Waterbrooke
Traffic Impact Study

Prepared For:

Mattamy Homes

Littlejohn
An S&ME Company

Prepared By:
Littlejohn Project No. 527116038
Dated: July 2016

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1.0 Introduction

This traffic impact study has been prepared to evaluate the impacts to the roadway network and intersections that may result from the development of the Waterbrooke residential project in Clermont, Florida. The project site is located south of SR 50 at Emil Jahna Road (see **Figure 1.1**), in southeastern Lake County, and will be incorporated into the City of Clermont.

The proposed development is planned to include 771± single-family homes and 302± townhomes/duplexes, for a total of 1,073 dwelling units. However, for the purposes of this analysis, the development will be analyzed as 1,100 single-family dwelling units to allow for minor changes in product offerings as plans are finalized for the development. The development will also contain an amenity center and park for exclusive use of the community residents. Build-out of the development is expected by 2025, with approximately 80-150 homes constructed per year.

The site originally included a sand mine, and there are two lakes within the property, which are the former borrow pits from the previous mining activities. In 2006, the site was approved for an age-restricted residential planned unit development. Two additional traffic impact studies have been completed for this development. The initial study (August 2013) analyzed the proposed development with 894 residential units and a single connection to SR 50 via Emil Jahna Road. The second study increased the number of dwelling units to 950 as well as added additional access to SR 50 via a realigned/extended Hartle Road, and no age restrictions on the residential units. This study builds upon the previous analysis to increase the total number of dwelling units to 1,073 and add an access to Hancock Road.

The proposed development will be developed in six phases (see **Figure 1.2**). The first three phases are located north of the larger of the two lakes/borrow pits, and will have access to SR 50 via Emil Jahna Road and Hartle Road (599 dwelling units). The fourth phase is located south of the large lake, between the powerline easement and Hartle Road (68 dwelling units). The fifth phase is located between Hancock Road and the powerline easement (272 dwelling units). Two access scenarios will be analyzed for the fourth and fifth phases – one scenario where both portions of the development can access both Hancock Road and Hartle Road, and one where only an emergency-access is provided across the powerline easement (loading all of the fourth phase onto Hartle Road and all of the fifth phase onto Hancock Road). The sixth phase is located east of Hartle Road and will access Hartle Road only (134 dwelling units). As the communities are planned to be gated, there is no cut-through assumed from the properties in Phases 4-6 in order to access Emil Jahna Road. However, the residential areas will be connected by an internal sidewalk/bicycle path system.

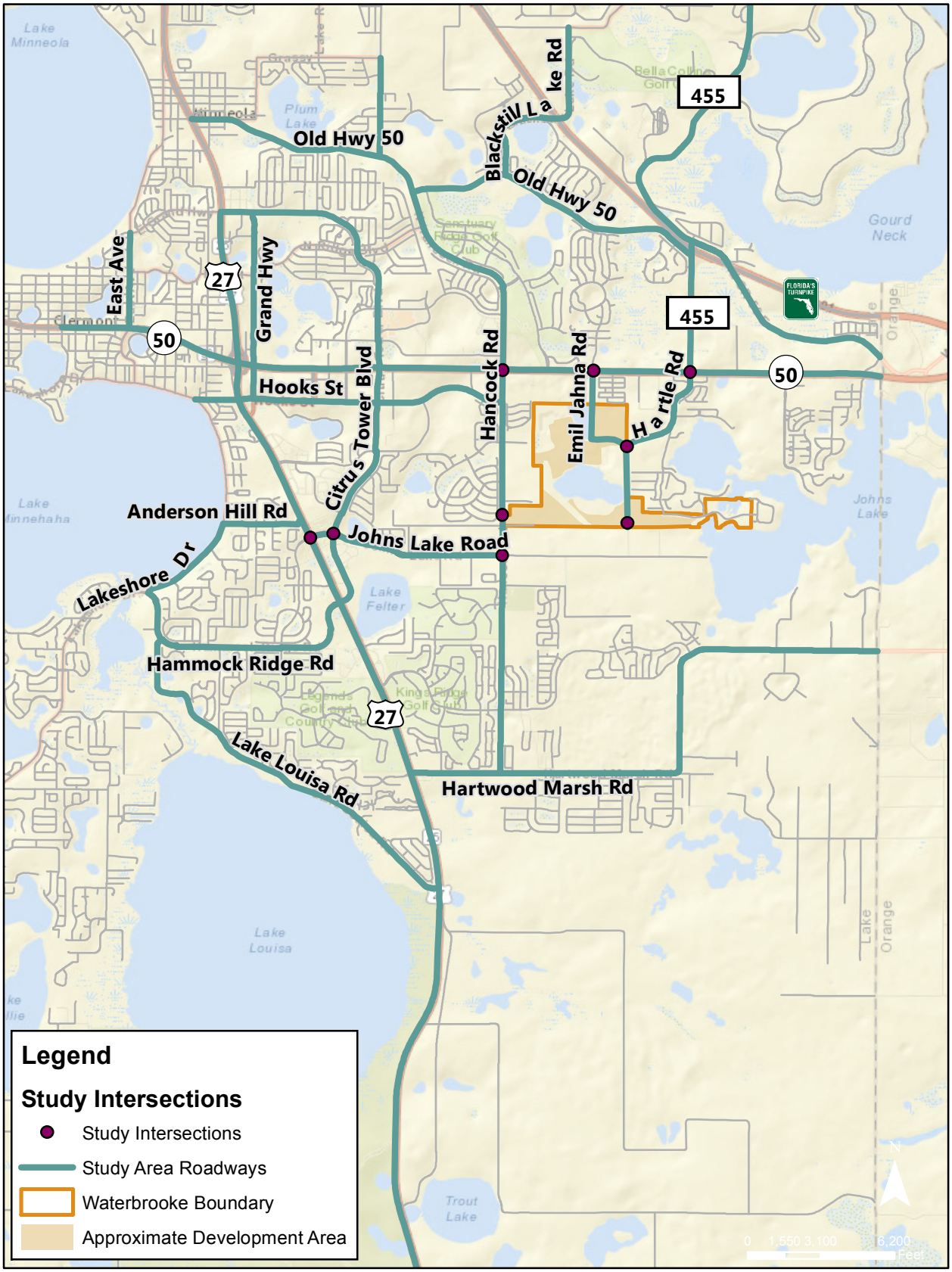
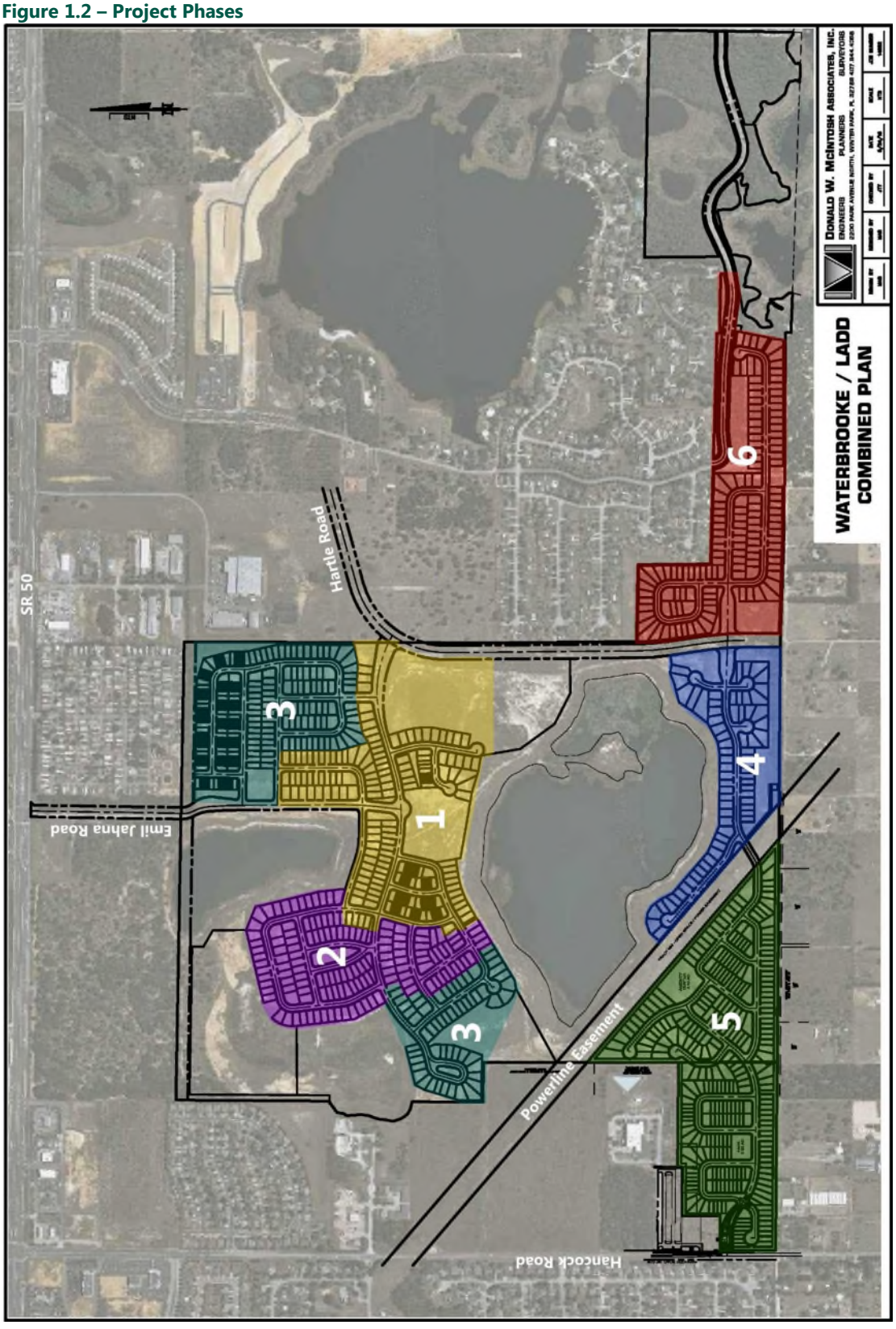

Old Hwy 50
Blackstill Lake Rd
455
Old Hwy 50
Gourd Neck
East Ave
27
Grand Hwy
50
Hooks St
Citrus Tower Blvd
Hancock Rd
Emil Jahna Rd
Hartle Rd
455
50
Anderson Hill Rd
Johns Lake Road
Lakeshore Dr
Hammock Ridge Rd
27
Lake Louisa Rd
Hartwood Marsh Rd
Lake Louisa
Trout Lake
Lake Orange
Legend
Study Intersections
Study Intersections
Study Area Roadways
Waterbrooke Boundary
Approximate Development Area
N
0 1,550 3,100 6,200
Feet

Figure 1.2 – Project Phases



2.0 Existing Conditions

2.1 Data Collection

As per the methodology approved by Lake-Sumter MPO staff, data from the previous study was utilized for the three study intersections along SR 50, and collected for the three study intersections on Johns Lake Road.

