MAY 2012

FINAL SR 46 DESIGN TRAFFIC Technical Memorandum

FINANCIAL PROJECT ID: 240216-4-28-01

ROADWAY IDS: 7704000 & 77040100

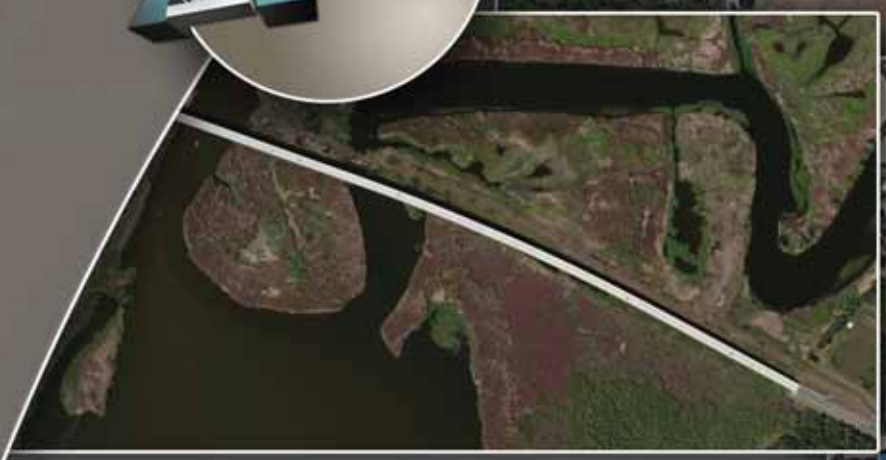
PREPARED FOR:

SEMINOLE COUNTY

FLORIDA'S NATURAL CHOICE

PREPARED BY:

GMB ENGINEERS & PLANNERS, INC.



Final

SR 46 Design Traffic Technical Memorandum

This Final Design Traffic Technical Memorandum is prepared in support of the evaluation of possible alternative improvements to the SR 46 corridor from SR 415/E. Lake Mary Boulevard to CR 426 in Seminole County, Florida (State Financial Project Number 240216-4-28-01). Phase I of the technical memorandum includes the development of existing traffic volumes, evaluation of existing operating conditions, development of design traffic characteristics, and crash analysis. Phase II of the study entails the development of future traffic forecasts for No-Build and Build Alternatives and evaluation of the characteristics and operating conditions of the corridor during the service life of the proposed roadway project.

Financial Project ID: 240216-4-28-01

Roadway IDs: 77040000 and 77040100

Prepared by:

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Prepared for:

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1. Introduction

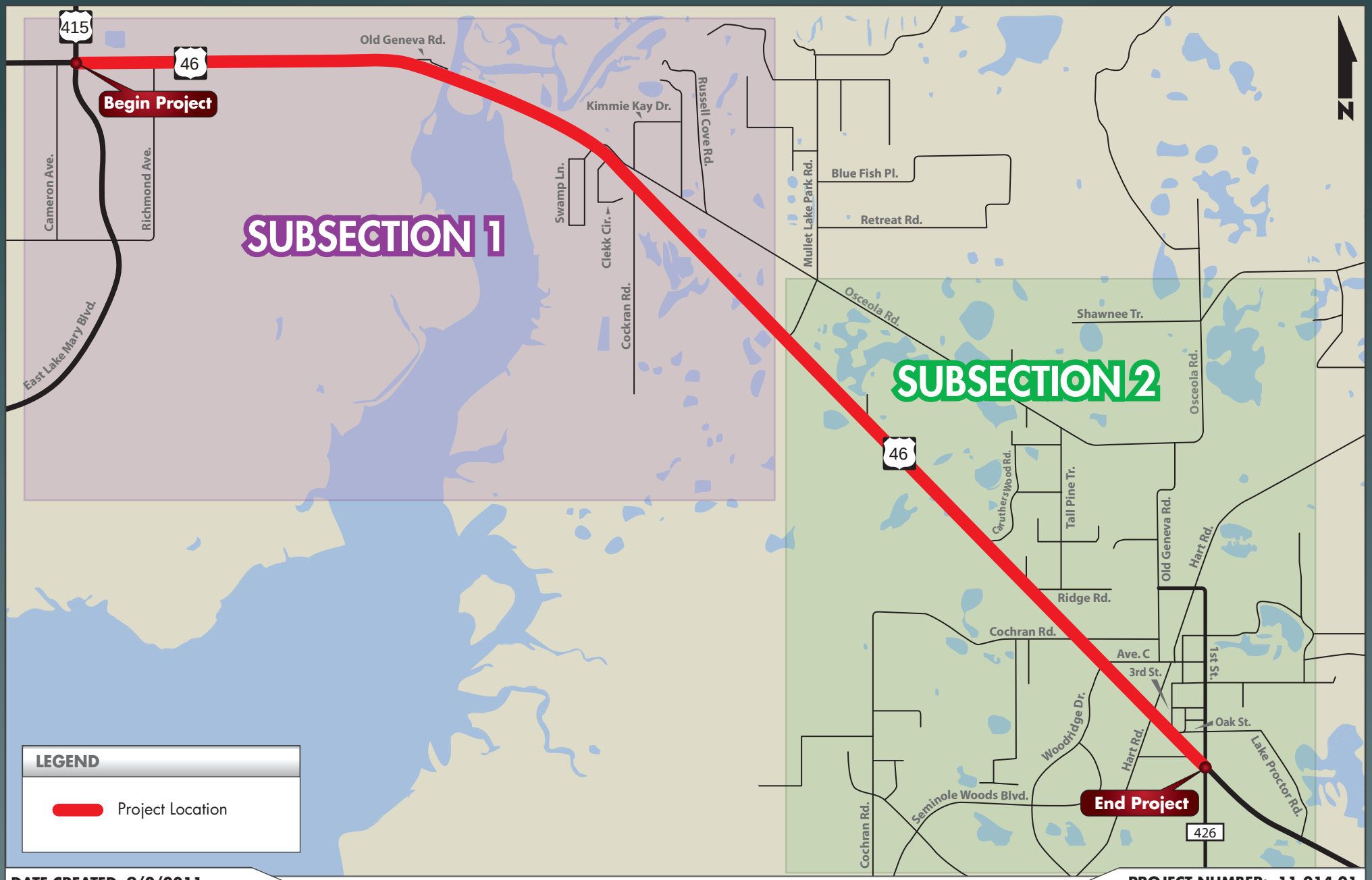
1.1 Background

Seminole County is conducting a Project Development and Environment (PD&E) study to evaluate possible alternative improvements to the SR 46 corridor from SR 415/E. Lake Mary Boulevard to CR 426 in Seminole County, Florida (State Financial Project Number 240216-4-28-01). GMB Engineers & Planners, Inc. has been retained by the Seminole County, as a sub-consultant to URS Corporation Southern (URS) to perform the design traffic analysis to determine the impacts and assess the need for future capacity improvements along SR 46 from SR 415/E. Lake Mary Boulevard to CR 426. The Final Technical Memorandum evaluates the existing and future conditions and provides recommended design characteristics and recommended improvements to accommodate future traffic projections along the SR 46 corridor.

The Design Traffic Process for this study is separated into two phases. They are:

- **Existing Conditions** – This phase of the study entails the development of existing traffic volumes, design characteristics, evaluation of existing operating conditions, and crash analysis.
- **Future Conditions** – This phase of the study entails the development of future traffic forecasts for the No Build and the Build Alternatives. In addition, this study includes an evaluation of the characteristics and operating conditions of the corridor during the service life of the proposed roadway project.

The current document is prepared in support of both the Existing Conditions and Future Conditions phases of the Design Traffic Analysis. This report has been prepared taking into account the comments provided by FDOT on December 1, 2011 (regarding to the existing conditions and the development of future traffic forecasts), the comments provided by Seminole County on March 17, 2012 (regarding the SR 46 Design Technical Memorandum – Draft Report), and a meeting held among GMB, URS, Kittelson, and Seminole County staff on May 2, 2012. The responses prepared by GMB Engineers and Planners, Inc. addressing the review comments by FDOT and Seminole County can be found in **Appendix A** of this report. The study area map is shown in **Figure 1.**



DATE CREATED: 9/2/2011

PROJECT NUMBER: 11-014.01

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Financial Project ID: 240216-4-28-01

FIGURE 1
Project Location Map

1.2 Description of Project

The SR 46 corridor is primarily an east/west facility from SR 415 to W Osceola Road and a northwest/southeast facility from W Osceola Road to CR 426. The major portion of the roadway segment to be studied is a rural principal arterial. The existing roadway consists of two travel lanes with a rural, open drainage system. Widening of SR 46 corridor between SR 415 and CR 426 as a four-lane section is included as a planned cost feasible improvement in the Metroplan Orlando 2030 Orlando Urban Area Transportation Study (OUATS) Long Range Transportation Plan (LRTP). The PD&E study will evaluate SR 46 improvements as a means of providing additional capacity, reducing congestion along the corridor, and operate as an improved emergency evacuation route.

1.3 Objective

The objective of this Technical Memorandum is to provide the Seminole County with the existing and future traffic forecasts for the No Build and Build Alternatives, and an evaluation of the roadway characteristics and operational conditions for the study corridor. This report entails the development of base year 2011 AADT, Peak Hour Volumes, intersection and roadway Level of Service (LOS) for the base year 2011. This report also involves the development of the design traffic characteristics including Standard K factor, Design Hour Directional Demand (D_{30}), and percentage of trucks for both the design hour and daily demand (T_f, T_{24}) that will be used in obtaining the future traffic volumes and future operational analysis.

This report includes the development of AADT, Directional Design Hour Volumes (DDHV), intersection and roadway Level of Service (LOS) for the opening year 2015, mid-design year 2025 and design year 2035 for the No Build and Build Alternatives, and signal warrant analysis for unsignalized intersections along the study corridor for the same future time periods.

1.4 Methodology

The methodology used for the development of this report includes:

- Collect available traffic count information from the FDOT's and County's historical traffic count records and from actual field count data. Review previous studies, traffic characteristics and other relevant data for the study corridor.

- Based on the data collection, use the collected year 2011 peak hour turning movement counts for performing intersection and arterial LOS analyses for the project corridor.
- Evaluate the existing traffic volumes based on capacity to determine if the roadway is currently operating under constrained or unconstrained conditions.
- Based on the data collection process, estimate the travel roadway characteristics of the corridor. These characteristics include Standard K factor, Directional Design Hour factor (D_{30}), Daily Truck factor (T_{24}), and Peak Truck factor (T_f).
- Collect five years of crash data along SR 46 for the study intersections within the study limits to perform crash analysis.
- Develop future year traffic volume forecasts for the corridor based on trends analysis of historical traffic counts, and/or travel demand models (FSUTMS), previous studies, and Bureau of Economic Business Research (BEBR) population projections.
- Develop the design hour turning movement volumes for the opening year and design year for the No Build and Build alternatives by applying the design characteristics including Standard K and D_{30} to the future year AADTs using TURNS5 program.
- Provide LOS analysis for the intersections and roadway segments along the study corridor for the No Build and Build alternatives for the opening, mid-design and design year design hour conditions.
- Based on the level of service analysis, provide recommendations for improvements to accommodate the anticipated travel demand.

2. Project Information

2.1 Project Location, Limits and Field Inventory

Within the project limits, **SR 46 is a two-lane rural principal arterial with an open drainage system serving both local and regional traffic. In addition, SR 46 serves as a major evacuation route for Northern Brevard and Southern Volusia Counties.** The recently extended four lane divided Lake Mary Boulevard intersects SR 46 at SR 415 and provides a direct connection to the Orlando-Sanford International Airport. The existing roadway characteristics that are relevant to this study are shown in **Table 1**. Straight Line Diagrams (SLDs) and the relevant Roadway Characteristics Inventory data (RCI) for the SR 46 corridor are provided in **Appendix B** of this report.

Table 1: Roadway Characteristics of SR 46 Corridor

Characteristic	Observation
Limits	SR 415 (MP 3.660) – CR 426 (MP 11.047)
Location	Seminole County
FDOT Roadway ID	➢ 77040000 (MP 3.660 to MP 5.295) and (MP 6.480 to MP 11.047) and 77040100 (MP 0.000 to MP 1.177)
Roadway Maintaining Agency	State
Functional Classification	➢ Two Lane Undivided Urban Other Principal Arterial – SR 415 (MP 3.660) to (MP 4.078) ➢ Two Lane Undivided Rural Other Principal Arterial – (MP 4.078) to CR 426 (MP 11.047)
Speed Limits	➢ SR 415 (MP 3.660) to East of SR 415 (MP 3.820): 50 MPH ➢ East of SR 415 (MP 3.820) to East of Hart Road (MP 10.717): 55MPH ➢ East of Hart Road (MP 10.717) to CR 426 (MP 11.047): 45 MPH
Adopted LOS	➢ FDOT LOS standard of "D" – Urban portion from SR 415 (MP 3.660) to (MP 4.078) ➢ FDOT LOS standard of "C" – Rural portion from MP 4.078 to CR 426 (MP 11.047) ➢ Seminole County has an adopted LOS standard of "E" for the entire corridor
Signalized Intersections from West to East	➢ SR 415/E. Lake Mary Boulevard (MP 3.660) (SIGNALIZED) ➢ CR 426/1st Street (MP 11.047) (SIGNALIZED)
Land Uses	➢ Predominantly commercial in the vicinity of SR 415 ➢ Predominantly vacant lands (north of SR 46) and managed environmental lands (south of SR 46) between east of SR 415 and Old Geneva Road ➢ Predominantly residential (north of SR 46) and residential (south of SR 46) between Old Geneva Road and CR 426.
Pavement Width	12 foot wide travel lanes
Sidewalks	None
Parallel Parking	None
Shared Use Path and Bike Lanes	None

3. Existing Conditions

This section describes the analysis of traffic flow operating conditions for the base year 2011 at the major intersections and roadway segments along the project corridor.

In analyzing the year 2011 operating conditions of the intersections and roadway segments, traffic counts collected from the field during August and September 2011 were used along with the existing roadway and intersection geometry. The actual turning movement volumes collected in the field were used for the year 2011 level of service (LOS) analysis for the intersections and roadway segments.

The year 2011 conditions intersection LOS analysis was performed using the signal timing data provided by Seminole County. The existing conditions intersection LOS analysis was performed using the Synchro Software (version 7.0). In addition, the existing conditions arterial LOS analysis was performed by comparing the existing arterial traffic volumes against generalized peak hour directional service volumes obtained from the 2009 FDOT Quality/Level of Service Handbook. The following sub-sections describe the overall process.

3.1 Traffic Count Information

Figures 2-1 and 2-2 provide the location of traffic counts and type of traffic count data collected for the study. All existing traffic count data was collected during August and September of 2011. The data collected included:

- 72 – Hour bi-directional classification volume counts (3 locations)
- 72 – Hour bi-directional volume counts (8 locations)
- 24 – Hour bi-directional volume counts (7 locations)
- 4 – Hour intersection turning movement counts for a.m. and p.m. peak hours (7 intersections)
- 1 – Hour Manual Traffic Counts (3 locations)

The weekday turning movement counts were collected for the intersections between the peak hours of 7:00-9:00 a.m. and 4:00-6:00 p.m.

All traffic count data collected were adjusted utilizing the latest (2010) FDOT axle (where applicable) and seasonal adjustment factors for Seminole County to provide 2011 annual average conditions.

As part of the traffic count program for this project, and as mentioned above, three locations along SR 46 were utilized in this study as vehicle classification counts. Vehicle composition for the classification count was broken into three primary vehicle types:

- Passenger Vehicles – Motorcycles, Cars, Vans, and Pickups;
- Medium Truck – Buses and 2 axle Single Unit Trucks;
- Heavy Trucks – (3 or 4 axles) Single Unit Trucks, 2 axle Tractors (with 1 or 2 axle Trailer), 3 axle Trailers (2 or 3 axle Trailers), and (5, 6 and 7 axle) Multi-trailers.

Based on these categories, percentages for overall trucks (medium and heavy) were determined for peak and daily traffic conditions. Copies of all traffic count data are provided in **Appendix C**. FDOT axle and seasonal adjustment factors for Seminole County are provided in **Appendix D**.

DATE CREATED: 9/13/2011

PROJECT NUMBER: 11-014.01

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Financial Project ID: 240216-4-28-01

FIGURE 2-1
Traffic Count Location
Subsection 1

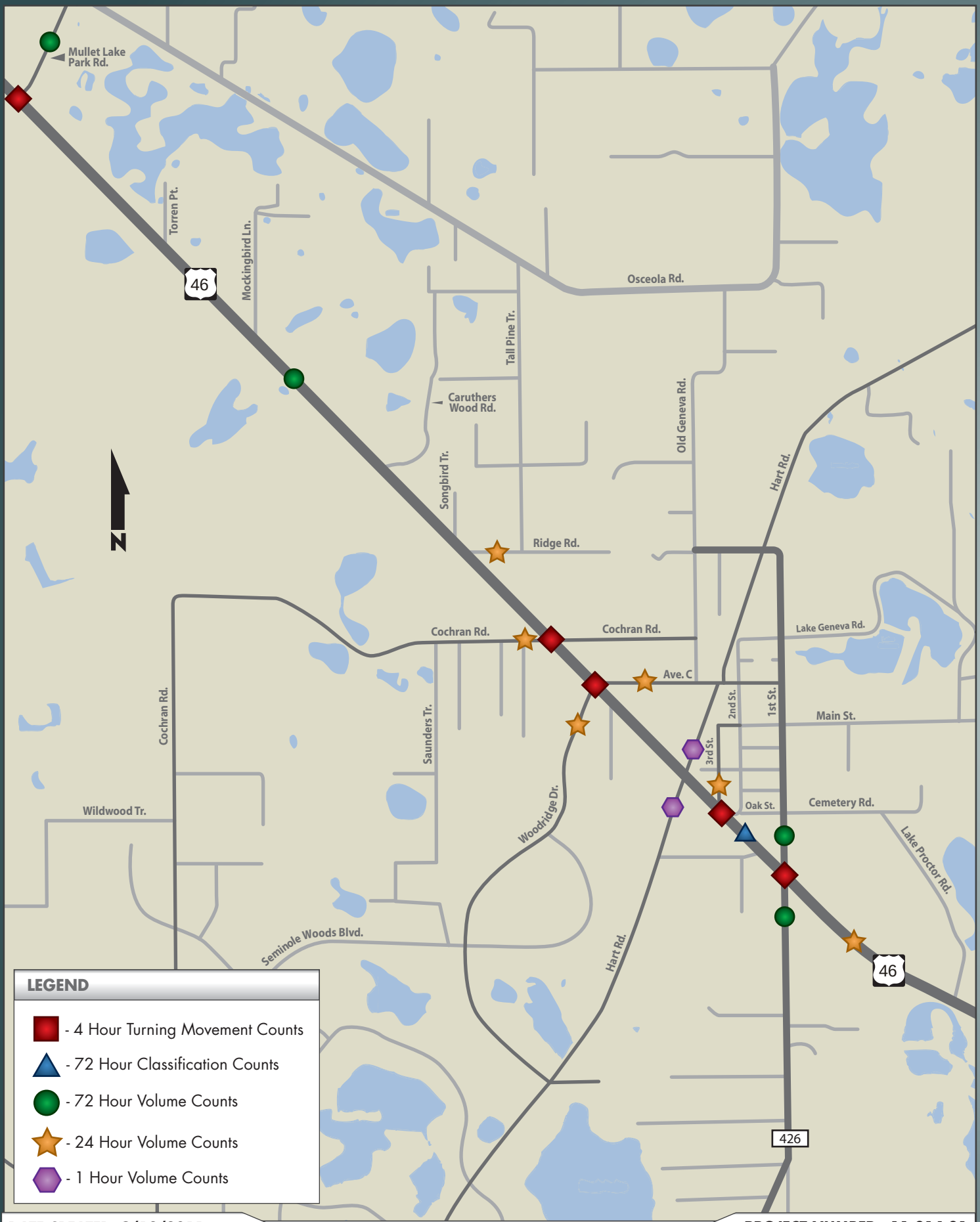

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FIGURE 2-2
Traffic Count Location
Subsection 2

3.2 Existing Geometry

Figures 3-1 through 3-2 provide the year 2011 intersection geometry for all the intersections to be evaluated in this study. The year 2011 intersection geometry information was obtained and verified based on field visits and aerial photographs. The following intersections are evaluated as part of this study:

- SR 46 and SR 415/E. Lake Mary Blvd (Signalized)
- SR 46 and Osceola Rd (Unsignalized)
- SR 46 and Mullet Lake Park Rd (Unsignalized)
- SR 46 and Woodridge Dr/Avenue C (Unsignalized)
- SR 46 and Cochran Rd (Unsignalized)
- SR 46 and 3rd St/Oak St (Unsignalized)
- SR 46 and CR 426/1st St (Signalized)

The intersection geometry information was collected during the traffic count data collection phase. The existing geometry plays a vital role in assessing the intersection LOS. LOS is a qualitative measure of how efficient a roadway or intersection operates. LOS A represents the highest traffic flow quality, while LOS E represents traffic flow at capacity. LOS F represents forced flow congested conditions. LOS B, C and D represent a gradual degradation in traffic flow quality before reaching capacity. The existing geometry was considered as one of the factors in determining potential intersection improvements to accommodate the travel demand.

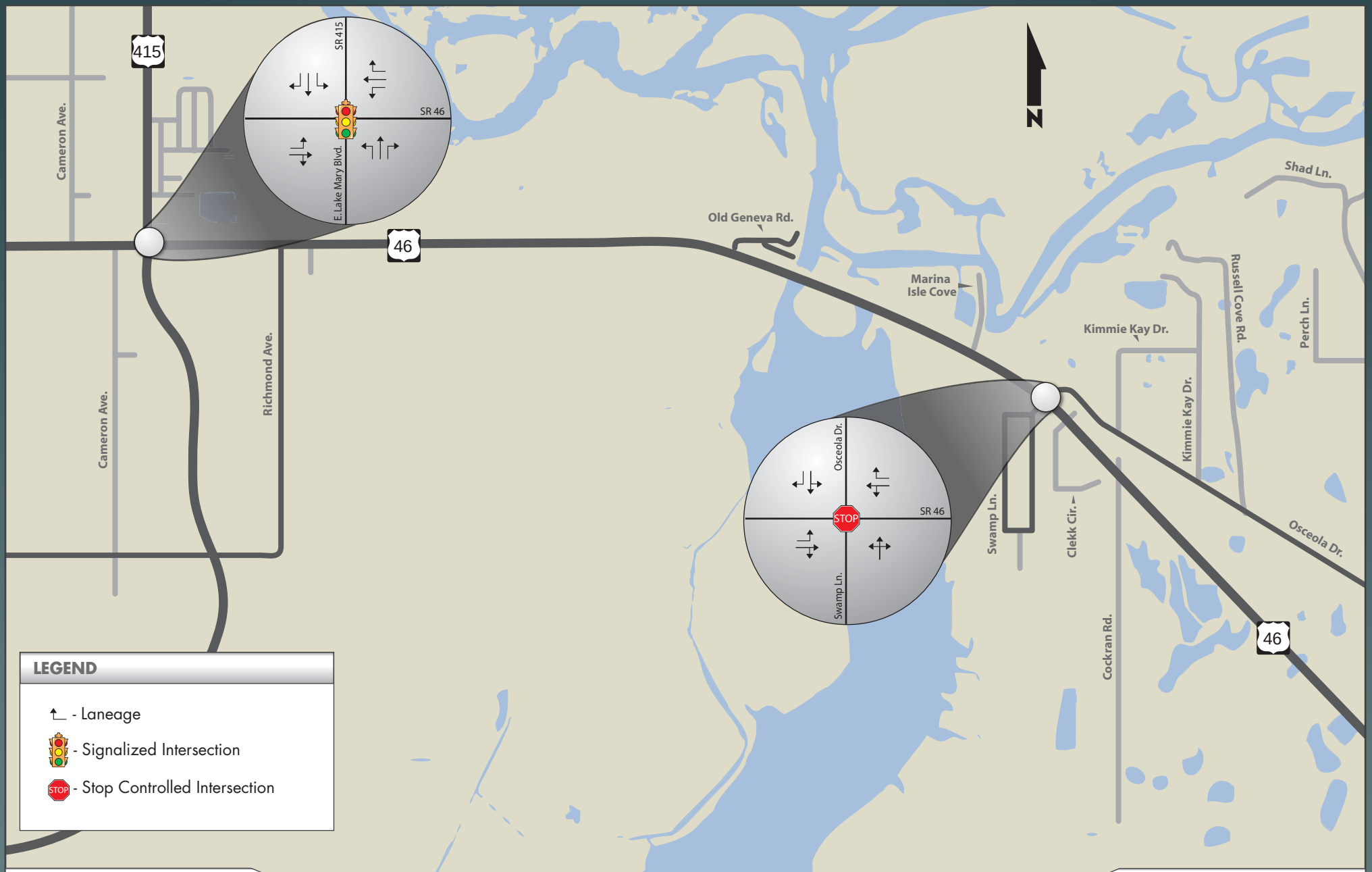

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FIGURE 3-1
Year 2011 Existing Geometry
Subsection 1

