5. SAFETY ANALYSIS

Although the new interchange on I-95 at Central Boulevard is not constructed at this time, a historical crash analysis was conducted to determine the types of crashes that occurred along the subject section of I-95. The last five years of available crash data (2013 through 2017) were obtained from the FDOT Crash Analysis Reporting System (CARS) on I-95 from south of PGA Boulevard to north of Central Boulevard. This includes the portion of interstate where Ramp A is proposed to be built. **Table 3** summarizes the observed crashes along these limits of I-95.

The number of crashes, crash types, severity, lighting conditions, surface conditions, when the crashes occurred, contributing causes, and weather conditions were all summarized in crash summary tables. The safety analyses is included in **Appendix D**.

A total of 78 crashes were reported within the study area during the five-year period. There were 21 crashes reported in 2013, 16 crashes in 2014, 9 crashes in 2015, 20 crashes in 2016, and 12 crashes in 2017. There were 31 crashes (or 40%) that involved injuries and no fatal crashes reported.

There were 48 (or 61%) reported crashes that occurred during daylight conditions and 41 (or 52%) reported crashes that occurred under dry surface conditions.

Overall, the leading crash type was Fixed Object, with 37 (or 47%) crashes reported for the five-year period. There were 11 Sideswipe crashes and 11 Sideswipe crashes reported during the 5-year period.

Table 3
Crash Summary of I-95 from South of PGA Boulevard to North of Central Boulevard

I-95		Number of Crashes Year					5 Year Total Crashes	Mean Crashes Per Year	%
		2013	2014	2015	2016	2017			
CRASH TYPE	Rear End	2	3	2	1	3	11	2	14.1%
	Head On	0	0	0	0	0	0	0	0.0%
	Angle	2	1	1	2	0	6	1	7.7%
	Left Turn	0	0	0	0	0	0	0	0.0%
	Right Turn	0	0	0	0	0	0	0	0.0%
	Sideswipe	4	2	1	3	1	11	2	14.1%
	Backed Into	0	0	0	0	0	0	0	0.0%
	Pedestrian	1	0	0	0	0	1	0	1.3%
	Bicycle	0	0	0	0	0	0	0	0.0%
	Fixed Object	*10*	*10*	*1*	*11*	*5*	*37*	*7*	*47.4%*
	Concrete Traffic Barrier	9	8	1	8	4	30	6	38.5%
	Tree (Standing)	0	1	0	2	0	3	1	3.8%
	Traffic Sign Support	0	0	0	1	0	1	0	1.3%
	Other Non Fixed Object Collisions	*1*	*0*	*1*	*2*	*1*	*5*	*1*	*6.4%*
	Parked Motor Vehicle	0	0	0	0	1	1	0	1.3%
	Struck by Falling/Shifting Cargo	1	0	0	0	0	1	0	1.3%
	Other Non-Fixed Object	0	0	1	2	0	3	1	3.8%
	Non-Collisions	*1*	*0*	*1*	*0*	*2*	*4*	*1*	*5.1%*
	Overturn/Rollover	0	0	1	0	1	2	0	2.6%
	Cargo/Equipment Loss or Shift	1	0	0	0	1	2	0	2.6%
	Others	0	0	2	1	0	3	1	3.8%
	Total Crashes	**21**	**16**	**9**	**20**	**12**	**78**	**16**	**100.0%**
SEVERITY	PDO Crashes	11	12	5	12	7	47	9	60.3%
	Fatal Crashes	0	0	0	0	0	0	0	0.0%
	Injury Crashes	10	4	4	8	5	31	6	39.7%
LIGHTING CONDITIONS	Daylight	16	9	5	12	6	48	10	61.5%
	Dusk	0	1	0	0	1	2	0	2.6%
	Dawn	0	0	1	0	0	1	0	1.3%
	Dark	5	6	3	8	5	27	5	34.6%
	Unknown	0	0	0	0	0	0	0	0.0%
SURFACE CONDITIONS	Dry	11	6	4	13	7	41	8	52.6%
	Wet	10	10	5	7	5	37	7	47.4%
	Others	0	0	0	0	0	0	0	0.0%

The study section of I-95 where Ramp A is proposed was evaluated using the Interactive Highway Safety Design Model (IHSDM). The IHSDM 2019 Release, 15.0.0 implements the Predictive Method of the Highway Safety Manual (HSM). The IHSDM Crash Prediction Module (CPM) estimates the frequency of crashes expected on a roadway when considering its geometric design and traffic characteristics.

