

Transportation Impact Study Overview

Joe Roviario – Director of Transportation Planning

Traffic analysis is the process of evaluating the effect of a proposed development's traffic demand on the existing transportation networks capacity.

All transportation impact studies should consist of four major components:

1. Methodology Development
2. Existing Conditions Analysis
3. Future Conditions Analysis
4. Mitigation Analysis

The proposed development (project) size, location and type of project will influence the type and level of detail required for each component of the transportation impact study.

ACRONYMNS

(AADT)	<u>Annual Average Daily Traffic</u>
(CFRPM)	<u>Central Florida Regional Planning Model</u>
(CTE)	<u>City/County Traffic Engineer</u>
(DO)	<u>Development Order</u>
(DRC)	<u>Development Review Committee</u>
(FDOT)	<u>Florida Department of Transportation</u>
(HCM)	<u>Highway Capacity Manual</u>
(HCS)	<u>Highway Capacity Software</u>
(ITE)	<u>Institute of Transportation Engineers</u>
(LDC)	<u>Land Development Code</u>
(LDM)	<u>Land Development Manager</u>
(LOS)	<u>Level of Service</u>
(MM)	<u>Methodology Memorandum</u>
(MOU)	<u>Memorandum of Understanding</u>
(TPO)	<u>Transportation Planning Organization</u>
(PHF)	<u>Peak-hour factor</u>
(Q/LOS)	<u>Quality Level of Service</u>
(TIA)	<u>Transportation Impact Analysis</u>
(TIP)	<u>Transportation Improvement Plan</u>
(TMC)	<u>Turning Movement Counts</u>
(V/C)	<u>Volume to Capacity</u>

1. Methodology

- Follows Volusia County Transportation Study Guidelines
- Provides Project Land Use type and Proposed Project Density
- Provides Project Location
- Provides Project Build-out Year
- Establishes Study Area, Roadway Segments and Study Intersections
- Documents Adopted Level of Service Standard (LOS) to be Followed
- Establishes Analysis Periods; Daily, AM Peak Hour, and PM Peak Hour
- Defines Assumptions to be utilized in the Analysis

Guidelines

TRANSPORTATION IMPACT ANALYSIS (TIA) Guidelines

Methodology

For
Development Applications



Requiring a TIA
in Volusia County, Florida

TIA Guidelines

As adopted on November 24, 2009

(The Volusia Transportation Organization (VTPO) was formally known as the Volusia County Metropolitan Planning Organization (VCMPO). The name change was effective July 1, 2010.)