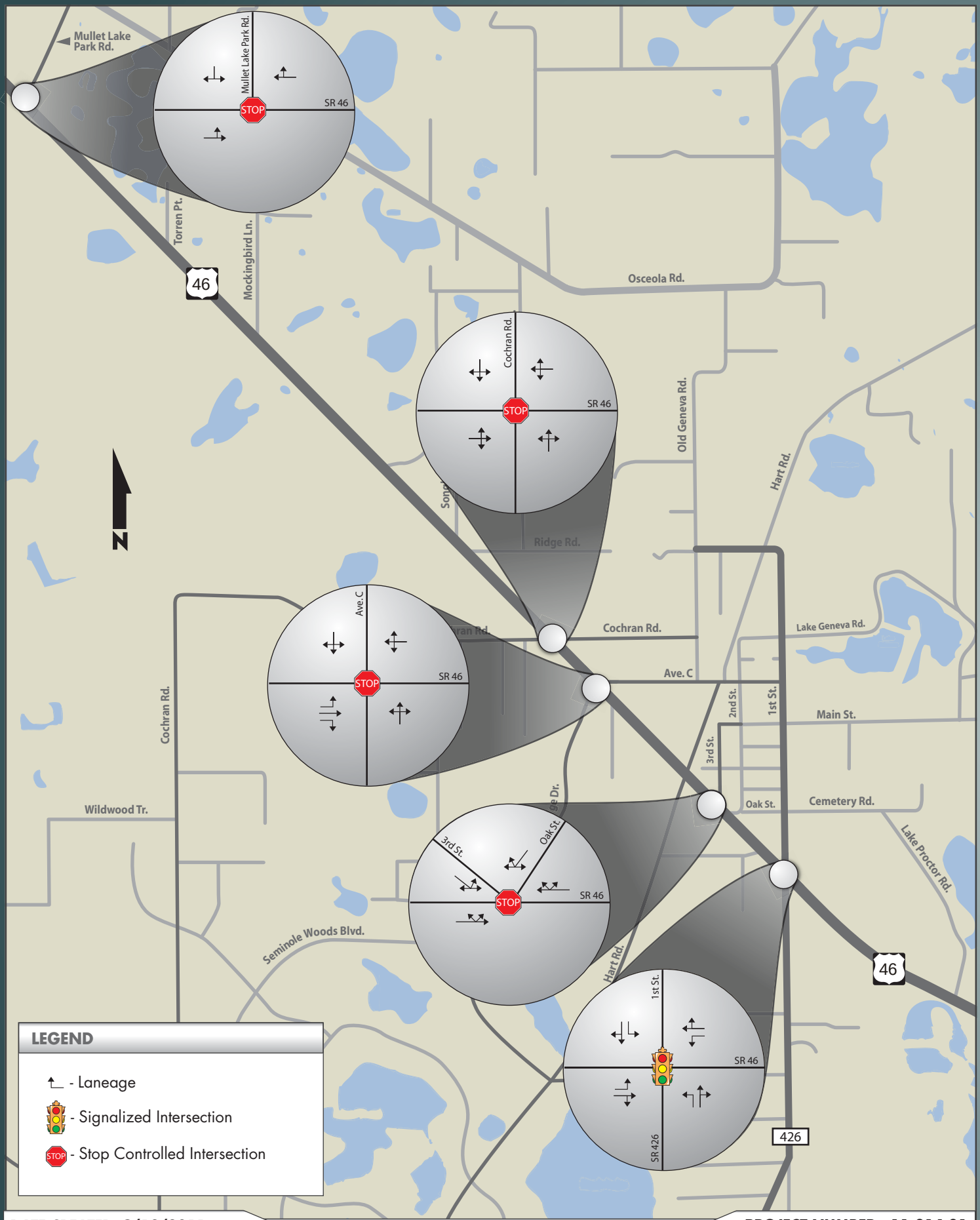

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FIGURE 3-2
Year 2011 Existing Geometry
Subsection 2

3.3 Existing Traffic Volumes

Traffic count information collected was used to develop existing traffic characteristics for the project corridors and the intersecting side streets. The truck factor for the peak condition was used in the existing intersection analysis. Based on the 72-Hour classification counts, the 72-Hour volume counts, and the 24-Hour volume counts, the directional split (D measured) for the roadways in the study area were derived. For the purpose of this study, p.m. peak hour volume counts and standard "K" factors were used to determine the daily traffic volumes for Old Geneva Road (north of SR 46) and Hart Road (north and south of SR 46).

The adjusted AADT volumes for the individual roadway segments are provided in **Table 2 and Figures 4-1 and 4-2**.

TABLE 2
SR 46 from SR 415/Lake Mary Boulevard to CR 426 - Design Traffic Report
YR 2011 Existing Traffic Volumes

Roadway / Segment	Traffic Count Date	Type of Count	Measured Characteristics									Axle Adj.[2]	Seasonal Adj.[1]	Adjusted AADT[3]
			ADT	Peak Hr.	NB/EB	SB/WB	Peak Time	"K"	"D"	"T_{24}"	"T_f"			
Mainline Characteristics														
SR 46														
West of SR 415/Lake Mary Boulevard	9/13/2011 to 9/15/2011	72-Hour Classification	10,435	887	608	279	4:30-5:30 PM	8.50%	68.55%	8.80%	6.10%	1.00	1.00	10,500
B/W SR 415/Lake Mary Boulevard and Osceola Road	8/23/2011 to 8/25/2011	72-Hour Classification	10,435	967	538	429	4:45-5:45 PM	9.27%	55.64%	11.80%	8.30%	1.00	1.01	10,500
B/W Osceola Road and Mullet Lake Park Road	8/30/2011 to 9/1/2011	72-Hour Bi Directional	8,863	820	439	381	5:15-6:15 PM	9.25%	53.54%	NA	NA	0.96	1.01	8,600
B/W Mullet Lake Park Road and Woodridge Drive	9/13/2011 to 9/15/2011	72-Hour Bi Directional	9,336	865	433	432	5:00-6:00 PM	9.27%	50.06%	NA	NA	0.96	1.00	9,000
West of CR 426	9/13/2011 to 9/15/2011	72-Hour Classification	8,691	822	386	436	4:45-5:45 PM	9.46%	53.04%	11.40%	8.60%	1.00	1.00	8,700
East of CR 426	8/30/2011	24-Hour Bi Directional	5,965	520	304	216	5:30-6:30 PM	8.72%	58.46%	NA	NA	0.96	1.01	5,800
Side Street Characteristics														
SR 415/Lake Mary Boulevard														
North of SR 46	8/23/2011 to 8/25/2011	72-Hour Bi Directional	15,858	1,632	1,195	437	4:45-5:45 PM	10.29%	73.21%	NA	NA	0.98	1.01	15,500
South of SR 46	8/23/2011 to 8/25/2011	72-Hour Bi Directional	9,263	1,002	145	857	7:15-8:15 AM	10.81%	85.52%	NA	NA	0.99	1.01	9,300
Richmond Avenue														
South of SR 46	8/30/2011	24-Hour Bi Directional	244	36	15	21	7:15-8:15 AM	14.75%	58.33%	NA	NA	0.99	1.01	250
Old Geneva Road														
North of SR 46	9/15/2011	1 Hour Manual Count[4]	133	12	7	5	5:00-6:00 PM	9.00%	58.33%	NA	NA	NA	1.00	150
Osceola Road														
East of SR 46	9/13/2011 to 9/15/2011	72-Hour Bi Directional	2,243	198	75	123	3:30-4:30 PM	8.81%	62.10%	NA	NA	0.97	1.00	2,200
Mullet Lake Park Road														
North of SR 46	8/23/2011 to 8/25/2011	72-Hour Bi Directional	693	60	37	23	6:00-7:00 PM	8.70%	61.33%	NA	NA	0.97	1.01	700
Ridge Road														
East of SR 46	8/23/2011	24-Hour Bi Directional	285	30	10	20	8:30-9:30 AM	10.53%	66.67%	NA	NA	0.97	1.01	300
Cochran Road														
East of SR 46	8/23/2011	4 Hour Manual Count[4]	56	5	2	3	7:00-8:00 AM	9.00%	60.00%	NA	NA	NA	1.01	60
West of SR 46	8/23/2011	24-Hour Bi Directional	757	82	64	18	7:30-8:30 AM	10.83%	78.05%	NA	NA	0.97	1.01	750
Avenue C/Woodridge Drive														
East of SR 46	8/23/2011	24-Hour Bi Directional	1,693	189	100	89	7:45-8:45 AM	11.16%	52.91%	NA	NA	0.97	1.01	1,700
West of SR 46	8/23/2011	24-Hour Bi Directional	238	31	22	9	8:15-9:15 AM	13.03%	70.97%	NA	NA	0.97	1.01	250
Hart Road														
North of SR 46	9/15/2011	1 Hour Manual Count[4]	44	4	2	2	4:00-5:00 PM	9.00%	50.00%	NA	NA	NA	1.00	40
South of SR 46	9/15/2011	1 Hour Manual Count[4]	44	4	3	1	4:00-5:00 PM	9.00%	75.00%	NA	NA	NA	1.00	40
3rd Street														
North of SR 46	8/23/2011	24-Hour Bi Directional	89	10	3	7	4:00-5:00 PM	11.24%	70.00%	NA	NA	0.97	1.01	90
CR 426/1st Street														
North of SR 46	9/13/2011 to 9/15/2011	72-Hour Bi Directional	3,922	421	172	249	8:00-9:00 AM	10.73%	59.14%	NA	NA	0.97	1.00	3,800
South of SR 46	8/23/2011 to 8/25/2011	72-Hour Bi Directional	8,742	832	313	519	7:30-8:30 AM	9.52%	62.39%	NA	NA	0.97	1.01	8,600

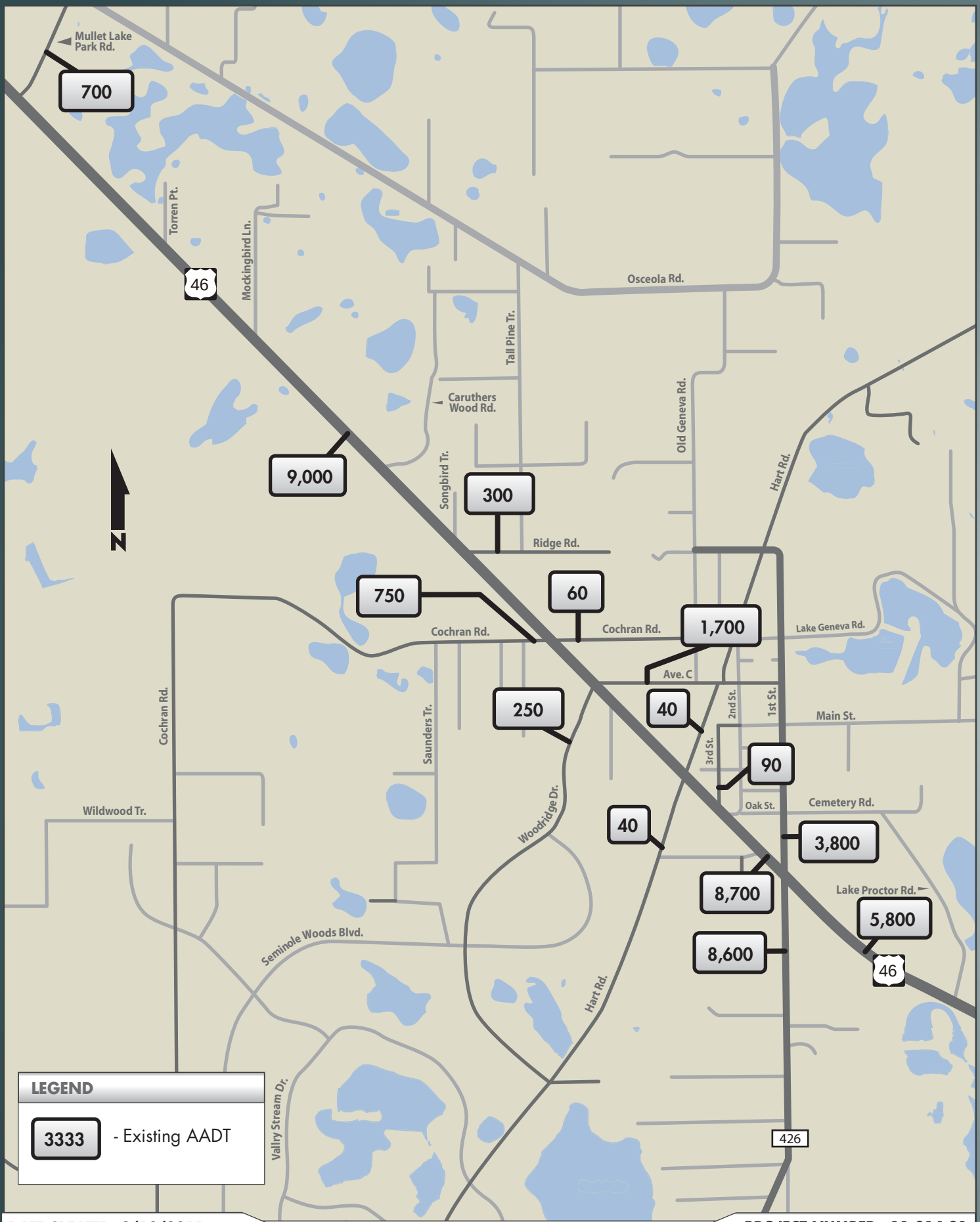
Notes:

1. Most Recent Seasonal Adjustment factors were obtained from FDOT 2010 Traffic Count CD.

2. Axle Adjustment factors were obtained from FDOT 2010 Traffic Count CD.

*3. Measured ADT * Axle Adjustment * Seasonal Adjustment = Adjusted AADT*

4.ADT was estimated using the peak hour volume and the standard "K" factor.



DATE CREATED: 9/13/2011

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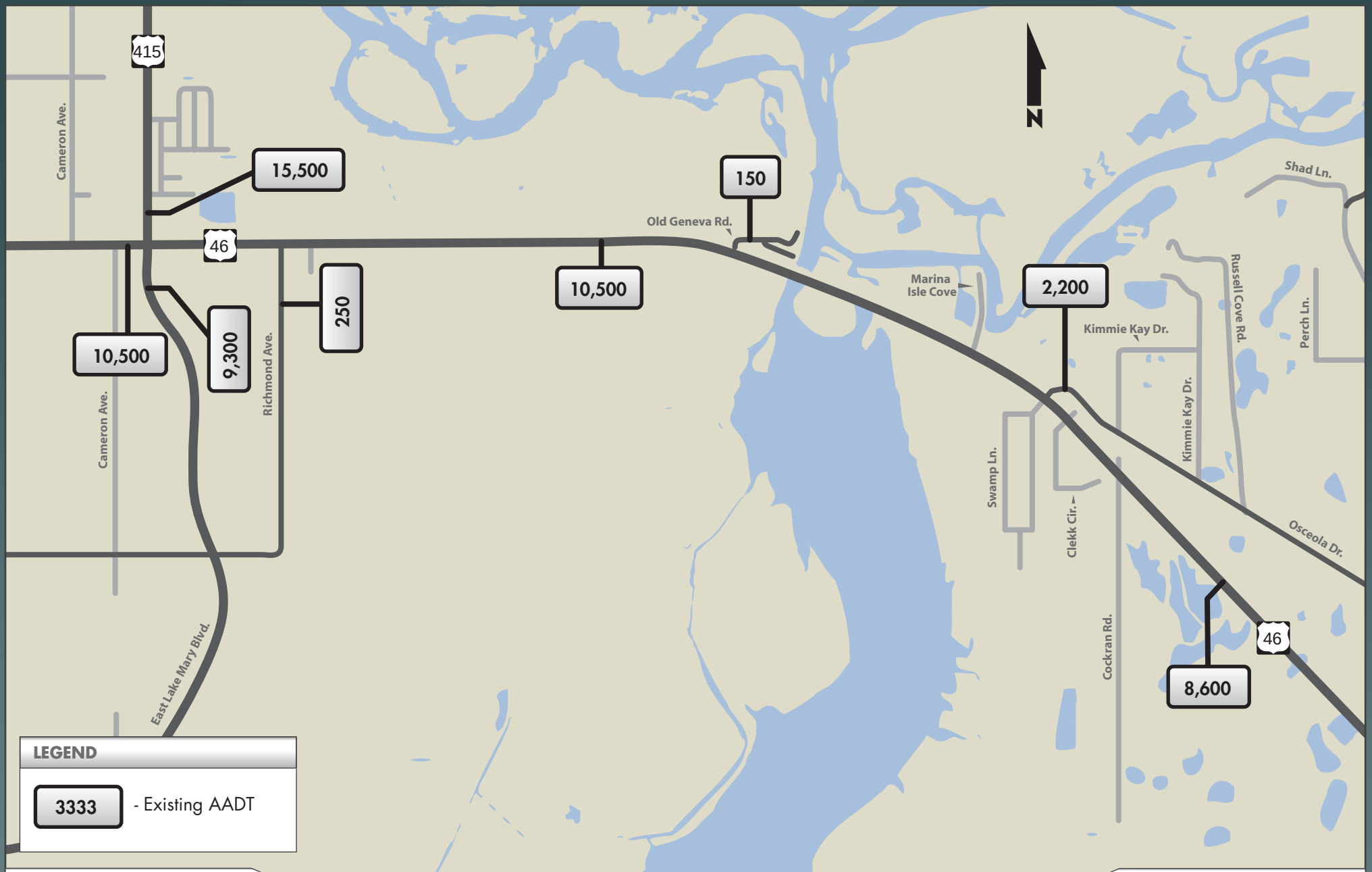
FIGURE 4-2
Year 2011 Existing AADT
Subsection 2



DATE CREATED: 9/15/2011

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FIGURE 4-1
Year 2011 Existing AADT
Subsection 1

3.3.1 Year 2011 Turning Movement Counts

Turning movement counts were obtained for the a.m. and p.m. peak hour conditions for the above-mentioned intersections. The actual (original) year 2011 a.m., and p.m. peak hour turning movement volumes collected at the study intersections are shown in **Appendix C**. For the purposes of this study, the original year 2011 a.m., and p.m. peak hour turning movement volumes were adjusted using a seasonal adjustment factor of 1.01 obtained from the 2010 Florida Traffic Information (FTI) DVD and are shown in **Figures 5-1 and 5-2**.

3.4 Year 2011 LOS Analysis

The level of service for the study intersections was determined using the procedures as outlined in the Transportation Research Board's – Highway Capacity Manual (HCM 2000) using the Synchro software version 7. Specific analysis techniques utilized in the study include the signalized, unsignalized intersections and arterial analyses. Since Synchro calculates arterial LOS only between signalized intersections, the a.m. and p.m. peak hour peak direction volumes between the intersections were compared against the latest Generalized Peak Hour Directional Service Volumes (dated October 4, 2010) from 2009 FDOT Quality/Level Of Service Handbook to obtain the arterial LOS.

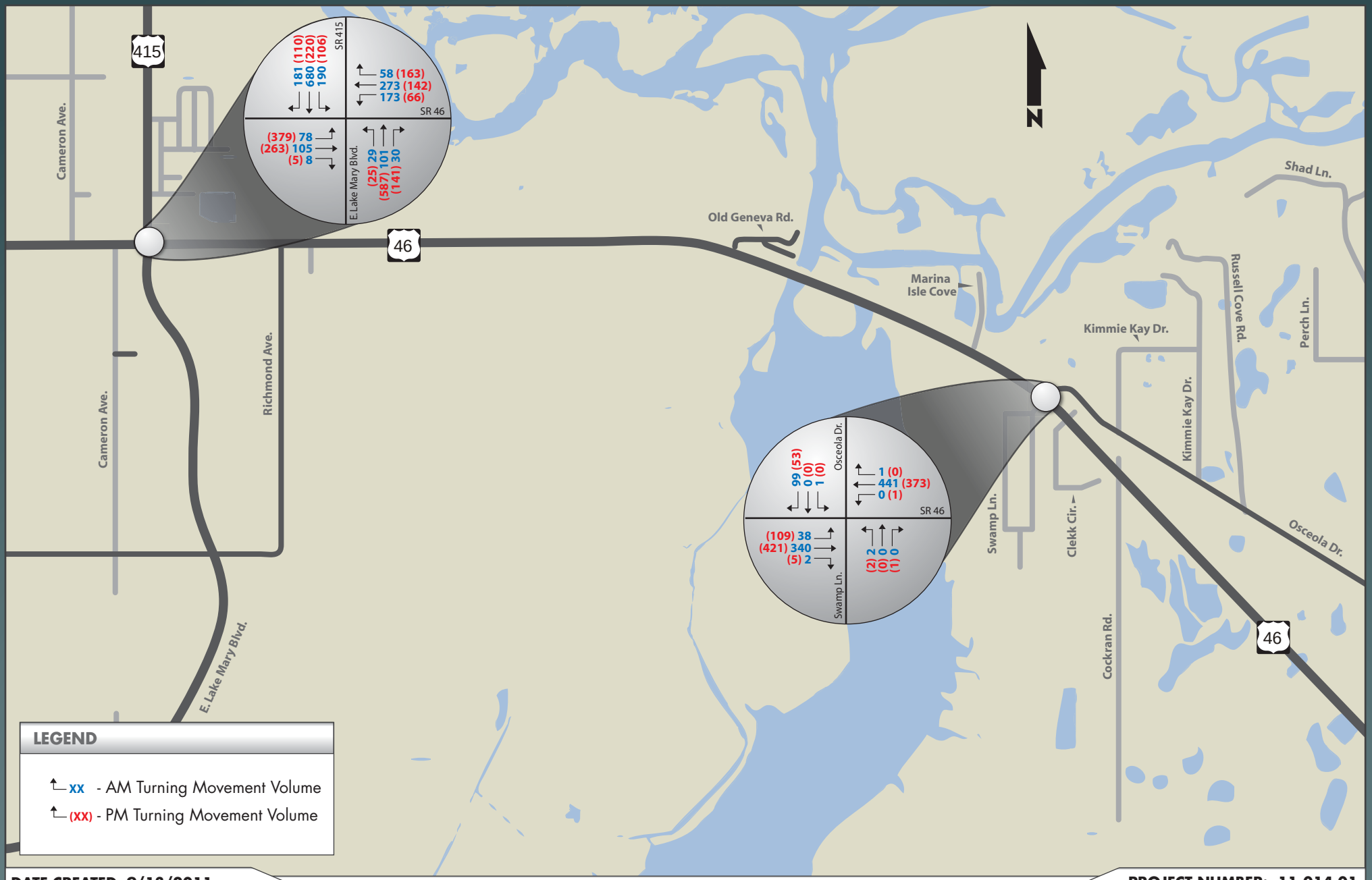

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FIGURE 5-1
Year 2011 AM Peak and PM Peak Hour
Turning Movement Volumes - Subsection 1

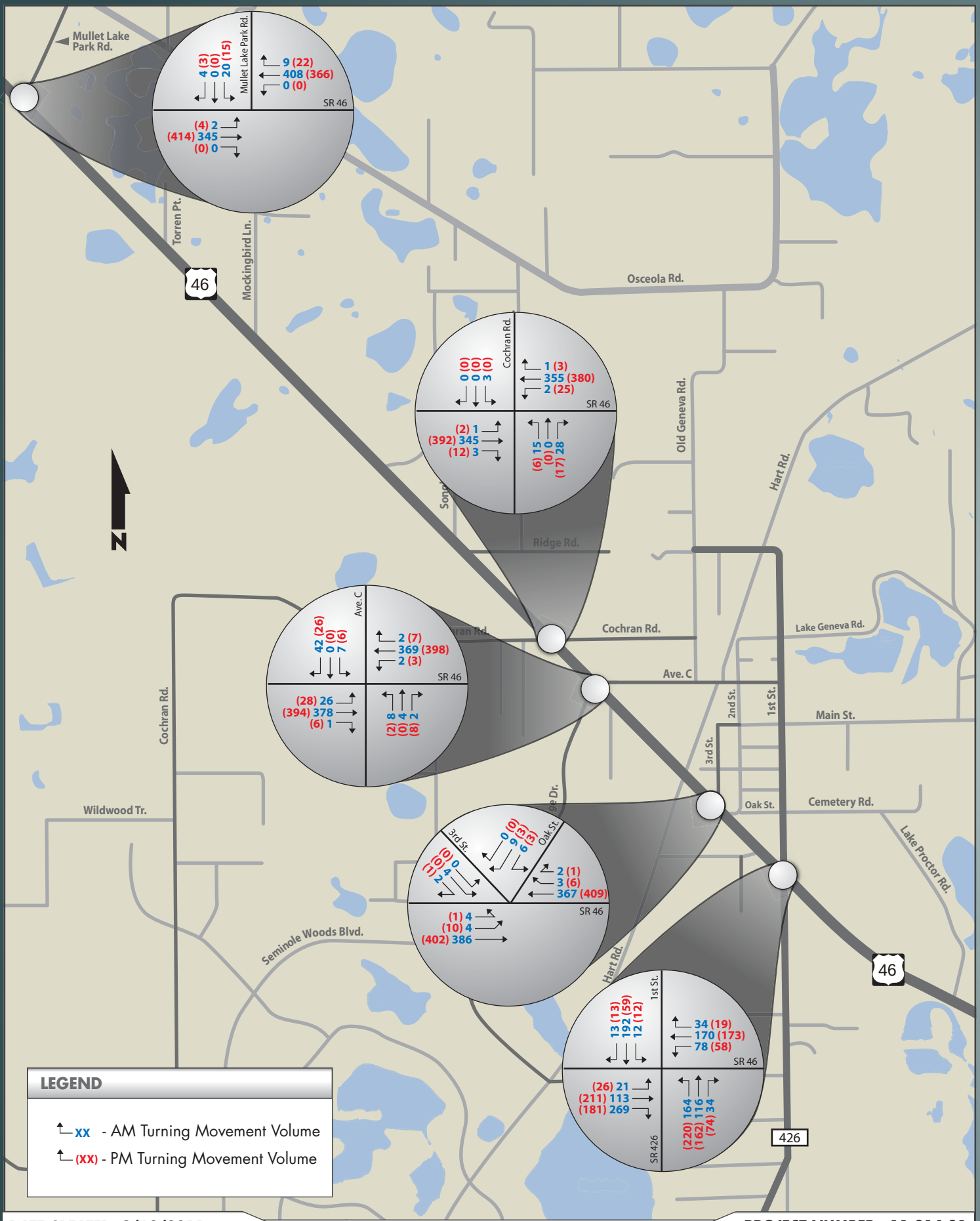

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FIGURE 5-2
Year 2011 AM Peak and PM Peak Hour
Turning Movement Volumes - Subsection 2

3.4.1 Year 2011 Intersection LOS Analysis

The year 2011 a.m. and p.m. peak hour turning movement volumes along with the year 2011 intersection geometry were used in the intersection LOS analysis. The signal timing data provided by the county was used in the intersection LOS analysis for the signalized intersections of SR 46 at SR 415/Lake Mary Boulevard and SR 46 at CR 426/1st Street. The two signals along SR 46 corridor operate under actuated-uncoordinated mode both in the a.m. and p.m. peak periods.

