I-75 SKETCH INTERSTATE PLAN TECHNICAL MEMORANDUM

SAFETY

November, 2010

Florida Department of Transportation
Systems Planning

I-75 Sketch Interstate Plan Safety Analysis

FLORIDA DEPARTMENT OF TRANSPORTATION

CENTRAL OFFICE

November 2010

Project Team

Florida Department of Transportation

- Systems Planning Office
- Safety Office
- Transportation Statistics Office

Florida Department of Transportation, Districts Two and Five Representatives

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Purpose

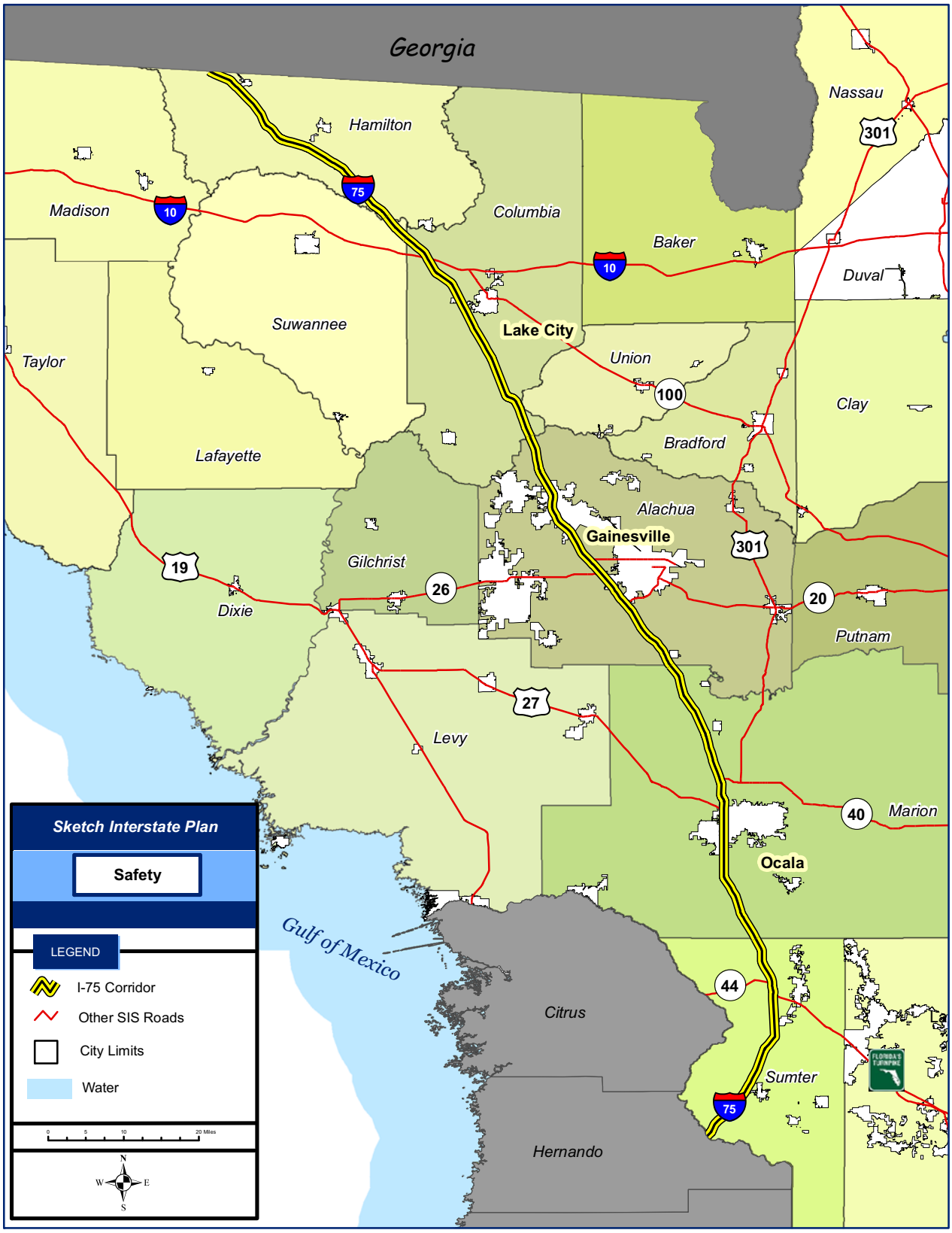
The Florida Department of Transportation Central Office in coordination with the District Offices has prepared a Sketch Interstate Plan for the I-75 corridor from the Florida-Georgia border south through Sumter County, Florida. **Exhibit 1** displays the I-75 Sketch Plan Corridor Area. The major purpose of this Sketch Interstate Plan is to improve the mobility of users of I-75 by examining the existing interstate system, with respect to planned improvements, and reveal general problem areas and trends that will be examined in more detail in a later phase. The preparation of a Sketch Plan is an integral part of the long range planning process for the development of the Strategic Intermodal System (SIS). As part of the Sketch Plan process, the Project Team, which included Department Staff and their consultant, developed multiple Technical Memorandums to analyze different concepts encompassing many focus areas. The I-75 Sketch Plan Technical Memorandums focus on:

- Safety
- Traffic
- Freight Mobility
- Environmental Analysis
- Planned Improvements and Conceptual Mobility Opportunities

The purpose of this Technical Memorandum was to analyze crash data reported on the I-75 Sketch Plan Corridor. The results of the analysis will represent the latest trends in police reported motor vehicle crashes along the I-75 corridor. The study will also attempt to identify potential safety challenges and concerns. Due to the delicate nature of crash statistics, the Project Team coordinated, reviewed and worked with the Florida Department of Transportation Safety Office when developing this Technical Memorandum.

The Project Team determined that there are many challenges to roadway safety along the I-75 Sketch Plan corridor ranging from a variety of causes including:

- Heavy traffic volumes
- Traffic conflicts due to a high density of interchange access points
- Construction
- Enforcement
- Driver Behavior



I-75 Sketch Interstate Plan

Exhibit 1: Study Area

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Terminology

In order to assist in the understanding of specific safety related terminology, the Project Team together with the Safety Office developed definitions for various terms used this report including:

- ***Frequency****:* The number of crashes that occur at an intersection or section of highway over a period of time.
- ***Traffic Volume Exposure****:* The amount of traffic traveling along a section of road or entering an intersection. Referred to in terms of Millions of Vehicle Miles Traveled (MVMT).
- ***Rates and Percentages****:* Accident rate formulas and percentages provide for comparative analysis between statewide averages and corridor averages developed by District.
- ***Crash Index****:* Used to combine different methods into a single measure; each measure can be weighted.

Methodology

The I-75 Sketch Plan Safety Technical Memorandum consists of conducting a crash analysis. For the crash analysis, all Long Form reported crashes occurring along the I-75 Sketch Plan corridor were obtained. The summary crash data was obtained from the Florida Department of Transportation Crash Analysis Reporting system (CAR) for years 2003 through 2007. Because comparing data by individual years may skew analysis, five years of crash data was selected to account for anomalies causes by outside influence such as construction projects. All crashes resulting in a vehicle being towed away, personal injury, or fatality are documented on Long Form Crash Reports and reported to the Department of Highway Safety and Motor Vehicles. Long Form crash reports are submitted to the Florida Department of Transportation (FDOT) where they are then uploaded to the CAR database. The critical analysis factors identified from CAR were:

1. Number of Crashes
2. Crash Identification by Segment
3. Crash Rates

Results of the crash data analysis were used by the Project Team to determine the existence of any trends. A goal of the crash analysis was not only to report the information, but also indicate the potential for a particular kind of system improvement or regulation change, and would be part of concept development for the overall Sketch Plan.

Data Sources

The following information was used to review the I-75 corridor crash statistics.

Crash Data: Excel format CAR data by segments for years 2003 through 2007 for the I-75 Sketch Plan corridor was obtained from the Florida Department of Transportation Safety Office.

ArcGIS: ArcMap software was used to portray multiple layers of data to determine geographical location and visually compare individual segments.

Roadway Characteristics Inventory (RCI): Roadway information including area type and Annual Average Daily Traffic (AADT) was reviewed.[1]

Discussion with Florida Department of Transportation Staff: Meetings were held with Department staff to determine if there are specific locations of concern that should be reviewed in more detail and to gain further insight into Safety concerns.

Overview of Method

Using the available data sources provide through CAR, GIS, and RCI the I-75 corridor was reviewed using the following method.

1. All crash segments along the I-75 Sketch Plan corridor were obtained and reported. Crashes totaling eight or more per segment were reported on the maps. Given the analysis characteristics within CAR, eight or more crashes per segment more accurately evaluates specific locations by avoiding potential outliers. Outliers may include multiple car pile-ups that may skew results on a given segment for a given year.
2. Data was organized by type along the corridor. Crash types include crash counts, rates, injuries, fatalities, and property damage. Data was further separated by District.
3. Crash counts and crash rates were the two primary elements reviewed because they most accurately reflect the crash patterns along the corridor. Crash counts show specific numbers of crashes that have occurred on a given segment within a given timeframe. Crash rates account for segment length, average daily traffic (ADT), timeframe, and counts.

