

# TOWN OF CUTLER BAY TRAFFIC IMPACT ANALYSIS METHODOLOGY



Calvin, Giordano & Associates, Inc.  
EXCEPTIONAL SOLUTIONS™

# OVERVIEW

- Background
- Discussion of Methodology
- Conclusions and Recommendations



# BACKGROUND

*The purpose is to provide a generally uniform methodology for identifying potential traffic impacts of new development and redevelopment on the transportation system in the Town of Cutler Bay (the Town). The intent is to identify the effect on road and intersection levels of service that is due solely to the project's impact, distinct from level of service issues that may currently exist or develop over time without the project.*



# BACKGROUND

- Currently traffic impact analysis methodology is negotiated at study outset.
- The different Town reviewers may differ in the analysis elements they require.
- The Methodology Guidelines provide a more predictable process and outcome.
- The intent is for Town staff to conduct the traffic impact analyses according to the guidelines.
- The guidelines rely on recognized analysis techniques and data sources.



# BACKGROUND

The Highway Capacity Manual 6<sup>th</sup> ed., March, 2016.

The National Academy of Sciences (NAS) was established by Congress in 1863 and is a private, nongovernmental institution to advise the nation on issues related to science and technology.

The Transportation Research Board (TRB) is one of seven major programs of the NAS. Its varied committees, task forces, and panels annually engage about 7,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia.

The TRB published the first Highway Capacity Manual (HCM) in 1950.



# BACKGROUND

The ITE Trip Generation Manual (10th ed.) and Trip Generation Handbook (3<sup>rd</sup> ed.),  
September 2017

The Institute of Transportation Engineers (ITE):

An international educational and scientific association of transportation professionals founded in 1930. Currently 17,000 members in 90 countries. ITE facilitates the application of technology and scientific principles.



# METHODOLOGY

## METHODOLOGY GUIDELINES MAJOR SECTIONS:

Trip Generation  
Distribution and Assignment  
Study Area Limits  
Analysis Scenarios  
Analysis Periods  
Data Collection  
Demand Volumes

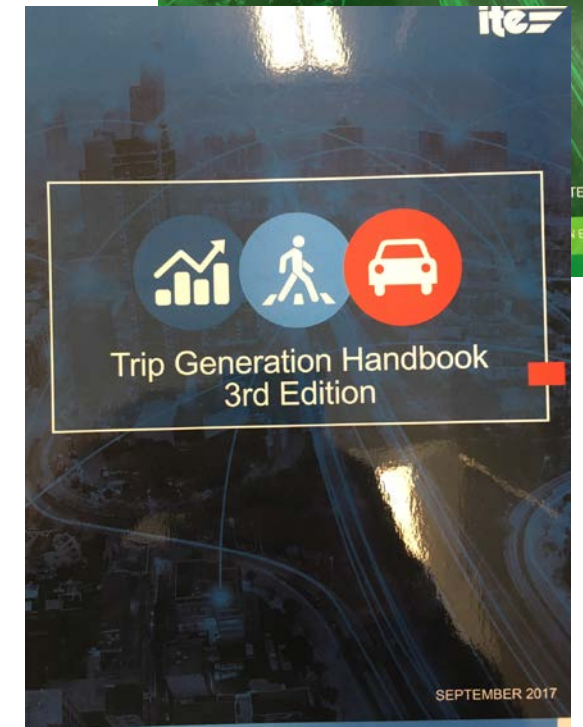
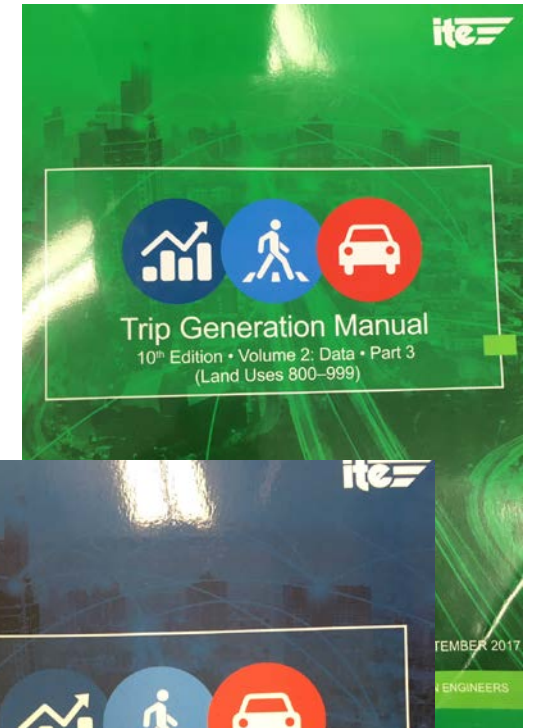
Level of Service Standards  
Roadway Segment Analysis  
Intersection Analysis  
Software  
Site Access  
Multimodal Considerations  
Mitigation of Impacts