According to Exhibit 16-2 (page 16-2) of Highway Capacity Manual (HCM 2000), an average control delay per vehicle from 55 seconds up to 80 seconds is considered LOS E condition and beyond 80 seconds is considered LOS F condition at a signalized intersection.

A summary of the LOS analysis for the study intersections is included in **Table 3**.

Table 3: Year 2011 Existing Intersection LOS Analysis Summary

Study Intersection	Traffic Control	Adopted LOS	AM Peak Hour		PM Peak Hour	
			Delay (sec/vehicle)	LOS	Delay (sec/vehicle)	LOS
SR 46 @						
SR 415/Lake Mary Blvd	Signal	D	36.5	D	40.3	D
Osceola Rd	Stop	C	8.8/15.3	A/C	8.5/13.8	A/B
Mullet Lake Park Rd	Stop	C	0.1/17.3	A/C	0.1/17.5	A/C
Cochran Rd	Stop	C	0.1/18.1	A/C	0.8/13.4	A/B
Woodridge Dr/Ave C	Stop	C	8.3/18.9	A/C	8.3/13.4	A/B
3rd St/Oak St	Stop	C	0.2/15.3	A/C	0.3/14.7	A/B
CR 426/1st St	Signal	C	18.7	B	15.3	B

Notes:

1. HCM based outputs are presented in this table for both the signalized and unsignalized intersections.
2. Overall intersection delay and LOS results are reported for signalized intersections.
3. In case of unsignalized intersections, worst-case results (delay and LOS) are reported for movements in both the major and minor approaches.

As shown in **Table 3**, during the year 2011 a.m. and p.m. peak hour conditions, all the signalized and unsignalized intersections along the project corridor were found to operate at or above the adopted LOS standard. The existing year 2011 a.m. and p.m. peak hour intersection capacity analysis along with the signal timing data used in the intersection analysis are included in **Appendix E**.

3.4.2 Year 2011 Arterial LOS Analysis

FDOT has classified the study segment along SR 46 between SR 415/Lake Mary Boulevard and Richmond Avenue as an urban principal arterial (class 1) with a LOS standard "D". For the purpose of assessing the arterial LOS of this segment of SR 46, the generalized peak hour directional service volumes for the LOS letters "B" through "E" were obtained from Table 7 of the 2009 FDOT Quality/Level Of Service Handbook and are shown below.

- LOS B – 510 vehicles per hour (VPH)
- LOS C – 820 VPH
- LOS D – 880 VPH
- LOS E – 880 VPH

Furthermore, FDOT has classified the study segment along SR 46 between Richmond Avenue and CR 426 as a rural principal arterial with a LOS standard "C". For the purpose of assessing the arterial LOS of this segment of SR 46, the generalized peak hour directional service volumes for the LOS letters "B" through "E" were obtained from Table 9 of the 2009 FDOT Quality/Level Of Service Handbook and are shown below.

- LOS B – 240 VPH
- LOS C – 430 VPH
- LOS D – 740 VPH
- LOS E – 1,480 VPH

As shown in **Table 4**, the SR 46 corridor from SR 415/Lake Mary Boulevard to CR 426/1st Street currently operates at acceptable level of service conditions during the a.m. peak and p.m. peak hours with the exception of the segment of SR 46 between Richmond Avenue and Mullet Park Road, which operates at a deficient LOS of "D" during the existing a.m. peak hour conditions, and the segment of SR 46 between Richmond Avenue and Osceola Road, which operates at a deficient LOS of "D" during the existing p.m. peak hour conditions.

Table 4: Year 2011 Existing Arterial LOS Analysis Summary

Roadway Segment on SR 46	Area Type	LOS Std.	Peak Hour Peak Direction Volume (VPH)	Arterial LOS
AM Peak Hour (Westbound)				
East of CR 426	Rural	C	282	C
West of CR 426	Rural	C	347	C
B/W Mullet Lake Park Road and Woodridge Drive	Rural	C	419	C
B/W Osceola Road and Mullet Lake Park Road	Rural	C	442	D
Richmond Avenue and Osceola Road	Rural	C	542	D
B/W SR 415/Lake Mary Boulevard and Richmond Avenue	Urban	D	504	B
West of SR 415/Lake Mary Boulevard	Urban	D	483	B
PM Peak Hour (Eastbound)				
West of SR 415/Lake Mary Boulevard	Urban	D	647	C
B/W SR 415/Lake Mary Boulevard and Richmond Avenue	Urban	D	510	C
Richmond Avenue and Osceola Road	Rural	C	535	D
B/W Osceola Road and Mullet Lake Park Road	Rural	C	422	C
B/W Mullet Lake Park Road and Woodridge Drive	Rural	C	428	C
West of CR 426	Rural	C	418	C
East of CR 426	Rural	C	297	C

Tables 7 and 9 of the 2009 FDOT Quality/Level of Service Handbook are included in **Appendix F**.

3.5 Crash Analysis

Crash records along SR 46 between SR 415/Lake Mary Boulevard and CR 426/1st Street were reviewed from January 1, 2006 until May 31, 2011. Information relating to the crash occurrences within the study area was provided by Seminole County and is summarized in Tables G-1 through G-15 (included in **Appendix G)**. The crashes were categorized by intersections. The crash data was analyzed using the procedures outlined in the **FDOT Topic Number 500-000-100-C, Section 1 pages 21 to 24**.

Table 5 shows a summary of the total number of collisions, fatalities, injuries that occurred at the intersections along SR 46 corridor. As seen in **Table 5,** between January 1, 2006 and May 31, 2011, two hundred thirty five (235) crashes occurred along the SR 46 corridor resulting in one hundred and twenty eight (128) injuries, six (6) fatalities and property damage estimated at $1,495,192.

Table 5: Crash Data Summary

Intersection	Total Crashes (1)	Fatalities	Injuries	Property Damages ($)	Appendix Table
SR 46 @					
SR 415	116	1	61	$674,627	G-1
Richmond Avenue	14	1	16	$95,700	G-2
Old Geneva Road	11	1	9	$99,800	G-3
Osceola Road	12	0	3	$66,150	G-4
Clekk Circle	1	0	6	$7,150	G-5
Mullet Lake	9	0	9	$74,700	G-6
Torren Point	4	0	0	$ 21,000	G-7
Mocking Bird Lane	8	0	1	$48,125	G-8
Songbird Trail	3	0	3	$20,000	G-9
Ridge Road	1	0	0	$500	G-10
Cochran Road	5	1	0	$16,150	G-11
Woodridge Drive	6	0	1	$12,800	G-12
Hart Road	3	0	0	$18,400	G-13
Oak Street	3	2	2	$45,700	G-14
CR 426	39	0	17	$294,390	G-15
Total	**235**	**6**	**128**	**$1,145,192**	

Notes:
1) The total crashes include all crashes that occurred within 500 feet of the intersections.

Based on the SR 46 corridor crash data analysis, the traffic volumes, and traffic patterns, the crash types along SR 46 from SR 415 to Osceola Road (approximately 2.72 miles) appear to be different to the crash types along SR 46 from Osceola Road to CR 426 (approximately 4.69 miles). Therefore, the crash rates were calculated separately for the two segments mentioned above.

One hundred and fifty three (153) crashes occurred between January 1, 2006 and May 31, 2011 along the roadway segment of SR 46 from SR 415 to Osceola Road resulting in an average of 28.25 crashes per year. The crash rate for SR 46 from SR 415 to Osceola Road was 2.72 crashes per million vehicle miles (C/MVM) traveled.

Similarly, eighty-two (82) crashes occurred between January 1, 2006 and May 31, 2011 along the roadway segment of SR 46 from Osceola Road to CR 426 resulting in an average of 15.14 crashes per

year. The crash rate for the second segment of the study corridor of SR 46 from Osceola Road to CR 426 was 0.98 crashes per million vehicle miles (C/MVM) traveled.

The crash rate in C/MVM for SR 46 from SR 415 to Osceola Road is calculated as follows:

*Crash rate = (N*1,000,000)/(365*Y*AADT*L)*

*= (153*1,000,000)/(365*5.416*10,435*2.72)*

= 2.72 C/MVM

The crash rate in C/MVM for SR 46 from Osceola Road to CR 426 is calculated as follows:

*Crash rate = (N*1,000,000)/(365*Y*AADT*L)*

*= (82*1,000,000)/(365*5.416*8,963*4.69)*

= 0.98 C/MVM

Where N = number of crashes

Y = number of years

AADT = Annual Average Daily Traffic

L = Length of the segment in miles

It should be noted that the statewide average crash rate for similar facilities (rural 2 lane undivided roadway segments) is 0.525 C/MVM. Therefore, the crash rate for the SR 46 roadway segments is higher than the statewide average crash rate for similar facilities.

3.5.1 Crash Analysis Observations

Among the two hundred and thirty five (235) crashes that occurred along SR 46, the rear end crashes accounted for 45.1% (106 crashes), angle crashes accounted for 10.6% (25 crashes), sideswipe crashes accounted to 10.2% (24 crashes) of the total crashes, and left-turn crashes accounted to 5.5% (13 crashes) of the total crashes.

The rear end crashes are typical of signalized intersections, which induce stop and go traffic. The angle collisions are due to the motorist disregarding the traffic signal at the intersection. The sideswipe collisions are mainly due to improper lane change, and left turn collisions are due to the motorists failing to yield the right of way during the permissive left turn phase and disregarding the traffic signal at the intersection.

Six (6) fatalities and one hundred and twenty eight (128) injuries occurred along the SR 46 corridor between January 1, 2006 and May 31, 2011. It should be noted that five (5) out the six (6) fatalities that occurred along the SR 46 corridor involved motorcycle passengers and were mostly caused by careless driving.

The following paragraphs attempt to summarize the important observations based on the crash analysis for the individual study intersection within the study period.

SR 46 @ SR 415 (signalized)

- 116 (49.4%) out of the total 235 crashes along the SR 46 corridor occurred at or near the intersection of SR 46 and SR 415. These crashes resulted in one fatality, 61 injuries and $674,627 in property damage.

- The fatality that occurred at this intersection resulted from an angle crash where a vehicle traveling southbound through (north to south) the intersection disregarded the traffic signal and was struck by a vehicle traveling westbound (east to west) though the intersection (August 24, 2010).

- Out of the total 116 crashes at this intersection, 62 (53%) were rear-end crashes, which are typical of a signalized intersection. In addition, there were 16 angle (14%), 12 sideswipe (10%), and 12 left turn (10%) crashes at the intersection.

SR 46 @ Richmond Avenue (unsignalized)

- Out of the total 14 crashes that occurred at this intersection, there were 6 rear-end (43%), 1 angle (7%), 2 sideswipe (14%), and 2 ran off road (14%) type crashes at the intersection. These crashes resulted in one fatality, 16 injuries and $95,700 in property damage.

- The fatality that occurred at this intersection resulted from an angle crash where a vehicle (motorcycle) attempting to make a northbound right turn maneuver (north to east) failed to yield the right of and was struck by a vehicle (motorcycle) traveling eastbound (west to east) through the intersection. The two motorist where ejected from the vehicles involved in this crash (October 7, 2006).

SR 46 @ Old Geneva Road (unsignalized)

- Out of the total 11 crashes that occurred at this intersection, there were 4 rear-end (36%), 1 sideswipe (9%), and 3 ran off road (27%) type crashes at the intersection. These crashes resulted in one fatality, 9 injuries and $99,800 in property damage.

- The fatality that occurred at this intersection resulted from a vehicle traveling westbound (east to west) which drove left of the center lane and struck 3 oncoming vehicles (2 motorcycles and a car) traveling eastbound (west to east)(September 19, 2009).

- 5 (45%) out of the total 11 crashes at this intersection occurred during nighttime conditions.

SR 46 @ Osceola Road (unsignalized)

- Out of the total 12 crashes that occurred at this intersection, there were 4 rear-end (33%), 1 angle (8%), 1 left turn (8%), 1 sideswipe (8%), and 2 ran off road (17%) type crashes at the intersection. These crashes resulted in 3 injuries and $66,150 in property damage.

- 7 (58%) out of the total 12 crashes at this intersection occurred during nighttime conditions.

SR 46 @ Clekk Circle (unsignalized)

- Only 1 sideswipe crash was reported for careless driving resulting in 6 injuries and property damage of $7,150 at this intersection.

SR 46 @ Mullet Lake Park Road (unsignalized)

- 9 crashes occurred at this intersection resulting in 9 injuries and $74,700 in property damage.

- Out of the total 9 crashes that occurred at this intersection, there were 6 (67%) crashes where the vehicle ran off the road mostly as a result of careless driving.

- 5 (56%) out of the total 9 crashes at this intersection occurred during nighttime conditions.

SR 46 @ Torren Point (unsignalized)

- 3 (75%) out of the total 4 crashes at this intersection were rear-end crashes, which occurred due to careless driving. These 4 crashes resulted in no fatalities, no injuries and $21,000 in property damage.

SR 46 @ Mockingbird Lane (unsignalized)

- Out of the total 8 crashes that occurred at this intersection, there were 6 other (75%) and 2 rear end (25%) crashes at the intersection. These crashes resulted in no fatalities, one injury and $48,125 in property damage.

SR 46 @ Songbird Trial (unsignalized)

- Out of the total 3 crashes that occurred at this intersection, there were 2 ran off road 67%) and 1 sideswipe (33%) crash at the intersection. These crashes resulted in no fatalities, one injury and $20,000 in property damage.

SR 46 @ Ridge Road (unsignalized)

- Only one crash was reported at the intersection, which occurred when the motorist was not able to avoid a movable object on the roadway. No improper driving/action was reported.

SR 46 @ Cochran Road (unsignalized)

- Out of the total 5 crashes that occurred at this intersection, there were 1 sideswipe 20%) and 1 sideswipe (20%) and 3 other (60%) crashes at the intersection. These crashes resulted in one fatality, no injuries and $16,150 in property damage.

- The fatality that occurred at this intersection resulted from a vehicle (a motorcycle) traveling westbound (east to west) which overturned while trying to stop for stopped traffic ahead. The passenger was ejected from the motorcycle (March 7, 2010).

- 4 (80%) out of the total 5 crashes at this intersection occurred during nighttime conditions.

SR 46 @ Woodridge Drive (unsignalized)

- Out of the total 6 crashes that occurred at this intersection, there were 2 rear-end (33%), 2 sideswipe (33%) and 2 other (34%) crashes at the intersection. These crashes resulted in no fatalities, one injury and $12,800 in property damage.

- 4 (67% %) out of the total 6 crashes at this intersection occurred during nighttime conditions.

SR 46 @ Hart Road (unsignalized)

- Out of the total 3 crashes that occurred at this intersection, there were one angle (33%) and 2, rear-end (67%) crashes at the intersection. These crashes resulted in no fatalities, no injuries and $18,400 in property damage.

- 2 (67%) out of the total 3 crashes at this intersection occurred during nighttime conditions.

SR 46 @ Oak Street (unsignalized)

- Out of the total 3 crashes that occurred at this intersection, there were one ran off road (33%) and 2 rear-end (67%) crashes at the intersection. These crashes resulted in two fatalities, two injuries and $45,700 in property damage.

- The 2 fatalities that occurred at this intersection resulted from a crash where 3 vehicles were involved (2 motorcycles and a vehicle pulling a trailer with no tail lights). The crash occurred when one of the motorcycles collided with the rear end of the trailer. The motorcycle overturned after the impact and the passenger was ejected from the vehicle. The second motorcycle overturned while trying to avoid colliding with the first motorcycle. The passenger of the second motorcycle was also ejected (March 5, 2011).

- 2 (67%) out of the total 3 crashes at this intersection occurred during nighttime conditions.

SR 46 @ CR 426 (signalized)

- 39 (16.6%) out of the total 235 crashes along the SR 46 corridor occurred at or near the intersection of SR 46 and CR 426. These crashes resulted in no fatalities, 17 injuries and $294,390 in property damage.

- Out of the total 39 crashes at this intersection, 19 (49%) were rear-end crashes, which are typical of a signalized intersection. In addition, there were 6 angle (15%), 2 sideswipe (5%), and 1 right turn (3%) crashes at the intersection.

- 10 (26%) out of the total 39 crashes at this intersection occurred during nighttime conditions.

4. Development of Design Characteristics

The design traffic characteristics established in this section were used in developing design hour volumes (DHV) for the intersections and directional design hour volumes (DDHV) for the roadway segments for the future conditions. These characteristics are determined based on the procedure outlined in the FDOT's Project Traffic Forecasting Handbook, dated October 2002.

4.1 Standard K Factor

The K factor represents the relationship between the travel demand occurring during the peak hour and the average annual daily traffic**.** The ratio of peak hour to annual average daily traffic factor (K) is used in the FDOT's planning through design phases. As indicated in the Draft Issue Paper on Improving Florida's Transportation Planning and Design Analysis Time Period Process (Adopting Standard K Factors throughout FDOT) dated July 15, 2011, a **Standard K Factor of 9.0%** for Arterials and Highways within "Transitioning to Urbanized Areas (Fringe Development Areas)" is recommended for the SR 46 corridor and the side streets that intersect the corridor.

4.2 D_{30} Factor

The D_{30} factor represents the directional factor occurring in the traffic flow during the 30th highest hour. In determining this factor for SR 46 and the side streets that intersect the main roadway corridor, statewide and national guidelines were compared to the field collected project traffic counts and traffic information contained in the 2010 FTI DVD. The measured D for the study area roadways are shown in **Table 6.** The average of the measured D factors for SR 46 corridor within the study limits is 53.07%.

Table 6: YR 2011 Measured "D" Factors

Roadway / Segment	2011 Measured "D"
Mainline Characteristics	
SR 46	
B/W SR 415/Lake Mary Boulevard and Osceola Road	55.64%
B/W Osceola Road and Mullet Lake Park Road	53.54%
B/W Mullet Lake Park Road and Woodridge Drive	50.06%
West of CR 426	53.04%
Average	**53.07%**
Side Street Characteristics	
SR 415/Lake Mary Boulevard	
North of SR 46	73.21%
South of SR 46	85.52%
Average	**79.37%**
Osceola Road	
East of SR 46	62.06%
Mullet Lake Park Road	
North of SR 46	61.33%
Cochran Road	
East of SR 46	60.00%
West of SR 46	78.05%
Average	**69.03%**
Avenue C/Woodridge Drive	
East of SR 46	52.91%
West of SR 46	70.97%
Average	**61.94%**
3rd Street	
North of SR 46	70.00%
CR 426/1st Street	
North of SR 46	59.14%
South of SR 46	62.39%
Average	**60.77%**

The 2010 FTI DVD was used to obtain the historical D_{30} factors for five (5) years between 2006 and 2010 for the FDOT count location sites #770299 (SR 46 west of the Saint John's river Bridge) and #770174 (SR 46 west of CR 426). As seen in **Table 7**, the average, minimum, and maximum D_{30} factors over the five

years for the two (2) count location sites along the SR 46 corridor are 52.78%, 52.08% and 53.66%, respectively.

Table 7: Historical FTI Data - D_{30} Values

Year	Count Locations along SR 46		Average
	Site # 770299 (West of St. Johns River)	Site # 770174 (West of CR 426)	
2006	52.00%	52.16%	52.08%
2007	52.35%	52.41%	52.38%
2008	54.56%	52.75%	53.66%
2009	54.56%	51.56%	53.06%
2010	52.91%	51.95%	52.43%
Average	53.28%	52.17%	52.72%
Minimum	52.00%	51.56%	52.08%
Maximum	54.56%	52.75%	53.66%

Table 8 provides the current recommended range of D_{30} values from the FDOT Project Traffic Forecasting Handbook (2002) and the Highway Capacity Manual (HCM 2000) for rural and urban arterials.

Table 8: Recommended Range of D_{30} Values

Values	Rural Arterial		Urban Arterial	
	FDOT[1]	HCM[2]	FDOT[1]	HCM[2]
Low	51.1%	54.0%	50.8%	52.0%
Average	58.1%	58.0%	57.9%	54.5%
High	79.6%	62.0%	67.1%	57.0%

Notes:
1) FDOT Project Traffic Forecasting Handbook, October 2002, Figure 3.10
2) FDOT Project Traffic Forecasting Handbook, October 2002, Figure 3.11

4.2.1 SR 46 Corridor

The average measured D from the 2011 traffic counts is 53.07%, while the average historical D_{30} obtained from the 2010 FTI DVD is 52.7%. Therefore, based on the comparison of average measured D and average historical D_{30}, **a D_{30} factor of 53.0% is recommended for the SR 46 corridor.**

4.2.2 Side Streets

For the purposes of this study, the measured D values from the 2011 traffic counts will be used for all the side streets as the recommended D_{30} factors. However, the recommended D_{30} factors will be restricted to the upper FDOT accepted limit for rural and urban arterials as shown in **Table 8**.

4.3 T_{24} & T_f Factors

The daily truck factor, T_{24} represents the percentage composition of medium sized and heavy trucks occurring in the traffic stream for a 24-hour period. The peak hour truck factor, T_f, is the percentage of truck traffic during the peak hour and is recommended as one-half of the T_{24} factor in the Project Traffic Forecasting Handbook. The truck factor for the daily condition will be used in determining Equivalent Single Axle Loadings (ESAL) for the project corridor.

As mentioned earlier in the report, three (3) 72 Hour bi-directional classification volume counts were conducted along SR 46 west of SR 415, between SR 415/Lake Mary Boulevard and Osceola Road, and west of CR 426. However, the year 2011 measured T_{24} and T_f factors for the SR 46 corridor were obtained from the counts collected between SR 415/Lake Mary Boulevard and Osceola Road and west of CR 426 since they are located within the study limits. As shown in **Table 9**, an average T_{24} factor of 11.6% and an average T_f factor of 8.5% were measured for the SR 46 corridor.

Table 9: YR 2011 Measured "T_{24}" and "T_f" Factors

Roadway / Segment	2011 Measured "T_{24}"	2011 Measured "T_f"
SR 46		
B/W SR 415/Lake Mary Boulevard and Osceola Road	11.8%	8.3%
West of CR 426	11.4%	8.6%
Average	**11.6%**	**8.5%**

Table 10 contains the historical SR 46 T_{24} factors, from the 2010 FTI DVD, for years 2006 through 2010 for the two (2) FDOT count site locations within the corridor (sites #770299 and #770174).

