10.0 SAFETY ASSESSMENT

10.1 Recommended Alternative Safety Enhancements

As discussed under Section 3.5 of the IMR, traffic safety is a concern along the arterial network within the vicinity of the I-95/SR 90 Interchange. Several intersections within the vicinity of the interchange have historically experienced abnormally high crash rates. These include the existing I-95 ramp terminal intersections at SW 8th Street and 3rd Avenue, the ramp terminal intersection at SW 7th Street and SW 4th Avenue and the adjacent intersections. The extensive weaving activities at these locations, together with the excessive traffic flows have been identified as contributing factors to the abnormally high crash rates at these locations. The Recommended Alternative for the I-95/SR 90 Interchange will provide improvements to address these and other safety concerns within the influence area of the interchange. Safety improvements include:

- The proposed new on-ramp from SW 7th Street to NB I-95 will substantially reduce weaving activity within the vicinity of the interchange. In the existing condition, access to NB I-95 from SW 7th Street involves travelling a circuitous route – WB along SW 7th Street, SB along SW 4th Avenue and EB along SW 8th Street to the I-95 NB On-Ramps. These maneuvers are accomplished across multiple lanes within very short city blocks and this creates a high crash risk condition. The proposed new on-ramp from SW 7th Street will alleviate this condition by providing a direct access to NB I-95 for approximately 940/1040 vehicles that make this movement during the AM/PM peak hours (2045 estimates).
- The proposed new I-95 NB on-ramp will reduce conflicting movements at four high crash intersections: SW 8th Street at 4th Avenue; SW 8th Street at 3rd Avenue, SW 7th Street at SW 3rd Avenue and SW 7th Street at SW 4th Avenue. This reduction in conflicting traffic will correspondingly reduce crashes and in particular right angle crashes at these intersections.
- The proposed improvements will reduce the risk for queue spillback onto I-95 mainline. Vissim microsimulation analysis demonstrates that with the existing interchange configuration, queues at the I-95 SB off-ramp will exceed the available storage resulting in queue spillbacks onto I-95 mainline during AM and PM peak periods. This condition creates a major safety concern with

standing queues on I-95 mainline adjacent to high-speed traffic. This safety concern is significantly reduced by the Recommended Alternative due to the substantial reduction in the generated queue lengths and durations.

10.2 Predictive Crash Analysis – SW 8th Street and SW 7th Street

The Highway Safety Manual (HSM) is the premier guide for performing quantitative crash prediction analyses for road facilities. The HSM procedures were reviewed for applicability to the SR 90/SW 8th Street/SW 7th Street IMR. Through this review, it was determined that the current HSM procedures could not be directly applied for crash prediction along SW 7th Street and SW 8th Street due to the unique characteristics of these roadways – one-way facilities, similar to the study roads, are not currently covered by the HSM. Given these limitations, an alternative procedure was used for quantifying the estimated crashes along SW 8th Street and SW 7th Street under the Build and No Build conditions. This procedure is described below.

The safety analysis applied for the study arterials evaluated crash rates at the four intersections that would be primarily impacted by the proposed build improvements. These are:

- SW 8th Street & SW 3rd Avenue
- SW 8th Street & SW 4th Avenue
- SW 7th Street & SW 3rd Avenue
- SW 7th Street & SW 4th Avenue

The above four referenced intersections will experience a reduction in traffic under the Build condition when compared to the No Build Condition. This is due to the proposed new on-ramp for WB SW 7th Street to NB I-95 which removes traffic from the arterial network. This reduction in traffic is a change in exposure which can be used to estimate the change in crashes between Build and No Build. The process involved the following steps:

1. Compute observed intersection crash rates. This is computed form historical crash data collected in 2011 through 2015.