[1] AADT used in determining the crash rate

4. Crash rates were organized and compared to average statewide rates. Average statewide rates in terms of crash/ MVMT[2] by area type are as follows:

    - rural interstate is 0.373
    - urban interstate is 0.743

    Below outlines how the crash rate is calculated:

$$\textbf{Crash Rate} = \text{crash count} / \text{exposure}$$

Where,

$$\text{Exposure} = \text{ADT} \times 365 \times 5 \times \text{length of segment}$$

5. Shape files for number of crashes and rates were created and compiled into ArcMap. ArcMap was the primary tool used for image evaluation.

6. Results were organized by average crash occurrences for both the Sketch Plan corridor and by District. A frequency analysis provided crash count results for the corridor. The crash data was then used to identify specific segments and locations with potential safety challenges and concerns.

[2] FDOT Safety Office, CAR System

Results of Analysis

Outlined in **Table 1** are the segment crash statistics of the I-75 corridor extending from the Florida-Georgia border south through Sumter County. Also included within **Table 1** is an urban and rural comparison by District.

Table 1
I-75 Corridor Crash Statistics

	STROAD	LENGTH	CRASHES	ADT	ACTUAL	AVERAGE	CONLV	FTL	INJ	PRTY
District 2	**Corridor**	**98**	**3,293**	**45,730**	**0.43**	**0.39**	**45.24**	**102**	**2,563**	**1,861**
	Rural	80	2,172	42,948	0.39	0.35	43.66	78	1,805	1,153
	Urban	18	1,121	58,845	0.63	0.57	52.69	24	758	708
District 5	**Corridor**	**67**	**3,067**	**57,441**	**0.48**	**0.40**	**52.94**	**87**	**3,254**	**1,374**
	Rural	48	1,947	50,656	0.47	0.37	51.91	64	2,060	853
	Urban	19	1,120	74,334	0.52	0.46	55.50	23	1,194	521
Sketch Plan Corridor	**Corridor**	**165**	**6,360**	**50,603**	**0.45**	**0.39**	**48.44**	**189**	**5,817**	**3,235**
	Rural	128	4,119	45,887	**0.42**	0.36	46.81	142	3,865	2,006
	Urban	37	2,241	67,418	**0.55**	0.51	53.70	47	1,952	1,229

STROAD: Roadway area type.
LENGTH: Length of all segments for specific area type.
CRASHES: Number of crash counts.
ADT: Average Daily Traffic.
ACTUAL: Actual crash rate.
AVERAGE: Average rates developed by facility type and District specific.
CONLV: Confidence level measuring reliability of the interval estimate.
FTL: Number of fatalities.
INJ: Number of injuries.
PRTY: Number of accounts of property damage.

To compare the I-75 study area to other interstates in Florida, statewide averages were collected. The Florida Interstate System is divided into two area types, rural and urban. The average statewide crash rate per million vehicle miles traveled for rural interstate is ***0.373*** and ***0.743*** for urban interstate.

It should be noted that the "average" crash rates provided in **Table 1** (not to be confused with statewide averages) is representative of all segments within the I-75 Sketch Plan corridor. The average individual segment rates are developed by facility type and are District specific. Average rates are applied to

facilities with "similar" characteristics such as functional classification, facility type, and capacity. Individual crash segment results for the complete I-75 Sketch Plan corridor have been provided within the **Appendix A**. All crash rate results were calculated by averaging the individual segments.

A crash analysis overview has been provided for both the I-75 Sketch Plan corridor by Districts Two and Five. Crash rates account for segment length, ADT, timeframe, and crash counts. For this reason, rates more accurately reflect general crash related trends than number of crashes by segment alone. However, number of crashes by segment more accurately pinpoints specific outliers because there are no multiple variables (ADT, length, etc.) accounted for that generally smooth the results.

Actual and average rates are compared to Statewide averages, corridor and area type averages. Following the technical results of the analysis, an analysis discussion is provided which specifically addresses potential safety challenges and concerns in regards to location, interstate design, and driver behavior.

Sketch Plan Corridor

	STROAD	LENGTH	CRASHES	ADT	ACTUAL	AVERAGE	CONLV	FTL	INJ	PRTY
Sketch Plan Corridor	**Corridor**	**165**	**6,360**	**50,603**	**0.45**	**0.39**	**48.44**	**189**	**5,817**	**3,235**
	Rural	128	4,119	45,887	**0.42**	**0.36**	46.81	142	3,865	2,006
	Urban	37	2,241	67,418	**0.55**	**0.51**	53.70	47	1,952	1,229

Corridor wide crash segment averages were developed which provide comparative value in addition to District and statewide averages. Upon review, the actual crash rate of **0.42** for rural designated sections of interstate rate above both the statewide levels ***(0.373)***, and the average rural corridor level of **0.36**. Actual urban rates of **0.55** are higher than the average rate of **0.51** but lower than statewide averages ***(0.743)***.

