

# Environmental Training for Florida Turnpike Enterprise

## Traffic Analysis



*August 2020*

The environmental review, consultation, and other actions required by applicable federal environmental laws described in this training are carried out by FDOT pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated December 14, 2016 executed by FHWA and FDOT.

# Overview of Part 2, Chapter 2 Traffic Analysis

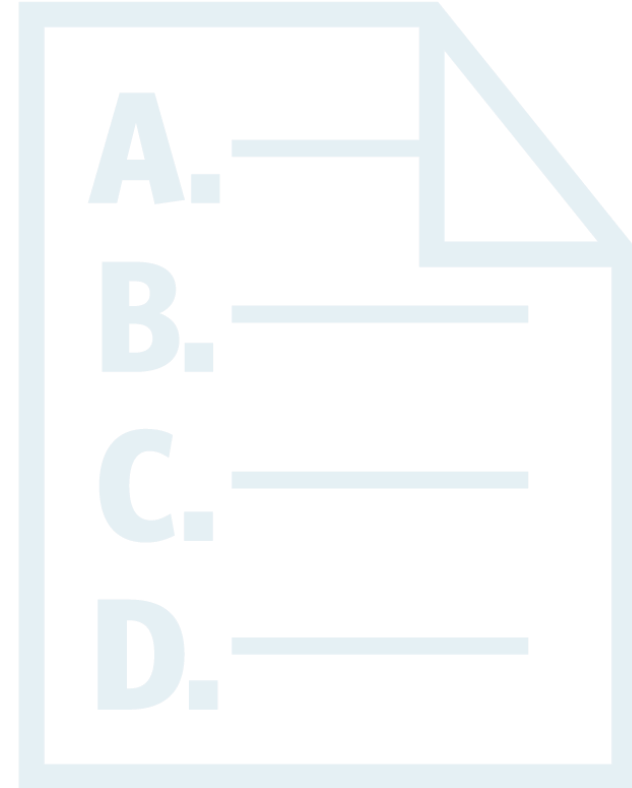
Provide guidance for preparing traffic analysis for Project Development and Environment (PD&E) studies.

- Scoping
- Data requirements
- Methodology
- Analysis
- Documentation

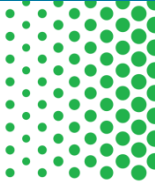


# Traffic Analysis Definition

- Traffic analysis is an evaluation of the interaction between demand and supply of a transportation facility
  - Demand is the amount of traffic load that intends to use the facility
  - Supply is the capacity of the facility to handle the demand
- The traffic analysis is one of the critical activities for a PD&E which forms the basis for developing and evaluating project alternatives



# Traffic Analysis for PD&E Includes

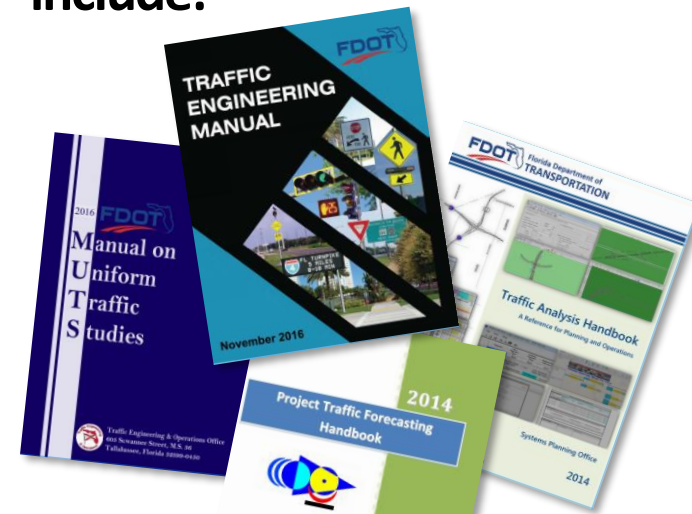


1. Develop traffic analysis objectives
2. Select performance measures
3. Determine analysis approach and select analysis tools
4. Identify data needed for the analyses
5. Specify collection methods and documentation
6. Perform traffic operational analysis and safety analysis
7. Document analysis results and assumptions

# Resources

**FDOT resources that are referenced in this chapter include:**

- FDOT Traffic Analysis Handbook
- FDOT Project Traffic Forecasting Handbook
- FDOT Traffic Engineering Manual (TEM)
- FDOT Manual of Uniform Traffic Studies (MUTS)

