TRANSPORTATION SITE IMPACT TRAINING

Estimating the Transportation Impacts of Growth

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION
SYSTEMS IMPLEMENTATION OFFICE

www.dot.state.fl.us/planning

Table of Contents

Tab 1. Presentation

Transportation Site Impact Training

Welcome

April 2019

State of Florida
Department of Transportation
Systems Implementation Office
www.dot.state.fl.us/planning

Introduction

- Presenter Introduction
- 1 day training

- Morning Exercise
  - Participants introduction:
    - Name
    - In two sentences where do you work and what do you do?
    - One Fun Fact about yourself (i.e. hobby, talent, travel, etc.)

Housekeeping

- Set phones to vibrate/silent
- Questions- ask lots of them at any time!
- Breaks
- Lunch
  - On your own

Presentation Icons

This will represent quick exercises

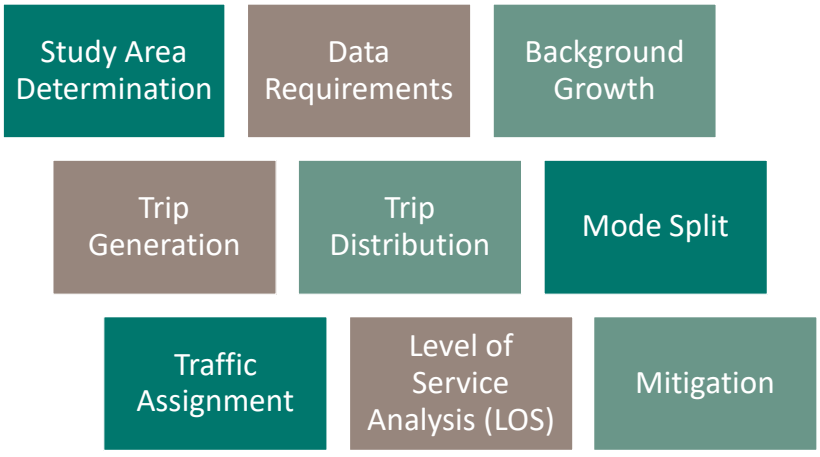
This will represent example problems

This will represent Case Studies

Training Objectives

- To understand how to use the Site Impact Applications Guide for reviewing developments
- To understand FDOT's guidance for reviewing various documents
- To demonstrate concepts discussed in the Transportation Site Impact Handbook through real-world examples
- To understand the thought process behind the decisions that go into a traffic study

General Concepts being Covered

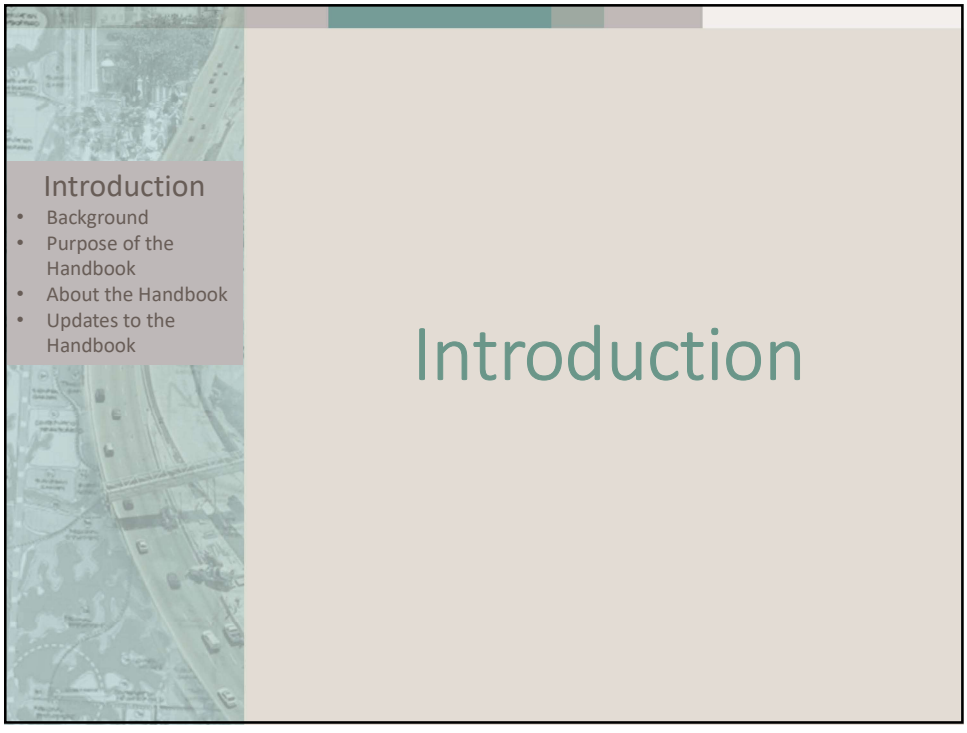


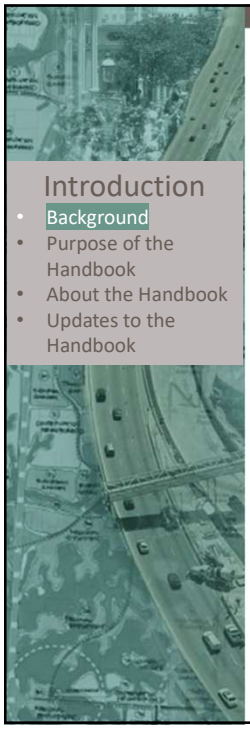
Agenda Overview

1.5 DAYS THAT WILL INCLUDE TRANSPORTATION SITE IMPACT HANDBOOK REVIEW, SITE IMPACT APPLICATION GUIDE OVERVIEW & HANDS ON APPLICATION

- Introduction
- Training Overview and Agenda
- Transportation Site Impact Handbook Overview
- Methodology Development
  - Study Area Requirements
  - Analysis Year
  - Traffic Analysis Periods
  - Forecasting Methodology
- Existing Conditions Analysis
  - Data Collection
- Future Conditions Analysis
  - Background Traffic
  - Trip Generation
  - Trip Distribution
  - Multimodal Evaluation
  - Assignment of Trips to Network
- Mitigation Analysis
  - LOS Analysis
  - Overview
- Additional Case Study Group Exercise
- Recap

Site Impact Applications Guide FDOT



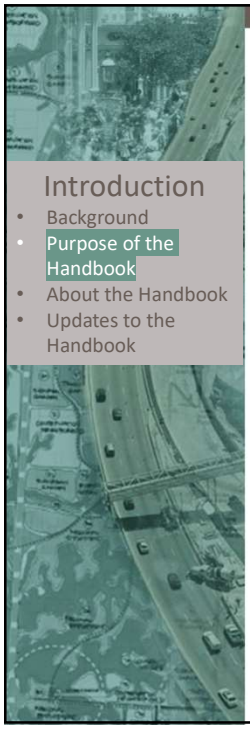


Introduction
- Background
- Purpose of the Handbook
- About the Handbook
- Updates to the Handbook

Background

Protect the integrity of the transportation system for the general public and to minimize degradation of both the regional and local transportation networks

- *Provide public agencies with a mechanism for managing transportation impacts*
- *Provide applicants with recommendations for effective site transportation planning*
- *Establish a framework for negotiation of mitigation measures for the impacts created by development*
- *Coordinate with local governments when a state facility will be impacted by a proposed development*
- *Promote multimodal transportation systems where appropriate*



Introduction
- Background
- Purpose of the Handbook
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- Updates to the Handbook

Purpose of Handbook

- Assist FDOT staff in their review of developments
- Who is this for?
  - FDOT
  - Local Governments
  - Other Transportation Partners
- WHY?
  - Communicate the FDOT's guidance for reviewing various documents
  - Provide consistent guidelines and methodology

Introduction
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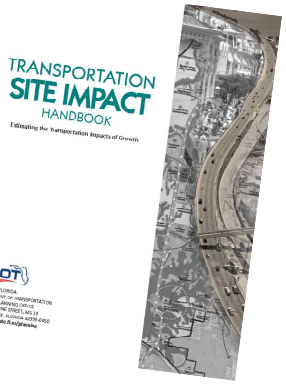
About this Handbook

- Provide guidance to transportation partners at all levels of government to enhance coordination in the existing review process



Introduction
- Background
- Purpose of the Handbook
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Updates to this Handbook

- Section 1.4 in the Handbook
  - State law pertaining to transportation has changed significantly since the Transportation Impact Handbook was updated in 2010.
- *State law is always subject to change*

Transportation Site Impact Process

- Step 1: Methodology Development
- Step 2: Existing Conditions Analysis
- Step 3: Future Conditions Analysis
- Step 4: Mitigation Analysis

Transportation Site Impact Process

Transportation Site Impact Process

- Step 1: Methodology Development
- Step 2: Existing Conditions Analysis
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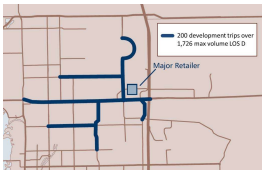
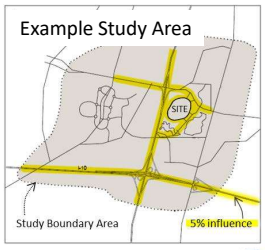
Methodology Development

- Make sure everyone is on the same page
  - Developer, Consultant Agencies
- How we analyze the impacts of the development
- Avoid wasted time and effort
- Agree on critical features of the study
  - Study Area
  - Time Horizon
  - General Transportation Factors

Example Traffic Impact Area



Example Study Area



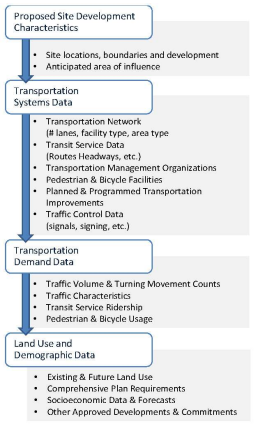
Transportation Site Impact Process

- Step 1: Methodology Development
- Step 2: Existing Conditions Analysis
- Step 3: Future Conditions Analysis
- Step 4: Mitigation Analysis

Existing Conditions Analysis

What are the physical and operational conditions of roadways and intersections?

- Data collection
- Traffic counts
- Transportation system
  - Including transit, bicycle and pedestrian facilities
- Land use/demographics



Transportation Site Impact Process

- Step 1: Methodology Development
- Step 2: Existing Conditions Analysis
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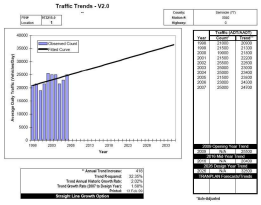
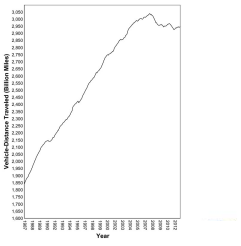
Future Conditions Analysis

What will the traffic conditions be in the future with and without the development?

- Background traffic
  - Traffic projections without development
- Trip generation
- Trip distribution
- Multimodal evaluation
- Assignment of trips to network





Transportation Site Impact Process

- Step 1: Methodology Development
- Step 2: Existing Conditions Analysis
- Step 3: Future Conditions Analysis
- Step 4: Mitigation Analysis

Mitigation Analysis

- Identify improvements if necessary
  - Determine where and how roadway deficiencies must be addressed
  - Determine timing of improvements

Methodology Step 1

- Overview
- Methodology Requirements
  - Study Area Requirements
  - Analysis Years
  - Traffic Analysis Periods
  - Forecasting Methodology
- Other Issues

Step 1 Methodology Development

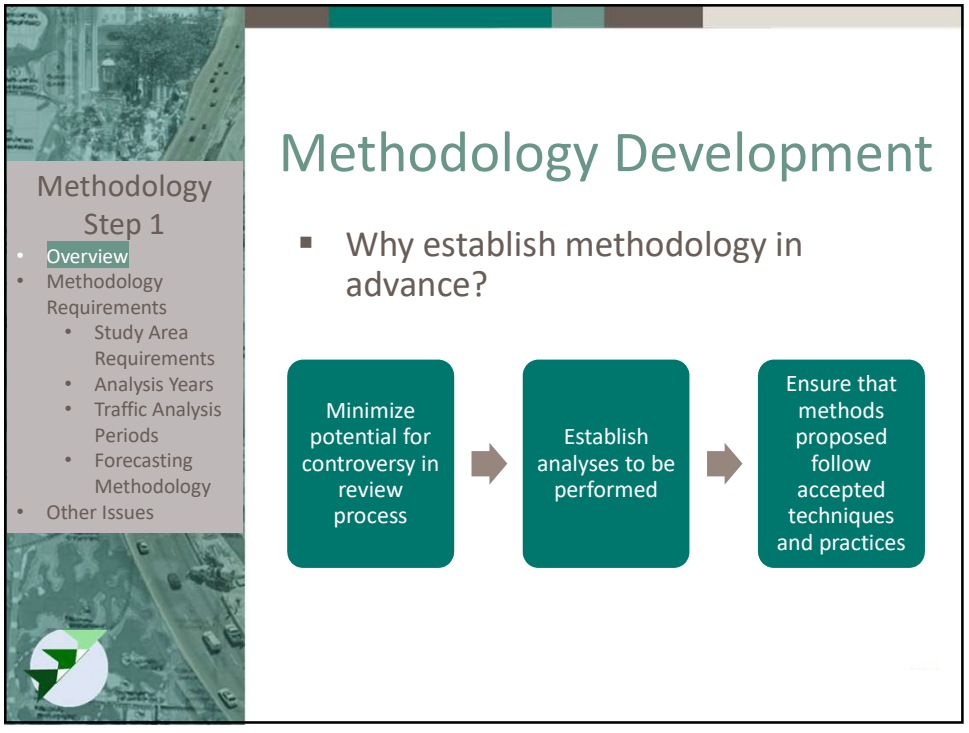
Example 1

Sunshine Palm Inc is planning a mixed use development that will include an high-turnover (sit-down) restaurant and a coffee/donut shop with a drive-through window.

- High-turnover restaurant- 2,500 ft^2 GFA
- Coffee/donut shop with drive-through- 2,100 ft^2 GFA

- Brainstorming Activity: What questions should be addressed during the methodology?

Take out Workbook Example for Presentation located in Page 2-1. This example will continue throughout the presentation.



Methodology Development

- Why establish methodology in advance?

Minimize potential for controversy in review process → Establish analyses to be performed → Ensure that methods proposed follow accepted techniques and practices

Methodology Step 1

- Overview
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Study Area Requirements

- Determining the "traffic impact area" or simply the "impact area"
  - Local, regional, or state critical
- What is needed:
  - Site map
  - Initial trip generation
  - Maximum Service Volume and existing volume of surrounding facilities
    - *Maximum Service Volume is the maximum volume a roadway segment can support before the LOS target is exceeded*

Methodology Step 1

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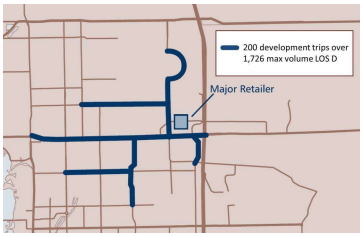
Study Area Requirements

- Local Criteria should be considered
- Reviewer should be familiar with the local ordinances and how they apply to the review process



Methodology Step 1

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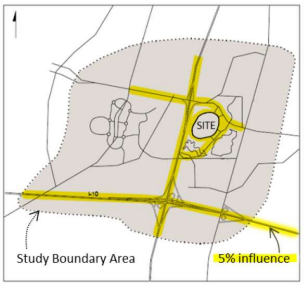
Study Area Requirements

- Project Traffic vs Max Service Volume
  - Comparison of project traffic to thresholds of the percentage of the maximum service flow rate at an established LOS target (ex: 5%)



Methodology Step 1

- Overview
- Methodology Requirements
  - Study Area Requirements
  - Analysis Years
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  - Forecasting Methods
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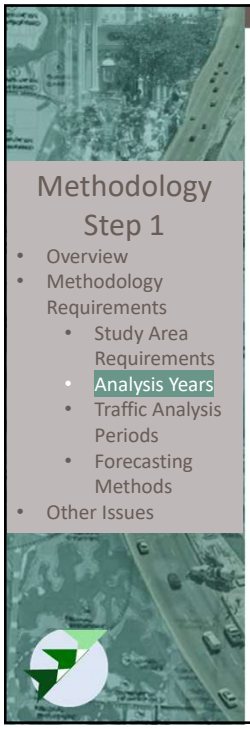
Study Area Requirements

- Distance from site
  - Defining a distance based on the number of trips generated by a development
    - Ex: 0.5 mile for developments generating 50 peak hour external trips
  - Tiered
    - Ex: Small scale analysis for developments generating 50-100 trips with a study area of 0.5 miles from the site
    - Ex: Large scale analysis for developments generating greater then 100 trips with a study area of 3 miles from the site



Methodology Step 1

- Overview
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Analysis Years

- Existing year
- Build out of the proposed development
- Build out of major phases in a multi-year development
- Where new road or major improvements are planned/programmed

Example 1

Sunshine Palm Inc is planning a mixed use development that will include an high-turnover (sit-down) restaurant and a coffee/donut shop with a drive-through window.

- High-turnover restaurant- 2,500 ft^2 GFA
- Coffee/donut shop with drive-through- 2,100 ft^2 GFA

Study area- Decision by City Staff. We will be looking at two intersections and two access driveways for this example.

- Existing Conditions (2017)
- Background Conditions (No-Build) (2019)
- Build Out Conditions (2019)

Example located in Page 2-1.

Methodology Step 1
- Overview
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Traffic Analysis Periods

- Transportation impact analyses are typically based on peak-hour analysis
- *Critical Hour- The period that has the highest combination of development and background traffic*
  - Usually AM peak hour (7-9 AM) and the PM Peak Hour (4-6 PM) on a typical weekday
  - May occur on weekends for land uses that generate high amounts of weekend trips (such as a big box stores, grocery stores, or churches)

Methodology Step 1
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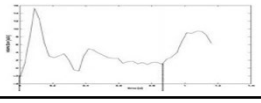
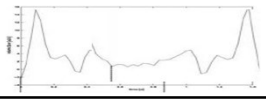
Traffic Analysis Periods

- Types of developments and critical hours
  - Residential vs Shopping Center
  - Hotel/Motel vs High School
  - Hospitals vs Doctor Offices

School

Hotel





Methodology Step 1

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Traffic Analysis Periods

	Weekday Street Peak Hour		
Development	**AM**	**PM**	**Other**
Residential	X	X	
Office	X	X	
Shopping Center		X	(including freestanding Discount Superstores)
Intersection capacity		X	
Access Design		X	Saturday 11:00-15:00
Restaurants Fast Food		X	11:00-13:00
Dinner Trade		X	
Industrial	X	X	Industrial Plant shifts may precede typical commuter adjacent street peak hour
Hotel/Motel		X	
Schools Grade	X		14:30-15:30
High	X		14:30-15:30
College	X	X	
Medical Hospitals	X	X	6:30-8:00 14:30-15:30
Doctors offices		X	9:00-10:00 16:00-18:00
Convenience Markets/Gas	X	X	
Sports/Recreational			Peak entry/exit of particular events

Adapted From: *ANALYSIS OF TRAFFIC IMPACT FOR NEW DEVELOPMENTS*
PAUL C. BOX, Skokie, Illinois ***Public Works Magazine:*** *February 1981*

Methodology Step 1

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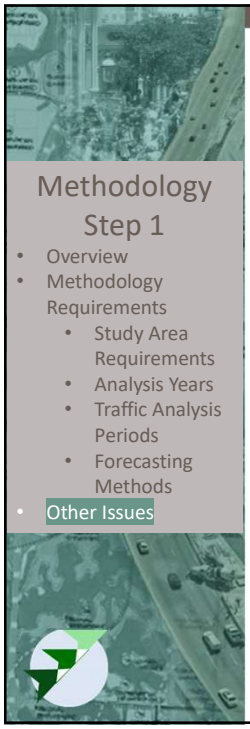
Forecasting Methods

- Detailed information about the application of adjustment factors to collected traffic counts is found in the Project Traffic Forecasting Handbook
- Example: Adjusting data to reflect the critical hour- AM and PM Peak Hour
  - K Factor- Ratio of Peak Hour to Annual Average Daily Traffic (AADT)

K-Factor = DHV ÷ AADT



Methodology Step 1

- Overview
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- Other Issues

Other Items to Consider

- Other major committed developments should be considered in any site impact analysis
- Is this a redevelopment? How to account for existing or previously approved or allowed traffic?
  - "Discounted"?
  - Time of vacancy
  - Existing Conditions
- Use of travel demand forecasting models
- Multimodal consideration

Example 1: Methodology

Sunshine Palm Inc is planning a mixed use development that will include a high-turnover (sit-down) restaurant and a coffee/donut shop with a drive-through window.

- High-turnover restaurant- 2,500 ft^2 GFA
- Coffee/donut shop with drive-through- 2,100 ft^2 GFA

Study area- Decision by city staff. We will be looking at two intersections and two access driveways for this example.

- Existing Conditions (2017)
- Background Conditions (No-Build) (2019)
- Build Out Conditions (2019)

- Analysis Period
  - AM

Example located in Page 2-1.

Existing Conditions Step 2

- Data Collection
  - Transportation System
  - Land Use/ Demographic
  - Traffic Data
- Analysis of Existing Conditions

Step 2 Existing Conditions

Existing Conditions Step 2

- Data Collection
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Data Collection

- Data Collection can be broken into 3 categories
  - Transportation System Data
  - Land Use and Demographic Data
  - Traffic Data




Existing Conditions Step 2

- Data Collection
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Data Collection: Transportation System

- Transportation Network
  - Number of Lanes, Facility Type, Area Type
- Traffic Control
  - Signals, Signing, etc.

Existing Conditions Step 2

- Data Collection
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Data Collection: Transportation System

For Network Purposes

- Transit Service Data
  - Routes, Highways, etc.
  - Pedestrian and Bicycle Faculties
- Transportation Demand Management
- Planned and Programmed Transportation Improvements

Existing Conditions Step 2

- Data Collection
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Data Collection: Transportation System

Context Classification

C1- Natural

C2- Rural

C2T- Rural Town

C3C- Suburban Commercial

C3R- Suburban Residential

C4- Urban General

C5-Urban Center

C6- Urban Core

FIGURE 2 FDOT CONTEXT CLASSIFICATIONS

C1-Natural
Lands preserved in a natural or wilderness condition, including lands unsuitable for settlement due to natural conditions.

C2-Rural
Sparsely settled lands; may include agricultural land, grassland, woodland, and wetlands.

C2T-Rural Town
Small concentrations of developed areas immediately surrounded by rural and natural areas; includes many historic towns.

C3R-Suburban Residential
Mostly residential uses within large blocks and a disconnected or sparse roadway network.

FDOT Context Classification

C3C-Suburban Commercial
Mostly non-residential uses with large building footprints and large parking lots within large blocks and a disconnected or sparse roadway network.

C4-Urban General
Mix of uses set within small blocks with a well-connected roadway network. May extend long distances. The roadway network usually connects to residential neighborhoods immediately along the corridor or behind the uses fronting the roadway.

C5-Urban Center
Mix of uses set within small blocks with a well-connected roadway network. Typically concentrated around a few blocks and identified as part of a civic or economic center of a community, town, or city.

C6-Urban Core
Areas with the highest densities and building heights, and within FDOT classified Large Urbanized Areas (population >1,000,000). Many are regional centers and destinations. Buildings have mixed uses, are built up to the roadway, and are within a well-connected roadway network.

FDOT Context Classification

Existing Conditions Step 2

- Data Collection
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- Analysis of Existing Conditions

Data Collection: Transportation System

Access Management Standards

Table 1
Access Management Standards for Limited Access Facilities

Access Class	Segment Location	Applicable Interchange Spacing Standard
1	Area Type 1 – CBD & CBD Fringe for Cities in Urbanized Areas	1 Mile
	Area Type 2 – Existing Urbanized Areas Other Than Area Type 1	2 Miles
	Area Type 3 – Transitioning Urbanized Areas and Urban Areas Other Than Area Type 1 OR 2	3 Miles
	Area Type 4 – Rural Areas	6 Miles

Table 2
Access Management Standards for Controlled Access Facilities

Access Class	Median	Median Opening Spacing Standard (feet)		Signal Spacing Standard (feet)	Connection Spacing Standard (feet)	
		Full	Directional		Posted Speed Greater than 45 MPH	Posted Speed of 45 MPH or less
2	Restrictive	2,640	1,320	2,640	1,320	660
3	Restrictive	2,640	1,320	2,640	660	440
4	Non-Restrictive			2,640	660	440
5	Restrictive	2,640 Posted Speed Greater than 45 MPH 1,320 Posted Speed of 45 MPH or less			2, 640 Posted Speed Greater than 45 MPH 1,320 Posted Speed of 45 MPH or less	
6	Non-Restrictive			1,320	440	245
7	Both Median Types	660	330	1,320	125	125

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Site Impact Applications Guide FDOT

Existing Conditions Step 2

- Data Collection
  - Transportation System
  - Land Use/ Demographic
  - Traffic Data
- Analysis of Existing Conditions

Data Collection: Land Use/Demographic

- Proposed site development characteristics
- Site locations, boundaries, and development
- Proposed land uses should be identified by intensity and classification consistent with *ITE's Trip Generation Manual*
- Proposed access locations signals, median openings, and major driveways should be identified

Existing Conditions Step 2

- Data Collection
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Data Collection: Land Use/Demographics

Large Scale Model

1. Transportation Analysis Zones (TAZ)
   - Location of the proposed development should be identified
2. Understand the model application and base data
3. Verify the ZDATA-socioeconomic data
4. Identify other committed developments within the area of influence
5. Adopted amendments to comp plan or other development agreements

Existing Conditions Step 2

- Data Collection
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- Analysis of Existing Conditions

Why Turning Counts?

- Used in HCM Software
- Used in FDOT LOS Analysis
- Used to help determine future turning movements
- May be used to assist with trip distribution of site trips

Existing Conditions Step 2

- Data Collection
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- Analysis of Existing Conditions

Traffic Counts

- Traffic Volume and Turning Movement Counts
- Traffic Characteristics (K,D,T)
- Transit Service Ridership
- Pedestrian and Bicycle Usage



Example 1

Let's Pause and Discuss the data collected for our example problem.

Example located in Page 2-2.

Existing Conditions Step 2

- Data Collection
  - Transportation System
  - Land Use/ Demographic
  - Traffic Data
- Analysis of Existing Conditions

Traffic Data Collection

- FDOT FTI Site
  - http://www.fdot.gov/statistics/trafficdata/
- Data must be collected where FDOT/local data is not available.
- Planning Analysis
  - 3 Day Counts (recommended Tuesday, Wednesday, and Thursday)
  - Rural Areas- 7 Days
  - Weekend Data needed depending on site

Existing Conditions Step 2

- Data Collection
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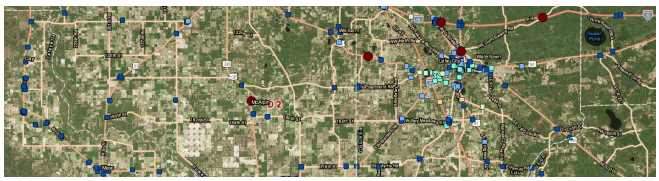
Data Collection: Traffic Data

- Current and historical traffic needed
  - Volumes, turning movement counts (TMC), peak and directional factors, ridership data, bicycle, and pedestrian activities
- FDOT Florida Traffic Information
  - Online application (no longer on a CD)



Existing Conditions Step 2

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Historical Traffic Data

- Recommended the last 5 years of data should be collected (if available)
- FDOT FTI Site
  - http://www.fdot.gov/statistics/trafficdata/

Example Using the Online Tool

- Activity Traffic Data Online
  - Pull 5 years of historical AADTs near the proposed development site
    1. FDOT Traffic Data
    2. Under Traffic Data select Florida Traffic Online
    3. Navigate to location of interest and turn on layer for Portable Traffic Monitoring Sites
    4. Click on Site
    5. Select Historical AADT

Let's explore the website together

Existing Conditions Step 2

- Data Collection
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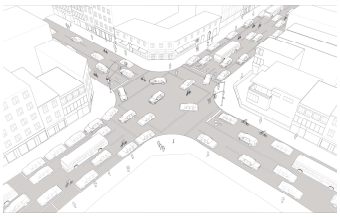
- Analysis of Existing Conditions

LOS Analysis



- Segments and Intersections
- Study Area Required
  (determined during methodology)
  - Major Street Segments in Study Area
  - Site Access Locations for the Development
  - Major Intersections in Study Area
- Performed by FDOT Approved Methods/Software

Examples of LOS By Mode for Urban Roadways

LOS	Automobile	Bicycle	Pedestrian	Bus
A/B				 >4 buses/hour
C/D				 2 to 4 buses/hour
E/F				 ≤ 1 bus/hour

Source 2013 FDOT LOS Handbook

Site Impact Applications Guide FDOT

TABLE 1

Generalized **Annual Average Daily** Volumes for Florida's **Urbanized Areas**

12/18/12

INTERRUPTED FLOW FACILITIES

STATE SIGNALIZED ARTERIALS

Class I (40 mph or higher posted speed limit)

Lanes	Median	B	C	D	E
2	Undivided	*	16,800	17,700	**
4	Divided	*	37,900	39,800	**
6	Divided	*	58,400	59,900	**
8	Divided	*	78,800	80,100	**

Class II (35 mph or slower posted speed limit)

Lanes	Median	B	C	D	E
2	Undivided	*	7,300	14,800	15,600
4	Divided	*	14,500	32,400	33,800
6	Divided	*	23,300	50,000	50,900
8	Divided	*	32,000	67,300	68,100

Non-State Signalized Roadway Adjustments

(After corresponding state volumes by the indicated percent.)

Non-State Signalized Roadways - 10%

Median & Turn Lane Adjustments

Lanes	Median	Exclusive Left Lanes	Exclusive Right Lanes	Adjustment Factors
2	Divided	Yes	No	+5%
2	Undivided	No	No	-20%
Multi	Undivided	Yes	No	-5%
Multi	Undivided	No	No	-25%
–	–	–	Yes	+ 5%

One-Way Facility Adjustment

Multiply the corresponding two-directional volumes in this table by 0.6

UNINTERRUPTED FLOW FACILITIES

FREEWAYS

Core Urbanized

Lanes	B	C	D	E
4	47,400	64,000	77,900	84,600
6	69,900	95,200	116,600	130,600
8	92,500	126,400	154,300	176,600
10	115,100	159,700	194,500	222,700
12	162,400	216,700	256,600	268,900

Urbanized

Lanes	B	C	D	E
4	45,800	61,500	74,400	79,900
6	68,100	93,000	111,800	123,300
8	91,500	123,500	148,700	166,800
10	114,800	156,000	187,100	210,300

Freeway Adjustments

Auxiliary Lanes Present in Both Directions	Ramp Metering
+ 20,000	+ 5%

UNINTERRUPTED FLOW HIGHWAYS

Lanes	Median	B	C	D	E
2	Undivided	8,600	17,000	24,200	33,300
4	Divided	36,700	51,800	65,600	72,600
6	Divided	55,000	77,700	98,300	108,800

Uninterrupted Flow Highway Adjustments

Lanes	Median	Exclusive left lanes	Adjustment factors
2	Divided	Yes	+5%
Multi	Undivided	Yes	-5%
Multi	Undivided	No	-25%

Source 2013 FDOT LOS Handbook

Site Impact Applications Guide FDOT

Existing Conditions Step 2

- Data Collection
  - Transportation System
  - Land Use/ Demographic
  - Traffic Data
- Analysis of Existing Conditions

Using the Generalized Tables

Daily Service Volume Tables

- Table 1 – Urbanized Areas
- Table 2 – Transitioning and Urban Areas
- Table 3 – Rural Undeveloped and Rural Developed Areas

Peak Hour Two-Way Service Volume Tables

- Table 4 – Urbanized Areas
- Table 5 – Transitions and Urban Areas
- Table 6 – Rural Undeveloped and Rural Developed Areas

Peak Hour Directional Service Volume Tables

- Table 7 – Urbanized Areas
- Table 8 – Transitioning and Urban Areas
- Table 9 – Rural Undeveloped and Rural Developed Areas

Existing Conditions Step 2

- Data Collection
  - Transportation System
  - Land Use/ Demographic
  - Traffic Data
- Analysis of Existing Conditions

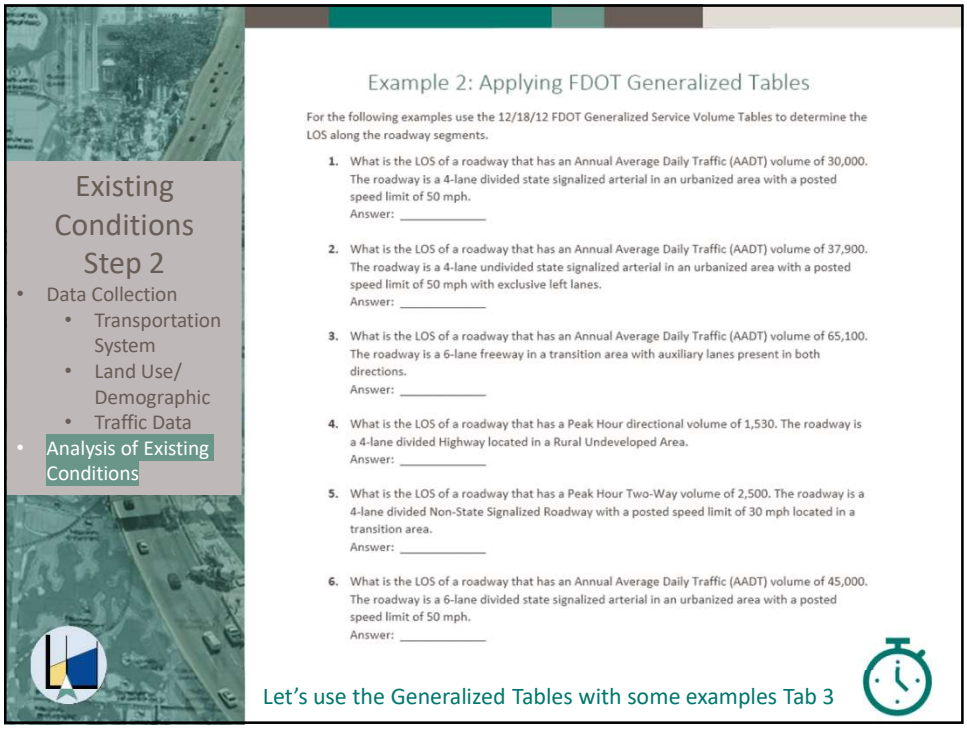
Area Types

- Urbanized Areas – minimum population 50,000.
- Transition/Urban areas- The fringe areas. Anticipated to become urbanized in the next 20 years.
- Urban area- population between 5,000 and 50,000 and not within urbanized areas.
- Rural
  - Rural undeveloped- no or minimal population or development.
  - Rural developed- cities and other populated areas with less than 5,000 or coastal roadways.

Existing Conditions Step 2

- Data Collection
  - Transportation System
  - Land Use/ Demographic
  - Traffic Data
- Analysis of Existing Conditions

Area Types



Example 1

Let's discuss the information below

Delay and LOS Table				2017 Existing	
Intersection	Control	Analysis Level	Time	Delay	LOS
Cypress Creek Road & Powerline Road	Signal	Intersection	AM	73.4	E
Cypress Creek Road & NW 6th Way	Signal	Intersection	AM	37.4	D
Powerline Road & Bank Driveway	Stop	Westbound Approach	AM	17.9	C
Cypress Creek Road & Bank Driveway	Stop	Northbound Approach	AM	25.7	D
		Westbound Left	AM	< 1.0	A

Example located in Page 2-3.

Site Impact Applications Guide FDOT

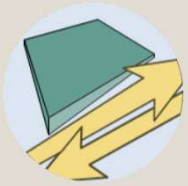
Existing Conditions

Step 2

- Data Collection
  - Transportation System
  - Land Use/ Demographic
  - Traffic Data
- Analysis of Existing Conditions

Overview

- During methodology determined area of influence, segments and intersections being analyzed, data sources
- Data collection needed to determine existing network characteristics
- Analyze the intersections and segments for existing LOS

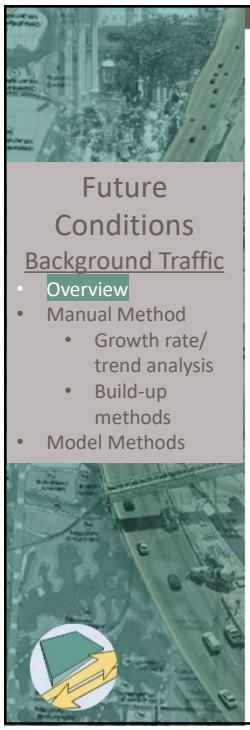


Step 3
Future Conditions

Future Conditions

What will the traffic conditions be in the future with and without the development?

- Background traffic
  - Development traffic projections without development
- Trip generation
- Trip distribution
- Multimodal evaluation
- Assignment of trips to network



Future Conditions

Background Traffic

- Overview
- Manual Method
  - Growth rate/ trend analysis
  - Build-up methods
- Model Methods

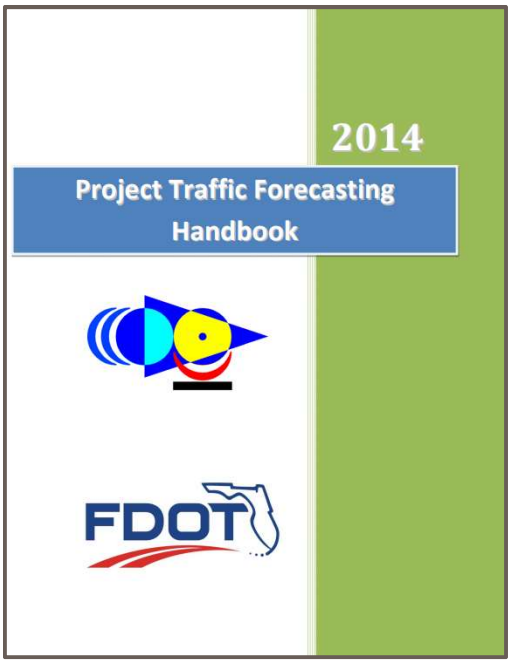
Future Background Traffic

- Expected increase in traffic from natural growth and traffic from other approved developments
  - But not the one you are analyzing
- Manual method
  - Traffic trend analysis
- Travel demand
  - Background traffic can be from travel demand modeling efforts

Future Conditions

Background Traffic

- Overview
- Manual Method
  - Growth rate/ trend analysis
  - Build-up methods
- Model Methods



Future Conditions

Background Traffic

- Overview
- Manual Method
  - Growth rate/ trend analysis
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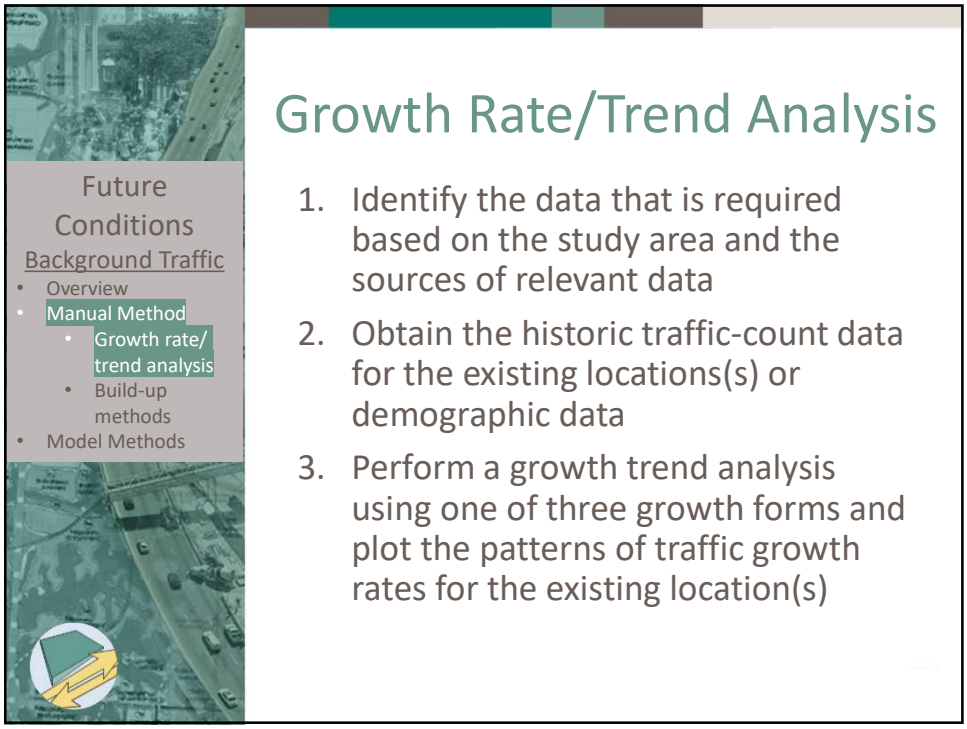
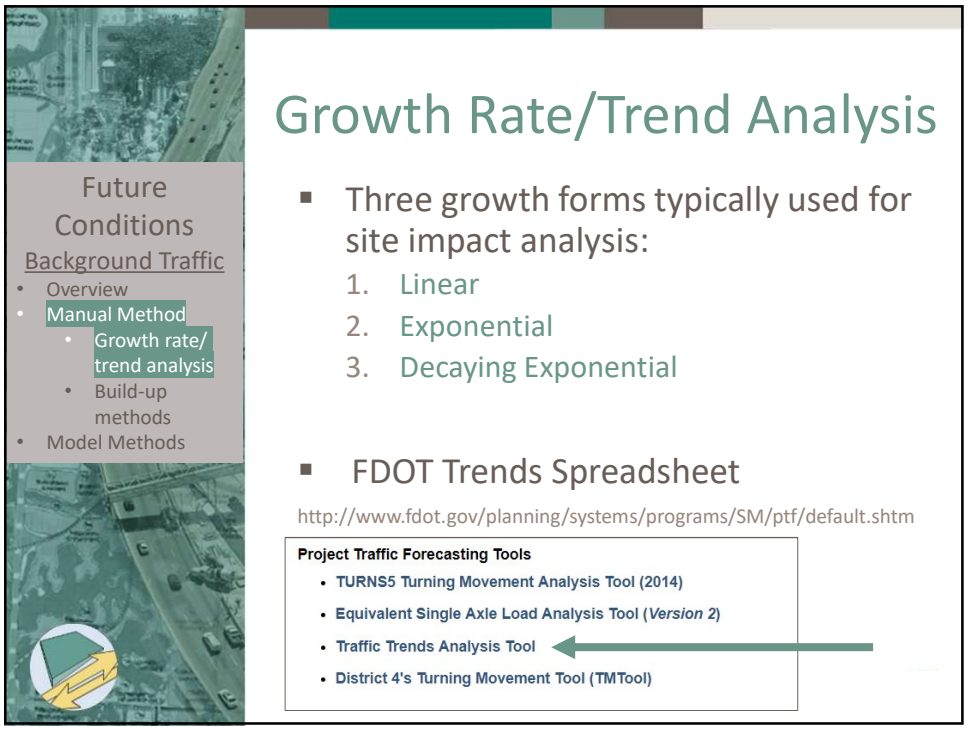
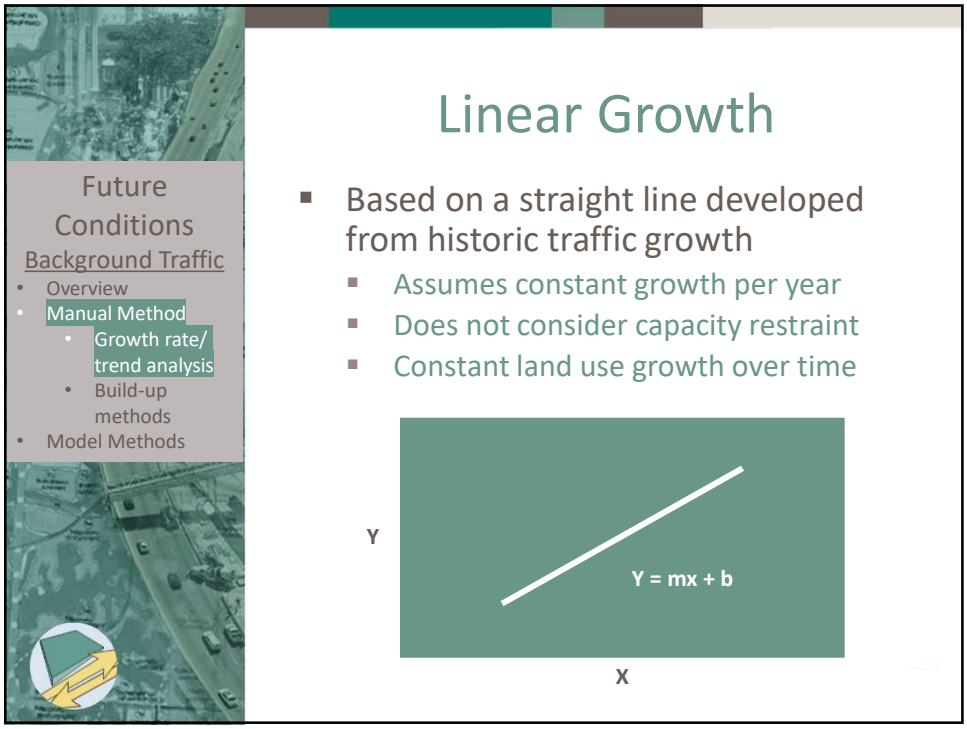
- Model Methods

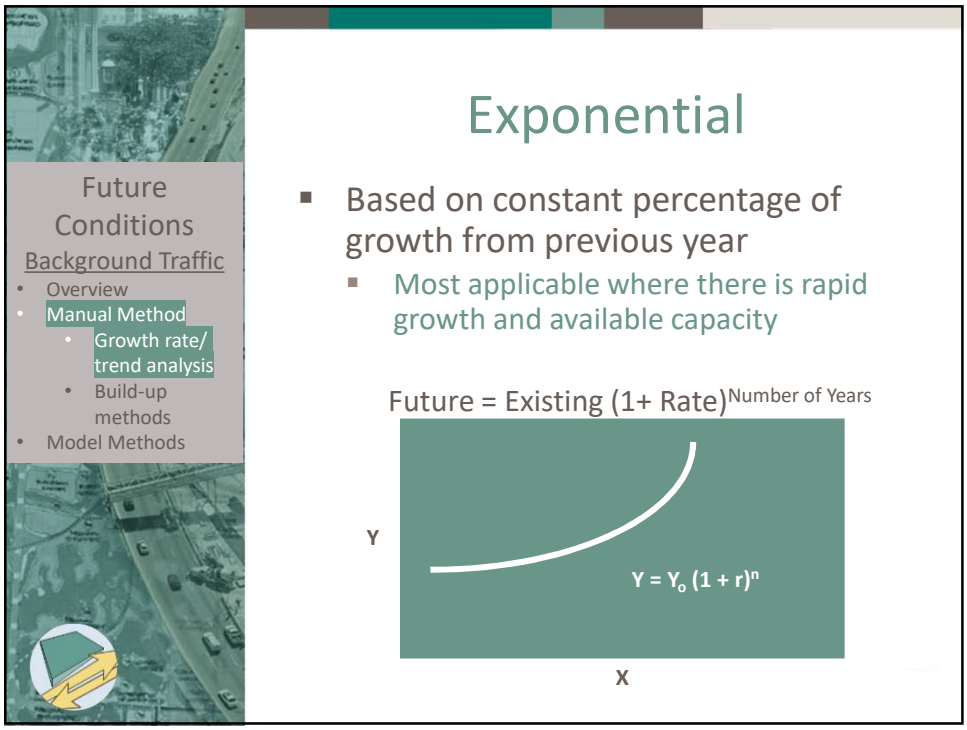
Growth Rate/Trend Analysis

- Uses historical data
- Data for at least the last five years
- Check for major transportation network or land use changes


Future Conditions
Background Traffic
• Overview
• Manual Method
• Growth rate/ trend analysis
• Build-up methods
• Model Methods
Growth Rate/Trend Analysis
1. Identify the data that is required based on the study area and the sources of relevant data
2. Obtain the historic traffic-count data for the existing locations(s) or demographic data
3. Perform a growth trend analysis using one of three growth forms and plot the patterns of traffic growth rates for the existing location(s)


Future Conditions
Background Traffic
• Overview
• Manual Method
• Growth rate/ trend analysis
• Build-up methods
• Model Methods
Growth Rate/Trend Analysis
▪ Three growth forms typically used for site impact analysis:
1. Linear
2. Exponential
3. Decaying Exponential
▪ FDOT Trends Spreadsheet
http://www.fdot.gov/planning/systems/programs/SM/ptf/default.shtm
Project Traffic Forecasting Tools
• TURNS5 Turning Movement Analysis Tool (2014)
• Equivalent Single Axle Load Analysis Tool (Version 2)
• Traffic Trends Analysis Tool
• District 4's Turning Movement Tool (TMTool)


Future Conditions
Background Traffic
• Overview
• Manual Method
• Growth rate/ trend analysis
• Build-up methods
• Model Methods
Linear Growth
Based on a straight line developed from historic traffic growth
Assumes constant growth per year
Does not consider capacity restraint
Constant land use growth over time
Y
Y = mx + b
X


Future Conditions
Background Traffic
• Overview
• Manual Method
• Growth rate/ trend analysis
• Build-up methods
• Model Methods
Exponential
Based on constant percentage of growth from previous year
Most applicable where there is rapid growth and available capacity
Future = Existing (1+ Rate)Number of Years
Y
Y = Y0 (1 + r)n
X

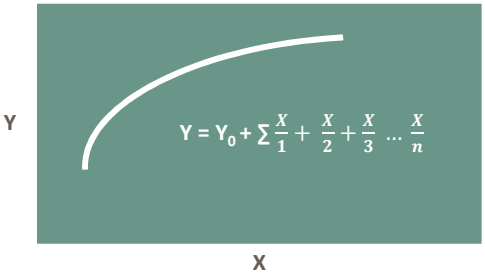
Future Conditions

Background Traffic

- Overview
- Manual Method
  - Growth rate/ trend analysis
  - Build-up methods
- Model Methods

Decaying Exponential

- Based on declining rate of growth over analysis period
  - Dense urbanized area
  - Remember: even fast growth areas eventually slow (build out)

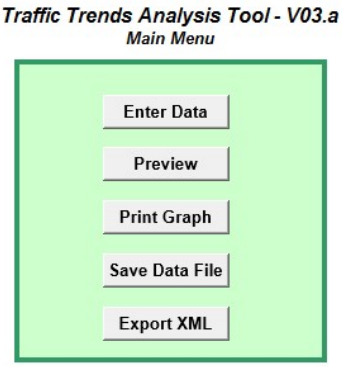


Future Conditions

Background Traffic

- Overview
- Manual Method
  - Growth rate/ trend analysis
  - Build-up methods
- Model Methods

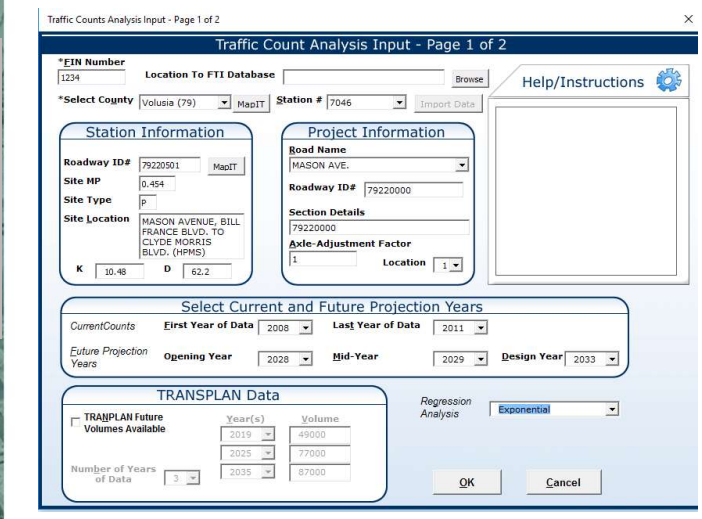
We will now go through an example using the available spreadsheet.