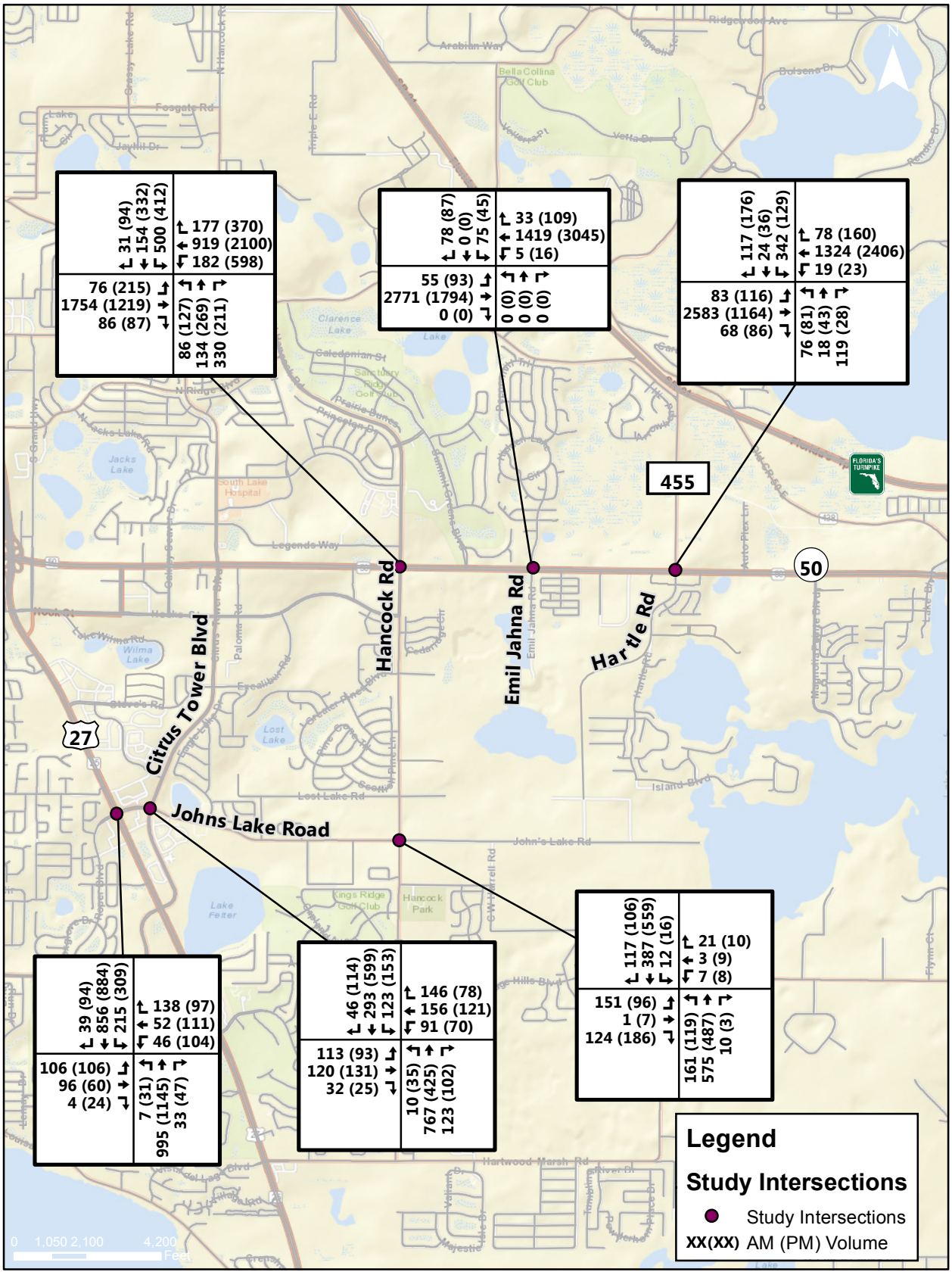
- SR 50 @ Hancock Road
- SR 50 @ Emil Jahna Road
- SR 50 @ Hartle Road
- Johns Lake Road @ US 27
- Johns Lake Road @ Citrus Tower Boulevard
- Johns Lake Road @ Hancock Road

As this is planned as a residential community, turning movement counts for each of the intersections were collected for both the AM (7-9 AM) and PM (4-6 PM) peak periods on August 12, 2015 (SR 50) and May 11, 2016 (Johns Lake Road). The turning movement counts are included in **Appendix A**.

The volumes for each of these intersections recorded during field data collection are shown on **Figure 2.1**. Before any analysis was conducted, the turning movement counts were adjusted based on the Seasonal Factor in the Peak Season Factor Category Report using a factor of 1.06 for the SR 50 counts and 1.00 for the Johns Lake Road counts (a copy of this report is included in **Appendix B**).

2.2 Intersection Analysis

Each of the existing study intersections were evaluated with the existing geometrics and signal timings using Synchro 8 (existing signal timing information is included in **Appendix C**). Per the Lake County and City of Clermont Comprehensive Plans, the minimum LOS standard for all roadways which are not on the Strategic Intermodal System/Florida Intrastate Highway System is LOS D, which was applied to the intersection analysis as well. The results of that analysis indicate that the intersections of SR 50/Emil Jahna Road, SR 50/Hartle Road, Citrus Tower Boulevard/Johns Lake Road, and Hancock Road/Johns Lake Road operate at an acceptable overall level of service during both peak periods, although there are movements at most of these intersections which do not meet the level of service standard. The intersection of SR 50/Hancock Road does not meet the level of service standard overall, or for any movements other than the westbound approach, in both the AM and PM peak period. This is due to high through volumes on SR 50 as well as high volumes on the minor street approaches. The intersection of US 27/Johns Lake Road does not meet the minimum LOS standards in the AM Peak Period, overall and on the approaches, due to the fact that the LOS standard is LOS C for state highways. A LOS C standard is difficult to achieve for signalized intersections in an urban environment, as the major through movements can generally only have a green time of 50-70% of the 100+ second cycle length.


L 31 (94) ↓ 154 (332) ↳ 500 (412)
↰ 177 (370) ← 919 (2100) ↱ 182 (598)
76 (215) 1754 (1219) 86 (87)
86 (127) 134 (269) 330 (211)
L 78 (87) ↓ 0 (0) ↳ 75 (45)
↰ 33 (109) ← 1419 (3045) ↱ 5 (16)
55 (93) 2771 (1794) 0 (0)
0 (0) 0 (0) 0 (0)
L 117 (176) ↓ 24 (36) ↳ 342 (129)
↰ 78 (160) ← 1324 (2406) ↱ 19 (23)
83 (116) 2583 (1164) 68 (86)
76 (81) 18 (43) 119 (28)
L 39 (94) ↓ 856 (884) ↳ 215 (309)
↰ 138 (97) ← 52 (111) ↱ 46 (104)
106 (106) 96 (60) 4 (24)
7 (31) 995 (1145) 33 (47)
L 46 (114) ↓ 293 (599) ↳ 123 (153)
↰ 146 (78) ← 156 (121) ↱ 91 (70)
113 (93) 120 (131) 32 (25)
10 (35) 767 (425) 123 (102)
L 117 (106) ↓ 387 (559) ↳ 12 (16)
↰ 21 (10) ← 3 (9) ↱ 7 (8)
151 (96) 1 (7) 124 (186)
161 (119) 575 (487) 10 (3)
455
50
27
Hancock Rd
Emil Jahna Rd
Hartle Rd
Citrus Tower Blvd
Johns Lake Road
Legend
Study Intersections
Study Intersections
XX(XX) AM (PM) Volume

However, as the average vehicular delay on the approaches is generally within between 50-80% of the cycle length for these intersections, all vehicles should be able to clear the intersection within one cycle during the peak periods. Details of the intersection analysis results are shown in **Table 2.1** and copies of the Synchro analysis printouts are included in **Appendix D**.

Table 2.1 – Existing Intersection Level of Service

Intersection	Stop Control	Intersection Conditions	Approach				
			Overall	EB	WB	NB	SB
AM Peak Period							
SR 50 @ Hancock Rd	Signal	LOS	E	E	D	F	E
		Delay (sec/veh)	67.2	76.7	42.7	85.7	74.0
SR 50 @ Emil Jahna Rd	Signal	LOS	B	B	A	A	E
		Delay (sec/veh)	10.3	10.1	6.7	0.0	76.0
SR 50 @ Hartle Rd	Signal	LOS	C	C	C	F	F
		Delay (sec/veh)	34.1	29.7	21.6	84.7	84.0
US 27 @ Johns Lake Rd	Signal	LOS	D	E	D	D	D
		Delay (sec/veh)	50.7	64.0	50.9	49.9	48.1
Citrus Tower Blvd @ Johns Lake Rd	Signal	LOS	C	C	D	C	C
		Delay (sec/veh)	30.0	34.8	40.6	28.8	20.5
Hancock Road @ Johns Lake Road	Signal	LOS	D	D	E	C	D
		Delay (sec/veh)	38.0	46.0	69.8	29.6	43.6
PM Peak Period							
SR 50 @ Hancock Rd	Signal	LOS	E	E	D	F	E
		Delay (sec/veh)	61.1	56.7	52.2	98.6	79.8
SR 50 @ Emil Jahna Rd	Signal	LOS	B	A	B	A	E
		Delay (sec/veh)	10.6	8.6	10.4	0.0	76.7
SR 50 @ Hartle Rd	Signal	LOS	D	B	C	F	F
		Delay (sec/veh)	36.6	18.3	29.2	112.1	161.5
US 27 @ Johns Lake Rd	Signal	LOS	C	E	E	C	C
		Delay (sec/veh)	34.9	62.4	64.9	28.8	29.9
Citrus Tower Blvd @ Johns Lake Rd	Signal	LOS	C	C	C	C	B
		Delay (sec/veh)	22.0	30.4	30.3	21.0	17.9
Hancock Road @ Johns Lake Road	Signal	LOS	C	E	F	B	C
		Delay (sec/veh)	33.6	74.8	86.2	18.2	23.6

Source: Littlejohn Engineering Associates

2.3 Existing Roadway Analysis

The existing AADT, peak-hour volumes, and committed trips for the roadways in the study area were compiled from the Lake-Sumter MPO Lake County Transportation Management System Segment Report, dated April 3, 2015, the 2016 Lake County Traffic Count Database, and FDOT's 2014 Florida Transportation Information (FTI). Based on the data provided in the 2016 Lake County Traffic Count Database, an average annual growth rate of 3.0% county-wide was calculated from data from 2013 and 2016, and thus the FDOT data was grown at a 3.0% rate from the 2013 count data provided in the 2014 FTI to match the 2016 data from Lake County. Using the Level of Service

thresholds published within the segment report, the existing level of service for each roadway was determined (based on existing trips). The results of that analysis are shown on **Table 2.2**.

Table 2.2 – Existing Roadway Segment Analysis

Roadway	Segment	LOS Std	LOS Capacity	AADT	Pk Dir	Pk Hr/ Pk Dir Existing	v/c	LOS
SR 50	CR 561 to East Ave	D	2,000	34,421	WB	1,688	0.84	C
	East Ave to US 27	D	3,020	43,709	WB	2,144	0.71	C
	US 27 to Hancock Road	D	3,020	44,255	WB	2,171	0.72	C
	Hancock Road to Emil Jahna Rd	D	3,020	56,275	WB	2,760	0.91	C
	Emil Jahna Rd to CR 455	D	3,020	56,275	WB	2,760	0.91	C
	CR 455 to Orange County Line	D	3,020	47,534	WB	2,332	0.77	C
US 27	Grand Hwy to SR 50	C	2,940	27,865	NB	1,367	0.46	C
	SR 50 to Johns Lake Rd	C	2,940	37,153	SB	1,822	0.62	C
	Johns Lake Rd to Hartwood Marsh Rd	C	2,940	33,328	NB	1,635	0.56	C
	Hartwood Marsh Rd to Lake Louisa Rd	C	2,940	22,947	NB	1,126	0.38	C
	Lake Louisa Rd to Boggy Marsh Rd	C	2,940	24,586	SB	1,206	0.41	C
Old Hwy 50	US 27 to Turkey Farm Rd	D	792	7,238	WB	378	0.48	C
	Turkey Farm Rd to CR 455	D	792	5,592	EB	448	0.57	C
	CR 455 to Orange County Line	D	792	5,950	WB	513	0.65	C
CR 455	Ridgewood Ave to CR 455/CR 50	D	1,200	6,879	SB	331	0.28	B
	CR 455/CR 50 to SR 50	D	675	7,844	NB	398	0.59	D
Citrus Tower Boulevard	US 27 to Oakley Seaver Dr	D	792	12,177	SB	601	0.76	C
	Oakley Seaver Dr to SR 50	D	1,800	16,110	NB	692	0.38	C
	SR 50 to Hooks St	D	1,800	17,355	SB	834	0.46	C
	Hooks St to Johns Lake Rd	D	1,800	18,431	SB	922	0.51	C
	Johns Lake Rd to US 27	D	1,800	14,579	SB	713	0.40	C
Hancock Road	CR 50 to Ridge Blvd	D	1,800	11,023	SB	472	0.26	C
	Ridge Blvd to SR 50	D	1,800	14,533	NB	643	0.36	C
	SR 50 to Hooks St	D	1,800	18,478	SB	932	0.52	C
	Hooks St to Johns Lake Rd	D	792	18,478	SB	932	1.18	F
	Johns Lake Rd to Hartwood Marsh Rd	D	792	8,483	SB	405	0.51	C
Hartwood Marsh Road	US 27 to Hancock Road	D	675	14,102	SB	771	1.14	F
	Hancock Road to 90 Degree Bend	D	675	10,247	NB	720	1.07	F
	90 Degree Bend to Orange County Line	D	675	10,247	NB	720	1.07	F