Results

The average rates for the combined rural/urban corridor were determined to be 0.39 while the actual rate was 0.45. The actual rate of 0.45 indicates that the corridor generally has a higher number of crashes and crash rates when compared to average rates (0.39) determined by the District. These results may further be compared to existing and subsequent Sketch Plans along similar interstate corridors.

Districts Two and Five

	STROAD	LENGTH	ACTUAL	AVERAGE
District 2	**Corridor**	**98**	**0.43**	**0.39**
	Rural	80	**0.39**	**0.35**
	Urban	18	**0.63**	**0.57**

	STROAD	LENGTH	ACTUAL	AVERAGE
District 5	**Corridor**	**67**	**0.48**	**0.4**
	Rural	48	**0.47**	**0.37**
	Urban	19	**0.52**	**0.46**

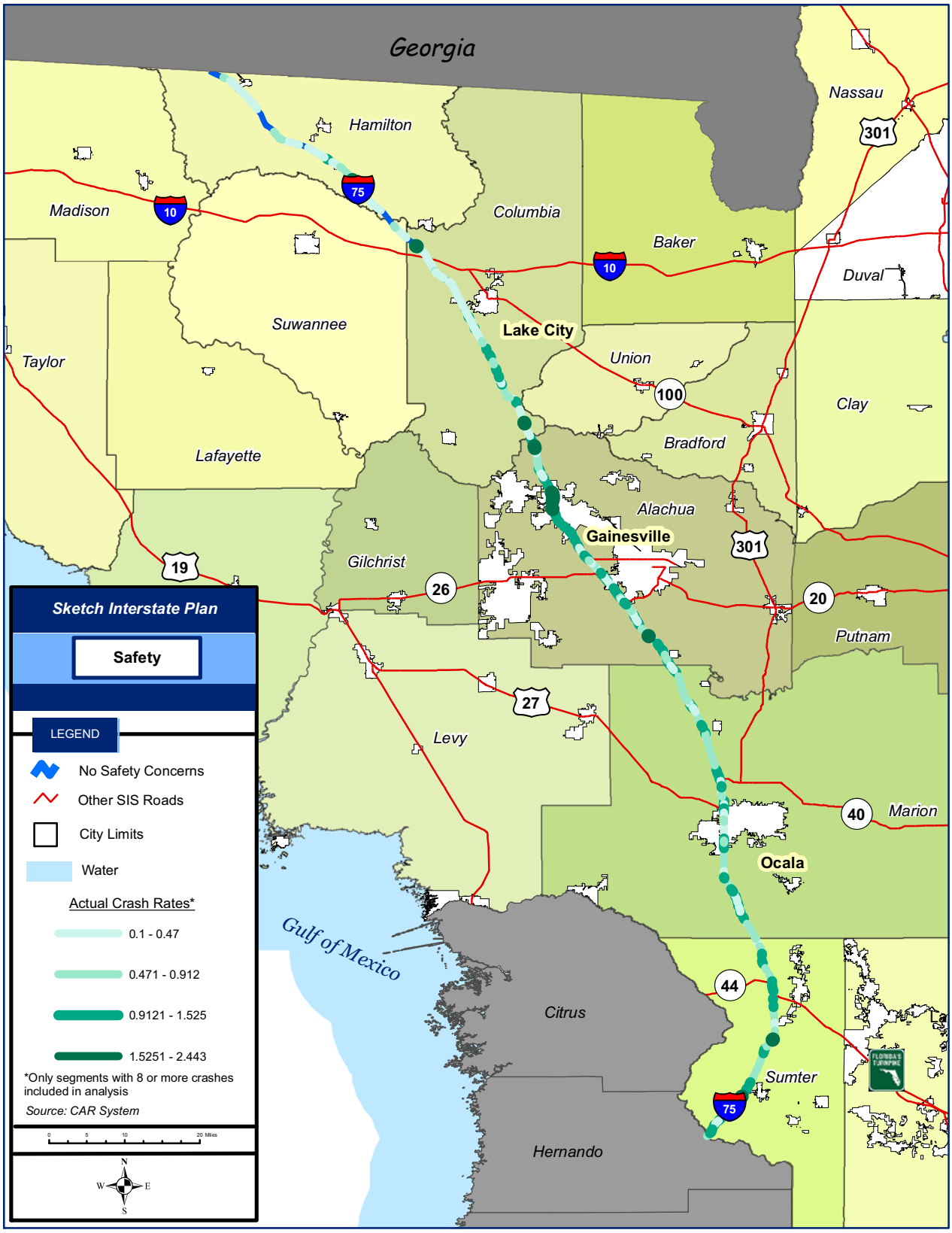
Districts Two and Five have been cross-examined to determine any patterns or fluctuations in crash rate results. The **urbanized segments** along I-75 at Gainesville in District Two were determined to have high actual crash rates of **0.63** relative to both the average rate of **0.57** and all remaining urban rates for both Districts. The **rural segments** along I-75 in District Five were determined to have much higher actual rates **(0.47)** relative to both the average rate **(0.37)** and District Two actual and average rural rates.