Table 10: SR 46 Historical FTI Data - T_{24} Values

Year	Count Locations along SR 46		Average
	Site # 770299 (West of St. Johns River)	Site # 770174 (West of CR 426)	
2006	12.70%	12.80%	12.75%
2007	12.20%	13.90%	13.05%
2008	12.20%	13.10%	12.65%
2009	12.20%	12.50%	12.35%
2010	10.10%	11.00%	10.55%
Average	11.88%	12.66%	12.27%
Minimum	10.10%	11.00%	10.55%
Maximum	12.70%	13.90%	13.05%

4.3.1 SR 46 Corridor

The measured T_{24} from the 2011 traffic counts is 11.6%, while the average of the historical T_{24} factors is 12.3%. In order to be conservative **a T_{24} factor of 12.3% is recommended for the SR 46 corridor. In addition, a T_f factor of 8.5% as measured in the field is recommended for the SR 46 corridor.**

4.3.2 Side Streets

Truck factors were not measured for the side streets. Historical data from the 2010 FTI DVD is also not available for the side streets, with the exception of SR 415 north of SR 46. Therefore, for the purposes of this study, a **T_{24} factor of 2.0% and a T_f factor of 1.0% are recommended for all the side streets, with the exception of SR 415 and Osceola Road north of SR 46. An average historical T_{24} factor of 8.8% and a T_f factor of 4.4% are recommended for SR 415 north of SR 46. A T_{24} factor of 10.0% and a T_f factor of 10.0% are recommended for Osceola Road north of SR 46 based on the 4 hour TMC volume counts collected.**

4.4 Recommended Design Traffic Characteristics

Based on the afore-mentioned discussions, the following **Table 11** provides a summary of the recommended design traffic characteristics for this study.

Table 11: Recommended Design Traffic Characteristics

Roadway / Segment	Recommended Design Characteristics			
	Standard "K" Factor	"D_{30}" Factor	"T_{24}" Factor	"T_f" Factor
Mainline Characteristics				
SR 46	9.0%	53.0%	12.3%	8.5%
Side Street Characteristics				
SR 415 (north of SR 46)	9.0%	67.1%	8.8%	4.4%
Lake Mary Boulevard	9.0%	67.1%	2.0%	1.0%
Osceola Road	9.0%	62.1%	10.0%[1]	10.0%[1]
Mullet Lake Park Road	9.0%	61.3%	2.0%	1.0%
Cochran Road	9.0%	69.0%	2.0%	1.0%
Avenue C/Woodridge Drive	9.0%	61.9%	2.0%	1.0%
3rd Street/Oak Street	9.0%	70.0%	2.0%	1.0%
CR 426/1st Street	9.0%	60.8%	2.0%	1.0%

Notes:
1) The "T_{24}" and "T_f" for Osceola Road north of SR 46 were determined from the 4 hour Turning Movement Count collected in the field.

5. Development of Future Traffic Forecasts

The development of traffic projections for the SR 46 study corridor requires the examination of historical growth, proposed development levels within the corridor vicinity, and a basic understanding of local traffic circulation patterns and travel characteristics of the corridor.

5.1 Design Period

Based on the information provided by Seminole County, the following design periods were used to provide the future traffic forecasts and roadway and intersection operation analysis for the study corridor.

- Opening Year – 2015
- Mid-design Year – 2025
- Design Year – 2035

5.2 Programmed and Planned Improvements

The following programmed / planned improvements are scheduled for the study area and were identified based on a review of the latest MetroPlan Orlando Transportation Improvement Program (TIP) (Fiscal Year [FY] 2011/12 - FY 2015/2016), and MetroPlan Orlando 2030 Long Range Transportation Plan (LRTP). The programmed / planned improvement documentation can be found in **Appendix H.**

5.2.1 Programmed Improvements

The following programmed improvements are scheduled for the study corridor and the intersecting corridors in the next five years, based on the latest MetroPlan Orlando TIP:

- **SR 415 from SR 46 to Volusia County Line:** This section of SR 415 is scheduled to be widened to a four-lane roadway and has construction funding in the FY 2011/2012.
- **SR 46 from Mellonville Avenue to SR 415**: Funding to acquire Right of Way (ROW) for the widening of this segment from two (2) lanes to four (4) lanes and construction is programmed for FY 2011/2012 and 2015/2016, respectively.
- **SR 46 from SR 415 to CR 426**: Funding for the Preliminary Engineering phase for the widening of this segment from two (2) lanes to four (4) lanes will be available by the FY 2014/2015.

5.2.2 Planned Improvements

The following improvements are planned for the study corridor and the intersecting corridors by the year 2030 based on the adopted Metroplan Orlando 2030 LRTP:

- **Lake Mary Boulevard from Country Club Road to SR 46**: Widen this section of Lake Mary Boulevard from four (4) to six (6) lanes. It should be noted that this improvement is not identified in the Seminole County Comprehensive Plan and based on discussions with Seminole County staff was not included in this study.
- **SR 46 from SR 415 to CR 426**: Widen this section of SR 46 from two (2) to four (4) lanes.
- **SR 46 from CR 426 to Volusia County Line**: Widen this section of SR 46 from two (2) to four (4) lanes.

5.3 Year 2035 Roadway Analysis Alternatives

As mentioned before, the future traffic forecast volumes were determined for the No Build and the Build Alternatives.

5.3.1 No Build Alternative

For the purpose of this scenario, the No Build traffic forecasts were developed for the SR 46 corridor from SR 415 to CR 426 as a two (2) lane roadway.

5.3.2 Build Alternative

For the purpose of this scenario, the Build traffic forecasts were developed for the SR 46 corridor from SR 415 to CR 426 as a four (4) lane roadway. As mentioned earlier, the Build Alternative is consistent with the latest adopted MetroPlan Orlando LRTP.

5.4 Future Travel Demand

The development of traffic forecasts for study corridors is not complete without a review of the historical traffic growth, population estimates along the corridor, and a review of the future year model forecasts. Due to the specific conditions associated with any roadway, it is necessary to utilize the various methods in projecting future traffic forecasts (such as trends analysis, population estimates and

Travel Demand Models) for comparison purposes. The following sections discuss the various methodologies used in developing future travel demand in the study.

5.4.1 Historical Traffic Growth

A trend analysis was performed for four (4) FDOT count stations along SR 46, and one (1) FDOT count station at SR 415. In addition, trend analyses were conducted at Osceola Road (north of SR 46) and CR 426 (south of SR 46) based on historical traffic information obtained from Seminole County. These count stations, provided historic counts ranging from 2000 to 2010. Based on this historical data, future growth trends were established by a least square linear regression of the historic counts. However, none of the trend R-squared values that give the goodness of fit of the model were greater than the required 75% for the models to trust. Therefore, the historical growths produced by trends analyses were not used in the development of future traffic forecasts. **Table 12** summarizes the trend analysis results. The trend analysis sheets are provided as **Appendix I**.

Table 12: Trend Analysis Growth Rates

Location	2011 AADT	2035 AADT	R^2 (%)	Annual Growth Rate (%)
Mainline)				
SR 46 (West of SR 415)	10,500	0	60.13%	-4.2%
SR 46 (SR 415 to Osceola Road)	10,500	9,200	16.94%	-0.5%
SR 46 (Osceola Road to CR 426)	9,000	8,100	6.04%	-0.4%
SR 46 (East of CR 426)	5,800	5,800	1.94%	0.0%
Side Streets				
SR 415 (North of SR 46)	15,500	24,300	46.43%	2.4%
Osceola Road (North of SR 46)	2,200	3,500	14.44%	2.5%
CR 426 (South of SR 46)	8,600	6,800	2.18%	-0.9%

5.4.2 Seminole County Population Projections

In addition to the trends analysis, population projection data obtained from the Bureau of Economic Business Research (BEBR) published by the University of Florida were used for comparison purposes. **Table 13** shows the year 2010 population data and the high and medium population estimates for the Year 2035 along with the corresponding growth rate.

Table 13: Population Analysis

Seminole County	Population Analysis		
	2010	2035	Growth
Medium Population Estimate	422,718	540,000	1.11%
High Population Estimate	422,718	656,800	2.22%

As seen on **Table 13**, the high and medium population estimates obtained from BEBR reported an annual growth rate of 2.2% and 1.1% per year, respectively. The BEBR population projection data are enclosed in **Appendix J**.

5.4.3 Travel Demand Model

The modeling efforts were completed for the No Build and Build Alternatives using the latest year 2035 Central Florida Regional Planning Model, Version 5.0 (CFRPM V5.0) released in 2010 and the most current Orlando Metroplan Year 2030 Orlando Urban Area Transportation Study (OUATS) cost feasible model.

The model based traffic projections for the No Build and the Build Alternatives were assessed for their reasonableness. Before accepting the model results as appropriate for use in the design traffic report, the results of the CFRPM and the OUATS transportation models for the study area were reviewed closely to determine the accuracy of the traffic forecasts.

The year 2010 Seminole countywide Model Conversion Output Factor (MOCF) of 0.98 was used to convert the Peak Season Weekday Average Daily Traffic (PSWADT) obtained from the travel demand models to Annual Average Daily Traffic (AADT). The year 2030 OUATS and 2035 CFRPM travel demand models were used to develop AADT volumes for the No Build & Build Alternatives. As seen in **Table 14**, the No Build and Build AADT projections obtained from the OUATS and CFRPM models were used to develop annual growth rates for the study corridor. Based on the OUATS model projections, the SR 46 corridor is anticipated to have an annual growth rate of 6.5% and 7.6% for the No Build and Build Alternatives, respectively. In addition, the CFRPM model projects the SR 46 corridor to sustain an annual growth rate of 8.1% and 10.3% for the No Build and Build Alternatives, respectively. The OUATS and CFRPM model plots have been enclosed in **Appendix K**.

Table 14

SR 46 from SR 415/Lake Mary Boulevard to CR 426 - Design Traffic Report

Model Analysis Growth Rates

Roadway Segment	NO BUILD - OUATS			Build - OUATS			NO BUILD - CFRPM			Build - CFRPM		
	YR 2011	YR 2030	Growth Rate	YR 2011	YR 2030	Growth Rate	YR 2011	YR 2035	Growth Rate	YR 2011	YR 2035	Growth Rate
Mainline												
SR 46												
West of SR 415	10,500	21,522	5.5%	10,500	23,709	6.6%	10,500	25,675	6.0%	10,500	29,098	7.4%
SR 415 to Osceola Road	10,500	25,078	7.3%	10,500	28,484	9.0%	10,500	26,493	6.3%	10,500	33,058	9.0%
Osceola Road to CR 426	9,000	23,600	8.5%	9,000	26,739	10.4%	9,000	25,340	7.6%	9,000	31,798	10.6%
East of CR 426	5,800	10,719	4.5%	5,800	10,737	4.5%	5,800	23,206	12.5%	5,800	25,584	14.2%
AVERAGE			*6.5%*			*7.6%*			*8.1%*			*10.3%*
Side Streets												
SR 415												
North of SR 46	15,500	33,570	6.1%	15,500	33,402	6.1%	15,500	39,746	6.5%	15,500	39,673	6.5%
South of SR 46	9,300	19,237	5.6%	9,300	26,066	9.5%	9,300	31,517	10.0%	9,300	31,639	10.0%
Osceola Road												
North of SR 46	2,200	----	----	2,200	----	----	2,200	----	----	2,200	----	----
CR 426												
North of SR 46	3,800	----	----	3,800	----	----	3,800	----	----	3,800	----	----
South of SR 46	8,600	23,965	9.4%	8,600	20,843	7.5%	8,600	19,242	5.2%	8,600	21,078	6.0%

5.5 Recommended Growth Rates

The growth rates obtained from the Trend Analysis, the OUATS model, the CFRPM Model, and the population estimates were compared in order to develop the recommended growth rates for the corridor. Based on the comparison of growth rates obtained using the four (4) methodologies, we recommend to use the annual growth rates of 8.1% and 10.3% obtained from the CFRPM model for the SR 46 corridor for both the No Build and Build Alternatives, respectively.

It is to be noted that these recommended annual growth rates appear to be high since the base traffic volumes at the corridor are low. The use of the CFRPM model traffic projections to develop the SR 46 corridor annual growth rates for the No Build and Build Alternatives is appropriate based on the fact that the CFRPM model is a district-wide model and includes Volusia County in its entirety. This is a critical consideration when developing the future traffic volume forecasts since SR 415 and SR 46 extend into Volusia County. In addition, based on conversations with Seminole County staff it was determined that while there are no approved Development of Regional impacts (DRIs) in the vicinity of the project, the study corridor is anticipated to incur substantial growth from cumulative effects of Sub DRI level developments that could be developed individually. Furthermore, as indicated in the Seminole County Future Land Use Element Objective 19, the Orlando Sanford International Airport has been identified as an Economic Development Target Area. Economic Development Target Areas are identified as areas to implement an aggressive strategy to attract specific industries which deliver economic growth. With this being said, it is anticipated that large industrial developments as well as new runways are anticipated to be built by the Build Alternative Design year of 2035 in the vicinity of the Orlando Sanford International Airport.

Furthermore, the only corridors to the north and south that would serve traffic traveling east-west through the district are the SR 50 corridor and the SR 44 corridor. However, the SR 50 and SR 46 corridors are not comparable parallel routes to the SR 46 corridor since the SR 50 corridor is located approximately 12-15 miles south of the SR 46 corridor and the SR 44 corridor is located approximately 15-19 miles north of the SR 46 corridor. In addition, the only access connections from to SR 50 to SR 46 are the Greeneway Expressway (on the west portion of the corridors) and I-95 (on the east potion of the corridors). The only access connections from SR 44 to SR 46 are CR 415 (on the west portion of the corridors) and I-95 (on the east potion of the corridors).

Based on the above mentioned facts, the fact that SR 46 is an emergency evacuation route and based on the input obtained from the Seminole County staff, the recommended growth rates of 8.1% for No Build and a 10.3% for Build Alternative for the SR 46 corridor are reasonable for the purpose of developing the future year traffic forecasts.

Table 15 summarizes the recommended annual growth rate of 8.1% for the SR 46 corridor No Build Alternative and the recommended annual growth rate of 10.3% for the SR 46 corridor Build Alternative. Furthermore, it is recommended that the growth rates obtained from the CFRPM model be used for CR 426 (south of SR 46).

Based on the CFRPM model, the annual growth rates for SR 415/Lake Mary Boulevard (north and south of SR 46) are 6.5% and 10.0%, respectively. However, these growth rates appear to be unrealistically high due to the fact that the CFRPM cost feasible model network includes Lake Mary Boulevard from Country Club Road to SR 46 as a six (6) lane planned roadway improvement. It should be noted that this improvement is not included in any future plans of the Seminole County Comprehensive Plan. Furthermore, based on conversations with Seminole County staff, it was determined that the widening of Lake Mary Boulevard south of SR 46 to six lanes is unlikely to occur by the design year 2035. Therefore, the future traffic forecasts for SR 415 (north of SR 46) and Lake Mary Boulevard (south of SR 46) were restricted to the future year AADT of 34,500 and 24,500, respectively (obtained based on design year traffic volumes and design hour K_{30}) reported in the SR 46 Project Traffic for PD&E and Design Report (from US 17/92 to SR 415), Financial Project ID: 240216-1, dated May 2005. Based on these future traffic forecasts, the recommended annual growth rate for the Build and No Build Alternatives is 5.1% for SR 415 (north of SR 46) and 6.8% for Lake Mary Boulevard (south of SR 46).

Due to the lack of information on all the other side streets, it is recommended that an annual growth rate of 2.0% be used to develop the future traffic forecasts for the No Build and Build Alternatives. The recommended growth rates are summarized in **Table 15**.

Table 15: Recommended Growth Rates

Roadway / Segment	No Build Alternative Growth Rate	Build Alternative Growth Rate
Mainline		
SR 46	8.1%	10.3%
Side Streets		
SR 415 (north of SR 46)	5.1%(1)	5.1%(1)
Lake Mary Boulevard (south of SR 46)	6.8%(1)	6.8%(1)
Osceola Road	2.0%	2.0%
Mullet Lake Park Road	2.0%	2.0%
Cochran Road	2.0%	2.0%
Avenue C/Woodridge Drive	2.0%	2.0%
3rd Street/Oak Street	2.0%	2.0%
1st Street (north of SR 46)	2.0%	2.0%
CR 426 (south of SR 46)	5.2%	6.0%

1) The annual growth rates for SR 415 (north of SR 46) and Lake Mary Boulevard (south of SR 46) were developed by comparing the 2011 AADT and future year AADT (obtained based on the design year traffic volumes and design hour K_{30} reported in the SR 46 Project Traffic for PD&E and Design Report (from US 17/92 to SR 415), Financial Project ID: 240216-1, dated May 2005.

5.6 No Build & Build Future AADT Volumes

The design year 2035 daily traffic volumes for the No Build and Build Alternatives were derived using the recommended annual growth rates (included in Table 15). In addition, the opening year 2015 and mid-design year 2025 traffic volumes were derived using interpolation of traffic volumes between 2011 and 2035. The future year AADT volumes for the No Build Alternative are shown in **Figures 6-1 and 6-2**. Furthermore, the future year AADT volumes are shown in **Figures 7-1 and 7-2** for the Build Alternative.

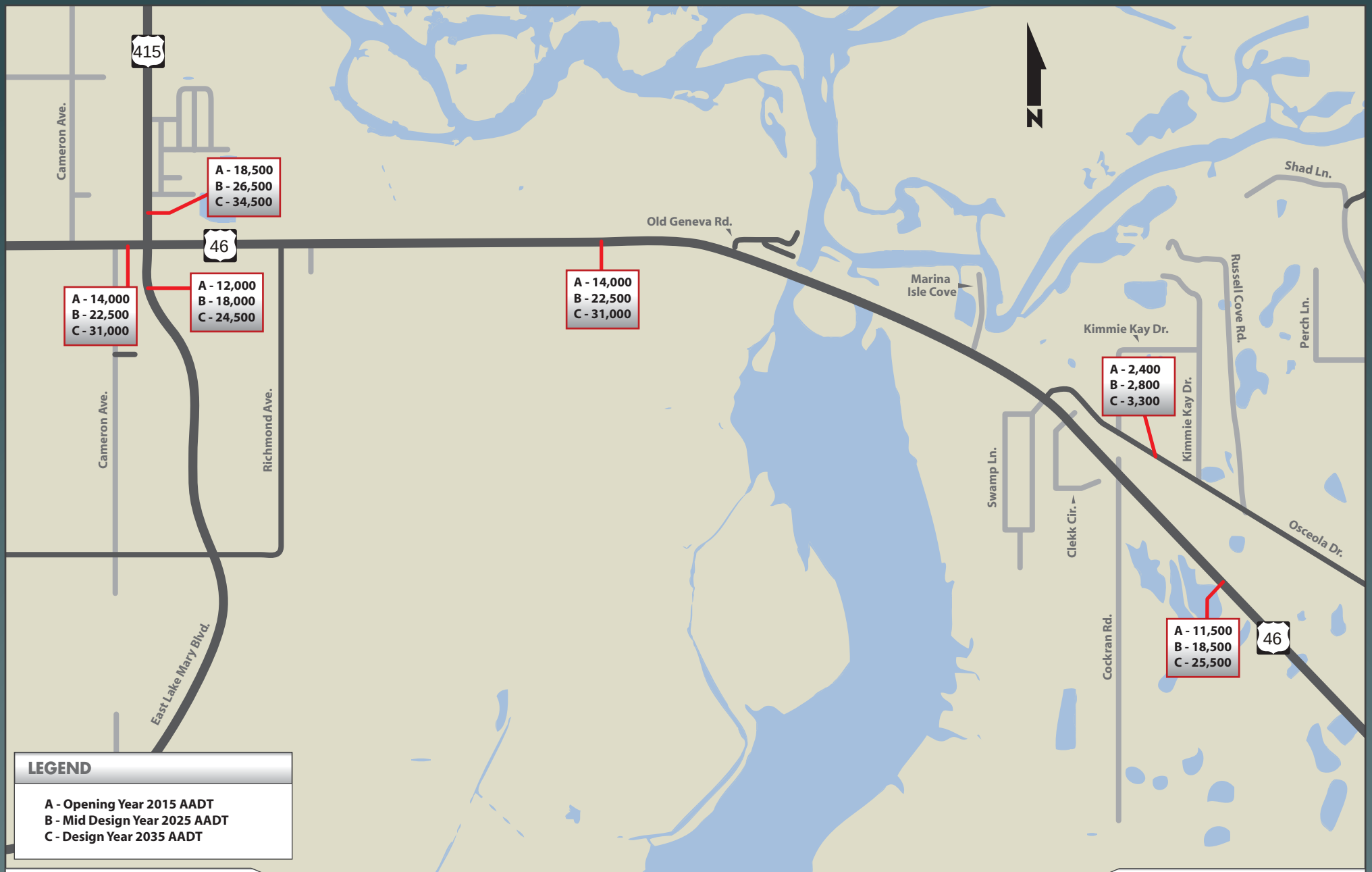

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FIGURE 6-1
Future AADT Volumes
No Build Alternative - Subsection 1

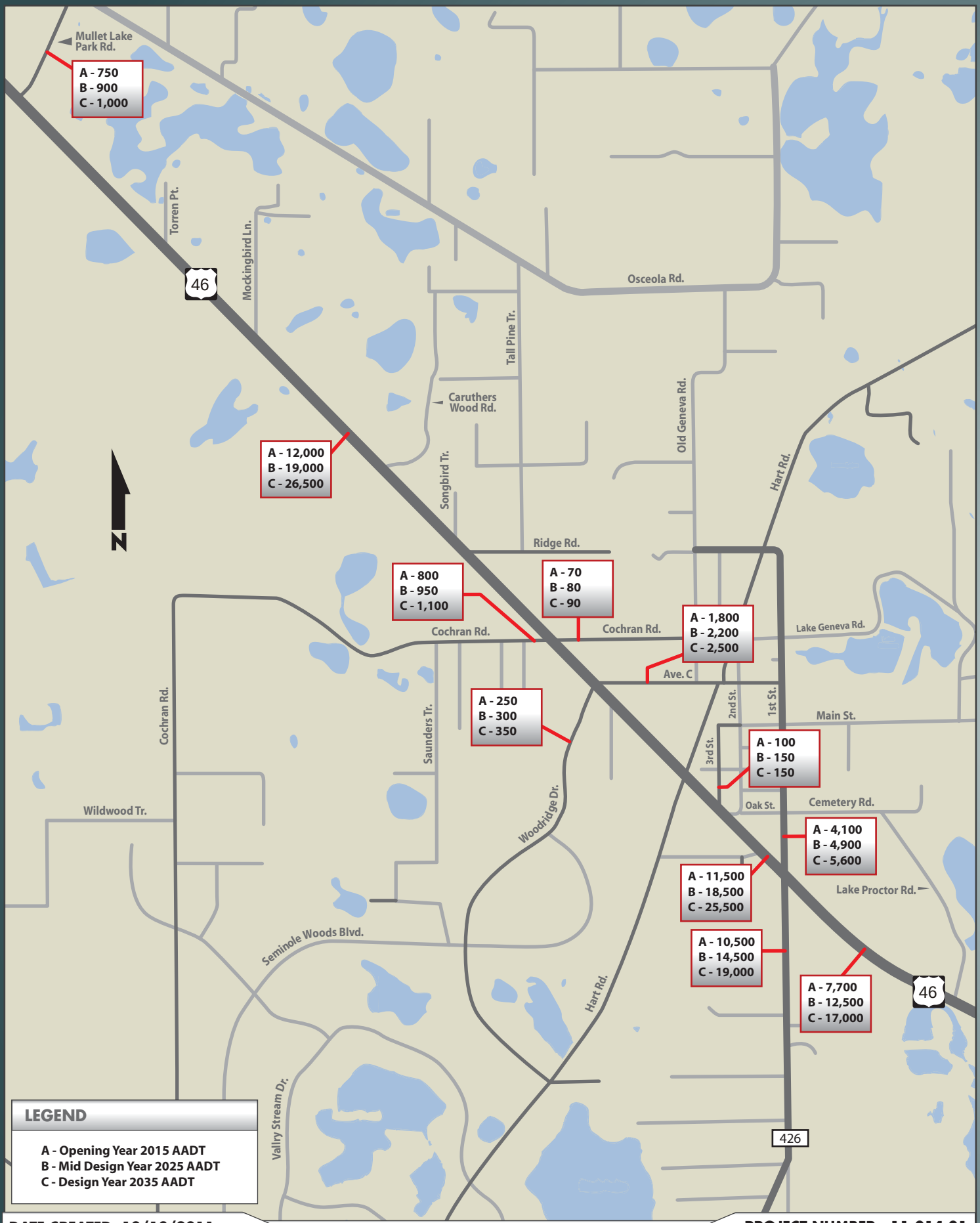

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FIGURE 6-2
Future AADT Volumes
No Build Alternative - Subsection 2