Level of Service Graphic

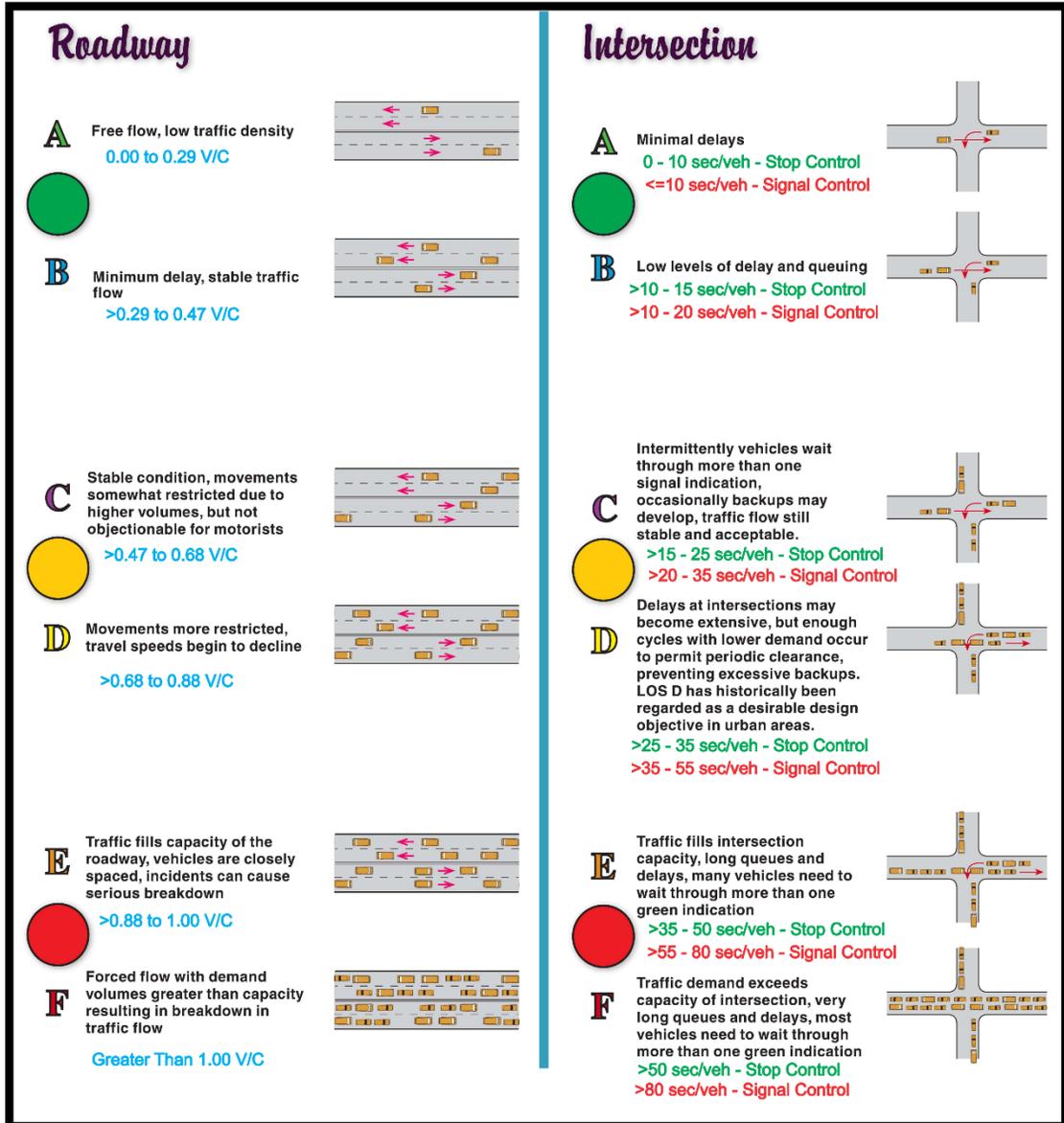


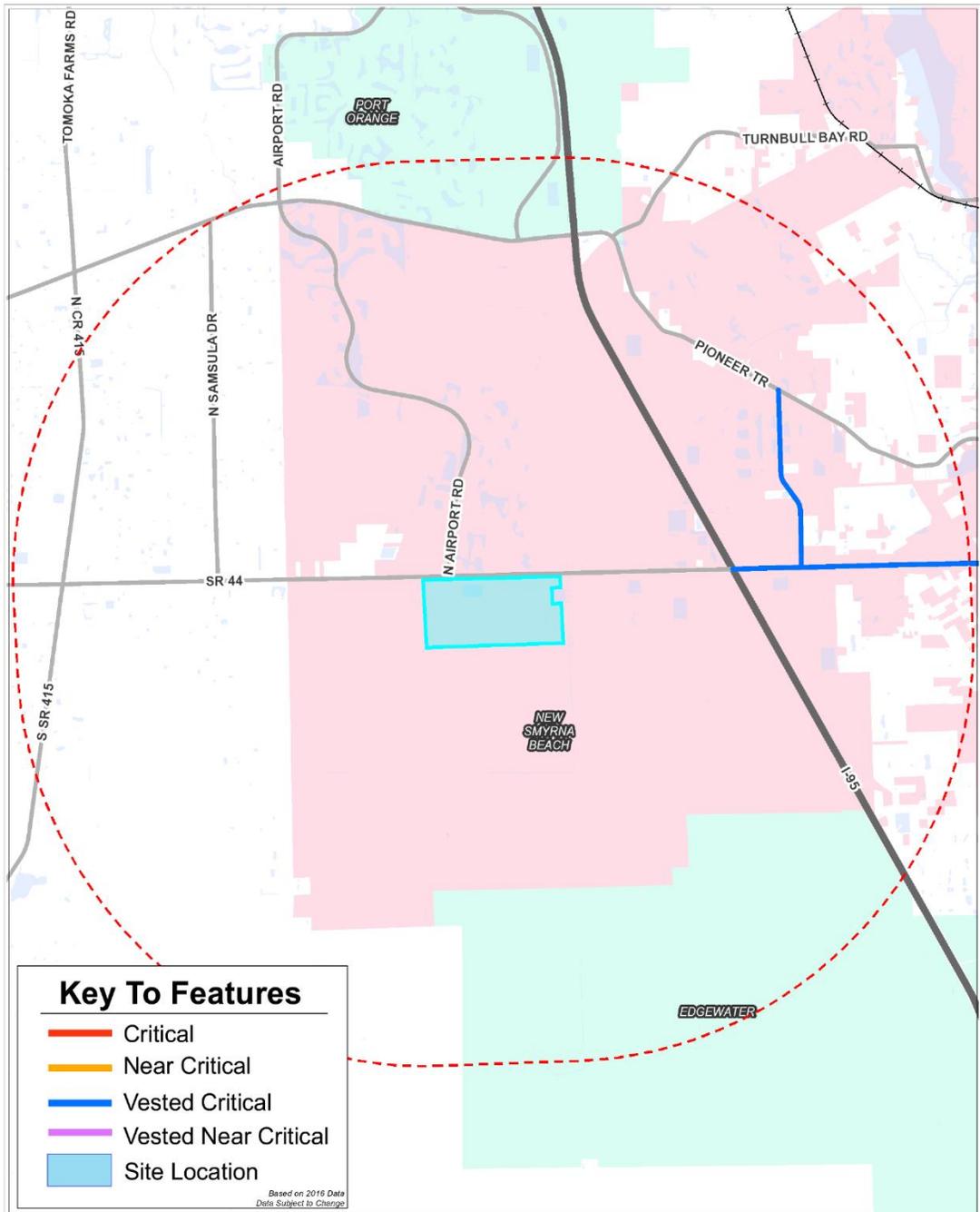
TABLE 1

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

January 2020

INTERRUPTED FLOW FACILITIES						UNINTERRUPTED FLOW FACILITIES					
STATE SIGNALIZED ARTERIALS						FREEWAYS					
Class I (40 mph or higher posted speed limit)						Core Urbanized					
Lanes	Median	B	C	D	E	Lanes	B	C	D	E	
2	Undivided	*	16,800	17,700	**	4	47,600	66,400	83,200	87,300	
4	Divided	*	37,900	39,800	**	6	70,100	97,800	123,600	131,200	
6	Divided	*	58,400	59,900	**	8	92,200	128,900	164,200	174,700	
8	Divided	*	78,800	80,100	**	10	115,300	158,900	203,600	218,600	
						12	136,500	192,400	246,200	272,900	
Class II (35 mph or slower posted speed limit)						Urbanized					
Lanes	Median	B	C	D	E	Lanes	B	C	D	E	
2	Undivided	*	7,300	14,800	15,600	4	45,900	62,700	75,600	85,400	
4	Divided	*	14,500	32,400	33,800	6	68,900	93,900	113,600	128,100	
6	Divided	*	23,300	50,000	50,900	8	91,900	125,200	151,300	170,900	
8	Divided	*	32,000	67,300	68,100	10	115,000	156,800	189,300	213,600	
Non-State Signalized Roadway Adjustments (Alter corresponding state volumes by the indicated percent.)						Freeway Adjustments					
Non-State Signalized Roadways - 10%						Auxiliary Lanes Present in Both Directions + 20,000					
						Ramp Metering + 5%					
Median & Turn Lane Adjustments						UNINTERRUPTED FLOW HIGHWAYS					
Lanes	Median	Exclusive Left Lanes	Exclusive Right Lanes	Adjustment Factors		Lanes	Median	B	C	D	E
2	Divided	Yes	No	+5%		2	Undivided	11,700	18,000	24,200	32,600
2	Undivided	No	No	-20%		4	Divided	36,300	52,600	66,200	75,300
Multi	Undivided	Yes	No	-5%		6	Divided	54,600	78,800	99,400	113,100
Multi	Undivided	No	No	-25%		Uninterrupted Flow Highway Adjustments					
-	-	-	Yes	+ 5%		Lanes	Median	Exclusive left lanes		Adjustment factors	
One-Way Facility Adjustment Multiply the corresponding two-directional volumes in this table by 0.6						2	Divided	Yes			+5%
						Multi	Undivided	Yes			-5%
						Multi	Undivided	No			-25%
BICYCLE MODE² (Multiply vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)						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 HCM and the Transit Capacity and Quality of Service Manual.					
Paved Shoulder/Bicycle Lane Coverage						² Level of service for the bicycle and pedestrian modes in this table is based on number of vehicles, not number of bicyclists or pedestrians using the facility.					
		B	C	D	E	³ Buses per hour shown are only for the peak hour in the single direction of the higher traffic flow.					
0-49%		*	2,900	7,600	19,700	* Cannot be achieved using table input value defaults.					
50-84%		2,100	6,700	19,700	>19,700	** 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.					
85-100%		9,300	19,700	>19,700	**	Source: Florida Department of Transportation Systems Implementation Office https://www.fdot.gov/planning/systems/					
PEDESTRIAN MODE² (Multiply 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						

Example of the 3-Mile Study Area



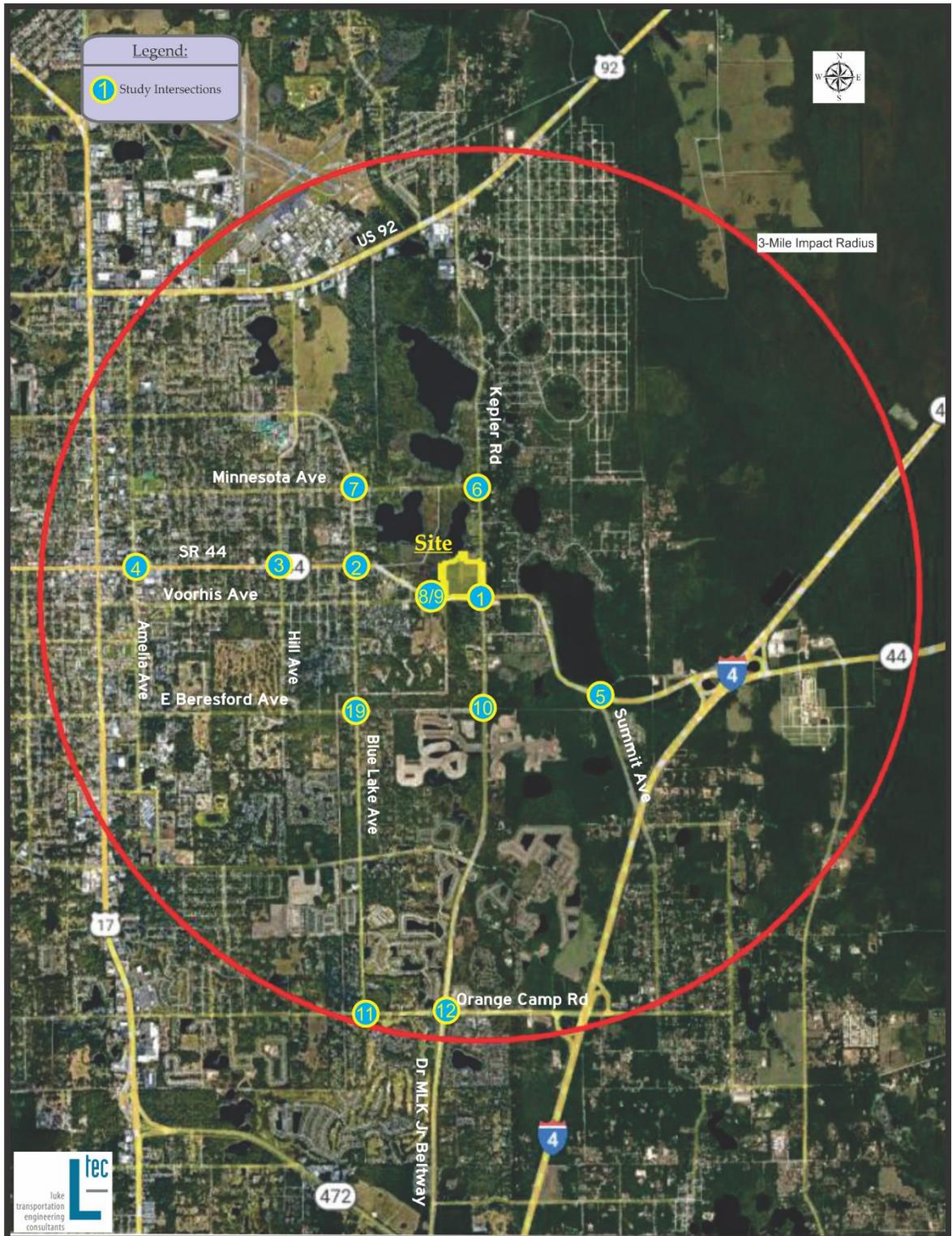
Mapping Tool Provided Courtesy of Volusia County Public Works and is a graphic representation only.