Results

These results indicate higher urbanized crash related trends in District Two and higher rural crash related trends in District Five.

Analysis Discussion

I-75 Sketch Plan crash statistics previously provided in **Table 1** displayed patterns and fluctuations noticed between both corridor averages and District averages. **Exhibits 2** and **3** below display crash statistics including total crashes and crash rates. Specific discussion of areas relating to exposure, counts, rates, and trends follows below.



I-75 Sketch Interstate Plan

Exhibit 2: Actual Crash Rates

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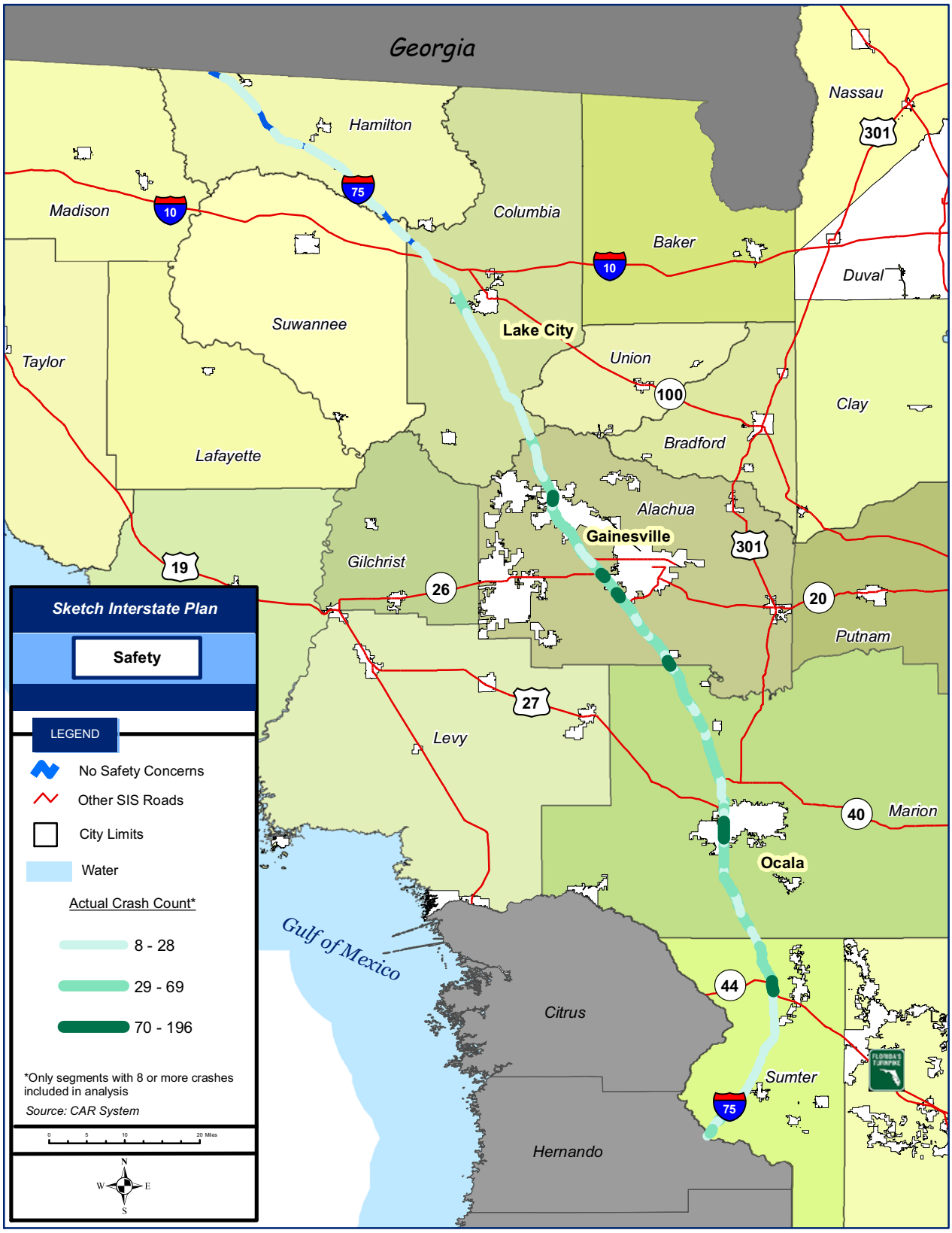