Table 2.2 con't. – Existing Roadway Segment Analysis

Roadway	Segment	LOS Std	LOS Capacity	AADT	Pk Dir	Pk Hr/ Pk Dir Existing	v/c	LOS
Lake Louisa Road	Lakeshore Dr to Vista Del Lago Blvd	D	675	3,456	NB	163	0.24	C
	Vista Del Lago Blvd to US 27	D	675	4,044	SB	301	0.45	C
Grand Highway	Citrus Tower Blvd to SR 50	D	675	6,436	NB	309	0.46	C
	SR 50 to Hooks St	D	1,800	6,292	SB	303	0.17	C
Hooks Street	Lakeshore Dr to US 27	D	675	7,007	EB	347	0.51	D
	US 27 to Oakley Seaver Dr	D	1,800	9,512	WB	396	0.22	C
	Oakley Seaver Dr to Citrus Tower Blvd	D	1,800	9,367	WB	398	0.22	C
	Citrus Tower Blvd to Hancock Rd	D	1,800	11,451	WB	603	0.34	C
Anderson Hill Road	Lakeshore Dr to US 27	D	675	1,584	EB	105	0.16	C
East Avenue	CR 561 to SR 50	D	675	5,103	WB	286	0.42	C
Hammock Ridge Road	Lakeshore Dr to US 27	D	1,800	15,472	WB	921	0.51	C
Lakeshore Drive	Hammock Ridge Road to Anderson Hill Rd	D	675	7,500	EB	416	0.62	D
Turkey Farm Road	E Grassy Lake Road to CR 50	D	675	344	EB	22	0.03	C
Johns Lake Road	US 27 to Hancock Road	D	675	8,489	EB	390	0.58	D
Blackstill Lake Road	Fosgate Rd to CR 50	D	612	3,135	SB	156	0.25	C

Source: Lake Sumter MPO TMS Report for Lake County, April 5, 2015 (LOS Standards/Roadway Capacity)
Lake County 2016 Master Roadway Count Table (AADT for non-state/federal roadways)
FDOT Florida Transportation Information 2014 (AADT for state/federal roadways, grown to 2016)

With only existing trips, there are four segments within the study area which do not meet the LOS standard for the roadway:

- Hancock Road: Hooks Street to Johns Lake Road
- Hartwood Marsh Road: US 27 to Hancock Road
- Hartwood Marsh Road: Hancock Road to 90 Degree Bend
- Hartwood Marsh Road: 90 Degree Bend to Orange County Line

There are no current plans within the Lake-Sumter MPO Long Range Transportation Plan (Cost Feasible Projects) and/or Transportation Improvement Program to provide any capacity improvements on any of the deficient roadways.

3.0 Proposed Development Plan

3.1 Development Program

The proposed development program for the Waterbrooke development includes a total of 1,073 dwelling units (771 single-family dwelling units, 302 townhomes). However, for the purposes of this analysis, the development will be analyzed as 1,100 single-family dwelling units. This will allow for the maximum flexibility in product types offered within the development (i.e. - single family, townhome, duplex, senior adult) as plans for each phase are finalized, as single-family has the highest trip generation of any of the proposed uses. Thus, as long as the final development does not exceed 1,100 dwelling units, the impacts from the proposed development are included within this study.

3.2 Site Access & Circulation

Access for the site will be provided from Emil Jahna Road, Hartle Road, and Hancock Road. There are a few features within the subject property which divide the development – the large lake/borrow pit, a powerline easement, and the extension of Hartle Road. The first three phases are all located on the north side of the largest lake/borrow pit, the fourth and fifth phases are located south of the lake/borrow pit between Hancock Road and Hartle Road, and the sixth phase is located east of Hartle Road (as is shown in **Figure 1.2**). The development north of the largest lake/borrow pit (phases 1-3) will have access to both Emil Jahna Road and Hartle Road. The development within Phase 6 will only have access to Hartle Road. The development within Phases 4 and 5 will be analyzed with two options for access – with both phases having access to both Hancock Road and Hartle Road and with only an emergency access between Phases 4 and 5 (and thus access to Phase 4 provided via Hartle Road, and access to Phase 5 provided via Hancock Road).

The study was also analyzed with two options for Emil Jahna Road. Within each build-out scenario, Emil Jahna Road was analyzed as both a two-lane roadway (Option 1) and as a four lane roadway (Option 2).

The development is proposed to be gated, and thus cut-through traffic between the various phases of development will not be permitted. However, there will be bicycle/pedestrian pathways linking the various development areas.

4.0 Trip Generation & Assignment

4.1 Project Traffic Estimates

The traffic estimates for the project were developed using the information contained in the *ITE Trip Generation Manual, 9th Edition*, using ITE Code 210 'Single Family Residential' for all dwelling units, as it produces the higher trip generation and thus will allow for minor variations in the proportion of each type of units provided as the final site plans are determined. These estimates were prepared to represent both the trips that will occur at the project driveways (inbound and outbound) for both the AM and PM peak-hour periods and for the net new trips that will be added to the external roadway network. The result of the trip generation estimation exercise is shown below in **Table 4.1**.

Internal trips are those which begin and end within the project site. External trips have either an origin or destination outside the project site. There will be no internal capture assumed for the proposed development, as the entire development is planned residential. Pass-by trips come directly from the traffic stream passing the facility on the adjacent street system and do not require a diversion from another roadway. Likewise, as the entire development is planned as residential, no pass-by is assumed for this project. No transit reduction will be assumed for this project, as there are no transit routes near the proposed development.

Table 4.1 – Trip Generation

Land Use	ITE Code	Intensity	Daily Trip Ends	Peak Period	Total	In		Out	
						%	Trips	%	Trips
Single-Family	210	1,100 DU	9,536	AM	780	25%	195	75%	585
				PM	909	63%	573	37%	336

Source: ITE Trip Generation Manual, 9th Edition

4.2 Trip Distribution

The proposed project was added into the currently approved Central Florida Regional Planning Model (CFRPM, v5.01) as three new TAZs, one with connections to Emil Jahna Road and Hartle Road, one with connections just to Hartle Road, and the last with connections to Hancock Road and Hartle Road. Both Emil Jahna Road and Hartle Road were added to the network as necessary. The model was run to determine the distribution of project trips onto the roadway network from the new development for the two scenarios. Print-outs of the model distribution are shown in **Appendix E**.

Both scenarios resulted in similar global distributions, with approximately 60% of the project trips to the east/northeast of the site, 25% of the project trips to the north/northwest, 10% to the south/southwest, and 5% in the TAZs near the project site. Based on the regional distribution of employment and attractions, this is a reasonable assignment.

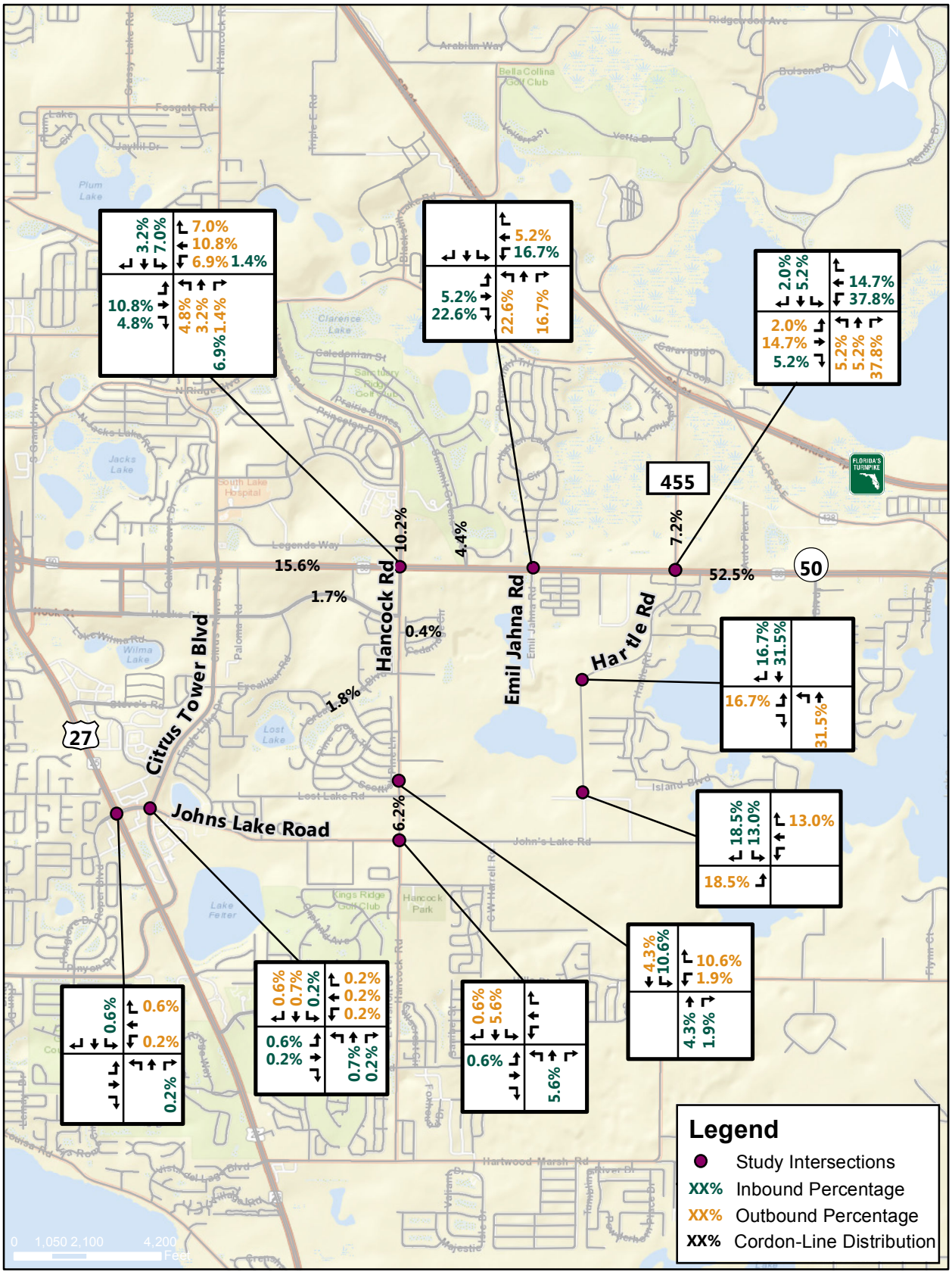
Project trips were assigned to the site access points based on intensity of development within the various phases of development and the allowed access from each phase, the direction of travel to and from the site, as well as engineering judgment. The model distribution on the roadway network between project access points (i.e. – Hancock Road between SR 50 and the project access and SR 50 between Hancock Road and Hartle Road) was updated based on the projected distribution of project trips between access points. All project traffic was assumed to use the first access point encountered that provides access to the correct area of the development, except for trips from Phases 1-3 and locations east along SR 50. For purposes of analysis, it was assumed that the trips to/from SR 50 east of Hartle Road from Phases 1-3 would be split 50%/50% between Emil Jahna Road and Hartle Road, as the majority of parcels would have more direct access from Emil Jahna Road, although the Hartle Road access is "first" and may have less traffic. The distribution of project trips onto the regional roadway network is shown on **Figure 4.1** and **Figure 4.2**.

4.3 Background Traffic Growth

The future analysis year for the proposed development is 2025. Background traffic volumes for the AM peak period intersection analysis were determined by growing the existing traffic volumes by 1% per year (from 2015/16 to 2025). The committed trips for each roadway segment were added to the existing counts to determine the future PM roadway volumes, and applied to the intersections for the PM peak period intersection analysis. Generally, committed trips on the approach segment were applied to the intersections at a ratio of the existing turning movement volumes, although some adjustments were made to better match the committed trips on the departure segment (such as at SR 50/Hancock Road, where there are more northbound committed trips leaving the intersection than southbound committed trips)

4.4 Projected Future Traffic

The projected project trips on each segment and intersection turning movement were added to the projected background/committed trips at each of the study locations in order to determine the total future roadway segment and intersection turning movement volumes. The projected future turning movement volumes are shown on **Figure 4.3 – Figure 4.6**.