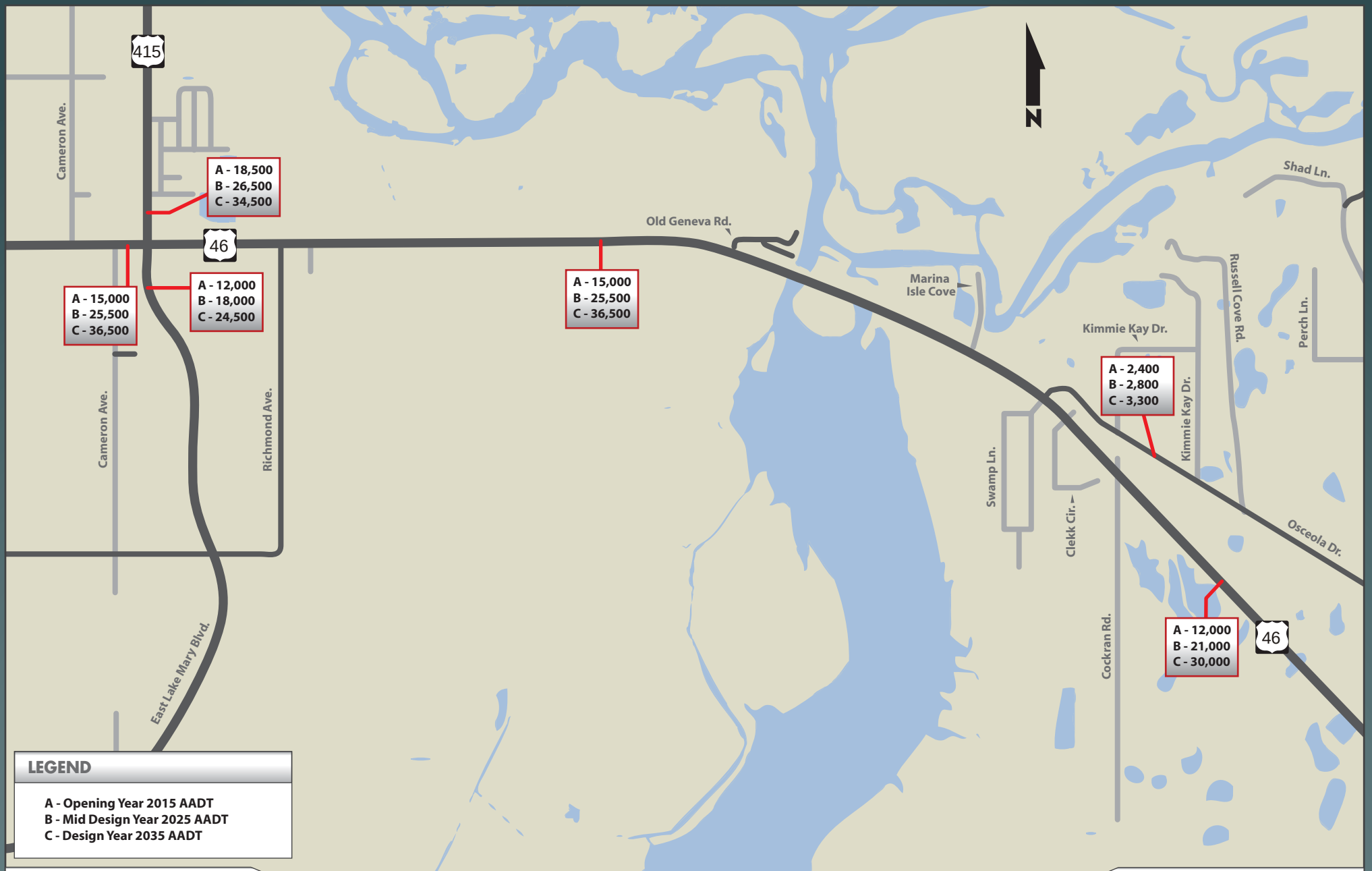

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FIGURE 7-1
Future AADT Volumes
Build Alternative - Subsection 1

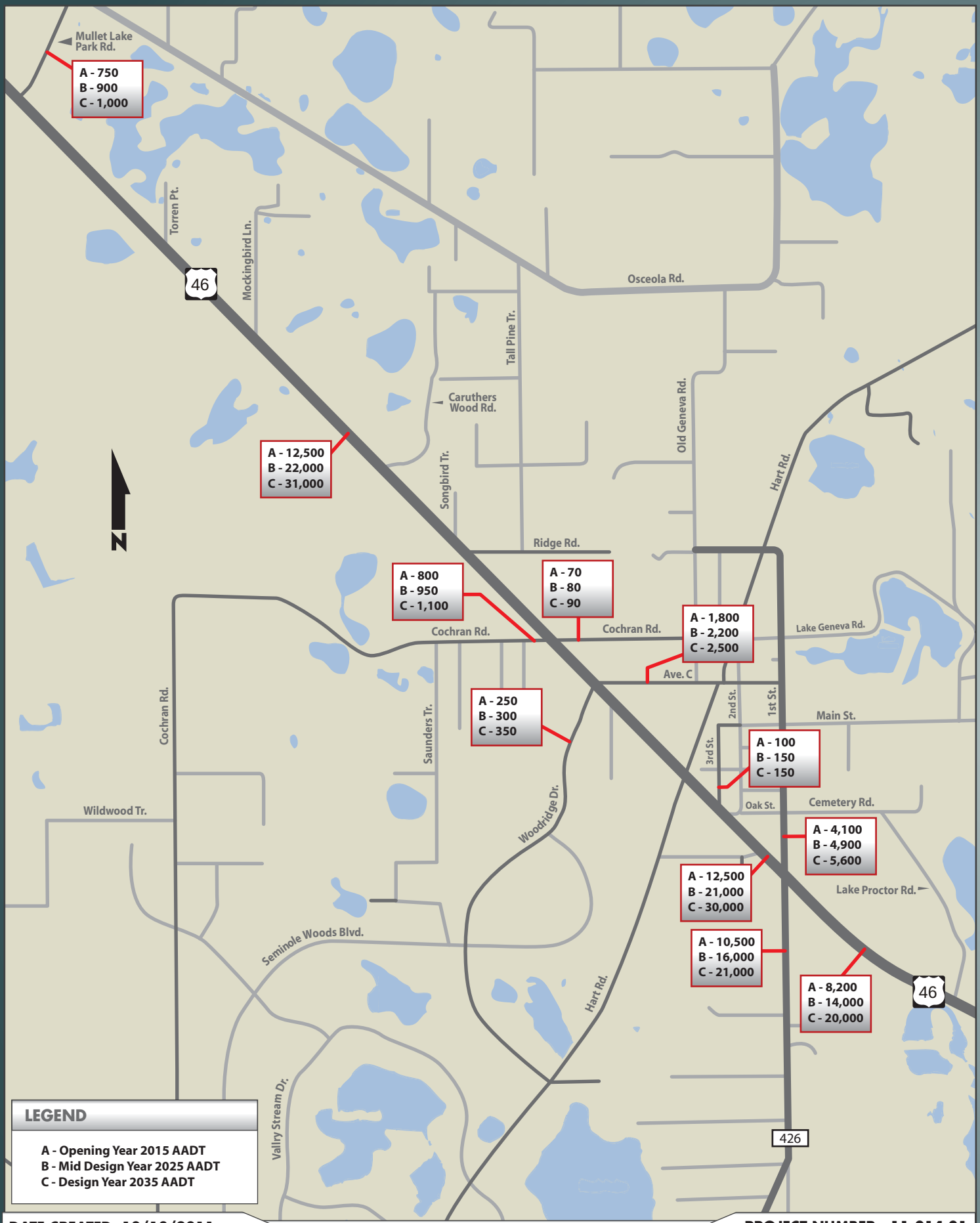

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FIGURE 7-2
Future AADT Volumes
Build Alternative - Subsection 2

5.7 Intersection Design Hour Volumes

The existing and future year AADTs for the No Build and Build Alternatives along with the recommended traffic characteristics were used to develop the design hour volumes (DHVs) for both the a.m. and p.m. design hours at the intersections for the opening, mid-design and design years.

The DHVs for the intersections were developed using the TURNS5 spreadsheet, which balances AADTs and calculates DHVs based on Standard K and D_{30} factors used as input into the program. The estimated design hour volumes for the a.m. and p.m. design hours from TURNS5 spreadsheet were assessed for reasonableness. In general, adjustments were made to ensure that the year 2015, 2025 and 2035 design hour volumes were higher than the existing peak hour volumes. Furthermore, the future year design turning movements were adjusted to reasonably match the Directional Design Hour Volume (DDHV) exiting the intersections along SR 46. These adjustments are necessary because accepting an estimated volume that is unrealistically large may lead to over design and accepting an estimated volume that is too small may result in an inadequate design. The adjustments that were made are reported in the TURNS5 output sheets included in **Appendix L**.

The future year a.m. and p.m. design hour volumes for the No Build Alternative are shown in **Figures 8-1** and **8-2**, **Figures 9-1** and **9-2** and **Figures 10-1** and **10-2** for the years 2015, 2025 and 2035, respectively. The future year a.m. and p.m. design hour volumes for the Build Alternative are shown in **Figures 11-1** and **11-2, Figures 12-1** and **12-2 and Figures 13-1** and **13-2** for years 2015, 2025 and 2035, respectively.

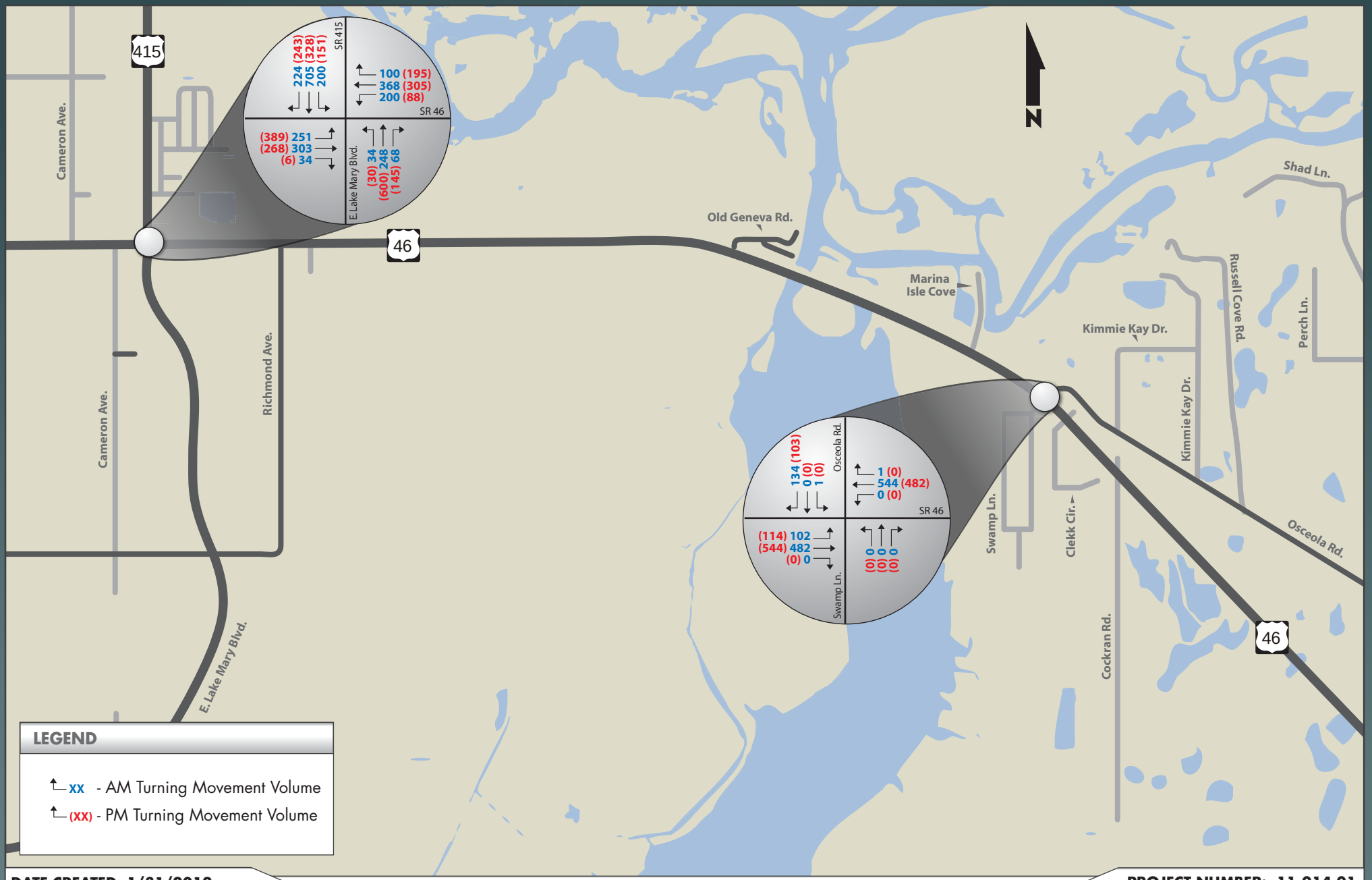

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FIGURE 8-1
Year 2015 Design Hour Turning Movement Volumes No Build - Subsection 1

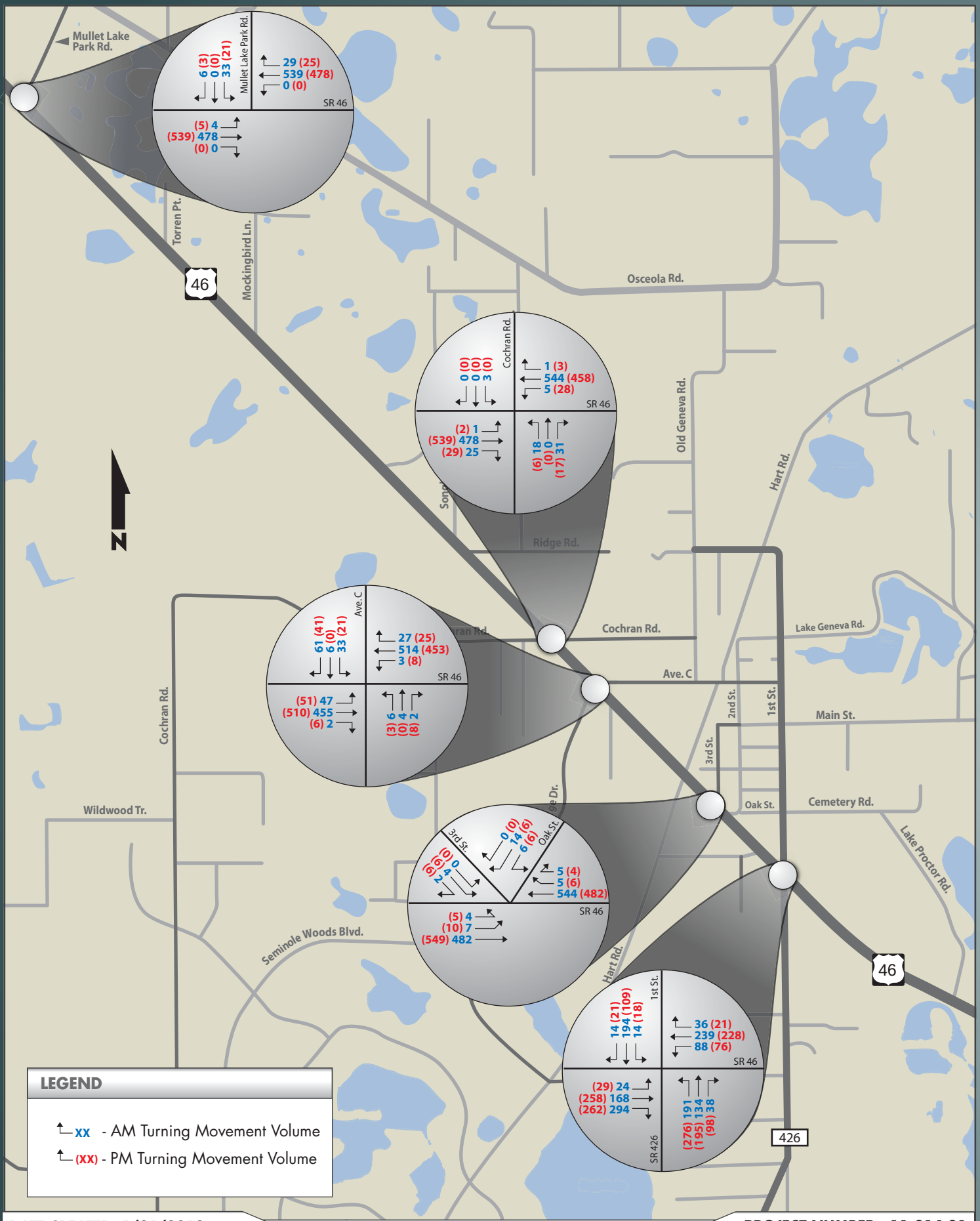

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FIGURE 8-2
Year 2015 Design Hour
Turning Movement Volumes
No Build - Subsection 2

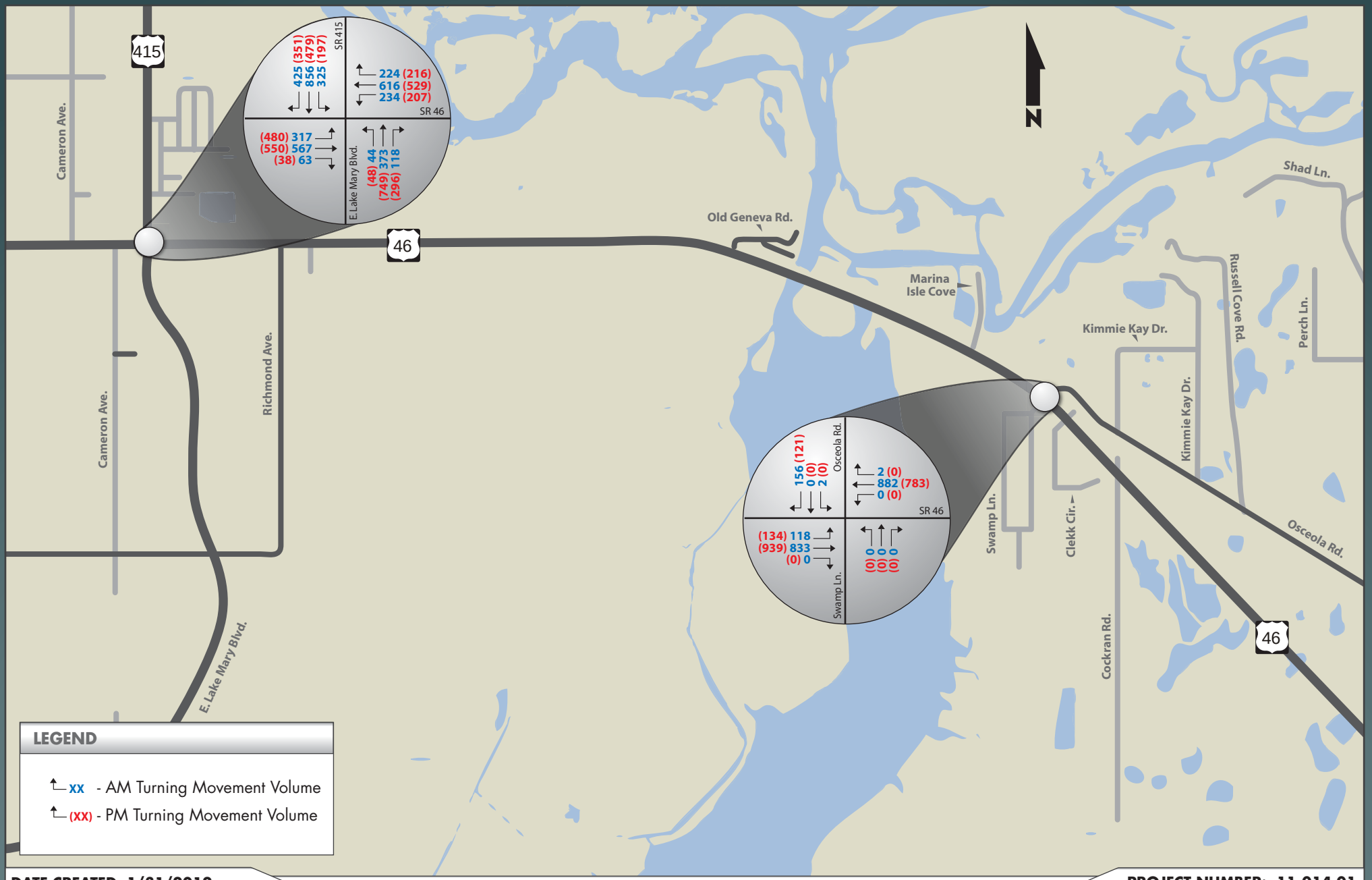

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FIGURE 9-1
Year 2025 Design Hour Turning Movement Volumes No Build - Subsection 1

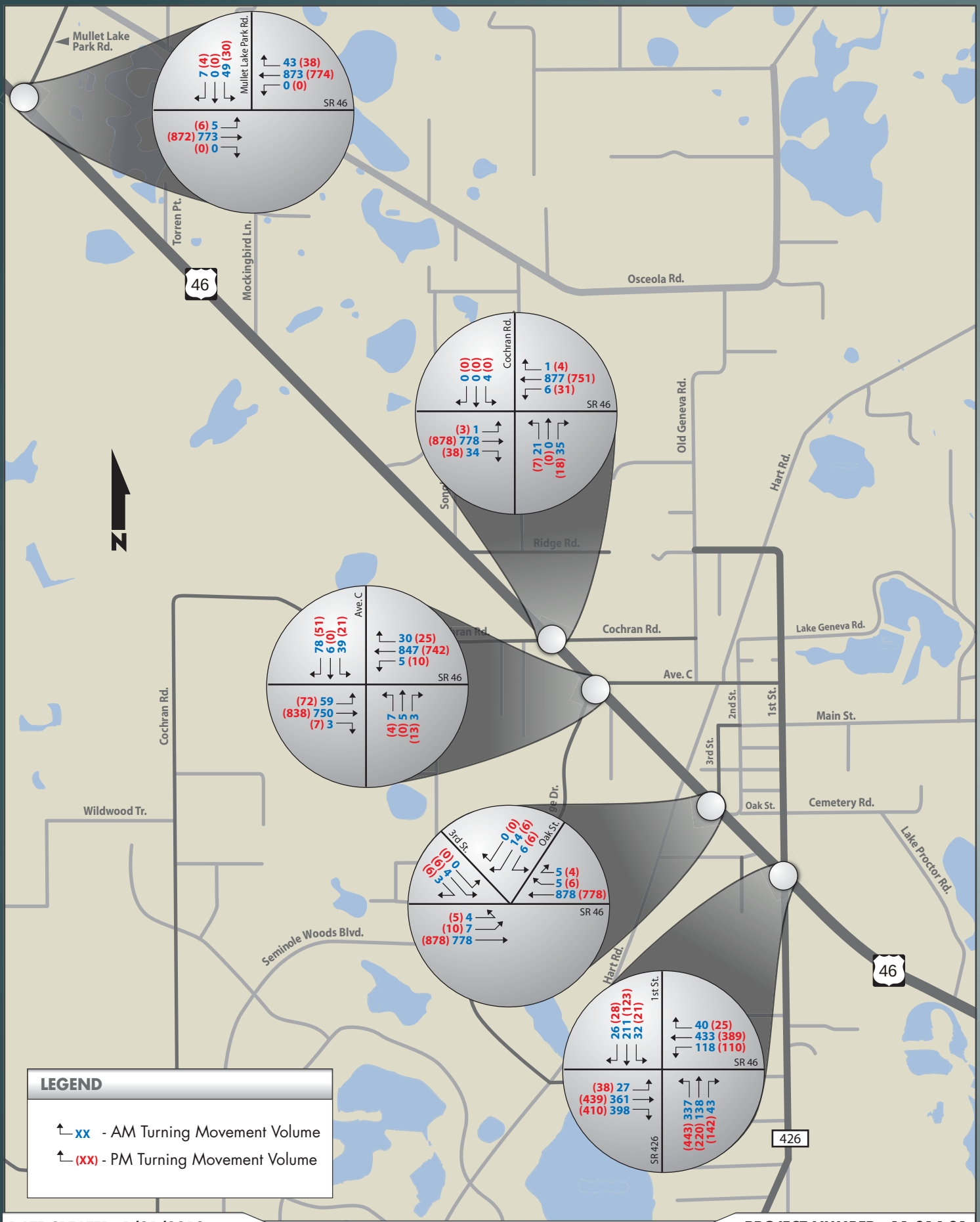

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FIGURE 9-2
Year 2025 Design Hour
Turning Movement Volumes
No Build - Subsection 2