I-75 Sketch Interstate Plan

Exhibit 3: Number of Crashes

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The I-75 Sketch Plan corridor shows two primary areas of safety concern based on analysis results. Alachua County exhibits safety challenges and concerns along nearly the entire I-75 corridor, but more specifically within the urban limits of Gainesville. Sumter County exhibits safety concerns at both the Florida Turnpike merge and southern portions along I-75 where six lanes are reduced to four lanes. Below are the individual detailed challenges and concerns:

- Alachua County contains the highest number and density of crashes along the I-75 corridor outside of the Turnpike merge. The Work Group believes this can be attributed to higher volumes and motorists making local trips between interchanges near the city of Gainesville. A challenge confronting this section is the ability to protect the "through" movement of I-75 along this stretch of the corridor.

- A concern in Sumter County is that it ranks high among both crash totals and crash rates. Specifically, the Work Group has determined that a high crash area is located in conjunction with the northbound merging of I-75 with the Florida Turnpike. The interchange movement associated with the I-75 corridor consists of generally merge and diverge traffic patterns. However, at this location, a weave is also created compounded with merge/diverge traffic. As motorists exit at the northbound off interchange to Wildwood, traffic merges from the Turnpike.

- Another area of concern is South of the Turnpike merge. I-75 is reduced from a 6 lane facility to a 4 lane facility. This lane reduction increases vehicle density per lane, which can contribute to the higher crash rates along this section of I-75.

Figure 1 portrays a frequency analysis of crashes along the I-75 corridor. Areas with high frequency surround Alachua County (centered) and Sumter County (right). The Florida Turnpike northbound merge creates a high number of crashes located at the southern portion of the corridor. Alachua County has a high number of crashes, which can be attributed to short trips by localized traffic. Outside of these two areas, I-75 at US 90 in Lake City remains a regional outlier for a high number of crashes.

Figure 1
Frequency Analysis

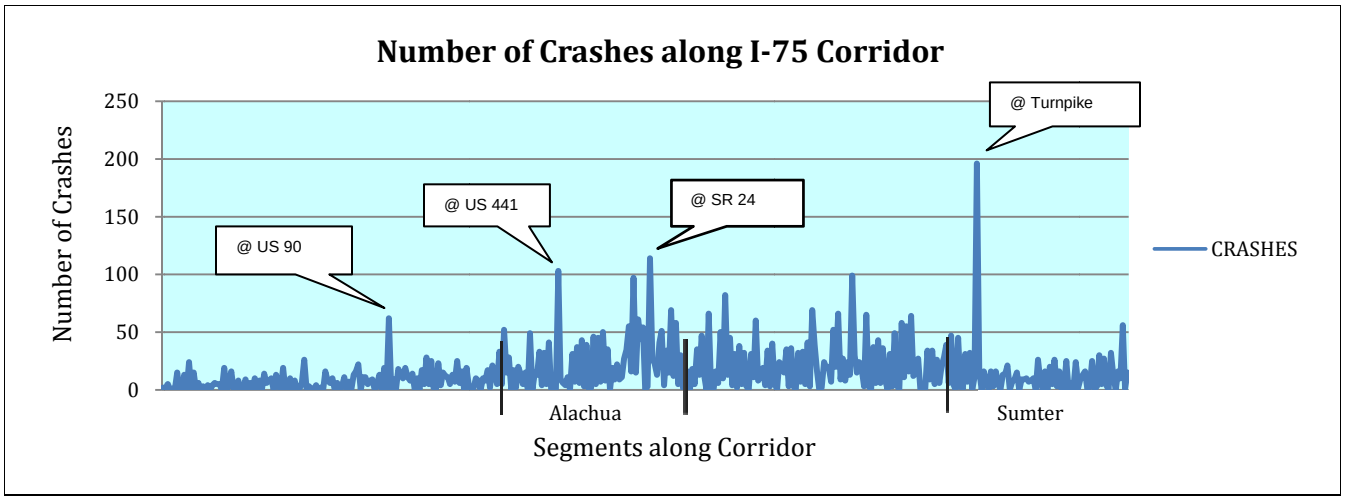
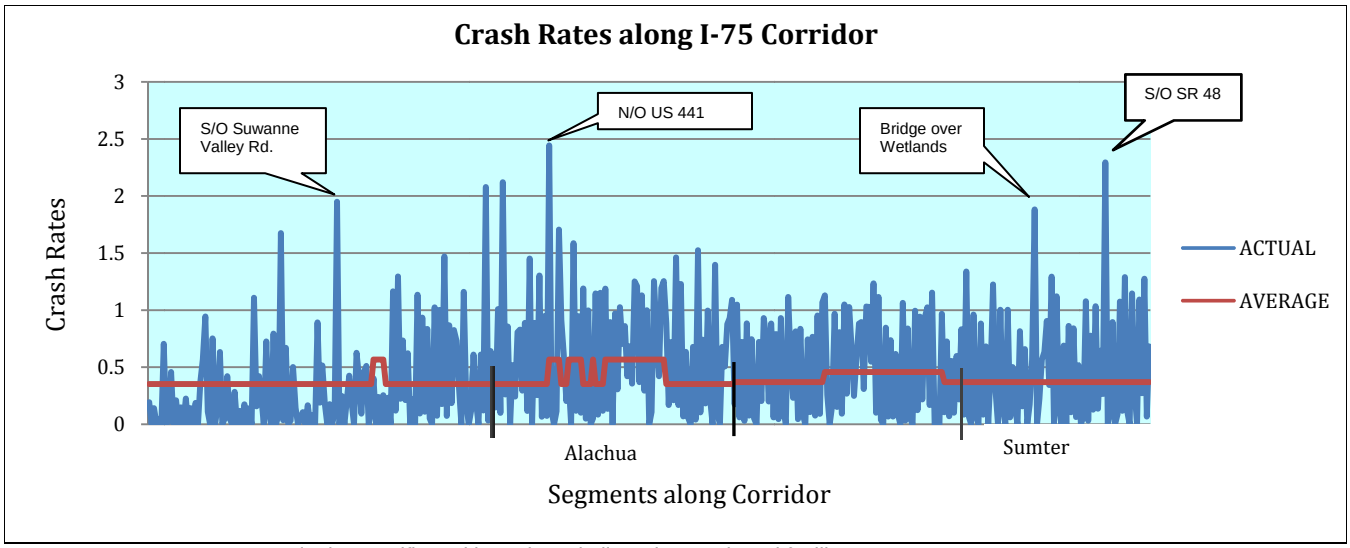