The HSM Predictive Method utilizes Safety Performance Functions (SPFs) to estimate the predicted number of crashes for a facility given its roadway characteristics and traffic volume. The I-95 facility was modeled for a length of approximately 3,800 feet (0.72 mi). The analysis limits are 500 feet south of the PGA Boulevard interchange and extend 3,300 feet north of the proposed Central Boulevard interchange. This area includes Ramp A under both the No Build condition and the proposed redesign.

The predictive safety analysis was conducted based on the characteristics of the I-95 study segment and Ramp A, which represent inputs for the analysis. The area is urban, and I-95 is a divided multi-lane freeway with a non-traversable median. For the purposes of this safety analysis, the travel speed on I-95 is presumed to be consistent with a limited access facility. Further, the HSM methodology does not include high occupancy vehicle (HOV) lane in its procedures. Therefore, the I-95 segment was modeled as a four-lane section in each direction and based on the projected 2040 traffic volume projections included in this report.

An estimate of the predicted number of crashes to occur between 2020 and 2040 was prepared for both the No Build condition and the proposed redesign (Build scenario) of Ramp A. **Table 4** summarizes the predicted crash results per the HSM Predictive Method. Findings indicate that if no design changes are made to Ramp A, there will be a cumulative total of 649.52 predicted crashes for the 20-year period. Of this total, 197.11 crashes will be injury and fatal crashes and 452.42 will be property damage only crashes.

If the improvements to Ramp A are implemented as described herein, the safety analysis predicts that a slight decrease will occur in the number of crashes reported. Results indicate that the Build scenario will generate a cumulative total of 593.57 crashes between 2020 and 2040, 183.95 fatal and injury crashes, and 409.62 property damage only crashes. Overall, the Build improvements will result in 55.95 fewer total crashes within the 20-year analysis period, while fatal and injury crashes will be reduced by 13.16 crashes during the same timeframe. The predictive safety analysis worksheets are included in **Appendix D**.

Table 4
Predictive Crash Analysis Comparison between 2020 and 2040

	2020 - 2040		
	Total Expected Crashes	**Fatal and Injury Crashes**	**Property Damage Only Crashes**
No Build Scenario	649.52	197.11	452.42
Build Scenario	593.57	183.95	409.62
Net Difference	*-55.95*	*-13.16*	*-42.80*

Note: Based on Interactive Highway Safety Design Model (IHSDM) Crash Prediction Method, per Highway Safety Manual

Overall, the approved 2015 design concept includes a sudden tapered merge condition on the inside of southbound I-95 that is not desirable from a safety perspective. It creates a high risk for collisions involving traffic merging onto I-95. Drivers occupying the inside lane of the two-lane ramp would be unexpectedly confronted with a sudden lane drop as they are accelerating along the ramp. Potential conflicts would exist on both sides of the vehicle, requiring the driver to immediately merge with traffic from either the I-95 mainline or the second lane of Ramp A. No recovery area for drivers occupying the inside lane of Ramp A is provided under the approved 2015 design concept.

In the proposed redesign of Ramp A, this tapered merge lane that creates an unexpected maneuver is eliminated thereby providing a safer merge condition. Drivers in the outside lane of Ramp A merge to a single lane in advance of the gore area, rather than encounter a sudden lane drop on the inside of Ramp A at the gore. In a challenging driving environment, the proposed design modification to Ramp A represents a safer condition as the driver has the entire weaving section to find an accommodating gap along southbound I-95; only faces conflicting vehicles on one side; and enjoys a recovery area.