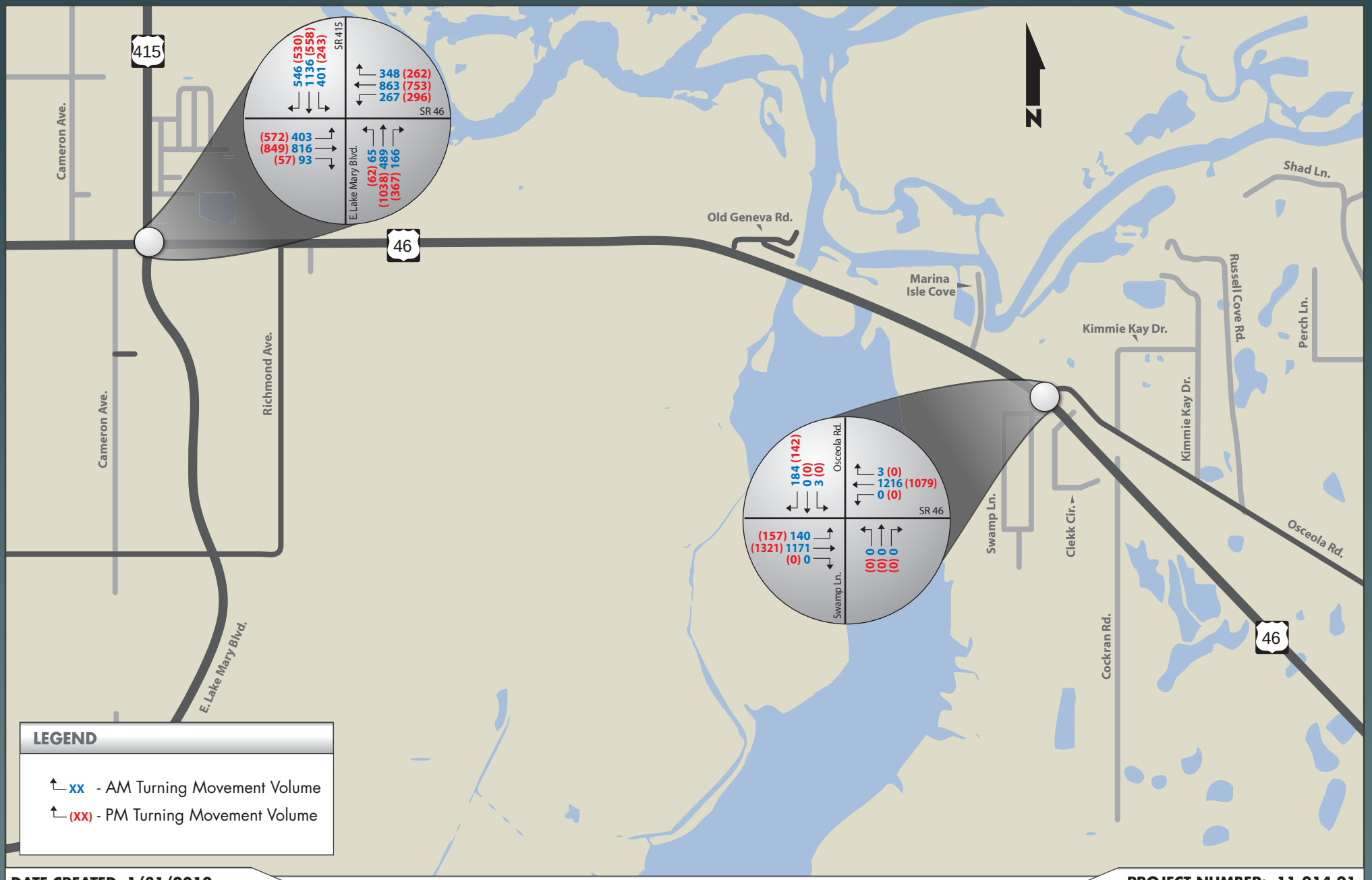

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FIGURE 10-1
Year 2035 Design Hour Turning Movement Volumes No Build - Subsection 1

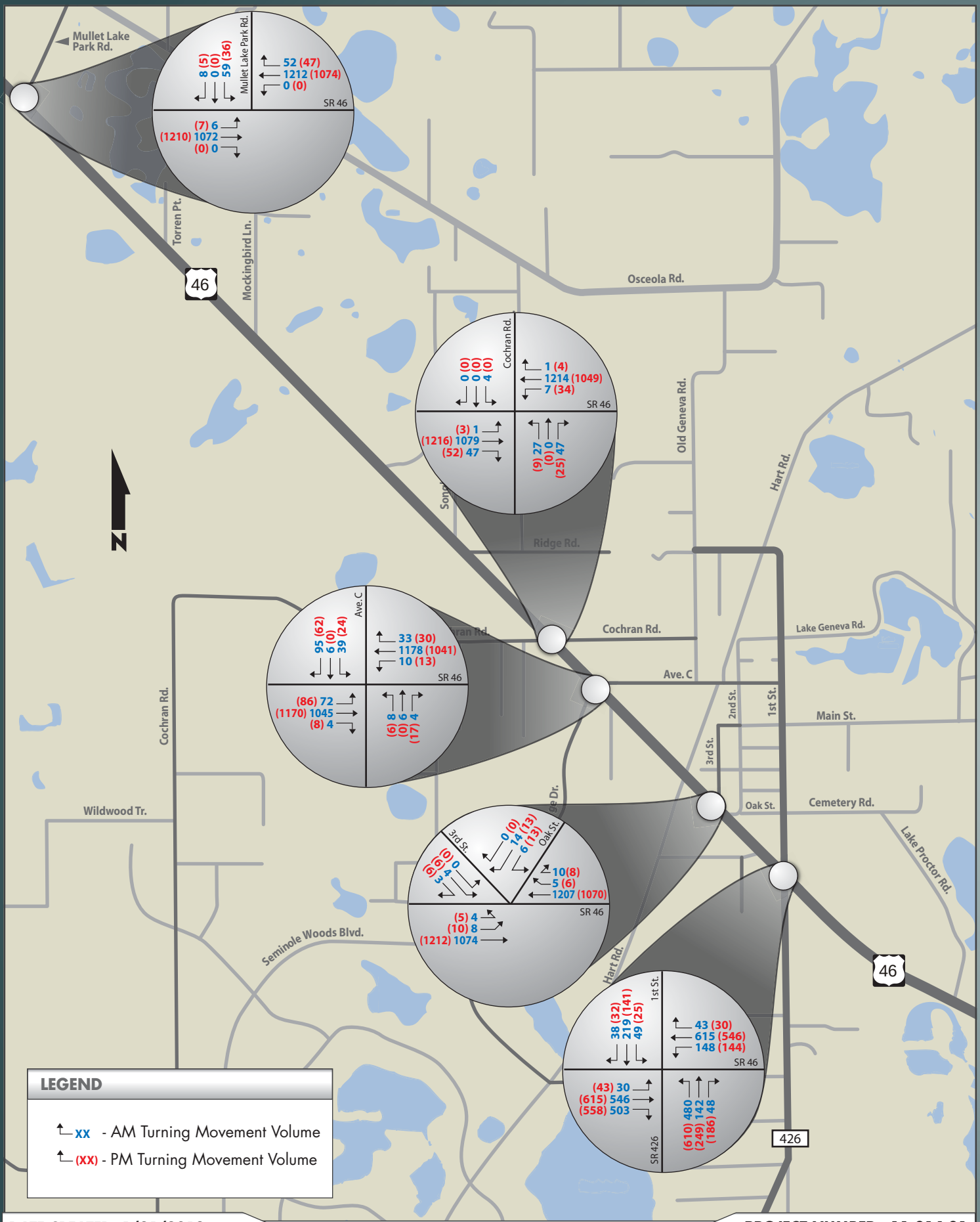

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FIGURE 10-2
Year 2035 Design Hour
Turning Movement Volumes
No Build - Subsection 2

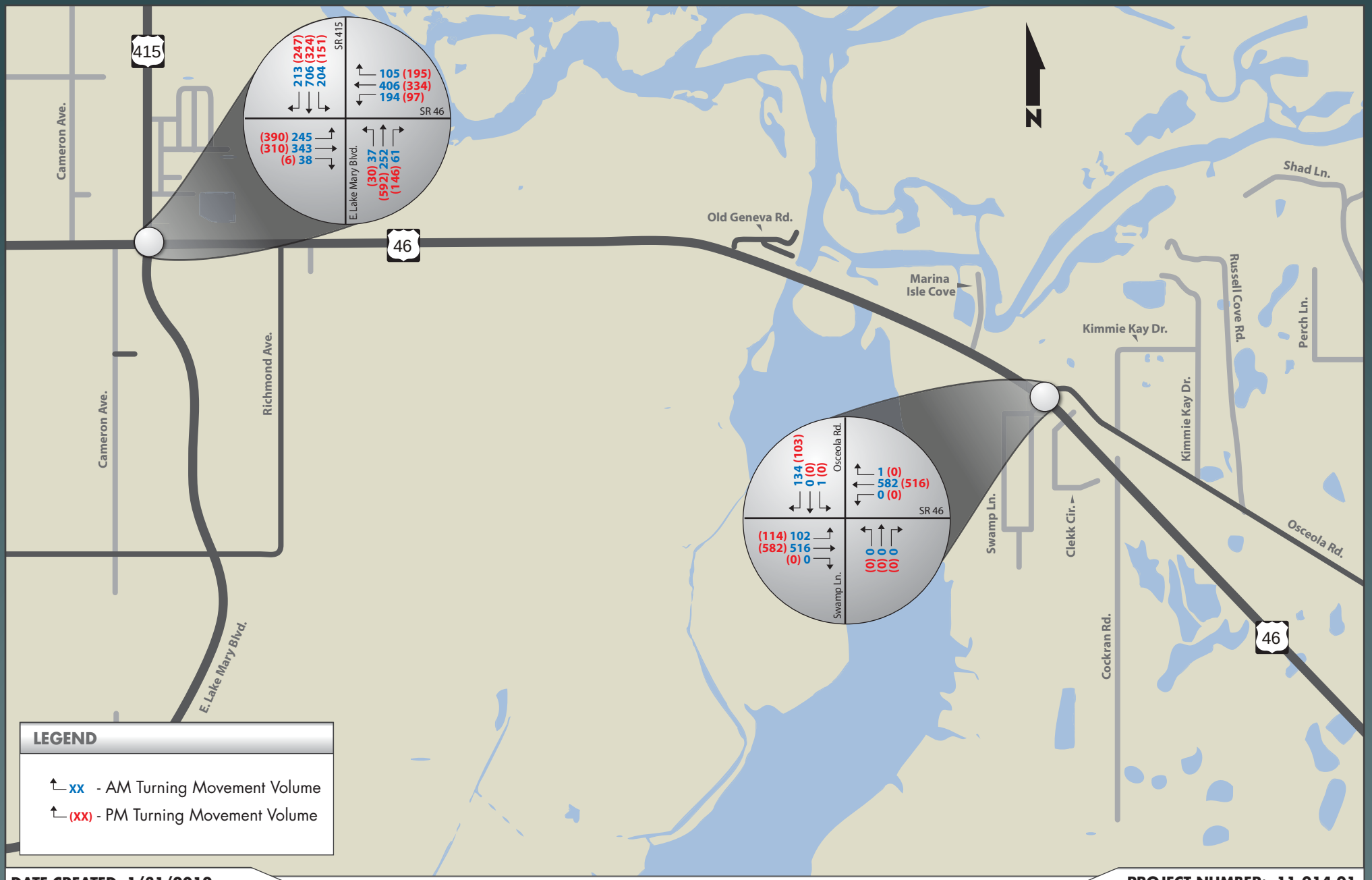

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FIGURE 11-1
Year 2015 Design Hour Turning Movement Volumes Build - Subsection 1

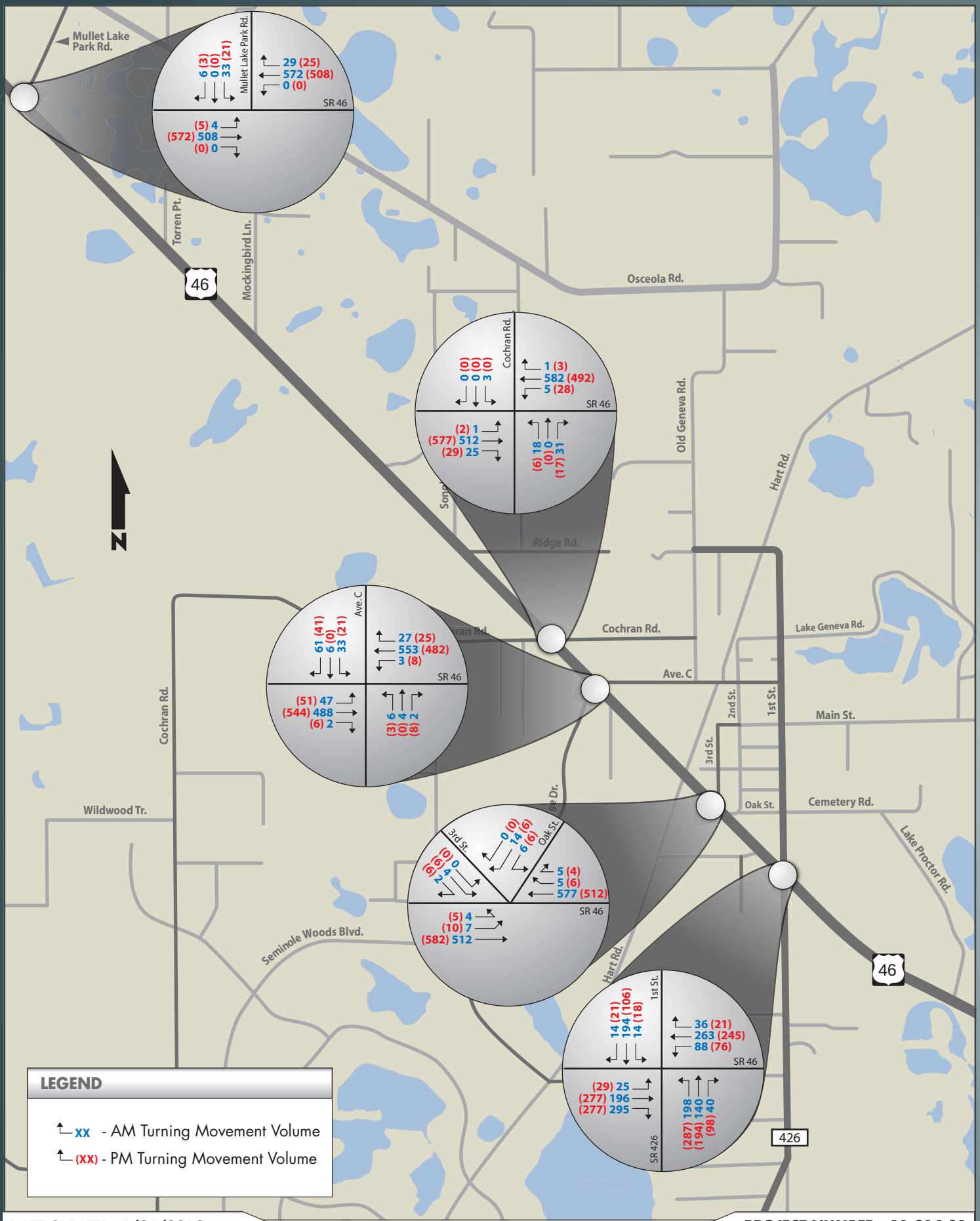

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FIGURE 11-2
Year 2015 Design Hour
Turning Movement Volumes
Build - Subsection 2

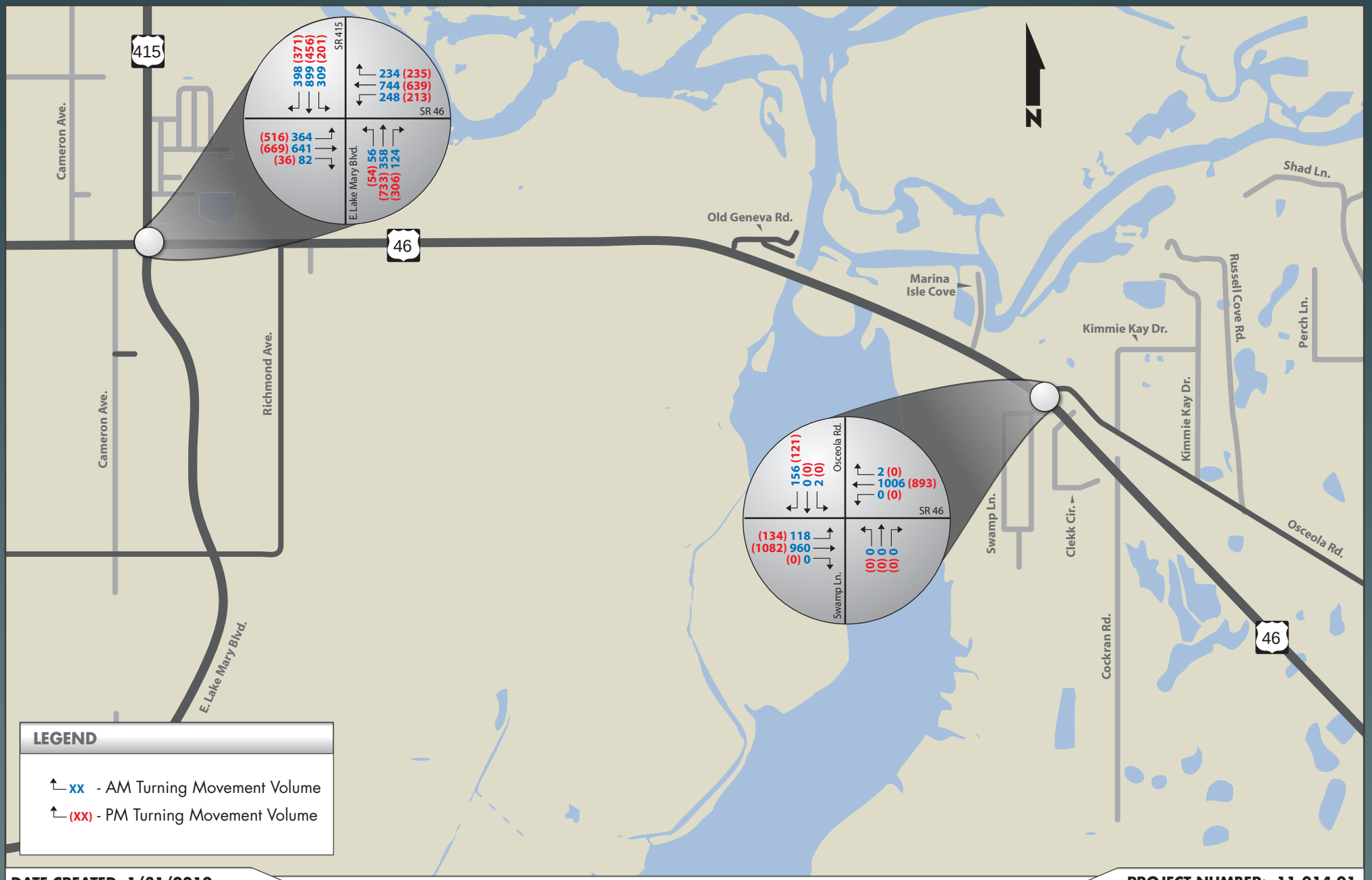

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FIGURE 12-1
Year 2025 Design Hour Turning Movement Volumes Build - Subsection 1

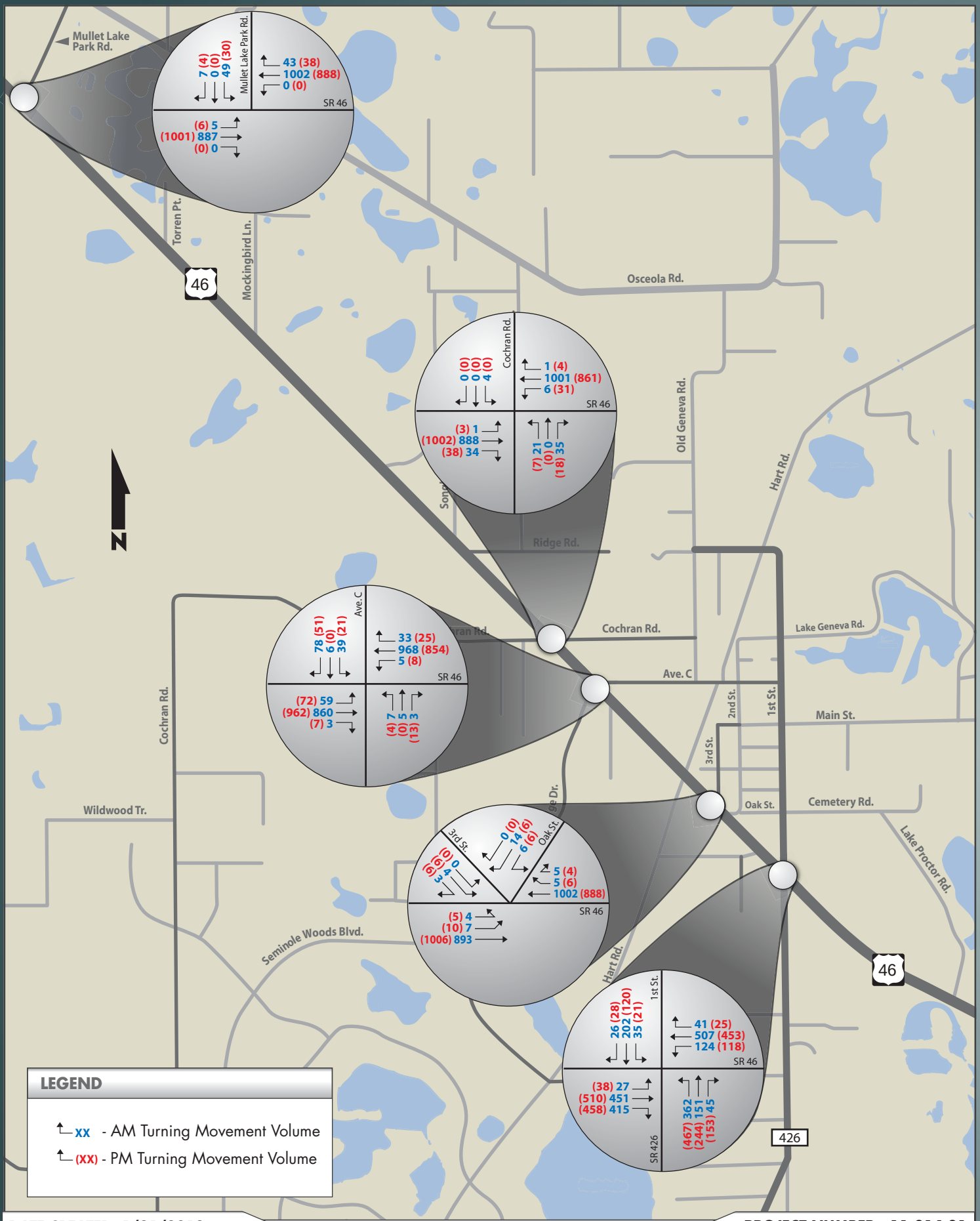

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FIGURE 12-2
Year 2025 Design Hour
Turning Movement Volumes
Build - Subsection 2

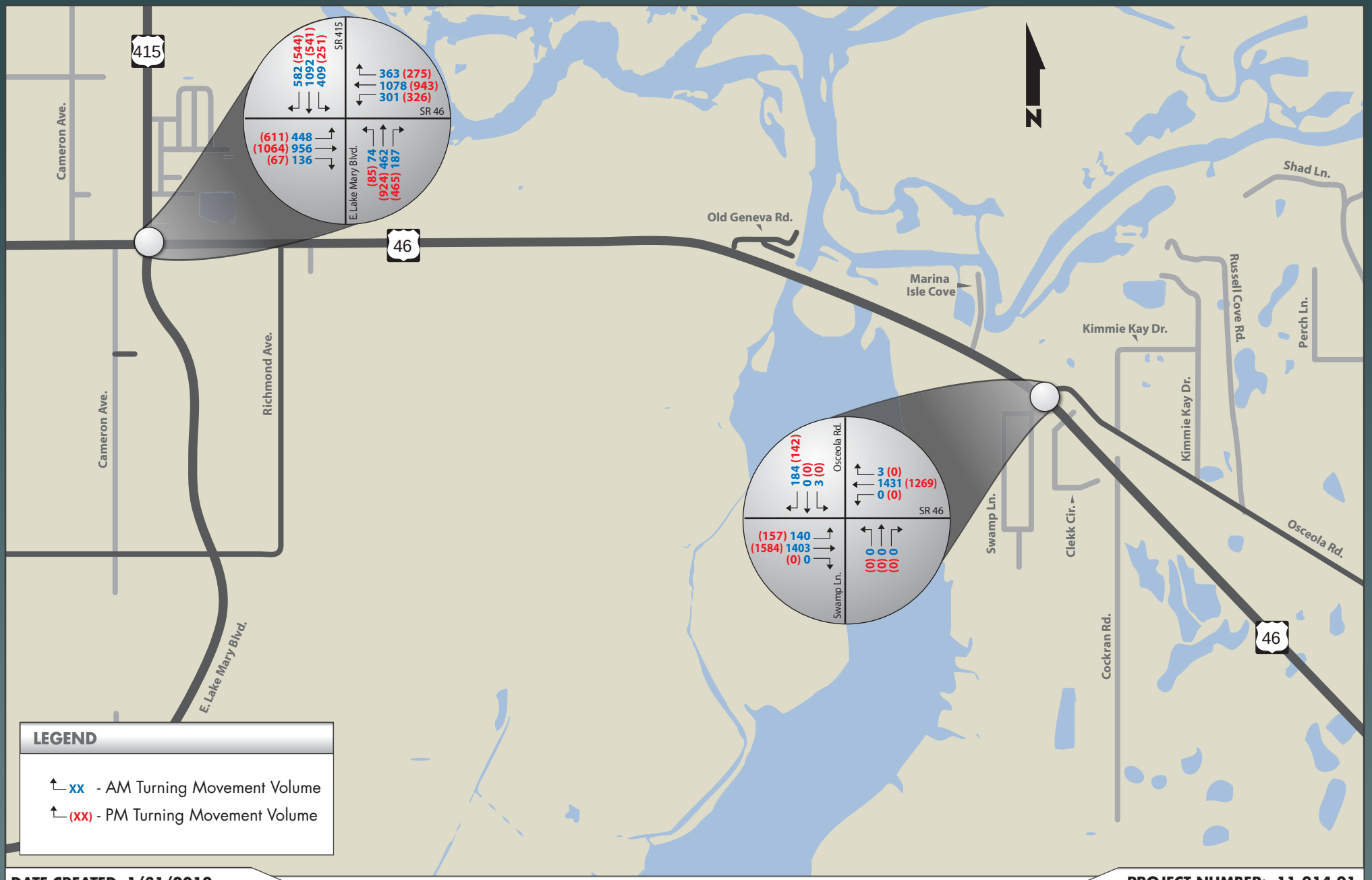

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FIGURE 13-1
Year 2035 Design Hour Turning Movement Volumes Build - Subsection 1

