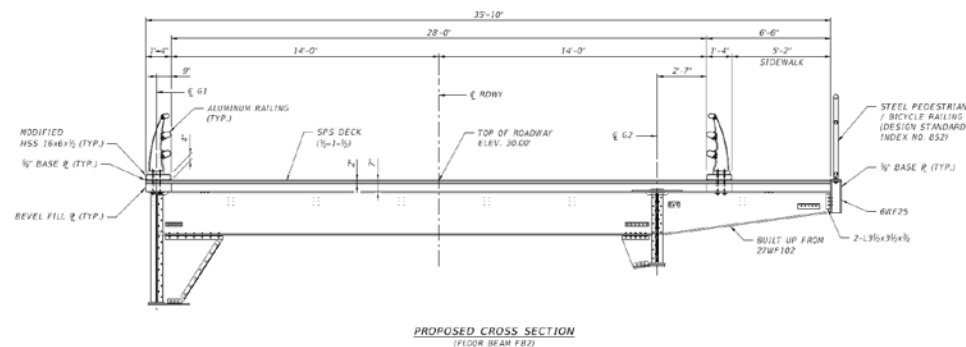


Figure 6: Proposed Configuration

Beyond the proposed cross section, sidewalk will be installed on the east side of the corridor, leading to and coming off the structure. **Because of to the 13 (52%) nighttime crashes that have occurred in the study area, consideration should be given to pedestrian level-lighting** along new sidewalk sections. Also, two crossings on A1A will be installed to link the new and existing sidewalk networks.

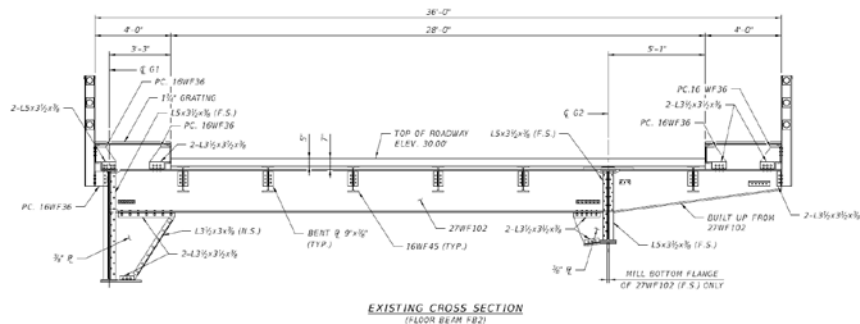


Figure 5: Existing Configuration

General Observations – Short Term Recommendations

Bike Markings

Bicycles were observed traversing the SR-A1A (Ocean Boulevard) bridge along both the paved shoulder and sidewalk. As a result of the nature of the nearby residential land uses, a mix of “recreational” and “enthusiasts.” Figure 7 depicts recreational cyclists on the sidewalk traversing the bridge contraflow on the sidewalk.



Figure 7: Recreational Cyclist Traversing Boca Raton Inlet Bridge

Figure 8 depicts a cyclist traversing the Boca Raton Inlet Bridge along the paved shoulder. Note that in this image, a pedestrian is walking along the sidewalk. The behavior depicted in the images is representative of the general behavior of cyclists and pedestrians along the bridge; cyclists on road bikes generally travel along the through lanes, cyclists on cruisers travel on the sidewalk on the west side of the bridge, and pedestrians travel on the sidewalk on the west side of the bridge.



Figure 8: Enthusiast Cyclist Traversing Boca Raton Inlet Bridge

Providing “sharrows” along SR-A1A on the bridge segment where there are signs indicating that bikes may take the full lane, will further encourage cyclists to use the throughway and remind drivers that cyclist are allowed on the road. Note that there were four crashes reported that involved a bicyclist.

Curve Warning

There are no curve warning signs on approach to the S-curve along the Boca Inlet Bridge on either approach. Although the approach speed of 35 mph may seem comfortable along SR-A1A (Ocean Boulevard), the approach may be problematic, particularly for southbound drivers at night due to a dark spot in overhead street lighting. Three crashes were reported at each of the curves prior to the bridge. Figure 9 depicts the southbound approach to the Boca Raton Inlet Bridge.



Figure 9: Southbound Approach to Boca Raton Inlet Bridge

Three crashes were identified at the first curve for the southbound approach to the drawbridge. Per the Crash Modification Factor Clearinghouse, installing advance static curve warning signs reduces serious injury, and minor injury crashes by 30% and property damage crashes by 8%. **Install curve warning signs on both approaches to the Boca Inlet Bridge; consider advisory speed reduction.**



Note that there are currently 14 signs on the southbound approach.

Barrier Delineation

The barrier wall on the Boca Inlet Bridge does not have reflectors to delineate the bridge's curvature. Figure 10 and Figure 11 depict the southbound approach to the Boca Inlet Bridge during daylight hours and nighttime respectively.



Figure 10: Southbound Approach to Bridge Curve in Daytime



Figure 11: Southbound Approach to Bridge Curve at Nighttime

Per the FHWA's Low Cost Treatments for Horizontal Curve Safety, retroreflective material, such as reflector panels of retroreflective sheeting, can be a highly effective treatment for delineating curves, especially at nighttime. Five nighttime crashes were identified along the study bridge segment. **Install a reflective barrier delineation to better alert drivers of approaching S-curve along the Boca Inlet Bridge.** Note that on this two-lane road, the delineation would be white on both sides of the road to match the color of adjacent edge lines.