Date 07/12/2021

3 mile Critical/Near Critical Roadway Buffer
South Village

N
W E
S
1 inch = 5,305 feet

Example of Project Location Study Area



2. Existing Conditions Analysis

The existing conditions analysis assess current conditions as a basis for comparison to future conditions. Items included are:

- Data Collection – 24-hour hose counts and AM/PM peak hour turning movement traffic counts
- Study roadway segments and study intersection analysis results
- Identify any programmed (funded) roadway network improvements (within next 3-years)

Examples of 24-Hour Hose Count

Luke Transportation Consulting Engineers, Inc.
Volume Report with Midnight Totals

Data File	: D1119003.PRN	Latitude / Longitude	28.491680°	-81.285408°
Station	: South of Sun Vista	Identification	: Counter 1	
Start Date	: Thursday, November 19, 2020	Start Time	: 00:00	
Stop Date	: Thursday, November 19, 2020	End Time	: 24:00	
City/Town	: Orlando	County	: Orange	
Location	: Goldenroad Road (SR 551)			

Northbound		19-Nov-20											
End Time	00	01	02	03	04	05	06	07	08	09	10	11	
15	51	28	19	27	27	40	116	144	215	206	171	193	
30	49	33	12	23	23	42	142	230	224	201	206	214	
45	39	21	26	20	26	83	161	238	213	190	187	247	
00	<u>31</u>	<u>24</u>	<u>22</u>	<u>19</u>	<u>40</u>	<u>87</u>	<u>134</u>	<u>215</u>	<u>180</u>	<u>207</u>	<u>214</u>	<u>203</u>	
Hour Total	170	106	79	89	116	252	553	827	832	804	778	857	
End Time	12	13	14	15	16	17	18	19	20	21	22	23	
15	238	253	294	290	328	324	339	223	173	157	134	79	
30	239	260	220	334	354	323	317	245	166	147	122	82	
45	258	269	250	337	298	343	245	217	149	134	98	67	
00	<u>226</u>	<u>230</u>	<u>275</u>	<u>330</u>	<u>304</u>	<u>327</u>	<u>230</u>	<u>181</u>	<u>162</u>	<u>122</u>	<u>76</u>	<u>62</u>	
Hour Total	961	1,012	1,039	1,291	1,284	1,317	1,131	866	650	560	430	290	

24 Hour Total Volume	16,294				
AM Peak Hour Begins	11:45	AM Peak Volume	938	Peak Hour Factor	0.91
PM Peak Hour Begins	15:30	PM Peak Volume	1,349	Peak Hour Factor	0.95

Southbound		19-Nov-20											
End Time	00	01	02	03	04	05	06	07	08	09	10	11	
15	34	30	18	38	37	79	138	223	230	218	186	225	
30	29	21	39	38	58	105	154	235	183	213	220	208	
45	33	15	21	40	79	145	214	252	204	237	225	237	
00	<u>30</u>	<u>17</u>	<u>24</u>	<u>50</u>	<u>87</u>	<u>136</u>	<u>166</u>	<u>235</u>	<u>221</u>	<u>238</u>	<u>227</u>	<u>234</u>	
Hour Total	126	83	102	166	261	465	672	945	838	906	858	904	
End Time	12	13	14	15	16	17	18	19	20	21	22	23	
15	255	238	212	266	287	305	283	223	183	140	104	59	
30	229	240	228	280	277	305	254	236	179	140	97	60	
45	237	228	250	275	284	288	220	202	162	119	88	54	
00	<u>207</u>	<u>232</u>	<u>265</u>	<u>276</u>	<u>281</u>	<u>278</u>	<u>238</u>	<u>217</u>	<u>146</u>	<u>103</u>	<u>55</u>	<u>50</u>	
Hour Total	928	938	955	1,097	1,129	1,176	995	878	670	502	344	223	

24 Hour Total Volume	16,161				
AM Peak Hour Begins	11:30	AM Peak Volume	955	Peak Hour Factor	0.94
PM Peak Hour Begins	16:45	PM Peak Volume	1,179	Peak Hour Factor	0.97

Two-Way Total		19-Nov-20											
End Time	00	01	02	03	04	05	06	07	08	09	10	11	
15	85	58	37	65	64	119	254	367	445	424	357	418	
30	78	54	51	61	81	147	296	465	407	414	426	422	
45	72	36	47	60	105	228	375	490	417	427	412	484	
00	<u>61</u>	<u>41</u>	<u>46</u>	<u>69</u>	<u>127</u>	<u>223</u>	<u>300</u>	<u>450</u>	<u>401</u>	<u>445</u>	<u>441</u>	<u>437</u>	
Hour Total	296	189	181	255	377	717	1,225	1,772	1,670	1,710	1,636	1,761	
End Time	12	13	14	15	16	17	18	19	20	21	22	23	
15	493	491	506	556	615	629	622	446	356	297	238	138	
30	468	500	448	614	631	628	571	481	345	287	219	142	
45	495	497	500	612	582	631	465	419	311	253	186	121	
00	<u>433</u>	<u>462</u>	<u>540</u>	<u>606</u>	<u>585</u>	<u>605</u>	<u>468</u>	<u>398</u>	<u>308</u>	<u>225</u>	<u>131</u>	<u>112</u>	
Hour Total	1,889	1,950	1,994	2,388	2,413	2,493	2,126	1,744	1,320	1,062	774	513	

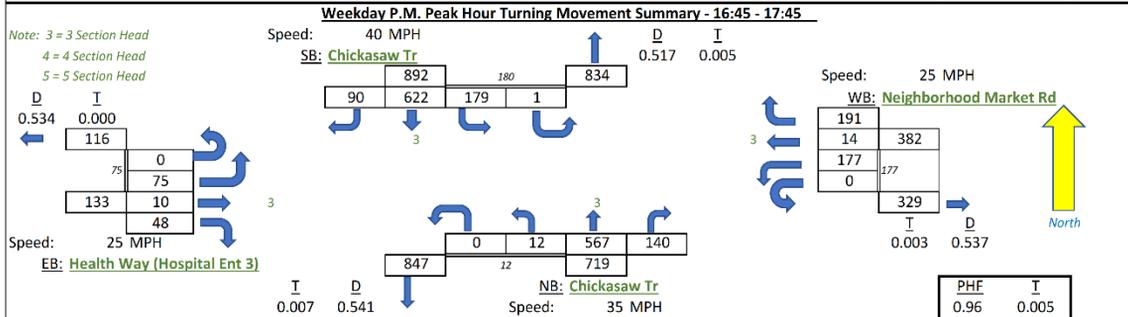
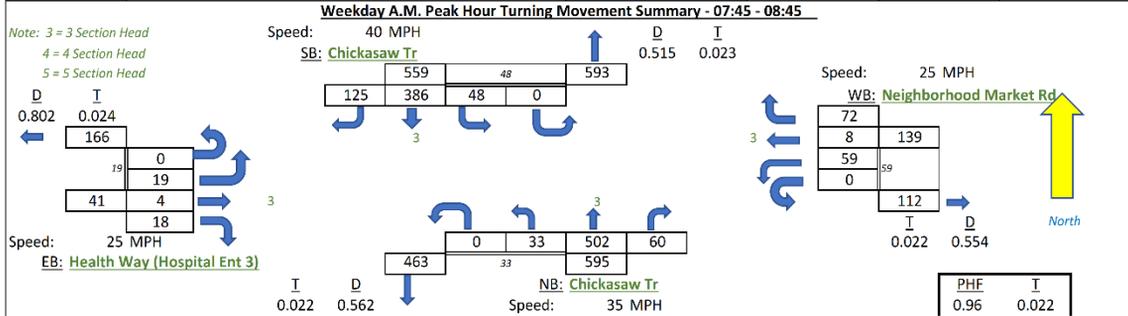
24 Hour Total Volume	32,455				
AM Peak Hour Begins	11:45	AM Peak Volume	1,893	Peak Hour Factor	0.96
PM Peak Hour Begins	17:00	PM Peak Volume	2,493	Peak Hour Factor	0.99