Future Conditions

Background Traffic

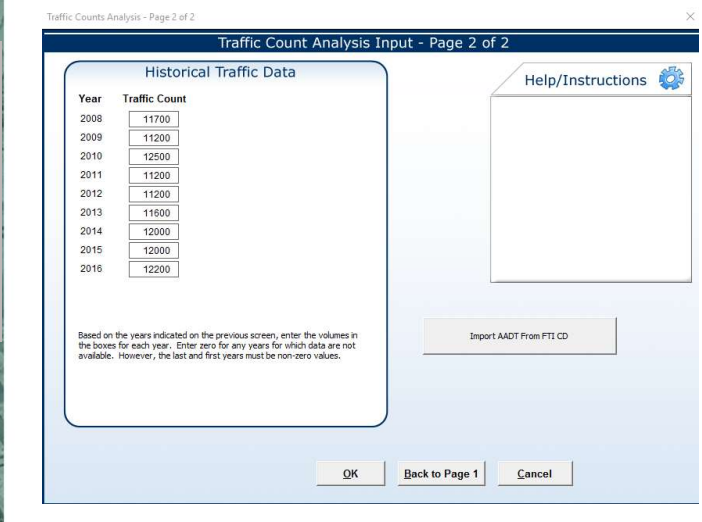
- Overview
- Manual Method
  - Growth rate/ trend analysis
  - Build-up methods
- Model Methods



Future Conditions

Background Traffic

- Overview
- Manual Method
  - Growth rate/ trend analysis
  - Build-up methods
- Model Methods



Future Conditions

Background Traffic

- Overview
- Manual Method
  - Growth rate/ trend analysis
  - Build-up methods
- Model Methods

County:	Volusia (79)
Station #:	7046
Highway:	MASON AVE.

Regression Analysis

Decaying exponential regression analysis of your data indicated a correlation of 7.2%. Linear correlation would be 13.2% and exponential correlation would be 13.6%.

OK

bserved Count
tted Curve

2016 12200 11900

R2 close to one is a better fit.

Future Conditions

Background Traffic

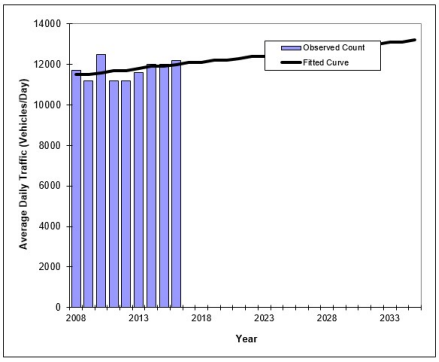
- Overview
- Manual Method
  - Growth rate/ trend analysis
  - Build-up methods
- Model Methods

Traffic Trends - V03.a

MASON AVE. -- 79220000

FIN#	1234
Location	1

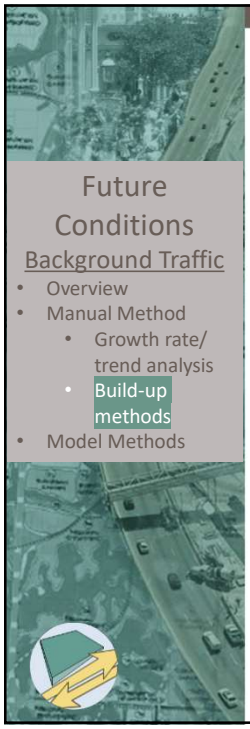
County:	Volusia (79)
Station #:	7046
Highway:	MASON AVE.



Year	Traffic (ADT/AADT) Count*	Trend**
2008	11700	11500
2009	11200	11500
2010	12500	11600
2011	11200	11700
2012	11200	11700
2013	11600	11800
2014	12000	11900
2015	12000	11900
2016	12200	12000
2028 Opening Year Trend		
2028	N/A	12700
2029 Mid-Year Trend		
2029	N/A	12800
2033 Design Year Trend		
2033	N/A	13100
TRANPLAN Forecasts/Trends		

*Axle-Adjusted

** Annual Trend Increase:	63
Trend R-squared:	13.22%
Trend Annual Historic Growth Rate:	0.54%
Trend Growth Rate (2016 to Design Year):	0.54%
Printed:	30-Jul-18
Straight Line Growth Option	

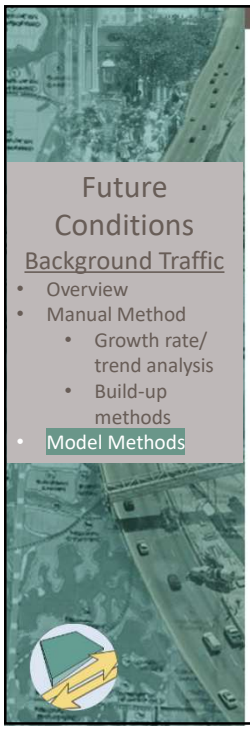


Future Conditions
Background Traffic
- Overview
- Manual Method
  - Growth rate/ trend analysis
  - Build-up methods
- Model Methods

Build-Up Method

Build-Up Method = approved development + background through traffic

- Access impacts of committed system improvements
  - Work with local and state agency staff to identify a subarea
  - Identify committed transportation projects and probable travel pattern changes within the subarea
- Identify and add approved development traffic
  - Confirm committed projects
  - Obtain trip assignment



Future Conditions
Background Traffic
- Overview
- Manual Method
  - Growth rate/ trend analysis
  - Build-up methods
- Model Methods

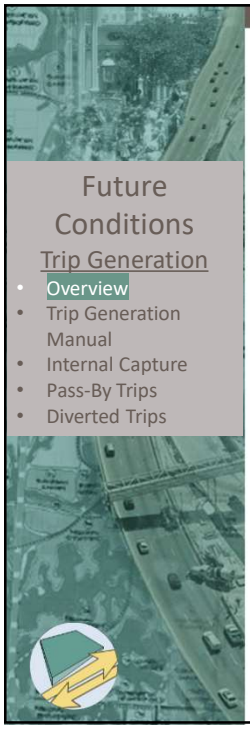
Model Methods

- Travel Demand Models
  - Calibrated to a base year and includes long-term future horizon year
  - Assist in traffic patterns and needs associated with site development
- Socioeconomic data- Zone Data (ZData)
- Be knowledgeable of network and TAZ assumptions in model
  - Year
  - E + C
  - Needs or Cost Feasible Network

Future Conditions

What will the traffic conditions be in the future with and without the development?

- Background traffic
  - Development traffic projections without development
- Trip generation
- Trip distribution
- Multimodal evaluation
- Assignment of trips to network



Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

Trip Generation

- Trip generation estimates the number of trips originating or destined for a TAZ, or in our case, a site
- Trip generation calculation needed even when large scale models are used
  - Large scale regional models are not intended for small areas (ex: Site Impact Analysis)

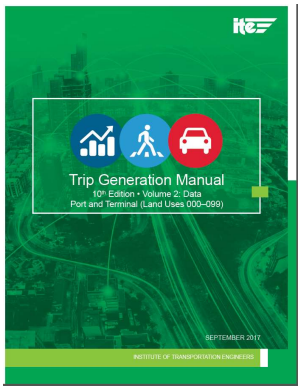
Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

Trip Generation Manual

- 10th Edition



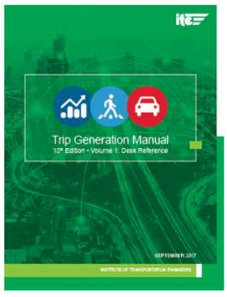
Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

What is a Trip End?

- Number of trips that come in or go out of a development
  - Volume at driveways
- A trip end is a single or one-direction vehicle movement with either the origin or destination (exiting or entering) inside the study site



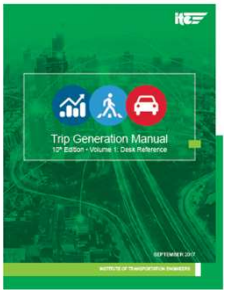
Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

How are trip generation rates determined?

- Traffic is counted at each entrance of a certain land use
- Traffic is then studied in relation to the size of certain "independent variables"
  - Dwelling units, 1,000 square feet, employees, students, fueling positions, rooms, etc.



Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
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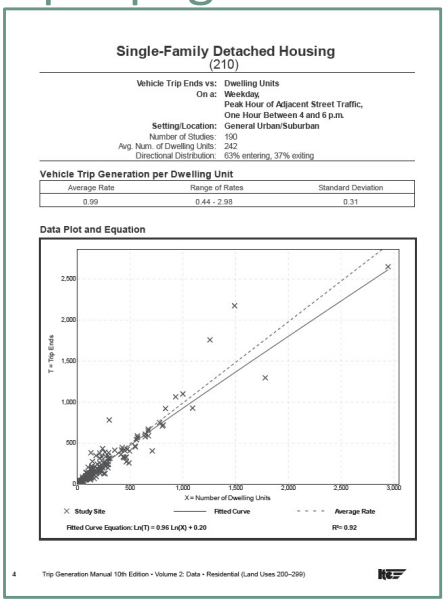
- Diverted Trips

Sample page from ITE



Single-Family Detached Housing
(210)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: General Urban/Suburban
Number of Studies: 190
Avg. Num. of Dwelling Units: 242
Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.99	0.44 - 2.98	0.31

Data Plot and Equation

T = Trip Ends
X = Number of Dwelling Units
Study Site — Fitted Curve - - - Average Rate
Fitted Curve Equation: Ln(T) = 0.96 Ln(X) + 0.20 R² = 0.92

4 Trip Generation Manual 10th Edition • Volume 2: Data • Residential (Land Uses 200–299)

Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

Sample page from ITE

Land Use (ITE Code)

Single-Family Detached Housing
(210)

Independent Variable

Time Period

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: General Urban/Suburban
Number of Studies: 190
Avg. Num. of Dwelling Units: 242
Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.99	0.44 - 2.98	0.31

Trip Generation Rate

Future Conditions

Trip Generation

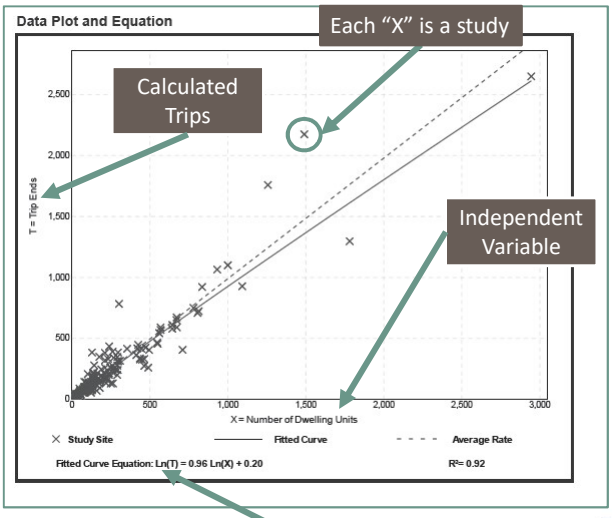
- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

Sample page from ITE

Each "X" is a study

Calculated Trips

Independent Variable



Equation

Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

Simple Trip Generation Example

- Daily trip generation rate for a single family home development = X trips
- 10 homes being built (known as "Dwelling Units")
- Dwelling Units are the "Independent Variable"
- How many weekday trips (i.e. trip ends) do we project?

Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

Single-Family Detached Housing
(210)

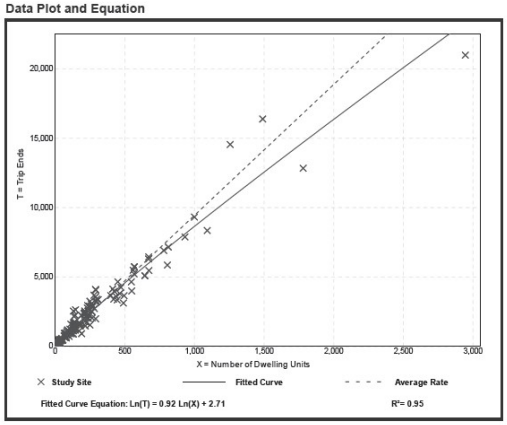
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 159
Avg. Num. of Dwelling Units: 264
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.44	4.81 - 19.39	2.10

Data Plot and Equation



Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

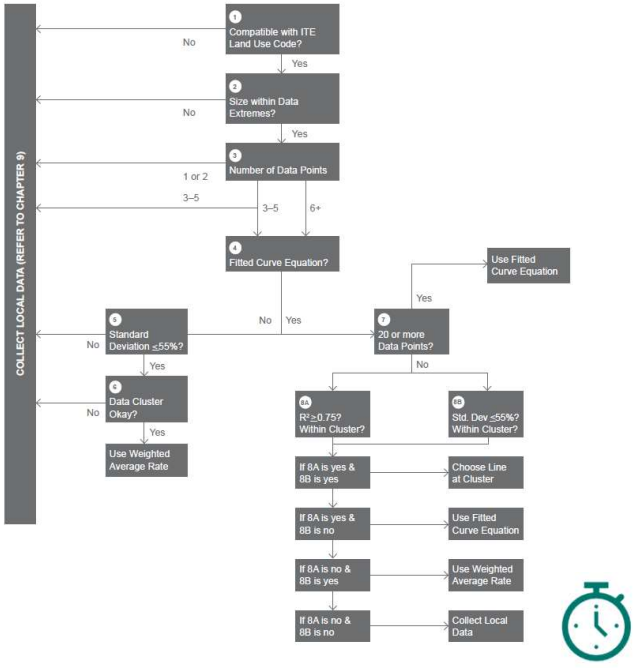
Simple Trip Generation Example

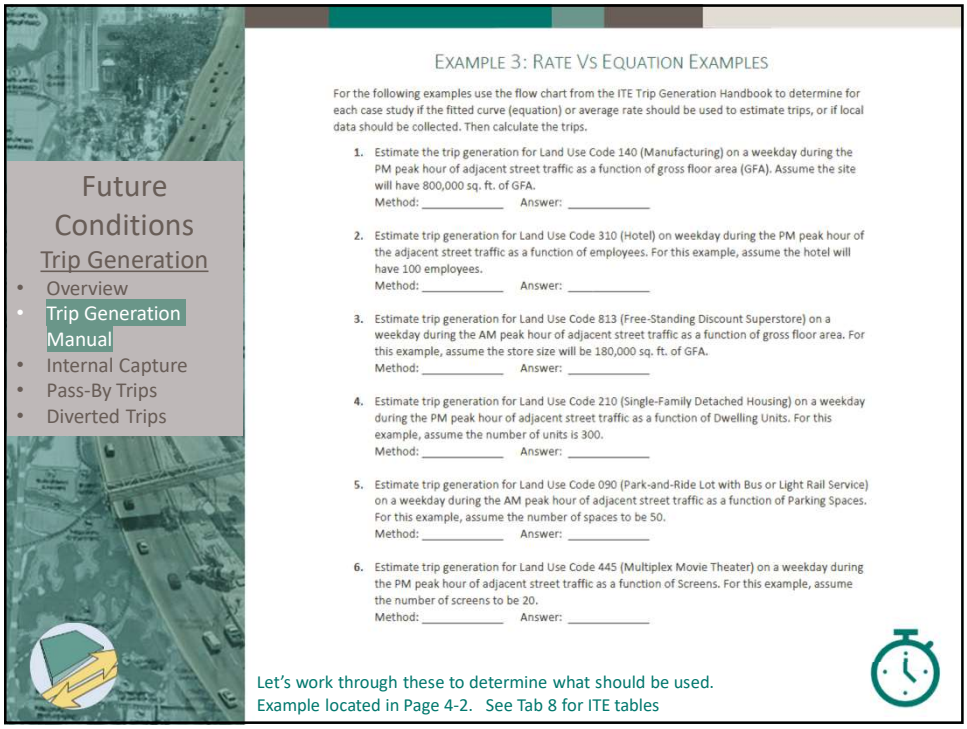
- Trip Rate=
  - T= 9.44(X)
- Fitted Curve Equation =
  - Ln(T) = 0.92Ln(X) + 2.71
- 10 Dwelling units
  - Rate: 9.44 (10) = 94.4 trips= 94 trips
  - Equation:
    - $e^{Ln(T)} = e^{(0.92*Ln(10)+2.71)}$
    - $T = e^{(0.92*Ln(10)+2.71)}$
    - T= 125
- Rate vs Equation

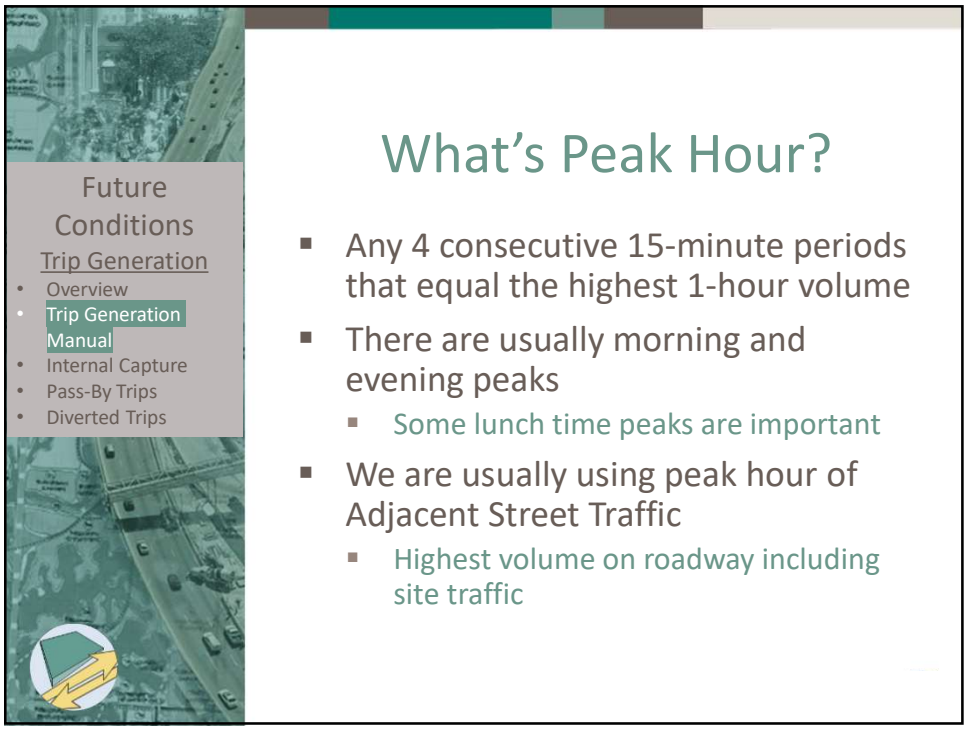
Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips




Future Conditions
Trip Generation
Overview
Trip Generation Manual
Internal Capture
Pass-By Trips
Diverted Trips
Example 3: Rate Vs Equation Examples
For the following examples use the flow chart from the ITE Trip Generation Handbook to determine for each case study if the fitted curve (equation) or average rate should be used to estimate trips, or if local data should be collected. Then calculate the trips.
1. Estimate the trip generation for Land Use Code 140 (Manufacturing) on a weekday during the PM peak hour of adjacent street traffic as a function of gross floor area (GFA). Assume the site will have 800,000 sq. ft. of GFA.
Method: _____ Answer: _____
2. Estimate trip generation for Land Use Code 310 (Hotel) on weekday during the PM peak hour of the adjacent street traffic as a function of employees. For this example, assume the hotel will have 100 employees.
Method: _____ Answer: _____
3. Estimate trip generation for Land Use Code 813 (Free-Standing Discount Superstore) on a weekday during the AM peak hour of adjacent street traffic as a function of gross floor area. For this example, assume the store size will be 180,000 sq. ft. of GFA.
Method: _____ Answer: _____
4. Estimate trip generation for Land Use Code 210 (Single-Family Detached Housing) on a weekday during the PM peak hour of adjacent street traffic as a function of Dwelling Units. For this example, assume the number of units is 300.
Method: _____ Answer: _____
5. Estimate trip generation for Land Use Code 090 (Park-and-Ride Lot with Bus or Light Rail Service) on a weekday during the AM peak hour of adjacent street traffic as a function of Parking Spaces. For this example, assume the number of spaces to be 50.
Method: _____ Answer: _____
6. Estimate trip generation for Land Use Code 445 (Multiplex Movie Theater) on a weekday during the PM peak hour of adjacent street traffic as a function of Screens. For this example, assume the number of screens to be 20.
Method: _____ Answer: _____
Let's work through these to determine what should be used.
Example located in Page 4-2. See Tab 8 for ITE tables


Future Conditions
Trip Generation
Overview
Trip Generation Manual
Internal Capture
Pass-By Trips
Diverted Trips
What's Peak Hour?
Any 4 consecutive 15-minute periods that equal the highest 1-hour volume
There are usually morning and evening peaks
Some lunch time peaks are important
We are usually using peak hour of Adjacent Street Traffic
Highest volume on roadway including site traffic

Example 1

For our restaurant and coffee shop example we will use the rate. In your workbook you will find the ITE Land Use sheets for each of these land uses. Fill out the remaining spaces.

Trip Generation AM Peak Period Calculation						
Land use	Land Use Code	Independent Variable	Average Rate	Total Trips	Entering Trips	Exiting Trips
High-Turnover (Sit-Down) Restaurant	932	2,500 ft²		25		
Coffee/Donut Shop with Drive-Through Window	937	2,100 ft²	88.99		95	92

Example located in Page 2-4.

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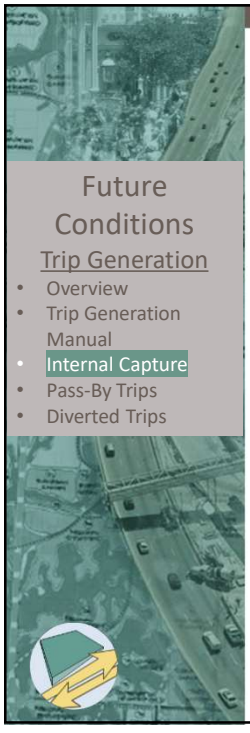


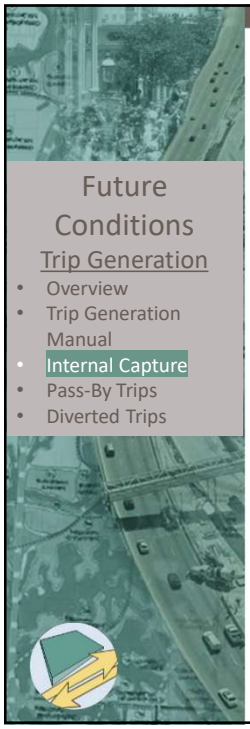
Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

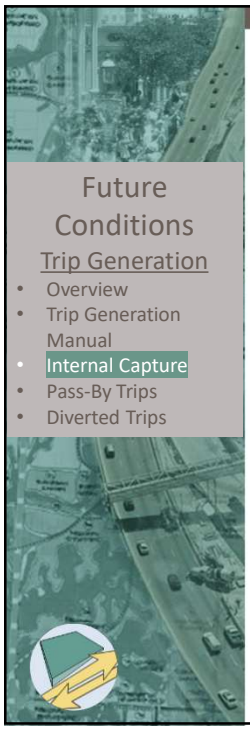
Internal Capture Trips

- Some developments are large and mixed use trips are served internally



Mixed Use Development

- Developments that contain two or more land use components
- Trip generation is calculated separately for each land use component
- Total development trip generation (external + internal) is determined by summing components



Internal Capture Consideration

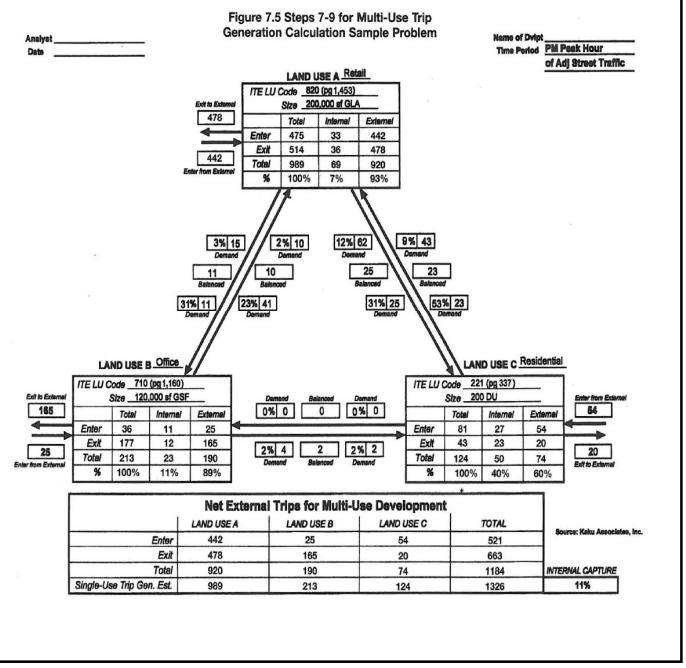
- Residential and employment centers should be compatible (with respect to income levels) to allow internal capture
- Trips that cross or use the public road system should not typically be subtracted with the internal trip component

Total Trip Generation – Internal Trips = External Trips

Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trip

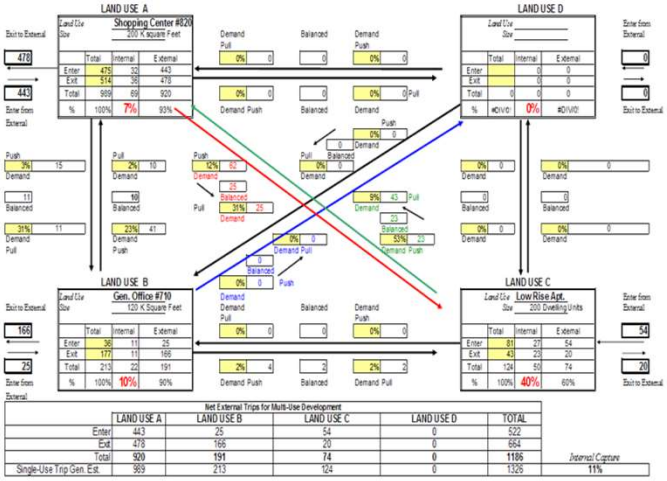


Trip Generation Handbook, 2nd Edition: Chapter 7 ■ ITE 99

Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trip



Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

Table 6.1 Unconstrained Internal Person Trip Capture Rates for Trip Origins within a Mixed-Use Development

		WEEKDAY	
		AM Peak Hour	PM Peak Hour
From OFFICE	To Retail	28%	20%
	To Restaurant	63%	4%
	To Cinema/Entertainment	0%	0%
	To Residential	1%	2%
	To Hotel	0%	0%
From RETAIL	To Office	29%	2%
	To Restaurant	13%	29%
	To Cinema/Entertainment	0%	4%
	To Residential	14%	26%
	To Hotel	0%	5%
From RESTAURANT	To Office	31%	3%
	To Retail	14%	41%
	To Cinema/Entertainment	0%	8%
	To Residential	4%	18%
	To Hotel	3%	7%
From CINEMA/ENTERTAINMENT	To Office	0%	2%
	To Retail	0%	21%
	To Restaurant	0%	31%
	To Residential	0%	8%
	To Hotel	0%	2%
From RESIDENTIAL	To Office	2%	4%
	To Retail	1%	42%
	To Restaurant	20%	21%
	To Cinema/Entertainment	0%	0%
	To Hotel	0%	3%
From HOTEL	To Office	75%	0%
	To Retail	14%	16%
	To Restaurant	9%	68%
	To Cinema/Entertainment	0%	0%
	To Residential	0%	2%

Source: Bochner, B., K. Hooper, B. Sperry, and R. Dunphy. NCHRP Report 684: *Enhancing Internal Trip Capture Estimation for Mixed-Use Developments*. Washington, DC: Transportation Research Board, Tables 99 and 100, 2011.

Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

Table 6.2 Unconstrained Internal Person Trip Capture Rates for Trip Destinations within a Mixed-Use Development

		Weekday	
		AM Peak Hour	PM Peak Hour
To OFFICE	From Retail	4%	31%
	From Restaurant	14%	30%
	From Cinema/Entertainment	0%	6%
	From Residential	3%	57%
	From Hotel	3%	0%
To RETAIL	From Office	32%	8%
	From Restaurant	8%	50%
	From Cinema/Entertainment	0%	4%
	From Residential	17%	10%
	From Hotel	4%	2%
To RESTAURANT	From Office	23%	2%
	From Retail	50%	29%
	From Cinema/Entertainment	0%	3%
	From Residential	20%	14%
	From Hotel	6%	5%
To CINEMA/ENTERTAINMENT	From Office	0%	1%
	From Retail	0%	26%
	From Restaurant	0%	32%
	From Residential	0%	0%
	From Hotel	0%	0%
To RESIDENTIAL	From Office	0%	4%
	From Retail	2%	46%
	From Restaurant	5%	16%
	From Cinema/Entertainment	0%	4%
	From Hotel	0%	0%
To HOTEL	From Office	0%	0%
	From Retail	0%	17%
	From Restaurant	4%	71%
	From Cinema/Entertainment	0%	1%
	From Residential	0%	12%

Source: Bochner, B., K. Hooper, B. Sperry, and R. Dunphy. NCHRP Report 684: *Enhancing Internal Trip Capture Estimation for Mixed-Use Developments*. Washington, DC: Transportation Research Board, Tables 101 and 102, 2011.

Input AM

NCHRP 8-51 Internal Trip Capture Estimation Tool

Project Name:		**Organization:**	
Project Location:		**Performed By:**	
Scenario Description:		**Date:**	
Analysis Year:		**Checked By:**	
Analysis Period:	AM Street Peak Hour	**Date:**	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail				0		
Restaurant				0		
Cinema/Entertainment				0		
Residential				0		
Hotel				0		
All Other Land Uses[2]				0		
Total				0	0	0

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses[2]						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	0	0	0
Internal Capture Percentage	0%	0%	0%
External Vehicle-Trips[3]	0	0	0
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	N/A	N/A
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	N/A	N/A

[1] Land Use Codes (LUCs) from *Trip Generation Informational Report* , published by the Institute of Transportation Engineers.
[2] Total estimate for all other land uses at mixed-use development site--not subject to internal trip capture computations in this estimator.
[3] Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.
[4] Person-Trips.
* Indicates computation that has been rounded to the nearest whole number.
Estimation Tool Developed by the Texas Transportation Institute

Output AM

Project Name:	0
Analysis Period:	AM Street Peak Hour

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	0	0	1.00	0	0
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	0	0	1.00	0	0
Hotel	1.00	0	0	1.00	0	0

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	0	0	0	0	0	0
Retail	0	0	0	0	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	0	0	0	0	0	0
Retail	0	0	0	0	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

[1] Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A
[2] Person-Trips
[3] Total estimate for all other land uses at mixed-use development site--not subject to internal trip capture computations in this estimator.
* Indicates computation that has been rounded to the nearest whole number.

NCHRP 684: Enhancing Internal Trip Capture Estimation for Mixed-Use Developments
https://www.fdot.gov/planning/systems/documents/sm/default.shtm

Site Impact Applications Guide FDOT

Input PM

NCHRP 8-51 Internal Trip Capture Estimation Tool

Project Name:		**Organization:**	
Project Location:		**Performed By:**	
Scenario Description:		**Date:**	
Analysis Year:		**Checked By:**	
Analysis Period:	PM Street Peak Hour	**Date:**	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail				0		
Restaurant				0		
Cinema/Entertainment				0		
Residential				0		
Hotel				0		
All Other Land Uses[2]				0		
Total				0	0	0

Table 2-P: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses[2]						

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary

	Total	Entering	Exiting
All Person-Trips	0	0	0
Internal Capture Percentage	0%	0%	0%
External Vehicle-Trips[3]	0	0	0
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	N/A	N/A
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	N/A	N/A

[1] Land Use Codes (LUCs) from *Trip Generation Informational Report* , published by the Institute of Transportation Engineers.
[2] Total estimate for all other land uses at mixed-use development site--not subject to internal trip capture computations in this estimator.
[3] Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P
[4] Person-Trips
* Indicates computation that has been rounded to the nearest whole number.
Estimation Tool Developed by the Texas Transportation Institute

Output PM

Project Name:	0
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	0	0	1.00	0	0
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	0	0	1.00	0	0
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	0	0	0	0	0	0
Retail	0	0	0	0	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	0	0	0	0	0	0
Retail	0	0	0	0	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

[1] Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P
[2] Person-Trips
[3] Total estimate for all other land uses at mixed-use development site--not subject to internal trip capture computations in this estimator.
* Indicates computation that has been rounded to the nearest whole number.

NCHRP 684: Enhancing Internal Trip Capture Estimation for Mixed-Use Developments
https://www.fdot.gov/planning/systems/documents/sm/default.shtm

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Table 7.1 Unconstrained Internal Trip Capture Rates for Trip Origins within a Multi-Use Development					
Land Use Pairs		Weekday		Proximity Adjustment	
		AM Peak Hour	PM Peak Hour	AM	PM
From OFFICE	To Office	0%	0%	1.000	1.000
	To Retail	28%	20%	1.000	1.000
	To Restaurant	63%	4%	1.000	1.000
	To Cinema/Entertainment	0%	0%	1.000	1.000
	To Residential	1%	2%	1.000	1.000
	To Hotel	0%	0%	1.000	1.000
From RETAIL	To Office	29%	2%	1.000	1.000
	To Retail	0%	0%	1.000	1.000
	To Restaurant	13%	29%	1.000	1.000
	To Cinema/Entertainment	0%	4%	1.000	1.000
	To Residential	14%	26%	1.000	1.000
	To Hotel	0%	5%	1.000	1.000
From RESTAURANT	To Office	31%	3%	1.000	1.000
	To Retail	14%	41%	1.000	1.000
	To Restaurant	0%	0%	1.000	1.000
	To Cinema/Entertainment	0%	8%	1.000	1.000
	To Residential	4%	18%	1.000	1.000
	To Hotel	3%	7%	1.000	1.000
From CINEMA/ENTERTAINMENT	To Office	0%	2%	1.000	1.000
	To Retail	0%	21%	1.000	1.000
	To Restaurant	0%	31%	1.000	1.000
	To Cinema/Entertainment	0%	0%	1.000	1.000
	To Residential	0%	8%	1.000	1.000
	To Hotel	0%	2%	1.000	1.000
From RESIDENTIAL	To Office	2%	4%	1.000	1.000
	To Retail	1%	42%	1.000	1.000
	To Restaurant	20%	21%	1.000	1.000
	To Cinema/Entertainment	0%	0%	1.000	1.000
	To Residential	0%	0%	1.000	1.000
	To Hotel	0%	3%	1.000	1.000
From HOTEL	To Office	75%	0%	1.000	1.000
	To Retail	14%	16%	1.000	1.000
	To Restaurant	9%	68%	1.000	1.000
	To Cinema/Entertainment	0%	0%	1.000	1.000
	To Residential	0%	2%	1.000	1.000
	To Hotel	0%	0%	1.000	1.000

Table 7.1a Adjusted Internal Trip Capture Rates for Trip Origins within a Multi-Use Development			
Land Use Pairs		Weekday	
		AM Peak Hour	PM Peak Hour
From OFFICE	To Office	0.0%	0.0%
	To Retail	28.0%	20.0%
	To Restaurant	63.0%	4.0%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	1.0%	2.0%
	To Hotel	0.0%	0.0%
From RETAIL	To Office	29.0%	2.0%
	To Retail	0.0%	0.0%
	To Restaurant	13.0%	29.0%
	To Cinema/Entertainment	0.0%	4.0%
	To Residential	14.0%	26.0%
	To Hotel	0.0%	5.0%
From RESTAURANT	To Office	31.0%	3.0%
	To Retail	14.0%	41.0%
	To Restaurant	0.0%	0.0%
	To Cinema/Entertainment	0.0%	8.0%
	To Residential	4.0%	18.0%
	To Hotel	3.0%	7.0%
From CINEMA/ENTERTAINMENT	To Office	0.0%	2.0%
	To Retail	0.0%	21.0%
	To Restaurant	0.0%	31.0%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	0.0%	8.0%
	To Hotel	0.0%	2.0%
From RESIDENTIAL	To Office	2.0%	4.0%
	To Retail	1.0%	42.0%
	To Restaurant	20.0%	21.0%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	0.0%	0.0%
	To Hotel	0.0%	3.0%
From HOTEL	To Office	75.0%	0.0%
	To Retail	14.0%	16.0%
	To Restaurant	9.0%	68.0%
	To Cinema/Entertainment	0.0%	0.0%
	To Residential	0.0%	2.0%
	To Hotel	0.0%	0.0%

NCHRP 684: Enhancing Internal Trip Capture Estimation for Mixed-Use Developments
https://www.fdot.gov/planning/systems/documents/sm/default.shtm

Table 7.2 Unconstrained Internal Trip Capture Rates for Trip Destinations within a Multi-Use Development					
Land Use Pairs		Weekday		Proximity Adjustment	
		AM Peak Hour	PM Peak Hour	AM	PM
To OFFICE	From Office	0%	0%	1.000	1.000
	From Retail	4%	31%	1.000	1.000
	From Restaurant	14%	30%	1.000	1.000
	From Cinema/Entertainment	0%	6%	1.000	1.000
	From Residential	3%	57%	1.000	1.000
	From Hotel	3%	0%	1.000	1.000
To RETAIL	From Office	32%	8%	1.000	1.000
	From Retail	0%	0%	1.000	1.000
	From Restaurant	8%	50%	1.000	1.000
	From Cinema/Entertainment	0%	4%	1.000	1.000
	From Residential	17%	10%	1.000	1.000
	From Hotel	4%	2%	1.000	1.000
To RESTAURANT	From Office	23%	2%	1.000	1.000
	From Retail	50%	29%	1.000	1.000
	From Restaurant	0%	0%	1.000	1.000
	From Cinema/Entertainment	0%	3%	1.000	1.000
	From Residential	20%	14%	1.000	1.000
	From Hotel	6%	5%	1.000	1.000
To CINEMA/ENTERTAINMENT	From Office	0%	1%	1.000	1.000
	From Retail	0%	26%	1.000	1.000
	From Restaurant	0%	32%	1.000	1.000
	From Cinema/Entertainment	0%	0%	1.000	1.000
	From Residential	0%	0%	1.000	1.000
	From Hotel	0%	0%	1.000	1.000
To RESIDENTIAL	From Office	0%	4%	1.000	1.000
	From Retail	2%	46%	1.000	1.000
	From Restaurant	5%	16%	1.000	1.000
	From Cinema/Entertainment	0%	4%	1.000	1.000
	From Residential	0%	0%	1.000	1.000
	From Hotel	0%	0%	1.000	1.000
To HOTEL	From Office	0%	0%	1.000	1.000
	From Retail	0%	17%	1.000	1.000
	From Restaurant	4%	71%	1.000	1.000
	From Cinema/Entertainment	0%	1%	1.000	1.000
	From Residential	0%	12%	1.000	1.000
	From Hotel	0%	0%	1.000	1.000

Table 7.2a Adjusted Internal Trip Capture Rates for Trip Destinations within a Multi-Use Development			
Land Use Pairs		Weekday	
		AM Peak Hour	PM Peak Hour
To OFFICE	From Office	0.0%	0.0%
	From Retail	4.0%	31.0%
	From Restaurant	14.0%	30.0%
	From Cinema/Entertainment	0.0%	6.0%
	From Residential	3.0%	57.0%
	From Hotel	3.0%	0.0%
To RETAIL	From Office	32.0%	8.0%
	From Retail	0.0%	0.0%
	From Restaurant	8.0%	50.0%
	From Cinema/Entertainment	0.0%	4.0%
	From Residential	17.0%	10.0%
	From Hotel	4.0%	2.0%
To RESTAURANT	From Office	23.0%	2.0%
	From Retail	50.0%	29.0%
	From Restaurant	0.0%	0.0%
	From Cinema/Entertainment	0.0%	3.0%
	From Residential	20.0%	14.0%
	From Hotel	6.0%	5.0%
To CINEMA/ENTERTAINMENT	From Office	0.0%	1.0%
	From Retail	0.0%	26.0%
	From Restaurant	0.0%	32.0%
	From Cinema/Entertainment	0.0%	0.0%
	From Residential	0.0%	0.0%
	From Hotel	0.0%	0.0%
To RESIDENTIAL	From Office	0.0%	4.0%
	From Retail	2.0%	46.0%
	From Restaurant	5.0%	16.0%
	From Cinema/Entertainment	0.0%	4.0%
	From Residential	0.0%	0.0%
	From Hotel	0.0%	0.0%
To HOTEL	From Office	0.0%	0.0%
	From Retail	0.0%	17.0%
	From Restaurant	4.0%	71.0%
	From Cinema/Entertainment	0.0%	1.0%
	From Residential	0.0%	12.0%
	From Hotel	0.0%	0.0%

NCHRP 684: Enhancing Internal Trip Capture Estimation for Mixed-Use Developments
https://www.fdot.gov/planning/systems/documents/sm/default.shtm

Site Impact Applications Guide FDOT

Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

Example 4: Internal Capture Worksheet

	GROSS TRIP GENERATION						
	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
		Enter	Exit	Enter	Exit	Enter	Exit
INPUT	Office						
	Retail					180	150
	Restaurant					45	40
	Cinema/Entertainment						
	Residential						
	Hotel						
	Total					225	190

For this example we will be determining the internal capture reduction for a mixed-use development that contains Retail and Restaurant.

See Page 5-1

Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

Example 4: Internal Capture Worksheet

Table 6.1 Unconstrained Internal Person Trip Capture Rates for Trip Origins within a Mixed-Use Development (P.M. Peak Hour)

P.M. PEAK	Origin Land Use	Destination Land Use: Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office		20%	4%	0%	2%	0%
	Retail	2%		29%	4%	26%	5%
	Restaurant	3%	41%		8%	18%	7%
	Cinema/Entertainment	2%	21%	31%		8%	2%
	Residential	4%	42%	21%	0%		3%
	Hotel	0%	16%	68%	0%	2%	

From ITE Trip Generation Handbook

See Page 5-2

Rows are Origins and Columns are Destination

1. Lets look at Origins first. These will be calculated using the Exiting Trips.

*** BASED ON EXIT ***

P.M. PEAK	(Exit) Land Use \ (Enter) Land Use	Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office						
	Retail						
	Restaurant		16				
	Cinema/Entertainment						
	Residential						
	Hotel						

Exit trips multiplied by the Origin percentages

See Page 5-3

Retail					180	150
Restaurant					45	40

150 x 0.29= 44

Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

Example 4: Internal Capture Worksheet

2. Now lets look at Destinations. These will be calculated using the Entering Trips.

Table 6.2 Unconstrained Internal Person Trip Capture Rates for Trip Destinations within a Mixed-Use Development (P.M. Peak Hour)

P.M. PEAK

Origin Land Use	Destination Land Use: Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
Office		8%	2%	1%	4%	0%
Retail	31%		29%	26%	46%	17%
Restaurant	30%	50%		32%	16%	71%
Cinema/Entertainment	6%	4%	3%		4%	1%
Residential	57%	10%	14%	0%		12%
Hotel	0%	2%	5%	0%	0%	

From ITE Trip Generation Handbook

See Page 5-2

*** BASED ON ENTER ***

P.M. PEAK

(Exit) Land Use	(Enter) Land Use: Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
Office						
Retail			13			
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Enter trips multiplied by the Destination percentages

See Page 5-3

Retail					180	150
Restaurant					45	40

180 x .5 = 90

Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

Example 4: Internal Capture Worksheet

*** BASED ON EXIT ***

P.M. PEAK

(Exit) Land Use	(Enter) Land Use: Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
Office						
Retail			44			
Restaurant		16				
Cinema/Entertainment						
Residential						
Hotel						

Exit trips multiplied by the Origin percentages

*** BASED ON ENTER ***

P.M. PEAK

(Exit) Land Use	(Enter) Land Use: Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
Office						
Retail			13			
Restaurant		90				
Cinema/Entertainment						
Residential						
Hotel						

Enter trips multiplied by the Destination percentages

*** MINIMUM ***

P.M. PEAK

(Exit) Land Use	(Enter) Land Use: Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Total Exit
Office							
Retail			13				
Restaurant							16
Cinema/Entertainment							
Residential							
Hotel							
Total Enter		16	13				

Minimum will control.

