4.1.3 Important Considerations and Assumptions

Important considerations and assumptions in the modeling procedure summarized below:

- The default calibration factors = 1 were used (No calibration factors were applied to the Prediction Models).
- The maximum number of through lanes on the freeway segments are capped at 10 lanes in the analysis. However, it should be noted that a segment in the D-B Concept contains 11 lanes but was modeled as a 10-lane segment. To overcome this modeling limitation, a proportionate per lane volume was calculated for the 11-lane segments thereby allowing this segment to be modeled as an equivalent 10-lane segment. This adjustment allows the effect of an 11-lane segment in regard to the likely reduction in future predicted crashes, to be captured in this analysis.

The segments where the project ties into the existing segments that are not changing in both the RFP and the D-B Concept designs, were not included in the safety performance analysis given that no change in safety performance is anticipated for these segments.

4.2 Safety Analysis Review

This section describes the safety conditions for the RFP and D-B Concepts and depicts the schematic configuration for the network.

4.2.1 Summary of Freeway Segments

The RFP and D-B Concept freeway segments shown in **Exhibits 4-1** and **4-2,** respectively on the next page, were defined using the segmentation criteria described in **Section 4.1.1**, with their associated segment numbers.

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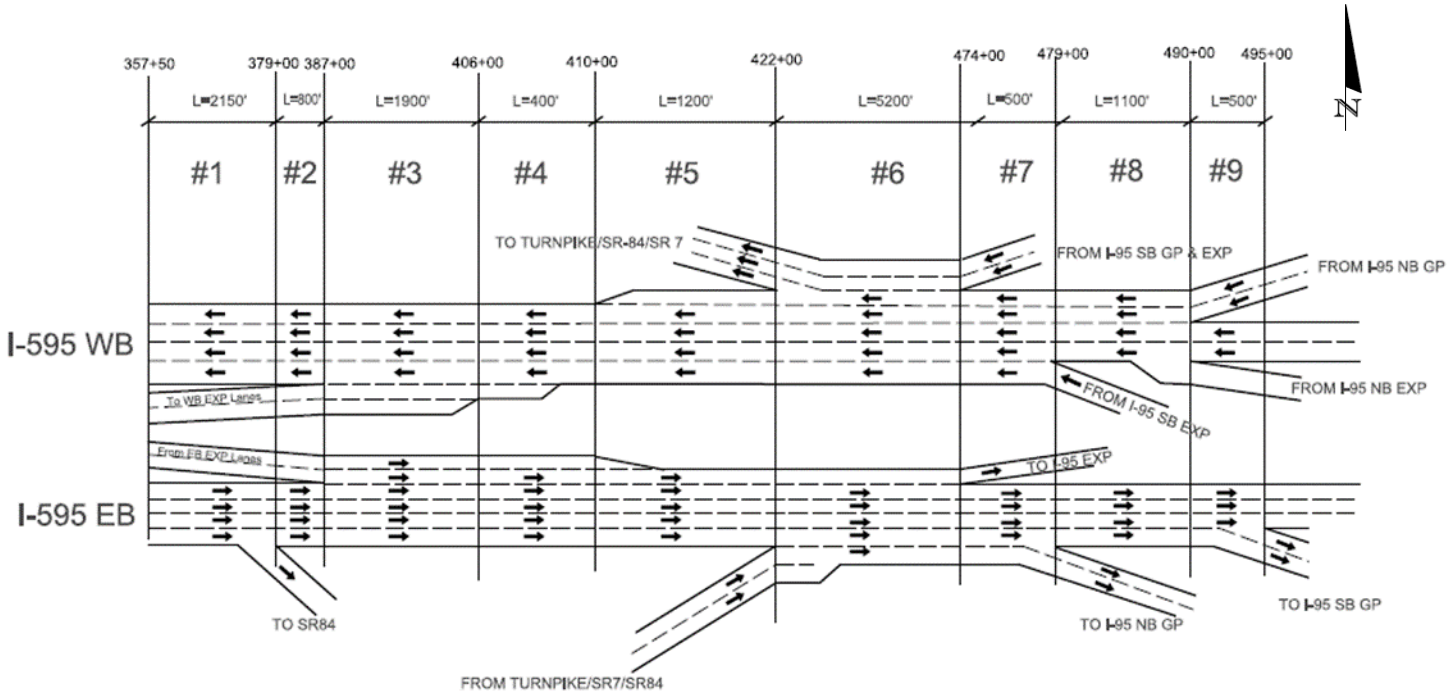