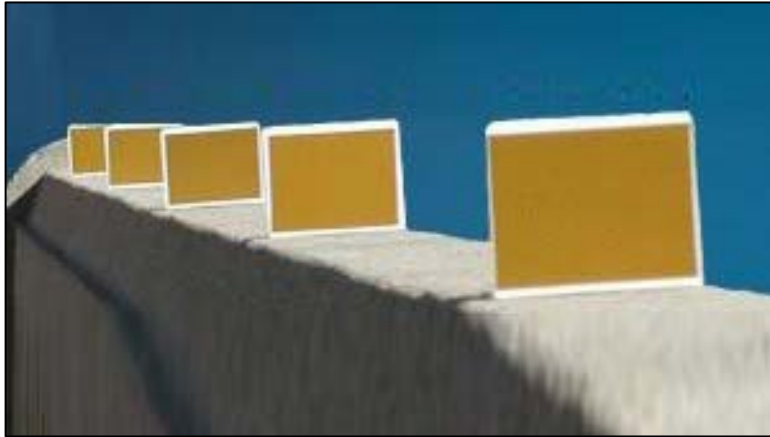


Figure 12: Barrier Delineation

Bus Stop

A bus stop currently is located on the east side of SR-A1A north of Ponce de Leon. Figure 13 and Figure 14 depicts the location of the northbound bus stop.

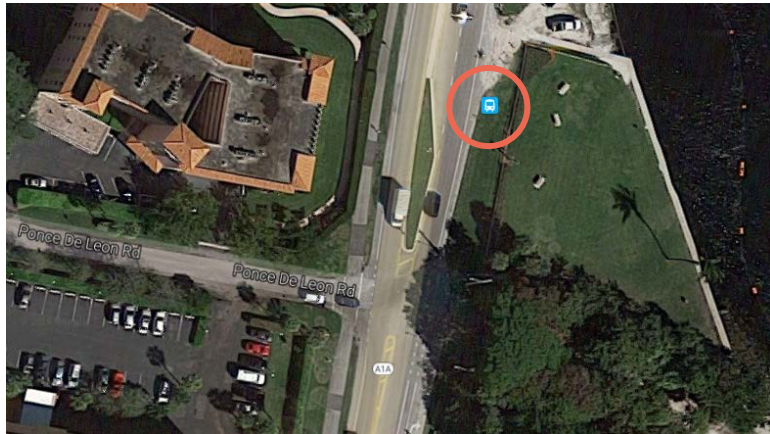


Figure 13: Northbound Bus Stop Location at Ponce de Leon



Figure 14: Northbound Bus Stop Image at Ponce de Leon

Concurrent with installing the planned mid-block pedestrian crossing (mentioned by City of Boca Raton staff during site visit) at Ponce de Leon, **coordinate with Palm Beach Transit to relocate the bus stop to the south** nearer the crossing at Ponce de Leon. Figure 15 depicts a concept drawing for the proposed mid-block crosswalk that will be implemented by FDOT.



Figure 15: Mid-block Crosswalk Concept

General Observations – Mid Term Recommendations

Nighttime Signal Visibility

Signal heads within the study area do not have reflective sheeting. Due to the 5 rear-end collisions and 13 nighttime crashes, **provide yellow retroreflective back plates on all signal indications** in the study area. The signals include:

- Signalized intersection at Camino Real
- Draw Bridge Signal Indications

Figure 16 depicts a nighttime view of the southbound approach to the drawbridge signal along SR-A1A.



Figure 16: Drawbridge Signal Nighttime View

Figure 17 depicts a northbound view at nighttime of the approach to Camino Real along SR-A1A (Ocean Boulevard). Per the Crash Modification Factor Clearinghouse, adding 3-inch yellow retroreflective sheeting to signal backplate reduces 15% of all urbanized area crashes.



Figure 17: Northbound Approach to Camino Real at Night

Mid-block Crosswalk

There are several mid-block crosswalks across SR-A1A (Ocean Boulevard) in the vicinity of the study area. Two crashes with a bicyclist were reported in the vicinity of the proposed and existing mid-block crossings.



Figure 18: Mid-block Pedestrian Crosswalk

Due to the two bicycle crashes, **conduct pedestrian turning movement counts to determine the feasibility of providing rectangular flashing beacons (RRFBs)** at the existing and proposed mid-block crossings. Per the FHWA's SA-09-009, RRFB are a lower cost alternative to traffic signals and hybrid signals and have been shown to increase driver yielding behavior at crosswalks significantly when supplementing standard pedestrian crossing warning signs and markings.



Note that Traffic Engineering Manual (TEM) requirements call for typical weekday counts; however, due to the beach accesses, a weekend count should be included.

General Observations – Long Term Recommendations

Sidewalk Gaps

In conjunction with the completion of the bridge rehabilitation work, sidewalks will need to be modified along SR-A1A on approach to the Boca Raton Inlet Bridge to access the new sidewalk on the bridge. Figure 19 depicts the northbound approach to the Boca Inlet Bridge; note that there are no sidewalks on either side of SR-A1A on the northbound approach. The eastside of SR-A1A has guardrail and drainage inlets.



Figure 19: Northbound Approach to Bridge

Figure 20 depicts a view to the south at the southern end of the bridge from the east side of SR-A1A. This is the side of SR-A1A at which the only proposed sidewalk along the Boca Inlet Bridge will be after the rehabilitation project is complete.



Figure 20: Southbound View on East Side of Bridge

Figure 21 depicts a view of the southbound approach to the Boca Inlet Bridge. The image shows a sidewalk on the west side of SR-A1A. This location currently does not meet Americans with Disabilities Act (ADA) standards as the sidewalk does not have a curb ramp and ends at a drainage inlet.



Figure 21: Southbound Approach to Bridge

Note that the work program project limits for the bridge rehabilitation work do not extend beyond the limits of the bridge. Due to the proposed drawbridge having sidewalks only on the east side, consider extending the limits of the drawbridge project south to the proposed mid-block crossing and north to Beach Club Way so the following can be considered:

- **Add sidewalks south of the bridge on the east side and connect with the proposed mid-block crossing.**
- **Consider adding crosswalks at the signalized intersection of SR-A1A (Ocean Boulevard) at East Camino Real to connect the new sidewalk on the east side with the shared use path on the west side of SR-A1A (Ocean Boulevard).**
- **Add sidewalk north of the bridge on the east side and connect it with the existing mid-block crossing 1,000 feet north of the drawbridge.**
- **Review the feasibility of adding a mid-block crossing between the north side of the drawbridge and the existing mid-block crossing**

approximately 1,000 feet north to connect the new sidewalk with the existing shared use path on the west side.

Figure 22 depicts a condition diagram showing existing lighting and existing sidewalk gaps along SR-A1A.