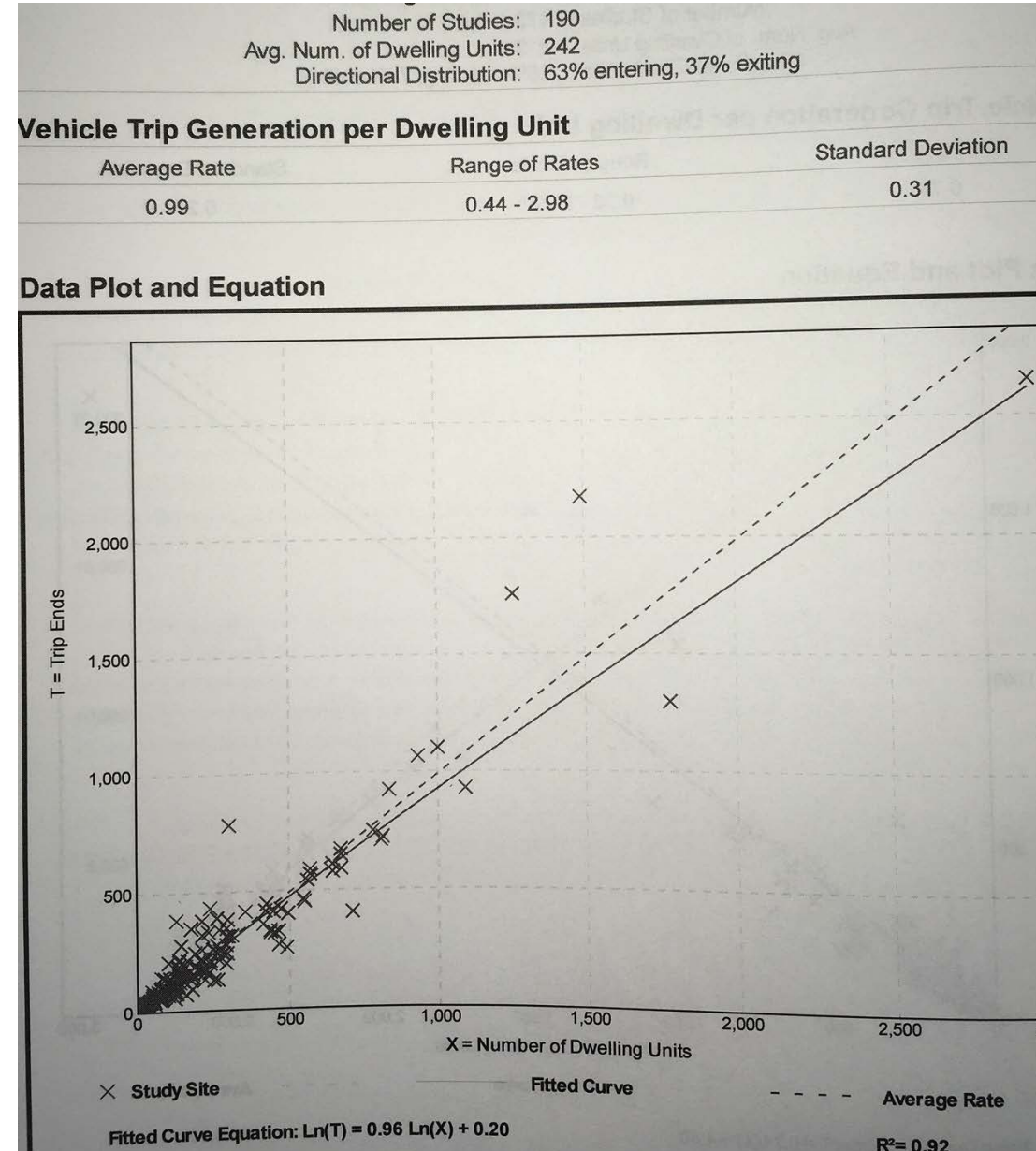
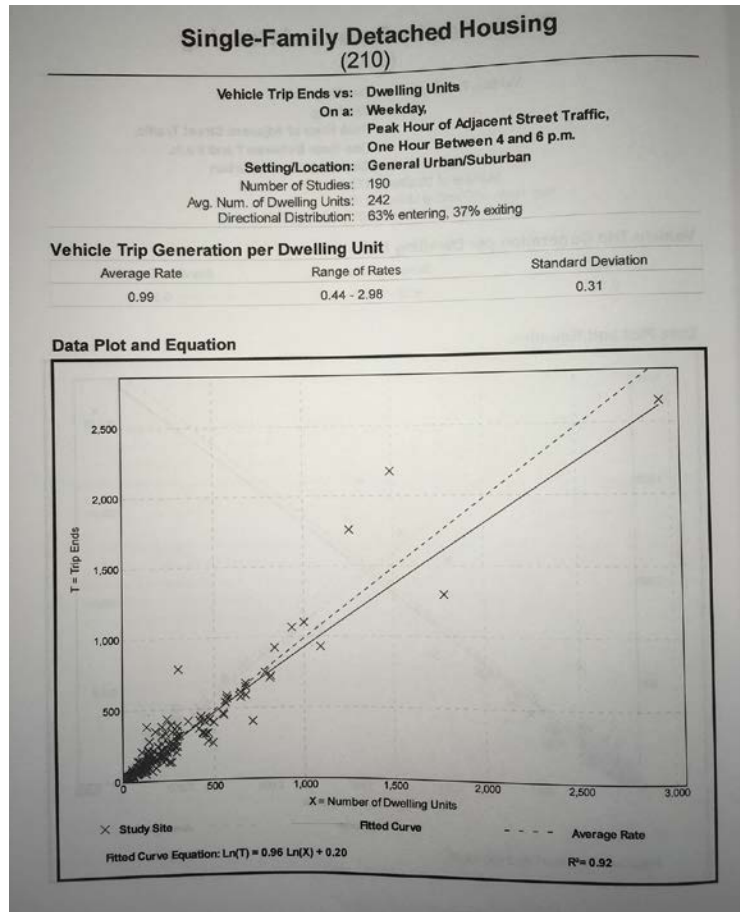
# TRIP GENERATION