See Page 5-3

Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

Example 4: Internal Capture Worksheet

		*** MINIMUM ***						
	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Total Exit
P.M. PEAK	Office							
	Retail			13				13
	Restaurant		16					16
	Cinema/Entertainment							
	Residential							
	Hotel							
	Total Enter		16	13				

Sum Columns for Entering trips and Sum Rows for Exiting trips

See Page 5-3

Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

Example 4: Internal Capture Worksheet

GROSS TRIP GENERATION								
	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour		
		Enter	Exit	Enter	Exit	Enter	Exit	
INPUT	Office							
	Retail					180	150	
	Restaurant					45	40	
	Cinema/Entertainment							
	Residential							
	Hotel							
	Total					225	190	

INTERNAL TRIPS (Minimums)								
	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour		
		Enter	Exit	Enter	Exit	Enter	Exit	
OUTPUT	Office							
	Retail							
	Restaurant							
	Cinema/Entertainment							
	Residential							
	Hotel							
	Total							
	% Reduction					14.0%		

Input Minimum Internal Capture Trips

EXTERNAL TRIPS								
	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour		
		Enter	Exit	Enter	Exit	Enter	Exit	
OUTPUT	Office							
	Retail					164	137	
	Restaurant					32	24	
	Cinema/Entertainment							
	Residential							
	Hotel							

See Page 5-1

Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

Example 4: Internal Capture Worksheet

GROSS TRIP GENERATION

	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
		Enter	Exit	Enter	Exit	Enter	Exit
INPUT	Office						
	Retail					180	150
	Restaurant					45	40
	Cinema/Entertainment						
	Residential						
	Hotel						
	Total					225	190

INTERNAL TRIPS (Minimums)

	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
		Enter	Exit	Enter	Exit	Enter	Exit
OUTPUT	Office						
	Retail					16	13
	Restaurant					13	16
	Cinema/Entertainment						
	Residential						
	Hotel						
	Total					29	29
	% Reduction					14.0%	

EXTERNAL TRIPS

	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
		Enter	Exit	Enter	Exit	Enter	Exit
OUTPUT	Office						
	Retail					164	137
	Restaurant					32	24
	Cinema/Entertainment						
	Residential						
	Hotel						

See Page 5-1

Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

Internal Capture Example Worksheet

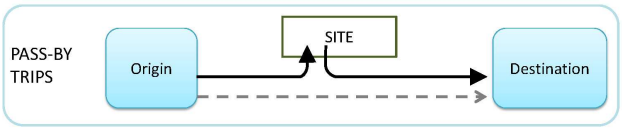
Let's work through the other Internal Capture Examples in Tab 5

Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

Pass-By Trips



Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

Pass-By Trips

- Trips that would have traveled on a street adjacent to a retail center even if the retail was not constructed
- Applied only to retail-oriented land uses
  - Shopping centers
  - Convenience markets
  - Gas stations
  - Fast-food restaurants
  - Drive-in banks
- Results in reduction of new trips added to network attributable to retail center

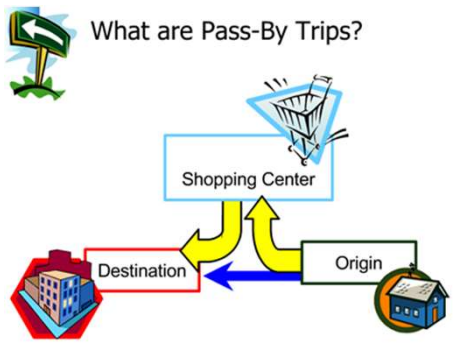
Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

Pass-By Trips

- ITE provides guidance on appropriate percentages
  - Shopping center percentages based on:
    - Size of retail space
    - Volume of adjacent street traffic (10% max)



Future Conditions

Trip Generation

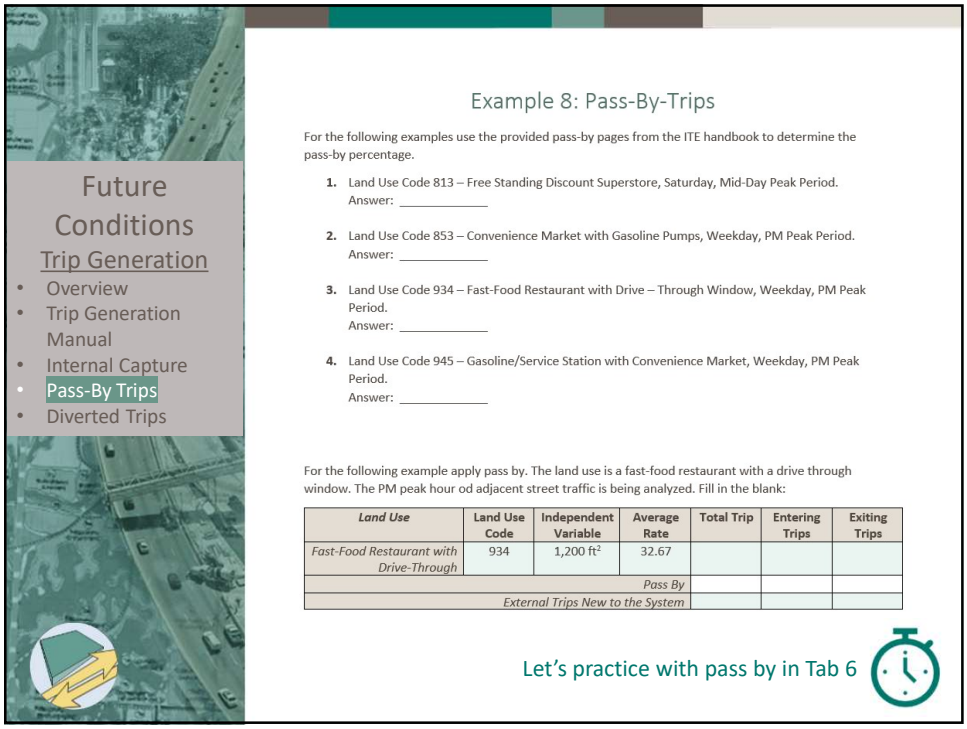
- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

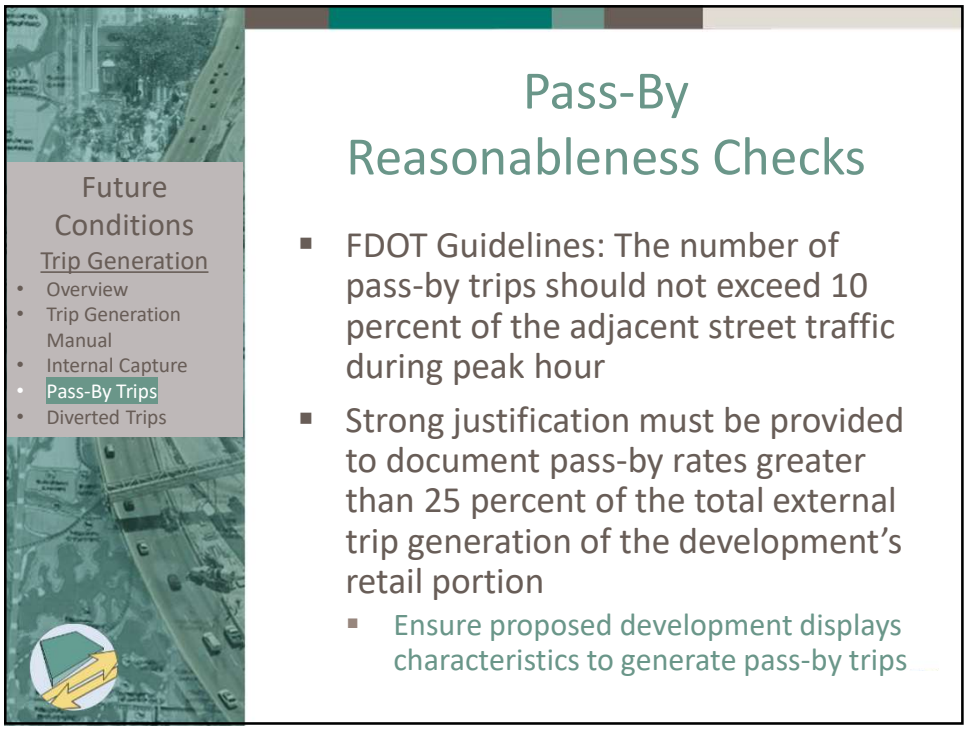
Pass-By Trips

Table E.38 Pass-By and Non-Pass-By Trips Weekday, PM Peak Period Land Use Code 945—Gasoline/Service Station with Convenience Market

SIZE (1,000 SQ. FT. GFA)	VEHICLE FUELING POSITIONS	LOCATION	WEEKDAY SURVEY DATE	NO. OF INTERVIEWS	TIME PERIOD	PASS-BY TRIP (%)	NON-PASS-BY TRIPS (%)			ADJ. STREET PEAK HOUR VOLUME	SOURCE
							PRIMARY	DIVERTED	TOTAL		
0.8	8	Louisville area, KY	1993	83	4:00–6:00 p.m.	52	8	40	48	4,965	Barton-Aschman Assoc.
0.6	8	Louisville, KY	1993	60	4:00–6:00 p.m.	53	20	27	47	1,491	Barton-Aschman Assoc.
0.7	10	Louisville, KY	1993	—	4:00–6:00 p.m.	57	19	24	43	1,812	Barton-Aschman Assoc.
0.7	8	Louisville area, KY	1993	—	4:00–6:00 p.m.	72	7	21	28	2,657	Barton-Aschman Assoc.
0.7	10	Louisville area, KY	1993	—	4:00–6:00 p.m.	55	16	29	45	2,657	Barton-Aschman Assoc.
0.8	8	Silver Spring, MD	1992	36	4:00–6:00 p.m.	67	14	19	33	3,095	RBA
0.4	8	Derwood, MD	1992	46	4:00–6:00 p.m.	46	11	43	54	3,770	RBA
2.1	8	Kensington, MD	1992	31	4:00–6:00 p.m.	52	13	35	48	1,785	RBA
1	8	Silver Spring, MD	1992	35	4:00–6:00 p.m.	54	3	43	46	7,080	RBA

Average Pass-By Trip Percentage: 56
"—" means no data were provided


Future Conditions
Trip Generation
Overview
Trip Generation Manual
Internal Capture
Pass-By Trips
Diverted Trips
Example 8: Pass-By-Trips
For the following examples use the provided pass-by pages from the ITE handbook to determine the pass-by percentage.
1. Land Use Code 813 – Free Standing Discount Superstore, Saturday, Mid-Day Peak Period.
Answer: _____
2. Land Use Code 853 – Convenience Market with Gasoline Pumps, Weekday, PM Peak Period.
Answer: _____
3. Land Use Code 934 – Fast-Food Restaurant with Drive – Through Window, Weekday, PM Peak Period.
Answer: _____
4. Land Use Code 945 – Gasoline/Service Station with Convenience Market, Weekday, PM Peak Period.
Answer: _____
For the following example apply pass by. The land use is a fast-food restaurant with a drive through window. The PM peak hour od adjacent street traffic is being analyzed. Fill in the blank:
Land Use | Land Use Code | Independent Variable | Average Rate | Total Trip | Entering Trips | Exiting Trips
Fast-Food Restaurant with Drive-Through | 934 | 1,200 ft² | 32.67
Pass By
External Trips New to the System
Let's practice with pass by in Tab 6


Future Conditions
Trip Generation
Overview
Trip Generation Manual
Internal Capture
Pass-By Trips
Diverted Trips
Pass-By Reasonableness Checks
FDOT Guidelines: The number of pass-by trips should not exceed 10 percent of the adjacent street traffic during peak hour
Strong justification must be provided to document pass-by rates greater than 25 percent of the total external trip generation of the development's retail portion
Ensure proposed development displays characteristics to generate pass-by trips

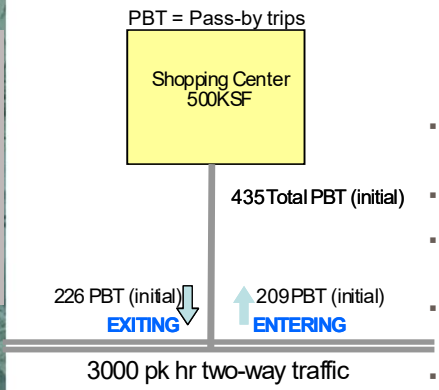
Future Conditions
Trip Generation
- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

10% of Adjacent Street Traffic

- Represent maximum number of trip ends that can be subtracted from base trip generation for pass-by analysis
- Common misuse:
  - Adjacent 2-way street traffic = 1000
  - 10% = 100
  - Those 100 vehicles enter the project, then exit the project for a total reduction of 200 from the trip generation

Future Conditions
Trip Generation
- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

10% of Adjacent Street Traffic

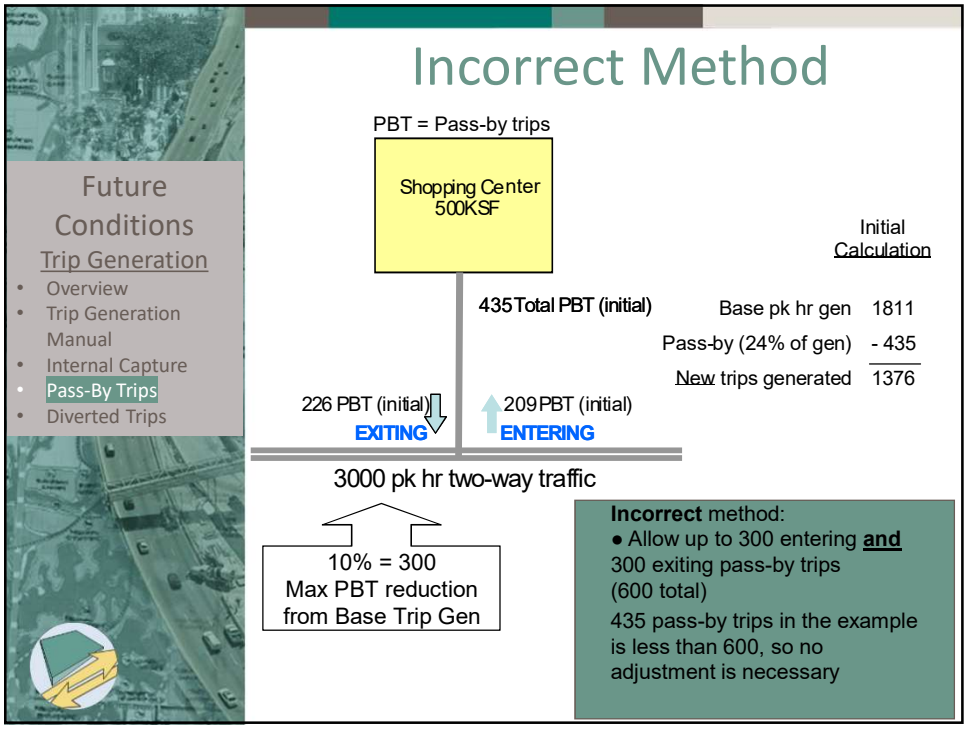


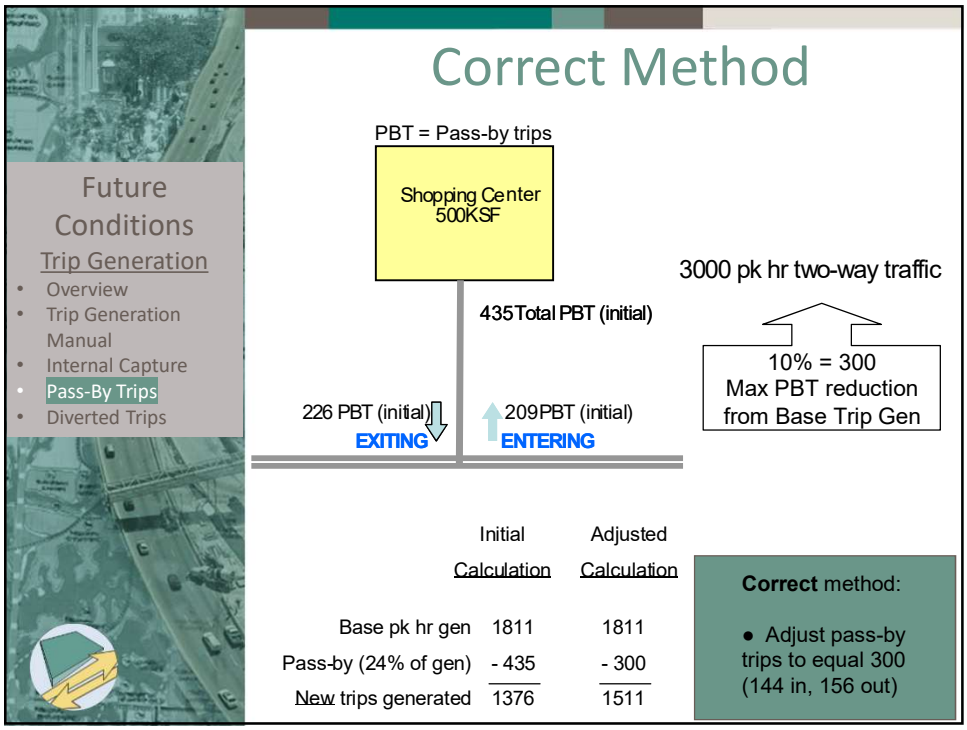
EXAMPLE

- Proposed: 500,000 gross square feet of shopping center space
- **1,811** peak hour generation
- 869 entering, 942 exiting (48%/52% split from ITE Report)
- **24%** pass-by trips (ITE Trip Generation Handbook)
- = **435** pass-by trips (209 entering, 226 exiting)

Adjacent street traffic volume (peak hour): **3,000**

10% of adjacent street traffic = 300

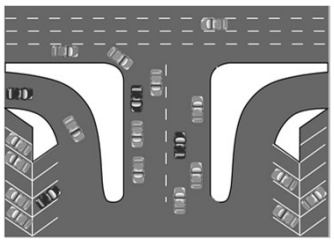

Future Conditions
Trip Generation
• Overview
• Trip Generation Manual
• Internal Capture
• Pass-By Trips
• Diverted Trips
Incorrect Method
PBT = Pass-by trips
Shopping Center 500KSF
435 Total PBT (initial)
226 PBT (initial)
EXITING
209 PBT (initial)
ENTERING
3000 pk hr two-way traffic
10% = 300
Max PBT reduction from Base Trip Gen
Initial Calculation
Base pk hr gen 1811
Pass-by (24% of gen) - 435
New trips generated 1376
Incorrect method:
● Allow up to 300 entering and 300 exiting pass-by trips (600 total)
435 pass-by trips in the example is less than 600, so no adjustment is necessary


Future Conditions
Trip Generation
• Overview
• Trip Generation Manual
• Internal Capture
• Pass-By Trips
• Diverted Trips
Correct Method
PBT = Pass-by trips
Shopping Center 500KSF
435 Total PBT (initial)
226 PBT (initial)
EXITING
209 PBT (initial)
ENTERING
3000 pk hr two-way traffic
10% = 300
Max PBT reduction from Base Trip Gen
Initial Calculation
Adjusted Calculation
Base pk hr gen 1811 1811
Pass-by (24% of gen) - 435 - 300
New trips generated 1376 1511
Correct method:
● Adjust pass-by trips to equal 300 (144 in, 156 out)

Future Conditions
Trip Generation
- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

Driveway Traffic Will Include All of the Pass-By Traffic

- Beware when analyzing driveways: analysis must include pass-by trips in driveway volumes
  - Driveway volumes should include all external and internal trips



Future Conditions
Trip Generation
- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

Pass-By Trips Example

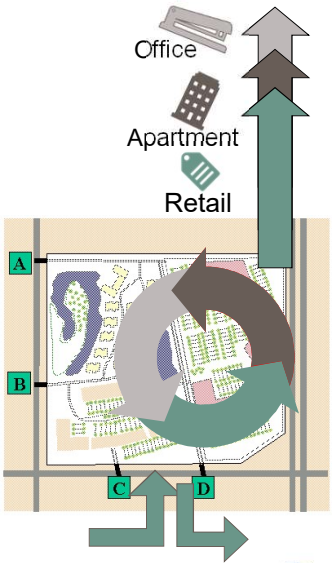
Total Trip Generation
- Internal Capture

_____

= External Trips
-Pass-By Percentage

_____

= External Trips New to the System



External Trips Example

	Apartment	Retail	Office	TOTAL
Total Trip Generation	310	3740	745	4795
Exiting Internal Capture	26	43	62	131
Entering Internal Capture	52	66	13	131
- Total Internal Capture	78	109	75	262
External Trips	232	3631	670	4533
- Pass-by Trips				

Site Impact Applications Guide FDOT

Pass-by Trips Example

	Apartment	Retail	Office	TOTAL
Total Trip Generation	310	3740	745	4795
Exiting Internal Capture	26	43	62	131
Entering Internal Capture	52	66	13	131
- Total Internal Capture	78	109	75	262
External Trips	232	3631	670	4533
Pass-by Percent	0%	20%	0%	
Pass-by Trips	0	726	0	726
External Trips New to System				

External Trips New to the System Example

	Apartment	Retail	Office	TOTAL
Total Trip Generation	310	3740	745	4795
Exiting Internal Capture	26	43	62	131
Entering Internal Capture	52	66	13	131
- Total Internal Capture	78	109	75	262
External Trips	232	3631	670	4533
Pass-by Percent	0%	20%	0%	
- Pass-by Trips	0	726	0	726
External Trips New to System	232	2905	670	3807

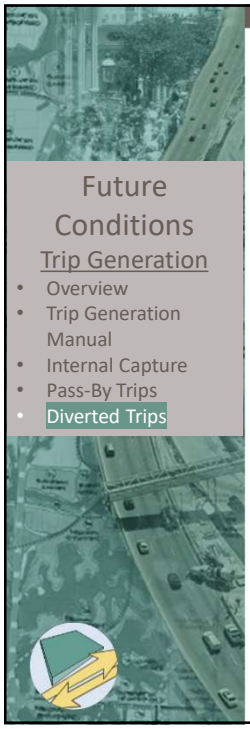
Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

Diverted Trip

- Similar to pass-by trips, except they divert from their original path to access a roadway adjacent to the site.
- Example:
  - Gas Station near a freeway interchange
    - Attract significant percentage of diverted trips.
    - Diverted trips are not new to the overall system, but depending on the size of the study area, they are typically new to the study area.



Future Conditions

Trip Generation

- Overview
- Trip Generation Manual
- Internal Capture
- Pass-By Trips
- Diverted Trips

Diverted Trip

- In most cases, attempting to account for diverted trips presents an unnecessary complication in the analysis.
- For cases which a heavily traveled corridor is the following things accounting for diverted trips may be useful:
  - 1. Within the study area,
  - 2. Not immediately adjacent to the site, and
  - 3. Expected to serve as the source for a number of retail trips
- In most cases, separating diverted trips from new trips is not necessary

Example 1

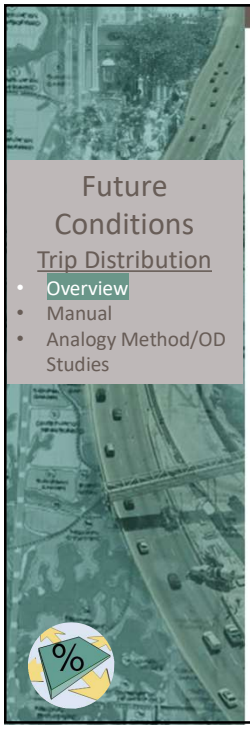
Trip Generation AM Peak Period Calculation						
Land use	Land Use Code	Independent Variable	Average Rate	Total Trips	Entering Trips	Exiting Trips
High-Turnover (Sit-Down) Restaurant	932	2,500 ft²	9.94	25	14	11
Coffee/Donut Shop with Drive-Through Window	937	2,100 ft²	88.99	187	95	92
			Total	**212**	**109**	**103**
Pass by						
High-Turnover (Sit-Down) Restaurant (50% AM Pass By)				12		
Coffee/Donut Shop with Drive-Through Widow (50% AM Pass By)				94		
			****Total Pass by Trips***	**106**	**53**	**53**
			External Trips New to the System			

Example located in Page 2-5.

Future Conditions

What will the traffic conditions be in the future with and without the development?

- Background traffic
  - Development traffic projections without development
- Trip generation
- Trip distribution
- Multimodal evaluation
- Assignment of trips to network



Future Conditions

Trip Distribution

- Overview
- Manual
- Analogy Method/OD Studies

Trip Distribution Overview

- Purpose of trip distribution is to determine the final destination and origin transportation analysis zones of the traffic studied in the impact analysis
- Trip distribution should be summarized in a figure that clearly shows the distribution of external trips from the site

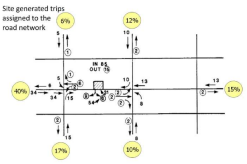
Future Conditions

Trip Distribution

- Overview
- Manual
- Analogy Method/OD Studies

Trip Distribution Manual Methods

- Manual methods of trip distribution provide the analyst with a basic understanding of the travel patterns and market areas associated with the development
  - Good judgment is essential
  - Understanding of existing and proposed land uses



Future Conditions

Trip Distribution

- Overview
- Manual
- Analogy Method/OD Studies

Trip Distribution Analogy Method/OD Studies

- The analogy method derives the trip distribution of a proposed development based on existing data collected at sites that are similar to the subject development
  - Traffic counts and turning movement data
  - License plate O-D survey
  - Home zip codes for employment centers

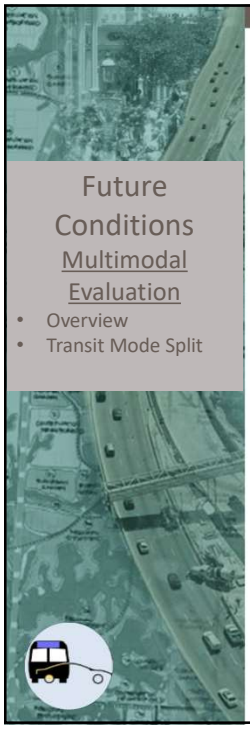
Example 1

Example located in Page 2-6.

Future Conditions

What will the traffic conditions be in the future with and without the development?

- Background traffic
  - Development traffic projections without development
- Trip generation
- Trip distribution
- Multimodal evaluation
- Assignment of trips to network



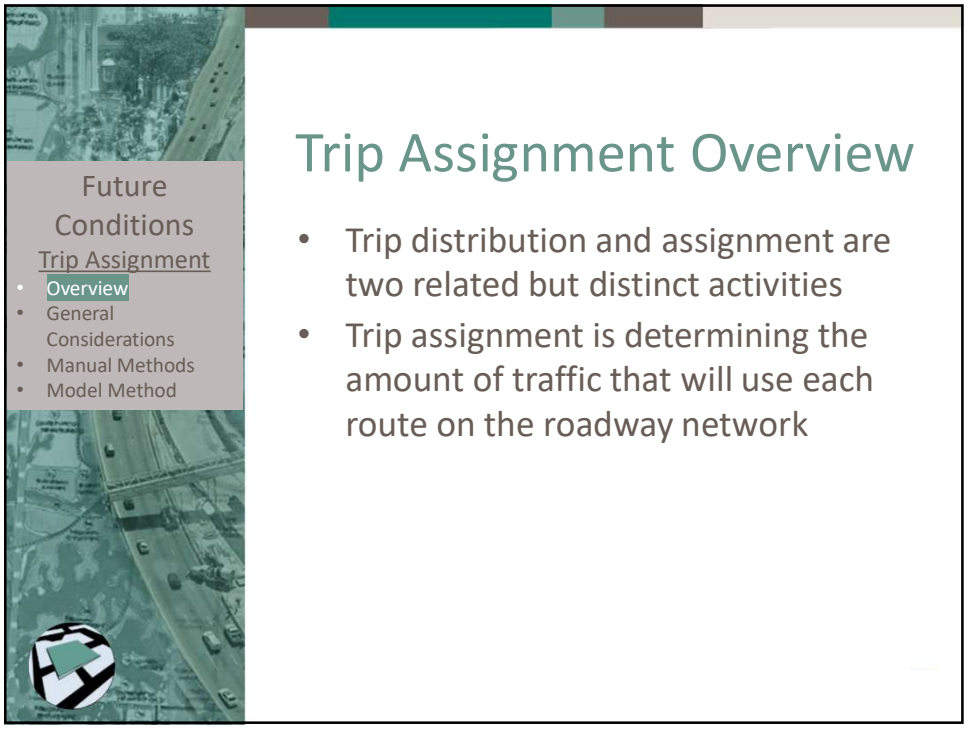
Multimodal Evaluation

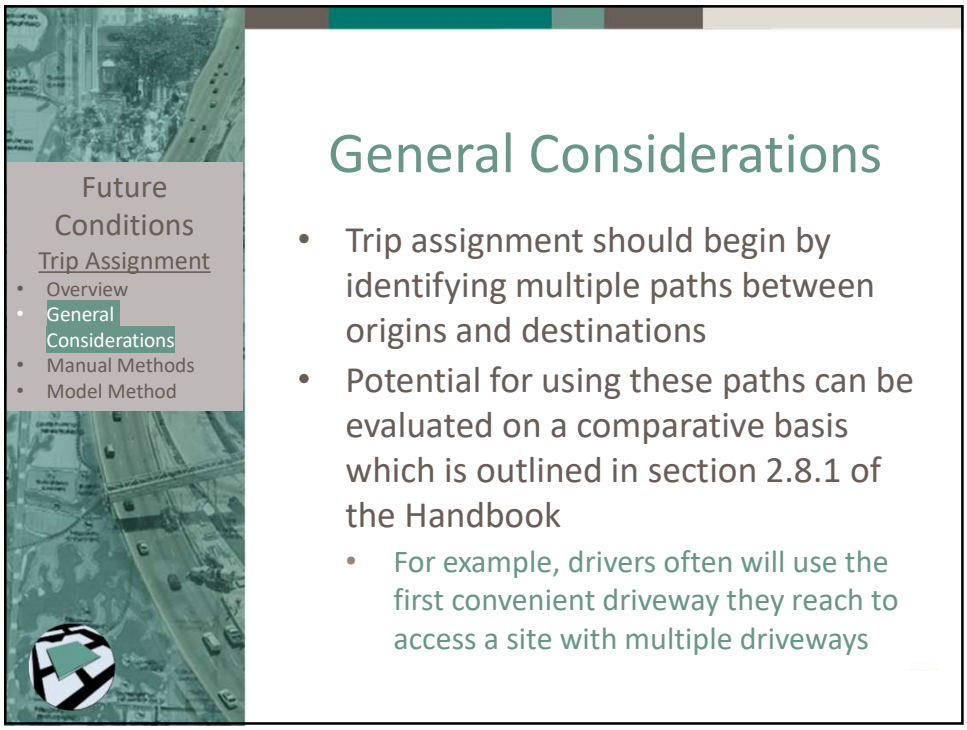
- Estimating the number of travelers between zones that are anticipated to use modes other than automobiles in the TIA (transit, bicycle, walking, etc.)
- Provide justification on any transit, bicycle, or pedestrian adjustment reducing vehicle trips
- FDOT's Transit Office has developed the transit analysis tool TBST (The Transit Boarding Estimation and Simulation Tool) used in transit assessment

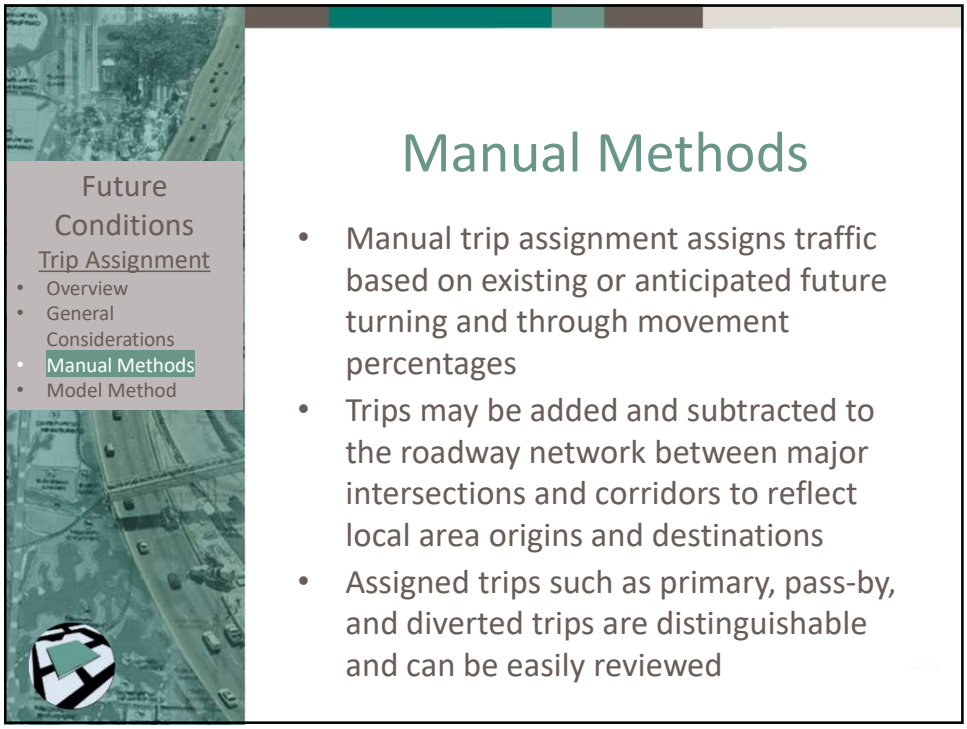
Future Conditions

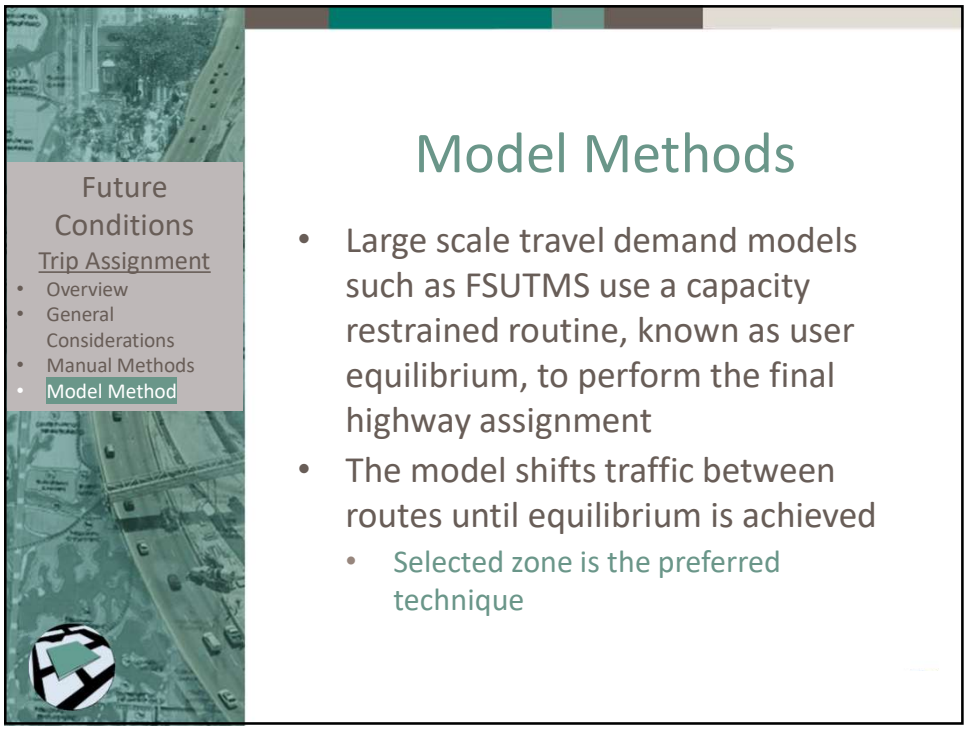
What will the traffic conditions be in the future with and without the development?

- Background traffic
  - Development traffic projections without development
- Trip generation
- Trip distribution
- Multimodal evaluation
- Assignment of trips to network


Future Conditions
Trip Assignment
Overview
General Considerations
Manual Methods
Model Method
Trip Assignment Overview
Trip distribution and assignment are two related but distinct activities
Trip assignment is determining the amount of traffic that will use each route on the roadway network

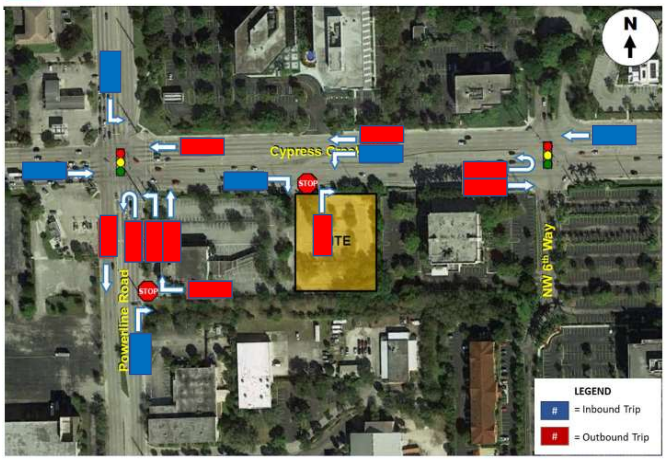

Future Conditions
Trip Assignment
Overview
General Considerations
Manual Methods
Model Method
General Considerations
Trip assignment should begin by identifying multiple paths between origins and destinations
Potential for using these paths can be evaluated on a comparative basis which is outlined in section 2.8.1 of the Handbook
For example, drivers often will use the first convenient driveway they reach to access a site with multiple driveways


Future Conditions
Trip Assignment
• Overview
• General Considerations
• Manual Methods
• Model Method
Manual Methods
• Manual trip assignment assigns traffic based on existing or anticipated future turning and through movement percentages
• Trips may be added and subtracted to the roadway network between major intersections and corridors to reflect local area origins and destinations
• Assigned trips such as primary, pass-by, and diverted trips are distinguishable and can be easily reviewed


Future Conditions
Trip Assignment
• Overview
• General Considerations
• Manual Methods
• Model Method
Model Methods
• Large scale travel demand models such as FSUTMS use a capacity restrained routine, known as user equilibrium, to perform the final highway assignment
• The model shifts traffic between routes until equilibrium is achieved
• Selected zone is the preferred technique

Example 1

Assign the percentages to the movements



Example located in Page 2-7.

Site Impact Applications Guide FDOT

Example 1

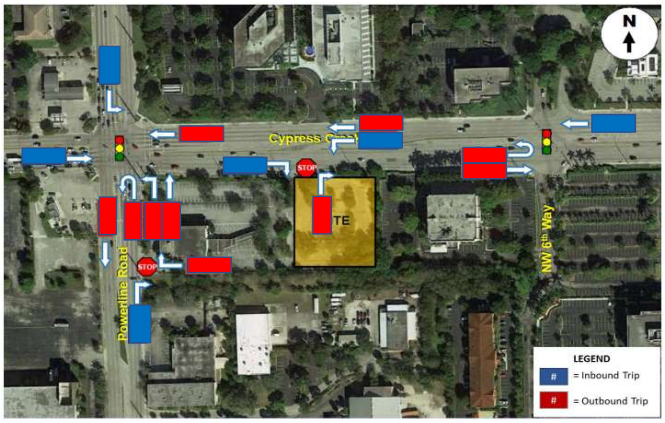
Is there only ONE answer? Let's discuss

Example located in Page 2-8.

Site Impact Applications Guide FDOT

Example 1

Apply your volumes to the percentages. Remember there are two volumes…. What are they?



Example located in Page 2-8.

Site Impact Applications Guide FDOT

Pass-By Trips Example

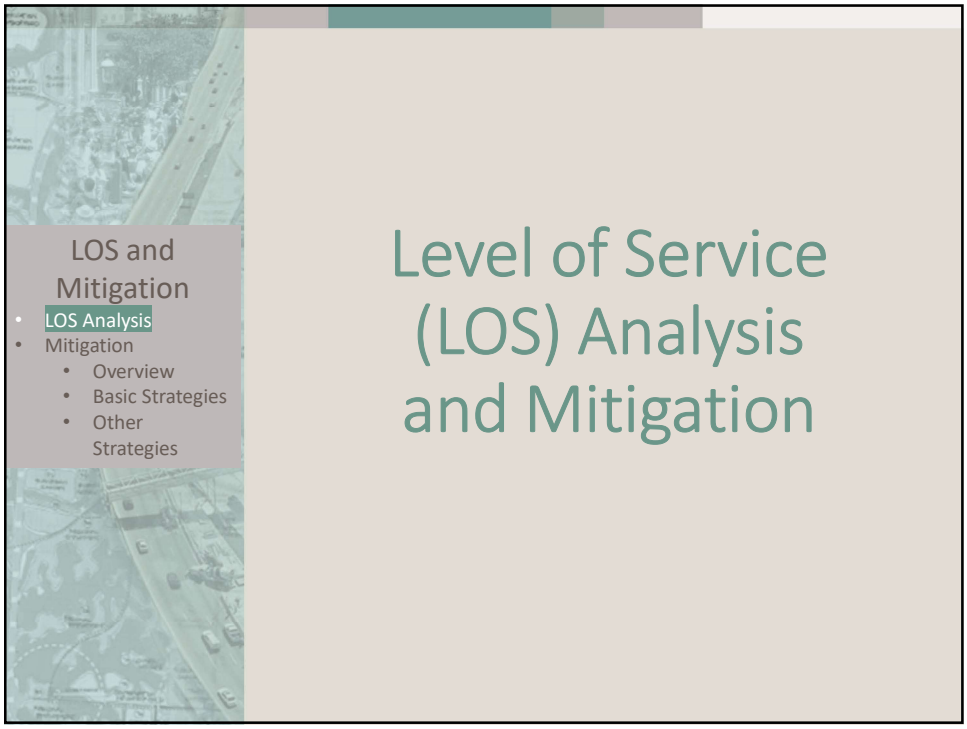
Total Trip Generation
- Internal Capture

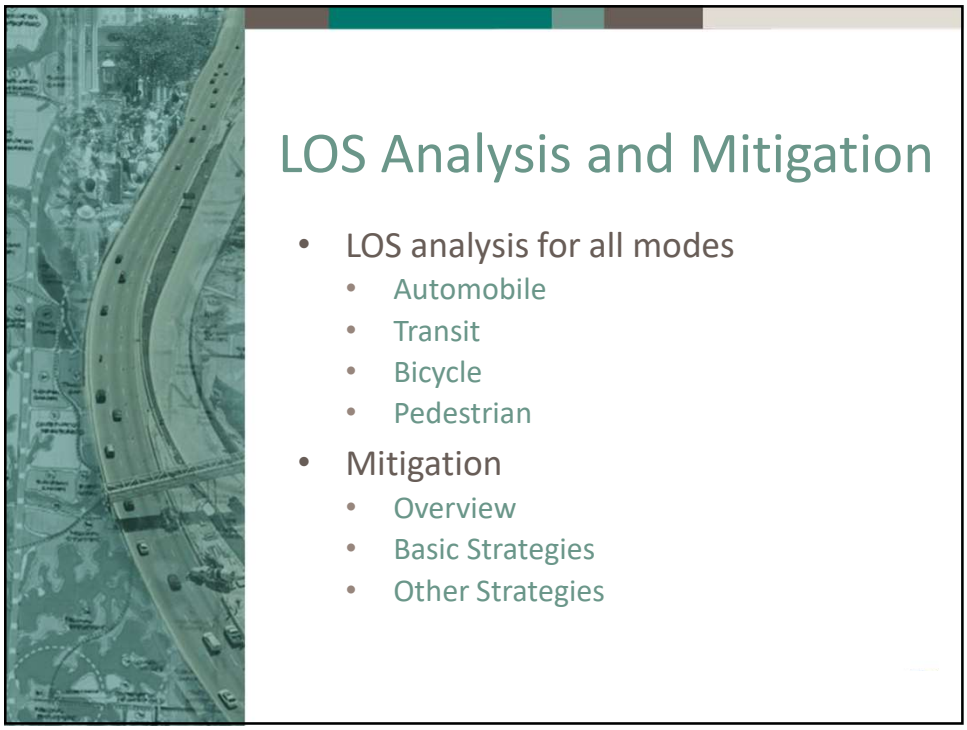
_____

= External Trips
-Pass-By Percentage

_____

= External Trips New to the System


LOS and Mitigation
• LOS Analysis
• Mitigation
• Overview
• Basic Strategies
• Other Strategies
Level of Service (LOS) Analysis and Mitigation


LOS Analysis and Mitigation
• LOS analysis for all modes
• Automobile
• Transit
• Bicycle
• Pedestrian
• Mitigation
• Overview
• Basic Strategies
• Other Strategies

LOS and Mitigation
- LOS Analysis
- Mitigation
  - Overview
  - Basic Strategies
  - Other Strategies

LOS Analysis

- There are several tools that are available for LOS analysis for a particular location
  - Highway Capacity Manual (HCM)
  - Highway Capacity Software (HCS)
  - FDOT Quality/Level of Service (Q/LOS) Handbook
    - Generalized Service Volume Tables

LOS and Mitigation
- LOS Analysis
- Mitigation
  - Overview
  - Basic Strategies
  - Other Strategies

Bicycle and Pedestrian LOS

- Bicycle and Pedestrian LOS assesses bicycling and walking conditions from the bicyclist's and/or and pedestrian's point-of-view
- Bicycle LOS based on five variables:
  - Average effective width of the outside thru lane
  - Motorized vehicle volumes
  - Motorized vehicle speeds
  - Heavy vehicle (truck) volumes
  - Pavement condition

Bicycle and Pedestrian LOS

- Pedestrian LOS based on four variables:
  - Existence of a sidewalk
  - Lateral separation of pedestrians from motorized vehicles
  - Motorized vehicle volumes
  - Motorized vehicle speeds

Transit LOS

- Transit quality of service assesses transit performance from the passenger point-of-view
  - LOS is used to quantify transit quality of service
- Three national resource documents most frequently used to assess transit LOS
  - Transit Capacity and Quality of Service Manual, 3rd Edition (TCQSM)
  - National Cooperative Highway Research Program (NCHRP) Report 616: Multimodal Level of Service Analysis for Urban Streets
  - Highway Capacity Manual, 6th Edition

LOS and Mitigation
- LOS Analysis
- Mitigation

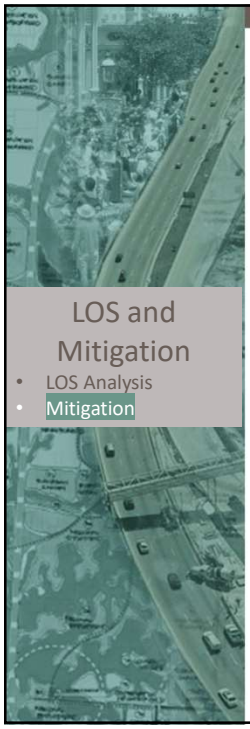
LOS Overview

- Each local and state government establishes a LOS standard for each public facility
- Establishing the comparison of existing and future (for all analysis years) estimated LOS of the study area is critical

Example 1

Delay and LOS Table				2017 Existing		2019 No Build		2019 Build	
Intersection	Control	Analysis Level	Time	Delay LOS	LOS	Delay LOS	LOS	Delay LOS	LOS
Cypress Creek Road & Powerline Road	Signal	Intersection	AM	**73.4**	**E**	**80.9**	**F**	**85.2**	**F**
Cypress Creek Road & NW 6th Way	Signal	Intersection	AM	37.4	D	37.3	D	37.4	D
Powerline Road & Bank Driveway	Stop	Westbound Approach	AM	17.9	C	18.3	C	26.3	D
Cypress Creek Road & Bank Driveway	Stop	Northbound Approach	AM	25.7	D	26.7	D	**38.3**	**E**
		Westbound Left	AM	< 1.0	A	< 1.0	A	3.9	A

Example located in Page 2-10.