Maintenance Items to Consider

During field reviews, various curb ramps were observed to be either missing ADA detectable warning surfaces or were not up to standard. Also the sidewalks on the drawbridge are not ADA accessible. **Consider having FDOT Maintenance add curb ramps (where feasible) and detectable warning surfaces at the locations shown on Figure 23.**

In addition many signs were observed as faded, worn, or peeling due to age or sun exposure. Although a sign inventory was not within this scope of work, signs that were noted as potentially needing to be replaced are shown on Figure 24. **Consider having FDOT Maintenance conduct a sign inventory to review of the corridor to review these signs and replace them where necessary.**

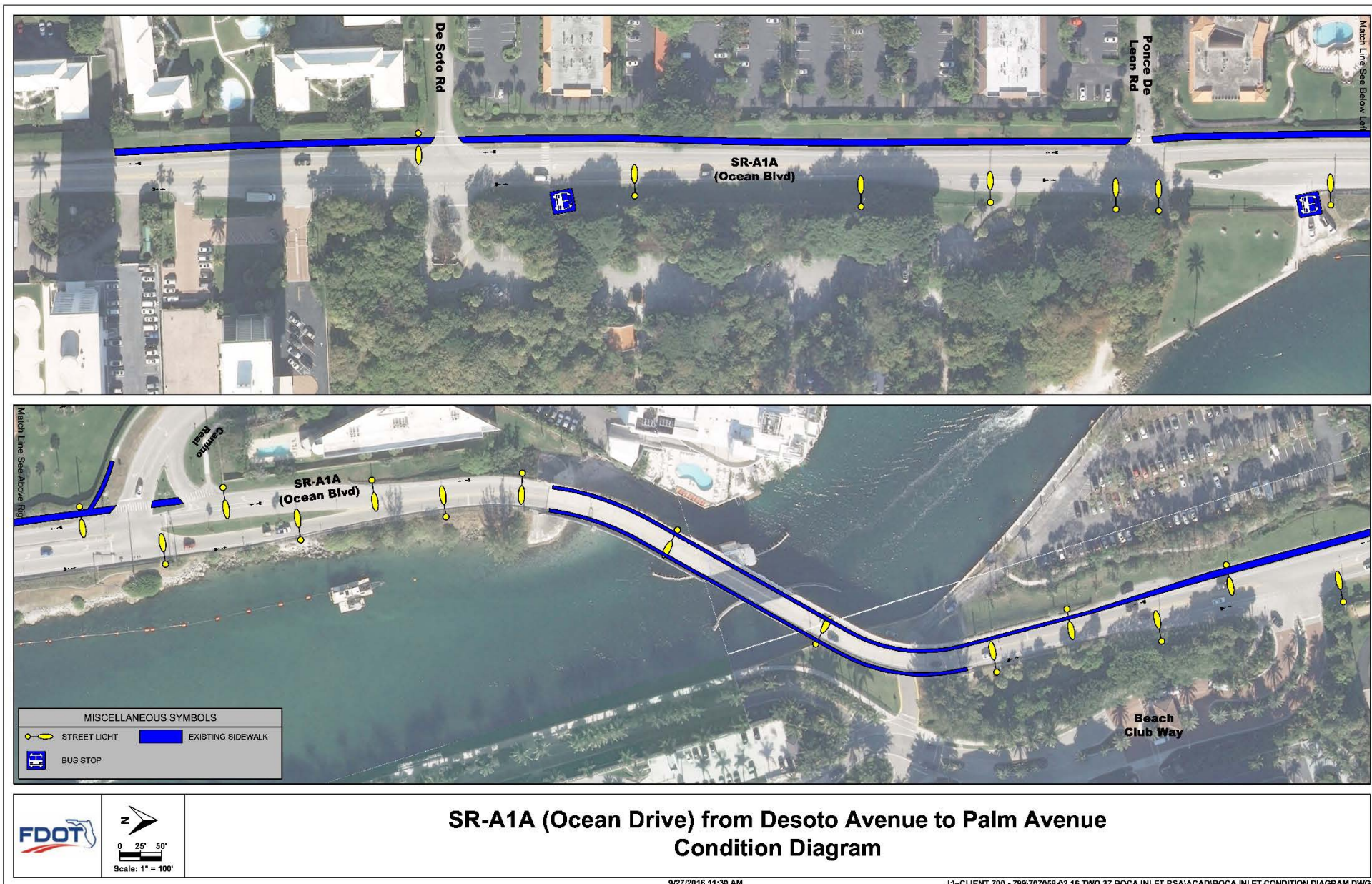


Figure 22: SR-A1A (Ocean Drive) Condition Diagram

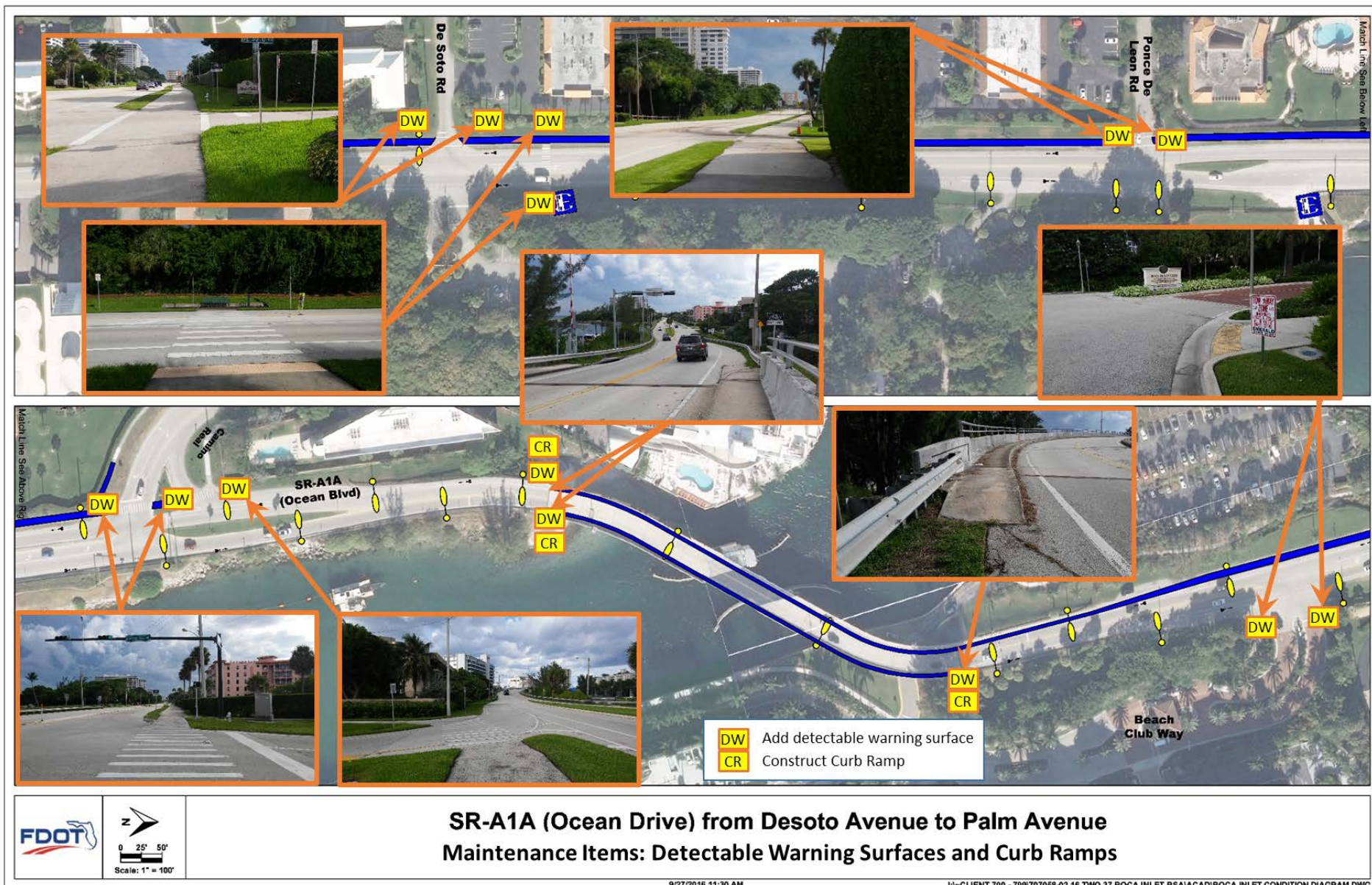


Figure 23: Maintenance Items Related to Detectable Warning Surfaces and Curb Ramps

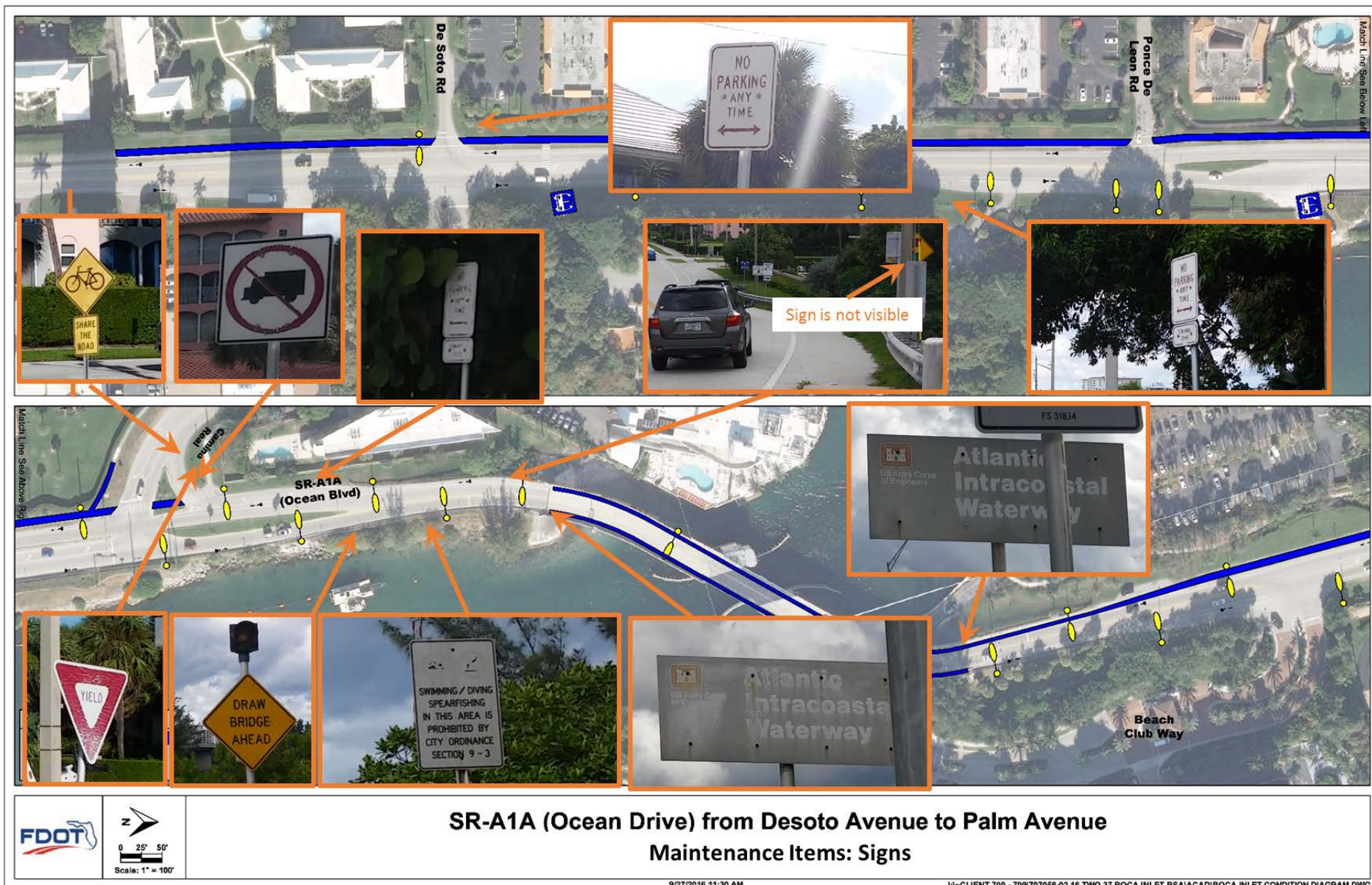


Figure 24: Maintenance Items Related to Signs

Crash Data Analysis

The segment along section 93060000 (SR-A1A / Ocean Boulevard) from mile post 0.894 (De Soto Road) to 1.409 (Boca Beach Club) is not on the State of Florida's high-crash segment list (2011–2013). However, the study area segment is between two segments that are on the high-crash list and include the following:

- MP 0.300 to 0.619, (south of Osceola Drive to Via Cabana Drive)
- MP 1.966 to 2.162, (south of Palm Avenue to north of SR-798/Palmetto Park)

Crash data from January 2010 to December 2014, were extracted from the State Crash Analysis Reporting System (CARS), Signal Four, and Tindale Oliver's Crash Data Management System (CDMS) along section 93060000 (SR-A1A / Ocean Boulevard) from mile post 0.894 (De Soto Road) to 1.409 (The Boca Beach Club). The five years of crash data were reviewed to identify any crash patterns that could be addressed as part of the RSA recommendations. During the 2010 to 2014 analysis period, 25 crashes were reported. Table 1 provides the overall number of crashes per study year, crash type, lighting, surface conditions, and injury severity.

As shown in Table 1, a high number of crashes occurring during dark-lighted conditions. Signs were observed during field observations, stating that street lights are turned off from March 1st through October 31st to protect the endangered sea turtles during their nesting period. As shown in Figure 25 and Figure 26, the signs state that SR-A1A street lights are turned off during this period due to the close proximity to the beach. In addition, Section 23-242 of Boca Raton's lighting ordinances state the following:

- 23-242 (4) Publicly owned lighting. Streetlights and lighting at parks and other publicly owned beach access areas shall be subject to the following:

- (a) Street sign lights and streetlights shall be located so that the bulk of their illumination will travel away from the beach. These lights shall be equipped with shades or shields that will minimize backlighting and reduce their visibility from the beach.
- (b) Lights at parks or other public beach access points shall be shielded or shaded during the period of March 1 to October 31 of each year.
- (c) Street sign lights directly or indirectly visible from the beach along State Road A1A shall be turned off from March 1 to October 31.

Table 1: Crash Statistics for SR-A1A / Ocean Boulevard (2010 to 2014)

SR-A1A (Ocean Avenue) from De Soto Road to Beach Club Way		Years					Total	Avg per	%	Statewide
		2010	2011	2012	2013	2014	Crashes	Year		%
Crash Type	Angle	0	0	2	0	0	2	0.4	8.0%	18.9%
	Bicycle	3	1	0	0	0	4	0.8	16.0%	1.2%
	Fixed Object	4	1	1	4	1	11	2.2	44.0%	5.9%
	Front to Rear (Rear-End)	1	0	1	2	1	5	1.0	20.0%	1.9%
	Lost Control	0	1	0	0	0	1	0.2	4.0%	4.2%
	Sideswipe, Same direction	0	1	1	0	0	2	0.4	8.0%	0.0%
	Total	8	4	5	6	2	25	5.0	100.0%	
Injury Severity	Fatal	0	0	0	0	0	0	0.0	0.0%	0.8%
	Incapacitating	3	1	0	1	0	5	1.0	20.0%	
	NonIncapacitating	0	1	1	0	1	3	0.6	12.0%	41.9%
	Possible Injury	1	0	2	1	0	4	0.8	16.0%	
	None	4	2	2	4	1	13	2.6	52.0%	57.3%
Total		8	4	5	6	2	25	5.0	100.0%	
Lighting Condition	Daylight	5	2	3	1	1	12	2.4	48.0%	69.4%
	Dawn	0	0	0	0	0	0	0.0	0.0%	1.6%
	Dark-Lighted	2	2	2	5	1	12	2.4	48.0%	20.1%
	Dark-Not Lighted	1	0	0	0	0	1	0.2	4.0%	5.5%
	Total	8	4	5	6	2	25	5.0	100.0%	
Surface Conditions	Dry	8	3	3	5	2	21	4.2	84.0%	82.0%
	Wet	0	1	1	0	0	2	0.4	8.0%	17.7%
	No Data	0	0	1	1	0	2	0.4	8.0%	0.3%
	Total	8	4	5	6	2	25	5.0	100.0%	



Figure 25: Sign Indicating Street Lights Turned Off for Sea Turtles



Figure 26 Sign Noting Sea Turtle Protection Warning Ordinance

Table 2 through Table 5 summarize all crashes from 2010-2014 by time of day and whether or not it was during turtle season. Two crashes occurred during the day of non-turtle season (Table 2), 10 crashes occurred during the day of turtle season (Table 3), 4 crashes occurred at night during non-turtle season, and 9 crashes occurred at night during turtle season. As summarized in Table 2 through Table 5, 9 of the 13 crashes occurred at night during turtle season. Of the 9 crashes reported at night during turtle season, 8 were reported to occur

during dark-lighted conditions. During night field reviews of September 29, October 2, and October 3, the corridor was also observed lit.

Table 2: Daytime Crashes Non Turtle Season, November – February 2010-2014

Day time Crashes Not During Turtle Season (November 1st through February 28th)			
HSMV #	Crash Conditions	Crash Type	Summary
80989620	11/03/12, 03:16 PM, Daylight, Clear, Dry road conditions	Front to Rear (Rear-End)	A westbound vehicle was slowing down for a bicyclist and was rear ended by another vehicle.
80989993	12/07/12, 07:29 AM, Daylight, No Data, No Data road conditions	Sideswipe, same direction	A northbound vehicle attempted to make a U-turn to avoid waiting for light at bridge and struck another vehicle.