Hancock Rd
Emil Jahna Rd
Hartle Rd
Citrus Tower Blvd
Johns Lake Road
455
50
27
Legends Way
10.2%
4.4%
7.2%
15.6%
52.5%
1.7%
0.4%
1.8%
6.2%
3.2% 7.0%
7.0% 10.8% 6.9% 1.4%
10.8% 4.8%
4.8% 3.2% 6.9% 1.4%
5.2%
5.2% 22.6%
22.6% 16.7%
16.7%
2.0% 5.2%
14.7% 37.8%
2.0% 14.7% 5.2%
5.2% 5.2% 37.8%
16.7% 31.5%
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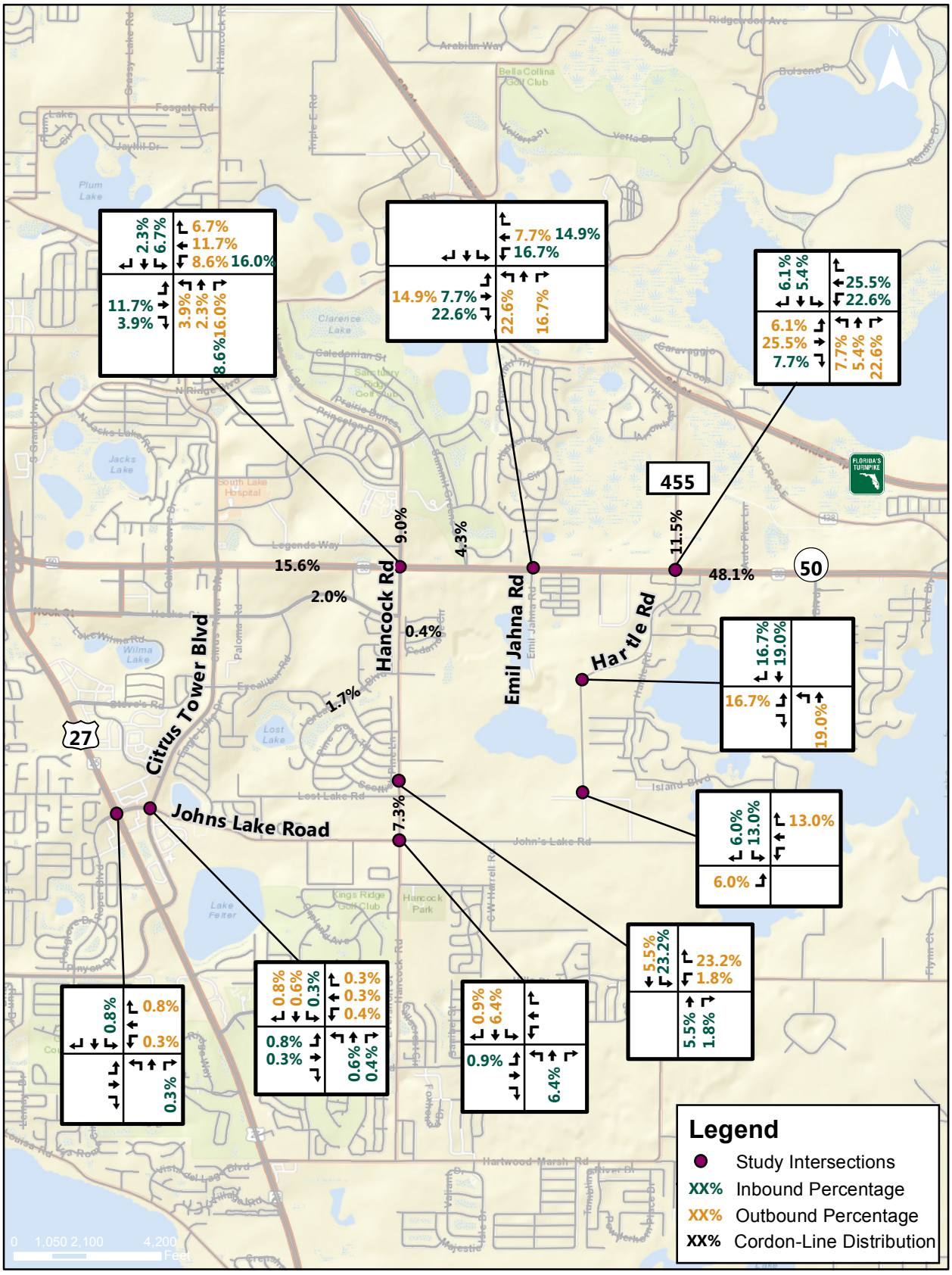
Study Intersections
XX% Inbound Percentage
XX% Outbound Percentage
XX% Cordon-Line Distribution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Hartle Rd
Johns Lake Road
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4.3%
11.5%
15.6%
48.1%
2.0%
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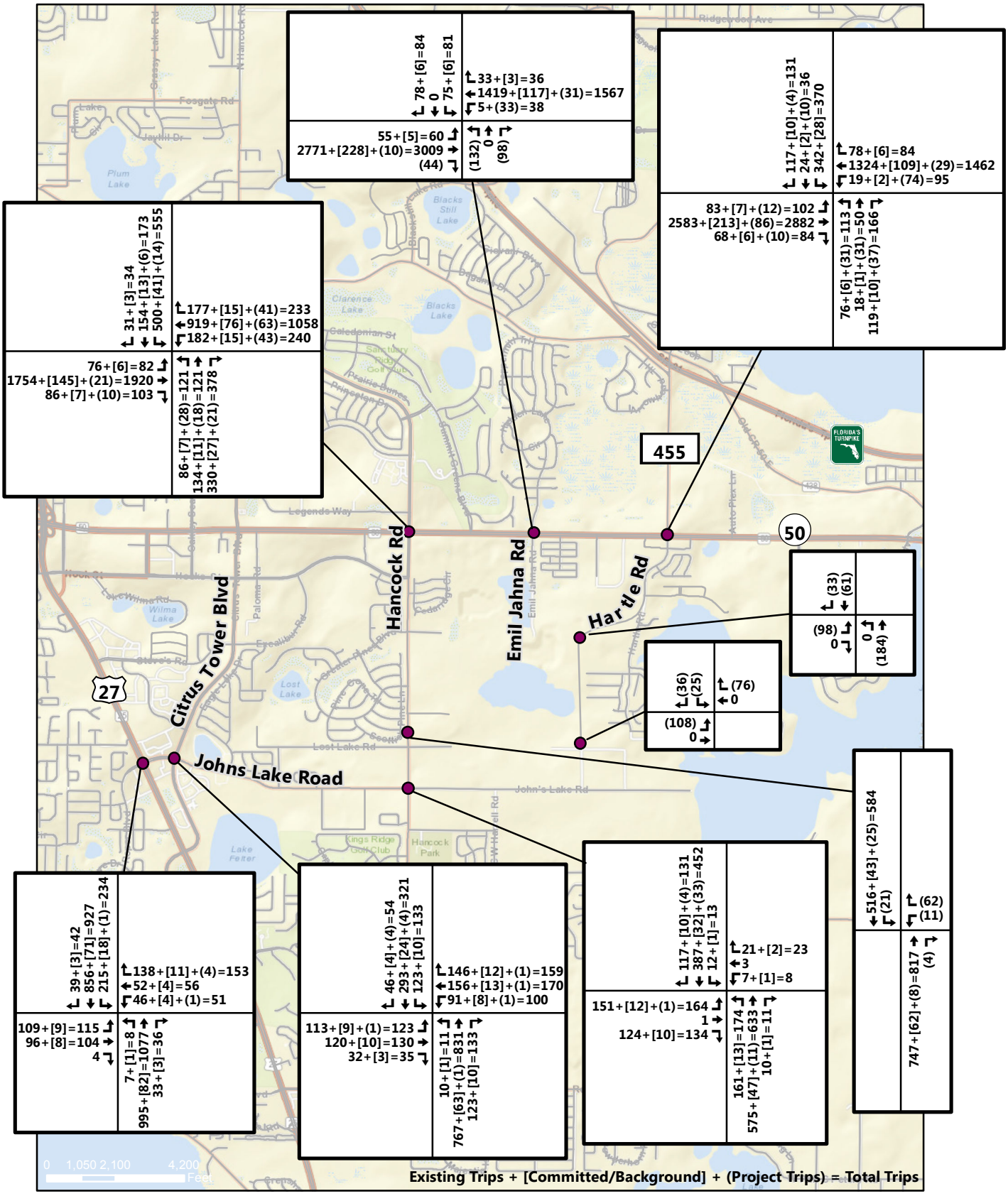
Legend
Study Intersections
XX% Inbound Percentage
XX% Outbound Percentage
XX% Cordon-Line Distribution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50
Hancock Rd
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293+[24]+(4)=321
123+[10]=133
146+[12]+(1)=159
156+[13]+(1)=170
91+[8]+(1)=100
113+[9]+(1)=123
120+[10]=130
32+[3]=35
10+[1]=11
767+[63]+(1)=831
123+[10]=133
117+[10]+(4)=131
387+[32]+(33)=452
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21+[2]=23
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7+[1]=8
151+[12]+(1)=164
1
124+[10]=134
161+[13]=174
575+[47]+(11)=633
10+[1]=11
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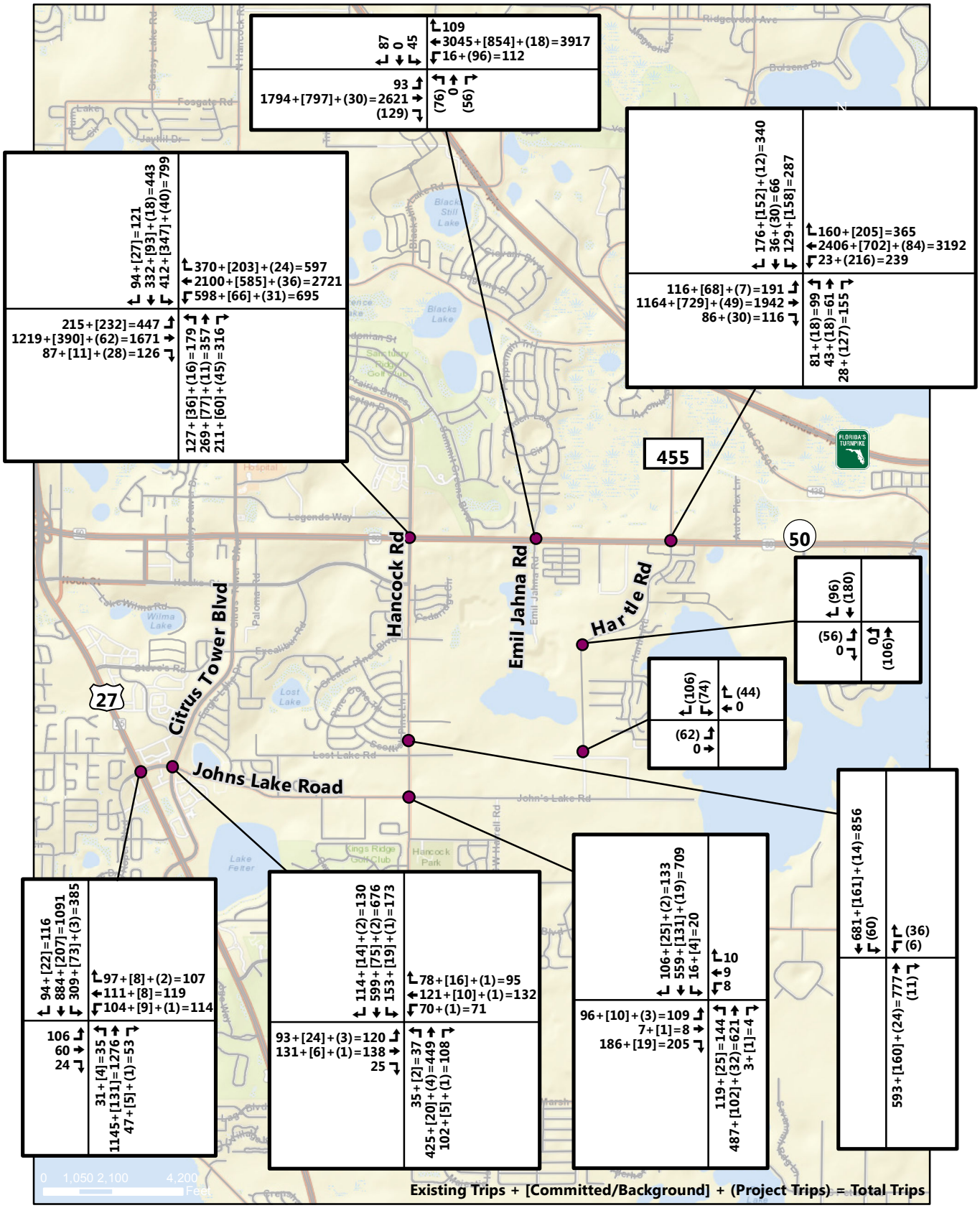
1,050
2,100
4,200
Feet
Existing Trips + [Committed/Background] + (Project Trips) = Total Trips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332+[93]+(18)=443
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2100+[585]+(36)=2721
598+[66]+(31)=695
215+[232]=447
1219+[390]+(62)=1671
87+[11]+(28)=126
127+[36]+(16)=179
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86+(30)=116
81+(18)=99
43+(18)=61
28+(127)=155
455
50
Hancock Rd
Emil Jahna Rd
Hartle Rd
Citrus Tower Blvd
27
Johns Lake Road
(96)
(180)
(56)
0
(106)
(106)
(74)
(44)
0
(62)
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106
60
24
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1145+[131]=1276
47+[5]+(1)=53
114+[14]+(2)=130
599+[75]+(2)=676
153+[19]+(1)=173
78+[16]+(1)=95
121+[10]+(1)=132
70+(1)=71
93+[24]+(3)=120
131+[6]+(1)=138
25
35+[2]=37
425+[20]+(4)=449
102+[5]+(1)=108
106+[25]+(2)=133
559+[131]+(19)=709
16+[4]=20
10
9
8
96+[10]+(3)=109
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681+[161]+(14)=856
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(36)
(6)
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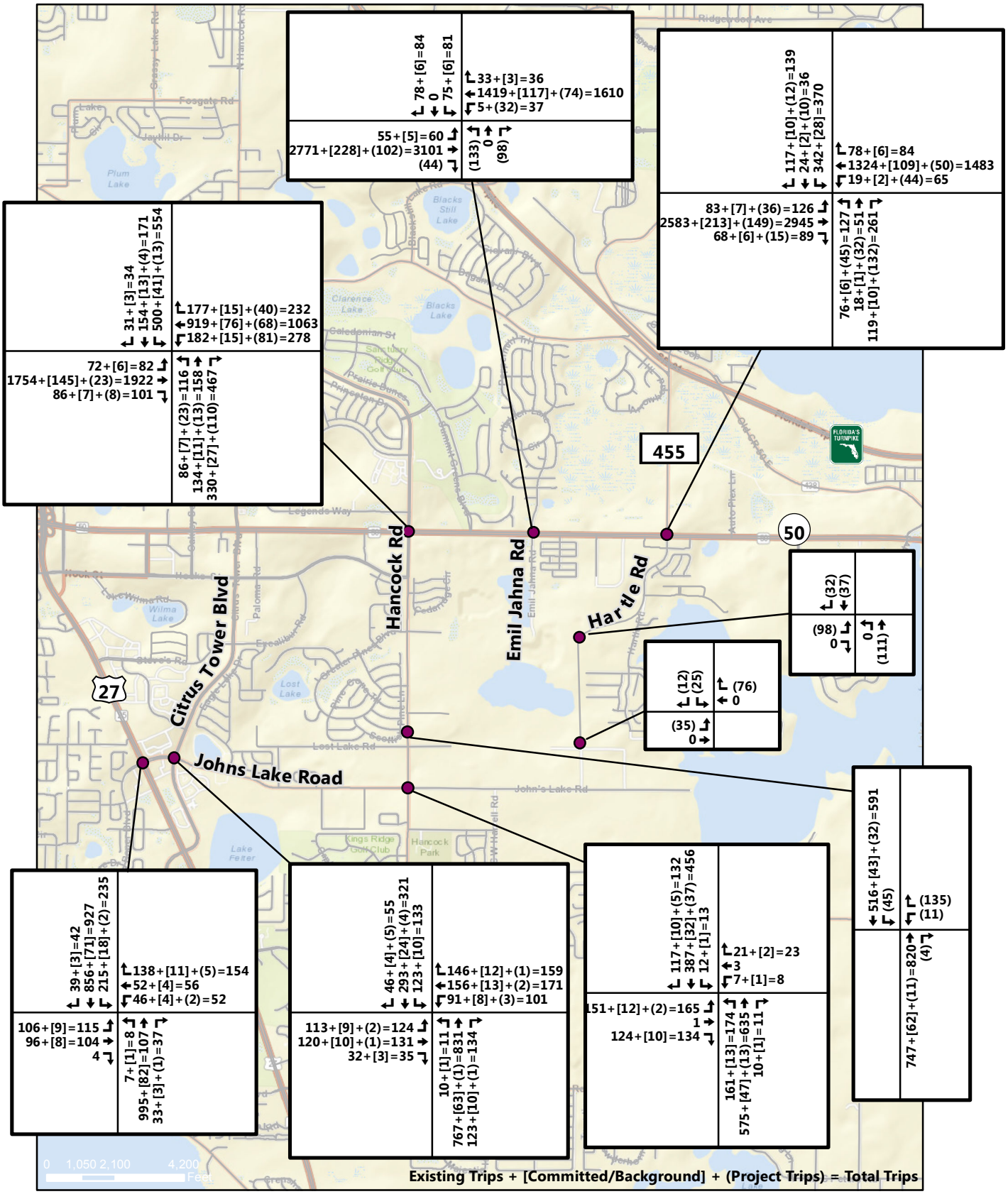
Feet
Existing Trips + [Committed/Background] + (Project Trips) = Total Trips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18+[1]+(32)=51