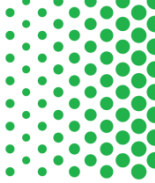


**FDOT guidance references national guidance such as:**

- Highway Capacity Manual (HCM)
- FHWA's Traffic Analysis Toolbox



# Traffic Analysis Objectives



1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

- The objectives of the traffic analysis should:
  - Reflect the purpose and need for the project and be measurable
  - Identify the performance problem or goal which the analysis seeks to answer
  - Identify the intended use and decision-makers of the traffic analysis results

# Scoping Traffic Analysis

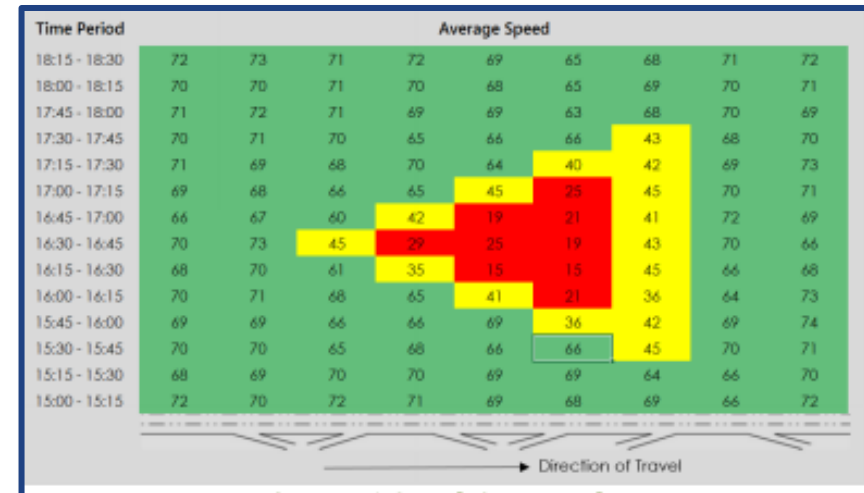
- Items that inform traffic analysis scope
  - Traffic study limits
  - Design years
  - Other analyses requirements such as economic, air quality and noise analyses
  - Special needs such as multimodal
- Review and consider previously completed traffic analyses





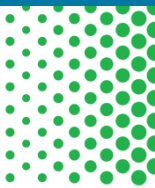
# Performance Methods of Effectiveness (MOE)

- Develop the Traffic Analysis Methodology
- Traffic Analysis MOEs
  - Throughput
  - Vehicle miles of travel
  - Volume/capacity ratio
  - Travel time
  - Travel speed
  - Total delay at intersections
  - Queue length
  - Number of stops
  - Density
- Travel time variance
- Travel time reliability
- Hours of congestion
- Level of Service (LOS)





# Common Performance MOEs



## Safety Analysis MOEs

- Actual crash rate
- Number of fatalities
- Crash severity level
- Economic loss

## Environmental / Economic Analysis MOEs

- Vehicle miles of travel
- Vehicle hours of delay
- Vehicle hours of travel
- Travel speed
- Emissions
- Number of crashes
- Travel time savings

Example MOEs					
	Network Performance (V/C)	System Deficiency (% of roadway segments over capacity)	Network Vehicle Travel Time Reduction (daily vehicle hours of travel)	Corridor Volume Across the St. Johns River** (AADT)	Annual Cost of Traffic Congestion (\$ millions)
Black	0.822	27.58%	328,041	72,600	\$5,153
Purple	0.824	26.69%	358,199	74,200	\$5,000
Brown 1 and 2	0.819	26.59%	331,900	63,900	\$5,172

# Selecting the Right Traffic Analysis Tool

Select the right analysis tools based on:

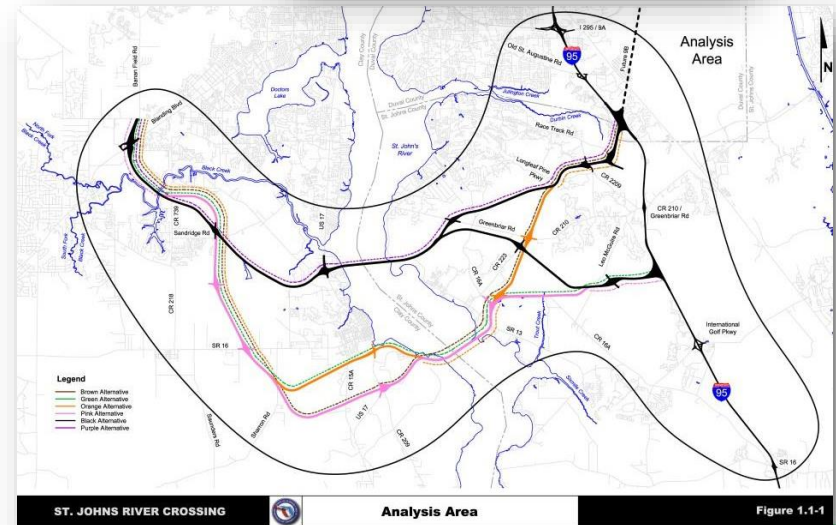
- Complexity of the project
- Magnitude of the traffic problem
- Performance measures
- Limitations of the tool