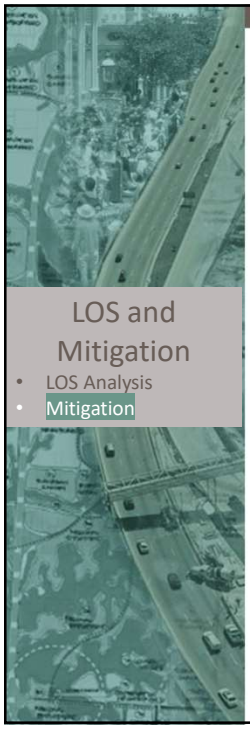


Mitigation

- If LOS is found to be unacceptable, improvements should be suggested and modeled to show the improvements needed to accommodate the proposed development traffic
- Planned improvements should be vetted with plans and programs from any applicable MPO and transportation authority, as well as the State Transportation Plan and applicable FDOT Work Program

Mitigation

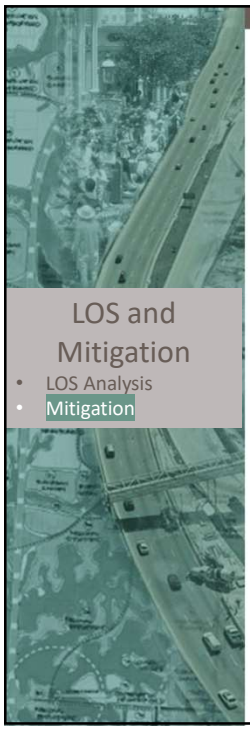
- Reducing transportation impacts can take many forms:
  - Enhancing operational efficiency
  - Reducing demand or increasing system capacity
  - Reduce level of development or phase development impacts with capital improvements
- When adverse transportation impacts are expected on Strategic Intermodal System (SIS) facilities, FDOT should work with local governments and other transportation agencies to identify and agree upon mitigation measures



LOS and Mitigation
- LOS Analysis
- Mitigation

Mitigation-Proportionate Share Contribution

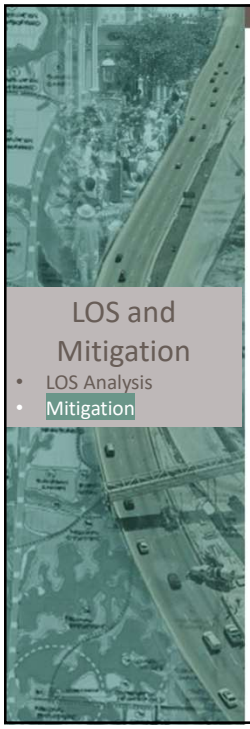
$$\text{Proportionate Share Contribution} = \text{Construction cost of the improvement to maintain or achieve the adopted LOS} \times \frac{\text{Number of trips from the proposed development expected to reach roadways during the peak hour from the stage or phase being approved}}{\text{Change in the peak hour maximum service volume of roadways resulting from construction of an improvement necessary to maintain or achieve the adopted LOS}}$$



LOS and Mitigation
- LOS Analysis
- Mitigation

Mitigation-Impact and Mobility Fee

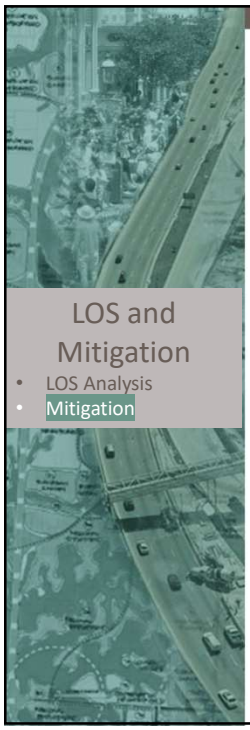
- Impact Fee
  - One-time charges imposed on new development as a condition of approval
- Mobility Fee
  - Charge on new development as a form of mitigation for its impact on a local transportation system.
  - Mobility fees can be used to help establish multimodal friendly land use patterns
    - Ex: Pasco County mobility-fee system assess improvement costs for roadway, transit, and bicycle/pedestrian infrastructure.



LOS and Mitigation
- LOS Analysis
- Mitigation

Mitigation- Case Studies #1

A traffic study performed for the City for a major development in the Central Business District (CBD) with access to non-State roadways has identified impact to a nearby Interstate off-ramp. The developer's traffic engineer has identified improvements to the ramp that the developer is willing to make to you (FDOT Traffic Operations Engineer). The intersection LOS analysis indicates that the improvement will mitigate the project's impacts, but the interchange intersection will continue to operate at a poor LOS. FDOT has an ongoing PD&E Study at the interchange currently, but it will not be completed soon. As an FDOT Traffic Operations Engineer, you are not clear what authority you have in this situation? How do you proceed?



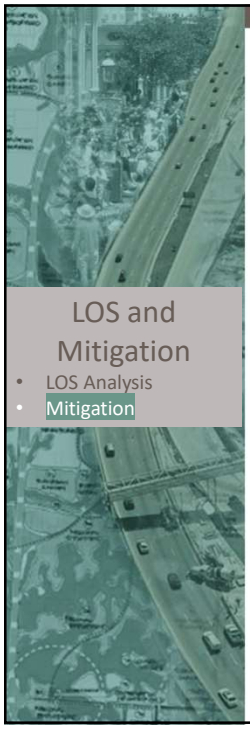
LOS and Mitigation
- LOS Analysis
- Mitigation

Mitigation- Case Studies #2

A traffic study was performed for the City for the redevelopment of adjacent two (2) parcels separated by a canal along significantly congested arterial (Doral Boulevard & NW 87th Avenue). The study identified several LOS deficiencies and turn lane length deficiencies for both parcels.

The west parcel (Doral Gateway) has an existing full access unsignalized intersection with no permitted westbound left-turn movement. All left-turn movements occur at a directional opening with a short turn lane to the east. The east parcel (Doral Corporate Center) also has an existing full access unsignalized intersection along Doral Boulevard close to Doral Gateway's access point) with another short left-turn lane into the site. Doral Corporate Center has a secondary existing full access unsignalized intersection along NW 87th Avenue that operates poorly.

Although the sites are being redeveloped by the same developer, the sites are owned by separate entities and are require access to the roadway network. The operational analysis clearly indicates that the current access plan will create operational and safety issues once constructed. How does the reviewer proceed?



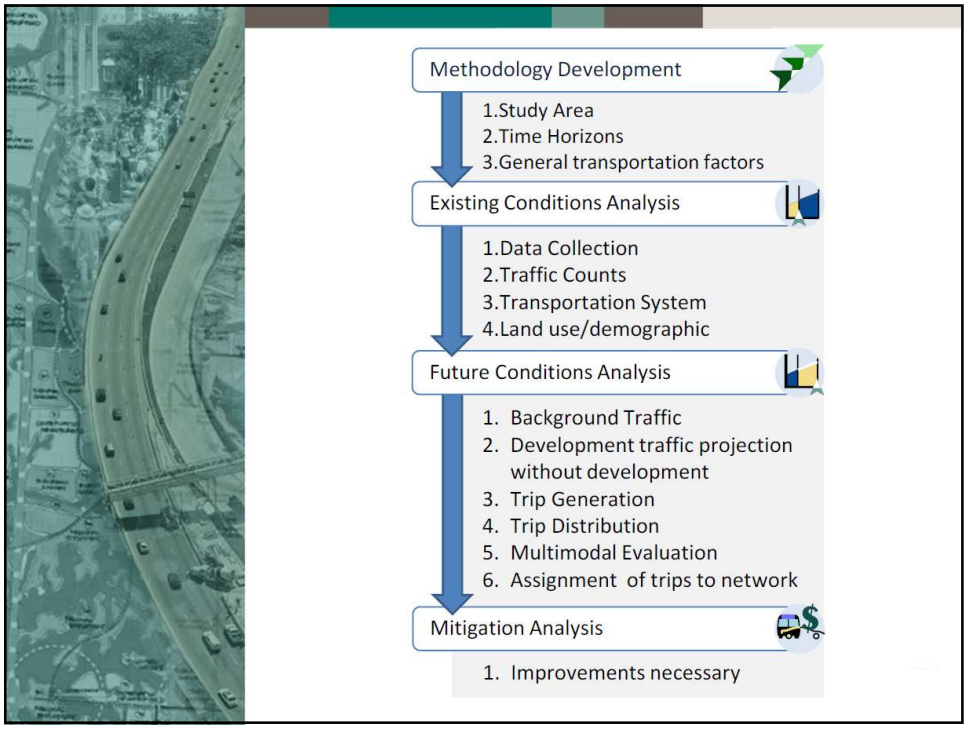
LOS and Mitigation

- LOS Analysis
- Mitigation

Mitigation- Case Studies #3

A traffic study was performed for the City for a redevelopment of a mixed-use development into a strictly warehousing. The proposed redevelopment is expected to be a decrease in trip generation given the change in uses. However, a traffic study was performed to address proposed changes in access. The traffic study indicates that the adjacent signalized intersection LOS does not meet local standards. Additionally, the northbound through lane drops at the intersection forcing vehicles to make a right-turn. It is apparent from the traffic study that an exclusive northbound right-turn lane would significantly improve operations. How does the reviewer proceed?

Overview



Tab 7: Additional Exercises

Workbook Example Analysis 1

MIXED USE DEVELOPMENT SEGMENT ANALYSIS

Proposed Land uses:
Convenience Market with Gasoline Pumps (8 pumps)
General Office (100,000 square feet)
High-Turnover (Sit-Down) (5,700)
Fast-Food Restaurant with Drive-Through Window (7,500)

TRIP GENERATION

Trip Generation PM Peak Period Calculation

Land use	Land Use Code	Independent Variable	Average Rate	Total Trips	Entering Trips	Exiting Trips
Convenience Market with Gasoline Pumps	853	16 fueling positions	23.04			
General Office	710	100,000 ft²	1.15			
High-Turnover (Sit-Down) Restaurant	932	5,700 ft²	9.77			
Fast-Food Restaurant with Drive-Through Window	934	7,500 ft²	32.67			
			Gross Total Trips	784	365	419

INTERNAL CAPTURE REDUCTION

Through the methodology meeting it was determined that the internal capture reduction would be capped at 15%.

Land use	Internal Capture Trips		External Trips		
	Entering Trips	Exiting Trips	Entering Trips	Exiting Trips	Total Trips
Convenience Market with Gasoline Pumps					
General Office					
High-Turnover (Sit-Down) Restaurant					
Fast-Food Restaurant with Drive-Through Window					
Totals	55	63	310	356	666

Workbook Example Analysis 2

STUDY INFORMATION

Land Uses:
High Rise Apartment - 464 Units
Retail (Shopping Center) – 7,000 square feet
Analysis Period
AM Peak Hour
PM Peak Hour
Trip Generation

Fill in the table below and determine if you should use the equation or the rate.

Available Trip Generation Average Rates and Equation

	Land use	Land Use Code	Independent Variable	Average Rate	Equation	R^2	Method you Should Use
AM	High-Rise Apartment						
	Retail (Shopping Center)						
PM	High-Rise Apartment						
	Retail (Shopping Center)						

Use the average rate for the completion of the table below.

Trip Generation – Use Average Rate

Land use	Land Use Code	Size and Units	AM			PM		
			IN	OUT	Total	IN	OUT	Total
High-Rise Apartment		464 Units						
Retail (Shopping Center)		7,000 ft²						
		Totals						

Tab 2. Example Problems

Workbook Example for Presentation

PRESENTATION EXAMPLE 1

Sunshine Palm Inc is planning a development that will include a high-turnover (sit-down) restaurant and a coffee/donut shop with a drive-through window.

2,500 ft^2
2,100 ft^2

Notes:

METHODOLOGY

Study Area Determination

For this example, the study area was determined and will include 2 intersections and 2 access driveways.

Scenarios

Existing Conditions (2017)
Background Conditions (no-build) (2019)
Buildout Conditions (2019)

Analysis Period

AM

Notes:

EXISTING CONDITIONS ANALYSIS

Data Collection

Notes:

Analysis of Existing Conditions

Delay and LOS Table				2017 Existing	
Intersection	Control	Analysis Level	Time	Delay LOS	LOS
Cypress Creek Road & Powerline Road	Signal	Intersection	AM	73.4	E
Cypress Creek Road & NW 6th Way	Signal	Intersection	AM	37.4	D
Powerline Road & Bank Driveway	Stop	Westbound Approach	AM	17.9	C
Cypress Creek Road & Bank Driveway	Stop	Northbound Approach	AM	25.7	D
		Westbound Left	AM	< 1.0	A

Notes:

FUTURE CONDITIONS ANALYSIS

Growth Rate- For this analysis we will use a 1% growth rate

Trip Generation

Attached are the Trip Generation Tables.

Trip Generation AM Peak Period Calculation						
Land use	Land Use Code	Independent Variable	Average Rate	Total Trips	Entering Trips	Exiting Trips
High-Turnover (Sit-Down) Restaurant	932	2,500 ft^2		25		
Coffee/Donut Shop with Drive-Through Window	937	2,100 ft^2	88.99		95	92

Notes:

Pass-by is not available for these land uses in the AM peak period. For this example, we will use the pass-by of 50% for the restaurant and 50% for the coffee/donut shop.

1. **10% Rule**

Look back on our data collection

- North-Side Roadway: 1,396 + 1,153 = 2,549
- East-West Roadway: 1,186 + 1,793 = 2,979
- Adjustment Shared Volume: 122 + 137 = 259
- 2,549 + 2,979 – 259 = 5,269
- 5,269 x 0.01 = **530**

2. Calculate pass by and New External Trips

Trip Generation AM Peak Period Calculation						
Land use	Land Use Code	Independent Variable	Average Rate	Total Trips	Entering Trips	Exiting Trips
High-Turnover (Sit-Down) Restaurant	932	2,500 ft^2	9.94	25	14	11
Coffee/Donut Shop with Drive-Through Window	937	2,100 ft^2	88.99	187	95	92
			Total	**212**	**109**	**103**
			Pass by			
			High-Turnover (Sit-Down) Restaurant (50% AM Pass By)	12		
			Coffee/Donut Shop with Drive-Through Widow (50% AM Pass By)	94		
			****Total Pass by Trips***	**106**	**53**	**53**
			External Trips New to the System			

Total Pass by Calculated is 106 which is less than the 10% cap of 530
Because this is not a mixed-use development internal capture is not considered.

Notes:

Trip Distribution

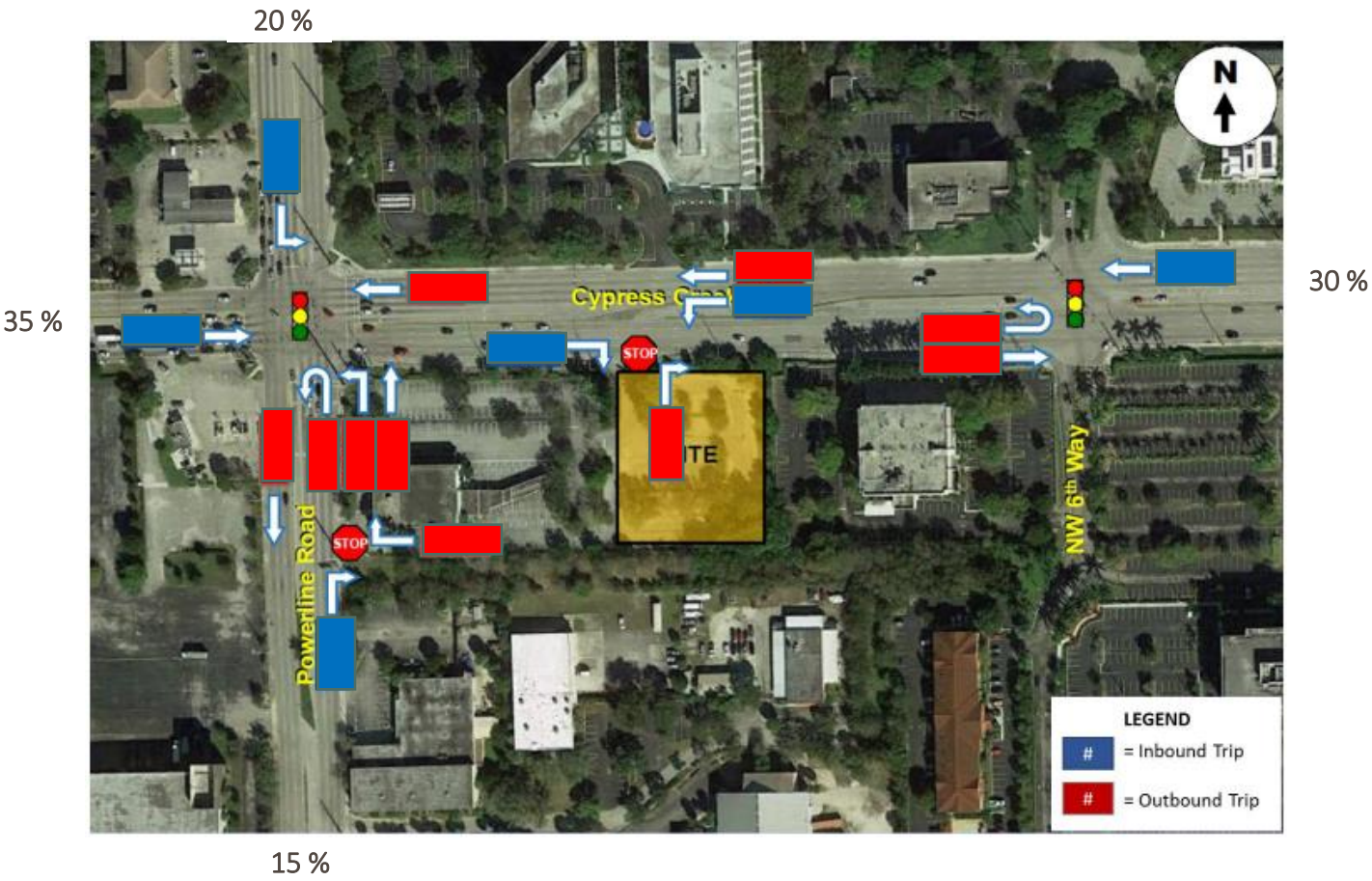
Distribution of trips to and from the site was determined manually, based on knowledge of the local network, current traffic volumes, and discussion with City staff. The following general assumptions were made:

Notes:

Trip Assignment

Consider:

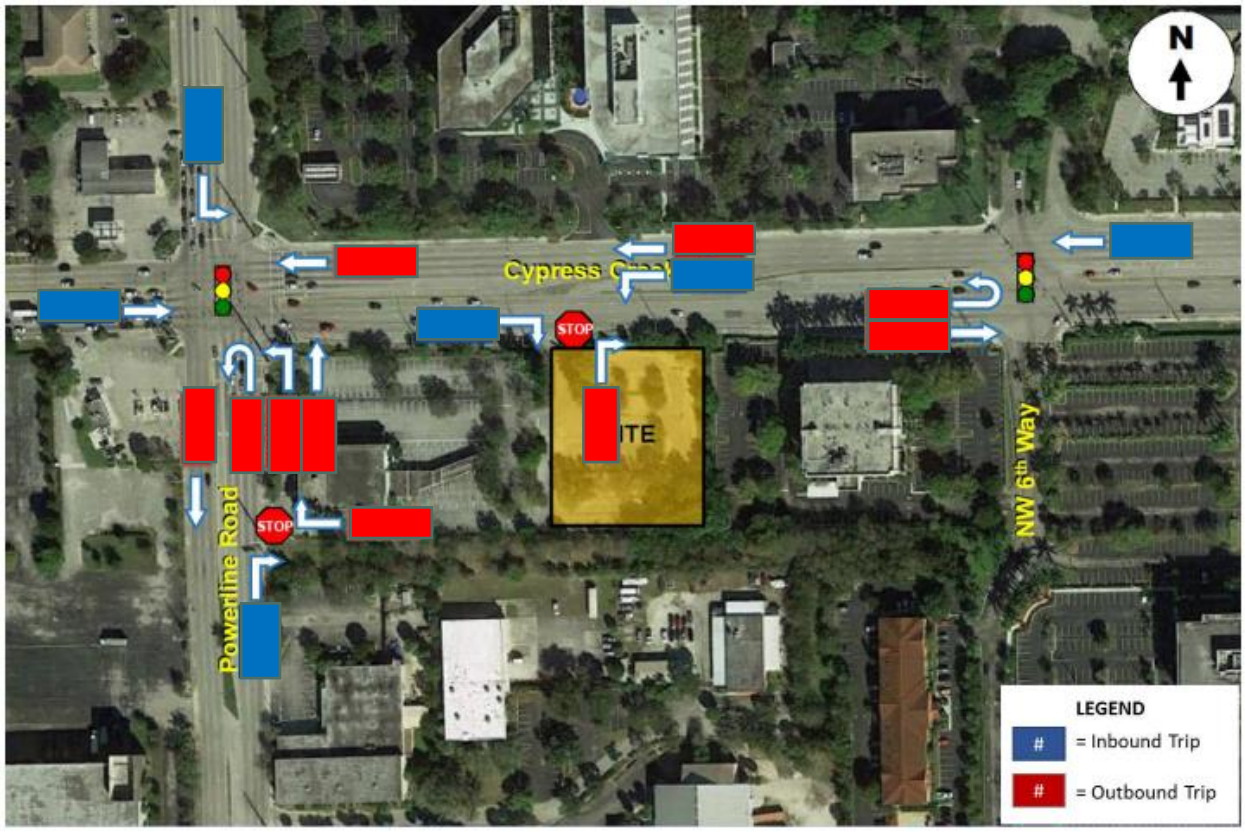
- Driver tendencies and local behavior (such as the percentage of drivers who choose the first available driveway when multiple options exist, and whether the use will draw local, daily users or regional drivers who are not likely to be familiar with the network).
- Internal circulation design (outbound trips tend to be more evenly distributed amount multiple exits comparted to inbound trips).
- Congestion and travel times by time of day (drivers familiarity with the area may consider avoid a congested left turn, for example).
- Planned network improvements that could modify assignment in one or more horizon years.
- One-way street or other factors that would lead to different inbound and outbound paths.




N
20%
5%
5%
30%
30%
35%
55%
STOP
5%
30%
15%
15%
30%
20%
35%
ITE
NW 6th Way
Powerline Road
STOP
65%
15%
LEGEND
#% = Inbound Trip
#% = Outbound Trip

Notes:

Calculate the project volume for each movement using the distribution and the trip generation.



Notes:

Analysis of Future Conditions

Delay and LOS Table				2017 Existing		2019 No Build		2019 Build	
Intersection	Control	Analysis Level	Time	Delay LOS	LOS	Delay LOS	LOS	Delay LOS	LOS
Cypress Creek Road & Powerline Road	Signal	Intersection	AM	**73.4**	**E**	**80.9**	**F**	**85.2**	**F**
Cypress Creek Road & NW 6th Way	Signal	Intersection	AM	37.4	D	37.3	D	37.4	D
Powerline Road & Bank Driveway	Stop	Westbound Approach	AM	17.9	C	18.3	C	26.3	D
Cypress Creek Road & Bank Driveway	Stop	Northbound Approach	AM	25.7	D	26.7	D	**38.3**	**E**
		Westbound Left	AM	< 1.0	A	< 1.0	A	3.9	A

Notes:

MITIGATION

- Mitigation is required at locations that are found to operate unacceptable. Agencies set their own criteria for unacceptable operations, and these may vary by agency type and geographic location.
- Typically, individual turning movements or overall intersections operating at LOS E or LOS F are considered to operate unacceptably, and require mitigations.
- Mitigation strategies for locations that are determined to operate unacceptably should be discussed with the review agency.
- When trips from a proposed development cause a deficiency, the proportionate share contribution shall be calculated using the formula below.

$$\text{Proportionate Share Contribution} = \text{Construction cost of the improvement to maintain or achieve the adopted LOS} \times \frac{\text{Number of trips from the proposed development expected to reach roadways during the peak hour from the stage or phase being approved}}{\text{Change in the peak hour maximum service volume or roadways resulting from construction of an improvement necessary to maintain or achieve the adopted LOS}}$$

If the road is determined to have a deficiency without the project traffic, the improvements necessary to correct the deficiency is the funding responsibility of the entity which maintains the roadway, and the costs to correct that deficiency shall be removed from the project's proportionate-share calculation. The development's proportionate share is then based only on the needed transportation improvements that are greater than that identified deficiency with the necessary improvements in place.

Results of Case Study

In this case study, although LOS F operations were identified at one intersection, it was determined that the deficiencies of this intersection will be addressed as part of the County's Transit Oriented Concurrency system.
Additionally, although LOS E can be expected for each driveway during at least one peak period, this was deemed acceptable as queuing would be contained on site.
No mitigation measures were recommended as part of the study.

Tab 3. FDOT Generalized Tables

Example 2: Applying FDOT Generalized Tables

For the following examples use the 12/18/12 FDOT Generalized Service Volume Tables to determine the LOS along the roadway segments.

1. What is the LOS of a roadway that has an Annual Average Daily Traffic (AADT) volume of 30,000. The roadway is a 4-lane divided state signalized arterial in an urbanized area with a posted speed limit of 50 mph.
   Answer: _____

2. What is the LOS of a roadway that has an Annual Average Daily Traffic (AADT) volume of 37,900. The roadway is a 4-lane undivided state signalized arterial in an urbanized area with a posted speed limit of 50 mph with exclusive left lanes.
   Answer: _____

3. What is the LOS of a roadway that has an Annual Average Daily Traffic (AADT) volume of 65,100. The roadway is a 6-lane freeway in a transition area with auxiliary lanes present in both directions.
   Answer: _____

4. What is the LOS of a roadway that has a Peak Hour directional volume of 1,530. The roadway is a 4-lane divided Highway located in a Rural Undeveloped Area.
   Answer: _____

5. What is the LOS of a roadway that has a Peak Hour Two-Way volume of 2,500. The roadway is a 4-lane divided Non-State Signalized Roadway with a posted speed limit of 30 mph located in a transition area.
   Answer: _____

6. What is the LOS of a roadway that has an Annual Average Daily Traffic (AADT) volume of 45,000. The roadway is a 6-lane divided state signalized arterial in an urbanized area with a posted speed limit of 50 mph.
   Answer: _____

TABLE 1

Generalized **Annual Average Daily** Volumes for Florida's **Urbanized Areas**

12/18/12

INTERRUPTED FLOW FACILITIES

STATE SIGNALIZED ARTERIALS

Class I (40 mph or higher posted speed limit)

Lanes	Median	B	C	D	E
2	Undivided	*	16,800	17,700	**
4	Divided	*	37,900	39,800	**
6	Divided	*	58,400	59,900	**
8	Divided	*	78,800	80,100	**

Class II (35 mph or slower posted speed limit)

Lanes	Median	B	C	D	E
2	Undivided	*	7,300	14,800	15,600
4	Divided	*	14,500	32,400	33,800
6	Divided	*	23,300	50,000	50,900
8	Divided	*	32,000	67,300	68,100

Non-State Signalized Roadway Adjustments

(Alter corresponding state volumes by the indicated percent.)

Non-State Signalized Roadways - 10%

Median & Turn Lane Adjustments

Lanes	Median	Exclusive Left Lanes	Exclusive Right Lanes	Adjustment Factors
2	Divided	Yes	No	+5%
2	Undivided	No	No	-20%
Multi	Undivided	Yes	No	-5%
Multi	Undivided	No	No	-25%
–	–	–	Yes	+ 5%

One-Way Facility Adjustment

Multiply the corresponding two-directional volumes in this table by 0.6

BICYCLE MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Paved Shoulder/Bicycle Lane Coverage	B	C	D	E
0-49%	*	2,900	7,600	19,700
50-84%	2,100	6,700	19,700	>19,700
85-100%	9,300	19,700	>19,700	**

PEDESTRIAN MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Sidewalk Coverage	B	C	D	E
0-49%	*	*	2,800	9,500
50-84%	*	1,600	8,700	15,800
85-100%	3,800	10,700	17,400	>19,700

BUS MODE (Scheduled Fixed Route)[3]

(Buses in peak hour in peak direction)

Sidewalk Coverage	B	C	D	E
0-84%	> 5	≥ 4	≥ 3	≥ 2
85-100%	> 4	≥ 3	≥ 2	≥ 1

UNINTERRUPTED FLOW FACILITIES

FREEWAYS

Core Urbanized

Lanes	B	C	D	E
4	47,400	64,000	77,900	84,600
6	69,900	95,200	116,600	130,600
8	92,500	126,400	154,300	176,600
10	115,100	159,700	194,500	222,700
12	162,400	216,700	256,600	268,900

Urbanized

Lanes	B	C	D	E
4	45,800	61,500	74,400	79,900
6	68,100	93,000	111,800	123,300
8	91,500	123,500	148,700	166,800
10	114,800	156,000	187,100	210,300

Freeway Adjustments

Auxiliary Lanes Present in Both Directions	Ramp Metering
+ 20,000	+ 5%

UNINTERRUPTED FLOW HIGHWAYS

Lanes	Median	B	C	D	E
2	Undivided	8,600	17,000	24,200	33,300
4	Divided	36,700	51,800	65,600	72,600
6	Divided	55,000	77,700	98,300	108,800

Uninterrupted Flow Highway Adjustments

Lanes	Median	Exclusive left lanes	Adjustment factors
2	Divided	Yes	+5%
Multi	Undivided	Yes	-5%
Multi	Undivided	No	-25%

[1]Values shown are presented as two-way annual average daily volumes for levels of service and are for the automobile/truck modes unless specifically stated. This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Calculations are based on planning applications of the Highway Capacity Manual and the Transit Capacity and Quality of Service Manual.

[2] Level of service for the bicycle and pedestrian modes in this table is based on number of motorized vehicles, not number of bicyclists or pedestrians using the facility.

[3] Buses per hour shown are only for the peak hour in the single direction of the higher traffic flow.

* Cannot be achieved using table input value defaults.

** Not applicable for that level of service letter grade. For the automobile mode, volumes greater than level of service D become F because intersection capacities have been reached. For the bicycle mode, the level of service letter grade (including F) is not achievable because there is no maximum vehicle volume threshold using table input value defaults.

Source:
Florida Department of Transportation
Systems Planning Office
www.dot.state.fl.us/planning/systems/sm/los/default.shtm

TABLE 1
(continued)

Generalized **Annual Average Daily** Volumes for Florida's **Urbanized Areas**

12/18/12

INPUT VALUE ASSUMPTIONS	Uninterrupted Flow Facilities				Interrupted Flow Facilities					
					State Arterials				Class I	
	Freeways	Core Freeways	Highways		Class I		Class II		Bicycle	Pedestrian
ROADWAY CHARACTERISTICS										
Area type (u,lu)	lu	lu	u	u	u	u	u	u	u	u
Number of through lanes (both dir.)	4-10	4-12	2	4-6	2	4-8	2	4-8	4	4
Posted speed (mph)	70	65	50	50	45	50	30	30	45	45
Free flow speed (mph)	75	70	55	55	50	55	35	35	50	50
Auxiliary Lanes (n,y)	n	n								
Median (n, nr, r)			n	r	n	r	n	r	r	r
Terrain (l,r)	l	l	l	l	l	l	l	l	l	l
% no passing zone			80							
Exclusive left turn lane impact (n, y)			[n]	y	y	y	y	y	y	y
Exclusive right turn lanes (n, y)					n	n	n	n	n	n
Facility length (mi)	4	4	5	5	2	2	1.9	1.8	2	2
Number of basic segments	4	4								
TRAFFIC CHARACTERISTICS										
Planning analysis hour factor (K)	0.090	0.085	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090
Directional distribution factor (D)	0.547	0.547	0.550	0.550	0.550	0.560	0.565	0.560	0.565	0.565
Peak hour factor (PHF)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Base saturation flow rate (pcphpl)			1,700	2,100	1,950	1,950	1,950	1,950	1,950	1,950
Heavy vehicle percent	4.0	4.0	2.0	2.0	1.0	1.0	1.0	1.0	2.5	2.0
Local adjustment factor	0.91	0.91	0.97	0.98						
% left turns					12	12	12	12	12	12
% right turns					12	12	12	12	12	12
CONTROL CHARACTERISTICS										
Number of signals					4	4	10	10	4	6
Arrival type (1-6)					3	3	4	4	4	4
Signal type (a, c, p)					c	c	c	c	c	c
Cycle length (C)					120	150	120	120	120	120
Effective green ratio (g/C)					0.44	0.45	0.44	0.44	0.44	0.44
MULTIMODAL CHARACTERISTICS										
Paved shoulder/bicycle lane (n, y)									n, 50%, y	n
Outside lane width (n, t, w)									t	t
Pavement condition (d, t, u)									t	
On-street parking (n, y)										
Sidewalk (n, y)										n, 50%, y
Sidewalk/roadway separation(a, t, w)										t
Sidewalk protective barrier (n, y)										n

LEVEL OF SERVICE THRESHOLDS

Level of Service	Freeways	Highways		Arterials		Bicycle	Ped	Bus
	Density	Two-Lane %ffs	Multilane Density	Class I ats	Class II ats	Score	Score	Buses/hr.
B	≤ 17	> 83.3	≤ 17	> 31 mph	> 22 mph	≤ 2.75	≤ 2.75	≤ 6
C	≤ 24	> 75.0	≤ 24	> 23 mph	> 17 mph	≤ 3.50	≤ 3.50	≤ 4
D	≤ 31	> 66.7	≤ 31	> 18 mph	> 13 mph	≤ 4.25	≤ 4.25	< 3
E	≤ 39	> 58.3	≤ 35	> 15 mph	> 10 mph	≤ 5.00	≤ 5.00	< 2

% ffs = Percent free flow speed ats = Average travel speed

TABLE 2

Generalized **Annual Average Daily** Volumes for Florida's **Transitioning Areas** and **Areas Over 5,000 Not In Urbanized Areas**[1]

12/18/12

INTERRUPTED FLOW FACILITIES

STATE SIGNALIZED ARTERIALS

Class I (40 mph or higher posted speed limit)

Lanes	Median	B	C	D	E
2	Undivided	*	14,400	16,200	**
4	Divided	*	34,000	35,500	**
6	Divided	*	52,100	53,500	**

Class II (35 mph or slower posted speed limit)

Lanes	Median	B	C	D	E
2	Undivided	*	6,500	13,300	14,200
4	Divided	*	9,900	28,800	31,600
6	Divided	*	16,000	44,900	47,600

Non-State Signalized Roadway Adjustments

(Alter corresponding state volumes by the indicated percent.)

Non-State Signalized Roadways - 10%

Median & Turn Lane Adjustments

Lanes	Median	Exclusive Left Lanes	Exclusive Right Lanes	Adjustment Factors
2	Divided	Yes	No	+5%
2	Undivided	No	No	-20%
Multi	Undivided	Yes	No	-5%
Multi	Undivided	No	No	-25%
–	–	–	Yes	+ 5%

One-Way Facility Adjustment

Multiply the corresponding two-directional volumes in this table by 0.6

BICYCLE MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Paved Shoulder/Bicycle Lane Coverage	B	C	D	E
0-49%	*	2,600	6,100	19,500
50-84%	1,900	5,500	18,400	>19,500
85-100%	7,500	19,500	>19,500	**

PEDESTRIAN MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Sidewalk Coverage	B	C	D	E
0-49%	*	*	2,800	9,400
50-84%	*	1,600	8,600	15,600
85-100%	3,800	10,500	17,100	>19,500

BUS MODE (Scheduled Fixed Route)[3]

(Buses in peak hour in peak direction)

Sidewalk Coverage	B	C	D	E
0-84%	> 5	≥ 4	≥ 3	≥ 2
85-100%	> 4	≥ 3	≥ 2	≥ 1

UNINTERRUPTED FLOW FACILITIES

FREEWAYS

Lanes	B	C	D	E
4	44,100	57,600	68,900	71,700
6	65,100	85,600	102,200	111,000
8	85,100	113,700	135,200	150,000
10	106,200	141,700	168,800	189,000

Freeway Adjustments

Auxiliary Lanes Present in Both Directions	Ramp Metering
+ 20,000	+ 5%

UNINTERRUPTED FLOW HIGHWAYS

Lanes	Median	B	C	D	E
2	Undivided	9,200	17,300	24,400	33,300
4	Divided	35,300	49,600	62,900	69,600
6	Divided	52,800	74,500	94,300	104,500

Uninterrupted Flow Highway Adjustments

Lanes	Median	Exclusive left lanes	Adjustment factors
2	Divided	Yes	+5%
Multi	Undivided	Yes	-5%
Multi	Undivided	No	-25%

[1] Values shown are presented as two-way annual average daily volumes for levels of service and are for the automobile/truck modes unless specifically stated. This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Calculations are based on planning applications of the Highway Capacity Manual and the Transit Capacity and Quality of Service Manual.

[2] Level of service for the bicycle and pedestrian modes in this table is based on number of motorized vehicles, not number of bicyclists or pedestrians using the facility.

[3] Buses per hour shown are only for the peak hour in the single direction of the higher traffic flow.

* Cannot be achieved using table input value defaults.

** Not applicable for that level of service letter grade. For the automobile mode, volumes greater than level of service D become F because intersection capacities have been reached. For the bicycle mode, the level of service letter grade (including F) is not achievable because there is no maximum vehicle volume threshold using table input value defaults.

Source:
Florida Department of Transportation
Systems Planning Office
www.dot.state.fl.us/planning/systems/sm/los/default.shtm

TABLE 2
(continued)

Generalized **Annual Average Daily** Volumes for Florida's **Transitioning** and **Areas Over 5,000 Not In Urbanized Areas**

12/18/12

INPUT VALUE ASSUMPTIONS	Uninterrupted Flow Facilities			Interrupted Flow Facilities					
				State Arterials				Class I	
	Freeways	Highways		Class I		Class II		Bicycle	Pedestrian
ROADWAY CHARACTERISTICS									
Area type (t,uo)	t	t	t	t	t	t	t	t	t
Number of through lanes (both dir.)	4-10	2	4-6	2	4-6	2	4-6	4	4
Posted speed (mph)	70	50	50	45	50	30	30	45	45
Free flow speed (mph)	75	55	55	50	55	35	35	50	50
Auxiliary lanes (n,y)	n	n	n						
Median (n, nr, r)		n	r	n	y	n	y	r	r
Terrain (l,r)	l	l	l	l	l	l	l	l	l
% no passing zone		60							
Exclusive left turn lane impact (n, y)		[n]	y	y	y	y	y	y	y
Exclusive right turn lanes (n, y)				n	n	n	n	n	n
Facility length (mi)	8	5	5	1.8	2	2	2	2	2
Number of basic segments	4								
TRAFFIC CHARACTERISTICS									
Planning analysis hour factor (K)	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090
Directional distribution factor (D)	0.555	0.550	0.550	0.550	0.570	0.570	0.565	0.570	0.570
Peak hour factor (PHF)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Base saturation flow rate (pcphpl)		1,700	2,100	1,950	1,950	1,950	1,950	1,950	1,950
Heavy vehicle percent	9.0	4.0	4.0	2.0	3.0	2.0	3.0	3.0	3.0
Local adjustment factor	0.85	0.97	0.95						
% left turns				12	12	12	12	12	12
% right turns				12	12	12	12	12	12
CONTROL CHARACTERISTICS									
Number of signals				5	4	10	10	4	6
Arrival type (1-6)				4	3	4	4	4	4
Signal type (a, c, p)				c	c	c	c	c	c
Cycle length (C)				120	150	120	150	120	120
Effective green ratio (g/C)				0.44	0.45	0.44	0.45	0.44	0.44
MULTIMODAL CHARACTERISTICS									
Paved shoulder/bicycle lane (n, y)								n, 50%, y	n
Outside lane width (n, t, w)								t	t
Pavement condition (d, t, u)								t	
On-street parking (n, y)								n	n
Sidewalk (n, y)									n, 50%, y
Sidewalk/roadway separation (a, t, w)									t
Sidewalk protective barrier (n, y)									n

LEVEL OF SERVICE THRESHOLDS

Level of Service	Freeways	Highways		Arterials		Bicycle	Ped	Bus
	Density	Two-Lane	Multilane	Class I	Class II	Score	Score	Buses/hr.
		%ffs	Density	ats	ats			
B	≤ 17	> 83.3	≤ 17	> 31 mph	> 22 mph	≤ 2.75	≤ 2.75	≤ 6
C	≤ 24	> 75.0	≤ 24	> 23 mph	> 17 mph	≤ 3.50	≤ 3.50	≤ 4
D	≤ 31	> 66.7	≤ 31	> 18 mph	> 13 mph	≤ 4.25	≤ 4.25	< 3
E	≤ 39	> 58.3	≤ 35	> 15 mph	> 10 mph	≤ 5.00	≤ 5.00	< 2

% ffs = Percent free flow speed ats = Average travel speed

TABLE 3

Generalized **Annual Average Daily** Volumes for Florida's **Rural Undeveloped Areas** and **Developed Areas Less Than 5,000 Population**[1]

12/18/12

INTERRUPTED FLOW FACILITIES

STATE SIGNALIZED ARTERIALS

Lanes	Median	B	C	D	E
2	Undivided	*	12,900	14,200	**
4	Divided	*	29,300	30,400	**
6	Divided	*	45,200	45,800	**

Non-State Signalized Roadway Adjustments

(Alter corresponding state volumes by the indicated percent.)

Non-State Signalized Roadways - 10%

Median & Turn Lane Adjustments

Lanes	Median	Exclusive Left Lanes	Exclusive Right Lanes	Adjustment Factors
2	Divided	Yes	No	+5%
2	Undivided	No	No	-20%
Multi	Undivided	Yes	No	-5%
Multi	Undivided	No	No	-25%
–	–	–	Yes	+ 5%

One-Way Facility Adjustment

Multiply the corresponding two-directional volumes in this table by 0.6

BICYCLE MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Rural Undeveloped

Paved Shoulder/Bicycle Lane Coverage	B	C	D	E
0-49%	*	1,300	2,000	3,200
50-84%	1,000	2,100	3,200	10,600
85-100%	2,600	3,900	18,500	>18,500

Developed Areas

Paved Shoulder/Bicycle Lane Coverage	B	C	D	E
0-49%	*	2,300	4,900	15,600
50-84%	1,700	4,500	13,300	18,500
85-100%	5,900	18,500	>18,500	**

PEDESTRIAN MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Sidewalk Coverage	B	C	D	E
0-49%	*	*	2,700	9,200
50-84%	*	1,500	8,400	14,900
85-100%	3,600	10,200	16,700	>19,200

UNINTERRUPTED FLOW FACILITIES

FREEWAYS

Lanes	B	C	D	E
4	28,800	43,000	52,300	60,000
6	43,000	64,000	78,300	92,500
8	57,500	85,400	104,400	123,500

Freeway Adjustments

Auxiliary Lanes Present in Both Directions

+ 20,000

UNINTERRUPTED FLOW HIGHWAYS

Rural Undeveloped

Lanes	Median	B	C	D	E
2	Undivided	4,700	8,400	14,300	28,600
4	Divided	25,700	40,300	51,000	57,900
6	Divided	38,800	60,400	76,700	86,800

Developed Areas

Lanes	Median	B	C	D	E
2	Undivided	8,700	16,400	23,100	31,500
4	Divided	25,900	40,700	52,400	59,600
6	Divided	38,800	61,000	78,400	89,500

Passing Lane Adjustments

Alter LOS B-D volumes in proportion to the passing lane length to the highway segment length

Uninterrupted Flow Highway Adjustments

Lanes	Median	Exclusive left lanes	Adjustment factors
2	Divided	Yes	+5%
Multi	Undivided	Yes	-5%
Multi	Undivided	No	-25%

[1]Values shown are presented as two-way annual average daily volumes for levels of service and are for the automobile/truck modes unless specifically stated. This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Calculations are based on planning applications of the Highway Capacity Manual and the Transit Capacity and Quality of Service Manual.

[2] Level of service for the bicycle and pedestrian modes in this table is based on number of motorized vehicles, not number of bicyclists or pedestrians using the facility.

* Cannot be achieved using table input value defaults.

** Not applicable for that level of service letter grade. For the automobile mode, volumes greater than level of service D become F because intersection capacities have been reached. For the bicycle mode, the level of service letter grade (including F) is not achievable because there is no maximum vehicle volume threshold using table input value defaults.

Source:
Florida Department of Transportation
Systems Planning Office
www.dot.state.fl.us/planning/systems/sm/los/default.shtm

TABLE 3
(continued)

Generalized **Annual Average Daily** Volumes for Florida's **Rural Undeveloped Areas** and **Developed Areas Less Than 5,000 Population**

12/18/12

INPUT VALUE ASSUMPTIONS	Uninterrupted Flow Facilities					Interrupted Flow Facilities				
	Freeways	Highways				Arterials		Bicycle		Pedestrian
ROADWAY CHARACTERISTICS										
Area type (ru, rd)	rural	ru	ru	rd	rd	rd	rd	ru	rd	rd
Number of through lanes (both dir.)	4-8	2	4-6	2	4-6	2	4-6	4	4	2
Posted speed (mph)	70	55	65	50	55	45	45	55	45	45
Free flow speed (mph)	75	60	70	55	60	50	50	60	50	50
Auxiliary lanes (n,y)	n									
Median (n, nr, r)		n	r	n	r	n	r	r	r	n
Terrain (l,r)	l	l	l	l	l	l	l	l	l	l
% no passing zone		20		60						
Exclusive left turn lanes (n, y)		[n]	y	[n]	y	y	y	y	y	y
Exclusive right turn lanes (n, y)						n	n	n	n	n
Facility length (mi)	14	10	10	5	5	1.9	2.2	4	2	2
Number of basic segments	4									
TRAFFIC CHARACTERISTICS										
Planning analysis hour factor (K)	0.105	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095
Directional distribution factor (D)	0.555	0.550	0.550	0.550	0.550	0.550	0.550	0.570	0.570	0.550
Peak hour factor (PHF)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Base saturation flow rate (pcphpl)		1,700	2,300	1,700	2,200	1,950	1,950	1,950	1,950	1,950
Heavy vehicle percent	12.0	5.0	12.0	4.0	4.0	3.0	3.0	6.0	3.5	3.0
Local adjustment factor	0.84	0.88	0.73	0.97	0.82					
% left turns						12	12		12	12
% right turns						12	12		12	12
CONTROL CHARACTERISTICS										
Number of signals						5	6	2	4	4
Arrival type (1-6)						3	3	3	3	3
Signal type (a, c, p)						c	c	a	a	a
Cycle length (C)						90	90	60	90	90
Effective green ratio (g/C)						0.44	0.44	0.37	0.44	0.44
MULTIMODAL CHARACTERISTICS										
Paved shoulder/bicycle lane (n, y)								n,50%,y	n,50%,y	n
Outside lane width (n, t, w)								t	t	t
Pavement condition (d, t, u)								t	t	
Sidewalk (n, y)										n,50%,y
Sidewalk/roadway separation(a, t,w)										t
Sidewalk protective barrier (n, y)										n

LEVEL OF SERVICE THRESHOLDS

Level of Service	Freeways	Highways				
		Two-Lane ru		Two-Lane rd	Multilane ru	Multilane rd
	Density	%tsf	ats	%ffs	Density	Density
B	≤ 14	≤ 50	≥ 55	> 83.3	≤ 14	≤ 14
C	≤ 22	≤ 65	≥ 50	> 75.0	≤ 22	≤ 22
D	≤ 29	≤ 80	≥ 45	> 66.7	≤ 29	≤ 29
E	≤ 36	> 80	≥ 40	> 58.3	≤ 34	≤ 34

Level of Service	Arterials	Bicycle	Pedestrian
	Major City/Co.(ats)	Score	Score
B	> 31 mph	≤ 2.75	≤ 2.75
C	> 23 mph	≤ 3.50	≤ 3.50
D	> 18 mph	≤ 4.25	≤ 4.25
E	> 15 mph	≤ 5.00	≤ 5.00

%tsf = Percent time spent following %ffs = Percent of free flow speed ats = Average travel speed ru = Rural undeveloped rd = Rural developed

TABLE 4

Generalized **Peak Hour Two-Way** Volumes for Florida's **Urbanized Areas**[1]

12/18/12

INTERRUPTED FLOW FACILITIES

STATE SIGNALIZED ARTERIALS

Class I (40 mph or higher posted speed limit)

Lanes	Median	B	C	D	E
2	Undivided	*	1,510	1,600	**
4	Divided	*	3,420	3,580	**
6	Divided	*	5,250	5,390	**
8	Divided	*	7,090	7,210	**

Class II (35 mph or slower posted speed limit)

Lanes	Median	B	C	D	E
2	Undivided	*	660	1,330	1,410
4	Divided	*	1,310	2,920	3,040
6	Divided	*	2,090	4,500	4,590
8	Divided	*	2,880	6,060	6,130

Non-State Signalized Roadway Adjustments

(Alter corresponding state volumes by the indicated percent.)

