# 5 SAFETY ANALYSIS

## 5.1 Safety Evaluation

A safety analysis, consistent with the FDOT IARUG (January 2018), was performed to compare the RFP Concept and the ATC #32. The analysis was performed using the Enhanced Interchange Safety Analysis Tool (ISATe).

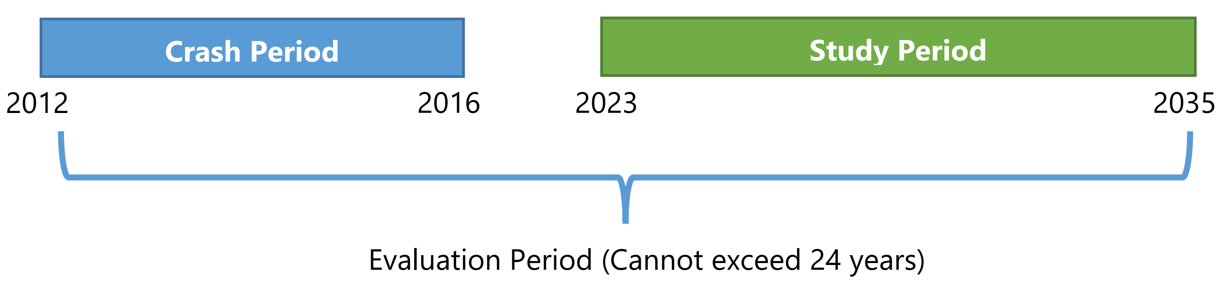
The basic purpose of ISATe is to provide design and safety engineers with an automated tool to aid in assessing the safety effects of geometric features and traffic control options. The ISATe can also be used to predict the safety performance of design alternatives for new interchanges before reconstruction of existing interchanges.

ISATe incorporates the disaggregate safety evaluation approach recommended by the Highway Safety Manual for its Part C predictive methods. In this regard, the freeway facility is disaggregated into one or more freeway sections and interchanges. The interchange is disaggregated into one or more ramps, C-D roads, and crossroad ramp terminals. Thus, a freeway facility consists of the following basic facility components:

- Freeway sections (with or without speed-change lanes).
- Ramps or C-D roads.
- Crossroad ramp terminals (i.e., the intersection between one or more ramps and the crossroad).

<u>ISATe Limitations:</u>

ISATe can accommodate a crash period that is 1 to 5 years in duration and an evaluation period that is 1 to 24 years in duration. If no crash data is available, then the study period is the same as the evaluation period.




### 5.1.1 Crash Data

The AOI includes both state roads and non-state roads. Hence, the crash data was obtained from Signal 4 Analytics. It is the only portal that includes crash data for both state roads and non-state roads.

Crash data was obtained for the most recent five years. At the time of data collection effort, the most recent five-year period for which the crash data was available is January 1, 2012, through December 31, 2016.

Crash data collection effort included the following roadways:

- I-4, from milepost 8.400 to 13.900
- SR 417, from milepost 16.200 to 17.455
- SR 46, from milepost 3.300 to 5.800
- International Parkway, from south of CR 46A (HE. Thomas Jr. Parkway) to north of SR 46
- Rinehart Road, from south of CR 46A (HE. Thomas Jr. Parkway) to north of SR 46
- CR 46A (H.E. Thomas Jr. Parkway), from west of International Parkway to east of Rinehart Road
- Garnet Lane, from west of Towne Center Boulevard to E Rinehart Road

In addition to the roadways, the data collection effort included the following interchanges and ramps:

- SR 417 interchange with Rinehart Road
  - SB on-ramp
  - SB off-ramp
  - NB on-ramp
  - NB off-ramp
- SR 417 interchange with I-4
  - NB SR 417 ramp to EB I-4
  - NB SR 417 ramp to WB I-4
  - WB I-4 ramp to SB SR 417
  - EB I-4 ramp to SB SR 417
- SR 417 at International Parkway
  - NB off-ramp
  - SB on-ramp
- I-4 at Lake Mary Boulevard
  - EB on-ramp
  - WB off-ramp
- I-4 at CR 46A (H.E. Thomas Jr. Parkway)
  - EB off-ramp
  - EB on-ramp
  - WB on-ramp
  - WB off-ramp
- I-4 at SR 46
  - WB on-ramp
  - WB off-ramp

- EB on-ramp
- EB off-ramp

- I-4 at US 17/92 (Seminole Boulevard)
  - EB off-ramp
  - WB on-ramp

### 5.1.2 Predictive Safety Analysis

ISATe includes predictive safety methods that are used to estimate the predictive average crash frequency for each segment. Additionally, since crash data was available, the Empirical Bayes (EB) Method was used by combining the predictive average crash frequency with five years of observed crash data to obtain a more reliable estimate of the expected crash frequency.

Depending on the geometric input, a CMF is associated with one geometric design or traffic control feature.

No calibration factors were applied.

The process includes the following steps:

- A severity distribution function (SDF) is used to compute the severity distribution for each site. This distribution is used to obtain an estimate of the expected average crash frequency by severity level.
- A crash type distribution is used to obtain an estimate of the expected average crash frequency by crash type category (e.g., head on, fixed object, etc.).
- The estimates of expected average crash frequency are summed for all years to obtain an estimate of the expected number of crashes for each site during the study period.
- The calculations for estimating the predictive average crash frequency is processed on a segment-by-segment and year-by-year basis. The process is repeated for each segment and year.

## 5.2 Data Inputs

ISATe requires geometric design features, traffic demand, traffic control features, and crash data (if available) for safety analysis. The data needed in ISATe is as summarized in **Table 5-1**.

**Table 5-1: Data Inputs for Safety Analysis**

| Data Category | Description |
|---|---|
| Basic Roadway Data | Number of through lanes, segment length |
| Alignment Data | Horizontal curve radius and length of a curve |
| Cross Section Data | Lane width, outside shoulder width, inside shoulder width, median width, rumble strips and barrier details |
| Roadside Data | Clear zone and presence of a barrier |
| Access Data | Ramp length, number of lanes, shoulder width |
| Traffic Data | AADT for the freeway segments, ramp segments, and ramp terminals |
| Crash Data | Number of crashes per year |

## 5.3 RFP and ATC #32 Concept Segments

The ISATe method requires the freeway facility to be broken into separate homogenous segments so that the appropriate CMF could be applied to individual segments. The ISATe manual suggests that the freeway facility be segmented if there is at least one change in the following features:

1. Number of through lanes
2. Lane width
3. Outside shoulder width
4. Inside shoulder width
5. Median width
6. Ramp presence
7. Clear zone width

Segmentation of the area of influence for the freeway facility resulted in 14 segments for the RFP Concept and 17 segments for ATC #32. **Figure 5-1** and **Figure 5-2** show the segments on I-4 for the RFP Concept and ATC #32.

The data inputs based on these segments are provided in **Appendix F**.