Exhibit 4-1: I-595 RFP Design Concept Freeway Segments

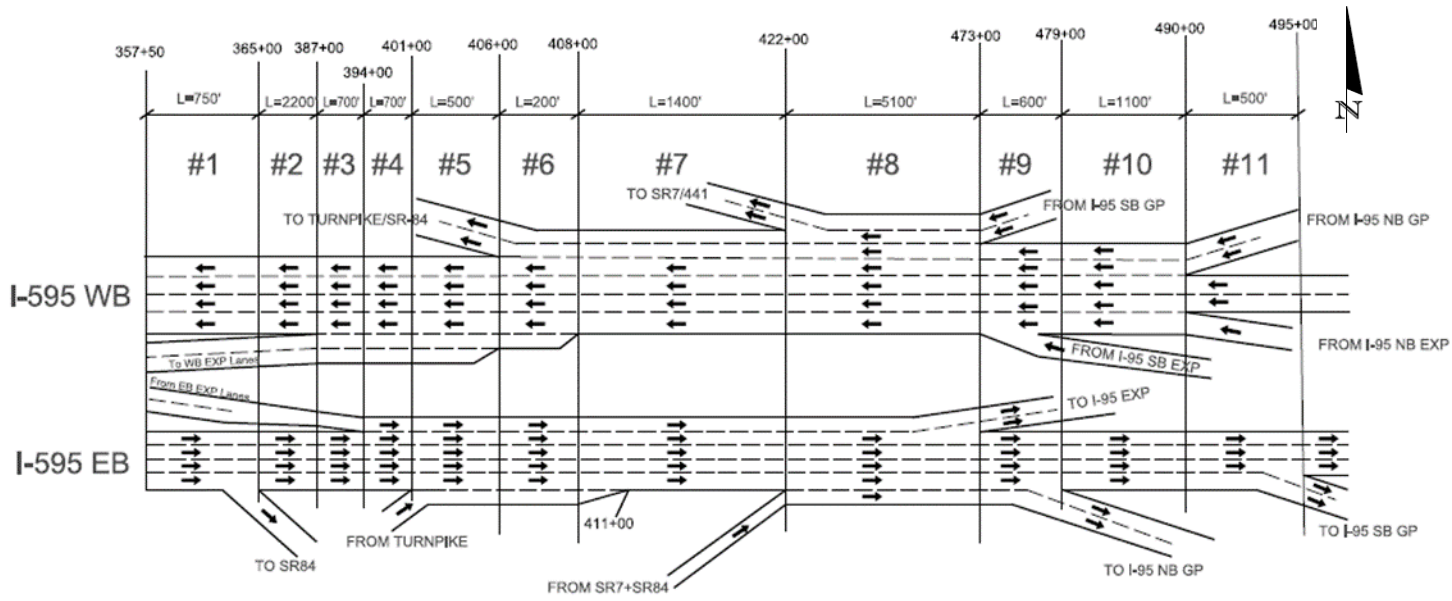

Exhibit 4-2: I-595 D-B Design Concept Freeway Segments

Tables 4-2 and **4-3,** on the next page, further define the limits of each freeway segment for the RFP and D-B Concepts, respectively.

Table 4-2: Summary of RFP Freeway Segments

Segment No.	Segment Description
Segment 01	From West of SR 84 EB Exit to EB SR 84 Exit.
Segment 02	From EB SR 84 Exit to EB Express Lanes Entrance/WB Express Lanes Exit.
Segment 03	From EB Express Lanes Entrance/ WB Express Lanes Exit to WB Express Lanes lane-addition taper.
Segment 04	From WB Express Lanes lane-addition taper to begin/end of EB/WB mainline lane-drop taper.
Segment 05	From EB/WB mainline lane-drop taper to EB Entrance/WB Exit to/from SR 7, SR 84 and Turnpike.
Segment 06	From SR 84 EB Entrance/ Turnpike WB Exit, to EB Exit to I-95 NB Express Lanes/ WB Entrance from I-95 SB GP and Express lanes.
Segment 07	From I-95 NB Express Lanes EB Exit to I-95 SB GP Lanes EB Exit.
Segment 08	From I-95 SB GP Lanes EB Exit to I-95 NB GP Lanes WB Entrance.
Segment 09	From I-95 NB GP Lanes WB Entrance to I-95 SB GP EB Exit.

Table 4-3: Summary of D-B Freeway Segments

Segment No.	Segment Description
Segment 01	From West of SR 84 EB Exit to EB SR 84 Exit.
Segment 02	From EB SR 84 Exit to EB Express Lanes Entrance/WB Express Lanes Exit.
Segment 03	From WB Express Lanes Exit to EB Express Lanes Entrance.
Segment 04	From EB Express Lanes Entrance to EB Turnpike Entrance.
Segment 05	From EB Turnpike Entrance to WB Turnpike & SR 84 Exit.
Segment 06	From WB Turnpike & SR 84 Exit to EB Turnpike Entrance Speed Change Lane Taper.
Segment 07	From EB Turnpike Entrance Speed Change Lane Taper to EB SR 7&SR 84 entrance & WB SR7&US441 Exit.
Segment 08	From EB SR 7&SR 84 entrance & WB SR7&US441 Exit to EB I-95 NB Express Lane Exit & WB I-95 SB GP Entrance.
Segment 09	From EB I-95 NB Express Lane Exit & WB I-95 SB GP Entrance to EB I-95 NB GP Exit.
Segment 10	From EB I-95 NB GP Exit to WB I-95 NB Express Lane & I-95 NB GP Entrances.
Segment 11	From WB I-95 NB Express Lane & I-95 NB GP Entrances to EB I-95 SB GP Exit.