- Latest edition of the ITE Trip Generation Manual and Trip Generation Handbook.
- Internal Capture allowed for complementary land uses.
- Pass-by Trip Capture allowed for certain restaurant and retail uses.
- **Diverted Trip Capture not allowed.**
- Non-ITE rates allowed if two sites within Miami-Dade County studied according to ITE guidelines.
- Credit given for trips from prior uses if operational in the last 12 months.

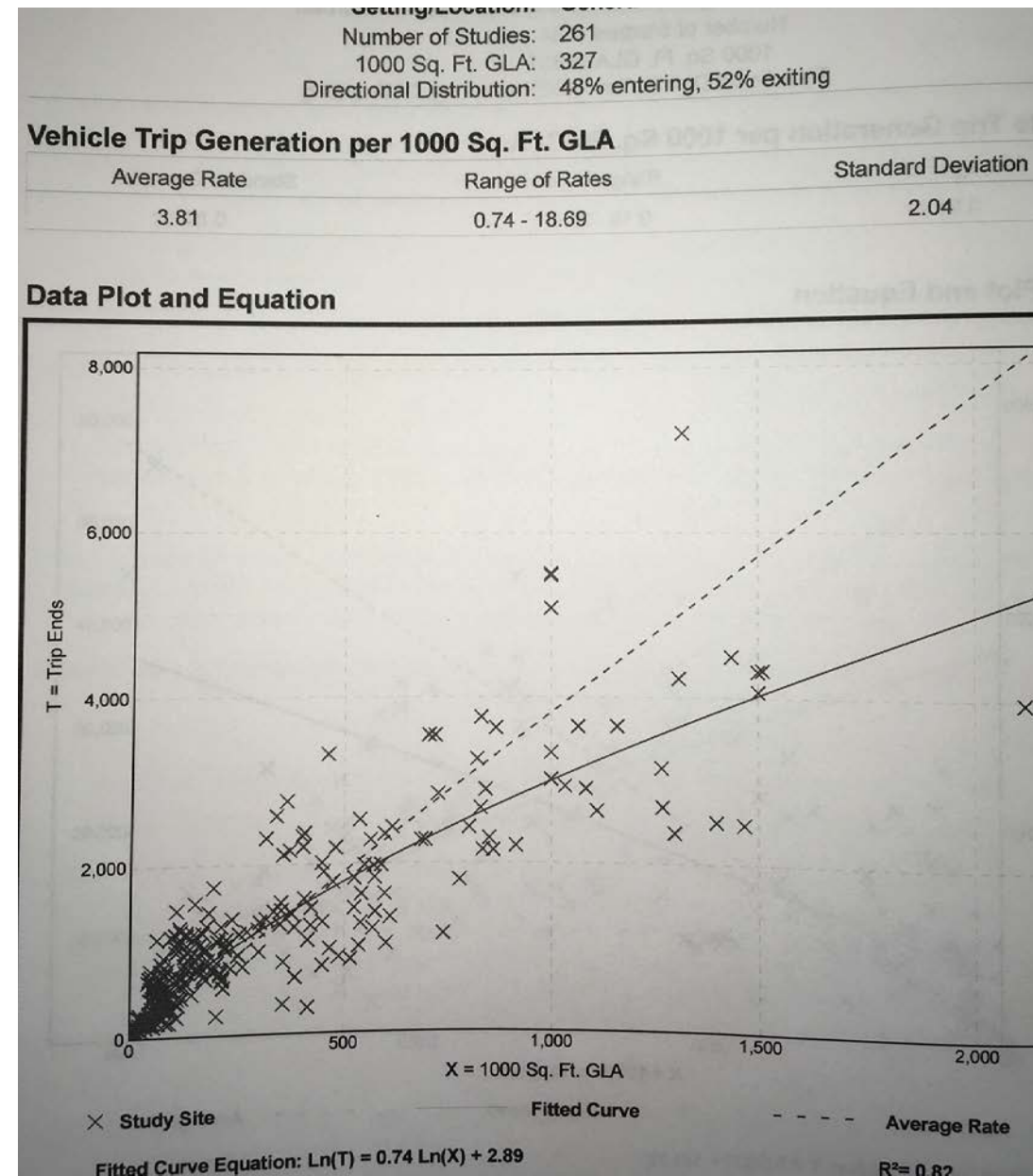
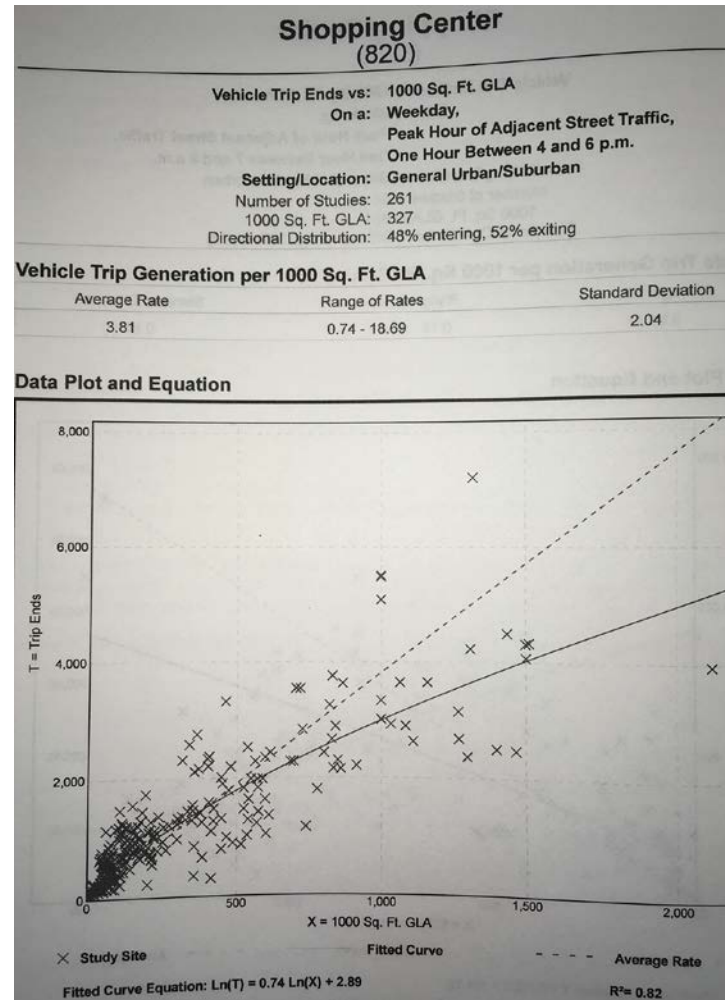