Non-State Signalized Roadways - 10%

Median & Turn Lane Adjustments

Lanes	Median	Exclusive Left Lanes	Exclusive Right Lanes	Adjustment Factors
2	Divided	Yes	No	+5%
2	Undivided	No	No	-20%
Multi	Undivided	Yes	No	-5%
Multi	Undivided	No	No	-25%
–	–	–	Yes	+ 5%

One-Way Facility Adjustment

Multiply the corresponding two-directional volumes in this table by 0.6

BICYCLE MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Paved Shoulder/Bicycle Lane Coverage	B	C	D	E
0-49%	*	260	680	1,770
50-84%	190	600	1,770	>1,770
85-100%	830	1,770	>1,770	**

PEDESTRIAN MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Sidewalk Coverage	B	C	D	E
0-49%	*	*	250	850
50-84%	*	150	780	1,420
85-100%	340	960	1,560	>1,770

BUS MODE (Scheduled Fixed Route)[3]

(Buses in peak hour in peak direction)

Sidewalk Coverage	B	C	D	E
0-84%	> 5	≥ 4	≥ 3	≥ 2
85-100%	> 4	≥ 3	≥ 2	≥ 1

UNINTERRUPTED FLOW FACILITIES

FREEWAYS

Lanes	B	C	D	E
4	4,120	5,540	6,700	7,190
6	6,130	8,370	10,060	11,100
8	8,230	11,100	13,390	15,010
10	10,330	14,040	16,840	18,930
12	14,450	18,880	22,030	22,860

Freeway Adjustments

Auxiliary Lanes Present in Both Directions	Ramp Metering
+ 1,800	+ 5%

UNINTERRUPTED FLOW HIGHWAYS

Lanes	Median	B	C	D	E
2	Undivided	770	1,530	2,170	2,990
4	Divided	3,300	4,660	5,900	6,530
6	Divided	4,950	6,990	8,840	9,790

Uninterrupted Flow Highway Adjustments

Lanes	Median	Exclusive left lanes	Adjustment factors
2	Divided	Yes	+5%
Multi	Undivided	Yes	-5%
Multi	Undivided	No	-25%

[1] Values shown are presented as peak hour two-way volumes for levels of service and are for the automobile/truck modes unless specifically stated. This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Calculations are based on planning applications of the Highway Capacity Manual and the Transit Capacity and Quality of Service Manual.

[2] Level of service for the bicycle and pedestrian modes in this table is based on number of motorized vehicles, not number of bicyclists or pedestrians using the facility.

[3] Buses per hour shown are only for the peak hour in the single direction of the higher traffic flow.

* Cannot be achieved using table input value defaults.

** Not applicable for that level of service letter grade. For the automobile mode, volumes greater than level of service D become F because intersection capacities have been reached. For the bicycle mode, the level of service letter grade (including F) is not achievable because there is no maximum vehicle volume threshold using table input value defaults.

Source:
Florida Department of Transportation
Systems Planning Office
www.dot.state.fl.us/planning/systems/sm/los/default.shtm

TABLE 4
(continued)

Generalized **Peak Hour Two-Way** Volumes for Florida's **Urbanized Areas**

12/18/12

INPUT VALUE ASSUMPTIONS	Uninterrupted Flow Facilities			Interrupted Flow Facilities					
				State Arterials				Class I	
	Freeways	Highways		Class I		Class II		Bicycle	Pedestrian
ROADWAY CHARACTERISTICS									
Area type (lu, u)	lu	u	u	u	u	u	u	u	u
Number of through lanes (both dir.)	4-12	2	4-6	2	4-8	2	4-8	4	4
Posted speed (mph)	70	50	50	45	50	30	30	45	45
Free flow speed (mph)	75	55	55	50	55	35	35	50	50
Auxiliary lanes (n,y)	n								
Median (n, nr, r)		n	r	n	r	n	r	r	r
Terrain (l,r)	l	l	l	l	l	l	l	l	l
% no passing zone		80							
Exclusive left turn lane impact (n, y)		[n]	y	y	y	y	y	y	y
Exclusive right turn lanes (n, y)				n	n	n	n	n	n
Facility length (mi)	4	5	5	2	2	1.9	1.8	2	2
Number of basic segments	4								
TRAFFIC CHARACTERISTICS									
Planning analysis hour factor (K)	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090
Directional distribution factor (D)	0.547	0.550	0.550	0.550	0.560	0.565	0.560	0.565	0.565
Peak hour factor (PHF)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Base saturation flow rate (pcphpl)		1,700	2,100	1,950	1,950	1,950	1,950	1,950	1,950
Heavy vehicle percent	4.0	2.0	2.0	1.0	1.0	1.0	1.0	2.5	2.0
Local adjustment factor	0.91	0.97	0.98						
% left turns				12	12	12	12	12	12
% right turns				12	12	12	12	12	12
CONTROL CHARACTERISTICS									
Number of signals				4	4	10	10	4	6
Arrival type (1-6)				3	3	4	4	4	4
Signal type (a, c, p)				c	c	c	c	c	c
Cycle length (C)				120	150	120	120	120	120
Effective green ratio (g/C)				0.44	0.45	0.44	0.44	0.44	0.44
MULTIMODAL CHARACTERISTICS									
Paved shoulder/bicycle lane (n, y)								n, 50%, y	n
Outside lane width (n, t, w)								t	t
Pavement condition (d, t, u)								t	
On-street parking (n, y)								n	n
Sidewalk (n, y)									n, 50%, y
Sidewalk/roadway separation (a, t, w)									t
Sidewalk protective barrier (n, y)									n

LEVEL OF SERVICE THRESHOLDS

Level of Service	Freeways	Highways		Arterials		Bicycle	Ped	Bus
	Density	Two-Lane %ffs	Multilane Density	Class I ats	Class II ats	Score	Score	Buses/hr.
B	≤ 17	> 83.3	≤ 17	> 31 mph	> 22 mph	≤ 2.75	≤ 2.75	≤ 6
C	≤ 24	> 75.0	≤ 24	> 23 mph	> 17 mph	≤ 3.50	≤ 3.50	≤ 4
D	≤ 31	> 66.7	≤ 31	> 18 mph	> 13 mph	≤ 4.25	≤ 4.25	< 3
E	≤ 39	> 58.3	≤ 35	> 15 mph	> 10 mph	≤ 5.00	≤ 5.00	< 2

% ffs = Percent free flow speed ats = Average travel speed

TABLE 5

Generalized **Peak Hour Two-Way** Volumes for Florida's **Transitioning** and **Areas Over 5,000 Not In Urbanized Areas**[1]

12/18/12

INTERRUPTED FLOW FACILITIES

STATE SIGNALIZED ARTERIALS

Class I (40 mph or higher posted speed limit)

Lanes	Median	B	C	D	E
2	Undivided	*	1,300	1,460	**
4	Divided	*	3,060	3,200	**
6	Divided	*	4,690	4,820	**

Class II (35 mph or slower posted speed limit)

Lanes	Median	B	C	D	E
2	Undivided	*	580	1,200	1,280
4	Divided	*	890	2,590	2,850
6	Divided	*	1,440	4,040	4,280

Non-State Signalized Roadway Adjustments

(Alter corresponding state volumes by the indicated percent.)

Non-State Signalized Roadways - 10%

Median & Turn Lane Adjustments

Lanes	Median	Exclusive Left Lanes	Exclusive Right Lanes	Adjustment Factors
2	Divided	Yes	No	+5%
2	Undivided	No	No	-20%
Multi	Undivided	Yes	No	-5%
Multi	Undivided	No	No	-25%
–	–	–	Yes	+ 5%

One-Way Facility Adjustment

Multiply the corresponding two-directional volumes in this table by 0.6

BICYCLE MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Paved Shoulder/Bicycle Lane Coverage	B	C	D	E
0-49%	*	140	550	1,760
50-84%	170	500	1,650	>1,760
85-100%	670	1,760	>1,760	**

PEDESTRIAN MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Sidewalk Coverage	B	C	D	E
0-49%	*	*	250	850
50-84%	*	150	780	1,410
85-100%	340	950	1,540	>1,760

BUS MODE (Scheduled Fixed Route)[3]

(Buses in peak hour in peak direction)

Sidewalk Coverage	B	C	D	E
0-84%	> 5	≥ 4	≥ 3	≥ 2
85-100%	> 4	≥ 3	≥ 2	≥ 1

UNINTERRUPTED FLOW FACILITIES

FREEWAYS

Lanes	B	C	D	E
4	3,970	5,190	6,200	6,460
6	5,860	7,710	9,190	9,990
8	7,660	10,230	12,170	13,500
10	9,550	12,750	15,190	17,010

Freeway Adjustments

Auxiliary Lanes Present in Both Directions	Ramp Metering
+ 1,800	+ 5%

UNINTERRUPTED FLOW HIGHWAYS

Lanes	Median	B	C	D	E
2	Undivided	820	1,550	2,190	2,990
4	Divided	3,170	4,460	5,660	6,260
6	Divided	4,750	6,700	8,480	9,400

Uninterrupted Flow Highway Adjustments

Lanes	Median	Exclusive left lanes	Adjustment factors
2	Divided	Yes	+5%
Multi	Undivided	Yes	-5%
Multi	Undivided	No	-25%

[1] Values shown are presented as peak hour two-way volumes for levels of service and are for the automobile/truck modes unless specifically stated. This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Calculations are based on planning applications of the Highway Capacity Manual and the Transit Capacity and Quality of Service Manual.

[2] Level of service for the bicycle and pedestrian modes in this table is based on number of motorized vehicles, not number of bicyclists or pedestrians using the facility.

[3] Buses per hour shown are only for the peak hour in the single direction of the higher traffic flow.

* Cannot be achieved using table input value defaults.

** Not applicable for that level of service letter grade. For the automobile mode, volumes greater than level of service D become F because intersection capacities have been reached. For the bicycle mode, the level of service letter grade (including F) is not achievable because there is no maximum vehicle volume threshold using table input value defaults.

Source:
Florida Department of Transportation
Systems Planning Office
www.dot.state.fl.us/planning/systems/sm/los/default.shtm

TABLE 5
(continued)

Generalized **Peak Hour Two-Way** Volumes for Florida's **Transitioning Areas** and **Areas Over 5,000 Not In Urbanized Areas**

12/18/12

INPUT VALUE ASSUMPTIONS	Uninterrupted Flow Facilities			Interrupted Flow Facilities					
				State Arterials				Class I	
	Freeways	Highways		Class I		Class II		Bicycle	Pedestrian
ROADWAY CHARACTERISTICS									
Area type (t,uo)	t	t	t	t	t	t	t	t	t
Number of through lanes (both dir.)	4-10	2	4-6	2	4-6	2	4-6	4	4
Posted speed (mph)	70	50	50	45	50	30	30	45	45
Free flow speed (mph)	75	55	55	50	55	35	35	50	50
Auxiliary lanes (n,y)	n	n	n						
Median (n, nr, r)		n	r	n	y	n	y	r	r
Terrain (l,r)	l	l	l	l	l	l	l	l	l
% no passing zone		60							
Exclusive left turn lane impact (n, y)		[n]	y	y	y	y	y	y	y
Exclusive right turn lanes (n, y)				n	n	n	n	n	n
Facility length (mi)	8	5	5	1.8	2	2	2	2	2
Number of basic segments	4								
TRAFFIC CHARACTERISTICS									
Planning analysis hour factor (K)	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090
Directional distribution factor (D)	0.555	0.550	0.550	0.550	0.570	0.570	0.565	0.570	0.570
Peak hour factor (PHF)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Base saturation flow rate (pcphpl)		1,700	2,100	1,950	1,950	1,950	1,950	1,950	1,950
Heavy vehicle percent	9.0	4.0	4.0	2.0	3.0	2.0	3.0	3.0	3.0
Local adjustment factor	0.85	0.97	0.95						
% left turns				12	12	12	12	12	12
% right turns				12	12	12	12	12	12
CONTROL CHARACTERISTICS									
Number of signals				5	4	10	10	4	6
Arrival type (1-6)				4	3	4	4	4	4
Signal type (a, c, p)				c	c	c	c	c	c
Cycle length (C)				120	150	120	150	120	120
Effective green ratio (g/C)				0.44	0.45	0.44	0.45	0.44	0.44
MULTIMODAL CHARACTERISTICS									
Paved shoulder/bicycle lane (n, y)								n, 50%, y	n
Outside lane width (n, t, w)								t	t
Pavement condition (d, t, u)								t	
On-street parking (n, y)								n	n
Sidewalk (n, y)									n, 50%, y
Sidewalk/roadway separation (a, t, w)									t
Sidewalk protective barrier (n, y)									n

LEVEL OF SERVICE THRESHOLDS

Level of Service	Freeways	Highways		Arterials		Bicycle	Ped	Bus
	Density	Two-Lane	Multilane	Class I	Class II	Score	Score	Buses/hr.
		%ffs	Density	ats	ats			
B	≤ 17	> 83.3	≤ 17	> 31 mph	> 22 mph	≤ 2.75	≤ 2.75	≤ 6
C	≤ 24	> 75.0	≤ 24	> 23 mph	> 17 mph	≤ 3.50	≤ 3.50	≤ 4
D	≤ 31	> 66.7	≤ 31	> 18 mph	> 13 mph	≤ 4.25	≤ 4.25	< 3
E	≤ 39	> 58.3	≤ 35	> 15 mph	> 10 mph	≤ 5.00	≤ 5.00	< 2

% ffs = Percent free flow speed ats = Average travel speed

TABLE 6

Generalized **Peak Hour Two-Way** Volumes for Florida's **Rural Undeveloped Areas** and **Developed Areas Less Than 5,000 Population**[1]

12/18/12

INTERRUPTED FLOW FACILITIES

STATE SIGNALIZED ARTERIALS

Lanes	Median	B	C	D	E
2	Undivided	*	1,220	1,350	**
4	Divided	*	2,790	2,890	**
6	Divided	*	4,300	4,350	**

Non-State Signalized Roadway Adjustments

(Alter corresponding state volumes by the indicated percent.)

Non-State Signalized Roadways - 10%

Median & Turn Lane Adjustments

Lanes	Median	Exclusive Left Lanes	Exclusive Right Lanes	Adjustment Factors
2	Divided	Yes	No	+5%
2	Undivided	No	No	-20%
Multi	Undivided	Yes	No	-5%
Multi	Undivided	No	No	-25%
–	–	–	Yes	+ 5%

One-Way Facility Adjustment

Multiply the corresponding two-directional volumes in this table by 0.6

BICYCLE MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Rural Undeveloped

Paved Shoulder/Bicycle Lane Coverage	B	C	D	E
0-49%	*	120	190	300
50-84%	100	200	310	>1,010
85-100%	250	370	1,760	>1,760

Developed Areas

Paved Shoulder/Bicycle Lane Coverage	B	C	D	E
0-49%	*	220	460	1,480
50-84%	170	430	1,270	>1,760
85-100%	560	1,760	>1,760	**

PEDESTRIAN MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Sidewalk Coverage	B	C	D	E
0-49%	*	*	220	840
50-84%	*	120	780	1,390
85-100%	320	940	1,560	>1,820

UNINTERRUPTED FLOW FACILITIES

FREEWAYS

Lanes	B	C	D	E
4	3,020	4,510	5,490	6,300
6	4,510	6,720	8,220	9,720
8	6,040	8,970	10,960	12,970

Freeway Adjustments

Auxiliary Lanes Present in Both Directions + 1,800

UNINTERRUPTED FLOW HIGHWAYS

Rural Undeveloped

Lanes	Median	B	C	D	E
2	Undivided	440	790	1,350	2,710
4	Divided	2,440	3,820	4,840	5,500
6	Divided	3,680	5,730	7,280	8,240

Developed Areas

Lanes	Median	B	C	D	E
2	Undivided	820	1,550	2,190	2,990
4	Divided	2,460	3,860	4,970	5,660
6	Divided	3,680	5,790	7,440	8,500

Passing Lane Adjustments

Alter LOS B-D volumes in proportion to the passing lane length to the highway segment length

Uninterrupted Flow Highway Adjustments

Lanes	Median	Exclusive left lanes	Adjustment factors
2	Divided	Yes	+5%
Multi	Undivided	Yes	-5%
Multi	Undivided	No	-25%

[1]Values shown are presented as peak hour two-way volumes for levels of service and are for the automobile/truck modes unless specifically stated. This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Calculations are based on planning applications of the Highway Capacity Manual and the Transit Capacity and Quality of Service Manual.

[2] Level of service for the bicycle and pedestrian modes in this table is based on number of motorized vehicles, not number of bicyclists or pedestrians using the facility.

* Cannot be achieved using table input value defaults.

** Not applicable for that level of service letter grade. For the automobile mode, volumes greater than level of service D become F because intersection capacities have been reached. For the bicycle mode, the level of service letter grade (including F) is not achievable because there is no maximum vehicle volume threshold using table input value defaults.

Source:
Florida Department of Transportation
Systems Planning Office
www.dot.state.fl.us/planning/systems/sm/los/default.shtm

TABLE 6
(continued)

Generalized **Peak Hour Two-Way** Volumes for Florida's **Rural Undeveloped Areas** and **Developed Areas Less Than 5,000 Population**

12/18/12

INPUT VALUE ASSUMPTIONS	Uninterrupted Flow Facilities					Interrupted Flow Facilities				
	Freeways	Highways				Arterials		Bicycle		Pedestrian
ROADWAY CHARACTERISTICS										
Area type (ru, rd)	rural	ru	ru	rd	rd	rd	rd	ru	rd	rd
Number of through lanes (both dir.)	4-8	2	4-6	2	4-6	2	4-6	4	4	2
Posted speed (mph)	70	55	65	50	55	45	45	55	45	45
Free flow speed (mph)	75	60	70	55	60	50	50	60	50	50
Auxiliary lanes (n,y)	n									
Median (n, nr, r)		n	r	n	r	n	r	r	r	n
Terrain (l,r)	l	l	l	l	l	l	l	l	l	l
% no passing zone		20		60						
Exclusive left turn lanes (n, y)		[n]	y	[n]	y	y	y	y	y	y
Exclusive right turn lanes (n, y)						n	n	n	n	n
Facility length (mi)	14	10	10	5	5	1.9	2.2	4	2	2
Number of basic segments	4									
TRAFFIC CHARACTERISTICS										
Planning analysis hour factor (K)	0.105	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095
Directional distribution factor (D)	0.555	0.550	0.550	0.550	0.550	0.550	0.550	0.570	0.570	0.550
Peak hour factor (PHF)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Base saturation flow rate (pcphpl)		1,700	2,300	1,700	2,200	1,950	1,950	1,950	1,950	1,950
Heavy vehicle percent	12.0	5.0	12.0	4.0	4.0	3.0	3.0	6.0	3.5	3.0
Local adjustment factor	0.84	0.88	0.73	0.97	0.82					
% left turns						12	12		12	12
% right turns						12	12		12	12
CONTROL CHARACTERISTICS										
Number of signals						5	6	2	4	4
Arrival type (1-6)						3	3	3	3	3
Signal type (a, c, p)						c	c	a	a	a
Cycle length (C)						90	90	60	90	90
Effective green ratio (g/C)						0.44	0.44	0.37	0.44	0.44
MULTIMODAL CHARACTERISTICS										
Paved shoulder/bicycle lane (n, y)								n,50%,y	n,50%,y	n
Outside lane width (n, t, w)								t	t	t
Pavement condition (d, t, w)								t	t	
Sidewalk (n, y)										n,50%,y
Sidewalk/roadway separation(a, t,w)										t
Sidewalk protective barrier (n, y)										n

LEVEL OF SERVICE THRESHOLDS

Level of Service	Freeways	Highways				
		Two-Lane ru		Two-Lane rd	Multilane ru	Multilane rd
	Density	%tsf	ats	%ffs	Density	Density
B	≤ 14	≤ 50	≤ 55	> 83.3	≤ 14	≤ 14
C	≤ 22	≤ 65	≤ 50	> 75.0	≤ 22	≤ 22
D	≤ 29	≤ 80	≤ 45	> 66.7	≤ 29	≤ 29
E	≤ 36	> 80	≤ 40	> 58.3	≤ 34	≤ 34

Level of Service	Arterials	Bicycle	Pedestrian
	Major City/Co.(ats)	Score	Score
B	> 31 mph	≤ 2.75	≤ 2.75
C	> 23 mph	≤ 3.50	≤ 3.50
D	> 18 mph	≤ 4.25	≤ 4.25
E	> 15 mph	≤ 5.00	≤ 5.00

%tsf = Percent time spent following %ffs = Percent of free flow speed ats = Average travel speed ru = Rural undeveloped rd = Rural developed

TABLE 7

Generalized **Peak Hour Directional** Volumes for Florida's **Urbanized Areas**[1]

12/18/12

INTERRUPTED FLOW FACILITIES

STATE SIGNALIZED ARTERIALS

Class I (40 mph or higher posted speed limit)

Lanes	Median	B	C	D	E
1	Undivided	*	830	880	**
2	Divided	*	1,910	2,000	**
3	Divided	*	2,940	3,020	**
4	Divided	*	3,970	4,040	**

Class II (35 mph or slower posted speed limit)

Lanes	Median	B	C	D	E
1	Undivided	*	370	750	800
2	Divided	*	730	1,630	1,700
3	Divided	*	1,170	2,520	2,560
4	Divided	*	1,610	3,390	3,420

Non-State Signalized Roadway Adjustments

(Alter corresponding state volumes by the indicated percent.)

Non-State Signalized Roadways - 10%

Median & Turn Lane Adjustments

Lanes	Median	Exclusive Left Lanes	Exclusive Right Lanes	Adjustment Factors
1	Divided	Yes	No	+5%
1	Undivided	No	No	-20%
Multi	Undivided	Yes	No	-5%
Multi	Undivided	No	No	-25%
–	–	–	Yes	+ 5%

One-Way Facility Adjustment

Multiply the corresponding directional volumes in this table by 1.2

UNINTERRUPTED FLOW FACILITIES

FREEWAYS

Lanes	B	C	D	E
2	2,260	3,020	3,660	3,940
3	3,360	4,580	5,500	6,080
4	4,500	6,080	7,320	8,220
5	5,660	7,680	9,220	10,360
6	7,900	10,320	12,060	12,500

Freeway Adjustments

Auxiliary Lane	Ramp Metering
+ 1,000	+ 5%

UNINTERRUPTED FLOW HIGHWAYS

Lanes	Median	B	C	D	E
1	Undivided	420	840	1,190	1,640
2	Divided	1,810	2,560	3,240	3,590
3	Divided	2,720	3,840	4,860	5,380

Uninterrupted Flow Highway Adjustments

Lanes	Median	Exclusive left lanes	Adjustment factors
1	Divided	Yes	+5%
Multi	Undivided	Yes	-5%
Multi	Undivided	No	-25%

BICYCLE MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Paved Shoulder/Bicycle Lane Coverage	B	C	D	E
0-49%	*	150	390	1,000
50-84%	110	340	1,000	>1,000
85-100%	470	1,000	>1,000	**

PEDESTRIAN MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Sidewalk Coverage	B	C	D	E
0-49%	*	*	140	480
50-84%	*	80	440	800
85-100%	200	540	880	>1,000

BUS MODE (Scheduled Fixed Route)[3]

(Buses in peak hour in peak direction)

Sidewalk Coverage	B	C	D	E
0-84%	> 5	≥ 4	≥ 3	≥ 2
85-100%	> 4	≥ 3	≥ 2	≥ 1

[1] Values shown are presented as peak hour directional volumes for levels of service and are for the automobile/truck modes unless specifically stated. This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Calculations are based on planning applications of the Highway Capacity Manual and the Transit Capacity and Quality of Service Manual.

[2] Level of service for the bicycle and pedestrian modes in this table is based on number of motorized vehicles, not number of bicyclists or pedestrians using the facility.

[3] Buses per hour shown are only for the peak hour in the single direction of the higher traffic flow.

* Cannot be achieved using table input value defaults.

** Not applicable for that level of service letter grade. For the automobile mode, volumes greater than level of service D become F because intersection capacities have been reached. For the bicycle mode, the level of service letter grade (including F) is not achievable because there is no maximum vehicle volume threshold using table input value defaults.

Source:
Florida Department of Transportation
Systems Planning Office
www.dot.state.fl.us/planning/systems/sm/los/default.shtm

TABLE 7
(continued)

Generalized **Peak Hour Directional** Volumes for Florida's **Urbanized Areas**

12/18/12

INPUT VALUE ASSUMPTIONS	Uninterrupted Flow Facilities			Interrupted Flow Facilities					
				State Arterials				Class I	
	Freeways	Highways		Class I		Class II		Bicycle	Pedestrian
ROADWAY CHARACTERISTICS									
Area type (lu, u)	lu	u	u	u	u	u	u	u	u
Number of through lanes (both dir.)	4-12	2	4-6	2	4-8	2	4-8	4	4
Posted speed (mph)	70	50	50	45	50	30	30	45	45
Free flow speed (mph)	75	55	55	50	55	35	35	50	50
Auxiliary lanes (n,y)	n								
Median (n, nr, r)		n	r	n	r	n	r	r	r
Terrain (l,r)	l	l	l	l	l	l	l	l	l
% no passing zone		80							
Exclusive left turn lane impact (n, y)		[n]	y	y	y	y	y	y	y
Exclusive right turn lanes (n, y)				n	n	n	n	n	n
Facility length (mi)	4	5	5	2	2	1.9	1.8	2	2
Number of basic segments	4								
TRAFFIC CHARACTERISTICS									
Planning analysis hour factor (K)	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090
Directional distribution factor (D)	0.547	0.550	0.550	0.550	0.560	0.565	0.560	0.565	0.565
Peak hour factor (PHF)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Base saturation flow rate (pcphpl)		1,700	2,100	1,950	1,950	1,950	1,950	1,950	1,950
Heavy vehicle percent	4.0	2.0	2.0	1.0	1.0	1.0	1.0	2.5	2.0
Local adjustment factor	0.91	0.97	0.98						
% left turns				12	12	12	12	12	12
% right turns				12	12	12	12	12	12
CONTROL CHARACTERISTICS									
Number of signals				4	4	10	10	4	6
Arrival type (1-6)				3	3	4	4	4	4
Signal type (a, c, p)				c	c	c	c	c	c
Cycle length (C)				120	150	120	120	120	120
Effective green ratio (g/C)				0.44	0.45	0.44	0.44	0.44	0.44
MULTIMODAL CHARACTERISTICS									
Paved shoulder/bicycle lane (n, y)								n, 50%, y	n
Outside lane width (n, t, w)								t	t
Pavement condition (d, t, w)								t	
On-street parking (n, y)								n	n
Sidewalk (n, y)									n, 50%, y
Sidewalk/roadway separation (a, t, w)									t
Sidewalk protective barrier (n, y)									n

LEVEL OF SERVICE THRESHOLDS

Level of Service	Freeways	Highways		Arterials		Bicycle	Ped	Bus
	Density	Two-Lane %ffs	Multilane Density	Class I ats	Class II ats	Score	Score	Buses/hr.
B	≤ 17	> 83.3	≤ 17	> 31 mph	> 22 mph	≤ 2.75	≤ 2.75	≤ 6
C	≤ 24	> 75.0	≤ 24	> 23 mph	> 17 mph	≤ 3.50	≤ 3.50	≤ 4
D	≤ 31	> 66.7	≤ 31	> 18 mph	> 13 mph	≤ 4.25	≤ 4.25	< 3
E	≤ 39	> 58.3	≤ 35	> 15 mph	> 10 mph	≤ 5.00	≤ 5.00	< 2

% ffs = Percent free flow speed ats = Average travel speed

TABLE 8

Generalized **Peak Hour Directional** Volumes for Florida's **Transitioning** and **Areas Over 5,000 Not In Urbanized Areas**[1]

12/18/12

INTERRUPTED FLOW FACILITIES

STATE SIGNALIZED ARTERIALS

Class I (40 mph or higher posted speed limit)

Lanes	Median	B	C	D	E
1	Undivided	*	710	800	**
2	Divided	*	1,740	1,820	**
3	Divided	*	2,670	2,740	**

Class II (35 mph or slower posted speed limit)

Lanes	Median	B	C	D	E
1	Undivided	*	330	680	720
2	Divided	*	500	1,460	1,600
3	Divided	*	810	2,280	2,420

Non-State Signalized Roadway Adjustments

(Alter corresponding state volumes by the indicated percent.)

Non-State Signalized Roadways - 10%

Median & Turn Lane Adjustments

Lanes	Median	Exclusive Left Lanes	Exclusive Right Lanes	Adjustment Factors
1	Divided	Yes	No	+5%
2	Undivided	No	No	-20%
Multi	Undivided	Yes	No	-5%
Multi	Undivided	No	No	-25%
–	–	–	Yes	+ 5%

One-Way Facility Adjustment

Multiply the corresponding directional volumes in this table by 1.2

UNINTERRUPTED FLOW FACILITIES

FREEWAYS

Lanes	B	C	D	E
2	2,200	2,880	3,440	3,580
3	3,260	4,280	5,100	5,540
4	4,260	5,680	6,760	7,500
5	5,300	7,080	8,440	9,440

Freeway Adjustments

Auxiliary Lane	Ramp Metering
+ 1,000	+ 5%

UNINTERRUPTED FLOW HIGHWAYS

Lanes	Median	B	C	D	E
1	Undivided	450	850	1,200	1,640
2	Divided	1,740	2,450	3,110	3,440
3	Divided	2,610	3,680	4,660	5,170

Uninterrupted Flow Highway Adjustments

Lanes	Median	Exclusive left lanes	Adjustment factors
1	Divided	Yes	+5%
Multi	Undivided	Yes	-5%
Multi	Undivided	No	-25%

BICYCLE MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Paved Shoulder/Bicycle Lane Coverage	B	C	D	E
0-49%	*	140	320	1,000
50-84%	100	280	940	>1,000
85-100%	380	1,000	>1,000	**

PEDESTRIAN MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Sidewalk Coverage	B	C	D	E
0-49%	*	*	140	480
50-84%	*	80	440	800
85-100%	200	540	880	>1,000

BUS MODE (Scheduled Fixed Route)[3]

(Buses in peak hour in peak direction)

Sidewalk Coverage	B	C	D	E
0-84%	> 5	≥ 4	≥ 3	≥ 2
85-100%	> 4	≥ 3	≥ 2	≥ 1

[1] Values shown are presented as peak hour directional volumes for levels of service and are for the automobile/truck modes unless specifically stated. This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Calculations are based on planning applications of the Highway Capacity Manual and the Transit Capacity and Quality of Service Manual.

[2] Level of service for the bicycle and pedestrian modes in this table is based on number of motorized vehicles, not number of bicyclists or pedestrians using the facility.

[3] Buses per hour shown are only for the peak hour in the single direction of the higher traffic flow.

* Cannot be achieved using table input value defaults.

** Not applicable for that level of service letter grade. For the automobile mode, volumes greater than level of service D become F because intersection capacities have been reached. For the bicycle mode, the level of service letter grade (including F) is not achievable because there is no maximum vehicle volume threshold using table input value defaults.

Source:
Florida Department of Transportation
Systems Planning Office
www.dot.state.fl.us/planning/systems/sm/los/default.shtm

TABLE 8
(continued)

Generalized **Peak Hour Directional** Volumes for Florida's **Transitioning** and **Areas Over 5,000 Not In Urbanized Areas**

12/18/12

INPUT VALUE ASSUMPTIONS	Uninterrupted Flow Facilities			Interrupted Flow Facilities					
				State Arterials				Class I	
	Freeways	Highways		Class I		Class II		Bicycle	Pedestrian
ROADWAY CHARACTERISTICS									
Area type (t,uo)	t	t	t	t	t	t	t	t	t
Number of through lanes (both dir.)	4-10	2	4-6	2	4-6	2	4-6	4	4
Posted speed (mph)	70	50	50	45	50	30	30	45	45
Free flow speed (mph)	75	55	55	50	55	35	35	50	50
Auxiliary lanes (n,y)	n	n	n						
Median (n, nr, r)		n	r	n	y	n	y	r	r
Terrain (l,r)	l	l	l	l	l	l	l	l	l
% no passing zone		60							
Exclusive left turn lane impact (n, y)		[n]	y	y	y	y	y	y	y
Exclusive right turn lanes (n, y)				n	n	n	n	n	n
Facility length (mi)	8	5	5	1.8	2	2	2	2	2
Number of basic segments	4								
TRAFFIC CHARACTERISTICS									
Planning analysis hour factor (K)	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090
Directional distribution factor (D)	0.555	0.550	0.550	0.550	0.570	0.570	0.565	0.570	0.570
Peak hour factor (PHF)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Base saturation flow rate (pcphpl)		1,700	2,100	1,950	1,950	1,950	1,950	1,950	1,950
Heavy vehicle percent	9.0	4.0	4.0	2.0	3.0	2.0	3.0	3.0	3.0
Local adjustment factor	0.85	0.97	0.95						
% left turns				12	12	12	12	12	12
% right turns				12	12	12	12	12	12
CONTROL CHARACTERISTICS									
Number of signals				5	4	10	10	4	6
Arrival type (1-6)				4	3	4	4	4	4
Signal type (a, c, p)				c	c	c	c	c	c
Cycle length (C)				120	150	120	150	120	120
Effective green ratio (g/C)				0.44	0.45	0.44	0.45	0.44	0.44
CONTROL CHARACTERISTICS									
Paved shoulder/bicycle lane (n, y)								n, 50%, y	n
Outside lane width (n, t, w)								t	t
Pavement condition (d, t, u)								t	
On-street parking (n, y)								n	n
Sidewalk (n, y)									n, 50%, y
Sidewalk/roadway separation (a, t, w)									t
Sidewalk protective barrier (n, y)									n

LEVEL OF SERVICE THRESHOLDS

Level of Service	Freeways	Highways		Arterials		Bicycle	Ped	Bus
	Density	Two-Lane	Multilane	Class I	Class II	Score	Score	Buses/hr.
		%ffs	Density	ats	ats			
B	≤ 17	> 83.3	≤ 17	> 31 mph	> 22 mph	≤ 2.75	≤ 2.75	≤ 6
C	≤ 24	> 75.0	≤ 24	> 23 mph	> 17 mph	≤ 3.50	≤ 3.50	≤ 4
D	≤ 31	> 66.7	≤ 31	> 18 mph	> 13 mph	≤ 4.25	≤ 4.25	< 3
E	≤ 39	> 58.3	≤ 35	> 15 mph	> 10 mph	≤ 5.00	≤ 5.00	< 2

% ffs = Percent free flow speed ats = Average travel speed

TABLE 9

Generalized **Peak Hour Directional** Volumes for Florida's **Rural Undeveloped Areas** and **Developed Areas Less Than 5,000 Population**[1]

12/18/12

INTERRUPTED FLOW FACILITIES

STATE SIGNALIZED ARTERIALS

Lanes	Median	B	C	D	E
1	Undivided	*	670	740	**
2	Divided	*	1,530	1,580	**
3	Divided	*	2,360	2,400	**

Non-State Signalized Roadway Adjustments

(Alter corresponding state volumes by the indicated percent.)

Non-State Signalized Roadways - 10%

Median & Turn Lane Adjustments

Lanes	Median	Exclusive Left Lanes	Exclusive Right Lanes	Adjustment Factors
1	Divided	Yes	No	+5%
1	Undivided	No	No	-20%
Multi	Undivided	Yes	No	-5%
Multi	Undivided	No	No	-25%
–	–	–	Yes	+ 5%

One-Way Facility Adjustment

Multiply the corresponding directional volumes in this table by 1.2

BICYCLE MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Rural Undeveloped

Paved Shoulder/Bicycle Lane Coverage	B	C	D	E
0-49%	*	70	110	170
50-84%	60	120	180	580
85-100%	140	210	1,000	>1,000

Developed Areas

Paved Shoulder/Bicycle Lane Coverage	B	C	D	E
0-49%	*	120	260	840
50-84%	100	240	720	1,000
85-100%	320	1,000	>1,000	**

PEDESTRIAN MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Sidewalk Coverage	B	C	D	E
0-49%	*	*	120	460
50-84%	*	80	430	770
85-100%	180	520	860	>1,000

UNINTERRUPTED FLOW FACILITIES

FREEWAYS

Lanes	B	C	D	E
2	1,680	2,500	3,040	3,500
3	2,500	3,720	4,560	5,400
4	3,360	4,980	6,080	7,200

Freeway Adjustments

Auxiliary Lanes Present in Both Directions + 1,000

UNINTERRUPTED FLOW HIGHWAYS

Rural Undeveloped

Lanes	Median	B	C	D	E
1	Undivided	240	430	740	1,490
2	Divided	1,340	2,100	2,660	3,020
3	Divided	2,020	3,150	4,000	4,530

Developed Areas

Lanes	Median	B	C	D	E
1	Undivided	450	850	1,200	1,640
2	Divided	1,350	2,120	2,730	3,110
3	Divided	2,020	3,180	4,090	4,670

Passing Lane Adjustments

Alter LOS B-D volumes in proportion to the passing lane length to the highway segment length

Uninterrupted Flow Highway Adjustments

Lanes	Median	Exclusive left lanes	Adjustment factors
1	Divided	Yes	+5%
Multi	Undivided	Yes	-5%
Multi	Undivided	No	-25%

[1]Values shown are presented as peak hour directional volumes for levels of service and are for the automobile/truck modes unless specifically stated. This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Calculations are based on planning applications of the Highway Capacity Manual and the Transit Capacity and Quality of Service Manual.

[2] Level of service for the bicycle and pedestrian modes in this table is based on number of motorized vehicles, not number of bicyclists or pedestrians using the facility.

* Cannot be achieved using table input value defaults.

** Not applicable for that level of service letter grade. For the automobile mode, volumes greater than level of service D become F because intersection capacities have been reached. For the bicycle mode, the level of service letter grade (including F) is not achievable because there is no maximum vehicle volume threshold using table input value defaults.

Source:

Florida Department of Transportation
Systems Planning Office
www.dot.state.fl.us/planning/systems/sm/los/default.shtm

TABLE 9
(continued)

Generalized **Peak Hour Directional** Volumes for Florida's **Rural Undeveloped Areas** and **Developed Areas Less Than 5,000 Population**

12/18/12

INPUT VALUE ASSUMPTIONS	Uninterrupted Flow Facilities					Interrupted Flow Facilities				
	Freeways	Highways				Arterials		Bicycle		Pedestrian
ROADWAY CHARACTERISTICS										
Area type (ru, rd)	rural	ru	ru	rd	rd	rd	rd	ru	rd	rd
Number of through lanes (both dir.)	4-8	2	4-6	2	4-6	2	4-6	4	4	2
Posted speed (mph)	70	55	65	50	55	45	45	55	45	45
Free flow speed (mph)	75	60	70	55	60	50	50	60	50	50
Auxiliary lanes (n,y)	n									
Median (n, nr, r)		n	r	n	r	n	r	r	r	n
Terrain (l,r)	l	l	l	l	l	l	l	l	l	l
% no passing zone		20		60						
Exclusive left turn lanes (n, y)		[n]	y	[n]	y	y	y	y	y	y
Exclusive right turn lanes (n, y)						n	n	n	n	n
Facility length (mi)	14	10	10	5	5	1.9	2.2	4	2	2
Number of basic segments	4									
TRAFFIC CHARACTERISTICS										
Planning analysis hour factor (K)	0.105	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095
Directional distribution factor (D)	0.555	0.550	0.550	0.550	0.550	0.550	0.550	0.570	0.570	0.550
Peak hour factor (PHF)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Base saturation flow rate (pcphpl)		1,700	2,300	1,700	2,200	1,950	1,950	1,950	1,950	1,950
Heavy vehicle percent	12.0	5.0	12.0	4.0	4.0	3.0	3.0	6.0	3.5	3.0
Local adjustment factor	0.84	0.88	0.73	0.97	0.82					
% left turns						12	12		12	12
% right turns						12	12		12	12
CONTROL CHARACTERISTICS										
Number of signals						5	6	2	4	4
Arrival type (1-6)						3	3	3	3	3
Signal type (a, c, p)						c	c	a	a	a
Cycle length (C)						90	90	60	90	90
Effective green ratio (g/C)						0.44	0.44	0.37	0.44	0.44
MULTIMODAL CHARACTERISTICS										
Paved shoulder/bicycle lane (n, y)								n,50%,y	n,50%,y	n
Outside lane width (n, t, w)								t	t	t
Pavement condition (d, t, u)								t	t	
Sidewalk (n, y)										n,50%,y
Sidewalk/roadway separation(a, t,w)										t
Sidewalk protective barrier (n, y)										n

LEVEL OF SERVICE THRESHOLDS

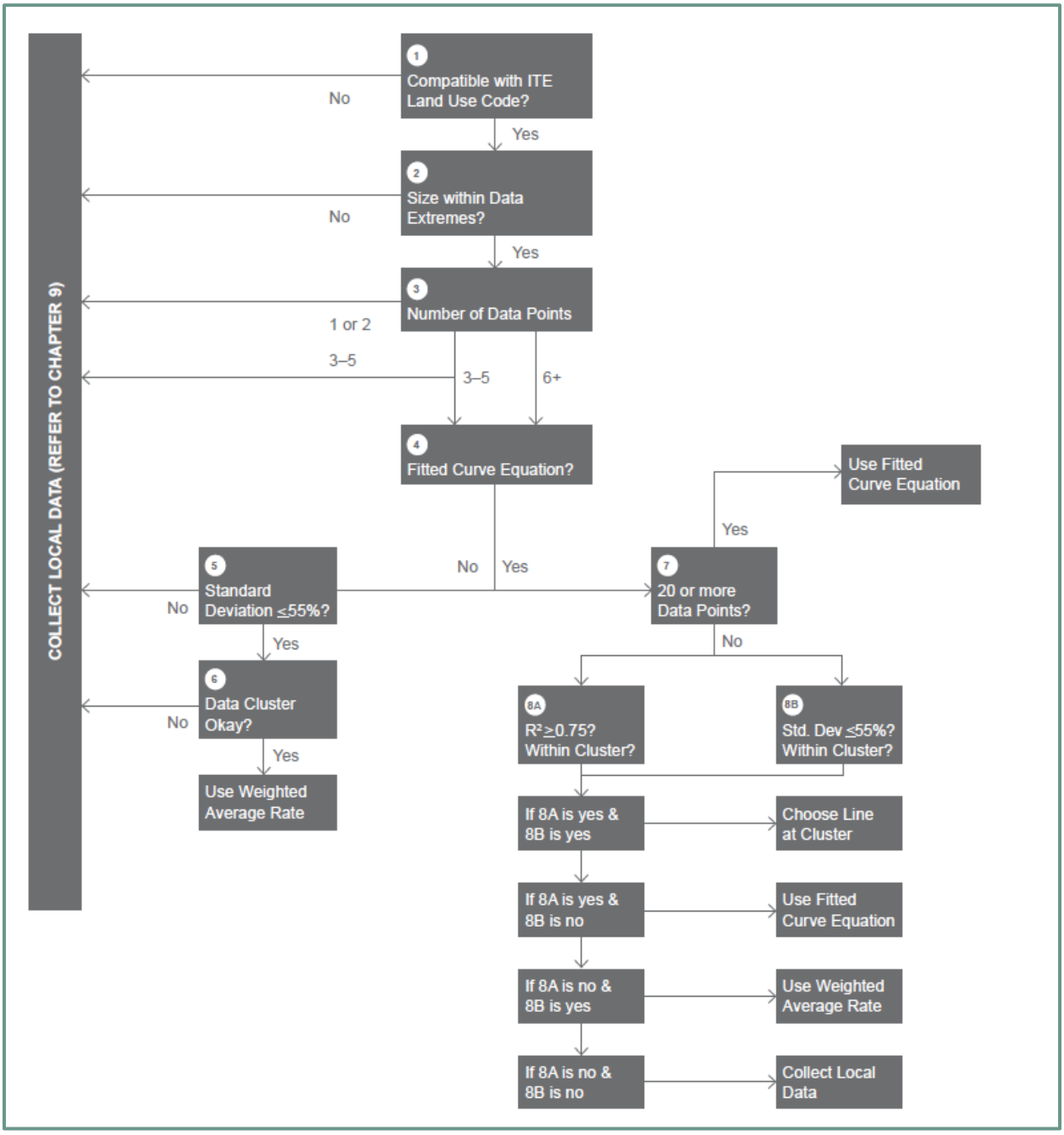
Level of Service	Freeways	Highways				
		Two-Lane ru		Two-Lane rd	Multilane ru	Multilane rd
	Density	%tsf	ats	%ffs	Density	Density
B	≤ 14	≤ 50	≥ 55	> 83.3	≤ 14	≤ 14
C	≤ 22	≤ 65	≥ 50	> 75.0	≤ 22	≤ 22
D	≤ 29	≤ 80	≥ 45	> 66.7	≤ 29	≤ 29
E	≤ 36	> 80	≥ 40	> 58.3	≤ 34	≤ 34

Level of Service	Arterials	Bicycle	Pedestrian
	Major City/Co.(ats)	Score	Score
B	> 31 mph	≤ 2.75	≤ 2.75
C	> 23 mph	≤ 3.50	≤ 3.50
D	> 18 mph	≤ 4.25	≤ 4.25
E	> 15 mph	≤ 5.00	≤ 5.00

%tsf = Percent time spent following %ffs = Percent of free flow speed ats = Average travel speed ru = Rural undeveloped rd = Rural developed

Tab 4. Rate vs Equation

Process for Selecting Average Rate or Equation in Trip Generation Manual Data (ITE Trip Generation Handbook 3rd Edition)



Example 3: Rate Vs Equation Examples

For the following examples use the flow chart from the ITE Trip Generation Handbook to determine for each case study if the fitted curve (equation) or average rate should be used to estimate trips, or if local data should be collected. Then calculate the trips.