Example of Turning Movement Count

Summary of Vehicle Movements

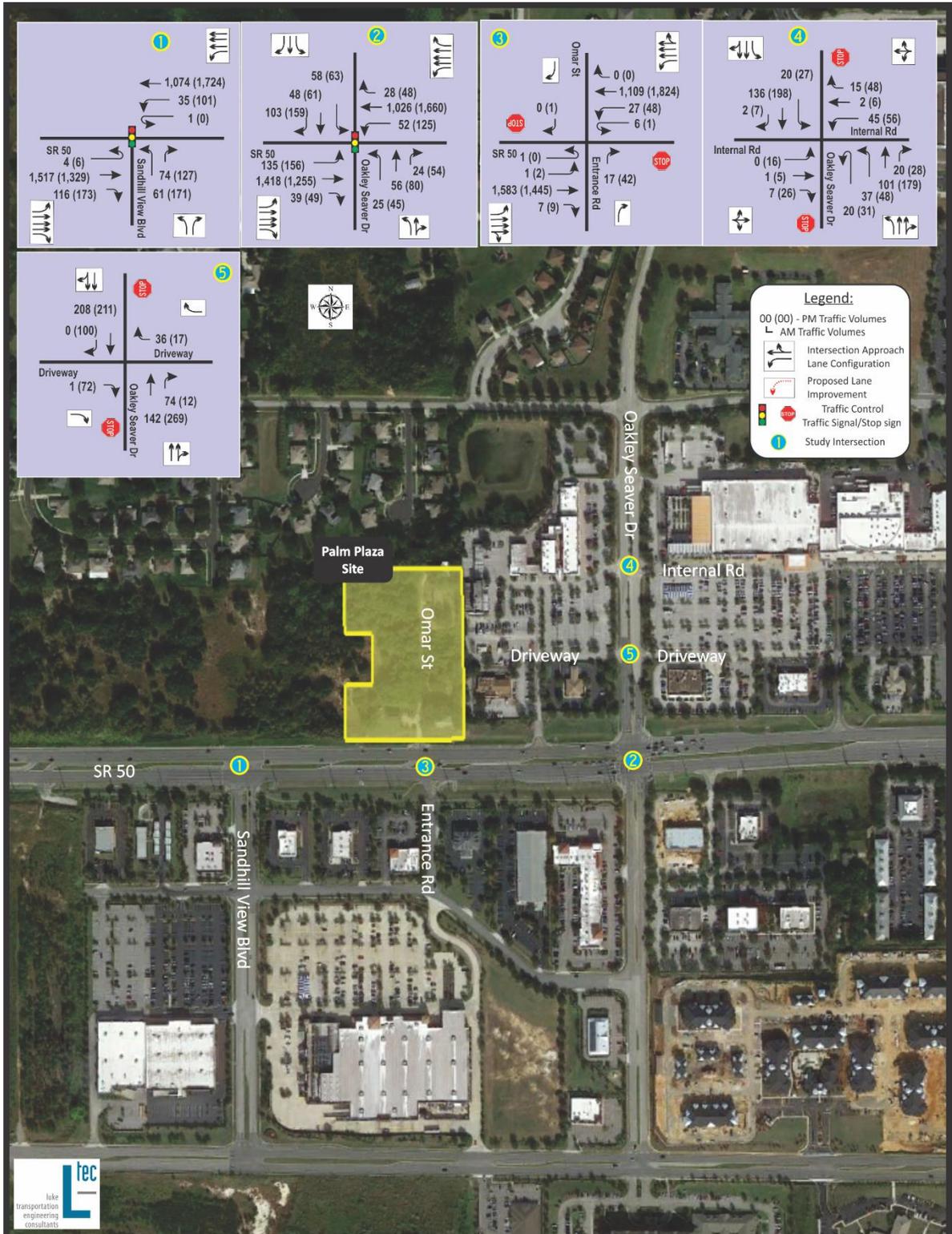
Luke Transportation Engineering Consultants

Project: AdventHealth - Lake Underhill Road Site	LTEC 23-0102		
N/S Road: Chickasaw Tr	Observer: LTEC Weather: Clear Rd Condition: Ok Signal: Yes Major St Movement: - PM Pk Hr Factor: 0.96	Latitude: 28.541450°	
E/W Road: Health Way (Hospital Ent 3)		Longitude: -81.277436°	
Date: Wednesday, July 26, 2023		Station #: 6	
City: Orlando			
County: Orange			
FDOT SF: 1.02			



Peak Hour Time Interval	Chickasaw Tr Northbound				Chickasaw Tr Southbound				Health Way (Hosp) Eastbound				Neighborhood Market Rd Westbound			
	Uturn	Lt	Thru	Rt	Uturn	Lt	Thru	Rt	Uturn	Lt	Thru	Rt	Uturn	Lt	Thru	Rt
# Lanes	1				1				1				1			
Length	200				295				335				180			
7:00 - 7:15	0	3	103	15	0	6	73	33	0	5	2	11	0	14	0	19
7:15 - 7:30	0	9	104	7	0	12	89	30	0	9	3	7	0	11	1	11
7:30 - 7:45	0	5	106	10	0	13	83	40	0	6	2	5	0	8	6	6
7:45 - 8:00	0	11	114	16	0	11	90	44	0	1	3	5	0	18	2	21
Hourly Sum	0	28	427	48	0	42	335	147	0	21	10	28	0	51	9	57
8:00 - 8:15	0	5	125	12	0	12	98	43	0	7	1	5	0	12	3	16
8:15 - 8:30	0	11	117	16	0	14	94	21	0	6	0	5	0	12	0	20
8:30 - 8:45	0	5	135	15	0	10	95	14	0	5	0	3	0	16	3	13
8:45 - 9:00	0	6	136	12	0	13	96	15	0	4	0	4	0	14	1	15
Hourly Sum	0	27	513	55	0	49	383	93	0	22	1	17	0	54	7	64
16:00 - 16:15	0	3	121	15	0	31	143	10	0	19	5	11	0	38	2	39
16:15 - 16:30	0	1	127	29	0	36	157	15	0	17	1	8	1	37	2	40
16:30 - 16:45	0	2	133	21	0	35	156	18	0	21	3	10	1	45	1	46
16:45 - 17:00	0	0	134	30	0	37	154	26	0	18	3	12	0	40	4	33
Hourly Sum	0	6	515	95	0	139	610	69	0	75	12	41	2	160	9	158
17:00 - 17:15	0	5	135	39	1	44	134	13	0	38	3	16	0	52	3	41
17:15 - 17:30	0	3	145	40	0	47	148	24	0	9	1	7	0	42	3	56
17:30 - 17:45	0	4	140	28	0	47	174	25	0	9	3	12	0	40	4	57
17:45 - 18:00	0	1	152	18	0	38	142	17	0	9	1	5	0	31	5	45
Hourly Sum	0	13	572	125	1	176	598	79	0	65	8	40	0	165	15	199
A.M. Peak Hour Summary - Seasonally Adjusted with FDOT Factor Adjustment Factor																
7:45 - 8:45	0	33	502	60	0	48	386	125	0	19	4	18	0	59	8	72
% Turns	0	5.5%	84.4%	10.1%	0	8.6%	69.1%	22.4%	0	46.3%	9.8%	43.9%	0	42.4%	5.8%	51.8%
P.M. Peak Hour Summary - Seasonally Adjusted with FDOT Factor Adjustment Factor																
16:45 - 17:45	0	12	565	140	1	179	622	90	0	75	10	48	0	177	14	191
% Turns	0	1.7%	78.8%	19.5%	0.1%	20.1%	69.7%	10.1%	0	56.4%	7.5%	36.1%	0	46.3%	3.7%	50.0%