Table 3: Daytime Crashes Turtle Season, March – October 2010-2014

Day time Crashes During Turtle Season (November 1st through February 28th)			
HSMV #	Crash Conditions	Crash Type	Summary
809863680	03/14/10, 05:41 PM, Daylight, Clear, Dry road conditions	Bicycle	Bicyclist was travelling in between stopped vehicles at SR-A1A (Ocean Boulevard) at Camino Real Boulevard and was struck by a northbound vehicle at around 5 mph.
809864960	04/13/10, 04:24 PM, Daylight, Clear, Dry road conditions	Fixed Object	A southbound vehicle failed to negotiate the curve and hit the wall on the east side. The driver believes he fell asleep.
809867120	06/13/10, 04:17 PM, Daylight, Clear, Dry road conditions	Front to Rear (Rear-End)	A northbound rear end occurred at the traffic signal while the light was red.
809868050	07/10/10, 04:04 PM, Daylight, Clear, Dry road conditions	Bicycle	A southbound vehicle was slowing down as the bridge was opening and the gate was coming down. A southbound bicyclist suddenly turned in front of the southbound vehicle and the vehicle was unable to stop and hit the bicyclist. The bicyclist doesn't recall what happened but stated he usually makes a U-turn at this location.
809871850	10/15/10, 03:35 PM, Daylight, Clear, Dry road conditions	Fixed Object	A driver attempted to avoid a crash and his shoe became stuck on the gas pedal. The driver took evasive actions and drove off the roadway to avoid a collision and struck bushes and then a FPL pole.
80988120	08/28/11, 07:49 AM, Daylight, Clear, Dry road conditions	Bicycle	A southbound motorcyclist drifted from his lane into the bike lane and struck a bicyclist. The bicyclist fell off his bike and the motorcyclist overturned.
80988205	10/09/11, 03:59 PM, Daylight, Clear, Dry road conditions	Lost Control	A southbound motorcyclist lost control on the bridge. The driver stated he hit a loose reflector on the ground which caused him to lose control.
80988933	07/14/12, 11:21 AM, Daylight, Clear, Dry road conditions	Angle	A southbound left turning vehicle struck a northbound vehicle at De Soto Road.
82611846	03/20/13, 02:22 PM, Daylight, No Data, No Data road conditions	Front to Rear (Rear-End)	A southbound vehicle was approaching the bridge while it was under construction and was stopped by a flagman. As the vehicle stopped it was rear ended by a trailing vehicle.
82617401	04/28/14, 08:31 AM, Daylight, Clear, Dry road conditions	Front to Rear (Rear-End)	As the gate was going down, the vehicle rear ended.

Table 4: Nighttime Crashes Non Turtle Season, Nov – Feb 2010-2014

Night time Crashes Not During Turtle Season (November 1st through February 28th)			
HSMV #	Crash Conditions	Crash Type	Summary
809872860	11/10/10, 07:07 PM, Dark-Lighted, Clear, Dry road conditions	Bicycle	A southbound left turning vehicle struck a northbound bicyclist at the driveway.
80987592	01/29/11, 04:33 AM, Dark-Lighted, Clear, Dry road conditions	Fixed Object	A northbound vehicle went in the median, struck a sign, travelled in the southbound lanes, went off the roadway, and struck the bushes on the west side. The driver reported she fell asleep while driving.
80989791	11/18/12, 09:19 PM, Dark-Lighted, Clear, Dry road conditions	Fixed Object	A northbound left-turning vehicle struck an irrigation valve, a sprinkler control box, and a "YIELD" sign. The crash was reported as a hit and run.
80990019	12/08/12, 11:15 PM, Dark-Lighted, Cloudy, Wet road conditions	Angle	A southbound vehicle was speeding, ran the red light, and struck an eastbound vehicle. The southbound driver smelled of alcohol, was unable to keep his balance, and had prescriptions in the passenger's seat. The driver was charged with DUI and was reported as having 0.121 BAC.

Table 5: Nighttime Crashes Turtle Season, March – October 2010-2014

Night time Crashes During Turtle Season March 1st through October 31st)			
HSMV #	Crash Conditions	Crash Type	Summary
809869730	08/27/10, 12:18 AM, Dark-Not Lighted, Clear, Dry road conditions	Fixed Object	A parked City vehicle struck a no parking sign as she was leaving the shoulder after responding to a call. The sign was noted in the driver's blind spot at the time.
809870230	09/10/10, 09:41 PM, Dark-Lighted, Clear, Dry road conditions	Fixed Object	A northbound vehicle hit the raised curb causing the tires to go flat. The driver claimed the car was pulling hard to the left. After the crash the driver noted as having a hard time balancing herself and therefore a DUI test was conducted and she was arrested.
80988266	10/29/11, 06:43 PM, Dark-Lighted, Rain, Wet road conditions	Sideswipe, same direction	An eastbound vehicle turned right from the eastbound left-turn lane and struck an vehicle in the right-turn lane.
82611984	03/30/13, 01:54 AM, Dark-Lighted, Clear, Dry road conditions	Fixed Object	As a northbound scooter approached the bridge, the scooter hit the curb of the sidewalk, lost control, and the driver was ejected from the scooter.
82612025	04/03/13, 02:06 AM, Dark-Lighted, Clear, Dry road conditions	Fixed Object	A southbound vehicle was approaching the bridge, attempted to avoid debris in roadway, drove off the roadway, hit the east concrete barrier, and the vehicle overturned.
82612941	06/09/13, 01:29 AM, Dark-Lighted, Clear, Dry road conditions	Front to Rear (Rear-End)	A southbound rear end occurred at SR-A1A (Ocean Boulevard) at Ponce De Leon Road. The driver had his right turn signal indicator on but made a left turn which confused the trailing vehicle and caused the rear end.
82613000	06/14/13, 12:41 AM, Dark-Lighted, Cloudy, Dry road conditions	Fixed Object	The driver of a southbound vehicle looked down to her phone to text, drifted off the roadway, and struck a fire hydrant.
82613989	09/08/13, 08:20 PM, Dark-Lighted, Clear, Dry road conditions	Fixed Object	The driver was driving northbound when a spider jumped on him causing him to lose control of the vehicle and crash into the guardrail on the northwest side of the bridge.
82618047	06/17/14, 04:35 AM, Dark-Lighted, Clear, Dry road conditions	Fixed Object	A northbound vehicle lost control on the bridge and crashed. The driver was unable to stand without losing his balance, and the officer smelled alcohol. A DUI test was not given.