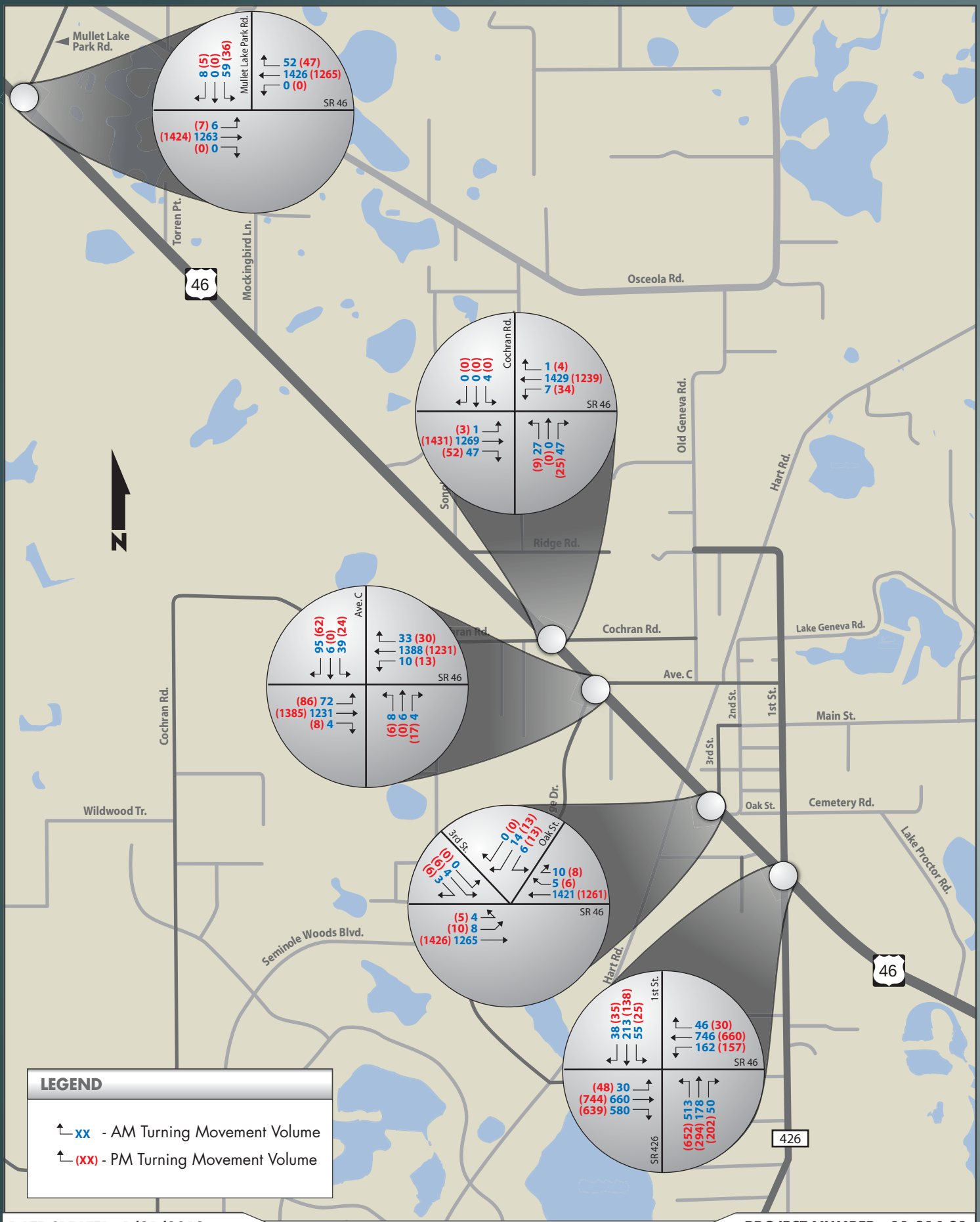

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FIGURE 13-2
Year 2035 Design Hour
Turning Movement Volumes
Build - Subsection 2

6. Future Operational Analysis

This section presents the results of the LOS operational analysis for the No Build and Build Alternatives. The Build Alternative was designed to examine how the four (4) lane widening of the SR 46 corridor and different geometric improvements at the study intersections would affect the traffic flow. The level of service for the study intersections was determined using the procedures as outlined in the Transportation Research Board's – Highway Capacity Manual (HCM 2000) using the Synchro software version 7. Specific analysis techniques utilized in the study include the signalized, unsignalized intersections and arterial analyses. Since Synchro calculates arterial LOS only between signalized intersections, the a.m. and p.m. peak hour peak direction volumes between the intersections were compared against the latest Generalized Peak Hour Directional Service Volumes (dated October 4, 2010) from 2009 FDOT Quality/Level Of Service Handbook to obtain the arterial LOS.

6.1 No Build Alternative Operational Analysis

6.1.1 No Build Geometry

The No Build geometry illustrated in **Figures 14-1** and **14-2** is the same as the existing roadway (2 lanes) and intersection geometry with the exception that it includes the programmed intersection improvements at SR 46 and SR 415/Lake Mary Boulevard beginning from the opening year 2015. The widening of SR 415 from SR 46 to the Volusia County line is programmed for construction in the FY 2011/2012 and the widening of SR 46 from Mellonville Avenue to SR 415 is programmed for construction in the FY 2015/2016.

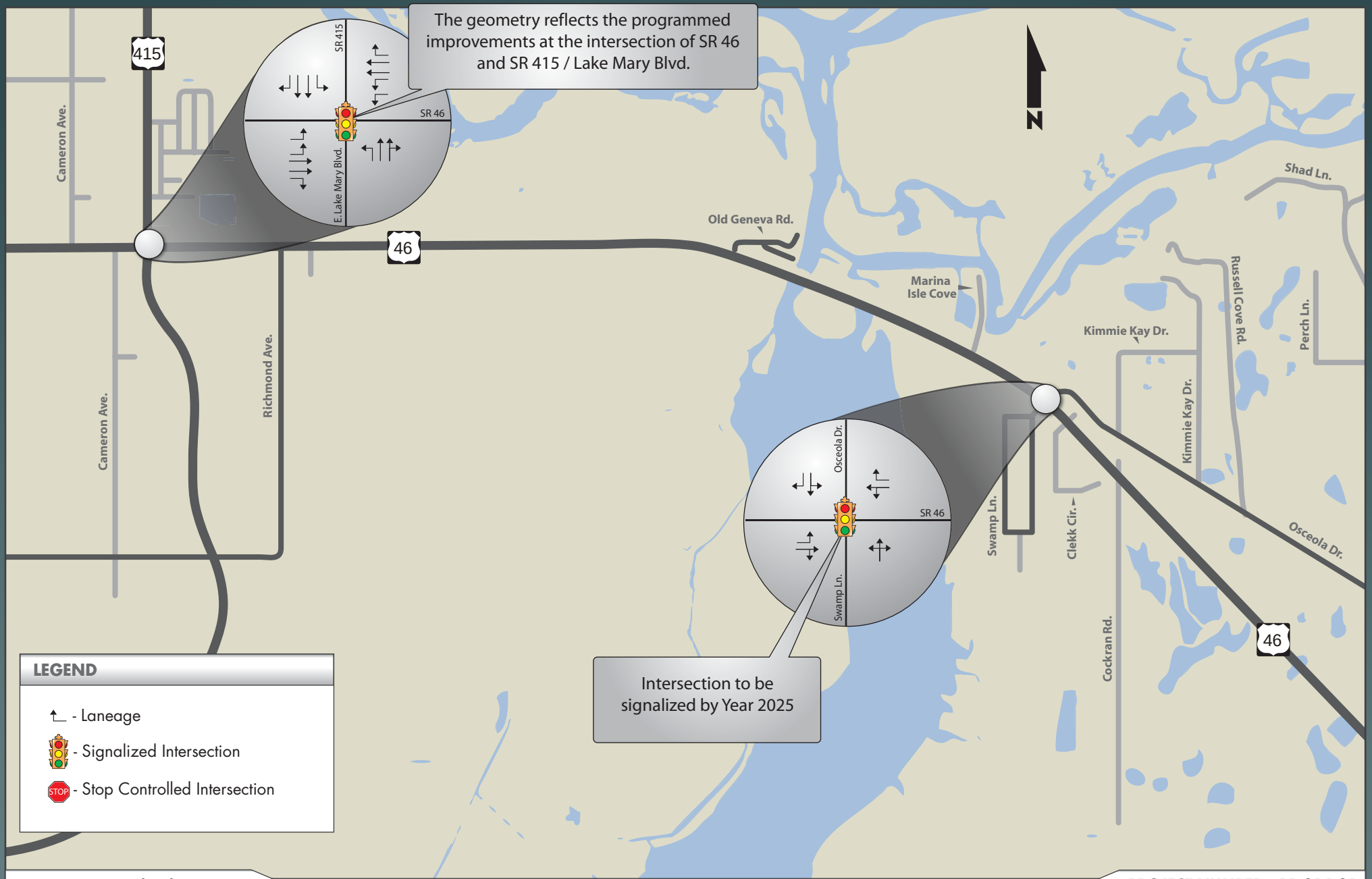

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FIGURE 14-1
No Build Geometry
Subsection 1

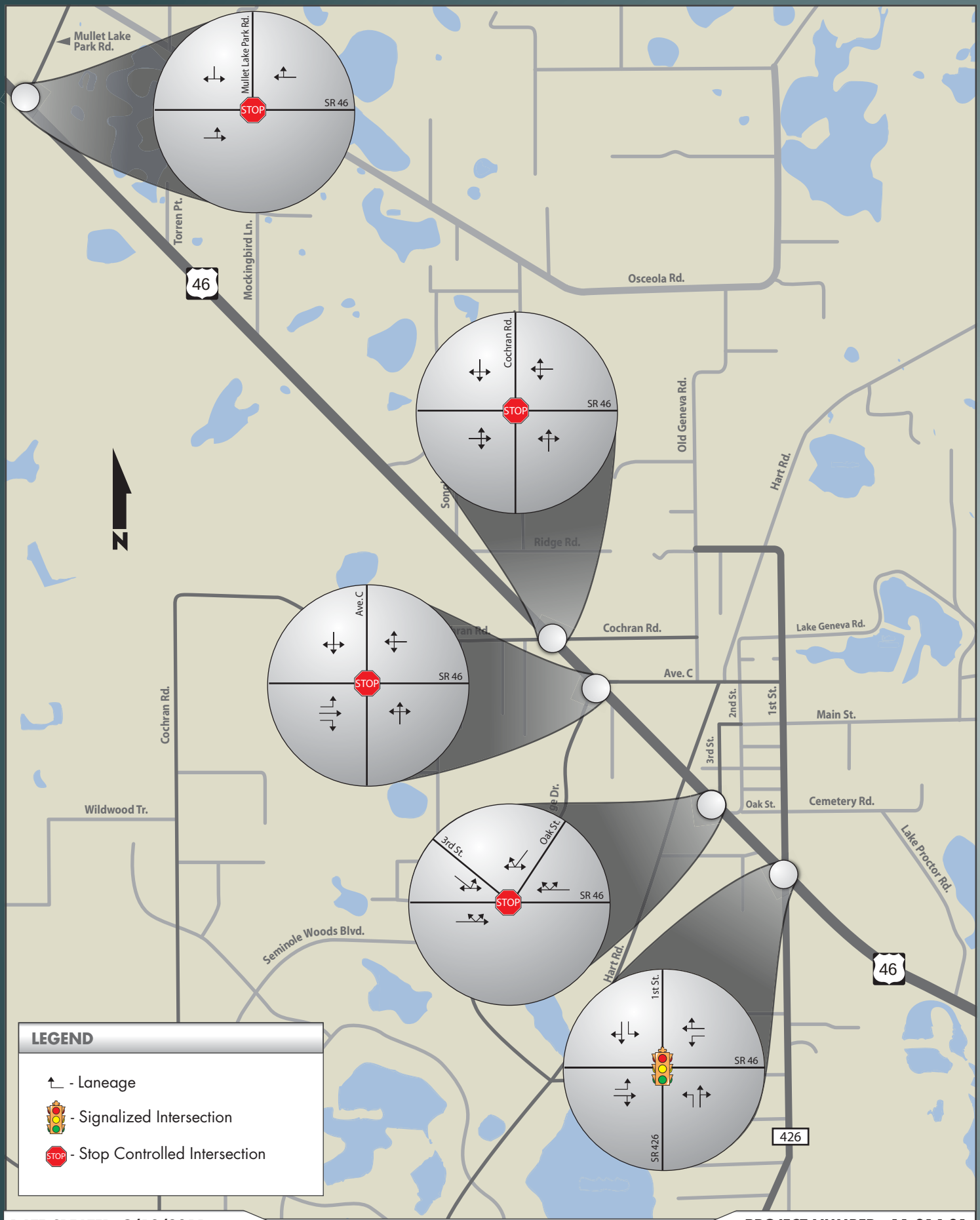

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FIGURE 14-2
No Build Geometry
Subsection 2

6.1.2 Signal Warrant Analysis for the No Build Alternative

The unsignalized intersections of SR 46 at Osceola Road, SR 46 at Mullet Lake Park Road, SR 46 at Cochran Road, SR 46 at Woodridge Drive/Avenue C, and SR 46 at Oak Street/3rd Street were evaluated for future signal requirements. The need for future signal requirements at these locations was evaluated using Signal Warrant 1A as specified in the Manual on Uniform Traffic Control Devices (MUTCD) 2009 Edition. Signal Warrant 1A is the Minimum Vehicle Volumes Warrant. It is to be noted, that the traffic volume threshold criterion for Signal Warrant 1B are substantially lower than those of Signal Warrant 1A and should be supported by delay data collected in the field to show that the intersection experiences excessive delay. Therefore, Warrant 1B was not used for Signal Warrant analysis for the future design years.

The future AADT volumes at these intersections were segregated using the same hourly percentages from the existing 72 or 24 hour tube counts to obtain the eight highest hourly volumes. Based on the condition that the posted speed limit along SR 46 is greater than 40 mph, the corresponding 70 percent volume criteria for signal warrant 1A was considered for all the unsignalized intersections.

- **SR 46 and Osceola Road:** The eastbound left turning movement was considered as the minor street approach and the westbound approach was considered as the major street approach for the purpose of signal warrant 1A at this intersection. Based on the signal warrant analysis, this intersection did not meet the 70% volume criteria for seven of the eight hours required for the minor street approach volumes during the opening year 2015. However, the intersection traffic volumes met the 70% volume criteria for all the required eight hours for the major and minor street approach volumes during the mid design year 2025 and the design year 2035.

- **SR 46 and Mullet Lake Park Road:** The traffic volume in the southbound approach was considered for the purpose of signal warrant 1A at this intersection. Based on the signal warrant analysis, this intersection did not meet the 70% volume criteria for any of the required eight hours for the side street volumes during the design year 2035.

- **SR 46 and Cochran Road:** Since the traffic volume in the eastbound approach is anticipated to be significantly larger than the traffic volume in the westbound approach, the traffic volume in the eastbound approach was considered for the purpose of signal warrant 1A. Based on the

signal warrant analysis, this intersection did not meet the 70% volume criteria for any of the required eight hours for the side street volumes during the design year 2035.

- **SR 46 and Woodridge Drive/Avenue C:** Since the traffic volume in the westbound approach (along Avenue C) is anticipated to be significantly larger than the traffic volume in the eastbound approach (along Woodridge Drive), the traffic volume along Avenue C (the westbound approach) was considered for the purpose of signal warrant 1A. Based on the signal warrant analysis, this intersection only meet the 70% volume criteria for two hours of the required eight hours for the side street volumes during the design year 2035.

- **SR 46 and 3rd Street/ Oak Street:** The 24 hour percentages for the southbound approach were not available when this report was prepared. Therefore, it was assumed that the minor approach 24 hour volume percentages at this intersection would be consistent with those of the minor approach at the intersection of SR 46 and Woodridge Drive/Avenue C. The traffic volume in the southbound approach was considered for the purpose of signal warrant 1A at this intersection. Based on the signal warrant analysis, this intersection did not meet the 70% volume criteria for any of the required eight hours for the side street volumes during the design year 2035.

The anticipated traffic volumes during the design year 2035 did not meet the 70% criteria for signal warrant 1A at any of the unsignalized intersections along the SR 46 corridor with the exception of the intersection of SR 46 and Osceola Road. The intersection of SR 46 and Osceola Road met the 70% criteria for signal warrant 1A starting in the mid design year 2025, therefore it was analyzed as a traffic signal controlled intersection for the years 2025 and 2035 No Build Alternative conditions. The other four unsignalized intersections were analyzed under a stop control during the opening, mid and design years for the No Build Alternative. The signal warrant sheets are provided in **Appendix M** of this report.

6.1.3 Intersection Operational Analysis – No Build Alternative

Intersection operational analyses were performed for the opening, mid-design and design years for the No Build Alternative for the a.m. and p.m. design hours. The results of the intersection analysis are summarized in **Table 16**. The Synchro Intersection Analysis Outputs for the No Build Alternative can be found in **Appendix N**.

Table 16: Future Intersection LOS Summary – No Build Alternative

Study Intersection	Traffic Control	Adopted LOS	YR 2015		YR 2025		YR 2035	
			Delay	LOS	Delay	LOS	Delay	LOS
AM Peak Hour								
SR 46 @								
SR 415/Lake Mary Blvd	Signal	D	31.0	C	42.9	D	**80.7**	**F**
Osceola Rd	Stop	C	9.2/15.9	A/C	11.1	B	23.7	C
Mullet Lake Park Rd	Stop	C	**0.1/26.0**	**A/D**	**0.2/153.4**	**A/F**	**0.5/1,221.3**	**A/F**
Cochran Rd	Stop	C	**0.1/26.7**	**A/D**	**0.2/76.5**	**A/F**	**0.7/464.1**	**A/F**
Woodridge Dr/Ave C	Stop	C	**8.9/27.7**	**A/D**	**10.5/201.4**	**B/F**	**13.1/1,055.2**	**B/F**
3rd St/Oak St	Stop	C	0.3/20.4	A/C	**0.5/44.0**	**A/E**	**1.4/129.2**	**A/F**
CR 426/1st St	Signal	C	20.9	C	**55.1**	**E**	**159.1**	**F**
PM Peak Hour								
SR 46 @								
SR 415/Lake Mary Blvd	Signal	D	39.0	D	**78.9**	**E**	**147.0**	**F**
Osceola Rd	Stop	C	9.0/13.2	A/B	10.2	B	**38.5**	**D**
Mullet Lake Park Rd	Stop	C	0.1/24.6	A/C	**0.2/95.9**	**A/F**	**0.7/724.8**	**A/F**
Cochran Rd	Stop	C	0.9/16.3	A/C	**1.3/35.8**	**A/E**	**3.0/146.6**	**A/F**
Woodridge Dr/Ave C	Stop	C	8.7/19.6	A/C	**10.1/66.0**	**B/F**	**12.1/695.9**	**B/F**
3rd St/Oak St	Stop	C	0.4/18.4	A/C	**0.7/42.2**	**A/E**	**1.8/203.6**	**A/F**
CR 426/1st St	Signal	C	21.4	C	**71.6**	**E**	**183.3**	**F**

Notes:

1. HCM based outputs are presented in this table for both the signalized and unsignalized intersections.
2. Overall intersection delay and LOS results are reported for signalized intersections.
3. In case of unsignalized intersections, worst case results (delay and LOS) are reported for movements in both the major and minor approaches.
4. Delay is presented in seconds/vehicle.
5. The intersection of SR 46 and Osceola Road was analyzed as a traffic signal controlled intersection starting in the mid design year 2025.

- **Opening Year 2015 - AM & PM Design Hours**

As shown in Table 16, under the No Build Alternative, the following intersections are projected to operate below the adopted LOS standard during the 2015 traffic conditions.

- The minor street approach at SR 46 and Mullet Lake Park Road (a.m. design hour).
- The minor street approach at SR 46 and Woodridge Drive/Avenue C (a.m. design hour).
- The minor street approach at SR 46 and Cochran Road (a.m. design hour).

- **Mid-design Year 2025 - AM & PM Design Hours**

Under the No Build Alternative, the following intersections are projected to operate below the adopted LOS standard during the 2025 a.m. and p.m. design hours.

- SR 46 and SR 415/Lake Mary Boulevard (p.m. design hour).
- The minor street approach at SR 46 and Mullet Lake Park Road (a.m. and p.m. design hours).
- The minor street approach at SR 46 and Cochran Road (a.m. and p.m. design hours).
- The minor street approach at SR 46 and Woodridge Drive/Avenue C (a.m. and p.m. design hours).
- The minor street approach at SR 46 and 3rd Street/Oak Street (a.m. and p.m. design hours).
- SR 46 and CR 426/1st Street (a.m. and p.m. design hours).

- **Design Year 2035 - AM & PM Design Hours**

Under the No Build Alternative, the following intersections are projected to operate below the adopted LOS standard during the 2035 a.m. and p.m. design hours.

- SR 46 and SR 415/Lake Mary Boulevard (a.m. and p.m. design hours).
- SR 46 and Osceola Road (p.m. design hour).
- The minor street approach at SR 46 and Mullet Lake Park Road (a.m. and p.m. design hours).
- The minor street approach at SR 46 and Cochran Road (a.m. and p.m. design hours).
- The minor street approach at SR 46 and Woodridge Drive/Avenue C (a.m. and p.m. design hours).
- The minor street approach at SR 46 and 3rd Street/Oak Street (a.m. and p.m. design hours).
- SR 46 and CR 426/1st Street (a.m. and p.m. design hours).

In conclusion, all of the study intersections on the SR 46 study corridor are projected to operate below the adopted LOS standard by the year 2035. Furthermore, it is recommended that all the unsignalized intersections along the study corridor be revisited periodically in the future to determine if any of the signal warrants are satisfied. The actual determination of when these intersections will be signalized shall be based on actual traffic counts and other pertinent data required for signal warrant analysis.

6.1.4 Future Arterial LOS Analysis – No Build Alternative

FDOT has classified the study segment along SR 46 between SR 415/Lake Mary Boulevard and Richmond Avenue as an urban principal arterial (class 1) with a LOS standard "D". For the purpose of assessing the arterial LOS of this segment of SR 46, the generalized peak hour directional service volumes for the LOS letters "B" through "E" were obtained from Table 7 of the 2009 FDOT Quality/Level of Service Handbook and are shown below.

- LOS B – 510 VPH
- LOS C – 820 VPH
- LOS D – 880 VPH
- LOS E – 880 VPH

Furthermore, FDOT has classified the study segment along SR 46 between Richmond Avenue and CR 426 as a rural principal arterial with a LOS standard "C". For the purpose of assessing the arterial LOS of this segment of SR 46, the generalized peak hour directional service volumes for the LOS letters "B" through "E" were obtained from Table 9 of the 2009 FDOT Quality/Level Of Service Handbook and are shown below.

- LOS B – 240 VPH
- LOS C – 430 VPH
- LOS D – 740 VPH
- LOS E – 1,480 VPH

Tables 7 and 9 of the 2009 FDOT Quality/Level of Service Handbook are included in **Appendix F**.

As shown in **Table 17**, the SR 46 corridor from Richmond Avenue and CR 426, is projected to operate at a deficient LOS of "D" under the No Build alternative during the opening year 2015 directional design hour conditions. Furthermore, the entire SR 46 corridor from SR 415/Lake Mary Boulevard to CR 426/1st Street is anticipated to operate under unacceptable level of service during the mid design year 2025 and design year 2035 directional design hour conditions under the No Build alternative.