Figure 2 displays the "actual" crash rates relative to the "average" crash rates along the I-75 corridor. The average rates are determined specifically by District characteristics and applied based on similar facility type to rural and urban interstate segments. Supportive of previous results, the highest actual crash rates occur through Alachua County and Sumter County.

Figure 2
Crash Rates



Note: Average rates are District specific and based on similar urban and rural facility types

The second highest I-75 corridor crash rate occurs at the southern portions of Sumter County outside of the influence of the Florida Turnpike merge that contributes to the highest number of crashes and injuries along the corridor **(Figure 1)**. High crash rates may be attributed to lane reduction, which increases vehicle densities.

Conclusions

The purpose of this safety section was to analyze crash data reported on the I-75 Sketch Plan corridor from the Florida-Georgia border south through Sumter County, Florida. Crash statistics provided valuable information when attempting to identify potential safety challenges and concerns. The following two locations were found to have the highest number of crashes and crash rates:

- Alachua County: High rates among both number of crashes and crash rates, specifically within the urban limits of Gainesville. These results may be attributed to local trips between interchanges and relatively higher traffic volumes.
- Sumter County: High crash counts were reported near the Florida Turnpike merge and high crash rates along the southern portions of the county where I-75 drops to four lanes.

Crashes throughout the I-75 corridor can be attributed primarily to merge/diverge locations associated with interchange movement. Further insight into the causes of crashes may be provided within individual crash data, which was not analyzed in detail for the purposes of the Sketch Plan. Only the Long Form crash reports were reviewed for the purposes of this study. Given the high traffic volumes and exposure, preliminary results conclude that the I-75 corridor currently remains a safe and efficient means of transporting people and goods throughout the state outside of the areas of concern addressed. As the analysis showed, heavy volumes and traffic conflicts due to interchange access points create safety challenges and concerns.