***Traffic Analysis Handbook*** contains guidance for selecting proper tools

Analysis Type	Level of Detail	Level of Analysis	Analysis Tool
Sketch Planning	Analyzing system elements to obtain general order-of-magnitude estimates of performance based capacity constraints and operational control	Generalized Planning	GSVT, LOSPLAN, HCM/HCS
Deterministic	Analyzing broad criteria and system performance based on geometric and physical capacity constraints; operational systems such traffic control and land use	Conceptual Planning & Preliminary Engineering; Design; Operation	LOSPLAN, HCM/HCS, Synchro, SIDRA
Travel Demand Modeling	Analyzing regional travel demand patterns, land use impacts and long range plans. Outputs of demand models are applied in analytical and microscopic analysis	Conceptual Planning	Cube Voyager
Microscopic Simulation	Analyzing system performance based on detailed individual user interactions; geometry and operational elements	Preliminary Engineering; Design; Operation	CORSIM, VISSIM, SimTraffic

# Determining Data Needs

- Consider project context project limits, study area, influence area, analysis method, and performance MOEs
- Obtain available data from prior studies
- Conduct field reviews to determine sufficiency of available data
- Collect data for all modes that exist or planned in the project area

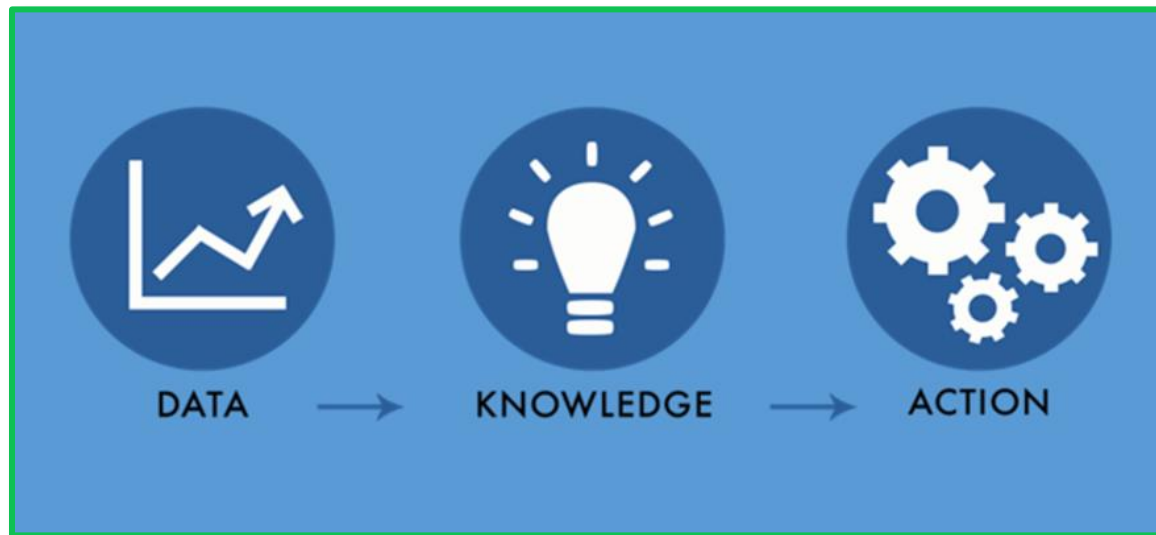


# Types of Data

Data collection effort is divided into three categories:

- Roadway characteristics
- Multimodal characteristics
- Operations and safety characteristics

Type of the traffic analysis will determine required data.