119+[10]+(132)=261
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177+[15]+(40)=232
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182+[15]+(81)=278
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86+[7]+(8)=101
86+[7]+(23)=116
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455
50
Hancock Rd
Emil Jahna Rd
Hartle Rd
Citrus Tower Blvd
27
Johns Lake Road
(32)
(37)
(98)
0
0
(111)
(12)
(25)
(76)
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(35)
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(11)
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(4)
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856+[71]=927
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106+[9]=115
96+[8]=104
4
7+[1]=8
995+[82]=107
33+[3]+(1)=37
46+[4]+(5)=55
293+[24]+(4)=321
123+[10]=133
146+[12]+(1)=159
156+[13]+(2)=171
91+[8]+(3)=101
113+[9]+(2)=124
120+[10]+(1)=131
32+[3]=35
10+[1]=11
767+[63]+(1)=831
123+[10]+(1)=134
117+[10]+(5)=132
387+[32]+(37)=456
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151+[12]+(2)=165
1
124+[10]=134
161+[13]=174
575+[47]+(13)=635
10+[1]=11
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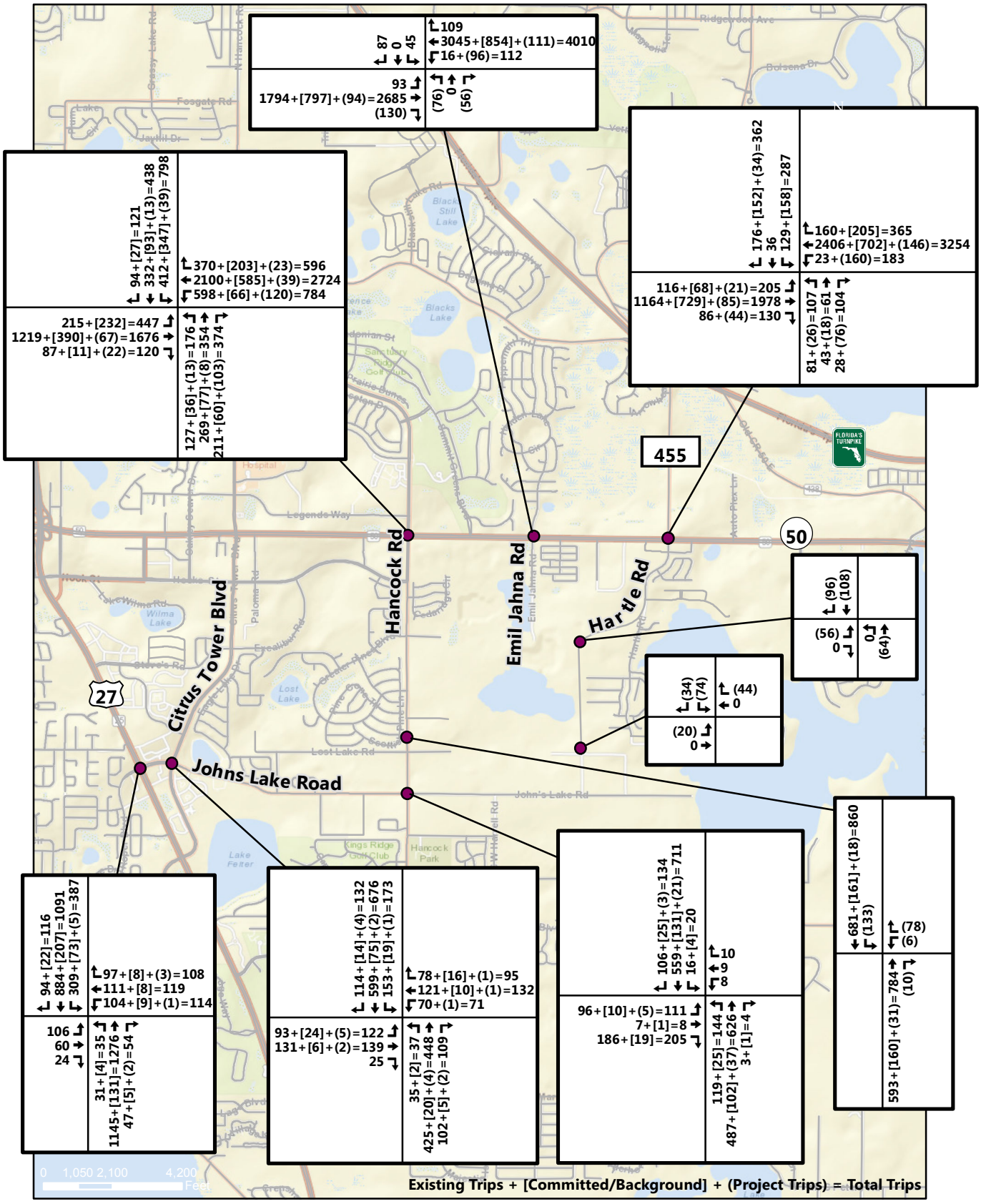
1,050
2,100
4,200
Feet
Existing Trips + [Committed/Background] + (Project Trips) = Total Trips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3045+[854]+(111)=4010
16+(96)=112
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1794+[797]+(94)=2685
(130)
(76)
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(56)
94+[27]=121
332+[93]+(13)=438
412+[347]+(39)=798
370+[203]+(23)=596
2100+[585]+(39)=2724
598+[66]+(120)=784
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87+[11]+(22)=120
127+[36]+(13)=176
269+[77]+(8)=354
211+[60]+(103)=374
176+[152]+(34)=362
36
129+[158]=287
160+[205]=365
2406+[702]+(146)=3254
23+(160)=183
116+[68]+(21)=205
1164+[729]+(85)=1978
86+(44)=130
81+(26)=107
43+(18)=61
28+(76)=104
455
50
Hancock Rd
Emil Jahna Rd
Hartle Rd
Citrus Tower Blvd
27
Johns Lake Road
(96)
(108)
(56)
0
(64)
(34)
(74)
(44)
0
(20)
0
94+[22]=116
884+[207]=1091
309+[73]+(5)=387
97+[8]+(3)=108
111+[8]=119
104+[9]+(1)=114
106
60
24
31+[4]=35
1145+[131]=1276
47+[5]+(2)=54
114+[14]+(4)=132
599+[75]+(2)=676
153+[19]+(1)=173
78+[16]+(1)=95
121+[10]+(1)=132
70+(1)=71
93+[24]+(5)=122
131+[6]+(2)=139
25
35+[2]=37
425+[20]+(4)=448
102+[5]+(2)=109
106+[25]+(3)=134
559+[131]+(21)=711
16+[4]=20
10
9
8
96+[10]+(5)=111
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681+[161]+(18)=860
(133)
(78)
(6)
593+[160]+(31)=784
(10)
0
1,050
2,100
4,200
Feet
Existing Trips + [Committed/Background] + (Project Trips) = Total Trips