# TRIP GENERATION



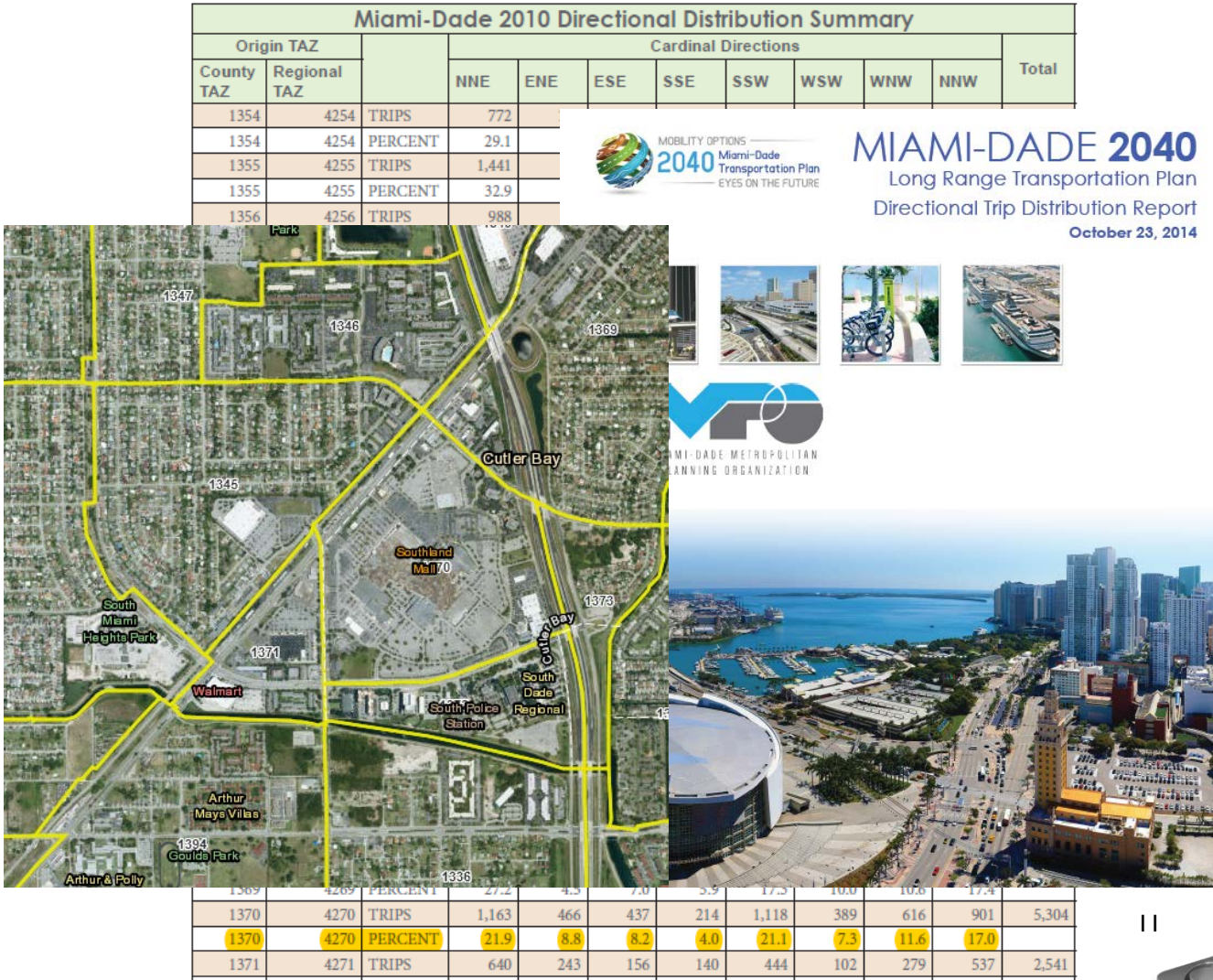
# TRIP GENERATION





# DISTRIBUTION AND ASSIGNMENT

- Latest edition of the *Directional Trip Distribution Report*
- Based on the Southeast Florida Regional Planning Model (SERPM), which simulates travel demand in three counties.
- Distribution pattern for each Traffic Analysis Zone (TAZ), a geographic area used in SERPM to represent land use. Must be modified to best suit street pattern.



# DISTRIBUTION AND ASSIGNMENT - CONT'D.

- Exceptions allowed if supported by data (eg. School).
- Trip Attenuation usually ignored.
- Driveway distribution must reflect the site plan.