1. Estimate the trip generation for Land Use Code 140 (Manufacturing) on a weekday during the PM peak hour of adjacent street traffic as a function of gross floor area (GFA). Assume the site will have 800,000 sq. ft. of GFA.
   Method: _____ Answer: _____

2. Estimate trip generation for Land Use Code 310 (Hotel) on weekday during the PM peak hour of the adjacent street traffic as a function of employees. For this example, assume the hotel will have 100 employees.
   Method: _____ Answer: _____

3. Estimate trip generation for Land Use Code 813 (Free-Standing Discount Superstore) on a weekday during the AM peak hour of adjacent street traffic as a function of gross floor area. For this example, assume the store size will be 180,000 sq. ft. of GFA.
   Method: _____ Answer: _____

4. Estimate trip generation for Land Use Code 210 (Single-Family Detached Housing) on a weekday during the PM peak hour of adjacent street traffic as a function of Dwelling Units. For this example, assume the number of units is 300.
   Method: _____ Answer: _____

5. Estimate trip generation for Land Use Code 090 (Park-and-Ride Lot with Bus or Light Rail Service) on a weekday during the AM peak hour of adjacent street traffic as a function of Parking Spaces. For this example, assume the number of spaces to be 50.
   Method: _____ Answer: _____

6. Estimate trip generation for Land Use Code 445 (Multiplex Movie Theater) on a weekday during the PM peak hour of adjacent street traffic as a function of Screens. For this example, assume the number of screens to be 20.
   Method: _____ Answer: _____

Brief Math Lesson

Defining Variables

- T= Trips
- X= Independent Variable

Using Rate

- Example: Average Rate is 1.16
- Calculate the estimated number of trips by multiplying the average rate by the independent variable. **T=1.16 (X)**

Using Fitted Curve Equation

- **T= 0.94(X) + 26.49**
  - Solve this equation by simply replacing X with your variable.
- **Ln(T)=0.95 Ln (X) + 0.36**
  - Steps for solving natural log equations
    1. Take the exponential of both sides of the equations (Assume X=10)
       - $e^{Ln(T)} = e^{(0.95*Ln(10)+0.36)}$
    2. The exponential of a natural log is 1 therefore:
       - $T = e^{(0.95*Ln(10)+0.36)}$
       - T= 13 Trips

Tab 5. Internal Captures

Example 4: Internal Capture | 2 Land Uses

GROSS TRIP GENERATION

INPUT

Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
	Enter	Exit	Enter	Exit	Enter	Exit
Office						
Retail					180	150
Restaurant					45	40
Cinema/Entertainment						
Residential						
Hotel						
Total					225	190

INTERNAL TRIPS (Minimums)

OUTPUT

Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
	Enter	Exit	Enter	Exit	Enter	Exit
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
Total						
% Reduction					14.0%	

EXTERNAL TRIPS

OUTPUT

Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
	Enter	Exit	Enter	Exit	Enter	Exit
Office						
Retail					164	137
Restaurant					32	24
Cinema/Entertainment						
Residential						
Hotel						

	Table 6.1 Unconstrained Internal Person Trip Capture Rates for Trip Origins within a Mixed-Use Development (P.M. Peak Hour)						
P.M. PEAK	Origin Land Use	Destination Land Use					From ITE Trip Generation Handbook
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office		20%	4%	0%	2%	0%
	Retail	2%		29%	4%	26%	5%
	Restaurant	3%	41%		8%	18%	7%
	Cinema/Entertainment	2%	21%	31%		8%	2%
	Residential	4%	42%	21%	0%		3%
	Hotel	0%	16%	68%	0%	2%	

	Table 6.2 Unconstrained Internal Person Trip Capture Rates for Trip Destinations within a Mixed-Use Development (P.M. Peak Hour)						
P.M. PEAK	Origin Land Use	Destination Land Use					From ITE Trip Generation Handbook
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office		8%	2%	1%	4%	0%
	Retail	31%		29%	26%	46%	17%
	Restaurant	30%	50%		32%	16%	71%
	Cinema/Entertainment	6%	4%	3%		4%	1%
	Residential	57%	10%	14%	0%		12%
	Hotel	0%	2%	5%	0%	0%	

*** BASED ON EXIT ***								
P.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Exit trips multiplied by the Origin percentages
	Office							
	Retail			44				
	Restaurant		16					
	Cinema/Entertainment							
	Residential							
	Hotel							

*** BASED ON ENTER ***								
P.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Enter trips multiplied by the Destination percentages
	Office							
	Retail							
	Restaurant		90					
	Cinema/Entertainment							
	Residential							
	Hotel							

*** MINIMUM ***								
P.M. PEAK	**(Exit) Land Use**	**(Enter) Land Use**						**Total Exit**
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	
	Office							
	Retail			13				
	Restaurant							16
	Cinema/Entertainment							
	Residential							
	Hotel							
	Total Enter		16	13				

Example 5: Internal Capture | 2 Land Uses

GROSS TRIP GENERATION

INPUT

Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
	Enter	Exit	Enter	Exit	Enter	Exit
Office					18	98
Retail						
Restaurant						
Cinema/Entertainment						
Residential					315	185
Hotel						
Total					333	283

INTERNAL TRIPS (Minimums)

OUTPUT

Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
	Enter	Exit	Enter	Exit	Enter	Exit
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
Total						
% Reduction					2.9%	

EXTERNAL TRIPS

OUTPUT

Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
	Enter	Exit	Enter	Exit	Enter	Exit
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

	Table 6.1 Unconstrained Internal Person Trip Capture Rates for Trip Origins within a Mixed-Use Development (P.M. Peak Hour)						
P.M. PEAK	Origin Land Use	Destination Land Use					From ITE Trip Generation Handbook
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office		20%	4%	0%	2%	0%
	Retail	2%		29%	4%	26%	5%
	Restaurant	3%	41%		8%	18%	7%
	Cinema/Entertainment	2%	21%	31%		8%	2%
	Residential	4%	42%	21%	0%		3%
	Hotel	0%	16%	68%	0%	2%	

	Table 6.2 Unconstrained Internal Person Trip Capture Rates for Trip Destinations within a Mixed-Use Development (P.M. Peak Hour)						
P.M. PEAK	Origin Land Use	Destination Land Use					From ITE Trip Generation Handbook
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office		8%	2%	1%	4%	0%
	Retail	31%		29%	26%	46%	17%
	Restaurant	30%	50%		32%	16%	71%
	Cinema/Entertainment	6%	4%	3%		4%	1%
	Residential	57%	10%	14%	0%		12%
	Hotel	0%	2%	5%	0%	0%	

*** BASED ON EXIT ***								
P.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Exit trips multiplied by the Origin percentages
	Office							
	Retail							
	Restaurant							
	Cinema/Entertainment							
	Residential							
	Hotel							

*** BASED ON ENTER ***								
P.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Enter trips multiplied by the Destination percentages
	Office							
	Retail							
	Restaurant							
	Cinema/Entertainment							
	Residential							
	Hotel							

*** MINIMUM ***								
P.M. PEAK	**(Exit) Land Use**	**(Enter) Land Use**						**Total Exit**
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	
	Office							
	Retail							
	Restaurant							
	Cinema/Entertainment							
	Residential							
	Hotel							
	Total Enter							

Example 6: Internal Capture |3 Land Uses

GROSS TRIP GENERATION

INPUT	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
		Enter	Exit	Enter	Exit	Enter	Exit
	Office					56	294
	Retail					186	178
	Restaurant						
	Cinema/Entertainment						
	Residential					189	111
	Hotel						
	Total					431	583

INTERNAL TRIPS (Minimums)

OUTPUT	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
		Enter	Exit	Enter	Exit	Enter	Exit
	Office						
	Retail						
	Restaurant						
	Cinema/Entertainment						
	Residential						
	Hotel						
	Total						
	% Reduction					18.5%	

EXTERNAL TRIPS

OUTPUT	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
		Enter	Exit	Enter	Exit	Enter	Exit
	Office					48	273
	Retail					152	128
	Restaurant						
	Cinema/Entertainment						
	Residential					137	88
	Hotel						

	Table 6.1 Unconstrained Internal Person Trip Capture Rates for Trip Origins within a Mixed-Use Development (P.M. Peak Hour)						
P.M. PEAK	Origin Land Use	Destination Land Use					From ITE Trip Generation Handbook
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office		20%	4%	0%	2%	0%
	Retail	2%		29%	4%	26%	5%
	Restaurant	3%	41%		8%	18%	7%
	Cinema/Entertainment	2%	21%	31%		8%	2%
	Residential	4%	42%	21%	0%		3%
	Hotel	0%	16%	68%	0%	2%	

	Table 6.2 Unconstrained Internal Person Trip Capture Rates for Trip Destinations within a Mixed-Use Development (P.M. Peak Hour)						
P.M. PEAK	Origin Land Use	Destination Land Use					From ITE Trip Generation Handbook
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office		8%	2%	1%	4%	0%
	Retail	31%		29%	26%	46%	17%
	Restaurant	30%	50%		32%	16%	71%
	Cinema/Entertainment	6%	4%	3%		4%	1%
	Residential	57%	10%	14%	0%		12%
	Hotel	0%	2%	5%	0%	0%	

*** BASED ON EXIT ***								
P.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Exit trips multiplied by the Origin percentages
	Office							
	Retail							
	Restaurant							
	Cinema/Entertainment							
	Residential							
	Hotel							

*** BASED ON ENTER ***								
P.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Enter trips multiplied by the Destination percentages
	Office							
	Retail							
	Restaurant							
	Cinema/Entertainment							
	Residential							
	Hotel							

*** MINIMUM ***								
P.M. PEAK	**(Exit) Land Use**	**(Enter) Land Use**						**Total Exit**
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	
	Office							
	Retail							
	Restaurant							
	Cinema/Entertainment							
	Residential							
	Hotel							
	Total Enter							

Example 7: Internal Capture | 3 Land Uses

GROSS TRIP GENERATION

	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
		Enter	Exit	Enter	Exit	Enter	Exit
INPUT	Office					56	60
	Retail						
	Restaurant					40	20
	Cinema/Entertainment						
	Residential					284	217
	Hotel						
	Total					380	296

INTERNAL TRIPS (Minimums)

	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
		Enter	Exit	Enter	Exit	Enter	Exit
OUTPUT	Office						
	Retail						
	Restaurant						
	Cinema/Entertainment						
	Residential						
	Hotel						
	Total						
	% Reduction					6.5%	

EXTERNAL TRIPS

	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
		Enter	Exit	Enter	Exit	Enter	Exit
OUTPUT	Office						
	Retail						
	Restaurant						
	Cinema/Entertainment						
	Residential						
	Hotel						

	Table 6.1 Unconstrained Internal Person Trip Capture Rates for Trip Origins within a Mixed-Use Development (P.M. Peak Hour)						
P.M. PEAK	Origin Land Use	Destination Land Use					From ITE Trip Generation Handbook
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office		20%	4%	0%	2%	0%
	Retail	2%		29%	4%	26%	5%
	Restaurant	3%	41%		8%	18%	7%
	Cinema/Entertainment	2%	21%	31%		8%	2%
	Residential	4%	42%	21%	0%		3%
	Hotel	0%	16%	68%	0%	2%	

	Table 6.2 Unconstrained Internal Person Trip Capture Rates for Trip Destinations within a Mixed-Use Development (P.M. Peak Hour)						
P.M. PEAK	Origin Land Use	Destination Land Use					From ITE Trip Generation Handbook
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office		8%	2%	1%	4%	0%
	Retail	31%		29%	26%	46%	17%
	Restaurant	30%	50%		32%	16%	71%
	Cinema/Entertainment	6%	4%	3%		4%	1%
	Residential	57%	10%	14%	0%		12%
	Hotel	0%	2%	5%	0%	0%	

*** BASED ON EXIT ***								
P.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Exit trips multiplied by the Origin percentages
	Office							
	Retail							
	Restaurant							
	Cinema/Entertainment							
	Residential							
	Hotel							

*** BASED ON ENTER ***								
P.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Enter trips multiplied by the Destination percentages
	Office							
	Retail							
	Restaurant							
	Cinema/Entertainment							
	Residential							
	Hotel							

*** MINIMUM ***								
P.M. PEAK	**(Exit) Land Use**	**(Enter) Land Use**						**Total Exit**
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	
	Office							
	Retail							
	Restaurant							
	Cinema/Entertainment							
	Residential							
	Hotel							
	Total Enter							

Tab 6. Pass-By-Trips

Example 8: Pass-By-Trips

For the following examples use the provided pass-by pages from the ITE handbook to determine the pass-by percentage.

1. Land Use Code 813 – Free Standing Discount Superstore, Saturday, Mid-Day Peak Period.
   Answer: _____

2. Land Use Code 853 – Convenience Market with Gasoline Pumps, Weekday, PM Peak Period.
   Answer: _____

3. Land Use Code 934 – Fast-Food Restaurant with Drive – Through Window, Weekday, PM Peak Period.
   Answer: _____

4. Land Use Code 945 – Gasoline/Service Station with Convenience Market, Weekday, PM Peak Period.
   Answer: _____

For the following example apply pass by. The land use is a fast-food restaurant with a drive through window. The PM peak hour od adjacent street traffic is being analyzed. Fill in the blank:

Land Use	**Land Use Code**	**Independent Variable**	**Average Rate**	**Total Trip**	**Entering Trips**	**Exiting Trips**
Fast-Food Restaurant with Drive-Through	934	1,200 ft^2	32.67			
			Pass By			
			External Trips New to the System			

Tab 7. Final Exercises

Workbook Example Analysis 1

MIXED USE DEVELOPMENT SEGMENT ANALYSIS

Proposed Land uses:

Convenience Market with Gasoline Pumps (8 pumps)
General Office (100,000 square feet)
High-Turnover (Sit-Down) (5,700)
Fast-Food Restaurant with Drive-Through Window (7,500)

TRIP GENERATION

Trip Generation PM Peak Period Calculation						
Land use	Land Use Code	Independent Variable	Average Rate	Total Trips	Entering Trips	Exiting Trips
Convenience Market with Gasoline Pumps	853	16 fueling positions	23.04			
General Office	710	100,000 ft^2	1.15			
High-Turnover (Sit-Down) Restaurant	932	5,700 ft^2	9.77			
Fast-Food Restaurant with Drive-Through Window	934	7,500 ft^2	32.67			
			Gross Total Trips	**784**	365	419

INTERNAL CAPTURE REDUCTION

Through the methodology meeting it was determined that the internal capture reduction would be capped at 15%.

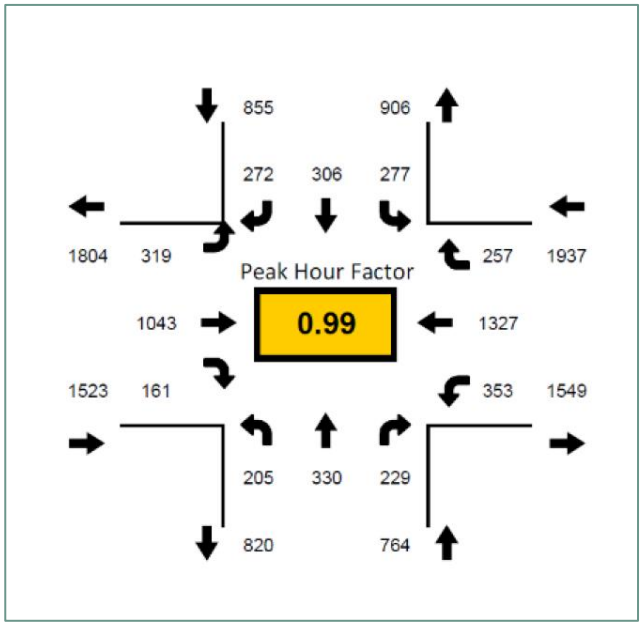
Land use	**Internal Capture Trips**		**External Trips**		
	Entering Trips	Exiting Trips	Entering Trips	Exiting Trips	Total Trips
Convenience Market with Gasoline Pumps					
General Office					
High-Turnover (Sit-Down) Restaurant					
Fast-Food Restaurant with Drive-Through Window					
Totals	55	63	310	356	666

PASS-BY TRAFFIC

Pass-By Reduction					
Land use	Land Use Code	Pass-By Trip Percentage	Total Pass-By Trips	Pass-By Entering Trips	Pass-By Exiting Trips
Convenience Market with Gasoline Pumps	853	66%			
General Office	710	-			
High-Turnover (Sit-Down) Restaurant	932	43%			
Fast-Food Restaurant with Drive-Through Window	934	50%			
Total Calculated Pass-By					

Pass-By Check PM Peak:

North-South Roadway: 855+906 = 1,761
East-West Roadway: 1,523+1,804 = 3,327
Shared Volume: 319 + 272 = 591
1,761 + 3,327 – 591 = 4,497
10% of 4,497 = 450
The calculated pass-by is less/more?



Project Trip Summary			
	Total Trips	Entering Trips	Exiting Trips
Gross Total Trips	784	365	419
Internal Capture Reduction			
External Trips			
Pass-By Reduction			
Net New External Trips			

SEGMENT ANALYSIS

Segments that are significantly impacted by the proposed development will be analyzed. For this example, the roadways where the development traffic makes up 3% or more of the maximum service volume at the adopted level-of-service target during the PM peak hour will be included in the analysis.

Segment Study Area Determination											
Roadway Segment	No. of Lanes	PHPD Serv. Vol	Project Dist.		Project Dir.		New Project Trips		% Significant		
			NB/ EB	SB/ WB	NB/ EB	SB/ WB	NB/ EB	SB/ WB	NB /EB	SB/ WB	Study Segment
9th Street											
SR 50/Colonial Drive to Story Road	2	713	1%	1%	Out	In					
Story Road to SR 438/Plant Street	2	713	3%	3%	Out	In					
Dillard Street											
Beard Road to SR 50	4	1,530	11%	11%	In	Out					
SR 50 to Project Entrance	4	1,530	15%	35%	In	Out					
Project Entrance to SR 438	4	1,530	25%	25%	Out	In					
SR 438 to Story Road	4	1,530	15%	15%	Out	In					
Story Road to Book Street	4	1,530	10%	10%	Out	In					

Segment Analysis									
Roadway Segment	No. of Lanes	PHPD Serv. Vol	2020 Background.		New Project Trips		Total Trips		Deficiency
			NB/ EB	SB/ WB	NB/ EB	SB/ WB	NB/EB	SB/WB	
Dillard Street									
SR 50 to Project Entrance	4	1,530	1,000	1,021					
Project Entrance to SR 438	4	1,530	1,100	1,021					

Workbook Example Analysis 2

STUDY INFORMATION

Land Uses:

High Rise Apartment - 464 Units

Retail (Shopping Center) – 7,000 square feet

Analysis Period

AM Peak Hour

PM Peak Hour

Trip Generation

Fill in the table below and determine if you should use the equation or the rate.

	Available Trip Generation Average Rates and Equation						
	Land use	Land Use Code	Independent Variable	Average Rate	Equation	R^2	Method you Should Use
AM	High-Rise Apartment						
	Retail (Shopping Center)						
PM	High-Rise Apartment						
	Retail (Shopping Center)						

Use the average rate for the completion of the table below.

Trip Generation – Use Average Rate								
			AM			PM		
Land use	Land Use Code	Size and Units	IN	OUT	Total	IN	OUT	Total
High-Rise Apartment		464 Units						
Retail (Shopping Center)		7,000 ft^2						
		Totals						

Use attached Internal Capture Sheets

	AM Internal Trips		PM Internal Trips	
Land use	IN	OUT	IN	OUT
High-Rise Apartment				
Retail (Shopping Center)				

External Trips

AM Trips	**Trip Generation**		**Internal Trips**		**External Trips**		
Land use	IN	OUT	IN	OUT	IN	OUT	Total
High-Rise Apartment							
Retail (Shopping Center)							
Totals							
PM Trips	**Trip Generation**		**Internal Trips**		**External Trips**		
Land use	IN	OUT	IN	OUT	IN	OUT	Total
High-Rise Apartment							
Retail (Shopping Center)							
Totals							

Multimodal Reduction

Within the Central Business District (CBD) where the project is proposed, the recommended transit reduction is approximately 23 percent, and the recommended pedestrian reduction is 10 percent. Taken together, a 33 percent multimodal reduction was applied to the estimated number of external trips during both the morning and evening peak hours.

AM Trips	**External Trips**		**Multimodal Trips**		**Net New External Trips**		
Land use	IN	OUT	IN	OUT	IN	OUT	Total
High-Rise Apartment							
Retail (Shopping Center)							
Totals							
PM Trips	**External Trips**		**Multimodal Trips**		**Net New External Trips**		
Land use	IN	OUT	IN	OUT	IN	OUT	Total
High-Rise Apartment							
Retail (Shopping Center)							
Totals							

Workbook Example Analysis 2 | Internal Capture Sheets

GROSS TRIP GENERATION

	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
		Enter	Exit	Enter	Exit	Enter	Exit
INPUT	Office						
	Retail						
	Restaurant						
	Cinema/Entertainment						
	Residential						
	Hotel						
	Total						

INTERNAL TRIPS (Minimums)

	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
		Enter	Exit	Enter	Exit	Enter	Exit
OUTPUT	Office						
	Retail						
	Restaurant						
	Cinema/Entertainment						
	Residential						
	Hotel						
	Total						
	% Reduction			2.3%		14.5%	

EXTERNAL TRIPS

	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
		Enter	Exit	Enter	Exit	Enter	Exit
OUTPUT	Office						
	Retail						
	Restaurant						
	Cinema/Entertainment						
	Residential						
	Hotel						

	Table 6.1 Unconstrained Internal Person Trip Capture Rates for Trip Origins within a Mixed-Use Development (P.M. Peak Hour)						
A.M. PEAK	Origin Land Use	Destination Land Use					From ITE Trip Generation Handbook
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office		28%	63%	0%	1%	0%
	Retail	29%		13%	0%	14%	0%
	Restaurant	31%	14%		0%	4%	3%
	Cinema/Entertainment	0%	0%	0%		0%	0%
	Residential	2%	1%	20%	0%		0%
	Hotel	75%	14%	9%	0%	0%	

	Table 6.2 Unconstrained Internal Person Trip Capture Rates for Trip Destinations within a Mixed-Use Development (P.M. Peak Hour)						
A.M. PEAK	Origin Land Use	Destination Land Use					From ITE Trip Generation Handbook
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office		32%	23%	0%	0%	0%
	Retail	4%		50%	0%	2%	0%
	Restaurant	14%	8%		0%	5%	4%
	Cinema/Entertainment	0%	0%	0%		0%	0%
	Residential	3%	17%	20%	0%		0%
	Hotel	3%	4%	6%	0%	0%	

*** BASED ON EXIT ***								
A.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Exit trips multiplied by the Origin percentages
	Office							
	Retail							
	Restaurant							
	Cinema/Entertainment							
	Residential							
	Hotel							

*** BASED ON ENTER ***								
A.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Enter trips multiplied by the Destination percentages
	Office							
	Retail							
	Restaurant							
	Cinema/Entertainment							
	Residential							
	Hotel							

*** MINIMUM ***								
A.M. PEAK	**(Exit) Land Use**	**(Enter) Land Use**						**Total Exit**
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	
	Office							
	Retail							
	Restaurant							
	Cinema/Entertainment							
	Residential							
	Hotel							
	Total Enter							

	Table 6.1 Unconstrained Internal Person Trip Capture Rates for Trip Origins within a Mixed-Use Development (P.M. Peak Hour)						
P.M. PEAK	Origin Land Use	Destination Land Use					From ITE Trip Generation Handbook
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office		20%	4%	0%	2%	0%
	Retail	2%		29%	4%	26%	5%
	Restaurant	3%	41%		8%	18%	7%
	Cinema/Entertainment	2%	21%	31%		8%	2%
	Residential	4%	42%	21%	0%		3%
	Hotel	0%	16%	68%	0%	2%	

	Table 6.2 Unconstrained Internal Person Trip Capture Rates for Trip Destinations within a Mixed-Use Development (P.M. Peak Hour)						
P.M. PEAK	Origin Land Use	Destination Land Use					From ITE Trip Generation Handbook
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office		8%	2%	1%	4%	0%
	Retail	31%		29%	26%	46%	17%
	Restaurant	30%	50%		32%	16%	71%
	Cinema/Entertainment	6%	4%	3%		4%	1%
	Residential	57%	10%	14%	0%		12%
	Hotel	0%	2%	5%	0%	0%	

*** BASED ON EXIT ***								
P.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Exit trips multiplied by the Origin percentages
	Office							
	Retail							
	Restaurant							
	Cinema/Entertainment							
	Residential							
	Hotel							

*** BASED ON ENTER ***								
P.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Enter trips multiplied by the Destination percentages
	Office							
	Retail							
	Restaurant							
	Cinema/Entertainment							
	Residential							
	Hotel							

*** MINIMUM ***								
P.M. PEAK	**(Exit) Land Use**	**(Enter) Land Use**						**Total Exit**
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	
	Office							
	Retail							
	Restaurant							
	Cinema/Entertainment							
	Residential							
	Hotel							
	Total Enter							

Tab 8. ITE Resources

Tab 8 | Table of Contents ITE Trip Generation Manual Tables

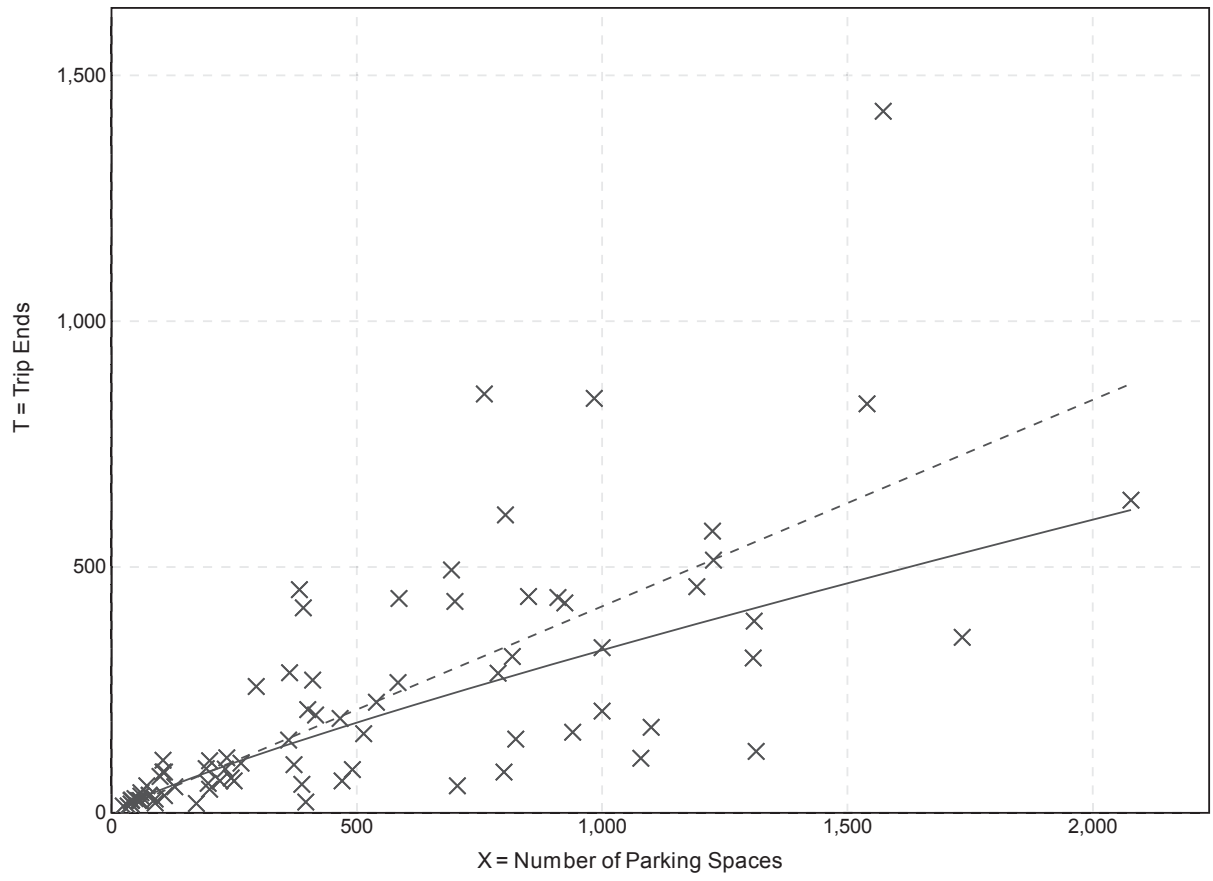
Park-and-Ride Lot with Bus or Light Rail Service
(090)

Vehicle Trip Ends vs:	**Parking Spaces**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	78
Avg. Num. of Parking Spaces:	538
Directional Distribution:	79% entering, 21% exiting

Vehicle Trip Generation per Parking Space

Average Rate	Range of Rates	Standard Deviation
0.42	0.06 - 1.19	0.26

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.85 Ln(X) - 0.07

R^2= 0.70

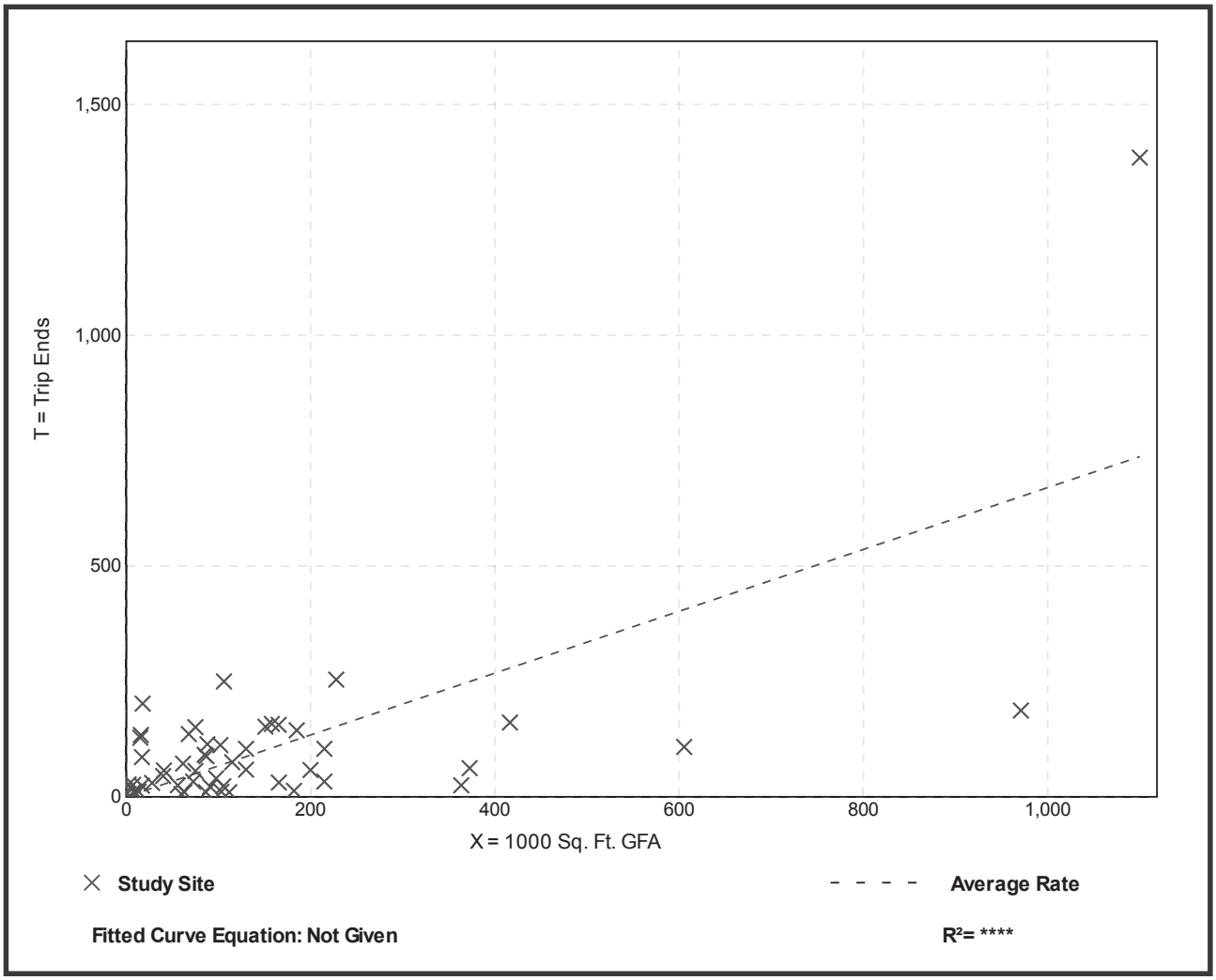
Manufacturing
(140)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	52
1000 Sq. Ft. GFA:	152
Directional Distribution:	31% entering, 69% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.67	0.07 - 11.37	0.94

Data Plot and Equation



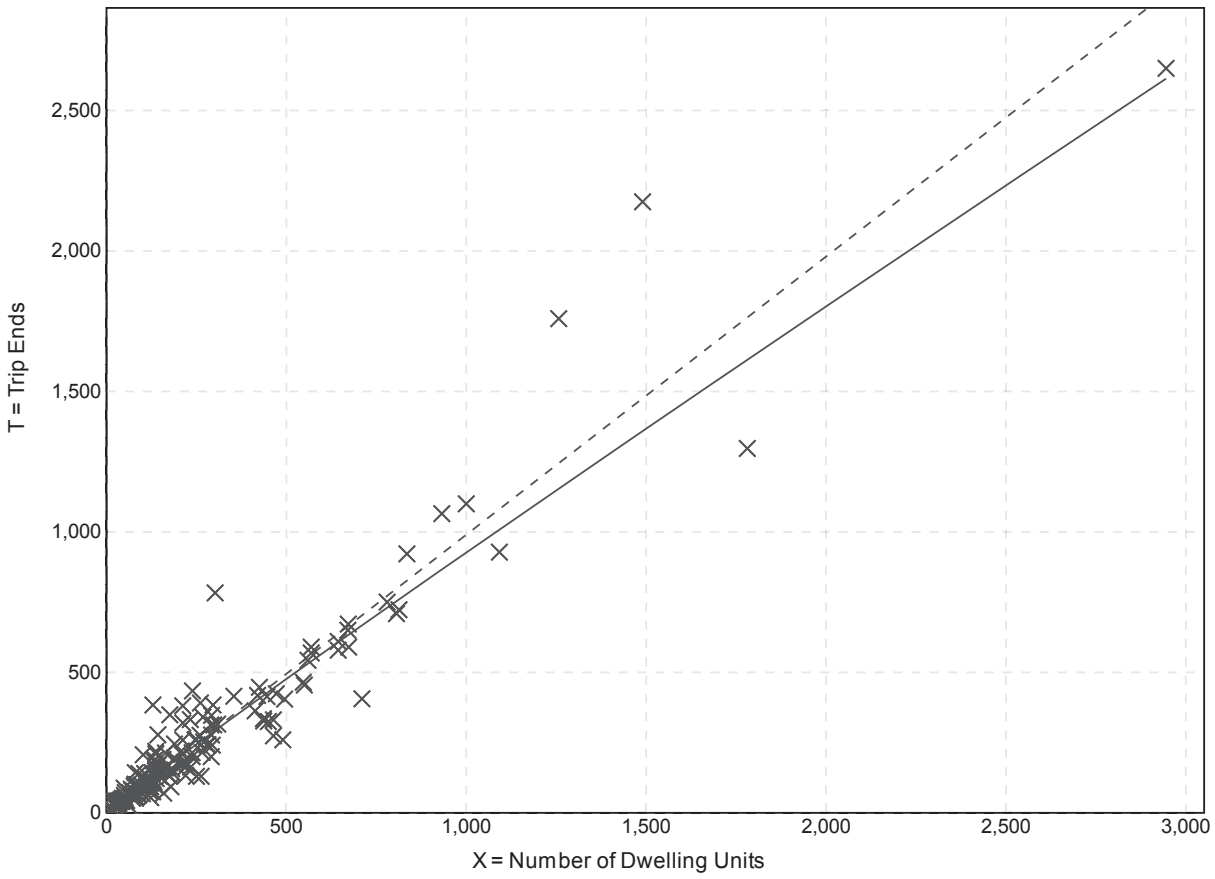
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	190
Avg. Num. of Dwelling Units:	242
Directional Distribution:	63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.99	0.44 - 2.98	0.31

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.96 Ln(X) + 0.20

R^2= 0.92

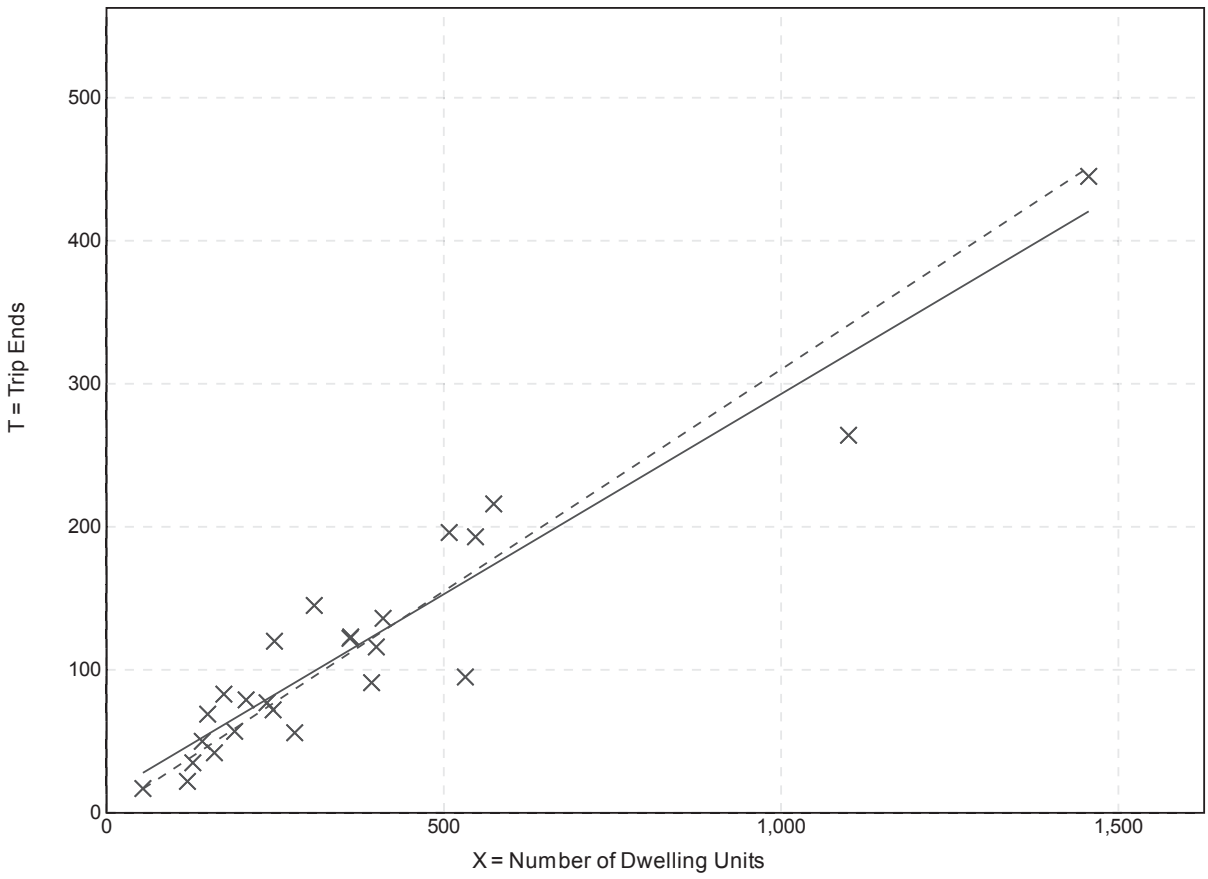
Multifamily Housing (High-Rise)
(222)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	25
Avg. Num. of Dwelling Units:	372
Directional Distribution:	24% entering, 76% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.31	0.18 - 0.48	0.08

Data Plot and Equation



Fitted Curve Equation: T = 0.28(X) + 12.86

R^2= 0.90

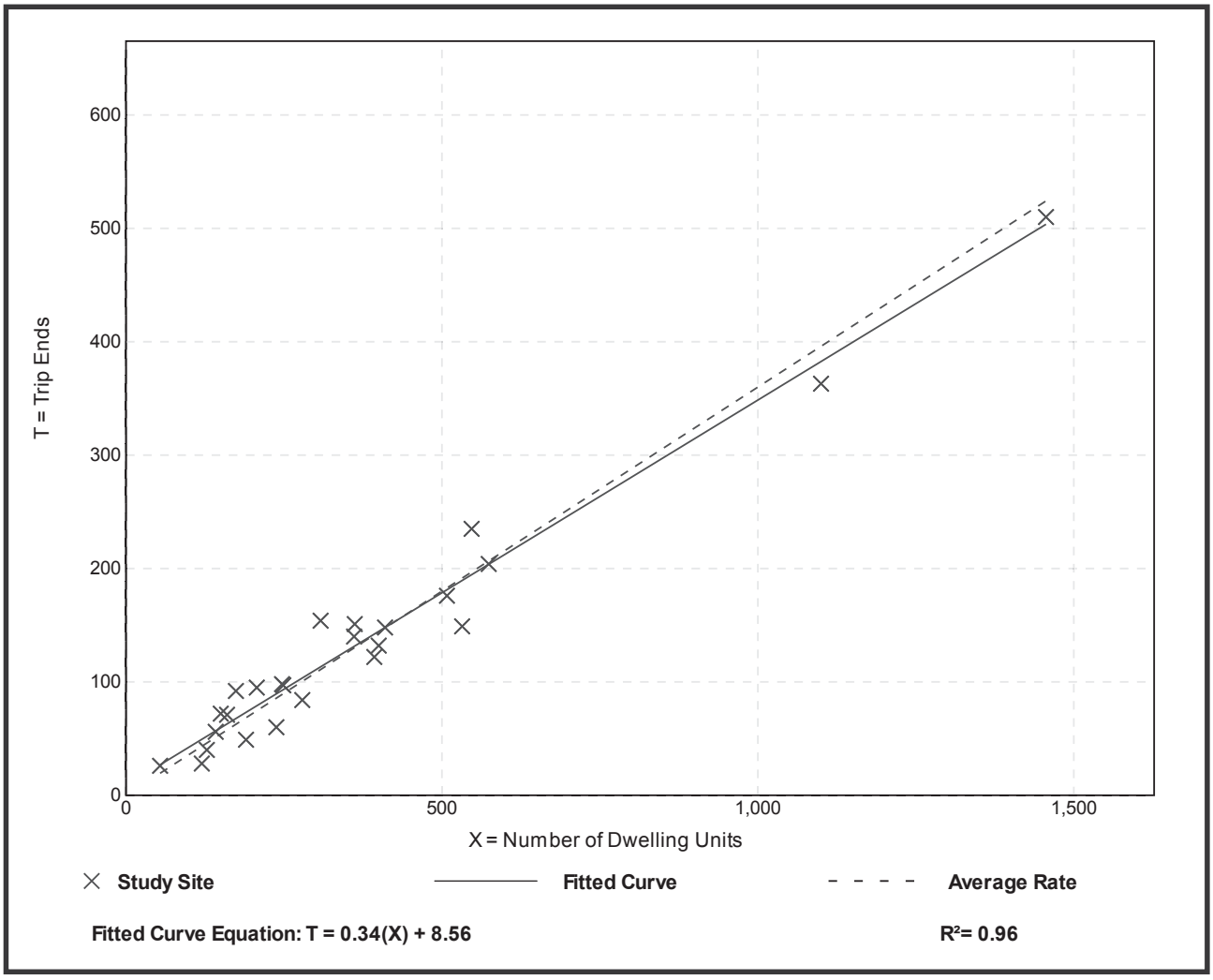
Multifamily Housing (High-Rise)
(222)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	25
Avg. Num. of Dwelling Units:	372
Directional Distribution:	61% entering, 39% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.36	0.23 - 0.53	0.06

Data Plot and Equation



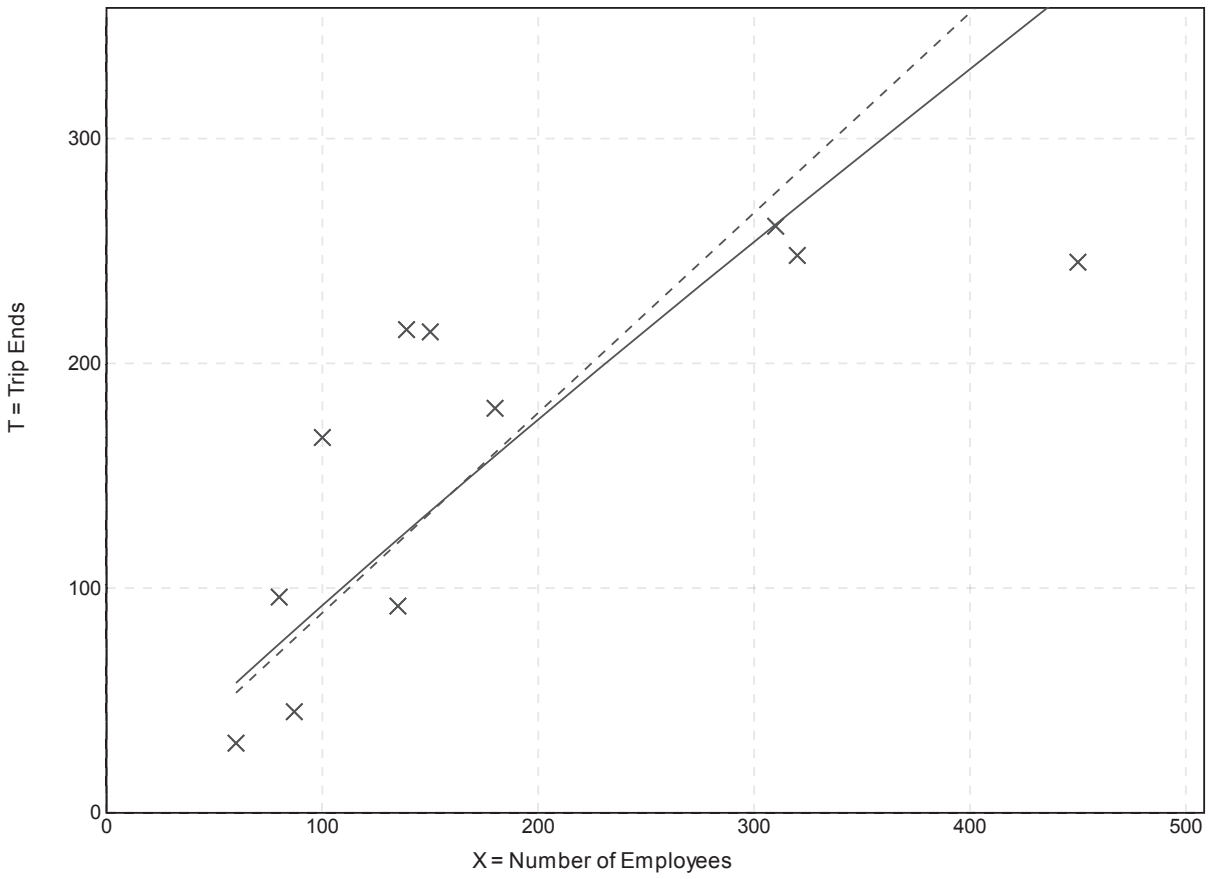
Hotel
(310)

Vehicle Trip Ends vs:	**Employees**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	11
Avg. Num. of Employees:	183
Directional Distribution:	54% entering, 46% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.89	0.52 - 1.67	0.38

Data Plot and Equation



Multiplex Movie Theater
(445)