5.0 Evaluation

The post development condition was evaluated based on the anticipated addition of project traffic and a modest amount of growth in background traffic. These analyses were conducted assuming no roadway or intersection improvements (with the exception of site access connections) will be made to any of the study area roadways or intersections.

5.1 Future Intersection Analysis – No-Build

The projected background trips and committed trips (on SR 50) were analyzed as the no-build scenario for the study area intersections using Synchro 8. The results of this evaluation is shown on **Table 5.1** with the printouts of the analysis shown in **Appendix F**. As this study covers a 10-year period with significant additional proposed development outside of the project site, it was assumed that the signals on this corridor would be retimed/coordinated to better serve the adjustments for the future traffic patterns.

Table 5.1 – Future Intersection Level of Service – No-Build

Intersection	Stop Control	Intersection Conditions	Approach				
			Overall	EB	WB	NB	SB
AM Peak Period							
SR 50 @ Hancock Rd	Signal	LOS	E	D	D	F	E
		Delay (sec/veh)	56.7	53.5	35.4	109.5	72.2
SR 50 @ Emil Jahna Rd	Signal	LOS	B	B	A	A	D
		Delay (sec/veh)	13.9	15.6	8.4	0.0	49.4
SR 50 @ Hartle Rd	Signal	LOS	D	D	C	F	F
		Delay (sec/veh)	45.4	46.9	22.2	94.9	93.5
US 27 @ Johns Lake Rd	Signal	LOS	C	D	C	D	C
		Delay (sec/veh)	32.5	46.0	34.0	39.8	22.1
Citrus Tower Blvd @ Johns Lake Rd	Signal	LOS	C	D	D	C	C
		Delay (sec/veh)	34.2	40.2	48.4	32.1	22.5
Hancock Road @ Johns Lake Road	Signal	LOS	D	E	E	C	D
		Delay (sec/veh)	39.8	62.1	73.6	29.3	38.5
PM Peak Period							
SR 50 @ Hancock Rd	Signal	LOS	F	F	F	F	F
		Delay (sec/veh)	194.6	113.2	237.7	169.9	215.7
SR 50 @ Emil Jahna Rd	Signal	LOS	C	B	C	A	E
		Delay (sec/veh)	25.3	10.6	34.4	0.0	65.6
SR 50 @ Hartle Rd	Signal	LOS	F	C	F	F	F
		Delay (sec/veh)	114.9	33.0	121.4	135.4	364.4
US 27 @ Johns Lake Rd	Signal	LOS	C	E	D	D	C
		Delay (sec/veh)	34.2	55.3	48.3	41.6	22.9
Citrus Tower Blvd @ Johns Lake Rd	Signal	LOS	C	D	D	B	B
		Delay (sec/veh)	23.3	53.9	48.3	14.8	12.9
Hancock Road @ Johns Lake Road	Signal	LOS	D	E	E	C	D
		Delay (sec/veh)	43.0	56.0	73.5	26.3	51.5

Source: Littlejohn Engineering Associates

The results of the analysis indicate there are significant delays in the no-build scenario, with the intersections of SR 50/Hancock Road and SR 50/Hartle Road not meeting the LOS standards overall and on most movements in the PM peak period and the minor street approaches not meeting the LOS standards in the AM peak period. Due to significantly high projected volumes on SR 50 (existing + committed trips), there is simply not sufficient green time available to serve the minor street approaches and major street left-turn movements. It should be noted that the programmed Turnpike interchange in Minneola may serve to reduce volumes on SR 50, as it is anticipated to divert a significant amount of traffic from the existing interchange on SR 50 in the Town of Oakland. These intersections are effectively "built-out" with turn lanes, leaving a solution of finding additional capacity at the intersections by widening SR 50 or an equivalent alternative.

While the intersection of US 27/Johns Lake Road does not meet the level of service standards for a roadway on the State Highway System (LOS C), the delays at this intersection are typical of an intersection in an urban environment, with average delays of up to 61.5 seconds throughout the movements.

An analysis of the 95th percentile queue length of each of the turn lanes into and out of the site are shown in **Table 5.2**. Based on the queue lengths shown in the analysis, all turn lanes into and out of the site have sufficient length for the 95th percentile queue and deceleration length, other than the westbound left-turn onto Hartle Road, which does not meet the required length by 8 feet. However, as this turn lane has 240 feet of deceleration length, this is not a substantial deficiency.

Table 5.2 – Queue Analysis – No-Build

Intersection	Stop Control	Lane	Existing Lane Length (ft)	95th% Queue Length (ft)	Required decel length[1] (ft)	Total length required (ft)
SR 50 @ Emil Jahna Rd	Signal (Option 1)	WB Left	320	42	240	282
	Signal (Option 2)	WB Left	320	42	240	282
SR 50 @ Hartle Rd	Signal	EB Right	480	7	240	247
		WB Left	290	58	240	298
		NB Left	120	95	0	95
	Signal (Improved)	EB Right	480	7	240	247
		WB Left	290	58	240	298
		NB Left	120	95	0	95

[1]Does not include required taper length
Source: Littlejohn Engineering Associates

5.2 Future Intersection Analysis – Scenario 1

The combined background, committed (for SR 50), and project trips were analyzed for the Scenario 1 access using Synchro 8. The results of these evaluations are shown in **Table 5.3** with the printouts of the analysis shown in **Appendix G**. As was completed for the no-build analysis, the traffic signals were retimed/optimized as it can be expected that retiming will occur over the next 10 years. The intersection of SR 50/Emil Jahna Road was analyzed with two options, with Option 1 being an improved two-lane roadway (bringing the roadway up to modern design standards) and Option 2 being a 4-lane roadway. All of the project access intersections operate within the level of service standards. Most of the deficiencies shown in Scenario 1 also operate below the level of service standard in the no-build condition, and thus are not the responsibility of the proposed development. All deficiencies on SR 50 are caused by high through movements on SR 50 which limit the available green time for turning movements and minor street approaches. Capacity improvements which would be necessary to serve the background traffic (widening to 8 lanes or equivalent improvement) would mitigate the traffic for the build-out scenarios as well. Additionally, the completion of the new Turnpike interchange in Minneola may offer some relief to SR 50 and lessen the demand on the through movements, improve the length of delays.

Table 5.3 – Future Intersection Level of Service – Scenario 1

Intersection	Stop Control	Intersection Conditions	Approach				
			Overall	EB	WB	NB	SB
AM Peak Period							
SR 50 @ Hancock Rd	Signal	LOS	E	D	D	F	E
		Delay (sec/veh)	61.2	52.6	39.3	139.3	77.7
SR 50 @ Emil Jahna Rd	Signal (Option 1)	LOS	D	D	B	D	D
		Delay (sec/veh)	38.8	50.3	14.9	52.5	42.9
	Signal (Option 2)	LOS	C	C	B	D	D
		Delay (sec/veh)	23.8	27.7	11.2	50.4	46.9
SR 50 @ Hartle Rd	Signal	LOS	E	E	C	F	F
		Delay (sec/veh)	70.4	77.6	29.2	165.5	110.7
	Signal (Improved)	LOS	E	E	C	E	F
		Delay (sec/veh)	66.3	78.2	29.3	77.4	109.1
US 27 @ Johns Lake Rd	Signal	LOS	C	D	D	D	C
		Delay (sec/veh)	32.5	46.0	33.7	39.8	22.1
Citrus Tower Blvd @ Johns Lake Rd	Signal	LOS	C	D	D	C	C
		Delay (sec/veh)	34.4	40.5	48.5	32.3	22.5
Hancock Road @ Johns Lake Road	Signal	LOS	D	E	E	D	D
		Delay (sec/veh)	51.4	65.8	79.4	44.0	51.4
Hartle Road @ North Access	TWSC	LOS	-	B		A	
		Delay (sec/veh)	-	10.8		0.0	
Hartle Road @ South Access	AWSC	LOS	-	A	A		A
		Delay (sec/veh)	-	8.1	6.9		7.4
Hancock Road @ South Access	TWSC	LOS	-		C		A
		Delay (sec/veh)	-		21.1		9.9

Table 5.3 cont. - Future Intersection Level of Service – Scenario 1

Intersection	Stop Control	Intersection Conditions	Approach				
			Overall	EB	WB	NB	SB
PM Peak Period							
SR 50 @ Hancock Rd	Signal	LOS	F	F	F	F	F
		Delay (sec/veh)	184.5	104.8	221.8	175.4	221.0
SR 50 @ Emil Jahna Rd	Signal (Option 1)	LOS	D	C	E	E	E
		Delay (sec/veh)	42.7	21.2	56.3	70.4	62.1
	Signal (Option 2)	LOS	C	B	D	E	E
		Delay (sec/veh)	32.7	17.5	41.5	67.5	63.9
SR 50 @ Hartle Rd	Signal	LOS	F	D	F	F	F
		Delay (sec/veh)	134.0	48.1	139.0	158.8	391.0
	Signal (Improved)	LOS	F	D	F	F	F
		Delay (sec/veh)	131.5	48.1	139.0	89.0	391.0
US 27 @ Johns Lake Rd	Signal	LOS	C	D	D	D	C
		Delay (sec/veh)	34.4	52.1	49.1	40.9	24.3
Citrus Tower Blvd @ Johns Lake Rd	Signal	LOS	C	D	D	B	B
		Delay (sec/veh)	23.5	54.1	48.5	14.9	13.0
Hancock Road @ Johns Lake Road	Signal	LOS	D	E	E	C	D
		Delay (sec/veh)	41.3	59.7	78.3	26.2	45.9
Hartle Road @ North Access	TWSC	LOS	-	B		A	
		Delay (sec/veh)	-	10.8		0.0	
Hartle Road @ South Access	TWSC	LOS	-	A	A		A
		Delay (sec/veh)	-	8.0	7.0		8.0
Hancock Road @ South Access	TWSC	LOS	-		C		A
		Delay (sec/veh)	-		22.7		10.0

Source: Littlejohn Engineering Associates

With the addition of project traffic at the SR 50/Emil Jahna Road intersection, the minor street approaches to this intersection operate below the level of service standard in the PM peak period. Both Options 1 and 2 for Emil Jahna Road (a 2-lane or 4-lane approach) result in operations below the level of service standard, although Option 2 allows more green time for the westbound left-turn approach, allowing that approach to meet level of service standards. However, with both options for Emil Jahna Road, the average delays for the minor street approaches are approximately half of the green time for the eastbound and westbound through volumes, indicating that all vehicles should be able to clear the intersection within one cycle, and that the delays are due to the extended green times required for the through volumes.

While there are existing deficiencies at the intersection of SR 50/Hartle Road, the addition of project trips significantly worsens the delays on the northbound approach in the AM peak period. The addition of an "overlap" phase (giving the northbound right-turns a green arrow while the westbound left-turns have a green arrow) would significantly lessen the delays on this movement/approach in the AM peak period. The existing turn-lanes at the intersection are sufficient to serve the traffic for each movement, and there are no additional turn lanes that would

mitigate any of the remaining deficiencies which are caused by the large volume of traffic on SR 50.

An analysis of the 95th percentile queue length of each of the turn lanes into and out of the site are shown in **Table 5.4**.

Table 5.4 – Queue Analysis – Scenario 1

Intersection	Stop Control	Lane	Existing Lane Length (ft)	95th% Queue Length (ft)	Required decel length[1] (ft)	Total length required (ft)
SR 50 @ Emil Jahna Rd	Signal (Option 1)	WB Left	320	195	240	435
	Signal (Option 2)	WB Left	320	201	240	441
SR 50 @ Hartle Rd	Signal	EB Right	480	4	240	244
		WB Left	290	424	240	664
		NB Left	120	114	0	114
	Signal (Improved)	EB Right	480	4	240	244
		WB Left	290	424	240	664
		NB Left	120	114	0	114
Hartle Road @ North Access	TWSC	SB Right	n/a	0	95	95
		NB Left	n/a	0	95	95
Hancock Road @ South Access	TWSC	SB Left	n/a	7	190	197
		NB Right	n/a	0	190	190
		WB Left	n/a	9	0	9

[1]Does not include required taper length
Source: Littlejohn Engineering Associates

When the required deceleration length is added to the projected 95th percentile queue for the roadway, the westbound left-turn lane at the intersection of SR 50/Emil Jahna Road, and the westbound left-turn lane at the intersection of SR 50/Hartle Road do not meet the required turn lane length. In lieu of extended the turn lanes at these intersections (as spacing to the upstream median openings prevents the extension of the lane to the proper length), a secondary left-turn lane may be added to store the vehicles.

5.3 Future Roadway Segment Analysis – Scenario 1

The project trips were added to the existing traffic volumes and committed trips shown in the Lake Sumter MPO TMS Report to determine the future roadway segment volumes. These volumes were identified and compared for each segment to the estimated capacity based on the FDOT Q/LOS Tables. The results of that analysis are shown in **Table 5.5**.

Based on the roadway segment analysis, there are seven (7) segments which are projected to operate below the level of service standard for the roadway. However, all of these segments are deficient with just the background and committed trips, and thus are backlogged before the addition of project trips.