Existing Intersection Traffic



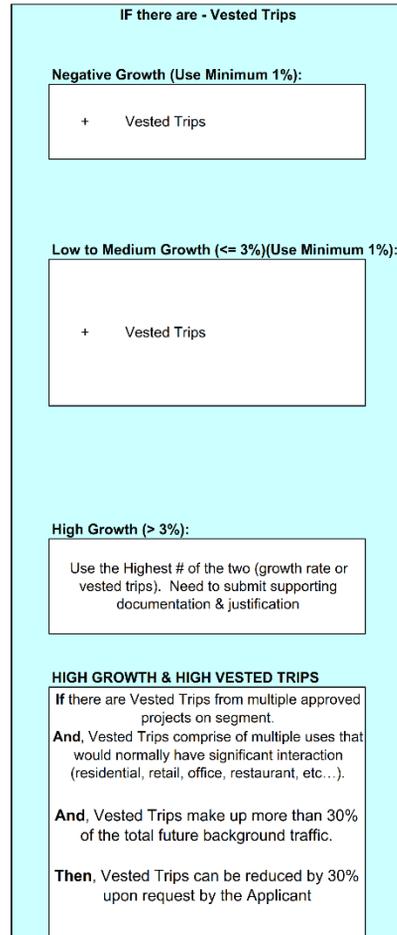
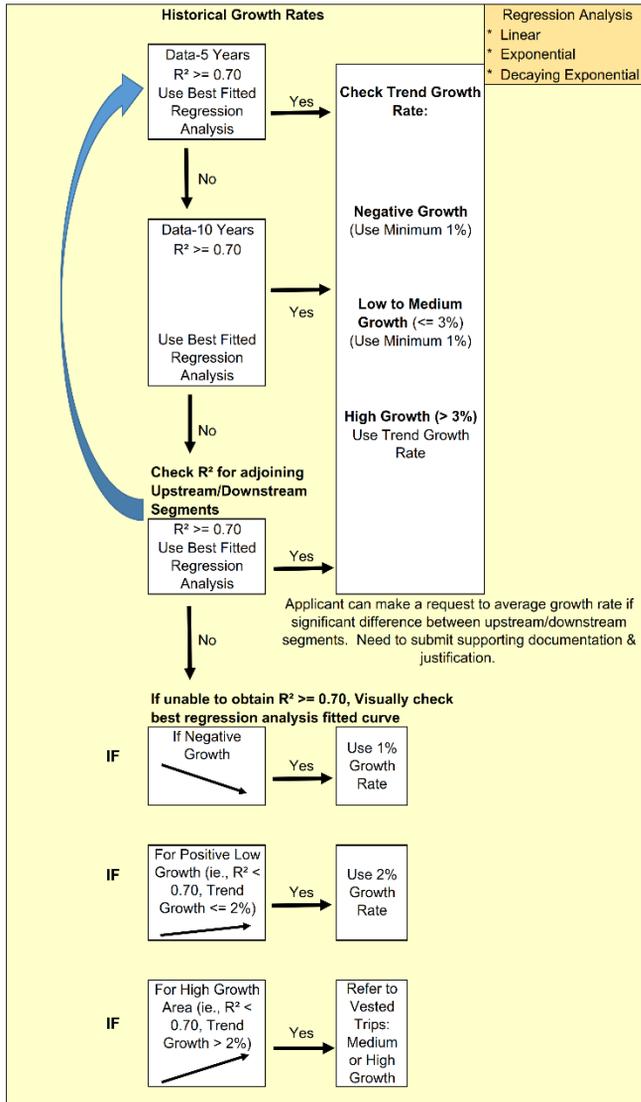
3. Future Conditions Analysis

The future conditions analysis is where the future impacts of the proposed development are assessed. These analyses are comprised of multiple steps:

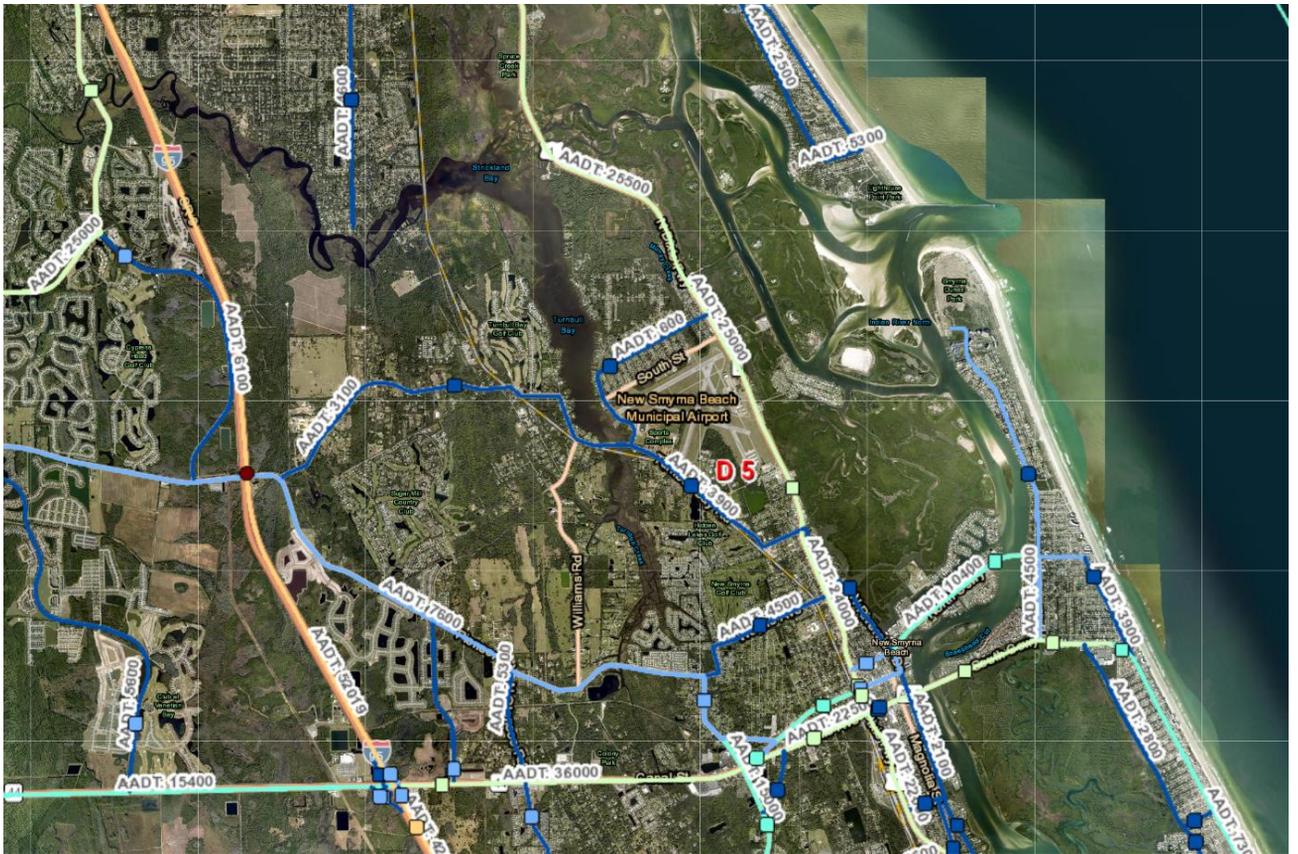
- Future Background Traffic
- Project Trip Generation
- Project Trip Distribution
- Assignment of Background and Project traffic to the study roadways/intersections network
- Evaluation of future roadways and intersections operational conditions

Background Traffic

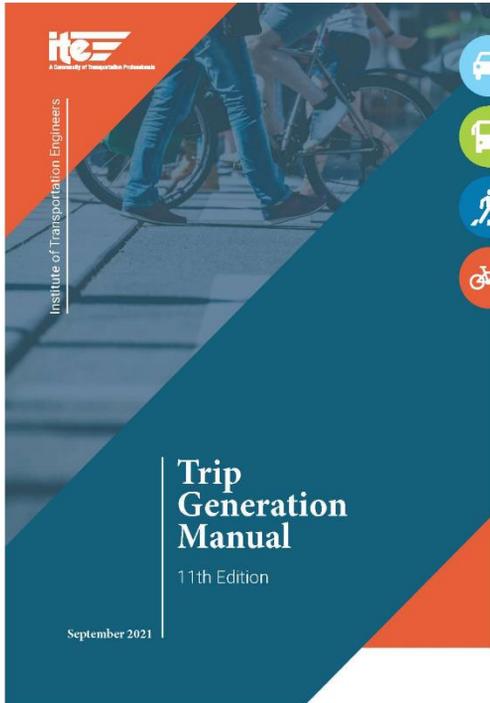
Volusia County's Segment Growth Rates and Vested Trips Instructions Policy



FDOT Count Locations



Trip Generation



ITE Trip Generation Report

The ITE Trip Generation Manual, 11th Edition.