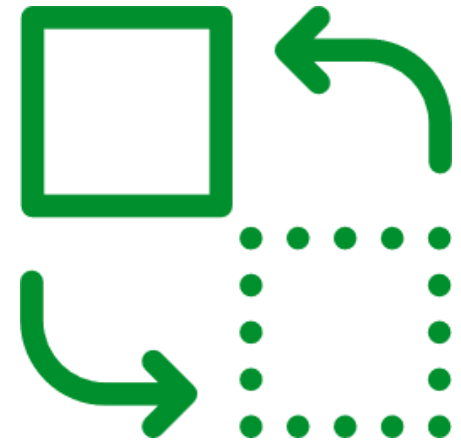
# Project Traffic Forecasting

- A process of estimating the future year traffic demand for a given project
- Forecast years
  - Opening Year
  - Interim Year
  - Planning horizon/design year
- Two options for forecasting
  - With a travel demand model
  - Without travel demand model



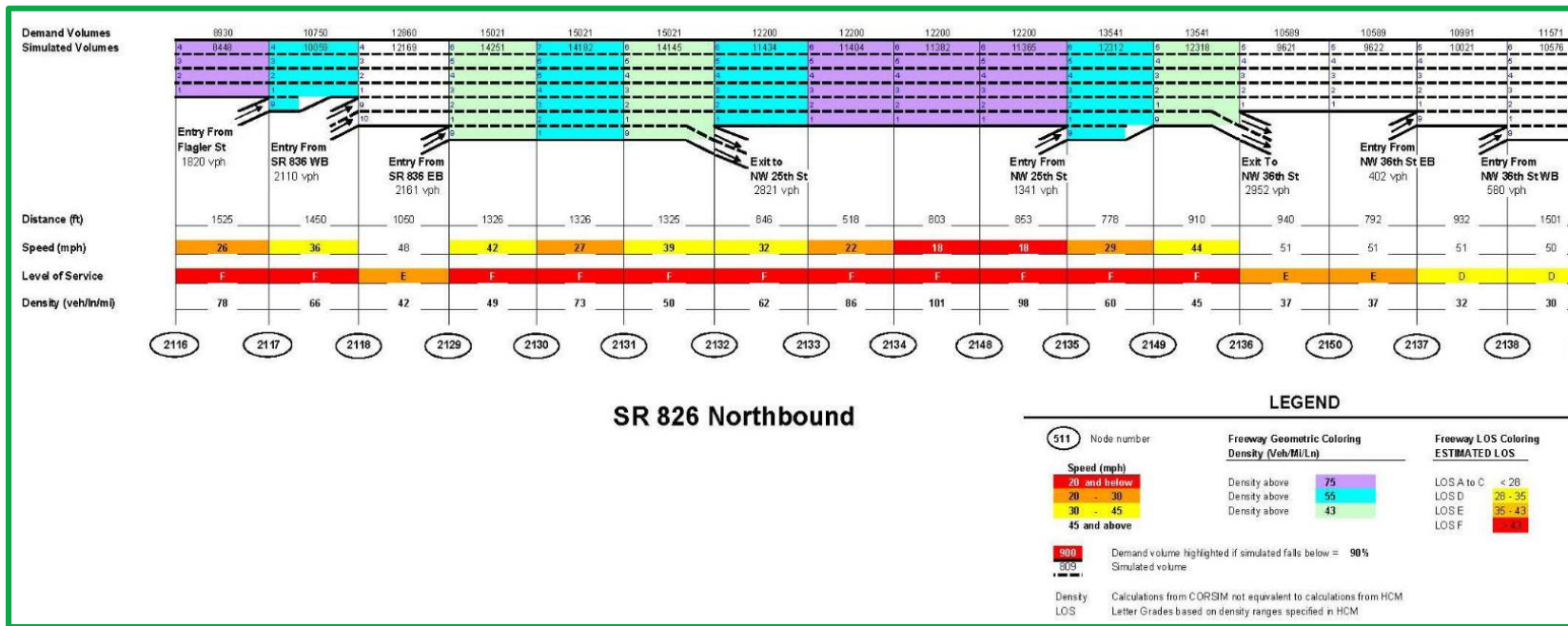
# Reevaluating Traffic Analysis

- For projects which require a reevaluation of PD&E
- Verify validity of traffic forecast by assess whether there have there been changes in
  - Economy and driving habits
  - Land use or growth
  - Scope of work
  - Transportation network
  - Adopted regional travel demand model
- If there is a substantial change in the traffic forecast, coordinate with OEM to address the need for re-evaluating project traffic