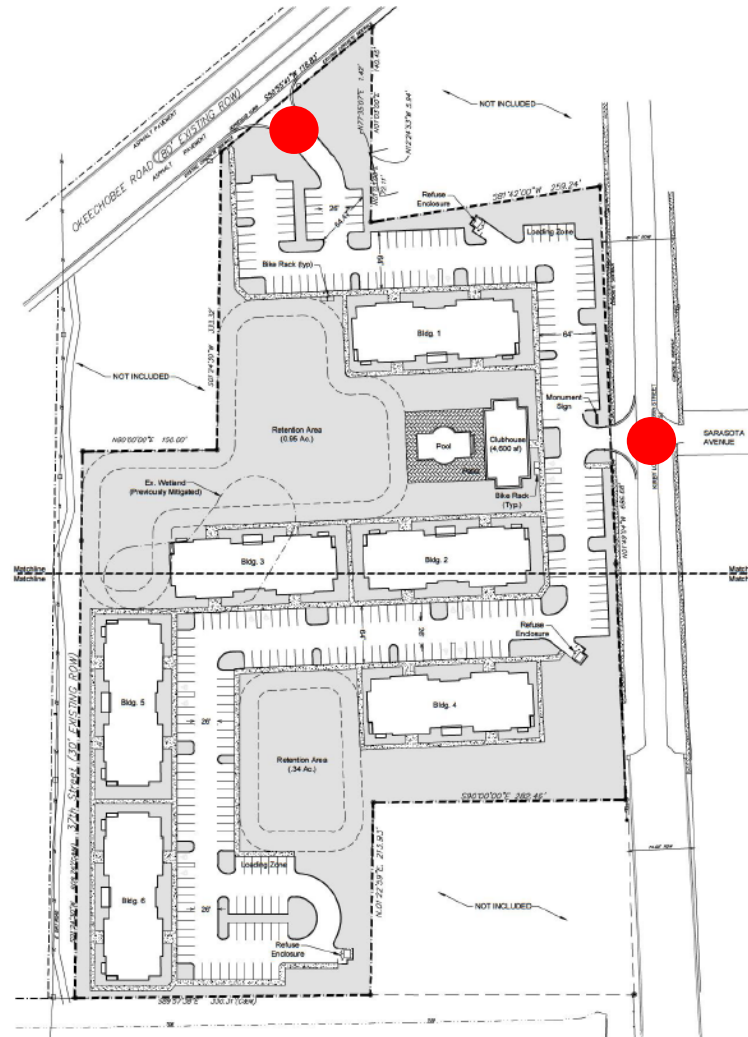


Figure 28: Shopping Tour Length Frequency Distribution

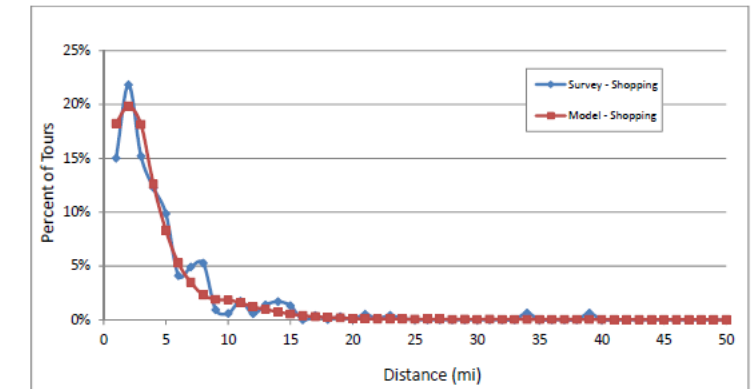
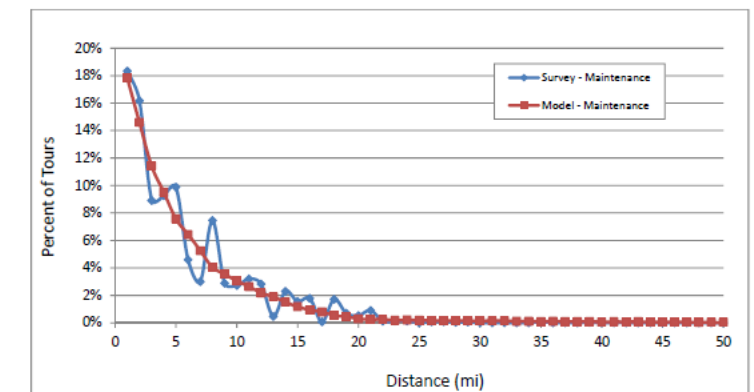


Figure 29: Maintenance Tour Length Frequency Distribution



# STUDY AREA LIMITS

- De-minimis impact: Project traffic consumes less than 1% of the road's minimum standard capacity. Traffic memo demonstrating this is required.
- Studied road segments:
  - Road segment that serves the project; and
  - All road segments where project traffic consumes more than 3% of the road's minimum standard capacity.
- Studied intersections: the intersections on the studied road segments and all site driveways.



# ANALYSIS SCENARIOS

- Existing Conditions
- Future Background
- Future Background plus Project

# ANALYSIS PERIODS

- Peak hours of background traffic on typical weekday mornings and afternoons.
- Other periods if significant project traffic generation.



# DATA COLLECTION

- Typical traffic conditions: Tuesday – Thursday, during normal school operation, outside holiday periods and special events.
- 72 Hour road volume counts.
- Used to identify the peak period of the intersections.
- 2 hours of turning movement counts in each peak period.
- Measuring the intersection approach volume behind the queue.
- Existing counts up to one year old acceptable.
- Other data: geometry, signal timing, crash history, video imagery, count trend history, etc.