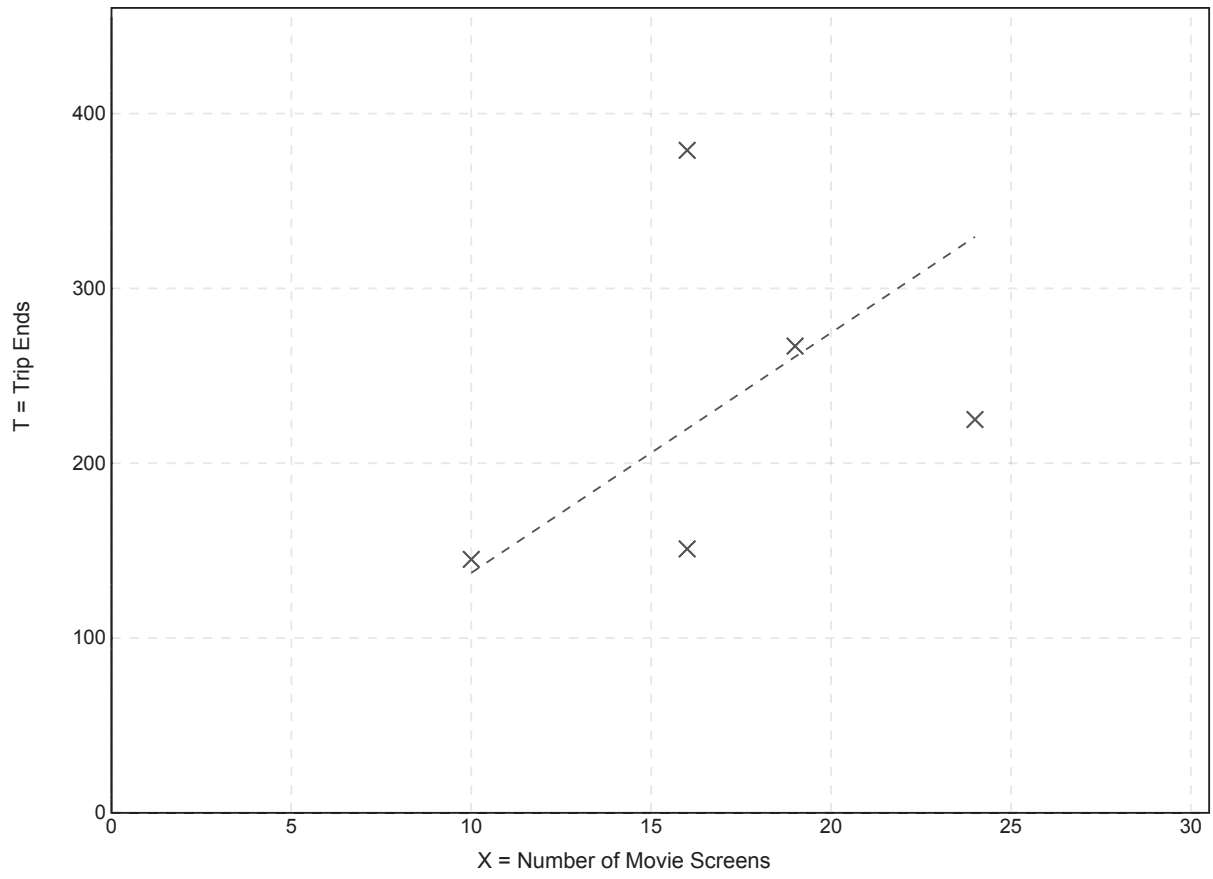
Vehicle Trip Ends vs:	**Movie Screens**
On a:	**Weekday,** **Peak Hour of Adjacent Street Traffic,** **One Hour Between 4 and 6 p.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	5
Avg. Num. of Movie Screens:	17
Directional Distribution:	51% entering, 49% exiting

Vehicle Trip Generation per Movie Screen

Average Rate	Range of Rates	Standard Deviation
13.73	9.38 - 23.69	5.87

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= ****

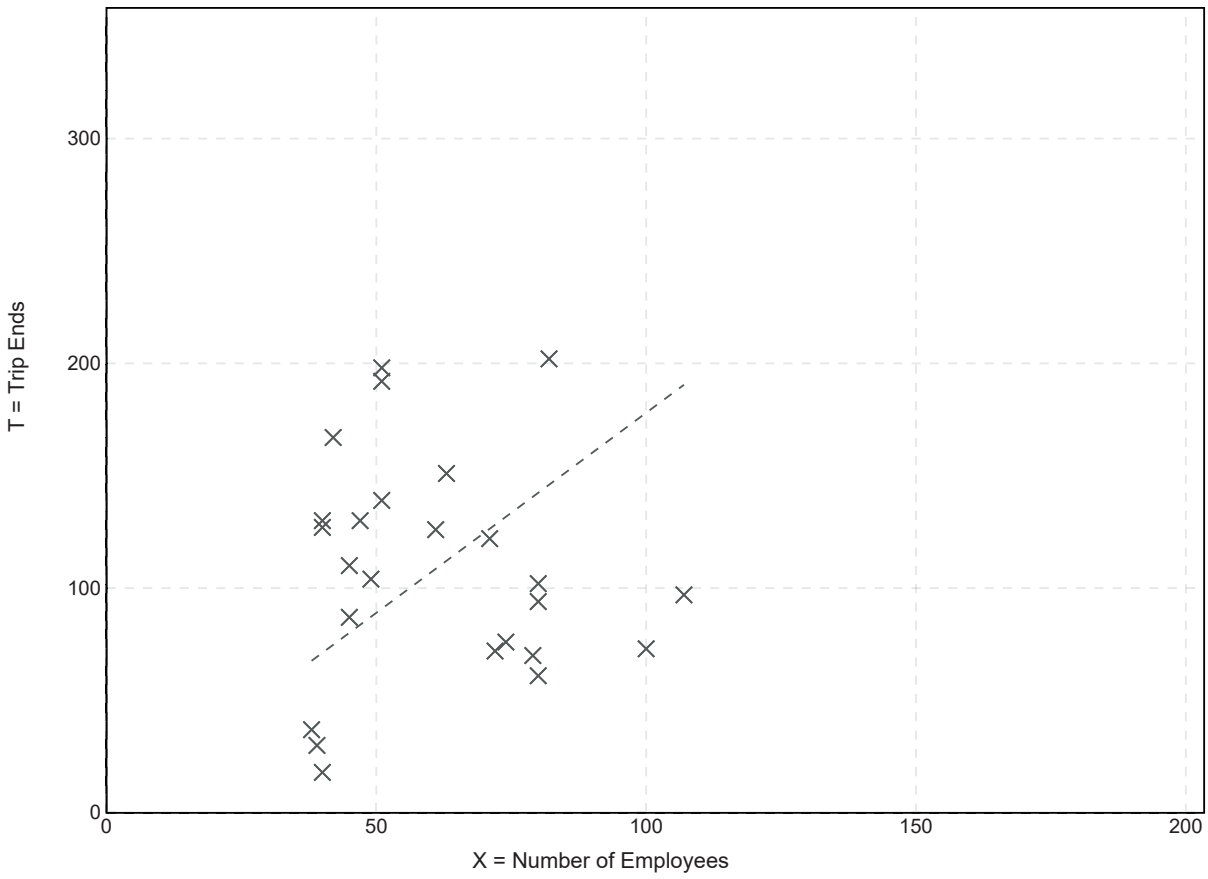
Elementary School
(520)

Vehicle Trip Ends vs:	**Employees**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	25
Avg. Num. of Employees:	61
Directional Distribution:	48% entering, 52% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
1.78	0.45 - 3.98	1.04

Data Plot and Equation



Fitted Curve Equation: Not Given

R^2= ****

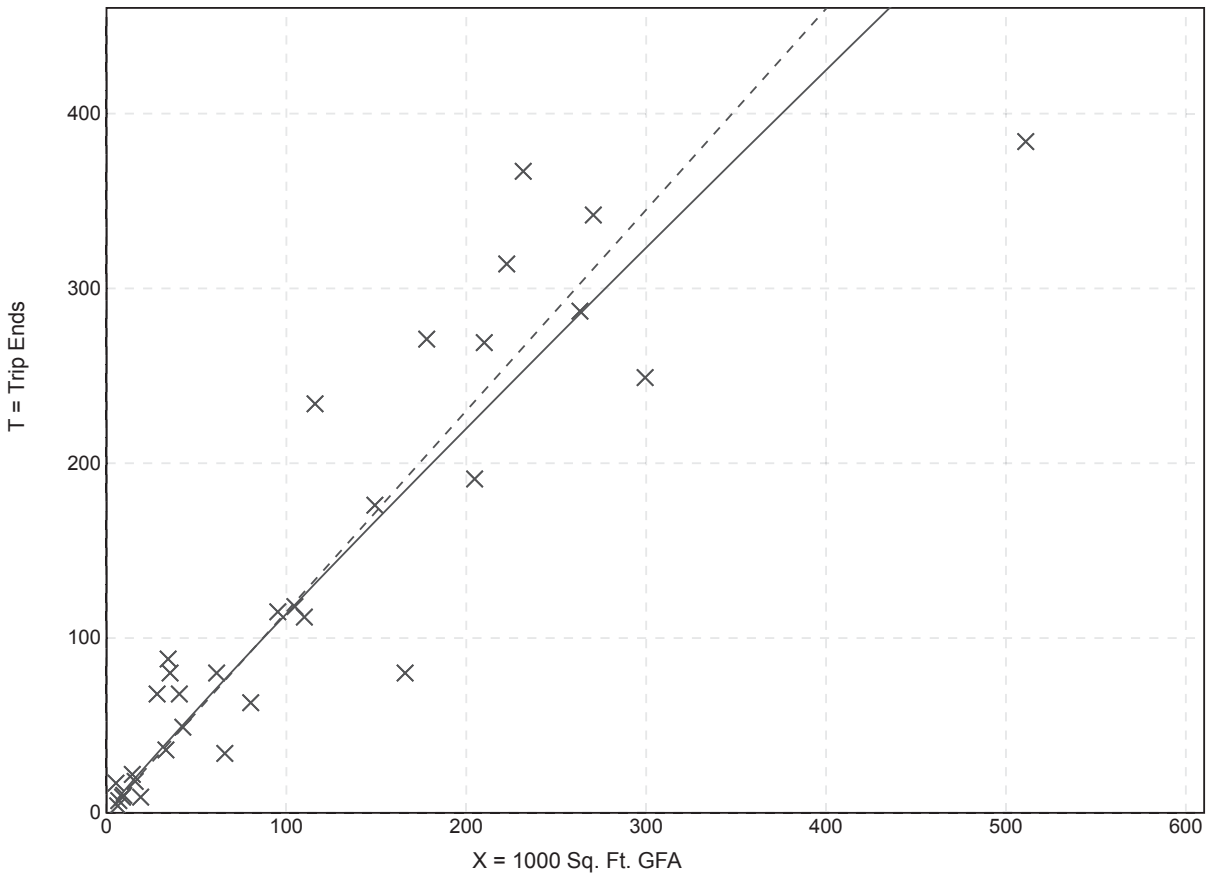
General Office Building
(710)

Vehicle Trip Ends vs: **1000 Sq. Ft. GFA**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 32
1000 Sq. Ft. GFA: 114
Directional Distribution: 16% entering, 84% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.15	0.47 - 3.23	0.42

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.95 Ln(X) + 0.36

R^2= 0.88

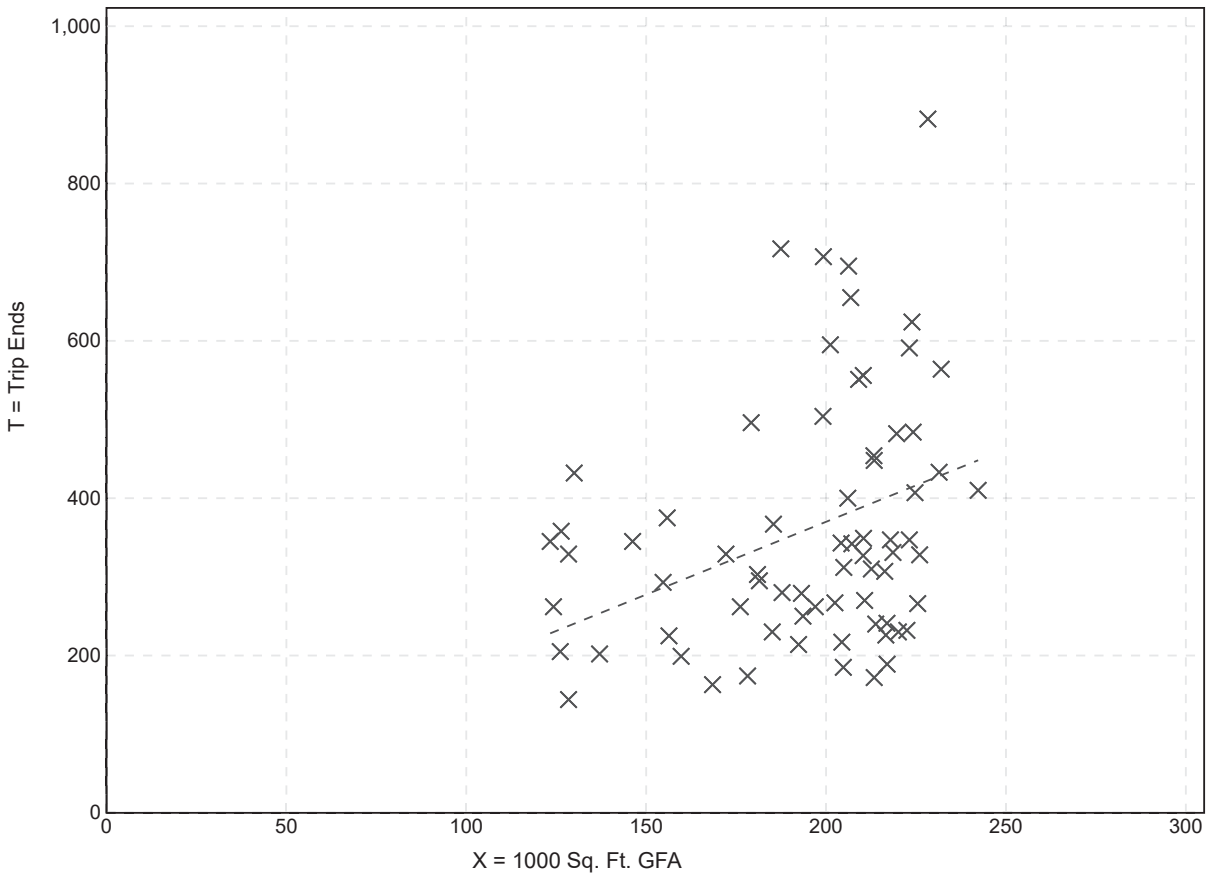
Free-Standing Discount Superstore
(813)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	70
1000 Sq. Ft. GFA:	194
Directional Distribution:	56% entering, 44% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.85	0.81 - 3.86	0.76

Data Plot and Equation



Fitted Curve Equation: Not Given

R^2= **

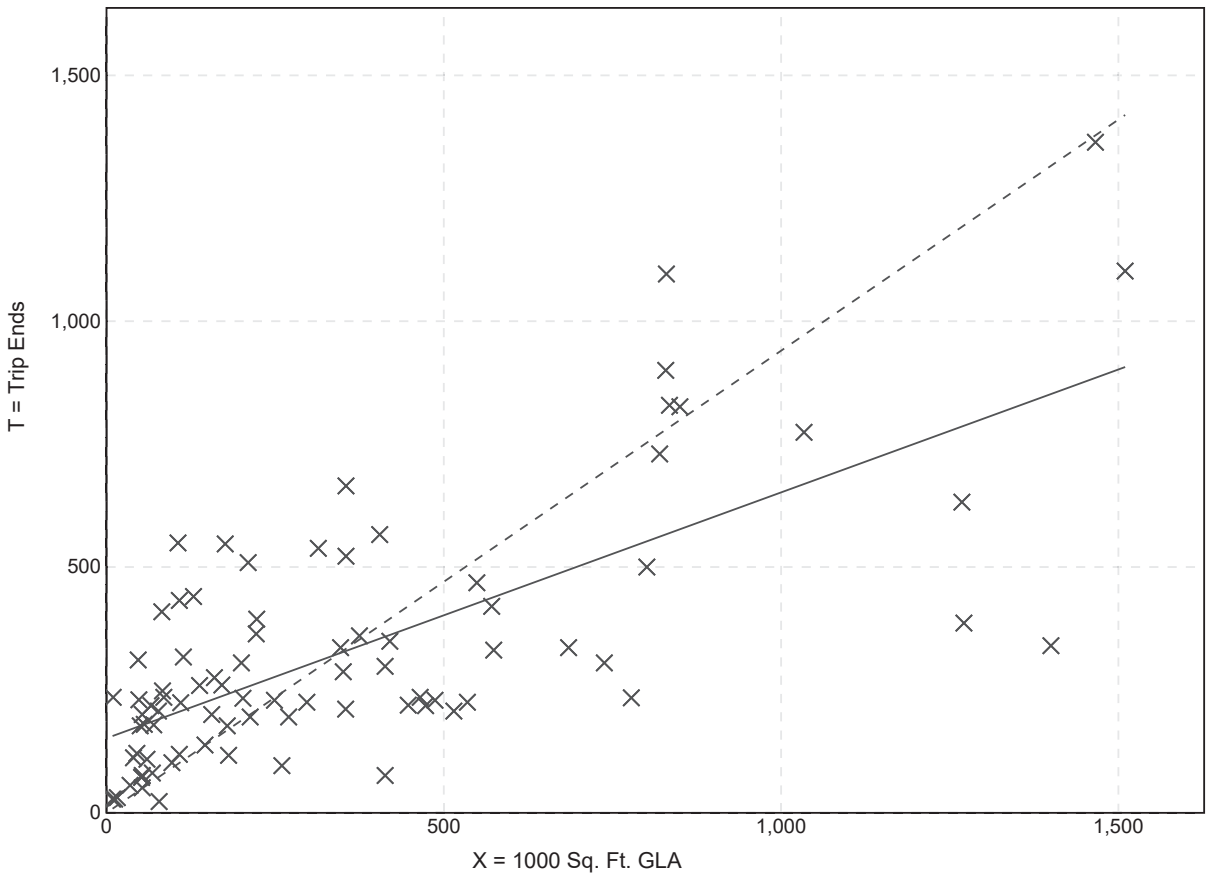
Shopping Center
(820)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GLA**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	84
1000 Sq. Ft. GLA:	351
Directional Distribution:	62% entering, 38% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
0.94	0.18 - 23.74	0.87

Data Plot and Equation



Fitted Curve Equation: T = 0.50(X) + 151.78

R^2= 0.50

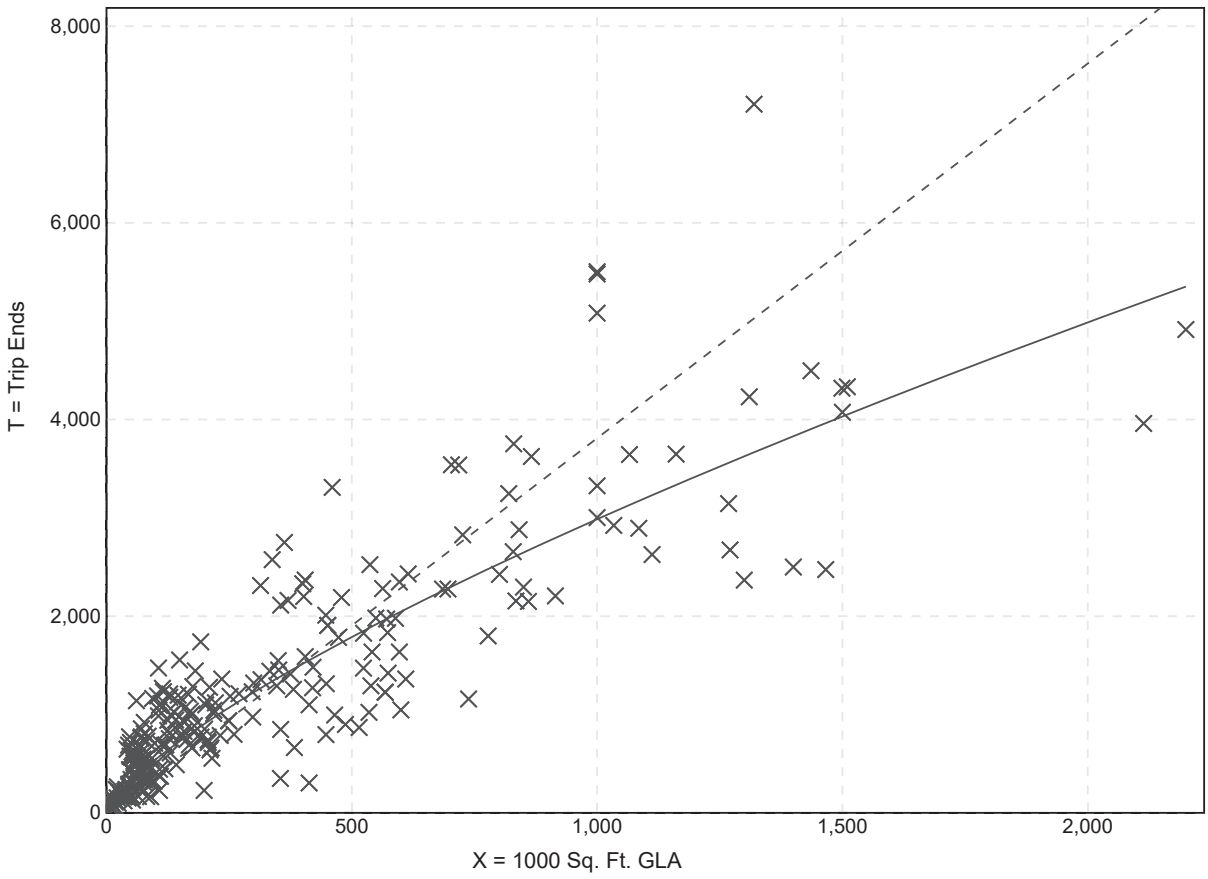
Shopping Center
(820)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GLA**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	261
1000 Sq. Ft. GLA:	327
Directional Distribution:	48% entering, 52% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
3.81	0.74 - 18.69	2.04

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.74 Ln(X) + 2.89

R^2= 0.82

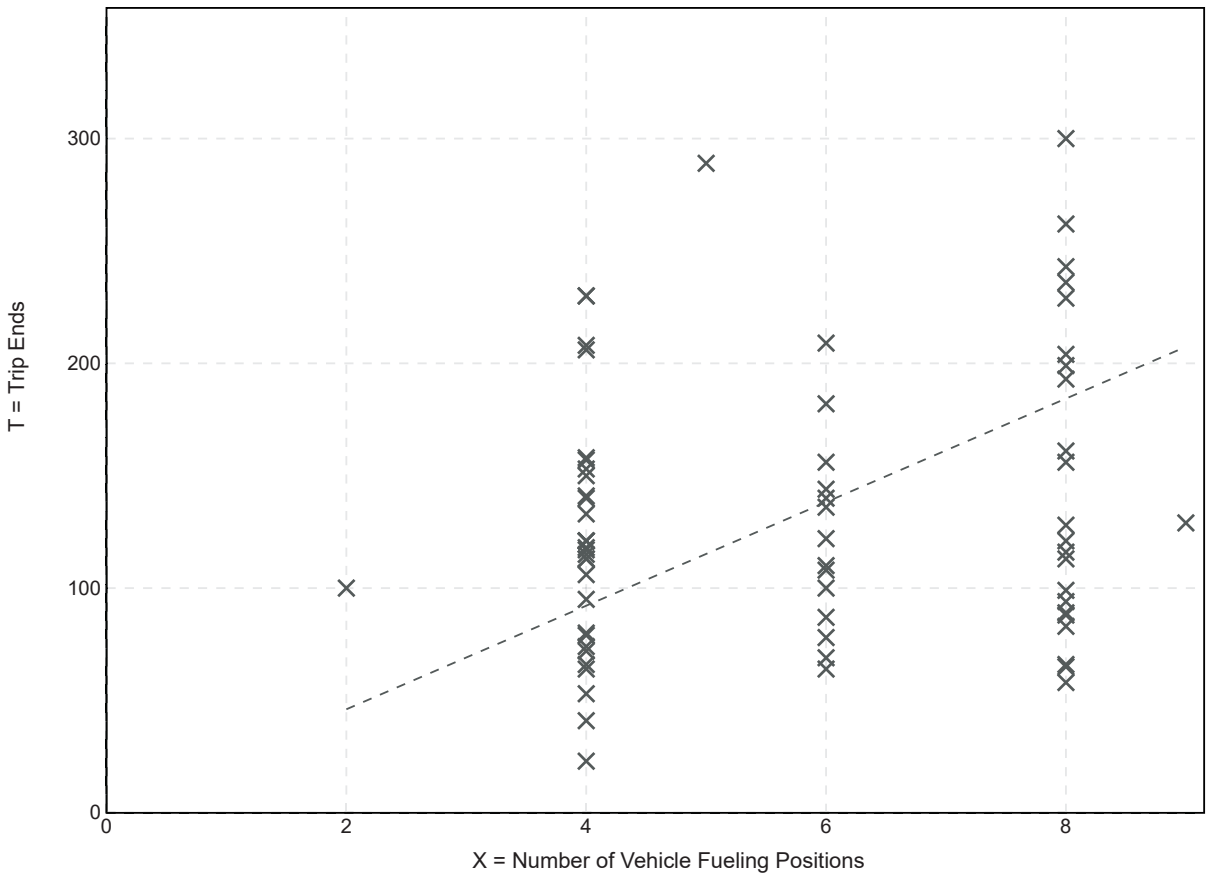
Convenience Market with Gasoline Pumps
(853)

Vehicle Trip Ends vs:	**Vehicle Fueling Positions**
On a:	**Weekday,** **Peak Hour of Adjacent Street Traffic,** **One Hour Between 4 and 6 p.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	69
Avg. Num. of Vehicle Fueling Positions:	6
Directional Distribution:	50% entering, 50% exiting

Vehicle Trip Generation per Vehicle Fueling Position

Average Rate	Range of Rates	Standard Deviation
23.04	5.75 - 57.80	11.91

Data Plot and Equation



Fitted Curve Equation: Not Given

R^2= ****

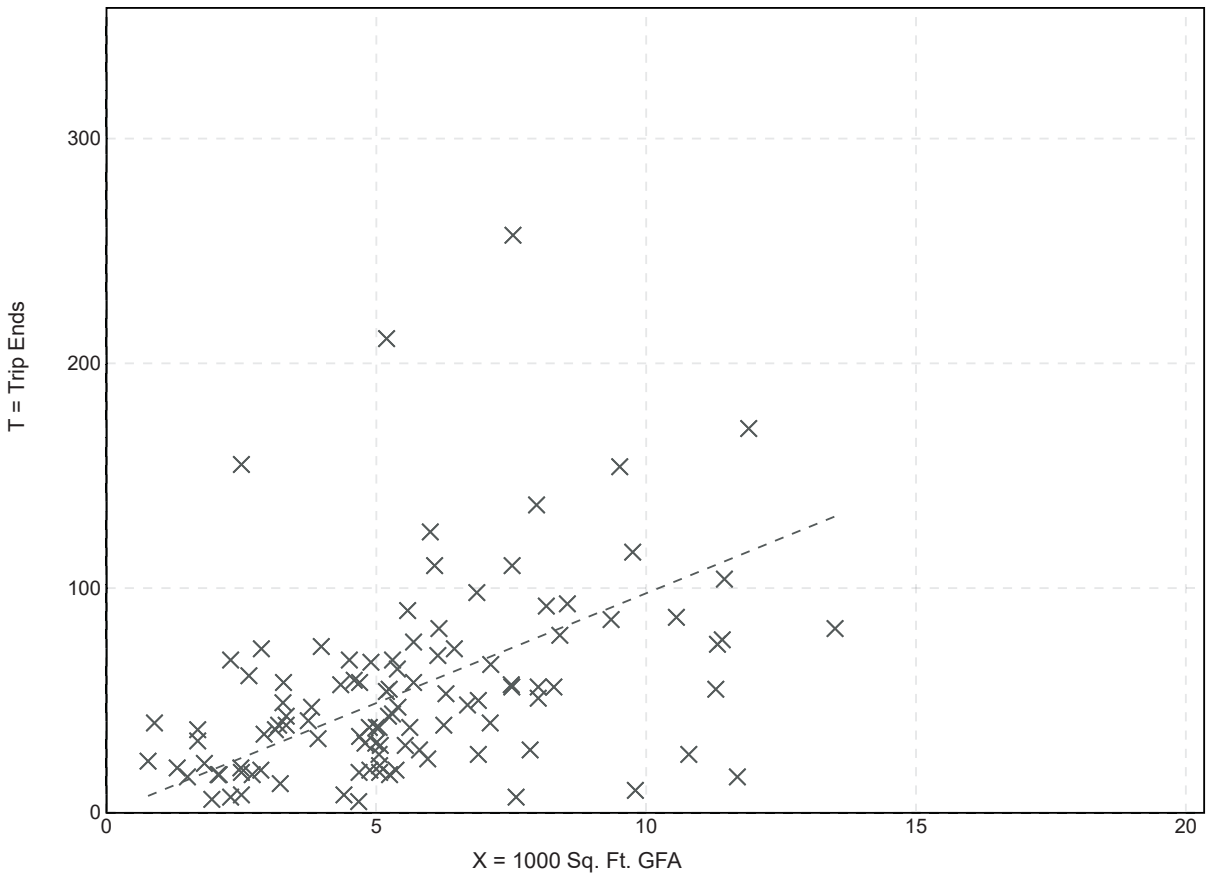
High-Turnover (Sit-Down) Restaurant
(932)

Vehicle Trip Ends vs: **1000 Sq. Ft. GFA**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 107
1000 Sq. Ft. GFA: 6
Directional Distribution: 62% entering, 38% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
9.77	0.92 - 62.00	7.37

Data Plot and Equation



Fitted Curve Equation: Not Given

R^2= **

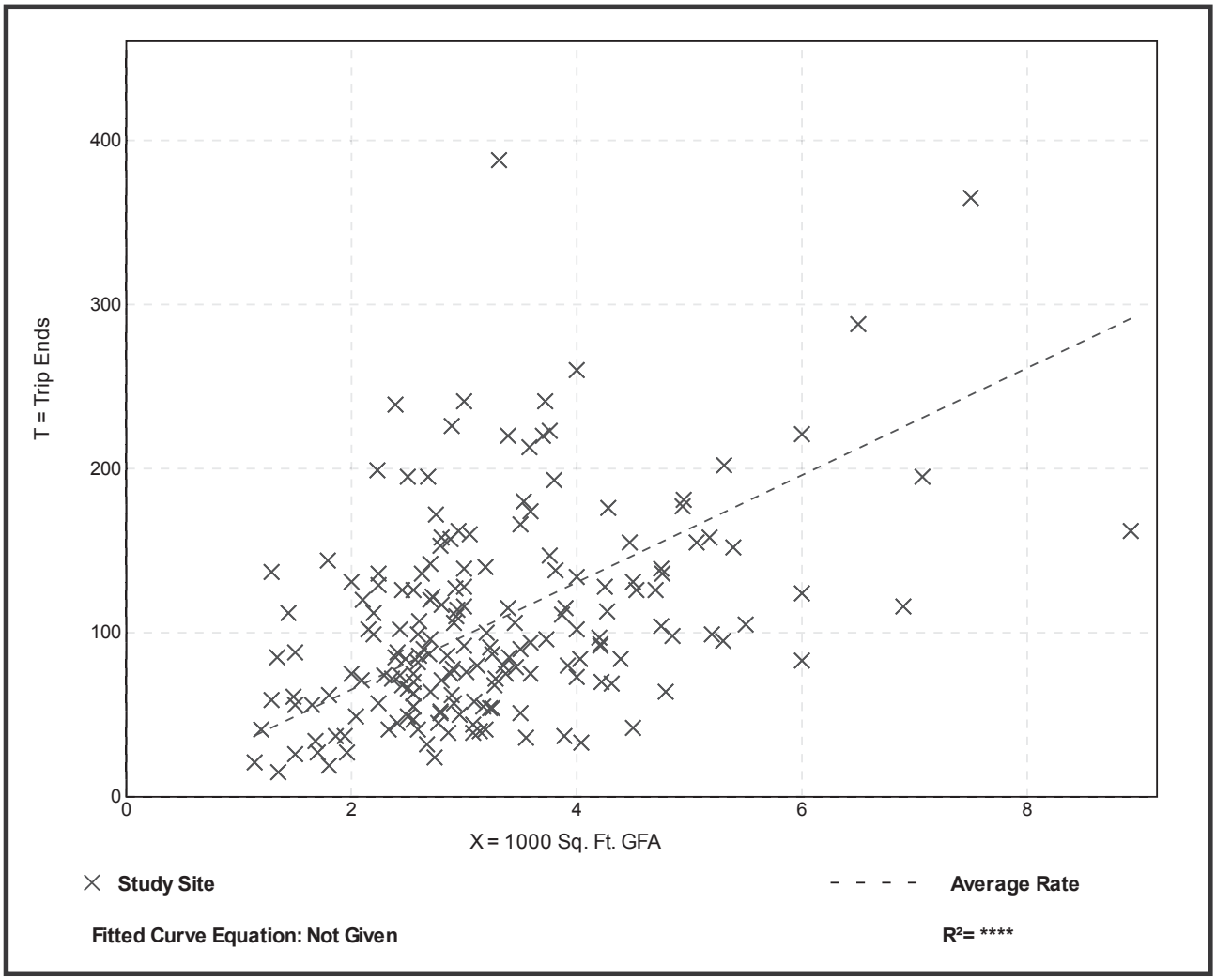
Fast-Food Restaurant with Drive-Through Window
(934)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday,** **Peak Hour of Adjacent Street Traffic,** **One Hour Between 4 and 6 p.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	185
1000 Sq. Ft. GFA:	3
Directional Distribution:	52% entering, 48% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
32.67	8.17 - 117.22	17.87

Data Plot and Equation



Coffee/Donut Shop with Drive-Through Window
(937)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	61
1000 Sq. Ft. GFA:	2
Directional Distribution:	51% entering, 49% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
88.99	18.32 - 353.57	48.19

Data Plot and Equation

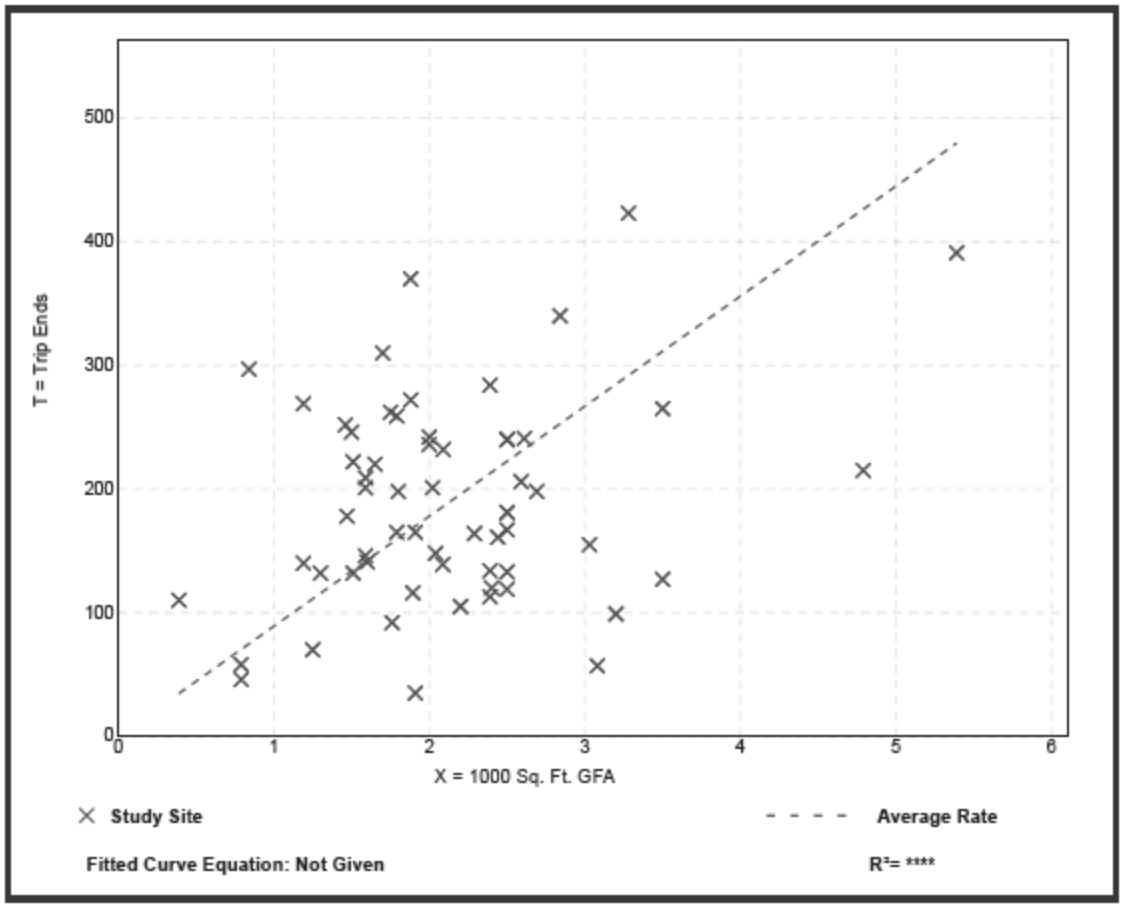


Table E.4 Pass-By and Non-Pass-By Trips Saturday, Mid-Day Peak Period Land Use Code 813—Free-Standing Discount Superstore

SIZE (1,000 SQ. FT. GFA)	LOCATION	SURVEY DATE	NO. OF INTERVIEWS	TIME PERIOD	PASS-BY TRIP (%)	NON-PASS-BY TRIP (%)			ADJ. STREET PEAK HOUR VOLUME	SOURCE
						PRIMARY	DIVERTED	TOTAL		
205	Louisville, KY	Sept.-Nov. 2007	360	12:00–4:00 p.m.	28	—	—	72	6,144	651-652
216	Pasadena, TX	Sept.-Nov. 2007	240	12:00–4:00 p.m.	16	—	—	84	11,898	651-652
213	Cedar Falls, IA	Sept.-Nov. 2007	156	12:00–4:00 p.m.	13	—	—	87	7,484	651-652
204	Pueblo, CO	Sept.-Nov. 2007	300	12:00–4:00 p.m.	11	—	—	89	4,764	651-652
185	Plano, IL	Sept.-Nov. 2007	162	12:00–4:00 p.m.	18	—	—	82	3,871	651-652
217	Sheboygan, WI	Sept.-Nov. 2007	441	12:00–4:00 p.m.	22	—	—	78	8,256	651-652
213	San Antonio, TX	Sept.-Nov. 2007	748	12:00–4:00 p.m.	28	—	—	72	12,332	651-652
226	Colonial Heights, VA	Sept.-Nov. 2007	270	12:00–4:00 p.m.	26	—	—	74	12,995	651-652
220	Milford, PA	Sept.-Nov. 2007	123	12:00–4:00 p.m.	26	—	—	74	7,024	651-652
222	Marysville, CA	Sept.-Nov. 2007	810	12:00–4:00 p.m.	25	—	—	75	5,429	651-652

Average Pass-By Trip Percentage: 21
"—" means no data were provided

Table E.16 Pass-By and Non-Pass-By Trips Weekday, PM Peak Period Land Use Code 853—Convenience Market with Gasoline Pumps

SIZE (1,000 SQ. FT. GFA)	LOCATION	WEEKDAY SURVEY DATE	NO. OF INTERVIEWS	TIME PERIOD	PASS-BY TRIP (%)	NON-PASS-BY TRIPS (%)			ADJ. STREET PEAK HOUR VOLUME	SOURCE
						PRIMARY	DIVERTED	TOTAL		
2.8	Louisville area, KY	1993	—	4:00–6:00 p.m.	62	11	27	38	2,875	Barton-Aschman Assoc.
2.4	Louisville area, KY	1993	—	4:00–6:00 p.m.	58	13	29	42	2,655	Barton-Aschman Assoc.
4.2	Louisville area, KY	1993	61	4:00–6:00 p.m.	58	26	16	42	2,300	Barton-Aschman Assoc.
2.6	Crestwood, KY	1993	68	4:00–6:00 p.m.	67	15	18	33	950	Barton-Aschman Assoc.
3.7	Louisville area, KY	1993	70	4:00–6:00 p.m.	61	16	23	39	2,175	Barton-Aschman Assoc.
3.0	New Albany, IN	1993	80	4:00–6:00 p.m.	65	15	20	35	1,165	Barton-Aschman Assoc.
2.3	Louisville, KY	1993	67	4:00–6:00 p.m.	57	16	27	43	1,954	Barton-Aschman Assoc.
2.2	New Albany, IN	1993	115	4:00–6:00 p.m.	48	16	36	52	820	Barton-Aschman Assoc.
3.6	Louisville area, KY	1993	60	4:00–6:00 p.m.	56	17	27	44	2,505	Barton-Aschman Assoc.
2.6	Seminole Co., FL	1989	82	4:00–6:00 p.m.	73	20	7	27	—	Tipton Associates Inc.
2.6	Seminole Co., FL	1989	98	4:00–6:00 p.m.	81	15	4	19	—	Tipton Associates Inc.
2.6	Seminole Co., FL	1989	115	4:00–6:00 p.m.	69	16	15	31	—	Tipton Associates Inc.
2.6	Volusia Co., FL	1989	98	4:00–6:00 p.m.	74	15	11	26	—	Tipton Associates Inc.
2.4	Volusia Co., FL	1989	38	4:00–6:00 p.m.	74	24	2	26	—	Tipton Associates Inc.
2.7	Volusia Co., FL	1989	82	4:00–6:00 p.m.	87	8	5	13	—	Tipton Associates Inc.
2.6	Seminole Co., FL	1989	99	2:00–4:00 p.m.	64	28	8	36	—	Tipton Associates Inc.
2.4	Volusia Co., FL	1989	38	2:00–4:00 p.m.	68	21	11	32	—	Tipton Associates Inc.

Average Pass-By Trip Percentage: 66
"—" means no data were provided

Table E.32 Pass-By and Non-Pass-By Trips Weekday, PM Peak Period
Land Use Code 934—Fast-Food Restaurant with Drive-Through Window

SEATS	SIZE (1,000 SQ. FT. GFA)	LOCATION	WEEKDAY SURVEY DATE	NO. OF INTERVIEWS	TIME PERIOD	PASS-BY TRIP (%)	NON-PASS-BY TRIPS (%)			ADJ. STREET PEAK HOUR VOLUME	SOURCE
							PRIMARY	DIVERTED	TOTAL		
—	~2.6	Minn-St. Paul, MN	1987	50	3:00–7:00 p.m.	25	27	48	75	—	—
—	<5.0	Chicago suburbs, IL	1987	80	3:00–6:00 p.m.	38	—	—	62	—	Kenig, O'Hara, Humes, Flock
—	<5.0	Chicago suburbs, IL	1987	100	3:00–6:00 p.m.	55	—	—	45	—	Kenig, O'Hara, Humes, Flock
—	<5.0	Chicago suburbs, IL	1987	159	3:00–6:00 p.m.	56	—	—	44	—	Kenig, O'Hara, Humes, Flock
—	<5.0	Chicago suburbs, IL	1987	225	3:00–6:00 p.m.	48	—	—	52	—	Kenig, O'Hara, Humes, Flock
—	<5.0	Chicago suburbs, IL	1987	88	3:00–6:00 p.m.	35	—	—	65	—	Kenig, O'Hara, Humes, Flock
—	<5.0	Chicago suburbs, IL	1987	84	3:00–6:00 p.m.	44	—	—	56	—	Kenig, O'Hara, Humes, Flock
88	1.3	Louisville area, KY	1993	—	4:00–6:00 p.m.	68	22	10	32	2,055	Barton-Aschman Assoc.
120	1.9	Louisville area, KY	1993	33	4:00–6:00 p.m.	67	24	9	33	2,447	Barton-Aschman Assoc.
87	4.2	New Albany, IN	1993	—	4:00–6:00 p.m.	56	25	19	44	1,632	Barton-Aschman Assoc.
150	3.0	Louisville area, KY	1993	—	4:00–6:00 p.m.	31	31	38	69	4,250	Barton-Aschman Assoc.
—	3.1	Kissimmee, FL	1995	28	2:00–6:00 p.m.	71	—	—	29	—	TPD Inc.
—	3.1	Apopka, FL	1996	29	2:00–6:00 p.m.	38	—	—	62	—	TPD Inc.
—	2.8	Winter Springs, FL	1995	47	2:00–6:00 p.m.	66	—	—	34	—	TPD Inc.
—	4.3	Longwood, FL	1994	304	2:00–6:00 p.m.	62	—	—	38	—	TPD Inc.
—	3.2	Altamonte Springs, FL	1996	202	2:00–6:00 p.m.	40	39	21	60	—	TPD Inc.
—	2.9	Winter Park, FL	1996	271	2:00–6:00 p.m.	41	41	18	59	—	TPD Inc.
—	3.3*	several	1996	varies	4:00–6:00 p.m.	62	—	—	38	—	Oracle Engineering

*Average of several combined studies.
Average Pass-By Trip Percentage: 50
"—" means no data were provided

Table E.38 Pass-By and Non-Pass-By Trips Weekday, PM Peak Period Land Use Code 945—Gasoline/Service Station with Convenience Market

SIZE (1,000 SQ. FT. GFA)	VEHICLE FUELING POSITIONS	LOCATION	WEEKDAY SURVEY DATE	NO. OF INTERVIEWS	TIME PERIOD	PASS-BY TRIP (%)	NON-PASS-BY TRIPS (%)			ADJ. STREET PEAK HOUR VOLUME	SOURCE
							PRIMARY	DIVERTED	TOTAL		
0.8	8	Louisville area, KY	1993	83	4:00–6:00 p.m.	52	8	40	48	4,965	Barton-Aschman Assoc.
0.6	8	Louisville, KY	1993	60	4:00–6:00 p.m.	53	20	27	47	1,491	Barton-Aschman Assoc.
0.7	10	Louisville, KY	1993	—	4:00–6:00 p.m.	57	19	24	43	1,812	Barton-Aschman Assoc.
0.7	8	Louisville area, KY	1993	—	4:00–6:00 p.m.	72	7	21	28	2,657	Barton-Aschman Assoc.
0.7	10	Louisville area, KY	1993	—	4:00–6:00 p.m.	55	16	29	45	2,657	Barton-Aschman Assoc.
0.8	8	Silver Spring, MD	1992	36	4:00–6:00 p.m.	67	14	19	33	3,095	RBA
0.4	8	Derwood, MD	1992	46	4:00–6:00 p.m.	46	11	43	54	3,770	RBA
2.1	8	Kensington, MD	1992	31	4:00–6:00 p.m.	52	13	35	48	1,785	RBA
1	8	Silver Spring, MD	1992	35	4:00–6:00 p.m.	54	3	43	46	7,080	RBA

Average Pass-By Trip Percentage: 56
"—" means no data were provided

Tab 9. Answers

Example 2: Applying FDOT Generalized Tables

For the following examples use the 12/18/12 FDOT Generalized Service Volume Tables to determine the LOS along the roadway segments.