# Operational Analysis

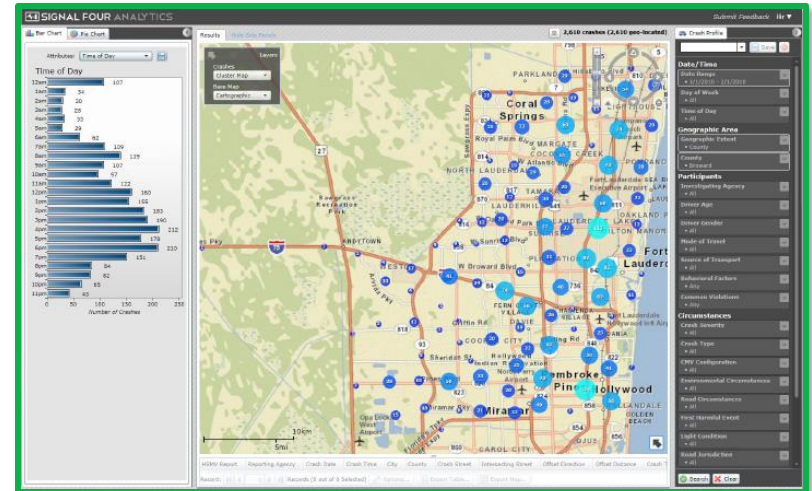
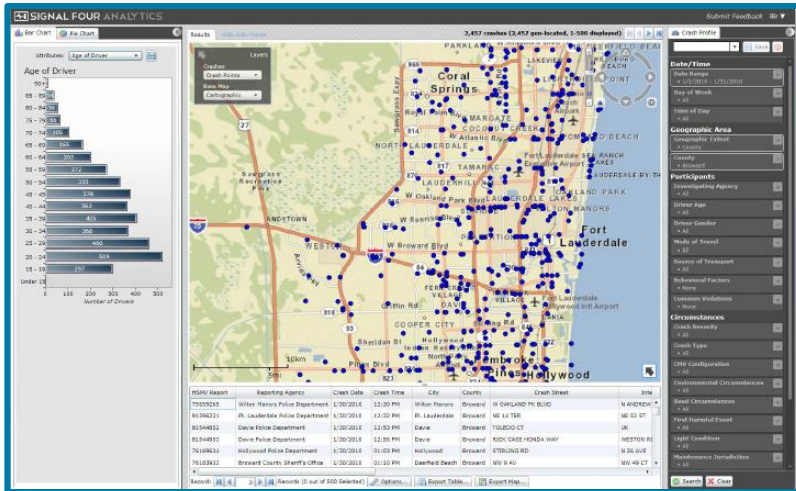
- Includes capacity and operational analysis to determine how well the project alternatives meet the purpose and need
- Only performed on viable or feasible project alternatives
- Use consistent tools and assumptions for each alternative evaluated





# Safety Analysis

- Analyzing crash history (5 yrs)
- Predicting crashes using HSM methods and tools



# Project Traffic Analysis Report (PTAR)

- Documents the results of the traffic analysis
- Summarizes methodology, findings and conclusions
- Supports decisions regarding project actions



1. Title Page
2. Executive Summary
3. Table of Contents
  - A. List of Figures
  - B. List of Tables
4. Introduction
  - A. Description of the proposed project
  - B. Analysis objective and project scope
  - C. Project location map
5. Analysis Methodology
  - A. Analysis methodology and assumptions
  - B. Analysis (temporal and spatial) boundary limits
  - C. Analysis tool(s)
6. Data Requirements
  - A. Data requirements and data sources
  - B. Data collection methodology
  - C. Summary of data collection and field observations
7. Baseline Analysis (Existing Conditions Analysis)
  - A. Operational analysis of the existing conditions
  - B. Safety analysis based on crash data and HSM procedure as appropriate
  - C. Multimodal evaluation

**Simulation Approach**

  - A. Base model development
  - B. Model verification/error checking
  - C. Model calibration
  - D. Model validation
8. Alternatives Analysis
  - A. No-Build alternative
    - i. Future year demand forecasts
    - ii. No-Build analysis (operational and safety)
  - B. Preliminary alternatives
    - i. Development of project concepts
    - ii. Screening of concepts
  - C. Build alternatives
    - i. Alternatives considered
    - ii. Traffic volume forecasts, trip pattern/circulation routes & assumptions
    - iii. Design considerations
    - iv. Model development (simulation approach only)
    - v. Operational analysis
    - vi. Safety analysis
  - D. Alternative evaluation matrix and description of success/failure of alternatives
9. Conclusions and Recommendations
10. References
11. Appendices