Table 5.5 – Roadway Segment Analysis (2025) – Scenario 1

Roadway	Segment	LOS Std	LOS Capacity	AADT	Pk Dir	Pk Hr/Pk Dir Existing	LOS	Committed Trips	Pk Hr/Pk Dir with Committed Trips	LOS	Project Trips	Background, Committed, and Project Trips	v/c	LOS
SR 50	CR 561 to East Ave	D	2,000	34,421	WB	1,688	C	124	1,812	C	13	1,825	0.91	C
	East Ave to US 27	D	3,020	43,709	WB	2,144	C	156	2,300	C	19	2,319	0.77	C
	US 27 to Hancock Road	D	3,020	44,255	WB	2,171	C	639	2,810	C	38	2,848	0.94	C
	Hancock Road to Emil Jahna Rd	D	3,020	56,275	WB	2,760	C	854	3,614	F	94	3,708	1.23	F
	Emil Jahna Rd to CR 455	D	3,020	56,275	WB	2,760	C	854	3,614	F	114	3,728	1.23	F
	CR 455 to Orange County Line	D	3,020	47,534	WB	2,332	C	907	3,239	F	263	3,502	1.16	F
US 27	Grand Hwy to SR 50	C	2,940	27,865	NB	1,367	C	173	1,540	C	2	1,542	0.52	C
	SR 50 to Johns Lake Rd	C	2,940	37,153	SB	1,822	C	302	2,124	C	1	2,125	0.72	C
	Johns Lake Rd to Hartwood Marsh Rd	C	2,940	33,328	NB	1,635	C	141	1,776	C	1	1,777	0.60	C
	Hartwood Marsh Rd to Lake Louisa Rd	C	2,940	22,947	NB	1,126	C	141	1,267	C	13	1,280	0.44	C
	Lake Louisa Rd to Boggy Marsh Rd	C	2,940	24,586	SB	1,206	C	50	1,256	C	7	1,263	0.43	C
Old Hwy 50	US 27 to Turkey Farm Rd	D	792	7,238	WB	378	C	172	550	C	7	557	0.70	C
	Turkey Farm Rd to CR 455	D	792	5,592	EB	448	C	305	753	D	18	771	0.97	D
	CR 455 to Orange County Line	D	792	5,950	WB	513	C	100	613	C	17	630	0.80	C
CR 455	Ridgewood Ave to CR 455/CR 50	D	1,200	6,879	SB	331	B	257	588	C	16	604	0.50	C
	CR 455/CR 50 to SR 50	D	675	7,844	NB	398	D	249	647	D	24	671	0.99	D
Citrus Tower Boulevard	US 27 to Oakley Seaver Dr	D	792	12,177	SB	601	C	6	607	C	11	618	0.78	C
	Oakley Seaver Dr to SR 50	D	1,800	16,110	NB	692	C	60	752	C	2	754	0.42	C
	SR 50 to Hooks St	D	1,800	17,355	SB	834	C	102	936	C	14	950	0.53	C
	Hooks St to Johns Lake Rd	D	1,800	18,431	SB	922	C	108	1,030	C	8	1,038	0.58	C
	Johns Lake Rd to US 27	D	1,800	14,579	SB	713	C	50	763	C	3	766	0.43	C
Hancock Road	CR 50 to Ridge Blvd	D	1,800	11,023	SB	472	C	394	866	C	27	893	0.50	C
	Ridge Blvd to SR 50	D	1,800	14,533	NB	643	C	611	1,254	C	31	1,285	0.71	C
	SR 50 to Hooks St	D	1,800	18,478	SB	932	C	170	1,102	C	77	1,179	0.66	C
	Hooks St to Johns Lake Rd	D	792	18,478	SB	932	F	161	1,093	F	74	1,167	1.47	F
	Johns Lake Rd to Hartwood Marsh Rd	D	792	8,483	SB	405	C	139	544	C	14	558	0.71	C
Hartwood Marsh Road	US 27 to Hancock Road	D	675	14,102	WB	771	F	11	782	F	8	790	1.17	F
	Hancock Road to 90 Degree Bend	D	675	10,247	EB	720	F	6	726	F	1	727	1.08	F
	90 Degree Bend to Orange County Line	D	675	10,247	EB	720	F	6	726	F	0	726	1.08	F
Lake Louisa Road	Lakeshore Dr to Vista Del Lago Blvd	D	675	3,456	EB	163	C	0	163	C	0	163	0.24	C
	Vista Del Lago Blvd to US 27	D	675	4,044	WB	301	C	0	301	C	0	301	0.45	C
Grand Highway	Citrus Tower Blvd to SR 50	D	675	6,436	NB	309	C	5	314	C	0	314	0.47	C
	SR 50 to Hooks St	D	1,800	6,292	SB	303	C	35	338	C	3	341	0.19	C

Table 5.5 cont. – Roadway Segment Analysis (2025) – Scenario 1

Roadway	Segment	LOS Std	LOS Capacity	AADT	Pk Dir	Pk Hr/Pk Dir Existing	LOS	Committed Trips	Pk Hr/Pk Dir with Committed Trips	LOS	Project Trips	Background, Committed, and Project Trips	v/c	LOS
Hooks Street	Lakeshore Dr to US 27	D	675	7,007	EB	347	D	4	351	D	0	351	0.52	D
	US 27 to Oakley Seaver Dr	D	1,800	9,512	WB	396	C	22	418	C	4	422	0.23	C
	Oakley Seaver Dr to Citrus Tower Blvd	D	1,800	9,367	WB	398	C	22	420	C	8	428	0.24	C
	Citrus Tower Blvd to Hancock Rd	D	1,800	11,451	WB	603	C	11	614	C	5	619	0.34	C
Anderson Hill Road	Lakeshore Dr to US 27	D	675	1,584	EB	105	C	0	105	C	2	107	0.16	C
East Avenue	CR 561 to SR 50	D	675	5,103	SB	286	C	0	286	C	3	289	0.43	C
Hammock Ridge Road	Lakeshore Dr to US 27	D	1,800	15,472	WB	921	C	60	981	C	1	982	0.55	C
Lakeshore Drive	Hammock Ridge Road to Anderson Hill Rd	D	675	7,500	NB	416	D	13	429	D	3	432	0.64	D
Turkey Farm Road	E Grassy Lake Road to CR 50	D	675	344	NB	22	C	0	22	C	9	31	0.05	C
Johns Lake Road	US 27 to Hancock Road	D	675	8,489	EB	390	D	26	416	D	6	422	0.62	D
Blackstill Lake Road	Fosgate Rd to CR 50	D	612	3,135	SB	156	C	68	224	C	1	225	0.37	C

Source: Lake Sumter MPO TMS Report for Lake County, April 5, 2015; Florida Traffic Online; Littlejohn

The required improvements (widening for additional lanes or equivalent capacity improvement) would also satisfy the demands of the project trips, and thus the project cannot be held responsible for the improvements to these segments, per Florida Statute 163.3180 (5) (h) 2. b.

5.4 Future Intersection Analysis – Scenario 2

The combined background, committed (for SR 50), and project trips were analyzed for the Scenario 2 access using Synchro 8. The results of these evaluations are shown in **Table 5.6** with the printouts of the analysis shown in **Appendix H**. As was completed for the no-build analysis, the traffic signals were retimed/optimized as it can be expected that retiming will occur over the next 10 years. The intersection of SR 50/Emil Jahna Road was analyzed with two options, with Option 1 being an improved two-lane roadway (bringing the roadway up to modern design standards) and Option 2 being a 4-lane roadway.

Table 5.6 – Future Intersection Level of Service – Scenario 2

Intersection	Stop Control	Intersection Conditions	Approach				
			Overall	EB	WB	NB	SB
AM Peak Period							
SR 50 @ Hancock Rd	Signal	LOS	F	E	D	F	F
		Delay (sec/veh)	81.9	67.3	54.2	200.8	82.0
	Signal (Improved)	LOS	E	E	D	E	E
		Delay (sec/veh)	60.5	57.2	50.3	75.6	78.1
SR 50 @ Emil Jahna Rd	Signal (Option 1)	LOS	C	D	B	E	D
		Delay (sec/veh)	32.4	38.7	13.6	74.9	51.1
	Signal (Option 2)	LOS	C	C	B	E	D
		Delay (sec/veh)	24.3	28.1	11.0	55.6	51.6
SR 50 @ Hartle Rd	Signal	LOS	F	E	C	F	F
		Delay (sec/veh)	86.8	73.5	30.2	398.6	120.1
	Signal (Improved)	LOS	E	E	C	F	F
		Delay (sec/veh)	72.1	75.0	27.6	188.2	110.8
US 27 @ Johns Lake Rd	Signal	LOS	C	D	C	D	C
		Delay (sec/veh)	26.6	39.1	29.4	49.1	20.0
Citrus Tower Blvd @ Johns Lake Rd	Signal	LOS	C	D	D	C	C
		Delay (sec/veh)	33.4	40.9	47.6	29.5	24.0
Hancock Road @ Johns Lake Road	Signal	LOS	D	E	E	D	D
		Delay (sec/veh)	54.4	58.4	76.7	53.4	52.3
Hartle Road @ North Access	TWSC	LOS	-	B		A	
		Delay (sec/veh)	-	10.2		0.0	
Hartle Road @ South Access	AWSC	LOS	-	A	A		A
		Delay (sec/veh)	-	7.5	6.8		7.3
Hancock Road @ South Access	TWSC	LOS	-		C		B
		Delay (sec/veh)	-		24.8		10.1

Table 5.6 cont. - Future Intersection Level of Service – Scenario 2

Intersection	Stop Control	Intersection Conditions	Approach				
			Overall	EB	WB	NB	SB
PM Peak Period							
SR 50 @ Hancock Rd	Signal	LOS	F	F	F	F	F
		Delay (sec/veh)	195.9	129.2	227.8	200.1	207.5
	Signal (Improved)	LOS	F	F	F	F	F
		Delay (sec/veh)	174.2	109.7	207.2	114.0	216.6
SR 50 @ Emil Jahna Rd	Signal (Option 1)	LOS	D	C	E	E	E
		Delay (sec/veh)	48.5	21.9	65.9	70.4	62.1
	Signal (Option 2)	LOS	D	B	D	E	E
		Delay (sec/veh)	37.6	18.1	49.7	67.5	63.9
SR 50 @ Hartle Rd	Signal	LOS	F	D	F	F	F
		Delay (sec/veh)	143.4	47.7	148.6	104.4	468.3
	Signal (Improved)	LOS	E	E	C	E	F
		Delay (sec/veh)	66.3	78.2	29.3	77.4	109.1
US 27 @ Johns Lake Rd	Signal	LOS	C	E	D	D	C
		Delay (sec/veh)	34.4	55.3	47.9	42.1	22.9
Citrus Tower Blvd @ Johns Lake Rd	Signal	LOS	C	D	D	B	B
		Delay (sec/veh)	23.5	54.1	48.5	14.9	13.0
Hancock Road @ Johns Lake Road	Signal	LOS	D	E	E	C	D
		Delay (sec/veh)	44.8	70.4	73.6	26.4	49.6
Hartle Road @ North Access	TWSC	LOS	-	A		A	
		Delay (sec/veh)	-	9.9		0.0	
Hartle Road @ South Access	TWSC	LOS	-	A	A		A
		Delay (sec/veh)	-	7.6	6.8		7.6
Hancock Road @ South Access	TWSC	LOS	-		C		B
		Delay (sec/veh)	-		23.3		10.6

Source: Littlejohn Engineering Associates

While the intersection of SR 50/Hancock Road operated below the level of service standards in the no-build analysis, the addition of project trips causes a significant increase in delays on the northbound approach in the AM and PM peak periods. The addition of a northbound right-turn lane mitigates for the additional delays caused by project trips, although there are still numerous deficiencies at the intersection that can only be mitigated with by improved capacity on SR 50.

At the intersection of SR 50/Emil Jahna Road, both options analyzed (2-lane or 4-lane roadway) result in deficient conditions for the minor street approaches due to the extended green times for the eastbound and westbound approaches. Option 2 (4-lane roadway) decreases average delays on the westbound approach in the PM peak period, allowing that approach to meet LOS standards.

As was indicated in Scenario 1, the addition of project trips significantly worsens the delays on the northbound approach to the SR 50/Hartle Road intersection, although this intersection did not

meet LOS standards in the no-build scenario. The addition of an "overlap" phase (giving the northbound right-turns a green arrow while the westbound left-turns have a green arrow) would significantly lessen the delays on this movement/approach in the AM peak period. The existing turn-lanes at the intersection are sufficient to serve the traffic for each movement, and there are no additions of turn lanes that would mitigate any of the remaining deficiencies which are caused by the large volume of traffic on SR 50.

All of the project access intersections operate within the level of service standards as two-lane roadways with no additional turn lanes proposed.

An analysis of the 95th percentile queue length of each of the turn lanes into and out of the site is shown in **Table 5.7**.

Table 5.7 – Queue Analysis – Scenario 2

Intersection	Stop Control	Lane	Existing Lane Length (ft)	95th% Queue Length (ft)	Required decel length[1] (ft)	Total length required (ft)
SR 50 @ Emil Jahna Rd	Signal (Option 1)	WB Left	320	195	240	435
	Signal (Option 2)	WB Left	320	201	240	441
SR 50 @ Hartle Rd	Signal	EB Right	480	30	240	270
		WB Left	290	306	240	646
		NB Left	120	121	0	121
	Signal (Improved)	EB Right	480	30	240	270
		WB Left	290	306	240	646
		NB Left	120	121	0	121
Hartle Road @ North Access	TWSC	SB Right	n/a	0	95	95
		NB Left	n/a	0	95	95
Hancock Road @ South Access	TWSC	SB Left	n/a	17	190	207
		NB Right	n/a	0	190	190
		WB Left	n/a	3	0	3

[1]Does not include required taper length
Source: Littlejohn Engineering Associates

When the required deceleration length is added to the projected 95th percentile queue for the roadway, the westbound left-turn lane at the intersection of SR 50/Emil Jahna Road, and the westbound left-turn lane at the intersection of SR 50/Hartle Road do not meet the required turn lane length. In lieu of extended the turn lanes at these intersections (as spacing to the upstream median openings prevents the extension of the lane to the proper length), a secondary left-turn lane may be added to store the vehicles.