1. What is the LOS of a roadway that has an Annual Average Daily Traffic (AADT) volume of 30,000. The roadway is a 4-lane divided state signalized arterial in an urbanized area with a posted speed limit of 50 mph.
   Answer: C

2. What is the LOS of a roadway that has an Annual Average Daily Traffic (AADT) volume of 37,900. The roadway is a 4-lane undivided state signalized arterial in an urbanized area with a posted speed limit of 50 mph with exclusive left lanes.
   Answer: F

3. What is the LOS of a roadway that has an Annual Average Daily Traffic (AADT) volume of 65,100. The roadway is a 6-lane freeway in a transition area with auxiliary lanes present in both directions.
   Answer: B

4. What is the LOS of a roadway that has a Peak Hour directional volume of 1,530. The roadway is a 4-lane divided Highway located in a Rural Undeveloped Area.
   Answer: C

5. What is the LOS of a roadway that has a Peak Hour Two-Way volume of 2,500. The roadway is a 4-lane divided Non-State Signalized Roadway with a posted speed limit of 30 mph located in a transition area.
   Answer: E

6. What is the LOS of a roadway that has an Annual Average Daily Traffic (AADT) volume of 45,000. The roadway is a 6-lane divided state signalized arterial in an urbanized area with a posted speed limit of 50 mph.
   Answer: C

Example 3: Rate Vs Equation

For the following examples use the flow chart from the ITE Trip Generation Handbook to determine for each case study if the fitted curve (equation) or average rate should be used to estimate trips, or if local data should be collected. Then calculate the trips.

1. Estimate the trip generation for Land Use Code 140 (Manufacturing) on a weekday during the PM peak hour of adjacent street traffic as a function of gross floor area (GFA). Assume the site will have 800,000 sq. ft. of GFA.
   Method: Weighted Average Answer: =800 * 0.67 = 536

2. Estimate trip generation for Land Use Code 310 (Hotel) on weekday during the PM peak hour of the adjacent street traffic as a function of employees. For this example, assume the hotel will have 100 employees.
   Method: Weighted Average Answer: 100*0.89 = 89

3. Estimate the daily trip generation for Land Use Code 520 (Elementary School) on a weekday during the PM peak hour for adjacent street traffic as a function of employees. For this example, assume 70 employees.
   Method: Weighted Average Answer: = 70*1.78 = 125

4. Estimate trip generation for Land Use Code 813 (Free-Standing Discount Superstore) on a weekday during the AM peak hour of adjacent street traffic as a function of gross floor area. For this example, assume the store size will be 180,000 sq. ft. of GFA.
   Method: Weighted Average Answer: = 1.85 * 180 = 333

5. Estimate trip generation for Land Use Code 210 (Single-Family Detached Housing) on a weekday during the PM peak hour of adjacent street traffic as a function of Dwelling Units. For this example, assume the number of units is 300.
   Method: Fitted Curve Answer: Ln(T) = 0.96 Ln(X) + 0.20 = 292

6. Estimate trip generation for Land Use Code 090 (Park-and-Ride Lot with Bus or Light Rail Service) on a weekday during the AM peak hour of adjacent street traffic as a function of Parking Spaces. For this example, assume the number of spaces to be 50.
   Method: Fitted Curve Answer: Ln(T) =0.85 Ln(X) – 0.07 = 26

7. Estimate trip generation for Land Use Code 445 (Multiplex Movie Theater) on a weekday during the PM peak hour of adjacent street traffic as a function of Screens. For this example, assume the number of screens to be 20.
   Method: Collect Local Data Answer: _____

Example 4: Internal Capture | 2 Land Uses

KEY

GROSS TRIP GENERATION

	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
		Enter	Exit	Enter	Exit	Enter	Exit
INPUT	Office						
	Retail					180	150
	Restaurant					45	40
	Cinema/Entertainment						
	Residential						
	Hotel						
	Total					225	190

INTERNAL TRIPS (Minimums)

	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
		Enter	Exit	Enter	Exit	Enter	Exit
OUTPUT	Office						
	Retail					16	13
	Restaurant					13	16
	Cinema/Entertainment						
	Residential						
	Hotel						
	Total					29	29
	% Reduction					14.0%	

EXTERNAL TRIPS

	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
		Enter	Exit	Enter	Exit	Enter	Exit
OUTPUT	Office						
	Retail					164	137
	Restaurant					32	24
	Cinema/Entertainment						
	Residential						
	Hotel						

	Table 6.1 Unconstrained Internal Person Trip Capture Rates for Trip Origins within a Mixed-Use Development (P.M. Peak Hour)						
P.M. PEAK	Origin Land Use	Destination Land Use					From ITE Trip Generation Handbook
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office		20%	4%	0%	2%	0%
	Retail	2%		29%	4%	26%	5%
	Restaurant	3%	41%		8%	18%	7%
	Cinema/Entertainment	2%	21%	31%		8%	2%
	Residential	4%	42%	21%	0%		3%
	Hotel	0%	16%	68%	0%	2%	

	Table 6.2 Unconstrained Internal Person Trip Capture Rates for Trip Destinations within a Mixed-Use Development (P.M. Peak Hour)						
P.M. PEAK	Origin Land Use	Destination Land Use					From ITE Trip Generation Handbook
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office		8%	2%	1%	4%	0%
	Retail	31%		29%	26%	46%	17%
	Restaurant	30%	50%		32%	16%	71%
	Cinema/Entertainment	6%	4%	3%		4%	1%
	Residential	57%	10%	14%	0%		12%
	Hotel	0%	2%	5%	0%	0%	

*** BASED ON EXIT ***								
P.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Exit trips multiplied by the Origin percentages
	Office							
	Retail			44				
	Restaurant		16					
	Cinema/Entertainment							
	Residential							
	Hotel							

*** BASED ON ENTER ***								
P.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Enter trips multiplied by the Destination percentages
	Office							
	Retail			13				
	Restaurant		90					
	Cinema/Entertainment							
	Residential							
	Hotel							

*** MINIMUM ***								
P.M. PEAK	**(Exit) Land Use**	**(Enter) Land Use**						**Total Exit**
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	
	Office							
	Retail			13				13
	Restaurant		16					16
	Cinema/Entertainment							
	Residential							
	Hotel							
	Total Enter		16	13				

Example 5: Internal Capture | 2 Land Uses

KEY

GROSS TRIP GENERATION

INPUT

Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
	Enter	Exit	Enter	Exit	Enter	Exit
Office					18	98
Retail						
Restaurant						
Cinema/Entertainment						
Residential					315	185
Hotel						
Total					333	283

INTERNAL TRIPS (Minimums)

OUTPUT

Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
	Enter	Exit	Enter	Exit	Enter	Exit
Office					7	2
Retail						
Restaurant						
Cinema/Entertainment						
Residential					2	7
Hotel						
Total					9	9
% Reduction					2.9%	

EXTERNAL TRIPS

OUTPUT

Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
	Enter	Exit	Enter	Exit	Enter	Exit
Office					11	96
Retail					0	0
Restaurant					0	0
Cinema/Entertainment					0	0
Residential					313	178
Hotel					0	0

	Table 6.1 Unconstrained Internal Person Trip Capture Rates for Trip Origins within a Mixed-Use Development (P.M. Peak Hour)						
P.M. PEAK	Origin Land Use	Destination Land Use					From ITE Trip Generation Handbook
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office		20%	4%	0%	2%	0%
	Retail	2%		29%	4%	26%	5%
	Restaurant	3%	41%		8%	18%	7%
	Cinema/Entertainment	2%	21%	31%		8%	2%
	Residential	4%	42%	21%	0%		3%
	Hotel	0%	16%	68%	0%	2%	

	Table 6.2 Unconstrained Internal Person Trip Capture Rates for Trip Destinations within a Mixed-Use Development (P.M. Peak Hour)						
P.M. PEAK	Origin Land Use	Destination Land Use					From ITE Trip Generation Handbook
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office		8%	2%	1%	4%	0%
	Retail	31%		29%	26%	46%	17%
	Restaurant	30%	50%		32%	16%	71%
	Cinema/Entertainment	6%	4%	3%		4%	1%
	Residential	57%	10%	14%	0%		12%
	Hotel	0%	2%	5%	0%	0%	

*** BASED ON EXIT ***								
P.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Exit trips multiplied by the Origin percentages
	Office					2		
	Retail							
	Restaurant							
	Cinema/Entertainment							
	Residential	7						
	Hotel							

*** BASED ON ENTER ***								
P.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Enter trips multiplied by the Destination percentages
	Office					13		
	Retail							
	Restaurant							
	Cinema/Entertainment							
	Residential	10						
	Hotel							

*** MINIMUM ***								
P.M. PEAK	**(Exit) Land Use**	**(Enter) Land Use**						**Total Exit**
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	
	Office					2		2
	Retail							
	Restaurant							
	Cinema/Entertainment							
	Residential	7						7
	Hotel							
	Total Enter	7				2		

Example 6: Internal Capture | 3 Land Uses

KEY

GROSS TRIP GENERATION

	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
		Enter	Exit	Enter	Exit	Enter	Exit
INPUT	Office					56	294
	Retail					186	178
	Restaurant						
	Cinema/Entertainment						
	Residential					189	111
	Hotel						
	Total					431	583

INTERNAL TRIPS (Minimums)

	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
		Enter	Exit	Enter	Exit	Enter	Exit
OUTPUT	Office					8	21
	Retail					34	50
	Restaurant						
	Cinema/Entertainment						
	Residential					52	23
	Hotel						
	Total					94	94
	% Reduction					18.5%	

EXTERNAL TRIPS

	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
		Enter	Exit	Enter	Exit	Enter	Exit
OUTPUT	Office					48	273
	Retail					152	128
	Restaurant						
	Cinema/Entertainment						
	Residential					137	88
	Hotel						

	Table 6.1 Unconstrained Internal Person Trip Capture Rates for Trip Origins within a Mixed-Use Development (P.M. Peak Hour)						
P.M. PEAK	Origin Land Use	Destination Land Use					From ITE Trip Generation Handbook
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office		20%	4%	0%	2%	0%
	Retail	2%		29%	4%	26%	5%
	Restaurant	3%	41%		8%	18%	7%
	Cinema/Entertainment	2%	21%	31%		8%	2%
	Residential	4%	42%	21%	0%		3%
	Hotel	0%	16%	68%	0%	2%	

	Table 6.2 Unconstrained Internal Person Trip Capture Rates for Trip Destinations within a Mixed-Use Development (P.M. Peak Hour)						
P.M. PEAK	Origin Land Use	Destination Land Use					From ITE Trip Generation Handbook
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office		8%	2%	1%	4%	0%
	Retail	31%		29%	26%	46%	17%
	Restaurant	30%	50%		32%	16%	71%
	Cinema/Entertainment	6%	4%	3%		4%	1%
	Residential	57%	10%	14%	0%		12%
	Hotel	0%	2%	5%	0%	0%	

*** BASED ON EXIT ***								
P.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Exit trips multiplied by the Origin percentages
	Office		59			6		
	Retail	4				46		
	Restaurant							
	Cinema/Entertainment							
	Residential	4	47					
	Hotel							

*** BASED ON ENTER ***								
P.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Enter trips multiplied by the Destination percentages
	Office		15			8		
	Retail	17				87		
	Restaurant							
	Cinema/Entertainment							
	Residential	32	19					
	Hotel							

*** MINIMUM ***								
P.M. PEAK	**(Exit) Land Use**	**(Enter) Land Use**						**Total Exit**
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	
	Office		15			6		21
	Retail	4				46		50
	Restaurant							
	Cinema/Entertainment							
	Residential	4	19					23
	Hotel							
	Total Enter	8	34			52		

Example 7: Internal Capture | 3 Land Uses

KEY

GROSS TRIP GENERATION

	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
		Enter	Exit	Enter	Exit	Enter	Exit
INPUT	Office					56	60
	Retail						
	Restaurant					40	20
	Cinema/Entertainment						
	Residential					284	217
	Hotel						
	Total					380	296

INTERNAL TRIPS (Minimums)

	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
		Enter	Exit	Enter	Exit	Enter	Exit
OUTPUT	Office					10	2
	Retail						
	Restaurant					7	5
	Cinema/Entertainment						
	Residential					5	15
	Hotel						
	Total					22	22
	% Reduction					6.5%	

EXTERNAL TRIPS

	Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
		Enter	Exit	Enter	Exit	Enter	Exit
OUTPUT	Office					46	58
	Retail						
	Restaurant					33	15
	Cinema/Entertainment						
	Residential					279	202
	Hotel						

	Table 6.1 Unconstrained Internal Person Trip Capture Rates for Trip Origins within a Mixed-Use Development (P.M. Peak Hour)						
P.M. PEAK	Origin Land Use	Destination Land Use					From ITE Trip Generation Handbook
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office		20%	4%	0%	2%	0%
	Retail	2%		29%	4%	26%	5%
	Restaurant	3%	41%		8%	18%	7%
	Cinema/Entertainment	2%	21%	31%		8%	2%
	Residential	4%	42%	21%	0%		3%
	Hotel	0%	16%	68%	0%	2%	

	Table 6.2 Unconstrained Internal Person Trip Capture Rates for Trip Destinations within a Mixed-Use Development (P.M. Peak Hour)						
P.M. PEAK	Origin Land Use	Destination Land Use					From ITE Trip Generation Handbook
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office		8%	2%	1%	4%	0%
	Retail	31%		29%	26%	46%	17%
	Restaurant	30%	50%		32%	16%	71%
	Cinema/Entertainment	6%	4%	3%		4%	1%
	Residential	57%	10%	14%	0%		12%
	Hotel	0%	2%	5%	0%	0%	

*** BASED ON EXIT ***								
P.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Exit trips multiplied by the Origin percentages
	Office			2		1		
	Retail							
	Restaurant	1				4		
	Cinema/Entertainment							
	Residential	9		45				
	Hotel							

*** BASED ON ENTER ***								
P.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Enter trips multiplied by the Destination percentages
	Office			1		11		
	Retail							
	Restaurant	17				45		
	Cinema/Entertainment							
	Residential	32		6				
	Hotel							

*** MINIMUM ***								
P.M. PEAK	**(Exit) Land Use**	**(Enter) Land Use**						**Total Exit**
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	
	Office			1		1		2
	Retail							
	Restaurant	1				4		5
	Cinema/Entertainment							
	Residential	9		6				15
	Hotel							
	Total Enter	10		7		5		

Example 8: Pass-By-Trips

For the following examples use the provided pass-by pages from the ITE handbook to determine the pass-by percentage.

1. Land Use Code 813 – Free Standing Discount Superstore, Saturday, Mid-Day Peak Period.
   Answer: 21%

2. Land Use Code 853 – Convenience Market with Gasoline Pumps, Weekday, PM Peak Period.
   Answer: 66%

3. Land Use Code 934 – Fast-Food Restaurant with Drive – Through Window, Weekday, PM Peak Period.
   Answer: 50%

4. Land Use Code 945 – Gasoline/Service Station with Convenience Market, Weekday, PM Peak Period.
   Answer: 56%

For the following example apply pass by. The land use is a fast-food restaurant with a drive through window. The PM peak hour od adjacent street traffic is being analyzed. Fill in the blank:

Land Use	**Land Use Code**	**Independent Variable**	**Average Rate**	**Total Trip**	**Entering Trips**	**Exiting Trips**
Fast-Food Restaurant with Drive-Through	934	1,200 ft^2	32.67	39	20	19
Pass By				20	10	10
External Trips New to the System				19	10	9

Workbook Example Analysis 1

MIXED USE DEVELOPMENT SEGMENT ANALYSIS
ANSWER KEY

Proposed Land uses:

Convenience Market with Gasoline Pumps (8 pumps)
General Office (100,000 square feet)
High-Turnover (Sit-Down) (5,700)
Fast-Food Restaurant with Drive-Through Window (7,500)

TRIP GENERATION

Trip Generation PM Peak Period Calculation						
Land use	Land Use Code	Independent Variable	Average Rate	Total Trips	Entering Trips	Exiting Trips
Convenience Market with Gasoline Pumps	853	16 fueling positions	23.04	368	184	184
General Office	710	100,000 ft^2	1.15	115	19	96
High-Turnover (Sit-Down) Restaurant	932	5,700 ft^2	9.77	56	35	21
Fast-Food Restaurant with Drive-Through Window	934	7,500 ft^2	32.67	245	127	118
			Gross Total Trips	**784**	365	419

INTERNAL CAPTURE REDUCTION

Through the methodology meeting it was determined that the internal capture reduction would be capped at 15%.

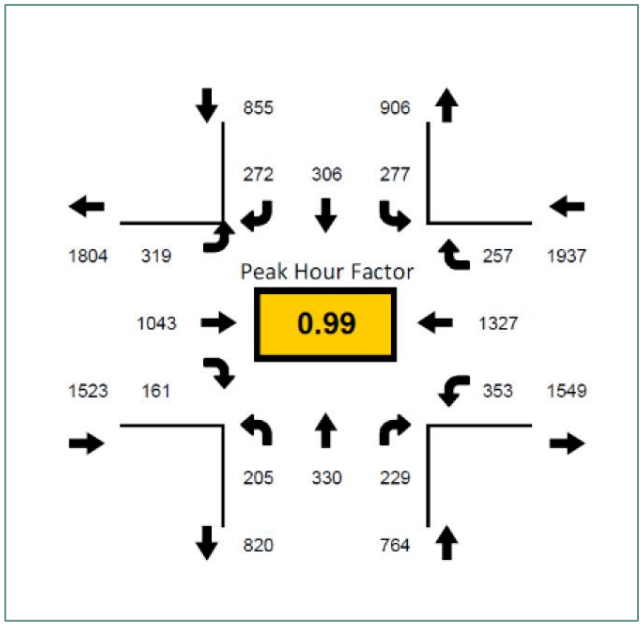
Land use	**Internal Capture Trips**		**External Trips**		
	Entering Trips	Exiting Trips	Entering Trips	Exiting Trips	Total Trips
Convenience Market with Gasoline Pumps	28	28	156	156	312
General Office	3	14	16	82	98
High-Turnover (Sit-Down) Restaurant	5	3	30	18	48
Fast-Food Restaurant with Drive-Through Window	19	18	108	100	208
Totals	55	63	310	356	666

PASS-BY TRAFFIC

Pass-By Reduction					
Land use	Land Use Code	Pass-By Trip Percentage	Total Pass-By Trips	Pass-By Entering Trips	Pass-By Exiting Trips
Convenience Market with Gasoline Pumps	853	66%	206	103	103
General Office	710	-	-	-	-
High-Turnover (Sit-Down) Restaurant	932	43%	21	10	11
Fast-Food Restaurant with Drive-Through Window	934	50%	104	52	52
Total Calculated Pass-By			331	165	166

Pass-By Check PM Peak:

North-South Roadway: 855+906 = 1,761
East-West Roadway: 1,523+1,804 = 3,327
Shared Volume: 319 + 272 = 591
1,761 + 3,327 – 591 = 4,497
10% of 4,497 = 450
The calculated pass-by is less/more?



Project Trip Summary			
	Total Trips	Entering Trips	Exiting Trips
Gross Total Trips	784	365	419
Internal Capture Reduction	118	55	63
External Trips	**666**	**310**	**356**
Pass-By Reduction	331	165	166
Net New External Trips	**335**	**145**	**190**

SEGMENT ANALYSIS

Segments that are significantly impacted by the proposed development will be analyzed. For this example, the roadways where the development traffic makes up 3% or more of the maximum service volume at the adopted level-of-service standard during the PM peak hour will be included in the analysis.

Segment Study Area Determination											
Roadway Segment	No. of Lanes	PHPD Serv. Vol	Project Dist.		Project Dir.		New Project Trips		% Significant		
			NB/ EB	SB/ WB	NB/ EB	SB/ WB	NB/ EB	SB/ WB	NB/ EB	SB/ WB	Study Segment
9th Street											
SR 50/Colonial Drive to Story Road	2	713	1%	1%	Out	In	2	1	0%	0%	No
Story Road to SR 438/Plant Street	2	713	3%	3%	Out	In	6	4	1%	1%	No
Dillard Street											
Beard Road to SR 50	4	1,530	11%	11%	In	Out	16	21	1%	1%	No
SR 50 to Project Entrance	4	1,530	15%	35%	In	Out	22	67	1%	4%	Yes
Project Entrance to SR 438	4	1,530	25%	25%	Out	In	48	36	3%	2%	Yes
SR 438 to Story Road	4	1,530	15%	15%	Out	In	29	22	2%	1%	No
Story Road to Book Street	4	1,530	10%	10%	Out	In	19	15	1%	1%	No

Segment Analysis									
Roadway Segment	No. of Lanes	PHPD Serv. Vol	2020 Background.		New Project Trips		Total Trips		Deficiency
			NB/ EB	SB/ WB	NB/ EB	SB/ WB	NB/EB	SB/WB	
Dillard Street									
SR 50 to Project Entrance	4	1,530	1,000	1,021	22	67	1,022	1,088	No
Project Entrance to SR 438	4	1,530	1,100	1,021	48	36	1,148	1,057	No

Workbook Example Analysis 2

KEY

Land Uses:

High Rise Apartment - 464 Units

Retail (Shopping Center) – 7,000 square feet

Analysis Period

AM Peak Hour

PM Peak Hour

Trip Generation

Fill in the table below and determine if you should use the equation or the rate and then calculate trip generation

	Available Trip Generation Average Rates and Equation						
	Land use	Land Use Code	Independent Variable	Average Rate	Equation	R^2	Method Used
AM	High-Rise Apartment	222	Units	0.31	T= 0.28(X) +12.86	0.90	Equation
	Retail (Shopping Center)	820	Square Feet	0.94	T= 0.50(X) +151.78	0.50	Equation
PM	High-Rise Apartment	222	Units	0.36	T = 0.34(X) +8.56	0.96	Equation
	Retail (Shopping Center)	820	Square Feet	3.81	Ln(T) = 0.74LN(X) + 2.89	0.82	Equation

Trip Generation – Used Rate for these for simplicity								
			AM			PM		
Land use	Land Use Code	Size and Units	IN	OUT	Total	IN	OUT	Total
High-Rise Apartment	222	464 Units	35	109	144	102	62	167
Retail (Shopping Center)	820	7,000 ft^2	4	3	7	13	14	27
Totals			39	112	151	115	79	194

Use attached Internal Capture Sheets

	AM Internal Trips		PM Internal Trips	
Land use	IN	OUT	IN	OUT
High-Rise Apartment	1	1	5	14
Retail (Shopping Center)	1	1	14	5

External Trips

AM Trips	**Trip Generation**		**Internal Trips**		**External Trips**		
Land use	IN	OUT	IN	OUT	IN	OUT	Total
High-Rise Apartment	35	105	1	1	34	104	-
Retail (Shopping Center)	19	12	1	1	18	11	-
Totals	54	117	2	2	52	115	-
PM Trips	**Trip Generation**		**Internal Trips**		**External Trips**		
Land use	IN	OUT	IN	OUT	IN	OUT	Total
High-Rise Apartment	98	63	5	14	93	49	-
Retail (Shopping Center)	48	53	14	5	34	48	-
Totals	146	116	18	18	127	97	-

Multimodal Reduction

Within the Central Business District (CBD) where the project is proposed, the recommended transit reduction is approximately 23 percent, and the recommended pedestrian reduction is 10 percent. Taken together, a 33 percent multimodal reduction was applied to the estimated number of external trips during both the morning and evening peak hours.

AM Trips	**External Trips**		**Multimodal Trips**		**Net New External Trips**		
Land use	IN	OUT	IN	OUT	IN	OUT	Total
High-Rise Apartment	34	104	11	34	23	70	-
Retail (Shopping Center)	18	11	6	4	12	7	-
Totals	52	115	17	38	35	77	-
PM Trips	**External Trips**		**Multimodal Trips**		**Net New External Trips**		
Land use	IN	OUT	IN	OUT	IN	OUT	Total
High-Rise Apartment	93	49	31	16	62	33	-
Retail (Shopping Center)	34	48	11	16	23	32	-
Totals	127	97	42	32	85	65	-

Workbook Example Analysis 2 | Internal Capture

GROSS TRIP GENERATION

INPUT

Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
	Enter	Exit	Enter	Exit	Enter	Exit
Office						
Retail			19	12	48	53
Restaurant						
Cinema/Entertainment						
Residential			35	105	98	63
Hotel						
Total			54	117	146	116

INTERNAL TRIPS (Minimums)

OUTPUT

Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
	Enter	Exit	Enter	Exit	Enter	Exit
Office						
Retail			1	1	5	14
Restaurant						
Cinema/Entertainment						
Residential			1	1	14	5
Hotel						
Total			2	2		
% Reduction			2.3%		14.5%	

EXTERNAL TRIPS

OUTPUT

Land Use	Daily		A.M. Peak Hour		P.M. Peak Hour	
	Enter	Exit	Enter	Exit	Enter	Exit
Office						
Retail			18	11	43	39
Restaurant						
Cinema/Entertainment						
Residential			34	104	84	58
Hotel						

Table 6.1 Unconstrained Internal Person Trip Capture Rates for Trip Origins within a Mixed-Use Development (P.M. Peak Hour)

A.M. PEAK	Origin Land Use	Destination Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	
	Office		28%	63%	0%	1%	0%	From ITE Trip Generation Handbook
	Retail	29%		13%	0%	14%	0%	
	Restaurant	31%	14%		0%	4%	3%	
	Cinema/Entertainment	0%	0%	0%		0%	0%	
	Residential	2%	1%	20%	0%		0%	
	Hotel	75%	14%	9%	0%	0%		

Table 6.2 Unconstrained Internal Person Trip Capture Rates for Trip Destinations within a Mixed-Use Development (P.M. Peak Hour)

A.M. PEAK	Origin Land Use	Destination Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	
	Office		32%	23%	0%	0%	0%	From ITE Trip Generation Handbook
	Retail	4%		50%	0%	2%	0%	
	Restaurant	14%	8%		0%	5%	4%	
	Cinema/Entertainment	0%	0%	0%		0%	0%	
	Residential	3%	17%	20%	0%		0%	
	Hotel	3%	4%	6%	0%	0%		

*** BASED ON EXIT ***								
A.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Exit trips multiplied by the Origin percentages
	Office							
	Retail					2		
	Restaurant							
	Cinema/Entertainment							
	Residential		1					
	Hotel							

*** BASED ON ENTER ***								
A.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Enter trips multiplied by the Destination percentages
	Office							
	Retail					1		
	Restaurant							
	Cinema/Entertainment							
	Residential		2					
	Hotel							

*** MINIMUM ***								
P.M. PEAK	**(Exit) Land Use**	**(Enter) Land Use**						**Total Exit**
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	
	Office							
	Retail					1		1
	Restaurant							
	Cinema/Entertainment							
	Residential		1					1
	Hotel							
	Total Enter		1			1		

	Table 6.1 Unconstrained Internal Person Trip Capture Rates for Trip Origins within a Mixed-Use Development (P.M. Peak Hour)						
P.M. PEAK	Origin Land Use	Destination Land Use					
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office		20%	4%	0%	2%	0%
	Retail	2%		29%	4%	26%	5%
	Restaurant	3%	41%		8%	18%	7%
	Cinema/Entertainment	2%	21%	31%		8%	2%
	Residential	4%	42%	21%	0%		3%
	Hotel	0%	16%	68%	0%	2%	

From ITE Trip Generation Handbook

	Table 6.2 Unconstrained Internal Person Trip Capture Rates for Trip Destinations within a Mixed-Use Development (P.M. Peak Hour)						
P.M. PEAK	Origin Land Use	Destination Land Use					
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel
	Office		8%	2%	1%	4%	0%
	Retail	31%		29%	26%	46%	17%
	Restaurant	30%	50%		32%	16%	71%
	Cinema/Entertainment	6%	4%	3%		4%	1%
	Residential	57%	10%	14%	0%		12%
	Hotel	0%	2%	5%	0%	0%	

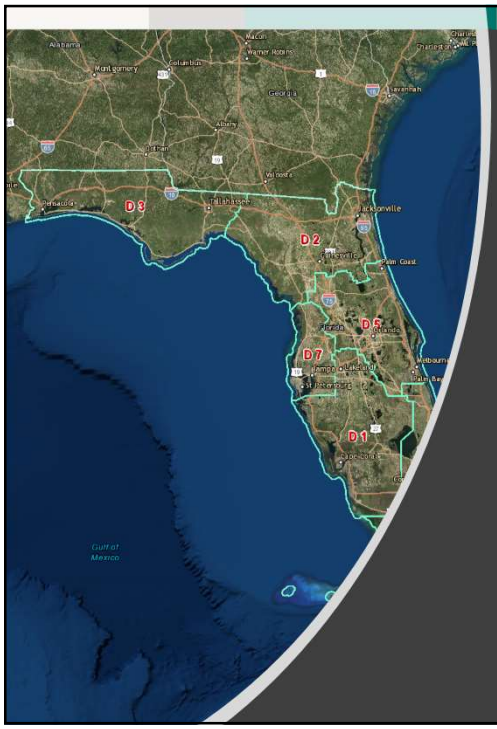
From ITE Trip Generation Handbook

*** BASED ON EXIT ***								
P.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Exit trips multiplied by the Origin percentages
	Office							
	Retail					14		
	Restaurant							
	Cinema/Entertainment							
	Residential		26					
	Hotel							

*** BASED ON ENTER ***								
P.M. PEAK	(Exit) Land Use	(Enter) Land Use						
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	Enter trips multiplied by the Destination percentages
	Office							
	Retail					45		
	Restaurant							
	Cinema/Entertainment							
	Residential		5					
	Hotel							

*** MINIMUM ***								
P.M. PEAK	**(Exit) Land Use**	**(Enter) Land Use**						**Total Exit**
		Office	Retail	Restaurant	Cinema/Ent.	Residential	Hotel	
	Office							
	Retail					14		14
	Restaurant							
	Cinema/Entertainment							
	Residential		5					5
	Hotel							
	Total Enter		5			14		

Tab 10. FDOT FTI Site



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Website

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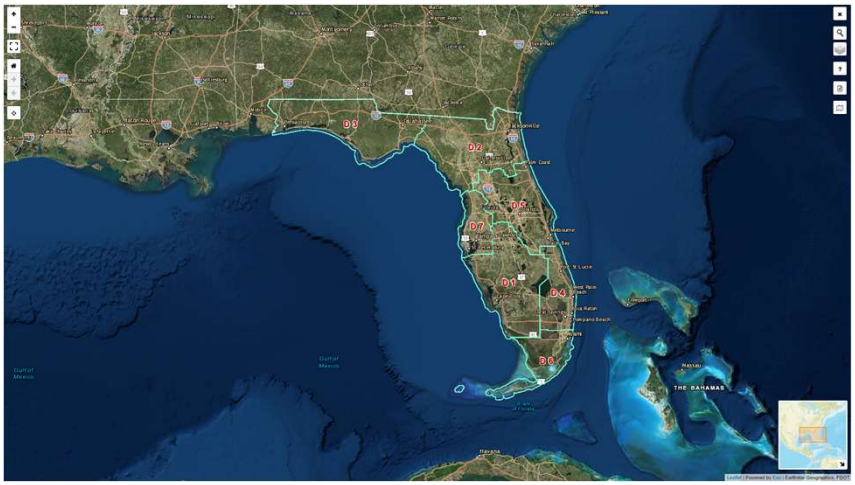
FDOT FTI Site |Original View



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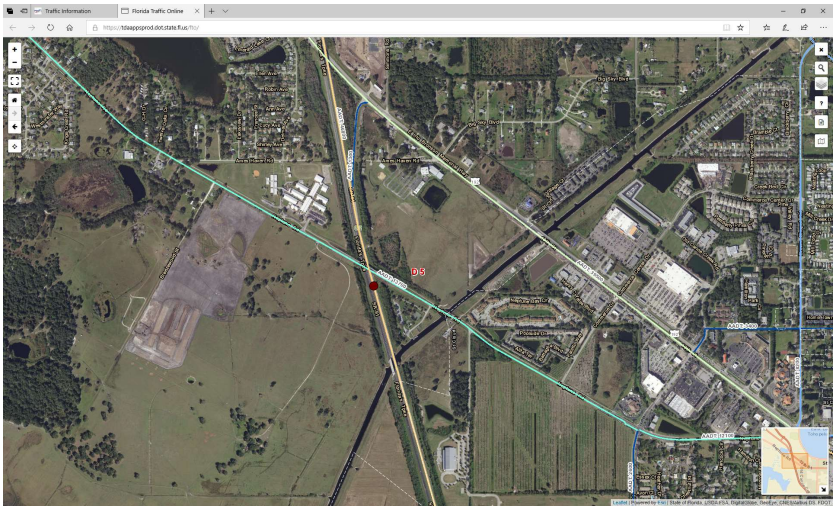
FDOT FTI Site | Zoom



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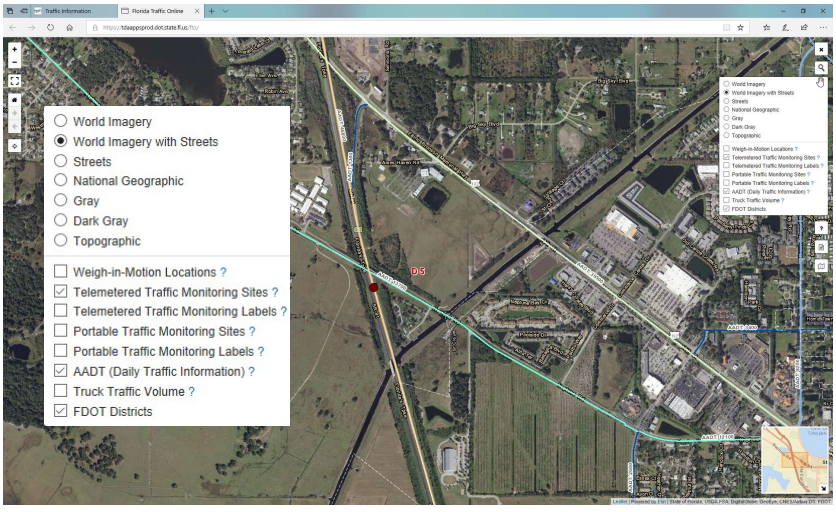
FDOT FTI Site | Layers



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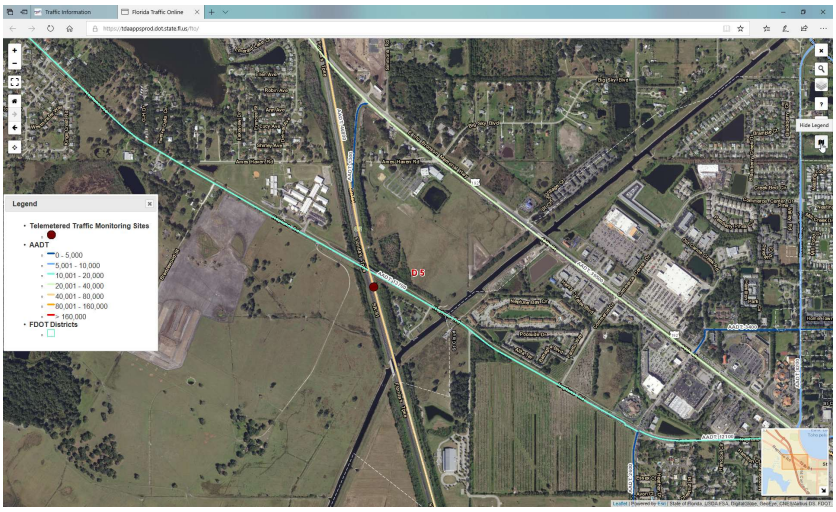
FDOT FTI Site | Legend



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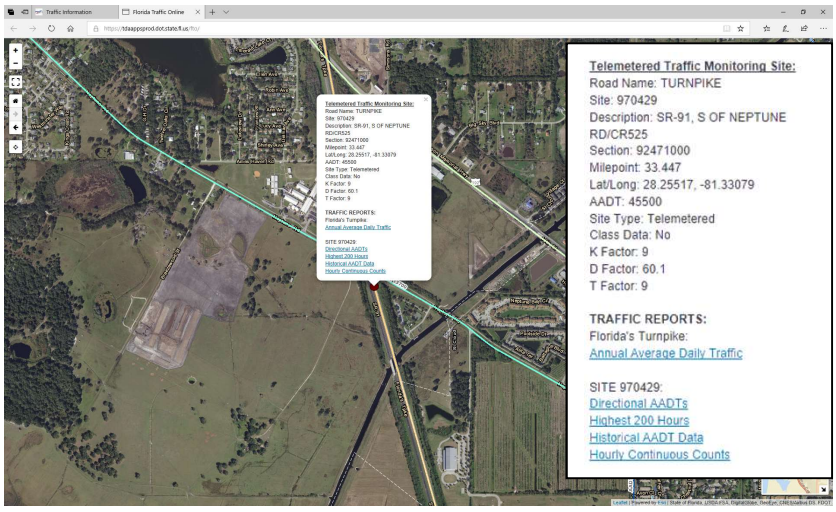
FDOT FTI Site |Data Window



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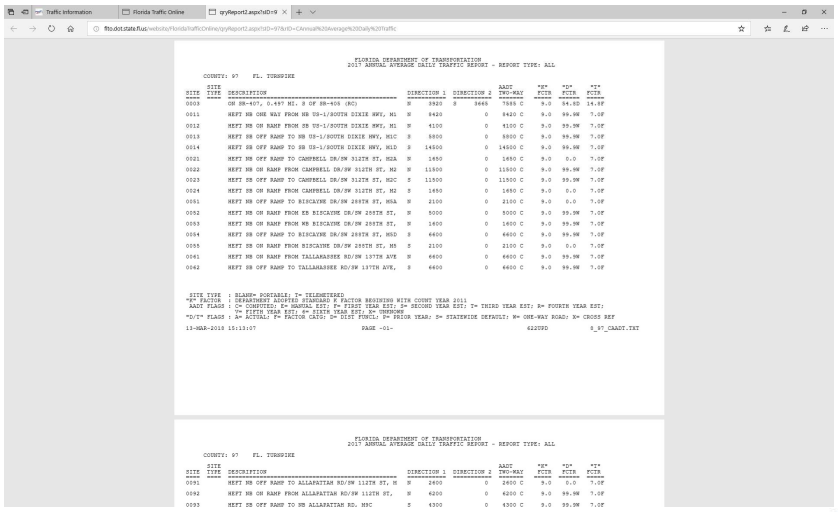
FDOT FTI Site | Reports



FLORIDA DEPARTMENT OF TRANSPORTATION
2017 ANNUAL AVERAGE DAILY TRAFFIC REPORT - REPORT TYPE: ALL

COUNTY: 97 FL. TURNPIKE

SITE	SITE TYPE	DESCRIPTION	DIRECTION 1	DIRECTION 2	AADT TWO-WAY	*K* FCTR	*D* FCTR	*T* FCTR
0003		ON SR-407, 0.497 MI. S OF SR-405 (RC)	N 3920	S 3665	7585 C	9.0	54.8D	14.8F
0011		NEFT NB ONE WAY FROM NB US-1/SOUTH DIXIE HWY, M1	N 8420	0	8420 C	9.0	99.9W	7.0F
0012		NEFT NB ON RAMP FROM SB US-1/SOUTH DIXIE HWY, M1	N 4100	0	4100 C	9.0	99.9W	7.0F
0013		NEFT SB OFF RAMP TO NB US-1/SOUTH DIXIE HWY, M1C	S 5800	0	5800 C	9.0	99.9W	7.0F
0014		NEFT SB OFF RAMP TO SB US-1/SOUTH DIXIE HWY, M1D	S 14500	0	14500 C	9.0	99.9W	7.0F
0021		NEFT NB OFF RAMP TO CAMPBELL DR/SW 312TH ST, M2A	N 1650	0	1650 C	9.0	0.0	7.0F
0022		NEFT NB ON RAMP FROM CAMPBELL DR/SW 312TH ST, M2	N 11500	0	11500 C	9.0	99.9W	7.0F
0023		NEFT SB OFF RAMP TO CAMPBELL DR/SW 312TH ST, M2C	S 11500	0	11500 C	9.0	99.9W	7.0F
0024		NEFT SB ON RAMP FROM CAMPBELL DR/SW 312TH ST, M2	S 1650	0	1650 C	9.0	0.0	7.0F
0051		NEFT NB OFF RAMP TO BISCAYNE DR/SW 288TH ST, M5A	N 2100	0	2100 C	9.0	0.0	7.0F
0052		NEFT NB ON RAMP FROM EB BISCAYNE DR/SW 288TH ST,	N 5000	0	5000 C	9.0	99.9W	7.0F
0053		NEFT NB ON RAMP FROM WB BISCAYNE DR/SW 288TH ST,	N 1400	0	1400 C	9.0	99.9W	7.0F
0054		NEFT SB OFF RAMP TO BISCAYNE DR/SW 288TH ST, M5D	S 6400	0	6400 C	9.0	99.9W	7.0F
0055		NEFT SB ON RAMP FROM BISCAYNE DR/SW 288TH ST, M5	S 2100	0	2100 C	9.0	0.0	7.0F
0061		NEFT NB ON RAMP FROM TALLAHASSEE RD/SW 197TH AVE	N 6600	0	6600 C	9.0	99.9W	7.0F
0062		NEFT NB OFF RAMP TO TALLAHASSEE RD/SW 197TH AVE,	N 6600	0	6600 C	9.0	99.9W	7.0F

SITE TYPE : BLANK= PORTABLE; T= TELEMETERED
"K" FACTOR : DEPARTMENT ADOPTED STANDARD K FACTOR BEGINNING WITH COUNT YEAR 2011
AADT FLAGS : C= COMPUTED; E= ESTIMATED; F= FIRST YEAR EST; S= SECOND YEAR EST; T= THIRD YEAR EST; R= FOURTH YEAR EST;
U= FIFTH YEAR EST; S= SIXTH YEAR EST; X= UNKNOWN
"D/T" FLAGS : A= ACTUAL; F= FACTOR CATG; D= DIST FUNCL; P= PRIOR YEAR; S= STATEWIDE DEFAULT; R= ONE-WAY ROAD; X= CROSS REF

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FLORIDA DEPARTMENT OF TRANSPORTATION
2017 ANNUAL AVERAGE DAILY TRAFFIC REPORT - REPORT TYPE: ALL

COUNTY: 97 FL. TURNPIKE

SITE	SITE TYPE	DESCRIPTION	DIRECTION 1	DIRECTION 2	AADT TWO-WAY	*K* FCTR	*D* FCTR	*T* FCTR
0091		NEFT NB OFF RAMP TO ALLAPATTAH RD/SW 112TH ST, M	N 2600	0	2600 C	9.0	0.0	7.0F
0092		NEFT NB ON RAMP FROM ALLAPATTAH RD/SW 112TH ST,	N 6200	0	6200 C	9.0	99.9W	7.0F
0093		NEFT SB OFF RAMP TO NB ALLAPATTAH RD. NSC	S 4300	0	4300 C	9.0	99.9W	7.0F

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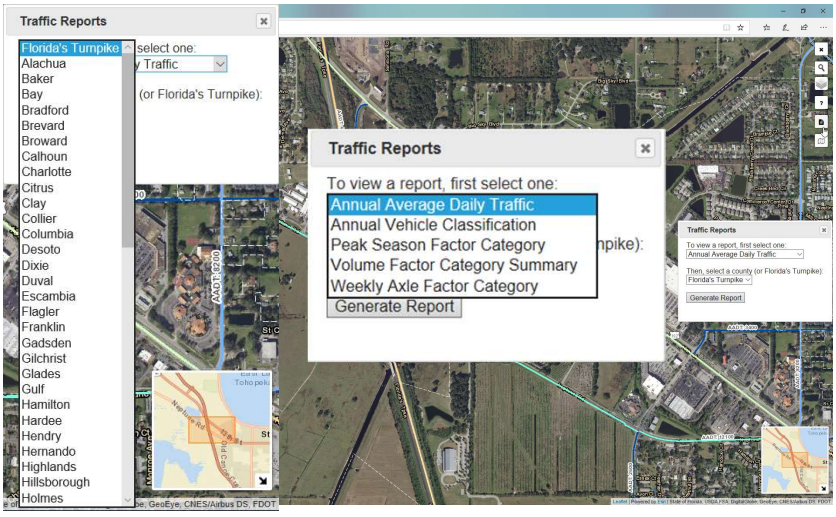

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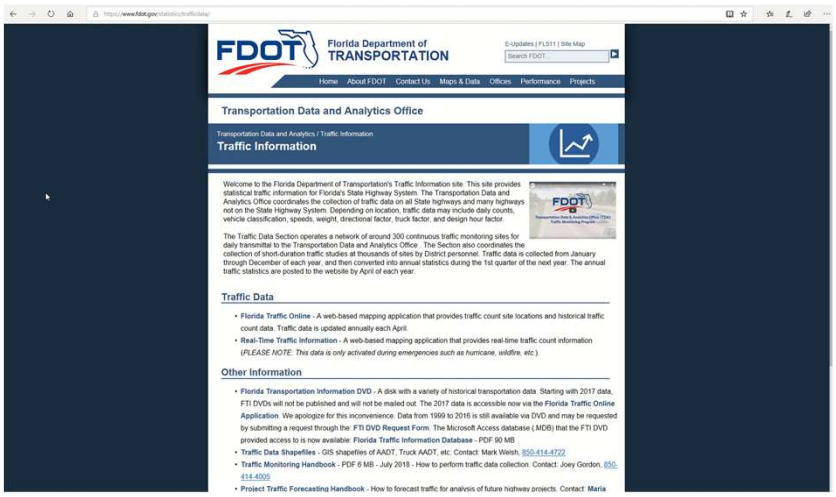

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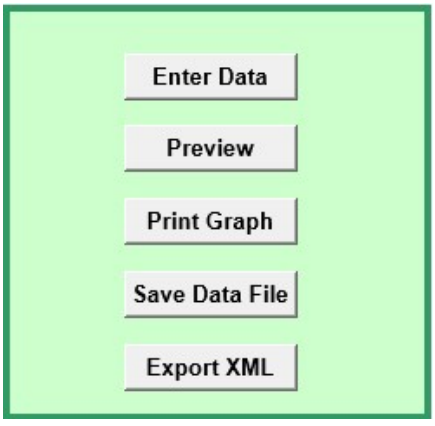

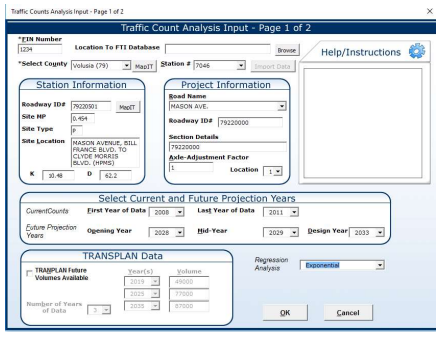

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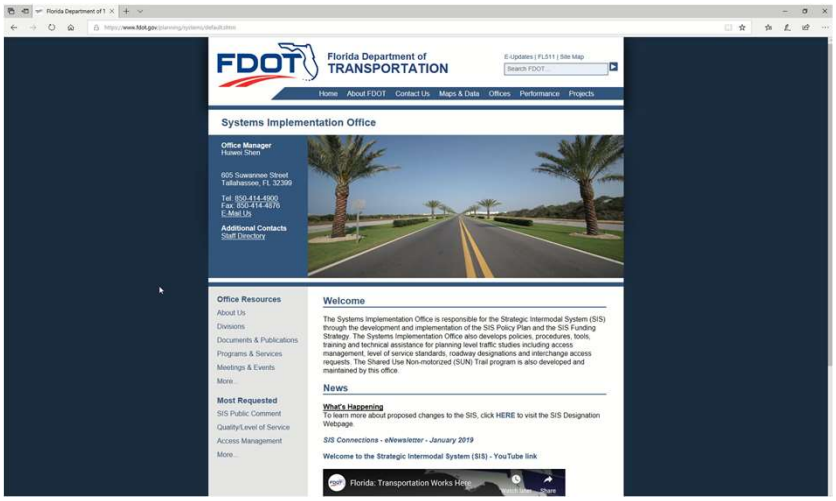
FDOT | Traffic Analysis Tool–V03.a



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