# Project Traffic Analysis Assumptions

## Traffic Forecasting Assumptions

Traffic forecast for the project was developed using:	
<input type="checkbox"/> Travel Demand Model	<input type="checkbox"/> Growth Rates
Type of Travel Demand Model Used: <input type="checkbox"/> Metropolitan Planning Model <input type="checkbox"/> Other Model	Refer to appropriate section of Project Traffic Analysis Report that discusses growth rates
Is the travel demand model based on the latest adopted Long Range Transportation Plan?	
<input type="checkbox"/> YES	<input type="checkbox"/> NO
_____ Date when MPO adopted the latest Long Range Transportation Plan	Explain why?
_____ Base Year of Travel Demand Model	
_____ Horizon Year of Travel Demand Model	
Long Range Transportation Plan documentation is available at (provide web address): _____	
<b>Traffic Data and Factors</b>	
Standard K = _____	Traffic Counts Collection Year = _____
D Factor = _____	Opening _____ Year = _____
T <sub>Daily</sub> = _____	Interim _____ Year = _____
	Design _____ Year = _____
Discuss any changes in land use, economics, population and employment data since the model was built	

## Traffic (operational and safety) Analysis Assumptions

- Study Area
- Key input parameters
- Calibration and validation parameters
- Analysis method and/or tools
- Performance MOEs

**Table 7-10 Model Calibration Reviewer's Checklist**

Financial Project ID: _____ Federal Aid Number: _____		
Project Name: _____		
State Road Number: _____ Co./Sec./Sub. : _____ Project MP: _____		
Item to Check	Description	Check
Model errors	<input type="checkbox"/> Simulation model contains no errors	<input type="checkbox"/>
	<input type="checkbox"/> Simulation model was accurately verified	<input type="checkbox"/>
	<input type="checkbox"/> All calibration MOEs are listed	<input type="checkbox"/>
MOEs	<input type="checkbox"/> Calibration targets/goals have been outlined	<input type="checkbox"/>
	<input type="checkbox"/> Calibration and validation data is sufficient to meet the targets	<input type="checkbox"/>
	<input type="checkbox"/> Calibration areas are clearly identified	<input type="checkbox"/>
Calibration process	<input type="checkbox"/> Calibration process is documented with all relevant calibration data, assumptions, and include a history of base model development	<input type="checkbox"/>
	<input type="checkbox"/> Calibration effort cover both AM and PM peak periods	<input type="checkbox"/>
	<input type="checkbox"/> Default calibration parameters were changed and documented	<input type="checkbox"/>
	<input type="checkbox"/> Model animation matches expected driver behavior and conditions observed in the field	<input type="checkbox"/>
Calibration targets	<input type="checkbox"/> Model replicates real-world bottleneck(s) and lane utilization	<input type="checkbox"/>
	<input type="checkbox"/> Calibration results are based on at least 10 simulation runs with different random seeds	<input type="checkbox"/>
	<input type="checkbox"/> Model output volumes satisfy volume calibration requirements	<input type="checkbox"/>
	<input type="checkbox"/> Model link capacities satisfy capacity calibration requirements	<input type="checkbox"/>
	<input type="checkbox"/> Model link speeds meet speed calibration requirements	<input type="checkbox"/>
	<input type="checkbox"/> Model link travel time meet calibration requirements	<input type="checkbox"/>
	<input type="checkbox"/> Model intersection delay results meet calibration requirements	<input type="checkbox"/>
<input type="checkbox"/> Model queuing replicates real-world conditions	<input type="checkbox"/>	
	<input type="checkbox"/> Calibrated model is validated with an independent data set	<input type="checkbox"/>
Comments: _____		

# Project Traffic Analysis Report Outline

- Technical Report Cover
- Executive Summary
- Traffic Analysis Assumptions
- Introduction
- Traffic Analysis Method
- Existing Conditions Analysis
- Development of Future Year Traffic Forecast
- Alternatives Analysis
- Summary of Analysis Results
- Appendix (Raw data used as inputs)

Florida Department of Transportation

District X

Project Title

Limits of Project

County, Florida

Financial Management Number: XXXXX-X

ETDM Number: XXXXXX

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by FDOT pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated December 14, 2016 and executed by FHWA and FDOT.

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