# DEMAND VOLUMES

- Existing Conditions:
  - Traffic counts are adjusted to peak season conditions.
  - FDOT Peak Season Factor Category (PSFC) Reports

2018 PEAK SEASON FACTOR CATEGORY REPORT - REPORT TYPE: COUNTY  
CATEGORY: 8701 MIAMI-DADE SOUTH

WEEK	DATES	SF	MOCF: 0.96 PSCF
1	01/01/2018 - 01/06/2018	1.01	1.05
2	01/07/2018 - 01/13/2018	1.01	1.05
3	01/14/2018 - 01/20/2018	1.00	1.04
4	01/21/2018 - 01/27/2018	0.99	1.03
* 5	01/28/2018 - 02/03/2018	0.98	1.02
* 6	02/04/2018 - 02/10/2018	0.97	1.01
* 7	02/11/2018 - 02/17/2018	0.96	1.00
* 8	02/18/2018 - 02/24/2018	0.96	1.00
* 9	02/25/2018 - 03/03/2018	0.96	1.00
*10	03/04/2018 - 03/10/2018	0.96	1.00
*11	03/11/2018 - 03/17/2018	0.96	1.00
*12	03/18/2018 - 03/24/2018	0.96	1.00
*13	03/25/2018 - 03/31/2018	0.96	1.00
*14	04/01/2018 - 04/07/2018	0.96	1.00
*15	04/08/2018 - 04/14/2018	0.96	1.00
*16	04/15/2018 - 04/21/2018	0.96	1.00
*17	04/22/2018 - 04/28/2018	0.98	1.02
18	04/29/2018 - 05/05/2018	0.99	1.03
19	05/06/2018 - 05/12/2018	1.01	1.05
20	05/13/2018 - 05/19/2018	1.02	1.06
21	05/20/2018 - 05/26/2018	1.03	1.07
22	05/27/2018 - 06/02/2018	1.03	1.07
23	06/03/2018 - 06/09/2018	1.04	1.08
24	06/10/2018 - 06/16/2018	1.04	1.08
25	06/17/2018 - 06/23/2018	1.04	1.08
26	06/24/2018 - 06/30/2018	1.04	1.08
27	07/01/2018 - 07/07/2018	1.05	1.09
28	07/08/2018 - 07/14/2018	1.05	1.09
29	07/15/2018 - 07/21/2018	1.05	1.09
30	07/22/2018 - 07/28/2018	1.04	1.08