4.2.2 Future Daily Volume Development

The future design hour traffic volumes and traffic characteristics (based on a 2040 horizon year) used in the analysis were obtained from the I-595 SIMR Reevaluation prepared to evaluate the RFP Concept. A standard K factor of 8% (per *Section 2.6, FDOT, 2014 Project Traffic Forecasting Handbook*) was used to estimate the Annual Average Daily Traffic (AADT) volumes used in this safety review. For the D-B Concept in the westbound direction, segment 8 has six (6) analysis lanes which exceeds the coding limitation in ISATe model that only allows for five (5) lanes. To address this, the volume density associated with the six (6) lane segment was proportioned across a five (5) lane segment in the analysis to predict the crashes in that segment. For that purpose, the 10,300 vph on the westbound segment was converted to per lane volume of 1,470 vphpl. A five (5) lane volume was then used in the analysis using a segment volume of 8,830 vph (1,470 vphpl x 5 = 8,830 vph). A summary table showing the estimation of AADT from the two-way peak hour volumes (derived by adding both directions for the PM peak hour) and the standard K is included in **Appendix E**.

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4.3 Future Safety Conditions

The assessment of future safety conditions for RFP and D-B Concepts considers the predicted crashes only for the sake of a safety performance comparison and does not consider the historical crash data. For the purpose of this analysis, the PM peak period was considered the critical period with the higher overall AADTs and crash frequencies and was adopted in the analysis. Following the same numbering system used in the exhibits in **Section 4.2.1,** the summary of the expected number of crashes and the predicted crash rates [Crashes per Million Vehicle Miles per year (MVM)] on the freeway segments are summarized in **Table 4-4** and **Table 4-5** for the RFP and D-B Concepts, respectively. The detailed breakdown of the input ISATe worksheets for the RFP and D-B Concepts are included in **Appendix E**.

Table 4-4: Summary of RFP Concept Expected No. of Crashes on Freeway Segments

Segment No.	Predicted N Crashes	Length (Mile)	ADT	Predicted Crash Rate (1)	Average Vehicle Exposure (M) (2)	% of Network
Segment 01	17.614	0.41	146,500	0.803	21.924	15.80%
Segment 02	6.721	0.15	143,500	0.855	7.857	5.78%
Segment 03	25.600	0.36	143,500	1.358	18.856	13.87%
Segment 04	3.013	0.075	143,500	0.767	3.928	2.89%
Segment 05	11.859	0.23	165,500	0.854	13.894	8.86%
Segment 06	75.208	0.98	236,375	0.889	84.551	37.76%
Segment 07	4.690	0.09	169,250	0.844	5.560	3.47%
Segment 08	10.665	0.21	127,500	1.091	9.773	8.09%
Segment 09	2.101	0.09	89,750	0.713	2.948	3.47%
Total	**157.5**	**2.60**	**Wt. Avg.**	**0.941(3)**		

(1) Predicted Crash Rate=No. of Crashes/M [Crash per MVM per year]
(2) M= (ADT x 365 x Highway Length in miles)/1 Million
(3) Weighted Avg. Crash rate = (∑segment i Predicted Crash rate x segment i length)/(∑ segment i length).
Notes:

- Normal Distribution Range for Crash Rates = Mean +/- 1 standard deviation.
- Standard Deviation = SQRT [(1/No. of Segments) x ∑ (xi – Avg.)^2].

As shown in **Table 4-4**, the length of the freeway segments in the RFP Concept, is about 2.60 miles with a total number of predicted crashes of 157.5 crashes per year, and a weighted crash rate average of about 0.941 crashes/MVM per year). Taking into consideration the empirical rule regarding Normally Distributed Samples, it is noted that 68% of the crash rates fall within 1 standard deviation (0.187) from the mean (0.941). Therefore, segments with predicted crash rates higher than 1.128 fall within the top 16% of the crash rates and are considered significantly higher than the predicted average crash rate. As a result, Segment 03 is considered higher than the predicted average in this section. The detailed breakdown of the type of predicted crashes from the ISATe outputs is included in **Appendix E**.