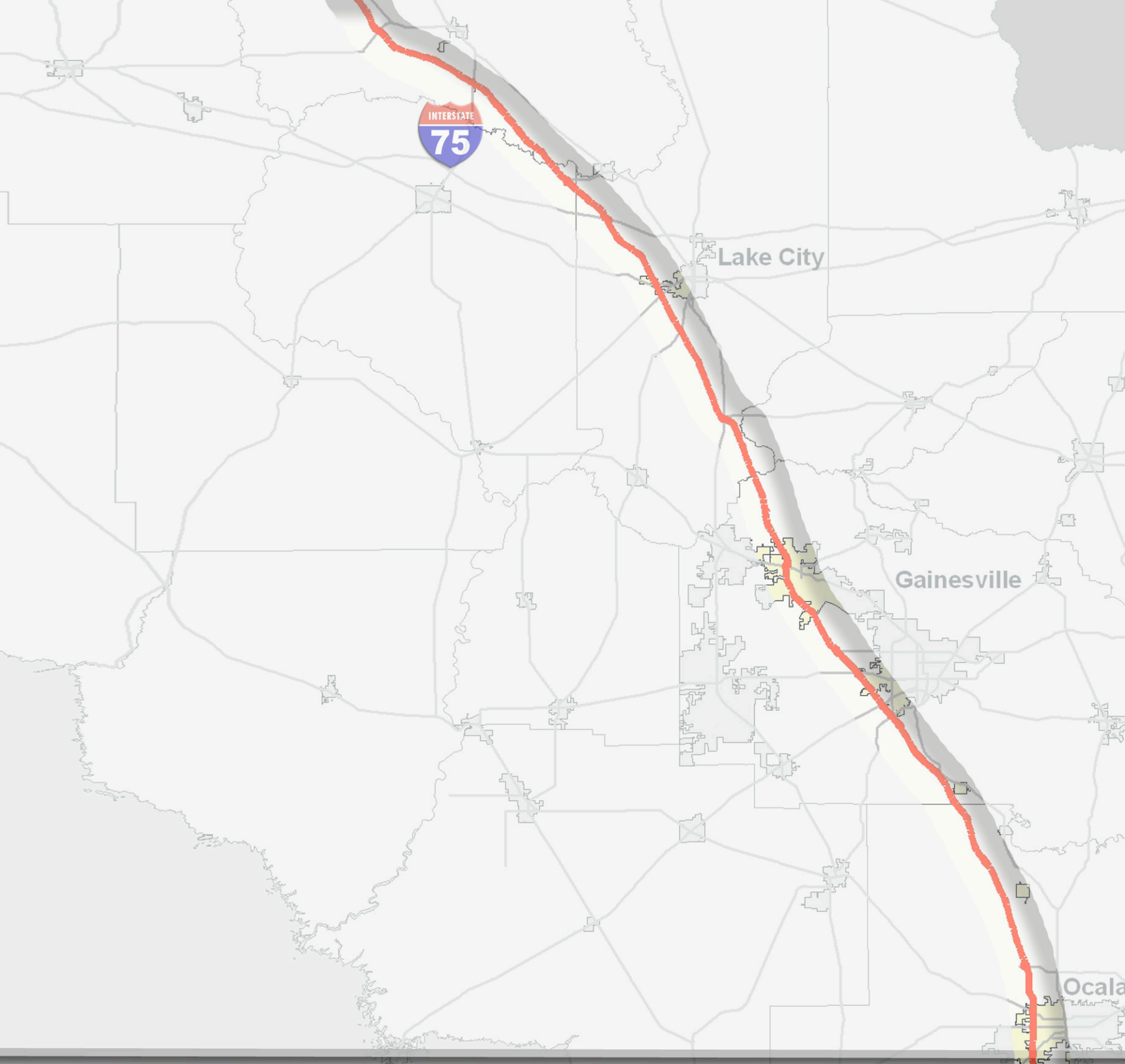
Next Steps

The crash statistics analyzed within this report provided insight into the challenges facing the I-75 Sketch Plan corridor. Driver behavior compounded with high traffic volumes tends to create concerns for urbanized sections of interstate. Rural sections of interstate through Sumter County combine higher speeds with reduced capacity (six lanes to four) which often proves to be a safety challenge for motorists. Trucks, commercial vehicles specifically, comprise approximately 25 percent of the total traffic along the corridor. These vehicles constitute an equally large percentage of crash involvement. A detailed section on truck traffic is provided within the complete Sketch Plan report. Results of this analysis may shed light on truck impacts to safety when cross-examined to truck trends along the corridor.

The causes of crashes along I-75 are not unique to the corridor. They are a combination of many factors such as driver behavior, traffic density, and localized short trips in urbanized areas. Some measures used to address these challenges are beltways around areas of safety concern, express routes, truck only lanes, and expansion of intelligent transportation systems (ITS). Safety results may be used to justify concept development in a similar fashion as traffic and capacity demand justifies expansion projects. A primary function of the I-75 Sketch Plan is to protect the very nature of the interstate facility. This may only be accomplished if safety challenges and concerns are incorporated into concept development just as traffic demand is incorporated into highway design.

Appendix

Appendix A: Method 1



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