Enables development of estimates of motor vehicle, pedestrian, transit user, bicyclist, and truck trips, generated by a land use based on its characteristics and setting. The data base offers a functionality to filter data records by their age, the region within North America, and the development size.

Land Use: 210 Single-Family Detached Housing

Description

A single-family detached housing site includes any single-family detached home on an individual lot. A typical site surveyed is a suburban subdivision.

Specialized Land Use

Data have been submitted for several single-family detached housing developments with homes that are commonly referred to as patio homes. A patio home is a detached housing unit that is located on a small lot with little (or no) front or back yard. In some subdivisions, communal maintenance of outside grounds is provided for the patio homes. The three patio home sites total 299 dwelling units with overall weighted average trip generation rates of 5.35 vehicle trips per dwelling unit for weekday, 0.26 for the AM adjacent street peak hour, and 0.47 for the PM adjacent street peak hour. These patio home rates based on a small sample of sites are lower than those for single-family detached housing (Land Use 210), lower than those for single-family attached housing (Land Use 251), and higher than those for senior adult housing – single-family (Land Use 251). Further analysis of this housing type will be conducted in a future edition of *Trip Generation Manual*.

Additional Data

The technical appendices provide supporting information on time-of-day distributions for this land use. The appendices can be accessed through either the ITE TripGen web app or the trip generation resource page on the ITE website (<https://www.ite.org/technical-resources/topics/trip-and-parking-generation/>).

For 30 of the study sites, data on the number of residents and number of household vehicles are available. The overall averages for the 30 sites are 3.6 residents per dwelling unit and 1.5 vehicles per dwelling unit.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Arizona, California, Connecticut, Delaware, Illinois, Indiana, Kentucky, Maryland, Massachusetts, Minnesota, Montana, New Jersey, North Carolina, Ohio, Ontario (CAN), Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Vermont, Virginia, and West Virginia.

Source Numbers

100, 105, 114, 126, 157, 167, 177, 197, 207, 211, 217, 267, 275, 293, 300, 319, 320, 356, 357, 367, 384, 387, 407, 435, 522, 550, 552, 579, 598, 601, 603, 614, 637, 711, 716, 720, 728, 735, 868, 869, 903, 925, 936, 1005, 1007, 1008, 1010, 1033, 1066, 1077, 1078, 1079

Single-Family Detached Housing (210)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban

Number of Studies: 174

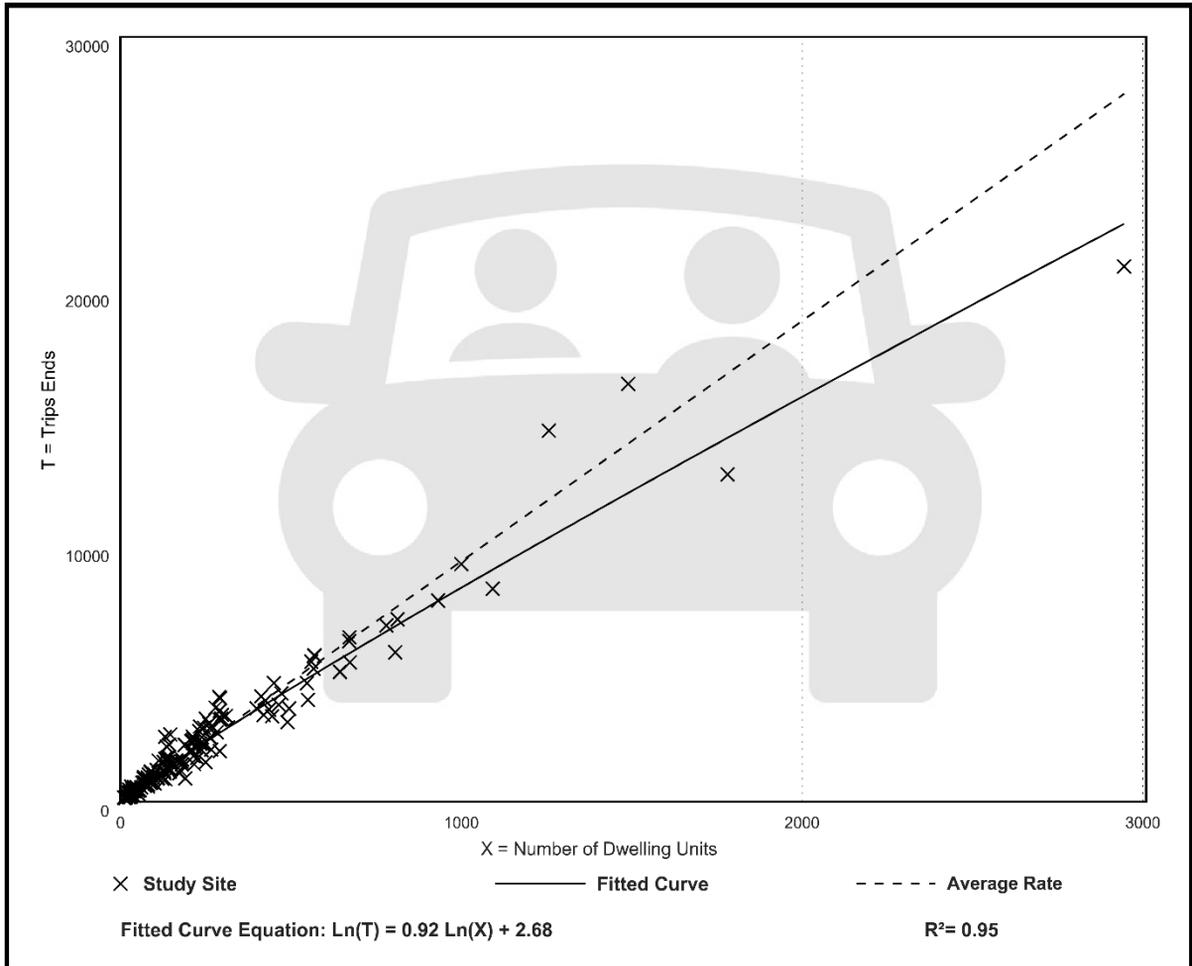
Avg. Num. of Dwelling Units: 246

Directional Distribution: 50% entering, 50% exiting

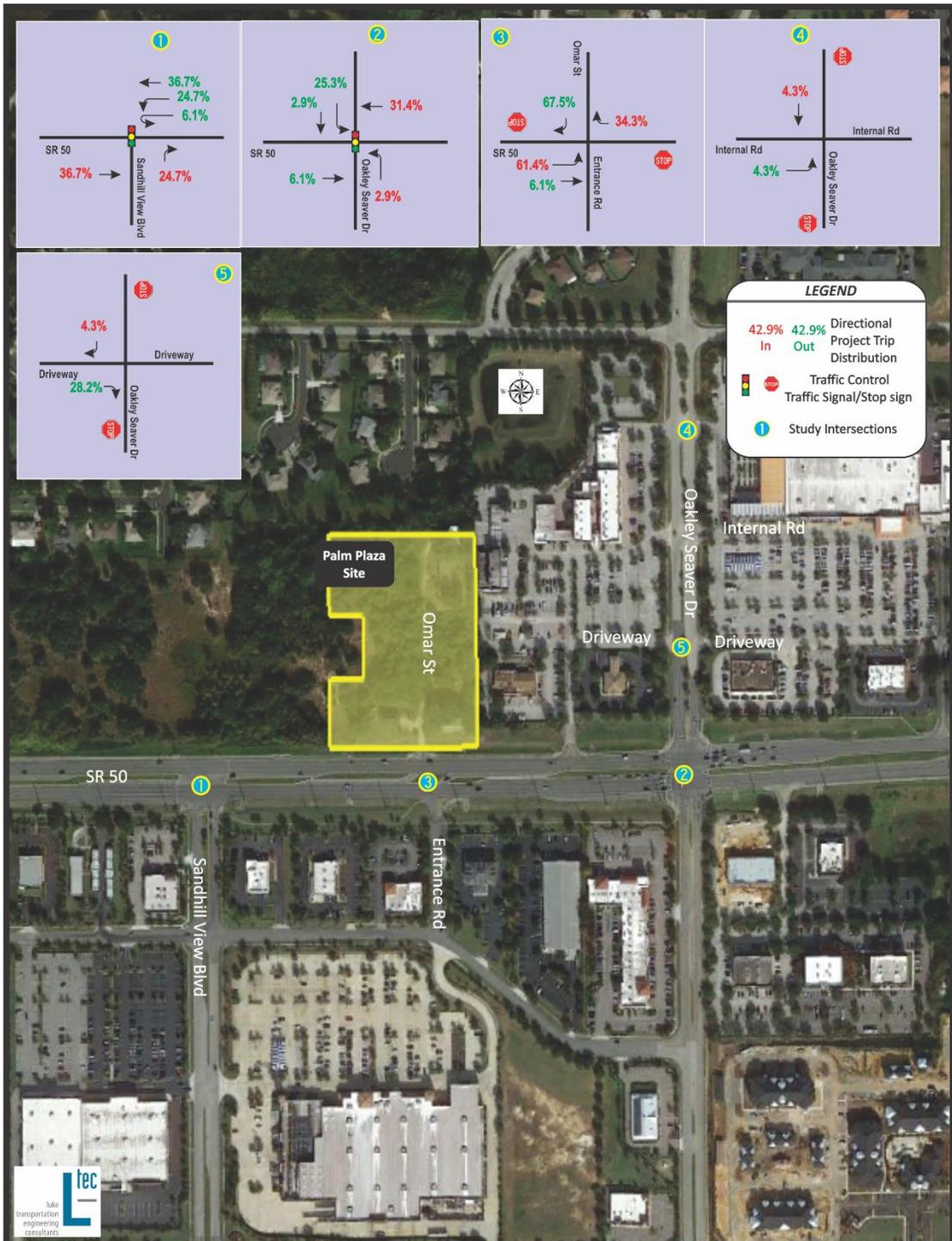
Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.43	4.45 - 22.61	2.13