Table 17
SR 46 from SR 415/Lake Mary Boulevard to CR 426 - Design Traffic Report
Future Arterial LOS Analysis Summary – No Build Alternative

Roadway Segment on SR 46	Area Type	LOS Std.	Maximum Service Volume (MSV)	AADT	Standard "K" Factor	"D_{30}" Factor	Directional Design Hour Volumes (DDHV)	Arterial LOS	Adverse?
Opening Year - 2015									
West of SR 415/Lake Mary Boulevard	Urban	D	880	14,000	9.0%	53.0%	650	C	No
B/W SR 415/Lake Mary Boulevard and Richmond Avenue	Urban	D	880	14,000	9.0%	53.0%	650	C	No
Richmond Avenue and Osceola Road	Rural	C	430	14,000	9.0%	53.0%	650	D	Yes
B/W Osceola Road and Mullet Lake Park Road	Rural	C	430	11,500	9.0%	53.0%	550	D	Yes
B/W Mullet Lake Park Road and Woodridge Drive	Rural	C	430	12,000	9.0%	53.0%	550	D	Yes
West of CR 426	Rural	C	430	11,500	9.0%	53.0%	550	D	Yes
East of CR 426	Rural	C	430	7,700	9.0%	53.0%	350	C	No
Mid Design Year - 2025									
West of SR 415/Lake Mary Boulevard	Urban	D	880	22,500	9.0%	53.0%	1,100	F	Yes
B/W SR 415/Lake Mary Boulevard and Richmond Avenue	Urban	D	880	22,500	9.0%	53.0%	1,100	F	Yes
Richmond Avenue and Osceola Road	Rural	C	430	22,500	9.0%	53.0%	1,100	E	Yes
B/W Osceola Road and Mullet Lake Park Road	Rural	C	430	18,500	9.0%	53.0%	900	E	Yes
B/W Mullet Lake Park Road and Woodridge Drive	Rural	C	430	19,000	9.0%	53.0%	900	E	Yes
West of CR 426	Rural	C	430	18,500	9.0%	53.0%	900	E	Yes
East of CR 426	Rural	C	430	12,500	9.0%	53.0%	600	D	Yes
Design Year - 2035									
West of SR 415/Lake Mary Boulevard	Urban	D	880	31,000	9.0%	53.0%	1,500	F	Yes
B/W SR 415/Lake Mary Boulevard and Richmond Avenue	Urban	D	880	31,000	9.0%	53.0%	1,500	F	Yes
Richmond Avenue and Osceola Road	Rural	C	430	31,000	9.0%	53.0%	1,500	F	Yes
B/W Osceola Road and Mullet Lake Park Road	Rural	C	430	25,500	9.0%	53.0%	1,200	E	Yes
B/W Mullet Lake Park Road and Woodridge Drive	Rural	C	430	26,500	9.0%	53.0%	1,300	E	Yes
West of CR 426	Rural	C	430	25,500	9.0%	53.0%	1,200	E	Yes
East of CR 426	Rural	C	430	17,000	9.0%	53.0%	800	E	Yes

6.2 Build Alternative Operational Analysis

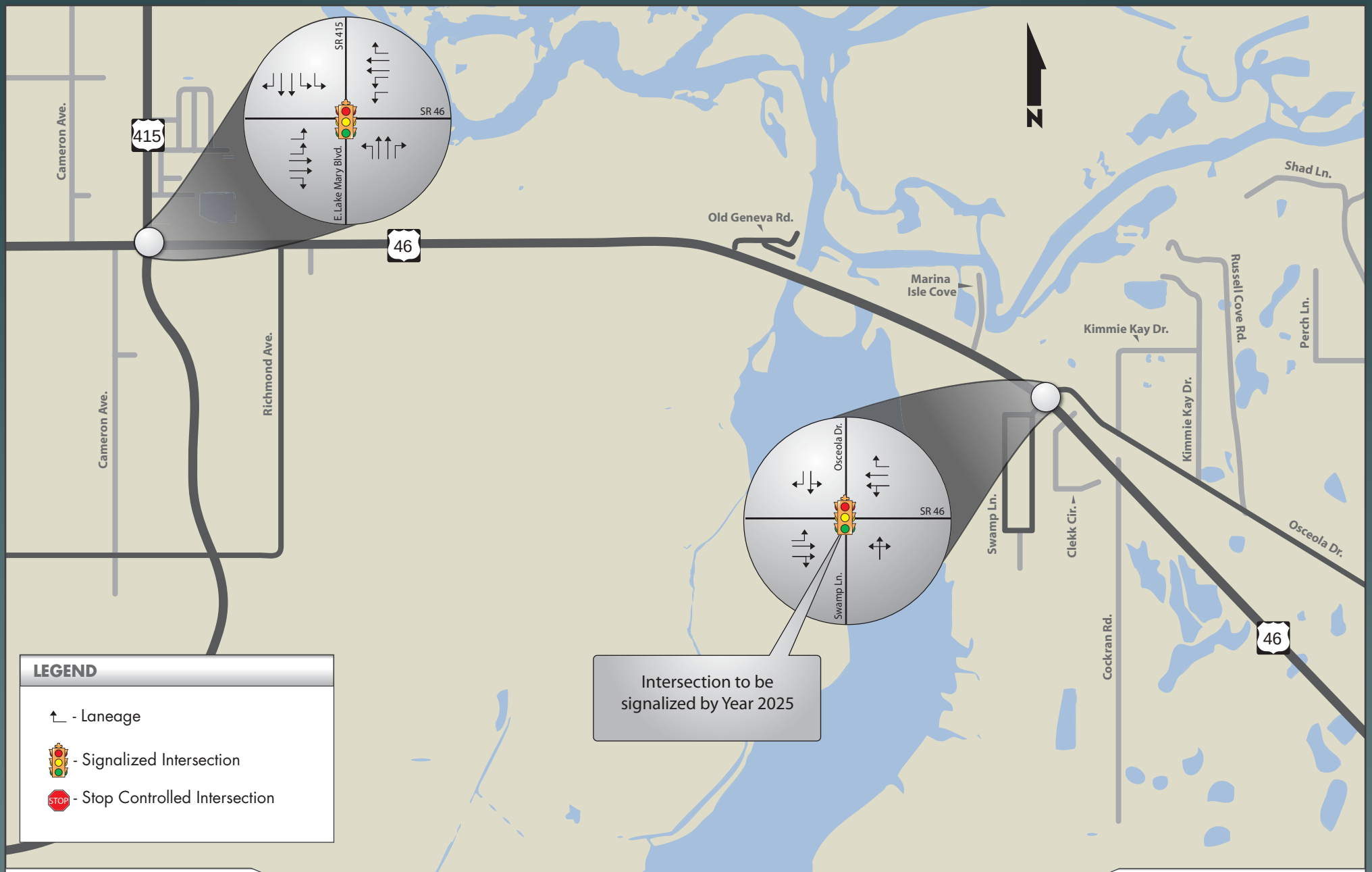
6.2.1 Build Alternative Geometry

The proposed build geometry for SR 46 from SR 415/Lake Mary Boulevard to CR 426/1st Street as shown in **Figures 15-1** and **15-2** includes an additional through lane in the eastbound and westbound directions and turn lane improvements as required to handle the projected traffic volumes. The proposed build geometry also includes the programmed intersection improvement at SR 46 and SR 415/Lake Mary Boulevard and additional turn lane improvements beginning from the opening year 2015. The widening of SR 415 from SR 46 is programmed for construction by FY 2011/2012 and the widening of SR 46 from Mellonville Avenue to SR 415 is programmed for construction by FY 2015/2016.

6.2.2 Signal Warrant Analysis for the Build Alternative

The unsignalized intersections of SR 46 at Osceola Road, SR 46 at Mullet Lake Road, SR 46 at Cochran Road, SR 46 at Woodridge Drive/Avenue C, and SR 46 at Oak Street/3rd Street were evaluated for future signal requirements. The need for future signal requirements at these locations was evaluated using Signal Warrant 1A as specified in the MUTCD 2009 Edition. It is to be noted, that the traffic volume threshold criterion for Signal Warrant 1B are substantially lower than those of Signal Warrant 1A and should be supported by delay data collected in the field to show that the intersection experiences excessive delay. Therefore, Warrant 1B was not used for Signal Warrant analysis for the future design years.

The future eight highest hours traffic volumes at these intersections were derived by multiplying the forecasted AADTs by the existing hourly profile percentages obtained from the 24 hour or 72 hour tube counts collected along the intersection approaches. Based on the condition that the posted speed limit along SR 46 is anticipated to be greater than 40 mph, the corresponding 70 percent volume criteria for signal warrant 1A was considered for all the unsignalized intersections.



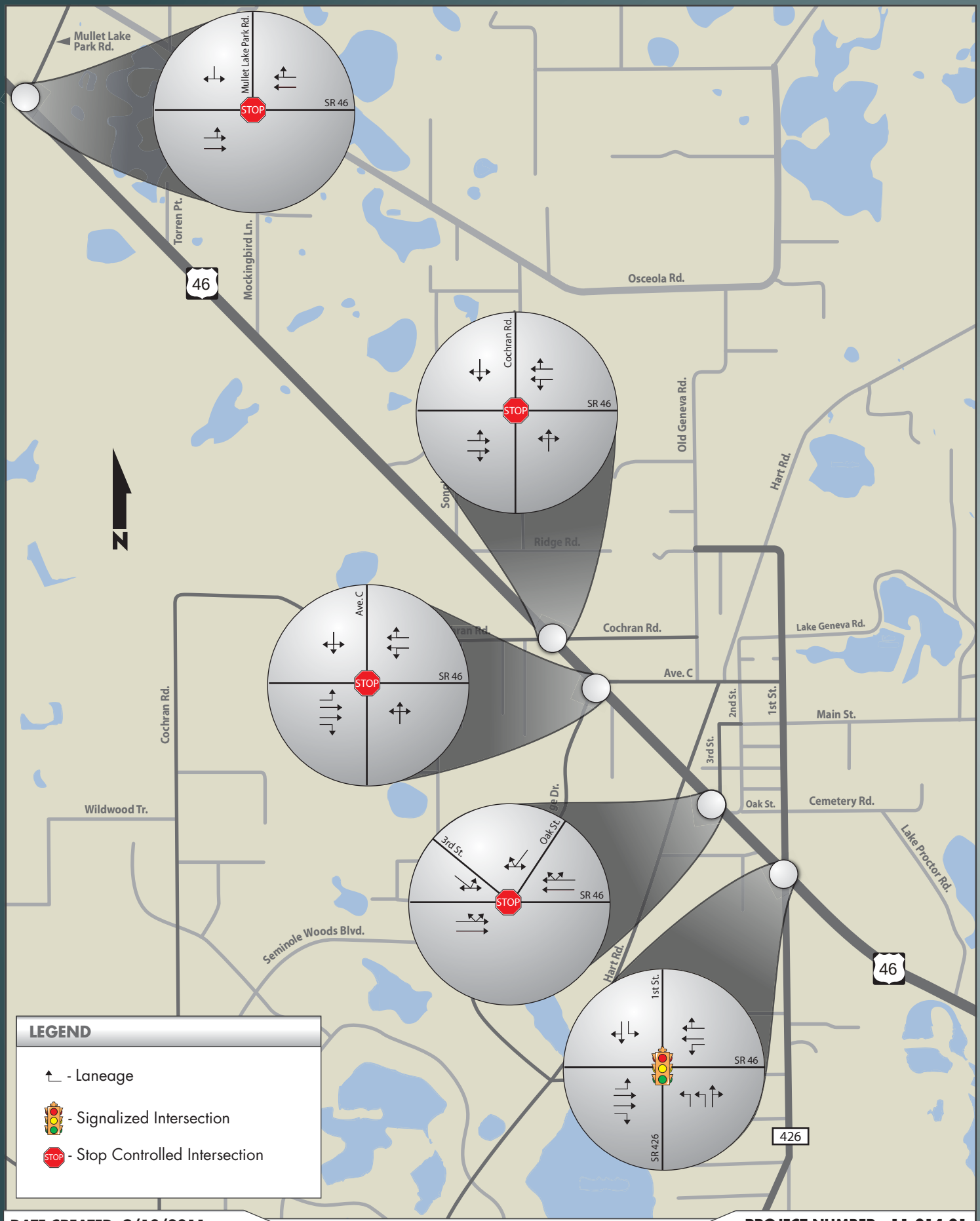
DATE CREATED: 9/13/2011

PROJECT NUMBER: 11-014.01

GMB ENGINEERS & PLANNERS, INC.
2602 East Livingston Street
Orlando, Florida 32803

Design Traffic for SR 46 PD&E
Financial Project ID: 240216-4-28-01

FIGURE 15-1
Build Geometry
Subsection 1



DATE CREATED: 9/13/2011

PROJECT NUMBER: 11-014.01

GMB ENGINEERS & PLANNERS, INC.
2602 East Livingston Street
Orlando, Florida 32803

Design Traffic for SR 46 PD&E

Financial Project ID: 240216-4-28-01

FIGURE 15-2
Build Geometry
Subsection 2

- **SR 46 and Osceola Road:** The eastbound left turning movement was considered as the minor street approach and the westbound approach was considered as the major street approach for the purpose of signal warrant 1A at this intersection. Based on the signal warrant analysis, this intersection did not meet the 70% volume criteria for six of the eight hours required for the minor street approach volumes during the opening year 2015. However, the intersection traffic volumes met the 70% volume criteria for all the required eight hours for the major and minor street approach volumes during the mid design year 2025 and the design year 2035.

- **SR 46 and Mullet Lake Park Road:** The traffic volume in the southbound approach was considered for the purpose of signal warrant 1A at this intersection. Based on the signal warrant analysis, this intersection did not meet the 70% volume criteria for any of the required eight hours for the side street volumes during the design year 2035.

- **SR 46 and Cochran Road:** Since the traffic volume in the eastbound approach is anticipated to be significantly larger than the traffic volume in the westbound approach, the traffic volume in the eastbound approach was considered for the purpose of signal warrant 1A. Based on the signal warrant analysis, this intersection did not meet the 70% volume criteria for any of the required eight hours for the side street volumes during the design year 2035.

- **SR 46 and Woodridge Drive/Avenue C:** Since the traffic volume in the westbound approach (along Avenue C) is anticipated to be significantly larger than the traffic volume in the eastbound approach (along Woodridge Drive), the traffic volume along Avenue C (the westbound approach) was considered for the purpose of signal warrant 1A. Based on the signal warrant analysis, this intersection only meet the 70% volume criteria for two hours of the required eight hours for the side street volumes during the design year 2035.

- **SR 46 and 3rd Street/Oak Street:** The 24 hour percentages for intersection at the southbound approach were not available when this report was prepared. Therefore, an assumption was made that the 24 hour percentages at this intersection would be consistent with those of the minor approach at the intersection of SR 46 and Woodridge Drive/Avenue C. The traffic volume in the southbound approach was considered for the purpose of signal warrant 1A at this intersection. Based on the signal warrant analysis, this intersection did not meet the 70%

volume criteria for any of the required eight hours for the side street volumes during the design year 2035.

The anticipated traffic volumes during the design year 2035 did not meet the 70% criteria for signal warrant 1A at any of the unsignalized intersections along the SR 46 corridor with the exception of the intersection of SR 46 and Osceola Road. The intersection of SR 46 and Osceola Road met the 70% criteria for signal warrant 1A starting in the mid design year 2025, therefore it was analyzed as a traffic signal controlled intersection for the years 2025 and 2035 Build Alternative conditions. The other four unsignalized intersections were analyzed under a stop control during the opening, mid and design years for the Build Alternative. The signal warrant sheets are provided in **Appendix M** of this report.

6.2.3 Intersection Operational Analysis – Build Alternative

Intersection operational analyses were performed for the opening, mid-design and design years for the Build Alternative for the a.m. and p.m. design hours. The results of the intersection analysis are summarized in Table 18. The Synchro Intersection Analysis Outputs for the Build Alternative can be found in **Appendix O**.

Table 18: Future Intersection LOS Summary – Build Alternative

Study Intersection	Traffic Control	Adopted LOS	YR 2015		YR 2025		YR 2035	
			Delay	LOS	Delay	LOS	Delay	LOS
AM Peak Hour								
SR 46 @								
SR 415/Lake Mary Blvd	Signal	D	33.3	C	48.3	D	**70.4**	**E**
Osceola Rd	Stop	C	9.4/15.0	A/B	7.6	A	10.0	B
Mullet Lake Park Rd	Stop	C	0.3/15.7	A/C	**0.3/31.7**	**A/D**	**0.5/94.4**	**A/F**
Cochran Rd	Stop	C	0.2/16.0	A/C	**0.3/26.5**	**A/D**	**0.5/47.4**	**A/E**
Woodridge Dr/Ave C	Stop	C	9.1/16.7	A/C	**11.5/29.2**	**B/D**	**15.7/87.2**	**C/F**
3rd St/Oak St	Stop	C	0.7/13.8	A/B	0.3/20.0	A/C	**2.5/32.0**	**A/D**
CR 426/1st St	Signal	C	18.3	B	19.0	B	24.7	C
PM Peak Hour								
SR 46 @								
SR 415/Lake Mary Blvd	Signal	D	33.6	C	46.2	D	**68.1**	**E**
Osceola Rd	Stop	C	9.2/11.1	A/B	6.7	A	8.6	A
Mullet Lake Park Rd	Stop	C	0.3/14.8	A/B	**0.3/25.2**	**A/D**	**0.5/50.0**	**A/E**
Cochran Rd	Stop	C	1.3/12.1	A/B	1.6/17.3	A/C	**3.0/27.6**	**A/D**
Woodridge Dr/Ave C	Stop	C	8.9/12.9	A/B	10.8/18.9	B/C	**14.2/35.7**	**B/E**
3rd St/Oak St	Stop	C	0.8/12.6	A/B	1.1/17.8	A/C	**2.2/29.2**	**A/D**
CR 426/1st St	Signal	C	16.0	B	18.1	B	25.5	C

Notes:

1. HCM based outputs are presented in this table for both the signalized and unsignalized intersections.
2. Overall intersection delay and LOS results are reported for signalized intersections.
3. In case of unsignalized intersections, worst case results (delay and LOS) are reported for movements in both the major and minor approaches.
4. Delay is presented in seconds/vehicle.
5. The intersection of SR 46 and Osceola Road was analyzed as a traffic signal controlled intersection starting in the mid design year 2025.

- **Opening Year 2015 - AM & PM Design Hours**

As shown in Table 18, under the Build Alternative, all the intersections are projected to operate at acceptable level of service conditions during the opening year 2015 a.m. and p.m. peak hours.

- **Mid-design Year 2025 - AM & PM Design Hours**

Under the Build Alternative, only the minor street approaches at two unsignalized intersections are projected to operate below the adopted LOS standard during the 2025 a.m. and p.m. design hours.

- The minor street approach at SR 46 and Mullet Lake Park Road (a.m. and p.m. design hours).
- The minor street approach at SR 46 and Cochran Road (a.m. design hour).
- The minor street approach at SR 46 and Woodridge Drive/Avenue C (a.m. design hour).

➢ **Design Year 2035 - AM & PM Design Hours**

Under the Build Alternative, the following intersections are projected to operate below the adopted LOS standard during the 2035 a.m. and p.m. design hours.

- SR 46 and SR 415/Lake Mary Boulevard (a.m. and p.m. design hours).
- The minor street approach at SR 46 and Mullet Lake Park Road (a.m. and p.m. design hours).
- The minor street approach at SR 46 and Cochran Road (a.m. and p.m. design hours).
- The minor street approach at SR 46 and Woodridge Drive/Avenue C (a.m. and p.m. design hours).
- The minor street approach at SR 46 and 3rd Street/Oak Street (a.m. and p.m. design hours).

In conclusion, the intersection of SR 46 and SR 415/Lake Mary Boulevard is anticipated to operate at an adverse level of service of "E" during the year 2035 (a.m. and p.m. peak hour) when compared against the FDOT adopted level of service standard of "D". However, Seminole County has an adopted level of service of "E" for this section of SR 46; therefore this intersection is anticipated to operate under acceptable conditions when compared against the County standards.

Seminole County adopted LOS standard for the side streets at the study unsignalized intersections is "LOS E". Therefore, only the intersections of SR 46 and Mullet Lake Park Rd (side street delay of 87.2 sec/veh) and SR 46 and Woodbridge Dr (side street delay of 94.4 sec/veh) display an adverse LOS of "F" (when compared against Seminole County LOS standards) during the Design Year 2035 a.m. peak hour conditions. It is to be noted that it is typical for unsignalized intersections to display an adverse LOS for the minor side streets and the delay displayed at these two intersections is not excessive. Therefore, additional minor improvements were not considered at the minor streets for the future Build condition analyses. Furthermore, the addition of the Build Alternative improvements at the SR 46 corridor intersections results in improved level of service conditions and reduced delay compared to the level of service conditions from the No Build Alternative.

6.2.4 Future Arterial LOS Analysis – Build Alternative

Based on the FDOT classification of SR 46 between SR 415/Lake Mary Boulevard and Richmond Avenue as an urban principal arterial (class 1) and the Build Alternative geometry (4 lanes), the following generalized peak hour directional service volumes for the LOS letters "B" through "E" were obtained from Table 7 of the 2009 FDOT Quality/Level Of Service Handbook for the purpose of assessing the arterial LOS of this segment of SR 46:

- LOS B – 1,560 VPH
- LOS C – 1,890 VPH
- LOS D – 1,960 VPH
- LOS E – 1,960 VPH

Furthermore, based on the FDOT classification of SR 46 between Richmond Avenue and CR 426 as rural principal arterial and the Build Alternative geometry (4 lanes), the following generalized peak hour directional service volumes for the LOS letters "B" through "E" were obtained from Table 7 of the 2009 FDOT Quality/Level Of Service Handbook for the purpose of assessing the arterial LOS of this segment of SR 46:

- LOS B – 1,410 VPH
- LOS C – 2,210 VPH
- LOS D – 2,800 VPH
- LOS E – 3,180 VPH

Tables 7 and 9 of the 2009 FDOT Quality/Level of Service Handbook are included in **Appendix F**.

As shown in **Table 19**, all the segments within the SR 46 corridor from SR 415/Lake Mary Boulevard to CR 426/1st Street are anticipated to operate at acceptable level of service conditions during the opening year 2015, mid design year 2025, and design year 2035 direction design hour conditions.

Table 19

SR 46 from SR 415/Lake Mary Boulevard to CR 426 - Design Traffic Report
Future Arterial LOS Analysis Summary – Build Alternative

Roadway Segment on SR 46	Area Type	LOS Std.	Maximum Service Volume (MSV)	AADT	Standard "K" Factor	"D_{30}" Factor	Directional Design Hour Volumes (DDHV)	Arterial LOS	Adverse?
Opening Year - 2015									
West of SR 415/Lake Mary Boulevard	Urban	D	1,960	15,000	9.0%	53.0%	700	B	No
B/W SR 415/Lake Mary Boulevard and Richmond Avenue	Urban	D	1,960	15,000	9.0%	53.0%	700	B	No
Richmond Avenue and Osceola Road	Rural	C	2,210	15,000	9.0%	53.0%	700	B	No
B/W Osceola Road and Mullet Lake Park Road	Rural	C	2,210	12,000	9.0%	53.0%	550	B	No
B/W Mullet Lake Park Road and Woodridge Drive	Rural	C	2,210	12,500	9.0%	53.0%	600	B	No
West of CR 426	Rural	C	2,210	12,500	9.0%	53.0%	600	B	No
East of CR 426	Rural	C	2,210	8,200	9.0%	53.0%	400	B	No
Mid Design Year - 2025									
West of SR 415/Lake Mary Boulevard	Urban	D	1,960	25,500	9.0%	53.0%	1,200	B	No
B/W SR 415/Lake Mary Boulevard and Richmond Avenue	Urban	D	1,960	25,500	9.0%	53.0%	1,200	B	No
Richmond Avenue and Osceola Road	Rural	C	2,210	25,500	9.0%	53.0%	1,200	B	No
B/W Osceola Road and Mullet Lake Park Road	Rural	C	2,210	21,000	9.0%	53.0%	1,000	B	No
B/W Mullet Lake Park Road and Woodridge Drive	Rural	C	2,210	22,000	9.0%	53.0%	1,000	B	No
West of CR 426	Rural	C	2,210	21,000	9.0%	53.0%	1,000	B	No
East of CR 426	Rural	C	2,210	14,000	9.0%	53.0%	650	B	No
Design Year - 2035									
West of SR 415/Lake Mary Boulevard	Urban	D	1,960	36,500	9.0%	53.0%	1,700	C	No
B/W SR 415/Lake Mary Boulevard and Richmond Avenue	Urban	D	1,960	36,500	9.0%	53.0%	1,700	C	No
Richmond Avenue and Osceola Road	Rural	C	2,210	36,500	9.0%	53.0%	1,700	C	No
B/W Osceola Road and Mullet Lake Park Road	Rural	C	2,210	30,000	9.0%	53.0%	1,400	B	No
B/W Mullet Lake Park Road and Woodridge Drive	Rural	C	2,210	31,000	9.0%	53.0%	1,500	C	No
West of CR 426	Rural	C	2,210	30,000	9.0%	53.0%	1,400	B	No
East of CR 426	Rural	C	2,210	20,000	9.0%	53.0%	950	B	No