Table 4-5: Summary of D-B Concept Expected No. of Crashes on Freeway Segments

Segment No.	Predicted N Crashes	Length (Mile)	ADT	Predicted Crash Rate (1)	Average Vehicle Exposure (M) (2)	% of Network
Segment 01	6.558	0.14	146,500	0.876	7.486	5.36%
Segment 02	17.371	0.42	143,500	0.790	21.999	16.09%
Segment 03	6.153	0.13	143,500	0.904	6.809	4.98%
Segment 04	6.895	0.13	143,500	1.013	6.809	4.98%
Segment 05	4.484	0.095	159,250	0.812	5.522	3.64%
Segment 06	3.133	0.04	205,875	1.042	3.006	1.53%
Segment 07	16.183	0.27	205,875	0.798	20.289	10.34%
Segment 08	68.887	0.97	218,000	0.893	77.183	37.16%
Segment 09	7.552	0.11	177,500	1.060	7.127	4.21%
Segment 10	6.971	0.21	127,500	0.713	9.773	8.05%
Segment 11	2.568	0.095	89,750	0.825	3.112	3.64%
Total	**146.8**	**2.61**	**Wt. Avg.**	**0.861 (3)**		

(1) Predicted Crash Rate=No. of Crashes/ M [Crash per MVM per year].
(2) M= (ADT x 365 x Highway Length in miles)/1 Million].
(3) Weighted Avg. Crash rate = (∑segment i Predicted Crash rate x segment i length)/ (∑ segment i length).

Notes:

- Normal Distribution Range for Crash Rates = Mean +/- 1 standard deviation.
- Standard Deviation = SQRT [(1/No. of Segments) x ∑ (xi – Avg.)^2].

As shown in **Table 4-5**, the length of the freeway segments in the D-B Concept, is about 2.61 miles with a total number of predicted crashes of 146.8 crashes, and a weighted crash rate average of all segments of about 0.861 crashes/MVM per year. Taking into consideration the empirical rule regarding Normally Distributed Samples, it is noted that 68% of the crash rates fall within 1 standard deviation (0.108) from the mean (0.861). Therefore, segments with crash rates higher than 0.969 fall within the top 16% of the crash rates and are considered higher than the average crash rate. As a result, the crash rates of segments 04, 06 and 09 are considered higher than the predicted average in this section. The detailed breakdown of the type of predicted crashes from the ISATe outputs is included in **Appendix E**.

4.4 Overall Network Summary

The overall network has a freeway length of 2.60 miles in the RFP Concept and 2.61 miles in the D-B Concept (See **Table 4-4** and **Table 4-5**) with a weighted average crash rate of 0.941 Crashes /MVM per year and 0.861 Crashes /MVM per year, respectively. The total predicted number of crashes is 157 crashes per year for the RFP Concept and 147 crashes per year for the D-B Concept.

4.5 Assessment of Segments with Highest Crash Rates

The segments with higher predicted crash rates from the average predicted crash rates of each section were identified to assess the critical areas and aspects that are expected to increase the predicted number of crashes within the overall network.

In the RFP Concept, the freeway segment with the highest crash rate was expected to be Segment 03 in **Exhibit 4-1**. Segment 03 has the highest crash rate of 1.358 Crashes /MVM per year.

In the D-B Concept, the freeway segments with crash rates higher than the normal distribution range (Mean +/- 1 standard deviation) were Segment 04, Segment 06 and Segment 09 in **Exhibit 4-2**. Segment 09 has the highest crash rate of 1.060 Crashes /MVM per year. The general contributing factors for the segments mentioned above are likely due to the presence of the speed-change lanes and the high maneuvering traffic volume on the segments. Segment 06 has a speed-change lane in the eastbound direction ending in the segment where the Turnpike traffic merges onto the mainline traffic. Additionally, the presence of the exit ramp from the I-595 westbound to the Turnpike may likely contribute to the higher crash rates in the segment. Moreover, Segment 09 includes an exit ramp to I-95 NB GP lanes in the eastbound direction and left-hand entrance ramp from I-95 SB Express Lanes resulting in a higher incidences of ramp entrance crashes that were predicted in the segment.

It should be noted that the crash rates on Segments 04, 06 and 09 in the D-B Concept are closer to the normal distribution range and are lower than the crash rate on Segment 03 of the RFP Concept.

4.6 Safety Analysis Summary

The objective of this safety analysis was to estimate and compare the future crash potentials of the RFP and D-B Concepts. Based on the procedures outlined in Chapters 18 and 19 of the Highway Safety Manual as well as from the output of the ISATe safety analysis tool, the total future predicted crashes within the study area for the RFP Concept is estimated at **157.5 crashes per year** with an average crash rate of **0.941 Crash/MVM per year** while the D-B Concept yielded **146.8 crashes per year** with an average crash rate of **0.861 Crash/MVM per year.** It can be concluded from these results that the D-B Concept is projected to experience a better safety performance in terms of the total number of crashes and the crash rates on the segment compared to RFP Concept.

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