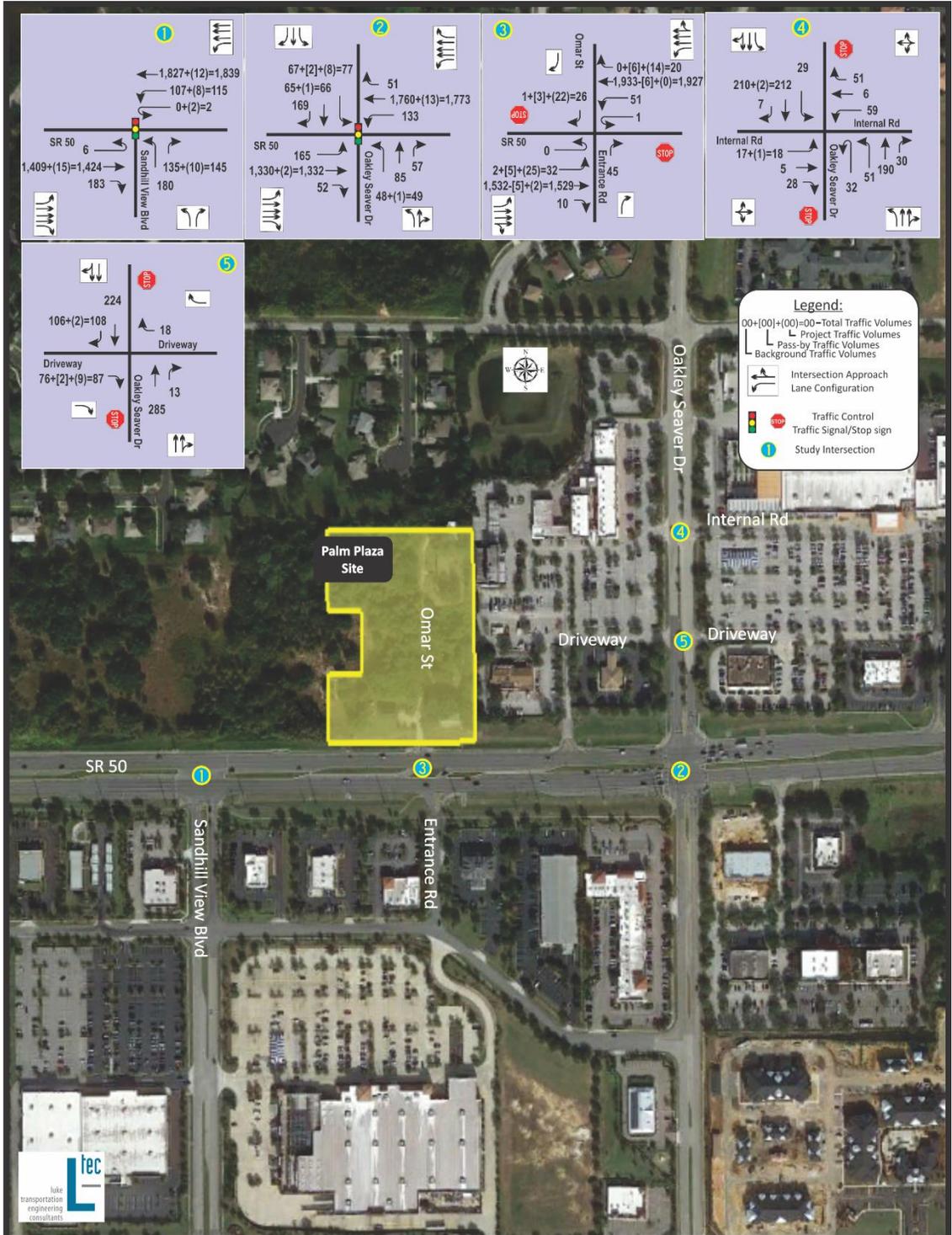
Data Plot and Equation



Intersection Project Trip Distribution



Intersection Trip Assignments



Roadway Segments Evaluation

Study Roadways Projected (2030) Level of Service

Roadway Segment From To		Station Number	# of Lanes	Adopted Functional (1)		P.M. Peak Hour 2-Way Trips					Meets Adopted LOS	Project P.M. Peak			
				Class	LOS	Back- Ground (2)	LOS	Project Trips	Total Trips	LOS		% of LOS Std.	3% Sig ?		
SR 44															
SR 415/CR 415	Samsula Dr	1,012	4	Principal Arterial	C	2,094	B	324	2,418	B	Yes	5.72%	Yes		
Samsula Dr	Airport Rd	423	4	Principal Arterial	C	1,831	B	331	2,162	B	Yes	5.85%	Yes		
Airport Rd	I-95	423	4	Principal Arterial	D	2,548	C	746	3,294	C	Yes	20.84%	Yes		
I-95	Sugar Mill Rd	515	4	Principal Arterial	D	4,497	F	260	4,757	F	No	7.26%	Yes		
Sugar Mill Rd	Glencoe Rd	515	4	Principal Arterial	D	4,497	F	216	4,713	F	No	6.03%	Yes		
Glencoe Rd	Colony Park Dr	515	4	Principal Arterial	D	4,497	F	205	4,702	F	No	5.73%	Yes		
Colony Park Dr	Mission Dr	515	4	Principal Arterial	D	4,497	F	138	4,635	F	No	3.85%	Yes		
Colony Park Dr	Live Oak St	515	4	Principal Arterial	D	2,672	C	80	2,752	C	Yes	2.23%	No		
SR 44 (Business) - Canal Street															
SR 44/Lytle St	Pioneer Tr	516	2	Minor Arterial	D	1,120	C	28	1,148	C	Yes	1.75%	No		
Pioneer Tr	US 1	111	2	Minor Arterial	D	1,405	C	23	1,428	C	Yes	1.44%	No		
SR 415 (Tomoka Farms Road)															
Acorn Lake Rd	SR44	1,009	2	Minor Arterial	C	1,369	C	86	1,455	C	Yes	3.93%	Yes		
SR44	Pioneer tr	1,840	2	Minor Arterial	C	1,011	C	18	1,029	C	Yes	1.11%	No		
Airport Road															
Pioneer Tr.	Luna Bella Ln	67	2	Major Collector	E	416	B	96	512	B	Yes	3.06%	Yes		
Luna Bella Ln	SR 44	68	2	Major Collector	E	956	C	136	1,092	C	Yes	4.33%	Yes		
Enterprise Avenue															
Pioneer Tr	Halleck Ave	570	2	Major Collector	E	953	D	5	958	D	Yes	0.49%	No		
Glencoe Road															
Taylor Rd	Paige Ave	730	2	Minor Collector	E	429	C	7	436	C	Yes	0.57%	No		
Paige Ave	SR 44	731	2	Minor Collector	E	599	D	8	607	D	Yes	0.78%	No		
SR 44	Pioneer Tr	732	2	Minor Collector	E	231	C	12	243	C	Yes	1.18%	No		
Josephine Street/10th Street															
Old Mission Rd	Tatum Blvd	1,000	2	Major Collector	E	805	D	8	813	D	Yes	0.78%	No		
Tatum Blvd	US 1	1,002	2	Major Collector	E	846	D	2	848	D	Yes	0.16%	No		
Mission Drive															
SR 44	Old Mission Rd	1,261	4	Major Collector	E	1,203	C	10	1,213	C	Yes	0.29%	No		
Old Mission Road															
Mission Dr	Josephine St	1,354	4	Major Collector	E	1,382	C	1	1,383	C	Yes	0.03%	No		
Josephine St	Park Ave	1,353	2	Major Collector	E	1,159	F	1	1,160	F	No	0.10%	No		
Pioneer Trail															
Airport Rd	Turnbull Bay Rd	1,465	2	Major Collector	E	1,069	C	32	1,101	C	Yes	2.60%	No		
Turnbull Bay Rd	Sugar Mill Dr	1,467	2	Major Collector	E	612	D	2	614	D	Yes	0.20%	No		
Sugar Mill Dr	Williams Rd	1,471	2	Major Collector	E	1,148	C	6	1,154	C	Yes	0.49%	No		
Williams Rd	Enterprise Ave	1,473	2	Major Collector	E	962	C	8	970	C	Yes	0.65%	No		
Sugar Mill Drive															
Pioneer Tr	Gibraltar Blvd	1,781	2	Minor Collector	E	592	C	22	614	C	Yes	1.79%	No		
Gibraltar Blvd	SR 44	1,781	4	Minor Collector	E	828	C	44	872	C	Yes	1.60%	No		
Taylor Road															
Glencoe Rd	Old Mission Rd	1,821	2	Minor Collector	E	565	D	7	572	D	Yes	0.69%	No		
Turnbull Bay Road															
Pioneer Tr	Williams Rd	1,863	2	Minor Collector	E	524	C	6	530	C	Yes	0.49%	No		
Williams Rd	Industrial Park Ave	1,865	2	Minor Collector	E	460	C	5	465	C	Yes	0.41%	No		
Industrial Park Ave	US 1	1,867	2	Minor Collector	E	415	C	8	423	C	Yes	0.78%	No		
Wallace Road															
Canal St	SR 44	1,955	3	Major Collector	E	732	D	7	739	D	Yes	0.53%	No		
Wayne Avenue															
Halleck St	US 1	1,970	2	Major Collector	E	712	D	2	714	D	Yes	0.20%	No		
Williams Boulevard															
Pioneer Trail	Airport Rd	1,989	4	Principal Arterial	D	772	C	0	772	C	Yes	0.00%	No		

Intersection Evaluation