2. Compute No Build traffic exposure. This is computed as the total traffic entering each intersection from opening year (2025) through design year (2045) under No Build Conditions. It is estimated from the project traffic forecast.
3. Compute Build traffic exposure. This is computed as the total traffic entering each intersection from opening year (2025) through design year (2045) under Build Conditions. It is estimated from the project traffic forecast.
4. Compute estimated crashes under No Build Conditions. This is computed as the product from steps 1 and 2 above.
5. Computed estimated crashes under Build Conditions. This is computed as the product from steps 1 and 3 above.
6. Compute crash reduction. The is computed from the difference between results from steps 4 and 5 above.

Detailed calculations for the above procedure are contained under **Appendix J** and summarized in **Table 10.1**. As depicted in **Table 10.1**, the total estimated crashes under the No Build and Build Conditions are approximately 4,077 and 3,158 respectively. This is a reduction of approximately 919 crashes over the design life of the project if the Recommended Build Alternative is implemented. The crash reduction translates to crash savings of approximately $133,586,000 (919 crashes reduced @ $123,589 per crash) based on FDOT's average crash cost for similar facilities.

Table 10.1 Intersections Crash Prediction Summary

Intersection	Observed Crash Rate 2011 – 2015 (Crashes per MEV)	No Build Crashes 2025 – 2045	Build Crashes 2025 – 2045	Crash Reduction
SW 8th St. and SW 4th Ave.	6.427	1874	1546	328
SW 8th St. and SW 3rd Ave	2.532	664	463	201
SW 7th St. and SW 4th Ave	2.460	847	713	134
SW 7th St. and SW 3rd Ave	2.456	692	436	256
Total		**4077**	**3158**	**919**

10.3 Predictive Crash Analysis – I-95 Mainline

A quantitative safety analysis was performed for the I-95 Mainline per the HSM predictive crash procedures. Computations were performed using the Enhanced Interchange Safety Analysis Tool (ISATe). This spreadsheet-based tool automates the calculations in Part C of the HSM. The analysis required gathering various input data for I-95 segments, ranging from geometric elements, such as alignment and cross section data, roadside and ramp access data and average annual daily traffic (AADT) data. Additionally, historical crash data for I-95 was gathered for applying the Empirical-Bayes (EB) methodology which combines the HSM's predictive procedures with observed data to compute expected crashes. These procedures were used for comparing expected crashes throughout the design life of the project (2025 through 2045) under No Build and Build Conditions.

Per the HSM procedures, I-95 mainline was segmented into homogenous sections with consistent cross section, traffic volume, and similar geometric features. This segmentation resulted in 11 homogenous sections under the No Build condition and 12 homogenous segments under the proposed Build condition. **Appendix J** contains lane schematics illustrating the segmentation of I-95, detailed input data and output

information from the analyses. It must be noted that due to limitations within the ISATe spreadsheet, a 24-year analysis is the maximum duration that can be evaluated. Therefore, ISATe documentation in **Appendix J** reports the analysis years as 2014 through 2034. However, the AADT coded for these horizon years reflect years 2025 through 2045 conditions. Additionally, ramps and ramp termini were not included in the HCM ISATe analysis as the proposed improvements will not significantly modify the existing ramps, except at the ramp terminals and modifications at the ramp terminals are considered in the arterial crash analysis evaluation. The proposed new NB I-95 on-ramp is considered in the safety analysis for I-95, with a new connection to the mainline in the Build Alternative. Results from the analyses are summarized in Table 10.2.

The results from the predictive crash analyses show no significant difference in the expected crashes along I-95 under the Build condition when compared to the No Build Condition. Notwithstanding, it is expected that the Build Condition will result in a reduction of crashes along I-95 mainline given that the proposed improvements will mitigate queue spillback onto I-95 mainline which occurs under the No Build Condition. The HSM procedures cannot explicitly model this queue spillback onto the mainline, hence it is not reflected in the results from the predictive crash analysis.

Table 10.2: I-95 Crash Prediction Summary

Crash Type	Expected Number of Crashes: 2025 - 2045		
	No Build	Build	Crash Difference
Multiple Vehicles	1412	1418	+6
Single Vehicle	601	598	-3
Total Crashes	2013	2016	+3