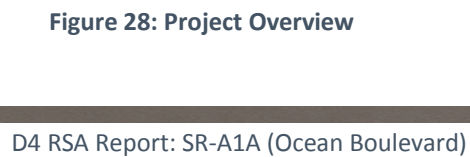
Figure 27 depicts the 25 crashes reported along (SR-A1A / Ocean Boulevard) from mile post 0.894 (De Soto Road) to 1.409 (The Boca Beach Club).



Figure 27: Collision Diagram (2010 to 2014)

Road Safety Audit Findings Summary

ID	Location Description:	Spot Observation Overview:	Suggestions for Consideration:	Assigned to:
01	SR-A1A through lanes	Cyclists use both roadway and sidewalk	Provide sharrows	FDOT
02	Northbound and southbound approach to bridge	No curve warning approach s-curve	Provide curve warning signs	FDOT
03	Barrier wall along bridge	No delineation	Provide reflective delineation	FDOT
04	North of Ponce De Leon	Bus stop on east side of SR-A1A	Relocate south to Ponce De Leon	Palm Beach Transit
05	Signal head approaches	No backplates	Provide yellow backplates	FDOT
06	Mid-block crosswalks across SR-A1A	Unsignalized mid-block crosswalks	Consider RRFB	FDOT
07	Corridorwide	Sidewalk gaps	Provide sidewalk continuity	FDOT



Road Safety Audit Findings Details - Spot Observations

ID	Location Description:	Spot Observation Overview:	Suggestions for Consideration:
01	SR-A1A through lanes	Cyclists use both roadway and sidewalk	Provide sharrows



Spot Observation Details:



Bicycles were observed traversing the SR-A1A (Ocean Boulevard) bridge along both the paved shoulder and sidewalk. As a result of the nature of the nearby residential land uses, a mix of “recreational” and “enthusiasts.” Recreational cyclists were observed on the sidewalk traversing the bridge contraflow on the sidewalk. Enthusiast cyclists were observed traversing the Boca Raton Inlet Bridge along the paved shoulder. Pedestrians conflicted with cyclists on the sidewalk when cyclists travel along the sidewalk.

Suggestion Details:


Providing “sharrows” along SR-A1A on the bridge segment where there are signs indicating that bikes may take the full lane, will further encourage cyclists to use the throughway and remind drivers that cyclists are allowed on the road. Note that there were four crashes reported that involved a bicyclist.




Agency:	Improvement Type:
FDOT	Pavement Markings
Time Frame:	EEE:
Short	Engineering
Level of Effort:	Comment:
Low	

ID	Location Description:	Spot Observation Overview:	Suggestions for Consideration:
02	Northbound and southbound approach to bridge	No curve warning approach s-curve	Provide curve warning signs
		<p>Spot Observation Details:</p> <p>There are no curve warning signs on approach to the S-curve along the Boca Inlet Bridge on either approach. Although the approach speed of 35 mph may seem comfortable along SR-A1A (Ocean Boulevard), the approach may be problematic, particularly for southbound drivers at night due to a dark spot in overhead street lighting. Three crashes were reported at each of the curves prior to the bridge. Per the Crash Modification Factor Clearinghouse, installing advance static curve warning signs reduces serious injury, and minor injury crashes by 30% and property damage crashes by 8%.</p>	
		<p>Suggestion Details:</p> <p>Install curve warning signs on both approaches to the Boca Inlet Bridge; consider advisory speed reduction.</p> <p>Note that there are currently fourteen signs on the southbound approach.</p>	
		<p>Agency:</p> <p>FDOT</p>	<p>Improvement Type:</p> <p>Signs</p>
		<p>Time Frame:</p> <p>Short</p>	<p>EEE:</p> <p>Engineering</p>
		<p>Level of Effort:</p> <p>Low</p>	<p>Comment:</p>

ID	Location Description:	Spot Observation Overview:	Suggestions for Consideration:
03	Barrier wall along bridge	No delineation	Provide reflective delineation

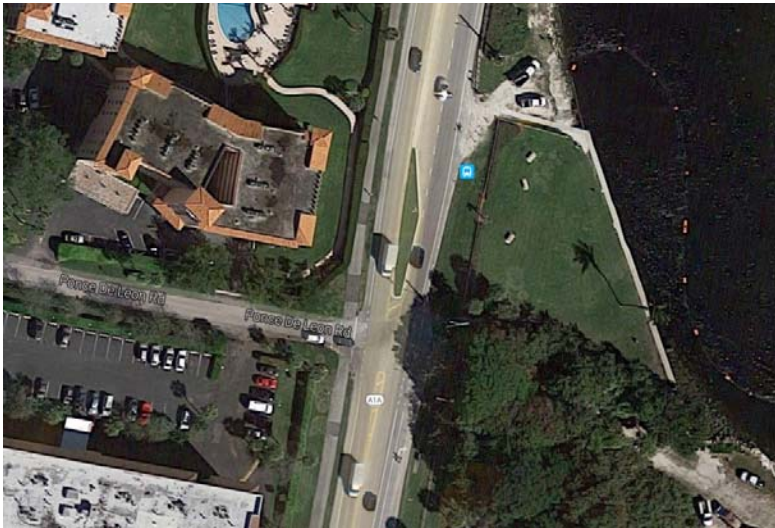




Spot Observation Details:	
The barrier wall on the Boca Inlet Bridge does not have reflectors to delineate the bridge’s curvature. Per the FHWA’s Low Cost Treatments for Horizontal Curve Safety, retroreflective material, such as reflector panels of retroreflective sheeting, can be a highly effective treatment for delineating curves, especially at nighttime. Five nighttime crashes were identified along the study bridge segment.	
Suggestion Details:	
Install a reflective barrier delineation to better alert drivers of approaching S-curve along the Boca Inlet Bridge. Note that on this two-lane road, the delineation would be white on both sides of the road to match the color of adjacent edge lines.	