# DEMAND VOLUMES CONT'D.

- Future Background:
  - Count trend history used to inflate existing counts to future year.
  - Minimum growth of 0.5% annually.
  - Limited use of growth rate averages.
- Future Background plus Project: adds the project traffic.



2013 AADT	2018 AADT	Annual Compound Growth	Adjusted Annual Compound Growth
19100	15700	-3.85%	-3.85%
37500	33000	-2.53%	-2.53%
5200	6600	4.88%	4.88%
Compound Growth Rate			-0.50%



# LEVEL OF SERVICE STANDARDS

- Adopted Standard (LOS D or E) from the Town's Growth Management Plan.
- Peak Hour Two-Way Service Volume from the latest edition of the FDOT Generalized Service Volume Tables.
- Intersection LOS Standard aligns with the more relaxed (E vs. D) of the intersecting road standards.



TABLE 4

Generalized **Peak Hour Two-Way** Volumes for Florida's **Urbanized Areas**<sup>1</sup>

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<sup>2</sup>

(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<sup>2</sup>

(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)<sup>3</sup>

(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	Ramp
Present in Both Directions + 1,800	Metering + 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%

<sup>1</sup>Values shown are presented as peak hour two-way volumes for levels of service and are for the automobile/truck mode 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.

<sup>2</sup> Level of service for the bicycle and pedestrian modes in this table is based on number of motorized vehicles, not number of bicycle lanes or pedestrians using the facility.

<sup>3</sup> 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 default.

\*\* 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 default.

Source:  
Florida Department of Transportation  
Systems Planning Office  
[www.dot.state.fl.us/planning/systems/tpo/tpo\\_default.htm](http://www.dot.state.fl.us/planning/systems/tpo/tpo_default.htm)

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# ROADWAY SEGMENT ANALYSIS

- Interrupted Flow Facilities – include intersection delays
- Level of Service (LOS) measure is average travel speed compared with free flow speed.

LOS	<u>Travel Speed Threshold by Base Free-Flow Speed (mi/h)</u>						
	55	50	45	40	35	30	25
A	>44	>40	>36	>32	>28	>24	>20
B	>37	>34	>30	>27	>23	>20	>17
C	>28	>25	>23	>20	>18	>15	>13
D	>22	>20	>18	>16	>14	>12	>10
E	>17	>15	>14	>12	>11	>9	>8
F	≤17	≤15	≤14	≤12	≤11	≤9	≤8

Highway Capacity Manual 6<sup>th</sup> ed., Exhibit 18-1



# ROADWAY SEGMENT ANALYSIS CONT'D.

- Initial: Generalized Service Volume Tables
- FDOT ARTPLAN – crude estimation of intersection delay
- Synchro – sophisticated intersection analysis software
- Add Synchro intersection delays to segment travel times to determine average travel speed and LOS.

Roadway	Direction	Intersection	Distance (mi)	Link Travel (s/veh)	Intersection Delay <sup>2</sup> (s/veh)	Total Delay (s/veh)	Average Speed (mph)	Arterial LOS
Old Cutler Road	NEB	SW 216 <sup>th</sup> Street	-	-	-	-	-	-
		Gulfstream / SW 97 <sup>th</sup> Avenue	0.4	41.14	27.7	68.84	20.9	C
		Marlin Road	0.3	30.86	5.3	36.16	29.9	A
		<b>Total</b>	<b>0.7</b>	<b>72.00</b>	<b>33.00</b>	<b>105.00</b>	<b>24.0</b>	<b>B</b>
	SWB	Marlin Road	-	-	-	-	-	-
		Gulfstream / SW 97 <sup>th</sup> Avenue	0.4	41.14	13.2	54.34	26.5	B
		SW 216 <sup>th</sup> Street	0.3	30.86	25.6	56.46	19.1	C
		<b>Total</b>	<b>0.7</b>	<b>72.00</b>	<b>38.8</b>	<b>110.80</b>	<b>22.7</b>	<b>C</b>





# INTERSECTION ANALYSIS

- Synchro software – consistent with HCM latest edition
- LOS measure is delay in seconds
- Analysis to report LOS, delay, and queues

Control Delay (s/veh)	LOS by Volume-to-Capacity Ratio <sup>a</sup>	
	≤1.0	>1.0
≤10	A	F
>10–20	B	F
>20–35	C	F
>35–55	D	F
>55–80	E	F
>80	F	F

Note: <sup>a</sup> For approach-based and intersectionwide assessments, LOS is defined solely by control delay.

Highway Capacity Manual 6<sup>th</sup> ed., Exhibit 19-8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑	↱	↰	↑	↱
Traffic Volume (veh/h)	42	378	161	73	376	74	198	361	108	37	117	17
Future Volume (veh/h)	42	378	161	73	376	74	198	361	108	37	117	17
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Q <sub>0</sub> ), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A <sub>pbt</sub> )	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	45	406	173	78	404	80	213	388	116	40	126	18
Adj No. of Lanes	1	1	1	1	2	0	1	2	0	1	1	1
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	413	554	674	344	935	184	482	640	189	314	282	240
Arrive On Green	0.05	0.30	0.30	0.07	0.32	0.32	0.13	0.24	0.24	0.04	0.15	0.15
Sat Flow, veh/h	1774	1863	1583	1774	2951	579	1774	2695	797	1774	1863	1583
Grp Volume(v), veh/h	45	406	173	78	241	243	213	253	251	40	126	18
Grp Sat Flow(s), veh/h/ln	1774	1863	1583	1774	1770	1760	1774	1770	1722	1774	1863	1583
Q Serve(g <sub>s</sub> ), s	0.9	9.9	3.6	1.5	5.4	5.5	4.7	6.4	6.6	0.9	3.1	0.5
Cycle Q Clear(g <sub>c</sub> ), s	0.9	9.9	3.6	1.5	5.4	5.5	4.7	6.4	6.6	0.9	3.1	0.5
Prop In Lane	1.00		1.00	1.00		0.33	1.00		0.46	1.00		1.00
Lane Grp Cap(c), veh/h	413	554	674	344	561	558	482	420	409	314	282	240
V/C Ratio(X)	0.11	0.73	0.26	0.23	0.43	0.44	0.44	0.60	0.61	0.13	0.45	0.07
Avail Cap(c <sub>a</sub> ), veh/h	630	2086	1977	526	1982	1972	553	1631	1588	537	1717	1460
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	11.4	15.9	9.3	11.8	13.6	13.7	13.7	17.1	17.2	16.8	19.5	18.4
Inor Delay (d <sub>2</sub> ), s/veh	0.1	1.9	0.2	0.3	0.5	0.5	0.6	1.4	1.5	0.2	1.1	0.1
Initial Q Delay(d <sub>3</sub> ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	0.4	5.4	1.6	0.7	2.7	2.7	2.3	3.3	3.2	0.5	1.7	0.2
LnGrp Delay(d), s/veh	11.5	17.8	9.5	12.1	14.1	14.2	14.3	18.5	18.7	17.0	20.6	18.5
LnGrp LOS	B	B	A	B	B	B	B	B	B	B	C	B
Approach Vol, veh/h	624			562			717			184		
Approach Delay, s/veh	15.1			13.9			17.3			19.6		
Approach LOS	B			B			B			B		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+R <sub>c</sub> ), s	7.8	19.5	11.0	12.1	6.8	20.5	6.6	16.5				
Change Period (Y+R <sub>c</sub> ), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (G <sub>max</sub> ), s	8.5	56.5	8.5	46.5	8.5	56.5	8.5	46.5				
Max Q Clear Time (g <sub>c</sub> +t <sub>1</sub> ), s	3.5	11.9	6.7	5.1	2.9	7.5	2.9	8.6				
Green Ext Time (p <sub>c</sub> ), s	0.1	3.1	0.1	0.8	0.0	3.0	0.0	3.4				
Intersection Summary												
HCM 2010 Ctrl Delay	15.9											
HCM 2010 LOS	B											



# SOFTWARE

- Results consistent with latest edition of the HCM
- FDOT spreadsheet tool ARTPLAN
- Synchro for most intersections including roundabouts
- SIDRA for some roundabouts





# SITE ACCESS AND MULTIMODAL CONSIDERATIONS

- Not analysis methodology
- Checklist of design issues affecting driveways, transit users, bicyclists and mobility service providers.



# MITIGATION OF IMPACTS

- Restore to Adopted Standard – in the Future plus Project Scenario.
- Proportionate Share Mitigation – method to distribute the cost of needed improvements among projects that consume only a small portion of the capacity being added by the considered improvement.



# CONCLUSION

- Historically, applicant's consultant performed the analysis for review by town staff. Different reviewers set the methodology for each study.
- Methodology Guidelines ensure that recognized techniques and data are used to perform analyses in the Town of Cutler Bay.
- Provides consistency and predictability in the process and outcome.
- Per Resolution 19-38 the Town will conduct the traffic study, according to these guidelines.
- Fair, efficient process.





## QUESTIONS AND ANSWERS