Study Intersections Level of Service

Approach / Movement	Lanes	Traffic Control	LnGrp Delay (d) (sec/veh)	LnGrp V/C Ratio	LnGr pLOS	95th %ile Queue (Feet)	LnGrp Delay (d) (sec/veh)	LnGrp V/C Ratio	LnGr pLOS	95th %ile Queue (Feet)
1 Fern Creek Avenue (NB/SB) and Oregon Street (EB/WB)										
			A.M. Peak Hour				P.M. Peak Hour			
EB	Left Thru Right	< 1 >	20.7	0.12	C	15	23.7	0.10	C	10
WB	Left Thru Right	< 1 >	24.7	0.59	C	78	27.0	0.52	C	55
NB	Left Thru Right	< 1 >	5.1	0.18	A	23	3.6	0.13	A	15
SB	Left Thru Right	< 1 >	5.0	0.16	A	20	3.7	0.17	A	18
Intersection Summary			12.7		B		11.0		B	
Approach / Movement	Lanes	Traffic Control	Control Delay (s) (sec/veh)	Lane V/C Ratio	Lane LOS	95th %ile Queue (Feet)	Control Delay (s) (sec/veh)	Lane V/C Ratio	Lane LOS	95th %ile Queue (Feet)
			A.M. Peak Hour				P.M. Peak Hour			
2 Fern Creek Avenue (NB/SB) and Montana Street (WB)										
WB	Left Right	< 1 >	11.0	0.011	B	0	9.8	0.018	A	3
NB	Thru Right	< 1 >	Free Flow							
SB	Left Thru	< 1 >	Free Flow	0.0	0.000	A	0	7.6	0.001	A
3 - Oregon Street (EB/WB) and Morris Avenue (SB)										
EB	Left Thru	< 1 >	Free Flow	7.5	0.038	A	3	7.3	0.026	A
WB	Thru Right	< 1 >	Free Flow							
SB	Left Right	< 1 >	10.3	0.221	B	20	9.6	0.169	A	15
4 - Oregon Street (EB/WB) and Hardy Avenue (SB)										
EB	Left Thru	< 1 >	Free Flow	7.7	0.006	A	0	7.5	0.010	A
WB	Thru Right	< 1 >	Free Flow							
SB	Left Right	< 1 >	10.1	0.005	B	0	9.7	0.005	A	0
5 - Morris Avenue (NB/SB) and School Entrance (EB)										
EB	Left Thru Right	< 1 >	Free Flow	7.2	0.006	A	0	7.2	0.003	A
WB	Left Thru Right	< 1 >	Free Flow	0.0	0.000	A	0	0.0	0.000	A
NB	Left Thru Right	< 1 >	8.7	0.004	A	0	8.8	0.016	A	0
SB	Left Thru Right	< 1 >	8.5	0.010	A	0	8.4	0.010	A	0

4. Mitigation Analysis

When the transportation impact analysis identifies an undesirable LOS as compared to the adopted LOS standard, mitigation measures to reduce or mitigate the transportation impacts should be undertaken.

Mitigation can be in the form of enhancing operational efficiency, increasing system capacity, or payment of a proportionate share of the identified need.

Mitigation can also reduce the level of development density or phase the development impacts with capital improvements.

Mitigation should be relative to the size of the transportation impact expected.

Example of Proportionate Share Calculation

Project Trips Proportionate Share Percentage and Cost Calculations

Roadways Over Capacity	Limits of Improvement (From - To)		Segment Length	Adopted LOS	Existing Generalized Capacity	Type of Improvement	Improved Generalized Capacity	Capacity Increase	Total Improvement Cost (1)	Project Trips	Project Trip Percentage	Project Trips Prop Share
SR 44	Blue Lake Ave	Kepler Rd	0.93	E	1,712	4LD	3,580	1,868	\$6,692,585.12	78	4.2%	\$280,253.79
SR 44	Kepler Rd	Summit Ave	1.27	E	1,712	4LD	3,580	1,868	\$9,139,336.67	47	2.5%	\$230,655.72
Orange Camp Road	Blue Lake Ave	Dr MLK Jr	0.55	E	1,540	4LD	3,410	1,870	\$4,880,930.24	12	0.6%	\$31,321.48
Orange Camp Road	Dr MLK Jr	I-4	1.00	E	1,540	4LD	3,410	1,870	\$8,874,418.61	12	0.6%	\$56,948.14
West Volusia Beltway	SR 472	Cassadaga Rd	0.40	E	1,540	4LD	3,410	1,870	\$2,479,108.80	56	3.0%	\$74,448.83
West Volusia Beltway	Cassadaga Rd	Orange Camp Rd	1.28	E	1,540	4LD	3,410	1,870	\$7,933,148.16	63	3.4%	\$268,021.62
West Volusia Beltway	Orange Camp Rd	Taylor Rd	1.04	E	1,540	4LD	3,410	1,870	\$6,445,682.88	97	5.2%	\$335,282.36
West Volusia Beltway	Taylor Rd	Beresford Ave. Ext	1.05	E	1,540	4LD	3,410	1,870	\$6,507,660.60	115	6.2%	\$401,317.34
West Volusia Beltway	Minnesota Ave	SR 44	0.75	E	1,540	4LD	3,410	1,870	\$4,648,329.00	168	9.0%	\$418,799.53

1. Roadway cost based on Volusia County Master Prop Share Approved Costs & Formulas June 2021.
 Luke Transportation Engineering Consultants, Inc., 2023

Total Improvement Cost **\$57,601,200.08**

Total Project Prop Share **\$2,097,048.82**

Questions?