5.5 Future Roadway Segment Analysis – Scenario 2

The project trips were added to the existing traffic volumes and committed trips shown in the Lake Sumter MPO TMS Report to determine the future roadway segment volumes. These volumes were identified and compared for each segment to the estimated capacity based on the FDOT Q/LOS Tables. The results of that analysis are shown in **Table 5.8**.

Based on the roadway segment analysis, there are eight (8) segments which are projected to operate below the level of service standard for the roadway. Of these segments, only one becomes deficient with the addition of project trips; with the rest operating below the level of service standards with the existing and/or existing + committed trips.

The segment where project trips result in the roadway volume becoming deficient is CR 455 from CR 455/CR 50 to SR 50. However, the addition of the Minneola Interchange may divert some of the existing and committed trips from this segment, which is only projected to be 10 vehicles over the level of service capacity with the addition of project trips.

The remaining segments are projected to be over-capacity prior to the addition of project trips, and thus can be considered backlogged. The required improvements (widening for additional lanes or equivalent capacity improvement) would also satisfy the demands of the project trips, and thus the project cannot be held responsible for the improvements to these segments, per Florida Statute 163.3180 (5) (h) 2. b.

Table 5.8 – Roadway Segment Analysis (2025) – Scenario 2

Roadway	Segment	LOS Std	LOS Capacity	AADT	Pk Dir	Pk Hr/Pk Dir Existing	LOS	Committed Trips	Pk Hr/Pk Dir with Committed Trips	LOS	Project Trips	Background, Committed, and Project Trips	v/c	LOS
SR 50	CR 561 to East Ave	D	2,000	34,421	WB	1,688	C	124	1,812	C	12	1,824	0.91	C
	East Ave to US 27	D	3,020	43,709	WB	2,144	C	156	2,300	C	18	2,318	0.77	C
	US 27 to Hancock Road	D	3,020	44,255	WB	2,171	C	639	2,810	C	30	2,840	0.94	C
	Hancock Road to Emil Jahna Rd	D	3,020	56,275	WB	2,760	C	854	3,614	F	207	3,821	1.27	F
	Emil Jahna Rd to CR 455	D	3,020	56,275	WB	2,760	C	854	3,614	F	107	3,721	1.23	F
	CR 455 to Orange County Line	D	3,020	47,534	WB	2,332	C	907	3,239	F	241	3,480	1.15	F
US 27	Grand Hwy to SR 50	C	2,940	27,865	NB	1,367	C	173	1,540	C	6	1,546	0.53	C
	SR 50 to Johns Lake Rd	C	2,940	37,153	SB	1,822	C	302	2,124	C	2	2,126	0.72	C
	Johns Lake Rd to Hartwood Marsh Rd	C	2,940	33,328	NB	1,635	C	141	1,776	C	2	1,778	0.60	C
	Hartwood Marsh Rd to Lake Louisa Rd	C	2,940	22,947	NB	1,126	C	141	1,267	C	12	1,279	0.44	C
	Lake Louisa Rd to Boggy Marsh Rd	C	2,940	24,586	SB	1,206	C	50	1,256	C	7	1,263	0.43	C
Old Hwy 50	US 27 to Turkey Farm Rd	D	792	7,238	WB	378	C	172	550	C	6	556	0.70	C
	Turkey Farm Rd to CR 455	D	792	5,592	EB	448	C	305	753	D	23	776	0.98	D
	CR 455 to Orange County Line	D	792	5,950	WB	513	C	100	613	C	25	638	0.81	C
CR 455	Ridgewood Ave to CR 455/CR 50	D	1,200	6,879	SB	331	B	257	588	C	17	605	0.50	C
	CR 455/CR 50 to SR 50	D	675	7,844	NB	398	D	249	647	D	38	685	1.01	E
Citrus Tower Boulevard	US 27 to Oakley Seaver Dr	D	792	12,177	SB	601	C	6	607	C	15	622	0.79	C
	Oakley Seaver Dr to SR 50	D	1,800	16,110	NB	692	C	60	752	C	6	758	0.42	C
	SR 50 to Hooks St	D	1,800	17,355	SB	834	C	102	936	C	16	952	0.53	C
	Hooks St to Johns Lake Rd	D	1,800	18,431	SB	922	C	108	1,030	C	8	1,038	0.58	C
	Johns Lake Rd to US 27	D	1,800	14,579	SB	713	C	50	763	C	3	766	0.43	C
Hancock Road	CR 50 to Ridge Blvd	D	1,800	11,023	SB	472	C	394	866	C	32	898	0.50	C
	Ridge Blvd to SR 50	D	1,800	14,533	NB	643	C	611	1,254	C	22	1,276	0.71	C
	SR 50 to Hooks St	D	1,800	18,478	SB	932	C	170	1,102	C	93	1,195	0.66	C
	Hooks St to Johns Lake Rd	D	792	18,478	SB	932	F	161	1,093	F	77	1,170	1.48	F
	Johns Lake Rd to Hartwood Marsh Rd	D	792	8,483	SB	405	C	139	544	C	18	562	0.71	C
Hartwood Marsh Road	US 27 to Hancock Road	D	675	14,102	WB	771	F	11	782	F	7	789	1.17	F
	Hancock Road to 90 Degree Bend	D	675	10,247	EB	720	F	6	726	F	5	731	1.08	F
	90 Degree Bend to Orange County Line	D	675	10,247	EB	720	F	6	726	F	4	730	1.08	F
Lake Louisa Road	Lakeshore Dr to Vista Del Lago Blvd	D	675	3,456	EB	163	C	0	163	C	0	163	0.24	C
	Vista Del Lago Blvd to US 27	D	675	4,044	WB	301	C	0	301	C	0	301	0.45	C
Grand Highway	Citrus Tower Blvd to SR 50	D	675	6,436	NB	309	C	5	314	C	0	314	0.47	C
	SR 50 to Hooks St	D	1,800	6,292	SB	303	C	35	338	C	3	341	0.19	C

Table 5.8 cont. – Roadway Segment Analysis (2025) – Scenario 2

Roadway	Segment	LOS Std	LOS Capacity	AADT	Pk Dir	Pk Hr/Pk Dir Existing	LOS	Committed Trips	Pk Hr/Pk Dir with Committed Trips	LOS	Project Trips	Background, Committed, and Project Trips	v/c	LOS
Hooks Street	Lakeshore Dr to US 27	D	675	7,007	EB	347	D	4	351	D	0	351	0.52	D
	US 27 to Oakley Seaver Dr	D	1,800	9,512	WB	396	C	22	418	C	4	422	0.23	C
	Oakley Seaver Dr to Citrus Tower Blvd	D	1,800	9,367	WB	398	C	22	420	C	8	428	0.24	C
	Citrus Tower Blvd to Hancock Rd	D	1,800	11,451	WB	603	C	11	614	C	5	619	0.34	C
Anderson Hill Road	Lakeshore Dr to US 27	D	675	1,584	EB	105	C	0	105	C	2	107	0.16	C
East Avenue	CR 561 to SR 50	D	675	5,103	SB	286	C	0	286	C	3	289	0.43	C
Hammock Ridge Road	Lakeshore Dr to US 27	D	1,800	15,472	WB	921	C	60	981	C	1	982	0.55	C
Lakeshore Drive	Hammock Ridge Road to Anderson Hill Rd	D	675	7,500	NB	416	D	13	429	D	3	432	0.64	D
Turkey Farm Road	E Grassy Lake Road to CR 50	D	675	344	NB	22	C	0	22	C	9	31	0.05	C
Johns Lake Road	US 27 to Hancock Road	D	675	8,489	EB	390	D	26	416	D	6	422	0.62	D
Blackstill Lake Road	Fosgate Rd to CR 50	D	612	3,135	SB	156	C	68	224	C	1	225	0.37	C

Source: Lake Sumter MPO TMS Report for Lake County, April 5, 2015; Florida Traffic Online; Littlejohn

6.0 Findings and Recommendations

6.1 Intersection Findings

The intersection analysis indicated that the majority of intersections in the study area do not fully meet the level of service standards for the roadway network. For the intersections on SR 50, this is primarily due to the large through volume on the eastbound and westbound approaches which require the majority of the green time at the intersection, and limit the ability to provide an acceptable level of service on the side streets. These intersections have appropriate turn lanes for the volume of traffic, and no additional turn lane improvements would significantly improve the delays for the minor street approaches and turning movements on the major roadway. Thus, the only solution to improve the operation of these intersections would be to increase capacity on SR 50 (through widening or other capacity improvements) or to reduce the demand on SR 50, which should happen with the construction of the Minneola interchange on the turnpike.

The intersections of SR 50/Hancock Road and SR 50/Hartle Road do not meet the LOS standards in the existing conditions. With the addition of project trips in both scenarios, there is a significant increase in the northbound delays at the SR 50/Hartle Road intersection, which could be lessened by the addition of a right-turn overlap phase (allowing the northbound right-turns to have a green arrow during the westbound left-turn phase). Likewise, in Scenario 2, there is a significant increase in delays on the northbound approach to the SR 50/Hancock Road intersection over the existing condition. Adding a dedicated right-turn lane at this intersection would lessen the delays on this approach. As both of these intersections have existing deficiencies prior to the addition of project volumes, improvements at these intersections should be accomplished through a proportionate fair-share agreement and credited to the impact fees of the project.

All of the direct project access points (onto Hancock Road and Hartle Road) operate at an acceptable level of service. The intersection of Hancock Road/south access point was assumed to have a southbound left-turn lane, a northbound right-turn lane, and a westbound left-turn lane. The intersection of Hartle Road/north access point was assumed to have a southbound right-turn lane and a northbound left-turn lane. No additional turn lanes were assumed for the Hartle Road/south access point intersection.

The intersection of SR 50/Emil Jahna Road was analyzed with two scenarios, a two-lane Emil Jahna Road (Option 1) and a four-lane Emil Jahna Road (Option 2). Option 2 reduces the delays on the minor street approach, but not significantly enough to impact the level of service of the approach.

The queue analysis of the access intersections indicated that the existing westbound left-turn lanes on SR 50 at the intersection of SR 50/Emil Jahna Road and SR 50/Hartle Road are too short to provide ample space for both the 95th percentile queue and the required deceleration distance per FDOT standards. At both of these intersections, there may not be sufficient length between the turn lane and upstream median openings to provide the required length, thus creating a double left-turn may be appropriate to satisfy the queuing requirements.

6.2 Roadway Network Findings

Based on the roadway segment analysis, there are seven (7) segments in Scenario 1 (cross-access allowed between Phases 5 & 6) and eight (8) segments in Scenario 2 (emergency access only between Phases 5 & 6) which are projected to operate below the level of service standard for the roadway. Of these segments, only one becomes deficient with the addition of project trips (in Scenario 2 only), with the rest operating below the level of service standards with the existing and/or existing + committed trips. The segment where project trips result in the roadway volumes becoming deficient in Scenario 2 is CR 455 from CR 455/CR 50 to SR 50. However, the addition of the Minneola Interchange may divert some of the existing and committed trips from this segment, which is only projected to be four vehicles over the level of service capacity with the addition of project trips in either Scenario.

The remaining seven segments are projected to be over-capacity prior to the addition of project trips, and thus can be considered backlogged. The required improvements (widening for additional lanes or equivalent capacity improvement) would also satisfy the demands of the project trips, and thus the project cannot be held responsible for the improvements to these segments, per Florida Statute 163.3180 (5) (h) 2. b.

6.3 Recommendations

Based on the above analysis, the following improvements are proposed:

1. Add northbound right-turn lane at the intersection of SR 50/Hancock Road (Scenario 2 only)
2. Add a northbound right-turn arrow to the signal at the intersection of SR 50/Hartle Road
3. Lengthen the westbound left-turn lane at the intersection of SR 50/Emil Jahna Road *or* add a second westbound left-turn lane (if Option 2 is selected for Emil Jahna Road)
4. Lengthen the westbound left-turn lane at the intersection of SR 50/Hartle Road *or* add a second westbound left-turn lane

Improvements 1 & 2 are both located on approaches that are currently backlogged (and thus the project has no responsibility for the improvement), but are recommended in order to improve delays experienced by project traffic. Improvements 3 & 4 are recommended in order to provide sufficient queuing and deceleration distance per FDOT standards. All improvements should be completed using a proportionate fair-share agreement, with any costs of the off-site improvements being credited against the impact fees for the development. The construction of a portion of Hartle Road, from the existing terminus to the southern border of the property, may also be considered part of the projects mitigation requirements in lieu of the recommended improvements, as it is a portion of a larger planned roadway between SR 50 and Hartwood Marsh Road. Any other improvements to the roadway network and/or intersections are the responsibility of the City, County, and/or FDOT per Florida Statute, as a backlogged facility.