Agency:	Improvement Type:
FDOT	Signs
Time Frame:	EEE:
Short	Engineering
Level of Effort:	Comment:
Low	

ID	Location Description:	Spot Observation Overview:	Suggestions for Consideration:
04	North of Ponce De Leon	Bus stop on east side of SR-A1A	Relocate south to Ponce De Leon



Spot Observation Details:

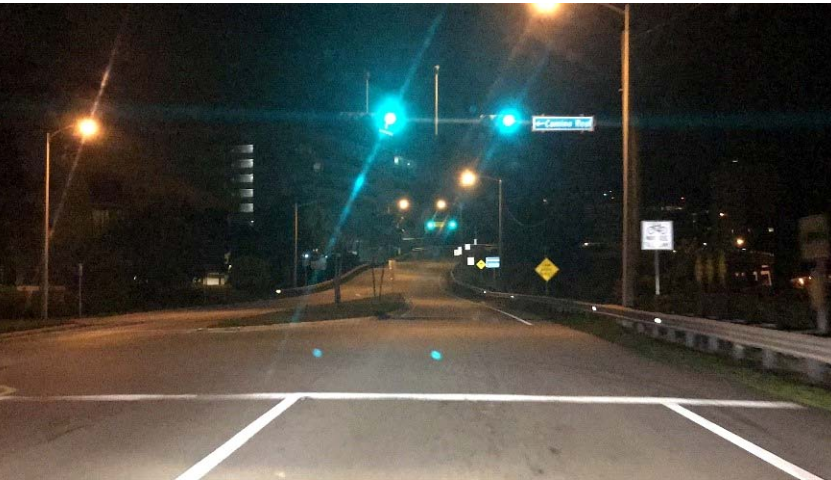
A bus stop currently is located on the east side of SR-A1A north of Ponce de Leon.

Suggestion Details:

Concurrent with installing the planned mid-block pedestrian crossing (mentioned by City of Boca Raton staff during site visit) at Ponce de Leon, coordinate with Palm Beach Transit to relocate the bus stop to the south nearer the crossing at Ponce de Leon.

Agency:	Improvement Type:
Palm Beach Transit	Bus stop
Time Frame:	EEE:
Short	Engineering
Level of Effort:	Comment:
Medium	

ID	Location Description:	Spot Observation Overview:	Suggestions for Consideration:
05	Signal head approaches	No backplates	Provide yellow backplates



Spot Observation Details:

Signal heads within the study area do not have reflective sheeting.



Suggestion Details:

Due to the 5 rear-end collisions and 13 nighttime crashes, provide yellow retroreflective back plates on all signal indications in the study area. The signals include:

- Signalized intersection at Camino Real
- Draw Bridge Signal Indicators

Per the Crash Modification Factor Clearinghouse, adding 3-inch yellow retroreflective sheeting to signal backplate reduces 15% of all urbanized area crashes.

Agency:	Improvement Type:
FDOT	Signal
Time Frame:	EEE:
Mid	Engineering
Level of Effort:	Comment:
Medium	

ID	Location Description:	Spot Observation Overview:	Suggestions for Consideration:
06	Mid-block crosswalks across SR-A1A	Unsignalized mid-block crosswalks	Consider RRFB
<div data-bbox="37 228 871 699">  </div> <div data-bbox="369 786 543 1300">  </div>		<div data-bbox="890 159 1192 191">Spot Observation Details:</div> <div data-bbox="890 204 2009 306"> <p>There are several mid-block crosswalks across SR-A1A (Ocean Boulevard) in the vicinity of the study area. Two crashes with a bicyclist were reported in the vicinity of the proposed and existing mid-block crossings.</p> </div>	
		<div data-bbox="890 581 1119 613">Suggestion Details:</div> <div data-bbox="890 626 2009 834"> <p>Due to the two bicycle crashes, conduct pedestrian turning movement counts to determine the feasibility of providing rectangular flashing beacons (RRFBs) at the existing and proposed mid-block crossings. Per the FHWA's SA-09-009, RRFB are a lower cost alternative to traffic signals and hybrid signals and have been shown to increase driver yielding behavior at crosswalks significantly when supplementing standard pedestrian crossing warning signs and markings.</p> </div>	
		<p>Note that Traffic Engineering Manual (TEM) requirements call for typical weekday counts; however, due to the beach accesses, a weekend count should be included.</p>	
		<div data-bbox="890 1076 989 1109">Agency:</div> <div data-bbox="890 1117 957 1141">FDOT</div>	<div data-bbox="1375 1076 1608 1109">Improvement Type:</div> <div data-bbox="1375 1117 1463 1141">Beacon</div>
		<div data-bbox="890 1166 1041 1198">Time Frame:</div> <div data-bbox="890 1206 938 1230">Mid</div>	<div data-bbox="1375 1166 1428 1190">EEE:</div> <div data-bbox="1375 1206 1516 1230">Engineering</div>
		<div data-bbox="890 1255 1064 1287">Level of Effort:</div> <div data-bbox="890 1295 991 1320">Medium</div>	<div data-bbox="1375 1255 1505 1287">Comment:</div>

**Spot Observation Details:**

After the rehabilitation project is complete, only the east side of SR-A1A will have a sidewalk across the Boca Inlet Bridge.

The northbound approach to the Boca Inlet Bridge has no sidewalks on either side of SR-A1A on the northbound approach. The eastside of SR-A1A has guardrail and drainage inlets. The southbound approach to the Boca Inlet Bridge has sidewalk on the west side of SR-A1A.

Suggestion Details:

In conjunction with the completion of the bridge rehabilitation work, sidewalks will need to be modified along SR-A1A on approach to the Boca Raton Inlet Bridge to access the new sidewalk on the bridge. Note that the work program project limits for the bridge rehabilitation work do not extend beyond the limits of the bridge.

**Agency:**

FDOT

Improvement Type:

Sidewalk

Time Frame:

Long

EEE:

Engineering

Level of Effort:

High

Comment: